

## Bentley Software Tools For Highway Upgrading Project

Angus W. Stocking, L.S.

### The Project

The SAFELink-Ipswich Motorway Upgrade project in Brisbane, Australia posed a substantial challenge to the SAFELink Alliance, a consortium of four partners that included Arup. The client—the Department of Transport and Mainroads Queensland, also an active team member in SAFELink Alliance—had the foresight and initiative to create the Alliance competition and structure for design and delivery of this very important section of infrastructure. The Centenary Highway Interchange was already one of Brisbane's busiest and was expected to get considerably busier according to demographic projections.

The immediate and priority requirements were to increase capacity of the highways, provide a free-flowing interchange, improve the existing road geometry/pavements to alleviate long commute times and increase road safety. In addition, some portions of the roadway were at relatively low

elevations within expected flood levels and the original interchange divided the surrounding community with landscaping that was generally viewed as unattractive.

The SAFELink Alliance also needed to work with the challenge of traffic that needed to be kept flowing throughout the upgrade as well as meet high sustainability standards. Environmental and community impacts during construction had to be kept to a minimum with local sports grounds and facilities needing relocation. And at the request of contracting agencies, compulsory land acquisitions had to be kept to a minimum while simultaneously providing for future expansion.

The project, which is currently under construction and due for completion in 2010, has already significantly reduced accident rates due to improved road geometry, better signage, less distracting urban landscaping and intelligent transport systems. Improved lighting design facilitated by advanced





3D modelling techniques is another contributing factor.

Raised highway levels and more effective drainage have made the interchange and the surrounding neighbourhoods less subject to flooding and by opening portions of the upgraded interchange in planned phases, commute times have dropped, even during the construction period. By redesigning from a perspective of connectivity, the surrounding communities are no longer split in two by the interchange. The community also benefits from the landscaping which improves views and buffers motorway sounds and from better noise management and lighting that is more considerate of the interchange's neighbours.

### Organizing For Success

To successfully design and manage this massive project, the

SAFELink Alliance divided the project into three phases. In phase one, target cost estimates were set and benchmarks were established to guide design and construction. Phase two was devoted to design and optioneering, in which the team evaluated and costed many options, trying to capture as much innovation as possible. In phase three, solutions were selected and conventional design and construction began. Andrew Lewis, an associate at Arup, explained, "These steps not only provided the structure for the best solution for the project, but also created significant pressure for the design team. Innovative design, process and procedures were required to successfully achieve all program milestones."

One challenge that the SAFELink Alliance struggled with in all phases was a shortage of skilled design talent. This was overcome with two strategies. First, a decision was made

to use MicroStation PowerDraft and Bentley MX as main interchange design tools. Team managers felt that MX, in particular, was relatively intuitive and could be taught quickly to new employees. Also, because these tools are fully interoperable with other design platforms, the SAFELink Alliance was able to make full use of designers who were conversant with AutoCAD.

Similarly, when doing specialized work like 3D lighting, modelling or landscape design, the SAFELink Alliance team could employ the best specialists or consultants available, regardless of what software tools they preferred. The second strategy grew out of the first—because interoperability was not an issue, the SAFELink Alliance could use ProjectWise to co-ordinate the work of teams around the globe. By

accessing skilled engineers wherever and whenever they were available and letting them work with their preferred tools, the SAFELink Alliance successfully overcame talent shortage challenges.

### Virtual And Physical Models

Models were used during the optioneering phase to visualize proposed solutions and to evaluate features. Ultimately, a parametric model built primarily with MicroStation PowerDraft and MX was completed and the SAFELink Alliance was able to use this to refine materials lists and cost estimates.

The MX model could also be used in tandem with structural modelling tools like TriForma and with nonBentley

