

Light Rail Transit

Case study of Central Phoenix-East Valley LRT

By Bentley Systems

Commuters in the Phoenix Metro area of Arizona (US) consider the local light rail transit (LRT) system a welcome alternative to driving. A month after it opened in 2008, traffic on the \$1.4 billion Central Phoenix-East Valley LRT exceeded projections by 19 per cent.

The Central Phoenix-East Valley project, which is owned and operated by Valley Metro Rail, includes 32 km of rail network, 26 stations, six park-and-ride lots, one 460 metre bridge across the Tempe Town Lake, and a maintenance and storage facility to house 50 light rail vehicles. It connects Phoenix, which is the state capital of Arizona, to the neighbouring cities of Tempe and Mesa.

The project team consisted of 250 professionals, including 100 employees of the general engineering consultant, Parsons Brinckerhoff (PB), a New York-headquartered global engineering major. Another 150 professionals were drawn from seven primary subconsultants and 63 sub-subconsultants.

PB worked on both phases of conceptual/preliminary engineering and final design. In the conceptual phase, it identified an optimum route, proposed station locations, analysed environmental impact, and prepared a draft environmental impact statement. It also developed design standards and criteria, preliminary operating plans, and cost estimates.

But all this would have been in vain if the project had not gained public approval. "Our first challenge was convincing elected officials, business owners, and Phoenix residents of the Phoenix area that the LRT was an alternative to driving," explains Craig Jamison, production manager, PB.

PB orchestrated a public outreach campaign via newsletters, citizen task forces,



neighbourhood outreach programmes, and project displays. The proposal received a favourable review, the final environmental impact statement was approved, and the Federal Transit

Authority approved the funding. In 2002, PB was selected as the general engineering consultant for final design and design services during construction.

"After approval, our most important challenge was keeping to schedule. Valley Metro and its partners believed that a fully operational system could be designed and constructed in six years," says Jamison.

PB divided the tracks into five segments and assigned responsibility for each segment to one of the five subconsultants. Two additional subconsultants were assigned to work on the Tempe Town Lake Bridge and the Maintenance and Operations Centre. Meanwhile, PB coordinated procurement and subconsultant work, as well as designing the system-wide components like signals, traction power electrification, and operating systems.

The right design tools had to be selected, given the scheduling. PB's team worked primarily with software sourced from Bentley. A hitch arose when Valley Metro's partner, the city of Phoenix (where two-thirds of the network is located), demanded AutoCAD deliverable that would be compatible with its city engineering plans, which are designed on an AutoCAD platform.

PB thought this might slow down the project and insisted on using Bentley products. The downside to working with non-Bentley software could have been significant. "It would have cost a lot of money and taken too much time initially."

However, the firm did offer to produce the

final design deliverables in AutoCAD's DWG format using the Bentley MicroStation's DWG compatibility features. "We weren't sure what the client would say, since this project was large. They agreed to our proposal."

The use of MicroStation – along with InRoads, Bentley Rail Track, and various Hecstad Methods products – during the final phase allowed PB and its team to hit the ground running.

The LRT opened on December 27, 2008. Ridership quickly exceeded expectations. Businesses along the route have benefited, especially in locations near the stations. Officials estimate that transit-oriented development investments in the three urban cores exceed \$2 billion and this will rise as routes are extended.

Valley Metro is committed to building traffic and ensuring the safety and comfort of commuters. One way to do this, while enhancing Valley Metro's green profile, is to keep stations as cool as possible by passive means.

PB used MicroStation, Visual Simulations, and 3D Studio Max to model shade conditions throughout the year, before working out optimal shading strategies. Horizontal fabric canopies minimise heat build-up, horizontal shading louvres encourage air circulation, and vertical surfaces are wrapped in plant material to lower surface temperature. Chilled water fountains at all 26 stations add an extra amenity for travellers.

"By reducing car use and road maintenance, light rail helped solve many chronic congestion problems in Phoenix and its surrounding cities," Jamison claims. "It also reduced carbon dioxide pollution; all light rail vehicles are electric, which greatly reduces the carbon footprint."

By September 2009, Valley Metro was getting 10,000 more users per day than the original projections of 26,000. Revenue is solid, businesses along the route are getting more footfalls, and there's less road congestion. Thus, picking the right software helped the PB team to deliver an outstandingly successful project, within a demanding schedule, while satisfying complex design criteria. ▀