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INFOWORKS CS FLOOD COMPARTMENTS IN PRACTICE
Flooding in Norfolk Street, Boston

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Introduction

Last year, I reported on the work done to assess the risk of flooding to individual properties in a low-lying part of Boston to justify the large cost resolving the flooding problems in Norfolk Street and Tawney Street. Current best-practice methods were employed leading ultimately to the use of LIDAR data in a Digital Terrain Model. I finished off by saying that; *"InfoWorks CS doesn't really use the DTM (Digital Terrain Model) to the full. The method used to overcome this was a time-consuming and convoluted way of getting there. It would be so much easier if InfoWorks CS made better use of DTM data, in the way that RS does.*

Release 7.5 of InfoWorks CS includes the use of "flood compartments" to represent the extent of flooding. This paper discusses its application to this particular example to assess how useful it is in practice.

Background

Norfolk Street is a low point in a flat landscape. An abandoned culverted watercourse runs under and along it, and once formed part of a sewer drain with a tide flap which discharged at low tide to the nearby river Witham. When modern sewerage was introduced from the 1930's on, the system remained combined, leading to the current problems.

As it was important to identify all properties at risk and ensure that they were protected by the scheme, it was decided that more survey data was needed than was available from the sewer records alone. This consisted of:

- Traditional level survey of roads, thresholds and airbricks
- LIDAR data to fill in the gaps and extend the range

The LIDAR data was very useful in improving the accuracy of the flood cones, enabling sensible values of the Floodable Area and depths Flood 1 and Flood 2 to be determined – by the simple manual means of tracing contours in MapInfo. This would be very tedious and inefficient over a large area, but was acceptable for the small number of nodes concerned here.

To improve the modelling of flooding, a number of dummy nodes were added to represent gullies, and the nodes were linked by dummy channels to represent the roads. The LIDAR data was also useful in determining exactly where these should run.

Figure 1 shows predicted flooding on a 3-D view, from last year's paper. What is actually shown is the projection of the flood cone onto the Digital Terrain Model. Where the cone is below ground level, it is invisible – simple as that. The dummy nodes allowed more cones to be drawn, and the flooding to be represented in a more linear way along the road. Effective, not especially clever, but time-consuming, especially if it has to be done over an extended area.
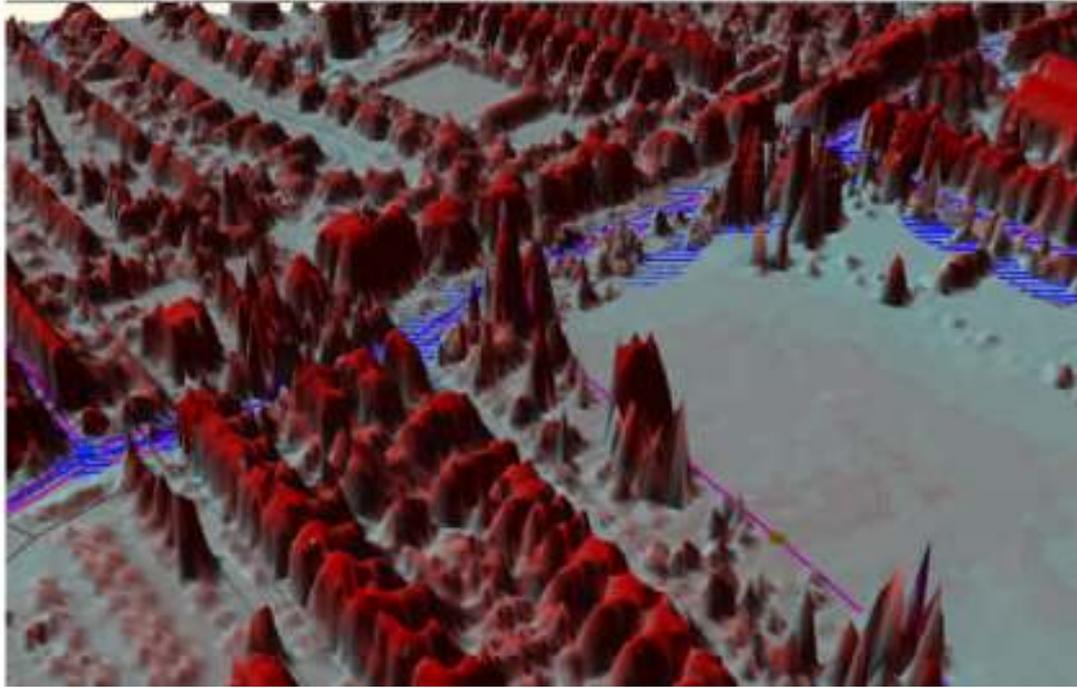
Figure 1: 3-D view of flooding in InfoWorks 6.5

However, on its own this wasn't enough to identify individual properties. The final step was to draw flooding contours for each return period (5, 10, 20 and 30 years) based on this information in MapInfo, and use these to identify the properties affected in each case. This allowed properties at risk of internal and external flooding at different return periods to be identified, and coded simply on a plan in the final report, as in Figure 2.


Figure 2: Flooding Properties

I had hoped that the Flood Compartments feature would be an improvement on this procedure. I noted last year that Wallingford Software were receptive to including some of the flood mapping capability of InfoWorks RS, so I was very pleased to see Flood Compartments included in release 7.5, and keen to see what they could do for me.

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Applying flood compartments

Flood Compartments can be defined from subcatchments or manually digitised. In this case, as I was only looking at a restricted area, and the floodable areas do not match subcatchments very well, I digitised them manually. I had already defined polygons for the previous analysis, so I used them to define the compartments.
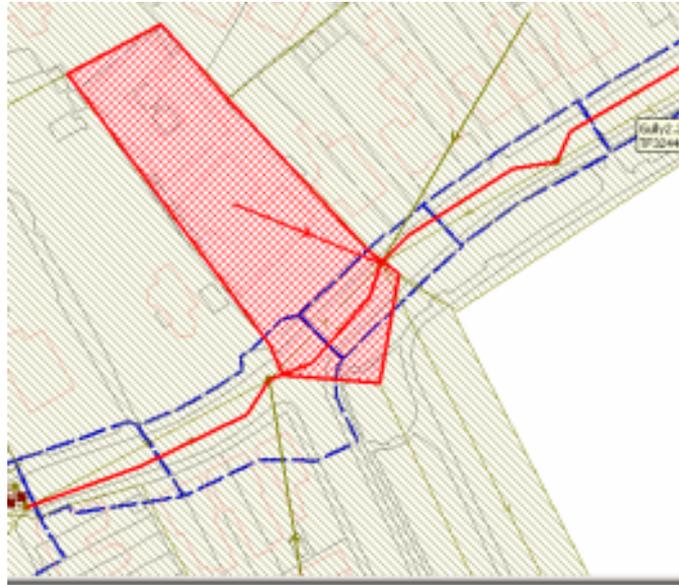
Figure 3: Subcatchments, flood compartments (blue polygons) and dummy channels

As with DTMs in general, displaying results is a matter of applying themes. I won't describe the process in detail, as it's all in Help and pretty obvious, but the results can be impressive, in either 2-D or 3-D views:
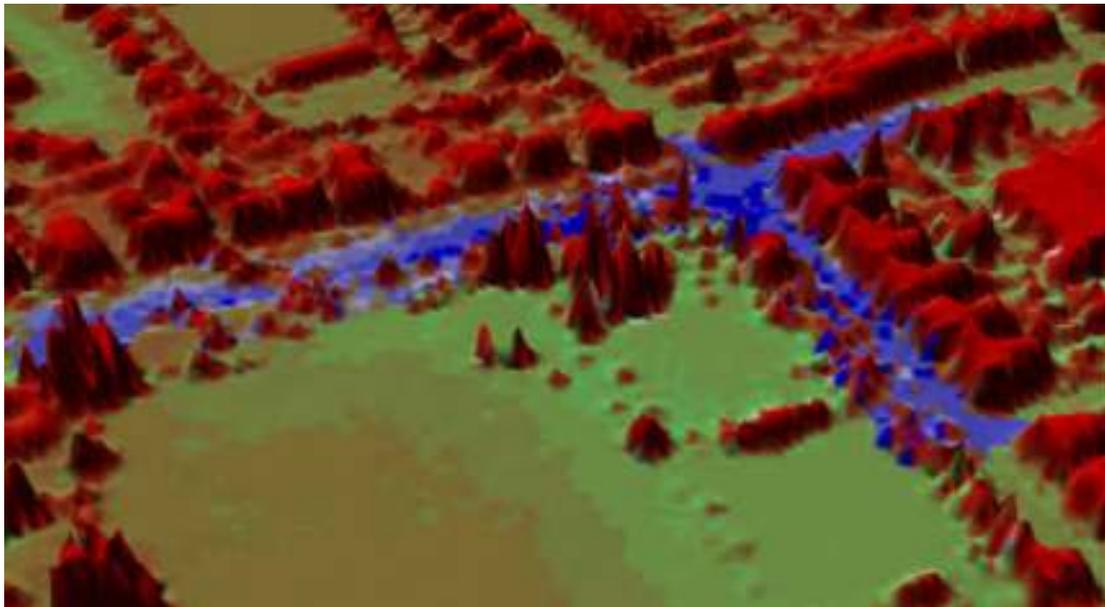
Figure 4: Flooding depth in shades of blue

Figure 5 shows details of a smaller area. Blue on houses hints at internal flooding. The flooding colours are draped over the DTM, which looks a little odd, but gives an idea of depth. The unfiltered DTM doesn't distinguish between trees and houses, but the filtered version

wouldn't show the buildings – there is a trade-off to be made. It would be possible to draw the compartment to exclude selected areas such as houses, but this would be very time-consuming.
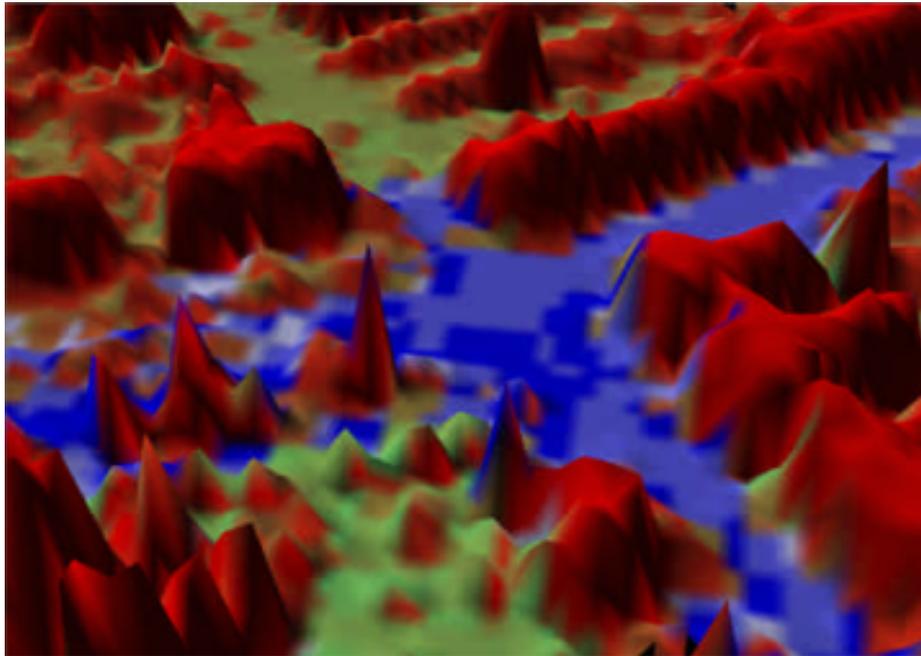

Figure 5: Detail of Figure 4

The key to the data displayed is the usual right-click Properties dialog:
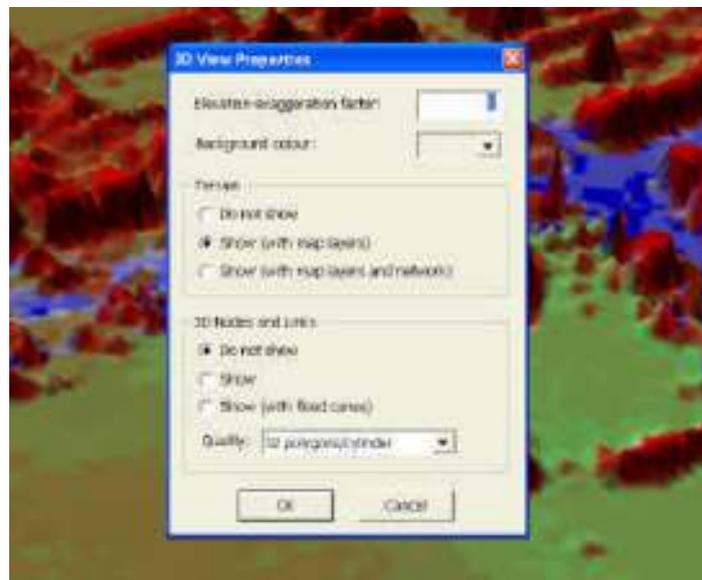

Figure 6: 3-D view Properties box

However, as the dialog hints at, the process still relies on defining a flood cone, which determines the depth of flooding. InfoWorks applies this within the flood compartment and shades DTM squares accordingly, whether or not it reflects reality. So I would still have had to use dummy channels, and to go through the process of determining a "best fit" flood cone. This is still a tedious process, and the cone can only be a very approximate representation of the level/ floodable area relationship. It is also a process that is very difficult to automate.

I had hoped for a more sophisticated use of the DTM data to take the place of the flood cone. There is an element of this in that several nodes can be included in a compartment, but all it really does is average the depths from the individual cones – it would be so much better for all the flood volumes to be added and the DTM used to determine the flood level.

CONCLUSIONS

Flood compartments do what they are intended to do - displaying flood depths over a defined area using thematics. The results of using flood compartments can be impressive, but InfoWorks CS **STILL** doesn't use the DTM (Digital Terrain Model) to the full. The flood compartments approach is a good start, but needs development to make it really useful. Claire Raynor's article (in IWCS Help) mentions that "A function to derive a rating curve to show area and level relationship is likely to be included in future versions of IWCS" – I hope this is what she means.