SPECIALIST EXPERTISE TUNNELLING

NATIONAL COMPANY 34 YEARS IN BUSINESS

1,700 EMPLOYEES

BMD DELIVER ON

- A PATH TO ZERO HARM
- SPECIALIST INTEGRATED PROJECT TEAMS
- QUICK AND EFFECTIVE DECISION MAKING

EXTENSIVE CAPABILITIES ACROSS KEY ELEMENTS THAT SUPPORT TUNNELLING OPERATIONS
WE SEE THINGS DIFFERENTLY

At the heart of our business is what we call The BMD Way which is evident in our people, values and culture.

The BMD Way connects every employee across our business and encapsulates our history, traditions and visions for the future.

‘We See Things Differently’ communicates how we think differently, yet in a like-minded way to our current and prospective clients and staff. Case studies and testimonials provide evidence of how we deliver certainty. It represents how proud we are of our relationship based organisation and acknowledges how important this pride has been to our ongoing success.

Most importantly, ‘We See Things Differently’ enables us to offer genuine benefits to our clients and the communities in which we operate.
WE SEE OUR STRENGTHS IN THE QUALITY OF OUR PEOPLE AND OUR GENUINE RELATIONSHIPS WITH CLIENTS, PARTNERS AND COMMUNITIES.

WE SEE OUR SUCCESS LINKED TO OUR ABILITY TO DELIVER CERTAINTY THROUGH CONSISTENT PERFORMANCE AND COLLABORATION.

WE SEE OUR FUTURE SHAPED BY ALL THAT HAS MADE US SUCCESSFUL IN THE PAST.
BMD Constructions is a wholly owned subsidiary of the BMD Group and has 1,700 employees working throughout Australia supported by third party certified management systems, substantial balance sheet strength and the resources and flexibility of a large Australian owned private company.

Long term client relationships have been the foundation of our success for over 30 years. BMD is committed to the highest standards of quality, service and value creation for all our clients. We regard every new contract as an opportunity to promote long term relationships and offer our new and existing clients a range of specific benefits including:

**Committed to Zero Harm** our behavioural based safety management system is supported by senior leadership and encourages personal responsibility towards safety and environmental management;

**Proven Management Systems** accredited by the Office of the Federal Safety Commissioner, our outcome focused approach is designed to deliver certainty through rigorous business systems maintained across all our projects, bringing a point of difference to our business;

**Financial Strength** based on consistent growth, projects are supported by a substantial balance sheet;

**Supportive of Local Communities** originating from a strong interest in providing long term benefits to all communities in which we operate, BMD proudly supports a strong network of local suppliers, subcontractors and industry associations. BMD also supports local community events and sponsorship programs;

**Specialist Integrated Project Teams** with expertise in construction of mine infrastructure incorporating all civil and industrial, mechanical disciplines;

**Quick and Effective Decision Making** achieved through a flat management structure that consistently results in outstanding performance;

**Indigenous Employment & Training** BMD is committed to equal opportunities in the workplace and has an Aboriginal and Torres Strait Islander Employment and Business Engagement Plan in place across the Group; and

**Women in the Workforce** compliant with the Equal Opportunity for Women in the Workplace Act alongside a number of initiatives implemented that focus on the development of female employees toward positions of management and leadership.
Legacy Way - Overview

Legacy Way
Brisbane, QLD, $1.5 billion
Brisbane City Council
2011 - 2015

Legacy Way is a 4.6 kilometre twin-bore toll road tunnel that will connect the Western Freeway at Toowong with the Inner City Bypass (ICB) at Kelvin Grove. The tunnel forms part of Brisbane City Council’s TransApex transport plan which, when complete, will link a network of critical transport infrastructure vital for Brisbane’s future growth.

In September 2010, Transcity – a joint venture between BMD Constructions, Ghella and Acciona was awarded the contract to design and construct the project, and operate and maintain Legacy Way for a period of ten years. Scope includes two parallel twin-lane tunnels that are approximately 12.4 metres in diameter and linked by cross passages every 120 metres.

After three years of construction, the project is on schedule and tunnelling is complete with both tunnel boring machines (TBMs), Annabell and Joyce achieving record speeds. Notably, the Legacy Way project won the ‘2013 Major Tunnelling Project of the Year’ award in the $500 million and over category at the International Tunnelling Awards held in London.

Scope of work includes:

- World record breaking performance for tunnel excavation by the TBMs;
- Removal of over 2,000,000 tonnes of spoil from tunnelling excavation;
- Approximately 38,000 segments line the tunnel and over 1,200 concrete piles;
- Over 185,000m² of asphalt laid across the whole project; and
- Delivery of a four hectare expansion to the Brisbane Botanic Gardens, Mt Coot-tha, which includes a new pond equivalent to nine Olympic size swimming pools.
LEGACY WAY - CONSTRUCTION TIMELINE

APRIL 2011
- Construction commenced at the western portal.

MAY 2011
- Construction commenced at the eastern portal.

JUNE 2011
- Commenced sheet piling at the western portal.
- Box construction commenced at western portal.

SEPTEMBER 2011
- Inner Northern Busway extension works commenced at the eastern portal.

JANUARY 2012
- Commenced construction of the acoustic building at the western portal.
- Start of piling for ventilation tunnel at eastern portal.

FEBRUARY 2012
- Completed the Inner Northern Busway extension work at the eastern portal.

MARCH 2012
- Spoil conveyor tunnel breakthrough at the western portal.

OCTOBER 2011
- Piling for cut and cover tunnel structure commenced at the eastern portal.
- Precast segment production commenced at Wacol.

MAY 2012
- Arrival of TBM 1 main drive.
- TBM 2 commissioning.
- Completion of acoustic shed at the western portal.
- Segment production reaches 9,000 at Wacol.

JUNE 2012
- Commenced onsite assembly of TBM 1.
- Completed the Energex Substation at the western portal.
- Installation of the water treatment plant at the western portal.
JULY 2012

Completion of piling for cut and cover tunnel structure at the eastern portal.

AUGUST 2012

Launch of TBM 1 from western portal.

AUGUST 2013

Blasting completed for the lower ventilation tunnel.

JUNE 2013

• TBM 1, Annabell, breakthrough.
• Completed the realignment of the ICB.

AUGUST 2012

Completion of piling for cut and cover tunnel structure at the eastern portal.

OCTOBER 2012

Segment production reaches 20,000.

OCTOBER 2012

• Launch of TBM 2 from the western portal.
• Project design completed.

APRIL 2013

TBM 2, Joyce breakthrough.

NOVEMBER 2013

• Transcity wins International Tunnelling Award
• Completion of backfill
• First tunnel drive through

FEBRUARY 2013

Realignment of the Western Freeway complete.

FEBRUARY 2014

Mechanical and electrical fitout commenced

SEPTMBER 2013

Acoustic shed disassembly complete

SEPTEMBER 2013

Completion of cross passage excavation

OCTOBER 2013

Completion of cross passage excavation

FEBRUARY 2014

Mechanical and electrical fitout commenced

JUNE 2013

Launch of TBM 1 from western portal.

JUNE 2013

Completion of piling for cut and cover tunnel structure at the eastern portal.

JUNE 2013

• TBM 1, Annabell, breakthrough.
• Completed the realignment of the ICB.
Transcity is committed to minimising the impact of construction activities on the environment and local community. The team developed a detailed Environmental Management Plan to ensure impacts from construction activities are effectively monitored, managed and mitigated. This included a comprehensive monitoring program covering noise, vibration, air and water quality.

To manage noise levels effectively during construction, Transcity completed extensive noise studies prior to construction starting. Noise monitoring was carried out at twelve noise sensitive locations, including residences and schools. The collected data was used to assist in ongoing noise monitoring on the project.

Examples of onsite noise mitigation include:

- Installation of temporary noise barriers;
- Adjusting the planning of works;
- Facilitating noisy works during the day;
- Selection of less noisy plant with appropriate mufflers;
- Ensuring plant and vehicles are equipped with white noise reversing beepers; and
- Construction of the acoustic shed to enclose all tunnelling related works.

Transcity has engaged residents and stakeholders affected by construction of Legacy Way in a proactive, face to face manner since the start of construction. The Transcity team aims to ensure residents are prepared for construction impacts, understand why these activities are necessary and are aware of the feedback mechanisms available so they can easily seek further information.

The team has dealt with 454 impacted residents directly above the tunnel, a further 2,500 within the zone of influence of the tunnel and approximately 6,000 residents at the eastern and western portals.

Community engagement tactics include:

- Meetings at key construction activity points with impacted stakeholders;
- Community Liaison Group (CLG) meetings every three months with representatives of community groups or impacted stakeholders;
- Frequent doorknocks of local areas;
- Latter box drops of project information;
- Set up and management of 24 hours, seven day a week project hotline;
- Management of Transcity email account; and
- Visitor Centre management.

Legacy Way Visitor Centre

Tree Planting at Simpson Falls
Construction of Legacy Way involves more than just the excavation of the 4.6 kilometre tunnels by tunnel boring machines. Key civil construction elements included:

**Cross Passages**
Construction of cross passages are required between the two tunnels to provide a safe environment for tunnel users and safe operation of Legacy Way. The Transcity team constructed 37 underground cross passages, located every 120 metres along the tunnel alignment, measuring four metres wide by 3.5 metres high and 10 metres long.

In order to excavate the hard rock mass, Transcity undertook drill and blast activities. This innovative construction methodology was ideal as it expedited the programme and significantly reduced the ongoing impacts of excavation on the surrounding community. The implementation of the drill and blast methodology reduced the effects of continuous excavation using hydraulic hammers.

**Western Freeway**
A key construction element was to realign inbound lanes of the Western Freeway and outbound lanes of the Inner City Bypass (ICB), to create the space required for the entrance and exit lanes of the tunnel.

As the eastern and western worksites are adjacent to two of Brisbane’s main arterial roads, the Western Freeway and the ICB, minimising disruption to road users was a top priority during the project’s design.

Ninety per cent of construction activity will be undertaken by Transcity ‘offline’, or safely behind roadside barriers to ensure there is minimal disruption to road users.

Traffic Management has been developed for major road works including:

**Western Freeway and ICB Realignment**
A key element in the alignment of the Western Freeway was to construct all major road works offline with only one major traffic switch required at both ends, minimising impacts to motorists.

**ICB Traffic**
During the excavation of the eastern cut and cover structure, the team established a SMS notification system which alerted motorists sixty minutes prior to any changes or closures on the ICB.

The team have implemented temporary works solutions to bring significant benefits to the project in terms of safety and completion times.

Transcity developed unique and innovative design solutions such as incorporating permanent structures into the temporary work required on site, thus expediting the program. This included combining the construction of the temporary acoustic shed, required to be built prior to the start of 24 hour tunnelling works, and the Tunnel Boring Machine launch box by aligning the piling with the permanent piles required for the permanent western cut and cover tunnel structures.

At the eastern worksite, the design of the tunnel boring machine (TBM) arrival structure was simplified and instead of gantry or mobile cranes to disassemble the machines, a hydraulic driven and rail based jacking system was installed. This ensured the machines could efficiently be taken apart underground and transported off site reducing impacts on the surrounding community and environment.
After the installation of the tunnel segments, the space between the tunnel and the segment needed to be filled with grout. To assist in this process, Transcity established an onsite plant to produce the specially designed two-component grout which could be piped down into the tunnel. The decision to pipe the grout assisted in a more streamlined logistics operation reducing traffic movements within the already constrained tunnel.

To manage the spoil while the machines excavated and lined the tunnels, Transcity designed a unique underground spoil conveyor to transport the excavated materials to the Mt Coot-tha Quarry. Constructed in only four months, the conveyor system is a major innovation as the team were able to reverse the conveyor system following TBM excavation to return excavated spoil back into the tunnel for backfilling up to the final road level.

During the design phase, Transcity ensured that the traffic and tunnel alignments made the construction staging simple and delivered work offline. This meticulous planning removed congestion concerns, reliability and safety with approximately ninety per cent of the work able to be completed behind barriers, resulting in a seamless transition for motorists with one traffic switch at both portals.

Transcity’s aim was to minimise and simplify plant movements and construction methodology from the outset. A large focus during the planning stage was re-designing the original layout to provide a project that could be constructed with both portals offline from any public interface including motorists and stakeholders. It also provided a simplified construction methodology and staging where the majority of work could be completed offline making construction inherently safer.

From here, the team’s focus shifted from site layouts to methodology. Even with an offline environment, the portals had very restricted work areas and significant planning was required with methodology to produce a safe construction environment.

A team of paramedics works together with the safety team to deliver all project safety messages across all toolboxes, prestart meetings and inductions.
BMD Constructions is proud to be part of the Transcity Joint Venture, constructing the Legacy Way project in Brisbane.

BMD Constructions has applied innovative construction methodology that expedited the programme and significantly reduced potential impacts on the surrounding community.

Major packages of work completed to date include the construction of two twin lane tunnels using tunnel boring machines, assembly and disassembly of a temporary acoustic building, cut and cover structures to construct the tunnel’s entry and exit portals as well as realignments of the Western Freeway and Inner City Bypass.

As part of the Legacy Way work, BMD Constructions has also been engaged to deliver the Moggill Road and Western Freeway Interchange upgrade that will cater for the future traffic patterns when the tunnel opens.

Looking ahead, BMD Constructions is pleased to deliver the final stages of the project and looks forward to the opening of this major piece of Brisbane road infrastructure.

Chris Brett
Construction Manager, Legacy Way
The WICET GC07 team developed innovative safety initiatives including:

**The Rotating Frame**
The team developed a methodology for the rotation of the 65 tonne Jacked Box segments from horizontal to vertical through the use of a structurally designed steel rotating frame. The original methodology was modified to eliminate the potential for uncontrolled movement through the inclusion of a high capacity winch and refined lifting procedure.

**The Jacking Slab**
To reduce the potential for injury, the team reviewed the original design and changed the size, shape and reinforcement spacing. The revised design included wider spacing of ligatures providing wider walkways and improved access for steel fixers.

**The Rocket Launcher**
The team designed and constructed a solution to transport and handle large pile liners across site called the ‘Rocket Launcher’. This design involved a six metre long launching mechanism constructed on the back of a tip truck. The tray is tipped until the pile liners are vertical and rest on the ground and eliminates the working at heights hazard.

The Wiggins Island Coal Export Terminal (WICET) is located at Golding Point and forms part of the existing Port of Gladstone, and has been designed to cater for the future worldwide coal demand.

BMD Constructions was awarded the ‘Wiggins Island Coal Export Terminal GC07’ (WICET GC07) civil works contract for the construction of the terminal’s rail receival facility that is designed to handle 7,600 tonnes of coal per hour and is connected to the terminal stockyard by a 5.6 kilometre overland conveyor.
Q50 FLOOD IMMUNITY PACKAGE

Location: Mackay, QLD | Value: $5.5 million | Client: Aurizon | Duration: April 2013 - November 2013

The project site is located approximately 40 kilometres south of Mackay and follows a North-South alignment between Sarina and Hay Point.

BMD Constructions was engaged to install eight concrete pipe culverts jacked under the existing rail lines of the Goonyella System.

The 924 kilometre Goonyella Rail System in Central Queensland services 30 coal mines in the northern Bowen Basin.

Live Rail Environment

Working in a live rail environment poses specific hazards such as those created by the high voltage overhead wiring, settlement control and the speed of railway locomotives.

With coal trains passing on a regular basis to and from Hay Point Terminal, it was extremely important to ensure the tunnelling activities did not affect the tracks stability and therefore, the rail traffic. The project team implemented the following initiatives:

Automatic Monitoring System
An Automatic Monitoring System was installed to monitor and record all track movements and has the capability to operate 24 hours a day, 7 days a week. The Monitoring System utilises survey prism targets attached to the sleepers to detect any vertical and horizontal movements of the rail.

Alarm System
In the event, any track settlement movement that is outside an established set of tolerance, an alarm will be raised and communication will be sent via e-mail or sms to the dedicated responsible persons.

Drilling Methodology

The installation methodology utilised for the culvert installation consists of a Tunnel Boring Machine (TBM) with a cutting head of 1,430 millimetre diameter.

During the drilling, the excavation was supported by steel liners that were specifically designed to support the rail load during the operation. Concrete pipes (RCJP) were jacked through and the steel liners were recovered at the exit pit.

This type of machine allows excavating through any material up to 40 MPa strength. A special rock cutting head can be fitted on the Tunnel Boring Machine if required.

This methodology eliminates rail traffic disruption without any speed restriction required.
OUR CONTACTS

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