Planning for SUDS

Introduction

The Flood and Water Management Act 2010 has clarified responsibility for the adoption and maintenance of SUDS.

This paper explores how technology can help the developer, their consultant and the approving body (SAB) to plan and implement a sustainable urban drainage system (SUDS) from the outset.

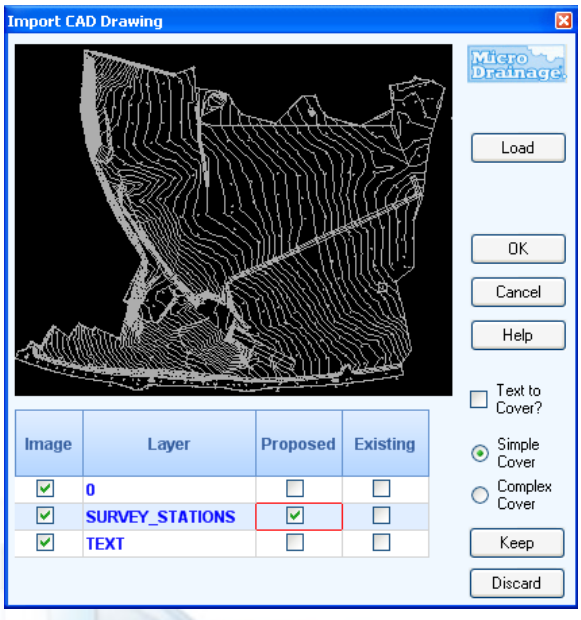
Existing Topography

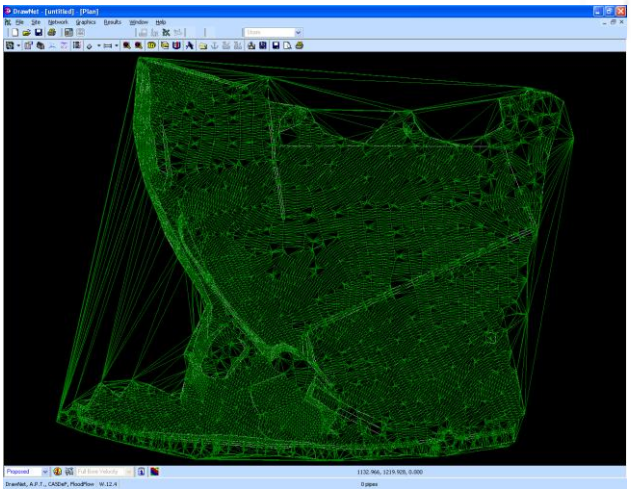
Prior to deciding on any aspect of a SUDS system it is of paramount importance to gain a clear understanding of the existing hydrological characteristics of the site.

As the SAB function is likely to be the responsibility of the unitary authority it is likely that a preliminary study will be increasingly required, because the same authority will also be responsible for surface water management under the Flood and Water Management Act 2010.

The results can also be used to communicate with all the stakeholders to produce a complimentary infrastructure layout that will take into account and maintain the 'blue corridors' (receptors and pathways).

There are a range of factors that can be assessed using either a ground survey or LIDAR data. GIS data can be imported into Win*Des* from a range of common formats such as .dxf, .dwg, .csv, .txt, .xml and .asc.



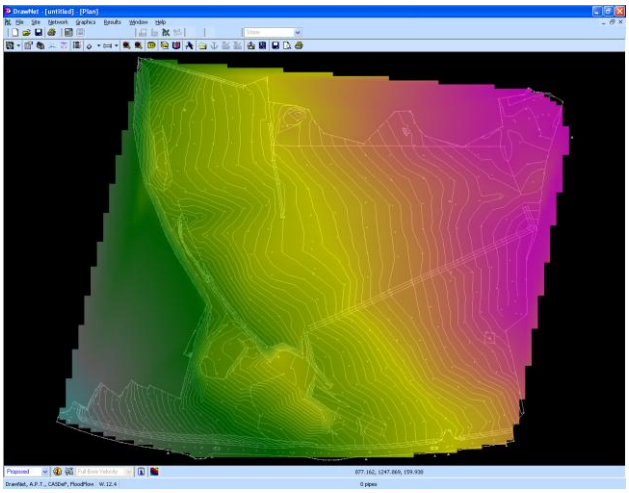


The ground points are imported and triangulated to produce a digital terrain model (DTM). The DTM can then be used to develop a clearer understanding of the natural catchment.

Site Characteristics: Height Map

There is a 'height map' function to help visualise the topography of the site. The program interprets the high and low points and splits the ground levels into seven coloured zones.

The image below clearly shows that the higher ground (coloured magenta) falls from the north east corner of the site towards the lower ground in the south west (coloured blue).



The height map function provides a good visual overview of the site. However, closer inspection will reveal that there may be intermediate flow paths where green fingers penetrate the yellow zone. These can be assessed with the following additional tools.

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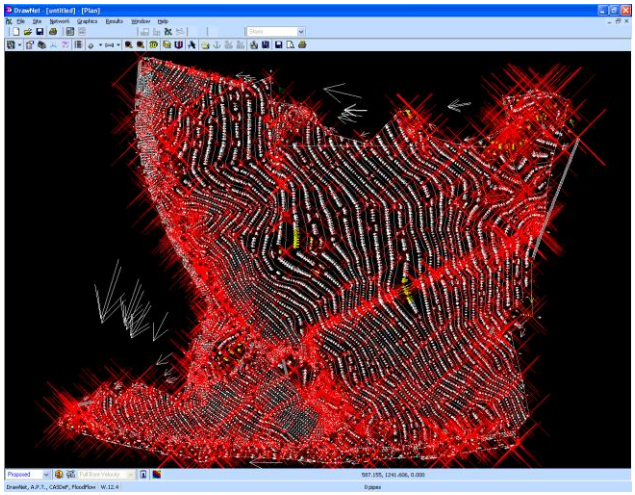
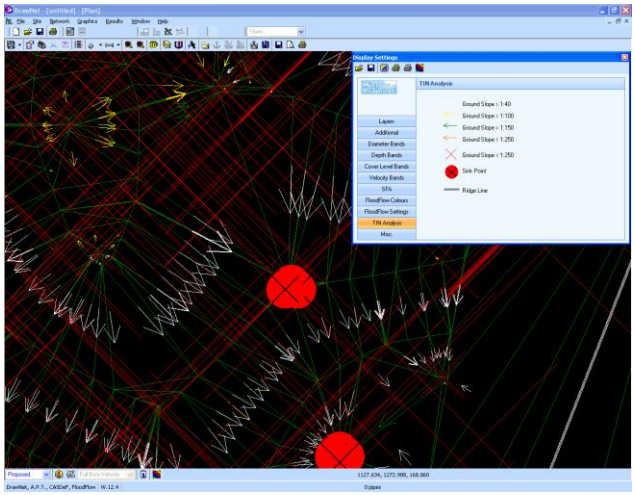
Site Characteristics: TIN Analysis

The TIN analysis function is used to identify possible flow paths, ridge lines and sink points based on a geometric analysis of the triangulated terrain profile. The line of steepest slope is identified for each triangle.



The arrows are colour coded based on a range of gradients. Ridge lines are defined as a shared line between two triangles where both opposing vertices are below the level of the line. Sinks are points where all surrounding vertices are higher.

The image below is a zoomed in graphic from the above model, to illustrate the gradient arrows and sink points. The TIN analysis function helps to identify sub-catchments on a site.



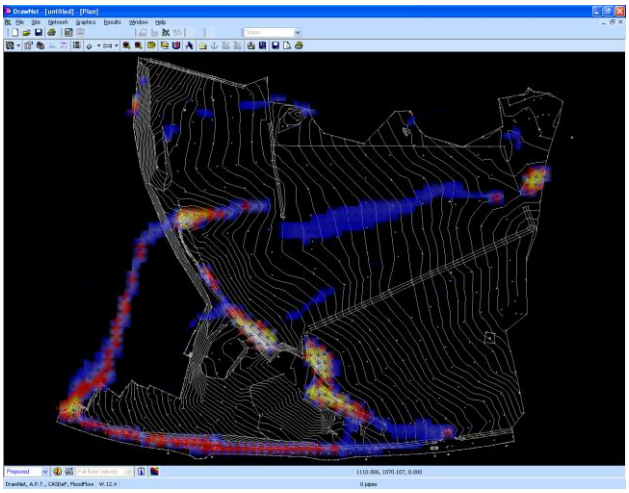
After the topography, sub-catchments, basins and slopes have been highlighted the DTM can be tested with a deluge of water.

Site Characteristics: FloodFlow Analysis

The Environment Agency has published river and coastal flood zones. However the recent extreme flooding events have been caused by a pluvial rather than fluvial source.

Deluging the DTM will identify the areas at greatest risk to pluvial flooding. The concept is to convert the unstructured DTM mesh into grid squares, apply a depth of water onto the surface and analyse how it runs across the model for a given period of time.

This will enable the 'blue corridors' to be identified across the catchment. The program will identify depth, direction and velocity of the overland flood flow routes.



Outputs

WinDes is renowned as the industry standard drainage design software suite because the program will not only produce compliant results but also provide user friendly and comprehensive outputs.

The most common drawing formats such as .dxf and .dwg can be used to communicate with the design team. GIS formats covering .sms and .asc are used to output for the approving authorities.

Profiles of the critical flow paths and depth gauges can be extracted to interrogate the extent of the overland flooding.

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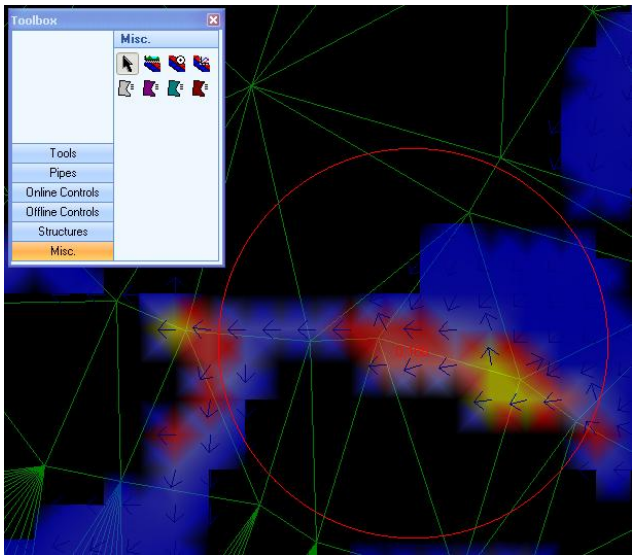

The results can therefore be communicated to the stakeholders, to enable a sustainable infrastructure layout to be planned in keeping with the natural catchment characteristics.

Following this preliminary analysis, ideally the urban designer will develop the final infrastructure layout to maintain the blue corridors.

The final infrastructure design can be imported into Win*Des* in a 3D format enabling a systematic approach to the sustainable urban drainage design to be applied. This is covered in more detail in the subsequent papers.

Summary

Pre-planning of SUDS systems is currently being undervalued by clients and overlooked by approving authorities.

The Flood and Water Management Act 2010 has clarified responsibility for the adoption and maintenance of SUDS with the unitary authority. The unitary authority also has responsibility for surface water management.

Therefore the effect of a new development upon the existing catchment is likely to come under more scrutiny earlier in the planning process.

The technology exists to help developers, their consultants and SAB's to analyse the existing catchment regime and gain approval in principle for a systematic SUDS approach at pre-planning stage.

SUDS Series of Papers

In the next paper the issue of preliminary design for SUDS is covered.

The complete series will comprise of the following papers;

- Legislation for SUDS Implementation
- Planning for SUDS
- Preliminary Design for SUDS
- Detailed Design for SUDS
- Auditing SUDS for extreme rainfall

Contact Details

For further information about Win*Des*, training and workshops, visit www.microdrainage.co.uk, email info@microdrainage.co.uk or call +44 (0)1635 582555.

To share your views, keep abreast of legislation and research visit Piped Up! The Micro Drainage blog at http://pipedup.wordpress.com

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