

URS Australia
Darren McKimm

SCOPE:

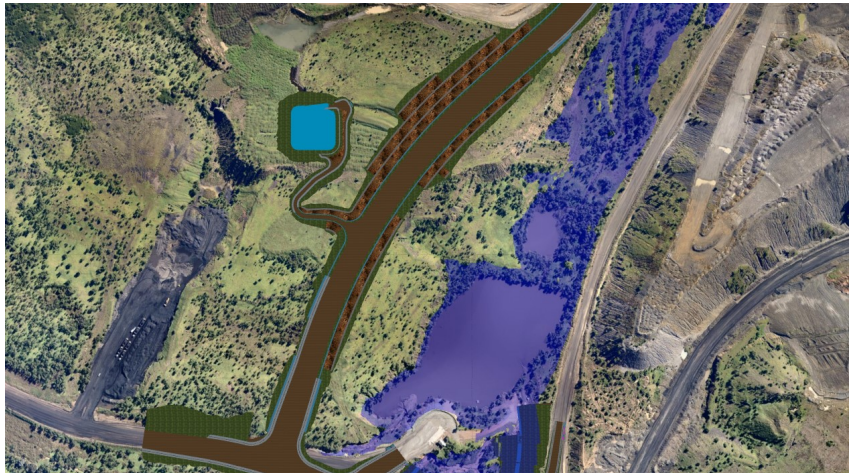
Carrying out road design and realignments with a creek diversion to allow for the continuing expansion of an open cut mine.

12d DIMENSIONS:

- Road design

Mining Expansion Project

Queensland



Project Summary

URS Australia was commissioned to carry out road design and realignments with a creek diversion to allow for the continuing expansion of an open cut mine. The section the project concentrated on was a 4km section of the open cut mining operation.

This project was designed to allow the progression of this section of the open cut mine high wall. The outcome of the works lessened the haul travel times for the removal of coal and spoil material.

A new heavy vehicle haul road was to be constructed north of the high wall with a creek diversion that re-routes an existing creek around the south of the high wall to allow for the high wall advance.

There were also minor road diversions, detours and new roads to construct as well as design of a spoil site for approximately 1.3 million cubic meters of material excavated for the creek diversion. The road works were designed to achieve a cut/fill balance.

The existing survey data was stored in a separate 12d Model project with models and tins shared to the design projects. This removed any issues of supplied data being altered or deleted as well as the having the latest survey being read by the design projects as they opened.

The Challenge

Parts of the new infrastructure either intersected, or passed over or under, meaning that the design of some roads was relying on geometry from adjacent or intersecting new and existing roads. In addition, the design of earth berm walls was dependent of vertical grades, proximity to intersections and clearance heights above existing roads.

A snapshot of the complete design:

- 138 functions - consisting of Apply Manys, Contour creation, TIN re-triangulations, Removal of Strings, and recolouring of triangles for visualisation

- 62 Super Alignment resolves. Some were re-run several times to allow, first horizontal computations and then later to get vertical geometry tie-ins from intersecting roads

- 34 Longsection plot PPFs
- 22 Cross section plot PPFs
- 50 Setout Table recalculations
- 73 Volume Calculation outputs

It would not be possible to run all these entities manually to update the design and expect all of the above to complete successfully.

The Solution

This is where the 'Chains' functionality in 12d Model software proved invaluable as a design tool.

Within all of the chains, the team was able to insert comments that headed sections of the chain for ease of reading and understanding, and notes on what was done at certain stages to alter computator reference points. This helped them remember what they had done some three months earlier, and also consider the work of other designers who had to alter/check design methodology at a later stage.

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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The project was split into discrete chains to run parts of the design, to reduce recalculation times. If road re-design was taking place, then just the road design chain was run, rather than all chains.

Chains in 12d Model made the design process both simple and complex:

- The **simplicity** of pressing one button to carry out a hundred or more commands in seconds updating designs and outputs
- The **complexity** of design interaction could be handled in a logical manner, giving the designer a flow process as well as a record of what the design elements are and how and where they fit together.

There were 11 chains in total that carried out the complete design operation. These discrete chains were:

- Creek Design
- Road Design
- Central Earth Berms
- Minor Access Roads
- Grade Separated Overpass Design
- Spoil Stockpile Design
- Plotting
- Setout
- Contour Creation
- Colouring of Triangles for Visualisation
- Volumes

There was an overall design chain that ran all the chains above to carry out the complete design from start to finish. This took about 7.5 minutes running over the computer network. This was reduced to about 3.5 minutes if all data was stored on the workstation.

The team also created several other chained chains, including a chain that only ran the Creek design and then the Road design. These two designs crossed paths at the coal haul road realignment, so for every creek diversion alteration, the road design was required to rerun as the creek tin was part of the road design's existing surface tin, and vice versa for the creek design.

Result

This process enabled the designer to run two interconnecting parts of the design only, without running plotting, setout and other design elements.

The innovative use of 12d Model software on this project saved the team a huge amount of time, and simplified processes.



Image source: Australian Mining



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.

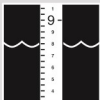
Accurate 3D modelling and the ability to share data between users allow teams to quickly and easily coordinate designs.



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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