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Cover photo:
Brisbane Airport Link Tunnel breakthrough — Courtesy of BrisConnections

Australasian Tunnelling Society is a Technical Society of Engineers Australia and affiliated with Australasian Institute of Mining and Metallurgy, the Institute of Professional Engineers New Zealand.

The ATS Journal is the official journal of the Australasian Tunnelling Society.

Chairmans Foreword

We held our 14th National Conference on the "Development of Underground Space" in Auckland during 8–9 March 2011. The Conference was very successful with over 300 delegates attending with a wide range of topics and disciplines covered. Aside from speakers and delegates from Australia and New Zealand there were speakers and attendees from North and South America, the European Union and Asia. Feedback on the conference has been overwhelmingly positive and the ATS Executive Committee will begin work shortly on organising the next one. We offer a really big thank you to Evan Giles and his organising committee and to AusIMM for managing the affair, well done.

Our State Groups continue to provide regular and varied technical sessions which many of you are attending and it is extremely pleasing to the Society that senior representatives from major companies are happy to share their expertise and time with our members.

The Executive Committee has been and will continue to focus on corporate governance and is working with Engineering Practice to develop revised Regulations and Guidelines for the ATS which will govern the Society going forward.

A small delegation of our members bid to host the 2014 World Tunnelling Congress at the ITA WTC in Helsinki in May and while it was extremely well received and commended for our very professional presentation by voting members, we were not successful. An informal vote by exhibitors had us in front. The bid was won by Brazil with the 2014 WTC to be held in Sao Paulo. We will be looking closely at whether we put forward a bid to host a future Congress. The support provided by Business Events Sydney to the ATS in putting forward our bid for the WTC 2014 was very professional and impressive.

The David Sugden Award was presented to the winner Ritesh Mhajan at the Australian night in Helsinki in May. Since then, the ATS was sad to learn that David passed away in July 2011 after a long and prestigious career.

Simon Knight – Chairman

EDITOR'S NOTE

I hope you enjoy this edition of the ATS Journal.

It is exciting to see that there are so many tunnelling projects happening in Australia and NZ. Please feel free to send me any articles you would like me to publish. Remember this is your journal. I am also excited to see how many tunnel refurbishment projects are happening particularly in NZ and the UK.

We are keen to hear whether you, the members, are happy with the current format of the journal and have included a feed back form at the back of this journal, you may also go to our website and fill in the feedback form there. If there is something more that you wish to see in the journal, please let us know.

You are also invited to submit adverts in the journal.

I look forward to hearing from you.

David Lees
ATS Journal
Editor

THE DAVID SUGDEN YOUNG ENGINEERS WRITING AWARD 2012

SPONSORED BY ATS

Win a chance to attend the 2013 ITA World Tunnel Congress in Geneva, Switzerland with accommodation

- The competition is open to all ATS Members and University Students under 35 years of age (as at 30 June, 2012)
- The task is to write a technical paper on any subject related to tunnelling and underground construction — not less than 2,000 words and not more than 5,000 words.
- Best paper to be judged by the ATS Executive Committee.
- Closing date 30th June 2012
- Winner announced by 31 August, 2012
- The prize includes complimentary conference registration fees and $2,000 towards personal travel and accommodation costs at the ITA World Tunnel Congress to be held in Geneva, Switzerland from 10–17 May 2013.

The winner may also have the opportunity to join the ATS Executive Committee as the Young Engineers Representative.

For more information contact Sheryl Harrington at the ATS Secretariat
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Brisbane's Airport Link

Tunnelling complete

In February 2011 'Rocksy', the first of two massive Tunnel Boring Machines (TBMs) working on the Airport Link project, broke through into the enormous 23 metre wide purpose built cavern deep underground at Wooloowin, marking the half way point of its 2.5 kilometre journey to Lutwyche.

Thiess John Holland Project Director Gordon Ralph congratulated Rocksy's tunnelling team on this significant milestone.

'Sandy', Airport Link's second Tunnel Boring Machine (TBMs) joined her sister 'Rocksy' breaking through into the Wooloowin cavern in March. Since tunnelling first began on the project at Windsor in March 2009, over nine kilometres of tunnelling had been completed, with over 3.2 kilometres of the permanent tunnel lining installed.

Premier Anna Bligh joined tunnelling crews in July at the final breakthrough when the two TBMs finally came to the end of their 2.5km underground journey, less than a year after setting out,

The Premier said the end of all major tunnelling was a significant milestone for the Airport Link projects. "The tunnellers have been working day and night underground on the projects for the last two years. They've made an extraordinary contribution to this vital project and they should be proud of a job well done," the Premier said.

'Sandy' broke through just after midday on 6th July and work began immediately to dismantle her cutterhead – and that of the first TBM to finish 'Rocksy'.

Scheduled to be open in mid- 2012, these vital projects are now 80% complete with nearly 15 kilometres of tunnels and ramps excavated between Bowen Hills and Toombul. Once operational, the Airport Link will be the first major motorway connecting Brisbane's CBD with the airport, providing high speed underground travel and eliminating 18 sets of traffic lights.

The TBMs have travelled a combined total of five kilometres from Kalinga Park to Lutwyche, working for 14,000 hours. Over the last year, the TBMs have moved through varying ground conditions from very hard rock to mud-like conditions. Using approximately 900 cutting wheels, they have excavated over 1.25 million tonnes of spoil which was transported to Nudgee Road via a two kilometre overland spoil conveyor. A total of 22,000 pre-cast concrete segments were used to make up the rings that form the tunnel lining. Twenty million hours have been worked to date and the projects have surpassed their expected peak employment bringing the jobs total to more than 4,300. The projects are creating 12,000 direct and indirect jobs.

Inside the excavated tunnels, back-up work is progressing to construct the smoke ducts and tunnel cross passages. When this work is complete, focus will move to the installation of ventilation fans, traffic management devices and tunnel safety systems.

Rocksy and Sandy's cutterheads and shields were then disconnected from the rest of the machine for burial. The TBMs were lowered into a purpose built pits below the floor of the Airport Link tunnels on 21st July. The two burial pits measure 14.5 metres wide and 16.5 metres deep and required 2,500m3 of concrete pumped continuously over 24 hours to fully bury the machines.

Holes had been cut into sections of the shield to ensure the complete internal and external encasement of the machine. By encasing the machines in concrete, no ground water will be able to come into contact with the machine shields and cutterheads, eliminating any possible contamination.

The two TBMs were custom built for the Airport Link project and this solution reduced the complexity involved in removing the cutterheads, while avoiding the need for additional surface work in the Lutwyche area. The last 180 metres of each machine, containing the back up gantries and conveyor belts, will be removed after the front ends are concreted into the burial pits. Construction commenced in February on the two burial pits which are 14.5 metres wide and 16.5 metres deep.

Now activity on the project transitions from tunnel excavation, the focus will move to providing connectivity between the tunnels and the existing road network. Improved connectivity for local communities will also be delivered through new pedestrian pathways and community parks and green space.

When Airport Link opens in mid-2012 it will be the first major motorway connecting Brisbane city with the airport and northern suburbs. It will improve travel times, providing six new lanes for drivers between Bowen Hills and Kedron and four new lanes between Kedron and Toombul.

The project, which is being designed and constructed by Thiess John Holland, along with the Northern Busway (Windsor to Kedron) and the Airport Roundabout Upgrade, is part of a massive $4.8 billion infrastructure investment on Brisbane's Northside.

Airport Link TBM — Fast Facts

- Model: Earth Pressure Balance
- Cutterhead diameter:12.48 metres (largest machines ever used in Australia)
- Weight: 3,600 tonnes
- Length:195 metres long, slightly longer than Suncorp Stadium playing field
- Cost: $45 Million and took 12 months to build and a further 3 months to assemble at Toombul.
- Cutterhead contains up to 80 x 17 inch cutters made of hardened steel
- Approx. 22 workers to operate a TBM
- Travels up to 55m below the surface
- Equipped to install full- circle concrete tunnel lining during excavation

Drive the Airport Link, before it's completed

From June 2011, motorists can sit at their computers and take a simulated test drive of the many trips possible from 55 entries and exits along the 6.7 kilometre, $4.8 billion Airport Link tunnel.

The Airport Link will connect the Clem7 and Inner City Bypass to Gympie, Stafford and Sandgate roads, along with the East West Arterial Road. From the East West Arterial Road, motorists can then drive to Brisbane Airport and Australia TradeCoast.

BrisConnections chief executive Ray Wilson described the new drive-through as a unique "frustration saver". "The simulations are incredibly realistic allowing motorists to navigate and experience the road as if they were driving it for real," Dr Wilson said. "Our unique frustration saver device also shows how many traffic lights, school zones and other congestion points motorists will avoid by using Airport Link. The technology we have used to create the simulations really is world-class. We wanted to create user-friendly and authentic experience for motorists to get to know Airport Link before using it."

Dr Wilson said the drive-through was for drivers to get used to choosing the right lane and how and when to enter the toll tunnel. "We want motorists to be comfortable with the road, familiarise themselves with the entry and exit points, signage, what lane to be in and get a better understanding of just how much time they will save on their journey, particularly during peak-hour traffic," he said.

Leighton Holdings braces for $4.2 billion airport tunnel project loss

Leighton Holdings has written $470 million off against its Airport Link toll tunnel project, and will make a large loss on the $4.2 billion project.

The big construction company said problems with airport link, including vastly underestimated design costs and materials, would slash its overall net profit by $329 million.

It also blamed Brisbane's long wet summer and January's flood for increasing costs as well as difficulties coordinating its construction at the Lutwyche Road end of the project with the Clem 7 under-river tunnel, which had caused it significant delays and cost as much as $50 million.

The group, whose subsidiaries Thiess and John Holland are building Airport Link, said the wet weather had ''severely hampered progress.

It had also struck more difficult and variable ground conditions in some areas, which had slowed tunnelling. Meanwhile, the design of the complex project had taken twice as long as originally expected and the reinforcing steel and concrete required had been significantly underestimated in its original tender.

Rush to finish

The builders of Brisbane's Airport Link toll tunnel have pulled out all stops to try to get it finished on schedule with about 1200 more workers currently employed on the project than originally forecast.

Ray Wilson, the managing director of Brisconnections, said the workforce employed on the project had hit 4200 "against the 3000 originally estimated at peak construction".

Leighton would face "liquidated damages" that would cover Brisconnections' debt-servicing obligations if the project was to run late.

Mr Wilson said there were already about 1000 workers "underground, and the number will rise to about 2000 as the mechanical and electrical fit-out of the facility cranks up.There will be 500 to 600 electricians working underground," Mr Wilson said.

Once the tunnel is operational, Brisconnections will employ about 120 to 140 people. Most will be recruited closer to the mid-2012 opening.

At present, Mr Wilson said, the group was concentrating on refining a strategy to convince as many people as possible to use the Airport Link tunnel.

Investigation into quality of air in Brisbane's north

The state government is investigating silica levels in dust samples associated with the new $4.8 billion Airport Link tunnel and busway in Brisbane's north.

The Department of Environment and Resource Management confirmed the three-month trial after residents expressed concerns over silicate in the dust around their homes. It follows concerns raised with construction company Thiess John Holland earlier this year after the company's dust samples between November 16, 2010 and January 15, 2011 went missing.

"A monitoring program to check for particle levels will be done for a three-month period, after which a detailed analysis will be taken," a Department of Environment and Resource Management statement said.

Brisbane floods impact Cross River Rail design

A transport department spokesman confirmed Cross River Rail's emergency evacuation route near Fairfield Gardens Shopping Centre was likely to be shifted in the wake of January's flood.

The main southside evacuation route from Brisbane's proposed underground rail project was submerged under 10 metres of water in January's flood and would not have been protected by floodgates. The Cross River Rail project team conceded the design flaw after Tennyson councillor Nicole Johnston demanded they move the evacuation route.

If trains are stopped mid-tunnel somewhere, they would walk the relevant passengers back and out the tunnel at the point if there are any safety incidents anywhere. The emergency evacuation tunnel is under a 12-metre high building on a large triangular piece of land close to Fairfield Gardens Shopping Centre on Fairfield Road.

The emergency access at this proposed location would have affected by the flooding however this would have been sealed to prevent water entering the building, and in the extremely unlikely event of requiring an evacuation at the same time as a flood, the underground station at Boggo Road would be used to evacuate passengers.

Concerns were also raised over the fill to be added to the rail yards at Moorooka but experts said this would notresult in any local flooding.Flood modelling has shown the filling will not result in any increased flood inundation either from a local flood or the flood experienced in January. This flooding assessment will be released as part of the environmental impact statement later this year.

Legacy Way

The Legacy Way tunnel runs from Toowong and connects to the Inner City Bypass at Kelvin Grove, near Kelvin Grove Road.

To be built on the quiet

There would be no repeat of Airport Link's noisy Sunday surface works during the construction of the Legacy Way tunnel, Lord Mayor Graham Quirk has promised.

The Brisbane City Council says major construction work on the Legacy Way project will not cause the same disruption to residents as the Airport Link. The $1.5 billion 4.6-kilometre twin two-lane road tunnel will connect the Western Freeway at Toowong to the Inner City Bypass at Bowen Hills by 2014.

The Legacy Way project will have surface work from 6.30am to 6.30pm Monday to Saturday. However, underground tunnelling, expected to start in April 2012, will operate around the clock, seven days a week.

Queensland Ombudsman has criticised the Queensland government for failing to protect residents from excessive noise from the complex $4.8 billion Airport Link project.

The Transcity consortium includes Australian construction company BMD Construction, Spanish company Acciona and Italian firm Ghella.

Transcity must submit a half yearly audit report to the Coordinator-General to determine whether imposed conditions have been met. The council has offered air conditioning and double glazing for 34 property owners who have indicated they will be affected by Legacy Way project noise. "volumetric resumptions" have also been offered to residents in Milton, Paddington and Bardon where the tunnel goes beneath their homes. Brisbane City Council has paid an average of $5000 to each of 340 "volumetric resumption".

The 12.4-metre diameter tunnel boring machine arrives in Australia in early 2012 and will take about three months to be set up.

The initial works on site at Toowong are creating the "launch box" for the tunnel boring machines, which includes a large acoustic shed, which will cover much of the site beside the Centenary Highway near the Toowong Cemetery. Spill from the tunnel will be taken by conveyor belt behind the Botanical Gardens to the nearby Mt Coot-tha Quarry, removing "87,000 truck movements" from local roads.

Tunnel carpark 'too far'

The controversy over the location of a workers' carpark for the Legacy Way tunnel has become more complicated.

Construction, Forestry, Mining and Energy Union building and civil construction co-ordinator Bud Neiland said the union did not want workers walking more than 400m from the carpark, meaning a shuttle bus was required for all of the site options on the table.

"These workers will be doing 12-hour shifts underground in generally uncomfortable conditions," Mr Neiland said.

"It would be unacceptable to then ask them to walk any long distance to their vehicles," he said.

However, a Brisbane City Council spokesman said it would not require shuttle buses from the parking site options in Anzac Park or at the Mt Coot-tha Park and Ride. "Workers at Clem 7 and Airport Link have been required to walk between 400m and 700m from their vehicles to the construction site entrance and there were no requests for a bus shuttle," he said.

Geoff Murray from Friends of Anzac Park said tunnel operator Transcity's advice to the public on the five carpark options had failed to take into account the extra 380m from the main gates of the construction site to the change rooms and general muster area, where workers meet before each shift. "It means costings are out all over the place they have taken the most wildly optimistic figures and passed them on to council as fact without considering the commonsense factors," Mr Murray said

Encroachment on elite school

Brisbane Grammar School will lose part of one of its high-profile sports fields to let the Northern Link tunnel – now known as Legacy Way – connect to the Inner City Bypass.

The resumption of around 8100 square metres of land is one of the first major issues steps in order for Brisbane's new $1.7 billion tunnel to push ahead.

The land is needed to realign the Inner City Bypass towards the Brisbane Grammar School to allow the tunnel entrance to come up on the Victoria Park Road side of the Inner City Bypass. It is held by the school as a deed of grant in trust.

The school will be paid compensation for the land, with that cost already included in the $1.7 billion budget for the tunnel that was adopted by council last September. The project asks for 1200 square metres for the actual tollway, 3180 square metres for construction works and 1463 square metres for drainage around the tunnel entrance.

CLEM7 TUNNEL

BASF saved construction time on CLEM 7 Tunnel

When it comes to underground construction, the performance of the waterproofing solution used is of paramount importance, particularly if the project is being constructed under one of Australia's major rivers. The spray-applied polymer membrane provided by BASF sprayed concrete machine saved time and effort on the construction of the 3 billion Dollar Clem Jones 7 Tunnel (Clem 7) in Brisbane, Australia. The project was completed seven months ahead of schedule.

With a tunnel length of 4.8 km, at its lowest point Clem 7 runs approximately 70 meters below sea level, so the responsibility of supplying a water-tight tunnel installation was a real challenge.

"We were given a very short delivery time," says project director Adam Hudson for the Contractors and Baulderstone Bilfinger Berger Joint Venture (LBBJV), "beginning work in August 2006 and with a completion date for October 2010."

Whilst the original specification of a traditional sheet membrane system was initially utilized, the installation of the sheet system was proving a time-consuming exercise. This was particularly evident in areas such as the cross-passages linking the south-bound tunnel to the north-bound, where extensive detailing of the applied membrane was necessary.

A membrane system with a fast rate of application was required because the delays were hampering the fast-track construction program. The project's engineers needed to find a replacement waterproofing solution that was quick and easy to apply, while also being capable of providing the long-term waterproofing performance required.

Quick and easy

The ideal solution was found in a spray-applied polymer membrane from BASF Construction Chemicals. MASTERSEAL 345 delivered the required combination of outstanding waterproofing performance, with extremely fast application. Once trained in the application of the product, it was possible for the LBBJV crew of four to apply up to 2,000 square meters of complete membrane in a day.

The product was applied with one of BASF's MEYCO Piccola dry-mix sprayed concrete machines. These machines were already being utilized on site, so the infrastructure required to adapt it to spraying was minimal.

MASTERSEAL 345 is a single-component spray-applied powder product, which once applied, bonds layers of sprayed or cast concrete, offering a good bond strength on both sides of the membrane. When mixed automatically with water at the nozzle and delivered to the substrate via compressed air, it provides a tough, elastic membrane layer. The flowable nature of the freshly applied product ensures all irregularities in the porous profile of the tunnel wall are coated evenly, providing a positive waterproof seal.

The inner final layer of sprayed concrete on Clem 7 was applied over MASTERSEAL 345 within days of the membrane's application, again creating massive construction cycle time efficiencies.

Over 68,000 square meters of the product was applied in various sections of the project, supplying the contractor with the quickly applied, high quality waterproofing option they required.

Clem 7 comprises twin 4.8 km road tunnels, excavated using two 12.4 m diameter TBMs and 10 roadheaders, to link the Brisbane suburbs of Woolloongabba in the south to Bowen Hills in the north. The tunnel includes cross passages approximately every 120 m, a cable tunnel beneath the tunnel floor, a smoke duct in the tunnel soffit, five underground substations, two low point sumps in the mainline tunnel and M&E fit out that uses the latest technologies to achieve one of the safest road tunnels in the world. Extensive surface works were required to tie the tunnels into the existing road network at six portal locations. The total route length of the bypass toll-road, including on-ramps, is 6.8 km. The tunnel was designed to ease inner-city congestion and is now a quick alternative to the route with over 24 traffic lights.

In the near future, Clem 7 will link with the Airport Link tunnel, offering even greater convenience for the Brisbane motorist.

Clem7 for sale

Brisbane's failed $3 billion Clem7 tunnel has been described by a potential buyer as a ''bite-sized'' asset that could attract interest from medium-sized pension and infrastructure funds.

The 6.8-kilometre tollway, which opened a year ago, includes a 4.8-kilometre tunnel linking roads on each side of the Brisbane River.

The company behind the Clem7 tunnel suffered from lower than expected traffic volumes and was unable to win support from all of its lenders to delay interest repayments until the adjoining Airport Link tunnel opened in 2012.

RiverCity Motorway, the owner of the tunnel under the Brisbane River, was placed in receivership in march. Analysts expect the tunnel to sell for less than $650 million – a discount of at least 50 per cent on its bank debt of $1.3 billion.

The failed company's lenders, including overseas banks and hedge funds, are expected to pressure the receivers from KordaMentha to dispose of the tunnel as quickly as possible.

Australia's largest toll-road operator, Transurban, is expected to run the ruler over the Clem7 but is considered an unlikely buyer because it might have difficulty raising money for another acquisition. Last year Transurban's largest shareholder, CP2, criticised it for pursuing a share issue to buy the Lane Cove Tunnel for $630 million, because it diluted its holding. Transurban's chief executive, Chris Lynch, has said that he was open to further acquisitions, but has not stated whether it is interested in the Clem7.

A KordaMentha partner, Martin Madden, said talks with the lenders about whether to sell the Clem7 were still some time away. ''We haven't finalised the timeframe within which we would or would not conduct a sale or refinance the debt,'' he said yesterday. ''Our first step is to look at how the business is operating.''

An Austock infrastructure analyst, Andrew Chambers, said he expected pension funds and specialist investors to consider buying the Clem7. ''I would also expect Transurban to have a look but I can't imagine them being too aggressive on price,'' he said.

Lane Cove Tunnel comes out of the dark

The Lane Cove Tunnel, long a financial basket case, is proving an immediate winner for its new owner, Transurban.

Australia's biggest tollroad operator has trumpeted the positive contribution the 3.6- kilometre tunnel has made since it took over from receivers last August. It was one of the standouts in Transurban's half-year results, which included a 48 per cent rise in net profit.

Transurban, which also operates the Westlink M7 and Hills M2 in Sydney, boasted of the tunnel's 6 per cent growth in traffic in the months since it took control, delivering total revenue of almost $24 million.

The listed tollroad operator's windfall stands in stark contrast with the tunnel's first owner, Connector Motorways, which went into receivership last year.

Transurban picked up the tunnel for a bargain $630 million, well below the $1.1 billion it cost to build. Unlike Connector, Transurban was not burdened with a huge debt to buy it and has been able to reduce its operating costs by about 30 per cent because it runs tollways across Sydney.

Northwest rail link

The northwest rail link will include Sydney's deepest tunnels – reaching almost 70m, or the equivalent of a 25-storey building, underground. By comparison, the Epping Chatswood rail link averages only 20m underground and most City Circle tracks are only a few metres below the surface.

Figures released by Transport Minister Gladys Berejiklian's office reveal the rail link's underground tunnels will reach 67m under shops at Thompsons Corner on the intersection of Pennant Hills and Castle Hill roads. At almost 70m underground the tunnel would be 20m deeper than Sydney Harbour at its deepest point.

Tender documents show the state government has set an ambitious task for developers of the 23km long northwest rail link, which includes 15km of deep, underground twin tunnels stretching from Epping to Kellyville.

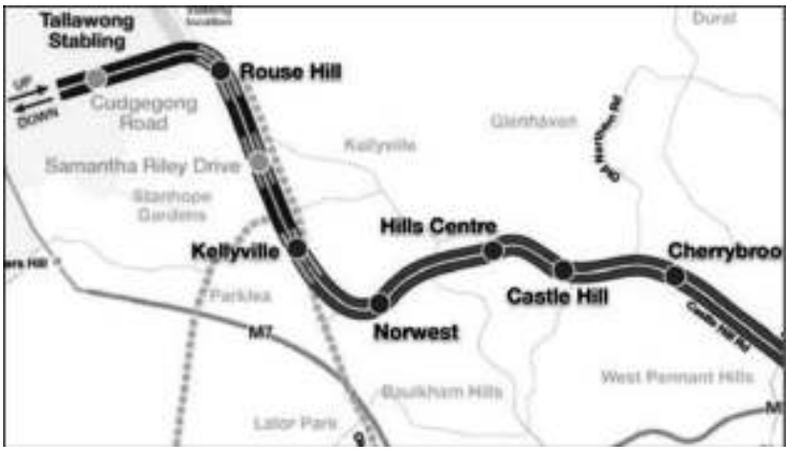
At its most shallow point – underneath Celebration Drive, Bella Vista – the tunnel will still be 18m deep. That's still 7m deeper than the roof of tunnels leading into the City Line's St James station. The roof of the Pitt St tunnel at Town Hall station is only four metres underground while Wynyard is just over 1m.

About 3km of the northwest link tunnels at Kellyville and Rouse Hill will be "cut and cover".

"Although the project has concept approval, more detailed design and engineering work will be required before a full environmental impact statement into the project can be developed," NSW Transport said in a statement.

The NSW Government has established a project team to progress the planning and delivery of the new North West rail link. The project team's initial priorities include determining the appropriate planning approvals, development of full costings, planning for integration with the existing rail network and ongoing engagement with communities along the route as well as other key stakeholders. The project team will review all previous planning and design work for the North West rail link.

The project team will shortly establish a visitors' centre for the project in the heart of Sydney's North West, providing people with information about the project.



A major tender has been called to help finalise design and operations options for the North West Rail Link.

The successful tenderer for engineering, rail systems and architecture services will form an integral part of the North West Rail Link Project Team, providing ongoing technical expertise to ensure the end product meets the needs of commuters and the community.

History

The North West Rail Link was originally announced in 1998 as a heavy rail line for completion in 2010; in 2006 the construction schedule was revised with a new completion date of 2017. On 20 November 2006, the government announced a staged plan for the North West Rail Link with train services to Castle Hill and Hills Centre in 2015, two years ahead of the original completion date of 2017.

In March, 2008 the Government changed the project to a metro line dubbed the North West Metro and expanded the line to run all the way to the Sydney CBD via the suburbs of Ryde, Gladesville, Drummoyne and Pyrmont. On 23 October, 2008, the NSW Government announced the CBD Metro instead, a shortened version of the North West Metro which would run from Rozelle to Central station, and the project was submitted to Infrastructure Australia for funding. It was announced that North West Metro may be extended to link from Rozelle Station to Epping and Macquarie Park in the future if the CBD Metro was built. Then, on 31 October 2008, the NSW Government announced that the North West Metro will be indefinitely deferred due to budgetary cuts.

On 21 February 2010, two and a half months after Kristina Keneally had become Premier, the NSW Government revealed the cancellation of the Sydney Metro project in its Metropolitan Transport Plan and returned to the North West Rail Link proposal. At the time, construction was anticipated to begin in 2017.

Following his victory in the NSW state election on 26 March 2011, newly-elected Premier Barry O'Farrell announced that his first order of business would be to start construction on the North West Rail Link. On 6 April 2011, Premier O'Farrell and newly-installed Transport Minister Gladys Berejiklian announced the project team that will be responsible for construction and delivery of the North West Rail Link. It is expected that initial planning and geotechnical investigation of the route corridor will begin by the end of 2011, with construction beginning before the 2015 state election.

On 15 May 2011, Transport Minister Gladys Berejiklian announced that a tender had been called for engineering, rail systems and architecture services.

Hills M2 Upgrade

As part of the Hills M2 Upgrade the Norfolk Tunnel will be widened to provide three traffic lanes and one break down lane in each direction.

Works include:

- Rock bolting of the existing tunnel.
- Widening works using an excavator, including widening of the batters (rock walls) on both approaches to the tunnel.
- Placement of new electrical and services trenches.

The need to modify the tunnel was identified in the *M2 Upgrade Environmental Assessment May 2010*. Work in the tunnel will generally be undertaken 24 hours per day, as it is the most complex part of the upgrade. The two tunnel tubes will be completed in separate stages.

Widening of the eastbound tunnel will commence first, followed by work in the westbound tube. The works are expected to take approximately 26 months to complete.

Traffic management has already been implemented in the tunnel including a reduced speed limit of 60 km/h. During the day, two eastbound and westbound lanes in the tunnel remain open to traffic. At night when work is taking place in a tunnel tube, traffic is switched to the other tube in a contra-flow arrangement.

Each tunnel tube is closed for periods of time outside of peak times so the widening work can be undertaken. It is planned that both tunnel tubes would not be closed at the same time unless in the event of an emergency or for safety reasons.

The Hills M2 Upgrade team has performed a rigorous assessment of the current condition of the tunnel which revealed both tubes are in sound geotechnical condition. As no additional loads are to be placed on the structure as part of the upgrade works, the structural integrity of either tube is highly unlikely to be affected. Rock bolts will be placed in each tube to shore up the widened structure and pin the secondary lining as part of upgrade works.

Work on the Upgrade commenced in January 2011 and will be ongoing until early 2013 to:

- Reduce congestion during busy morning and afternoon periods.
- Restore a 100km/h speed limit along the westbound carriageway from Lane Cove Road to Beecroft Road.
- Provide new entry/exit points to improve access to the north west from Windsor Road and Sydney's growing residential and business centres in Macquarie Park.

A feature of the upgrade includes additional eastbound lane from Pennant Hills Road, through the Norfolk Tunnel, to Lane Cove Road which includes installation of tunnel crown support in the eastbound tunnel which started in April 2011.

Tunnel preparatory works include:

- Utility service pit and trench work east of the tunnel, which involves core drilling and saw cutting through the road surface on the eastbound lanes, east of the tunnel,

Norfolk Tunnel curtain eastbound 17 June 2011

to locate power and telecommunication services and then excavating a pit and trench. A vacuum truck and tipper trucks will be used to remove the spoil. This work will be carried out at night between the hours of 8pm and 5:00am. However, the noisier activities such as rock breaking and pavement breaking will be completed by midnight and saw cutting will be completed by 1am. This work is scheduled to take place on the dates shown over the page. Machinery and equipment will include excavators, core drills, saws cutters, vacuum trucks, small power tools and lighting towers. This work requires a full closure of the eastbound tunnel at night due to the high volume of traffic during daytime peak periods. Eastbound traffic will be diverted to the westbound tunnel which will operate with one lane in each direction.

- Safety screen construction west of the tunnel which involves attaching temporary safety screens to the concrete barriers already in place along the westbound carriageway, west of the tunnel. The safety screens are installed to protect passing vehicles from any falling rocks during excavation of the rock batter. Machinery and equipment used includes lighting towers, small cranes, light vehicles and hand tools. This work will be undertaken at night, when traffic volumes are lower, and requires closure of the left lane on the westbound carriageway. You may experience increased noise levels as a result of these activities. The project team will take measures to keep this to a minimum.

Hydraulic splitting work in the tunnel 25 June 2011

Vibration monitoring equipment in the Norfolk Tunnel 30 April 2011

Northern Sewerage Project Update

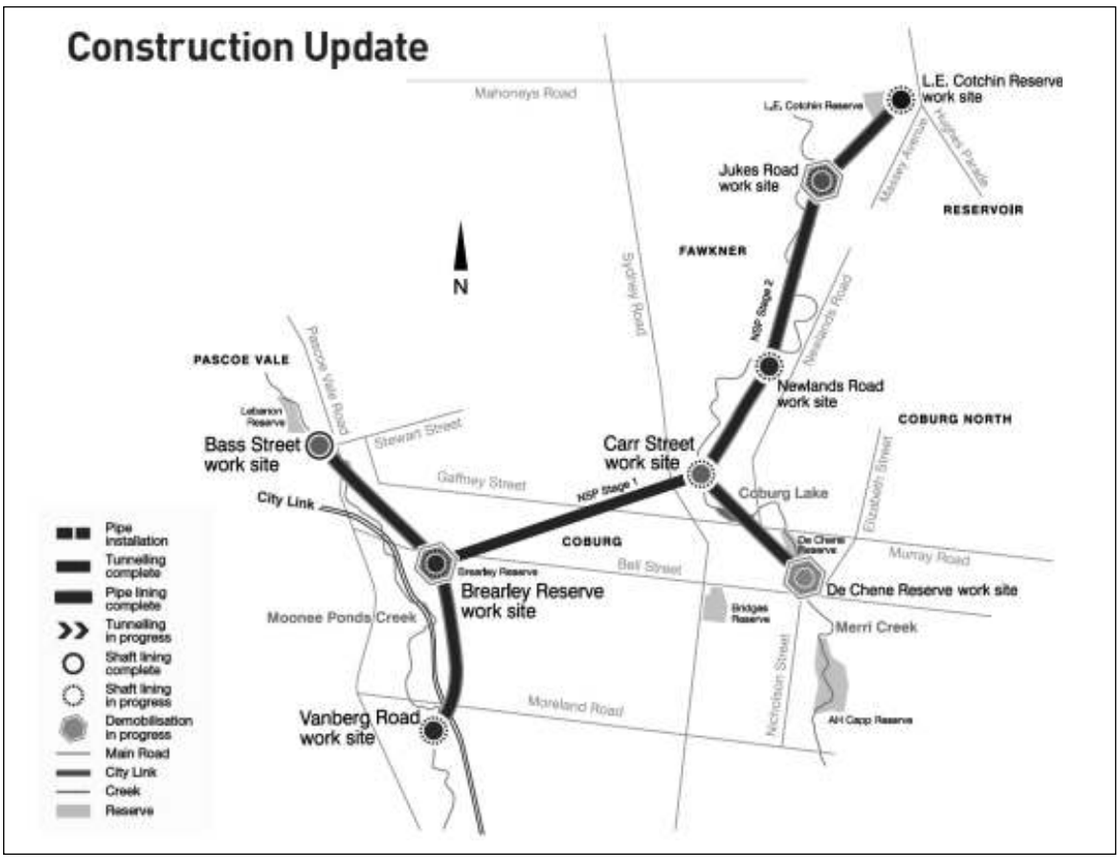
Works on the NSP are progressing well with tunnelling excavation now completed and pipe lining operations underway (or completed) along several of the project's seven tunnel alignments. The next phase of construction activities to occur at the Newlands Road shaft site involves concrete lining the walls of the 32m deep vertical access shaft. These works commenced in February 2011, and will continue through until mid 2011.

Tunnel pipe lining installation works commenced along the Brearley Reserve to Carr Street tunnel alignment in January 2011, and are due for completion by mid 2011. In all, a total of 488 glassfibre reinforced plastic (GRP) pipes and 12,500m3 of grout will be laid along the 2.9km tunnel.

The NSP has commenced the next phase of construction activities at its Carr Street site, with the commencement of shaft lining activities in February 2011. The construction of the permanent access shaft for the new sewer involves lining the current or temporary shaft wall with reinforced concrete and then installing a High Density Polyethylene (HDPE) lining.

The next phase of construction activities at Vanberg Road has commenced, with preparatory works for shaft lining well underway. The construction of the permanent access shaft for the new sewer will involve lining the current or temporary shaft wall with reinforced concrete and then installing a High Density Polyethylene (HDPE) lining.

Works to connect the new NSP sewer at L.E. Cotchin Reserve, Reservoir to the existing sewer located at Edgars Creek commenced in January 2011. Excavation of the temporary manhole access is currently underway on the roundabout at the intersection of Hughes Parade and Massey Avenue. Once excavation has been completed, the team will commence pipejacking of a new, small diameter sewer to connect into the 39m deep vertical access shaft at L.E. Cotchin Reserve. These activities will then be followed by the excavation of a temporary jacking shaft along Hughes Parade, Reservoir, and further pipejacking works.



As part of works on the Edgars Creek Intercepting sewer connection, the Dredge Street bus stop, located on the northwest-bound carriageway of Hughes Parade has been temporarily relocated to a location approximately 15m northwest of its previous location. Please note that there has been no disruption to the current bus service, although the bus shelter will be unavailable throughout these works, which are scheduled for completion in late 2011.

The NSP team have recently commenced demobilisation and site reinstatement activities at De Chene Reserve, Jukes Road and Brearley Reserve. Demobilisation works will commence at the remaining sites once shaft lining works are complete. The NSP is tracking ahead of its scheduled mid 2012 completion date and is currently due for completion by the end of this year.

Works to connect the new sewer at L.E. Cotchin Reserve to the existing sewer located beneath Hughes Parade, Reservoir, are progressing well. Connection works involve laying a total of 320 metres of new sewer pipe under Hughes Parade and the construction of three entry pits; one at the Massey Avenue roundabout; one north of Pallant Avenue; and one near Edgars Creek Bridge.

At L.E. Cotchin Reserve, the installation of the drop pipe is complete and the site is in care and maintenance until the pipe-jack breakthrough from works on Edgars Creek. Excavation has begun on the temporary access manhole on the Edgars Creek Bridge, while the temporary jacking shaft nears completion. Preparations are also commencing for bypass pumping works in mid August, and the start of pipe-jacking activities.

Blue Mountains Tunnel Bypass

A long-term advocate of building a bypass tunnel or highway around the Blue Mountains is among representatives of the state government's new infrastructure authority.

The Premier, Barry O'Farrell, has appointed food exporter Roger Fletcher, chairman of the National Export Lamb, Sheep and Goat Industries Council and director of the Australian Meat Industry Council, to the new Board of Infrastructure NSW.

Mr Fletcher said a highway bypass or tunnel around the Blue Mountains, following the route of the Bells Line of Road, would ''make a big difference to NSW. It is the main artery to the west,'' he said. Some National Party MPs are also in favour of another alternative to the Great Western Highway through the Blue Mountains.

The Sydney businessman, David Gonski, is also among the appointments to the state government's new board of Infrastructure NSW, headed by former Liberal Premier, Nick Greiner.

Announcing the new appointments, Mr O'Farrell said Infrastructure NSW would ''take the politics out of the delivery of new services for NSW''. He said the new board would be responsible for preparing infrastructure strategies for the next five to 20 years for NSW.

Other board members will include Carolyn Kay, a director of Allens Arthur Robinson, Brambles, the Commonwealth Bank, The Sydney Institute and the chairman of Sydney Airport Corporation, Max Moore-Wilton, a former secretary to the Department of the Prime Minister and Cabinet.

The chief executive of Infrastructure NSW, Paul Broad, will also join the new board with representatives from the Department of Premier and Cabinet and the Treasury.

Boring under rail needed for transmission line

Ergon Energy has sought tenders for construction work associated with the Moranbah – Broadlea 132 KV transmission line, located in Queensland's Mackay Whitsunday Region.

The works include constructing 132 KV line entries into Broadlea Substation and at the existing Moranbah Substation, which will include the undergrounding of fibre optic connections beneath a railway where there is inadequate clearance.

Horizontal boring and trenching of the fibre is included in this work. The tender also includes new poles for the 66 KV landing spans at Broadlea substation for the Moorvale and Carborough feeders. There may also be minor maintenance required to the Moranbah – Broadlea feeder to enable it to be energised at 132 KV.

Tenders closed on 6 July 2011.

Microtunnelling to give new life to Auchenflower

Queensland Urban Utilities will invest $A9.2 million over the next 16 months on the sewage system in Auchenflower, located in Queensland, to improve capacity and reduce the risk of sewer overflows.

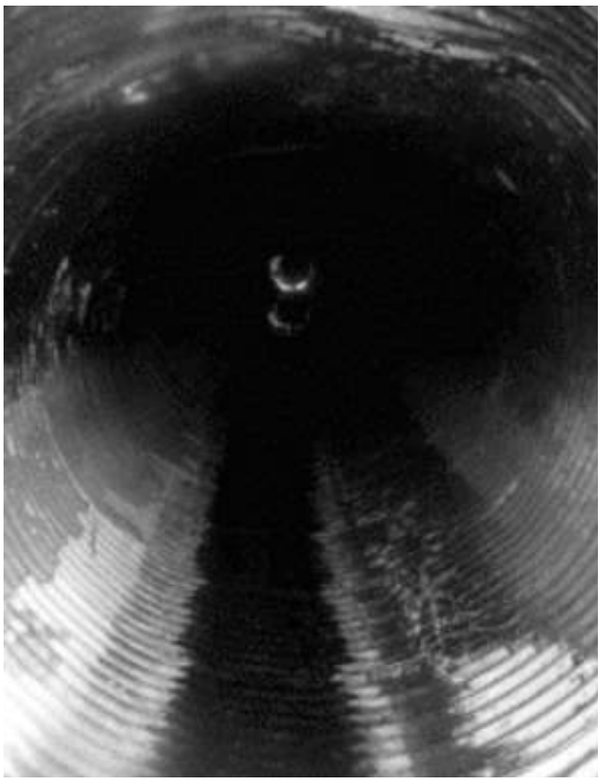
The Auchenflower Sewer Upgrade Project will reline the existing sewage system and use microtunnelling to install new pipes along Torwood Street, Eagle Terrace, under the railway line into Roy Street and Lang Parade, connecting to the sewer system on Coronation Drive.

Queensland Urban Utilities Chief Executive Officer Noel Faulkner said the existing sewage system was built more than 70 years ago and has experienced increasing demand from population growth.

"By using microtunnelling...we are able to improve capacity of the sewage system while minimising the impact to the community," Mr Faulkner said.

Entry and exit shafts for the tunnel boring machine will be excavated at intervals along the project route.

Work is due for completion by mid-2012.



The project is part of a $A3.2 billion capital works investment in water and sewage infrastructure by Queensland Urban Utilities.

Tunnel proposal for Bendigo CBD

A 3.5km road tunnel under the Bendigo CBD would allow a proposed four-lane highway to ease traffic congestion without ruining sensitive neighbourhoods.

The suggestion comes from Bendigo North West Plains Ward councillor Bruce Phillips, a former VicRoads Bendigo regional director who served as senior project manager on projects including the Hume Freeway bypass of Wodonga.

Cr Phillips said he would propose the tunnel as part of his submission to the Bendigo Road Transport Strategy draft plan.

One of the proposals is for a four-lane road linking Kangaroo Flat with White Hills, with suggestions the road would follow the railway line, then Hattam and Adam streets before passing through Quarry Hill and along the railway line east of the CBD.

"What I'm proposing is a 3.5-kilometre tunnel under the centre of Bendigo, under the middle of the Bendigo Marketplace," he said. "It would be a shuttle for north-south and south-north traffic that has no business in the centre of Bendigo. Other traffic could get off at either end and enter the town."

Cr Phillips said as it stands, the surface road would cut through suburbs including Quarry Hill and would include roundabouts and traffic lights that would disrupt traffic. "The area we're talking about isn't a heritage area but it has many heritage-type properties," he said. "I know the council has some difficulty dealing with those properties. But it's council policy to preserve those buildings."

Cr Phillips said the proposal may seem over the top now but will be necessary in decades to come.

Queensland Curtis LNG Project

The Queensland Curtis LNG (QCLNG) pipeline network includes a 380 km Export Pipeline from the area of the QGC Gas Field Component in the Surat Basin of southern Queensland to the LNG Facility in Gladstone.

There are six primary crossing options between the mainland and Curtis Island under consideration.

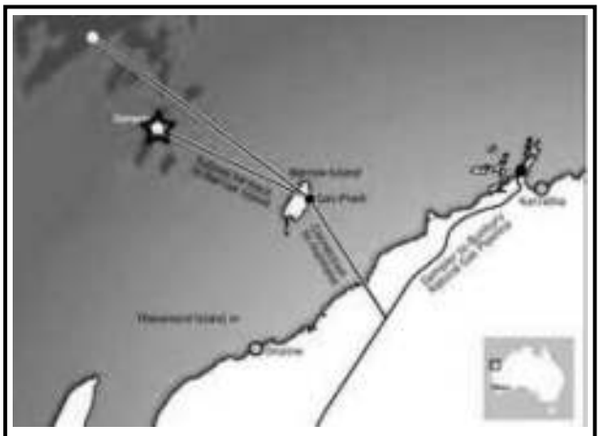
Crossing techniques under consideration for the marine routes involve:

- conventional offshore pipe lay whereby line pipe is welded together on a lay vessel and lowered to the seabed. The pipeline may also be installed into a pre-cut trench, although this is technically more challenging than post-lay trenching
- open-cut pipeline installation whereby a trench is prepared across a section of land and a pre-strung section of pipeline pulled into the trench with flotation aids attached. Once in position the flotation aids are removed and the pipeline sinks to the bottom of the trench, which is then backfilled with either in-situ spoils or imported material. This type of construction is often employed in soft swampy ground conditions
- trenchless techniques (e.g. horizontally directional drilling or tunnelling) whereby a pre-strung section of pipeline pulled or installed in a tunnel or horizontal drill hole. This type of construction is often employed in under-river crossings, under-lake crossings and under sand dunes in onshore-tooffshore crossings.
- offshore or onshore pull-in pipeline installation whereby a section of pipeline, either pre-trung or welded together on a lay vessel, is pulled into final position using either a winch from onshore or a winch from an offshore platform.

Application of any of the above construction techniques is subject to confirmation by a combination of risk assessments, environmental impact assessments, cost estimates, schedule estimates and detailed engineering based on comprehensive site investigation and survey data.

The routes under consideration may also employ a combination of the above techniques to facilitate pipeline construction. The pipeline crossing will be decided during a detailed design phase which is ongoing.

Attachment of the pipeline to the possible Curtis Island bridge was also considered. However this option is not favoured by QGC on safety grounds associated with the presence of a gas pipeline suspended above a shipping channel.



Gorgon gas project

The Gorgon gas project is a natural gas project in Western Australia, involving the development of the Greater Gorgon gas fields, subsea gas-gathering infrastructure, and a liquefied natural gas (LNG) plant on Barrow Island.

The Gorgon field is centered about 130 kilometres off the north-west coast of Western Australia, where the water depth is approximately 200 metres. Barrow Island lies off the Pilbara coast, 85 kilometres north-north-east of Onslow and 140 kilometres west of Karratha.

Gorgon was discovered in 1981 The project received preliminary environmental approvals in September 2007. The project developers then submitted revised plans to cover an expansion in the size of the project. Final environmental approval was received from the state government on 11 August 2009. On 26 August 2009, the Federal Environment Minister announced that the expanded project on Barrow Island had been given conditional environmental approval.

The Gorgon gas field is said to contain 1.1×10^{12} m3 of natural gas and may have a lifespan of 60 years. The project is being developed by the Gorgon Joint Venture, which consists of Chevron Australia, Shell Development Australia, Mobil Australia Resources, Osaka Gas, Tokyo Gas, Chubu Electric Power. First LNG is planned for 2014 with production ending between 2054–2074.

The subsea gas-gathering system will be located on the ocean floor over the Gorgon gas fields. Micro tunnelling is expected to be a key part of bringing the gas ashore.

Great Ocean Road gets boring

Barwon Water is undertaking a $A16.8 million upgrade of the Torquay and Jan Juc water supply system in Victoria.

Three key projects are involved in the program, including construction of a new storage tank, pump station and pipelines. A $A1.9 million upgrade to the Jan Juc water supply system was the first project to begin, with work starting in early March 2011.It involves constructing a new pump station and a 2.7 km water supply pipeline.

Sections of the pipeline are being bored underground to minimise disruption and protect vegetation along the pipeline route. Infratec has been contracted to complete the boring.

Barwon Water General Manager Capital Projects Paul Northey said Torquay and Jan Juc had experienced rapid population growth and new infrastructure was required to meet future demand.

"The infrastructure will also cater for future development and improve water pressure for existing customers."

Work was completed in June 2011. Construction of a new 15 million litre storage tank also began at the end of March. The $A7.1 million tank is expected to be completed by June 2012.

Work on a 3.2 km pipeline to connect the new tank to the storage basin on Grossmans Road will start in the April and is expected to be completed in September 2011.

The projects are part of the Barwon Water Alliance capital works program.

Melbourne Metro Rail Tunnel

Detailed animation of Melbourne Metro Tunnel project can be seen at http://www.transport.vic.gov.au/projects/news/video-updates/melbourne-metro-rail-tunnel-detailed-animation

There is no audio on this video. This is an artist's impression only.

Victoria Government tunnel plans

A tunnel from the Eastern Freeway to the Tullamarine Freeway will be considered by the Baillieu government as part of an infrastructure plan ordered by Treasurer Kim Wells, following widespread criticism that Victoria is not planning major projects. Mr Wells has ordered his department to urgently get to work on an infrastructure plan for Victoria after being warned the state is at risk of losing billions of dollars of investment and thousands of skilled workers to New South Wales and Queensland.

It is believed that the government will reconsider a range of transport projects flagged by the previous government, including an east-west road tunnel from the Eastern Freeway to the Tullamarine Freeway, a metro rail tunnel from Footscray to St Kilda Road, and a ''missing link'' connection between the Metropolitan Ring Road and the Eastern Freeway.

Infrastructure Australia chief Sir Rod Eddington is believed to have recently told the Baillieu government to consider following the NSW government's lead, which has announced a new body headed by former premier Nick Greiner called Infrastructure NSW to aggressively pursue major projects.

But Mr Wells said he had decided against such an agency because the role could be performed more cost effectively by the Department of Treasury and Finance. After being warned that inaction on infrastructure could threaten the state economy Mr Wells, six weeks ago, ordered his department head Grant Hehir to develop what he called an ''infrastructure pipeline'' – providing detailed proposals for short, medium and long-term major projects.

It is unclear when the major new plan will be released or how it will be funded, but the department is working with the Department of Transport and other agencies to develop it.

"My view is that we need to make this body as efficient as possible and at the moment I'm satisfied that the Department of Treasury and Finance are the right people to be pulling it together," Mr Wells said. ''We have spoken to nearly every single very large contractor in this state but the message is very clear: this is about targeting the investment in tough economic times to make sure that we are able to boost productivity."

The decision represents a belated acknowledgement by the government that Victoria is in danger of losing its reputation as an innovative state when it comes to procuring major projects. Senior Melbourne business figures are worried about the lack of action, warning they are now looking to NSW, Queensland, Western Australia and Asia because of the long lead times associated with major projects.

"People are nervous about what happens next," a Melbourne-based business figure closely involved with high-profile major projects said. "Six months, 12 months, 18 months, I don't know. It's a pain in the arse sitting here waiting for a whole lot of work that we were doing before and we don't know whether it is going ahead or not going ahead."

Mr Wells said he was determined to make rigorous decisions to avoid mistakes of the former Brumby government. But he refused to be drawn on when or if the plan would be released. "When I talk to the contractors in Melbourne, they are looking for certainty," he said. "The issue of the pipeline is an important part of addressing their concerns and we believe this will be an incredibly positive step forward for the state and to give certainty to those large contractors."Business and transport lobby groups are also getting tetchy.

RACV general manager Brian Negus said Melbourne needed a long-term transport plan to address the ''frustration" being felt by road and public transport users. Victorian Employers Chamber of Commerce and Industry chief executive Mark Stone said he understood the government's immediate priority was implementing election promises, but a long-term blueprint for Victoria was needed.

Wangaratta diverts ageing main

North East Water is undertaking a series of works to reconstruct a sewer main in Wangaratta, located in Victoria, following its collapse on New Year's Eve.

A temporary solution was put in place immediately after the collapse – a pipeline running both above and below ground – enabling sewage to be diverted around the damaged section of main. However, the company has made a permanent replacement a priority.

Approximately 130 m of the sewer main gave way in the area around Harper and Moore streets, south-west of the CBD, prompting a rapid response from North East Water Operations staff to avert any spillage to the environment.

North East Water Executive Manager Planning and Infrastructure Kevin Freeman said "We have received the design plans for the installation of a new section of main to be laid on an alternative route.

"The mains in this area are around 60 years old and buried more than 6 m under the ground, and this particular section is beyond repair so a permanent bypass is the best option."

The new main will cost approximately $200,000. The project also includes the assessment and, if necessary, relining of other sewer pipes in the area.

Mr Freeman said "We have done video camera inspection of some of the pipes in the area, and we've found that a number of similar mains are degraded and will require relining, including a section of about 400 m from Moore St to Graham Avenue."

Tunnel under the suburbs in fast rail plan

Southern Cross station could get a $2 billion upgrade as part of a proposed high-speed rail link to Sydney.

A massive tunnel from Melbourne's northern fringe would run under the suburbs as part of the project, which could cost between $61 billion and $108 billion.

Express trains from Southern Cross would take about three hours to get to central Sydney.

The Federal Government's High Speed Rail Study, released at the beginning of August 2011, also nominated North Melbourne station as a possible terminus for the link.

The report said the high-speed line would mostly follow the Hume Freeway to the border, but could divert to a new station at Shepparton. A route through Melbourne's east and Gippsland was rejected on cost, population and environmental grounds.

Major construction works would be needed to have six platforms at least 250m long at either Southern Cross or North Melbourne. A complicated $3.3 billion network of railway overpasses would also be required to bypass metropolitan and regional trains.

The report said the two station options would cost $2 billion each, but found there was more potential for property development at North Melbourne.

The trains would run at 200km/h in the metropolitan area, increasing to 350km/h outside Melbourne. A trip to Sydney was estimated to cost $99 for an economy ticket and $197 for a business-class fare.

Federal Transport Minister Anthony Albanese said taxpayers would have to foot part of the bill. A second phase of the study will now begin. It will look more closely at the finances, and is due to be completed next year.

Capital works begin at the Sydney Opera House

The State funded capital works program to enhance tourist and visitor safety at the Sydney Opera House has now commenced as planned and on schedule. The $152m Vehicle Access and Pedestrian Safety Project (VAPS) is the largest single capital works program undertaken at the Sydney Opera House since its opening in 1973. The VAPS Development Application was rigorously assessed by the NSW Department of Planning and was formally approved late last year.

Work has commenced to secure the Forecourt site, with a hoarding around the site. The Forecourt will now remain closed to the public until mid-2013. The VAPS project will improve safety by diverting heavy vehicles from the Forecourt to a new underground roadway and loading dock. The first stage of the project is to divert the Bennelong Drain, a major stormwater drain serving the CBD, which runs across the Forecourt. Phase one has been contracted to the highly regarded construction company Seymour Whyte. Excavation work will begin near the Queen Elizabeth Gate entrance to the Royal Botanic Gardens at the south-eastern tip of Bennelong Point.

The VAPS project involves:

- the diversion of the Bennelong Drain;
- the excavation of a new access road and loading dock under the Forecourt; and
- remediation of the existing road to remove the curbs

Sydney Opera House will remain fully operational throughout the project, with theatres, restaurants and guided tours open for business. The Forecourt will close to the public from today and is expected to re-open to the public in mid 2013.

Curved pipejack breaks southern hemisphere record

A recently completed pipejacking installation in south-east Queensland, Australia, has set a new length record for the technique. At 1,032m-long, the Pringle Hill project, undertaken by the Northern Network Alliance (NNA, LinkWater Projects, McConnell Dowell, Abigroup and KBR) is believed to be the longest completed so far in the southern hemisphere. The 2,100mm i.d. pipejack involved significant curvature – from launch to exit pits, the pipe climbs through a vertical curve of 60m.

Given the curvature and vertical travel, pipejacking was chosen for the installation, in conjunction with an advanced VMT guidance system to ensure everything was on track. A Herrenknecht AVND-2000AB microtunnelling system was used for the tunnelling. The unit would be jacked through the drive using 3m-long concrete pipe sections of 2.1m i.d. Furthermore, in order to keep jacking forces within acceptable limits, especially through the curves and change in elevation, a total of ten interjack stations were deployed along the tunnel alignment.

Installation began on August 25 2010. Although ground conditions comprised silt stone and partial sandstone, the team managed to achieve an average production rate of 7.5m/shift, working two 12-hour shifts per day, seven days per week.

One of the most important aspects of the construction was the alignment itself and maintaining navigational control. The construction plan called for the drive to cover some 1,030m in a straight line in the horizontal plane, while in the vertical plane, the first 50m were straight followed by a 780m curve on a radius of 8,000m. The drive was to be completed with the final 215m being straight but with a +10% grade. This meant that the navigation used for the drive would be a key element in the success of the tunnel.

A spokesman for VMT said that its SLS-Microtunnelling LT guidance system was chosen because it "offers significant advantages for larger or curved tunnelling projects." Furthermore, VMT claims that the system's ability to determine, continually update and display the tunnel boring machine's (TBM) current position, independent of drift or refraction, guarantees optimum control in long pipeline excavations and in complex curves. The SLS guidance system employs self-referencing algorhithms and a motorised laser total station. According to VMT, its use results in uninterrupted production, minimal supervision by the surveyor, reduced machine down time and cost-effectiveness.

During the course of the drive, two gyro-theodolite survey campaigns were implemented to check the position and route and, once completed, there was almost no orientation corrections required to the ongoing tunnel route/alignment. The first campaign was completed at a chainage of 400m with the second achieved at a chainage of 780m. The pipejacking section of the tunnelling works was completed on November 1 2010, some five weeks ahead of schedule. Breakthrough was achieved to a very high accuracy with the drive being less than 50mm off-target in both horizontal and vertical planes.

The pipejacking section of the tunnelling works was completed on November 1 2010, some five weeks ahead of schedule.

Darwin goes underground

Work on undergrounding power lines in Darwin's northern suburbs, located in the Northern Territory, continurd with some projects completed within the first few months of 2011.

Power and Water Corporation used directional boring under road crossings and into properties to install conduits into which the new underground cables will be placed.

Since the project began in 2004, the Darwin suburb of Nightcliff has been fully undergrounded and works in Rapid Creek and Millner are nearing completion. Undergrounding powerlines lowers the likelihood of power outages in storms, preventing those caused by falling branches and lightning strikes or animals touching the lines and causing the system to short circuit.

Reliability of supply and the life expectancy of the lines are expected to increase dramatically, and removing the powerpoles and overhead powerlines improves the aesthetics of the streetscape.

Old tram tunnels could free city streets

The federal government's infrastructure adviser will consider whether it is feasible to use old tram tunnels underneath Wynyard station as a means of clearing clogged city streets.

Every weekday morning, the state government says, buses carry more than 11,500 passengers each hour from the north to the south end of Sydney Harbour Bridge – more people than travel across the bridge by train. But the buses are clogging the streets and the need to accommodate them is leading planners to think about new ways of directing them to the edge of the city, possibly even going underground.

Infrastructure Australia has been asked by the federal Transport Minister, Anthony Albanese, to look at how cities are using their existing assets as part of a national public transport strategy. The call has reignited interest in an old set of tunnels running beneath one of the city's most crowded corridors.

Figures obtained this week highlight the huge task of accommodating bus traffic from the north, which has grown rapidly in the absence of a north-west rail link, and which clogs up the CBD around York Street. According to the Department of Transport, the number of bus commuters who cross the bridge southbound between 7am and 9am has grown 15 per cent in just three years – from 20,000 in 2007 to 23,000 last year. In contrast, an average 22,600 rail passengers cross the bridge in the morning peak along with 15,400 cars.

At Wynyard station, there are still remnants of tunnels that once catered to trams rolling off the bridge. The tunnels themselves, built between 1927 and 1932, are testimony to Sydney's propensity to compromise on transport projects. Under a plan by J.J.C. Bradfield, the engineer behind the Harbour Bridge and Sydney's underground rail network, the tunnels were to be used for a rail connection that linked Wynyard to Mosman and the northern beaches via the bridge. But that idea was shelved. Instead, in a more modest scheme, from 1932 trams ran down the tunnels from the north shore to Wynyard. By 1958, however, the tracks were closed and by 1962, the tunnels at Wynyard had been converted into a car park under the Menzies Hotel that remains in use today.

That may yet change. The co-ordinator of Infrastructure Australia, Michael Deegan, said use of the tunnels was being assessed as part of a new national public transport strategy. ''There has been a discussion around what's the capacity and possible options for using some of those tunnels,'' Mr Deegan said. ''Instead of building new stuff, can we use what's there?''

And the Department of Transport has signalled it still wants to use the tram tunnels to help Sydney transport.

''In the long term the Department of Transport does not support the continued use of the former tram tunnels for car parking,'' a spokesman for the department said.

Another transport planner, who did not want to be named, went further and said that the tunnels could be revived for a separate bus track connecting the city across the bridge to the northern beaches. But this proposal would require the closure of the Cahill Expressway to once again link the tunnel's exit at Argyle Street to the bridge. Doing so would demand other measures to raise the bridge's carrying capacity.

Greens condemn rail tunnel costs

The cost of building rail tunnels in NSW is more than four times that in Europe, prompting calls for a parliamentary inquiry into the way the state government budgets for public transport.

NSW Treasury's method of predicting rail costs was fundamentally flawed by including big allowances for risk, according to the Greens transport spokeswoman, Cate Faehrmann.

She told a forum in northern Sydney she feared the huge price tag attached to rail projects was a ploy to make public transport less attractive to governments than motorway building. When Parliament resumes after the election, she will move for an inquiry by the Legislative Council, where the Greens might have the balance of power.

''Why is it that rail projects cost so much more in NSW than elsewhere in Australia and overseas?'' she said. ''Something doesn't smell right about these costings.'' She said commuters and the economy were suffering.

The concerns are based on the steep rise in the predicted cost of rail lines in Sydney. When the north-west rail link was proposed in 1998, running seven kilometres from Epping to Castle Hill, the estimated cost was $360 million. The proposed line has since been extended to 22 kilometres but the projected cost, $7.5 billion, is more than 20 times the original.

In 1998, the entire cost of a rail link from Parramatta to Chatswood was put at $1.4 billion. The Carr government delivered only half the project, from Chatswood to Epping. The most recent estimate to complete the link, from Epping to Parramatta, has been put at $2.6 billion.

At a parliamentary committee hearing in September, the director-general of Transport NSW, Les Wielinga, said the $2.6 billion estimate was for only the civil infrastructure, design and construction of the line. It did not include stabling, rolling stock or property acquisition.

He said a project such as the Epping to Parramatta line would typically be costed with about 30 per cent contingency built in. But the contingency would almost always be used.

EcoTransit, an advocacy group that organised the forum at which Ms Faehrmann spoke, has argued that transport projects in NSW are overpriced. It compares the Gotthard Base Tunnel, which runs for 57 kilometres under the Swiss Alps and was costed at $90 million a kilometre of track, even though it involved tunnelling through granite, with the projected cost of the north-west rail link, which is $366 million a kilometre.

In a letter to the Commonwealth Grants Commission in 2009, the Treasurer, Eric Roozendaal, said tunnelling through Sydney sandstone cost $400 million a kilometre. EcoTransit cites the 72-kilometre Mandurah line in Western Australia, built for $1.2 billion or $17 million a kilometre. The south-west rail link in Sydney is costed at $106 million a kilometre.

Ms Faehrmann said an inquiry was needed to scrutinise rail contracts. ''Closed hearings will allow commercial-in-confidence information to be examined,'' she said. ''Scrutiny must be applied and the inflated costings brought to account.''

New infrastructure in Northern Territory

Sitzler Brothers have been awarded a tender for sewer and power headworks at the new suburb of Kilgariff, located at Alice Springs, Northern Territory.

Trenchless Technology will be used to complete major road and rail crossings involved in the project.

Minister for Central Australia Karl Hampton said it was an important step in the growth of Alice Springs.

"This $A4.3 m project will provide sewerage and power infrastructure for Alice Springs' newest suburb, employing around 15 Territorians, five of whom will be trainees and five Indigenous," Mr Hampton said.

Sitzler will construct a sewer pump station and rising main between the proposed development site and the current sewerage treatment facility in Alice Springs. The works form part one of a three-stage project, with road works and water supply to come.

Perth freeway tunnel to be expanded

There are concerns two major developments planned for the Perth CBD will bring the city's traffic to a standstill.

Work on the Northbridge link and the new waterfront development is expected to begin later this year forcing closures along major routes in and out of the city.

In a bid to combat the problem, the State Government intends to expand the Graham Farmer freeway tunnel to three lanes in both directions.

Curtin University's Professor of Sustainability Peter Newman says the Government will need to increase bus and rail services to the city or risk gridlock. "We need a lot more trains and a lot more buses," he said. "They are full at the moment at peak times so we need more of them so it makes it easier for people to get out of their car."

He says Perth is at the point where it is suddenly very hard to get anywhere by car. "Now we've hit the wall we have to see that this is part of growing up as a big city and you can't go back so the only way forward is a major revamp of public transport," he said.

In a bid to combat the problem, the State Government intends to expand the Graham Farmer freeway tunnel to three lanes in both directions.

Melbourne Main Sewer Replacement

The final tunnel of the $A220 million Melbourne Main Sewer Replacement project, located in Victoria, has been completed.

The project, undertaken by Melbourne Water, John Holland, GHD and Aurecon, involves replacing a century-old sewer main to potentially triple sewage capacity for the city's growing population.

The 875 m Northern Tunnel, from Fennel Reserve in Port Melbourne to South Wharf in Docklands, is part of 2.3 km of main tunnel completed within the project.

The task was undertaken by a 103 m, 164 tonne tunnel boring machine, named Lucy Loo by a Port Melbourne Primary School student.

It excavated more than 15,000 cubic metres of spoil while creating the 2.4 m diameter main tunnel.

Melbourne Water Project Director Phil Corluka said the Northern Tunnel drive was one of the most challenging engineering feats of the project because of soft ground and surrounding infrastructure.

"There are always challenges in working underground, and the conditions underneath Port Melbourne have meant navigating through both tough rock and clay-like silt, making guiding the machine difficult at times," he said.

Melbourne Water said it would move onto lining the tunnel with 1.8 m diameter glass reinforced plastic pipes.

The project is expected to be completed in 2012.

Narellan Road bus tunnel

Campbelltown Council will continue to fight the RTA's planned tunnel for buses under Narellan Road.

"The idea is to put this $20 million to better use than to what the RTA is suggesting. With the amount those [red light and speed] cameras flash down there with people trying to get across Narellan Road it may save some people some hefty fines," Cr Lake said

Campbelltown councillor and Wollondilly MP Jai Rowell said he agreed with the council's stance. "That $20 million could be better used — maybe with a flyover."

Council staff are putting together a costing for a supporting road or a flyover to improve traffic flow as an alternative to the bus road.

Harbour tunnel proposal may call on public

Aucklanders could soon have their say on the contentious plan to build a tunnel across the Waitemata Harbour. The proposal for a second harbour crossing has stirred ongoing debate due to the multi-billion dollar price tag attached to building either a bridge or a tunnel.

A tunnel route between the central city and the North Shore would cost from $4 to 5.3 billion compared to $3 to $3.9b for the bridge crossing.

Auckland Council Transport committee chairman Mike Lee says the Council prefers the tunnel option. "There will be no real reason to move away from that consensus. A tunnel has much more resilience, and a second bridge would look ugly and have problems getting consent." But he wasn't expecting a quick decision on the project. "The bridge and tunnel has been studied to death.

The second Waitemata Harbour crossing is not expected to be completed until at least 2030.

Transport Minister Stephen Joyce said the benefit-cost ratio was more in favour of a bridge than a tunnel, but refused to be drawn into the debate on what option the Government believed was best. Once public feedback is given through Auckland Plan, the NZ Transport Agency will make a recommendation to the Government. The Government aren't expected to make a decision until at least next year.

Discussions over an additional harbour crossing have been ongoing since congestion became a problem on the Auckland Harbour Bridge during the mid-1980s. A 2010 report by the New Zealand Transport Agency said the new crossing would reduce congestion and increase traffic volumes to Auckland's central city.

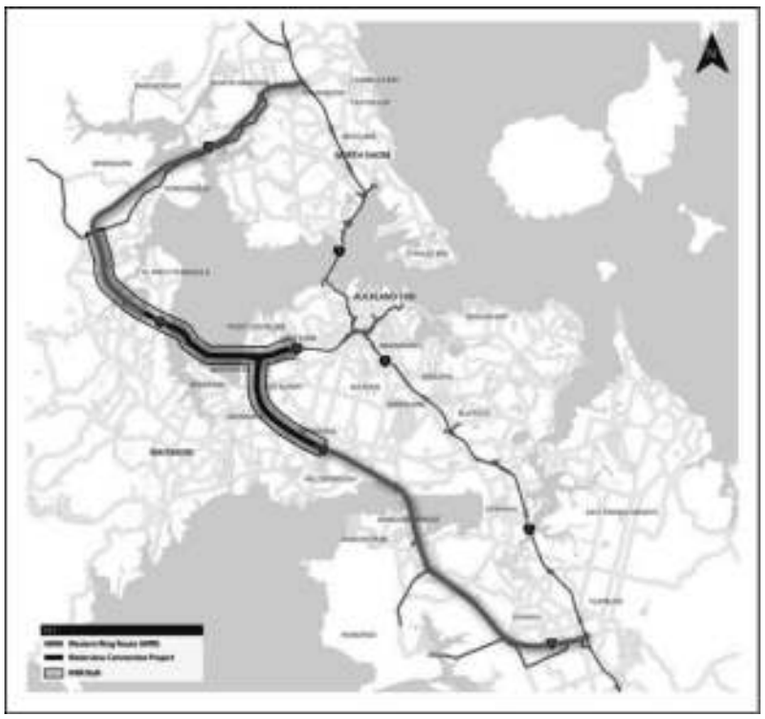
Funding for a second crossing is still to be decided, but the NZTA has raised the possibility of $6 to $8 tolls.

Auckland members of the Automobile Association also favour a tunnel

Rail or road crossing

An independent survey has found many Aucklanders want a rail service on the new Waitemata Harbour crossing. A UMR Research poll found 79% of 241 people surveyed think that train tracks should be installed on the new crossing, whichever form it takes.

Traffic on the Auckland Harbour bridge – currently 168,000 vehicles a day – is expected to rise by about 40,000 vehicles a day by 2041. The Government wants a new crossing built in the next 20 years to cope with demand.



Waterview Connection's next stage

The NZ Transport Agency (NZTA) has welcomed the final Board of Inquiry decision granting designation and resource consents to construct the Waterview Connection.

The NZTA's State Highways Manager for Auckland and Northland Tommy Parker says this is an exciting decision, clearing the way for the Transport Agency to shortly name the successful consortium to construct the country's largest roading project to date.

"It's great news for Auckland and for all of New Zealand. The Waterview Connection will help to complete the Western Ring Route, creating a transport solution that will unlock Auckland's potential for economic growth – and the whole country stands to benefit from that.

"With the Board's final decision now delivered we're looking ahead to the announcement of the successful tenderer with the anticipation that construction will start later this year," says Mr Parker.

The Waterview Connection with its twin three-lane tunnels, is a complex undertaking that is the first ever roading project to be considered using the new national consenting process. Last month, the Board released a draft decision granting the NZTA consent to construct the project.

"We've welcomed the opportunity for all parties to review that decision and provide comment. Now we have the final go ahead to get on and deliver a project that will improve the city's motorway network, improve travel times and ease congestion on local roads when it is completed," Mr Parker says.

The Waterview Connection, linking the Southwestern Motorway (State Highway 20) and the Northwestern Motorway (SH16) – also includes widening and raising the causeway and other capacity improvement works on the Northwestern Motorway to provide a transport alternative to SH1 through central Auckland.

The project will also provide better connections and improved facilities for those going by cycle or by foot. Catching the bus will also be easier with new bus priority measures and the addition of dedicated bus lanes for key sections of the project.

The NZTA's application for designation and resource consent to construct the Waterview Connection was lodged with the Environmental Protection Authority in August last year and referred to a Board of Inquiry soon after. Hearings to consider the application began in February, where the Board considered all the evidence and submissions on the project from the NZTA, local authorities, the community and other interested parties.

Mr Parker says the NZTA welcomed the opportunity to present its case and felt that the decision – which has required some additional mitigation measures from the NZTA – reflected the careful consideration of the project requirements and the community's needs and concerns.

"The Board was tasked with considering detailed investigations and evidence provided as part of the NZTA's application as well as taking into account the community's concerns. As a result the Board has tasked the NZTA with making some changes to the scheme including moving the location of the vent stacks and providing some additional open space measures. We now look forward to constructing a project that delivers best value for money while mitigating the effects on the community. We'll also be creating community liaison groups – made up of community representatives – prior to

construction to ensure that the community is kept well informed of what's happening."

The Transport Agency (NZTA) hasy named a Fletcher-led consortium as the preferred team for building the half-tunnelled 4.5km Waterview motor-way in Auckland within a $1.4 billion budget.

Fletcher Construction is confident it can lead New Zealand's largest roading project while also taking charge of much of Christchurch's rebuild.

Fletcher Construction's engineering general manager, Graham Darlow, who is chairman of the successful consortium's board, said the company would rely heavily on McConnell Dowell Constructors and Japan's Obayashi Corporation as tunnelling partners.

Other principals in the Well-Connected consortium are Parsons Brinckerhoff, designer Beca and geotechnical experts Tonkin and Taylor. The group will also have five "sub-alliance" partners.

Mr Darlow said Fletcher had completed the duplicate Manukau Harbour motorway crossing and New Lynn rail trench and, once the Victoria Park motorway tunnel opened early next year, would have no major project in Auckland apart from Waterview.

He acknowledged Waterview was something of a "lifesaver" for Fletcher, which wanted the first spade in the ground before Christmas. But there was a lot of design work to do, even though his team and another shortlisted consortium led by Leighton Contractors had worked on the project since late last year. The priority was to finish that work and order a tunnel boring machine from Europe for delivery in 12 to 18 months.

Despite the big budget, the Government insists the project would be far more cost-effective than the previous completely underground proposal. It will include two 2.4km three-lane tunnels between Owairaka and Waterview, where a three-tiered interchange will be built between State Highway 20 and the Northwestern Motorway.

That motorway will also be widened by 2016 between St Lukes and Te Atatu under contracts yet to be tendered, for which the Transport Agency has a remaining budget of about $600 million.

The Waterview Connection Project is a crucial component of completing the Western Ring Route. It is one of the seven 'roads of national significance projects identified by the Government as key to unlocking the New Zealand's potential for economic growth. Other components of the Western Ring Route are well underway or complete. The Hobsonville Deviation and Brigham Creek Extension Project is scheduled to be completed this year, six months ahead of schedule. Once completed the Western Ring Route will provide a 48km alternative to SH1 and will help to ease congestion and travel times for both freight and people.

A project summary statement is available on the NZ Transport Agency website.

Britomart Loop

Auckland leaders look likely to use Government arguments for completing their motorway network as ammunition for building a $2.4 billion central city rail tunnel.

The 3.5km tunnel would create a rail loop linking the existing Britomart terminus with the suburban rail line at Mt Eden.

Officials lined up with Auckland Council transport committee members yesterday in describing the tunnel as a "strategic fit" with the Government's aspirations for turning the country's largest city into an internationally competitive economic powerhouse.

They warned that without it, the city's roads and railway lines would become clogged by 2024, when there would be no spare capacity left for trains and buses, let alone more cars.

Auckland Transport stakeholder manager Stephen Rainbow, leading presentations by officials from his organisation and the council, said it had always been envisaged Britomart Station be opened into a loop tunnel after rail electrification.

He compared the completion of the western ring motorway route, which the Government is backing to the hilt with $2 billion of new investment, with what he saw as a critical need to complete Auckland's rail network.

Transport Minister Steven Joyce said that a Government review had found a glowing business case for the rail tunnel seriously lacking in substance, although he agreed to let the Auckland Council safeguard the 3.5km route at its expense. But Dr Rainbow said the tunnel, which would create a loop through Britomart with the western and southern rail lines, was "not just some folly dreamed up by traffic engineers as the next big capital project in the city. It's been envisaged for years and years and years that Britomart would be pushed through and that this critical final link in the rail network would be completed to optimise rail in this city."

He indicated that an important change since the tunnel business case was prepared last year for KiwiRail and the former Auckland Regional Transport Authority was earthquake damage to Christchurch. "Christchurch is probably going to take at least a decade to rebuild," he said. "With Wellington's economy static, Auckland's economy and particularly its business basis in the central city is critical to the future of this country."

Councillor Chris Fletcher, a former National Party minister who as Auckland City mayor from 1998 until 2001 ensured the construction of Britomart, said even Mr Joyce had acknowledged to her that the tunnel was "a logical strategic fit." Auckland Council chief planning officer Roger Blakeley said the Government would not realise a full return on its $1.1 billion rail electrification investment without completing the central city link.

Mayor determined to go ahead with rail tunnel

Auckland's mayor says his council will press on with plans for an inner-city rail tunnel, despite the Government rejecting its business case.

The Government says the Auckland Council's case for the $2.4 billion project exaggerates the benefits by at least three times. It does support the council continuing to secure the route for possible construction some time in the future.

The Government says the council over-estimates the effect the tunnel will have on transforming downtown Auckland and should explore other transport options more fully.

Mayor Len Brown has staked his political future on the project and says it will continue. He expects the tunnel to open in 2017.

Mr Brown says the council can afford to secure the route and gain consents over the next two years, during which time he believes the Government can be convinced of helping to fund its construction.

A business case prepared for the Auckland Council argued that the tunnel would transform the downtown area and every $1 spent would deliver up to $2.30 in benefits.

Auckland rail loop safe from taniwha

Representatives of Auckland's Ngati Whatua hapu say mention of a taniwha under the CBD should not be taken as a threat to a $2.4 billion rail tunnel.

Their advice follows a reminder to transport planners by Auckland Council Maori Statutory Board member Glen Wilcox of a spiritual creature living in an ancient creek now buried under much of Queen St and the Town Hall.

Mr Wilcox caused nervousness at a council committee meeting at the hall when he asked: "What's been done about the taniwha Horotiu who lives just outside here, and that tunnel will be going right through his rohe [territory]?" His bombshell, which he dropped as a brief mention at the end of a list of general questions about Auckland Mayor Len Brown's top transport project, went unanswered by officials at the meeting.

But Ngati Whatua o Orakei cultural adviser Malcolm Paterson said that the word taniwha meant many things, including a guardian of environmental values. He believed Mr Wilcox was probably flagging a need for Maori to be consulted properly on the project.

"The analogy I would give you is that this is not too dissimilar to the way people say in English, 'Are you aware of the elephant in the room?'," Mr Paterson said. "When you hear that in English, people don't think there's literally a large pachyderm in the room. Certainly, I wouldn't see that what Glen has said about raising awareness about the stream and what he identifies as a taniwha associated with it would be cause to stop this project."

He believed Ngati Whatua would expect to be engaged fully in such a large project and to influence its design to ensure benefits not just for transport but for the city's environment and heritage. He said that although the Waihorotiu stream was now out of sight, it still existed, running through pipes and carrying heavy metals to the Waitemata Harbour. Opportunities should therefore be sought by the project designers "to just not bugger up the ecosystem more, but perhaps enhance it".

Ngati Whatua o Orakei Trust Board chairman Grant Hawke also said he believed Mr Wilcox was simply signalling a need to take care over designing and building the tunnel.

Auckland Transport spokesman Wally Thomas said a detailed route and three station locations for the tunnel – which is likely to skirt around the underground stream and not cross it until it reaches the waterfront – had yet to be finalised. "There will be extensive engagement and discussion with all parties, including local iwi, once we get the green light to proceed with the [route] designation," he said.

A map from the 1840s of the old creek and its tributaries before it was covered over. A second map of modern Auckland shows a western tributary of the stream starting at a spring under the YMCA carpark, to the northeast of Pitt St, between Vincent St and Greys Ave.

Consultants' preferred route would avoid the tributary and the stream, except for drainage through Queen Elizabeth II Square next to Britomart, which was an unreclaimed part of the harbour when the stream was buried.

But Mr Hawke said the taniwha swam into the tide as well as up and down the stream.

Terrace Tunnel closer to completion

A major step in the upgrade of The Terrace Tunnel has been completed, with the last remnants of the old ceiling pulled down.

The ceiling has been removed going to enable the installation of four giant jet fans, to control smoke in the event of a tunnel fire.New tunnel cameras are also being installed to give a better picture of any accidents.

NZTA state highways manager Rod James said four more fans, as well as lighting, electronic signs and a deluge system to extinguish fires, are also due to be put in.

The $50 million safety upgrade is due to be completed in time for the start of the Rugby World Cup in September.

Welcome Bay Tunnel trouble

The proposed Welcome Bay tunnel appears to be losing favour with roading project decision makers as the NZ Transport Agency considers other options.

The tunnel would take traffic from Welcome Bay to the Hairini causeway by going under the Maungatapu roundabout.

It was an election promise made by National leader John Key in 2008 as the best way to separate Welcome Bay traffic from through-traffic on State Highway 29. National promised to pay for the tunnel and a replacement four lane bridge over the Hairini causeway.

In March, 2010, Bay of Plenty electorate MP Tony Ryall and Tauranga MP Simon Bridges confirmed to Western Bay Mayor Ross Paterson and Tauranga Mayor Stuart Crosby that the government will keep that election promise. Now it appears the NZ Transport Agency is looking at other options..

NZTA project manager for the Welcome Bay roundabout Neil Mason says "The tunnel is not in the picture".

The intention appears to be to do away with the little roundabout and create a bigger one, taking property off people who live up Ohauiti Road so they can create a retaining wall and lower the road, and then go back over Maori land. The plan is for Welcome Bay residents going to Tauranga to have to turn left into Ohauiti Road and back onto State Highway 29 downhill from Palmers Garden World.

The tunnel would take traffic from Welcome Bay to the Hairini causeway by going under the Maungatapu roundabout.

Mt Victoria Tunnel systems set for upgrade

The NZ Transport Agency (NZTA) started work on 9 May 2011 to upgrade the Mt Victoria Tunnel's operating systems. The NZTA's acting highways and network operations manager Mark Owen says the tunnel's fire fighting systems will be upgraded and earthquake strengthening will be carried out.

Mr Owen says the upgrade will bring the tunnel's systems up to modern standards and extend its life. Work is expected to be completed in early 2012, and the tunnel will remain open during Rugby World Cup games being held in the capital. "The Mt Victoria Tunnel is a vital transport link for the people of Wellington and a key part of the country's state highway network. The tunnel is now 80 years old and it's time for an upgrade," says Mr Owen. "Once completed, it will be safer and more resilient in the event of a fire or earthquake."

Mr Owen says the tunnel will be closed overnight between 8pm and 6am five nights per week from Sundays to Thursdays, for work to take place. Closure information will be published on the project website and every Monday in the Dominion Post, and advertised on radio.

"This is important work and it can't be done when the tunnel is in use, so to minimise disruption to motorists and local residents we'll be doing the work overnight, and putting clearly marked diversion routes in place. We are also trying to minimise noise and disturbance for locals by timing noisy and dusty work earlier in the evenings where possible. It's essential the upgrade is done efficiently. Closing the tunnel five nights a week is the best way to do this without affecting peak time traffic flows in and out of the city. We appreciate it's a big adjustment for everyone who uses the tunnel, and we'll be working hard to ensure these changes go smoothly as have the Terrace Tunnel closures".

Mt Victoria second tunnel

The Government announced two years ago it was planning to spend $2.4 billion to upgrade State Highway 1 from Wellington Airport to Levin.

Wellington Mayor Celia Wade-Brown, who spoke against the plans in her election campaign, has now reassured the New Zealand Transport Agency that the council still wants the work to proceed.

Key elements could include a duplicate Mt Victoria tunnel, possibly at the end of Paterson St. This project was then estimated to cost $217 million. Ruahine St at the southern end of the tunnel would be turned into a four-lane expressway to the airport with additional improvements to speed traffic flows at the Basin Reserve. This could include a flyover or tunnel at the northern end of the basin. The estimated cost of this project was $36m. A second Terrace Tunnel estimated to cost $150m.

The Transport Agency owns a string of houses along Paterson St, and at the corner of Brougham and Austin streets – marking out the likely path of a proposed second tunnel through Mt Victoria.

The district plan places restrictions on demolishing Mt Victoria and Mt Cook houses built before the 1930s.

The Transport Agency made a submission to the council in 2009 calling for an amendment to the district plan; "that it is necessary that the importance of Wellington's character be balanced with the infrastructure needs of the city and region". In particular, it mentioned that "future road improvements in and around the Basin Reserve (ie Ellice St, Dufferin St and Paterson St) and the future duplication of the Mt Victoria Tunnel may affect pre-1930 properties".

The council did not adopt the amendment, and NZTA made an appeal to the Environment Court last November. The case has yet to be heard. The Paterson St houses have rateable values of up to $1.675 million.

NZTA transport planning manager Selwyn Blackmore said the properties – all built before 1930 – were bought between the 1960s and 1980s "in anticipation of a duplicate Mt Victoria Tunnel".

Preservation options for the houses – such as shifting them – would be considered, he said. "The NZ Transport Agency is committed to the preservation of heritage properties ... We look forward to working closely with the Wellington City Council and the NZ Historic Places Trust when we are in a position to determine the future of the properties on Paterson St."

An announcement about the route for the tunnel and for State Highway 1 is expected later this year. They will be part of the $2.2 billion Levin-to-Wellington-Airport road of national significance.

Paterson St resident Kate Foot has lived in historic Ettrick Cottage for six years. The house, which she leases, would have to be shifted if the road went ahead, as her landlord rented the land from NZTA, she said. But Ms Foot was not too concerned about the street's heritage being lost, because most of the houses were run-down student flats. Many were cold, dark "holes", and the street was often a mess.

City council transport portfolio leader Andy Foster said the city would try to mediate with the Transport Agency. The demolition rule was not designed to affect entire streets, but to maintain the character of the suburb. It was designed to stop the demolition of individual houses within character streets. "We're trying to protect the inherent character of those inner-city suburbs. If you have an entire street disappearing, then in a sense you're not trying to protect character. It's a different situation than we designed the rule for."

Major roading projects would always clash with housing, and those issues would be considered once the Transport Agency announced the designation for the tunnel development and consultation began, he said.

Victoria Park Tunnel project

Traffic heading north out of Auckland and over the harbour bridge has a new route in with new lanes taking traffic over the top of the northern exit of the new tunnel being built to take northbound traffic.

NZTA's state highways manager for Northland and Auckland, Tommy Parker, said the on-ramp had been an important part of the tunnel project that has posed both engineering and traffic management challenges at New Zealand's busiest motorway interchange. He said the Victoria Park Tunnel project was the largest road construction project under way in the country and the first of the Government's seven roads of national significance and will remove the last significant traffic bottleneck on Auckland's central motorway network.

The tunnel under Victoria Park would take three northbound lanes and south bound traffic only would use the Victoria Park overbridge. The tunnel is due to open to two lanes of traffic in early November and the entire project would be completed next March.

Loaded mystery pistol found

An archaeologist has been brought in after an old pistol was unearthed during construction of the Victoria Park Tunnel near Auckland's waterfront. The semi-loaded pistol was discovered in an old well, and it could have even been a murder weapon.

"The pistol was found on the very base of the well so it looks like it was thrown in there while the well was still in use," said Archaeologist Sarah Phean. "Unfortunately the handle has rotted away (but) it would have been wooden."

The gun is being soaked in a lab to try and preserve what is left. "The whole metal double barrel and the two triggers have been preserved," Phean said. "One of them (triggers) was fired so that certainly leads to interesting questions as to why it was fired and why it ended up in the bottom of the well."

NZTA puts the lid on

The NZ Transport Agency's State Highways Manager for Auckland and Northland, Tommy Parker, says the 450 metere-long tunnel structure was completed in just 15 months, with the positioning of the last beams on Saturday 2nd July, and the tunnel remains on track to open to traffic on 7 November, three months early.

Placement of the last beams clears the way for an increase in activity out of sight inside the tunnel.

The tunnel is due to open to two lanes of traffic in early November and the entire project would be completed next March.

Below ground, the electrical and mechanical services needed to operate the tunnel safely are being installed. These included lights, extraction fans and communication and fire protection systems. The tunnel's fire lining is 80 per cent complete and traffic barriers are being built.

"The Alliance responsible for the Vic Park project (NZTA, Fletcher Construction, Beca, Parsons Brinckerhoff and Higgins) has moved construction along at an extraordinary pace. Grass is now growing again where, just a few months ago, there were more than a dozen cranes and drilling rigs operating in thick mud," says Mr Parker.

Work is underway to reinstate trees, grassed areas and paths on top of the tunnel under Victoria Park. A new skatepark is taking shape on the site of the original one in Beaumont Street, and an Auckland Council art project is also progressing to brighten the underside of the Victoria Park flyover.

Mr Parker said the Victoria Park Tunnel project aimed to return all but a very small section of the park to the community before the start of the Rugby World Cup in early September. It would also reopen the popular Jacobs Ladder staircase and the new walkway connecting it to Beaumont Street.

Across Victoria Street, work to build a new Wellington Street motorway on ramp and the tunnel approach was continuing. Mr Parker says this area would also be totally transformed as the project comes to an end.

The Victoria Park Tunnel project will be the first of the seven roads of national significance identified by the Government as essential to New Zealand's economic prosperity to be completed. Together, the tunnel, the

reconfigured existing viaduct, and extra southbound capacity from the Newmarket Viaduct to Greenlane, will remove the last remaining bottleneck on the motorway network through central Auckland and provide more reliable and safer journeys.

Mr Parker says that while the tunnel will open to two lanes of traffic in early November, it will be January before Auckland experiences the full benefits of the Victoria Park Tunnel and its associated motorway widening through St Marys Bay.

"Once northbound traffic is using the tunnel, we will reconfigure the Victoria Park flyover to carry southbound traffic. Our aim is to have all three northbound lanes in the tunnel and all four southbound lanes using the flyover by mid-January."

The NZTA and its Alliance partners plan an extensive campaign to educate drivers about the new layout for motorway lanes. "The changes will be extensive, particularly for people driving southbound over the existing viaduct," Mr Parker says.

Historic Auckland hotel on the move

Engineers have successfully moved Auckland's historic Birdcage hotel more than 24 metres back towards its final site.

The 1886 Birdcage hotel was moved 40 metres to allow for work to begin on the Victoria Park tunnel in August last year to make way for a major transport project.

With the $340 million tunnel about 80 percent complete, the last stage of the project cannot take place until the hotel is moved back to where it originally sat. The painstaking process of sliding the 740 tonne hotel slowly along four specially-built runway beams took two days.

Workmen spent the past several hours moving the hydraulic rams to the back of the hotel so that they could push the hotel to its final site, over the remaining 20 metres. The cost of both the moves is estimated to cost about $2.5 million.

The hotel, which marks the original shoreline of Freemans Bay, was rotated seven degrees, anti-clockwise, so that one side of the tavern will be parallel to the new alignment of Franklin Road. It will sit over the southern portal of the tunnel and become the focal point of a new public plaza.

Lyttelton Tunnel canopy demolished

The NZ Transport Agency (NZTA) said that the severely damaged Lyttelton tunnel canopy had to be demolished following the Christchurch earthquake in February.

The tunnel was re-opened for use by emergency vehicles during the chrisis, and Mr Connors says a steady stream of emergency services used the tunnel to travel to and from Lyttelton. While alternate access to Lyttelton was available for private vehicles via local roads.

The Lyttelton tunnel was closed immediately following the earthquake, as rockfalls caused significant damage to the tunnel canopy and to the tunnel control building.

The NZTA's immediate priority was to re-establish the tunnel as a route for emergency services in and out of Lyttelton. Mr Connors says that while the tunnel itself has been inspected and remains structurally sound, the canopy and the tunnel control building were both severely damaged.

The canopy itself was a significant safety hazard with risks from ongoing rockfalls on the tunnel approaches. "We're working now to retrofit containment devices to catch any falling rocks," Mr Connors said.

The tunnel control building was deemed unsafe to occupy. The tunnel's electrical systems and exhaust fans were operated by back-up generators.

Awakino Tunnel on State Highway 3

Works to trim the inside walls of the Awakino Tunnel on State Highway 3 to deliver a safer journey for trucks travelling this stretch of road, was carried out in April.

The NZ Transport Agency (NZTA) Waikato State Highways Manager Kaye Clark says historically there have been problems with trucks scraping the inside walls of the one-lane tunnel, and some trucks were unable to pass through the tunnel due to their size.

The tunnel still remains single-lane, but will be a lot safer to travel through. The changes are a result of a safe system approach, where safety agencies look at all of the combined factors that contribute to making safer journeys, including safe roads and roadsides, vehicles, speeds and road use.

"This work could also deliver time and cost savings for the trucking industry and provide more flexibility in route options, due to this section of the state highway network being opened up to use by larger trucks."

To minimise the impact on motorists travelling through this area, works were scheduled to take place at night between 8pm-4am.

Blast prompts warning over Caversham tunnel

Auckland's deadly gas blast – which claimed the life of a worker – is a "tragic reminder" the same threat could lurk inside Dunedin's Caversham tunnel, a Dunedin City Council manager John Mackie said.

Mr Mackie said yesterday there was a real risk the same sort of explosion could happen inside the Caversham tunnel if methane gas leaked from a council-owned gravity sewer which ran through the tunnel. It could not be assumed the tunnel would be safe just because it had openings at both ends and air running through it.

Last month, Mr Mackie had delivered a blunt warning to councillors, during 2011-12 draft annual plan deliberations, about the risk of methane and hydrogen sulphide gases escaping into the tunnel. That did not stop councillors committing to reopening the tunnel to cyclists and pedestrians, subject to further studies and safety work, and budgeting an extra $100,000 to pay for the work to begin.

It also did not stop councillors again debating the merits of the Caversham tunnel project during this week's full council meeting, called to confirm draft annual plan decisions ahead of final confirmation on June 27.

Cr Neil Collins, speaking at this week's meeting, said the situation that led to the Auckland explosion "was not a mile apart" from that in the Caversham tunnel. He wanted the council's pledge to reopen the tunnel, and the $100,000 funding allocated, removed from the draft annual plan. However, his move was defeated at a vote after other councillors argued against it.

Cr Kate Wilson – a member of the working party exploring reopening tunnel – said a thorough review, funded by the $100,000 budgeted, would examine whether the tunnel was safe for public use. There were "quite clear distinctions" between the fatal accidents overseas cited by Mr Mackie and the situation in the Caversham tunnel, she said.

Unknown gas blamed for NZ tunnel blast

The explosion which killed one man and injured six others in a tunnel in the Auckland suburb of Onehunga on June 4th 2011 was caused by an unidentified gas, New Zealand emergency services say.

The explosion happened 4m into a tunnel where a new water main was being connected in Onehunga's Mt Smart Road, said Superintendent George Fraser, the police officer in charge of the rescue and recovery mission.

The workers had just entered the tunnel and were only a few metres into it when the blast happened, blowing two men out of the tunnel and injuring five. One man is believed to have lost limbs and Canadian mother-of-two and Watercare Services maintenance planner Philomen Gulland was killed at the scene.

The blast occurred at 8.15am as a team inspected work linking two large water mains. Contractors had been working to connect a new water main to an existing one at the intersection of Mt Smart Rd, Victoria St and Athens Rd, in Onehunga, the chief executive of New Zealand's Watercare Services. Both pipes were 1.9m in diameter. A section of one pipe had been removed at about 7.15am in preparation for the connection, but the explosion occurred soon after the team entered the excavated area to inspect the work. Two men were reportedly blown out of the tunnel.

Auckland fire acting area commander Steve Lakin said seven specialist appliances were sent to the area. "When the Fire Service arrived at the scene it was a rescue operation. They rescued six people from the vicinity of what is an underground pipe. After we made the scene safe and realising it had been a fatal accident, the Fire Service, along with the other emergency services, made an effort to enter the tunnel to determine the state of play. We entered the tunnel with gas detection equipment and found that there were explosive limits of gases inside the tunnel."

The 1.5km pipe was about 3m underground and was 2.5m in diameter, allowing people to walk into it before the diameter reduced.

They flooded the pipe with material to reduce the risk of another explosion.

Snow drifts burden Homer Tunnel

Massive westerly storm hit the NZ South Island and closed one of the country's premier tourist routes for almost a week in July when workers battled to clear snow from round the Homer Tunnel, which links Queenstown and Te Anau to Milford Sound.

Getting to the Homer Tunnel was an obstacle course, even in a chain-equipped, front-end loader. The snowdrifts were massive; standing 2.5 metres in places. With nuge snowdrifts line the road leading to the tunnel. The scenery is beautiful but the only people to see it are workers clearing the road.

Wayne Carran of Downer EDI Works said, "it was falling faster than we could clear it. It's not possible to keep it open and the other thing is we've had the first of the avalanches."

The snowdrifts brought down trees but did not block the road. So much snow fell that diggers were scooping it well away from the road, so it did not collapse back in and cause more blockages. The weight of the snow was bringing down branches across the road and a helicopter was bought in flying over the trees to blow it away.

The westerly storm lasted more than a week and it's not often the road is closed this long. Luckily it was the low season for tourists; with only about 200 cars a day coming through this time of year, whereas in summer it is up to 1600.

Dart-Milford tunnel

The company behind a $170 million bid to build an underground tunnel between the Routeburn and Hollyford valley has said a Department of Conservation decision was imminent.

The Christchurch-based Milford Dart Company lodged a concession application with DOC last year.

In 2005, the firm unveiled plans to build an 11.3km tunnel, the Dart Passage, that could cut travel time between Queenstown and Milford to two hours.

Milford Dart spokesman and director Tom Elworthy yesterday said the decision on the application to DOC Southland conservancy was held up while the conservation authority considered Mount Aspiring and Fiordland National Park management plans.

The scope of the main application was narrowed down until it complied with the park management plans for Mt Aspiring and Fiordland, he said. "We are reasonably confident we will get a decision from them. Construction would take about three years.

Southland District Mayor Frana Cardno supports the Southland Conservation Board recommendation the Department of Conservation (Doc) remains neutral on the proposed Dart-Milford tunnel – as long as the management plan for Fiordland National Park is followed.

The board has verbally advised Doc to take a neutral stance on the application from Milford Dart because the $170 million project was equally "consistent" and "inconsistent" under the park's management plan, board chairman Robin McNeill said.

The proposal was "difficult" because there were "pros and cons and the plan was never written with a tunnel in mind. That makes it difficult to figure out how to treat it," he said.

Mrs Cardno supported the advice, saying New Zealand was "about quality tourism, not how quick we can get them places ... To me, putting a tunnel through a World Heritage park where they see nothing is not quality tourism."

The tunnel proponents say the 11.3km tunnel between Routeburn Station near Glenorchy and the Hollyford Valley could slash travel times between Queenstown and Milford. Mrs Cardno said there was concern about the effects the project would have on the "pristine" national park.

Milford Dart director Tom Elworthy said after an initial reading of the board's pre-draft report he was still "optimistic" the plan would go ahead. He rejected Mrs Cardno's claims the tunnel would undermine the quality of tourists' experience.

"If it's about quality tourism, how does 11 hours in a bus help? It's all about connectivity and opening up the whole network. It will free up a whole lot of time for people to spend money rather than sit on a bus." Doc Southland concessions and acting statutory land management manager Stewart Genery said now that Milford Dart had received the draft it would be given the opportunity to make comments that would be added to the final report.

If accepted, the report is likely to go out for public consultation.

Kohat Tunnel re-opens

The Kohat Tunnel on the Pakistan border, closed following two bomb blasts that ripped through it on 28th January. However the tunnel was reopened for passenger vehicles two days later, although cargo vehicles were not be allowed to pass through the tunnel.

At least five people were killed and 19 others injured when two explosives-laden trucks were detonated by suicide bombers, one inside the tunnel and the other at its entrance. The attackers had entered the tunnel from the Darra Adamkhel side.

Local sources said that the two attacks that occurred at 12:30am on Saturday, badly damaged the Pak-Japan Friendship Tunnel, which links the southern districts of Khyber-Pakhtunkhwa with Peshawar. They said that the first blast occurred some 600 metres inside the tunnel when a Bedford truck was detonated by a suicide attacker. The second truck, an oil tanker, was detonated on the checkpost outside the tunnel, unmanned at the time.

According to Bomb Disposal Unit (BDU) officials' estimate, the two trucks carried at least 1,000 kilograms of explosives. Twelve vehicles, including cars, were caught in the blast and destroyed.

The blast left a three-foot-deep and 18-foot-wide crater inside the tunnel. The electricity, drainage and exhaust systems of the tunnel were also damaged.

Kohat Tunnel, also known as Pak-Japan Friendship Tunnel, is Pakistan's longest road tunnel and the second longest tunnel after the Khojak Tunnel and is situated on Indus Highway. The Rs5 billion tunnel was opened to traffic in June 2003.

This is second time in the past few years that militants have targeted the tunnel. Earlier during Operation Eagle Swoop in January 2007, Taliban militants captured the tunnel and detonated explosives-laden vehicles inside it.

World's highest tunnel

Construction of the world's highest tunnel began in southwestern Sichuan Province in May. At an altitude of 4,240 to 4,380 meters, the seven-kilometre, 1.12 billion yuan ($172 million) Trola Mountain tunnel will link Chengdu, the capital city of Sichuan Province, in the east, with Lhasa of the Tibetan Autonomous Region in the west via the Sichuan-Tibet Highway.

The tunnel will also shorten travel time from more than two hours to approximately 10 minutes, construction manager Li Ming said, and is scheduled to be completed within four years.

The 2,415-kilometer Sichuan-Tibet highway is considered one of the world's most deadly as it traverses a dozen rivers and 14 mountains with altitudes of 4,000 to 5,000 meters. The Trola tunnel will reduce the notorious danger for truck drivers who zigzag daily up and down the mountain switchbacks where wrecked vehicles lie scattered along the road.

LACK OF FUNDS HITS LOWARI TUNNEL

The Lowari Tunnel project, conceived way back in 1956, has been left incomplete again much to the anger of the people of Chitral, the largest district area-wise in Khyber Pakhtunkhwa.

Funds shortage has hit work on a nearly 2-km-long tunnel, which is on a road that will link Pakistan with Tajikistan.

The Lowari tunnel project has got delayed as no construction activity has been carried out there for several months.

The tunnel will provide an all-weather route to Khyber Pakhtunkhwa province's Chitral district that gets cut off from the rest of the country in winter. The road will also link Pakistan with Tajikistan.

The work on the tunnel began six years ago and about Rs.8 billion has already been spent.

An official said the foreign contractor has demanded that his dues should be cleared and also sought a new contract as well as increasing by 50 percent the funds allocated for the project.

Initially, an amount of Rs.9 billion was allocated and it was subsequently revised to to Rs.18 billion due to design changes and rise in price of construction material. The deadline for its completion was extended to 2014

The MNA from Chitral Shahzada Mohiuddin said at the beginning of August 2011 that construction work on the Lowari Tunnel would restart soon.

The MNA said that he had conveyed the resentment of the people of Chitral over the suspension of work on the mega project to Prime Minister Syed Yousuf Raza Gilani who assured him that the required funds would be released to the executing company soon.

According to the latest estimate of the National Highway Authority (NHA), Rs17 billion would be needed to expand the width of the eight-km-long tunnel from the current 11 feet to 23 feet and reconstruct roads on its northern and southern portals.

These modifications are being made after the project design was changed from rail to road tunnel. The MNA said the project was to be completed in four years.

Relocation of staff

Following a meagre allocation in the federal budget for the Lowari tunnel project, Korean construction company Sambu has decided to shift its staff and machinery from the site. They said that only Rs1 billion had been earmarked for the project in the recent budget of which Rs667 million would be used for clearance of outstanding dues of the company. They said that the company would leave the site by July 9 as it could not afford to keep its men and machinery idle, waiting for the required funds.

A portion of the technical staff and machinery was therefore shifted to the Golen Gol hydel power project in central Chitral whose construction contract had been acquired by the company.

About 45 per cent of the work had been completed, including 8.5 km main tunnel and 2.2 km approach tunnel on Chitral side. They said that the rest of the work, including 20 km approach roads on either side of the tunnel, was left to be accomplished when funds were available.

It was learnt that the consultant firm of the project had already withdrawn from the site when the National Highway Authority reportedly failed to clear its dues.

The sources said that as per the agreement deed of the project, the government was bound to pay both the construction company and the consultant firm, even if work was stopped on the site due to funds shortage.

Demonstrations

After the South Korean construction company, Sambu JV, stopped work on the project and the two European consultant firms quit due to non-payment by the National Highway Authority (NHA) the people of Chitral started staging protests in Chitral town and Peshawar and asking the government to provide the promised funds so that the construction firm and consultants could be paid and work resumed on Lowari Tunnel.

The Chitralis were looking forward to the early completion of the tunnel as it would have provided them access to rest of Pakistan all year round. The Chitral valley is cut-off from the country for almost five months during the winter due to heavy snowfall on the Lowari Pass, the 10,320 feet (3200 metres) high mountain pass linking Chitral with the Upper Dir district.

On May 5, 2011 Sambu JV served notice on the NHA under the terms of their contract demanding payment of its outstanding dues. The 28-day notice period ended on June 3 and the next step by the South Korean firm was to write to the NHA to form a committee for final settlement. This would effectively end the participation of Sambu JV in the project. This would be all the more disappointing because 44 percent of the work on the project has been completed.

This must have been one of the toughest contracts for the South Korean company. The weather is extremely cold and harsh at the Lowari Pass and there have been periods of insecurity in the area, particularly during the militant attacks in Malakand division, which includes both Chitral and the two Dir districts.

The Sambu JV management was frustrated when its more than 500 employees and heavy machinery sat idle due to suspension of work on the project. Plans were hurriedly made to send back 17 Koreans working on the project and shift some of the 500 Pakistani workers and machinery to other smaller projects contracted by Sambu JV in Chitral. Hoping to get paid, Sambu JV continued to do limited work on the tunnel in absence of consultants who stopped working last October.

All those hopes were dashed in June when one billion rupees only were earmarked for Lowari Tunnel project in the federal budget and the NHA allocations. As the NHA had to pay Rs700 million outstanding dues to Sambu and the Austrian and Spanish consultants' firms, the remaining Rs300 million allocated for Lowari Tunnel wasn't enough for the contractor to resume work on the project. This isn't the first time that work on the project has been stopped. In fact, Lowari Tunnel has been an unlucky project. Perhaps no other project has taken so long to be completed.

Chitrali Children staged a protest demonstration against the federal government for insufficient fund allocation. Chairman of Tanzeem-e-Tahafuz-e-Haquq-Chitral and elders led the protesting children outside cantonment Railway Station holding placards inscribed with slogans in favour of construction of the project, the kids also chanted their slogans against the government in this regard. Talking to media persons, the chairman of TTHC said that the federal government had allocated only Rs 1 billion for such a mega project while construction company Sambo would have to pay Rs 70 million to different departments including Pakistan state Oil, construction machineries and other related instruments and the rest amount of Rs 30 million out of Rs 1 billion is nothing for the project.

The Sambo company, he said had stopped work on the project for one year and the said allocated amount would not make it able to restart the work and expedite construction work for the completion of tunnel within the fixed time till 2013.

The TTHC chairman said that a conspiracy against Sambo Company was being hatched aimed at compelling it to leave and wind up the project and he warned that the Chitralis would not accept such kind delaying tactics regarding the tunnel. He added that 45 percent work on the project had been completed while the remaining 55 percent could be completed early if the government provided the requirement funds as per demand of sambo.

The chitralis, he said were peaceful people and the lawari tunnel was gift for them by a dictator Gen (Retd) Pervez Musharraf but he regretted the democratic setup was trying to deprive chitralis of their rights.

The children, therefore, demanded of President Asif Ali Zardari and Prime Minister Yusuf Raza Gilani to announce the required more fund for the project so that work on it could be resumed.

History

Work on it was first started in 1974 by the government of Prime Minister Zulfikar Ali Bhutto, who enjoyed popularity in Chitral. It was going to be a 8.75 kilometres long tunnel to provide an all-weather road link to Chitral and reduce the journey time from Chitral to Peshawar from 14 hours by almost half.

However, work on the project was stopped in December 1979 following the Soviet invasion of Afghanistan. It is said the fear that the Soviet Red Army would be able to use the tunnel to cross over to Dir from Chitral before advancing downcountry to the heartland of Pakistan was one reason that work on Lowari Tunnel project was halted. If true, it was absurd because there is no evidence that the Soviet Union wanted to invade Pakistan to reach the warm waters of the Arabian Sea.

The work on the redesigned project was started in September 2005. It was initially designed as a rail tunnel but was subsequently changed to road tunnel. The estimated cost was to be Rs5.4 billion, which later rose to Rs6 billion. Now the cost of the civil works is stated to be Rs8-9 billion. The December 2013 timeline for completion of the project would also be difficult to meet in view of the delays and suspension of work. The people of Chitral, forced in the past to travel at their risk via Afghanistan's Kunar province and Bajaur Agency to reach Peshawar and dependent during the winter on the irregular PIA flights, would have to wait longer for Lowari Tunnel to be completed and made usable.

Rohtang Tunnel

Work begins from both portals

Digging of the 8.8 km-long strategically important Rohtang tunnel has now started from the opposite end in Lahaul-Spiti at full pace. After being disrupted for six months, work from north portal of tunnel has begun with the same speed as in the south portal.

According to Rohtang tunnel chief engineer PK Mahajan, a team of experts was on final stages of giving shape to the north portal. "Once the portal is created, work on excavation of tunnel would be executed expeditiously to compensate for the loss of six precious months of winters."

The team at south portal has crossed the 1 km RD line and now they were about to touch the 1.1 km milestone, he said. At an altitude of 10,000 feet above sea level, construction work of the tunnel by Border Roads Organization (BRO) is reportedly facing many challenges one after another. These include low atmospheric pressure, severe cold conditions, blockage of north portal of the tunnel and unsteady weather, Mahajan said.

Work on Rohtang tunnel started on July 28 last year. Having been given a deadline of five years to complete the work, BRO could drill only 1 km tunnel in first year. BRO officials attributed this delay to the time taken in installing machinery and building of roads and quarters for workers. To meet the time target, BRO will now have to excavate the remaining 7.8 kms of the tunnel in four years. BRO has deployed its men and machines from both sides of the tunnel, but closure of north portal for six months every year was making them lag behind the schedule, he pointed out.

Mahajan said that this year, they will work hard to compensate the losses last year. The organization was now finding ways to keep the work running throughout the year from north portal also, he added.

Cloudburst

At least eight people, all working on the high altitude Rohtang tunnel project, were thought to have died and over 24 injured in flash flood due to a massive cloudburst at Dhundi in the Kullu valley in July 2011.

There were around 133 people working at the site when the cloudburst happened at 12:05 am. The flash flood also washed away labourers' huts and the office of the private contractor.

"Nine people were reported missing, one of whom later returned. A large number of people saved their lives by running away from the project site," Kullu Deputy Commissioner B M Nanta said.

Two bodies were recovered from the Beas and were identified. The state police along with Indo-Tibetan Border Police and SSB undertook a massive search and rescue operation, but heavy rains raised the Beas water level and hindered operations.

After Rohtang another tunnel to connect borders

Aimed at providing all weather connectivity to areas along China and Pakistan border project Deepak – wing of Border Road Organization (BRO) has cleared way for constructing another tunnel beneath Shinkula pass, while work progresses speedily on Rs1500 crore strategic Rohtang tunnel. Project. Deepak has completed pre- feasibility report on proposed tunnel under Shinkula pass, which is aimed at providing unhindered access to Manali –Leh Road. The engineers of Border Road Organization had conducted studies for nearly past nine months exploring possibilities for cutting tunnel across 15,920 feet Shinkula pass.

Snow and Avalanche Studies Establishment (SASE)-Laboratory of Defense, Research and Development Organization which has its headquarter in Manali has set up its centre in Shinkula for snow studies. "Pre-feasibility report would be sent to Union government" confirmed Chief Engineer Deepak Project, IR Mathur, while he added that feasibility studies would be based on data and snow studies. Studies have assessed technical and economic feasibility for boring tunnel.

Border Road Organization engineer were in dilemma whether to construct tunnel, as government had earlier been mulling over a proposal to construct a road for crossing over Shinkula pass. But after snow studies engineers are now of the opinion that tunnel was only solution that could provide all weather connectivity to border areas in Kashmir.

According to engineers, borders roads spend nearly Rs 7 to Rs 8 crore annually on clearing snow on roads leading to Leh and Ladakh. The proposed tunnel at Shinkula pass will have a distance of four to five kilometres length and estimated cost of the project is pegged about Rs 600-700 crore.

Provided Defense Ministry gives go ahead for feasibility studies, the border road organization will examine environmental issues, identify possible tunnel routing alignments and estimate costs of infrastructure and equipment required. "Right now we are looking for feasible point for cutting tunnel. If we go upwards distance of tunnel will be shortened but it's obvious that height altitude snow is more," said an engineer requesting anonymity.

If proposal for tunnel is translated into reality, it would reduce distance to Leh by 100 kilometres and would prove significant for faster, movement of troops, which was greatly felt during the kargil conflict when the main routes connect Ladakh came under firing from the Pakistani troops. At that time to 470 kilometres s road stretch connecting Manali and Leh had proved vital for the defence supplies. The Indian government had begun to feel need for providing all weather road to Ladakh.

Even though the Rohtang tunnel was conceived way back in 1983 as an alternate route for strategic considerations, it was only in September last year that that the Cabinet sub-committee on Security cleared the Rohtang tunnel project. The Tunnelling work at Rohtang took of the in June last year After United Progressive Alliance Chairperson Sonia Gandhi laid foundation of the eight kilometres tunnel.

Zo-jila Pass Tunnel

The Beacon The Border Roads Organization entrusted with the maintenance of main highways and frontier roads in Jammu and Kashmir, has taken up the plan to construct a tunnel on Srinagar-Leh Highway near Zo-jila Pass and feasibility report of the project would be complete by May this year.

This was stated by Brigadier T P S Rawat of 22 Brigade at Beacon headquarter Rangreth here. The project would be completed at the cost of Rs 1500 crores. "The work on the tunnel would be started immediately after the completion of feasibility report in May," Brig Rawat told reporters.

He said Beacon has no shortage of funds for the project and it got delay because of last year's unrest in Kashmir. "Three kilometer tunnel would be dug near 'Zed pass' Sonamarg and from Baltal to Mini Marg there is proposal of another 12 kilometer tunnel in first phase. This would reduce the distance by 25–0 kilometers and make the highway all weather road. It would also minimize chances of accidents on the highway," he added.

Brig Rawat also said that Beacon would construct tunnels at Sadhna Top on Tangdar road, Fareqan Gali on Keeran road and Zed Gali on Gurez road.

He said that Srinagar-Jammu National Highway would be made four-lane and work on it would start soon. Brig Rawat praised Beacon for clearing snow on Valley roads in record time.

‘Lifeline’ tunnel to be rebuilt

The entrance to Salang Tunnel. At an average height of 11,600 feet, it is the world’s second highest next to the Eisenhower Tunnel in the Rockies. Due to the effects of wartime damage, severe weather, constant use and little maintenance, the tunnel has been described as “a tragedy waiting to happen,” largely because of poor ventilation and a rough surface that results in truck tip-overs inside. / The Leaf-Chronicle/Philip Grey

The lifeline that connects 14 Afghanistan provinces is scheduled for a makeover that is expected to take 3 1/2 to four years to complete.

The project will address problems with the vital Salang Tunnel that crosses the Hindu Kush mountain range under Salang Pass, according to Maj. Gen. John F. Campbell, commander of the 101st Airborne Division.

Campbell said the three-phase U.S. Army-managed construction plan will begin with emergency repairs to the Salang Tunnel, which is the only major north-south route in Afghanistan to remain open all year.

The next phase will be to build a bypass through Bamyan Province to facilitate logistics and commerce during a planned tunnel shutdown. That phase is expected to last about 18 months.

The last phase will be the shutdown and rebuilding of the tunnel, lasting 18 to 24 months.

Major disasters have taken hundreds of lives in the 1.6-mile-long Salang Tunnel. Despite the dangers, which include carbon monoxide poisoning from a non-working ventilation system and truck tipovers due to large ruts carved out during ice removal, the tunnel was considered too vital to shut down for extended maintenance without a usable alternative route.

The last phase will be the shutdown and rebuilding of the tunnel, lasting 18 to 24 months.

The longest previous shutdown, about five years, came by deliberate destruction. In 1996, Northern Alliance leader Ahmad Shah Masood destroyed both entrances to the tunnel after the Taliban captured Kabul. The ventilation system also was destroyed.

The tunnel was reopened in 2002 following the fall of the Taliban. Since then, it has been closed temporarily several times, mostly because of avalanches in winter, including one in February 2010 that took more than 150 lives.

Previously, the largest loss of life inside the tunnel came in 1982 when a tanker truck exploded, incinerating at least 176 people.

India’s 2nd longest road tunnel

Maharashtra will soon have the second longest tunnel in the country that will connect Khopoli to Lonavla. The eight-kilometre-long tunnel, to be built off the Mumbai-Pune Expressway by the Maharashtra State Road Development Corporation (MSRDC), is part of the corporation’s plan to expand the expressway and the National Highway-4 (NH-4), also known as the old Mumbai Pune Highway.

The 11-km Rohtang Tunnel, to be built under the Rohtang Pass on the Leh-Manali Highway, is India’s longest tunnel that is likely to be completed by 2014.

The tunnel on the expressway will start after Khopoli off the expressway and will cut through mountains to emerge at the Sinhagad Educational Institute beyond Lonavla. The project is expected to begin by the end of 2012 and would be finished in four years’ time.

“We will add two lanes to the six-lane Mumbai-Pune Express-way and two new lanes to the four-lane old highway,” said Bipin Shrimali, MSRDC vice chairman and managing director.

The MSRDC expects the tunnel to serve as a dedicated lane for motorists on the expressway, solving traffic problems. At certain sections on the pass near Khandala, both NH-4 and the expressway merge to form a common road. Both routes get clogged with traffic if the pass is closed in case of accidents or landslides during the monsoon.

India's Longest Rail Tunnel

India's longest rail tunnel which will connect the Kashmir valley of India to the rest of the India will be completed and commissioned by December, 2012 believe the authorities. This rail link will attain completion only after the completion of a tunnel connecting the Banihal to Qazigund. The entire project cost is estimated to be Rs. 19,500 crore.

This tunnel bored using the latest technologies will be the longest tunnel in India and second largest in Asia (next to 20km Wushaoling tunnel in Gansu, China). This will beat the record of the 6.5km Karbude tunnel of the Konkan Railway which held the name of India's longest tunnel till date. This engineering feat named T80 will pierce through the wall separating the valley from Jammu, the Pir Panjal range.

This project is a part of one of the biggest mountain construction projects since independence, Jammu-Udhampur-Katra-Qazigund-Baramulla railway line.

This rail line when completed will reduce the time for travel as well as bring down the costs of travelling from the valley to other places. This tunnel will provide all weather connectivity and is provided with an 8 ft wide service road along the tunnel. The link is important as it connects even during the heavy snowfall periods when the only other road tunnel, the Jawahar link is blocked.

The construction of this tunnel is by the Austrian tunneling method where the geological stress from the surrounding rock is used to stabilize the tunnel hole.

With the Banihal-Qazigund rail line commissioned before 2012, the Kashmir valley will be connected with the rest of the country and it will be a new achievement for Indian railways.

The Salang Pass – Afghanistan

The Salang Pass, one of many Soviet-era relics across Afghanistan, is a constant hurdle military convoys of the 101st Sustainment Brigade need to overcome to resupply service members in Regional Command North.

A long stretch of dirt-covered roads and smaller tunnels lead up to the Salang Pass. As a forest in the foothills gets smaller and smaller in the rear-view mirror, the road hugs the edge of a cliff as the convoys reach higher into the sky.

Earth slides and avalanches are sporadic and can occur upon a convoy at any moment, blocking the route and potentially trapping soldiers. The most recent avalanche happened this past February and claimed the lives of 200 Afghans.

Regardless of the conditions that lay ahead, the convoys continue to make the trek through the mountains.

The roads are unpaved, or at least don't look paved from all the mud and rocks that fall from the mountains.

The convoys share the road with hundreds of Afghans, who make the trip through the pass daily. The sides of the pass are littered with cars, minivans and Host Nation trucks that couldn't make the journey up the mountainside.

The narrow road quickly becomes congested with vehicles following a breakdown or accident. Soldiers with the convoys, sometimes with assistance from the Afghan National Army, have to lead the way and breakup the ensuing gridlock.

The road winds along a steep cliff, passing through many tunnels, before reaching the peak. A four-kilometre long tunnel sits at the top and leads the way to the other side. The soldiers can tell the summit is approaching by the diminishing oxygen and the popping ears.

Snow and ice are constant at the top, and the convoys with armoured vehicles and host nation trucks need extra attention to make it through. Sometimes, snow chains are not enough for the host nation trucks.

Ice is a hurdle for the drivers to overcome, but of more concern is the build up of carbon monoxide which is so bad and thick that it's almost like a fog.

The massive amounts of car exhaust have nowhere to go. The tunnel walls are sealed to prevent snow from making its way inside, although water still drips in and turns to ice. There are no lights inside.

Amber-Jaigarh tunnel work

The underpass between Amber Fort and the Jaigarh Fort in Jaipur, which used to be once the secret getaway for the Jaipur royals, may now be open to tourists. The minister of tourism, art & culture, Bina Kak, met secretary of Sawai Man Singh II Trust, Diya Kumari at the City Palace, to facilitate work on the project.

While work on the underground tunnel, which once connected the two forts, had begun some time ago from the Amber Fort, it could not be completed till the passage that opened at the Jaigarh Fort at the other end had an in-principle approval of the Jaipur royal family that manages the Jaigarh Fort.

The tunnel work was commenced by the Amber Development & Management Authority about two years ago at the fort. According to sources, "Since, the part of the tunnel in Jaigarh Fort is under the Sawai Man Singh II Trust, the minister had discussions with Diya Kumari for smooth implementation of the tunnel project."

Once the tunnel is completed, the tourists will get an opportunity to walk from one fort to the other. This new feature will prove to be extremely popular with tourists, the minister said.

Islamabad project to build tunnel for MPs

The plan to construct a tunnel or subway from Parliament House to Parliament Lodges to provide a safe passage to the legislators has been shelved as some relevant departments are not ready to give security clearance in this regard.

"Some security departments have certain concerns over the construction of the proposed tunnel," said Capital Development Authority (CDA) Chairman Imtiaz Inyat Ellahi. He said there was a proposal to construct the tunnel but its cost estimates and designing had never been done.

In view of the security concerns, the parliamentarians demanded of the government to construct a tunnel for their safe movement from Parliament House to Parliament Lodges which are at a distance of 500 feet from each other.

Parliament Lodges have some 365 executive suits allotted to the senators and MNAs for their stay in Islamabad especially when sessions of the two houses are in progress. The Parliament House and Parliament Lodges are located in the high security zone or red zone in the federal capital where one cannot enter without strict checking by the police at two to three different points.

HCC-Alstom JV bags Tehri Pumped Storage Plant

Infrastructure major Hindustan Construction Company has bagged contract worth Rs 1,843 crore, in a joint venture with Alstom, from THDC India Ltd to construct Tehri Pumped Storage Plant in Tehri, Uttarakhand.

The project is to be completed in 54 months. The scope of work involves construction of head race tunnel, surge shaft, penstocks, underground powerhouse, bus bar gallery and cavern, and tail race tunnel among others.

Tehri Pump Storage project (TMSP) comprises of four reversible pump turbine units of 250 MW each and after completion, additional generation capacity of 1,000 MW will be added to the Northern Region, the statement added.

The operation of TMSP is based on the concept of recycling of water discharged between upper reservoir and lower reservoir, in which Tehri dam reservoir will function as the upper reservoir, while Koteshwar reservoir would work as the lower balancing reservoir.

Namma Metro – Bangalore

In May Bangalore Metro Rail Corporation Limited (BMRCL) commenced tunnel boring work from Majestic near the Kempegowda terminus of the Karnataka State Road Transport Corporation. Two Tunnel Boring Machines (TBMs), which were dismantled and shipped from Japan for the purpose.

The 8.8-km-long underground section of metro will have four stations — at Minsk Square, Central College Campus, opposite the Vidhana Soudha and at Majestic. The TBM will dig the tunnel at a depth of 25 metres to 30 metres. Layers of granite rock can be expected at such depth, and work is expected to proceed at a slow pace; a mere 11 metres of earth would be dug each day by the TBM.

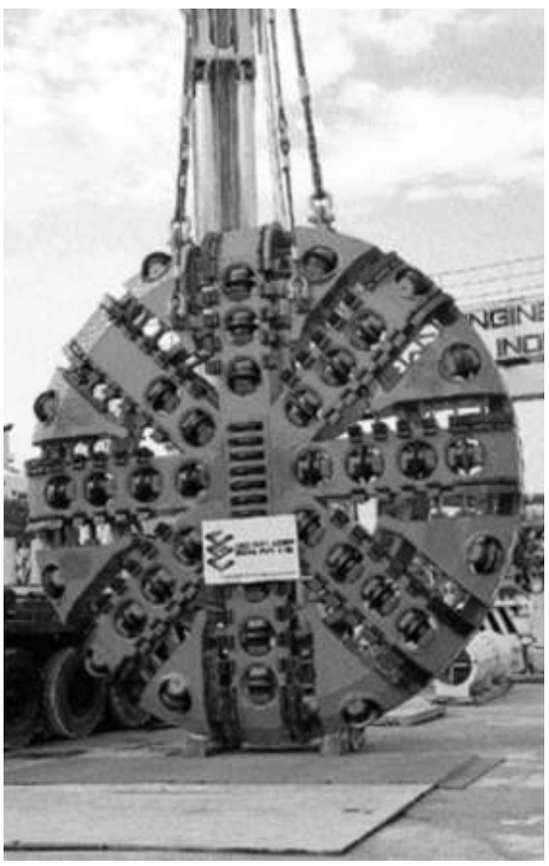
Tunnel drilling work is set to begin at Majestic, go up to the proposed station at the City Civil Court, turn towards KR Circle, move in front of Vidhana Soudha and then turn towards Minsk Square. The tunnel will go in a straight line with a few curves, so it will not be aligned with the roads above.

Tracks of Namma Metro will go underground at M Chinnaswamy Stadium, in front of BRV Junction. BMRCL said that the ramp and the base slab at this spot are ready. Excavation work is underway both in front of Vidhana Soudha and Central College campus. At Minsk Square, the BMRCL has completed steel decking of the surface, so drilling is expected to be easy at this spot.

In all, there will be about 520 personnel working for the tunnelling project and at a time about 25 people each will work for each TBM. The personnel, including Japanese (supervising personnel of Continental Engineering Corporation), Taiwanese, British, Canadians, Filipinos and Indians, will work in two shifts with four days of weekly off per month. The machines will dig twin tunnels for Namma Metro's underground section between Chinnaswamy Stadium and Majestic (a distance of about 4.5 km). The contract has been awarded to the Continental Engineering Corporation-Soma-CEC International Corporation India Joint Venture.

The chief minister and Bangalore Metro Rail Corporation Limited (BMRCL) officials were all cheers as the TBM nicknamed "Helen" commenced operations, the first of its kind in south of the Vindhyas for a urban mass transit project.

The 8.8-km-long underground section of metro will have four stations — at Minsk Square, Central College Campus, opposite the Vidhana Soudha and at Majestic.



76km tunnel for Upper Wardha Dam

Channeling water from the proposed Jamghat hydroelectricity project to Upper Wardha dam via a tunnel is considered would help improve irrigation in the region of Madhya Pradesh and the increased water supply in Upper Wardha dam can also be used to promote industries.

The Jamghat hydroelectricity project has been proposed with Maharashtra getting around 15 TMC water from it. A report has also asked the state to create storage in the territory of Madhya Pradesh to regulate water for use in Maharashtra. Madhya Pradesh has agreed to construct storages across the Kanhan sites within its territory.

Hydel power station

The local leaders of political parties have warned the government of locking out the local Hydel power station of Wapda if its operation and management is not transferred to the small Hydel development organisation (SHYDO) of the provincial government within a month.

Speaking at a press conference, Maulana Sher Aziz of JI, Sher Aga of ANP, Fazle Rahim of PML-N, Maulana Abdul Shakoor of JUI and Abdul Latif of PTI said that the Wapda had been ignoring improvement of its power station in Chitral due to which the residents were facing massive power load shedding.

They have appealed to the water and power minister to transfer the power station to the SHYDO for its effective operation.

Major contracts awarded on Chennai metro

Metro Rail of Chennai, southeast India, has recently awarded major contracts for the construction of underground works and tunnels for the city's new metro system. Two of the major contracts amounting to US$569 million were awarded to a JV comprising Indian infrastructure group Afcons and Russia-based Transtonnelstroy.

The contracts cover the design and construction of nine underground stations and nearly 9km of TBM-bored twin tunnels; due to start imminently, they are scheduled for completion by May 2015.

The two contracts – worth US$343 million and US$226million – respectively cover a 5.5km length from Egmore to Washermenpet (5 stations) and a 3.1km length from Thiurmangalam to Shenoy Nagar (4 stations).

Ramakrishna V Ramanan of Afcons Infrastructure, said: "We have been a key partner in Delhi Metro, having carried out seven projects for them. Similarly, we are currently executing the first underwater metro tunnel below the Hoogly river in Kolkatta for Kolkatta Metro. Now we are proud and privileged to have such an important association with Chennai Metro."

A part of the Shapoorji Pallonji civil engineering group, Afcons Infrastructure has been a key player in the construction of the Delhi metro and has also been involved in a wide variety of Indian infrastructure projects both in India and abroad.

Karnala tunnel proposal

Maharashtra PWD minister Chhagan Bhujbal has said that a proposal to construct an underground tunnel at Karnala as part of the upgrade of the 475 km long Mumbai-Goa highway is under consideration. Replying to a debate on the calling attention notice about the upgrade of the National Highway number 17 on the Mumbai-Goa road, Bhujbal said the Centre has refused permission for the acquisition of forest land at Karnala bird sanctuary in Raigad district.

He said the government is planning to upgrade the highway into four lanes and a feasibility report of the Indapur-Zarap area, a narrow section, which has seen several accidents in the past few years due to accidents due to overtaking, has been received. The final report of four laning of this section through privatisation, is expected soon.

Work starts on Tirana-Elbasan tunnel

Prime Minister Sali Berisha took part at the inauguration of the commencement of works on construction of Tirana-Elbasan highway. "This is a dream turning into reality," Berisha said in his speech.

The project for the construction of the Tirana-Elbasan tunnel, will cut not only geographical distance but also the time.

Berisha stressed that Tirana-Elbasan highway after the route of the nation is the second largest public built for Albania.

Sea tunnel link for Penang

Penang may get a third link – a 6.5km sea tunnel linking Gurney Drive on Penang Island and Bagan Ajam on the mainland.

Chief Minister Lim Guan Eng said the project was proposed by the Chinese company Beijing Urban Construction Group Co Ltd (BUCG), which built the famous Bird's Nest Olympic stadium in Beijing.

He said a memorandum of understanding (MoU) has been signed between the state and BUCG on Thursday in Putrajaya, in the presence of Prime Minister Datuk Seri Najib Tun Razak and Chinese premier Wen Jiabao. "To get China's attention is a compliment for Penang," Lim said.

Lim said the Penang Municipal Council would embark on a six-month study to ascertain the technical, physical and funding requirements for the project. He added that although BUCG had proposed the third link, the project would have to be awarded through an open tender.

Proposed Mumbai-Pune expressway tunnel

An 8km long tunnel is being proposed by the Maharashtra State Road Development Corporation (MSRDC) through the Western Ghats on the Mumbai-Pune Expressway, considered one of the best highways in the country.

The tunnel will not only shorten the journey by at least 30 minutes, but also, importantly, help in avoiding accidents and traffic snarls on the Ghat section.

The tunnel, or even two tunnels, will be constructed from Khopoli to Lonavla cutting through the dangerous hilly section. This is a crucial segment of the route as the six-lane expressway and the old four-lane Pune highway converge at this point where congestion is common and authorities have been unable to widen the narrow road as the union environment ministry has not given permission.

While the plan to construct a tunnel is being hailed by expressway users, the major challenge before MSRDC is to obtain various clearances before embarking on the project that is likely to cost Rs30-40 billion (Dh3.3 billion).

Studies yet to begin

"A pre-feasibility study has yet to be done and MSRDC has to appoint a consultant the scope of whose job includes getting the clearances," A.V. Deodhar, Superintending Engineer, MSRDC, told Gulf News.

Clearances will have to be obtained from the Ministry of Environment and Forests, National Highways Authority of India and Ministry of Road Transport and Highways — all of which is expected to take a year. The project may then take four years or so to be completed.

Chenani-Nashri Tunnel

The construction of the Chenani-Nashri Tunnel, a 9-km-long two-lane tunnel, on the Jammu-Srinagar National Highway, will improve the connectivity of several villages to what is the only road-link to the Kashmir Valley.

The tunnel, which will be the longest of the route, in Udhampur district, is expected to cost around Rs. 2,519 crore and will be completed in five years.

"In order to improve connectivity between Jammu and Srinagar, along with other sections of the Valley, the highway will have the 9-km tunnel. This will reduce the distance and travel time," an official said. The 2.5-km-long Jawahar tunnel, between Banihal and Qazigund, is currently the longest tunnel on the highway.

Second Tunnel Breakthrough at Song Giang 2 Hydropower Project

Cavico Hydropower, has broken through a second tunnel that connects the water intake gate with an adit sub-tunnel at the Song Giang 2 Hydropower project. The tunnel excavated by Cavico is 3,018 feet long and 8 feet wide.

In January 2009, Cavico was awarded a contract to excavate a 2.8-mile-long headrace tunnel, two sub-tunnels, and a 138-foot-high surge shaft. Cavico expects the Song Giang 2 project to generate approximately $10 million in total revenues for the Company.

The Song Giang 2 hydropower plant is located on the Song Giang River, southwest of Khanh Hoa Province, which is 31 miles from Nha Trang city. Upon completion, the 37-megawatt hydropower plant is expected to generate 141 million kilowatt-hours of electricity annually. The plant will be connected to the national grid to help ease the electricity supply shortage in the country. The Song Giang 2 hydropower plant has a total estimated investment value of approximately $50 million and is considered to be one of the largest hydropower projects in Khanh Hoa Province.

"This second breakthrough represents another critical milestone that will lead to a complete breakthrough for the Song Giang 2 project," commented Mr. Hung Manh Tran, executive vice president of Cavico. "We are excited by the strong progress our teams are making at Song Giang 2 and expect to complete the tunnel construction on schedule."

Delhi Metro to use tunnel tech in Walled City

The Delhi Metro Rail Corporation (DMRC) will use an EPB TBM for the construction of Jaipur Metro's Chandpole-Badi Chaupar rail track in the Walled City area.

Under phase-II of the project, an underground tunnel would be dug from Chandpole to Badi Chaupar through the congested areas of the old city. People living on the route fear that the project will damage the ancient buildings and spoil the heritage structure of the old city. However, putting to rest such apprehensions, DMRC officials said the technology was successfully used to protect the historical monuments in Delhi and Chennai for metro rail projects.

" Deployed in tracks aligned with sensitive areas and important buildings, the EPBM manages the earth pressure with regards to soft ground or densely populated areas ensuring minimum ground movement," the DMRC spokesperson said. "Experts monitor the construction process and run tests to ensure that there are no ground vibrations," he said.

Herrenknecht fortunes blossom in Asia

TBM-maker Herrenknecht may be doing business globally, but it is in Asia that its fortunes have really taken off. Recent figures released by the company show that in China, for instance, it is on target to complete a total of 251 projects realised with TBMs of diameters larger than 4.2m. This amounts to a potential tunnel length of more than 600km, of which around 430km have already been excavated – 325km for metro systems alone.

Given the current boom in Asian tunnelling, the company has also notched-up successes elsewhere, such as in Singapore, where the Land Transport Authority (LTA) now aims to create 278km of metro by 2020. Having been involved on Phase 1 of Singapore's Downtown Line, Herrenknecht will now supply a further ten machines for Phase 2, comprising four mixshields and six EPBs, all of 6.6m diameter. The alignment will comprise variable ground conditions and granite. Construction has already begun on Phase 2, with tunnelling scheduled to begin before the end of June. Phase 3 is currently out to tender. When it opens in 2016, the 40km line is expected to carry 500,000 passengers daily.

Java Water tunnel

Minister of Public Works Djoko Kirmanto (right), Central Java Governor Bibit Waluyo (middle) and Pemali-Juwana Flood Control Centre chief Hartanto (left) walk together after observing the tunnelling process at the Jatibarang Reservoir in Semarang, Central Java. The water tunnel, measuring 421.5 meters with a 6.9 meter diameter, will channel water from the Kreo River starting in August.

Malaysian Crocker Range tunnel

The district will be developed into a leading tourist destination in Malaysia with the construction of a RM3 billion tunnel penetrating the Crocker Range in the near future. Assistant Rural Development Minister, Datuk Hj Sairin Karno, said the proposed 54km tunnel will begin in Apin-Apin, Keningau and end in Kinarut, Papar.

It is considered that the tunnel will be another significant landmark for tourist attraction in the country, and should there be water shortage in Kota Kinabalu, Keningau can supply water from the Pegalan river through the tunnel.

"It depends on the creativity of PWD to undertake construction of the tunnel because, although the construction cost is rather expensive, the results will benefit and profit the country greatly," he said.

Salangor water tunnel nearing completion

The tunnel to supply raw water from Pahang to Selangor, that is under construction, is 70% completed, and well ahead of its scheduled finish in 2014.

The project will supply raw water from Sungai Semantan in Pahang to Hulu Langat in Selangor, through a tunnel measuring 5.2m over a distance of 44.6km, Supplying 1,890 million litres of water per day for the people in Selangor.

One hundred and ten Orang Asli families were moved from Sungai Temir in Raub as their land would be submerged by water once the tunnel was in operation. The affected Orang Asli community was provided with a bungalow-type house for each family and their main source of income would be from the 2ha palm oil plantation and 0.4ha of land for their fruits farms.

Borneo tunnel breaks record

A recently completed tunnel on the island of Borneo has become Malaysia's longest-ever under river pipejack project. Contractor Kumpulan-Nishimatsu-Hock Seng Lee consortium (KNH) has achieved what has been hailed as a technical milestone, following the completion of the 280m tunnel under the Sarawak river.

The work included the jacking of 92 sewage pipes of 1.5m diameter, as well as the construction of deep shafts in the city to allow lowering and retrieval of the tunnel boring machine. During its 280m drive, through mostly hard rock, the laser-guided TBM required three changes of cutterhead, although this did not prevent it from arriving at its destination on schedule.

The alternative method would have been to construct an open trench along the entire pipeline route through the city of Kuching, crossing the river by means of a costly bridge and pumping station. The completed under-river section forms part of an 8km tunnel linking Kuching to a new sewerage plant near the Zecon toll which will process the city's wastewater and remove a major pollution source. Currently, Kuching's sewage is stored in septic tanks which are more often than not emptied untreated into rivers, while grey water ends up in rivers and waterways. The main sewer line is expected to be completed by the beginning of 2012, with connections in the central business district starting this year

Jakarta Studies Pedestrian Tunnel

Plans to build an underground tunnel for pedestrians in Jakarta, such as those in Tokyo, Japan, are being discussed, said Jakarta Deputy Governor Prijanto.

"They are very effective in dealing with traffic congestion," he said at the City Hall. Jakarta is currently arranging the software for the concept. "The regulation doesn't exist yet, but it will begin this year," he said. According to Prijanto, Jakarta has a similar tunnel in Blok M and Kota station. "Blok M Square and Blok M connect a business centre," he said.

Phuket's Airport Link Front Runner Seeks Tunnel

The construction firm that has emerged as favourite to build Phuket's airport link is also likely to build Thailand's high-speed rail link, hence the impression conveyed by consultant Tophon Kraianupongsa that the Phuket project will become theirs, too.

Governor Tri said that more than 10 companies remain in the running and all contenders will be presenting to the Phuket public next month, at a date and venue to be fixed.

But Khun Tophon says Zhi Shan Yan, a Hong Kong firm backed by South Korean funding, will be ready to start within 30 days of a memorandum of understanding being signed – and is also talking to Patong Mayor Pian Keesin about the controversial road tunnel through Patong Hill.

It would certainly make sense to build the airport link with the tunnel – if the tunnel is going ahead.

On the table are links from Phuket International Airport to Phuket City (41.42 kilometres) Phuket City to Patong (18.4 kilometres) and Bangkoo (the bypass intersection) to Chalong (16.8 kilometres).

What has yet to be determined is whether the link goes at road level at a cost of approximately 10 billion baht or is elevated at a cost of 20 billion baht.

Both options are likely to affect former Governor Wichai Praisa-ngob's attractive median strip parade of Phuket's symbolic palmyra. More of the trees are still being planted along the median strip beyond the airport junction.

Construction of Phuket's convention hall, north of the airport, is expected to begin in September and be finished by 2013 at the latest, Governor Tri said.

Some would-be airport link contractors have suggested a link continuation running north to the convention centre.

Part of the debate centres on whether the link would be express to Phuket City and Patong, or stopping-all-stations for locals as well as tourist visitors.

Plainly, given the time it would take some tourists to get from the airport to Patong, Kata and Karon via Phuket City, many will probably prefer to foot the bill for an expensive taxi.

Critics of the project fear an airport link could become an expensive ''white elephant'' that fails to give Phuket what it needs: the backbone for an efficient public transport system.

Unless the link system is capable of going directly from Phuket airport to Patong and the west coast, many onlookers believe Phuket would be better served by a comprehensive network of low-cost public buses.

Phuket's Tunnel Vision: Time to Put Safety First

Phuket desperately needs an alternative to the expensive taxi and tuk-tuk monopoly

The long-awaited Kathu-Patong tunnel is moving a step closer with the news that a feasibility study is to be completed soon. No date has been set yet for construction to begin because the project still has to be approved by the government.

The tunnel is expected to cost six billion baht and Patong Mayor Pian Keesin said the feasibility study should be completed and handed to Patong Municipality by September 2011.

Mayor Pian said the three consultant agencies, Epsilon Co, PlanPro Corp, and The Energy and Environmental Engineering Centre, from Kasetsart University's Faculty of Engineering, have proposed that the tunnel under Patong Hill should start from near Go-Kart Speedway field. The proposed tunnel will be 165 metres long.

Mayor Pian said once the feasibility study was completed the municipality would send the proposal to the Ministry of Transportation for budget approval.

He said the budget of five to six billion baht would come from the government and there were already some construction companies from China and Korea interested in doing the construction work. And there is light at the end of the tunnel for the Baan Morn community who have opposed the project because their land will be expropriated by the municipality. Mayor Pian said the land owners affected will get compensation at the same market value as Patong's land prices.

Plans unveiled for Phuket's Patong tunnel

Research consultants conducting the feasibility study for Phuket's controversial Kathu-Patong tunnel project have announced the route they plan to propose to the government.

The proposed route would start from Soi Bang Thong on Phra Barami Rd near the Go-Kart Speedway in Kathu, tunnel through the hills and connect with Phang Muang Sai Kor Rd in Patong, explained Anurak Srisawaeng, one of the study panel members.

Mr Anurak explained to a public meeting that the total length of the proposed route is 3.07 kilometres. "The route from Kathu will start with a four-lane, ground-level road about 625 meters long. The road will lead to twin tunnels, about 1,600 meters long, through the Nakkerd Hills," he said. "At the end of the tunnels, the route will continue on a 504m elevated road which will become a six-lane road connecting to Phang Muang Sai Kor Road," Mr Anurak explained.

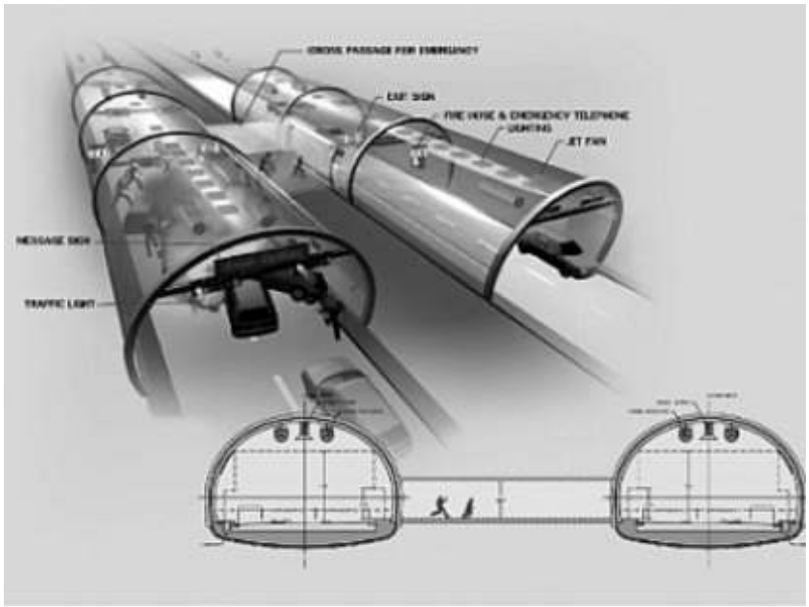
Study project manager Pongchanit Chuwiruch said that public opinion will be taken into consideration, but the final decision will ultimately belong to the Ministry of Transport. "Generally, projects do not need to have 100 per cent agreement [by all stakeholders] in order for construction to be approved," he said. "But we definitely have to listen to the people who oppose the project too, and thus find suitable measures for them," he added.

One earlier concern had been safety and the need for evacuation routes, a contingency now addressed with the tunnels showing exit passages for people trapped inside. However, several local residents repeated their concern over receiving inadequate compensation for land needed for the project.

Regardless, Mr Pongchanit said, "If everything goes well, without opposition or obstacles, the tunnel could be completed within six years.

Mr Pongchanit said, "If everything goes well, without opposition or obstacles, the tunnel could be completed within six years.

The plans provide for an elevated road stretching more than 500 meters.



Evacuation routes for people trapped in the tunnels by fire were also presented.

Makiyama Tunnel
A tunnel between life and chaos

A mile-long tunnel through the mountains separates devastated fishing neighborhoods from the rest of Japan, and from the world to which they once belonged.

On March 11 when Japan was shaken by one of the century's biggest earthquakes and its coast battered by tsunami waves. Workers from the seafront factories in his neighborhood converged on the tunnel, their hundreds of cars jamming and swallowed by the tsunami.

It took days for the military to clear the tunnel. Now, braving the tunnel on foot has become one of the only ways for people to reach Ishinomaki's port area, which includes the neighborhood of Sakanamachi, or "Fish Town," a blue-collar district of sea-front factories, fishing operations and warehouses. What started as a trickle of people coming through the tunnel has turned into a stream.

With buildings in ruins and workers still missing, the businesses of Ishinomaki have been crushed by the tsunami and earthquake. Helping them and their counterparts around Japan bounce back will be a major test for the government.

Makiyama tunnel is pitch dark in parts amid electricity blackouts, and lacks sidewalks because it was never meant for pedestrians. A cold wind blows through. With so many cars lost in the disaster and hitchhiking socially unacceptable in Japan, even in a crisis, many have walked for miles before they reach the tunnel.

Some of the people traveling through find their loved ones. Others find they have lost them. Some pass in the other direction, saying they'll leave the devastated areas for good.

"You can see the light at the end, but it takes surprisingly long to get to it," said one person who had been through.

Over the years, Ishinomaki has been known for its oysters, whaling harpoons and a giant replica of a 17th-century galleon. Today it is trying to revive local enthusiasm about the city with a museum dedicated to a local comic artist known as "The Emperor of Manga," and action hero statues along some of its streets. Through the tunnel from Ishinomaki's center are the fishing neighborhoods, Ishinomaki's blue-collar section.

There is a small car sticking out of the window of the neighborhood laundromat. In a nearby gas station, the pumps had been pushed flat to the ground, away from the sea, like dominoes.

"You can see the light at the end, but it takes surprisingly long to get to it," said one person who had been through.

Digging complete on Shanghai airport tunnel

Digging work has been completed on a tunnel linking the two terminals at Hongqiao International Airport.

Once complete, planners say this will greatly cut travelling time and reduce congestion.

The Yingbin No.3 Road Tunnel is expected to cut the driving time between the east and west of the airport to five minutes, according to the builder, Shanghai Tunnel Co.

At present, it takes about 30 minutes to bypass the airport, longer when traffic is heavy.

The tunnel, which runs under the south of the airport, also passes beneath Changning and Minhang districts. Planners say it will also alleviate congestion there.

Equipment installation and interior work will soon begin along the 1,862-meter-long, four-lane tunnel. Earlier reports said the tunnel will open by the end of the year.

Builders said they have ensured that subsidence levels above the tunnel will be kept to within 10 millimetres to avoid damage to runways, the apron and fuel pipes.

Shiziyang Tunnel

China has completed the construction of the country's first underwater railway tunnel, which allows trains to run at 350 km/h under the Pearl River estuary in China.

The almost 11 km Shiziyang Tunnel, is part of a 140km high-speed line from Guangzhou to Shenzhen and Hong Kong. It is designed for speeds of up to 350 km/h – the fastest underwater tunnel in the world as well as being China's longest underwater tunnel. This allows rail journeys between Guangzhou and Hong Kong to take only 40 minutes – much faster than the previous 2 hour journey. The Guangzhou-Shenzhen-Hong Kong express rail link is part of a broader expansion of high speed rail in China; journeys from Beijing to Hong Kong will take only 8 hours.

Construction began in November 2007, with a budget of CNY2.4 billion; the tunnel was completed in 2011, and passenger services are expected to begin in 2012. Unusually, the tunnel boring machines were designed to be dismantled inside the tunnel.

Route of Guangzhou-Shenzhen-Hong Kong Express Rail Link

Bond helps Australian company on Kuwait job

The provision of a performance bond by the Australian government's Export Finance and Insurance Corp (EFIC) will allow Bothar Boring and Tunnelling (BBT) to participate in a US$8.6 million microtunnelling contract in Kuwait.

The project could see BBT microtunnel a total length of 15,445m of pipe in varying diameters, to upgrade sewer systems in the Al Firdous and Ardiya areas of Kuwait City. The project is funded by Kuwait's Ministry of Public Works.

Main contractor Kuwait Company for Process Plant Construction & Contracting (KCPC) required BBT to provide a performance bond; this would give KCPC the ability to call on the bond to reduce any losses should BBT not perform its obligations under the contract. EFIC provided a US$865,000, 36-month performance bond to facilitate BBT's participation in the contract.

BBT's managing director Mark Dart, explained: "Without EFIC's support, the full cash collateral we needed to provide in order to secure the bond would have meant diverting working capital from other opportunities and therefore potentially hindering our ability to develop further business opportunities. The performance bond provided by EFIC has enabled us to participate in this major contract and keep growing our business."

BBT specialises in underground pipeline construction and tunnelling in Australia.

Kier JV in Hong Kong station win

A joint venture comprising Kier Construction, Laing O'Rourke and Kaden Construction, has been awarded a US$308 million contract by Hong Kong's MTR Corporation for the construction of the new Admiralty integrated station.

The four-year contract will see the existing Admiralty station extended to provide interchange facilities between the existing Tsuen Wan Line, the new South Island Line (East) and the proposed Shatin to Central Link. In addition to four new platforms to be constructed below the existing station, the works include an interchange concourse, relocation of existing passenger entrances, and external landscaping.

Kier says the contract was won against strong international competition, following a two-stage tender process, and will be executed under a target cost arrangement, with work starting on site immediately.

Chinese philanthropist offers to build cross-strait undersea tunnel

China's best-known philanthropist has said he would be willing to spend his entire fortune to build an undersea tunnel and high-speed railway across the Taiwan Strait.

Chen Guangbiao, who has been handing out envelopes of cash on the streets of Taiwan, told the media that he can liquidate almost all his assets now to fund such a project.

The idea is for him to keep just 100,000 Chinese yuan and a house, and use the rest of the money to build a tunnel and a railway line between China's southeastern city of Xiamen and Taiwan's central city of Taichung, he said.

"I can spend all of my fortune now on this cause because I know I can make back the money in a few years," he said.

Chen, who made his fortune from the recycling of construction materials, said he can also call on other philanthropic entrepreneurs in China to get involved.

"The 21st Century is the century for the Chinese," he said. "I believe that a cross-Taiwan Strait bullet train system can be built if all Chinese philanthropists could contribute one-tenth of their assets to such a project."

China Tunnel Collapses

Twelve workers died when a railway tunnel collapsed in northwest China's Gansu Province whilst 19 were rescued at a tunnel in South west China in March 2011.

The tunnel in Shandan County in the city of Zhangye, located along a new rail link currently being constructed between Gansu's provincial capital of Lanzhou and the city of Urumqi in the Xinjiang Uygur Autonomous Region collapsed at about 4:00 in the morning. Rescuers with the Gansu provincial fire department used special equipment to search for signs of life in the, but found no signs of life, said Fang Guojian, union chairman of the Second Bureau of China Railway Co. Ltd., the prime contractor of the new railway. All of the 12 missing workers are employees of Fang's company. More than 500 rescuers helped to try and prop up the tunnel with lumber, reinforce its walls and clean up debris. Fang said the rescue work was difficult and risky, as falling rubble and seeping water could cause another collapse at any time.

Meanwhile workers from a road construction crew in Shangrila county in Yunnan province were buried when unstable geological conditions caused the tunnel they were digging to collapse. Rescue workers managed to pull them to safety the following afternoon after digging a 65-foot (20-meter) long emergency evacuation passage. The rescue teams sent in water, oxygen and electricity supplies to the trapped men as they sought to free them.

The same tunnel collapsed again in August when an area five-to-seven-meters long collapsed about 460 meters away from the mouth of the tunnel, The recent collapse was caused by water seeping after heavy rains trapping eight workers. Eight workers were trapped for three days but were finally rescued unharmed.

Middle East's longest traffic tunnel

Parts of Salam tunnel project were completed in July 2011 to end traffic woes. Parts of the project, which will cost at least Dhfive billion, officials at the Abu Dhabi Municipality said "Work is progressing smoothly and we expect the entire project to be completed before the end of this year…we hope it will be then officially inaugurated and drivers will be able to use the tunnel that will largely ease traffic congestions in the area."

The project, which will have a capacity of more than 50,000 cars per hour, comprises four parts involving a three-km tunnel, subways and massive causeways including one that links the city to nearby Reem Island, which is expected to be inhabited by nearly 150,000 people this year.

South Korea's Samsung Construction is carrying out the Dhfive-billion project, which starts from the eastern entrance of Abu Dhabi city and runs under Alsalam Street towards Port Zayed on the western tip of the capital.

The project has severely disrupted traffic and caused massive road bottlenecks on Salam Street and the densely-inhabited Tourist Club area in the Western part of the Capital but officials say such problems would be a matter of the past once the tunnel and accompanying flyovers are completed.

Once the tunnel is completed, passengers coming from Dubai and other emirates will have two optional directions—either to take the expanded surface road into the capital or plunge around 15 metres underground into the tunnel. Those heading for Reem can just turn right and drive along the causeway.

The tunnel will run underground from the capital's northeastern entrance straight to Port Zayed and other coastal areas in the southern part of the city, where the fish market and harbour, the sprawling vegetable market, the ageing Iranian free port, cooperative societies and other facilities are located.

The tunnel will run underground from the capital's northeastern entrance straight to Port Zayed and other coastal areas in the southern part of the city…

Abu Dhabi Dh5.7b sewer tunnel

Abu Dhabi has embarked on a Dh5.7-billion Strategic Tunnel Enhancement Programme (STEP), which will be one of the longest gravity-driven wastewater tunnels in the world.

The sewerage company has awarded a contract to the Italian construction group Impregilo, which won the Dh725-million Tunnel Contract 02 of the project. The project will reduce power and maintenance costs through the decommissioning of 34 existing pumping stations across Abu Dhabi island and the mainland.

This milestone project is expected to provide an economic solution to the long-term growth of Abu Dhabi island and mainland. The system will be fully operational by the end of 2014, providing for the projected flow of 800,000 cubic metres of sewage per day.

In the final stage, STEP will have a built-in capacity to handle 1.7 million cubic metres of sewage a day, which is forecast for the year 2030. All treated water will be returned to the urban areas for irrigation

The 41-kilometre long STEP project comprises 80-metre deep sewer tunnels with a diameter reaching 5.5 metres. The secondary network of pipes feeding the tunnels extends to more than 50km with a diameter reaching 3 metres.

At the end of the tunnel, a powerful pumping station is placed with a capacity to pump 30 cubic metres/per second. The gravity-driven tunnels will meet the development needs of Abu Dhabi in the next century and provide an environment-friendly solution.

Expressway tunnel blast in NW China

Rescuers pulled out two bodies from an expressway tunnel inferno after a traffic accident caused two tank trucks to blast in early April in northwest China's Gansu Province.

The tunnel was seen shrouded in the vapour as nearly 10 fire engines shot water columns towards the raging fire. The rescue work was hard due to "very high temperature," said the rescuers, who believed more people were likely to be trapped inside the tunnel. Altogether three vehicles, including two tank trucks and one cargo van were mangled due to the blast and the ensuing fire, which also damaged the tunnel facilities and led to the closure of the expressway.

Water leak delays Gautrain

An engineer's plan for sorting out the Gautrain tunnel water problems indicates this could take 10 months and could cost up to R100 million.

The R28.1 billion high-speed has past its extended starting date of June 28, and there has been a dispute between the province and the concessionaire over the water problem; whose responsibility it is; and how to fix it. There is no clarity on when the train will be fully operational.

The problem is the seepage and inflow of water into the tunnel between Park station, in the Joburg CBD, and Rosebank.

The Railway Safety Regulator issued a safety compliance certificate for the Gautrain earlier this month.

"The water seepage problem is not an immediate threat to the safety of operations," said Letsane Rathaba, the regulator's general manager of safety assurance. It has met the minimum safety requirements."

However, the water problem means the tunnel does not meet the minimum standards in the concession agreement between Gauteng and Bombela.

The agreement states that "there shall be no discernible flow of water through the tunnel lining" and that the tunnel must be sufficiently watertight to ensure the safety of the power supply, the maintenance of the track geometry, and that the hydrological conditions around the tunnel are not disturbed. There may not be more water inflow than 10 litres per minute per 10 metres.

A dispute resolution board recently ordered the Bombela Concession Company (BCC) to do the remedial work. Bombela's tunnel remedial works plan identifies the problem area as sections about 1.2km long between Park station and the E1 emergency shaft, and about 1.1km long between the E1 and the E2 shafts. Costs are not listed, but the plan refers to the need for a bond to be provided by Bombela to the province, and suggests R100m.

Detailed costs will be worked out after the work is planned, and the plan refers to the need for an estimated price, "including all mark-ups typically provided for on this project by the concessionaire". The work involves extra grouting for the tunnel, including boring holes up to 4m deep to inject grout.

The plan estimates three months to design and plan the work, then six to eight months to do the work, finishing at the end of May 2012.

This assumes that the work will be done after hours, working four or five hours a night, which has been argued over between the province, the BCC and the Bombela Operating Company (BOC), which will operate the finished railway. The province proposed a phased opening to allow the Gautrain to run between Rosebank and Pretoria, which would involve sealing off the Rosebank-Park station section.

The BCC wanted to open the Gautrain fully and do the remedial work after hours. A third option is to run the Gautrain while the remedial work is prepared, then close the relevant section when work starts.

The BOC objected to the after-hours work option. "At the beginning of the trial run, it took four weeks to get rid of the dust present in the tunnel as a result of the works. We therefore believe that dust would become a daily safety issue, as it would be unreasonable to expect that every day the dust generated by the works is taken out of the tunnel at the end of the engineering hours," it said.

Herrenknecht set to make record TBM for Russian tunnel

German TBM-maker Herrenknecht has received an order for the world's largest diameter tunnel boring machine (TBM). Russian operator Nevskaya Concession Company (NCC) has ordered a 19.25m-diameter mixshield machine to work on the Orlovski tunnel which, when completed, will link both banks of the Neva river in the heart of St Petersburg.

Herrenknecht supremo Martin Herrenknecht met Russian premier Vladimir Putin recently in St Petersburg to discuss the contract. According to a Herrenknecht spokesperson, Mr Putin wanted to find out first-hand about the road tunnel project.

The contract represents the biggest single order ever received by the Schwanau-based company, following intense preparatory collaboration between it and NCC.

The twin-deck, 1km Orlovski tunnel will have three lanes on each level, and is designed to relieve traffic congestion in the city centre. It will also allow bridges on the river to remain in the open position for longer, thereby increasing shipping intensity both on the river and on the Volga/Baltic waterway.

The TBM will be 82m-long and will deliver 8,400kW of drive power to the cutting wheel; the shield alone will weigh 3,800t. The huge diameter cutterwheel will excavate 600m3 of soil/hour across an excavation area that is said to be 50% larger than that of the largest TBM currently operating – the 15.5m diameter EPB shield used on the Sparvo tunnel in Italy.

Tunnelling is due to start in spring 2013 with opening scheduled for 2016.

Tunnel boring begins on Toronto subway extension

The first of four tunnel-boring machines was launched by the Toronto Transit Commission on 17th June 2011 morning marking the start of construction on the York-Toronto transit extension, the first subway line to cross municipal borders.

The project is an 8.6-kilometre extension of the TTC's Yonge-University-Spadina line from Downsview Station to the Vaughan Metropolitan Centre at Highway 7.

"It will become a vital link for commuters, residents and businesses," Toronto Mayor Rob Ford said at a news conference at the site of the future Sheppard West station.

"It will give hundreds of thousands of daily commuters new transportation options, reduce gridlock on our roads and make Toronto and our neighbour, York Region, better places to work, play and live."

Ford joined federal and provincial representatives to announce the start of drilling for one of the four Toronto-built tunnel boring machines named Holey, Moley, Yorkie and Torkie.

The $2.6 billion project, jointly funded by the government of Canada, the Province of Ontario, the city of Toronto and York Region, is expected to open by late 2015.

TTC chair Karen Stintz said the extension is on-time and on-budget.

The new line will have four stations in Toronto and one at York University.

"Currently there are 2,000 buses that go to York [University] everyday," Stintz said. "Once this project is open it will help alleviate some of that congestion and meet our regional goals of reduced congestion and reduced emissions."

The other stations include Sheppard West, beside the Barrie Go Transit Line, Finch West Station at Keele Street and Finch Avenue, Steeles West, at North West Gate and Steeles Avenue, Highway 407, adjacent to the highway and Jane Street, and Vaughan Corporate Centre, near Highway 7 west and Jane Street.

Environment Minister Peter Kent said the project has already created jobs and will continue to boost the economy in the GTA.

"It's a solution that simply makes sense," Kent said at the press conference. "We believe investment in transit boosts jobs and boosts the economies of the GTA and Canada."

The giant machines are built by Lovat, a company owned by Caterpillar that employs 380 workers in the GTA. More than 20,000 jobs are expected to be created by the project.

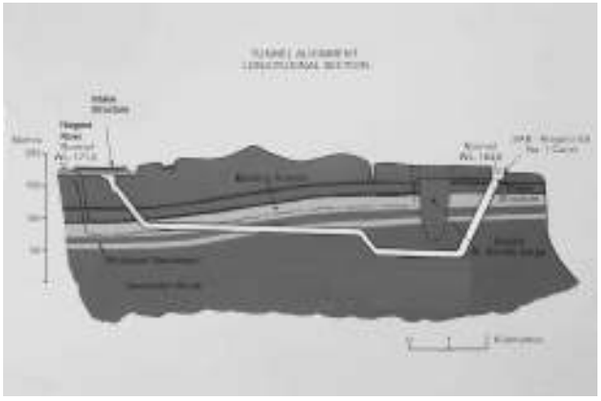
Robbins TBM breaks through at Niagara

Big Becky, the Robbins main beam TBM boring the new 10.2km hydro-tunnel at Niagara, Canada, holed through finally on May 13. The event was marked by a highly-publicised ceremony attended by local officials, construction workers and stakeholders.

Tom Mitchell, president and CEO of Ontario Power Generation (OPG), hailed the breakthrough as a historic event for the region. "Today we witnessed the completion of one of the largest underground excavations in history. It was accomplished by Big Becky, the largest hard rock boring machine in the world."

Mr Mitchell added: "It's important we recognise the employees from OPG, Strabag, Hatch Mott MacDonald, sub contractors and the hundreds of men and women who went deep underground everyday to make this project a reality."

Robbins' project manager Mike Kolenich, said: "There is a tremendous sense of accomplishment here. There were huge logistical challenges in just delivering and assembling the TBM onsite, and the machine has also overcome significant geologic challenges."



The US$1.6 billion hydro-project will draw water from the Niagara river, close to the falls, and convey it over 4km to the Sir Adam Beck hydro-generating station. The Robbins TBM bored along an alignment that comprised predominantly shale, with some limestone, dolostone, sandstone and mudstone up to 200MPa UCS. But in the shale formations, large rock blocks fell from the tunnel crown before rock support could be placed. In some cases, significant over-break up to 3m above the cutterhead support was reported. Spiling was used along a significant stretch of the tunnel. Further along the route, OPG and contractor Strabag altered the vertical alignment of the tunnel, raising it 45m out of the shale until rock conditions became competent. Yet despite these conditions, the TBM still managed to break records in the 11m-diameter (or larger) TBM class, achieving 468m in one month, and 153m in one week, both in July 2009. As of 2010, the machine has operated in mixed-face mode, with the upper half of the tunnel in shale, and the lower half in sandstone. Although tunnel excavation has been completed, there is still a further two years of work: two-thirds of the concrete lining remains to be installed, comprising a 600mm-thick, cast in-situ concrete plus polyolefin waterproofing membrane. Other work includes the outlet structure, gates and removal of the cofferdam in the Niagara River. The project is due for completion in 2013.

Underground work will continue for a couple more years, before the tunnel is completely finished. The project is expected to be completed and helping to generate electricity by the end of 2013.

The Niagara Tunnel Project will enable Ontario Power Generation to re-direct extra water from the head of the Horseshoe Falls to the Sir Adam Beck Generating Stations, which currently are not at capacity. It's expected the tunnel will enable OPG to power an additional 160,000 homes per year with clean, renewable energy.

The project cost more and took longer than originally projected, but Ontario officials say it will be worth it, considering the tunnel will be in operation for 100 years.

Chicago Deep Tunnel Sewerage System

The Deep Tunnel system was intended not only to curb water pollution, but also to prevent sewage from backing up into basements in the Chicago-area after big storms.

Officials in charge of the massive project promised that flood-control reservoirs near O'Hare International Airport, southwest suburban McCook and south suburban Thornton would capture deluges of storm runoff funnelled into giant tunnels and dramatically reduce flooding. When officials unveiled the project in 1972, they projected it would be complete by 1983.

But the Metropolitan Water Reclamation District has revealed recently that its main reservoir, won't be operational until the end of the next decade. They blame the latest delay on declining federal support and the recession, which dried up demand for limestone at a McCook quarry that will be converted into the district's biggest retention pond.

As a result, Chicago and three dozen suburbs, stretching from Wilmette to Western Springs, are expected to remain at risk for sewage backups for years to come. Areas most prone to basement flooding include some of the city's poorest neighbourhoods, according to a study commissioned by the Chicago Department of Water Management.

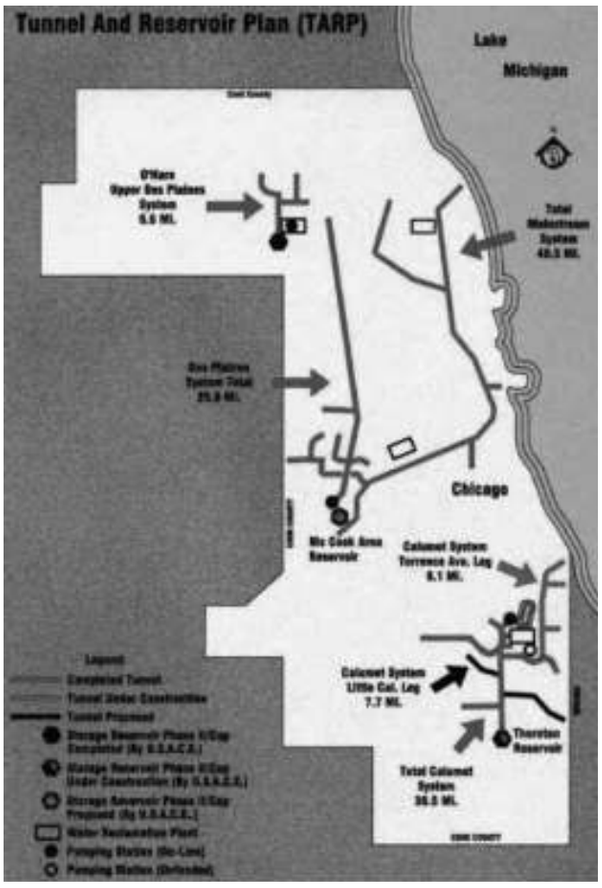
Mining work is finished on the 7.9 mile Little Calumet Leg of the Deep Tunnel System, and final connections are scheduled for completion on March 1. When the Little Calumet leg of the tunnel goes into operation, it will mark the total completion of all 109.4 miles of tunnel included under Phase I of the TARP project, and the culmination of 30 years of tunnel construction. Stretching beneath Cook County, the tunnel is 15 feet in diameter, lined with concrete and is located at a depth of 150 to 300 feet below ground in limestone rock.

As a result of the Tunnel and Reservoir Plan, fish have returned to the Chicago River, the Calumet River and the Des Plaines River. Residents of the communities of Dixmoor, Riverdale, Harvey, Phoenix, Dolton, South Holland Calumet City and Lansing will benefit because polluted stormwater will go into the tunnel rather than into the Little Calumet River.

The first of three huge terminal reservoirs – the O'Hare CUP near O'Hare International Airport – was completed in 1998. These reservoirs are a joint project of the Water Reclamation District and the U.S. Army Corps of Engineers.

Eventually, all the captured stormwater will flow by gravity to the Thornton Reservoir, and then will be pumped to the Calumet Water Reclamation Plant for treatment.

Funding to complete the plan has been tough to obtain for the past several years. Long-term plans to reduce pollution, flood damage, and associated costs by completing the



Tunnel and Reservoir Plan (TARP) hinge on continued funding by the United States Army Corps of Engineers. The $230 million reservoir in Thornton is under construction, funded by the District to accelerate its completion by 2014.

The reservoirs collect combined stormwater and sewerage collected by the 109 mile long Deep Tunnel until it can be treated and safely released into the region's waterways. This avoids the diversion of fresh water from Lake Michigan to dilute the contaminated water.

When completed, the three reservoirs will increase the capacity of the TARP system by 15.6 billion gallons, providing flood relief benefits and additional pollution control improvements.

Students Design New York City Tunnel

Civil Engineering students at Stevens Institute of Technology are working on the design of a section of the East Side access tunnel which will bring more Long Island Rail Road trains into New York City. The Senior Design team of Reed Cummings, Leonid Katsman, Matthew Lawson, and Dylan Lupo has assessed and designed a 120-foot tunnel that will run under Northern Boulevard for the East Side Access public works project in New York City. The team is advised by Associate Professor of Civil Engineering Leslie Brunell and sponsored by Schiavone Construction.

"This is a very complex project with numerous structures above the proposed tunnel and water surrounding the area," says Dr. Brunell, "the experience of working on a real life project with so many constraints has really shown this team how complex some Civil Engineering designs can be."

The East Side Access project seeks to connect the Long Island Railroad directly with Grand Central Station through a tunnel that runs from Manhattan, under the East River, through a tunnel in Queens, where it connects to the main railroad lines. "One of the most difficult aspects of designing for such a project," Leonid says, "is the amount of pre-existing structures that must be factored into the design."

"It can't disturb road and subway traffic," he says, though both will run above the proposed tunnel. "Also, the subway cannot move up or down in elevation. We must also factor in contaminated groundwater, which raises safety concerns."

Leonid explains, "What Schiavone is looking for from us, is how to temporarily support the structures that sit above the tunnel, as well as stabilize the soil to create safe working condition, and prevent contaminated water from leaving the site."

In other words, the physical structure of the tunnel aside, the team had to deal with the pressing issues of soil and water. The water level presented some distinctive challenges in stabilizing the area in order to dig and implement the structure.

If the tunnel is dug out without first stabilizing the ground in some way, wet soil will rush to the bottom because the site sits below the water table. The team came upon a unique solution for this problem. "We designed a way to freeze the ground," Matthew says. "Our design calls for installing freeze pipes to prevent groundwater from seeping in." Ground freezing is a unique century-old process in which pipes, extending into the earth, circulate a cooling medium such as liquid nitrogen. The cooling medium extracts heat from the soil, chilling the water in the ground until it freezes. This allows excavations at levels below the water table. "Frozen soil acts like a concrete, so it serves as an effective ground stabilization technique as well," Matthew says.

"This is kind of an unusual project with the existing structures above us and the need to dig below the water table," Dylan says. "Schiavone said they had never dealt with anything like this before – it is pretty unique."

A broad-based Stevens education prepared students with a strong foundation for this real-world project. "It pieces together so many different things that we have learned," Dylan says. "Classes in steel and concrete design really helped with designing the underpinnings. We also used the computer models to analyze the trusses, and the geotechnical engineering class came in handy in preparing our design and dealing with the soil."

The project also challenged the team to go beyond their book learning, and even beyond their extensive cooperative education experience. "This project really exposed us to Geotechnical Engineering," Matthew says. "We had all taken a geotechnical class, but this is pretty advanced work."The team members immersed themselves in advanced research, in areas such as ground freezing, grouting, and ground stabilization. "We spent a good part of the first few months just doing a massive amount of research," Matthew says. In the end, they walk away with a better understanding of geotechnical engineering, and how to innovate when presented with a very complex problem.

Tunnelling under the White House

The West Wing of the White House is vanishing. For years to come, the front yard at 1600 Pennsylvania Ave. will remain a noisy building site called the "Big Dig." The White House describes the job as an overdue upgrade of underground utilities.

A secret tunnel is being built, too. Spokeswoman Sahar Wali, however, said the construction would not involve the Presidential Emergency Operations Centre, the hardened bunker under the East Wing that's a shelter from nuclear attack. And she insisted that tunnel isn't a new shelter — just a means of maintaining access to the utilities.

Metro officials set meetings on plans for L.A. train tunnel

Metro officials plan to unveil the almost-final environmental studies for a proposed downtown train tunnel to connect light-rail lines serving Long Beach, the San Gabriel Valley and the Eastside and Westside of Los Angeles.

The MTA announced its engineers are finishing environmental plans for the light-rail tunnel and will show them to downtown residents and commuters at midday Tuesday and on Wednesday and Thursday evenings. The MTA board has yet to approve the environmental plans, but has already approved the concept and funding for what MTA staff says is a priority project to tie together 85 miles of light-rail tracks across most of the county.

The Regional Connector tunnel would allow "one-seat" train service from Long Beach to Claremont, or Santa Monica to East Los Angeles. The 1.9-mile-long tunnel would extend north below Flower Street from Seventh to Second streets, then curve east below the Second Street vehicle tunnel under Bunker Hill. It would connect to the new Yellow Line tracks between Union Station and the Little Tokyo Station.

New underground train stations would be built at the Central Library, Disney Hall, near Angel's Flight and just west of Little Tokyo. The $1.2 billion project is funded primarily by local sales tax funds approved by voters, and is slated to open in about 2018

Caldecott Tunnel

The Caldecott Tunnel's 3,389-foot fourth bore is expected to start carrying westbound traffic by the end of 2013.

But the hills surrounding the Caldecott Tunnel are a bit gassy. This is just one of the challenges facing construction crews digging the long-awaited $391 million fourth bore of the tunnel carrying Highway 24 traffic through the East Bay hills.

Despite that difficulty, the uncertain nature of digging a hole through the hills, and the need to avoid unduly annoying neighbours on the west end of the tunnel, work on the 3,389-foot fourth bore is progressing.

Crews started digging the top half of the tunnel at the east end in August, and had excavated their way about 1,175 feet into the hills as of Wednesday. A second tunnelling crew has started digging on the west side, and has made it about 10 feet into the hillside. While their pace depends on the composition of soils they encounter, they're expected to meet – about 1,100 feet from the Oakland side – probably in the fall.

The two-lane tunnel, with shoulders, an emergency walkway and seven passages to the third bore, is expected to carry westbound traffic beginning in late 2013.

The contractor, Tutor-Saliba, is using the New Austrian Tunnelling Method to dig through the hills.

Crews will dig through three different types of soil formations, and as they move forward.

Caltrans, which was sued by a neighbourhood coalition, has erected a 30-foot-tall, $3.5 million sound wall to protect the apartments, and monitors noise, to comply with a settlement. Hauling will be banned from 9 p.m. to 7 a.m. although construction work continues day and night.

Euclid Creek tunnel

The Euclid Creek tunnel will be the first construction project on record under Lake Erie. But when construction begins on the $198 million Euclid Creek Tunnel, will be the first visible evidence of the $3 billion plan by the Northeast Ohio Regional Sewer District to meet requirements of the federal Clean Water Act over the next 25 years.

The prime contractor on the job, McNally Tunnelling, a Canadian-owned company with offices in Westlake, last constructed a tunnel in Westlake nearly 20 years ago, but has never gone under a body of water like Lake Erie.

The sewer district engineered the tunnel to go under the lake in part because the cost of acquiring lake-shore property or easements would likely be greater than the extra cost to lengthen the tunnel and burrow under the lake. Instead, the district got the OK from the U.S. Army Corps of Engineers to tunnel under the lake.

"It turned out that the curve of the tunnel was actually more favourable to go under the lake, anyway," said Kellie Rotunno, sewer district engineer. "Liquids, sewage or anything else, don't like 90-degree turns." And mining through Chagrin shale won't be any different under the lake as it will be is under Lakeshore Boulevard, engineers and contractors said.

The sewer district here, like a number of other regions, has chosen to construct massive sewage storage tunnels – like the existing Mill Creek Tunnel some 300 feet under Garfield Heights – to catch and temporarily hold sewer overflows during rainstorms.

The sewage is then pumped to a treatment plant during dry weather and then returned to Lake Erie.

The upcoming project gets its name from the 24-square-mile watershed of Euclid Creek, a stream that drains parts of Beachwood, Lyndhurst, Highland Heights and Richmond Heights before cutting through Euclid-Cleveland border to the lake.

The sewage stored in the new tunnel will be pumped to the district's Easterly plant at East 140th Street, a facility that takes in sewage from a 76-square-mile area from the east side of Cleveland through Mayfield Heights to the east and as far south as Moreland Hills. About 40 percent of that area has combined sanitary-storm sewers.

The 18,000-foot-long, 24-foot-diameter Euclid Creek Tunnel will run from the Bratenahl-Cleveland border east to about 185th Street near the Cleveland-Euclid border. It will reach between 190 and 220 feet underground and will have the capacity to hold 70 million gallons of combined sewage.

Microtunnelling with curves in Hawaii

The Beachwalk Forcemain Project in Honolulu, Hawaii, has been claimed to feature the first-ever multiple-curved microtunnel project. Contractor Frank Coluccio Construction is in the process of installing shafts and microtunnels on the project, which comprises five separate microtunnel drives, all averaging over 335m in length.

Creating the tunnel is a new 'state of the art' Rasa Microtunnel Machine and two-metre o.d. Hobas jacking pipe installed at depths in excess of 15m below sea level in challenging soil conditions that include sands, corals and lava deposits. For the five deep shafts on the project, Coluccio is also performing all of the shaft work, drilling and jet grouting.

Later this year, the project will also see Coluccio complete what is claimed to be both the first multiple-curved microtunnel as well as the longest curved microtunnel drive ever undertaken in North America. Many of the microtunnel drives are located beneath waterways and historical sites, making access to the tunnel machine virtually impossible in the event of encountering an obstruction.

Hampton Roads Bridge-Tunnel upgraded

A new lighting system just finished in the eastbound tube of the Hampton Roads Bridge-Tunnel should help ease traffic slowdowns caused by the 'tunnel effect.'

'Tunnel effect' is a phrase used to describe motorists who brake unnecessarily when entering a tunnel because of light adjustment.

The new lights are nearly three times brighter than those they replaced. Officials claim they illuminate the tunnel more efficiently, while improving the transition zone: the time needed for the eyes to adjust to lighting changes.

The automated lighting controls will also regulate lighting levels within the tunnel, more effectively adjusting the tunnel lights to the ambient light outside the tube.

The $8.3 million lighting project included replacing the conduit and electrical cables on interior tunnel walls, as well as the removal and disposal of the existing system.

Officials said the project, which began in August 2009, was completed on time and within budget.

'Tunnel effect' is a phrase used to describe motorists who brake unnecessarily when entering a tunnel because of light adjustment.

Ville-Marie tunnel collapse

Part of the Ville-Marie tunnel in Montreal collapsed on 31 July 2011. It is considered that excessive removal of concrete might have weakened the walls of the downtown tunnel, causing a massive concrete lattice to crash to the roadway. Officials are pointing fingers at a consortium that was in charge of a water-blasting operation inside the Ville-Marie tunnel.

The tumbling concrete sent several construction workers running for cover while a number of motorists slammed on their brakes to avoid a collision. Quebec Transport Minister Sam Hamad, a civil engineer, expressed concerns about the work done by the CIMA+/SNC-Lavalin/ Dessau consortium.

It is understood that the contractor was asked to remove six inches of concrete under the lattice, which might not have left enough support to hold the structure in place.

The tunnel collapse sent a wave of anger and fear through Quebec, rekindling memories of the deadly collapse of an overpass in suburban Laval, Que., in 2006 where five people were crushed to death. A public inquiry later highlighted a "build and forget" mentality that permeated Quebec during a construction boom in the 1960s and 1970s.

Hamad said he will ask for a departmental review of all stages of public construction projects. But it is claimed that the transport department didn't verify the tunnel consortium's on-site plans prior to the start of work adit is standard procedure for the province to allow construction firms to verify their own work, without oversight from a government engineer.

The tunnel reopened after extra supports were added to make the tunnel more secure. The road is used by about 100,000 vehicles during an average weekday.

Milestone reached in Metro Vancouver water project

After cost overruns and delays, the twin tunnels for the Seymour-Capilano water filtration plant have finally been bored — two years behind schedule.

A tunnel boring machine broke through to daylight on April 15th, marking a milestone in the $800-million project after the second of two vertical shafts reached the surface at the Capilano end.

The tunnels, which are almost four metres in diameter and about seven kilometres long, will carry water from the filtration plant in the Lower Seymour Conservation reserve to a new pumping station near the Capilano Reservoir, starting in 2013.

The plant is already filtering water from the Seymour reservoir. Tim Stevenson, a Vancouver councillor and Metro Vancouver's water committee chairman, said the breakthrough marks the end of the most challenging part of the tunnel project. "We've made great progress, despite some unexpected challenges," he said.

The twin tunnel project was set back two years after Metro Vancouver fired its former contractor Bilfinger-Berger after its workers walked off the job, complaining that several workers were injured by falling and bursting rock.

Metro Vancouver is hoping to recover a chunk of the costs by suing the company, but the trial isn't expected to be heard until late 2012. "We certainly feel we should get a sizable portion of that," Stevenson said.

Water is the largest budget expenditure for the regional district, which last year cost Metro $222 million. About 46 per cent of that is for debt service, interest and sinking fund debentures.

Metro Vancouver expects to see water rates jump from about $213 per household to $300 per household by 2015 as it continues to pay off major projects such as the Seymour-Capilano water treatment plant.

Pedestrian tunnel for Toronto Island airport

The stage is set for Toronto's island airport to get its long awaited pedestrian tunnel, with a last-minute deal reached over land use between the city and the Toronto Port Authority.

Under the proposed deal, the parties have agreed to swap land along the lakeshore to ease tunnel design and construction. The tunnel, initially proposed as pedestrian only, will now be designed to carry city water mains and sewers. Placing the water lines in the tunnel will cost the city $10-million, about half the estimated cost of running water services separately to the island, a staff report to council states.

As part of the agreement, the city will lease land for three years to the Port Authority during construction and both parties have agreed to resolve traffic concerns in the docking area at the foot of Bathurst Street. The land to be leased from the city includes the Canada Malting site and land under the Gardiner Expressway.

The preservation of the original airport terminal building also is included in the deal. The building, constructed in the late 1930s, is the oldest of its kind in Canada. The staff report states talks are taking place to find a potential site for the terminal, such as Downsview Park, if it is no longer needed at the airport

Although the new city council hasn't taken a formal position on the tunnel, Mayor Rob Ford has said he supports it.

The Port Authority announced in January, 2010, that it intended to pursue a private-public partnership to construct a pedestrian-only tunnel beneath the western gap after Ottawa rejected the project as a candidate for stimulus funding. Fees from the airport's users are being used to cover the costs.

Local councillor Adam Vaughan described the proposed agreement as the "sweetheart of sweetheart deals," noting that the city will lease land for $3-per-square foot a year to the Port Authority, which could collect about the same amount in one day in parking fees.

The airport is aiming to open the tunnel in 2013, but a final date has not been set, a spokeswoman for the Port Authority said.

Herrenknecht TBM delivered to Lee tunnel site

Late July saw UK water utility Thames Water take delivery of an 8.9m diameter Herrenknecht TBM which will be used to bore the US$647 million Lee tunnel in London. The 6.4km sewer has been designed to prevent 16mt of raw sewage flowing into the river Thames during periods of heavy rainfall.

From Herrenknecht's Schwanau base in southern Germany, the machine was transported by barge in large sections down the river Rhine to Rotterdam, from where it was shipped across the sea to Tilbury, southeast England. From there, it was transported overnight by road to Beckton, east London.

When it begins mining in January 2012, the closed-face slurry machine is expected to advance around 17m/day through a predominantly chalk and flint geology with high groundwater pressures. Work began in September 2010 on the 38m-diameter, 80m-deep shaft at Beckton sewage works where the machine will begin its journey. Three other shafts will also be required, up to 25m ID.

Tunnelling is expected to be completed by the end of 2013. The contractor is MVB, comprising Morgan Sindall, Vinci Construction Grands Projets and Bachy Soletanche.

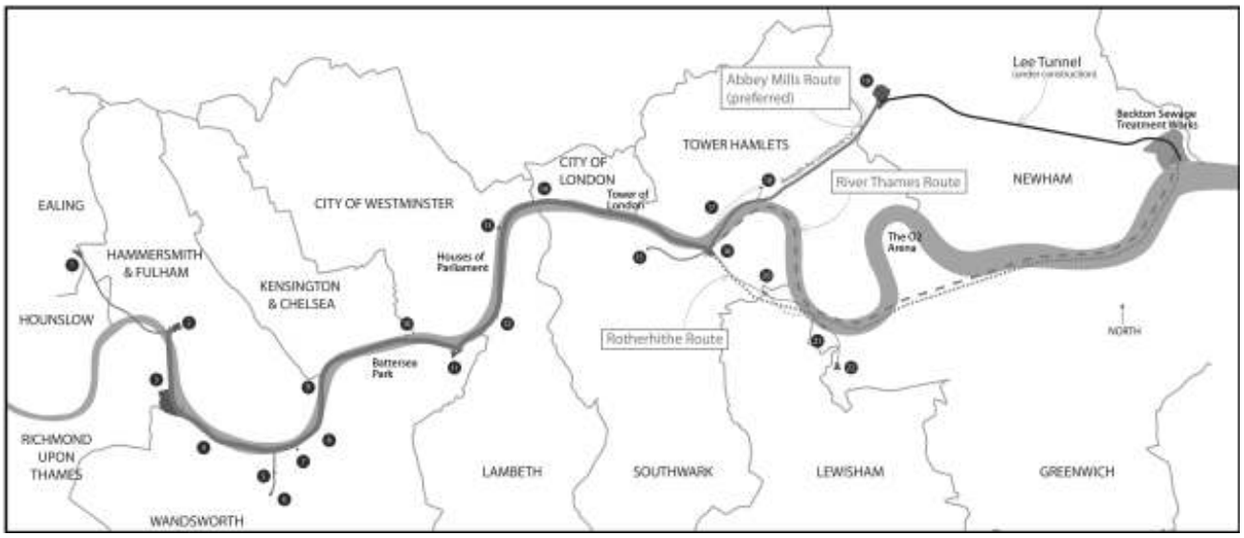
Hindhead Tunnel – Best in class

The £371m Hindhead tunnel has been recognised as the best of its type on the planet. The one-and-a-quarter-mile-long stretch of the A3 is expected to open this summer and will be the longest road tunnel under land in the UK. And in a beauty contest of global tunnels it scooped Best in Class at the International Tunnelling Awards in London.

The win capped a good year for engineers working on the major road scheme, part of the four-mile bypass being built on the Hampshire/Surrey border. Not only is the road due to open on time, but the massive project is also on budget. It is hoped that the new scheme will help to wipe out the notorious bottleneck at the Hindhead traffic lights which at peak times can add up to 40 minutes to a trip from Portsmouth to the M25 and beyond. It will also lift the daily blight of heavy traffic in Hindhead village and remove the A3 from winding around the famous Devil's Punchbowl beauty spot and reunite hundreds of acres of heathland in the Surrey Hills.

Judges said new construction techniques used to build the two, two-lane tubes through the hills were 'a tremendous step forward for UK tunnelling'. They were very impressed by the way the tunnel has been made watertight by spraying a waterproof membrane on to the roof. They also applauded the £12m saved by using new building techniques and the way diversions on the existing A3 have been used during the four-year building project.

The contract for the Highways Agency scheme was awarded to Balfour Beatty in 2002, with a design by Mott MacDonald. Highways Agency project manager Paul Arnold said: 'I'm delighted the judging panel recognised the hard work and world-class innovation that brought this major scheme to life. Four years in, main construction on both the tunnel and the new stretch of the A3 has been successfully completed on time and on budget".



RIVER THAMES
'SUPER-SEWER' PLAN

A panel of experts is to review plans to build a £3.6bn "super-sewer" across London. Thames Water wants to build the sewer from west to east London to stop millions of tonnes of sewage leaking into the River Thames every year.

The Thames Tunnel Commission, sponsored by Hammersmith and Fulham Council, will examine whether the 20-mile (32km) tunnel is the best solution.

A second phase of consultation on the plan is due to start in the autumn.

A 14-week consultation on the proposal ended in January.

Opponents to the scheme have raised concerns over the impact of construction works on parks and house prices as well as the cost to Londoners. But Thames Water maintains the tunnel is vital to cut pollution which kills fish, damages wildlife and poses a health hazard.

Lord Selborne, who will lead the team scrutinising the plans, said: "I welcome the opportunity to pose the questions that millions of water bill payers are starting to ask. The key question is whether this multi-billion pound project is the best solution to making the Thames cleaner or whether there are sensible alternatives that are cheaper, greener and less disruptive. We agree that the unacceptable level of sewage discharges to the river must be resolved at minimum cost"

Hammersmith and Fulham Council leader, Stephen Greenhalgh, said: "Doing nothing is not an option, but we need to consider the possibility that there are better alternatives. It remains my view that an alternative hybrid scheme, involving a shorter tunnel, diversion of run-off rainwater and sustainable drainage as well as improved river water treatment should be revisited as a matter of urgency."

Thames Water said alternative options would cost more, be more disruptive and not achieve the required environmental standards.

A spokesman said: "We agree that the unacceptable level of sewage discharges to the river must be resolved at minimum cost. So we welcome the appointment of this commission and we look forward to providing whatever information and assistance Lord Selborne and his colleagues may require."

The firm said an updated estimate of the cost of the scheme would be given when the second phase of the public consultation begins in the autumn.

If approved, construction on the tunnel would begin in 2013 and be completed by 2020.

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Thames Water wants to build the sewer from west to east London to stop millions of tonnes of sewage leaking into the River Thames every year.

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Tyne's second road tunnel

The second road tunnel under the River Tyne was opened to traffic in February 2011. Construction work on the new tunnel began in 2008. The £260m project has taken three years to complete and will eventually operate alongside the existing Tyne Tunnel, which was opened in 1967.

The new tunnel will initially have one lane of traffic in each direction between Jarrow in South Tyneside and Howdon in North Tyneside. The existing tunnel will close for about 10 months to be refurbished.

David Wood, chairman of the Tyne and Wear Integrated Transport Authority (TWITA), said: "It is incredibly exciting to be on the brink of this milestone event for the New Tyne Crossing project.

'Momentous occasion'

"As only the third tunnel of its kind in Britain we should not underestimate the achievement that has been made in reaching this stage.

"The commissioning of the new road tunnel represents the culmination of many years of planning, of considerable financial investment, and of almost three years of civil engineering works.

"To see traffic flowing through the new tunnel will be a momentous occasion for the project, and for the people of Tyne and Wear."

Trevor Jackson, managing director of TT2, who will manage the new tunnel, added: "This fantastic, state-of-the-art facility will offer motorists an improved driving experience from day one, and provides the North East with an engineering achievement to be proud of."

Main construction work for the second tunnel began in October 2008.

The existing tunnel has carried an average of 11m vehicles a year.

New Tyne tunnel to be 'safest in UK'

An emergency exercise was staged on Feb 12th at the new Tyne Tunnel, to test safety standards to the limit. This full-scale emergency exercise was one of a range a range of tests and checks that were carried out before the tunnel could be opened.

The exercise aimed to replicate a serious emergency incident within the tunnel, and tested the in-built safety systems, their integration with those of the emergency services, and the effectiveness of the combined response.

The new road tunnel is the first in the UK to be fitted with a fixed fire suppression system, which releases a fine mist to dampen flames, to help motorists escape and reduce the extent of any fire damage.

The system has been endorsed by the Tyne and Wear Fire and Rescue Service, and, once commissioned after its testing, will claim to make the Tyne Tunnel the safest road tunnel in the country.

Original Tyne Tunnel workers see new river crossing

Workers who helped build the first Tyne Tunnel were given a VIP tour of the new multi million-pound crossing ahead of its opening..

The first road tunnel under the River Tyne, linking North and South Tyneside, opened to traffic in 1967. The second £260m tunnel, which has taken three years to construct, is due to open at the end of February. Contractors hosted a special site tour of the new tunnel for some who worked on the original in the 1960s.

The existing tunnel carries more than 11m vehicles a year.

The new tunnel has been built east of the existing site between Jarrow in South Tyneside and Howden in North Tyneside. Among those given special access to the new tunnel was Brenda Hutchinson, who worked in the drawings office of the design team for the original vehicle tunnel.

She said: "Women weren't allowed into the first tunnel when it was being built, as it was considered bad luck. It has been fascinating to look behind the scenes at the new tunnel and to be allowed all the way on to the site."

Nicolas Caille, project managing director for Bouygues Travaux Publics UK, the main contractor of the new tunnel, said: "I've enjoyed listening to the tales about how the first tunnel was built. Comparing the challenges they faced with the ones we've tackled has been fascinating. They did things very differently in the 1960s."

Revamp plan for Tyne pedestrian and cyclist tunnel

Plans for a multimillion-pound upgrade to the Tyne pedestrian and cyclist tunnel have been submitted. The pedestrian and cyclist tunnel is a Grade II-listed structure.

As part of the £6m project, the Tyne and Wear Integrated Transport Authority (TWITA) wants to replace two of the original wooden-step escalators.

There would also be repairs to the damaged tile lining of the Grade II-listed structure, and improvements to the lighting. In addition, the entrance rotundas at Howdon and Jarrow would be restored.

Paul Fenwick, project director for TWITA, said: "The tunnels have been providing an important link under the Tyne for 60 years. However, in recent years the age of the equipment has led to increasing frequency of breakdowns and has meant our customers have not received the reliable service they deserve. This refurbishment will see these tunnels enter a new and exciting era, providing an efficient and reliable service to the people of Tyne and Wear and beyond."

New fire warning system for A55 tunnel

A £365,000 public address system to warn motorists of emergencies is to be installed in the A55's Pen-y-Clip tunnel this year. Work to install the PA system, which will warn drivers of accidents or fires up ahead, will begin on the tunnel near Penmaenmawr in September 2011.

It will give audio warnings to drivers to help them evacuate their vehicles more quickly. Evacuation signs and lights will also be upgraded.

A spokeswoman for the Welsh Assembly Government said the work would cause minimal disruption and will be carried out overnight. Work will take a year to complete.

The project will be the first of its kind in Wales, and similar upgrades will be installed in Conwy and Penmaenbach tunnels in the future. The project is part of a £4.8 million package to upgrade Wales' trunk roads.

Drakelow Tunnels

The Drakelow Tunnels are a former underground military complex beneath the Kingsford Country Park near the village of Kinver, Staffordshire, which cover 250,000 sq ft (23,000 m2).

The tunnels, which have a total length of 3.5 mi (5.6 km) to 4 mi (6.4 km) have a very interesting past and are a historical monument to the military history of the United Kingdom.

Designed by Sir Alexander Gibb & Partners, the Drakelow Tunnel Complex (originally called "Drakelow Underground Dispersal Factory") was excavated during World War II in sandstone hills near the village of Kinver and the town of Kidderminster, Worcestershire.

It was originally constructed as a shadow factory for the Rover car company who were at the time manufacturing engines for the Bristol Aeroplane Company.

It was also intended to supply components to Rover's main shadow factories at Acocks Green and Solihull, to supply spare parts, and to act as a backup facility if either of the main shadow factories was damaged by enemy action.

The cost of the facility was originally estimated at £285,000, and construction, which began in June 1941, was expected to take just one year.

In the event, the underground factory achieved full production in May 1943 and the final cost exceeded £1,000,000. The site consists of numerous tunnels that stretch for around 3.5 mi (5.6 km), although public access on tours is limited to less than a quarter of the site.

The tunnels contained dormitories, storage areas, workshops, electrical equipment, toilets, offices, a BBC studio, a GPO Telephones communications facility and other facilities.

During the 1950s and the growing Cold War, the site was initially used by the Ministry of Supply for storage.

Then around 1958 part of the site was developed by the Home Office as a Regional Seat of Government (RSG9).

It was publicly exposed in a demonstration held there by the West Midlands Committee of 100 in the summer of 1963. Under later Home Defence schemes the bunker was designated a Sub-Regional Control (SRC), Sub-Regional Headquarters (SRHQ) and finally Regional Government Headquarters (RGHQ).

The site was greatly modernised in the early 1980s, only a small portion of the site was designated for use.

New blast doors were fitted in place of the previous wooden factory doors and the interior of the site was refurbished in the areas forward of tunnel 4.

In about 1990 there was a plan to move the RGHQ to a much smaller bunker, formerly used by UKWMO, at Lawford Heath near Rugby.

In the end this never happened, and the Drakelow site was decommissioned and sold in around 1993.

BLACKWALL TUNNEL UPGRADE

Transport for London (TfL) and their contractor, BAM Nuttall have been carrying out a safety upgrade of the 113 year old Blackwall Tunnel.

These works have included vital upgrade works as well as resurfacing the entire 1.4 km tunnel.

Since work began in February 2010, new ventilation fans have been installed in the tunnel's four shafts as well as new lighting, upgraded CCTV and new communications systems installed throughout the tunnel. TIL has also begun installing 26 inlets in the tunnel wall (including emergency phones and fire extinguisher) providing a safe area for any drivers whose vehicles have broken down within the tunnel.

By working with the contractor and using innovative thinking to allow sections of the works to be carried out during the day as well as at night, TIL and BAM Nuttall have managed to bring the project forward to complete one year earlier than originally expected.

The historic Blackwall Tunnel, which is managed by TIL, is part of London's Victorian legacy. The northbound tunnel was built in 1897 for horse-drawn carts and carriages. It is possible the tunnels had to be curved, rather than straight, because the horses would bolt if they saw the light at the end of them. It now serves as one of the key east London river crossings, and is used by up to 50,000 cars and lorries per day. (The southbound tunnel was built in the 1960s also carries 50,000 vehicles per day).

The northbound tunnel was last modernised in 1992, although some of its ventilation equipment dates from the 1960s. It needed a thorough refurbishment, both to install new generation safety systems and ensure it is serviceable for many more years of heavy use.

The works include improvement n the capacity to detect accidents, control fires, remove smoke from the tunnel and evacuate motorists (should this become necessary), to guide emergency services to an incident faster and keep drivers better informed while it's occurring, Improve lighting for greater visibility, especially when smoke is present, installation of Auto tunnel closure system to stop traffic and to keep traffic well back from the tunnel if an incident has occurred, improved public address system, better mobile phone coverage throughout the tunnel, and more emergency points so stranded motorists can contact the control room. The refurbishment project will also improve the systems which detect over-height vehicles before they try to enter the tunnel, become stuck and block traffic. The upgrade works are expected to reduce the need for upgrades in the future (it could be anything up to 25 years before it is required to refurbish parts of the tunnel again).

The main works will be complete by the start of the Olympic games and the remaining works will cease during the games and the tunnel will be put back into 'full time use' for their duration.

The northbound tunnel was last modernised in 1992, although some of its ventilation equipment dates from the 1960s

CrossRail brings Connaught Tunnel back to life

The Connaught Tunnel is a 600m 'cut and cover' tunnel that's now disused. It was built in 1878 to transport, among other things, passengers and goods from the nearby docks and it became known as the North Woolwich line.

Now it's going to be brought back to life as part of the Crossrail project.

They call it "renovate and reuse" and it will cost £50m to get the tunnel into a fit state so that tracks and the electricity supply can be put in.

They think it is cheaper than tunnelling underneath.

The engineers are extremely excited and nervous about what they'll find when soil excavations begin and they are eager to preserve the transport heritage of the capital.

Built under the docks in the East End of London, the Connaught Tunnel has been abandoned ever since the North London Line was closed down in December 2006 after the DLR extension was completed, and it has lain empty ever since.

Soon though, builders will rudely wake it from its slumber with some quite substantial works and it will eventually return to life as a train tunnel once again.

A bit of history

The Royal Victoria Dock was opened in 1855 on a previously uninhabited area of the Plaistow Marshes to provide space for the larger cargo ships, and was a commercial success. So much so, that the company decided to build another dock next door to cope with demand, the Royal Albert Dock.

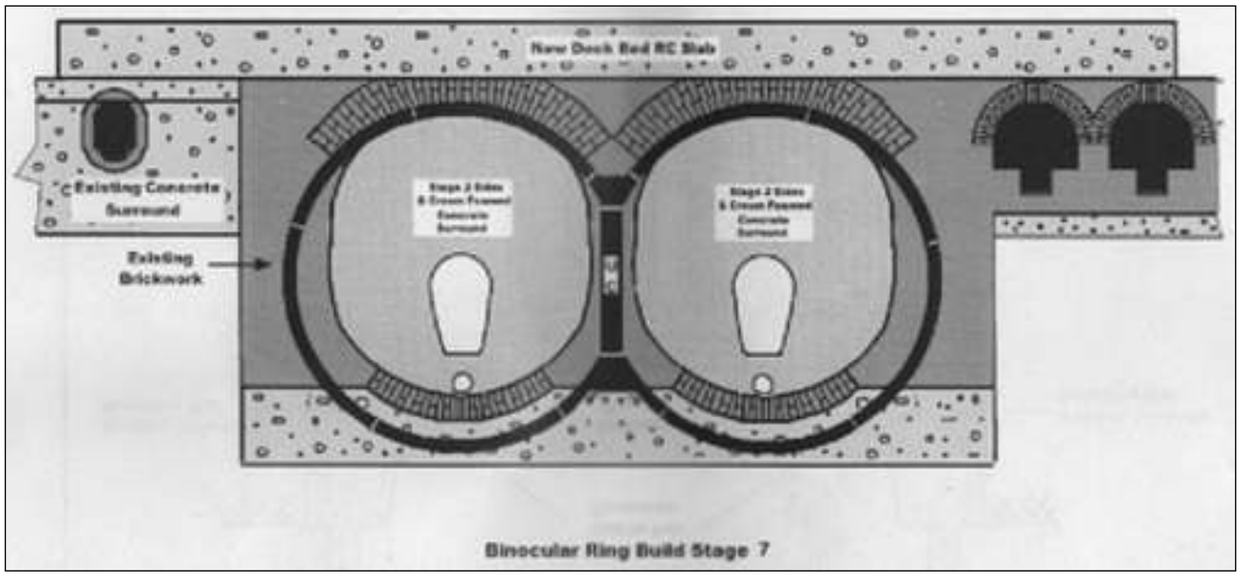
The problem was that they had only recently built a railway around the north and east of the first dock, and it would cut the two docks in half, so they decided to dig a cut-and-cover tunnel, and then build the dock above that. And so they did, in 1878.

A thin water channel linked the two docks running right over the tunnel, but as ships got larger they couldn't fit through the narrow canal and it was deepened to 8 meters to cope. Unfortunately, they were a bit too aggressive, and it wasn't long before the bottoms of the boats were scraping the top of the tunnel.

Not particularly good for the boats, and definitely not good for the tunnel underneath.

As a result in 1935, a 100 meter length of double-track wide tunnel was filled in and two smaller iron lined tunnels left behind for the trains.

And so it remained, being used by the North London Line while the docks above slowly decayed before their resurrection in the 1980s.



In the middle though, the huge tunnel suddenly shrinks to two smaller almost tube-like tunnels lined with iron rings. This is the section which runs directly underneath the watery path linking the two docks. A ventilation shaft at each end marks the start of the transformation from high vaults to small tunnel – and these ventilation shafts are visible above ground, as is the pumping house that used to keep the tunnels dry.

The proposal is to dredge the canal above to remove about a metre of silt and a 1-metre thick concrete slab will be poured on the bottom to act as a protective shield. Then the rusting iron rings will be removed and the tunnels filled with a low strength foam concrete to stop the tunnel collapsing. Having created a solid concrete/brick plug along the dock insert, then the whole thing will be tunneled out again to create the wider tunnels needed for Crossrail trains and their overhead electrics, and lined with modern utilitarian concrete rings.

The digging out of the new tunnel is expected to be done by hand.

The alignment of the tracks through Silvertown makes the existing station unsuitable for use by Crossrail trains. The station will therefore be demolished, though passive provision will be made nearby for a future Crossrail station in the event of the development of adjacent properties.

Although some early thoughts were to either just build a new tunnel, or just bulldoze their way through the Connaught Tunnel, the people handing the works are quite keen to save as much as possible. The brick/concrete arches that mark the entrances to the tunnels for example will be preserved in situ.

Likewise, the brick tunnel will be sympathetically repaired – and while the works to the iron-lined central section will destroy it, there was never any realistic hope of preserving that intact. So there will be a restored entrance/exit, but a concrete middle. The good thing is that the cost of these works, while a significant £50 million, is still less than it would cost to have dug brand new tunnels. The reconstruction of tunnel including fitting out is expected to take a bit over four years.

Gothard tunnel

Excavation work on the world's longest rail tunnel under the Gotthard was completed in March, with the breakthrough of the second tube.

The last metres of rock in the west tunnel were pierced five months after the breakthrough in the east tube of the Gotthard Base Tunnel.

Work continues on lining the two single track tunnels, each 57 kilometres long, and installing the infrastructure. The work is already underway in some stretches. AlpTransit Gotthard, the company building the tunnel, is due to hand it over to Swiss Federal Railways at the end of May 2016. It is scheduled to open to traffic in 2017. The total Gotthard system, where construction started in 1996, is about 152 kilometres long, including access tunnels and shafts. About 56 per cent was excavating by tunnel boring machine and the rest by drilling and blasting. More than 28 million tonnes of rock was removed from the mountain. The Gotthard Base Tunnel has taken over the world record from the Seikan tunnel in Japan, which has a length of 53.85 kilometres.

The Gotthard Base Tunnel is part of a $14.4 billion effort aimed at cutting the number of heavy trucks passing over the Swiss Alps in half, while also drastically reducing the physical toll on these essential roads and slashing the amount of pollution.

The idea for a flat rail line under the Gotthard massif was first posed in 1947 and endorsed by the Swiss government in 1962, planning began in earnest in 1992. And it became a reality in 1998 with the last of five referendums (none of which got less than 65 percent approval) instituting a series of taxes--on oil, on trucks, and on people's purchases--intended to fully pay for the new tunnel system. "It's a gift of a Swiss generation to ourselves," said Yves Bonanomi, who in addition to performing geological research for the giant effort also escorts journalists, politicians, and other VIPs through the labyrinthine construction here.

The impetus for what is officially known as the New Rail Link through the Alps was a desire to cut in half the 1.3 million heavy trucks that ferry cargo through these stunning mountains every year. Today, there is century-plus-year old rail line that crosses through these high passes, but it forces trains to navigate hairy curves and climb hundreds of metres before heading right back down again.

By building the Gotthard Base Tunnel and its accompanying 15-kilometre Ceneri Base Tunnel (planned to open in 2019), Switzerland expects to reduce truck traffic to 650,000 a year and double cargo traffic from 20 million tons a year to 40 million tons. Maximum speeds will be as high as 155 miles an hour.

In addition, the tunnels will allow a better meshing of Swiss and Italian passenger train schedules, making more runs between Zurich and Milan possible.

Though the Ceneri tunnel is a major component of the larger project, it's the Gotthard tunnel, and its world-record length, that draws most of the interest. This is not just a single long tunnel. In fact, because safety and efficiency concerns led planners to design side-by-side one-way tunnels, the entire system, counting crossover tunnels, ventilation tunnels, and emergency stations, has required the excavation of 151.2 kilometres of Swiss Alps.

And because the goal of the project has been to reuse nearly 100 percent of the dirt and rock dug up, that's meant Switzerland has had a steady source of materials for making concrete and gravel, for filling old quarries and gravel pits, and for things like building dams. There was enough left over for the creation of island bird sanctuaries in Switzerland's Lake Lucerne.

Rather than planning a single, two-track tunnel, Swiss planners decided on two that are parallel and one-way. This is partly for efficiency but also for safety: by having trains travel only in one direction, there is almost no chance for a calamitous head-on collision.

But the design is much more than just two side-by-side tunnels. There are also two crossover tunnels that will allow trains to switch sides in case of an accident or for maintenance, and two full emergency stop stations 20 kilometres apart where passengers can quickly and safely escape from a burning train into a special passageway that leads to a side tunnel where rescue will come quickly. The stations are big enough to handle up to 1,000 passengers, and take advantage of an overpressure system in which smoke cannot enter the escape passageways.

The crossover tunnel is the fork where trains can continue to head in the direction they were going, or switch to. That is expected to be done in cases of maintenance on one of the two one-way tunnels, or when there is an accident.

There are also separate passageways every 325 metres that bridge the 40 metres between the tunnels, allowing people aboard a stricken train to escape to safety if it can't make it to one of the emergency stations.

Finally, there are ventilation tunnels above the emergency stations designed to draw smoke from burning trains up through seven shafts at 250 cubic metres a second, a feature that is thought could clear the air in seconds in case of a conflagration and keep any people in the area safe from smoke inhalation.

At Sedrun, which is about a third of the way between the tunnel's portals at Erstfeld (to the north) and Bodio (to the south), there are twin 800-metre-tall shafts descending from a kilometre inside the mountain. One is for workers and other guests, and the other is for transporting equipment and other materials. Much of the machinery being used in the tunnels was sent down whole, but some was too big to fit in the elevators and had to be sent in parts and assembled below.

While creating a separate crossover tunnel that trains can move onto in the case of maintenance or an accident might seem like a simple matter of constructing another section of tunnel, Bonanomi explained that there are additional complications.

A large cavern for a train station for Sedrun is being built just adjacent to the tunnel. This station, which would be called Porta Alpina, could handle passenger trains on the Zermatt to St. Moritz line and in theory could see as many as 3,000 people a day during ski season.

But this is but a vision for the future. There are no plans to build out the train station any time soon. Whether the station is built or not, however, the Gotthard Base Tunnel is one of the largest infrastructure projects Switzerland has ever seen. It is the world's longest tunnel and it's 800 metres below the Alps

ABB wins $21 million contract for world's largest tunnel ventilation system

ABB, the leading power and automation technology group, has won an order worth about $21 million from AlpTransit Gotthard AG (ATG) to provide a ventilation system for the Gotthard Base Tunnel in Switzerland, which will carry trains beneath the Alps. It is the world's largest railway tunnel project, with a route length of 57 km. In total the project's network of tunnels, shafts and passages equals 152 km. The order was booked in the first quarter of 2011.

Technical rail systems are scheduled to be installed and operational by 2017. Once completed, an estimated 200 to 250 trains per day will travel through the tunnel.

Together with TLT Turbo GmbH (Germany), ABB represents a consortium that was awarded the project, which is worth about $45 million. The consortium is responsible for developing, producing and installing what will be the largest tunnel ventilation system ever built, providing fresh air for the entire tunnel network. ABB technologies will ensure it operates at the highest levels of reliability and energy efficiency.

"System reliability, safety and quality are critical in this tunnel project. The ventilation system meets ATG's highest safety requirements, while ensuring energy efficient operation," said Veli-Matti Reinikkala, head of ABB's Process Automation division. "This project demonstrates how our comprehensive solutions and application know-how developed in process industries can help improve efficiency of other operations."

ABB's scope of supply includes medium- and low-voltage switchgear other electrical equipment, 800xA control systems, sensors and other digital field devices to measure air flow and temperature, drive systems and other automation equipment. ABB is also responsible cable design and delivery, as well the installation, assembly and commissioning of the other components.

Bats in tunnel get own traffic lights

A special set of traffic lights is to be installed for Oxfordshire bats who live in a tunnel shared with commuter rail trains. The theory behind the move is that as trains approach the tunnel, bright lights will switch on to warn the bats of oncoming danger.

Traffic lights for bats is a first in the UK.

It's natural for bats to avoid bright light and the trials will be conducted in a bid to add a second service between Oxford and London, via Bicester.

If bats and trains can work together then it's hoped travel time will be quicker and more effective. At the moment feeding bats use the tunnel, located near underneath the Wolvercote roundabout on the A40, while travelling around the north Oxfordshire countryside and a colony use it as a day time roost.

Geoff Billington, an ecological consultant, said the system would be trialled for a month to see if the bats can be trained to avoid trains by either flying out of the tunnel or crawl into small crevices and drains. 'The basic idea of the system is that the lights will come on and then a train appears,' he said. 'We hope that the bats may learn to associate the two things. It is clear they already scamper out of the way when we have observed them as trains pass through the tunnel now.'

Koralm railway tunnel

Aker Solutions' wholly-owned subsidiary Aker Wirth has won a contract to supply two tunnel boring machines for the Koralm railway tunnel project in Austria.

Strabag AG and Aker Wirth, part of Aker Solutions' drilling technologies business, have signed a contract for two telescopic shield machines.

The two tunnel boring machines, each with a diameter of 9.93 metres, will be in operation from October 2012 at main construction lot KAT 2. This section, approximately 20 km in length, represents the heart of the 32.5 km long Koralm tunnel. It is part of the new high-speed train route linking Graz and Klagenfurt. Access to the underground construction work areas brings a particular challenge. The only possibility is a 60 metres deep shaft.

The two telescopic shield tunnel boring machines can be identified by the typical gripping from Aker Wirth in the rear sections of the shield. The shields with the wing-type gripping are thereby optimally supported in the bored tunnel by means of secure three-point bearing. This allows the machine a highly efficient drilling progress with very little vibration.

The cutter head is driven by electric motors with an overall power rating of 4,800 kW and the maximum cutting torque is 30,000 kNm. The back-up belonging to the boring machine, will be delivered and constructed by the long-standing cooperation partner Rowa Tunnelling Logistics AG from Switzerland. The entire tunnelling system is approximately 160 metres long and weighs in excess of 1,800 tonnes.

The manufacturing of each tunnel boring machine will take around a year and the first machine will start tunnelling in October 2012.

With the Koralm tunnel, the ÖBB (Austrian railway system) is constructing a new high-speed train route between Graz and Klagenfurt. This will reduce travel durations in the future by more than a half. This 130 km long key link is part of the Baltic-Adriatic Axis from Eastern Europe to Northern Italy via Austria.

The Koralm tunnel, with two parallel single-track tunnel tubes and a length of more than 30 km, is the core of this railway line and will be one of the longest traffic tunnels in the world.

3rd Largest Tunnel in Germany

The Bulgarian company "Adval" JSC and the German Ed. Züblin AG held the grand opening of the third largest tunnel in Germany, the "Blessberg" tunnel.

The ceremony was attended by the German Minister of Transport Dr. Peter Rahmsauer, the Prime Minister of Thuringia Christine Lieberknecht, the Chairman of the Board of the German Railways (Deutsche Bahn AG) Dr. Ruediger Grube, the transport minister of Thuringia Christian Carius, the SPD deputy Sabine Doht and the Regional Administrator of Sonneberg region – Christine Zitzmann.

Representatives of the Bulgarian partner company "Adval" on the ceremony were the executive director Valenting Trashliev and the General Director of the German branch – Krum Trashliev.

Being 8,314 metres long, the "Blessberg" tunnel is the longest of 22 railway tunnels, which make up the new high speed section of the German Railways "Deutsche Bahn", between the cities of Erfurt and Ebensfeld.

"Blessberg" is also the longest tunnel dug by the two companies involved in the project, "Adval" A.D. and Ed. Züblin AG. The underground facility crosses the main massif of mount Thüringer Wald between the Goldisthal and Truckenthal villages and is part of the railway connection between Nurnberg and Erfurt.

As soon as the tunnel is completed and operational, "Blessberg" will be the third longest tunnel in Germany, after Landrückentunnel and Münderer.

The construction of the "Blessberg" tunnel costs more than EUR 200 M. "Blessberg" is the longest of a total of 27 tunnels on the 500-km-long express railway between Munich and Berlin, due to be fully finished by 2017. An integral part of the "Blessberg" tunnel construction was digging the tunnel Goldberg (1120 m) from December 2008 to August 2009. The total quantity of earth excavated during the construction of the two tunnels is more than 1,150,000.00 m3 and to strengthen them have been used around 120,000 m3 concrete mould.

"Adval" JSC was founded in 1993. The company specializes predominantly in tunnel construction and strengthening structures. "Adval" is the first company in Bulgaria to adopt and apply the New Austrian Tunnelling Method. The company performs anchors, drilling and grouting works and sprayed concrete.

In partnership with other well-known European companies and also individually, "Adval" participates in tunnel construction work in Germany, Spain, Greece and Bulgaria. Since 2008, the company has been working as a main contractor in the metro construction in the city of Sofia. In just less than twenty years "Adval" has executed the construction of over 50km metro (subway), highway, railroad and hydro technical tunnels.

Dorukhan Tunnel

Siemens is to equip the Dorukhan Tunnel between Mengen and Devrek in Turkey with the latest power, lighting and ventilation equipment, along with the associated safety and communications systems.

The order was placed by KGM (Karayollari Genel Müdürlügü), Turkey's General Directorate of Highways, and has a value in a single-digit million euro figure.

The turnkey handover of the new system is scheduled for January 2012. A project to equip the DAK (Düzce-Akcakoca-Eregli) tunnel system in the province of Zonguldak, placed with Siemens by KGM at the end of 2011, is already nearing completion.

The Turkish Transportation Ministry is currently mounting a great effort to develop the country's highway network. In September 2009, together with Turkey's General Directorate of Highways, KGM, the ministry presented plans for 12 new highway routes, which are due to be realised by 2023.

First Solar Tunnel in Europe

This 3km tunnel running on solar power is part of the Paris to Amsterdam line and the first in Europe, promising to save a ton of energy that would otherwise be wasted during the trip.

Now Paris and Amsterdam obviously aren't two miles apart. But this thing features a 16,000 solar panel array that could power 50 per cent of the entire Antwerp station, where the first train to pass through it departed from. Imagine if more of these popped up on other train lines.

Michelangelo's David threatened by train tunnel

Michelangelo's David is endangered from vibrations from a nearby construction site for excavation work on a new high-speed train to run underneath the Italian city of Florence.

Architect Fernando De Simone is concerned that the digging will violently shake the Galleria dell'Accademia, which houses the world-famous statue and he predicts the reverberations will be so bad they could cause the 17-foot (5.17 metre) marble nude to topple over.

"Tunnels will pass about 600 metres (1,970 feet) from Michelangelo's statue of David, the ankles of which, it is well known, are riddled with micro-fissures," De Simone said. De Simone has been campaigning to have the statue removed before the tunnelling work begins. He says vibrations from nearby traffic and the constant pounding from thousands of daily visitors are also having a detrimental effect on David.

"The risk of collapse or slippage in the marble of the statue's lower joints will be very high [because of] the resonance caused by excavation machinery for the high-speed train tunnel, as well as the vibrations of passing trains thereafter," he added.

Created between 1501 and 1504, Michelangelo's statute representing the biblical figure of David is widely regarded as the most perfect nude male form ever sculpted.

It was originally erected in the Piazza della Signoria public square but was moved to Galleria dell'Accademia in 1873 to protect it from the weather.

Fehmarn Tunnel project

Technical details have been released for the massive tunnel project that will link Denmark's southernmost island to the continent via a sea tunnel beneath the 19 kilometre wide Fehmarn Belt strait.

The technical plan was produced by Femern A/S, the publicly-owned firm in charge of building the Fehmarn Tunnel. Femern A/S is a subsidiary of the company responsible for operating the Great Belt Bridge, which links western and eastern Denmark.

The plans for the new tunnel call for 80 separate, 200-metre-long tunnel sections with a combined weight of 75,000 tons. The price tag for those 80 components is estimated at some 13 billion kroner for production alone.

The project, which is considered one of Europe's largest road construction projects, is scheduled to be finished by 2020. In the meantime, it is expected to create thousands of new jobs for the Lolland-Falster region – an area of Denmark generally known for unemployment and dying towns – not for jobs and growth.

In HR terms, the tunnel's construction is projected to bring the region a whopping 50,000 man-years in jobs. Some 25,000 of those man-years are for workers directly employed in building the tunnel, while the other half are projected to come from secondary jobs associated with the project.

The news that the little town of Rødbyhavn, where the tunnel will start on the Danish side, will be the project's production centre was received with joy by Lolland's mayor, Stig Vestergaard.

"The many thousands of jobs will have a tremendous impact on the whole Lolland and Falster region. We are hoping that many local, unemployed people will be able to get jobs, but also that there will be lots of new jobs in connection with servicing it, which could be very significant for our local tradesmen. This is fantastic news, we have gotten today," Vestergaard told Berlingske Business.

"The whole thing could turn the region around again. After the financial crisis things went downhill. Now we are on the way up again. It's good news, and I am certain it will mean a totally new Lolland when the whole thing is finished in 2020," Vestergaard added.

In addition to a four-lane motorway, the Fehmarn Tunnel will include a two-track rail link. It is expected to reduce travel time across the strait between Denmark and Germany to ten minutes by car and seven minutes by train. Currently, the trip takes 45 minutes by ferry.

Czech Dobrovského tunnel

Dobrovskeho Tunnels are an important part of the Grand City Ring in Brno. Construction commenced in February 2008. The two parallel, double-lane, about 1250m long mined tunnels and are the main element of the entire project. Tunnel I leads along the Žabov-eská-Dobrovského line, whilst tunnel II runs in parallel, about 60m south, on the extended axis of Pešinova Street. Tunnel I is 1237m long in total with a mined length of 1019m and cut-and-cover sections 168m and 50m long. Tunnel II is 1258m long in total with a mined length of 1060m. The cut-and-cover parts are constructed by the same technique as those for the Tunnel I and are 149m and 49m long.

Tunnel cross section – basic engineering data
Basic width of traffic lanes in the tunnel: 3.50m
Height clearance: 4.50m
Curb-to-curb width: 8.50m
Traffic space area: 57.95m2
Polluted air exhaust space: 12.0m2
Primary lining 350mm thick: 11.95m3/lm
Secondary lining min. 500mm thick: 32.53m3/lm
Excavated cross-sectional area: about 130m2

The geological sequence within the tunnel cross section consist of secondary loess and anthropogenic fills, between 3 to 10m thick, with layers of locally saturated gravel to sand terraces in the bottom horizon. The layer underlying the terrace consists of Neogene clays (the so-called Brno tegel), forming layers up to several tens of metres thick (the bedrock was not encountered by boreholes over 60m deep). Ground water is bound to the gravel-sand layers in the upper Neogene horizon, in the form of aquifers in local depressions. The clays are of rigid to solid consistency. Regarding plasticity, tegels are highly plastic and, on contact with water, under certain conditions, heavily swelling occurs. The overburden height is roughly identical for both tunnels, varying from 6m to the maximum value of about 21m. In terms of the vertical position, both tunnels are located in Neogene clays, in a way guaranteeing that the minimum impermeable height of the Neogene clay overburden of about 2 to 3m above the excavation is always maintained.

The high-density surface development, together with related utility networks and roads on the surface and the difficult conditions of the Brno clay (tegel), ranks the Královo Pole tunnelling project among absolutely unique civil engineering projects, having no equal in the Czech Republic.

Exploration galleries had been designed and excavated in 2001 to 2003, with an assumption that the construction of the tunnel tubes would start not later than two years after

the completion of the excavation of the galleries. However due to delays in building permits the tunnel excavation was not allowed to commence until 2008.

The construction method, excavation sequence and reinforcement of the primary shotcrete lining by means of HEBREX elements, which were developed especially for this project, have been used for the first time in the Czech Republic. The monitoring of impacts of the construction and tunnel excavation is the most extensive as has ever been carried out in the Czech Republic.

The name HEBREX (abbreviated to HBX) originated as a compound word consisting of the marking for rolled-steel sections HEB and the usual marking of standard steel lattice arches BRETEX, which are commonly used as primary support. The HBX support elements join favourable properties of rolled-steel sections (high flexural rigidity and immediate capacity to carry loads without being embedded in shotcrete, a long deformation path) and lattice girders (good bond between shotcrete and the girders). In addition, the HBXs allow savings in the steel consumption compared with HEB rolled-steel elements, of about 10–15%.

The tunnel was originally meant to open in 2010. However the original design of fire ventilation in zoning decision documentation did not meet latest PIARC requirements. There is however some irony in the recent court order stopping the construction of "Dobrovského tunnels". The investors are supposed to improve the project due to the environmental regulation – but the order also means that the local areas will suffer from heavy traffic for a few more months. According to the latest estimate, Dobrovského tunnels will open in May 2012.

Flood-relief tunnel for central Malta

An 11-kilometre-long tunnel that forms part of a multi-million euro flood relief project aimed at diverting rainwater in villages prone to flooding has been given the go-ahead by the planning authority in central Malta.

The tunnel will run through the valleys and urban areas of Birkirkara, Msida, Wied is-Sewda, Attard, Lija, Balzan and Gżira, directing the water towards Marsamxett and discharging it at Ta' Xbiex.

After a two-hour hearing, the board unanimously approved the €56 million development, which is crucial to the long-planned and promised national flood relief project.

Project manager George Buhaġiar explained it was very difficult to build a channel system in urban areas, which, ultimately, were the most prone to flooding.

Initially, it was planned the flood relief project would also incorporate a water conservation and harvesting plan. However, it was soon clear combining the two elements would not be cost effective.

"If we included a water conservation plan, the cost would have been unjustified for EU funding," Mr Buhaġiar said.

Instead, it was decided to focus on flood relief which, in the future, could be linked to smaller water conservation projects. An underground tunnel system was the most cost effective, costing an estimated €3,000 per metre, compared to €7,000 a metre for culverts and €9,000 a metre for pipes, architect Carmel Mifsud Borg explained.

With 72 metal gratings, 50 silt traps and buried at depths that range from eight to 52 metres, the tunnel will have six shafts strategically located near the main tunnel, which will be used as entrance and exit points during the construction and operation of the tunnel.

An effort was made to try and pass the tunnels under main roads but it was not always possible and, in fact, they would pass under private property at certain points, Mr Mifsud Borg explained.

Martin Testaferrata, a resident, called on the planning authority to have the tunnels rerouted in such a way as not to pass under his property. "I don't want to make any threats but there always remains the possibility of legal action," he said.

Planning authority chairman Austin Walker pointed out that all registered objectors had the right to take legal action against the applicant but not the authority. The project has been on the drawing board for 15 years and has been re-launched a number of times, accompanied by largely unchanged plans and ministerial press releases.

Last June, another two applications related to the flood relief project were approved – for Qormi and Marsa and another for the area of Żebbuġ – for infrastructural works involving the reconstruction and modification of channels and bridges.

The planning authority board also approved landscaping works in the ditch below the entrance to Valletta together with some changes to the City Gate design.

Malta to Gozo tunnel proposed

Gozitan businessman Joseph Borg took advantage of the Prime Minister's visit to his factory and called for the building of a "permanent road" between the two islands.

"It is time to connect the two islands with a permanent road," Mr Borg, former chairman of Gozo Channel, said towards the end of his speech, saying it would be good for everyone, especially Gozitan enterprise.

Mr Borg said later his idea was not to have a bridge, which would have a negative visual impact, but an underwater tunnel.

"I think the most feasible solution, having the least environmental impact, would be a subsea tunnel," Mr Borg said, adding he and others had been looking at this option in detail.

His surprise statement during Prime Minister Lawrence Gonzi's visit to FXB's Xewkija furniture factory, was meant to ignite a national debate on the matter.

Dr Gonzi said the government was committed to increasing accessibility between the two islands but did not commit to take up the proposal.

Even though some may find the ferry crossing between Malta and Gozo quaint and charming, many Gozitan residents feel the commute stands in the way of the islands' development.

"There are times where I have to travel to Malta three, four times a week and it always eats up two to four hours of my time, that's up to 16 hours a week, which I'm sure you'll agree is not good," Mr Borg said.

"Time is money. Wherever in the world there was increased accessibility, there was a positive impact on the other side.

If you look at the bridge connecting Copenhagen and (Swedish city) Malmö, business in Malmö doubled. In summary, any improved connection will be beneficial for both sides," Mr Borg said.

Underground Nuclear waste in Finland

The focus is on Onkalo, a little-known project being built on a Finnish island some 100 miles northwest of Helsinki. It is there that engineers are digging a 4-mile-long tunnel 1,600 feet deep in 1.8 billion-year-old bedrock.

When completed in 10 years, the tunnel will be used to store tons of Finland's nuclear waste. In another 10 years, the tunnel will be sealed, hopefully for 100,000 years, which is the time it takes for nuclear waste to decontaminate.

But there are problems. One is the Ice Age predicted to arrive in 60,000 years. How will the weight of the ice affect the structure?

Elura Mine/Endeavour Mine Cobar

The commencement of the Elura mine was the district's most notable development in the 1980s. The Electrolytic Zinc Co. of Asia Ltd commenced work on the Elura prospect, then a magnetic anomaly, in 1973–74.

The prospect was found to be a world class zinc-lead-silver deposit. By 1980, EZ Industries Ltd had predicted a mining project to employ about 500 people during the construction phase and 350-400 during mining operations at an initially planned annual capacity of 1.1Mt.

The company commenced production from it in March 1983, following 10 years of ongoing exploration and development. A major underground mine with a range of about 200-350 employees during the 1980s mining and treatment, Elura became the second largest metallic mine in the State, with many up-to-date features ensuring high efficiency and productivity.

The total cost of the mine and associated facilities was about $200 million, and by mid decade it was operating at a high level, in excess of 1Mt per annum. The development of a totally new mine gave a strong economic boost to Cobar, as well as further stimulating exploration within the region.

However, only two years after its official opening a dramatic decline in metal prices in 1985 rendered the Elura operation a significant loss maker. The slump was most dramatic in zinc prices, but also affected the CSA mine, where closure was contemplated. Both mines weathered the crisis, although Elura remained in a loss situation through 1986 and beyond.

The Elura mine was acquired by North Broken Hill Holdings Ltd in 1985, after the latter took over EZ Industries Ltd in 1984. Subsequently it became part of Pasminco Ltd Holdings in 1988. Pasminco Ltd operates three lead-zinc mines in NSW, the North mine and ZC mine at Broken Hill, and the Elura mine.

Through merging the lead-zinc mining and smelting assets of North Broken Hill Peko Ltd and CRA Ltd in 1988, Pasminco Ltd became one of the world's largest base metal mining and smelting companies.

The recession of 1991 again severely threatened the operation of the Cobar area mines, with Elura reducing staff by over 260 employees and Pasminco Ltd suffering a loss.

With a bid to become a major lead/zinc/silver producer CBH Resources took over the Pasminco-Elura Mine and renamed it Endeavor Mine in September 2003.

The orebody is similar to others in the Cobar Basin in that it has the form of massive vertical pillars. The mine is an entirely underground operation accessed by both traditional shaft haulage and road trains, with concentrator, drying, storage and rail facilities on the mine lease. The road trains used at Endeavor are an Australian innovation introduced by CBH and feature a second unit engine at the back of the unit. These machines, driven by 920 horsepower, haul ore and waste along spiralled underground tunnels.

In extracting the mineral, ore is taken from the surface stockpile and placed in a concentrator where froth flotation separates the particles of valuable zinc, lead and silver materials from the waste.

Metal concentrates are then dried for rail freighting to smelters in Port Pirie in South Australia and overseas, predominately Japan.

Endeavor has a total capacity of 1,200,000 tonnes of ore per annum with capabilities to produce 140,000 tonnes zinc concentrates per annum, and 60,000 tonnes of lead concentrates per annum containing 70,000 tonnes zinc, and 40,000 tonnes lead and 31,000 kilograms of silver.

Between the period 30 June 2006 and 30 June 2007, Endeavor's production increased by 87 per cent.

At current mining rates Endeavor has a 15 year life. During 2007 the mine has undertaken some major upgrades to sustain the life-of-mine. These upgrades include the installation of a pastefill plant to enable the mining of large blocks of high-grade ore developed in previous mining and the construction of a new decline. This decline will provide an additional haulage way for the top 300 metres of the mine where truck speeds have been slow, significantly improving the turn-around cycle for ore haulage and upgrading the mine's output capacity.

Along with Endeavor, CBH manages an operating base metal mine at Broken Hill and developmental projects at Sulphur Springs in Western Australia and Hera in the Cobar area. Together with its operational and developmental projects, exploration projects are currently underway in the Cobar Basin, Napier Range in Western Australia and Constance Range in Queensland. In addition to these projects, the Company owns a concentrate ship-loading facility at Newcastle.

Ausdrill expansion underground

Ausdrill says it is considering expanding into the underground mining services sector as it secures a $75 million contract with Fortescue Metals Group.

The Perth-based mining services company said in a statement that is was examining options for the establishment of a new division that provides underground services within Australia.

The options were to either establish the new division as a start-up or through acquisitions, with Ausdrill having previously investigated the possible takeover of rival Barminco, which fell over due to unsuccessful negotiations.

"We are pleased that Ausdrill continues to be a provider of mining services to aid in the expansion of the iron ore industry in the Pilbara," Ausdrill managing director Ron Sayers said.

"Due to the increasing level of activity in the region, we believe there are significant opportunities to provide further services to the industry to new and existing customers.

"We also remain focussed on expanding our service offering to the resources industry in a way that will create shareholder value.

Sunrise Dam mine awards biggest contract to date

Gold producer AngloGold Ashanti's Sunrise Dam mine awarded Australian underground mining contractor Barminco its largest contract to date, worth A$500-million over five years.

The Sunrise Dam gold mine is located in the northern goldfields of Western Australia, 220 km north-east of Kalgoorlie and 55 km south of Laverton. The mine consists of a large openpit, which went underground and began producing in 2003.

The scope of the contract includes full underground mining services, such as development, production, labour and short-term scheduling, with the potential for a three-year contract extension. The contract, which is the second-largest underground mining contract to be awarded in Australia and the largest for Barminco in its 21-year history, follows the company being awarded a three-year underground contract, worth A$60-million, for Western Areas' Spotted Quoll nickel mine, near Hyden.

Barminco group client and commercial manager Dave Noort says this contract provides a validation of Barminco's working methods, which include establishing long-term close relationships with clients.

"The renewal of this significant contract signifies recognition of the company's ability to consistently deliver industry-best safety and productivity performances," adds Barminco CEO Neil Warburton.

He says a contract with such a high-calibre client relfects a partnership that has grown over many years, delivering on key performance outcomes for AngloGold Ashanti and resulting in a high level of confidence in Barminco.

Working together for safer Tasmanian mines

The Tasmanian Minister for Workplace Relations, David O'Byrne, in March 2011 marked the commencement of new laws to protect workers, and make mining operations safer in Tasmania. The new mine safety requirements have been added to the Workplace Health and Safety Act 1995 and the Workplace Health and Safety Regulations 1998, and come into effect today. They've been developed co-operatively with employers groups and unions – leading to full agreement from all parties.

The AWU has welcomed the commencement of new laws, starting today, which protect workers, and make mining operations safer in Tasmania.

"The tragic mining accidents at Renison and Beaconsfield brought home to Tasmanians the risk involved in underground mining", said Mr O'Byrne. "We've listened carefully, and acted on the findings of the Coronial inquests into those accidents – including the recommendation for mine-specific safety regulations. These new laws are built on strong co-operation and consensus between the Government, Workplace Standards, employers and unions. By working together, we can provide the safest possible conditions for mine workers, give them extra confidence in going about their work, and ensure a bright and prosperous future for the Tasmanian mining industry," he said.

Key provisions of the new mine-specific laws and regulations include:

- General and specific responsibilities of the mine operator in relation to occupational health and safety.
- The requirement for each mine to implement a health and safety management system, to protect the health and safety of mine workers and other who may be exposed to risks arising from mining operations. Risk management processes and procedures must be included in the health and safety management system.
- A requirement for the mine operator to appoint a site senior officer with requisite knowledge or qualifications according to particular characteristics of the mine.
- And, specific safety measures for particular hazards, including those in relation to ground control, atmosphere and ventilation, vehicles and other mobile plant.

Until now, the Act has placed broad and generic duties of care on those people who influence health and safety at work – especially employers. However, the Act and its supporting regulations have contained very few provisions targeting the specific hazards and operations of mines. That lack of specific provisions was found to be inadequate for potentially highly dangerous mining activity.

The new laws took longer than expected to develop, but all parties agreed it was most important to conduct thorough research on complex issues, and take the necessary time to get the measures right. Consultation on the proposed new laws started in 2008, and a reference group was appointed to help develop the specific regulations. That group included members from:

- The Tasmanian MInerals Council;
- Cement Concrete and Aggregates Australia;
- The Australian Workers' Union;
- CFMEU (Mining and Energy Division);
- Workplace Standards Tasmania

Some of the new requirements will not apply immediately to existing mines. For example, smaller mines (based on the total number of hours worked by all persons) will have at least until January 1st 2012, before having to implement a health and safety management system. Larger mines had two months following the announcement at the beginning of March 2011.

Mt Gordon underground collapse

In March 2011, Aditya Birla, the Australian unit of India's Hindalco Industries Ltd. halted work at the shuttered Mount Gordon copper mine in Australia because of damage from recent heavy rain. Underground mining work was suspended following a collapse of the F1 vent shaft collar. Recent heavy rains were believed to have undermined the collar, according to the company. All miners were evacuated from the mine. There were no injuries.

Work on restarting underground mining remained suspended while an investigation was carried out into the collapse of the vent shaft collar. Miners then re-entered Mt Gordon underground mining works for the re-commencement of operations once the risk to the underground operations and extent of the damage and repair was confirmed.

The mine is located in Queensland, approximately 120km north of Mt Isa at Gunpowder. The operation can mine 1.2mtpa of ore from the Mammoth underground decline.

The mine was closed in February 2009 because of declining copper prices and the company now wants to restart the operation. Copper prices have more than doubled since it closed the mine.

Aditya Birla also produces copper from the Nifty mine in Western Australia. Hindalco holds 51 percent of the company.

Underground flooding prevention

As underground mines across Australia recover from the impact of recent rainfall and subsequent flood levels, safety authorities are now warning mine operators to consider the potential impact of water ingress from surface accumulations, directly or via aquifers, in volumes miners have not experienced before.

This was recently demonstrated in Queensland, where a coal mine nearly had a fatal accident after water gushed into an underground mine, forcing three miners to climb nearby equipment to escape.

While recommended water management strategies include the installation of water-retaining bulkheads and dam walls, a range of variables needs to be considered to determine the underground structural design parameters, particularly in addressing unknown potential conditions.

Following the development of a water-resistant, single application shotblast product, Aquacrete's mine support team, in co-operation with independent structural engineers, PB, has developed a design basis that has been applied in the construction of water-retaining structures at underground mines around Australia.

"Our observations and experiences in designing water-retaining structures with Wet-Repel consistently confirm that the most significant factors influencing bulkhead performance are the interface of the bulkhead with the surrounding strata as well as the potential magnitude of the hydraulic pressure to which they may be subjected," Michael Salu, technical executive for PB Energy, Mining and Industry said.

To determine the maximum overpressure requirement, mines need to consider not only the water to be stored in the impoundment behind the bulkhead, but also to evaluate potential additional sources of water.

Mines currently affected by increased rainfall and flood conditions need to consider all potential sources of surface water that could find their way into the underground mining environment.

They also need to consider the impact of overlying or underlying adjacent mine operations, any nearby infrastructure and their water safety management plans.

"While it may be difficult to establish the impact of unknown conditions, it is essential in determining the bulkhead design to ensure long-term structural integrity.

"With an appropriate factor of safety applied to the engineering calculations, a bulkhead can be designed to maximise effectiveness in addressing a range of underground conditions," Salu said.

As sustained water pressure poses the risk of leakage through fractures and strata surrounding the bulkhead, the strata in the immediate roof, floor and ribs needs to be assessed in detail and should include all strata that can be affected by a change in hydrologic conditions.

"Most known bulkhead failures have been through the surrounding strata or along the strata/bulkhead interface"

According to Aquacrete managing director, John Whitfield, selecting a product that can be keyed into the surrounding mine geology is of critical importance.

"Most known bulkhead failures have been through the surrounding strata or along the strata/bulkhead interface.

"This is due, not only to the fact that water pressure is not always constant, but also because sustained water pressure over a period of time can lead to softening of the surrounding strata.

The effect of sustained water or rain over a period of time affecting a coal mine was shown in Victoria, where the Princes Highway saw a partial collapse in the Gippsland region after water undermined an underground mine. "Wet-Repel's ability to bond well to hard rock and coal, as well as its low water permeability and high compressive strength, has certainly demonstrated the impact that these factors have on long-term structural integrity of bulkheads.

According to Whitfield, it has been put to the test in underground mines for the past five years, with consistent results. As mines address changes to their operational environments, it is important that unknown conditions be carefully considered.

While the occurrence of underground mining incidents directly attributable to inundations has been limited in the past, engineered design of bulkheads to withstand sustained and significant water pressure is now vital.

"Our technical services team has subjected our products to stringent testing protocols over the years. In addition to live blast testing, our shotblast products have undergone tests to determine compressive strength, over-pressure ratings, diffusivity properties and water permeability ratings.

"As our clients are able to obtain independent engineering design and certification for their installations, they have the assurance of knowing that their bulkheads are designed to address their individual site conditions – a feature that has become increasingly important with the changes in mine environments," Whitfield said.

The Mount underground mine

Focus Minerals has started gold mining at The Mount underground mine, in Western Australia, which could lift its yearly gold output by between 40 000 oz and 60 000 oz.

Focus is targeting 1 500 oz of gold per vertical shaft metre at The Mount, with the extraction of 40 vertical metres a year, to support the production forecast.

"The Mount will give Focus an additional source of high-grade feed for the Three Mile Hill processing facility as we move into production through the June quarter," said CEO Campbell Baird.

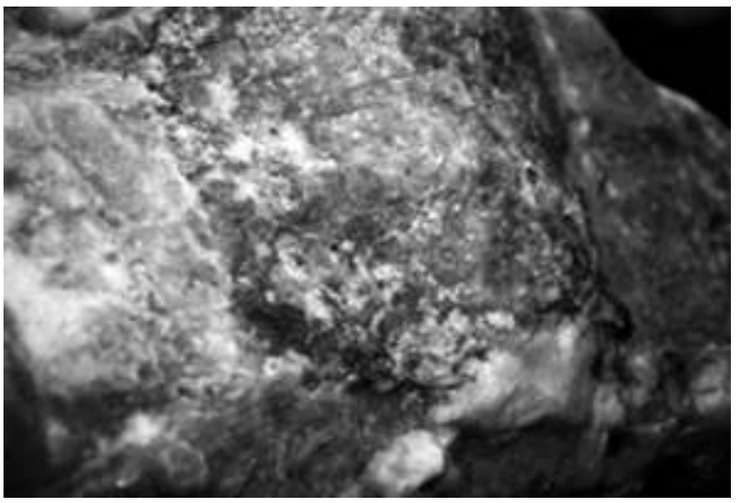
The Mount, which is situated about 80 km from the Three Mile Hill processing plant, has an inferred resource of 2,1-million tons, at 5,5 g/t, for a total of 370 000 oz.

The start of commercial mining at The Mount was significant, since it marked the beginning of a second production platform to complement existing underground mining operations at the Tindals Mining Centre, in Coolgardie, Baird added.

"We aim to have The Mount at full-scale production by the end of the year."

In parallel with the start of the new production, an exploration cross-cut has also started to test mineralisation in the Main and Fuchs lode areas.

The exploration cross-cut will test around 15 structures as it is developed enabling Focus to more accurately assess each structure for mining. The Mount included 15 parallel sub-vertical lodes across a 300-m by 600-m area, which was open in all directions and at depth, providing substantial upside for additional high-grade reserves. The project has already produced more than 34 555 t, at 7,78 g/t from trial mining.



A royal commission of inquiry into the disaster started in Greymouth on July 11, meanwhile receiver John Fisk is preparing the mine for sale.

New Zealand Mine Rescue manager Trevor Watts remains involved in the Pike River operation. Mines Rescue Trust continues to advise the receivers on the safety of re-entering the mine.

However the families of Pike River miners killed in last year's explosion are still determined to recover the bodies of the 29 men killed last November. Families' spokesman Bernie Monk said they had advice from an expert that alternative approaches to recovering the body were possible.

Grey District Mayor Tony Kokshoorn has backed the families' push to recover their loved ones remains but the families continue to meet the Pike River coal mine receivers, the Mines Rescue Service, a mining union, the Department of Labour and the police.

Speaking at the six month anniversary since the first explosion Kokshoorn said the sealed mine was inert and no longer explosive, but the receivers' priority was to sell the mine.

The families had been made to believe the victims' bodies had been incinerated, but recent footage showed that many areas of the mine were untouched by fire and some bodies were intact. Recent revelations that bodies had been seen in the mine, and that self-rescue boxes were opened and the families were tormented by fears that some of the men could have been waiting for rescue.

Despite the region's history of coalmining tragedies, "people are still shocked that this happened".

Over the past six months West Coast MPs Damien O'Connor and Kevin Hague have called for Prime Minister John Key to take responsibility for the body-recovery operation.

Royal Commission first phase

Flames shooting from Pike River's ventilation shaft in November became a horrifying image of the disaster underneath the West Coast's Paparoa Ranges.

Little did the public know that Mines Rescue Service had warned more than a year earlier the 108m shaft would be "virtually impossible" to use as the only escape route if workers were trapped.

It was one of many unsettling revelations uncovered during the first of four phases by the Royal Commission into the deaths of 29 men in the underground coalmine.

The two-week hearing at the Greymouth District Court, focused on mining laws and the mine's geography, conception, approval, design and development.

Claims raised at the hearing included that the mine lacked a safe second way out, Pike River Coal (PRC) had poor understanding of the mine's geology, ventilation and gas monitoring and that it faced pressures from production delays and financial woes.

Twelve witnesses gave evidence but the last, Pike River Coal chief executive Peter Whittall, was the most eagerly anticipated. Victims' families packed the public gallery.

Whittall defended the company's safety efforts despite "lamentable" financial and production difficulties.

Questions focused on the mine's 108m ventilation shaft, which he said the company considered an "escape way" rather than a secondary way out. Initially, the ventilation shaft had been deemed unsuitable as an emergency access, but that changed to it being unsuitable "as a permanent emergency exit".

Whittall said mine workers were directed to a fresh air base if unable to escape via the 2.3km tunnel. The law says a mine must have a secondary exit. The company had planned to build a second exit since 2005 and had six options in its draft mine plan, tabled nine days before the first explosion, Whittall said.

Former chief inspector of coal mines Harry Bell said he had told the mine's technical manager it was "nonsensical madness" to only have a single tunnel. Bell, who had 62 years' coal-mining experience, including stints at Pike

River, said rolled steel joists were supposed to be put in the mine's tunnel to support the unstable Hawera fault area. Instead, the company used shotcrete, which he said would not withstand an earthquake and would leave the men trapped if the tunnel collapsed. "At that time, I was not thinking of the obvious risk in the tunnel of explosions at that weak point."

It was believed a rockfall occurred near the fault area after the explosions and blocked access to the 29 men's bodies.

Bell also criticised the mine's ventilation system, saying it was too slow and unable to deal with methane, which could accumulate up the tunnel. "PRC did not seem to understand the seriousness of the gas issue," he said.

Law changes in the 1990s were attacked for weakening mine monitoring. In 1992, the Coal Mining Act was repealed and the Health and Safety in Employment Act was introduced, giving employers responsibility to ensure workplaces were safe.

The Health and Safety in Employment (Mining – Underground) Regulations introduced seven years later ditched the mines inspectorate group and shifted mines inspection to the Department of Labour.

It led to mines inspectors visiting underground mines three-monthly, a "dramatic difference" compared with weekly inspections under the previous mines inspectorate, lawyer for Pike River victims' families, Nicholas Davidson, told the hearing.

In 1998 there were seven specialist coalmine inspectors but that dropped to two in 2011, and one of those positions is vacant after the second inspector resigned two weeks before the inquiry began.

Former chief inspector of coal mines Robin Hughes said the November 19 explosion had its origins in repealing the Coal Mining Act. Hughes, who had more than 40 years' experience in coalmining, said Labour Department mines inspectors were paid much less, which decreased staff quality and knowledge.

Bell agreed, telling the inquiry that ditching the mines inspectorate "was a recipe for disaster". "I believe miners need and have always needed another pair of eyes looking over them and looking out for them," he said.

The department's workplace health and safety policy manager, James Murphy, confirmed mining had the highest number of workplace accidents of all industries in 2005. "Obviously, what we do know is that when things go wrong in mining, they're often catastrophic," he said.

Whittall said outside court after the hearing's final day that New Zealand's deregulated mining situation was in stark contrast to Australia's tightly regulated mining industry.

Dr Jane Newman, a geologist with more than 30 years' experience in studying the Pike River coal seam, called the company's approach to the mine's geology "inadequate" and its geological database "sketchy".

At the inquiry, she hypothesised the coal seam might have been split in two by a sandstone rock layer.

Methane gas trapped in the unknown coal seam above or below where the miners worked could have been released in an outburst, or it could have caused roof instability, she said.

"I'm not saying that this is necessarily what happened at Pike River, this is just an example of potentially what can happen." She was concerned enough about the mine's safety to warn her husband not to enter the mine when he visited it three or four months before the explosions.

Solid Energy chief executive Dr Don Elder also told the hearing the company had poor knowledge of the geology and had faced pressures from production delays and financial woes.

The state-owned enterprise had sold Pike River's stockpiled coal for it after the explosions, but found its quality was lower than that of premium hard coking coal that the company had claimed it was, he said.

Stacey Shortall, counsel for Pike River directors, officers and management, accused Elder of using his testimony to talk down the mine's value so it would be cheaper for Solid Energy to buy.

Elder strongly denied the allegation. "That's not why I'm here," Elder bristled. "Twenty-nine people are dead. That's 29 very good reasons to present my evidence and to assist the commission to find the right answer."

At the hearing's end, many agreed the commissioners had allowed more to come out than expected. "I think we are going to get to the truth, no two ways about that," said Bernie Monk, spokesman for the Pike River families, whose son, Michael, was one of the 29 dead.

The inquiry's next phase, to run for three weeks, will start on September 5 and would look into the search and rescue operation.

Phase three would cover what happened at Pike River on November 19. Phase four would compare New Zealand's mining practices with selected overseas countries and the impact environmental issues have on mining.

Pike River inquiry critical to Coast's future

The future of West Coast mining depends on the outcome of the Royal Commission into the Pike River mine disaster, the Grey District Mayor says.

The Royal Commission of Inquiry will investigate what caused the explosions at the mine as well as the search and rescue operation carried out in the wake of the explosion. Mayor Tony Kokshoorn is confident the inquiry will get to the bottom of what happened.

"And this is why the government has put a Royal Commission of Inquiry in place and that is there so they can leave no stone unturned and come up with answers," he said. "At the end of the day at stake are future miners' lives down those mines."

Mr Kokshoorn says numerous lawyers have been working on the case. "I think they will get to the bottom of this and they have to get to the bottom of this, we've got thousands of miners in the future working down those pits."

Mr Kokshoorn has no doubt coal will come out of the Pike River mine in the future.

Pike River mine illegal by Australian standards

Prime Minister John Key said the one-entry Pike River mine would have been illegal by Australian standards, and he expects changes will need to be made to New Zealand's mining practices.

In an interview with The Australian newspaper, Mr Key said changes would be made to mining safety laws after 29 men were killed at the West Coast coal mine last year.

Although Mr Key told the newspaper he was not in a position to "give a full response" on mining safety until after the inquiry, he said "we do have to ask the question" about safety standards. "We have taken an interim review of our mines to check for safety but long term, there'll need to be other changes, I suspect," he said.

When questioned, Mr Key told news media he was not saying New Zealand's mining standards were lower than those across the Tasman. "I'm saying they are different from Australia, the way the mine was consented in New Zealand is likely to be legal, but that's a matter for the Royal Commission of Inquiry to look at, it's not for me to pre-judge what they might find," he said. "From a construction perspective, that mine would not be consented in Australia and was consented in New Zealand. From a safety standard perspective that's a matter for the Royal Commission to tell us whether they think there are proposed changes or whether there is a necessary need for changes in safety standards in New Zealand."

Mr Key previously said he had he had no reason to doubt New Zealand's standards. "I have no reason to believe that New Zealand's safety standards are any less than Australia's, and in fact our safety record for the most part has been very good," he told news media in the days following the disaster.

The Labour Party said Mr Key had done a "total about-face" on the issue. West Coast-based Labour MP Damien O'Connor said it was difficult to understand why Mr Key had made the comments to an Australian newspaper, but had not told the families of the Pike River victims.

"If John Key is confident enough to make such an announcement, despite previously stated our safety standards were the same as Australia's, then he should do something about the current situation in New Zealand where no underground mining regulations exist."

Leader Phil Goff also spoke out against the comments. "He said it was dangerous to make comments about safety ahead of the Royal Commission, that was just a month ago," he said. "This is a total change in direction. If

he's got information then surely he should give that information to those most immediately involved first and then act of it."

The Engineering, Manufacturing and Printing Union (EPMU), which represents miners, also called for action. "Now we know that the government has identified problems with safety standards, we can act now to fix them," EPMU national secretary Andrew Little said. "We don't need to wait for the Royal Commission's decision. And we can spare the families further pain and suffering."

Mr Little said there was plenty of international evidence and expertise available to start making changes to mine safety regulations now.

An audit by two Australian mining experts, issued last month, found two New Zealand mines were not fully compliant with health and safety regulations, but found no evidence of imminent danger at any of the four mines investigated.

Pike survivor quits NZ for Aussie mine

In his last experience working in an underground coal mine in New Zealand, Daniel Rockhouse lost a brother, a bunch of good mates and colleagues – and almost his own life.

But the Pike River mine survivor is now mining in Australia – something he says he felt compelled to do. "I had to go back underground for myself. Just to prove to myself that I could still do it," Mr Rockhouse said. "It's conquering the demons ... facing your fears. And I like doing it. I like going underground, as strange as that may sound. Before the blast, I enjoyed the job. Whether I continue being a miner forever – that's another question."

Mr Rockhouse, 25, was one of two workers who escaped the Pike River mine after a fierce explosion tore through it on November 19. The blast knocked him off his feet and unconscious, but he was then able to help injured colleague Russell Smith out to safety. But 29 of his colleagues, including his brother Ben, 21, did not make it out.

Mr Rockhouse says he thought someone would be waiting when he and Russell Smith emerged from the portal. A camera at the entrance to the mine has recorded the moment when the two survivors tasted fresh air and freedom. "There was no one there," Rockhouse told TV ONE's Sunday programme . "I assume the reason for that is because they have been told to not be anywhere near the mine until someone needed help."

The same camera that recorded the first devastating blast at the mine, shows Rockhouse and Smith emerging from the depths with their arms around each other.

After a long layoff, and some counselling, Mr Rockhouse is now in Queensland at the North Goonyella coal mine, near Mackay where he has been working underground since June 2011.

"I was pretty nervous when I first went down. I thought I would freak out a little bit. But it was quite normal. It was just like any other day. There are times when I do get a bit of a fright, I guess you would call it. When smoke comes up off machines and things like that. When certain smells come past me ... it makes me think."

Mr Rockhouse is working on an underground loader, as he was on the day of the Pike River blast. "Sometimes it's hard ... I think about my brother a lot when I'm down there. The mine I'm at, the conditions are quite similar. "I'll never forget my mates [at Pike River]. I talk about them all the time. I find that if I talk about them, and I talk about my brother, it helps."

He works with a couple of contractors who used to work at Pike River – including one who greeted him when he got out of the mine after the November explosion. He finds having them around helps.

Shifting to Australia meant a fresh start. His wife, Sarah, and the four children they share – including a 4-month-old – are to join him by Christmas "when I have a bit of money behind me".

"New Zealand will always be my home and I'll probably end up back there one day. But just coming over here does give you a bit of a break because it's so much bigger ... and even though I'm in a mining-orientated town, they don't really know who I am. I can just kind of keep a low profile."

"It's never going to be fully over until we get [Ben] back. A lot of families have done memorials for their loved ones, but we have chosen not to. We have chosen to wait."

His father, Neville Rockhouse, said he was proud of his son for going back to doing what he loved. Having worked at the Pike River mine himself, Neville Rockhouse said he would be prepared to return to the industry as well.

He did not fear for his son, because he still believed the risks in mining could be managed.

Solid Energy interested in Pike River coal resource

Solid Energy has confirmed its interest in the Pike River coalfield and says that it is almost certainly the only company with the credibility – knowledge, experience and track record – to mine the resource safely and economically.

However Solid Energy is warning that this will be one of the most challenging coal resources in the world to develop and that there are a number of current issues that have to be resolved. Further substantial exploration and other work are needed to confirm a credible mine plan. The company also says that the existing mine assets may not form a significant part of any future mining operation, leaving only the coal permit and access agreements as the primary assets of value.

Solid Energy Chief Executive Officer, Dr Don Elder, says that as the receiver prepares to sell the assets and recover

value for the creditors, the company is taking the unusual step of laying out its views and concerns about the future of the resource because it believes there is only one more opportunity to develop this coal resource.

"Obviously as a potential purchaser of some of Pike River assets, we have a vested interest, but after what everyone has been through it is time for reality. We know everyone on the West Coast and in New Zealand would be concerned if the assets were acquired with great aspirations, but with a lack of the knowledge, understanding and experience to deliver in these conditions.

"Mining the Pike River resource in a way that is safe, economically viable and meets and respects the wishes of the community and the families of those who died has many challenges. Solid Energy is committed to meeting all those should we find ourselves responsible for this resource and we expect anyone else to be held to the same expectations." Dr Elder says.

"As a non-negotiable part of that, the wishes of the families have to be a priority in considering all options including potential recovery, if feasible, of the 29 miners' bodies. The same applies to the unsecured creditors on the West Coast; any solution to invest in and work the mine needs to address that issue as a top priority," Dr Elder says. "We're very concerned that this resource has been the subject of unrealistic expectations for too long. Continuing this will lead to more disappointment, and another set of mining and financial issues further down the track.

"New Zealand is one of the most geologically, geographically and environmentally challenging environments in the world. The West Coast of New Zealand is the most difficult coal mining environment in New Zealand, by far. We've spent the last 110 years learning that, often the hard way. Our current operating mines at Spring Creek just down the road, and Stockton to the north, have 60 years' experience in this geological environment, yet we're still being hit with surprises and learning hard lessons every day. But Spring Creek mine is still open after 10 years and producing half a million tonnes of coal a year which is testament to what we have learned.

"Pike River was projected to quickly exceed one million tonnes annual production as an underground mine. Yet Pike has huge geological challenges that are no different to Spring Creek or anywhere else on the Coast. We believe this resource is not characterised, nor is the geology understood, to anywhere near the level required in these conditions, even in the areas already mined. Before we consider a coal resource well enough understood to develop a safe and economic mine, we expect drill holes to be at minimum spacing of 100 metres. Even this doesn't avoid continual surprises with faults and other unexpected geological features, each of which can cost days to weeks of lost production.

"Public information suggests drilling at Pike River is currently less than a tenth of that minimum density, and that is only in the part of the resource that was the initial target. The rest of the resource, although suggested by some to be well upwards of 50 million tonnes is, by international standards, inferred at best. Several years of intensive drilling, resource and geological characterisation, and mine planning are needed before a good conceptual mine model could be developed – and that assumes the best mine concept is also compatible with all the geographic and environmental constraints that will have to be addressed. We'd be extremely concerned if anyone planned to start mining again in that environment without first doing all this work.

"Parts of the Pike River resource could be opencast mined. However, even if allowed, this would be among the most difficult and challenging opencast operations anywhere in the world considering the resource, access, infrastructure and the absolute requirement above all to do it safely. The area best suited for opencast mining is likely to be the area of the coal resource about which least is known and which presents most risks – geologically, geographically and environmentally. Parts of the resource might be mined underground but we have major reservations about suggestions that the existing underground mine operations could simply continue with some changes.

"There are many very good underground mine operators around the world, including some with experience in exceptionally difficult conditions. But this is not a relatively straightforward small operation that can move to production fairly quickly. Neither would it be acceptable for the West Coast, or New Zealand, for someone to come in and strip out the quickest easiest coal (if there is any) – by either opencast or underground mining. If the value in this total coal resource is ever to be realised, it will only be through a very carefully planned and developed long-term integration of underground and opencast mining. Anything other than this will risk sterilising a significant part of this valuable coal resource."

Calls to tag recovery with sale

Meanwhile, the Government has asked its lawyers to look into making the recovery of bodies from the Pike River mine a condition of its sale.

Prime Minister John Key has said that Crown Law and the Ministry of Economic Development would be giving the Government advice on whether retrieving the bodies of the 29 miners could be put in the mine's sale and purchase agreement.

With a sale pending, families are concerned the new owners could seal off the area where the men are and mine around them. Families' lawyer Nick Davidson QC says he believes the Crown Minerals Act can be amended so recovering the bodies is tagged to the mining licence.

Kokshoorn has been calling on the Government to make recovery of the miners' bodies a condition of a new mining licence. Kokshoorn said the Prime Minister has been a good listener on the issue. He said the mining licence will give a new mine company the ability to extract the $4 billion to $6 billion worth of coal that is in the mine.

Spring Creek Underground Mine

Spring Creek Mining Company is a joint venture between Solid Energy and Cargill. Solid Energy operates the mine on behalf of the joint venture. The mine employs approximately 200 mineworkers, tradespeople and professional specialists and provides regular work for a range of contractors and service providers. Spring Creek's high-energy semi-soft coking coal is supplied to West Coast and upper South Island industrial customers and is exported through Lyttelton Port of Christchurch for use in steelmaking.

Coal extraction at Spring Creek Underground Mine, near Greymouth, resumed after a small fire started on an underground front-end loader being driven out of the mine. The fire was quickly extinguished by the machine operator. Solid Energy's Chief Operating Officer, Barry Bragg, says the workforce was brought out of the mine and as a precaution the mine's other loader machines were stood down and inspected. The Mines Inspector was notified.

Mr Bragg says the mine's emergency procedures worked well and Solid Energy is confident the mine is operating safely. Coal production at Spring Creek has been minimal since early November last year, when the mine's monitoring systems identified signs of spontaneous combustion in two areas. At the time, the workforce was evacuated for a short period. Although development work (the process of preparing areas of coal for mining) resumed, coal extraction was put on hold while these incidents were fully investigated.

The first explosion at Pike River Mine took place later that month. While the Pike River response involved a number of Solid Energy personnel and equipment from Spring Creek, it was the spontaneous combustion incidents within Spring Creek which led to the decision by the mine's management to undertake a full safety review to further improve safety within the operation.

Barry Bragg says, "The decision to undertake this comprehensive safety review was Solid Energy's alone. The review has been thorough and wide-ranging. The Spring Creek team identified a number of improvements – for instance, automating checks which had been done manually – which were reviewed and supported by independent experts and which have now been fully implemented.

"As a result, full-scale mine development at Spring Creek restarted in late February and the return to full coal extraction is set to resume tomorrow. Spring Creek's workforce of 200 has been fully employed throughout this time – the mine was never closed.

"Our aim with the review, the resulting improvements and staff training has been to further improve the safety of this operation," Mr Bragg says. "The standard we are aiming for is world's best practice."

Solid Energy has kept its Spring Creek workforce informed throughout and remains confident that its operations are being carried out in a safe manner. The Department of Labour's draft findings following its recent inspection of the mine did not identify any safety issues.

Randalls mine life extended

Gold miner Integra Mining has increased the ore reserve as its Randalls gold project, in Western Australia, by 94%, or 230 000 oz.. The miner says that the updated ore reserve was based only on the four openpit resources, with the potential underground production not included in the current ore reserve. If only the openpit ore reserves were processed, without the introduction of the high-grade underground production, the Randalls mine life would be extended to six years, at an upgraded processing rate of around one-million tons a year.

Integra said in a statement that the ore reserve upgrade and the meaningful extension of the mine life was consistent with the company's long-stated strategy of establishing a robust operation based on an initial modest, yet highly profitable ore reserve, and then progressively adding to the ore reserve using cash flow from operations.

"This ore reserve upgrade provides a very solid foundation for further growth and continues Integra's track record of delivering on its promises," said MD Chris Cairns. "While the highly profitable six-year mine life on openpit ore reserve alone is very robust, the real value driver will be the outcome of trial underground mining at the high-grade Cock-eyed Bob gold deposit, later this year."

Cairns said that if successful, this would catalyse the progressive development of the high-grade Cock-eyed Bob, Santa and Maxwells gold deposits as underground operations capable of materially increasing annual gold production from the Randalls gold project, and extending the mine life to ten years.

The trial underground mining at Cock-eyed Bob is planned to start in the December quarter, and if commercially successful, would lead to the underground development of the Santa gold deposit.

Upon the completion of openpit mining operations at the Maxwells gold deposit, underground development would start from the base of the openpit.

Australian review of NZ mines released

An Australian-led review of New Zealand mines has found health and safety issues but no evidence of imminent danger in the country's underground coal sites.

The NZ government ordered the review in the wake of the country's Pike River mine disaster last November, which killed 29 men, including two Australians, two Britons and one South African.

Queenslanders Willie Joynson, 49, and Josh Ufer, 25, were among those killed in the series of methane explosions in the underground coalmine, near Greymouth on the west coast of the South Island. The bodies of all men remain in the mine.

The audit by two Australian mining experts checked three mines near the Pike River site and a fourth in the North Island and found "no evidence of imminent danger" at any of the sites. However two of the smaller South Island mines did not meet health and safety standards.

Report co-author Brett Garland, chief executive at mining company Caledon Resources in Queensland, said the mines were in "generally good state"."We found great openness from the management and the employees of the mines which is a very good sign," Mr Garland said today. By giving us honest answers we saw the practices were in pretty good shape inside New Zealand mines."

He did, however, recommend better self-audit checking processes of systems "to make sure people are doing what they say they are doing".

NZ Minister of Labour Kate Wilkinson said the department had already begun working with mines to implement recommendations. She said the audit will be forwarded to the Pike River Royal Commission, which will begin dissecting NZ's mining regulations, practices and geography at hearings in July.

The disaster has raised significant concerns about mining safety standards across the Tasman. At the commission's preliminary hearing in April, a lawyer for the country's mining union, Nigel Hampton QC, said regulations lag two decades behind Australia's and require dramatic improvements. He recommended NZ draw on Australia's "substantial" mine safety knowledge to prevent a repeat of the killer blasts.

While Mr Garland played down the audit's findings, the mining union head Andrew Little said basic flaws in safety systems were a "huge concern". "Overall, what these reports really highlight is the complete and utter failure of our mines inspectorate system," he said. "There is no systematic checking, supervision and oversight of our underground mining in New Zealand. If we're serious about lifting the quality of health and safety in mines then that has got to change."

Mine rescue teams battle it out in Bendigo

Mine rescuers descended on Bendigo on 13th August for the 19th annual Victorian Underground Mine Rescue Competition.

Competitors from Western Australia, Tasmania, New South Wales and Victoria battled it out against a local team from the Fosterville Gold Mine.

The skills, teamwork and endurance of the mine rescue teams and emergency response were tested in a range of emergency situations at three locations – UME Australia in Marong Road, Northgate Minerals at Fosterville and the CFA training ground at Huntly.

The six teams competed in eight different exercises including theory, Spence Herd Challenge, first aid, rope rescue, team skills, breathing apparatus practical, firefighting and search and rescue.

The winners of the competition were announced late last night at a presentation dinner at the Foundry Hotel.

Competition manager Dick Livingstone said the competition provided mine workers with a way to improve their skills.

"Every mine needs to have a good emergency response," he said. "You hope you will never have an accident but you need to be well prepared, and you don't get a lot of practice so this is a good way to get their skills up and build good camaraderie."

Mr Livingstone said the state-wide competition had been held in Bendigo for all except two of the past 19 years.

He said Bendigo was an ideal location because of its historical link to mining, central location and range of good facilities.

Kalgoorlie North Project

Excelsior Gold commenced drilling at its Kalgoorlie North Project in mid-July aiming to expand current resources in the Zoroastrian area, and enable preliminary underground mine studies to start.

The reverse circulation and diamond drilling program will test for extensions of the high-grade resource beneath the southern end of the Zoroastrian Pit where an Inferred Resource of 18,500 ounces (ozs) of gold was established in April.

The company believes that the Excelsior/Zoroastrian area in Western Australia has potential to host very substantial gold resources amenable to exploitation by underground and open pit mining methods.

The area is located midway between the plus million ounce deposits at Paddington, 17 kilometres to the south, and Aphrodite Gold's Aphrodite project, 17 kilometres to the north.

Importantly, the project is located near Kalgoorlie, with regional infrastructure and supporting exploration and mining services.

Since acquiring Kalgoorlie North in August 2009, Excelsior Gold has added 300,000ozs to the project resources through assessment of historic drilling data and targeted drilling campaigns which have successfully grown the resource at an average of 20ozs per drill metre and at a cost of less than $10/resource ounce.

A previous lack of drilling to the south, west and at depth, has limited the extent of the current resource to only four lode positions over a strike length of 160 metres, and a vertical depth of 45 metres below the pit floor, which is 60 metres deep.

The company said the new drilling will target seven interpreted lode positions over 350 metres of strike and 150 metres vertical extent below and to the south of the Zoroastrian open pit.

Drilling is also designed to following up on previous significant intercepts including 4 metres at 11.3 grams per tonne (g/t) gold, 1 metre at 89.5g/t gold., and 11 metres at 13.6 g/t gold.

In addition, Excelsior is planning to drill the northern end of the Zoroastrian Pit to examine the spectacular gold intersections in historic drill holes of 9.8m at 1746g/t gold and 6 metres at 289g/t gold.

The company is also awaiting Department of Mines and Petroleum's approval to commence a reverse circulation and diamond drilling drill program at the Excelsior deposit, 300 metres to the east of Zoroastrian, to extend the current resource beneath and along strike from the existing open pit.

The Indicated and Inferred Resources at Excelsior total 251,000ozs (not including past production of 97,000ozs) down to an approximate vertical depth of 220 metres.

The deep drilling is designed to test 200m down plunge/dip of the current resource over 750 metres of strike and has the potential to significantly increase the Resource.

Tremors

Barrick Australia was forced to temporarily close two of its Kalgoorlie mines in July after they were hit by earth tremors this afternoon.

Geoscience Australia said Kalgoorlie felt a small tremor, registering around 3.3 magnitude on the scale, just after midday on 27th July. The tremor was centred on Barrick's Kanowna Belle underground mine, said a spokesman for Geoscience Australia, and was a natural event. Barrick immediately shut and evacuated its Kanowna Belle mine, along with the nearby Raleigh operation.

Sources say workers have still not returned to operation, and the night shift is unlikely to start work as safety inspections are likely to continue overnight. The tremor was also felt at the Super Pit, operated by Barrick and Newmont Mining. A spokesperson for the operation said the tremor had been felt, but operations had not been affected.

Windows were rattled in Kalgoorlie, and residents have also reported feeling the tremor, but there have been no reports of damage or injury from the small seismic event.

Nicolson Gold Project

Bulletin Resources has intersected further high grade gold, extending mineralisation below a former open pit at its wholly-owned Nicolson's Gold Project in the Kimberley region of Western Australia.

Highlights from drilling at Nicolson's lode extending below the former open pit include 7 metres at 22.8 grams per tonne (g/t) gold, including 4 metres at 38.8g/t gold. Bulletin has also revealed the potential discovery of a high grade hanging wall lode north of the open pit that includes 3 metres at 11.7g/t gold. Assays from the current drilling north of the open pit will provide further information on the lightly drilled hanging wall lode.

Marty Phillips, managing director, said "with drilling now underway at Nicolson's South, we are confident of defining further high grade lodes and expanding Bulletin's resource base beyond the current estimate."

Bulletin has appointed Mick Fitzgerald to executive director of operations and will be responsible for management of the project. Phillips said, "Mick's experience, especially in narrow vein underground mining, will greatly assist us in developing an appropriate mining strategy to progress the Nicolson's Project towards production."

Mine Ventilation Australia

Laws requiring ventilation officers in mines only affect Queensland's coal, NSW's coal and hard rock and all WA's mines. Nationwide ventilation standards, which are expected to bring increased efficiency for inter-state miners and incorporate the best laws from around the country into a single document, will have to wait. Harmonisation has been stymied by a political impasse between the Federal and NSW governments.

Dr Brake is an underground mining ventilation consultant and educator with over 30 years' industry experience. He founded Mine Ventilation Australia and has long argued for changes in the approach to mine ventilation. In a 2004 technical paper Dr Brake outlined the impacts of changes in the mining industry to the ventilation profession.

General trends of downsizing, outsourcing technical skills away from mine sites and the removal of legislated requirements for formal ticketing of ventilation staff are particular areas of concern, according to Dr Brake.

Previously, state laws required all mines to have an on-site ventilation officer certified by a government inspectorate. Dr Brake argued that removal of this requirement in many jurisdictions has left a vacuum of ventilation expertise. Officers, therefore, may not have formal training and are stretched across additional roles, he explained.

Dr Brake wrote that there is a wide variation of technical competency in ventilation across Australia. This is compounded by the fact that "many mines assume that the ventilation knowledge that a young engineer obtains as a university undergraduate is sufficient for him to take on the role of a competent ventilation officer. This is rarely the case; in effect, the engineer is left to sink or swim."

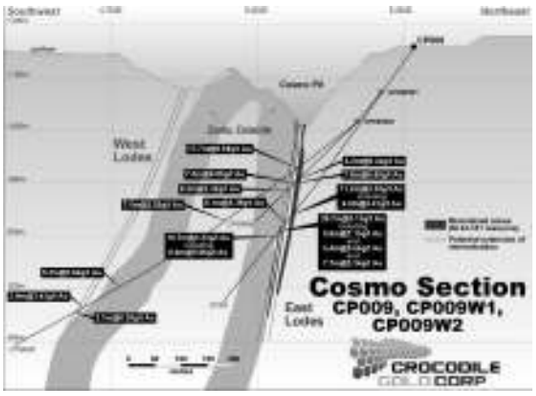
Making matters worse is the increasing use of mining contractors. Two year rotations of technical staff can mean that the focus of a mine can "become very short term, especially in areas such as ventilation," Dr Brake wrote.

In a recent interview with the AJM, Dr Brake said "I think there is a long way to go to get the ventilation in our mines to what I think is an acceptable standard. There has got to be a push towards ventilation officers in mines. Even if it is not a statutory requirement, they need to have a recognised qualification – somebody has to take responsibility for the ventilation in a mine."

Ventilation is often an entry level job for engineering graduates and their experience in the role is rarely positive, Dr Brake said. "We put our least experienced people into those jobs. We usually give them other jobs to do as well, which to them are probably more interesting and get more attention. Then we leave them to learn by making mistakes, which is embarrassing for them. So generally speaking, the six months or so that they spend in ventilation is reasonably unpleasant in terms of their getting flak from the workforce and management," he explained.

Dr Brake said "I ran into one student recently who had done a dual degree in mining engineering and mineral economics at one of the biggest mining engineering programs in the country, and he had not done a single course in ventilation. He brought this up with his course advisor, who said it is not really a necessary, core subject.

"There is certainly a shortage of ventilation expertise in Australia. To me, the biggest problem is at a mine level. There is just woeful ignorance."



Cosmo underground mine

Crocodile Gold is continuing to optimize the design for the Cosmo underground mine with its consultants to maximize the early delivery of tonnage and grade to the mill

Following the completion of a highly competitive tender process, Leighton Contractors' Resources Division has been selected for a 3 year contract for the mining and development of the Cosmo underground mine. The terms of the contract are consistent with the average mining costs detailed in the 2007 Cosmo Underground Feasibility study which Crocodile Gold is currently optimizing with its consultants. Leighton Contractors' Resources Division is currently mobilizing to site and expects to begin development shortly.

Crocodile Gold has completed a review of the Cosmo underground design work and with its consultants is currently working through a number of optimizations to maximize overall production and recovery of the ore. With the extra rainfall received and delays in dewatering the Cosmo pit Crocodile Gold expects development ore to be mined later in the second quarter and production ore later in the third quarter of 2011.

Wattle Dam underground gold mine

A new mine plan has extended until the end of 2013, the current estimated mine life for one of Australia's highest grade gold mines - Ramelius' wholly owned and producing Wattle Dam mine near Kambalda in Western Australia's eastern goldfields.

With at least two and a half years estimated remaining production now in hand, Ramelius Resources Limited (ASX:RMS) said the new mine plan, based on development of the Block C and D zones at Wattle Dam – delivered the longest mine life estimate to date for the mine in its open pit and now underground mining history.

"This mine plan is expected to deliver an average of 13,500 tonnes per month over the period to the end of 2013," Ramelius' Managing Director, Mr Ian Gordon, said today.

"Based on diamond drill results, the material in Block D is expected to be similar to that in Block A and B, which has averaged over 20 grams per tonne to the end of March 2011. Block C is likely to be lower grade as there have not been as many visible gold intercepts in this area.

A more precise grade will become clear once development ore from both Block D and C has been milled."

Mr Gordon said he expected a seamless production profile from Wattle Dam as it boasted in excess of 50,000 tonnes of Wattle Dam and other ore currently stockpiled and 30,000 tonnes yet to be mined from Block B.

He said the majority of capital development needed for the expansion was completed and further deep exploration drilling is planned for the June 2011 quarter.

Ramelius' Chairman, Mr Bob Kennedy, said Wattle Dam was continuing to prove up the high grade mineralisation that enabled the initial open pit mining followed by the transition to underground.

"We have some expectation that further exploration below Block D will result in an extension of the mine to even greater depths."

"The nature of the Wattle Dam deposit is such that it defies definition by normal JORC requirements and is only proven by actually mining the ore. To date, the results have been excellent and we expect those results to continue at high grade."

Ramelius last week announced the go-ahead to commence gold mining at its Mt Magnet project, 600 kilometres northeast of Perth – the Company's second gold mine in Western Australia.

Mr Kennedy said the increased cash flow from two gold mines would enable the Ramelius Board to look at advanced exploration projects or corporately for acquisitions that will further add to resources and cash flow.

Leighton snags $317m in goldmine work

The world's largest contract miner Leighton Holdings has won two new goldmining contracts worth $317 million.

Newcrest Mining, Australia's largest goldminer, awarded Leighton a $200 million contract for works at the Telfer mine in Western Australia's Pilbara region.

Canadian company Crocodile Gold has signed up the company for a $117 million contract at the Cosmo Deeps underground gold mine in the Northern Territory.

Leighton Contractors will provide mining equipment, workers and buildings for Newcrest and complete mining services for Crocodile Gold, with provision for a contract extension with the mine life estimated at 10 years.

Challenger Underground Mine

Kingsgate Consolidated on Monday told delegates at the Paydirt South Australian Resources and Energy Investment conference that its Challenger operation could host as much as three-million ounces of gold. This was more than double the historic production and known reserves.

MD Gavin Thomas said that the company was also looking at every way possible to lift annual production from the Challenger underground mine, in South Australia's far west, to 120 000 oz/y from the current 100 000 oz/y.

"In very simple terms, we believe the structures in and around this mine will see Kingsgate exploring and developing here for at least the next two decades," Thomas said. He noted that like any underground mine, Challenger was a challenging and complex underground mine. However, Thomas noted that by June of this year, the mine would have produced some 750 000 oz of gold since its start 2002, and has current gold reserves of over 400 000 oz within a one-million ounce resource. "This is a big underground system and we have made a high commitment to sustained and aggressive exploration drilling programmes and are very comfortable with a forecast that this can be at least three-million ounces as we continue to identify additional lodes."

He added that the endowment at Challenger has significant upside and Kingsgate believed that it could be mining there for well over ten to 15 years. Thomas said Challenger was "only one dot surrounded by many similar anomalies" and only the gold price would impact the amount of gold produced.

The Challenger mine was acquired by Kingsgate Consolidated after the company acquired fellow gold miner Dominion Mining in February 2011.

Ventilation shaft development at Huntly

Solid Energy has awarded a contract to engineering and construction company, McConnell Dowell Constructors (MacDow), for the excavation and construction of a new ventilation shaft to service the northern sector of the Huntly East Underground Mine in the Waikato.

"The ventilation shaft is the single largest capital item in the five year project to develop and extend East Mine we announced in 2009," says Craig Smith, Solid Energy's General Manager of Underground Operations. "The mine extension accesses reserves for on going coal supply to New Zealand Steel, increasing the Huntly East Mine's current life by 15 years and the workforce from today's 160 to around 230 people."

The proposed 270 metre deep shaft is required to ventilate the expanded mine. Currently all surface infrastructure, including ventilation fans, is located on the eastern side of the Waikato River while the mine's workings are progressing northwards on the western side of the river.

Construction of the ventilation shaft is the most significant phase of the development. Subsequent phases include installing two fans and associated foundations, installing pipework and electrical cables the length of the shaft and constructing a landscaped earth bund around the site. An access road to the site was completed as the first stage of the development.

Excavation and construction of the shaft, which includes intersection and connection with Huntly East Mine's underground workings, is expected to take approximately eighteen months. Once completed, the concrete-lined shaft will be 4.3 metres in diameter.

PROMINENT HILL – ANKATA DECLINE

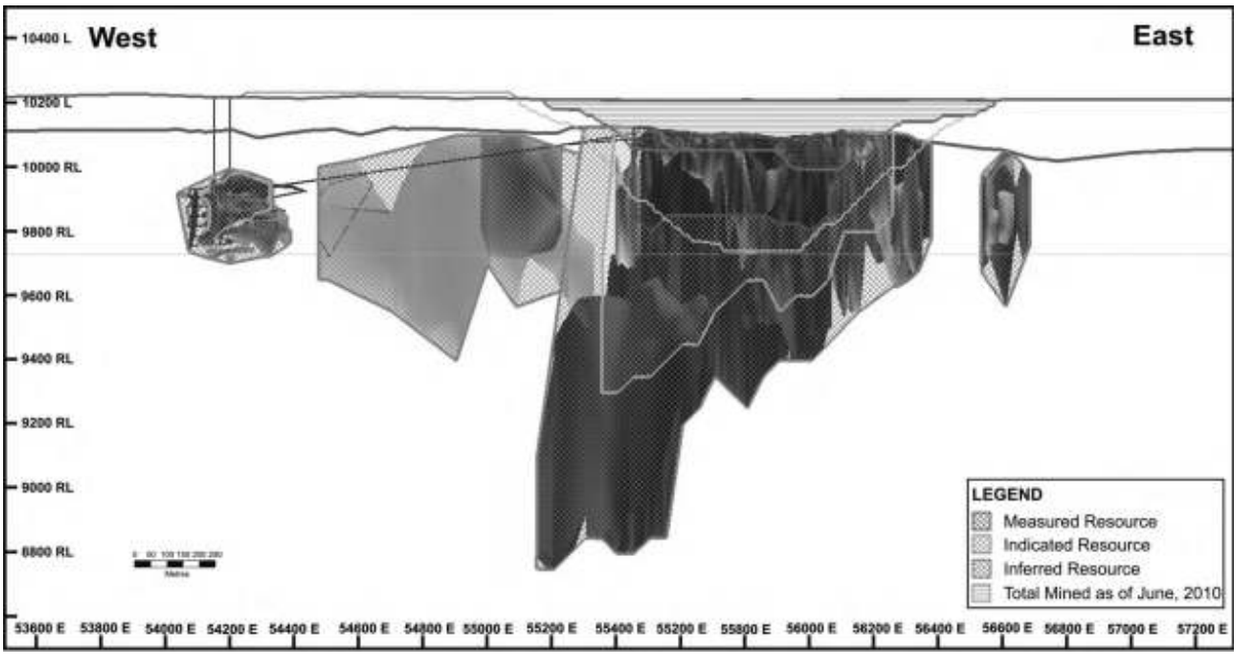
Oz Minerals says that it remains focused on increasing copper production during the remainder of the year, as it moved closer to reaching its target output of between 100 000 t/y and 110 000 t/y of copper.

For the quarter ended June, the miner said that its Prominent Hill operation, in South Australia, increased production to some 28,017 t of copper, from the 25,708 t produced in the previous quarter. Gold production was also higher at 44,219 oz during the three months to June.

"The focus remains on maximising copper production levels as revenue generated from the treatment of copper ore is about four times that generated from the treatment of ore at current commodity prices," said CEO Terry Burgess. He noted that as a result, during the quarter under review, copper ore was treated in preference to gold ore, and, therefore, gold production was below the current guidance level on an annualised basis.

Burgess said that going forward, the percentage of gold ore in the feed to the mill would be varied, depending upon its hardness, in order to optimise copper production through the plant.

Meanwhile, Burgess reported that the development of the Ankata underground decline was on schedule for reaching the orebody during the third quarter this year, and for first production from the first quarter of 2012.



During May, the Oz Minerals board approved the continuation of the underground decline, after the Ankata ore body has been accessed.

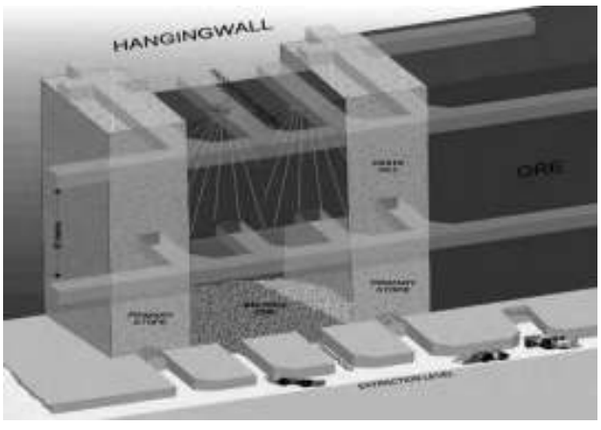
The extended decline would veer back towards the east and would be used to facilitate further exploration drilling and could allow timely access to potential underground mining areas, should studies prove positive.

Ankata Decline commenced in December 2010. An interim portal has now been established and the decline has advanced 730m (now @ 250m/month)

The development was anticipated to cost between A$25-million and A$30-million, and funding for this would be taken from the existing exploration budgets during 2011. Burgess said that the exploration decline was expected to be completed in mid-2012.

Oz Minerals are sinking two ventilation shafts for Ankata Deposit each 286m deep, 5m diameter, The shafts will be equipped with two primary vent fans moving 440 m3/s of air. Both shafts are now 110m deep with 176m to raisebore which started in August 2011.

Underground mining is planned by long hole open stoping method.



Lobby groups slam Arkaroola mining ban

South Australia's Chamber of Minerals and Energy (SACOME) and the Australian Uranium Association (AUA) have voiced their disappointment in the Arkaroola mining ban.

Premier Mike Rann announced a ban of mining operations in 'perpetuity' in the region, initiating a plan to have the region World Heritage listed.

SACOME stated that this "announcement sets a dangerous precedent and ignores future innovation". Jason Kuchel, chief executive of SACOME said "we are deeply disturbed by the precedent of banning mining under the very act that exists to enable mining".

"For a Government that claims to be pro-mining and pro-innovation, this announcement does not even contemplate obvious future advances in technology and processes."

AUA head, Michael Angwin agreed. "The announcement favours one set of users over another in a decision which fails to recognise the continuing exemplary environmental performance of the mining sector," Angwin said.

"This decision has the potential to destroy businesses and it certainly destroys future opportunity."

Kuchel added that "this action does not even allow for underground mining that in future years could be viable by access from outside this area, using techniques that would ensure no surface disturbance whatsoever".

"It also sends the wrong message to national and international investors in this State's mineral resources sector about the adequacy and security of their investment risks – whether exploration, mining or support infrastructure."

Kuchel also said the announcement was a slap in the face to the industry after meetings had already been scheduled with ministers to discuss the issue over the coming weeks.

Both lobby groups urged the Government to reconsider the announcement.

If this proposal is not overturned and dumped in favour of a level playing field that allows the mining industry to contribute to dual mining and environmental protection processes, Kuchel said.

"We call on the Government to urgently consider a policy of 'No net loss of land for exploration and mining' in South Australia to give reassurance to the industry that these highly unusual precedents will not become the thin edge of the wedge, potentially stifling mining before we ever had a boom in this state.

"We share the concerns of the South Australian Chamber of Mines and Energy about the precedent this decision sets and the negative signals it sends to investors," Angwin said.

Centennial opens new Airly Coal

Centennial Coal has officially opened the Airly mine. The 80 million tonne thermal coal mine is located near Capertee village, North West of Lithgow, in New South Wales' Western Coalfields. The underground mine has a projected mine life of 20 years and is expected to produce up to 1.8 million tonnes per annum using continuous miners.

Currently, the Airly coal mine has 61 employees and is recruiting more to bring existing levels to 70. When fully operational the mine will employ 130 people. Initial production commenced in December 2009, with the first shipment of thermal coal transported to Port Kembla in April 2010.

Speaking at the opening, Centennial managing director and CEO Bob Cameron outlined the design and construction of the mine, which demonstrated "a commitment to safety, the environment and

innovation. "The commitment to safety was evidenced by there being no lost time injuries over the 260 000 man-hours of labour used to construct the surface infrastructure," Cameron said. He went on to say that Centennial has "made a significant investment in building this mine and are firmly committed to a long term future in the valley."

Poseidon Nickel to restart Mount Windarra mine

Poseidon Nickel has taken the decision to restart underground mining at its Mount Windarra nickel mine, in Western Australia.

The nickel company has entered into an agreement with GSM Mining to complete the refurbishment of the underground mine down to 550 m below the surface, which is where the previous mining operations came to an end.

The completion of the refurbishment would allow Poseidon to undertake further drilling activity from underground, and to complete preparations for the start of mining operations.

The Windarra nickel project is a historical mine site which, over an 18-year period, mined some eight-million tons of nickel ore grading 1,55%, which, after processing resulted in the shipment of one-million tons of nickel concentrate grading 10%.

Mining operations were ceased in the early 1990s, owing to the low nickel prices.

Poseidon told shareholders that during 2008, GSM successfully refurbished an initial 1 000 m of the decline, under a similar contract, and that it would now complete the remaining 3 500 m.

The refurbishment would include the removal of water from the mine, rock bolting and meshing of the decline, as well as the installation of various infrastructure necessary to start mining operations.

The work would take around ten months to complete, and would cost about A$8-million.

Poseidon noted that the refurbishment of the underground mine, carried out in 2008, demonstrated the viability of the procedure and the cost per metre. The decline was seen to be in good condition with steel support and rock bolts installed when the mine was previously operational, remaining largely in place and competent.

To date, Poseidon has defined 102 528 t of Joint Ore Reserves Committee-compliant nickel sulphide resources at the Windarra nickel project. This comprises of 66 962 t of contained nickel at Mount Windarra adjacent and below the existing underground infrastructure and, in addition, a maiden 25 269 t nickel resource at the newly discovered Cerberus deposit and 10 298 t of contained nickel at South Windarra.

Virtual reality training sends mine rescue workers underground

The latest virtual reality training and rescue simulator designed to reduce accidents and save lives in Australian open cut and underground mines was launched at the end of July 2011 by Minister for Skills, Jobs and Workplace Relations, Senator Chris Evans.

The latest immersive 360° virtual reality simulation technology at the Newcastle Mines Rescue Station in Argenton enables miners to be trained in real life scenarios and test their responses to life-threatening hazards in a safe learning environment.

"This amazing new software demonstrates how technology can be used to train people for the very critical task of mine rescue," Senator Evans said.

"While we would hope workers will never need to have to use these skills, or encounter mine accidents, it is reassuring to know that companies are investing in initiatives for the safety of Australian miners."

Developed by Coal Services, the world-leading software package has been developed over the past 18 months and is the latest stage of a five-year project.

Technical experts from Coal Services provided advice to mine operators in the recent Pike River coal mine explosion and the rescue of 33 miners trapped underground in Chile last year.

While at the mine training site, Senator Evans also presided over the dedication of an historic Poppet Head – the top of the first steel headframe constructed in Australia in 1888 and a significant piece of Australia's mining history. "Today we celebrate both the heritage and the future of Australia's coal mining industry – an industry in which the future is secure," Senator Evans said.

Mandalong South exploration

Wyong Councillors have again rejected Centennial Coal's application for an access agreement to Council owned land at the waste disposal site at Buttonderry.

The miner's submission to the council requested an access agreement to drill exploration boreholes on Council owned land.

The exploration boreholes are part of an exploration drilling program south of Centennial's Mandalong Mine, an established underground coal mine operating in the Mandalong Valley near Morisset.

Wyong Council claims there is a risk to the tip's infrastructure, such as breaking a sediment point, is making it reluctant to give approval.

Centennial Coal's Katie Brassil told Australian Mining that the company has been attempting to negotiate an access agreement since October last year but in this instance the landholder – the council – has not cooperated.

"Our preference is always to negotiate an access agreement but in the event that it is not possible, the Act regulating this process provides a way forward," she said.

"We have an exploration license for the area in which we are conducting this drilling program and have completed the appropriate environmental studies.

"Five of the 53 boreholes in our exploration drilling program are in and around Council's water disposal facility.

"In October last year we made a submission to council with respect to gaining access to their site.

"At a November council meeting, councillors rejected a report which recommended the General Manager be given authority to negotiate and execute an access agreement with Centennial.

"As a result of councillors refusing to negotiate an access agreement we were then required to use the provisions under the Act to progress the issue further.

"In February we advised council we would be progressing the issue using the provisions under the Mining Act.

Local media reported that a council report by seniors said if the results of the exploration drilling program were positive, the primary impact from future underground longwall mining was surface subsidence, but the threat could be removed by relocating the borehole to the north of the sediment pond. Brassil said the councillor who successfully moved that the process be halted until after the state election, Su Wynn, was misinformed.

"This is a huge mine that abutts the former Wallarah 2 proposal and poses a huge environmental risk," the councillor said.

"If the sediment ponds were to be damaged we would have enormous leaching problems and our water supply would suffer.

"Not only that but ratepayers would have to fund the cost of repairs."

Brassil told Australian Mining she believes there seems to be a misunderstanding of the difference between an exploration drilling program and a mining proposal.

"The objectives of an exploration drilling program is to locate the coal seam, ascertain the quantity and quality of the resource and to determine if there is an economically viable and recoverable resources.

"The issue is being raised by council would be addressed at the time a mine was proposed and would be addressed within the rigours of the environmental assessment process.

"We will continue to communicate openly with council as we meticulously move through the process provided to us under the Act to ensure we conclude our drilling on schedule.

"Council's decision will not impact our progress."

Earlier this month, the Department of Planning rejected a coal mine proposal north of Wyong, due to ecological and heritage impacts.

King of the Hills underground gold mine

Gold miner St Barbara has started production at the King of the Hills underground gold mine, in Western Australia, ahead of schedule.

The ore from the project would be processed at the Gwalia mill, where previously processed stockpiled development ore has confirmed the metallurgical characteristics of the ore body.

St Barbara said in a statement on Wednesday that the new mine would complement its existing operations at Leonora, and would provide additional ore to fully use the available milling capacity at the Gwalia treatment plant.

The King of the Hills mine is expected to produce between 55 000 oz/y and 60 000 oz/y of gold, for the next five to six years, with the potential for a mine-life extension.

"The start of gold production from King of the Hills is an important demonstration of St Barbara's organic growth potential," said MD and CEO Tim Lehany.

"It is also pleasing that the project has achieved, or bettered, each of the key project milestones since being approved just over 12 months ago."

Bandanna's feasible longwall ambitions

Feasibility studies have been completed for three of Bandanna Energy's Bowen Basin thermal coal projects, with the Springsure Creek project targeting two longwall operations for 11 million tonnes per annum run-of-mine.

The initial production from one longwall operation is aiming for 5.5Mtpa ROM, with first development coal expected as early as 2014 and first longwall coal due a year later. Bandanna did not reveal any dates for starting a second longwall to double production.

Larpro Projects, which also completed the feasibility studies for Bandanna's Arcturus and Dingo West projects, based the Springsure Creek feasibility study on at least a 23-year mine life for production of 195.8Mt of product coal. As the coal is expected to have less than 10% ash on an air-dried basis, the proposed development does not include building a coal handling and processing plant. Coal will be hauled through the Baunhnia line connecting the Blackwater rail system for export through the proposed Wiggins Island Coal Export Terminal near Gladstone. The operational workforce is forecast to reach 332 for two longwall operations, while the peak construction workforce is tipped to number 300.

Springsure Creek is part of Bandanna's wholly owned "golden triangle" of projects, including the Arcturus and Arcadia projects, with all the tenements within 50 kilometres of each other in thermal coal turf in the southern Bowen Basin. With the feasibility study completed, the Arcturus project is targeting 5Mtpa of product coal through open cut mining, and underground mining in the later years. First coal could be in 2014, subject to government approvals, while the final open cut strip will open up access for highwall mining and the establishment of a punch longwall operation. No coal preparation plant was included as part of the mine's designs as the raw coal has an expected ash content of 13%. The mine will use the same port and rail arrangements as Springsure Creek.

Larpro assessed that the first 17 years of mining would produce 70.1Mt of coal. Construction is expected to employ up to 240 construction workers, while mining will need a 200-strong operational workforce. The Dingo West open cut project will be the first cab off the rank for the company with coal production tipped for late 2012, pending government approvals. Located next to the Blackwater rail corridor and 250km from Gladstone, the southern area of the permit hosts several suitable open pit locations for a truck and shovel operation.

The small open cut project is targeting 1Mtpa of product coal, including pulverised coal injection coal, with a mine life of at least 18 years. Construction is expected to require up to 220 workers while mining will employ 110.

Larpro found that all these projects have a "material positive" net present value in its economic assessments. "The receipt of the feasibility studies is a significant milestone in moving the projects toward production," Bandanna managing director Dr Ray Shaw said. "Based on the positive outcomes of these studies, Bandanna will undertake definitive feasibility studies on each of these projects to better define in detail the projects and related costs."

The Arcadia project near Xstrata's Rolleston mine holds potential for two longwall operations, but the feasibility study results are not in yet for this golden triangle project.

The prospect of fully integrating the golden triangle projects has Bandanna contemplating more than 20Mtpa of coal production from open cut and underground operations. Bandanna plans to bring in joint venture partners to acquire project interests and help fund development. The company is also prepared to put up to half of its large stake in the $1.5 billion South Galilee open cut and underground thermal coal project on the table.

Private resources company AMCI is set to earn up to half of this project from Bandanna by funding $25 million of exploration and development.

The small open cut project is targeting 1Mtpa of product coal, including pulverised coal injection coal, with a mine life of at least 18 years.

Central Murchison Gold Project

Aragon Resources is focused on discovery and development of the Central Murchison Gold Project located between the towns of Mt Magnet and Cue approximately 600km north-east of Perth, Western Australia. This core asset is the focus of exploration activities and provides Aragon with an excellent opportunity to potentially develop profitable mining operations.

Aragon's strategy is to recommence gold operations across the CMGP by sourcing gold production from multiple underground and open pit sources. Since acquiring the Project in January 2010 Aragon has increased the resource based from 1.5 million ounces to 2.0 million ounces and has established an initial Mining Reserve Estimate of 614,000 ounces for the first phase of its planned underground mining developments at Big Bell and Day Dawn. As part of the development strategy Aragon maintains a focus on exploring for new open pittable gold discoveries across each of the three parallel historic goldfields that make up the CMGP.

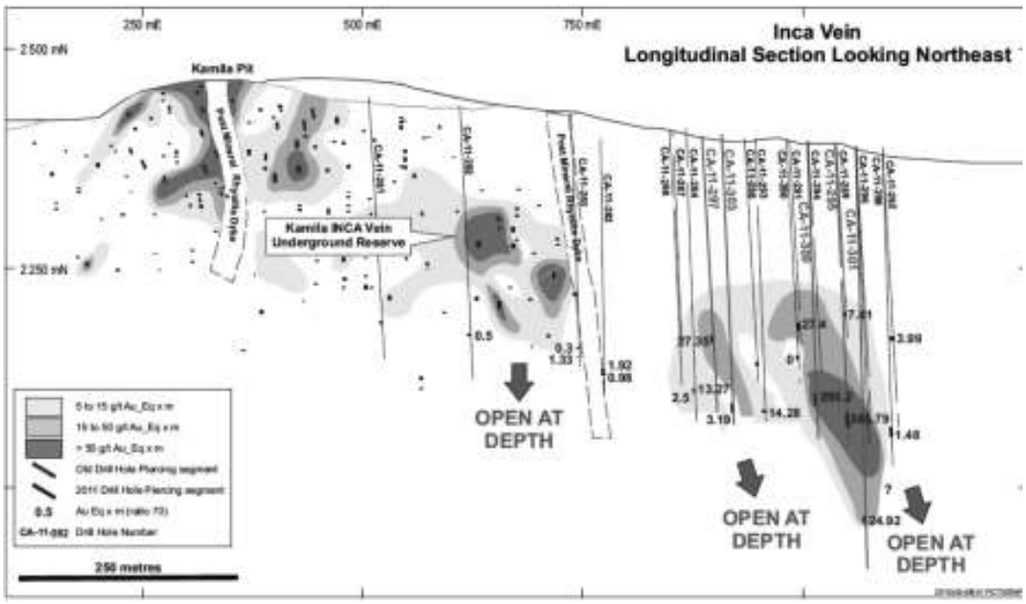
Ensham mine output to rise

Idemitsu Kosan Co says it plans to raise coal output at Australia's Ensham mine by 25 percent in the summer from current levels, to full production of 500,000 tonnes per month.

The company plans to begin underground mining at Ensham after its output from open-pit mining recovers to full capacity, a company official told Reuters, delayed from an original plan for the middle of 2011.

Production at the Ensham mine is expected to fall to 4.35 million tonnes in the year starting in April, down 13.3 percent from a year-earlier due to severe floods in the Emerald area.

The company last year announced it would invest A$140 million ($154 million) to begin underground mining – a process that will allow Idemitsu to continue securing coal efficiently.



Kamila SE Extension Zone

Troy Resources announced assay results for follow-up drilling completed at the Kamila SE Target outside the existing NI43-101 Mineral Resource and Mining Reserve on the southeast of the second post mineral dyke.

These are very significant and exciting results for Troy as these intercepts support the CA-11-295 high grade intercept outside of the current Reserves and Resources in theKamila South East Extension. Being less than 500m laterally from the existing Kamila underground Reserves, the areas could be easily accessed by underground development. The focus of future drilling will be to define the high grade vein zones along strike and at depth. This high grade zone in addition to extending the mine life, would potentially enable the mine to reschedule underground mining

Troy commenced drilling on the extensions of the main veins that comprise the Kamila Deposit. The purpose of the current program is to test the known veins (Inca Vein, B Vein Aztec Vein and SE Extension Vein) at depth and along strike through a series of infill and step-out extensional drill holes within the structurally complex northwest southeast corridor that hosts the Kamila and Mercado Deposits.

Troy announced that final assays have confirmed the interval as14.70m at 7.79g/t gold and 1,292g/t silver or 26.24g/t Au_eq from 342.50m. An additional 8 holes have been drilled and all holes have intersected the Inca Vein with significant new assay.

These intercepts are all located southeast of the second rhyolite dyke and outside the current Mining Reserve. The current drilling has confirmed that both Inca Vein and the Southeast Extension Vein are mineralised and continue to the southeast which represents potential extensions to the underground Resource but additional drilling is required and planned.

Results to date have been very encouraging with a potential new zone of mineralisation suggested from the drilling completed to date at Kamila SE Extension Target. New high grade mineralisation associated with variable vein widths has been encountered. To date the drilling density is insufficient to clearly define orientation and/or delineate the extent of the zone. Additional drilling is required and is in progress.

Rio Tinto suspends Argyle diamond mine expansion

Rio Tinto has suspended the expansion of its Argyle diamond mine, in Western Australia, as it examines the risk of possible flooding.

Construction of the underground mine at Argyle has been suspended temporarily as risk assessments are undertaken to determine if there is any risk from the build-up of water in the openpit due to the excessive wet season rainfall.

While the risk assessment is under way, diamond production continued as normal.

In September 2010, the diversified miner approved a $803-million investment to ramp-up the underground block cave project at the Argyle diamond mine, turning the project from an openpit, to an underground operation.

The underground operation was expected to be fully operational by 2013, and would extend the project's life until at least 2019.

George Fisher Lead, Zinc and Silver Mine

In 1947, MIM geologists discovered a lead-zinc-silver deposit 20km north of Mount Isa, named Hilton after the then Mount Isa mine manager. In 1981, similar mineralisation was located 2km further north. MIM first decided to develop Hilton in 1969 but market factors delayed start-up of the 1Mt/y mine and concentrator until 1990. George Fisher is now owned and operated by Xstrata plc, following its acquisition of MIM Holdings.

Studies in 1994–95 originated a plan with new and existing mining facilities but with all the ore processing at Mount Isa. The development of this expanded George Fisher mine, named after MIM's chairman in the 1950s and 1960s, was approved in 1998 and production started in mid-2000. By the second-quarter of 2001, George Fisher had become the main ore supplier to the Isa concentrator. Capital expenditures included A$230m on mine development and A$40m on upgrading the No.2 concentrator and lead smelter at Mount Isa.

Despite geotechnical problems encountered at both George Fisher South and George Fisher North in the first quarter of 2007, production steadily increased to reach record production levels in the final quarter with total ore production of 2.8 million tons up by 8% compared to 2006. Following improvements to hoisting capacity made in the second half of 2007, production at George Fisher increased by 17% to 1.46 million tons of ore in the first half.

Geology and reserves

The ore at George Fisher lies in the central part of the Lower Proterozoic Urquhart Shale. However, the mineralised section is only one-third the thickness of the Mount Isa ore zone, extending from 300m to 1,000m depth for 6.5km. It is more folded and more interrupted by faults and dykes. Ore zones are from 3m to 25m thick. 11 orebodies have been assessed, the two to be mined containing 24Mt and providing a ten-year mine life at a production rate of 2.5Mt/y.

As of mid-2005, Xstrata stated the reserves as: George Fisher South – 10Mt grading 7.8% zinc, 5.6% lead and 130g/t silver. George Fisher North – 11.4Mt grading 8.8% zinc, 4.7% lead and 92g/t silver. Resources at the South orebody were 22Mt at 8.9% zinc, 6.5% lead and 150g/t silver, while those at George Fisher North stood at 14Mt at 10% zinc, 5.15% lead and 100g/t silver.

Underground mining

A hoist upgrade deployed in 2006 saw a 17% increase in ore mined in the first half of 2007 to 1.46 million tons. MIM started cut-and-fill mining at Hilton but later switched to bench mining as well as adding sub-level open stoping in three areas and remote control of load-haul-dump machines. The rail haulage was supplied with rolling stock from Mount Isa. The northern ore is accessed by a decline from the base of the Hilton ramp. Below this, a truck haulage runs to the Hilton hoisting shaft. A second ventilation shaft and a fill pass were raise-bored for the new mining area. The high-grade C and D orebodies are open-stoped. The mobile equipment fleet includes drilling, LHD and trucking equipment from competing suppliers. In 2002, the George Fisher mine added a new decline and further changed the mine design during 2004 to improve the mining sequence. A hoist upgrade deployed in 2006 saw a 17% increase in ore mined in the first half of 2007 to 1.46 million tons.

The KG53 decline at George Fisher mine was approved in the last quarter of 2007 and is two-thirds complete. The project is expected to commence production in the final quarter of 2008, producing 500,000 tons per annum and supplementing production at George Fisher North underground mine. A new tailings filter plant and a paste-fill plant are under construction which will allow for increased backfill to match increased ore production. Both facilities are expected to be completed in the fourth quarter of 2008.

Ore processing

The Hilton concentrator was designed to recover three separate products for shipment to Mount Isa as a slurry. It incorporated techniques new to Mount Isa, including SAG milling, tower-mill regrinding and flotation with MIM-designed column cells and Jameson cells. The plant reached rated output shortly after commissioning but switched to treating copper converter slag from Mount Isa in the mid 1990s when the mining rate was cut and ore was trucked to the Mount Isa lead-zinc concentrator.

Long-run processing of 2.5Mt/y ore from George Fisher required modifications and general upgrading at the Mount Isa lead-zinc concentrator and lead smelter. Engineering contractors Bateman Brown & Root carried out this work. In particular, the flotation circuit was reconfigured to incorporate MIM's IsaMill technology for very fine grinding and froth pumping. This yielded a near 10% performance improvement in recoveries to 78.8% Pb and 73.4% Zn, with the zinc recovery rising to 80.7% in FY2002. In the lead plant the sintering machine was rebuilt, the blast furnace crucible replaced and a new control system installed.

Production

Planned full rate George Fisher mine output is 2.5Mt/y yielding 170,000t/y of zinc, 100,000t/y of lead and 5Moz of silver-in-concentrate. Ore production in FY2002 was 0.5Mt (6.2% Pb, 8.3% Zn and 150g/t Ag) at Hilton and 1.4Mt (5.6% Pb, 8.2% Zn and 140g/t Ag) at George Fisher. Xstrata Zinc now consolidates the ore production from its George Fisher and Mount Isa operations (see Mount Isa Lead profile).

Total production at George Fisher for 2007 increased 8% to a record 2.8 Mt. These and other results helped minimise the damage of lost production following the fire in the zinc lead concentrator in September 2007.

The future

Queensland Government approvals have been received for a AUD274 million (USD246 million) expansion of George Fisher Mine to increase the production rate by almost 30% from 2013.

The George Fisher Mine (GFM) expansion follows the approval of the AUD133 million Black Star Deeps open cut development to bring the total value of new mining projects in Mount Isa announced by Xstrata Zinc this year to AUD407 million (USD362 million).

Both projects ensure the full utilisation of the zinc-lead concentrator capacity in Mount Isa which was raised to 8.0 million tonnes per annum in 2009. The GFM expansion will increase the annual production rate from 3.5 million tonnes per annum to 4.5 million tonnes per annum and will create jobs for an additional 250 contractors in construction and 120 employees in its operation.

The project involves the development of a second hoisting shaft and associated infrastructure to service the northern area of the mine using large diameter raise boring technology. It will also include the installation of an underground crushing and ore handling facility and upgrades to power and air ventilation services. An existing shaft servicing the northern end of the mine will be lined and extended by 420 metres to a depth of 1,140 metres.

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Norseman Gold working on improving underground workings

In a third quarter results report, the group said is making progress in improving the underground workings at the Norseman mine in Western Australia.

Norseman Gold PLC has produced 11,781 ounces of gold in the three months to end-March 2011, up from 11,162 in the preceding quarter to end-December.

Norseman previously cut its production forecast for the current financial year to end-June 2011 because the underground workings were making slower progress than forecast.

Norseman had lowered its full-year gold production forecast to between 55,000 and 60,000 ounces from a previously flagged figure of 65,000 ounces. The reduced forecast was reiterated today.

Progress at the North Royal open pit has been satisfactory but the company is currently looking to improve performance.

At the Bullen Decline, drilling was started on a potential block that the company believes can be easily accessed for mechanised mining. Norsamen also successfully trialled the extraction method for the mining of underground remnant pillars. It is anticipated that this method will supplement the production profile at Bullen for the long term.

The Harlequin Decline continued to perform poorly during the quarter, however work has been commenced on a number of initiatives to rectify the production short fall. Infrastructure is being developed to increase the productivity and improve the ventilation, and this work is expected to be completed during the June 2011 quarter.

At the OK Decline capital development continued to open up working areas during the quarter. Stoping continued to ramp up slowly as personnel were recruited and trained to undertake the stoping operations.

The company has conducted a review into its operations, including a detailed examination of mining schedules. A strategy to reduce costs and increase short term production has been implemented.

The first stage of the strategy has been to cut all capital expenditure except where associated with the ongoing development of the North Royal open pit or where short term production increases would result from the expenditure.

The second stage has been to cut all excess manpower and equipment to match the current production output of the underground mines. As a result, the company will reduce its workforce by up to 50 personnel, and reduce the size of the underground fleet by number of items of plant including three diamond drill rigs and a twin boom jumbo.

The intent of these two initial measures is to return each of the underground mines to profitability in as short a time as practicable.

The third and final stage of the plan is to look at the medium to long-term future of each of the underground mines to establish a mine plan that will ensure their profitability out from their current status. This third-stage planning is continuing.

Frog's Leg Mine

In 2010, an extensive 35,000-metre underground resource drilling program using a 40X40-metre drill grid was conducted across the entire 1,200-metre strike length of the deposit.

This exploration program significantly surpassed expectations, outlining a total of 348,000 Measured and Indicated ounces of gold (177,480 ounces attributable to La Mancha),(2) significantly more than the 150,000 ounces (76,500 ounces attributable to La Mancha) originally targeted. The focus in the coming months will be to develop a new reserve and life-of-mine plan to demonstrate the potential to develop the mine down to the level of 600 metres below surface.

The 2011 exploration objective is to test the potential of extension of the resource at depth on a large grid down to 1,000 metres; the neighbouring Kundana and Raleigh underground resources are approaching this depth.

Parkers Hill

Parkers Hill, located immediately east of the mined ore zones at Mineral Hill and within leases, lies 65 kilometres north of Condobolin, in New South Wales. Mining contractor Pybar has provided underground mining services at Parkers Hill for Kimberley. The contractor has been on-site since December last year.

Key works completed to date are:

- Establishment of primary ventilation, power and air services to the underground mine.
- With water levels in the decline now below the access level to the Parkers Hill development, dewatering activities are now focussed to further lower water levels to access deeper areas of the mine for exploration and assessment.
- Jumbo mobilised to site in readiness for mine level development.
- Completion of rehabilitation of the Portal.

The following works remain to be completed prior to initial ore production, which is anticipated at midyear:

- Completion of minor ground support by bolting and meshing in selected areas of the decline drive to 190 level as identified by external geotechnical advice. The first development cut is expected to be achieved in three weeks;
- Completion at the 225 level of a new, 185 metre long, drive (5x5 metres) to connect to the ventilation fan raise to provide fresh airway for the new stopes.
- Development works associated with the first stope to be established between the 180 and 225 metre levels.

The processing plant key refurbishments include renovations of the crusher feed bin, all feed chutes and primary crusher motor, while new conveyor belts and a working platform atop the fine ore bins have been installed. The processing plant at Mineral Hill operated under previous owners from 1989 to 2005.

Kimberley Metals remains on track to meet production of copper concentrates from the Parkers Hill deposit in New South Wales after refurbishing the processing plant at the neighbouring Mineral Hill deposit. The company has been preparing a recommencement of mining operations at Mineral Hill since August 2010, with an expected first production targeted for the middle of this year.

Kimberley's development plan for Mineral Hill contemplates the development of both the Parkers Hill underground copper-lead-zinc mine and the Pearse open-cut gold-silver mine.

Strong demand for mining simulators

Australian supplier of surface and underground mining equipment simulators Immersive Technologies has experienced sales numbers near the record level seen in 2008, before the global financial crisis occurred.

The company believes that, as mining companies recover from the effects of the global financial crisis, their focus has centred on improving operations and that, as the simulators have been proved to substantially improve operator safety and increase mine site profitability, these products have gained popularity.

The company also introduced the new-generation PRO3 simulator, designed for surface mining, at the end of last year and attributes about 25% of sales revenue to the launch of the new product.

Immersive Technologies CEO Peter Salfinger says that the company is pleased to see such strong demand for its products and services. "Feedback from mining companies that have tested the product has been fantastic, with the advance in visual realism and equipment accuracy being noted as important factors in increasing training effectiveness and retention."

He comments that the strong sales figures the company experienced during 2010 continue to demonstrate the growing acceptance of simulator training across the mining industry. He notes that the positive trend also looks set to continue this year.

The PRO3 simulator builds on the strong success of its predecessor, the AES Series 2B, which has become the global industry standard in mining simulator training over the past 11 years, with hundreds of units now located across 29 countries.

Further, the company believes that the PRO3 sets an industry benchmark with its next-generation technology, the result of extensive research and devel- opment, combined with wide-ranging customer and original-equipment manufacturer consultation and feedback.

"The majority of our first PRO3 simulators have been sold to existing long-term customers, who see the new technology as a way of expanding on the positive results they have already experienced to date," Salfinger notes.

The PRO3 motion platform delivers a high level of feedback required to accurately simulate all surface mining equipment operation, which includes rapid jolts, feelings of acceleration or the fine-tuned sensitivity necessary for dozer operation.

The first PRO3 simulator was commissioned in Queensland, Australia, for a significant international mining company, which was followed by PRO3 sales in Canada, Chile, Indonesia, Peru, the US and Zambia.

Immersive Technologies also launched the UG360 simulator, last year, which was specifically designed for training underground equipment operators.

Perilya delays investment on Mount Oxide

Perilya has announced an increase in the mineral resource estimate for the Mount Oxide copper and cobalt mine, Queensland to 224,000 tonnes of contained copper.

The mine was intermittently mined between 1920 and 1971 both by small open pit and underground operation.

Perilya's managing director, Paul Arndt says the resource upgrade continued to strengthen the Mount Oxide Copper Project and demonstrated its potential for additional resource and reserve growth in the future. Arndt says the mine remains an exciting project and one which continues to show significant potential for copper mineralisation with a number of high grade copper zones still open at depth and along strike.

Significant cobalt and silver resources also have the potential to add additional value to the project.

Perilya claims the downturn will not stop the company reviewing options for the development of the project such is its confidence in the prospectivity of the Mount Oxide copper project.

Perilya has now announced that the development study of the Mount Oxide copper project, in Queensland, would be extended after a recent drilling programme confirmed underground mineralisation. The findings have delayed Perilya's plans to make a development decision on the Mount Oxide project by the second quarter of 2011.

In the company's quarterly report, for the three months to March, CEO and MD Paul Arndt said that the findings, along with the recent technical evaluation and stakeholder discussions have identified the potential for an underground mining option, which was initially excluded from the scope of the development study.

"We believe the potential for a favourable impact on project economics justifies further analysis of underground mining as well as combined shallow open pit and underground mine development," said Arndt.

He noted that further drilling would resume in the current quarter to test for higher grade extensions of copper mineralisation, which was still open at depth and along strike.

"Perilya believes that the results of the recent work justifies drilling over the 2011 field season and a study extension to determine the most favourable outcomes for both its shareholders and project stakeholders, and to provide an appropriate level of confidence for an investment decision," Arndt added.

Aswell as the development studies at the Mount Oxide project, Perilya would also would also continue with its exploration drilling programme in the Flinders region of South Australia, and in particular, around the North Moolooloo area.

Perilya, during the quarter, also announced its intentions to start the development of the Potosi & Silver Peak mines in Broken Hill, following the receipt of all necessary development approvals in December last year.

Arndt said that sales during the quarter from the Broken Hill operation were affected by the completion of an extensive upgrade at the storage and ship-loading facilities at the Port Pirie, in South Australia. The upgrade necessitated the closing of the facility from late December through to mid March, which meant that no shipments or sale of Broken Hill products could be made during this period.

Silver Lake Resources

Silver Lake, under Les Davis has continued to "tick all boxes" over the past 2–3 years. The completion of the ventilation shaft within Daisy Milano on time and on budget is an important pre-cursor to Silver Lake increasing production to 200,000 ounces per annum. The remaining requirement of upgrade and debottlenecking Lakewood processing facility is on target.

Silver Lake Resources has successfully completed the 520 metre ventilation shaft at Mount Monger, removing a constraint on its underground operations, moving a step closer towards production target of 200,000 ounces per annum by 2014.

The other requirement for stepping up production to meet this target is the upgrade and debottlenecking of the Lakewood Gold Processing Facility to 1 million tonnes per annum by September 2012 quarter. This project is underway and on target.

The Mount Monger operation contains the Daisy Milano and Daisy East underground mines, along with the Costello open pit, located 50 kilometres from Kalgoorlie in Western Australia.

Production at Mount Monger is currently being sourced from three independent mines: Daisy Milano, Daisy East and initial ore development at Rosemary.

The company's Three Daisy Milano strategy is built around having three independent mines accessed from existing infrastructure and each producing approximately 60,000 ounces per annum by 2014.

BROKEN HILL

Development of the Rasp mine on Central Mining Lease 7 is in one of the most intensely worked areas between the Perilya Limited North and South mining leases and it had a stop start scenario with the big stall being when the zinc price crashed in during the global financial crisis.

The Rasp mine is now owned by CBH Resources as a private company, taken over by Toho Zinc of Japan after a big wrestling match a few years ago with global refiner Nyrstar.

The mine bears the name of Charles Rasp, the boundary rider who in the late 1800s discovered the makings of the Broken Hill ore system that became one of the world's biggest lead, zinc and silver mining centers. Companies that evolved through mine developments at Broken Hill include BHP.

CBH Resources' manager Stephen Dennis told the Resources & Energy Symposium in Broken Hill that the decline mine was now 2.5 kilometres long into areas where early Broken Hill miners were averse to mining zinc lodes and has a further 1 kilometres to go.

The operation, being built for AUD 155 million will be producing for at least 15 years at the rate of about 65,000 tonnes of zinc and 38,000 tonnes of lead. It will also produce about 1 million ounces of silver per annum.

CBH also owns the Endeavour mine near Cobar in NSW which is producing about 720,000 tonnes per annum of ore for 82,000 tonnes of zinc in concentrates for 82,000 tonnes of zinc and 47,000 tonnes of lead in concentrates.

Xstrata expand Ernest Henry

Xstrata Copper has agreed to buy two tenements in the Australian state of Queensland for as part of plans to expand its Ernest Henry operation.

The E1 and Monakoff tenements are located 8 kilometres (5 miles) east and 21 km south, respectively, of Ernest Henry, and Xtrata plans production from copper deposits at both sites to make an "incremental contribution" to ERM's overall output from the second half of 2012.

Ernest Henry's open pit operations are scheduled to finish later this year and Xstrata are currently in the process of transforming the site into a major underground mining operation with an associated magnetite extraction plant. The E1 and Monakoff copper projects offer an attractive opportunity to expand Ernest Henry's expected production profile by utilizing the remaining capacity of the Ernest Henry concentrator while leveraging other significant synergies available through our existing site infrastructure, equipment and workforce.

Underground transformation

The transformation of open pit mining operations at Ernest Henry to a major shaft underground mine is on budget with the shaft scheduled to be commissioned in the first quarter of 2013.

The mine has completed the construction of a magnetite plant and the plant is now in the commissioning phase. The plant cost A$79 million ($69 million) to build and is a key component in the $542 million project to transform the mine into a major underground cooper-gold operation.

The magnetite processing plant at Ernest Henry Mining will produce around 1.2 million metric tons of magnetite concentrate a year at full capacity for export to Asia. Magnetite concentrate is a key by-product of the copper-gold concentrating process. Xstrata Copper has already produced its first magnetite concentrate from the plant and expects to start exporting the product in the first half of 2011.

Lady Loretta

Xstrata Zinc has announced construction will begin immediately to develop the $246 million Lady Loretta mineral deposit located 140 kilometres north west of Mount Isa. Work on the development of the decline, underground services and surface infrastructure of the project will be the first priority.

The deposit holds an estimated 13.7 million tonnes of high grade zinc-lead-silver ore and has a projected mine life of 10 years.

The underground mine, which is predicted to be operational by 2013, will produce 1 million tonnes per annum of zinc-lead-silver ore and an annual average of 126 kilotonnes of zinc in concentrate and 40 kilotonnes of lead in concentrate. The ore will be treated at Xstrata's existing Mount Isa processing facilities.

Xstrata Zinc Australia chief executive officer Brian Hearne said the Lady Loretta deposit was a significant addition to the company's stable of zinc assets.

"Lady Loretta's higher grade zinc improves the overall quality of our Mount Isa resource base, increases annual average zinc production from this region by around 20 per cent to 100,000 tonnes and supports further cost efficiencies from the Mount Isa operations," he said.

The project will create an estimated 230 jobs during the mine's construction phase and will support a similar number of employees once operational.

State Member for Mount Isa Betty Kiernan welcomed news of the development as a key step towards a sustainable Mount Isa. "This is an example of the type of long term decision we need to support the future of Mount Isa," she said. "With $800 million worth of projects now under construction... Xstrata Zinc is contributing greatly to the region."

Development of the Lady Loretta deposit follows the approval of an expansion of Xstrata's Handlebar Hill open cut zinc-lead mine which will extend the mine's life to 2013.

Xstrata's Zinc resources in and around Mount Isa, including Lady Loretta, comprise the world's largest zinc resource base with an estimated 600 million tonnes of ore and 36 million tonnes of contained zinc metal.

Meanwhile, the company yesterday released its production report for the six months ending June 30 which showed significant gains.

Cloncurry's Ernest Henry Mine produced a copper concentrate yield three times higher than the corresponding period last year, due to the mining of the final high grade ore zone of the pit, while a strong second quarter performance at Mount Isa Mines led to an improvement in zinc in concentrate volumes from the Australian operations.

Rio Tinto tests advanced technologies

Rio Tinto is testing new techniques for underground tunnelling, mineral exploration and improved recovery of ore in its latest push to develop competitive advantage through its Mine of the FutureTM program.

Launched in 2008, Mine of the FutureTM introduces next-generation technologies for mining operations that aim to reduce costs, increase efficiency and improve health, safety and environmental performance.

1. **Shaft and tunnel boring systems**

   Rio Tinto is in advanced stages of developing new shaft and tunnel boring systems aimed at significantly reducing the time taken to excavate underground.

   The tunnel boring system will be trialled next year at the Northparkes copper and gold mine in New South Wales with shaft boring system trials to follow.

   Rio Tinto believes these rapid mine construction developments through the tunnel and shaft boring systems could lead to a reduction of up to 40% in the time taken to construct an underground mine.

2. **Innovation in mineral recovery**

   Rio Tinto is working on ways of improving rates of ore recovery from mature and complex deposits.

   Pilot projects are underway in both iron ore and copper aiming to upgrade marginal ore, reclaim ore from waste streams and improve efficiency through lower energy consumption.

3. **Advanced exploration technologies**

   An airborne gravity gradiometre is being tested as a potential tool for finding the next tier one ore body. The device can be deployed in an aero plane to detect small changes in the gravitational forces which result in density differences in the earth that indicate potential mineral deposits.

   The gradiometre represents a step change in exploration geophysics and will fill a gap in airborne mineral exploration methods, providing Rio Tinto with specific satellite mapping to help it find the possible deposits of the future.

   Mr John McGagh Rio Tinto head of innovation said "The revolutionary technologies being tested now cement Rio Tinto's leading position in the field of mining innovation. Mine of the FutureTM is giving Rio Tinto a competitive edge in the global mining landscape by generating more efficient and cost-competitive methods of finding, extracting and processing mineral resources and providing new, engaging and diverse employment opportunities."

   Recent milestones in the Mine of the FutureTM program include the one-year anniversary of servicing the Pilbara from the Operations Centre in Perth, Western Australia and trialing and initial roll out of automated haulage and drilling systems. The program is run in conjunction with leading universities and organizations.

4. **Operations Centre**

   Rio Tinto's Pilbara iron ore mining and infrastructure has been controlled remotely for the past 12 months from the Operations Centre in Perth. The Centre has more than 400 employees overseeing and ensuring the synchronization of the mine, rail and port systems in the Pilbara region.

   The benefits of the Operations Centre can already be quantified with increased efficiency, improved safety, decreased variability and better identification of performance issues across the iron ore business in Western Australia.

5. **Automated mining systems**

   Rio Tinto plans to double its fleet of driverless haul trucks at its iron ore operations in Western Australia following a successful two year trial at the West Angelas mine.

   The broader operational deployment of the autonomous trucks marks a step forward in the development of the Mine of the FutureTM vision, delivering improved safety and production efficiency in haulage.

   Rio Tinto is also trialling autonomous production drills designed to provide a reliable and repeatable process in blast hole drilling.

   The intent of the integrated system is that automated blast-hole drill rigs will precisely position the blast holes, conduct live rock analysis, dictate to the explosives delivery vehicle the correct charge for each hole and provide data supporting three dimensional mapping systems to provide detailed imaging of each deposit. A number of critical system components have already been successfully tested in Rio Tinto operations.

Australian Mine Safety Simulator Could Save Lives in China

Groundbreaking virtual reality technology developed in Australia has been sold to China where it will be used to improve the safety of mine workers. The iCinema system is a 360-degree, 3D safety simulator that teaches miners how to survive life-threatening events underground. It has been installed at one of China's leading mine safety research installations, the Shenyang Institute of Coal Technology and Engineering Group.

This experimental program allows miners to step into a virtual underground world and feel part of the scenery.

Participants are surrounded by a circular screen and wear 3D glasses. They are immersed in the simulated environment through flowing images from 12 projectors and a 24-channel sound system.

Up to 30 trainees can take part at one time. They can ride on a virtual underground mine vehicle that travels through a labyrinth of tunnels modeled on an actual mine in Australia's New South Wales. Participants say they feel like they can reach out and touch the simulated roof bolts.

The head researcher, Professor Dennis Del Favero, is the director of the iCinema Research Center at the University of New South Wales.

"We believe it will almost certainly save lives because there is nothing like real life simulation. Miners require a high level of skill. They face dangers that are unparalleled in many ways and probably the only parallel with the dangers of working in a mine is working as a member of the defense force in a battlefield," said Del Favero.

China's mining industry is the most dangerous in the world. In recent years, officials estimate averages of six miners are killed on the job every day. Chinese authorities have closed down hundreds of illegal mines and increased safety inspections to try to reduce the danger.

The Australian-made simulator is in many ways similar to a giant video game aimed at preparing miners to recognize the danger signs for a variety of hazards. One of the biggest threats in coal mines are gas explosions and the simulator tries to prepare miners for the worst.

"The trainee would realize they would have been killed in that event if it happened underground. But what they can actually do in the simulator is move through the event and look at the physical damage it does to people but also the physical consequences and physical damage it has on machinery," Del Favero explained. "And we're now moving through, we're trailing through and all around us we can see the consequences, the destruction of the outburst."

The project has taken seven years to develop at the University of New South Wales in Sydney, through the collaboration of the College of Fine Arts, the Faculty of Engineering and the School of Mining. There has also been input from the mining industry, trade unions and the government.

The technology is used at four sites around New South Wales, where it has trained thousands of people during the past three years.

Mining vs farming

Member for Gregory Vaughan Johnson has challenged the Queensland State Government to show its "sincerity" and commitment to protecting prime agricultural land in the Golden Triangle, south of Emerald, threatened by two proposed coal mines.

Mr Johnson said the government's actions in relation to the environmental impact study of the Bandanna Energy open-cut and underground mines would expose its true position on mining versus farming.

"It would be very short-sighted to dig it up when this kind of land has never been rehabilitated to its primary use, anywhere in Australia. The best science says it can't be done, for either open-cut or underground mining. And to date, with the best of attempts, it never has been," Mr Johnson said. "We should not be mining our food bowl out of existence. The land along the Comet River at Orion and Springsure Creek clearly qualifies for protection and it will be a sad day if the government fails to extend that protection."

Conveyor belt problems – spying a solution

If a mining operation were a human body, then conveyor belts would be the veins. They carry all the important material to where it is needed in the quickest and most efficient way possible, but what happens when they stop?

A belt breakage instantly stops operations and results in businesses hemorrhaging lost revenues.

Mines typically inspect belt conditions by walking along the belt, but this is a hazardous and time consuming jobs as belt length can be ten kilometers long, and some parts may not be accessible at all.

Miners often outsource belt inspection to specialised companies, with inspection periods varying from a week to even a month.

This approach is expensive and can be unreliable due to the limitations of manual inspection.

Australian company BeltSpy has developed an inspection system that utilises machine vision technology to monitor and maintain conveyor belts in underground mines.

It is designed for use during production hours under full conveyor load conditions.

Beltspy's inspection system is comprised of a high speed digital camera for every belt (with two cameras for double sided installation), a dedicated underground server for each belt, a single workstation, and associated components.

The system uses an image processing algorithm to automatically detect and flag clip joins; splice joins; damaged belt surfaces; and damaged edges, which collectively come under a Points of Interest (POI) umbrella.

The system maintains these precise belt metrics relative to a reference location (RL).

The locations of the POI's distance from the RL are compiled by the system, providing instant access to the POI images.

It also allows for sequential and random belt image browsing.

The single workstation located on the surface allows an operator to inspect the carry and back sides of all belts in the mine by analysing high resolution images anywhere along the belt, and access to images of any flagged locations. The operator's workstation uses a two-monitor configuration for both carry side belt inspection or a three-monitor configuration if both sides of the belt need to be inspected.

The first monitor is used to control system activity and depicts the graphical representation of the conveyor with all the POI placed on it, while the last two monitors focus on rendering belt fragments (around one metre in length) for carry and back sides, with both images synchronised.

Flagging can be carried out manually or automatically.

An analysis tool allows the potential damage to be flagged during full production periods, allowing for conveyor downtimes to be fully focused on maintenance activities.

It also allows for online monitoring of damage, providing predictive maintenance capabilities.

Operators can also visually compare two images of the same location taken at two different times, so that the user can analyse historical changes in the belt's condition.

The operator can take full belt images at any time and the system can be scheduled to take belt images automatically at pre-defined times every day.

There is no limit of the number of belt condition images that can be stored, with images uploaded in approximately 100 milliseconds.

The BeltSpy system also allows for the monitoring of the development of failing belts in real time until downtimes can be scheduled.

Margaret River Coal Mine

Australia's Environmental Protection Agency (EPA) has refused permission for a coal mine in the Margaret River region of Western Australia on grounds that it would be environmentally unacceptable. EPA Chairman Paul Vogel said that the no was based on the proponent's referral information and environmental advice presented to the EPA.

A mining company wished to mine coal about 15 km away from the centre of Margaret River, but the proposal has met widespread opposition from environmentalists and locals.

Premier Colin Barnett said he believed the EPA made the right decision. He said that he had already expressed the thought that it was a very doubtful prospect to have an underground coal mine in a prime wine growing area of Western Australia and clearly there were large environmental risks to the water supply and water quality in the aquifers.

LD Operations said the company was disappointed that the Vasse Coal Project would not proceed to a full public environmental review and public engagement period. Peter Ross the Managing Director of the company said that the company had not been provided with any information, evidence or reasons for the decision declare the project environmentally unacceptable.

He added that they were seeking clarification of the basis for the decision and considering its rights in terms of appeal. He said that they were keenly awaiting the reasons for the determination, as well as access to additional information sought by the EPA from other government agencies ahead of making its decision.

Coal miner appeals

LD Operations is lodging an appeal against its proposal for an underground coal mine in West Australia's Margaret River region.

Its application for the mine was previously rejected by the WA Environmental Protection Authority (EPA) on the grounds that it would 'pose a risk to nearby aquifers'.

However, the miner is now accusing the EPA of "selective, inadequate and incomplete consideration" of advice from various government agencies, according to The West Australian.

LD Operations have called for environment minister Bill Marmion to carry out a full assessment of the projected coal mine.

The miner claims that EPA decision to label the coal mine 'environmentally unacceptable' is "so fundamentally flawed that the report cannot be relied upon."

The EPA report originally stated that "even though some of the significant impacts, or risks, may be presented as being manageable because of their low probability of occurring, the environmental consequences of some low probability event may be so serious, widespread or irreversible that the proposal, taken as a whole, on balance, presents unacceptable risks to important environmental values, and thus makes the proposal environmentally unacceptable."

LD Operations managing director Peter Ross called this statement "fundamentally flawed", adding that "the EPA's determination is without merit and is contradictory to the material before the authority, including that provided by government agencies"

Residents of the region have hit out at the miner, stating that it did not listen to community concerns. Local action group No COALition spokesperson Ian Parmenter has previously claimed that LD Operations is ignoring critical advice. "It's just farcical, they are just clutching at straws, the potential dangers to the water in this region should rule it out completely, not just for this one mine but from all other proposed mining in this south west corner," he said.

Regarding Ross' claims that the study was flawed, Parmenter stated that "the EPA made a thorough analysis of the information that was provided to them and came up with the only logical answer which was this is totally unacceptable." Parmenter went on to say that "(EPA chairman) Paul Vogel was right in ruling it environmentally

unacceptable and LD Operations needs to be knocked on the head and told to go away."

The State Government is already considering whether to introduce legislation to protect the area from mining. WA premier Colin Barnett said that any laws introduced would be similar to those protecting the Swan Valley, but added that "we're not legislating to stop the mining industry. If we legislate, it's to protect the unique, tourist and agricultural characteristics of Margaret River."

Fellow coal miner Western Coal has also applied for mining leases in the Margaret River region.

Ads launched

Anti-coal protesters have ramped up their campaign against an underground coal mine near Margaret River, launching a series of print and television advertisements.

There has been strong community opposition to plans by LD Operations to establish the mine at Osmington.

The documentary film maker Michael Muntz is behind the ads which will run on commercial television and in newspapers throughout WA.

He says the ads will refer people to an online petition. "The tactic we've used is purely and simply to make people realise that mining in Margaret River could have disastrous consequences and that they can do something about it by letting the Government know that they don't want mining in Margaret River," he said.

A spokesman for the No Coalition community group Ian Parmenter says the new ads will boost the campaign. "The ultimate aim is to get this whole thing stopped and to make the public jump up and down and saying 'no, there won't be coal mining in Margaret River'," he said.

"What we've got to do is convince people beyond this region itself of how important this issue is."

Mr Muntz says it is hoped the ads will take the anti-coal message to a wider audience.

Tommyknocker mine refuge station

With miner safety in underground operations becoming more and more of an issue, not before time, underground refuges are becoming a norm rather than an exception.

Following some recent high profile underground mining accidents – specially designed and equipped mine refuges are becoming a norm in today's mining operations. Ideally these should be 'portable' in the respect that it is possible to move them as the main working areas in a mine advance, or themselves are moved to new areas of the property under the mining plan.

Thus specialist Canadian company RANA Medical's Tommyknocker self- contained portable modular mine refuge chamber should be of particular interest to underground miners everywhere, and may nowadays also find use in particularly long civil tunnelling jobs.

RANA (Rimer Alco North America) Respiratory Care Group, was founded in 1987 and is headquartered in Winnipeg, Manitoba. The company specialises in offering healthcare programs and services for people with respiratory problems but also provides equipment for the medical, commercial and mining industries, including its Tommyknocker fully equipped mine refuge installations which it has been making since 1995.

(It is called the Tommyknocker after a traditional term describing miners who have been trapped in cave-ins and pound on the rocks for rescue.)

The Tommyknocker unit's specifications are as follows:

- Physical dimensions
  - Standard length 4.3m (custom sizes available by adding 60cm sections)
  - Width 2.2m
  - Height 2.2m
  - Weight 1990kg
- Electrical (other voltages/frequencies are available)
  - Charger inputs: 120V AC, 60 Hz
  - Outputs: 12V DC
- Heavy-duty 12-gauge steel construction; sandblasted, epoxy primed and urethane painted
- 2 sealed doors with freezer style handles provide an air lock; rear door contains a window
- 2 rooms
  - Main room: Refuge area containing padded benches for comfortable seating and extra storage; a Refuge One Air Centre can also be included
  - Air lock room: 4 feet in length containing a 24-litre toilet, drinking water dispenser and first aid kit
- Solid steel wall-dividers between rooms

Other available options include:

- Compressed Air Hook-up: includes filter, regulator, drain and noise muffler
  - Connects to the mine's compressed air system
- Carbon Monoxide Scrubber
  - Model size is based on expected carbon monoxide concentration
- Portable Gas Monitor with digital gauges
  - Measures oxygen, carbon dioxide, carbon monoxide, heat and humidity
- Air Conditioner: DC powered, split-mount
  - Controls heat and humidity
  - Batteries and a charger are mounted under the benches
  - Up to 36 hours of back-up battery power supplied by a 12V 50 amp charger and 12 batteries
  - Other voltages are available
  - Using DC instead of AC power means the unit lacks an inverter, which extends battery life.
- Testing
  - Each unit undergoes a standing pressure test to ensure the unit is leak proof.
  - Each unit must hold a pressure of 3 inches of water for a minimum of 60 seconds.

Air sources for the refuge chamber would include the mine's compressed air supply and/or the Chamber can be supplied independently using a Refuge One Air Centre to supply breathable filtered air. The sealed doors maintain the internal air quality by providing an air lock. Leak testing ensures toxic gases are kept out of the chamber and breathable air stays in. Internal lighting operates on battery or mine power. Externally mounted warning lights indicate when batteries require charging.

The Refuge One Air Centre purges carbon dioxide by passing the chamber's air through carbon dioxide scrubbers. The unit also replenishes oxygen from high-pressure oxygen cylinders at a metred rate based on the number of occupants. It's available with the Tommyknocker chamber, or independently for installation in an existing mine refuge station.

Tunnel dig uncovers archaeologists' treasure trove

An old well, abandoned more than 100 years ago, is providing archaeologists with some rich pickings on a new Auckland motorway route.

The well was found on the route of a new motorway tunnel in Auckland near the old Rob Roy Hotel in St Mary's Bay near the Auckland suburb of Ponsonby.

When it was abandoned more than 100 years ago the well became "a bit of a depository for rubbish" and had turned up some exciting finds, said archaeologist Sarah Phear.

"Within the well they have found all sorts of 19th century remains, artefacts like shoes and tin cans – some of them sardine cans – and other things like that.

"When the well fell into disuse, which was probably towards the end of the 19th century, it has just been used as a refuse dump. There were quite a lot of artefacts which was quite nice."

She said the well was also full of organic material but some of the artefacts were in good condition because there was little oxygen there to encourage decay.

Some of the material, including some of the cans and other metal remains, was being conserved.

The well was found south of the Rob Roy Hotel, latterly known as the Birdcage, which was moved about 40 metres up the road in St Marys Bay to allow the new tunnel to be built.

The 124-year-old hotel will due to be moved back once the tunnel is completed.

The tunnel will take north-bound traffic to ease congestion over the Victoria Park overbridge which will be reconfigured to take only south bound traffic.

Archaeologists looked into the basement area after the hotel was moved but found nothing of interest other than evidence that the hotel was built on the foreshore before St Marys Bay was reclaimed.

Heritage of Humpybong Creek Culvert recognised

Some 80 guests gathered on the bank of Humpybong Creek, Redcliffe, north of Brisbane on 29 June for the ceremony marking the award of an Engineering Heritage National Landmark to McKay's Minimum Energy Loss Culvert. Constructed in 1961 to provide the outlet of Humpybong Creek to Moreton Bay, this was the first structure built using Minimum Energy Loss principles, an approach developed by the late Professor Gordon McKay at the University of Queensland in the late 1950s.

Governor of Queensland Penelope Wensley unveiled the marker. Among the guests were members of the McKay family, and the mayor, several councillors and staff members of the Moreton Regional Council.

Engineers Australia Queensland Division deputy president Steven Goh said it was the 152nd site to be recognised with the status. Moreton Bay Regional Council Mayor Allan Sutherland said the culvert was constructed in 1961 using the Minimum Energy Loss concept developed by Professor Gordon McKay from the University of Queensland. ``It was the first of its kind in the world,'' he said. ``It solved Redcliffe's creek outfall problem much more economically than would have been possible with a conventional culvert.

``Fifty years on, the technology is still holding up, and the design has been used throughout Australia, the United States, the United Kingdom and Canada.'' Cr Sutherland said the design, which converts high-level turbulent water flow into low-level streamline flow, was particularly good at dealing with torrential rainfall in relatively flat areas such as Redcliffe. ``The raised outfall level limits beach sand being washed into and choking the culvert,'' he said. ``It also helps to minimise salt water intrusion into Humpybong Creek.'' Ms Wensley said she was delighted the culvert had been given praise because it alerted the wider community to the ``engineering marvel''. ``I would be very, very surprised if anyone realises it actually represents the world-first application of an energy-saving idea,'' she said. ``Experts today still marvel at the beauty and ingenuity of this design. ``It saved successive councils a great deal of money and effort.''

Guests at the ceremony included (l-r) Queensland governor Penelope Wensley, Kerry Johnston, Margaret Johnston, Andrew McKay, Dorothy McKay and Brian McKay.

Humpybong Creek Outlet

Humpybong Creek was the original water source for the 1824 convict settlement in Redcliffe and last century became a swimming lagoon, popular with locals and holiday makers. There was a short timber bridge which carried Redcliffe Parade over the creek. The outlet was narrow because the waves in Moreton Bay kept trying to fill in the creek outlet. When Redcliffe suffered heavy storms the lagoon level rose considerably before the flood could flow out through the narrow outlet.

In the mid 1930s the Council wanted to develop the northern end of the CBD, One way to prevent the water level in the lagoon from rising was to excavate a wide creek outlet and put a long bridge over it. Unfortunately, as the last flood became a memory, the waves would transport the beach sand back over the outlet. The outlet would become narrow again requiring expensive maintenance if flooding was to be avoided.

The Council approached Dr Gordon McKay of the Civil Engineering Department of the University of Queensland. In England and Germany McKay had become an expert in the use of physical scale models to solve engineering problems. In the era before digital computers, hydraulic engineers like McKay would build models and pass floods through them, sometimes to meet model tides. There were equations which related the water flow, velocities and tidal times to the scale used. McKay had arrived in Brisbane in 1951 and had soon developed a reputation for ingenious solutions to drainage, river flooding, dam and coastal problems.

McKay had read an account of a model for a similar problem in Nuremburg, Germany. The model had streamlined walls, and was trumpet shaped, on both inlet and outlet. There was an energy loss through the model, but it was much smaller than losses in a conventional culvert.

For Humpybong Creek, McKay built a model with streamlined walls on the inlet and outlet structures. The culvert section of the model was rectangular and its bed was well below the lips at each end so that the water flowing down the inlet could accelerate to quite a high speed. When McKay tested the model he was surprised to find that the energy losses in the inlet and outlet were almost immeasurable and significantly less than those in the Nuremburg model.

As a result of the model the Humpybong Creek culvert was the derivation of a design method for this type of structure so that they could be built with confidence anywhere in the world. In Brisbane there are a number of these structures under the M1 and Gateway Arterial. There is also a very interesting example where Nudgee Road and the Gateway Arterial cross Kedron Brook. It is particularly interesting because the walls are grassed banks rather than vertical concrete walls.

Another important consequence of the construction of the Humpybong Creek culvert was a new type of weir which McKay evolved by considering the behaviour of flow over the weir at the culvert inlet.

Another important consequence of the construction of the Humpybong Creek culvert was a new type of weir which McKay evolved by considering the behaviour of flow over the weir at the culvert inlet. The first example of this new type of weir was built at Claremont in 1963, and the largest example was built in Chinchilla on the Condamine River in 1973. On the upstream side of these weirs the bed rises to a circular arc as in the Humpybong weir then tapers gradually in the downstream direction. The beauty of the design is that by the time the water level downstream rises to a floodplain level there is no energy loss over the weir and therefore the water level upstream is identical and the weir is invisible.

Landslide at Belair Tunnel, Adelaide – 7th February 1928

More than 150 rescuers, working in pouring rain, with thunder crashing and lightning vividly adding to the terror of the tragedy, fought all night and until the afternoon against a huge pile of stones and clay that held their comrades captive.

Magnificent efforts were made by the men to clear the railway tracks. Nearby residents also, contributed their share to the rescue by tireless work in providing refreshments for relief parties.

The weight of falling earth and boulders forced one side of the tunnel slightly inwards. When the Melbourne express passed through on its way to Adelaide the long train only narrowly cleared the opening.

Of the nine men involved in the landslide which occurred on The Hills railway line, at the Belair tunnel, on Tuesday evening, six died. The first five were dead when extricated, and one died later after being admitted to the Adelaide Hospital.

The Victor Harbour train near Belair tunnel which caved in at Adelaide end after heavy rains Victor Harbour Train

The line was cleared, and railway traffic resumed by six o'clock the following morning

Merri Creek WWII tunnel dig closed down

A team of WW2 enthusiasts led by Mark Rawson, have been clearing a tunnel complex at Merri Creek Westgarth (near the Oldis Gardens) since 2001. They believe these to be part of a military system, which stored munitions during WW2 and was possibly connected to an artillery depot in Green Street to the north. There apparently was an anti aircraft battery on the opposite side of the creek, a WWI gun mounted on the cliff top and/or another installation at the Fairfield Infections diseases hospital. There have also been various oral traditions about a guarded tunnel entrance during and after WW2 and caches of weapons or other US marked crates.

The tunnels are cut in very weathered basalt, with no evidence of rock drilling or tool marks, suggesting it was fairly easy going requiring only pick and baring. The entrance and first 30-odd metres is about 2m high and 0.6m wide and level, about 2-3 m above normal creek level, and maybe 20m below the park. A vertical shaft to the surface 3--40m in has been plugged at the surface (recently) and two other tunnels run off about 4-5m above the lower one. The enthusiasts have plans annotated 1941, that show a tunnel partly conforming to what they have found.

It is clearly not a natural lava tube; it is unlikely to be gold mining (although some of the less well informed diggers did excavate shafts and tunnels in pretty unlikely locations); it doesn't seem to be a sewer tunnel, as it does not connect to any existing or known main, although there would appear to be sewage seeping into it; there is a big 19th century stormwater drain close by and other underground services.

But the contents of a 70-year-old WWII tunnel in the banks of Merri Creek will remain a mystery after Darebin Council shut down the dig site.

Council workers welded shut the gates to the Northcote site and ordered the excavation filled in after a decade of support for the project carried out by a team of amateur historians. The council has contributed more than $10,000 to site stabilisation. But Darebin city design and environment director Daniel Freer said "explorations had not been fruitful".

He said the council entered an agreement with Mr Rawson in 2001 to undertake the works for "the purposes of research, exploration and salvage of underground World War II sites" but nothing had come of it.

Mr Speed, 73, became aware of the tunnel as a child growing up in Northcote in the early 1940s. Mr Rawson's team unearthed a map from council archives showing the tunnel was built in 1941 and test drilling in nearby streets indicated it was part of a network. They have been painstakingly digging out a brick and clay plug for the past decade. Mr Speed said the council was short-sighted in closing down the project when more time was needed to unearth the mystery.

Mystery unlocked

Solicitor Mark Rawson and a team of amateur historians had spent weekends during the past 10 years excavating a tunnel in the banks of Northcote's Merri Creek, believing it was used by the US Army during World War II and contained munitions or something more sinister.

But according to Canberra resident Roger Thompson the tunnel was drilled to investigate an underground stream.

"It had nothing to do with the war effort at all," Mr Thompson said. "There was an underground stream causing subsidence (in surrounding streets)." Mr Thompson said he clearly remembered his father and other Northcote Council "gangers" (labourers) using explosives to help them dig the tunnel in 1941.

Peter Thompson, Roger's father, with the fishing reel he received from Northcote City Council upon his retirement in 1974, supervised the tunnelling.

"I was eight years old and I used to go down there after school and sit in there, right beside the fellow who lit the fuse, then we'd run like hell," he said. "It was very exciting and not something you'd forget."

Mr Thompson said the project fizzled when council funding ran out and a lot of the men were called away to help out with the war effort. Merri Creek Management Committee manager Luisa Macmillan said there was evidence to back up Mr Thompson's claims about underground water. She said early records showed a tributary running into the Merri Creek near the tunnel site. "The little creek valley was filled in at some stage, but when drainage in the area was not working it's possible they would have to dig it out to make a formal drainage connection," Ms Macmillan said.

But Darebin director of city design and environment Daniel Freer said he was not aware of underground streams in the area. "The council does not have conclusive evidence of the tunnel's purpose," Mr Freer said, before promising further investigation in coming weeks.

BATTLE OF HORSESHOE TUNNEL

A thirteen-year battle to maintain the Thomson River Tunnel may have finally reached a resolution. Friends of the Horseshoe Tunnel, State Government representatives and the West Gippsland Catchment Management Authority recently met in a bid to end the long running dispute.

Originally, the WGCMA believed the tunnel had interrupted the migration path of threatened native fish and the water authority had considered diverting the river back to its original course. However, community concerns were raised regarding the historical value of the tunnel, leading WGMCA to investigate alternative options.

Friends of the Horseshoe Tunnel spokesperson Terry Lowater said the decision to maintain the tunnel was the "best outcome so far". He said WGCMA and Friends of the Horseshoe Tunnel have taken a step in the right direction. "The tunnel is now an important tourist attraction and needs to maintain its character and integrity," Mr Lowater said. He said more than 2700 people have accessed the track leading to the tunnel since April, which showed the value of the area to residents and tourists.

On advice from the Department of Sustainability and Environment, an independent review of the Thomson Riverlinks project was undertaken by the Department of Sustainability and Environmental technical assessment panel. The review assessed the adequacy of the project purpose, objectives, documentation and recommendations to reinstate fish passage around Horseshoe Bend.

WGCMA chief executive Martin Fuller said this project was the final step in linking the Thomson River from the Gippsland Lakes to Victoria's alpine region. The WGCMA is awaiting the final findings of the TAP review to guide the next steps of the Thomson Riverlinks project.

The Horseshoe Bend Tunnel – "The Idea"

The history of the Horseshoe Bend tunnel starts early in the beginnings of the 20th Century.

Gold in Walhalla had started to become increasingly expensive to mine due to seams that dived deeper and deeper beneath the mountainside. New methods and ideas were sought, and one of these a proposed river diversion project had interest running hot.

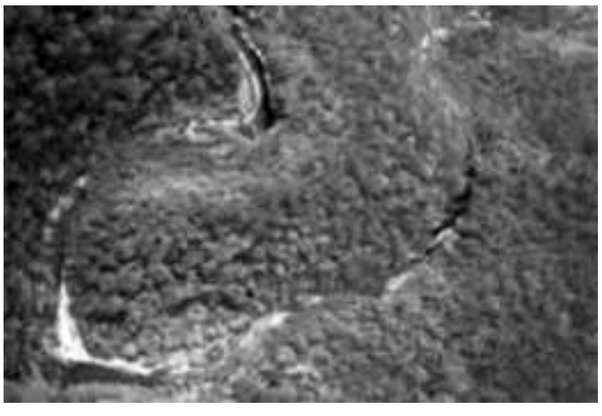
The idea was simple there was gold in the Thomson river bed but the river was on top of it making it difficult to get to. If the river could be moved or 'diverted' the gold could be more easily alluvial mined. This wasn't a new concept at the time as it had been used quite successfully on several rivers throughout Gippsland including the nearby Aberfeldy River but not of the scale planned.

Location

A likely section was selected near the then railways famous Horseshoe Bend turn, through a near by ridge of land known as The Stockriders spur. Located about 4km south-west of the historical Walhalla township, and 1.5kms below where stringers creek joins the Thomson River.

Here the diversion was planned, which once completed, would enable the river to flow through a tunnel, leaving the dry river bed to be sluiced for alluvial gold

During the month of august in 1911, the Thomson River Alluvial Gold & Tailings Recovery Company worked



through the first 215 feet of sheer rock at the entrance to the diversion Tunnel. Things slowed down markedly after hitting unexpectedly hard rock and having little success with traditional manual extraction methods, it was decided that the job to complete the Tunnel be tendered. William John Hannaford (better known as Jack) secured the project.

Jack Hannaford

Jack's Parents emigrated from England in June 1876 and settled in Moonta, South Australia where Jack was born on 6 January 1884.

In 1890, they moved to Walhalla, finally settling on the west side of the Thomson River, downstream from the Thomson Railway Station that still stands today. When Jack married in 1908, he built a dwelling on the east side of the Thomson River opposite his parents. He was not a miner, but a 'Jack' of all trades.

At the time of the Tunnel Diversion Project, he had four children. His wife Clara used to help him in labour, wheeling rock out on the trolley after blasting.

The Opening

The tunnel opening was to be a gala day. Both the tunnel approaches from the entrance and exit had been completed, leaving only a thin separation wall of rock, which would be blown on the day of the opening with great fanfare.

Everything was in readiness. With the charges to blow the channel open having being prepared the previous day.

Unbeknown to the miner who was to set off the explosives, Jack had taken his wife Clara and three eldest Children (the youngest only 23 months old), to the river exit end of the Tunnel, to allow them one last ride on the trolley. Apparently, the miners had become impatient waiting for Jack to return, and when he did appear at the tunnel entrance where the crown were assembled, the cry went up to light the fuses. Being unable to stop them Jack had to scramble for safety, within moments of the channel blasting, water flowed through the tunnel, sweeping his wife and children out of the exit and into the river.

Fortunately the story has a happy ending as Clara, being a good swimmer, was able to rescue them all.

The End

Unfortunately the fortunes of the Thomson River Alluvial Gold and Tailings Recovery Company are not known.

It is believed that the workings they undertook in the now dry river bed brought no significant dividends, or at least not enough to make this a viable commercial endeavour.

The sluicing of this part of the Thomson River was one of the last major initiatives to win payable gold turning the Walhalla wheel full circle from the first prospectors working for gold in stringers creek in the early 1860's.

Today the tunnel and its associated dry river bed stand as one of the very few fully operational monuments to our gold mining heritage, and while there is still gold there it is mainly tourists who visit it today.

Medieval water tunnel

Heritage activist and historian Dr H G Daddi has discovered a medieval period water tunnel, which was almost buried in the ground. This major water supply tunnel, according to historical records, ensured uninterrupted water supply to Bijapur city during the 15th century.

Built by Ali Adil Shah I around 1560, this water supply tunnel originated at Toravi near the city and is almost 6 km in length. The tunnel used to carry water from Toravi catchment area and Bhat Bawadi, situated near Toravi to Sangeet Mahal reservoir and later to Surang Bawadi, situated at Sath Khabar through a pipeline with intervening control towers. Then from Surang Bawadi, the tunnel ran towards Ibrahim Rouza and Taj Bawadi.

Dr Daddi said that several chambers, embankments and high level conduits built at Toravi are evidence of the high skills the engineers of the Adil Shahi period had acquired.

The water brought from Toravi through this tunnel was stored in tanks and ponds built in and round the city to ensure water supply to the people throughout the year. Apart from being used for domestic purposes, the water was also used for fountains, gardens and as a cooling system at the palace, he added.

Built in solid rock, the tunnel has a diametrical size of 8x6 feet. Amazingly, the tunnel had been laid 60 feet below the surface at some places to maintain the water flow towards downstream. From close observation, one could easily say that vertical air shafts in the tunnels ensured adequate and regular water supply to the city, which, according to historians had a population of 10 lakh during Adil Shahi's period.

Historic Garden Island tunnel

A top-secret tunnel, lost in time beneath Sydney's Garden Island naval base has revealed a hidden piece of our city's military past.

Two separate tunnel systems were blasted out of the sandstone under Garden Island during World War II. They were to serve as air-raid shelters in case the Royal Australian Navy base was attacked. It is not known if this latrine was ever used but the toilets form just one part of the tunnel system that remains deep below the surface, hidden from public view – until now.

One system was built at the base's northern end, with another dug into the slope running down from Potts Point. Garden Island historian and former ADI electrical compliance co-ordinator David Stockman has been researching the tunnels for five years. Stockman believes there may be yet another tunnel running from the base to the heart of the city.

"People keep telling me about a tunnel to the city but I'm yet to find a record of it," he said. "I don't know if it exists but I can't rule it out."

But if anyone is going to get to the bottom of the secrets held deep beneath the base, it is Mr Stockman. He worked at the naval complex for 40 years and both his grandfather and father worked on the Island. But finding historical records on the tunnels was proving difficult.

"The National Archive recognises my login, I've been searching their records so much," Mr Stockman said. "I've only been able to find one historical photo of the tunnels."

The northernmost bunker is made up of five interconnecting tunnels that once housed back-up generators, a telephone exchange and a casualty clearing station. Cut into the sandstone and supported with wooden struts, the original tunnel systems would have resembled a mine, Mr Stockman said.

During a refurbishment in 1978, most of the tunnels were reinforced with concrete and steel. They are now only used to run communication and fuel lines across the Island. Some tunnels were named after London landmarks including Petticoat Lane and Saunders Corner, but details are still rough. "When or who gave the tunnels their names is lost in history," Mr Stockman said.

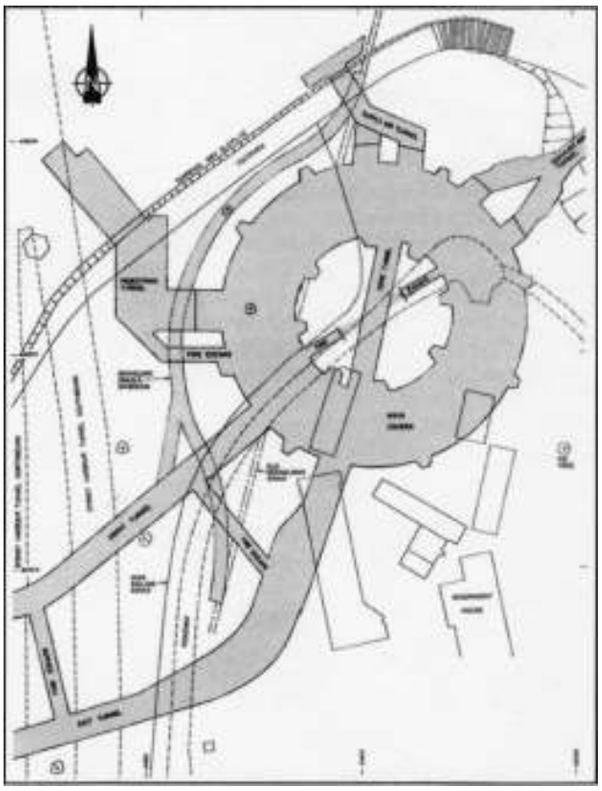
The Sydney Opera House Car Park and the Double Helix by Dr Philip Pells

Published by Philsquare Publishing, Katoomba, July 2011.

The Sydney Opera House Car Park is a marvel of modern Australian underground construction yet when I was producing the ATS book on the History of Australian Tunnelling last year I was surprised to find how difficult it was to find any information on its construction. Dr Pells, who was responsible for the geotechnical design, has now filled that gap with an excellent publication detailing the innovative design and the challenges during construction. But Philip has not stopped there. He has then continued on a journey of research into the use of the double helix both in nature and in historical construction.

The 1,110 capacity car park was built in1993 and is almost as innovative as the Opera House itself. The 12 storey double helix concrete building is contained in a giant doughnut shaped cavern, within the sandstone only a few metres below the Royal Botanic Gardens.

The book includes colour photographs of the excavation work by Thiess using huge Caterpillar D10s and describes the challenges of then removing these on completion



from the base of a very deep basement 36 metres deep, 72 metres in diameter, with its base 26 metres below sea level and the roof only 7 metres below the Royal Botanic Gardens.

The construction then concludes with the double helix concrete structure which enabled the last car parked to not be at the bottom corner of the car park but at the top of the out ramp.

Philip then reviews the presence of the helix in nature and the development of the Archimedes screw, the construction of helix and double helix staircases in history and its development by Leonardo De Vinci, and then the construction of other buildings through history. He also provides a mathematical study of the geometry of a helix and its use as a pump, spring and propeller.

Philip also provides an interesting history of the site at Bennelong Point, including the construction of the Opera House and the excavation beneath it for the Sydney Harbour Tunnel.

All in all a fascinating insight into the development of the engineering marvel of a helix or double helix and how this concept became the basis of one of Australia's most exciting underground constructions.

I recommend this book to anyone who is interested in Australian Engineering. There are a limited number of copies produced so don't miss out. Copies can be obtained from the website at www.pellsconsulting.com.au or contact marita@pellsconsulting.com.au.

History of underground wine storage

Storing wine underground has been a good idea for thousands of years. A few historical highlights illustrate the long-standing tradition:

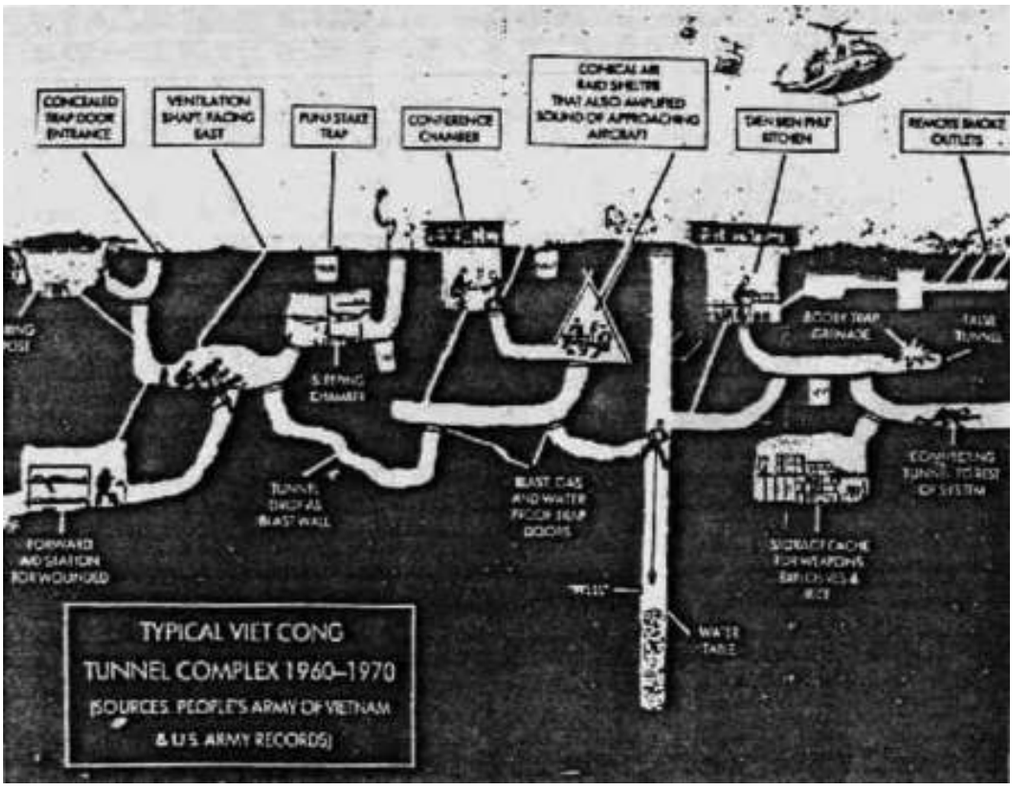
- A family living in northern Iran 7,000 years ago used what may be one of the world's earliest known wine cellars. Archaeologist Mary Voigt discovered half a dozen 2½-gallon pottery jugs containing wine residue embedded in the earthen floor along one wall of a 'kitchen' of a Neolithic mudbrick building.
- Romans would store their wine in the conveniently located catacombs.
- France's first wine caves were abandoned crayeres, from which Roman builders had excavated limestone blocks. From these early discoveries, it was only a short step to dig caves for the specific purpose of storing and aging wines and caves were dug throughout Europe.
- Wine makers in the New World brought Old World knowledge. For example, Brotherhood Winery, America's oldest winery, was founded by European immigrant John Jaques and it still uses underground cellars dating to the mid-1800s.
- A few wine caves in California, notably those of the Schramberg and Beringer Wineries, were hand-dug in the late 1800s by Chinese laborers who had honed their pick-and-shovel skills building the transcontinental railroad.
- Waters Edge Estate houses Western Australia's oldest underground wine cellar. Established in 1829 on what was once a colonial land grant, given to one Thomas Waters, a botanist who came to Western Australia on the first fleet it produced Western Australia's very first vintages.

- Seppeltsfield was established by Joseph Seppelt in 1852. By 1865 it was South Australia's largest winery. with an extensive underground wine cellar.
- The Champagne Cellars at the Great Western Vineyards in Victoria are a network of underground barrel vaulted 'drives' cut out from decomposed granite by out of work gold miners, were commenced between 1868 and 1870 by Joseph Best, English-born founder of the vineyards.

- New Zealand's biggest underground wine cave is at the Gibbston Valley vineyard. The underground cave has been blasted out of the solid schist of the Central Otago mountains, and creates an ideal natural environment to mature award-winning wines – stored at a constant 12-14°C (53.6-57.2°F) – and a perfect place to appreciate them
- In modern times, Beginning around 1970, increased demand and improved excavation techniques sparked a new wave of wine cave construction in California, which produces more than 90 percent of US wine. By 2003, about 115 of the man-made caverns have been built in Napa and Sonoma Counties. They range in size from a few thousand square feet to around 50,000. The caves are used primarily for aging wines, but some wineries press them into service for public relations purposes by conducting tours. Some use portions of the tunnel-shaped caves as dining rooms; others have built more spacious underground rooms specifically for special events like concerts, weddings, and corporate seminars. At least three (Jarvis Winery in Napa, White Rock Vineyards in Napa, and Staglin Family Vineyard in Rutherford) operate their entire wine production cycle underground.

Tunnel Beach – NZ

Tunnel Beach is a locality 7.5 kilometres (4.7 mi) southwest of the city centre of Dunedin, New Zealand. Located just south of St Clair, Tunnel Beach has sea-carved sandstone cliffs, rock arches and caves. Beyond the beauty of the rugged sandstone cliffs, its claim to fame is the tunnel down to the beach that a local politician, John Cargill, son of Captain William Cargill, had commissioned for his family in the 1870s.



VIETNAM TUNNEL RATS

This year the Tunnel Rats of Vietnam returned to Nui Dat to recognise 45 years since their squadron set up its operational base there in 1966.

The organisers of the tour encouraged other participants to attend. When we met in Saigon we were 40 Tunnel Rats, 15 sons of Tunnel Rats, four other Vietnam Vets, 14 serving combat engineers and eight "worthless civilians". I was lucky to be joined by my sons, Simon and Alexander, who had a great time and gained some understanding of our role, and the challenges we faced during our "tours" of Vietnam from 1966 to 1972.

The combat engineers' role hasn't changed much and is still similar in Afghanistan today. We operated as two-man "mini teams" when with the Armoured Corp, or as two-man "splinter teams" when on patrol with the Infantry battalions. For larger mine clearance or bunker demolition tasks we formed seven-man combat engineer ready re-action teams.

Tasks included bunker and tunnel searches and demolition, as well as detecting the ever-present mines and booby traps. The squadron consisted of three troops of combat engineers who suffered many casualties during the war. Of all the units serving in Vietnam, combat engineers had one of the highest casualty rates, averaged around 30 per cent.

During our trip this year we visited the Cu Chi tunnel system north of Saigon. Now a popular tourist destination, it has significant importance to us, as the Australian Tunnel Rats were the first to search and attempt to

destroy this complex in 1966 while attached to the American 173rd Airborne Division.

We also visited numerous sites with Phuoc Tuy province where the Australian Task Force was based, and met former Viet Cong and National Vietnamese Army commanders who spoke openly of their role in the war, as well as their respect for the Australians as skilled jungle fighters.

The highlight of the tour was finding the original Squadron HQ's location in the rubber plantation at Nui Dat. The memorial rock which had been at the base of the squadron flag pole was discovered, and used to conduct a moving memorial service for the combat engineers that we lost in Vietnam. I was also fortunate to locate my 3 Troop Headquarters site. This necessitated yet another group photo of fellow 3 troopers, something that will be cherished by all.

Tunnel Rats

The tunnel rats were American, Australian and New Zealand soldiers who performed underground search and destroy missions during the Vietnam War. In the course of the war, the Viet Cong created extensive underground complexes. Whenever troops would uncover a tunnel, tunnel rats were sent in to kill any hiding enemy soldiers and to plant explosives to destroy the tunnels.

A tunnel rat was equipped with only a standard issue .45 caliber pistol, a bayonet and a flashlight, although most tunnel rats were allowed to choose another pistol with which to arm themselves. The tunnels were very dangerous, with numerous booby traps and enemies lying in wait. Often there were flooded U-bends in the tunnels to trap gas. Guards manned holes on the sides of tunnels through which spears could be thrust, impaling a crawling intruder. Not only were there human enemies, but also dangerous creatures, such as snakes, rats, spiders, scorpions, and ants. Black-Bearded Tomb Bats (Taphozous melanopogon) and Lesser Dawn Bats (Eonycteris spelaea) roosted in the tunnels and were a harmless nuisance if awoken.

Due to the confined space, the tunnel rats disliked the intense muzzle blast of the comparatively large .45 caliber round, which would often leave them temporarily deaf, and it was not uncommon for them to use whatever handgun they might find. A particularly favored weapon was a specially modified Smith & Wesson Model 29 known as the "quiet special purpose revolver". Unlike the standard Model 29, which fires a .44 Magnum cartridge, the quiet special purpose revolver instead shot a .410 shotgun shell. This cartridge was far less loud than the .45 caliber. In addition, the revolver lacked as much recoil as the M1911, was lighter, more useful in a tight, claustrophobic space such as a tunnel, and very compact as well.

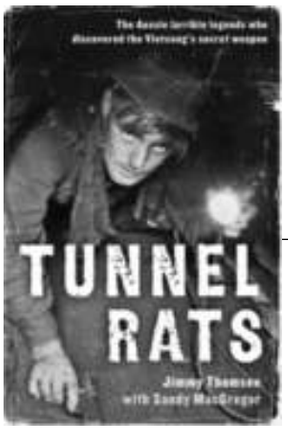
Tunnel rats were generally, but not exclusively, men of smaller stature in order to fit in the narrow tunnels. Such tactics came to prominence following their successful application in January 1966 during a combined US-Australian action against the Củ Chi tunnels in Binh Duong Province, known as Operation Crimp.

Part of the tunnel complex at Cu Chi.

A new book about the Australian Army engineers of 3 Field Troop has just been published. Thrilling, inspiring and action packed, this is the true story of the unsung heroes of Australia's war in Vietnam. Living up to their motto of 'We Make and We Break', they created the legend of the Tunnel Rats.

They were young, they were Australian, they were Army engineers and they were the first allied soldiers to risk their lives in the darkness of the Vietcong tunnels of South Vietnam. Staring death squarely in the face every day, not only did they follow their enemy down into these unknown underground labyrinths, but matched the Vietcong's jungle warfare skills and defused thousands of their clever booby traps.

Off duty, it was a different story. The bad boys of 3 Field Troop were a boozing, brawling, bonking bunch of larrikins, who cut a swathe through the bars and brothels of Saigon, fought American Military Police to a standstill, built a secret casino and booby-trapped their own HQ to teach their officers a lesson.



Tunnel Rats
by Jimmy Thomson
with Sandy MacGregor

Publisher: Allen & Unwin
ISBN: 9781742694245
Price: $27.99

Lötschberg tunnel celebrates 100 years

It took 961 tonnes of dynamite, five years of hard work and cost the lives of 64 men for workers to pierce the middle of the Lötschberg tunnel a century ago.

The high point of the construction of the 14.6-kilometre alpine tunnel joining the cantons of Bern and Valais was celebrated in April by a symbolic train journey by dignitaries and representatives of the company BLS. The breakthrough on March 31, 1911, was an engineering triumph. Despite an accident in 1908 which forced an 800-metre detour, the final gap between the two sides was just 10.2 centimetres vertically and 25.7 centimetres laterally. Two years later the work was complete and the tunnel opened to traffic, speeding up the journey to and from Italy. The tunnel at the summit lost importance after the new base tunnel entered into service in 2007, reducing travel time from north to south by one hour.

ATS-AUSIMM Article: 14th ATS Conference

Auckland played host to a truly international audience of over 300 delegates between 8 & 10 March this year, when the 14th Triennial Australasian Tunnelling Conference was held at the Sky City Convention Centre. Speakers and attendees from North and South America, the European Union and Asia added a good sprinkle of colour to the mainly Australian and NZ audience.

Themed "Development of Underground Space", it was the first dedicated tunnelling conference to be held in New Zealand. Right time; right place! Auckland is bursting at the seams. Providing for new infrastructure and for the replenishment of old components is a continuum of challenges for the likes of Watercare Services Limited and other CCO's (council controlled organisations) such as these led to the RONS (roads of national significance) projects for NZTA. They include a vital link between existing highway networks – the Waterview Connection, incorporating 2.3km of twin 3-lane tunnels, which will make available an alternative arterial across metropolitan Auckland from Manukau in the south to Puhoi in the north.

Conference feedback was very positive – it was a success. In part that was a result of having three strong keynote speakers. Conference Day 1 started with a challenge from Colin Crampton, Group Manager Highways and Network Operations, NZTA, who presented the opening address. He provided a strong encouragement for excellence, but also a timely reminder that we are a service industry. Our success depends on the success that our clients have in meeting their overarching goals. The tunnels we build are a means to an end; our tunnels are secondary to the overall service being provided.

Professor Giovanni Barla from the Polytechnic University of Turin set a high bar on day 1; an excellent blend of theory and practice regarding open face issues in TBM excavation in deep tunnels. The second plenary session on Day 2 given by Professor Arnold Dix was provocative in its challenge of an honest provision of fire and life systems, mixing in phrases such as "protection of people or profit". Day 3 saw Alan Morris unfold issues faced elsewhere, bringing an Asian flavour to the conference.

The conference theme permitted a wide range of topics and disciplines to be covered. There were multiple technical sessions on geotechnical aspects of tunnelling, ground support, tunnel excavationand fire& life safety. Further sessions covered hydropower, transportation tunnels and environmental challenges and risk. Over the 3 days of the conference, 58 technical papers were presented by speakers from all arms of the tunnelling industry with the overall standard of the papers being very high.

Aside from attending technical sessions and networking with their tunnelling friends and counterparts, the conference delegates were kept busy with a number of other activities including:

Conference Trade Exhibition – over 30 companies, all major players in the worldwide tunnelling industry, exhibited

Optional site visit to view the Victoria Park Tunnel construction

Conference Dinner on the 2nd night – the after dinner speaker was ex-All Black Eric Rush, who provided a very humorous and entertaining talk on his humble beginnings and international rugby experiences

Evan Giles

Conference Chair

Executive, Tunnels and Geotechnical,
PB New Zealand

The History of Australian Tunnelling

A colour publication by the Australasian Tunnelling Society

Over 150 pages of unique Australian tunneling projects from early 1800s to projects completed in 2009.

The book is available from ATS Secretariat Sheryl Harrington at Engineers Australia for $95 +GST

ALLEN NEYLAND TUNNELLING ACHIEVEMENT AWARD

Presented to Arnold Dix

ON THE OCCASION OF THE FOURTEENTH AUSTRALASIAN TUNNELLING CONFERENCE, AUCKLAND, MARCH, 2011

Arnold Dix has over the past 15 years established a reputation both within the Australasian tunnelling industry and internationally as a leading advisor on legal, technical, and risk management issues, particularly in the area of fire and life safety, related to the delivery and operation of underground infrastructure. Arnold has dual qualifications in Science and the Law, having graduated with a BSc Hons in Geology in 1985 and an LLB in 1987. He was admitted to the Victorian Bar in 1989 and continues to practice as a Barrister as well as technical and strategic advisor.

Arnold's first close involvement in the tunnelling field was in 1996 thorough the Melbourne City Link Project when he was engaged as part of the legal team established address a number of appeals that had been lodged against the Works Permit Application to build the ventilation system for the project. That commission required Arnold to travel to Europe to take witness statements from experts in the field. This trip introduced Arnold to European expertise in the field of tunnelling and also introduced Europe, and later the world, to Arnold's unique passion for whatever issue he is involve with at any given time and his mischievous sense of humour!

By the late 1990's Arnold had developed a real interest and fascination with tunnelling and the underground space, and the overseas experts he was liaising with 'spotted' the talent that Arnold's intellect and enthusiasm represented and introduced him to the mystical world of PIARC and the International Tunnelling Association (ITA). Since 2000, Arnold has been an Australian Delegate on the PIARC Working Group, 6, 'Tunnel Ventilation Safety and Environment' where he has undertaken the role of Special Task Group Leader on several important initiatives. He also hold a number of important positions within the ITA including; Chairman of the Contractual Practices Group, Secretary of the Security Group and Legal Counsel to the ITA Executive.

Additionally, Arnold has been afforded to the very rare honour of being invited by the United States to participate as a full voting member on two committees of the National Fire Protection Association (NFPA). These committees are NFPA130 – Underground Fixed Guideway Systems and NFPA – 502 Road Tunnels. Arnold has participated in these two committees since 2004 and 2005 respectively. At the invitation of the Japanese Government, Arnold has also participated in the Society for Social Management systems – Centre of excellence disaster engineering program for Japan since 2006. These appointments confirm his international stature.

The Australasian Tunnelling Industry is indebted to Arnold, not just for the substantial contribution that he has made to our domestic tunnelling practice, particularly in the fields of fire and life safety engineering, but also for the promotion of our local practice to the world at large.

At the invitation of the Japanese Government, Arnold has also participated in the Society for Social Management systems – Centre of excellence disaster engineering program for Japan since 2006.

David Sugden 1919–2011

ATS are said to hear the news of the death of David Sugden who passed away on the evening of 17th July 2011 aged 82.

David was the driving force behind the successful design of mechanical full-face rock excavation machinery over a number of years, resulting in the forging of countless tunnels all across the world. David has continually shown a commitment to innovation and design throughout his career, often custom making machinery to solve problems that arose and for which no existing devices were available or appropriate. As a result of this attitude, David is listed as the inventor on over 40 patents.

David was born in Western Australia aNd began his career in 1938 as a Cadet Engineer with the Public Works Dept of WA he continued with a number of appointments at the Hydro-Electric Commission of Tasmania. Whilst at the HEC, David was instrumental in introducing the Commission and subsequently Australia to Machine tunnelling. In 1967, David began a long and internationally recognised consultancy career that continues to this day. Notably he has had significant involvement with both the Robbins Company of Seattle, USA and Terratec Asia Pacific. In 1967, David began a long and internationally recognised consultancy career that continued until early in the 2000's. He was the driving force behind the successful design of modern Tunnel Boring Machines that have since resulted in the excavation of countless tunnels throughout the world. At the Tasmanian Hydro, David conceived systems for construction that were not available on the global market at the time, including:

- 3 Tower cableways
- radial cableways
- Hydraulic drill jumbos
- Hydrostatic transmission locomotives
- Cherry pickers and so on.

He did not limit his immense talent to designing tunnelling equipment. To his credit are high horsepower, hydraulic motors, marine propellers, and even violins. Dave's love of music was like many of his interests. He had a way of enjoying a musical performance at a deeper level of feeling than most, to the point of analysis and engineering investigation. His musical thinking expanded to include design and development of a new way to make beautiful sound as with a design of a revolutionary violin. The Institute of Engineers in Australia recognised his contribution to tunnelling and the mentoring of young engineers involved in the field, with the Alan Neyland Memorial Award during 1996, and then in 2003, the Michell Award for his outstanding contribution to Australian Mechanical Engineering. In 2004 the Australasian Tunnelling Society conceived the David Sugden Award to encourage young engineers to develop the art of technical writing, and in 2007 they published David's treatise on Fundamentals of Hard Rock Excavation. During 2002 he was awarded the Order of Australia.David leaves behind his five sons, Robert, Michael, Chris, Nigel, and John, and his second wife, Margaret, who has been is support now formany years. Peg, the mother of David's' boys died 20 years ago.

Gus Nothdurft 1920 to 2011

By Robyn Nothdurft

Gus Nothdurft passed on 2.2.2011 aged 91. He came out to Australia in 1951 under a sponsorship with Kaiser-Walsh-Perini Raymond as a carpenter and progressed through the ranks on various Thiess Projects including the Snowy.

Dad made many lifelong friends in the snowy and also helped a lot of people with anywhere from food, a roof over their heads to lending money because that is how he was.

Not much has been said about my father over the years which is a shame because he was a quiet achiever. He got the job done and seemed to get called in whenever something went wrong. He was called "grumpy" by a lot of his men and had the loudest whistle in the snowy.

He had a great deal of respect for the Thiess boys and was in particular fond of Colin.

Both my sister Petra and I were raised in the Snowy and have fond memories still of that part of our lives.

We will be travelling back to Cooma on 5 October to scatter my parents ashes at Happy Jack and Bella Vista – access permitting.

Rest in Peace Gus a man among men.

METRO – A joint Safety in Infrastructure project

METRO is a three year Swedish research project about infrastructure protection. The focus of the project is on the protection of underground rail mass transport systems, such as tunnels and subway stations. Both fire and explosion hazards are studied, and aspects such as evacuation, rescue operations and smoke control are important parts of the project.

As part of the project a series of small-scale, medium-scale and full-scale experiments will be performed. The full-scale test will be performed 13 September in the Brunsberg tunnel near Arvika, Sweden. The goal with these tests is to develop design fires for underground rail mass transport systems. In the full-scale fire experiments, commuter trains provided by Stockholm Public Transport (SL) will be used. The experiments will result in heat release rate curves for varying conditions (materials, ventilation, etc). These results, together with the developed mathematical models for gas temperatures, radiation, smoke spread, toxicity and extraordinary strain on construction, will be valuable tools when designing tunnels and planning rescue operations.

A total of nine partners take part in the project. METRO is funded by five organizations, namely Stockholm Public Transport (SL), Swedish Civil Contingencies Agency (MSB), the Swedish Transport Administration, the Swedish Fortifications Agency, and the Swedish Fire Research Board.

In conjunction with the full-scale tests, a seminar will be organized concerning the project and results to date. Some of the speakers are:

Haukur Ingason (SP Technical Research Institute of Sweden) Anders Bergqvist (CEO Swedish Fire Protection Association) Magnus Ranstorp (Swedish National Defense College) Martin Brown (Director of Safety, Health and Environment, Transport for London) Jan Wisén (Fire Chief Greater Stockholm Fire Brigade)

You are invited to participate in this METRO Seminar and visit the test site of the full-scale fire test 13 – 14 September 2011 at ENGgården, Brunskog, Sweden, click here for more information.

Registrations should be made online at: http://www.sp.se/en/training/Sidor/metro_seminar_2011.aspx

Please make sure to register as soon as possible due to a limited number of participants.

For more information about the METRO project please visit the METRO web site at: www.metroproject.se

Dr. Haukur Ingason

Project Leader METRO project
Adj. Professor Mälardalen University

ATS Sydney Group Report

Since the Executive meeting held on 7th March the Sydney Group have continued to have monthly meetings at one of the committee members' offices. Attendance has been good with 8 or 9 members present at each meeting.

Report on Activities

Activity	Outcome
2011 presentations	1. 16th February – Chris Windsor on "Reconciliation of Strain, Structure, Strength & Stress and its application to Civil Engineering Projects". 2. 13th April – Gary Kile from PB (USA) on "Boston Big Dig". 3. 15th June – Rob Nievergelt on "Adelaide Desalination Plant" 4. 17th August – Stefan Bernard on "Introduction to Shotcrete Guide". 5. 19th October – Charles McDonald from BrisConnections on "Airport Link" 6. 16th November – Dr Keith Jonson on tunnel safety related issues (NSW Workcover Tunnelling Code of Practice and recent developments in safety).
2012 presentations	• There has been interest for a combined Risk Estimating Society/ATS talk – following an enquiry from Evans & Peck. To be investigated further. • Presentation of the Austroads – Aust & NZ Tunnel Design Guidelines.
Technical session – Thank you	• A case of mixed wine (2008 Orange Cabernet Sauvignon & 2009 Yarra Valley Sauvignon Blanc) has been obtained with specially printed ATS labelling. A twin box will be provided to the guest presenter after each technical session.
Sydney AGM	• Sydney Group AGM (and final technical session) will move from December to 16th November. • The order of the evening to be the same as last year 1. AGM 2. Presentation 3. Meal. • Call for Committee members to go out at the October technical session. • Closing date for nominations – 9th November. • An extra committee meeting will be held on 9th November to collate and discuss nominees & office bearers. The Executive will receive the list of nominates prior to the AGM. • Once the Committee is elected at the AGM, office bearers can be ratified.
Sydney ATS Golf Day	• Golf Day at Northbridge Golf Club on 14th October • Sponsorship still available. • Suggested cost to be $125 per player.
Sydney ATS Group Gmail Account	• A new gmail account was set up in June 2011. • This facility will enable the storage of documents, templates and the Non EA/ATS-member list. There is a 10MB limit.

Daryl Gilchrist
Secretary, Sydney Group

ATS Brisbane Group Report

Tunnelling activity continued at strong levels in Brisbane through 2011. The Airport Link Northern Busway continues although most tunnelling work is now complete. Legacy Way (aka Northern Link) has now started with TBM tunnelling due to commence early next year. The $8B Cross River Rail project has been delayed as a result of the recent Brisbane floods. Over the past 12 months, we have held a number of technical sessions as listed below. Typically we attract audiences of between 80 and 120.

Date	Title	Speaker	Sponsor
February 2011	Northern Link – The Winning Solution	Dale Gilbert et al, Transcity	Transcity
April 2011	Airport Link Progress Update	Charles MacDonald, BrisConnections	BrisConnections
May 2011	Constructing the Tunnels for the Victorian Desalination Plant	Glyn Edwards, Thiess	Thiess Pty Ltd
June 2011	Tunnelling Opportunities in New Zealand	Dr Harry Asche, Aurecon	Aurecon
June 2011	Site Visit to Airport Link Jacked Boxes		

Plans are well advanced for our second ATS Industry Golf Day in October (a charity event) – committed sponsorship is already well ahead of last year's event. So far this year our local committee has held one breakfast meeting and has another planned in September. Engineers Australia Queensland continues to support us by providing a superb venue for our technical sessions and also a videostreaming service via their EAQ website.

Our local ATS committee comprises:

Andrew Day, Thiess (Chairman)	Alex DeAboitiz, City North Infrastructure	Charles MacDonald, BrisConnections
Scott Keniston, Bamser (Secretary)	Andrea Edney, Leighton	Jeremy Kruger, Thiess
Alan Robertson, AusRocks (Treasurer)	Doug Maconochie, Parsons Brinckerhoff	Simon Strong, Herrenknecht
Warren Mahoney, BASF	Christophe Bragard, Arup	Stephen Vaughan, UQ (Young Engineer)
Craig Roberts, BOSFA	Matthew Norbert, GHD	

Andrew Day
Chairman, Brsbane Group

ATS Melbourne Group Report

The Victorian Group has been successful in delivering a regular program of technical sessions for its members. We have been able to hold one session per month in this reporting period, and from an analysis of the attendance figures and feedback, there continues to be a good mix of clients, consultants and contractors as well as a good number of young engineers at each event.

A summary of the technical meetings for the period are as follows;

23rd February 2011	Rock bolting in underground coal mining – a South African experience by Lesley Munsamy (GH&D).
23rd March 2011	Crossrail and SCL, a presentation by David Gutteridge (Mott MacDonald).
27th April 2011	Soft ground TBM tunnelling in the Yarra delta, by Adam Gorny (John Holland Tunnelling)
25th May 2011	Tunnelling for the Adelaide desalination project, by Rodney Harrison (McConnell Dowell) and Rob Nievergelt (SMEC).
8th June 2011	Is selecting a TBM a puzzle? A joint meeting with AGS, presentations by Andrew Campbell (AECOM) and Tony Peach
27th July 2011	TBM's – Future trends presented by Doug Harding (Robbins)

The continuing trend of a full program and well attended sessions is most encouraging, thanks largely to an expanded committee which has enabled the workload to be shared around.

With the exception of one of these technical sessions, all were fully sponsored and we acknowledge the support from McConnell Dowell, John Holland, Mott MacDonald, GH&D and Robins.

The program currently planned for the second half of 2011 is as follows.

August 2011	Constructing tunnels for the Victorian desalination project
September 2011	Legacy Way – an update
October 2011	Geotechnical baseline reports
November 2011	TBA

The Victorian Groups AGM is scheduled to coincide with the October technical session. A budget for the 2011–12 year has been prepared and is attached to this report.

Ed Taylor

Chair, Victorian Group

ATS WA Chapter Report

Since last report in March 2011, the WA Chapter has not held any technical sessions. Two sessions are planned for August and September:

18 August	Victoria desalination project tunnels
1 September	Latest developments with Singapore tunnelling projects

The Public Transport Authority of Western Australia **Perth City Link Rail Project** involves lowering the Fremantle rail lines into cut and cover tunnel above the existing Joondalup line bored tunnels, eventually to be followed by lowering of the Wellington Street Bus Station underground to enable redevelopment of the Perth Rail Yard land for public open space, residential and commercial towers and other civic developments. The first stage of the project, lowering the rail lines, was awarded to the Perth city rail Alliance (John Holland-GHD-PTA) in March 2011, and detailed design and early site works are well underway. Project completion is scheduled for 2014.

The Desal 2 Project at Binningup, about 1.5 hours' drive south of Perth is nearing completion. It will supply water to Perth, as well as the nearby regional city of Bunbury. It is designed to initially deliver 50 gigalitres of potable water per year or 20% of Perth's requirements. Capacity may be increased to 100 gigalitres/year at a future date. The project will deliver potable water into the South West Integrated System via a 30 km 1.3m diameter pipeline to a storage facility near Harvey. It is expected to be operational in 2011.

The site is located at about 1.2km from the coast with most of the plant situated in a disused limestone quarry. The two intake and one outlet pipelines from the plant to the beach and extending about 500m under the ocean were successfully constructed using two slurry tunnel boring machines and pipejacking technology to cover a distance of about 900m for each tunnel. Wet recovery techniques were used to retrieve the TBMs from offshore. The project is being undertaken by the Southern SeaWater Alliance and the Water Corporation (SSJV) and the tunnelling work was undertaken by Zueblin Australia Pty Ltd.

Several oil and gas projects are either considering or well advanced with a TBM tunnel/pipe Jack shore crossing to bring product pipelines safely onshore (e.g. Wheatstone and Woodside Browse).

The WA Chapter Committee comprises 5 members and meets monthly. The Chapter has over 70 individual members plus 5 company memberships registered in WA. Keep an eye on the ATS website for future event details.

Eric Hudson-Smith

WA Chapter Chair

New Zealand Chapter Report

Report on Activities

Activity	Outcome
14th ATS Conference	A very successful conference was held at the Sky City Conference Centre in Auckland. Over 300 delegates attended. The venue and catering was good and AUSIMM excelled in managing the event, achieving a record number (ZERO) of complaints and no negative feedback. The conference was preceded by a half-day course on Tunnel Design given by Professor Giovanni Barla of the Turin Polytechnic University. The course was fully subscribed and the revenue generated covered all costs, including travel costs from Italy for Prof Barla, leaving a small profit contribution. The event was profitable and the half-share allocated to ATS is A$113,444.72. This will underpin the financial stability of the ATS over the coming years.
Hibernation	There has been some intense activity in the industry with many of the members involved in project bids. This activity coupled with the energy expended in the preparatory work for the conference led the group to agree that group activities will be put on hold until the end of winter, with 1–2 evening talks being planned to complete the year.

Australian Shotcrete Society – AuSS

Future Aims and Strategies – 2011 and beyond

Since the International conference there have been two national committee meetings. In a morning meeting held at Ryde golf club, we set out some basic strategic areas where we want to go in the future. These were:

1. To set up a specific AuSS web site . This will be a basic format initially getting more interactive in the future. Hopefully it can be linked with the ATS website and vice versa.
2. A series of seminars are being organised in various states for 2011. This is in addition to the CIA seminars that are organized in Perth, Adelaide, Melbourne, Sydney and Brisbane.
3. Training – and nozzle man certification. The AuSS aims to be a central coordinator in the EFNARC modified training program for shotcrete nozzle man certification. Approximately some 5 EFNARC trainers exist in Australia who are already of trainer standard. We are to attempt to coordinate and take a leading role in organizing via the EFNARC trained personnel the future training, certification and databank involved. Effectively the AuSS would be one part of the certification process, and be a signatory to granted certificates.
4. Member List – the accurate list of members is still a major problem for the AuSS within the ATS. The last list goes back some 2–3 years and really can not be relied upon. The mail out list for the American Shotcrete magazine is probably the most accurate but even that is suspect. We definitely need a way to accurately determine our membership within the ATS. To this end the first thing that is to be done is a mail out to our existing mail out list with a flyer, asking several questions. I would like to find an administrative way of determining the AuSS membership within EA / ATS asap, as it is only stirring various members on the committee who would like to have a separate body.
5. A presentational video on aspects of shotcreting is proposed to be put together in the next 2 quarters. This will be a simple basic video that can be used at various conferences and expos, to fly the flag regarding shotcrete and the Society.
6. Financials – The treasurer presented the latest financials showing a healthy balance sheet, and the requirement to invest in some of the earlier strategies above.

Shotcrete Guideline (2nd Edition)

Actual Title "Recommended practice – Shotcreting in Australia"

The 2nd Edition is now available on the CIA website. The AuSS have also discussed that we will provide an electronic copy to all our member , once the membership database is finalized, and up to date.

John Gelson
Shotcrete Group Representative

Assessing, managing and monitoring impacts on buildings induced by urban tunnelling

Parsons Brinckerhoff tunnelling expert Dr Nagen Loganathan will take to the podium at the Tunnelling 20 Twenty Conference in Hong Kong next week.

Dr Loganathan who is widely recognised for his technical skills, has recently published "An Innovative Method for assessing Tunnelling Induced Risks to Adjacent Structures."

Dr Loganathan said that tunnel excavation is inevitably associated with high risks because of the variability of ground and groundwater conditions.

"In urban environments, tunnelling risks are particularly high because of their potential impacts on adjacent structures and utilities.

"The monograph that I produced introduces a methodology to minimise those risks by identifying ground-loss and deformation mechanisms associated with tunnelling," said Dr Loganathan

Dr Loganathan's presentation will look at:

- Assessing and protecting buildings in city centre
- Predicting and monitoring movements, differential settlements and response of buildings
- Understanding the effect of dewatering
- Considering long-term ground movements
- Predicting ground movements when tunnelling in stiff over-consolidated clays
- Managing requirements of building owners – avoiding unnecessary protection of structures
- Assessing effect of adjacent construction on tunnels

WHERE: The Excelsior, Hong Kong

WHEN: 14.50pm on Wednesday 21 September

Networking: the future of tunnelling

The ASTT Networking Evening, hosted by Melbourne Water and Great Southern Press, was attended by a sold out crowd of over 60 industry professionals gathering to hear the latest tunnelling innovations and projects.

The presentation part of the evening was convened by Kate Pemberton, Editor of Trenchless Australasia, who outlined current developments across the industry and insight into the upcoming No-Dig Down Under 2011 Conference and Exhibition.

ASTT Victoria Councillor Chris Frangos welcomed delegates and speakers to the networking event, after which he introduced Program Manager for Melbourne Water's Pipelines (Sewerage and Drainage) Capital Program Phil Corluka.

Mr Corluka introduced the tunnelling projects to be discussed – Melbourne Main Sewer Replacement (MMSR) and the Northern Sewerage Project (NSP). The presentations focused on the use of Trenchless Technology in delivery of MMSR and NSP.

Melbourne Water Stage 1 Project Manager Mike Filby explained the historical context of the sewer system in Melbourne, known as "smellbourne" before the installation of the network.

Melbourne Water Project Manager (MMSR) Peter Clarke spoke about tunnelling the infamous coote island silt under the Docklands to increase the capacity of the CBD's sole sewer outlet.

John Holland Tunnelling Operations Manager Evan Stamatopoulos addressed industry developments, technical advancements and future directions in Trenchless Technology.

Following the closing of the presentations, drinks and canapés were provided to enable colleagues and industry associates to catch up, talk trenchless or otherwise, and look forward to the future of the trenchless industry.

The third networking event in this series will be held 12 May in Brisbane, focussing on HDD and geothermal. Places are filling up fast.

2011 Mine Ventilation Conference

5–6 September 2011,
University of New South Wales
http://austminevent.com.au/

This Conference will focus on Coal Mine Ventilation. It is envisaged that future Conferences will be expanded to include underground metal and other mining activities requiring ventilation.

Keynote Speaker

Dr David Cliff

Underground explosion expert and director of the University of Queensland's Minerals Industry Safety and Health Centre will be the keynote speaker of the conference.

Other speakers include:

Mick Brady – Joncris

Rao Balusu – CSIRO

John Rowland – Dallas Mining Services

Mark Parcell – The Safety Managers

Ting Ren – University of Wollongong

Basil Beamish – University of Queensland

Adrian Halim – West Australian School of Mines

Alex Lim – Donaldson Coal

Mark Ogle – Tahmoor

Borys Poborowski – Austar Coal Mine Pty Ltd

For registration enquires please contact:

Tara Hicks
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Still from Carlo Ledesma's indie horror debut, The Tunnel

THE TUNNEL

The Tunnel

A torrent of thrills in Sydney's secret underground

By Joshua Blackman

At this year's Sundance Film Festival, Kevin Smith gave film executives the finger by stating to their faces that he would not submit to the traditional method of distribution for his new film, Red State. Subsequently, he's taken the film out on the road to huge theatre houses in the United States to try and recoup his $3m budget – and maybe even make a profit. It's a brave and not unprecedented technique, much like the one employed by Distracted Media's Julian Harvey and Enzo Tedeschi, two local producers whose found-footage horror flick, *The Tunnel*, has sold-out the opening night of A Night Of Horror Film Festival.

The Tunnel was financed through what its producers call the "135k Project," a scheme that gives individuals the opportunity to invest in the production by buying some of the 135,000 frames that make up the 90-minute film, for $1 a pop. By circumventing the laborious and often fruitless fundraising process, it's given the filmmakers extraordinary freedom and creative control. It's also scared the bejesus out of traditional studio executives and investors: not only will the film not have a conventional cinematic release, but it will be released online, for free, via the peer-to-peer file-sharing protocol, BitTorrent.

'BitTorrent' and 'free' are not two words executives want to hear, and this idea, at least initially, ruffled industry feathers. Tedeschi tried at least five times to get the film listed on the Internet Movie Database (IMDb) – only to have it rejected, probably due to BitTorrent's pronounced association with online piracy. And after announcing that *The Tunnel* would be released online for free, no distributor would go near the film for a theatrical screening. But now, almost a year later, director Carlo Ledesma is finding people are starting to come around.

"As soon as we announced it we got a few calls from film festivals and even a few distributors saying they wanted to explore the possibility of showing it in a few cinemas here and there. We knew we were never going to get a widespread theatre release, but that's okay with us, because our main goal is to get the film seen by as many people as we can."

The film is a horror-documentary about a group of journalists who venture into Sydney's underground tunnels. (It's based on 'Lake St. James', an unused, water-logged tunnel that was for a time going to be used by the government as a water store.) It begins with them chasing a story about homeless people who've gone missing; however (as per the film's tagline) it turns out the story is chasing them.

"It is a found-footage horror movie on the surface, but it's also a sort of human drama documentary," says Ledesma, a first-time feature helmer whose short *The Haircut* won a special prize at the Short Film Corner at Cannes in 2007. "I think what we decided to make different with this film is you actually get to see who lives and who doesn't make it as the film goes on, because we do interview shots with the survivors. We're hoping the interest in the film will lie not so much in the unexpected but in the human drama."

The DIY shooting style was well-suited to the micro-budget, and even without a traditional release, it looks like *The Tunnel* will recoup its costs. The industry has come around too – the film is now listed on IMDb, and the filmmakers have nabbed a direct-to-DVD deal with Transmission and Paramount. As for the future of the 135k technique, the jury's still out.

"I think it's a way. I wouldn't say it's *the* way," says Ledesma, with rising confidence. "The thing we're adamant about telling people is, look, we're not declaring to the world that this is the future, or this is the way to do things from here on. What we're merely trying to do is present filmmakers with an option, for people like us; saying you don't need a distribution deal from a studio or from a big company to get your film made, or to get seen."

"The internet is there to be used by us. Data rates are getting faster. It is easier to download stuff. We're exploring it as an option and we're gladly raising out hands to be the guinea pig for this kind of model. And in the coming years, we'll keep on honing it and refining it. Hopefully other people will do the same. We'll see what happens."

What: *The Tunnel* – Opening Night for A Night Of Horror Film Festival

When: March 31 – April 8

Where: Dendy Newtown More: www.anightofhorror.com

Check out the new Aussie film *The Tunnel* filmed in the historic St James station tunnels in Sydney. The story is a bit crass but the tunnel shots are awesome.

Now showing on Showtime on Foxtel

Check out the teaser on You Tube

http://www.youtube.com/watch?v=u47cTpo70EE&feature=player_embedded

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Updated : December 17, 2010

5th International Symposium on Tunnel Safety and Security in New York, 14-16th March 2012

Call for papers - Final Announcement

Dear Colleague,

We are pleased to send this final Call for Papers for the 5th International Symposium on Tunnel Safety and Security (ISTSS 2012), to be held at The Roosevelt Hotel in New York, USA, 14-16th March 2012. This event will bring together expertise in the field of safety and security for 3 days of presentations and exhibits.

The ISTSS has rapidly become a highly respected scientific Symposium on Tunnel Safety and Security globally. Since its inception in 2003 it has continued to attract delegates from all over the world.

We have already received many submissions. This is your final reminder to make a submission. Paper abstracts should be submitted to the Secretariat by email (istss@sp.se) by 1st June 2011, poster abstracts by the 1st September 2011.

For more information see Call for Papers or visit the Symposium website (www.istss.se) where you can find Author instructions.

If you have any questions you are also welcome to contact us.

Registration will open soon at www.istss.se

Kind regards,

Mrs Kaisa Kaukoranta
ISTSS Organizing Committee

LinkedIn

Please join our group at LinkedIn.

Contact

Kaisa Kaukoranta
ISTSS Organizing Committee

SP Technical Research Institute of Sweden, Fire Technology Department

E-mail: istss@sp.se

SP Technical Research Institute of Sweden - Phone +46 10 516 50 00 - www.sp.se

5th International Symposium on Tunnel Safety and Security in New York, 14-16th March 2012

Call for papers - Fifth Announcement

Dear Colleague,

We are pleased to send this fifth Call for Papers for the 5th International Symposium on Tunnel Safety and Security (ISTSS 2012), to be held at The Roosevelt Hotel in New York, USA, 14-16th March 2012. This event will bring together expertise in the field of safety and security for 3 days of presentations and exhibits. The previous symposium in Frankfurt in March 2010 was a great success with more than 240 delegates.

We hope that you are interested in taking part in ISTSS 2012 and welcome you to submit a paper or poster for presentation. Papers and posters will be reviewed on the basis of an extended abstract of not more than two pages. Paper abstracts should be submitted to the Secretariat by email (istss@sp.se) by 1st June 2011, poster abstracts by the 1st September 2011.

For more information see Call for Papers or visit the Symposium website (www.istss.se) where you can find Author instruction.

If you have any questions you are also welcome to contact us.

Kind regards,

Mrs Kaisa Kaukoranta
ISTSS Organizing Committee

Narrow Vein Mining Conference 2012

Working Smarter Through Technical Collaboration

26–27 March 2012 | Perth, Western Australia

THE CONFERENCE

Narrow vein mining operations form a relatively small but important part of the global mining industry, principally focused on commodities such as gold, silver and tin. Many historical narrow vein mineral fields are now being reworked or redeveloped in Australia and beyond.

The skills and expertise required to manage these resources are arguably highly specialised and relatively rare at this time. The challenges of narrow vein deposits include: dealing with issues of complex geology; high to extreme nugget effects; ore/waste misclassification; high planned and additional dilution; the need for strong selectivity; high-stress conditions; low tonnes per vertical metre; and coarse gold and/or complex metallurgy. Today, there is an overarching need for lower costs, mechanisation and a zero harm environment.

The purpose of this Conference is to gather all involved in narrow vein mining, including geologists, mining/geotechnical engineers, and metallurgists. The future of narrow vein mining depends upon skilled professionals and on developing practical and innovative methods for orebody definition, mining and processing.

Dr Simon Dominy FAusIMM(C)
Conference Chair – Snowden Group/
WA School of Mines

THE THEME

The theme for this conference is *"working smarter through technical collaboration"* and will incorporate papers on the following topics:

- Geological controls on narrow orebodies
- Resource/reserve estimation and reporting
- Monitoring and controlling dilution
- Best practices in mining
- Bulk or selective mining methods?
- Geotechnical challenges
- Managing narrow vein operations
- Removing technical silos to achieve professional unity
- Health & Safety issues
- Mineral processing – from core to brick

SPONSORSHIP & EXHIBITION OPPORTUNITIES

Showcase your business at the Conference and register your interest in sponsorship today! A Trade Exhibition will be held in association with the event and will provide an excellent opportunity for companies to display their products and services to the participants. Should you wish to discuss opportunities, develop a package to suit your budget, or if you have any enquiries, please do not hesitate to contact event management.

Event Management: The AusIMM
Belinda Martin, Senior Coordinator, Conferences & Events
Telephone: +61 3 9658 6125
Email: bmartin@ausimm.com.au

5th International Symposium on Tunnel Safety and Security in New York, 14-16th March 2012

Registration is now open!

Dear Colleague,

It is my pleasure to announce that registration for ISTSS is now open.

At the previous ISTSS in Frankfurt we had over 250 delegates from some 30 countries. We hope to see even more in New York next year.

For more information check out our website www.istss.se .

Yours,

Prof. Haukur Ingason
Chair, ISTSS Scientific Committee

LinkedIn

Please join our group at LinkedIn.

Contact

Kaisa Kaukoranta
ISTSS Organizing Committee

SP Technical Research Institute of Sweden, Fire Technology Department

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PROJECT EVALUATION 2012

24–25 May 2012

Grand Hyatt, Melbourne, Australia

http://www.ausimm.com.au/projectevaluation2012/

CALLING FOR PAPERS – Submission Deadline 22 August

Project Evaluation 2012 is the third conference in a developing series of conferences that commenced in 2007 and was followed up with a conference in 2009. The broad objective of these conferences was to provide a professional forum for personnel responsible for undertaking evaluations of mineral properties and projects and also those who rely on them for financial decision making as investors or as developers.

In 2007 the theme for the Project Evaluation Conference was "Getting it Right" against a background of major growth in the minerals industry and the accelerating demand for project evaluations. In this context "Getting Right" was about putting a focus on an increased need to ensure that the very process of those evaluations are sound and the standards applied ensure their success.

In the 2009's theme was "Moving Forward in Challenging Times" and this theme could hardly have been more apt. However, at the time of its inception the trend for the minerals industry and economy was all up on the back of a booming world economy and by the time the conference came round in 2009 with the pace of mineral project development had significantly slowed down as a result of the GFC.

In 2012 our theme will be "Dealing with Uncertainty". This is reality for a project. From inception to completion we have to deal with a plethora of variable inputs, many beyond our control. We need to be cognisant of these, plan for and model them, so that considered decisions can be made.

THE PROPOSED TOPICS ARE:

- Dealing with uncertainty, management of opportunity and risks
- Application of project evaluation tools methods
- The role of benchmarking
- Financial modelling
- Resolving issues project issues
- Building effective project teams
- Effective management of the project evaluations
- Sustainability
- Social License

ONLINE ABSTRACT SUBMISSION

Please submit an abstract not exceeding 300 words in English to the Project Evaluation Conference 2012 Speakers' Portal http://www.ausimm.com.au/projectevaluation2012/papers.asp

Abstract Submission Deadline – 22 August 2011

Papers which are accepted by the Committee will be subject to peer review and the selection criteria include relevance to Conference themes, accuracy and originality of ideas, significance of the contribution and quality of presentation. All accepted papers will be published in the Conference Proceedings and presented at Conference technical sessions. Authors are required to attend the Conference to present their papers.

For further information, please contact:
Olivia Tet Fong, Coordinator, Publications Telephone: +61 3 9658 6153 | Facsimile: +61 3 9662 3662

For all enquiries including Sponsorship, Exhibition Opportunities and general enquiries:
Tara Hicks, Coordinator, Conferences & Events Telephone: +61 3 9658 6127 | Facsimile: +61 3 9662 3662
Email: thicks@ausimm.com.au

The Centre for Engineering Leadership and Management and Young Engineers Australia have once again joined forces to present the 2012 Engineering Leadership Conference (ELC 2012).

With the extraordinary insights gained from ELC 2010 still fresh in our memory, it's now time to diarise the next conference which is only 15 short months away.

The conference runs from 30 May 2012 to 2 June 2012 at the Adelaide Convention Centre, with workshops and technical tours on the first day, paper presentations, poster sessions and workshops on the two formal session days and a Conference social tour on the final day (Saturday).

The spirit of the 2010 conference and its outcomes have paved a path to this coming conference theme – **Passing the Baton – Engineering Australia's Future**.

Specifically designed conference content and addresses by eminent international and local keynote speakers will focus on the global issues that will shape the future of our industry in the 21st C.

As emerging leaders learn and develop their skills based upon the experience of others, the intelligence growth of our industry relies more and more on substantial and robust business events such as the Engineering Leadership Conference. It will deliver on the theme as resolutely as the last conference.

Add the website www.elc2012.org to your favourites and visit regularly for updates and information on conference content, keynote speakers, registration details and special announcements.

Make sure to fast forward you diary to 30 May 2012 – 2 June 2012 and mark the dates for the Engineering Leadership Conference. It's not to be missed!

All further enquiries please contact the Conference Office:

elc2012@icms.com.au Phone: +61 7 3844 1138

THE 6TH ANNUAL

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Infrastructure is hard. If it was easy, if the lead times were easy, even the last government would have tried to do it before the election [...]. We are keen to get on with the job." *Barry O'Farrell, 28th March 2011*

Dear Mr Lees ,

During his election campaign the NSW Premier made the delivery of major transport infrastructure projects for Sydney and New South Wales a key priority for his government. Now it is time to "get on with the job"

The **NSW Transport Infrastructure Summit** returns in 2011 with two focussed days: Day One- **Sydney Briefing Day** | Day Two: **NSW Freight Briefing Day**

Tailor your participation and **attend one or both briefing days** to focus on what really matters to your organisation. Both conference days will contain of case study presentations, panel discussions and policy perspectives

SYDNEY BRIEFING DAY 5 October 2011	NSW FREIGHT BRIEFING DAY October 2011
• Delivering the North-West rail link • What opportunities are there for private operators to deliver better public transport outcomes in Sydney? • The role of transport infrastructure in the population debate • Transforming Sydney's West	• Assessing the current state of the NSW Freight network • Examining the progress of major transport infrastructure construction and upgrade works currently underway • Taking a closer look at missing links in the freight transport network and initiatives that will lead to an increase in productivity and regional growth
View the agenda here Book your place here	View the agenda here Book your place here

Look out for further agenda updates at **www.informa.com.au/nswtransport**

SPONSORSHIP & EXHIBITION: To profile your company at this focussed conference, contact: sarah.cullen@informa.com.au or call Sarah Cullen on 03 8842 2430

Andrea Hoymann
Conference Manager
LLDCN State Transport Series

The University of New South Wales in conjunction with The AusIMM is hosting the

2011 Mine Ventilation Conference

5–6 September 2011, University of New South Wales

This Conference will focus on Coal Mine Ventilation.It is envisaged that future Conferences will be expanded to include underground metal and other mining activities requiring ventilation.

Keynote Speaker

Dr David Cliff

Underground explosion expert and director of the University of Queensland's Minerals Industry Safety and Health Centre will be the keynote speaker of the conference.

Other speakers include:

Mick Brady – Joncris

Rao Balusu – CSIRO

John Rowland – Dallas Mining Services

Mark Parcell – The Safety Managers

Ting Ren – University of Wollongong

Basil Beamish – University of Queensland

Adrian Halim – West Australian School of Mines

Alex Lim – Donaldson Coal

For registration enquires please contact:

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For sponsorship, exhibition and technical enquiries please contact:

Duncan Chalmers
The Conference Convener
Email: d.chalmers@unsw.edu.au

ATS Tunnel Database

NEW SOUTH WALES

Project:	Sydney CBD Metro		
Client: SMA	**Designer** PB/Arup	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Sydney CBD West Metro will initially run from Central to Rozelle and eventually to the north west	**Current status:**	Cancelled

Project:	City Relief Line		
Client: SMA	**Designer** PB/Arup	**Contractor:**	**Supervising Engineer:**
Scope of work:	5km priority tunnel is proposed to be constructed from Eveleigh to Wynyard, separating western services from inner city trains	**Current status:**	Transport NSW is starting alignment and design studies for the project and will investigate a number of alignment and construction options

Project:	Mardi-Mangrove pipeline		
Client: Gosford City and Wyong Shire Councils	**Designer** GHD	**Contractor:** John Holland	**Supervising Engineer:**
Scope of work:	Two pipelines, including 1.9 kilometre section from Wyong River to Mardi Dam, which will be microtunnelled	**Current status:**	Completed June 2011

Project:	Central Coast Rail Upgrade		
Client: RIC	**Designer** Connell Wagner (Concept) – complete	**Contractor:**	**Supervising Engineer:**
Scope of work:	Hornsby to Hawkesbury. 11.5km twin 8m dia. Rail tunnels.	**Current status:**	EIS complete.

Project:	F3 to M2 Road Tunnel		
Client: RTA and Federal DOTARS	**Designer** SKM (preliminary design)	**Contractor:**	**Supervising Engineer:**
Scope of work:	8km road tunnel to connect the southern end of the F3 Freeway with the M2 Tollroad	**Current status:**	Preferred corridor selected. Preparing the Terms of Reference for development of a concept proposal Construction timetable for the project is yet to be established.

Project:	M5 East tunnel widening		
Client: RTA	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	Provision of additional four new lanes in a cut and cover tunnel next to the existing the M5 East tunnel	**Current status:**	Proposed

Project:	M4 East Link		
Client: RTA	**Designer** Connell Wagner	**Contractor:**	**Supervising Engineer:**
Scope of work:	5.5km long, privately funded, road tunnel to connect the eastern end of the M4 Motorway with the CityWest Link.	**Current status:**	On hold awaiting funding

Project:	F6 Transport Corridor		
Client:	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	20-kilometre motorway from the Sutherland Shire to the city Tunnelled section between Port Hacking Road at Sylvania and Loftus	**Current status:**	Economic Impact Study complete

Project:	Bells Line of Road		
Client: RTA	**Designer** Maunsell	**Contractor:**	**Supervising Engineer:**
Scope of work:	1.2km tunnel to remove 13% grade near Kurrajong	**Current status:**	On Hold

Project:	Busby's Bore Project		
Client: Clean Up Australia	**Designer** KBR	**Contractor:**	**Supervising Engineer:**
Scope of work:	Connection to Busby's Bore and underground water storage in disused St James Railway Tunnel	**Current status:**	Concept design

Project:	Hill M2 Upgrade		
Client: Transurban Group	**Designer** HBO & EMTB in asoociation with T ract Consultants	**Contractor:** Leighton Contractors	**Supervising Engineer:**
Scope of work:	Rock bolting of the existing tunnel. Widening works using an excavator, including widening of the batters (rock walls) on both approaches to the tunnel.· Placement of new electrical and services trenches	**Current status:**	On going

Project:	South Sydney Freight Line		
Client: ARTC	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	• 30km single track running parallel to the Main South line between Sefton railway station and Macarthur railway station • Cut and Cover tunnel at Sefton. Required to carry the SSFL underneath the existing Bankstown Line • Underground proposal through Cabramatta Railway Station.	**Current status:**	Tenders currently being reviewed

Project:	City East Cable Tunnel		
Client: EnergyAustralia	**Designer** AECOM	**Contractor:**	**Managing Contractor**
Scope of work:	3.2 km TBM tunnel from Surry Hills to Sydney CBD including connections to existing and proposed substations	**Current status:**	Detailed Design

Project:	Wynyard Pedestrian Tunnel		
Client: Barangaroo Delivery Authority	**Designer**	**Contractor:**	**Managing Contractor**
Scope of work:	1.4 million, 200-metre long nine metre wide walkway linking Barangaroo with Wynyard station	**Current status:**	Financing approved

Project:	North West Rail Link		
Client: NSW Gov't Transport Construction Authority (TCA)	**Designer** TBA	**Contractor:** TBA	**Managing Contractor** TBA
Scope of work:	23km long northwest rail link, which includes 15km of deep, underground twin tunnels stretching from Epping to Kellyville	**Current status:**	Out to tender

Project:	South West Rail Link		
Client: NSW Gov't Transport Construction Authority (TCA)	**Designer** SMEC, KBR, GHD	**Contractor:** John Holland	**Managing Contractor** John Holland
Scope of work:	Rail underpass under Hume Highway (80 m long) between Glenfield and Leppington	**Current status:**	Detailed Design

Project:	Pacific Hwy Tintenbah-Ewingsdale Upgrade, St Helena Tunnel		
Client: RTA	**Designer** TBA	**Contractor:** Baulderstone Hornibrook	**Managing Contractor**
Scope of work:	Twin 350 m long three lane road tunnels.	**Current status:**	Tender awarded

Project:	Sydney Opera House Vehicle Access and Pedestrian Safety Project		
Client: RTA	**Designer** TBA	**Contractor:** TBA	**Managing Contractor**
Scope of work:	Cavern under Opera House forcourt for loading dock	**Current status:**	Tender awarded

QUEENSLAND

Project:	Airport Link & Northern Busway		
Client: Queensland Government	**Designer** PB Arup	**Contractor:** Thiess/John Holland JV	**Supervising Engineer:**
Scope of work:	$4.3B PPP project. Construction of road tunnels and a busway including Australia's longest road tunnel at 6.7km long	**Current Status:** Final cost likely to be $5B. Project 80% complete – mech & elec fitout in progress. Target completion June 2012.	Both TBMs Rocksy and Sandy completed TBM work. Heading (roadheader) and bench (drill and blast) almost complete. Toombul Jack box tunnel complete.

Project:	Northern Link		
Client: Brisbane City Council	**Designer** GHD, URS, Cardno	**Contractor:** Transcity – Acciona, Ghella BMD Constructions	**Supervising Engineer:**
Scope of work:	2 x 4km road tunnels from Toowong to Milton. Additional 550m x 4.8m x 4m conveyor tunnel (drill and blast) to transport tunnel spoil into Mt Coot-tha quarry.	**Current Status:** Portal construction underway at eastern and western ends.	Contractor appointed. First TBM expected to start in May 2012 and to be complete by 2014. Conveyor tunnel scheduled to start late September 2011.

Project:	East-West Orbital Tunnel		
Client: Brisbane City Council	**Designer**	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Tunnel joining Toowong to Everton Park	**Current Status:**	Feasibility study in progress

Project:	East-West Link Tunnel		
Client: Brisbane City Council	**Designer**	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Completion of inner city ring road connecting. 6km from Pacific Highway to East-west Orbital Tunnel (complete 2031).	**Current status:**	Review of traffic demand being completed. Scheduled to be built after 2026 but may be brought forward.

Project:	Toowoomba Bypass		
Client: Queensland Main Roads	**Designer**	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	42km road costing $1B+ will include 735 m twin tube tunnel at top of Great Dividing Range	**Current status:**	Pilot tunnel completed. Project on hold awaiting funding

Project:	Cross River Rail		
Client: DTMR	**Designer** TBA	**Contractor:**	**Supervising Engineer:**
Scope of work:	A 19km proposed corridor would include a tunnel under the Brisbane River and new stations, running from Salisbury, in Brisbane's south, to Wooloowin, in the north, via Woolloongabba, the CBD and Bowen Hills. $8.2B project.	**Current status:**	Feasibility study is continuing

Project:	Inner Orbital Tunnel		
Client: DTMR	**Designer**	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	8km road tunnel between Toowong and EvertonPark	**Current status:**	Planning complete and included in the Western Brisbane Transport Strategy

Project:	Stafford Road Tunnel		
Client: DTMR	**Designer**	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Urban motorway tunnel under Stafford Road to connect the proposed North West Transport Corridor and Inner Orbital with Airport Link	**Current status:**	Planning complete and included in the Western Brisbane Transport Strategy

Project:	Kingsford Smith Tunnel		
Client: Queensland Main Roads	**Designer**	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Tunnel to link traffic from the Gateway Motorway and Australia Trade Coast to the Inner City Bypass	**Current status:**	Proposed. Early design options to be developed before Christmas 2010

Project:	Auchenflower Sewer Upgrade		
Client: Queensland Urban Utilities	**Designer**	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Microtunnelling to install new pipes along Torwood Street, Eagle Terrace, under the railway line into Roy Street and Lang Parade, connecting to the sewer system on Coronation Drive	**Current status:**	Commenced, Work is due for completion by mid-2012.

Project:	Curtis LNG Project		
Client: Queensland Urban Utilities	**Designer**	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Tunnel crossing to Curtis Island	**Current status:**	Proposed

WESTERN AUSTRALIA

Project:	Perth Airport Rail Link		
Client: Public Transport Authority	**Designer** AECOM (study)	**Contractor:** N/A	**Supervising Engineer:** N/A
Scope of work:	Twin track electrified passenger heavy rail route from Midland Line near Bayswater Station to a new possible terminal station at High Wycombe. Route to service growing Office and Industrial Park with underground station near current Domestic Terminal. Tunnel options extend under main airport runway to new underground station at International Terminal, continuing eastwards under future runway to High Wycombe (total track length up to 10km, approx half in cut and cover and bored tunnel).	**Current status:**	Pre-feasibility Studies including preferred route identification and preliminary costing, report submitted.

Project:	Woodside Browse Gas Pipeline Shore Crossing		
Client: Woodside	**Designer** TBA	**Contractor:** TBA	**Supervising Engineer:** N/A
Scope of work:	TBM pipejack or segmentally lined tunnel up to 2km length in up to 20m water depth carrying 3 LNG pipelines onshore.	**Current status:**	Expressions of Interest have been submitted and Woodside is currently reviewing.

Project:	Northern suburbs sewer		
Client: Water Corporation	**Designer** N/A	**Contractor:** DM Civil	**Supervising Engineer:** N/A
Scope of work:	4.4 km section of sewer pipe through the suburbs of Woodvale, Kingsley, Madeley and Wanneroo,	**Current status:**	Sewer construction is expected to be completed by 2011

Project:	The Perth City Link Project		
Client: Public Transport Authority	**Designer** N/A	**Contractor:** JHG-GHD	**Supervising Engineer:** N/A
Scope of work:	Lowering twin Fremantle lines underground in cut and cover tunnel above existing Joondalup line bored tunnels west of Perth Central Station. Includes new pedestrian underpass beneath all tracks and platforms within Perth Central Station. Lowering of Wellington Street Bus Station underground with bus access ramp to west.	**Current status:**	Perth City Link Rail Project Awarded to John Holland-GHD Joint Venture in March 2011. Rail lowering project due for completion in 2014. Bus station lowering project due to follow, with completion by 2016.

Project:	Wheatstone gas pipelines Shore Crossing Tunnel		
Client: Chevron	**Designer** TBA	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	TBM pipejack tunnel planned for carrying LNG gas pipelines through surf zone and shore crossing into Plant site	**Current status:**	Chevron, the ultimate client is currently reviewing submissions from 4 contractors. A decision on the preferred contractor is imminent.

Project:	Southern Seawater Desalination Project – Subsea Pipejack Tunnels		
Client: Southern Seawater Alliance	**Designer** An Alliance comprising Water Corporation, Technicas Reunidas, Valorizia Agua, AJ Lucas and Worley Parsons.	**Contractor:** Zueblin Australia	**Supervising Engineer:** N/A
Scope of work:	Three TBM pipejack tunnels approx 900m long under coastal sand dunes (approx 400m) and out to sea (500m). Two Herrenknecht slurry TBMs used with bored diameters 3.0m and 2.4m. TBMs retrieved from below seabed.	**Current status:**	Tunnels completed

VICTORIA

Project:	Melbourne Metro		
Client: DoT	**Designer** TBA	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Stage 1 – new rail tunnel between Dynon in the west and St Kilda Road near Domain with new stations in North Melbourne, Parkville, and St Kilda Road. Satge 2 – linking Domain to the Caulfield corridor	**Current status:**	Stage 1 - expected to start construction in 2012 and be completed by 2018

Project:	East-West Tunnel		
Client: VicRoads	**Designer** TBA	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Potential tunnel under Carlton and Royal Park running from the Tullamarine Freeway to the Western Ring Road	**Current status:**	Study planned

Project:	WestLink — Stage 1		
Client: LMA	**Designer** Aurecon/AECOM/GHD	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	3.5km tunnel stretching from the ports area to Paramount Rd, West Footscray	**Current status:**	Construction is not expected to start until at least 2013, and depends on Federal Government support for funding

Project:	Northern Sewer Project		
Client: Melbourne Water	**Designer** SKM/Jacobs	**Contractor:** JHG	**Supervising Engineer:**
Scope of work:	Stage 1 – 8km of 1.6m and 2.5m diameter sewer tunnels. Stage 2 – 4.5km and 1.8km diameter sewer tunnels	**Current status:**	Tunnelling complete

Project:	Hoddle Street Tunnel		
Client: Vic Roads	**Designer** GHD	**Contractor:** TBA	**Supervising Engineer:** TBA
Scope of work:	Tunnel would run from the Eastern Freeway to Wellington Parade, near the MCG.	**Current status:**	In planning. Two-year government consultation process

Project:	Wonthaggi Desaliantion Plant		
Client: Department of Sustainable Energy	**Designer** GHD	**Contractor:** Thiess Degremont	**Supervising Engineer:** TBA
Scope of work:	Desalination plant will include intake and outake tunnels offshore up to 2.5km long	**Current status:**	Tunnelling complete

Project:	Melbourne Main Sewer Replacement		
Client: Melbourne Water	**Designer** GHD	**Contractor:** John Holland	**Supervising Engineer:** Aurecon
Scope of work:	$220 million 2.3km 1.8m diameter new sewer includes six shafts 10–15m deep and 142m crossing of Yarra River	**Current status:**	Tunnelling complete May 2011, project completion in 2012

Project:	Frankston Drainage Improvement Project		
Client: Melbourne Water	**Designer** GHD	**Contractor:** Winslow Infrastructure	**Supervising Engineer:** GHD
Scope of work:	1.5 kilometre 3 m OD tunnel with 2.5 m dia concrete stormwater pipeline from Monash University to Kananook Creek.	**Current status:**	Complete

Project:	Regional Rail Link		
Client: DoT	**Designer** KBR/Arup	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Potential rail tunnels under Footscray as part of the broader Regional Rail Link project from Werribee South to Southern Cross Station via Tarneit	**Current status:**	Business case study in progress

Project:	North East Link		
Client: LMA	**Designer** GHD	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Potential road tunnel from Greensborough to Bullen linking the Western Ring Road to the Eastern freeway	**Current status:**	Not before 2018

Project:	Bendigo CBD		
Client: VicRoads	**Designer** GHD	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	A 3.5km road tunnel under the Bendigo CBD	**Current status:**	Proposed

SOUTH AUSTRALIA

Project:	Adelaide Desalination Plant		
Client: SA Water	**Designer**	**Contractor:** Winslow Infrastructure	**Supervising Engineer:**
Scope of work:	11.5 km pipeline from Port Stanvac to the Happy Valley water treatment storage facility including 6 tunnel bores ranging from 30 to 160m	**Current status:**	Tunnel works complete. Project due to be commissioned late 2011

NORTHERN TERRITORY

Project:	Darwin Water Main		
Client: Darwin City Council and the Department of Planning and Infrastructure	**Designer**	**Contractor:** Winslow Infrastructure	**Supervising Engineer:**
Scope of work:	Construction of several major water mains will take place in two stages. Stage 1 includes installing 1.2 km of 450mm steel pipe. Stage 2 includes the installation of 9 km of 450 mm steel water in Darwin's CBD.	**Current status:**	Complete

Project:	Kilgarif Power and Water		
Client: Power and Water	**Designer**	**Contractor:** Sitzler Brothers	**Supervising Engineer:**
Scope of work:	$A4.3 m to bore under major road and rail crossings	**Current status:**	Complete

TASMANIA

Project:	Hobart City Tunnel		
Client: Hobart City Council	**Designer**	**Contractor:** TBA	**Supervising Engineer:**
Scope of work:	Tunnel from the Southern Outlet at Davey St to Brooker Ave under West Hobart and North Hobart, and a second stage through the Queen's Domain to the Tasman Bridge.	**Current status:**	Proposed.

NEW ZEALAND

Project:	Homer Tunnel Upgrade		
Client:	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	2 Lane tunnel	**Current status:**	In planning

Project:	Victorai Park Tunnel		
Client: Transit NZ	**Designer** V Formation (Fletcher Construction, Beca Engineering, Higgins Contractors and Parsons and Brinckerhoff)	**Contractor:**	**Supervising Engineer:**
Scope of work:	440m long 2 Lane tunnel	**Current status:**	450 metere-long tunnel structure was completed in July. The tunnel will open to two lanes of traffic in early November but it will be January before Auckland experiences the full benefits of the Victoria Park Tunnel and its associated motorway widening through St Marys Bay.

Project:	Waterview Connection		
Client: NZTA	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	Linking of Southwestern Motorway (State Highway 20) and the Northwestern Motorway (SH16), including twin three-lane tunnels	**Current status:**	Construction awarded to Fletcher Construction Co. Ltd, and Leighton Contractors Pty Ltd

Project:	Milford Dart Tunnel		
Client: Milford Dart Co.	**Designer** URS	**Contractor:**	**Supervising Engineer:**
Scope of work:	10.2 kms of 5m diameter tunnel for single lane bus route or rail	**Current status:**	In planning

Project:	North Bank Tunnel		
Client: Meridian Energy	**Designer** URS	**Contractor:**	**Supervising Engineer:**
Scope of work:	36kms of 12m diameter headrace tunnel & hydro power station	**Current status:**	In planning

Project:	Tauranga Tunnel		
Client: Local Govt	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	Three routes for a road tunnel through the Kaimai Ranges, linking Tauranga with the Waikato	**Current status:**	Currently being investigated by the NZ Transport Agency

Project:	Britomart rail loop		
Client: Auckland Regional Transport Authority	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	A 3.5 km loop linking Britomart with the current western line. Three new underground stations at Aotea Square, Newton and K' Road.	**Current status:**	Planning and conceptual design in progress

Project:	Wellington Northern Corridor		
Client: NZ Transport Agency Board	**Designer** AECOM, Parsons Brinckerhoff and Beca	**Contractor:**	**Supervising Engineer:**
Scope of work:	Four lane expressway from Levin to Wellington Airport including duplication of Mt Victoria and Terrace tunnels.	**Current status:**	In planning

Project:	Central Interceptor Project		
Client: Local Govt	**Designer** AECOM	**Contractor:**	**Supervising Engineer:**
Scope of work:	New sewer tunnel approximately 14 kilometres in length from central Auckland to Mangere Wastewater Treatment Plant	**Current status:**	Design in progress — construction to be completed by 2025

Project:	Nevis Tunnel		
Client: NZ Transport Agency	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	Tunnel to replace a rockfall-prone stretch of highway at the Nevis Bluff, midway between Cromwell and Queenstown	**Current status:**	Concept

Project:	Waitemata Harbour		
Client: NZTA	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	Potential tunnel route between the central city and the North Shore would cost from $4 to 5.3 billion	**Current status:**	Concept

Project:	Welcome Bay Tunnel		
Client: NZTA	**Designer**	**Contractor:**	**Supervising Engineer:**
Scope of work:	Tunnel or roundabout proposed	**Current status:**	Proposed