

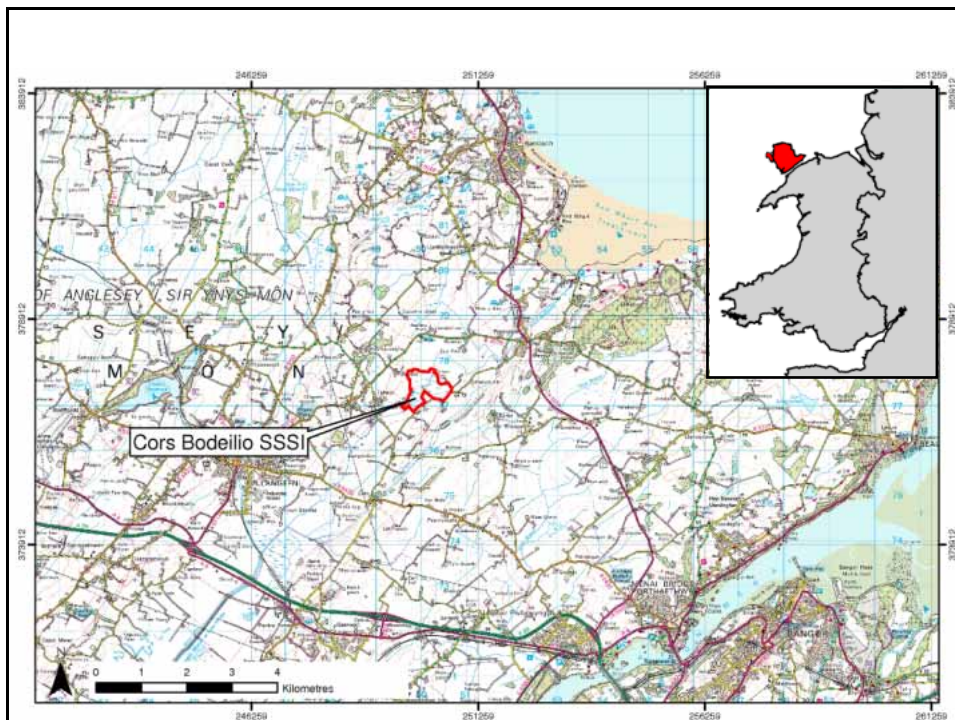


Development of a high-resolution conceptual hydro-ecological understanding of an internationally recognised fen wetland – Cors Bodeilio, Anglesey, Wales

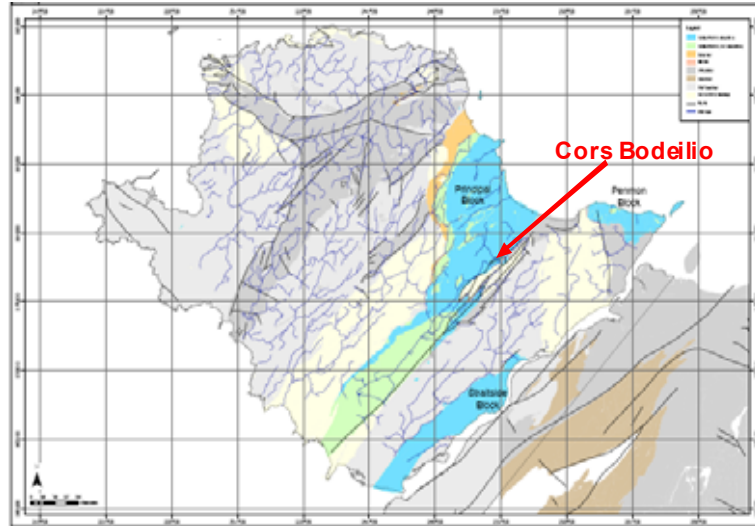
Dr Rob Low, Hydrogeologist, WMC

Dr Peter Jones, Peatland Ecologist, CCW

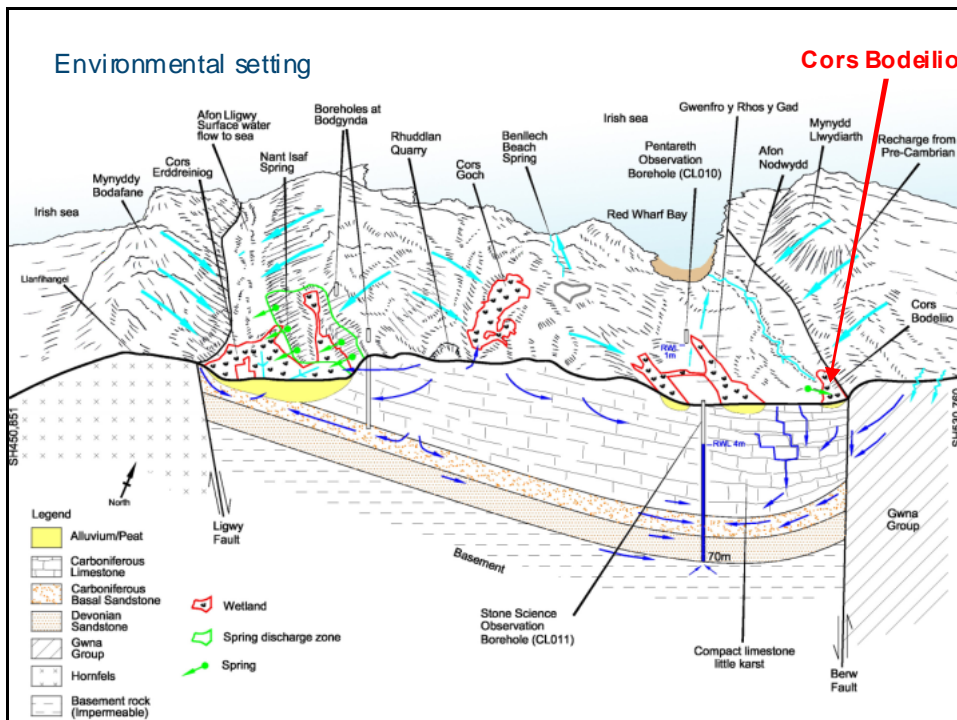
Dave Headworth, Senior Technical Specialist
(Groundwater), EAW



Geological setting



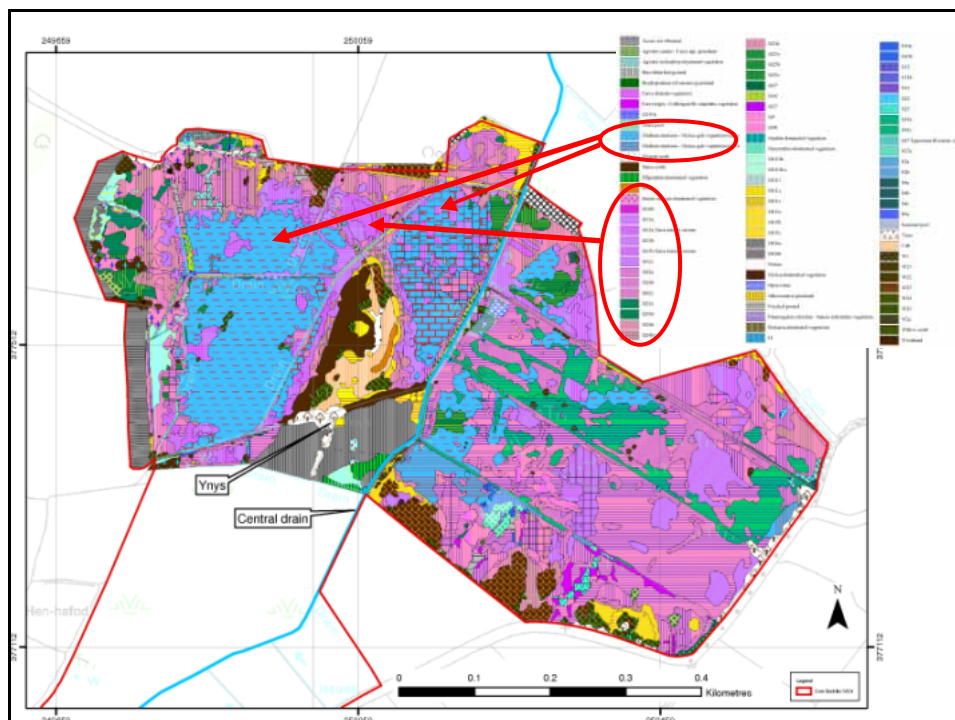
Environmental setting





Designations & interest features

- Internationally important site - SSSI; mostly NNR; constituent part of the Anglesey Fens SAC; constituent part of the Anglesey and Llyn Fens RAMSAR site.
- The Annex 1 habitats (under the EU Habitats Directive 92/43/EEC) that are a primary reason for selection of the site are:
 - ~ Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210)
 - ~ Alkaline fens (7230)





Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210)





Asiantaeth yr
Amgylchedd Cymru
Environment
Agency Wales

WATER
MANAGEMENT
CONSULTANTS
A Schibhorgan Company



Asiantaeth yr
Amgylchedd Cymru
Environment
Agency Wales

WATER
MANAGEMENT
CONSULTANTS
A Schibhorgan Company

Alkaline fens (7230)



Alkaline fens (7230)



Alkaline fens (7230)



Hydro-ecological conceptual model..... a description of the hydro(geo)logical characteristics and functioning which support the features of conservation interest.



Requirement for a detailed hydro-ecological understanding – site specific

- To provide a fundamental understanding of the site to inform its management, e.g CCW policy of enhanced NNR restoration.
- To test the conclusion of the risk screening for WFD – *at risk from chemical pressures*.
- To assess the hydro-ecological impacts of surface water drainage under the WLMP process.

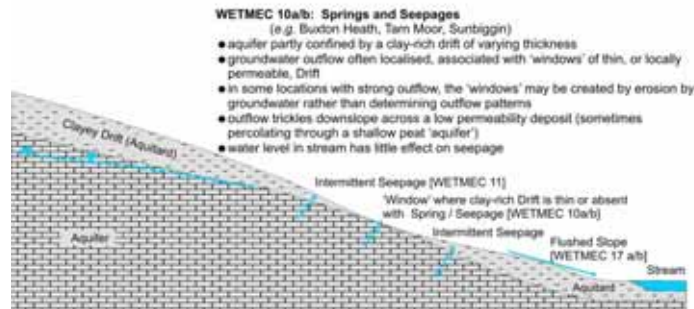


Requirement for a detailed hydro-ecological understanding – generic

- To address the deficiency of reliable long-term hydrometric data identified in the 'Ecohydrological Guidelines for Lowland Wetland Plant Communities' for Annex I wetland habitats



Requirement for a detailed hydro-ecological understanding – generic



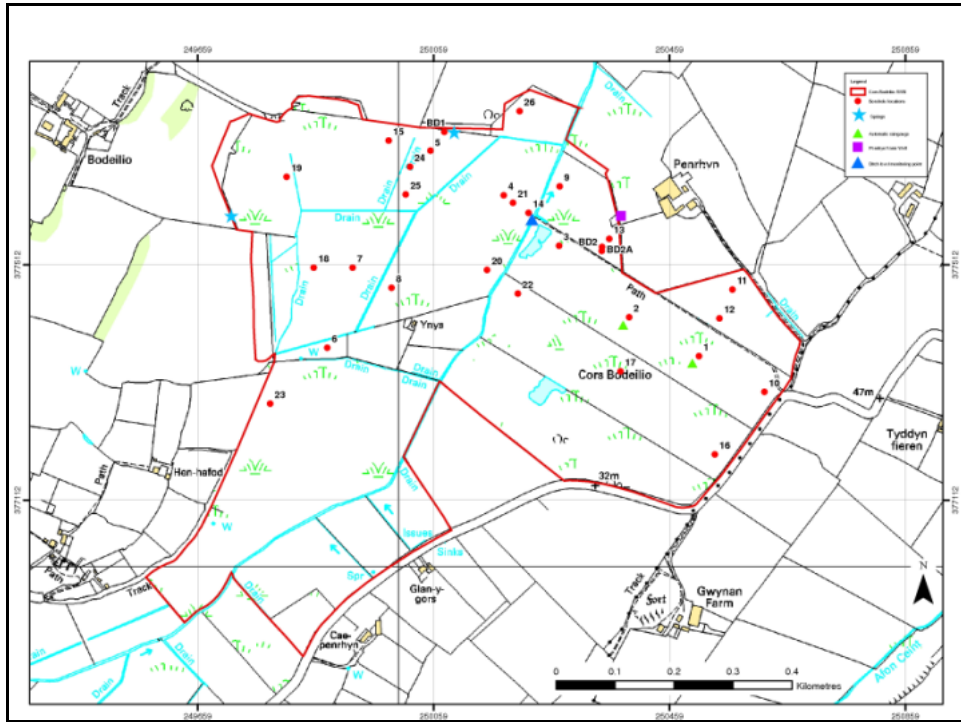
- To test the veracity of WetMecs proposed under the Wetland Framework Project.

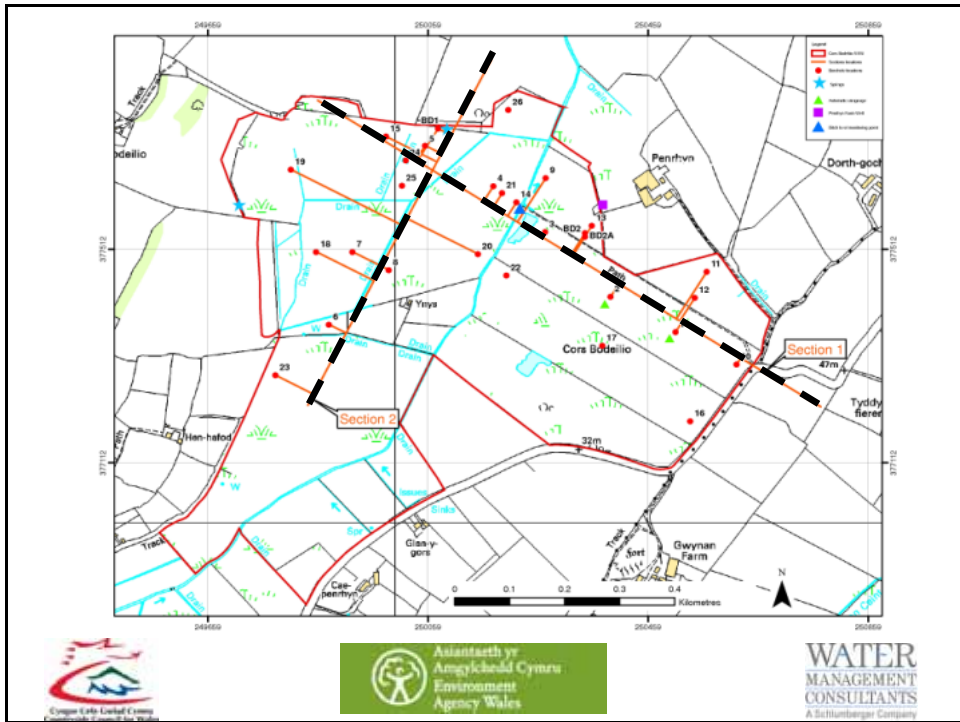
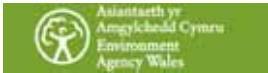


Characterisation, instrumentation and monitoring of Cors Bodeilio

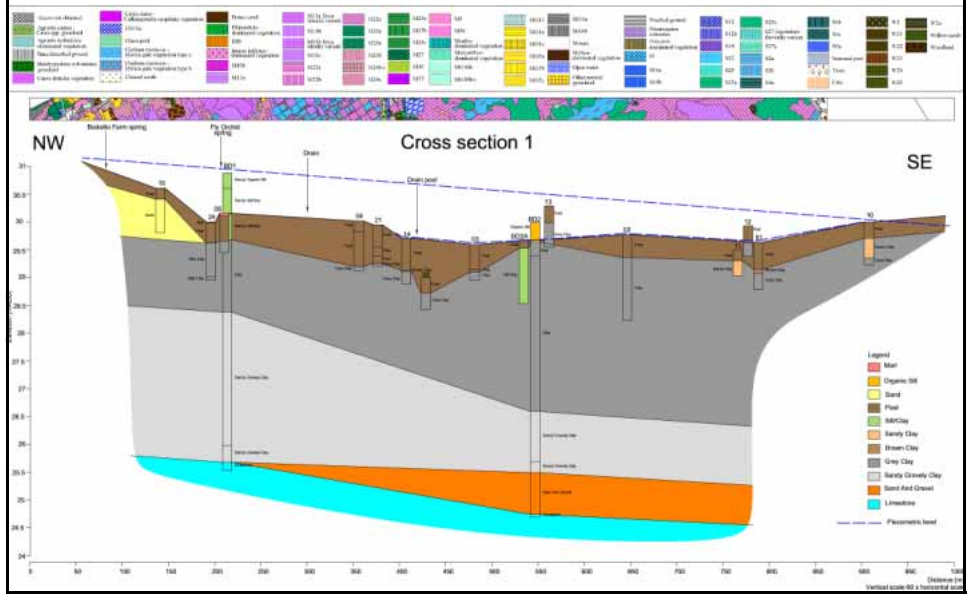
- Piezometers (Jan '08) - 2 x 5.5 m deep, screened over bottom 0.5 m
- Dipwells (Oct '06 – August '07) - 25 x c. 1 m deep
- Piezometers and 5 dipwells equipped with pressure transducers – recording at 1 hr frequency
- Two EAW observation boreholes into Carb' Lmst & ORS within 2.5 km
- Water quality sampling
- Tipping bucket rainfall recorder
- Measurement of peat shrinkage/expansion
- High-resolution NVC survey and quadrat records



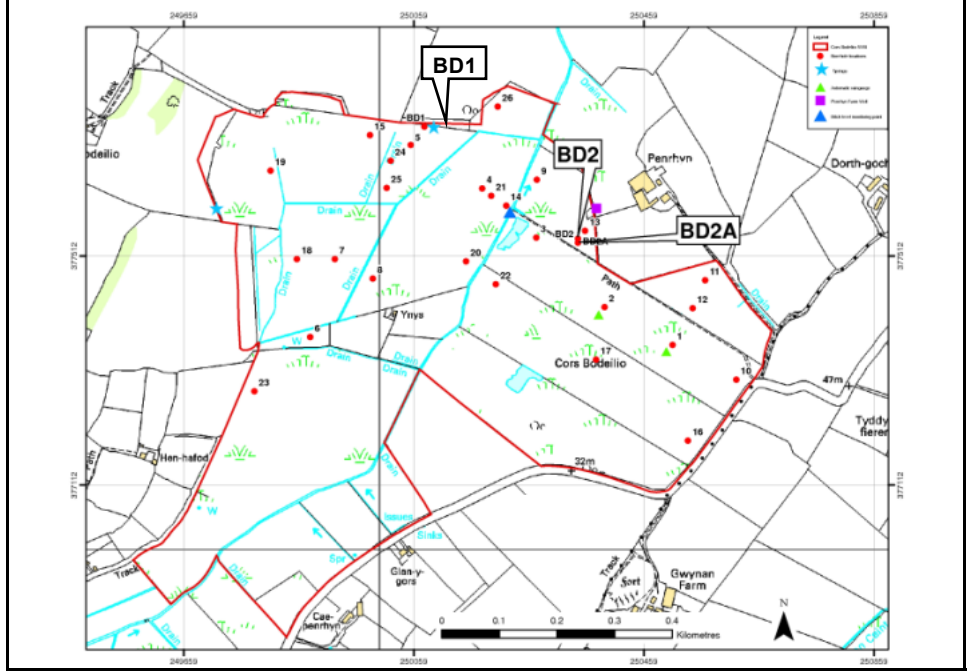


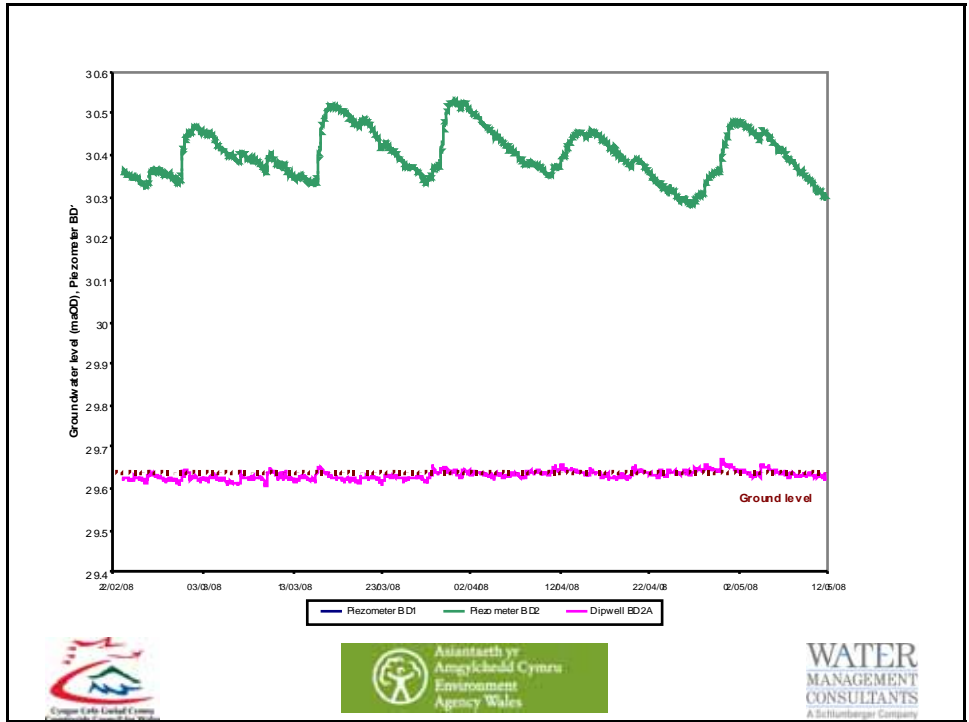


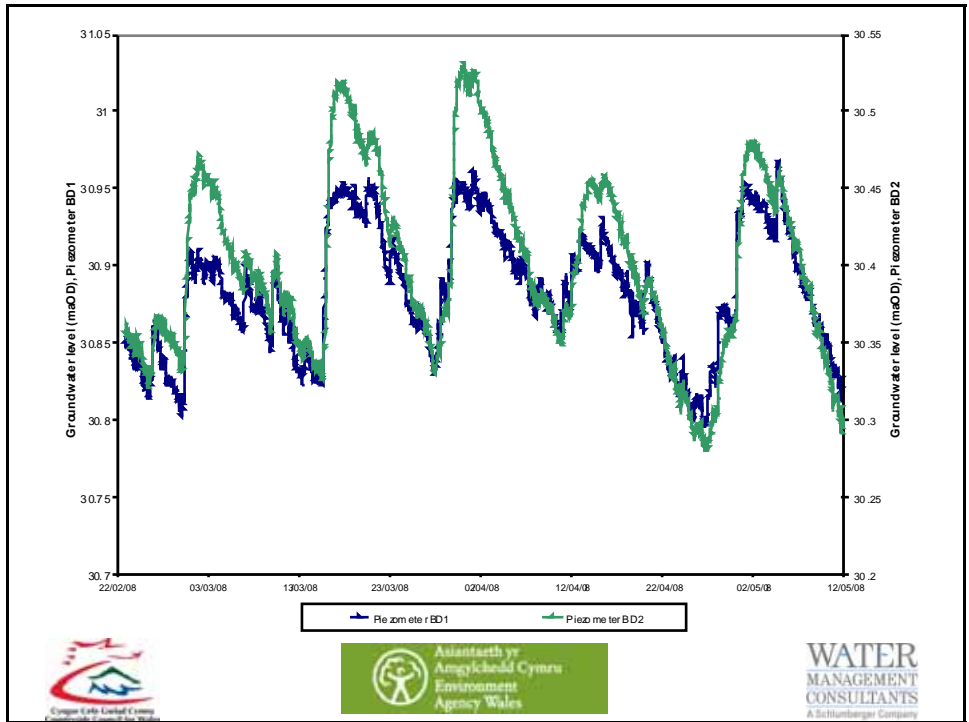
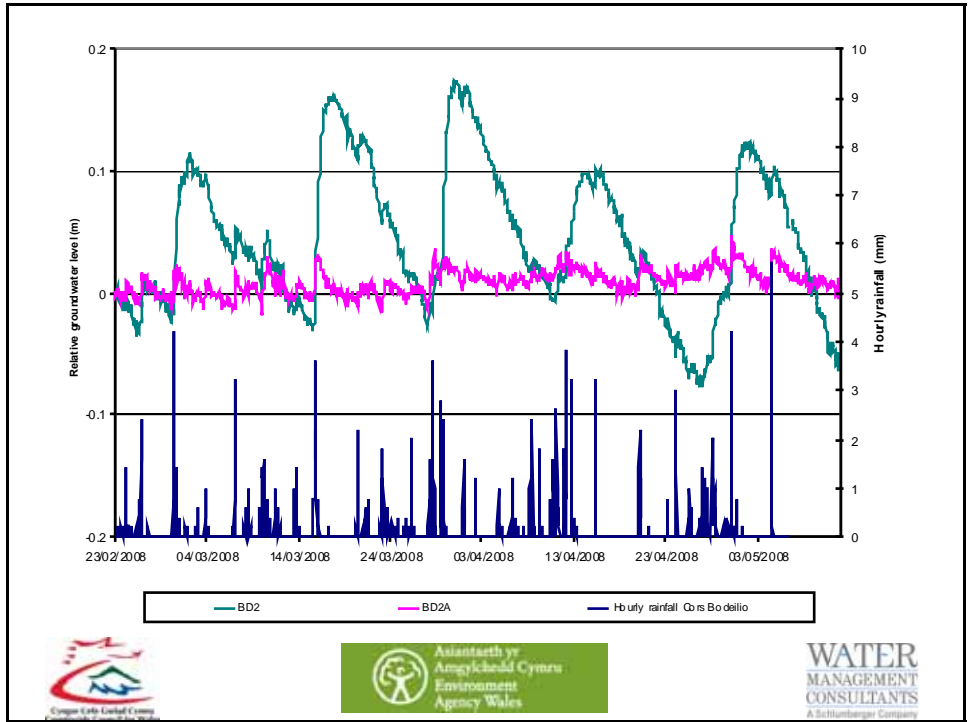
Characterisation of substrate



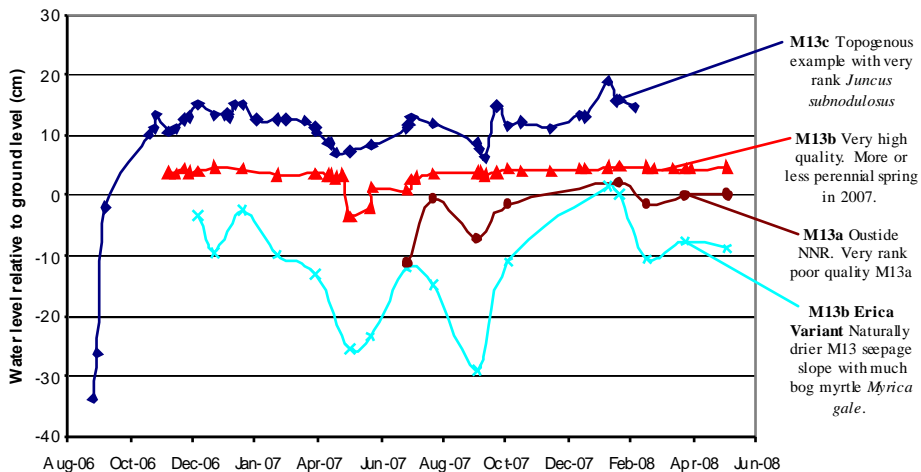
Analysis of water level data







Water levels in M13 alkaline fen



M13c Topogenous example with very rank *Juncus subnodulosus*

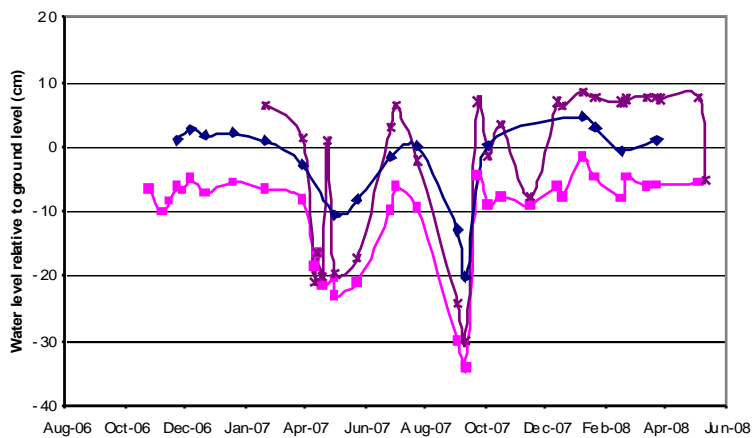
M13b Very high quality. More or less perennial spring in 2007.

M13a Outside NNR. Very rank poor quality M13a

M13b Erica Variant Naturally drier M13 seepage slope with much bog myrtle *Myrica gale*.



Water levels in Cladio-Molinietum calcareous fen



Classic *Cladio-Molinietum* (CM). Comparatively species-poor vegetation dominated by *Cladium*

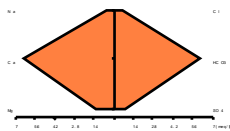


Groundwater quality measurements

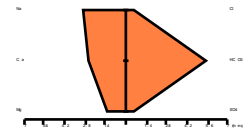
Piezometer	pH	EC (µS/cm)	Organic Carbon (mg/l)	Dissolved Oxygen (mg/l)	Nitrate – N (mg/l)	Nitrate (mg/l)
BD1	6.91	725				
BD2	6.74	686				
Tapwater at Penrhyn Farm	7.28	680				
Fly Orchid Spring	7.33	647	1.19	8.07	6.68	29.6
Bodelio Farm Spring	7.24	637	1.65	11.97	2.80	12.4
Pentraeth EA observation borehole	7.38	500	0.62	2.05	0.35	1.6
Stone Science EA observation borehole	7.67	561	0.80	3.79	0.20	0.9



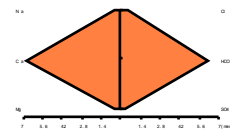
Pentraeth EA observation borehole



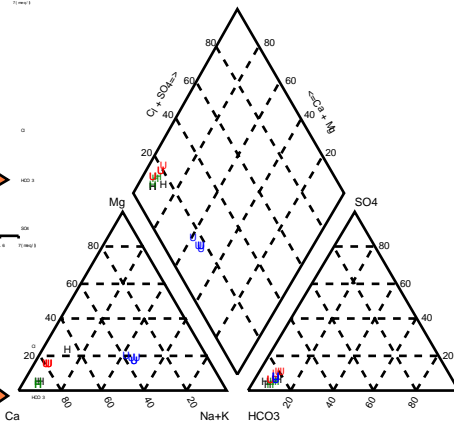
Stone Science EA observation borehole



Bodelio Farm Pond

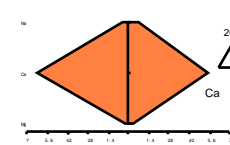


Piper Plot

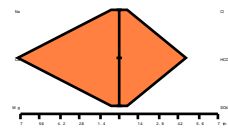


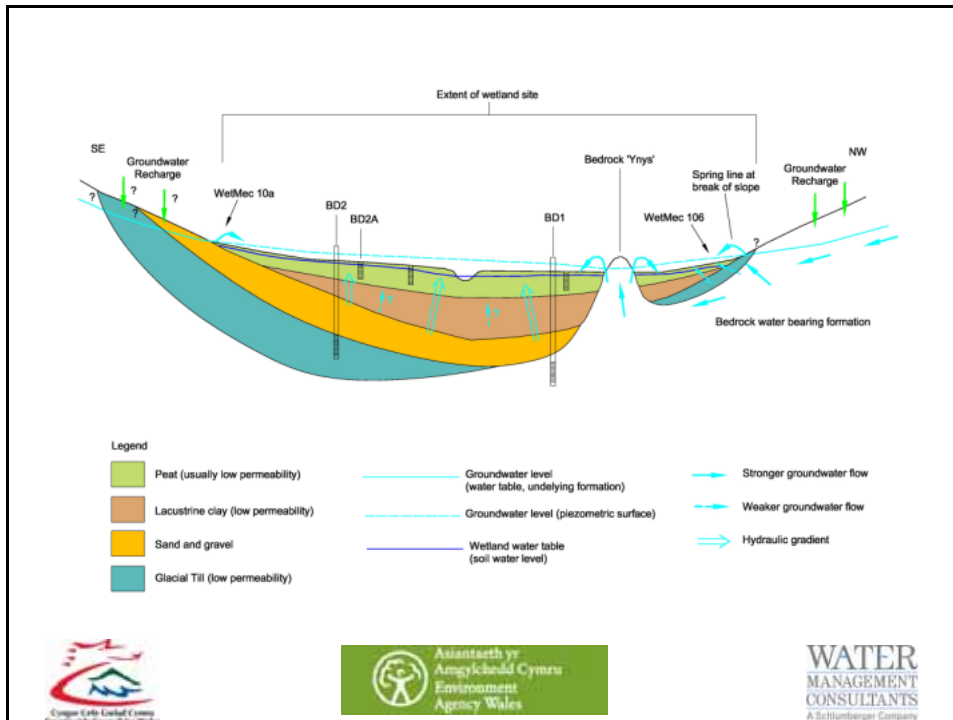
- Legend
- U PENTRAETH EAW OBSERVATION BOREHOLE
- STONE SCIENCE EAW OBSERVATION BOREHOLE
- H BODELIO FARM POND
- H FLY ORCHID SPRING

Fly Orchid Spring



Penrhyn Farm Well





Conclusions

- Work in progress - investigations started in 2005, concentrated in 2007-8
- But, already some useful information – monitoring over the summer/autumn period is likely to provide more information in relation to the various reasons for carrying out the project
- Work to date has proved that the site is a highly varied and inter-dependent system - a real challenge for conservation management



Conclusions... cont'd

- Nitrate concentrations are much higher than desired – source & significance of impacts under WFD needs to be investigated.
- Information for Hydro-ecological Guidelines; noticeably different water level regimes supporting stands of the same community.
- Surface water drains have a significant local effect on soil water levels, but this impact does not come under the WLMP process.



Further work

- Longer datasets required to refine conceptual understanding and provide information for hydro-ecological guidelines, therefore continue monitoring.....
- Expand monitoring coverage to south-western part of site (not in CCW ownership)
- Hydraulic testing of the piezometers?
- Surface water discharge measurement – springs & central drain?



Acknowledgements

- Environment Agency Wales – Gareth Farr, Beth Davies
- CCW – Les Colley, Morris Williams, Richard Williams, Will Sandison, Bob Haycock, Matt Sutton and others
- WMC – Amanda Coffey, Paul ('Scouser') Inman, Richard Pim (Associate), Dave Holmes



Future proofing –
Pete's investment for
long-term monitoring!

