



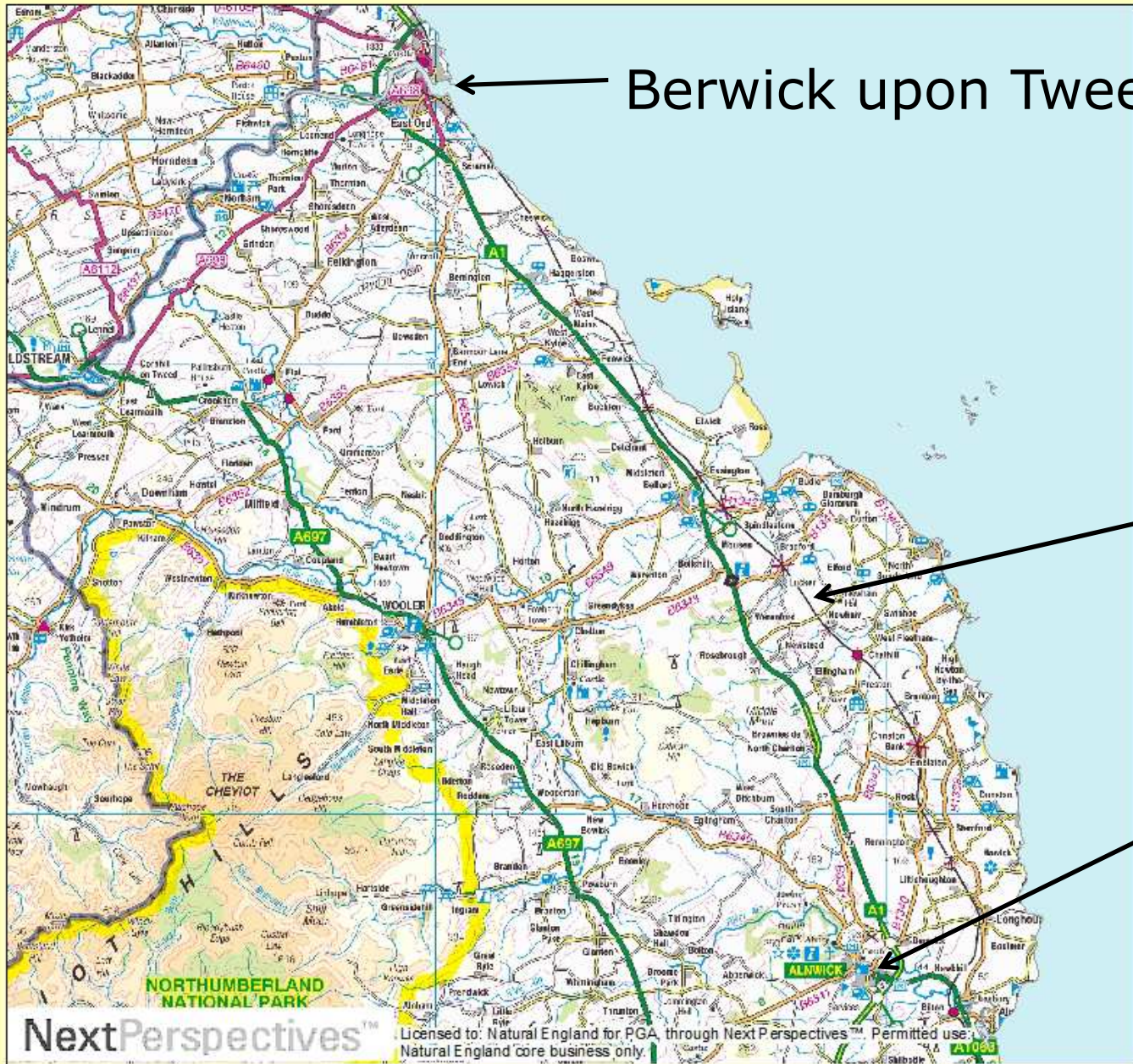
# **Newham Fen NNR Northumberland - an example of GDE complexities?**

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Natural England

# Newham Fen



- Site & setting
- Water level monitoring
- Interpretation of evidence
- Conclusions thus far
- Further work?



Berwick upon Tweed

Newham Fen - Location

Newham Fen

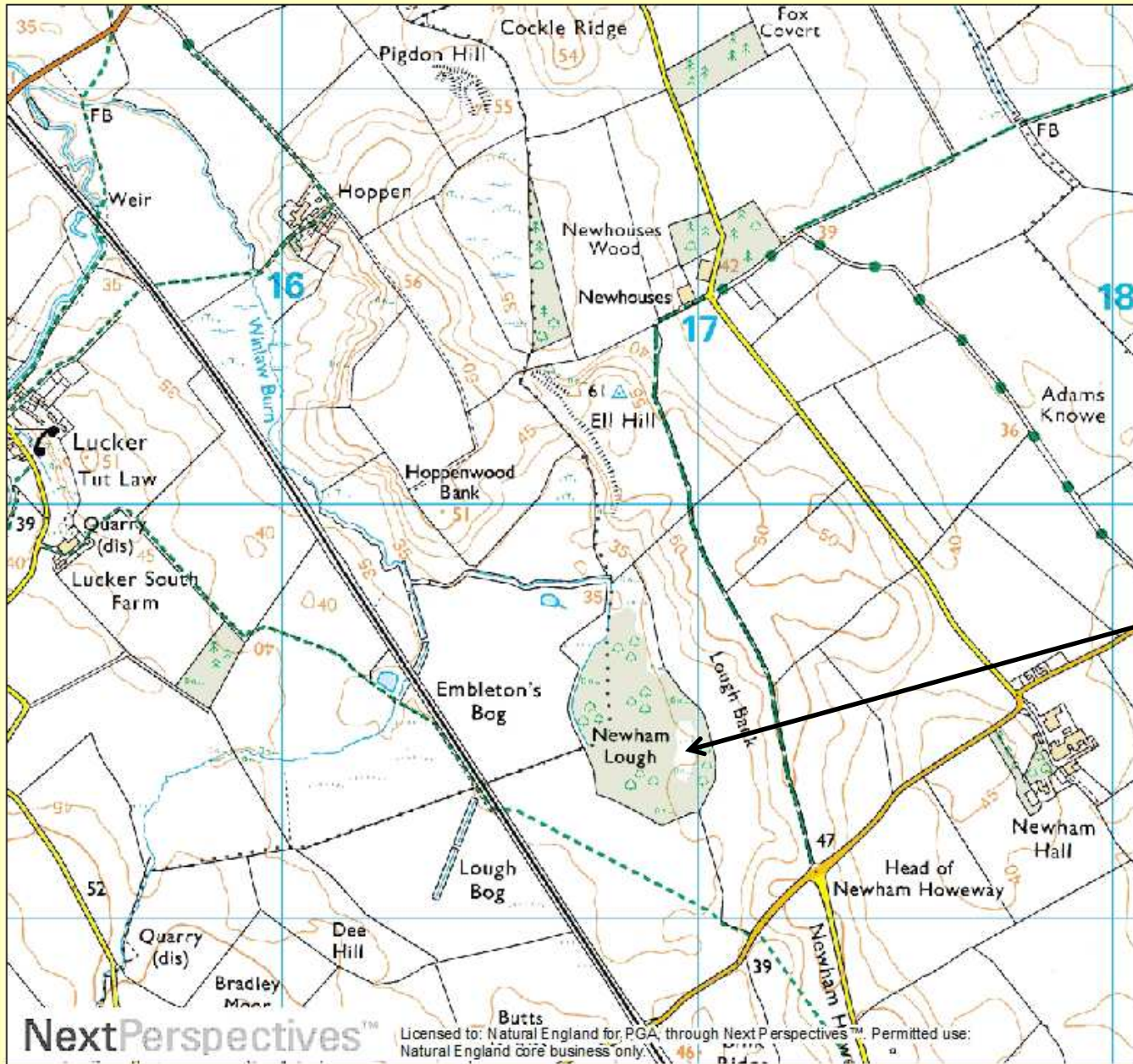
Alnwick



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Newham Fen

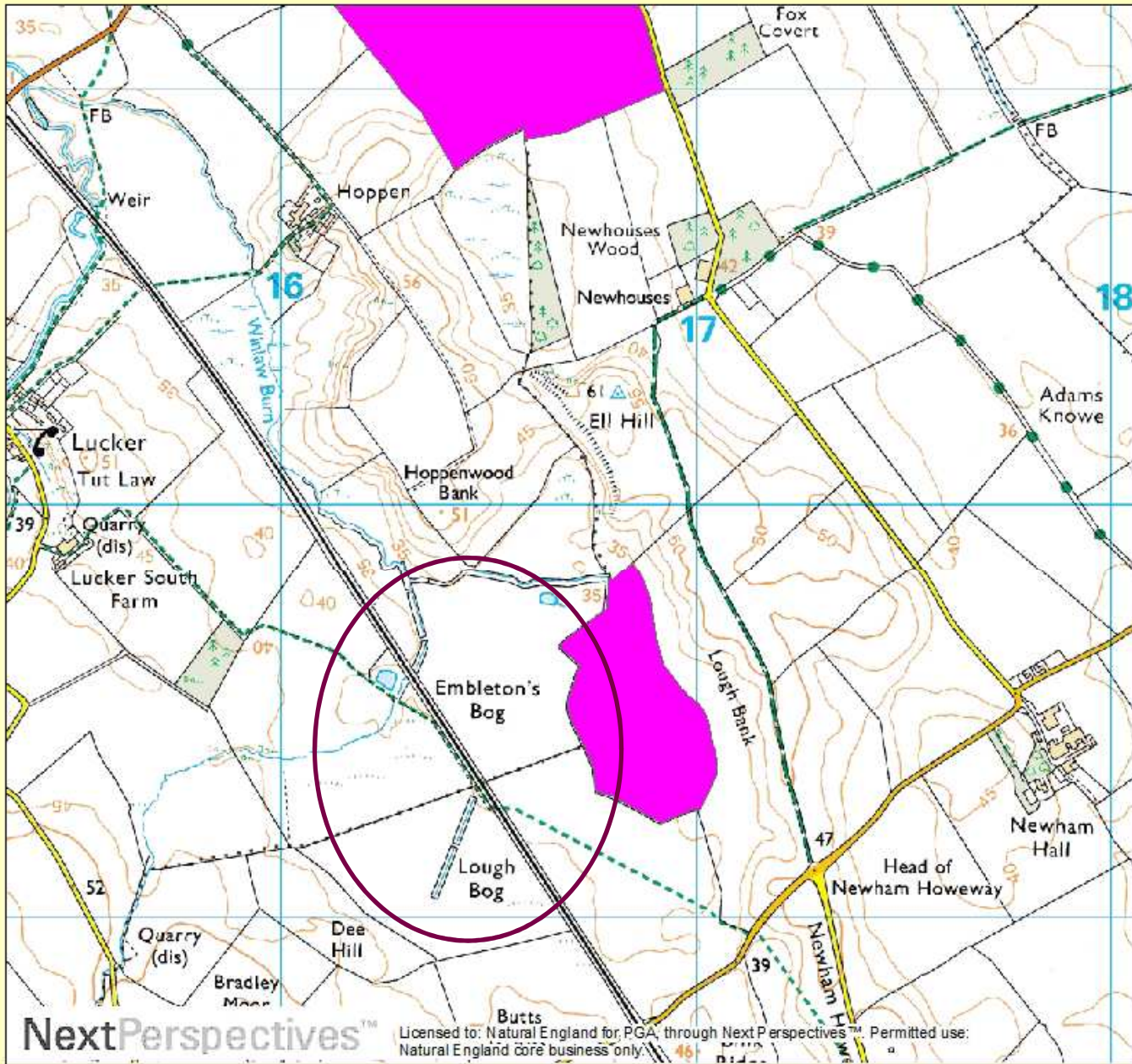
Newham Fen (SAC; NNR)



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**Bradford Kames SSSI**

**Newham Fen SSSI**



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# Newham Fen & Embleton's Bog – view over site



Embleton's Bog

Newham Fen



# Newham Fen – view from south



Embleton's Bog  
(Western Fields)

Newham Fen

Lough Bank



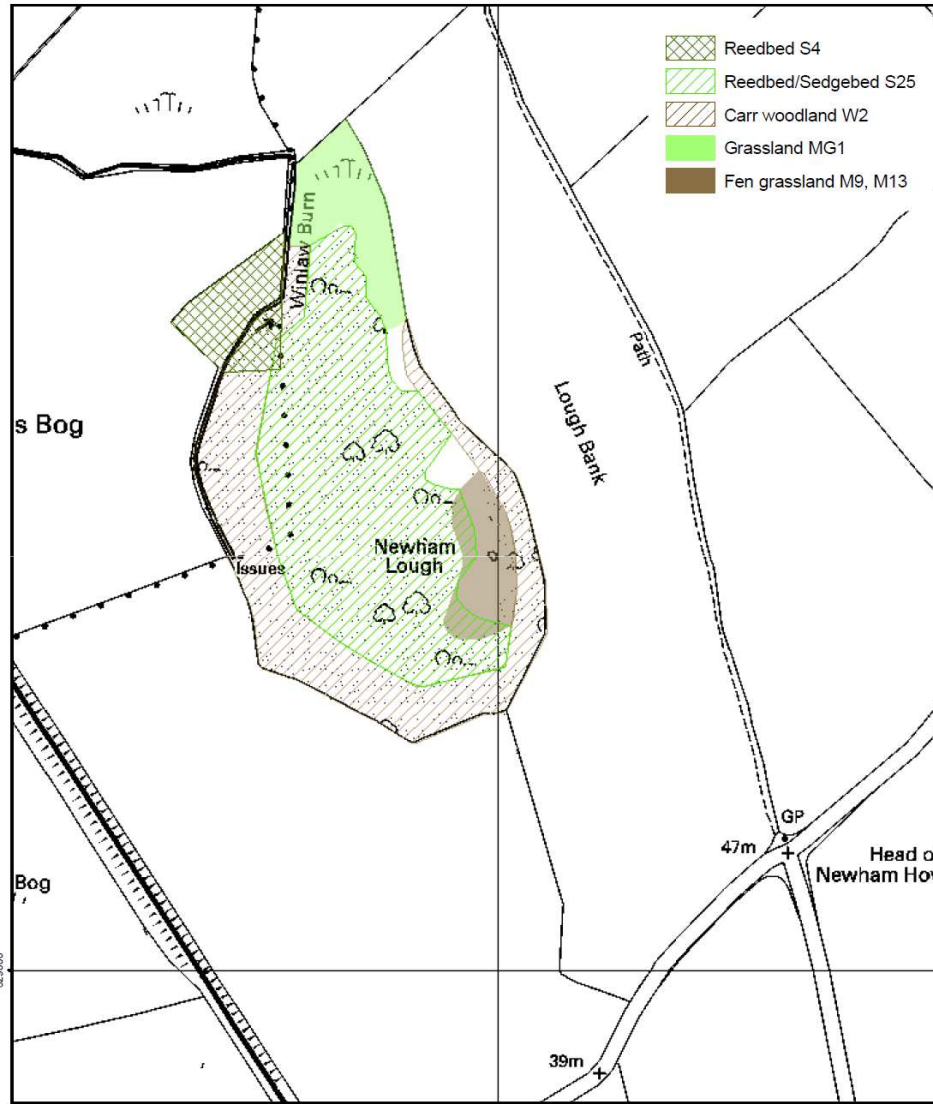
## Vegetation – SAC description



- Newham is important as a lowland short sedge fen in north-east England, a part of the UK in which **Alkaline fens** are rare.
- The site is an example of basin fen, developed from the hydroseral succession of a small lake.
- The main fen community is M13 *Schoenus nigricans* – *Juncus subnodulosus* mire and M9 *Carex rostrata* – *Calliergon cuspidatum/giganteum* mire,
- and there are transitions to S25 *Phragmites australis* – *Eupatorium cannabinum* tall-herb fen, MG1 *Arrhenatherum elatius* grassland and W2 *Salix cinerea* – *Betula pubescens* – *Phragmites australis* woodland.
- A number of rare species occur at this site, including narrow-leaved marsh-orchid *Dactylorhiza traunsteineri*, coralroot orchid *Corallorhiza trifida*, dark-leaved willow *Salix myrsinifolia* and round-leaved wintergreen *Pyrola rotundifolia*.



# Vegetation



Scale 1:5000

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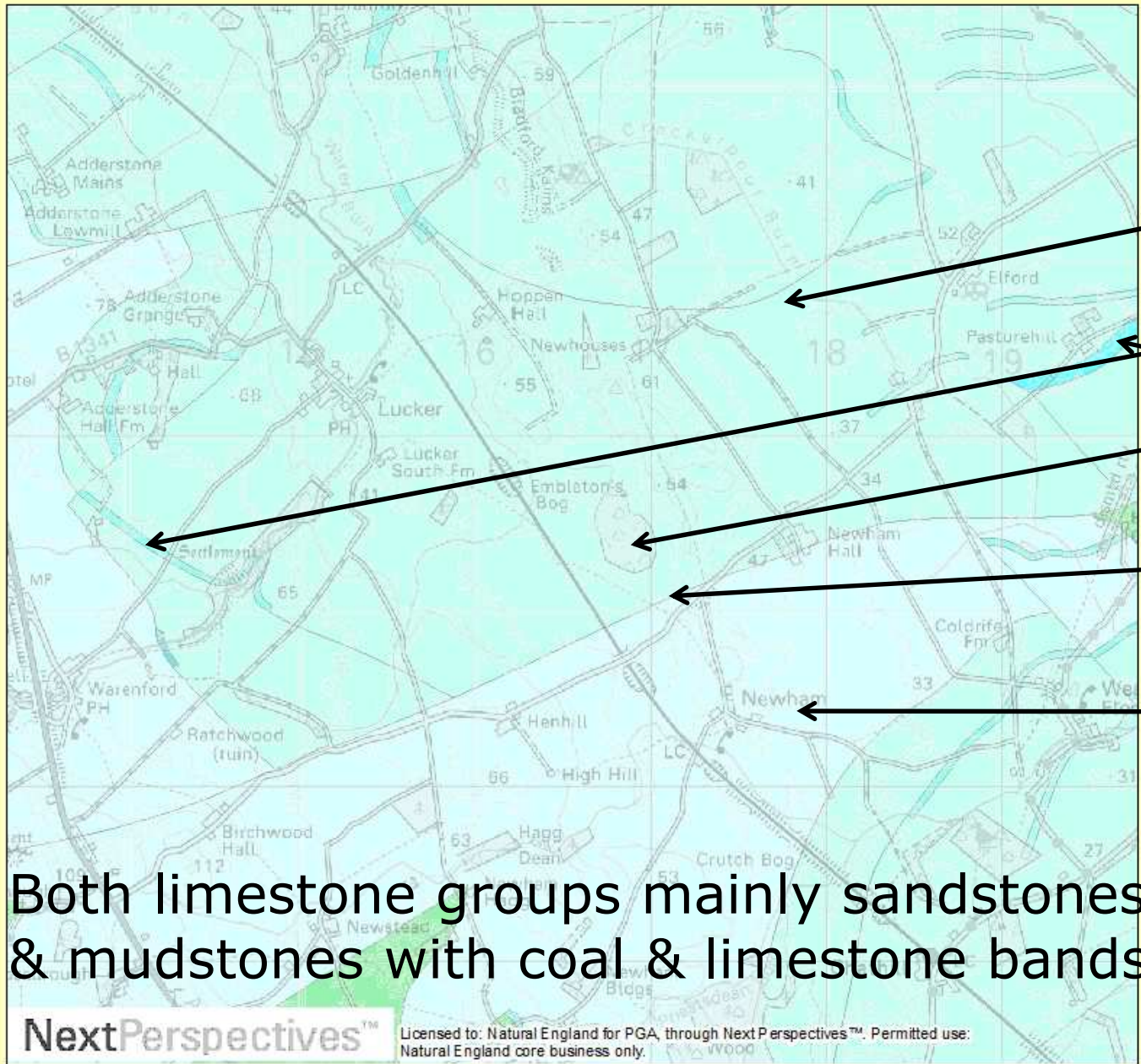




# Questions



- Key source(s) of water for the fen?
- Main controls on water levels both within fen and wider Embleton's Bog?
- Implications for site management?
  - Habitat restoration in areas outside SSSI / NNR?



**Newham Fen**

**Bedrock geology**

Middle Limestone Group (Alston Formation)

Limestone Bands

**Newham Fen**

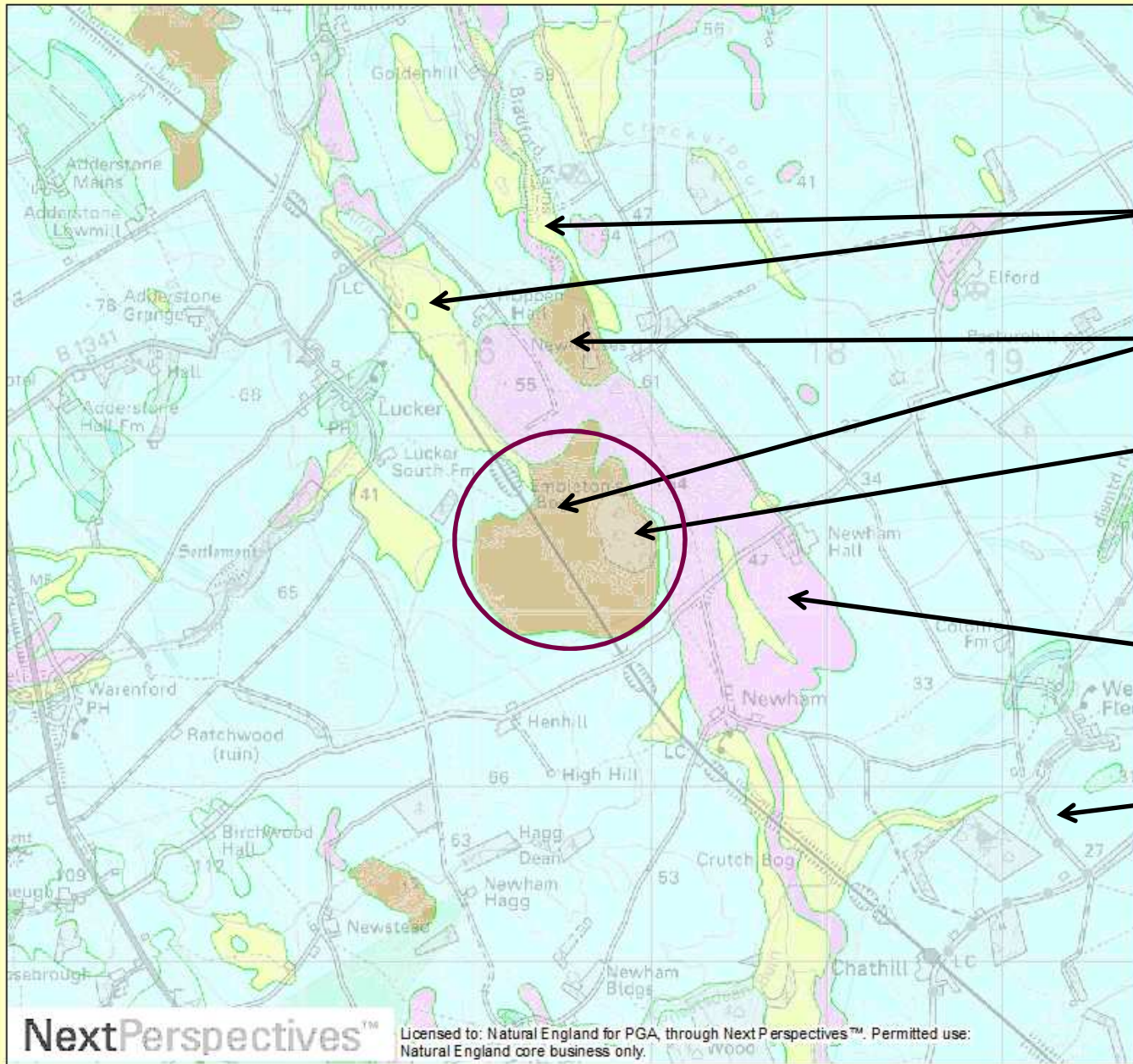
Fault

Lower Limestone Group (Tyne Limestone form'n)

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Both limestone groups mainly sandstones & mudstones with coal & limestone bands





**Newham Fen**

**Superficial geology**

Alluvium

Peat

Newham Fen

Glaciofluvial  
sands & gravels

Till



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# Investigations



NATURAL  
ENGLAND

# History of investigations



- Thompson 1963 – auger (?) investigations
- Newson 1983 onwards – hydrological investigations & series of reports (manual dipwells plus chart recorders; N)
- Early 1990's – effects of drought (4 successive years!) on vegetation
- Vegetation – 1958 onwards
- Various BSc, MSc & PhD theses!
  
- Large et al 2007. *Using long term monitoring of fen hydrology and vegetation to underpin wetland restoration strategies*. Applied Vegetation Science 10: 417-428.
  
- Wetherell 2010 onwards – hydrological monitoring (dataloggers etc)
  - Anything new to learn??!





Newham Fen  
location of dataloggers etc



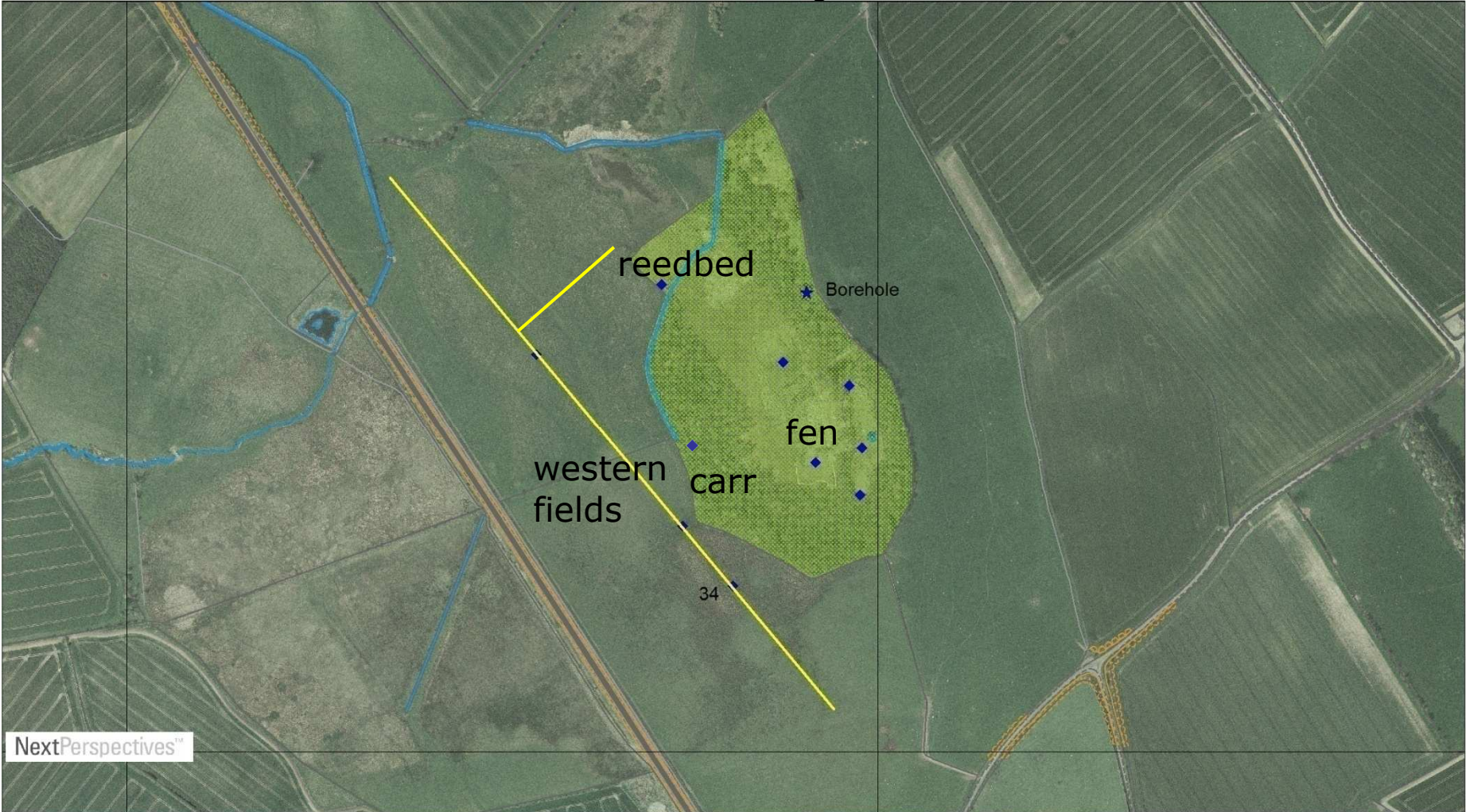
Dataloggers



Line of dipwells



Drainage features



Scale 1:5000 Map 1 of 1  
0 100 200 300m  
0 250 500 750m

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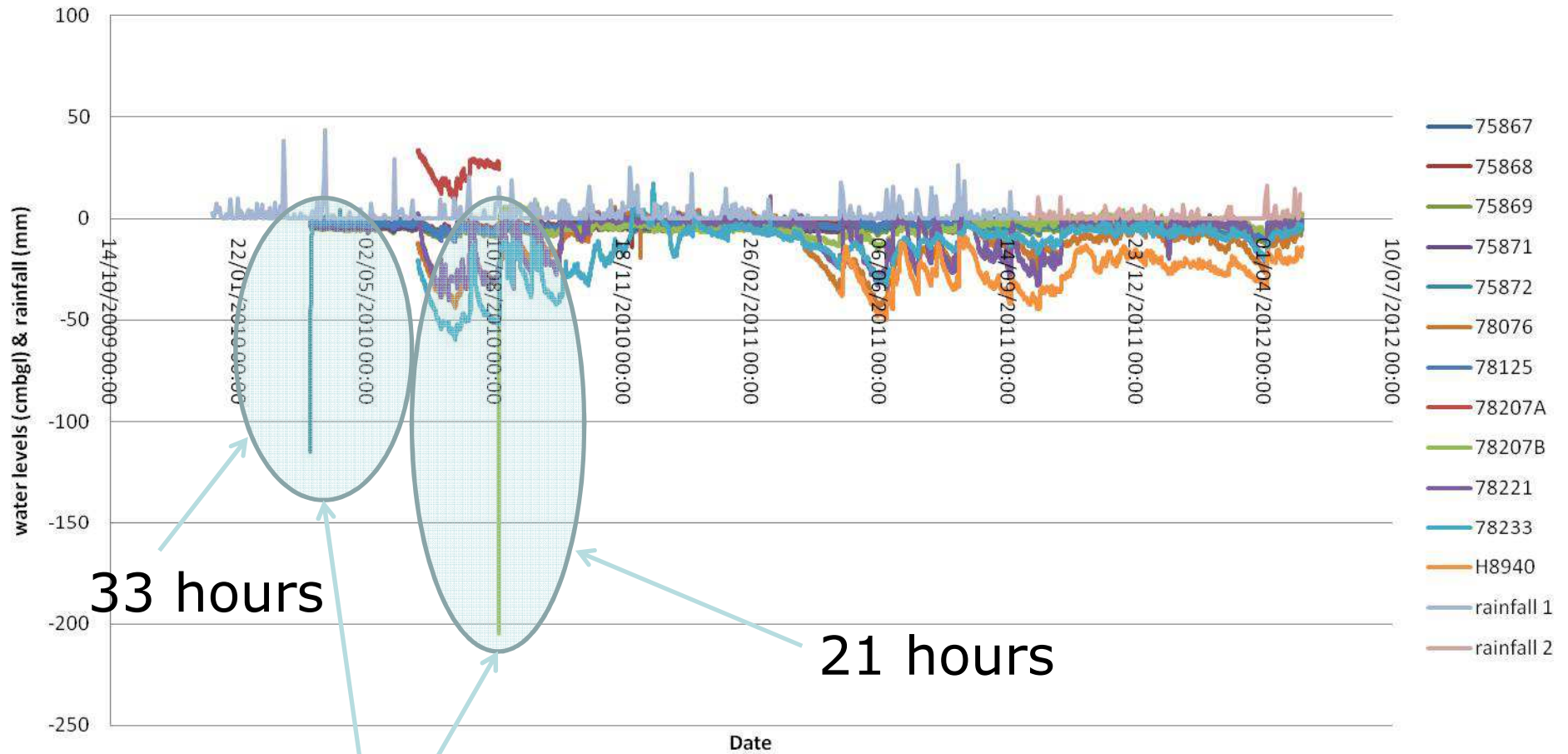


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# Newham Fen - water levels & rainfall Jan 2010 to May 2012

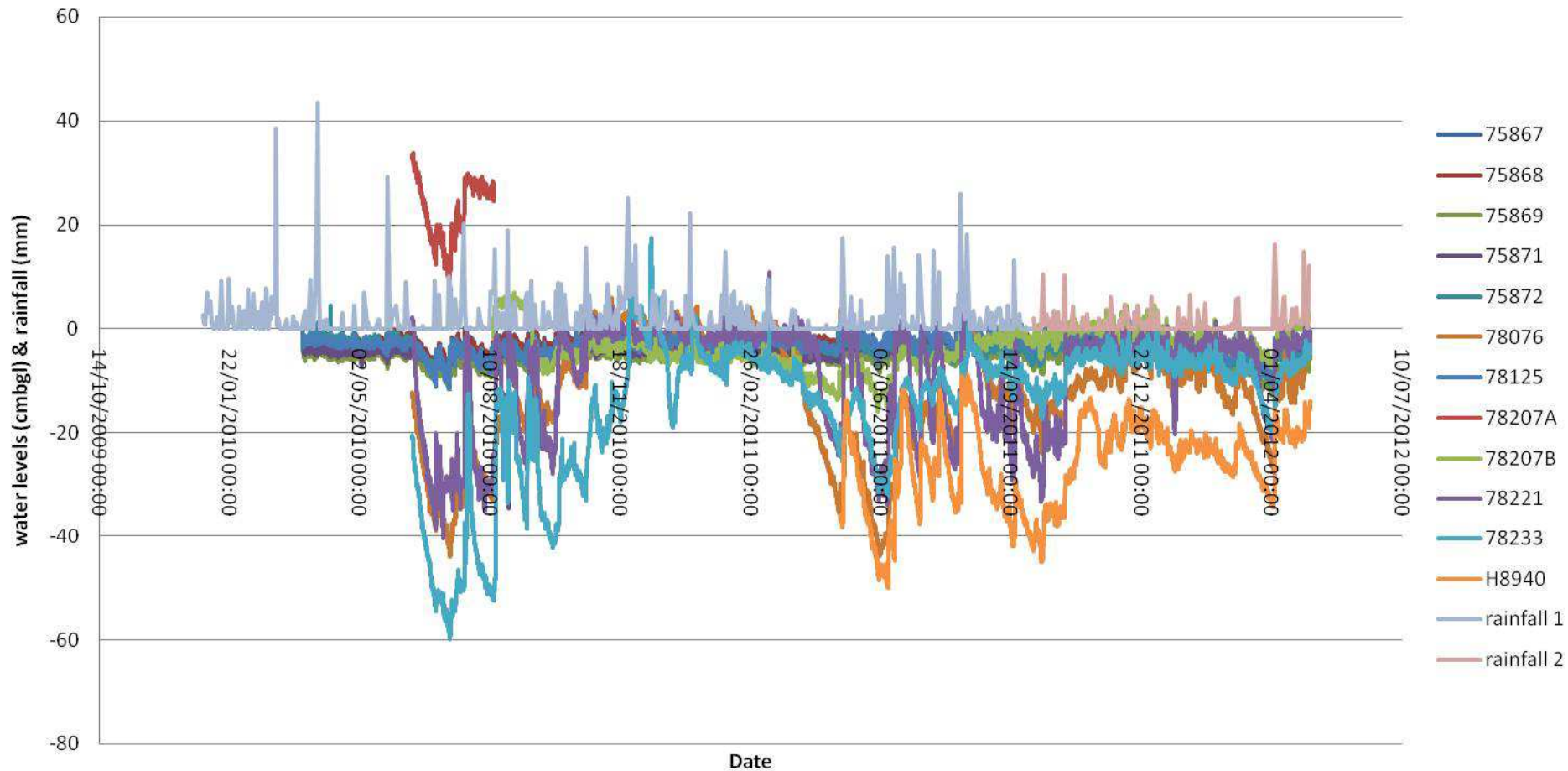


33 hours

21 hours

Recovery of water levels

# Newham Fen - water levels & rainfall Jan 2010 to May 2012



Two distinct types of response?

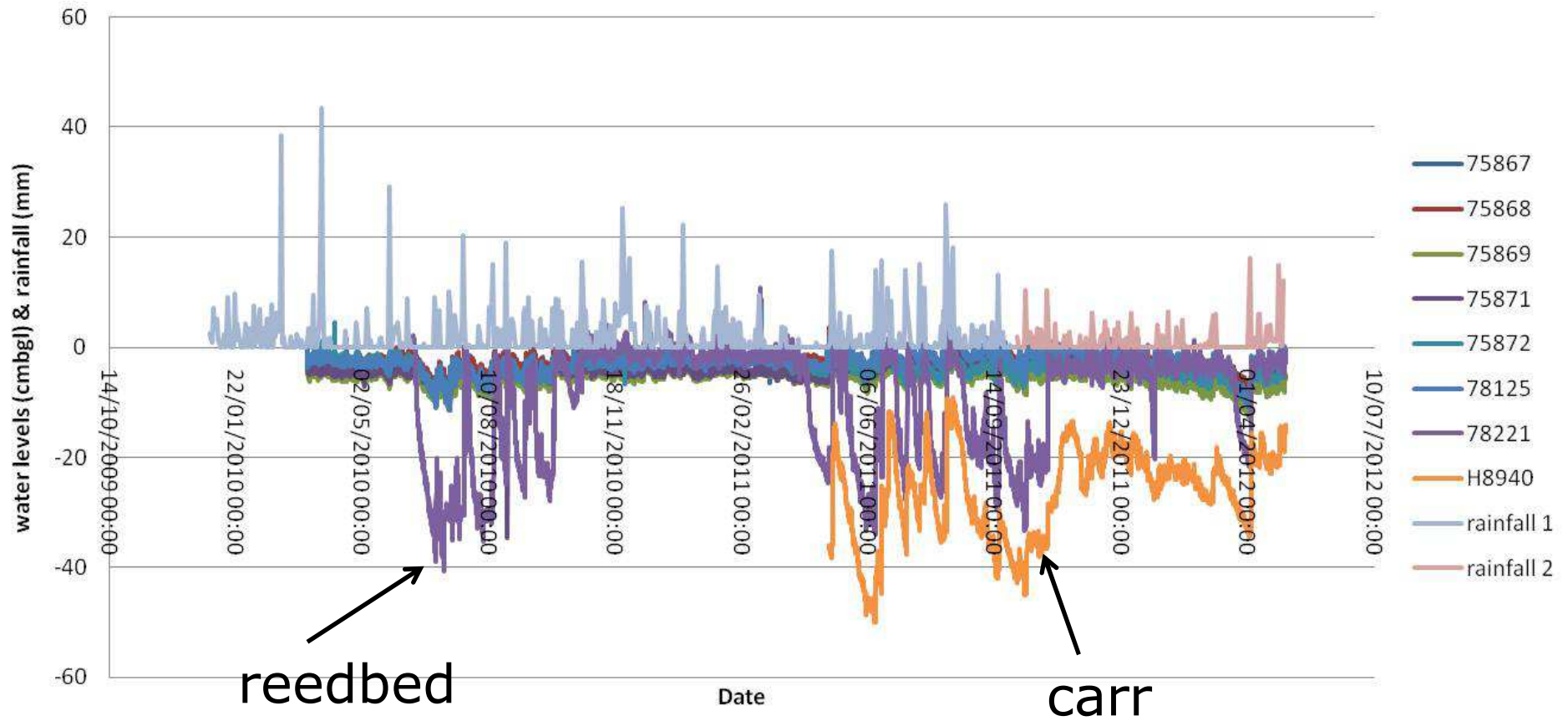
# Distribution of loggers



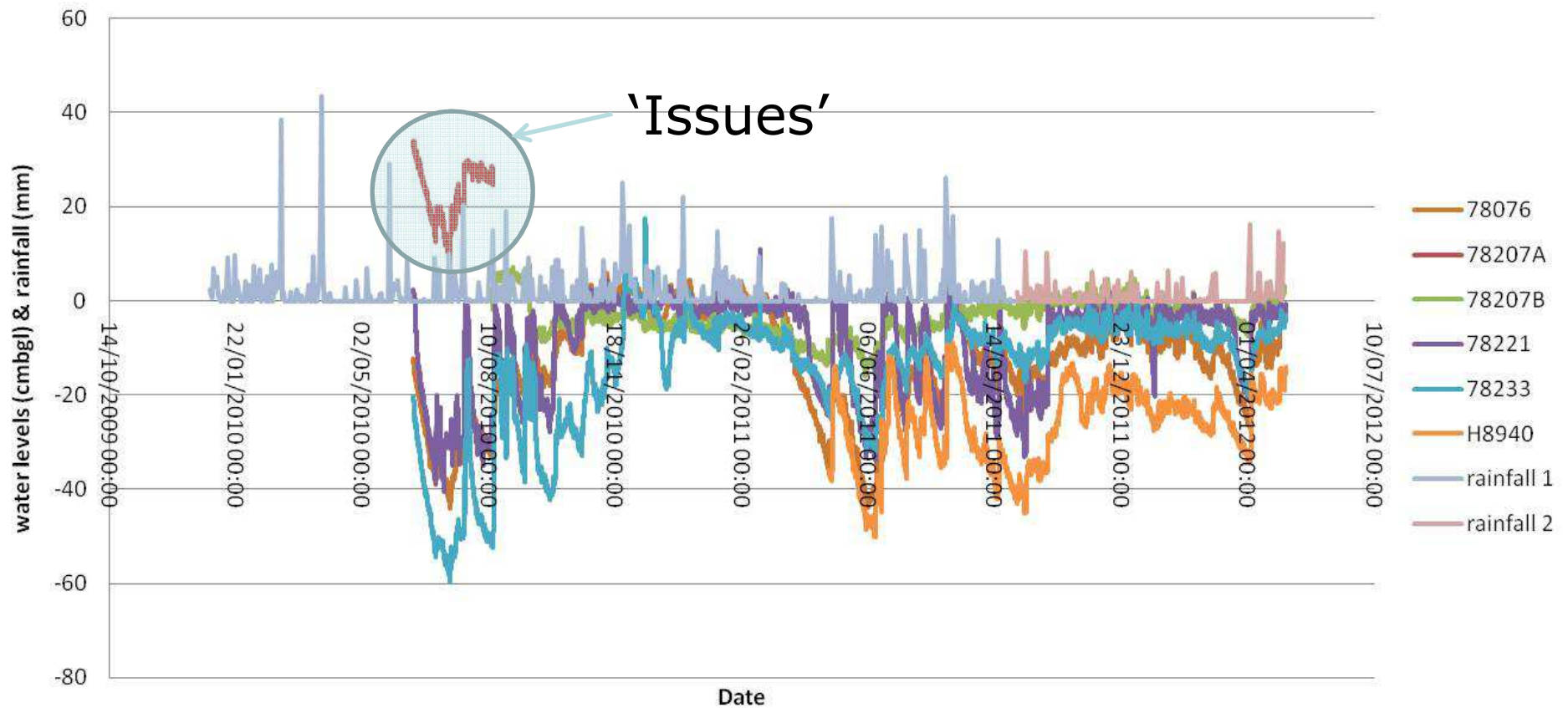
Western Field (Embleton's Bog)	Intermediate	Fen
78076	78221 (reedbed)	75867
78233	H8940 (carr)	75868
78207A		75869
78207B		75871
		75872
		78125



# Newham Fen - water levels & rainfall Jan 2010 to May 2012. [Fen , reedbed & carr]

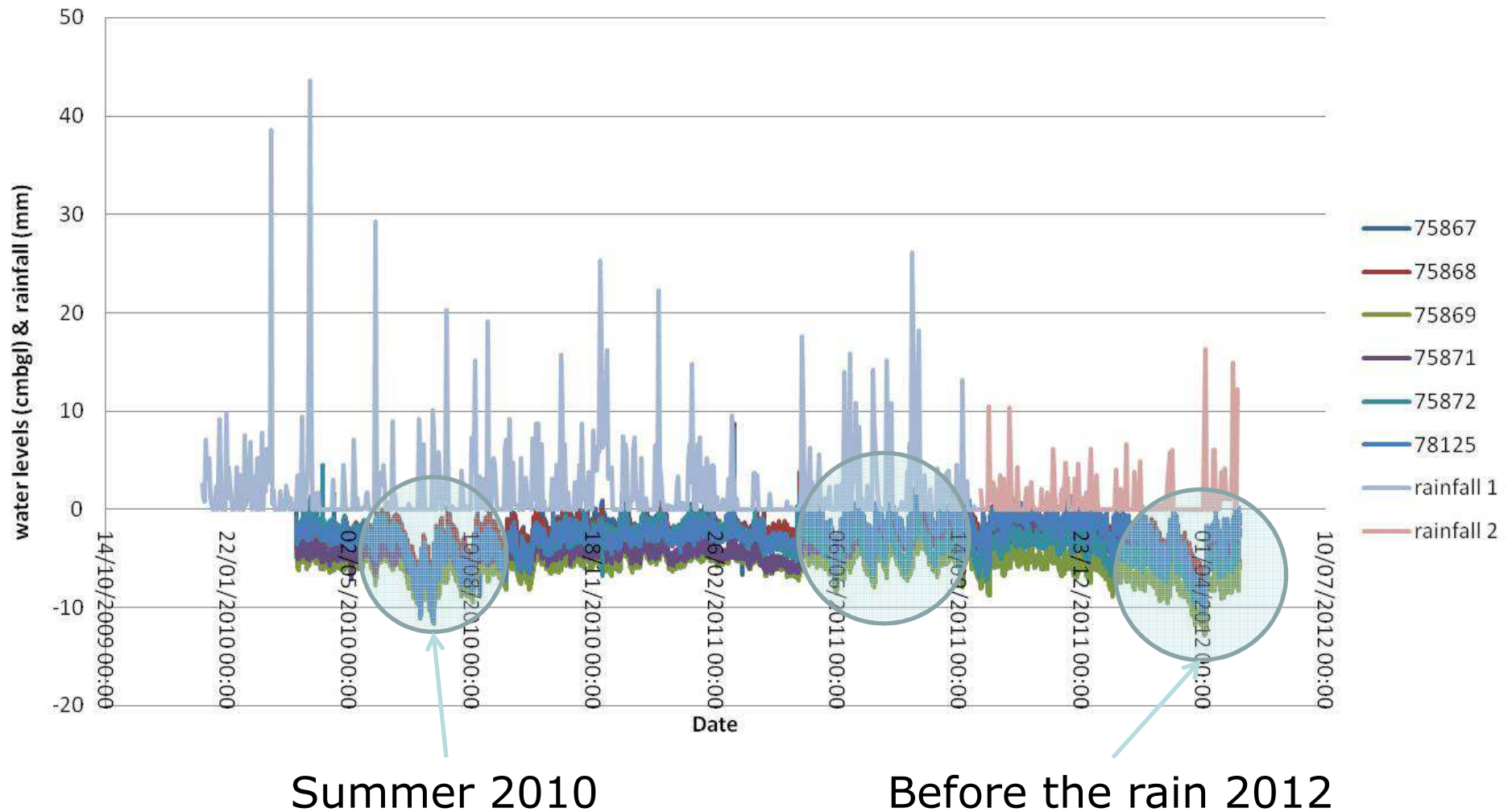


## Newham Fen - water levels & rainfall Jan 2010 to May 2012 [western field, carr, reedbed}



Very responsive to rainfall  
Variation in water levels 40cm+  
Frequently >20cm below surface

## Newham Fen - water levels & rainfall Jan 2010 to May 2012. [Fen]



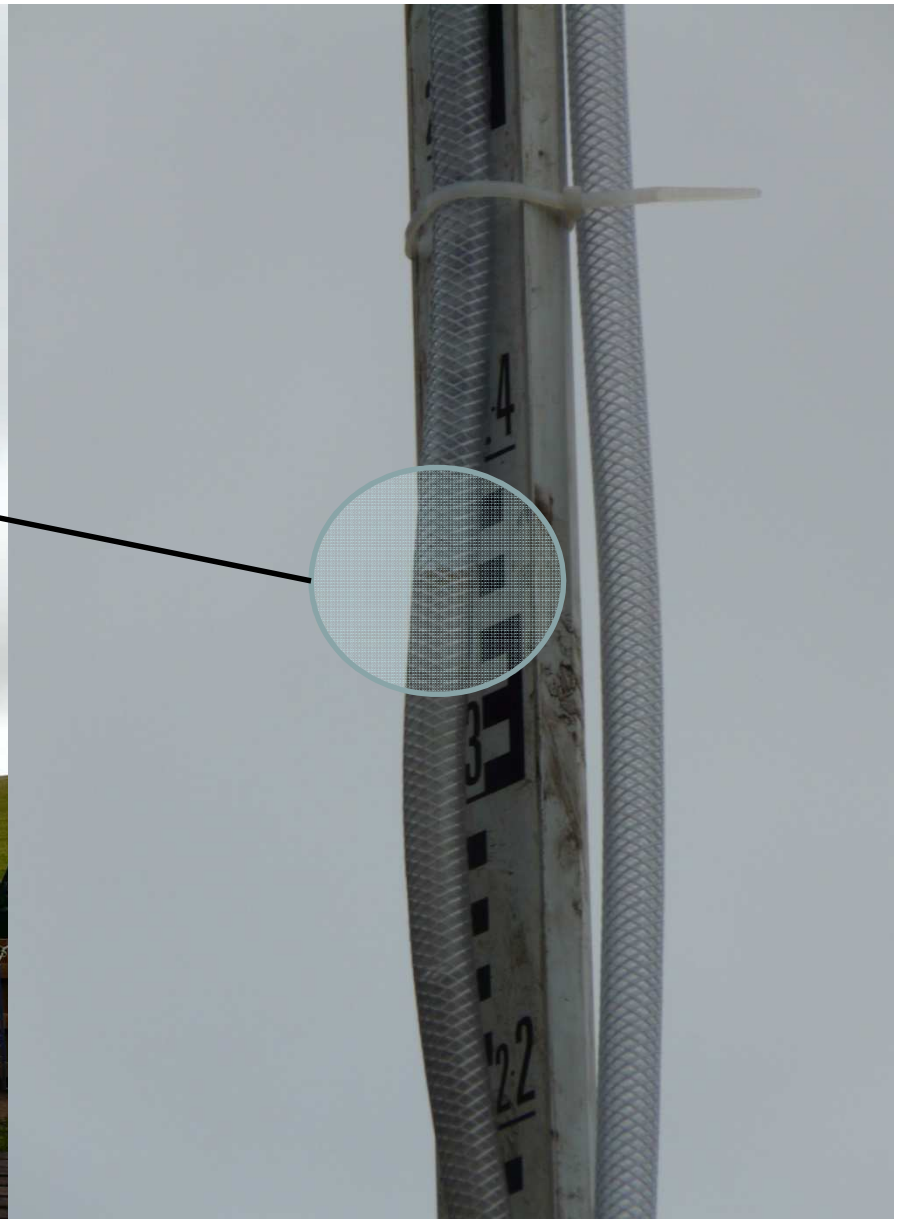
Much less responsive to rainfall  
Water levels generally within 5cm of ground level

# Borehole



- Drilled 1997 in response to drought
- Source of water for fen?
- But water wrong chemistry?
  - generally higher pH & lower EC than fen etc waters.
- Now forms part of EA groundwater monitoring network



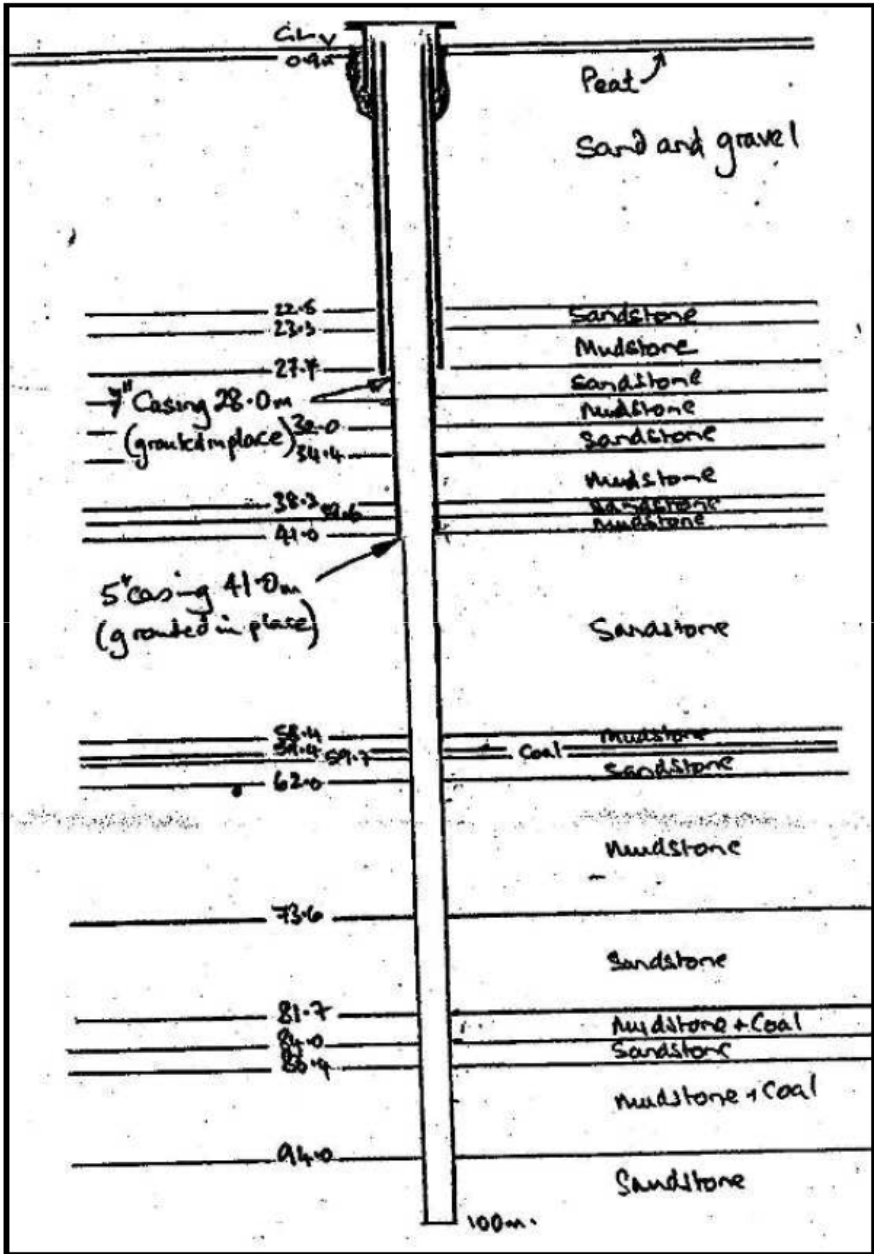


Head ~3.5m above ground level (12/08/2010)

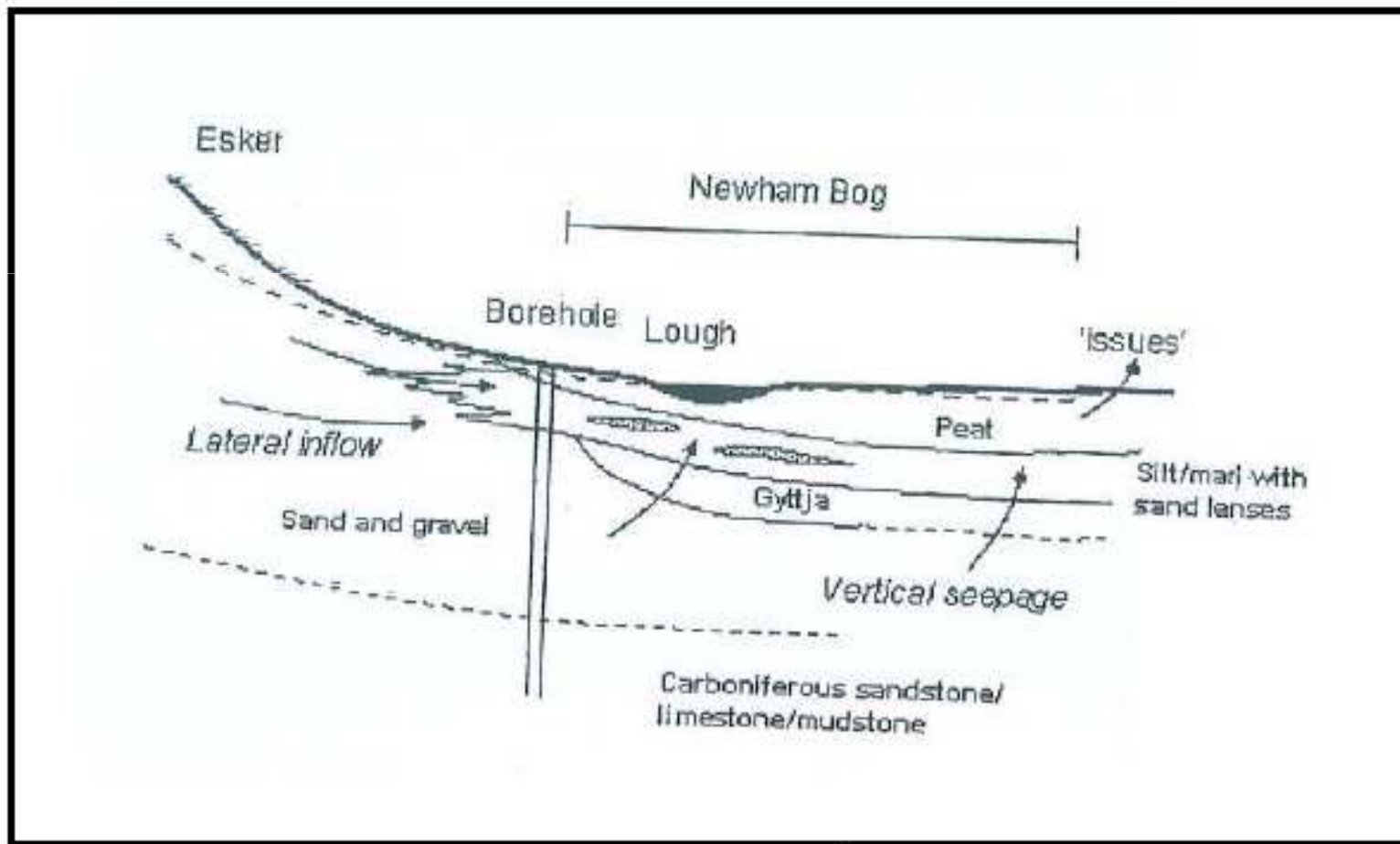
# Borehole log



Alkaline fen groundwater??



# Cross section E – W



From Newson 2002, based on Thompson 1963

# Sands & Gravels – Lough Bank



- Glaciofluvial deposits
- Described in BGS memoirs – but also Geological Conservation Review (GCR)
  - Bradford Kames SSSI
  - 13km long feature
  - Notified for glacial geomorphology
- “Series of elongate mounds of sand and silt associated with locally sinuous, esker like ridges composed of silt, sand and gravel”
- “Casts of feeder meltwater streams, which formed as subglacial or englacial eskers”
- Springs (local) & other peat deposits associated with ridge



Newham Fen  
location of dataloggers etc



Dataloggers



Line of dipwells



Drainage features



Areas of flooding



Scale 1:5000 Map 1 of 1  
0 100 200 300m  
0 250 500 750m

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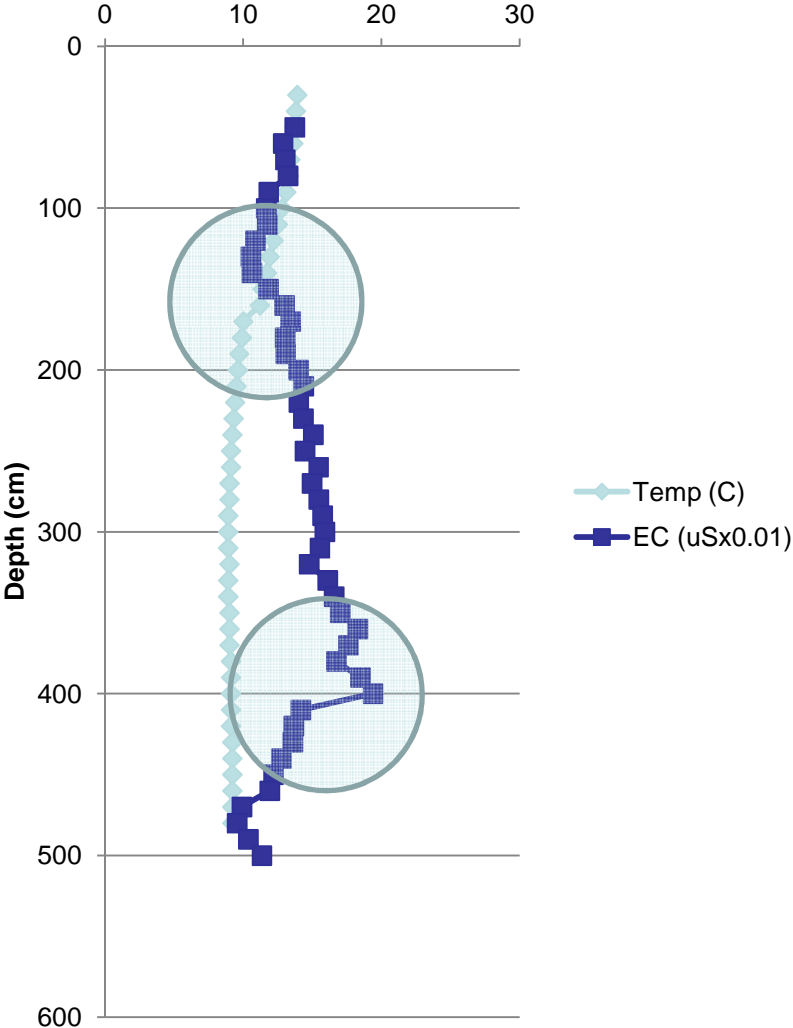
# Other investigations



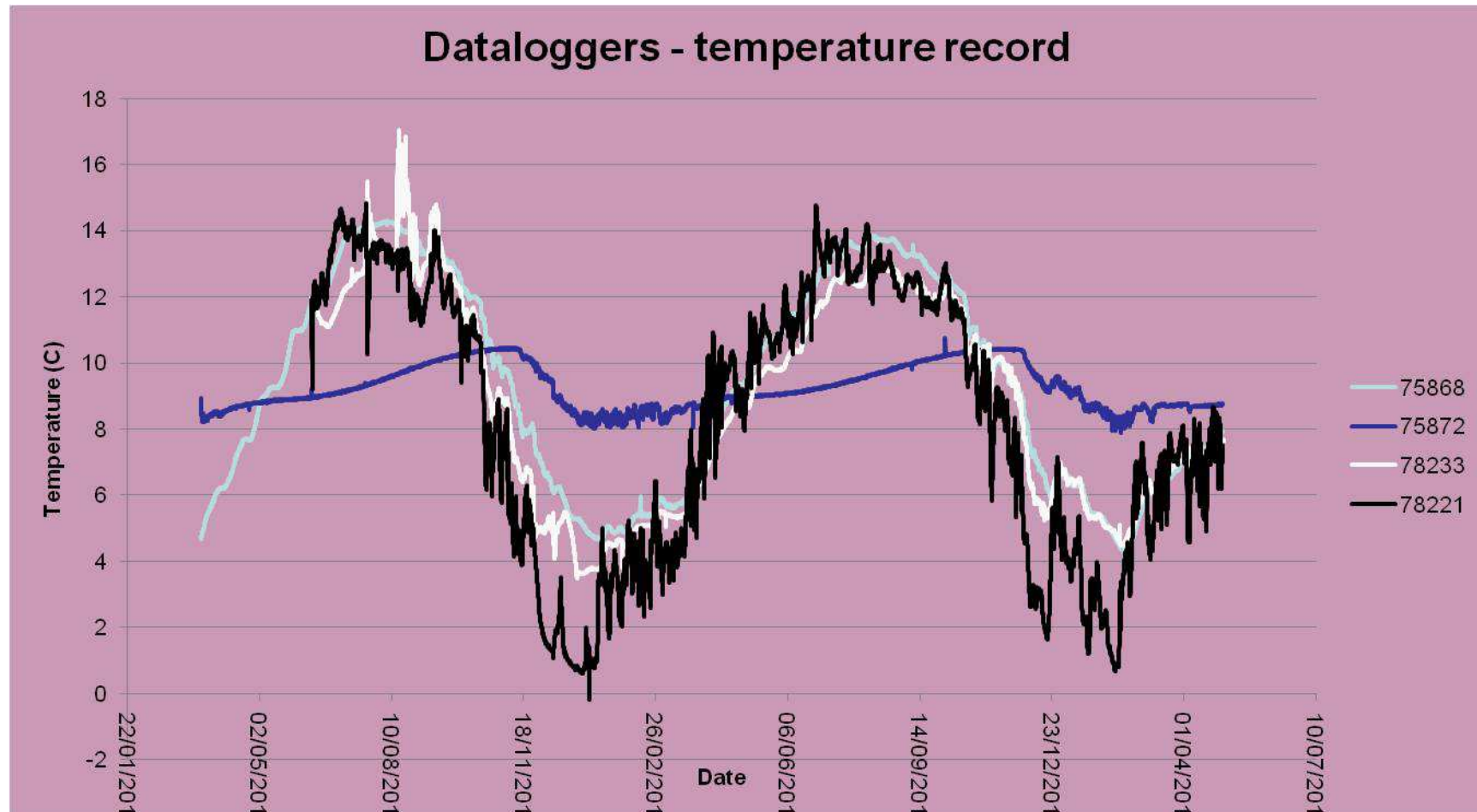
# Prickstock – EC-T probe



### Prickstock - Dipwell 34



# Temperature - dataloggers





## Conclusions thus far



- Fen area predominantly groundwater fed
  - Aquifer = Lough Bank
- Western fields – precipitation & surface water
- While both part of wider Embleton's Bog, different WETMECs
  
- Restoration of western fields to fen?
  - No – needs (alkaline) groundwater input
- Restoration of western fields to wetland?
  - Yes – water level management to remove water in spring?  
(breeding waders & grazing)

## Further work



- Estimate water balance – implications of fluvioglacial aquifer
- More detailed analysis of logger data (eg rainfall responses; T?)
- Further water chemistry analysis (pH / EC in particular)
- Look at drainage network further – field drains etc; water level management
- Borehole datalogger analysis
- Dipwell + datalogger on E edge fen (drift aquifer)
- Prickstock in fen? – transects / grid
- Numerical model??

# Acknowledgements



Previous research & discussions on site:

- Malcolm Newson; Andy Large; Geoff Parkin & others from Newcastle University
- Mark Whiteman; Roger Meade; Heather Musgrave; Andy Brookes (although it didn't quite make it onto the GWDTE investigations list)

Fieldwork (especially the muddy bits!)

- Andrew Craggs; Rob Low

Rainfall data & land management history

- Rosie (Newham Hall)

