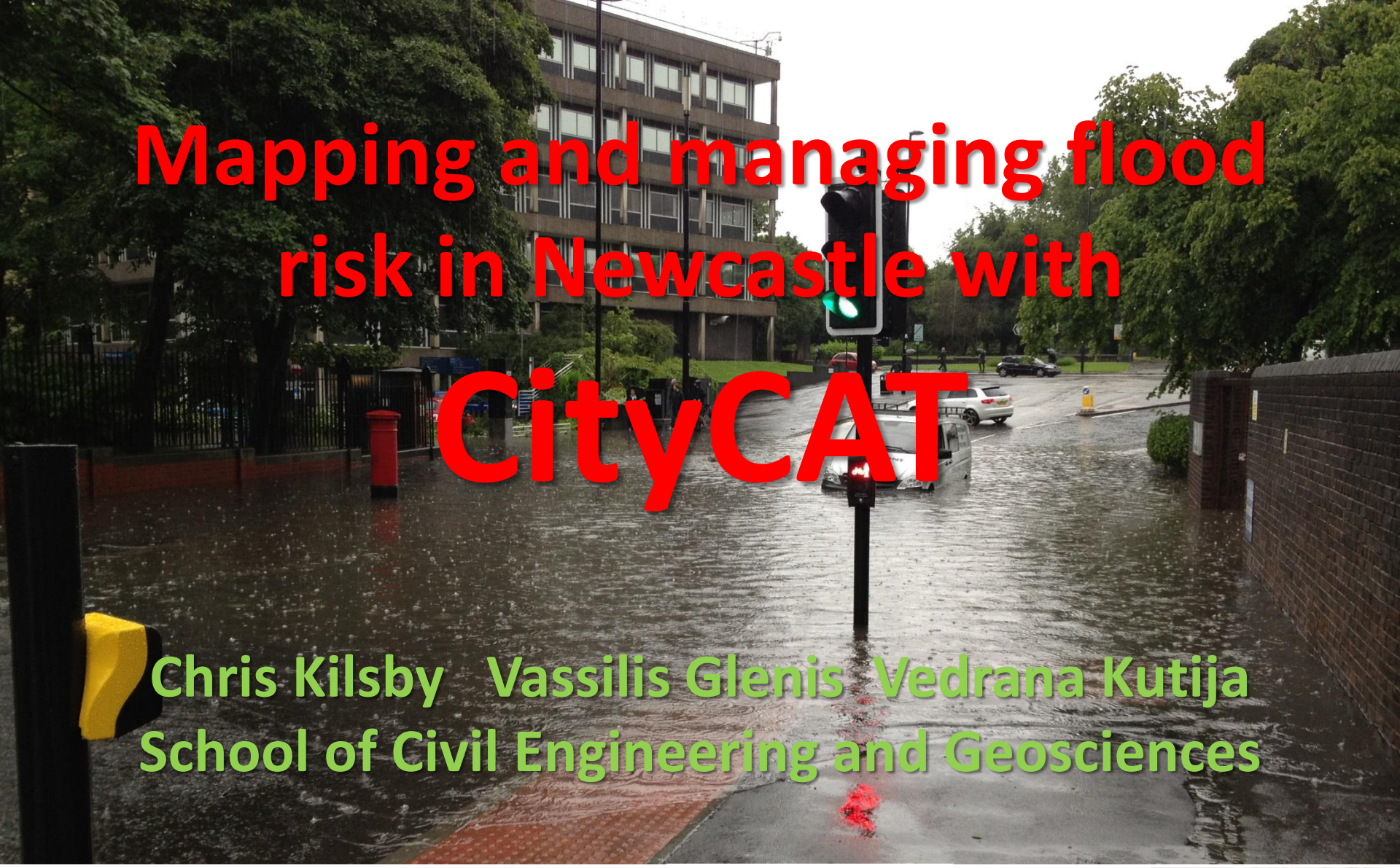

Mapping and managing flood risk in Newcastle with CityCAT

Chris Kilsby Vassilis Glenis Vedrana Kutija
School of Civil Engineering and Geosciences

Newcastle University

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CESER
Centre for Earth Systems Engineering Research

Overview

1. Brief history of Newcastle flooding…
2. The CityCAT model and flood risk maps
3. Implications of flood risk mapping…

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LARGE THUNDERSTORM FLOODING IN NEWCASTLE

26th August 1792

12th August 1809

11th June 1833

10th June 1835

18th June 1839

8th August 1849

12th August 1890

8th July 1893

19th July 1901

Courtesy: David Archer

16TH SEPTEMBER 1913

2.85 inches (72 mm) rain in 1h 30mins

"Flooding occurred at numerous points in the city, miniature lakes two feet deep being formed in different thoroughfares. A torrent of water swept through St Thomas churchyard, burst through the floors and windows of Lovaine hall and flooded it to a depth of 4 feet. Businessmen in order to gain their offices had to take off their shoes and stockings and wade knee deep to a higher level. The Royal Grammar School was flooded and the summer vacation has been extended for a week."

Courtesy: David Archer

Jesmond Road

Courtesy: Sarah Mulligan

22ND JUNE 1941

1.97 inches (50mm) in 35 mins; 3.74 inches (95mm) in 85 mins

Not recorded in the papers at the time due to war restrictions

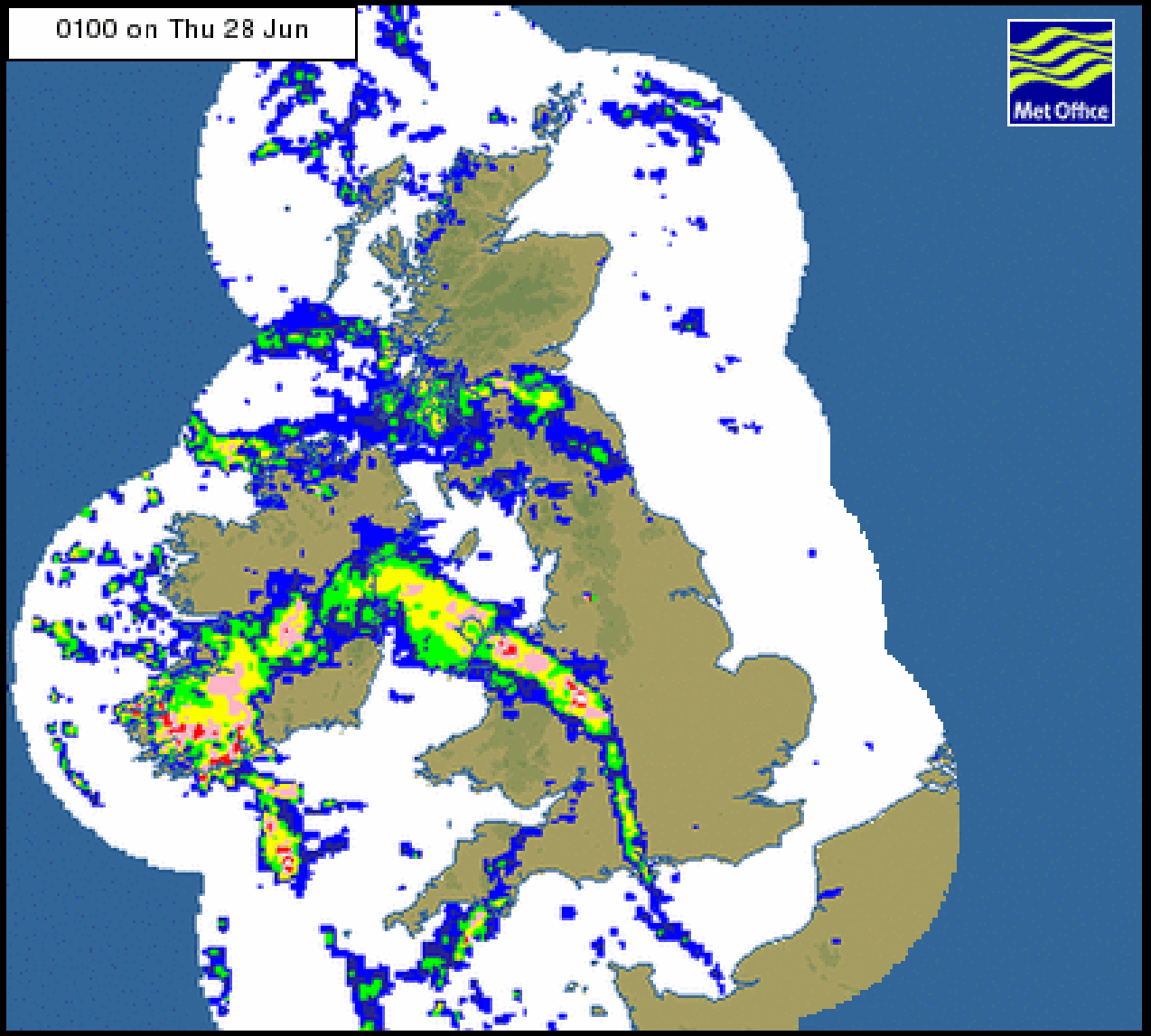
A succession of severe thunderstorms causing damage by lightning and flooding. Most damage done at Denton Burn.

Courtesy: David Archer

Denton Burn

Courtesy: David Archer

The Toon Monsoon



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Courtesy: Dr Richard Allan, Reading University

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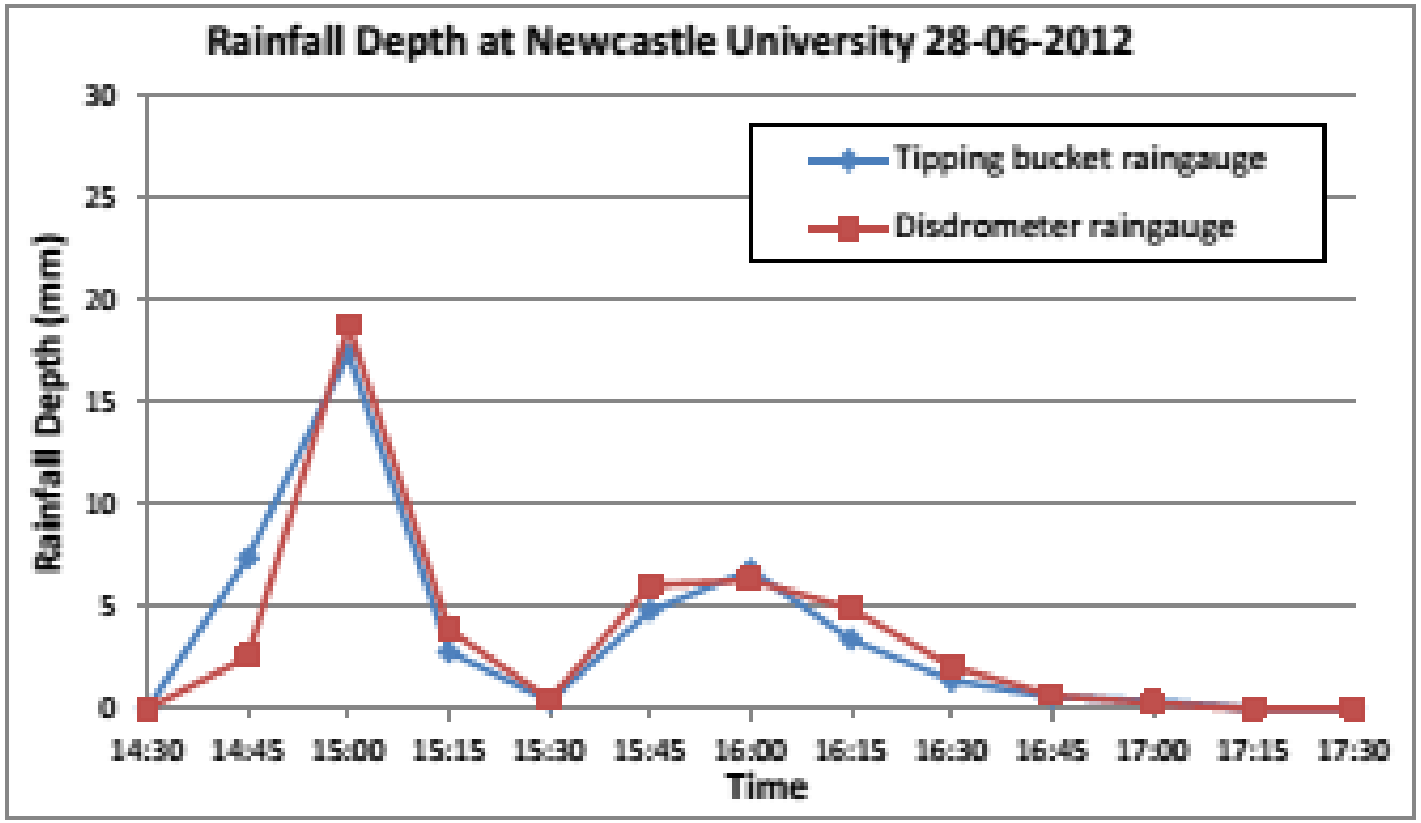
June 28 2012 - rainfall



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June 28 2012 - flood

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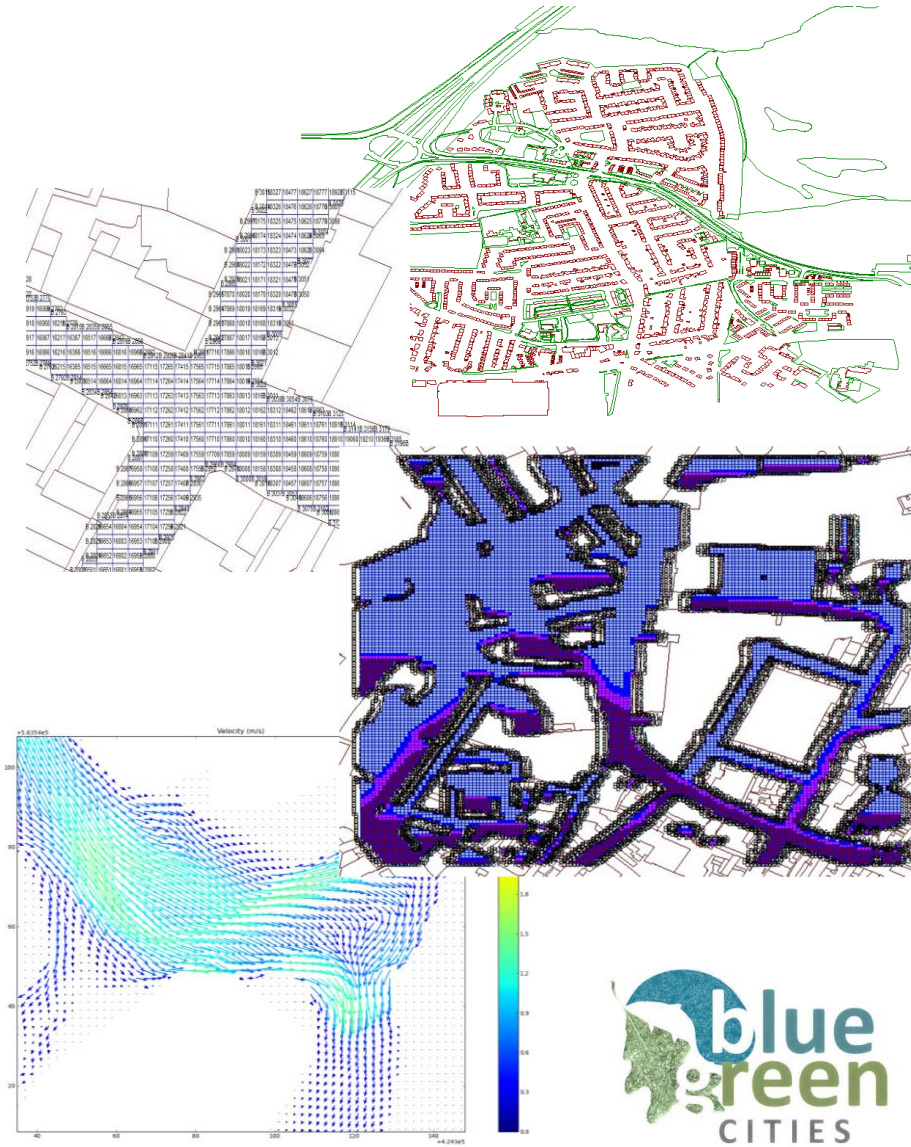
City Catchment Analysis Tool - **CityCAT**

What is it? Unique software tool for modelling, analysis and visualisation of flooding.

What does it do? Rapid assessment of pluvial and fluvial flood risk and effects of flood alleviation measures.

What's new? Fast and efficient - easy to use

- Uses readily available data (OS Mastermap and lidar)
- Includes buildings and green space and other features
- Coupled sewer and surface
- Gives flow depth and velocity



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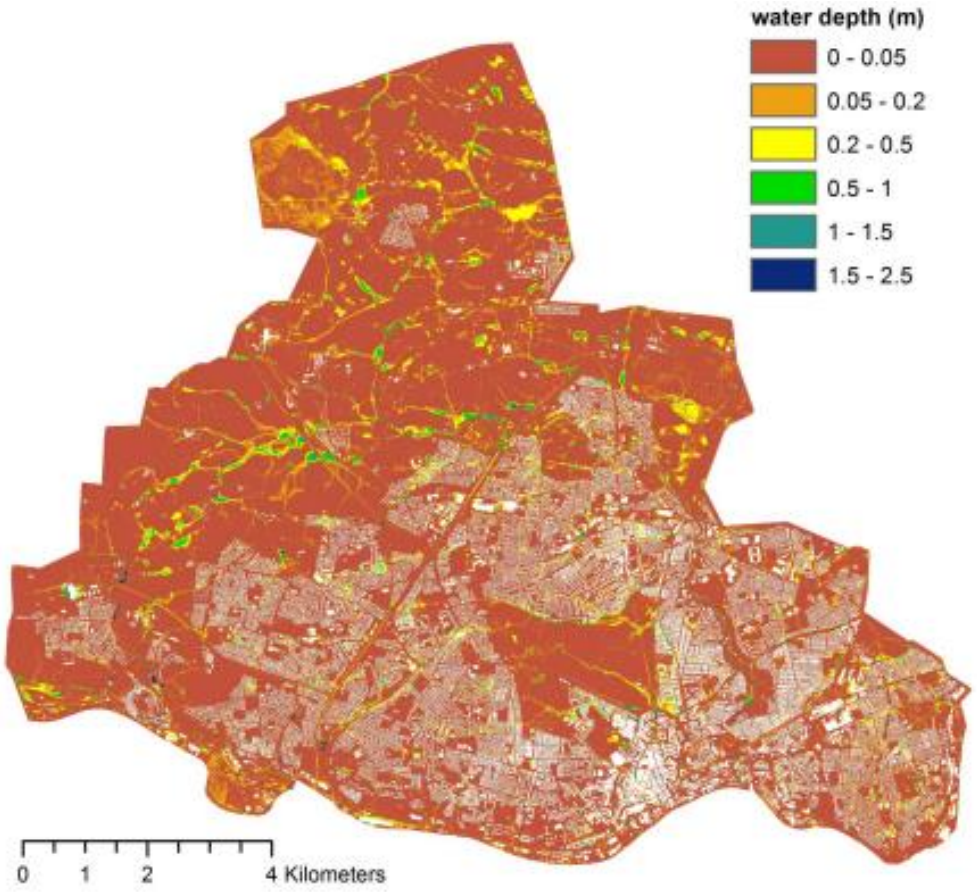
CityCAT output – whole of Newcastle



Water depth map of Newcastle City Council area (~130km^2). Storm event of 60 minutes and 100 years return period .

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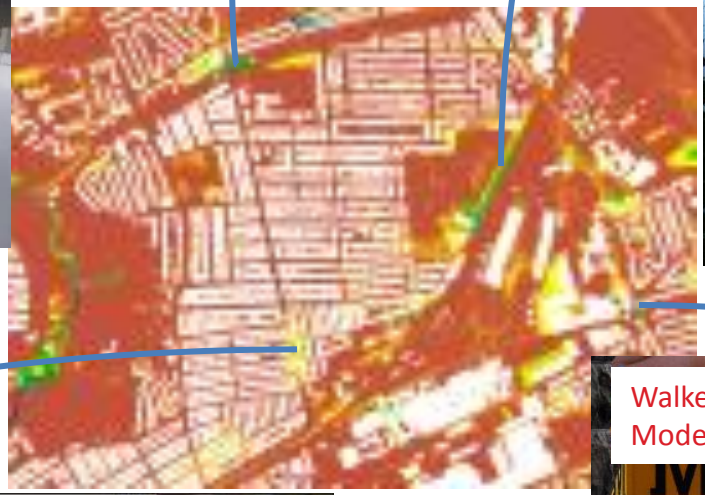
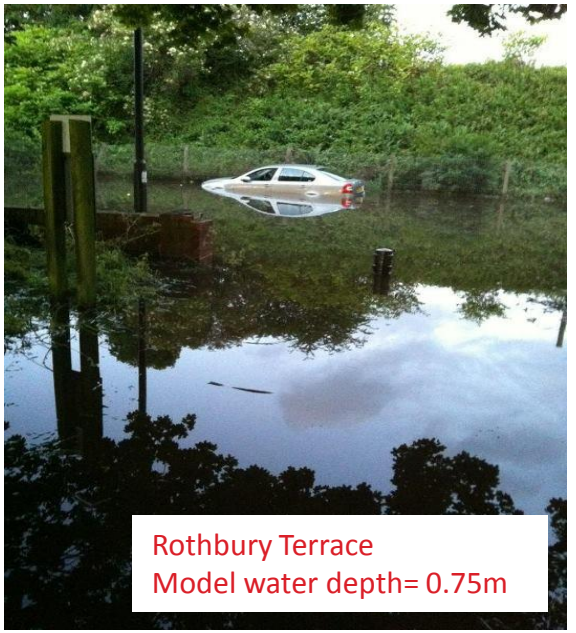
CityCAT validation

Crossing of Coast Road with Benton Road and Chillingham Road. Modelwater depth=1.45m

Newcastle flood on June 28th, 2012

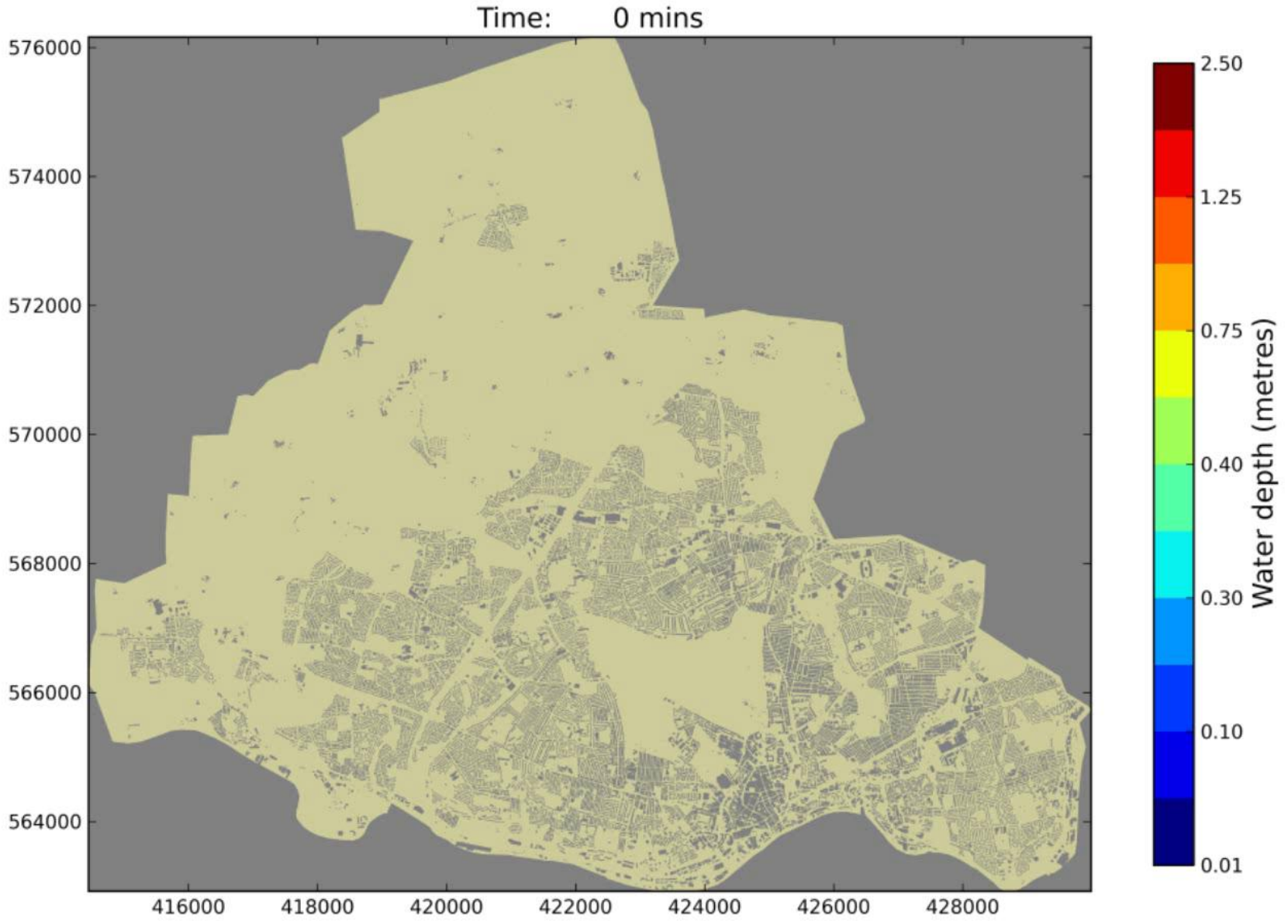


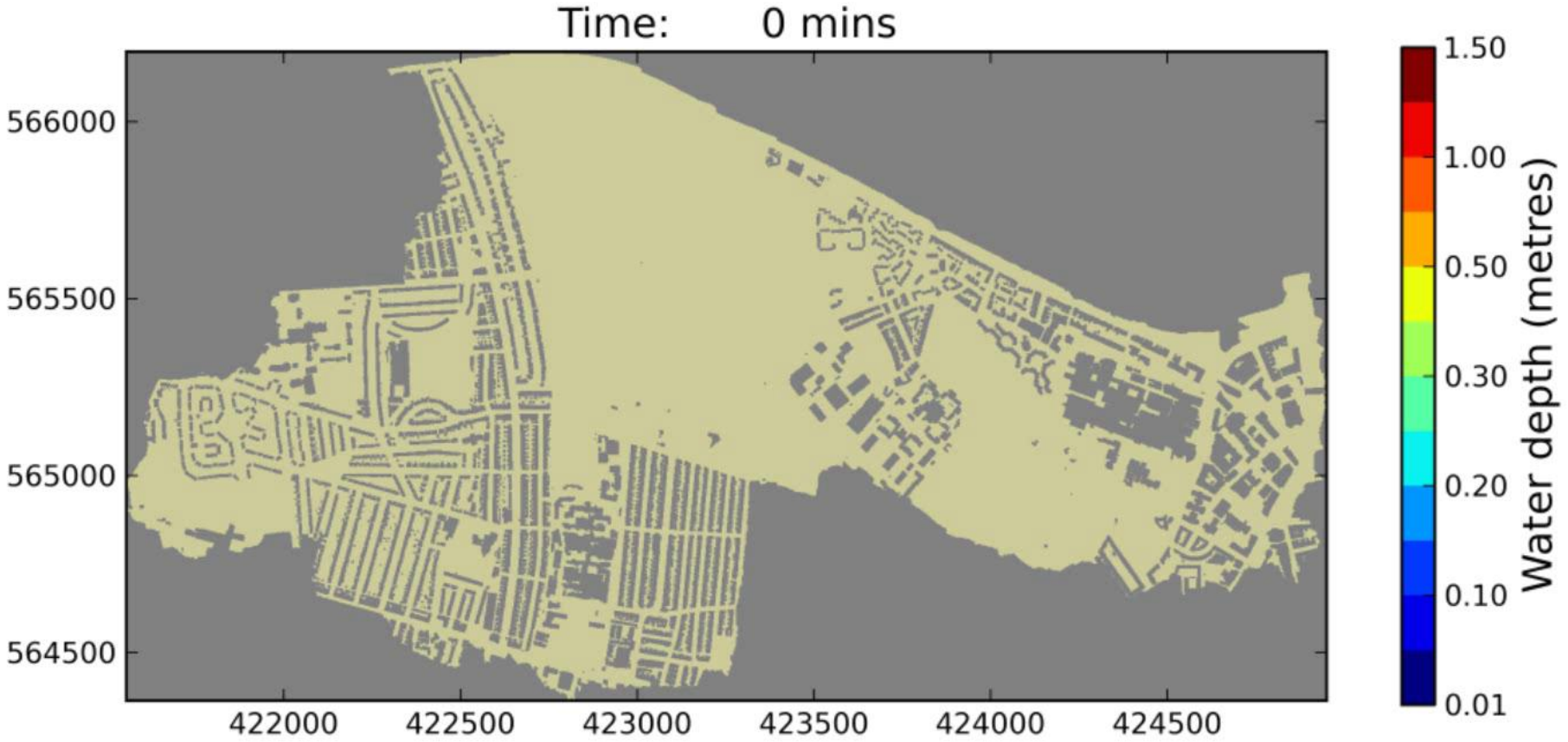


Rothbury Terrace
Model water depth= 0.75m

Chillingham Road
Model depth=0.45m

Walkergate
Model depth=1.36m


Time: 0 mins
576000
574000
572000
570000
568000
566000
564000
416000
418000
420000
422000
424000
426000
428000
2.50
1.25
0.75
0.40
0.30
0.10
0.01
Water depth (metres)


Time: 0 mins
566000
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424000
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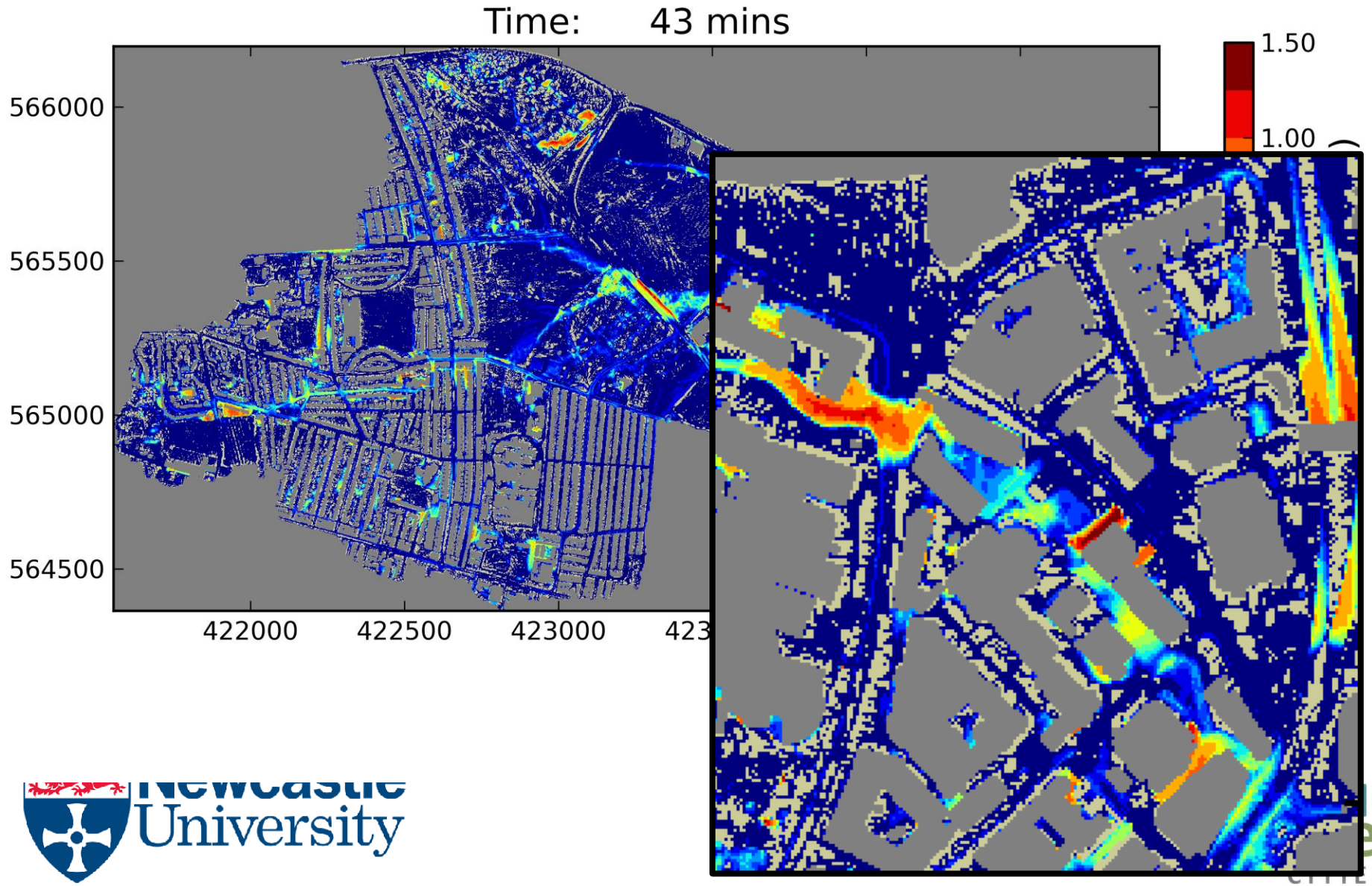
1.00
0.50
0.30
0.20
0.10
0.01
Water depth (metres)



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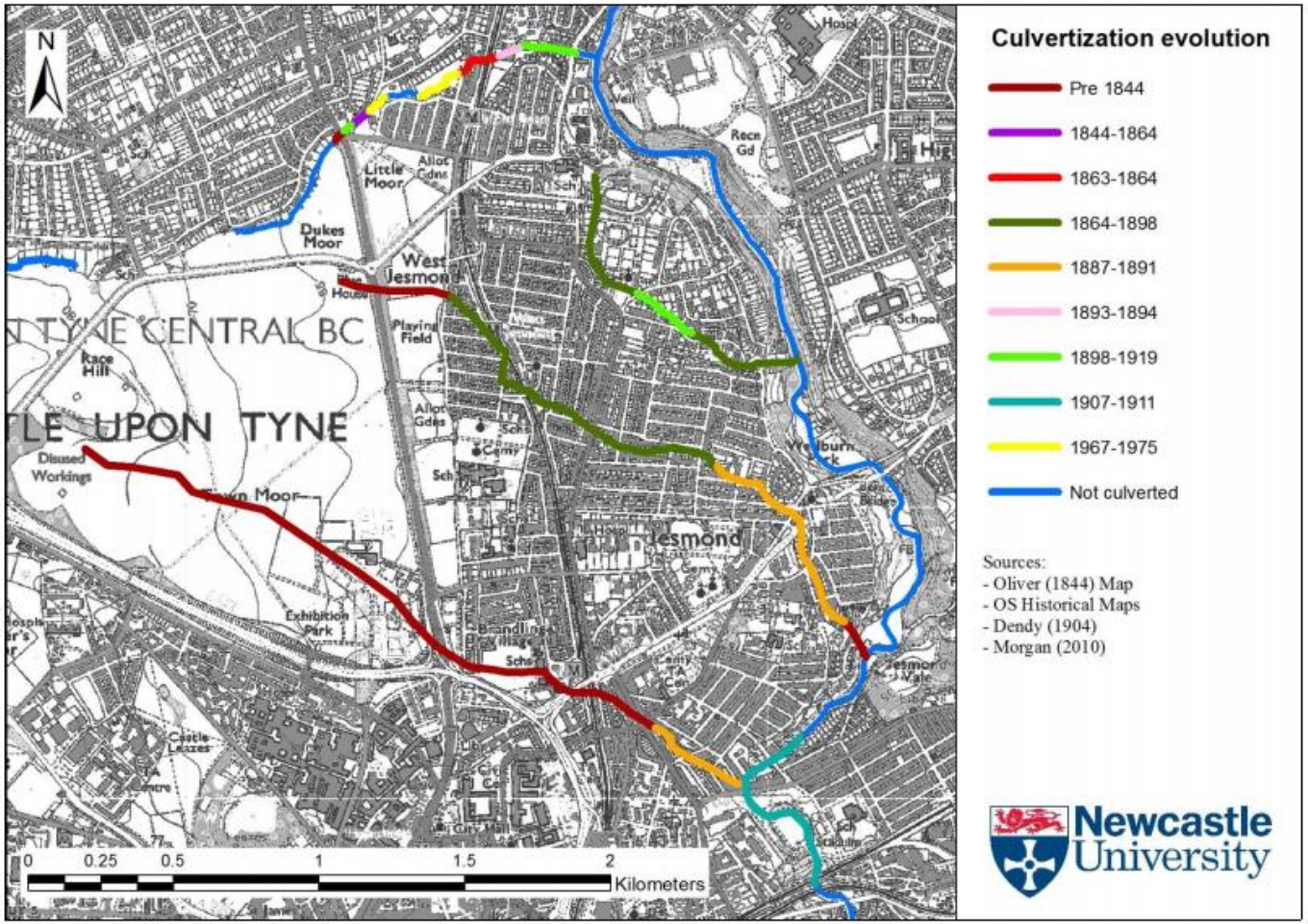
Culverts in Newcastle : old rivers



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Courtesy M Toraldo,
MSc project CEGS

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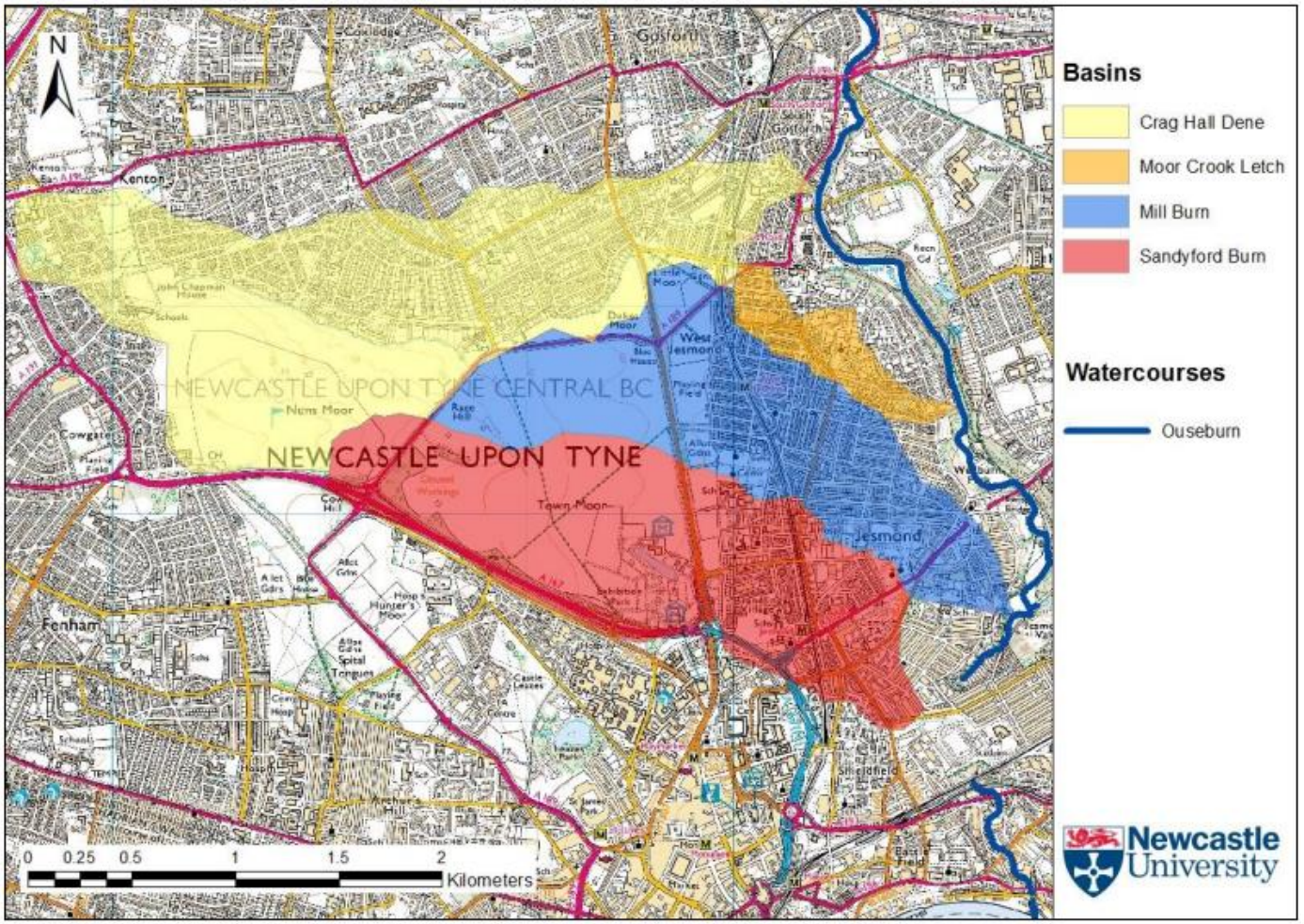
Culverts in Newcastle : catchments



Courtesy M Toraldo,
MSc project CEGS

Crag Hall Burn – present condition

Source : Newcastle City Council

Courtesy M Toraldo,
MSc project CEGS

CityCAT model : Crag Hall Dene

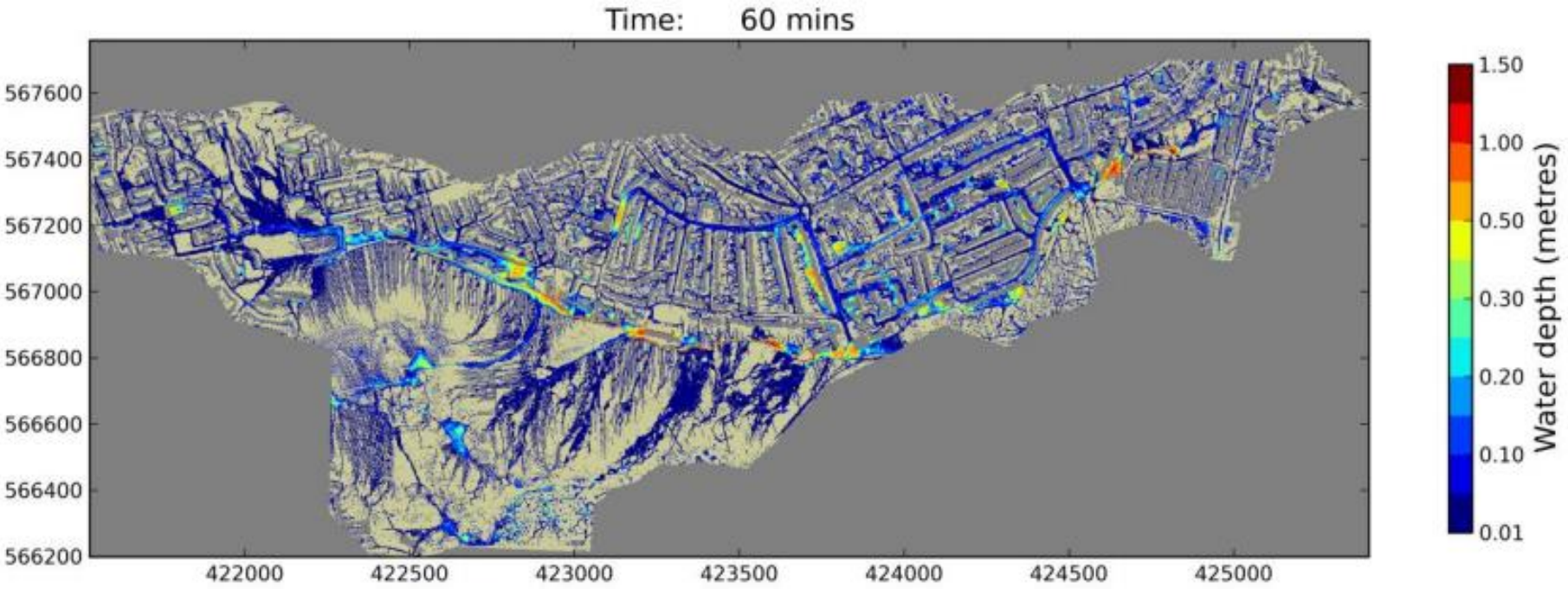
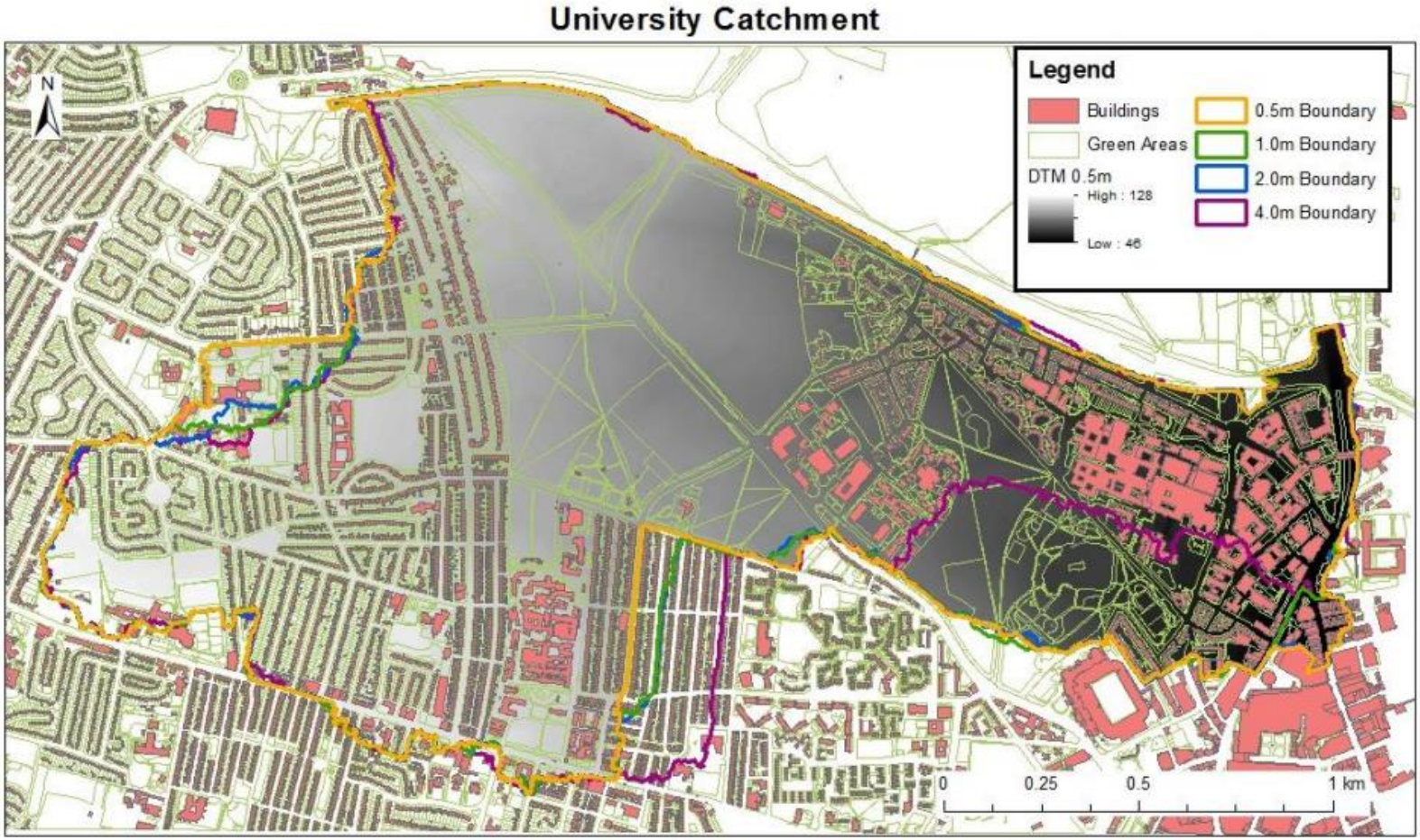


Figure 4-13. Result of simulation 17 (RP 100 y, duration 1 h, sewer network not active).

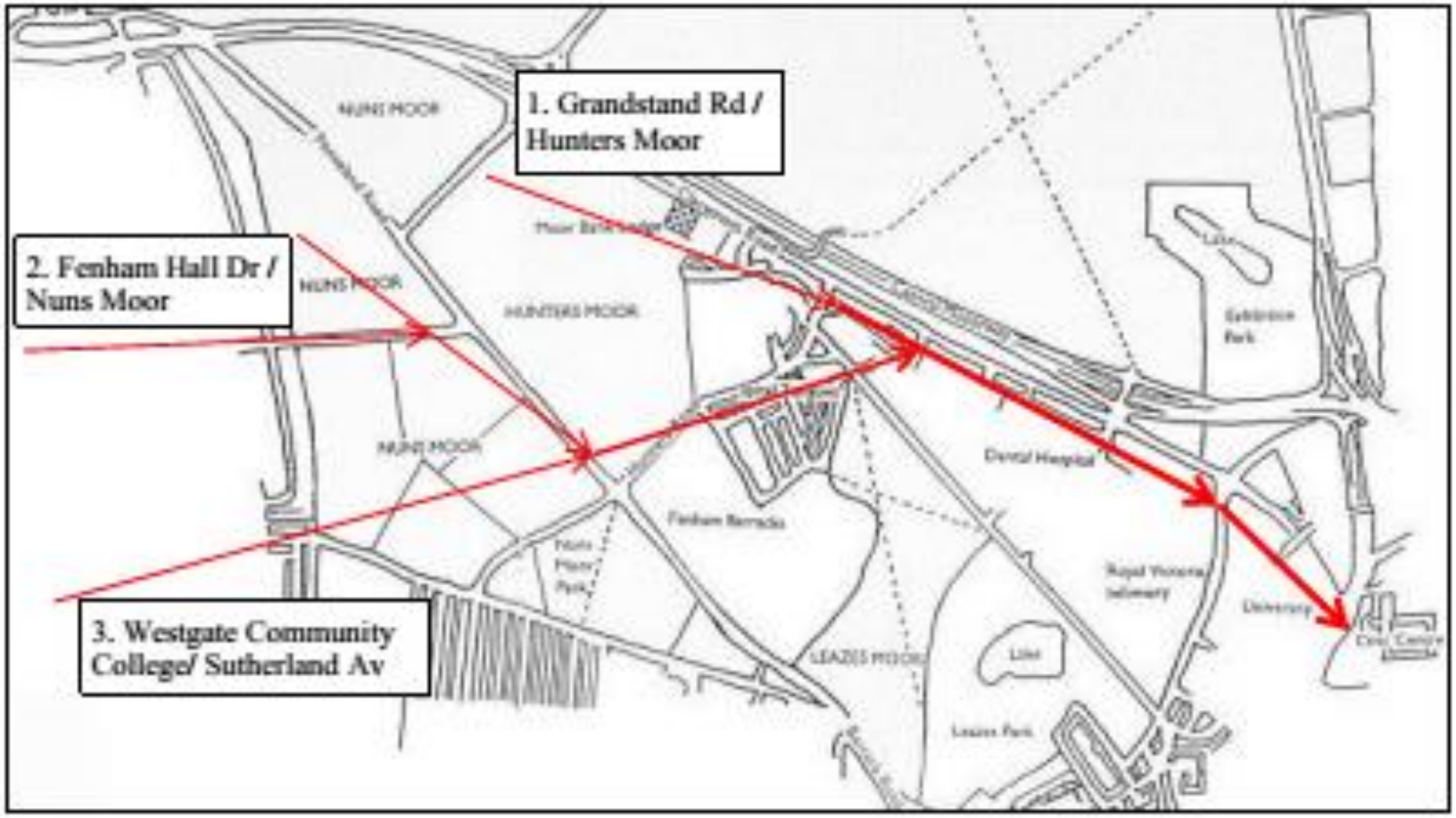
Courtesy M Toraldo,
MSc project CEGS

“University” Catchment



Courtesy CAM Stijne, MSc project CEGS

Sources of runoff



Courtesy CAM Stijne, MSc project CEGS

Vulnerability Mapping

Courtesy CAM Stijne, MSc project CEGS

Conclusions

Flood risk mapping and analysis with CityCAT allows:

- Identification of vulnerable areas
- Identification of sources of runoff
- Identifying opportunities for alleviation
- Design and testing of schemes

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