

## Bentley's Design Tool Helped Reduce Project Cost Through Innovative Contracting

*Angus W. Stocking*

South Road is metropolitan Adelaide's most important north-south arterial route and is absolutely critical for suburban commuters. It currently carries up to 88,000 vehicles per day and that number is projected to rise 6 percent each year through 2026. To keep traffic flowing, the South Australian Government is transforming 22 kilometers of South Road—from Southern Expressway in the south to Port River Expressway in the north to a continuous, nonstop route.

The first and most important step in this process is the construction of the Gallipoli Underpass at the intersection of South Road and ANZAC Highway. Since ANZAC Highway carries about 50,000 vehicles daily, the challenging design and construction of the underpass called for an innovative contracting approach.

The project was designed and built by AdelaideConnect, a consortium that included Parsons Brinckerhoff Australia, Hassell, and Kath Moore and Associates and contractors. Thies and Leed

Engineering and Construction and the Department for Transport, Energy, and Infrastructure.

### Meeting Challenges Through Innovative Techniques

AdelaideConnect faced two major challenges: staying within a tight budget, and maintaining traffic on at least two lanes in each direction at all times during construction. Lesser challenges included protecting nearby homes from noise, building sustainably, and honoring the Australian and New Zealand Army Corps (ANZAC) for which the highway is named.

The consortium knew that significant innovation would be needed for a successful project, so they settled on an early contractor involvement procurement strategy intended to reduce costs and find new construction solutions. This was only the second time early contractor involvement had been used on a South Australian infrastructure project. By contractually aligning



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One consequence of early contractor involvement was a radically different final design for the underpass. Rather than the single-point urban interchange called for in the reference design documents, AdelaideConnect emerged from the design process with a diamond interchange. This unexpected solution had several advantages, including shifting major construction to the west, making it much easier to keep traffic moving during the build. In addition, the bridge deck was reduced, U-turns became part of the design, and pedestrian crossings could be staged to reduce congestion.

the client, designer, and contractor early in the design phase, early contractor involvement makes the most of design talent from each partner, and generates more accurate labor and quantity estimates.

"We realized substantial savings due to early contractor involvement, starting with a 25 percent reduction of concept design costs compared to the client's original budget and, eventually, a further 11 percent reduction in construction costs as we applied innovations realized during the detailed design," said, Parsons Brinckerhoff Senior Road Designer Geoff Hepworth.

### Accurate Estimations, Key To The Success Of Early Contractor Involvement Strategy

Model-based design in MX was important to the success of early contractor involvement on the Gallipoli Underpass project. "It was very easy to get accurate quantities, which made estimating easier for the contractors," Hepworth said. "The builders and our designers could work together with the model to review constructability. This way, we could propose innovative techniques and designs and be sure of their economic efficiency" he added.

Setting standards in MX also made the design process more efficient. For example, the project team set up a string naming convention that eliminated guesswork. This made it easy to quantify certain string types, such as traffic barriers, and easily pull quantities out of the model.

Early contractor involvement was enhanced for this project by physically locating key personnel in the same building. For example, when designers called for large bridge piles rather than underground bridge anchors, which could have greatly increased pile costs, the contractors worked with the designers to determine how this method would be more efficient to build and more cost effective.

Keeping a total of four lanes open on both roadways at all times was logistically complex and made it more difficult to work safely in the narrow corridor. The consortium negotiated this challenge by phasing construction. In the first phase, the southern half of the bridge and underpass was built to withstand live loads even though unfinished. Traffic was diverted around the construction site on surface roads.

In phase two, traffic was moved onto the completed southern



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half, while the northern half was completed. In phase three, the two halves were joined and opened to traffic. This reduced traffic on the remaining at-grade sections of South Road, allowing these sections to be rehabilitated. Traffic never stopped on South Road, and there were only five weekend restrictions on ANZAC Highway. Bus traffic kept moving even during these restrictions.

### Working With The Community

Saving money and keeping lanes open were not the only measures of success on this roadway project. It was also important that the local residents were kept happy. AdelaideConnect connected with the surrounding community early on by including consultation specialists in the design process. Their work enabled the designers, builders, and the client to appreciate and address community concerns as design progressed, rather than making changes late in the process in response to complaints.

This proactive approach to community engagement continued with a well-conceived outreach campaign, including extensive use of visualizations and drive-throughs based on the MX model; the formation of community representative groups, with meetings held throughout the design process and into construction; the use of specialist auditors who reviewed the design to be sure that roadway users like cyclists, the visually impaired, and pedestrians weren't marginalized; and inclusion of community comments with

the technical review comments so that community concerns were given equal weight. Among the firsts for the Department for Transport, Energy, and Infrastructure was the establishment of a project-specific website and a project-specific toll-free inquiry line.

This thorough, inclusive approach led to many tangible improvements in the Gallipoli Underpass design. For example, consulting with bus services resulted in improved access to public transportation. And since noise emerged early as a primary community concern, designers integrated noise modeling into the design process, which resulted in better choices of road surfacing, noise walls, and acoustic treatments. Noise walls, which were planned to be constructed at the end of the project, were constructed early in the project to reduce the impacts of noise, visual amenity, and dust during construction. This occurred as a direct result of liaison with the community. The community also benefits from the underpass itself, which saves commuters up to six minutes of travel each way, every single day.

To honor ANZAC, laser-cut memorials were built into each corner of the interchange and a memorial grove was established. This grove complemented a green boulevard concept that was applied to South Road, along with an emphasis on pre-European landscapes that minimize irrigation while improving stormwater management and minimizing maintenance.

Parsons Brinckerhoff Australia's State Manager David Cruikshanks-Boyd, concluded, "The early contractor involvement arrangement applies the age-old idea of getting the builder involved as early as possible, and allowed all parties to work together to provide cost savings and integrate greater constructability into the design. We've created a gateway from the sea to the suburbs that will honor the ANZAC spirit and serve as a landmark we can value now and in the future."



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