

ISIS-TUFLOW-PIPE link ...and other stories

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Introduction

- Rationale
- How to use the new link
- Example - Coventry
- Other developments

Why ISIS-TUFLOW-PIPE?

- Better reflects the typical usage, especially in UK
- Builds on complementary strengths of both ISIS and “ESTRY”
 - E.g. ISIS for large, complex open-channel networks
 - “ESTRY” for underground pipe networks

Why?

- Because you asked for it!
- No need to convert existing models built in either
- Removes requirement to insert dummy layers

When?

- ISIS v3.5.1
- TUFLOW 2011-09-AA
- Both released early October 2011

How?

- Very similar to existing ISIS-TUFLOW link
- ISIS calculates flow; TUFLOW calculates head (X1DQ link), or
- TUFLOW calculates flow; ISIS calculates head (X1DH link)
- “ESTRY” node needs to be snapped to an ISIS node...
- ...directly or using a connector

X1DH link

- TUFLOW calculates flow; ISIS calculates head
- Default behaviour - no need to define in 1d_nwk file
- Flow applied to ISIS as a lateral inflow (as in 2D HX link)
- Typical usage: pipe outfall discharging into open channel

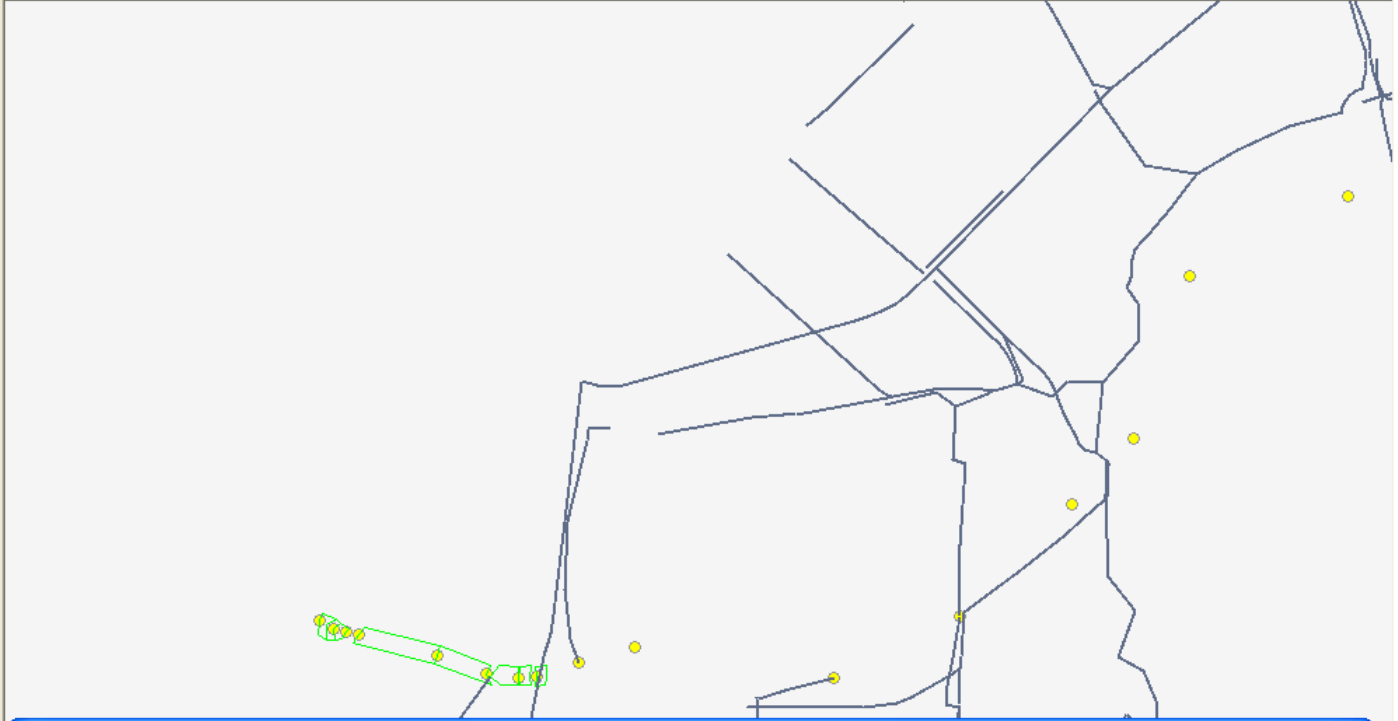
X1DQ link

- TUFLOW calculates head; ISIS calculates flow
- Need to define *Conn_2D* attribute as “X1DQ” in 1d_nwk layer
- ISIS node must be an HTBDY unit
- Typical usage - ISIS flowing directly into TUFLOW 1d network

TUFLOW control files

- ISIS nodes layer (Read GIS ISIS nodes)
- TUFLOW 1D network layer (Read GIS Network)
- (reference *.tcf file name in ISIS Event File (*.ief))

- Layers
- Sherbourne
 - 2d_bc_code_Sherbourne_ISIS_polygon.shp
 - Polygon
 - 2d_loc_Sherbourne_polyline.shp
 - Polyline
 - 2d_bc_Coventry_down_1000yr_polyline_002....
 - Polygon
 - 2d_bc_code_Sherbourne_ISIS_point.shp
 - Point
 - 1d_nwk_Sherbourne_002_polyline.shp**
 - Polyline**
 - ...
 - Polyline
 - 2d_rf_Sherbourne_point.shp
 - Point
 - 2d_bc_Coventry_down_1000yr_polyline_003....
 - PolyLine
 - 1d_ISISnodes_Sherbourne_point_001.shp
 - Point
 - SHR_ISIS_ESTRY_1_h_g002.50_Max.asc
 - Map Server layer
 - check files
 - 2d_1d_to_2d_check.mif



Attributes [1d_nwk_Sherbourne_002_polyline.shp]

#	id [S]	type [S]	ignore [S]	ucs [S]	len_or_ana [D]	n_or_n_f [D]	us_invert [D]	ds_invert [D]	form_loss [D]	pblockage [D]	inlet_type [S]	conn_2d [S]	conn_no
0	1182231161.1	C	F	T	0	0.025	79.856	79.58	0	0			-1
1	1182231211.1	C	F	T	0	0.025	77.837	77.75	0	0			-1
2	1182231867.1	C	F	T	0	0.025	86.276	86.26	0	0			-1
3	1182231930.1	C	F	T	0	0.025	85.999	85.76	0	0			-1
4	1182231990.1	C	F	T	0	0.025	84.94	84.47	0	0			-1
5	1182232114.1	C	F	T	0	0.025	105.515	105.47	0	0			-1
6	1182234947.1	C	F	T	0	0.025	83.129	82.96	0	0			-1
7	1182235010.1	C	F	T	0	0.025	75.644	75.56	0	0			-1
8	1182235011.1	C	F	T	0	0.025	76.875	76.6	0	0			-1
9	1182235022.1	C	F	T	0	0.025	76.627	76.58	0	0			-1
10	1182235178.1	C	F	T	0	0.025	79.858	79.75	0	0			-1
11	1182235182.1	C	F	T	0	0.025	79.473	79.17	0	0			-1
12	1182235359.1	C	F	T	0	0.025	82.296	82.21	0	0			-1
13	1182235477.1	C	F	T	0	0.025	83.227	81.89	0	0			-1
14	1182235556.1	C	F	T	0	0.025	81.002	80.02	0	0			-1
15	1182235557.1	C	F	T	0	0.025	76.133	75.86	0	0			-1
16	1182235564.1	C	F	T	0	0.025	77.053	76.133	0	0			-1
17	1182235605.1	C	F	T	0	0.025	77.45	77.42	0	0			-1

Attributes

Time Steps Colour Ramp

[Empty]

TextPad - C:\Projects\Sherbourne\Results\1d\SHR_ISIS_ESTRY_1_KLA.eof

File Edit Search View Tools Macros Configure Window Help

Find incrementally Match case

C:\Projects\Sherbourne\Results\1... C:\Projects\Sherbourne\Results\1d\SHR... Document 1 * C:\Projects\WHISIS\testing\ISIS-ESTRY\... C:\Projects\WHISIS\testing\ISIS-ESTRY\... C:\Projects\WHISIS\testi...

10:40:00	0.000 G	0.000 D	0.000 F	0.000 F	0.016 F	0.001 D	-0.010LF	-0.003 F	0.173 F	0.000 F
10:45:00	0.000 G	0.000 D	0.000 F	0.000 F	0.017 F	0.002 D	-0.012LF	-0.001 F	0.175 F	0.000 F
10:50:00	0.000 G	0.000 D	0.000 F	0.000 F	0.017 F	0.002 D	-0.019 F	-0.001 F	0.174 F	0.000 F
10:55:00	0.000 G	0.000 D	0.000 F	0.000 F	0.018 F	0.002 D	-0.012LF	-0.002 F	0.173 F	0.000 F
11:00:00	0.000 G	0.000 D	0.000 F	0.000 F	0.017 F	0.002 D	-0.018 F	-0.001 F	0.174 F	0.000 F
11:05:00	0.000 G	0.000 D	0.000 F	0.000 F	0.017 F	0.002 D	-0.018 F	-0.001 F	0.173 F	0.000 F
11:10:00	0.000 G	0.000 D	0.000 F	0.000 F	0.017 F	0.002 D	-0.019 F	-0.001 F	0.173 F	0.000 F
11:15:00	0.000 G	0.000 D	0.000 F	0.000 F	0.017 F	0.002 D	-0.019 F	-0.001 F	0.172 F	0.000 F
11:20:00	0.000 G	0.000 D	0.000 F	0.000 F	0.016 F	0.002 D	-0.013LF	-0.002 F	0.170 F	0.000 F
11:25:00	0.000 G	0.000 D	0.000 F	0.000 F	0.016 F	0.002 D	-0.013LF	-0.002 F	0.170 F	0.000 F
11:30:00	0.000 G	0.000 D	0.000 F	0.000 F	0.016 F	0.002 D	-0.019 F	-0.001 F	0.171 F	0.000 F
11:35:00	0.000 G	0.000 D	0.000 F	0.000 F	0.016 F	0.002 D	-0.019 F	-0.001 F	0.171 F	0.000 F
11:40:00	0.000 G	0.000 D	0.000 F	0.000 F	0.014 F	0.002 D	-0.019 F	-0.001 F	0.170 F	0.000 F
11:45:00	0.000 G	0.000 D	0.000 F	0.000 F	0.014 F	0.002 A	-0.019 F	-0.001 F	0.170 F	0.000 F
11:50:00	0.000 G	0.000 D	0.000 F	0.000 F	0.013 F	0.002 A	-0.019 F	-0.001 F	0.170 F	0.000 F
11:55:00	0.000 G	0.000 D	0.000 F	0.000 F	0.013 F	0.002 A	-0.020 F	-0.001 F	0.170 F	0.000 F

HEADS AT NODES (m) 1182231161.1 to 1182231990.2

Hour	1182231161	1182231161	21182231211	1182231211	21182231867	1182231867	21182231930	1182231930	21182231990	1182231990
0:00:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:05:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:10:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:15:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:20:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:25:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:30:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:35:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:40:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:45:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:50:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
0:55:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
1:00:00	79.855 E	79.579 E	77.836 E	77.749 E	86.275 E	86.259 E	85.998 E	85.739 E	84.939 E	84.459 E
1:05:00	79.942	79.636	77.854	77.752	86.283	86.265	86.021	85.744	84.946	84.463
1:10:00	79.919	79.651	77.911	77.792	86.298	86.274	86.046	85.779	84.974	84.477
1:15:00	79.899	79.634	77.960	77.910	86.317	86.295	86.050	85.799	85.001	84.510
1:20:00	79.893	79.634	77.982	77.931	86.388	86.380	86.137	85.856	85.138	84.632
1:25:00	79.996	79.674	78.354	78.312	86.704	86.699	86.273	86.013	85.378	84.865
1:30:00	80.844	80.633	79.133	79.018	87.372	87.370	86.430	86.302	86.081	85.785
1:35:00	82.455	82.279	80.189	80.013	87.960	87.953	87.832	87.828	87.798	87.446
1:40:00	83.752	83.404	80.820	80.627	87.971	87.966	90.610	90.599	90.365	89.740
1:45:00	84.119	83.656	80.763	80.590	88.019	88.008	90.880	90.708	90.448	89.798
1:50:00	84.154	83.687	80.585	80.419	88.059	88.048	90.960	90.751	90.482	89.813
1:55:00	84.196	83.728	80.429	80.267	88.108	88.087	90.967	90.778	90.501	89.826
2:00:00	84.245	83.779	80.330	80.171	88.140	88.116	90.983	90.813	90.519	89.837
2:05:00	84.319	83.845	80.269	80.111	88.168	88.139	90.990	90.834	90.530	89.844
2:10:00	84.331	83.858	80.234	80.077	88.184	88.153	90.986	90.833	90.532	89.848
2:15:00	84.342	83.871	80.209	80.053	88.193	88.159	90.962	90.814	90.524	89.845
2:20:00	84.355	83.890	80.197	80.041	88.184	88.152	90.938	90.785	90.513	89.839
2:25:00	84.373	83.910	80.211	80.051	88.170	88.140	90.927	90.757	90.499	89.832
2:30:00	84.393	83.927	80.240	80.078	88.152	88.126	90.842	90.731	90.487	89.824
2:35:00	84.409	83.937	80.277	80.112	88.136	88.112	90.798	90.709	90.476	89.817
2:40:00	84.423	83.949	80.325	80.155	88.123	88.102	90.764	90.686	90.463	89.810
2:45:00	84.430	83.961	80.367	80.195	88.110	88.089	90.738	90.669	90.447	89.804
2:50:00	84.436	83.978	80.409	80.233	88.097	88.079	90.712	90.654	90.434	89.798
2:55:00	84.438	83.982	80.450	80.272	88.086	88.070	90.693	90.641	90.423	89.794

8338 1729 Read | Ovr | Block | Sync | Rec | Caps

Example usage

- Coventry SWMP
- Existing ISIS model of the River Sherbourne, including culverted section through city centre
- Existing IWCS combined sewer and surface water model
- Latter converted to TUFLOW with 1D components
- Both 1D and 2D elements of TUFLOW linked with the ISIS model
- Combined pluvial and fluvial inputs

Google Maps - Microsoft Internet Explorer provided by Halcrow.

http://maps.google.co.uk/

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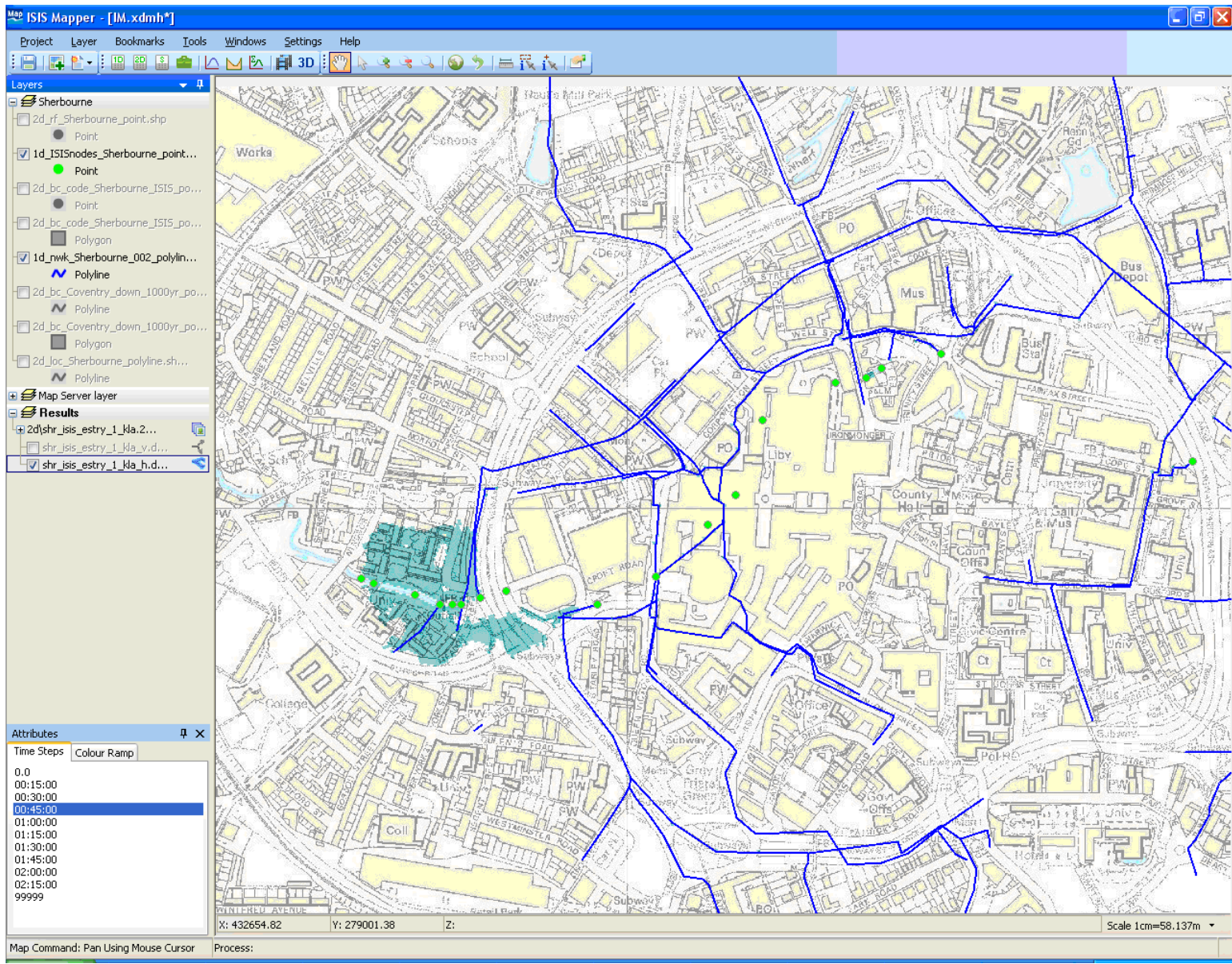
Google

Satellite Traffic

1000 ft
200 m

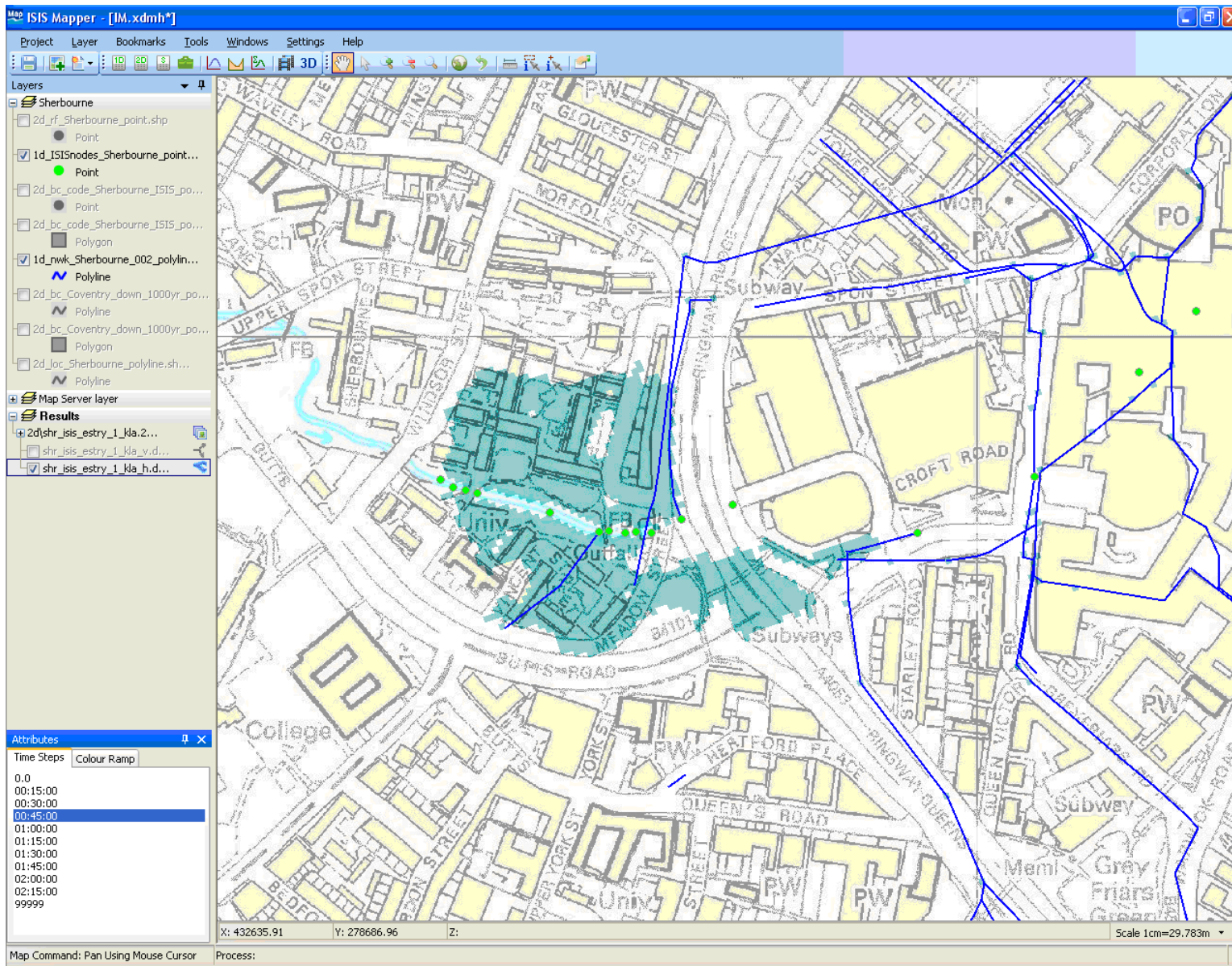
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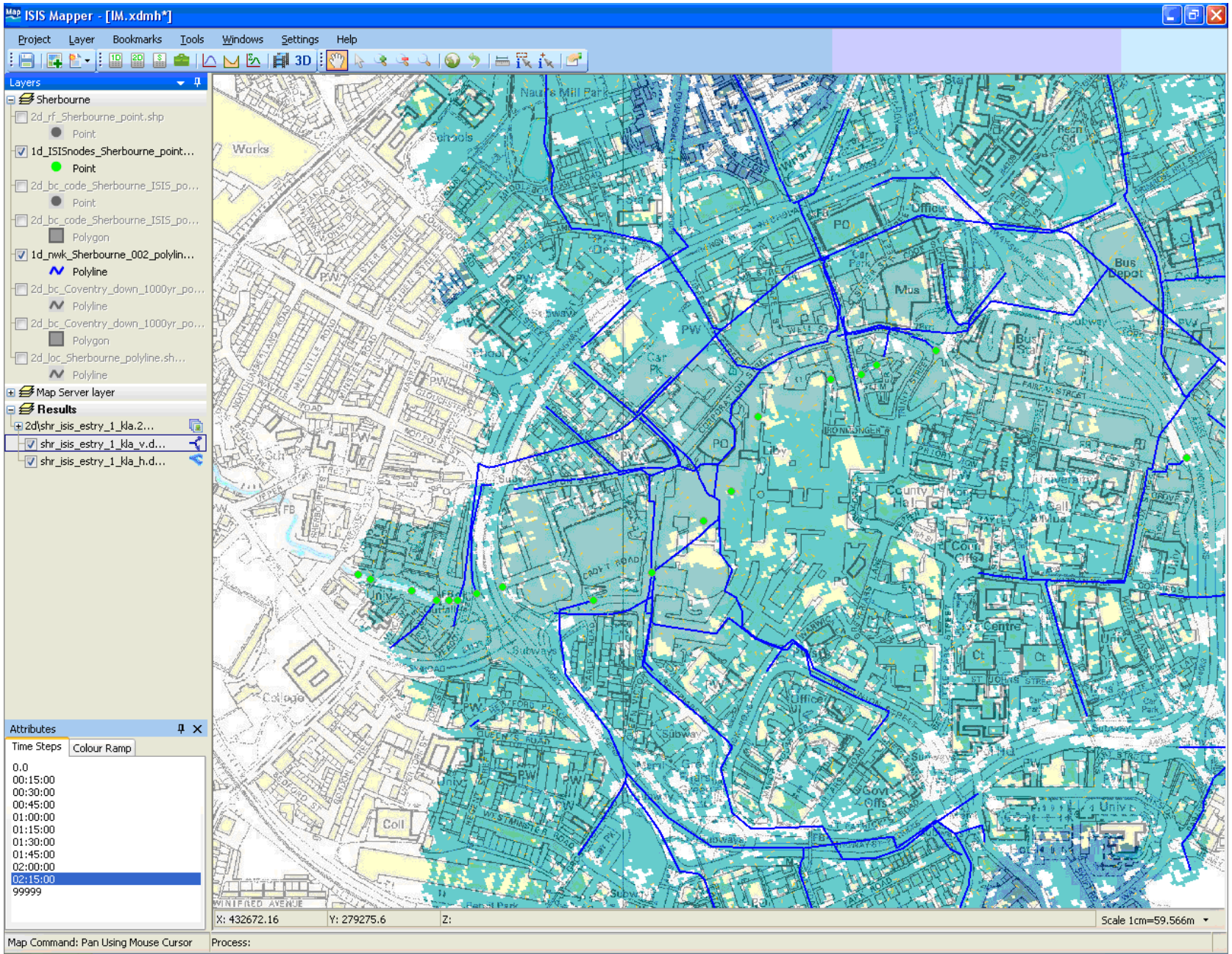
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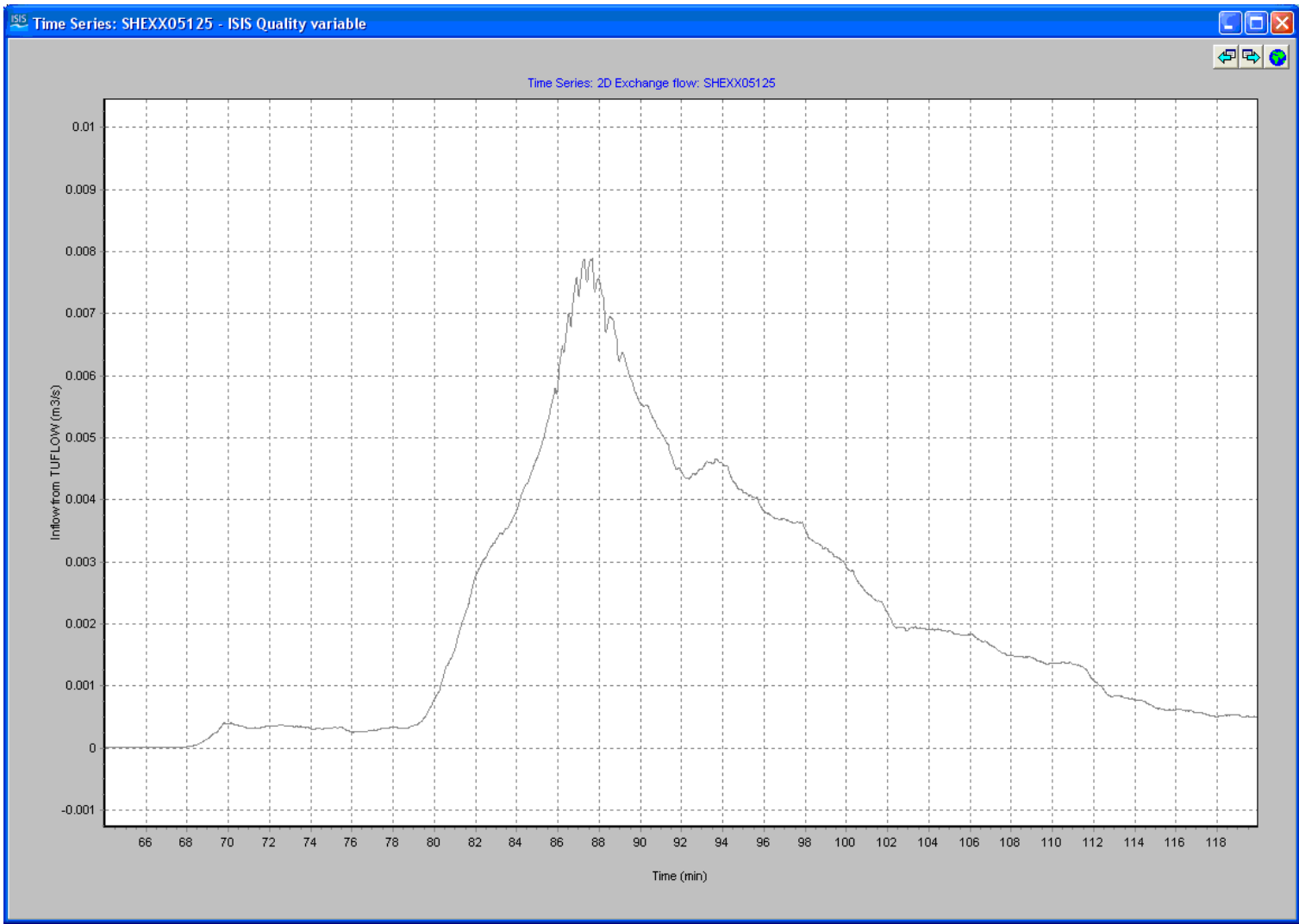


Model conversion

- IWCS network converted to “ESTRY” network
- Overland domain modelled in TUFLOW
- Existing ISIS model kept largely unchanged
- Linked to TUFLOW using HX (2D) and X1DH (1D) connections







ISIS QXBDY?

- Alternative to X1DH link
- Flow from TUFLOW directly into ISIS upstream boundary
- Use where one would normally have an ISIS QTBDY
- But...
- Not particularly stable at present
- Coded in, but currently hidden

Other developments

- 64-bit ISIS-TUFLOW
 - Available with ISIS v3.5.1; TUFLOW 2011-09-AA
 - Enables large TUFLOW models to link with ISIS and take advantage of increased memory capacity
- Anything else?
- Suggestions gratefully received