

Land Surveys

CLIENT: Acciona

12d DIMENSIONS:

- Water

Project Summary

An exciting construction project for Sydney CBD infrastructure - the CBD and South East Light Rail (CSELR). The 12 kilometre alignment features 19 stops, extending from Circular Quay to Central Station, through Surry Hills to Moore Park then branching off to Kingsford and Randwick. The project included 10 substations, a stabling yard, and a maintenance facility.

The CSELR was designed, constructed, operated, and maintained by a private operating company as part of a Public Private Partnership (PPP). The PPP contract was awarded to the ALTRAC Light Rail Consortium, which included Acciona, Alstom, Transdev, and Capella Capital.

Land Surveys was commissioned by Patriot Environmental Services. Patriot was engaged on the project to provide the non-destructive digging services. This system is used to safely expose the utilities in order to treat them, or relocate them. Patriot engaged the vast skills of Land Surveys for surveying and utility

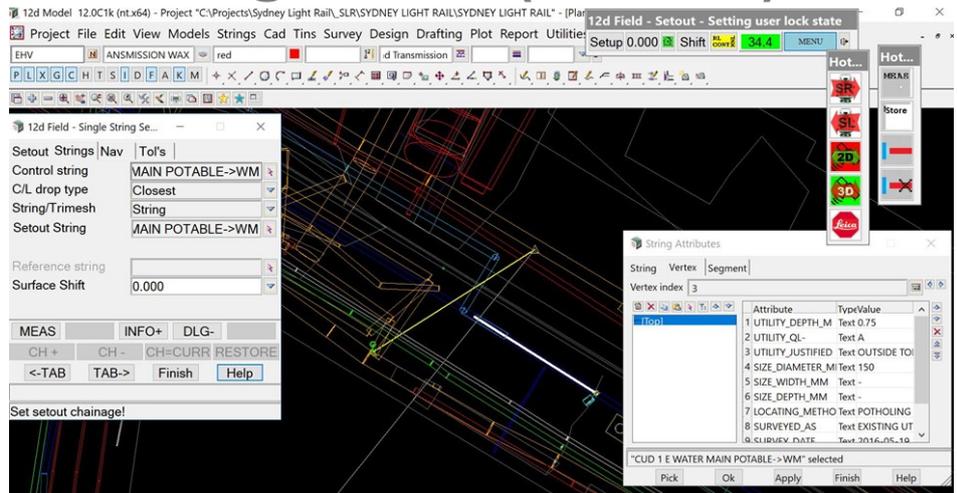
For more information

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.



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Sydney CBD and South East Light Rail (CSELR)



mapping to be undertaken.

Land Surveys was tasked to map all the existing utilities and associated structures through the Surry Hills zone, which is from Central Station, through to South Dowling Street, Surry Hills via Devonshire Street.

The Challenge

There were multiple challenges involved, including the rail being constrained by its horizontal and vertical geometry, as well as being in the middle of Australia's largest and most densely built up city. This resulted in the need to treat the existing utilities required to protect them from any vibration and active loads from the rail, or completely relocate them outside the construction zone.

The service records showed that some of the services were more than 100 years old. Some records were incomplete, or missing, creating a significant challenge on the project. In addition, more than 1,500 undocumented services were identified across the alignment during the service mapping and investigation work

completed by Land Surveys with other service locating companies.

The scale of this project was exceptionally large, and as such, it took a lot of resources and coordination. Consultation was required with each asset owner, as well as an assortment of required permit grants, whilst maintaining utility supplies to schools, businesses, and homes at all times in the area.

The Solution

The first step was to document all the existing services. This was done via locators to mark out the information on the ground, along with undertaking investigative trenching. The data was then captured using 12d Field software. As there was a vast number of services to document, the team used 12d Model map files with 12d Field code lists to allow them to process the data as they picked it up. This allowed them to see any errors or issues immediately. They documented this information with the required GIS database attached to each of the CAD elements as per the AS5488-2013 including additional attributes relevant to the project. They used the attributes to get

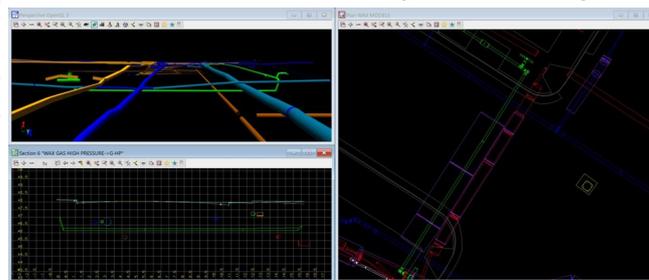
12d Model to auto pipe and culvert the services to display their extents, as some services banks were more than 2m wide and more than 1m thick. There were pipes nearly 1,200mm in diameter. This information was critical to understanding the space they were working with, and to ensuring they met the separation distances required by the safety in design specifications.

After collecting the data, it was sent to the client's design team to design the models. The design team was also using 12d Model to design the utility model placements and civil design. Due to their use of 12d Model, they could provide 12da files that Land Surveys could easily drop straight into their 12d Model project files, and overlay to their survey models. This enabled them to instantly see the relationship between the design and the existing services, in 3D.

They then went on site and marked up those designs using 12d Field. At this point, if any engineers, supervisors or construction crews had any queries around measurements, or separations, the Land Surveys team was able to answer those queries onsite. They were also able to pull sections and add data in as needed, generate reports and distribute important information all from the field. Any new data collected was automatically processed as described above. Once the pickup was done, there was little to no additional processing required, and with 4G data access, they were able to email the collected data fully processed straight to the client and their design team, removing the time loss of having to go back to the office. This whole process saved large amounts of time by increasing the efficiency of the crews in the field, and allowed the engineers to make important decisions in the field much faster and more effectively.

Designs were being developed mainly based on 'B' class data with accuracy up to 500mm vertically and horizontally. When the design model was issued, the accuracy of the existing utility model was improved by being upgraded to

'A' class through investigation trenching, resulting in some clashes. Clashes had to be detected as soon as possible to allow the designers to rectify significant clashes. Using the clash detection functionality in 12d Model, the Land Surveys team was able to identify any clashes as the existing services model improved. The client was then notified immediately and issue alerts generated. The designers were also notified, enabling them to adjust the design accordingly while still under the review and endorsement process. Most, if not all, of the issues were rectified prior to the main scope of works commencing, reducing the chances of any delays by the work crews (and associated costs).



To ensure safety onsite, the project required an excavation permit to allow the teams to safely excavate. This was achieved by ensuring each excavation was marked up by the utility locating teams, and the crew's walk-through, in regard to the services they were working around and the restrictions that were in place. The teams used the utility model Land Surveys had generated in 12d Model to ensure all services were located and marked up on the ground, given they could not rely on the DBYD as the DBYD did not include decommissioned services, property connections, or any of the 1,500 undocumented services located. The team was also able to use 12d software to extract out attributed data such as the pipe size, the configuration, the material type, and the extent of the banks. Land Surveys, along with the Utility Mapping teams, helped run permit training with competency tests to ensure the crews working around the live services could understand the marking on the ground, in accordance with AS5488, along with the procedures and restrictions required by the asset owners for working around live services.

The Result

By applying these processes and using the intelligent functions of 12d in the field, the project was able to bring the service strike rate and near miss incident rate involving utilities down significantly.



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.

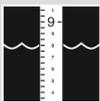
Accurate 3D modelling and the ability to share data between users allow teams to quickly and easily coordinate designs.



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.**

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