COMPANY
SMEC

LOCATION
Sydney, Australia

SOFTWARE
Autodesk® InfraWorks® 360
Autodesk® Navisworks Manage
AutoCAD® Civil 3D®
Autodesk® Revit®
Autodesk® Vault Professional
A360®
AutoCAD®
Autodesk® 3ds Max®

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—**Neil Evans**
Director of Strategy
and New Business
SMEC

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—**Steve Macbeth**
CAD Manager
SMEC

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—**Chris Steer**
BIM Manager
SMEC

All aboard with BIM

BIM helps leading firm win and deliver AU$8.3 billion public rail project

Image courtesy of SMEC.

Introduction

Expected to open in 2019, the North West Rail Link will be the first fully automated transit rail system in Australia. It's poised to change the way people in one of Sydney's fastest-growing regions think about transportation. Residents—who have the highest car ownership rate in Australia—will have a quick, convenient, and comfortable public transit option.

SMEC, a professional services firm focused on major infrastructure, is leading the design effort on two key portions of the AU$8.3 billion project: operations, trains, and systems and surface and viaduct civil work. The lead client in the public-private partnership, the New South Wales Government, mandated the use of Building Information Modeling (BIM) on the project. BIM is an intelligent model-based process that adds insight to every phase of infrastructure projects.

"The client wanted to realize the time, cost, and quality benefits you see with a model-based process," explains Neil Evans, SMEC's director of strategy and new business. "SMEC was already on the path to BIM. We see BIM helping us to streamline our workflows and improve efficiency. The North West Rail Link project inspired us to accelerate the pace of our BIM adoption—and BIM is proving to be an invaluable asset on the project."

The challenge

The North West Rail Link will feature eight new stations, 4,000 commuter car parking spaces, and twin 15 km tunnels, which will be Australia's longest rail tunnels. Projects of this size and complexity require farsighted management—and proactive attention to the smallest details. Large teams from multiple disciplines, including architects, civil engineers, and structural engineers, are contributing to a fast-paced design process. Everything from conduits to pipes to ducts needs to fit together during construction. Even relatively minor coordination issues could lead to delays and higher costs.

"Every infrastructure project is a good fit for BIM, but that's especially true when you have extensive underground work," says Chris Steer, SMEC's BIM manager for Australia. "When a duct and a penetration don't line up, it can be hard to identify in a 2D process, and rework becomes almost inevitable. Using BIM, we're working with intelligent objects in 3D models. BIM helps reveal issues that would be virtually impossible to spot otherwise."

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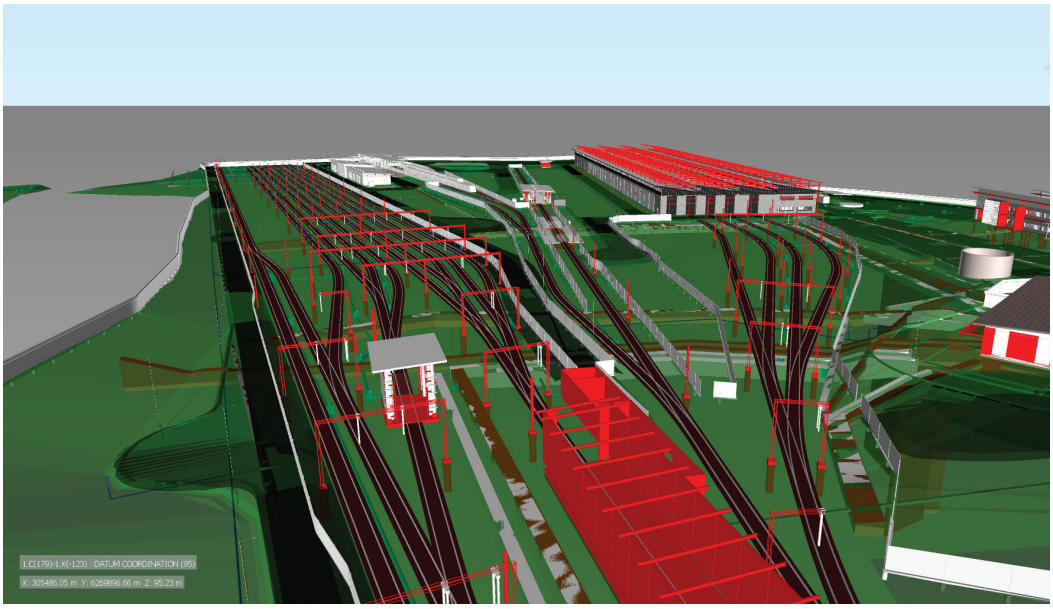

Image courtesy of SMEC.

The solution

The rail link requires a more total use of BIM than prior SMEC projects. The team quickly began to view BIM as a process that connects all aspects of a project—not a technology or software tool. Software, including Autodesk® AutoCAD® Civil 3D®, Autodesk® Revit®, and Autodesk® Navisworks® Manage, helps enable the process. The team turned to Civil 3D software for the roadwork, earthworks, rail line, and water and sewer components. Revit software supports the architectural and structural design process. The various design models come together as a federated model in Navisworks Manage software. Autodesk® Vault helps enforce design management processes and version control.

"BIM connects the team in ways that are impossible with 2D design," says Steve Macbeth, SMEC's CAD manager. "You have an immediate view into what the other disciplines are doing. The process is much more connected than exchanging and figuring out sets of drawings at regular intervals. Even the client can give more and better input earlier because the direction of the design is clearer."

According to Steer, Autodesk® Consulting is assisting as SMEC accelerates its BIM adoption. He says, "Autodesk Consulting has helped us make sure that the systems and processes we're relying on are encompassing. They've also helped us develop country-specific packages of standards. Working with them has been a collaborative and productive process."

Beyond 3D

One of SMEC's partners on the project initially designed portions of the rail lines in a 3D application that did not include intelligent objects. SMEC decided to shift to Civil 3D instead. That's because Civil 3D enables a process that uses intelligent objects—not just 3D visualization. An intelligent object "understands" its specifications and the standards governing its use. In contrast, an unintelligent element in a 3D design behaves more like a simple image.

"In Civil 3D, you can assign attributes to an object, calculate tender quantities more automatically, and make changes dynamically," says Steer, continuing he said."The object intelligence provides greater speed and accuracy."

"The beauty of BIM is in the object-based intelligence as much as it is in the visualization," adds Evans. "The intelligence gives you more control over every aspect of the design, and objects retain their intelligence throughout the life of the asset. You end up with a model that can facilitate operations and maintenance. BIM is really a cradle-to-grave process. It doesn't need to stop with planning and design."

Managing and enhancing the model

Every one to two weeks, the extended project team brings together their models at a coordination workshop. The federated model that results helps to highlight clashes and also helps the team identify opportunities to improve the design.

Navisworks Manage software facilitates the process by aggregating the models, enabling construction sequencing, and helping to detect interferences. Internally, the SMEC team uses Vault data management software to connect its people with the latest versions of different portions of the model.

"Clashes are far more obvious in a BIM process. We're resolving issues in minutes that would have been easy to miss in a 2D process," explains Steer. "The design improvements we're finding are just as meaningful. For instance, we recently reviewed two trenches serving a substation and saw that we could combine the trenches into one. It's going to deliver both cost and timesaving during construction along with maintenance advantages over the life of the asset."

"We're experiencing team coordination benefits from Vault," notes Macbeth. "Vault helps give our global team access to the latest design files without having to manage who did what and when manually. We have more control over and insight into the process. It helps to enforce consistency while also saving our people time."

The result

As SMEC continues its transition to a model-based workflow, the firm predicts that BIM represents a transformative shift. "Going from manual drafting to 2D design tools was a huge step, and moving from 2D to BIM is just as important," says Evans. "People sometimes equate BIM with 3D visualization, and it's more than that. You generate a body of knowledge in BIM that can be used from conception to decommissioning. As the building changes, you add to the intelligence within the model. There's an opportunity to add quality and save time and money at very stage."

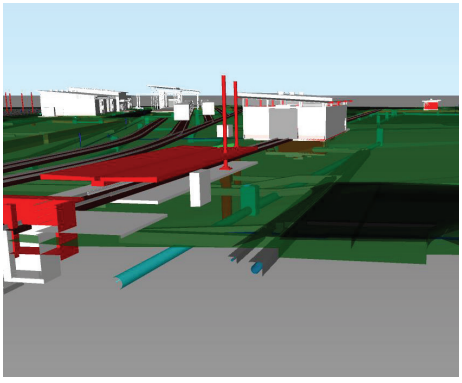

Image courtesy of SMEC.

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