Natural flood management in pumped and highly modified lowland catchments:
River Hull NFM study

Background

- Feasibility study funded by FDGiA
- Allocated based on RHICS recommendations
- River Hull Integrated Catchment Strategy
- Chalk bedrock
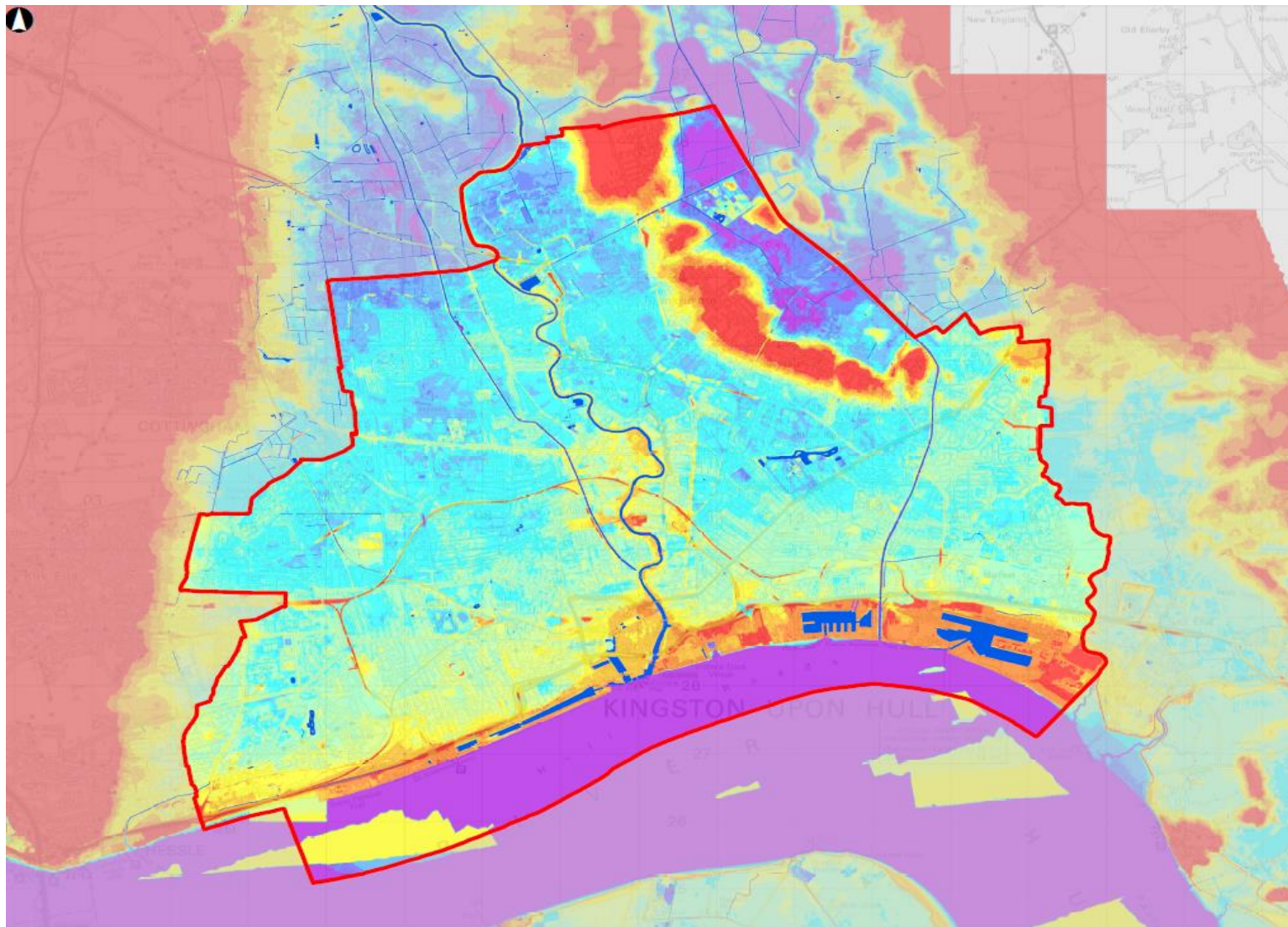- Drained marsh land

Image: Environment Agency

Legend

Hull City Council Area

Waterbodies and Docks

Ground Level (m)

	< 0.5
	0.5 - 1.0
	1.0 - 1.5
	1.5 - 2.0
	2.0 - 2.5
	2.5 - 3.0
	3.0 - 4.0
	4.0 - 5.0
	5.0 - 6.0
	> 6.0

Note: Ground levels based on Environment Agency LIDAR DTM data.

F1	2016-10-25	DvdL	DD	DD
Issue	Date	By	Chkd	Appd

Metres

0   650   1,300   2,600

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Client

Hull City Council

Job Title

Hull SFRA

Ground levels

Scale at A3

1:50,000

Job No	Drawing Status
232639	**For Issue**
Drawing No		Issue
Figure 0		**F1**

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River Hull Integrated Catchment Strategy (RHICS)

Table 8 - Initial list of flood risk management options

OPTION Label	Short Description
1	Holderness Drain increased PS capacities
2	Holderness Drain improvements
3	Holderness Drain storage areas
4	Hull Storage areas
5	Waterside pumping
6	Hull Maintenance
7	Embankment Raising
8	Upland Storage/Natural Flood Management
9	Upper Hull Diversion
10	Lower Holderness Drain Diversion
11	Tidal Sluice

Table: RHICS

Project aim:

- This study seeks to provide an evidence base to demonstrate the extent to which Natural Flood Management (NFM) measures could reduce peak flows along the River Hull, and in particular at the point where the River Hull crosses the Hull City Council boundary to the north of the city.

Please see the User Guide and Technical Report on the hosting website for further information about these maps.

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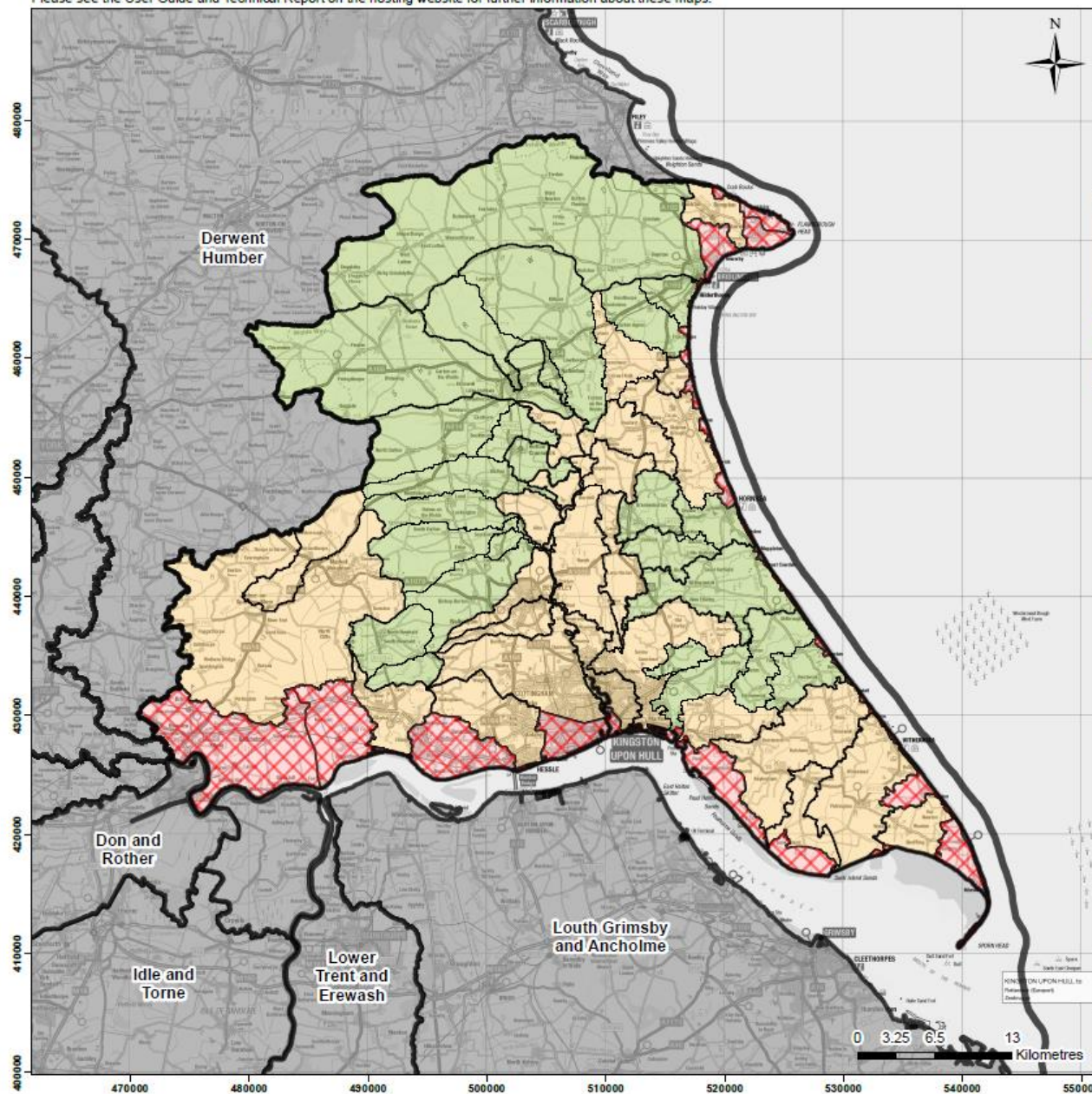
Mapping the Potential for Working with Natural Processes

Management Catchment
Hull and East Riding

Catchment Size (km^2):
2,220

River Basin District:
Humber

Please select an option from the drop down menu below in order to symbolise the Waterbody Catchments in different ways.

Catchment Type

Catchment Type

Headwater

Non-Headwater

Not included due to tidal influence.

Switch Map Labels
On / Off ✓

Environment Agency

JBA consulting

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Modelling extents:

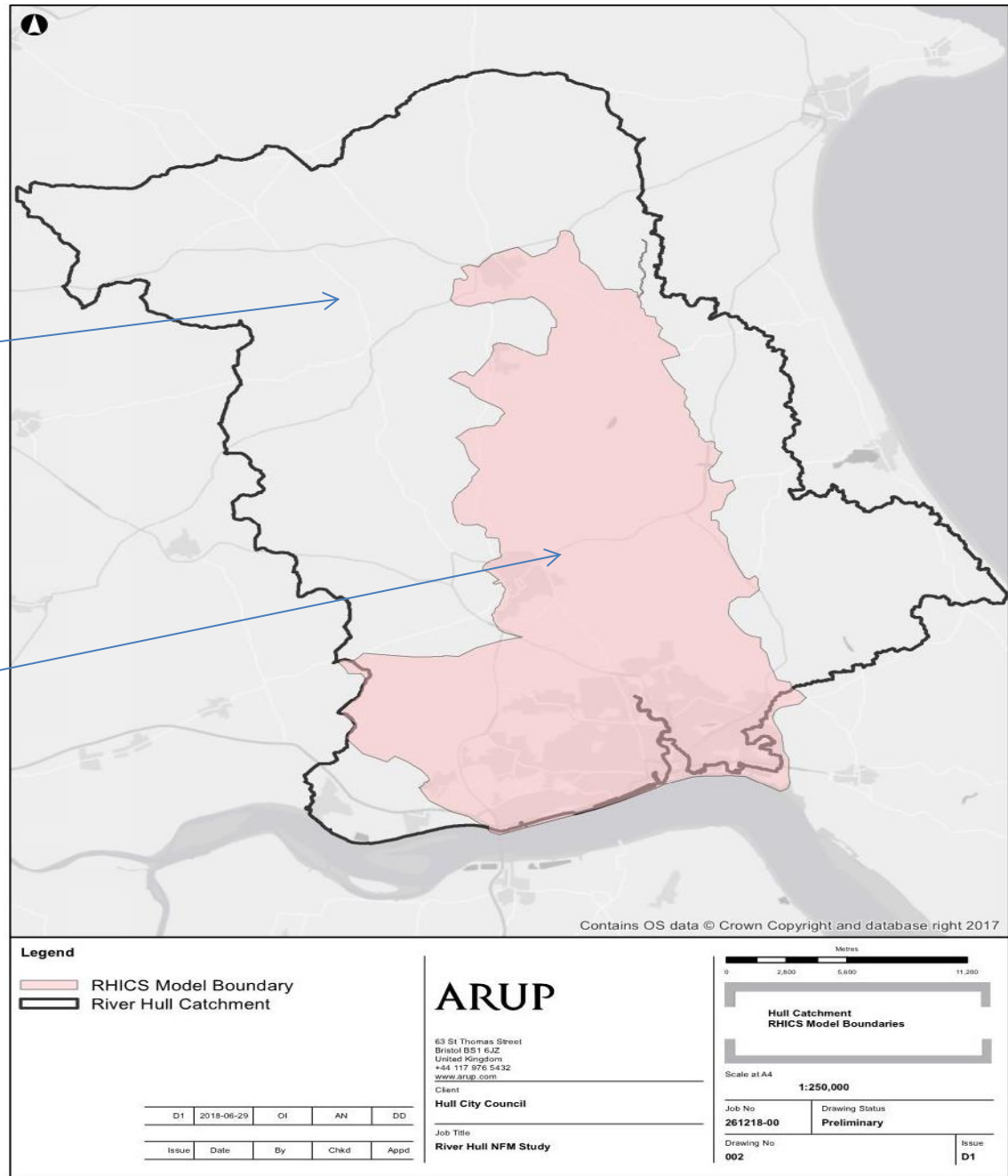

Phase 1 modelling

Phase 2 modelling

Image:
Task 1 modelling and outputs
report (draft), ARUP
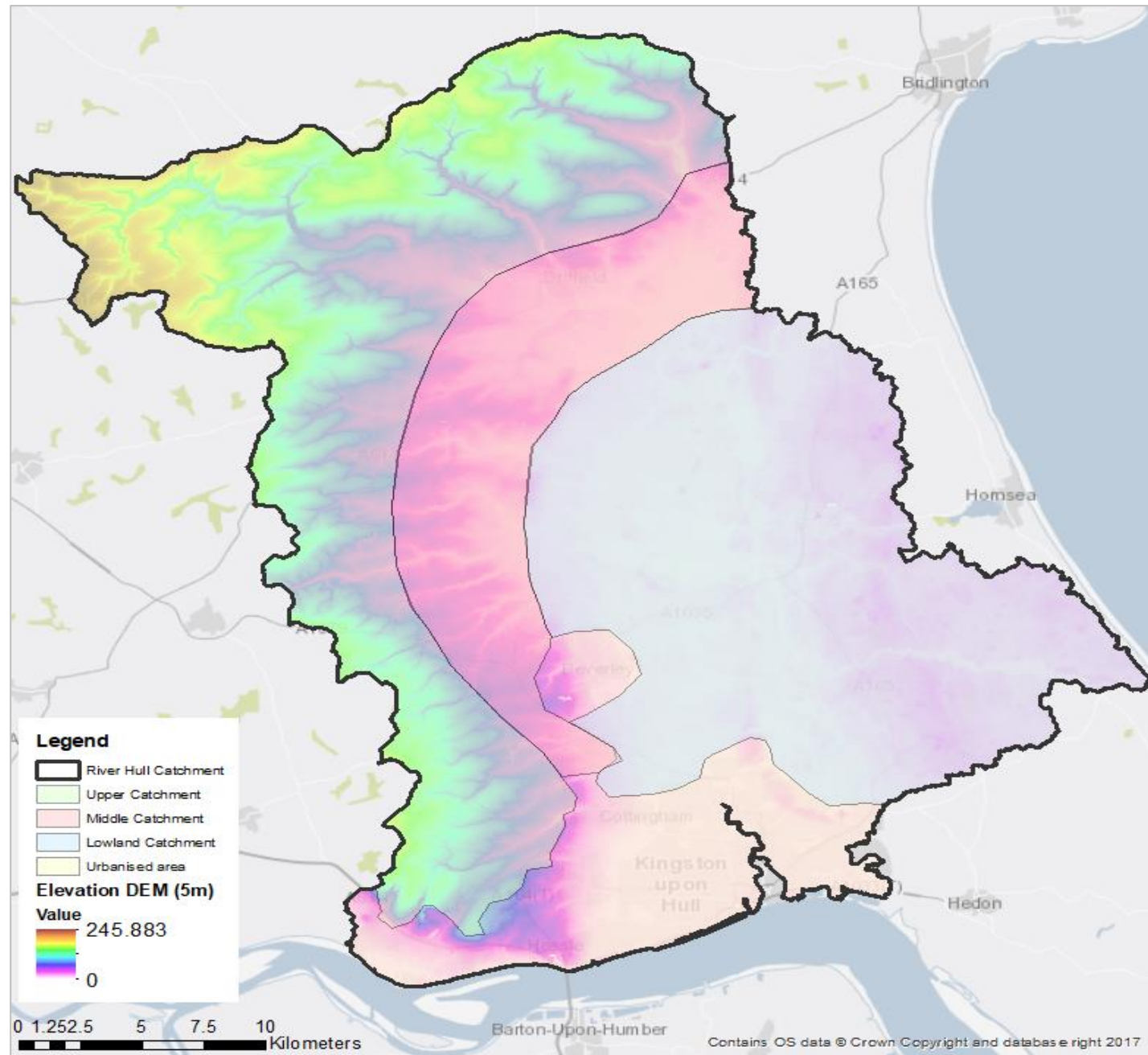
Upland/ lowland definitions

Image:
Task 1 modelling and outputs report (draft), ARUP

Our modelling approach:

UNIVERSITY OF HULL

ARUP

Stage 1: strategic modelling using CAESAR-Lisflood

- To identify sub-catchments suitable for NFM pending site walkovers
- Upper sub-catchments (outside of the RHICS ICM boundary)
- Surface water < 30-40%
- Rainfall magnitudes of ???
- Feed fluvial inputs into RHICS

Stage 2: detailed modelling using RHICS ICM model

- Determine how NFM interventions identified in stage 1 affects peak flows within the RHICS boundary
- Determine economic assessment
- Cost-Benefit analysis
- Measuring fluvial flows at specific points along River Hull up to Hull city boundary

Preliminary results

Possible NFM intervention	Upper	Middle	Lower	Urbanised
Large Woody Debris (LWD)	Y	N	N	N
Riparian woodland	Y	Y	N	N
Runoff Attenuation Features (RAFs)	Y	Y	N	N
Buffer strips	Y	Y	N	N
Contour planting	Y	Y	N	N
Changes to land use management	N	Y	N	N
Large ponds	N	Y	N	N
Floodplain storage	N	Y	Y	N
Wetland creation	N	Y	Y	N
SuDS	N	N	N	Y

Table:
Task 1 modelling and outputs report (draft), ARUP

Limitations:

- Ability to model full integrated catchment, including pumping
- Ability to apply direct rainfall within the RHICS boundary
- Dominance of chalk bedrock → groundwater influence = high, surface water influence = low (2-40%)
- Tidal influence downstream

Final output of this project will include:

- Opportunity maps and modelling results
- Quantitative hydrological evidence showing the impact of implementing NFM
- Provide evidence to be used in future funding bids
- Qualitatively show ecosystem services benefits
- Show how NFM could be beneficial when taking into account climate change
- Discuss the future of NFM in the wake of BREXIT through the input of a policy advisor (who worked on the Governments 25 year environmental plan
- Set a standard going forward to shape the future of land management practices

- **This is a feasibility study and is not exhaustive. This study does not in any way intend to dictate how land use should be – this study adds to the evidence base of NFM, increases our awareness of the River Hull catchments, demonstrates good partnership working and provides an opportunity to review how we manage land in the future.**