Barwon Water

12d DIMENSIONS:
● Water

West Barwon Dam

Project Summary

Barwon Water, as a major water supplier in Victoria, needs to know the full storage capacity of its reservoirs. It also needs to be able to quickly and accurately determine the amount of water available in the reservoirs at any time.

For more information

To find out more about how you can create better designs faster with the 12d Model solution for civil engineering design, visit www.12d.com.

Australasia: Sydney
P: sales@12d.com
M: +61 2 9970 7117
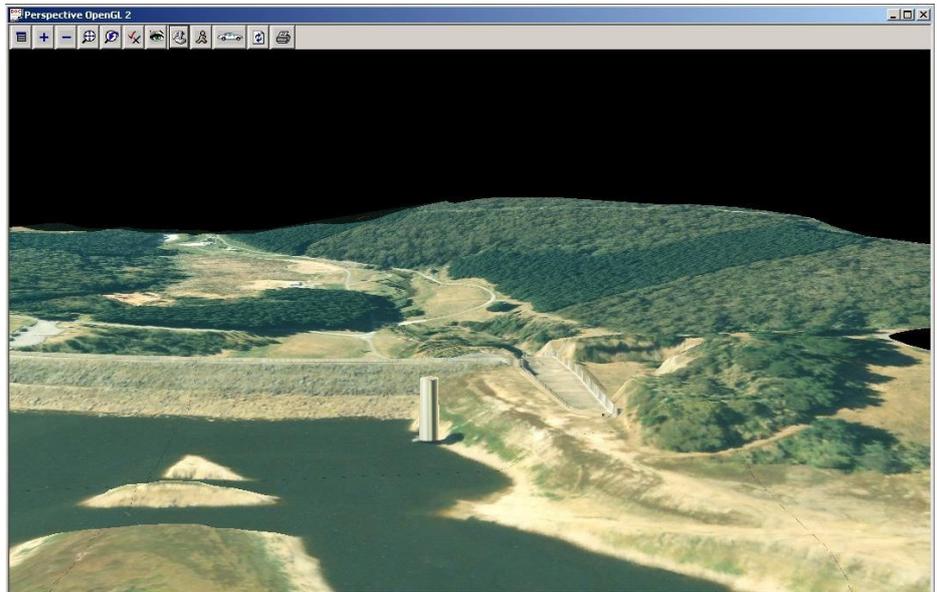
The Challenge

A simple method to help calculate the available water is to create a depth-storage curve for each reservoir. The depth-storage curve is simply a table of the storage in the reservoir for a given depth of water. Once a depth-storage curve exists, measuring the current depth of water in the reservoir instantly gives the volume of water in the reservoir. To facilitate the use of this method of determining storage, Barwon Water requires accurate depth-storage curves for all the reservoirs.

The best method of creating a depth-storage curve is to construct an accurate three dimensional model of the reservoir. The volume of water below any height can then be calculated, and as the accuracy of the reservoir model is improved, the depth-storage curves can be updated.

The mapping of the physical shape of the reservoir above the water line can be obtained by traditional land based survey techniques and photogrammetry, but for land below the water line, when draining of the reservoir is not an option, other methods such as hydrographics (depth sounding) are needed.

The Solution

Using the West Barwon Reservoir as a test case, Barwon Water has used a variety of technologies including 12d Model software, CEEMAN hydrographic software, Ortho-12d rectification software, GPS and a boat to collect sufficient data within the water's edge to complete the reservoir model. Fergus Butcher, a Survey student working for Barwon Water decided to undertake the task and use it as a final year project under the supervision of the Barwon Water Spatial Information Coordinator, Ian McLachlan.

The existing data set provided by the team at Barwon Water was quite extensive and was put together using various surveying techniques, from feature surveying to stereo modelling using aerial photography. When the hydrographic survey was to be conducted it was vital that the water level of the storage at the

12d° Model

time of the survey be greater than that represented in the existing data set so that redundant data could be collected and compared, thus providing a cross check.

Also of crucial importance was that all the data was in the same co-ordinate system. For this project the Australian Map Grid (AMG) and the Australian Height Datum (AHD) were used. Barwon Water surveyors had accurately determined the AMG co-ordinates of fourteen control points for surveillance monitoring which could now be used for the project. These control points were

essential for the GPS work – the GPS base station needs to be set up over a known point so that it can send the differential corrections via a radio link to the boat. This means that once the AMG coordinates are computed for the ten monitoring points, any one of them can be used as the known point for the base station.

Before venturing onto the water, information useful for the navigation of the boat was prepared in 12d Model from existing Barwon Water survey data. 'Track lines' for the boat were also constructed in 12d Model. When loaded into the laptop on the boat, the track lines act as guidelines for the boat to help achieve an even distribution of data points over the bottom of the storage.

CEEMAN, the hydrographic software used for the project, can be configured in a number of ways. For this project the software was running on a laptop on the boat and received the echo sounding data through one USB port and GPS data from a GPS rover through another USB port.
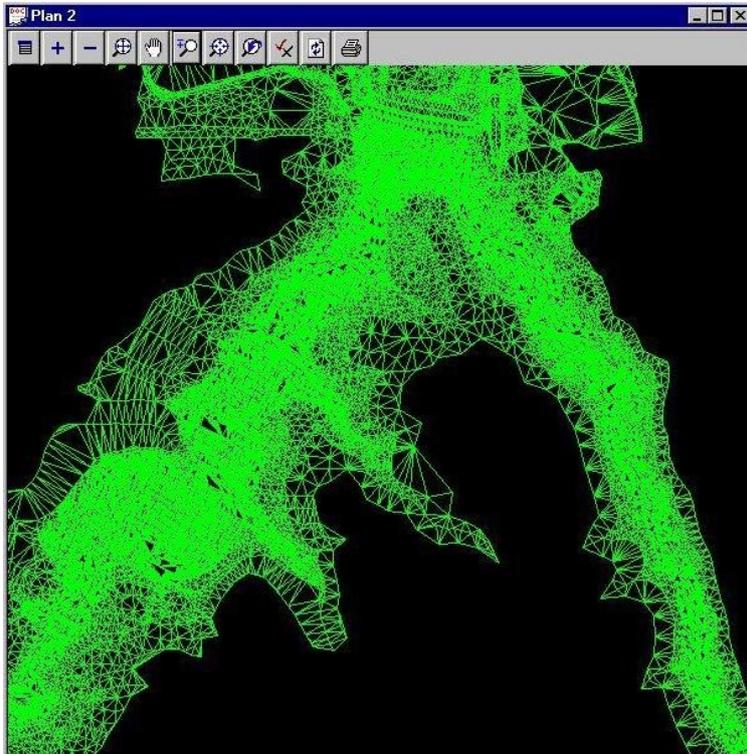
The Result

Using the navigation data from 12d Model as background data and GPS positioning, CEEMAN could display the position of the boat within the reservoir at any given time. This allowed on screen display of the current position of the boat and the track lines which gave the helmsman the ability to steer along any selected track line and start and stop collecting data at the correct times.

CEEMAN automatically saved the collected data throughout the survey so the helmsman operating the computer never had to worry about interrupting the data collection to save work.

"It took three full days to complete the data collection" said Fergus. "On days one and three there was myself and my immediate supervisor onboard the boat, whilst a survey team of three set up the base station and then continued with separate work of their own. On day two there were three of us, again myself and my immediate supervisor and one of the surveyors."
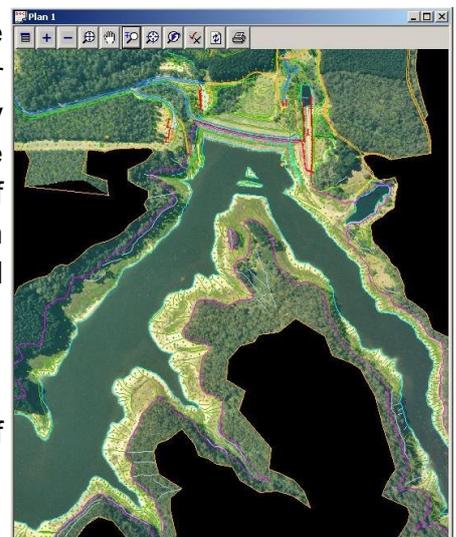
Roads and Highways

12d Model's design option is the smarter solution for the design, modification and maintenance of Road and Highway projects.

Enjoy advanced 3D tools to design local and major roads, intersections, roundabouts, highways, interchanges and much more.

Ports and Dredging

12d Model is the solution for port infrastructure and dredging, easily managing the very large datasets and complex volume calculations often required by these projects.

A complete range of flexible and customisable volume calculation tools allow teams to extract and present the information quickly and easily.

Land Development

12d Model is the most versatile solution for the creation of sustainable land development projects, including residential, commercial and industrial developments, recreational areas, landfills, and agriculture projects.

Easily manage all aspects of your land development project from earthwork quantities, road design utilities and drainage design.

Airport Infrastructure

12d Model provides a solution for the design, construction and analysis of new airports, as well as the upgrade and maintenance of existing runways and airport infrastructure.

Easily manage large airport infrastructure projects and share data across multi-disciplinary teams.

Rail

12d Track has been specifically designed for the survey, design and construction of light, heavy and high speed rail projects.

Extensive railway tools in 12d Track allow the rail designer to quickly and easily design their projects. These options are built on the existing 3D modelling and design tools available in 12d Model.

Mining Infrastructure

12d Model's powerful set of exploration, site investigation, survey and analysis tools are crucial for the initial design, construction and ongoing operation of mining projects.

Comprehensive tools for the survey, design and construction of access roads, railways, earthworks and services allow for the coordinated design and management of mining infrastructure from within 12d Model.

Drainage, Sewer and Utilities

12d Model provides comprehensive tools for the design, analysis and optimisation of stormwater and sewer projects using rational, dynamic (hydrograph) and 2d drainage methods.

Powerful clash detection management allows for efficient 3D modelling of service networks such as gas, electricity, telecommunications and water prior to construction.

Surveying

12d Model is a complete surveying package providing the tools to manage all facets of surveyed data including LIDAR, topographical, as-built, conformance, traversing, geodetics, data mapping, labelling and much more.

The 12d Field option runs on a ruggedized tablet and gives the user access to full 12d Model functionality, allowing you to take the entire project into the field with the most comprehensive pick-up and set-out tools.

Oil and Gas

12d Model assists with the design, construction and mapping of oil and gas pipelines, original site exploration and the wide range of infrastructure required for oil and gas projects.

Accurate 3D modelling and the ability to share data between users allow teams to quickly and easily coordinate designs.

Construction

12d Model is the ultimate software for construction with powerful set-out options, direct interfaces to machine control and detailed conformance reporting and auditing.

Manage 3D data and control volumes, quantities and progress claims with 12d Model. Set-out your project and undertake conformance and as-built surveys live on-site using 12d Field.
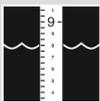
Rivers, Dams and Hydrology

12d Model handles very large datasets and interfaces with a wide range of analysis packages, making it perfect for flood studies and the management of rivers and dams.

12d has partnered with industry leading analysis software, allowing users to apply 2D drainage analysis from within 12d Model.

Environmental

12d Model's ability to handle very large datasets combined with flexible and comprehensive 3D analysis and modeling tools make it perfect for a wide variety of environmental projects.

Existing workflows can adopt 12d Model easily as it allows users to directly interface with GIS systems and most software packages and file formats.

Why Choose 12d?

- **Powerful data processing & intelligent functionality.**
- **Modular, easy to update & completely customisable.**
- **Seamless integration with major industry software and hardware.**
- **Used in over 55 countries worldwide.**
- **Friendly support & training from industry experts.**

12d Model