

## Mortons Urban Solutions

CLIENT: Project 28 Pty Ltd

12d DIMENSIONS:

- Water

### Project Summary

First phase of a 4,500 lot master planned community in Kings Forest.

The Kings Forest site is on the far north coast of NSW, approximately 20km south of the Queensland/NSW border. Kings Forest is identified within the NSW State Government's Far North Coast Regional Strategy and Tweed Shire Council's adopted "Tweed Urban and Employment Lands Release Strategy 2009" as one of the largest contributors for the provision of new housing and employment within the Tweed Shire in the next 25 years (*Source: Tweed Shire Council*).

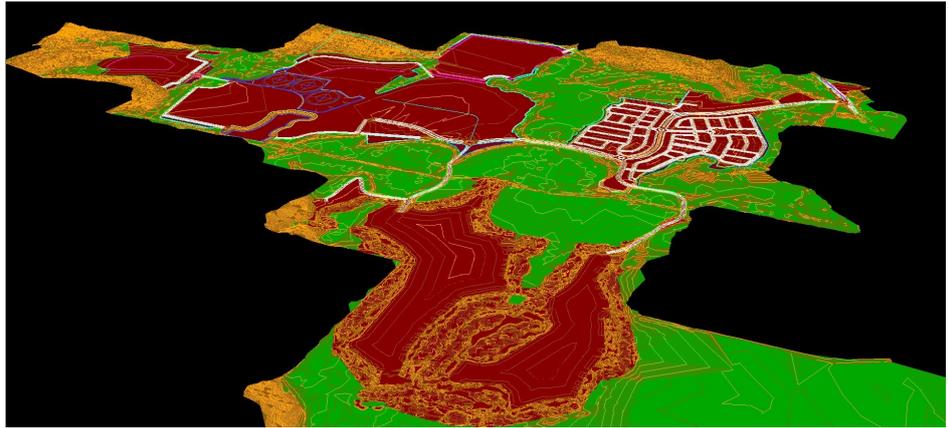
### For more information

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](http://www.12d.com).



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# Kings Forest Development



*Image Source: Mortons Urban Solutions*

### The Challenge

In November 2006, Kings Forest was listed as a State Significant Site under the State Environmental Planning Policy (Major Development) 2005. This had the effect of nominating the applicable zoning which applies to the whole site, as well as nominating specific controls which affect all future development at the Kings Forest site (*Source: Tweed Shire Council*).

Kings Forest comprises around 866 hectares of flood affected flat land. The primary constraints for the Mortons team included cultural heritage, SEPP 14 wetlands and groundwater dependent ecosystems, perched groundwater, and protected fauna.

The development of this land for residential, commercial and institutional purposes includes approximately 4,500 home sites, community facilities, and a commercial precinct.

Flood plain management and flood immunity presented significant obstacles to development of the site, with initial studies indicating the necessity to import approximately 1 million cubic metres of material (representing a potential development cost up to

\$20 million).

The first phase of the development incorporated 431 dwellings, estate major access, detailed grading and stormwater analysis of all interdependent areas, and full site preliminary grading.

Initial modelling of the site based on site constraints indicated areas potentially available for development, with the first phase comprising approximately 64 hectares of flat land, the largest portion of which being approximately 850m wide x 850m long.

In order to perform grading of such a flat site, the traditional approach would be to create a shield using the road network with the centre of the site being graded outward towards the perimeter over roughly 425m. Such a grading would require a central area roughly 2.2m higher than the perimeter (at 0.5% nominal grading), requiring an import of approximately 200,000m<sup>3</sup> of material in the first phase. The traditional alternative would be to construct a central drainage channel.

Local haulage costs and sourcing

material were prohibitive costs, so a solution that minimised import was highly desirable. The construction of a swale within the site with corresponding duplication of roads and resultant loss of yield were economically undesirable outcomes. Thus, the Mortons team was required to find an optimum solution meeting the requirements of QUDM (minor/major storm flow paths, etc.), and maximising yield and minimising import.

### The Solution

The team initially established a largely flat site with saw-toothed roads, which went some way to reducing import and maintaining major storm flow paths, necessitating a piped drainage system in excess of the “minor storm” requirements.

They determined to change their perspective of the site from a water shedding development to one behaving more like a mitigated release reservoir. The challenge there was managing stormwater objectives over an effectively flat large site without causing nuisance or risk to property or people.

Infiltration and storage swales were utilised on the perimeter of the site within an area permitting earth works, but this area could contain no infrastructure. This effectively managed flows around the perimeter; however, it was the centre of the site that presented a more complicated issue.

The site has a central spine road servicing the whole development, and so leant itself to the design of a central drain, meaning Mortons could halve the distances for overland flow to travel. This also provided an opportunity to manage flood immunity and stage outflows, and provide at source infiltration.

The first phase of the development comprised

15 inter-connected basins fed variously by daylighting and surcharging outlets, incorporating infiltration, and multiple bi-directional outlet pipes and weir outlets. The surcharging outlets were drained to daylight via a 300 diameter pipe, to ensure even the lowest flows were infiltrated to meet water quality objectives.

Treatment of the site in this way was only possible because of the powerful bifurcating pit, basin outflow and infiltration capabilities within the Dynamic Drainage Analysis component of **12d Model** software.

Using a combination of multiple outlets, basin links and channels, basins formed part of the conveyance system, permitting design of the central road with no longitudinal grade, thereby significantly reducing earthworks import and achieving the lowest practical level for secondary road connection.

The result of this design was that Mortons negated the requirement for import and achieved a spoil of approximately 60,000m<sup>3</sup> which could be used in other areas. The net improvement of earthworks was roughly 260,000m<sup>3</sup> or \$5.2 million in phase 1 alone.



Image Source: Gold Coast Bulletin

### The Result

This design philosophy of utilising the site’s reservoir potential will continue to be used to reduce the necessity for import as Mortons progresses through the remaining phases of the development.

Extensive consultation was being undertaken with Tweed Shire Council after this first phase, including an in-house presentation to discuss what could be considered at the extreme end of “conventional” stormwater systems.

This innovative approach could have an impact on many future projects of this type.



## 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.

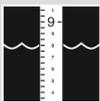
Accurate 3D modelling and the ability to share data between users allow teams to quickly and easily coordinate designs.



## 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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