



# Integrated design approach saves time and money

Bentley's Building Information Modeling (BIM) methodology saved approximately US\$1.5 million in design and contracting costs for a water recycling plant project in Australia.

MWH Global, recently acquired by Stantec, used Bentley's collaborative software to design a water recycling plant, which reduces water consumption by 62 percent in a greenfield development project in Googong, New South Wales, Australia. Googong is located less than 20 kilometers southeast of Canberra, the national capital.

Googong Township Proprietary Limited (GTPPL), a newly formed partnership, is developing the area into a self-contained community comprising schools, parks, shops, businesses, and 6,200 homes for 18,000 residents.

Severe water restrictions and the construction of desalination plants in recent years have not sufficiently relieved the New South Wales region from the effects of a 10-year drought, so GTPPL incorporated a water recycling plant into the Googong greenfield development project. Googong retained the consultancy MWH Global to facilitate the plant design.

The new facility uses a membrane bioreactor technology as the foundation for an integrated water cycle with a dedicated water recycling plant to meet water demand and sustainability by only using the

equivalent water needed for 6,500 people. The MWH design taps into the main supply line to Canberra for fresh potable water and feeds that water into assigned potable water storage tanks in Googong. That water is gravity fed from the tanks to Googong residences.

Wastewater, runoff water from properties, and rainwater is collected and pumped into the water recycling plant, where it is filtered and disinfected. This water is then sent to the water recycling storage tanks to be gravity fed to the residences for irrigation, toilet flushing and household washing.

The MWH team used their global resources and an integrated and collaborative design approach using Bentley software to meet complex challenges – difficult terrain and tight deadlines – to deliver the project on time and budget.

Harnessing resources from Sydney, Melbourne, Brisbane, and Pune, India, MWH used collaborative software to seamlessly integrate workflows among the multi-site design teams. "We used ProjectWise® to control the models and drawings," says Terry Sowden,

MWH head CAD designer. Implementing an integrated design approach using Bentley Navigator allowed MWH to simultaneously deliver drawings and models with managed version control, and capitalize on the time difference between Australia and India to keep the project moving along the tight schedule.

MWH used 3D modeling from concept through detailed design, including earthwork, roads, structures, piping, and mechanical equipment. The team used automatic signoff to issue drawing and models, and i-models kept data integrity to the client on site. MWH used 3D models, via Navigator and i-models, in review meetings and two-day workshops involving all stakeholders early in the design process. This provided valuable insight on where to locate valves and pumps and how they would operate as part of the plant under various scenarios.

With this information, the design team could identify and address operational, maintenance, construction, and clash and dimensional issues at the 3D model review stage before beginning construction. This saved significant time that might

otherwise be spent making costly changes later in the process.

## Precise freshwater connection

With Googong's fresh potable water being fed from a single water line to Canberra, MWH had just a six-day tie-in window to tap into the city's water supply before the supply to Canberra was threatened. Precise modeling was crucial to establishing the DN1800 pipe connection within this time constraint. The spool pieces for the pipe that were designed based on the plant model had to be absolutely millimeter perfect, and had to fit within the inconsistent incline of the pipe. With four circumferential welds required to attach the spools, each taking six hours to complete, there was no room for error. MWH relied on Bentley software to create intelligible collaborative models enabling the team to streamline design and analysis and ensure accuracy to fit the spools and keep the project on schedule. Sowden reports that on day five, the final spool slotted in perfectly.

## Site restrictions solved

Terrain and site restrictions posed additional challenges. Located on a



Googong's water recycling plant will meet the water demand of 18,000 residents and ensure sustainability by only using the equivalent water needed for 6,500 people. Photo by Bentley

six-meter sloping terrain overlaying rock formations, the AUD 7 million water treatment project required optimum cut-and-fill ratios to minimize costly rock excavation for the underground piping and services.

MWH used PlantWise® to lay out the yard piping separated in three strata with services on top, process piping in the middle, and drainage on the bottom. Working with many gravity-fed pipes that required a 300-millimeter separation between each pipe and numerous pipe crossings, MWH needed to accurately define the location of the directional changes within the model and accommodate changes in real time from construction crews already onsite.

The Export Coordinates in Bentley PlantWise enabled MWH to input thousands of coordinates for each separate pipe and automatically export that information to an Excel spreadsheet. Using this function accelerated information sharing allowing design and construction to occur simultaneously.

In addition to sub-terrain piping, the above-ground facilities had a limited footprint imposed by the developers to allow more space to accommodate homes as well as to

minimize noise to the residences. The above-ground pumps needed to be shielded by the bioreactor wall from the homes for noise prevention and had to maintain an equivalent gap on all sides for maintenance purposes. 3D collaborative modeling was essential to meeting these requirements, and enhances communication among the designers and constructors to ensure plant integrity.

**Advancing water management**

With an integrated design approach using ProjectWise (collaboration and model control), Bentley plant design applications (piping design), AECOSim Building Designer (BIM), InRoads® (civil design), and Bentley Navigator (3D model reviews) MWH delivered its drawings on time and met the project deadline. The project delivery team brought life to the 3D plant models using Bentley LumenRT, Bentley's immersive visualization software, integrating fly-through animations and presenting the water-efficient design during township consultations. The 3D visualizations helped instill Googong's residents with a richer understanding of project intent, and revealed where the plant would be situated in the greenfield development.

Bentley's collaborative software enabled MWH to work closely with constructors, providing valuable information including material takeoffs, tabulated 3D coordinates, and spool piece equipment lists to minimize construction costs. Engaging operations, construction, maintenance, and design staff during the model reviews helped identify clashes, minimize changes during construction, and reduce operational costs. The real payoff, however, is that wastewater from Googong homes is now treatable and the new integrated water cycle will reduce potable water consumption by 62 percent.

Detailed design of the GTPL water recycling plant using Bentley's collaborative software. Image provided by Bentley



>> **By using a shared data repository, MWH designers could do clash detections much earlier in the design process and save material costs.**  
**Santanu Das, Bentley SVP, Design Modeling**  
 >>

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