12d Model's Drainage modules offer substantial benefits from conception to construction of piped drainage networks.

Drainage Layout

12d Model is the tool to create your drainage network. With inbuilt automated pipe grading functions, 12d can grade your drainage design with the click of a button.

12d Model handles whole projects, not just road or drainage requirements, enabling the management of all services, roads, and other surfaces in one system, reducing errors resulting from service clashes or design amendments.

Drainage layout includes:

- ✓ Layout your complete drainage network inside 12d with invert levels set relative to finished design surface levels.
- ✓ Convert 2d cad layouts to 3d drainage networks.
- ✓ Automatically set minimum pipe cover and grades with user defined settings.
- ✓ Powerful graphics to integrate network layout and vertical grading.
- ✓ Defines catchments with auto linking to inlets and labelling catchment plans
- ✓ Automatic service clash detection and reporting.

Drainage Analysis

The drainage analysis module allows for Rational hydrological and hydraulic analysis of a drainage network.

Site specific rainfall data can be entered and stored in a rainfall file that can be utilised across many projects.

Using the Rational Method, catchments with variable runoff characteristics can be created and maintained, with time of concentrations calculated by typed input or automatically determined by graphical flow path creation.

Multiple catchments can be assigned to inlets in the drainage network.

The hydraulic requirements of the drainage network are automatically calculated based on rainfall intensities and return periods from the rainfall file.

Pipes within the network, including culverts, are then sized and managed in the Network Editor with overland and bypass flows able to be calculated and graphically represented.

Ku losses within pits and flow velocities are determined with hydraulic grade lines shown and plotted. The network can be designed and sized based on both flow depth or pressurised (freeboard) methods and hydrological and hydraulic reports automatically produced.

Flooded widths and roadway depths are shown graphically in 12d. 12d calculates the width of flow using normal depth calculations. For more detailed analysis, HEC RAS projects can be created with discharge results from the hydrology calculations.

Flooding from drainage pits are difficult to conceptualise, so 12d displays where spill from the flooded area will occur.

Schedules / Results and Presentation

12d Model allows user customisation of results to achieve the highest standard for company and client presentation.

Schedules / results and presentation include:

- ✓ User defined construction setout tables, northing/easting or road centreline chainage/offset.
- ✓ Automatic network quantity schedules (pipes and manholes by depth range) for pricing.
- ✓ Earthwork trench excavation volumes based on custom templates that vary with depth and pipe size.
- ✓ Automatic service clash detection and reporting.
- ✓ Produces finished/cad quality drawings complete with hydraulic data, drawing sheets and title blocks.

Dynamic Drainage

The Dynamic Drainage module allows detailed hydrological and hydraulic modelling based on volumetric (hydrograph) methods and hydraulics based on the St Venant equation.

Features include:

- ✓ 100% integration with civil design

UTILITIES & URBAN DRAINAGE

- ✓ Storm-water basin design
- ✓ Basin area data direct from design surface
- ✓ Integrates with 12d's Visualisation! (note: Visualisation is a separate module)
- ✓ Inlet capacities, bypass flow, dynamic pit loss calculation (Ku/Kw)
- ✓ Natural channel shapes from design surface
- ✓ Graphical results showing elevations, flows, velocity & other hydraulic parameters
- ✓ Includes Australian (AR&R including ILSAX) & NZ SCS hydrology methods
- ✓ Uses all the terms of the St Venant equations
- ✓ Customisable & region specific outputs

Complex hydraulic situations including adverse grades, flow reversal, tidal outfall, flap gates and fixed backwater can be modelled within the network due to the introduction of Dynamic Wave calculations.

Many types of conduit configurations can be included in the drainage network such as natural / irregular rectangular and trapezoidal conduits, as well as weir and orifice configurations.

The inclusion of hydrograph methodology allows the design of basins such as dry retarding, wet detention and interconnected basins to be properly supported.

Hydrograph methods already implemented within the software are ILSAX and NZ SCS.

Reporting and analysis of the dynamic network can be complemented with a range of time series graphs navigated from within 12d that can be saved and exported into other documents.

These graphs include depth, elevation, volumes and inflows/outflows.

Hydrology / Hydraulic Design or Interface

The drainage module interfaces with MicroDrainage, Info Works, Drains, ILSAX, PC Drain, RAT 2000, Spreadsheets, XP-SWMM, and XP-STORM. This combines the "real world" power of 12d's terrain modeling and pipe grading capabilities with other specialised hydraulic design packages.

Analysis results can be brought back into 12d and drainage networks updated automatically.

Sewer – Waste Water Reticulation

The Sewer module is an extension of the drainage module and supports the design of gravity operated waste water reticulation systems, typically those required for new land sub-divisions and development projects.

The user enters proposed manholes, pipelines and end of line points. Obstructions which pass over, under or parallel to the design lines within a user specified corridor about the design line will be shown on long and cross section views.

When satisfied with the design invert levels, connections from the design line to the individual house blocks can be added and reported on.

Earthwork volumes for trenches can be calculated along the selected design line.

The special waste water reticulation longitudinal plots are user defined and show existing surface, manholes, design pipelines, pipe grades, property connection points and all obstructions. Long sections plots to the Melbourne Water standard are included.

Pipeline

This module is used to support the design of major pipelines of any diameter (e.g. 2000mm) and any length.

Pipeline allows for the extraction of long sections and cross sections against the digital terrain model for the proposed route, plus all the obstructions that run parallel to or cross a corridor of user given width on either side of the centre line of the route.

The joint deflection for pipes of a user nominated length is calculated and interactively displayed along the pipeline.

Earthwork volumes for trenches can be calculated along the selected design line.

The special pipeline longitudinal plots show the existing surface, design pipeline, depth of cut or fill to pipe invert, percentage grades and vertical curve data or deflection angles, and all obstructions.

WHY CHOOSE 12D?

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