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EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE UP TO $2 MILLION

FOUNDATION ENGINEERING

MULTI-UNIT DEVELOPMENT, 147 HASTINGS STREET SCARBOROUGH

Client/Principal: Welink Group

Foundation Engineering was responsible for providing an alternate shoring system using steel piles and chemical grout injection for the development of a series of dwellings on the Scarborough beach front. This shoring system was to support the excavation at the site as well as provide adequate bearing for the new structure. Additionally, the piles were used to facilitate the shotcrete wall installation by simply tack welding the wall reinforcement to the steel piles.

When they were approached by the client who was seeking a solution to provide ground stabilisation support as well as functioning as piling supports for the new structure, Foundation Engineering realised the job was not going to be easy to design.

Due to the sloping nature of the site, some piles were required to support the existing structures either side of the property during the excavation. However, there were other sections of the site that required the piles be exposed up to several metres. The installation rig required was able to handle the tricky site conditions resulting from having such a steep, sandy surface. In comparison, a traditional CFA pile installation rig would have struggled to install concrete piles along such a steep run.

The concept of using steel piles as a retaining system in lieu of typical CFA piles was the first of its kind to Foundation Engineering's knowledge. The ability to have a faster install time for the piles, then a minimal curing time for the grout allowed for the project to save time and resources. This system was perfect for this project site due to the stepped nature of the construction.

Not only was there a time saving element in the installation of the piles; the time saving properties of the system continued through to the forming up of the shotcrete. The fact that the steel reinforcement could simply be tack welded to the steel piles simplified the whole shotcreting process.

In order to ensure that the system could be implemented, a series of tests were done in a controlled environment to ensure the grout would bridge the gaps between the piles. The installers were able to familiarise themselves with the process and the results showed a positive indication that the conditions at the Scarborough address would be suitable for this system.

The process of installing screw piles generates no spoils or waste overburden, as opposed to the traditional 10% allowance for wastage using concrete. Any pile off-cuts can be taken off-site for reuse on other projects.

Screw piles are significantly faster (typically by a factor of two) to install than bored piles and therefore are able to accelerate the critical path of a project. Due to this accelerated critical path, the client was able to produce the shotcrete walls earlier than anticipated.

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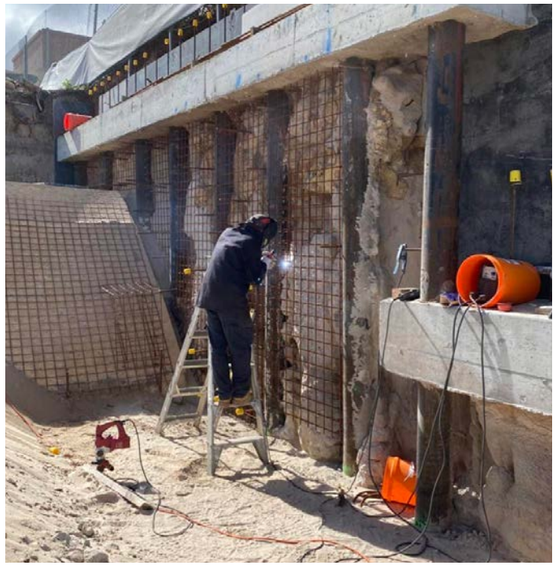

FOUNDATION ENGINEERING

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EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE UP TO $2 MILLION

BMD URBAN & CITY OF KALAMUNDA

STIRK PARK DRAINAGE UPGRADE

Client/Principal: City of Kalamunda

BMD Urban was engaged by the City of Kalamunda to deliver the Stirk Park Pond and Drainage Upgrade project. The project involved an upgrade to increase the lake's size by almost three times its original, from 370 to 1380 cubic metres, while also improving the drainage and flow of the lake.

Works required pumping and draining of the pond to install a new base and liner, Ecosol storm pit and box culverts, extension of the existing lake, further improved downstream erosion controls through filling in scours and installation of rock weirs at regular intervals, as well as minor landscaping and rehabilitation works.

During construction of the biofiltration garden bed, BMD found a large deposit of bentonite white clay. Through consultation with a geotechnical engineer, it was determined that the benefit of pouring concrete was not going to outweigh the benefit of using the existing material on site to line the pond basin. The bentonite was excavated to be reused as a waterproof, flexible substitute for the concrete liner. There were no separation issues, and the reused liner delivered an environmentally friendly result in addition to the considerable saving of time and cost which was passed onto the client.

In consultation with the client, BMD also reused all the excavated natural granite rock as additional lining of the creek to create more habitat.

The project's technical complexities came in the latent conditions experienced. BMD's expertise in the water and wastewater sector allowed for collaboration with the client and innovative approaches to constructability, scope changes and redesigns. The project was delivered under budget and two weeks ahead of schedule as a result of the combination of smart solutions and scope savings, together with BMD's high performance and exceptional staging.

BMD's focus on program involved constant monitoring through forensic reviews of the 'as planned' and 'as built' contract schedule. In combination with a detailed review of the contract, this ensured the project position was always maintained. In parallel with the internal review and analysis, BMD's collaborative approach ensured consistent and open dialogue with the client. BMD informed the client of all challenges and corresponding actions, and delivered innovative strategies to minimise the impacts of the external factors and deliver a commercially successful project.

The new infrastructure for the lake was delivered to the highest technical standards while prioritising the local community and looking after the surrounding environment. BMD retained existing mature trees, reused materials and preserved the local turtle habitat through a relocation program. The upgrade delivered by BMD has significantly increased amenity value to the park by providing considerable benefits to the community, with families expected to make full use of the park once additional upgrades to the Stirk Park masterplan is complete.

The new infrastructure was delivered to the highest technical standards while prioritising the local community and looking after the surrounding environment.

BMD

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EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE UP TO $2 MILLION

ENVIRO INFRASTRUCTURE

BRIDGE 0601A

Principal: Main Roads Western Australia

Enviro was appointed by Main Roads as head contractor for the major structural replacement of Bridge 0601A, over Salt River in the Shire of Bruce Rock. Stage One of the project involved the construction of a temporary side-track and demolition of the existing timber bridge structure, and Stage Two the construction of a new culvert structure to replace the bridge.

Main Roads requested a temporary track be provided to the side of the existing bridge for use during construction. The track provided a single 4.5m-wide lane and allowed for barriers on both sides. Three 600mm pipe culverts were installed in the track to allow water flow during construction. For the temporary culverts a steel culvert element was used to minimize cost to the Principal and mitigate COVID-related supply chain issues. Once the temporary track was constructed, the existing structure was demolished, and the new bridge constructed in a single stage.

Prior to mobilization the site was subject to the heaviest rainfall in over a decade, and the site footprint subsequently flooded. Enviro had to completely redesign its dewatering and delay mobilization for over six weeks due to this high flow environment.

This was the first project which Enviro had delivered working under the MRWA Major Works specifications. This upgrade in specification requirements was a significant learning curve for our team, particularly on the rigorous quality reporting and project administration.

Enviro (as a Main Roads structures panel contractor) coordinated the negotiations between Main Roads, the Shire of Bruce Rock and the designers (AECOM) to ensure that all applicable engineering management requirements were met and all parties' assets and operations were protected for the duration of works. The bridge's location on the major heavy haulage transport artery between Perth and the Wheatbelt meant detailed traffic management planning had to be undertaken, particularly for the period where the temporary side-track was in use. The site's footprint also extended into the ARC Infrastructure rail reserve, meaning detailed consultation with the track operator was required prior to construction commencement.

Adding to the project complexities, the HDPE culverts specified were manufactured to order in the United States, with an expected 20-week lead time even before the onset of COVID-19 supply chain constraints.

HDPE pipes were adopted due to the high salinity at the bridge site. Alternative options for the replacement to account for the high salinity nominated by the designers included reinforced concrete boxes with fibre reinforcement or stainless steel pipes. These alternative options were assessed not cost effective when compared to HDPE.

COVID-related supply chain disruption, combined with significant industrial action at Fremantle Port, caused shipping delays on multiple dispatches of Enviro's HDPE pipe order from the USA. Enviro's project management team revised the delivery schedule and deployed project teams to alternative sites at the request of Main Roads to mitigate any additional mobilisation costs and keep the project on budget. We relentlessly pressed the American suppliers and freight forwarders to expedite the shipments, allowing for site mobilisation in late 2021.

Two apprentices were employed for the duration of the project – both in the carpentry field, and both recruited from the Great Southern Region. These two apprentices started their career with Enviro on this project and are both now working on MRWA bridge projects across the state.

Enviro's project management team revised the HDPE culvert delivery schedule and deployed project teams to alternative sites at the request of Main Roads to mitigate any additional mobilisation costs and keep the project on budget.

The site's significant bypass-dewatering requirements meant additional control measures including regular monitoring, demarcation and exclusion zones and fauna clearances were required to be undertaken throughout the project delivery. Enviro installed temporary stormwater infrastructure to ensure no contamination of nearby waterways whilst civil scopes under the bridge were executed, and to ensure safe passage for wildlife until the new drainage pits and pipework was installed. Environmental delineation markers were erected around the site to demarcate the approved works footprint, and no breaches of this boundary were recorded in the five months of project delivery.

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EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE UP TO $2 MILLION

NEO CIVIL

MERSEY POINT GRANITE SEAWALL

Client/Principal: City of Rockingham

Completion of works on the Mersey Point Granite Seawall project were crucial to protecting one of the most vulnerable parts of the City of Rockingham's coastline.

Neo Civil's scope of works under this contract included:

- Demolition and removal of existing limestone seawall;
- Earthworks, excavation, backfilling and compaction related to upgrade/extension of the seawall;
- Construction of the seawall as per the drawings and the specification;
- Construction of beach access stairs as per the drawings and the specification.
- Design and construction of screw pile foundation as per the specification and required performance criteria.
- Footpath reconstruction.
- Foreshore fence installation.
- Mulching.

The coastal protection efforts at Mersey Point involved extensive work on the western end of the seawall, with construction taking place along the stretch of coastline that is located on Arcadia Drive near Pengos Café.

This part of the project involved the removal of the existing temporary limestone seawall, which was replaced with a new 400m granite seawall. The existing limestone seawall and timber beach stairs were replaced with a new 400-metre granite seawall and steel beach stairs.

Neo identified early that the clearing allowed for some sections of the works was insufficient for the project. The City were advised of this issue and Neo requested the City apply for a clearing permit to encompass the affected works areas. Unfortunately, the timeframe required for a revised clearing permit from DBCA/DWER would cause a considerable delay to the proposed start of the works.

To avoid any delays, the methodology and sequencing was immediately revised. Neo changed the approach to the construction of the seawall toe by placing the rock from the top of the batter. There would not be a requirement for clearing and there would be minimum impact on the surrounding zones.

The project required a cofferdam to be constructed and the site dewatered below sea level. This was a challenge as during construction the cofferdam was subject to storms, wind and swell - it was imperative that it was built fit for purpose. The cofferdam withstood these events and Neo's methodology resulted in no issues related to the cofferdam.

The cofferdam was a critical element for the project and a major challenge despite Neo's long experience with coastal works. As the work area bordered a marine park, the design had to meet environmental requirements.

Neo's methodology involved placing rock at the seaward face of the dam, constructed and deconstructed in approximately 50-metre sections.

It became apparent that staging of the works needed to be flexible but

not impact on critical path elements. An example of potential impact was when, due to a technical query, there was an unexpected wait time for the new stairs to be on site.

Effective traffic management was crucial to provide access for local residents and mitigate any potential interactions between vehicles/pedestrians and rock trucks. The project was located on a small footprint in a busy area – local businesses and activities could not be impacted, and access to the beach was required.

The company delivering the granite rock to site backloaded the limestone from the old seawall and took it to be recycled into another project in Point Peron. Strict adherence to the Environmental Management Plans and Neo's environmental procedures resulted in no environmental issues on site and no impact on the marine park.

NEO Civil
Civil Engineering Contractors

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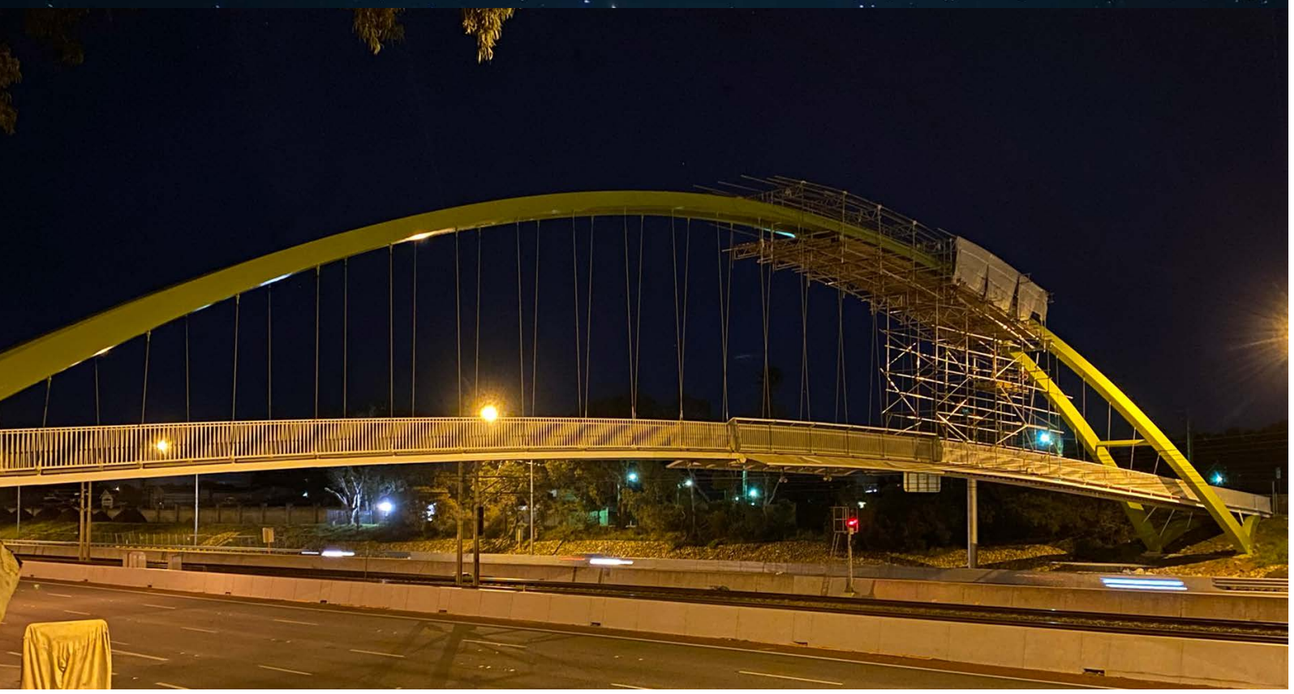
EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE $2 - 5 MILLION



ENVIRO INFRASTRUCTURE

HECTOR STREET FOOTBRIDGE REFURBISHMENT

Principal: Main Roads Western Australia

Main Roads engaged Enviro Infrastructure as head contractor to undertake remedial works to this single span steel arch suspension bridge, which spans the Mitchell Freeway and Joondalup rail line in Osborne Park.

Enviro's scope of works included protective coating maintenance, weld inspection testing and repairs, and deck plank end repairs.

The project required sustained partial closure, full shutdown and isolation of both the freeway and the rail line, including the overhead live equipment (OLE). Enviro is highly experienced in both the Main Roads and PTA networks, with a track record of delivering high risk projects with road/rail interfaces, and with the capacity to direct manage the PTA's rail access requirements.

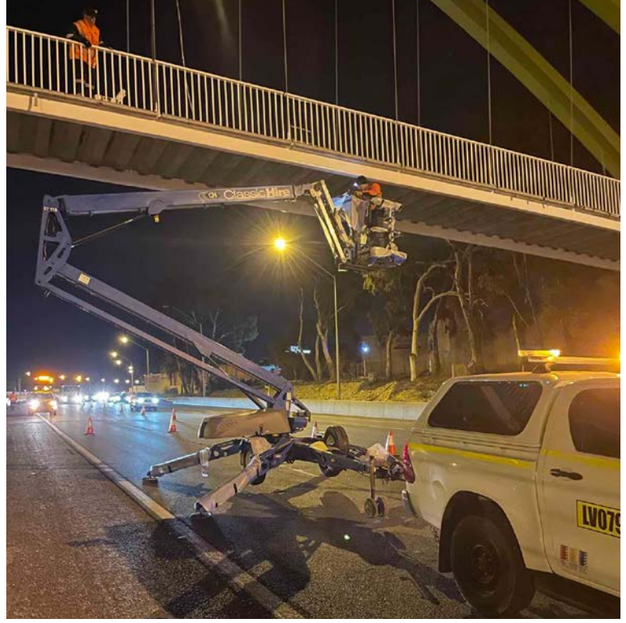
Upon project award, Enviro began a comprehensive design analysis and risk identification program which involved the principal, the independent verifying engineers (AECOM), the PTA and Enviro's internal engineering team and contractors. In over 10 years of delivering road and rail projects for Main Roads and PTA, Enviro considered this their most technically challenging project yet.

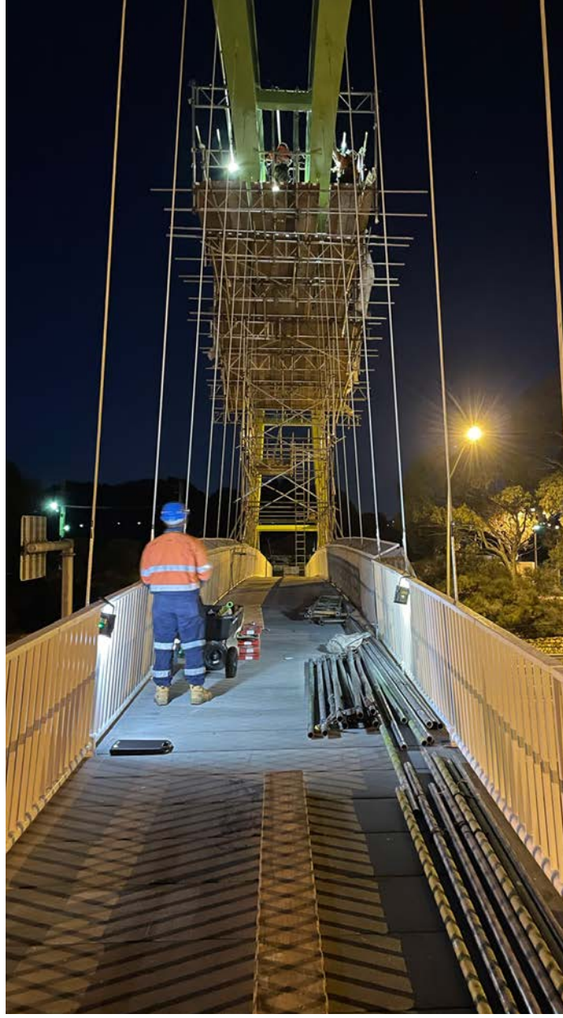
Detailed planning for the project included the comprehensive design of a full encapsulated suspended scaffold for the structure, which not only had to be engineered to withstand wind loadings of the exposed location, it also required earthing and bonding design to mitigate risk of electrical energy transfer from the OLE. Enviro and its key subcontractors collaborated to develop a scaffold structure which provided nearly 100% encapsulation of the abrasive blasting materials, preventing any impact on road and rail users or assets.

Due to the height and location of the structure components, detailed structure and decking bearing calculations were undertaken to determine what size sections of scaffold could be installed and safely worked (considering garnet and equipment loadings). Installation schedules were built back from these calculations, and aligned with concurrent rolling lane closures of the freeway and shutdown/isolations of the rail line. The resulting design and delivery program stipulated 97 individual nights of freeway or rail isolation, requiring Enviro's Track Protection Officers and traffic management teams to consult heavily with PTA rail access teams, overhead isolation teams and integrate with three other projects already delivering major traffic works on the freeway lanes.

Once the scaffold was installed and verified as encapsulated, trade teams worked continuously over seven months to blast and paint the structure, without spilling or leaking any abrasive garnet, paint or ancillary equipment onto the freeway or rail reserve below.

The project was executed at the busiest time on the PTA network in recent history, with Metronet and other major alliance projects causing a backlog of works and near gridlock on access to the network. As a result, Enviro had to forecast works staging more than 13 weeks in advance to submit access applications, which were often rejected or reduced one to two weeks in advance of works execution, meaning the Enviro's project and rail managers were in a near constant state of schedule and methodology modification.





Enviro's project and rail managers were in a near constant state of schedule and methodology modification.

The highest risk environmental factor on this project was the contaminated waste garnet. Despite no lead paint being present on the structure, all waste garnet was heavily contaminated with over 40 years of redundant coatings. This waste garnet was diligently collected using a series of extractor fans and chutes and placed into bulka bags for transport. All waste garnet removed from site was taken to an inert waste recycling facility in Kwinana where it is treated prior to disposal at a secondary licensed area.

The project was delivered over almost seven months onsite, all works being nightshift. Enviro developed a detailed project COVID management plan, which included redundancy in staff during periods of COVID isolation, and remote working capacity for project managers.

Enviro

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EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE $2 - 5 MILLION

DM CIVIL

ROLEYSTONE DN760 PIPE REPLACEMENT

Principal: Water Corporation

The Canning Dam water mains are an element of the state's Integrated Water Supply Scheme (IWSS). The back feed main is a DN760 'locking bar' pipe. This 100-year-old pipe has now reached its service life and is in the process of gradual replacement.

DM Civil was awarded the contract to replace a section of the main near Butcher Road in Roleystone.

The project's anticipated complexities were the scope of work to be carried out safely on a one in three ground slope over clay soils and granite rock, working alongside an existing live trunk main supported on pedestals on the sloping section and buried in rocky ground across the farmland, where the new DN600 pipe was originally to be laid between the existing live trunk mains. There was also the challenge of maintaining access and minimising impact for the resident farmer, including livestock movement.

A third challenge was crossing Soldiers Road at depth in unconfirmed ground conditions while sequencing multiple tie-ins to the existing trunk and distribution mains.

Major scheduling milestones at the time of tender were winter weather and tie-in dates, with time windows that are controlled by seasonal water supply requirements and water supply contingency measures that are also season-related and dependent on the available network in this area.

DM Civil's Project Manager was a driving force behind the solutions implemented for numerous unexpected challenges and complexities including:

- Construction activity during the wettest winter on record.
- Increasing the length of the bypass pipeline from 170m to 380m long, requiring the procurement of additional non-standard PE pipe at short notice. The quantity of PE pipe required had to be sourced from two manufacturers, necessitating further assessment and testing of pipe, resins and jointing.
- Transport and placement of pipe and materials down the slope of the hillside off Butcher Road down to the Canning River. The DN400 PE bypass pipe would have to travel up the hillside over 170m, with sharp rocky outcrops that would damage any welded pipe dragged over it. A solution was needed to facilitate safe pipe placement and involved the use of a second-hand roll of conveyor belt, as well as hauling the fully welded length up the slop with a 12-tonne winch and 40t HDD pulling head welded to the front of the string.
- Tie-ins having to align with allowable shutdown windows to ensure minimal supply disruption to the region.

The experienced project team were exceptional in their project management and delivery. The already varied length of the bypass pipeline was a critical service while the MSCL pipeline was out of commission. Two additional polyethylene welding technicians were trained from DM Civil's permanent staff from theoretical and onsite training during the course of the contract.

Significant safety concerns were effectively managed, included working on steep slopes for people, plant and machinery, working in proximity to live water mains, weather conditions and environmental changes due to unprecedented rainfall and ensuring that livestock were kept isolated from the work.

Given the environmentally sensitive nature of the project, successful strategies had to be considered for protecting the Canning River from siltation and weed infestation, minimising any impact to the riverbed and banks for the new MSCL pipework, ensuring no additional clearing was required along the construction corridor and isolating the land owner's livestock from moving plant and machinery, as well as ensuring containment within their paddocks.

The most significant stakeholder, the resident of the property where the project took place, was highly accommodating. His property access was the only one available to enter the works and he had livestock that needed protection from construction activity. DM Civil was able to provide assistance for a new retaining wall and dividing fence at his request.

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EXCELLENCE IN CIVIL CONSTRUCTION: PROJECT VALUE $5 - 10 MILLION

ROB CARR & WATER CORPORATION

GNANGARA BRANCH SEWER SECTION 2

Principal: Water Corporation

The Water Corporation is in the process of significantly upgrading the sewer network in Perth's northern suburbs. Rob Carr was engaged to construct a new branch sewer along Lancaster Road adjacent to Wanneroo Road through to the intersection of Parri Road and Regali Way in Wangara.

Rob Carr's specialist capability in microtunnelling and detailed complex civil works, along with its management of Water Corporation panel member subcontractors for the plastic welding works was an essential part of the winning formula for the Gnangara Branch Sewer Section 2 Project.

To facilitate the installation of the new branch sewer, Rob Carr constructed 1,455m of DN1000 gravity sewer by microtunnelling and open trench excavation using glass reinforced plastic (GRP) pipe. The gravity sewer construction also involved the installation of numerous DN1500 access chambers along the alignment.

To complete the new branch sewer works, 335m of DN900 sewer pressure main was also installed via open trench excavation, using high density polyethylene pipe (HDPE).

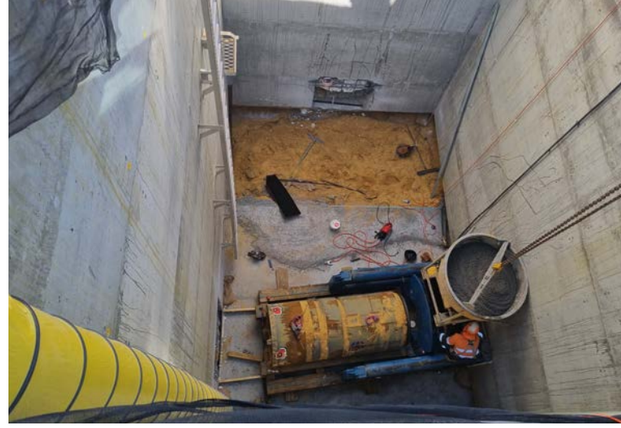
The microtunnelling was carried out over four separate drives over 500m through ground predominantly consisting of soft to medium sand with limestone pinnacles.

The project's largest constraint was maintaining access to existing businesses and residents while constructing the large and deep sewer asset. This was at times a challenge when constructing works required long stretches of excavations to be open to allow efficient pipe installation. Rob Carr in conjunction with the Water Corporation negotiated access requirements with businesses, constructing additional access, bridging the trenches or agreeing alternate access with adjacent property owners.

The location and proximity of the existing infrastructure, in ground services and structures along the alignment itself created a number of site access and constructability challenges. To overcome these challenges, Rob Carr employed slurry pressure balanced microtunnelling for the trenchless section of the works and caisson and shoring box techniques for construction of the deep access shafts.

Each method of delivery provided industry best practice techniques, mitigating the construction risk for the tunnels and shafts in comparison to other techniques within the geotechnical profile presented across the site.

Rob Carr constructed two eight-metre by six-metre rectangular caissons some 11m deep. The caissons provided a safe and structural working environment to complete the tunnelling and to later



construct the access chambers. The open cut section of the works combined the use of proprietary shoring boxes, steel plates, benching and steel universal columns to support the excavations and services.

At the connection point, the ground water table was found to be 2.5m higher than that detailed in the geotechnical report. The project team, in conjunction with the Water Corporation, was able to secure a dewatering licence for the increased water extraction and discharge within seven days of measuring the increased flow rate required to dewater the shaft.

This quick action allowed the tunnelling works to continue without delay, showcasing the collaborative team culture.

Employing a one team approach in the interest of achieving successful project outcomes, the team was able to navigate a complex and highly technical project through the COVID-19 pandemic. Whether it was providing construction excellence to maintain access for established businesses, dealing with a higher than expected water table, employing bespoke techniques to overcome technical challenges or working within restricted site footprints, the team was able to meet its industry best practice goals for the project.

The team's commitment to innovation also shone through in slurry design, local bridge construction to maintain access for stakeholders, relocation of structures for safer asset operation and unconventional launch shaft methodology, all leading to improvements in construction efficiency and better project outcomes.

The implementation of Rob Carr's robust ISO accredited HSEQ systems led to excellent health, safety, environmental and qualitative outcomes on the project.

Though the conditions were very challenging, the project was completed successfully and well ahead of the contract schedule.

Employing a one team approach in the interest of achieving successful project outcomes, the team was able to navigate a complex and highly technical project through the pandemic.

ROB CARR

WATER CORPORATION

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EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE $5 - 10 MILLION

GEORGIOU GROUP

OSBORNE PARK DRAIN STAGE 2

Client: Water Corporation

To keep up with growth and development in Osborne Park and surrounding areas, an upgrade of drainage infrastructure was essential to increase drain capacity and minimise flooding issues.

The project involved the installation of a new culvert under Scarborough Beach Road. The project also facilitated the construction of a new section of the drain to join the new culvert to the existing drain network.

Detailed scope of works included:

- Upgrade the existing 560m of open drain downstream of Scarborough Beach Road.
- A new five-barrel, 1,500-diameter pipe crossing Scarborough Beach Road including support of numerous services and significant traffic management planning.
- Realignment of the shared path, retaining wall and screen wall at the Scarborough Beach Road Outlet Structure.
- Construction of new headwalls on either side of Scarborough Beach Road.
- The construction of a new open drain on the northern side of Scarborough Beach Road connecting the new headwall and culverts to the existing drain.

The team utilised innovation to overcome a series of challenges, such as:

- Complex site works through Scarborough Beach Road crossing requiring an accelerated timeframe for completion.
- Development of a temporary works service support system to protect critical services during open excavation works and allowing safe installation of culverts underneath.
- Overall staging and detailed planning of the crossing works to maintain two-way traffic and path diversions along Scarborough Beach Road through a small site footprint, whilst also maintaining access to neighbouring businesses and minimising disruption.
- Bunding and bypass pumping of the live open drain in stages to allow regrading and stone pitching of the open drain embankments.
- Environmental management of Acid Sulphate Soils and dewatering which had levels higher than expected.

Despite these challenges, the team delivered the project on time and budget.

Months of preparation went into developing the final lift studies and detailed installation schedules, with the eleven bridge segments successfully installed over two weekends.

The project required a new pipe crossing to be installed under Scarborough Beach Road. The options to undertake the work were through open excavation or under-road boring to keep the road open. Several factors made it impossible to successfully bore the pipes, such as existing ground conditions, depth of cover to pipe and the closeness of each pipe to one another.

The only option available was to complete a more traditional open excavation. The team still faced constrained space issues and a requirement to keep the road open during works, so complex staging was developed to allow works to occur. Constraints included the Western Power substation on one side and the existing headwall and culvert on the other, this meant side tracks or widenings were not an option. The staging was separated into the following:

- Install temporary footpath diversion around works to allow pipework installation to commence.
- Excavate and install pipework up to the southern verge. This allowed the team to cross under and support the majority of the existing services without impacting the road users.
- Set up traffic management and closure of the first half of Scarborough Beach Road. Establish a temporary support structure in the middle of the road to allow works to be backfilled and connected whilst still maintaining minimum lane widths.
- Backfill and reconstruct the existing road.
- Relocate traffic management, switch traffic on the recently completed section, then excavate and install the second half of the road crossing.
- Once the pipework was installed past the road's edge, it was able to be laid all the way up to the new headwall whilst the existing road was being backfilled and re-instated.

This staging provided the team with the most efficient timeframe and minimised risk compared to the under road boring option. The project's methodology and programme were a critical component of the team's tender submission to give Water Corporation confidence in Georgiou's proposal and minimise risk on-site.

Georgiou

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EXCELLENCE IN CIVIL CONSTRUCTION: PROJECT VALUE $10 - $30 MILLION

GEORGIOU GROUP

KWINANA FREEWAY PEDESTRIAN AND CYCLE PATH

Client: Main Roads Western Australia

The Kwinana Freeway Pedestrian and Cycle Path provides an uninterrupted journey between Mandurah and Perth CBD and improves safety by eliminating conflict between traffic and path users. Georgiou constructed 700m of new shared path between Leach Highway and Brian Avenue, including a new 45m underpass at Cranford Avenue on-ramp, and upgraded a further 455m of existing path.

Georgiou overcame many challenges, such as protection of an existing water sewer main, live services and tight project boundary to find innovation which influenced the project's final design and construction methodology, saving the client time and money.

The project site was approximately 800m long and 20m wide, bordered by the busy Kwinana Freeway to the east and residential properties to the west. The site was so restrictive that for the noise wall panel installation, a 250-tonne crane was set up using lanes on the freeway, with lane closures implemented.

A key concern for the local community was protecting the trees along Selway Road. The team worked with the community and client to change the construction staging to preserve the trees. Additionally, through collaboration with the client and designers, the team was able to reuse the existing northern noise wall panels, reducing time, materials, and cost. Georgiou also provided recommendations through consultation with the client to include Indigenous artwork in the underpass.

An existing Water Corporation 900-millimetre diameter sewer pressure main extended the length of the project, with the team required to drive nine 15m steel sheets within 1.5m of the sewer pressure main. A section of the concrete roof also had to be constructed within 800mm of the main.

Through consultation with the client, Georgiou engaged a piling contractor and utilised a Giken piling machine. The Giken clamps onto the sheet piles and augurs the piles into position, mitigating all noise and vibration and eliminating any risk to the adjacent sewer pressure main. The piling sequence was also planned very carefully, with the piles closest to the sewer being installed initially

to provide further protection to the main, whilst the rest of the scope of works was undertaken. As an additional measure, ground vibration monitoring was used throughout piling works near the main to ensure no vibration limits were exceeded.

During piling activities, the rig encountered unexpected rock and given no vibration was allowed, rock breakers were not able to be used. The team utilised a special rock auger to drill out the rock prior to placing the steel sheets, which greatly increased the duration of the activity. The team then rescheduled the remaining scope of works to mitigate these delays and meet project milestones.

Due to tight project boundaries and to reduce the closure time of the Cranford Avenue on-ramp, the underpass was constructed in a top-down manner. This meant the roof slab had to be constructed prior to the base slab and walls. This was achieved by excavating down to roof level, installing the steel sheet piles and constructing the roof slab capping beams, and constructing the roof slab. Once cured, the inside of the underpass was excavated using small plant and equipment. Once excavated, the base slab was constructed, which was undertaken in multiple pours. Finally, the underpass walls were constructed, made complex by the space restrictions and the distance from the concrete supply. Letterboxes had to be formed at intervals along the length of the wall formwork to allow concrete to be placed. Formwork wall vibrators were also used to ensure the concrete was sufficiently compacted. A line pump was also utilised to get the concrete inside the underpass - pumping concrete over a distance of 50m.

Georgiou

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EARTH AWARDS
Excellence in Civil Construction

FINALIST

EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE $10 - $30 MILLION

BMD CONSTRUCTIONS

MOUNT HOLLAND AERODROME

Client: Covalent Lithium

Covalent Lithium's Mt Holland mine site in the goldfields is located approximately 500km east of Perth. BMD Constructions was engaged to construct an aerodrome to provide fast and direct access for personnel travelling to and from the mine site from Perth.

BMD was responsible for the construction of the bulk and detailed earthworks, drainage, runway, taxiway and apron pavements, aerodrome lighting and communication facilities, visual aids, line markings, and fencing. This included:

- bulk earthworks with 350,000 cubic metres of embankment fill
- 80,000 square metres of gravel stabilised pavements
- 1,600m long and 30m wide sealed runway
- 140m long and 23m wide sealed taxiway
- sealed aircraft parking apron approximately 150m long and 135m wide
- 6km of fencing.

BMD was committed to the program delivery deadline from the outset, investing in the project's early planning phase to identify key challenges, generate management strategies, and allocate appropriate resources to achieve construction excellence.

A strong team culture was maintained throughout the duration of the project with a focus on achieving high performance through collaboration and innovations driven by management and implemented in training and communication. An example of collaborative contracting was in overcoming the engineering challenges associated with sourcing suitable pavement gravels at the aerodrome site. Unique to BMD's tender approach was to combine airfield management experience with the local market to achieve the client's request to utilise the gravels present within close proximity of the aerodrome location. BMD's approach was to cement stabilise the local gravels for a compliant subbase and basecourse to achieve the required strength for the pavement layers and achieve cost savings by not importing material.

Extensive testing was carried out and trial mixes were developed in a geotechnical laboratory to establish the optimum percentage of cement to be added to the material to make it compliant. Once the optimum cement content was established, BMD conducted trial sections onsite to verify the working methods and the pavement

An additional 16 days of time savings passed onto the client was achieved through cement stabilising in one layer.

properties for the placing of subbase and basecourse, and cement stabilising. The innovative blending of onsite materials with cement for the subbase and basecourse directly resulted in $700,000 of cost savings and an additional 16 days of time savings was achieved through cement stabilising in one layer.

The project also had limited access to water supply. BMD's approach was the use of a stabilising machine to control the water input into the pavement layers through a fine-tuned process and ultimately achieved cement stabilising in one layer instead of two.

BMD prioritised the local community in its delivery of the project, maintaining close liaison with the Shire of Yilgarn to coordinate construction deliveries, particularly following periods of significant rain events which had the gravel access roads closed. BMD was also proud to engage 5.7% of the project workforce from the local Aboriginal community and 3.5% of the contract value was completed by Aboriginal-owned businesses.

The runway, apron, taxiway and associated aerodrome infrastructure was successfully completed in an eight-month delivery window and is a leading example of how early engagement, ingenuity of engineering solutions, appreciation of the design intent and a thorough understanding of the risks and challenges involved can deliver a quality aircraft pavement outcome. At completion, over 350,000 cubic metres of bulk earthworks and 80,000 square metres of bitumen sealed pavements were constructed.

BMD

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JUDGES' AWARD WINNER

EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE $10 - $30 MILLION

SRG GLOBAL

20ML KARRATHA WATER TANK AND ASSOCIATED WORKS

Client: Water Corporation

A new and more durable water tank was needed for the City of Karratha following the destruction of the existing tank during Tropical Cyclone Damien in February 2020, to protect Karratha's water supply during extreme weather events and secure the community's water supply for decades to come. The tank had to be designed with an expected lifespan of 100 years in a region known for extreme weather events.

SRG's scope of works included demolition, removal and disposal off site of existing steel tank and all associated elements; design and Construction of a new 20 megalitre concrete water tank; pipework, mechanical and valving; civil earthworks; hardstands; drainage; tank ancillaries; and instrumentation. The SRG team were also awarded additional works for the management of the additional civil and piping scope required to be able to commission the tank and link to the two existing water supply structures.

SRG Global brought an engineering mindset and in-house design capabilities to drive innovation and ensure constructability was at the forefront throughout the design process. SRG Global teamed with Karratha-based, Aboriginal-owned company Yurra, and worked with specialist design consultants and local subcontractors to develop the ultimate solution that guaranteed construction of the new tank was completed before the start of the cyclone season, to ensure water security for the city.

SRG's experience in designing and constructing large flat concrete slabs in high-rise buildings was instrumental in the design and successful delivery of the Karratha water tank.

To overcome the risk of cracks developing in the concrete base and creating a water path, SRG incorporated a flat slab post tensioning system into the slab construction. This innovative solution resulted in a significant reduction in concrete while providing increased reinforcement volume in the base slab. Most importantly, the risk of cracks developing during its service life has been substantially mitigated.

Collaboration between the design and construction teams resulted in a significantly more robust construction technique to further limit the possibility of any cracks forming. This technique required the base slab to be cast in a single concrete pour to avoid joints which in future could potentially become a water path. This solution required careful planning and execution across all disciplines on site.

The tank had to be designed with an expected lifespan of 100 years in a region known for extreme weather events.

The wall panels were manufactured by a local subcontractor in Karratha using mould formwork to ensure a quality, watertight product offering several benefits:

- 23% reduction in wall thickness compared to the concept design.
- improved quality control using a factory environment for casting concrete.
- Accelerated program through manufacturing offsite concurrently with other works onsite.
- Improved safety – limited work at heights, less formwork, falsework and scaffold required onsite.

Production in Karratha reduced transport costs and carbon emissions.

During installation, concrete was placed between the pre-cast panels while they were installed to stich them together and form the walls. The project team then installed waterproofing membranes to the concrete joints to ensure these were watertight. Secondary waterproofing measures were also incorporated into the design.

Another very successful innovation on the project was the alternative temporary works propping system utilised during the wall installation. This used a counterweight system to avoid the need for anchor bracing into the already cast base slab, which could have been overloaded and caused damage in a high wind event.

A concrete roof was installed on the water tank to ensure the design life is achieved and water quality is secure from any contaminates. The roof design used a hammer head style beam, which reduced the overall depth requirement and allowed for simplified construction with a single pin connection at the columns. Precast roof panels were then used to reduce formwork and provide a base for the final topping slab stitching the roof together.

Unfortunately, by this stage of the pandemic, local concrete supplies were limited and as a result, SRG decided to fabricate the panels in Perth. This enabled the team to achieve the highest concrete quality ensuring that the panels were free from defects, achieved a 100-year design life and most importantly, were watertight.

SRG GLOBAL

CIVIL CONTRACTORS FEDERATION
EARTH AWARDS
Excellence in Civil Construction

FINALIST

EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE $10 - $30 MILLION

WONGUTHA WAY ALLIANCE

COMPRISING CAREYMC, CENTRAL EARTHMOVING COMPANY & MAIN ROADS WESTERN AUSTRALIA

OUTBACK WAY PROJECT

Client: Main Roads Western Australia

The Wongutha Way Alliance was formed in December 2019 between Main Roads Western Australia, CareyMC and Central Earthmoving to deliver road construction and sealing works on Great Central Road; the Western Australian portion of the "Outback Highway" – Australia's diagonal shortcut between Laverton in WA and Winton in Queensland. The Alliance aimed to maximise local business and local Aboriginal participation and employment through the works.

It was identified that local resources, both materials and workforce, would be limited. Targeted strategies had to be developed to find construction water, pavement materials, and a local workforce. Works like this had not been in this area for a number of years, with local skillsets not necessarily suited to highly specialised works.

Resource investigations commenced in early 2020 with water drilling and gravel investigations at locations identified by geologists. Four bores and two gravel pits were identified along the 40-kilometre stretch of Work Package 1.

The Alliance had a remit to provide opportunities for local business, local employment and most importantly local Aboriginal business development and employment. The Laverton community is over 950km from Perth with a population of fewer than 1000 people.

Together, the Alliance participants committed to developing a local Aboriginal workforce and to actively engage with local business to facilitate the works. Over the 18-month project, over 27% of the works were completed by Aboriginal business, with over 18% from local Aboriginal business. In addition, a further 25% was completed by non-indigenous local business, resulting in over 50% of the works being completed by either Aboriginal or local business.

After utilising recognised formal training qualifications, the Alliance identified the need to develop a bespoke Training Program for local people who were not necessarily ready for ongoing construction work. This involved engaging with the local Aboriginal community to seek out respected elders to engage on the project, Aboriginal trainers and a tailored development plan to "graduate" trainees into working on the project.

The implementation of this strategy led to over 90% retention for the remainder of the works. Trainees gained "real" on the job learning, solving their own mistakes, utilising inconsistent naturally occurring material on a Main Roads project. The training crew successfully completing large sections of the Great Central Rd and other associated infrastructure to Main Roads specification under their own management and trainer supervision.

carey

CENTRALS
CIVIL, EARTHMOVING & MINING CONTRACTORS

mainroads
WESTERN AUSTRALIA

The Alliance retained over 40% Aboriginal workforce, with 17% from local communities. 22 trainees received formal civil construction qualifications, with a further 14 traffic management tickets issued.

Overall, the Alliance retained over 40% Aboriginal workforce, with 17% from local communities. 22 trainees received formal civil construction qualifications, with a further 14 traffic management tickets issued. These skills have been able to be transferred to other employers post the Alliance, with over 70% of the workforce retained within our industry.

Whilst actively seeking these local and Aboriginal key result areas, the Alliance was also required to source and develop the required natural resources (water and pavement gravels) necessary for construction, manage local stakeholders and subcontractors, manage the impacts of COVID restrictions in remote Aboriginal communities, whilst completing the design works and construct for the 42-kilometre upgrade of the Great Central Road.

Over the 18 months the project was LTI free over 108,000 manhours with works completed ahead of schedule. The Alliance has proven that the active engagement of trainees, completing meaningful works, learning from their mistakes can still result in the safe, successful delivery of project outcomes.

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WINNER

EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE $30M TO $75M

GEORGIOU GROUP & MAIN ROADS WA

KAREL AVENUE UPGRADE

Client: Main Roads Western Australia

The Karel Avenue Upgrade involved the widening of Karel Avenue over Roe Highway and the freight railway to create a dual carriageway from Farrington Road to Berrigan Drive. The project also accommodated two new rail passenger lines next to the existing freight rail lines on the Thornlie to Cockburn line, part of the wider Metronet program, through the upgrade of the existing rail grade separation with Karel Avenue.

From a design and construction perspective, the most challenging aspect of the project was the extension and widening of the existing Karel Avenue grade separation with the Thornlie to Cockburn rail line. Bridge 1595 required widening from a single to a double-lane carriageway and lengthening to accommodate the future railway underneath. The original design was not compliant with the higher Australian Standard rail collision loads introduced in 2017 and didn't include allowance for Karel Avenue widening. The design solution chosen was to replace the existing bridge 1595 with the new longer and wider bridge 1595A.

Due to several constraints, it was not possible to build Bridge 1595A next to the existing one as part of the new structure had to occupy the footprint of the existing bridge. Disruptions to Karel Avenue traffic flow had to be minimised and the rail traffic underneath could not be disrupted. Construction staging assumed high importance and the design developed allowed for the de-construction of Bridge 1595 in two major stages and the construction of the bridge 1595A in two major stages as well.

To allow for this two-stage construction an even number of girders were adopted in the design. Following the installation of the four western-most bridge girders and the construction of the cast in-situ topping, a third stitch deck pour in between the two stages of the bridge deck was engineered to control the different structural behaviour of the two sections of the bridge.

Sprayed concrete technology was used for the north abutment for soil retaining and to strengthen the abutment structures for rail collision load. This represents one of the first applications of sprayed concrete for Main Roads bridges in an urban environment.

A great level of planning and stakeholder engagement was required to ensure all excavations in proximity to key assets were clearly understood and approved by the relevant stakeholder.

A significant consideration during the design phase was the interface with live services. To the south of the bridge, there was a high-pressure APA gas service and a BP fuel line servicing Perth Airport from Henderson. These two assets required significant interface with the relevant stakeholders for excavations, piling installation works and beam installation whilst traversing the assets.

To the north of the bridge were several other services including Telstra communications, ARC Infrastructure communications, Western Power communications and overhead transmission lines as well as an ATCO gas high pressure pipeline. A great level of planning and stakeholder engagement was required to ensure all excavations in proximity to these key assets were clearly understood and approved by the relevant stakeholder.

One significant challenge – with respect to working around the overhead transmission powerlines – was the heavy lifts required to install the T-Roff bridge beams. The number and size of cranes to install the bridge beams were strategically selected to mitigate any potential risk to the installation operation as well as the Western Power asset itself. One particular lift had close proximity to powerlines; through consultation with Western Power, it was decided to shut down the powerlines over a weekend closure. This required significant planning and advance notification to Western Power and the broader network.

Through clear communication with our client and the key stakeholders, coupled with regular planning workshops and programming meetings, Georgiou was able to deliver the programmed works without negatively impacting the assets within the construction footprint.

Georgiou

mainroads
WESTERN AUSTRALIA

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Excellence in Civil Construction

FINALIST

EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE $30M TO $75M

WHITTENS

WHITE QUARTZ ROAD REALIGNMENT

Client: Rio Tinto

Whittens was engaged to complete the White Quartz Road Realignment Project for valued client, Rio Tinto, delivering an essential piece of infrastructure adjacent to Rio Tinto's Brockman 4 mine site, about 60km north-west of Tom Price.

Working adjacent to existing mine infrastructure and completing critical works during the Pilbara wet season were challenging aspects of the project that were overcome thorugh detailed planning and efficient execution

Whittens' scope of work included significant Design and Construct packages. This was a testament to the growth of the organisation and its ability to manage the respective subcontractors in ensuring the client's requirements have been understood and delivered.

The road realignment and associated civil works comprised the establishment, operation, management, and rehabilitation of borrow pits, to complete the construction and sealing of the 1.1km White Quartz Road, which included intersection and road widening to West Walmsley Drive. Whittens successfully constructed a 1km unsealed bypass road for Oversize Overmass (OSOM) vehicles, and two sealed diversion roads to maintain traffic flows and ensure worker safety during the execution of the works.

This was followed by construction of a 600m dual lane mining haul road overpass, over the White Quartz Road, with an embankment height reaching 12.5m. Design, supply and install was required of a 73m pre-cast concrete arch to allow the haul road overpass, including mechanically stabilised earth spandrel and head walls, structural earthworks backfill and associated infrastructure for underpass lighting.

The final portions to the project involved the construction of a new warehouse yard and washdown including evaporation pond, hardstands, concrete slabs and water services. Whittens was also engaged to carry out the supply and installation of two new automated gatehouses, including heavy and light vehicle park ups, OSOM gates and associated infrastructure for services.

The project involved the self-delivery of over 300,000 cubic metres of earthworks and 2,000 cu. m of concrete, as well as the management of a multitude of specialist subcontractors, which included surface

mining, drill and blast, material screening, heavy craneage, HDPE pond liner and welding, fencing, cement stabilisation, kerbing, sealing, asphalt, and line marking.

At the tender stage, Whittens developed a 4D staging methodology video to highlight critical elements of the works and ensure deep understanding was acquired across the business, planning team and project personnel. Whittens used this understanding to establish opportunities for potential cost saving and value-add propositions as part of its pricing submission.

Part of the value-add proposition included the option for Rio Tinto to directly engage the existing pre-mobilised drill and blast contractor currently on site instead of mobilising another contractor, generating significant savings to the client.

Indigenous land and heritage was carefully considered during the planning of the project to ensure the local Aboriginal peoples' spiritual, physical, social and cultural connection to the land was observed. To prevent any impacts on heritage sites, Whittens initiated an agreement with the client to demarcate exclusion and avoidance areas within the Project area.

Whittens is confident that completion of the White Quartz Road Realignment Project will provide a legacy within the business, the community and the industry in which it operates for many years to come.

WHITTENS

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WINNER

EXCELLENCE IN CIVIL CONSTRUCTION: PROJECT VALUE $75M TO $150M

DOWNER

DENNY AVENUE LEVEL CROSSING REMOVAL PROJECT

Client: Public Transport Authority

The Denny Avenue Level Crossing in Kelmscott is the first crossing to be removed under the METRONET Level Crossing Removal program. The project includes closing and removing the Denny Avenue level crossing and replacing it with a rail over road grade separation at Davis Road. The existing rail line was realigned and raised, and the surrounding road network lowered to facilitate creation of the underpass.

The scope also includes a footbridge, road works and civic facilities. These works aim to revitalise the Kelmscott town centre by creating a public plaza adjacent to the station, including provision of services to enable use by pop-up food and product vendors.

Denny Avenue was a complex, high-risk project with challenges including:

- A challenging brownfield site including an operating electrified urban railway, with a major highway and local roads carrying significant traffic volumes.
- COVID related impacts to construction and delivery of materials.
- Scope: rail (45%) and road & civic (55%) works requiring a broad range of design and construction skills.
- PTA requests for fast tracking of construction which resulted in aggressive construction targets.
- Major high risk service relocations with critical path program implications
- Significant stakeholder influences and constraints including a major commercial precinct within the site.
- Challenging ground conditions during the underpass construction.
- Complex service relocation requirements.
- Significant scope increases during design and construction.
- Close State Government scrutiny.

The project was initially tendered, bid and awarded as two projects; a rail package delivered over seven stages, and a roads package delivered over the course of five stages/three separable portions over 84 weeks. Upon award the Public Transport Authority (PTA) requested Downer to look at an accelerated program to remove the Denny Avenue Level crossing earlier than original programmed date of mid-August.

After consultation with key stakeholders and suppliers, Downer presented the proposal to close level crossing four months early by completing an extended 11-day rail shutdown with works conducted 24/7 – the first extended rail shutdown on PTA's network.

This revised methodology saw the baseline program completely adjusted and a revised critical path formed, bringing new challenges

Downer managed these program pressures through a Value Engineering process, analysing and reviewing the project and creating solutions during the design phase.

that shaped the planning and delivery of the project.

Downer managed these program pressures through a Value Engineering process, analysing and reviewing the project and creating solutions during the design phase. This resulted in the development of accelerated construction techniques, as well as better use of materials (bridge components and retaining walls), and the optimisation of road levels and drainage for the underpass.

A major challenge was the progression of design concurrently with construction. Piling, abutments and the cast in-situ bridge were all constructed with an incomplete design. Coupled with the requirement to work double shift seven days a week from mid-January, there was added pressure on the engineering and design team to provide drawings for critical areas and respond to site queries immediately to keep construction progressing.

All critical delivery items were reliant on services being removed, relocated or installed, in consultation with multiple stakeholders.

Downer and its design team engaged collaboratively with the PTA, Main Roads and all service providers through biweekly meetings to provide designs for the relocation of power poles, water mains, gas mains, communications services and sewer. This approach was in-line with the Project Charter, and the buy-in from all parties enabled changes that allowed for expedited delivery, including:

- Engineered shoring solutions to hold up power poles to allow removal of stabilising poles that were in the way.
- The main Water Corporation trunk main was bypass pumped to provide earlier removal of a 1500mm water main that was in the way of bridge construction.

Downer addressed these and other challenges through early and ongoing consultation, including workshops with all key stakeholders, including DevelopmentWA, City of Armadale, utility providers, Main Roads WA and PTA. Multiple information sessions were also held to keep the community and local business owners updated and prepared for any impacts of construction.

Downer
Relationships creating success

CIVIL CONTRACTORS FEDERATION
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WINNER

EXCELLENCE IN CIVIL CONSTRUCTION: PROJECT VALUE GREATER THAN $150M

ARMADALE ACCESS ALLIANCE

COMPRISING LAING O'ROURKE, BG&E & MAIN ROADS WESTERN AUSTRALIA

ARMADALE ROAD TO NORTH LAKE ROAD BRIDGE PROJECT

Client: Main Roads Western Australia

The Armadale Road to North Lake Road Bridge Project involved the construction of two grade-separated roundabouts at Tapper Road and Solomon Road to create a duck and dive alignment; a new bridge over Kwinana Freeway; new freeway on and off ramps and collector distributor roads; upgrades to Armadale Road; and improved access and parking for Cockburn Station.

This new infrastructure addressed congestion at the Kwinana Freeway, Armadale Road and Beeliar Drive interchange, which was Perth's fifth most congested intersection. The bypass around Cockburn Central station and the Cockburn Gateway Shopping Centre alleviates the previously heavy traffic congestion, particularly at the train station during peak times, improving efficiency and comfort for commuters by both road and rail.

The construction of Bridge 1733, a three-span bridge across Kwinana Freeway, required major enabling works. The western abutment works required an anchored sheet pile wall to retain an existing high-pressure gas main, and the eastern abutment works required a diversion of a major telecommunications service. The soffit of the new bridge clashed with the existing overhead wiring for the Perth to Mandurah Rail line, so the Alliance had to re-work and lower the overhead wiring in the vicinity of the bridge.

The overhead lines modifications works were delivered over 18 consecutive shifts, limited to two hours of working time each night, to ensure the works did not impact train operations.

The bridge beam lifts and superstructure works were particularly challenging. Two of the bridge's three spans had varying impacts on the rail corridor, and therefore differing constraints for crane set up and install. This required the installation of the bridge beams to be completed in three distinct phases from December 2020 to January 2021.

Laing O'Rourke's digital engineering (DE) capability and virtual data-driven models were instrumental, being used to design and plan the protection and relocation of services, eliminate clashes and model construction methodologies for erection of the bridges under shutdown constraints. Laing O'Rourke's application of DE on the project was exemplary and established a new standard for Laing O'Rourke projects.

Main Roads had for some time sought a contractor willing to share the cost of trialling intelligent compaction technology on a project.

Laing O'Rourke agreed to split costs 50/50 for an integrated measurement system which, fitted to a roller, provides real-time data on the stiffness of compacted materials, the number of passes the roller has made, and when optimum compaction is reached. Further trialling is now being evaluated for the Thomas Road over Rail Bridge project.

The project marked the first use in Western Australia of Blindsight, an artificial intelligence vision product conceived and developed by Laing O'Rourke's Technology and Innovation Group. Blindsight sees and recognises people, plant and infrastructure, assesses their interactions among them and determines when safety responses are needed – effectively giving plant operators 'eyes in the back of their head'. Internal HSE data reviews indicate that Blindsight technology can reduce accidents by 15%, reduce fatal and severe risks by 20%, reduce prevention costs by 5%, and improve on-site relationships.

Recovered, repurposed, and recycled items used on the Armadale Road to North Lake Road Bridge project included:

- More than 29,000 tonnes of Crushed Recycled Concrete, equating to almost one-third of the new permanent road subbase coming from recycled materials
- More than five percent of all new asphalt laid used reclaimed asphalt materials, totalling 2,500 tonnes of recycled material
- Approximately 14,000 tonnes of fill material imported from nearby projects by other proponents, resulting in a 10% increase in originally planned reused fill
- Retaining walls constructed using Eco-Blocks locally made from recycled construction waste that has been crushed and graded.

Armadale Access Alliance

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FINALIST

EXCELLENCE IN CIVIL CONSTRUCTION:
PROJECT VALUE GREATER THAN $150M

CPB CONTRACTORS

ROBE VALLEY SUSTAINING PROJECT

Client: Rio Tinto

Robe Valley is an open-pit iron ore mine about 120km southwest of Karratha, with operations dating back to 1972.

The Robe Valley iron ore mine expansion, also known as the Robe Valley Sustaining (RVS) project, involved development and expansion of three open-pits on three new deposits – namely Mesa B, Mesa C, and Mesa H – as well as the construction of supporting infrastructure for continued operations at Mesa A and Mesa J to sustain existing Robe Valley production. The three new open-pit mines will utilise existing infrastructure facilities including the rail network, port facilities, and the power stations.

CPB Contractors were awarded three packages of work within the RVS Project:

- Miscellaneous Earthworks package, known as Mesa K and J; involved miscellaneous earthworks around the Mesa J and K sites.
- Mesa A Concrete Works involved constructing concrete and ancillary structures for a new iron ore processing plant.
- Mesa B and C Bulk Earthworks involved bulk earthworks and structures (a tunnel and bridge) for heavy vehicle haulage roads and light vehicle access roads.

The main scope of the bulk earthworks was to create breaches into existing escarpment. This was a complex process. An extensive drilling and blasting program, of more than 1 million cubic metres was required to widen the existing Mesa A breach and create Mesa B and C breach access ramps. The detailed drilling operations required the material to be sampled, tested, and classed as ore or waste.

Careful coordination of drilling and blasting operations, selective excavation and utilising all waste material reduced the requirement for clearing of additional areas for borrow pits.

To complete the Mesa A package of works at the existing Rio Tinto wet processing facility, the wet plant conveyor was required to be completely shut down. The conveyor services the train load-out from the Mesa A iron ore mine.

Works to enhance the existing wet plant foundations and build additional foundations for supplementary infrastructure required careful and strategic planning with Calibre and Rio Tinto to schedule the necessary shutdowns.

As planning shutdowns involves input from numerous stakeholders, so too does the understanding of the requirements to have shutdowns run smoothly. The series of shutdowns requested for the wet

processing facility were meticulously planned and executed, enabling the plant to resume operations to load-out iron ore materials.

To construct a tunnel and bridge as part of the bulk earthworks package, the CPB Contractors team meticulously planned a rail occupation of the fully operational Mesa A iron ore cargo facility. These works had the potential to obstruct and disrupt the railway operations of Rio Tinto and therefore required approval from RTIO Rail Control.

The rail possessions to complete construction of the tunnel required close cooperation with various stakeholders and teams on and off site, and some highly detailed planning and scheduling. Not only do successful rail possessions require months of advance scheduling, but they also require strong team alignment to ensure each of the high-risk activities are planned, endorsed, and align with the requisite safety systems.

With no amount of effort spared, the project team completed all railway line possessions without causing any delays to operations, and all works completed without any rail incidents reported.

The team committed to reducing construction impacts on native vegetation wherever possible. Works were carefully planned with vegetation saving in mind and as a result, only half of the allowable amount of vegetation was cleared.

Despite working within the harsh Pilbara environment, the CPB

The project team completed all railway line possessions without causing any delays to operations.

Contractors team thrived. From the extreme summer temperatures to the seasonal torrential downpours, it was the resilience and tenacity of the entire team that consistently delivered despite the external forces of nature.

CPB CONTRACTORS