



Project Summary

Organization:
MWH Global

Location:
New South Wales, Australia

Project Objective:

- Deliver a water treatment plant using MBR technology with an integrated water cycle.
- Reduce potable water consumption for the new greenfield community.
- Minimize wastewater discharge to the environment by substituting recycled water for household use and urban irrigation.
- Ensure timely delivery and operation to coincide with township development.

Products Used:

ProjectWise, AECOSim Building Designer, InRoads, Bentley Navigator, PlantWise, and LumenRT

Fast Facts

- MWH designed Australia's first integrated water cycle to provide potable, recycled, and wastewater services to a new greenfield community development.
- Bentley 3D modeling applications facilitated collaborative design and decision making enabling MWH to meet the developer's tight delivery schedule and overcome challenging terrain.
- ProjectWise, PlantWise, and Navigator provided MWH with an integrated modeling solution by optimizing information mobility among a multi-site design team, allowing all stakeholders' input during the model review stage.

ROI

- The water plant design will reduce the community's potable water consumption by 62 percent.
- Identifying operational, maintenance, construction, and design issues using 3D modeling enabled MWH to meet an aggressive deadline and minimize risk.

MWH Global Water Recycling Plant Design Reduces Water Consumption by 60 Percent

Bentley Software Helps Ensure Water Efficiency by Recycling up to 62 Percent of the Township's Wastewater for Non-potable Use

Creating a Water-efficient Culture

Googong is a pristine site located in New South Wales, less than 20 kilometers southeast of Canberra, Australia's national capital. Googong Township Proprietary Limited (GTPL), 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. Given that severe water restrictions and the construction of expensive desalination plants in recent years have not sufficiently relieved the New South Wales region from the effects of a 10-year drought, GTPL incorporated a water recycling plant into the Googong greenfield development project. Googong retained MWH Global to facilitate the plant design based on its expertise working on some of the world's largest and most significant water and natural resource projects.

GTPL wanted a design that used membrane bioreactor technology (MBR) as the foundation for an integrated water cycle with a dedicated water recycling plant that would meet water demand and ensure sustainability by only using the equivalent water needed for 6,500 people. To begin the

cycle MWH had to tap into the main supply line to Canberra for fresh potable water, and feed that water into assigned potable water storage tanks in Googong. That water then would be gravity fed from the tanks to Googong residences for drinking and showering. Wastewater, runoff water from the properties, and rainwater was also needed to be collected and pumped into the water recycling plant to be filtered and disinfected.

This water was then sent to the water recycling storage tanks to be gravity fed back to the residences for irrigation, toilet flushing, and household washing. Facing complex challenges from difficult terrain

and tight deadlines, the project team required precision engineering to deliver the project on time and on budget. To overcome these challenges, MWH utilized global resources and implemented an integrated and collaborative design approach using Bentley software.

Optimizing Information Mobility

Harnessing resources from Sydney, Melbourne, Brisbane, and Pune, India, MWH required collaborative software to seamlessly integrate workflows among the multi-site design teams. "Being a multi-national company, we don't always have the skills we need in our home office. Therefore, we do a lot of drafting in our Pune, India, office. We used ProjectWise® to control the models and drawings," explained MWH head CAD designer Terry Sowden. 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.



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.

MWH used 3D modeling from concept through detailed design, including earthwork, roads, structures, piping, and mechanical equipment. Information mobility kept design and construction on schedule. The team used automatic signoff to issue drawings 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 MWH with valuable insight on where to locate valves and pumps and how they would operate as part of the plant under various scenarios.

"It's a great pleasure to recognize the outstanding team that delivered the Googong Water Recycling Plant, which was delivered to a high standard and on a tight time frame. The client has voiced appreciation, noting in particular the stakeholder challenges through which the MWH team helped them to navigate."

— Marshall Davert
President, MWH Global

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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.

Accurate Modeling Establishes 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 and they 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 intelligent collaborative models enabling the team to streamline design and analysis and ensure accuracy to fit the spools and keep the project on schedule.

Within the six-day tie-in period, each day was predicated on the success of the prior day's work, with the fifth day being the most crucial as the final spool was to be fitted. "There were a lot of nervous people monitoring the progress on site and through photos. On day five, the final spool slotted in perfectly, and there were a lot of relieved and happy faces," stated Sowden.

Overcoming Terrain and Site Restrictions

Another challenge facing MWH was managing the site constraints of the Googong area. Located on a 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.

With the Export Coordinates function in Bentley PlantWise, MWH was able 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. "While we were still designing, the construction people were on site actually constructing this. We were able to make the changes in the model and then have the Excel spreadsheet quickly updated," explained Sowden.

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 enhanced 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 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 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 situate 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.