

# Poole Harbour Habitat Creation Scheme

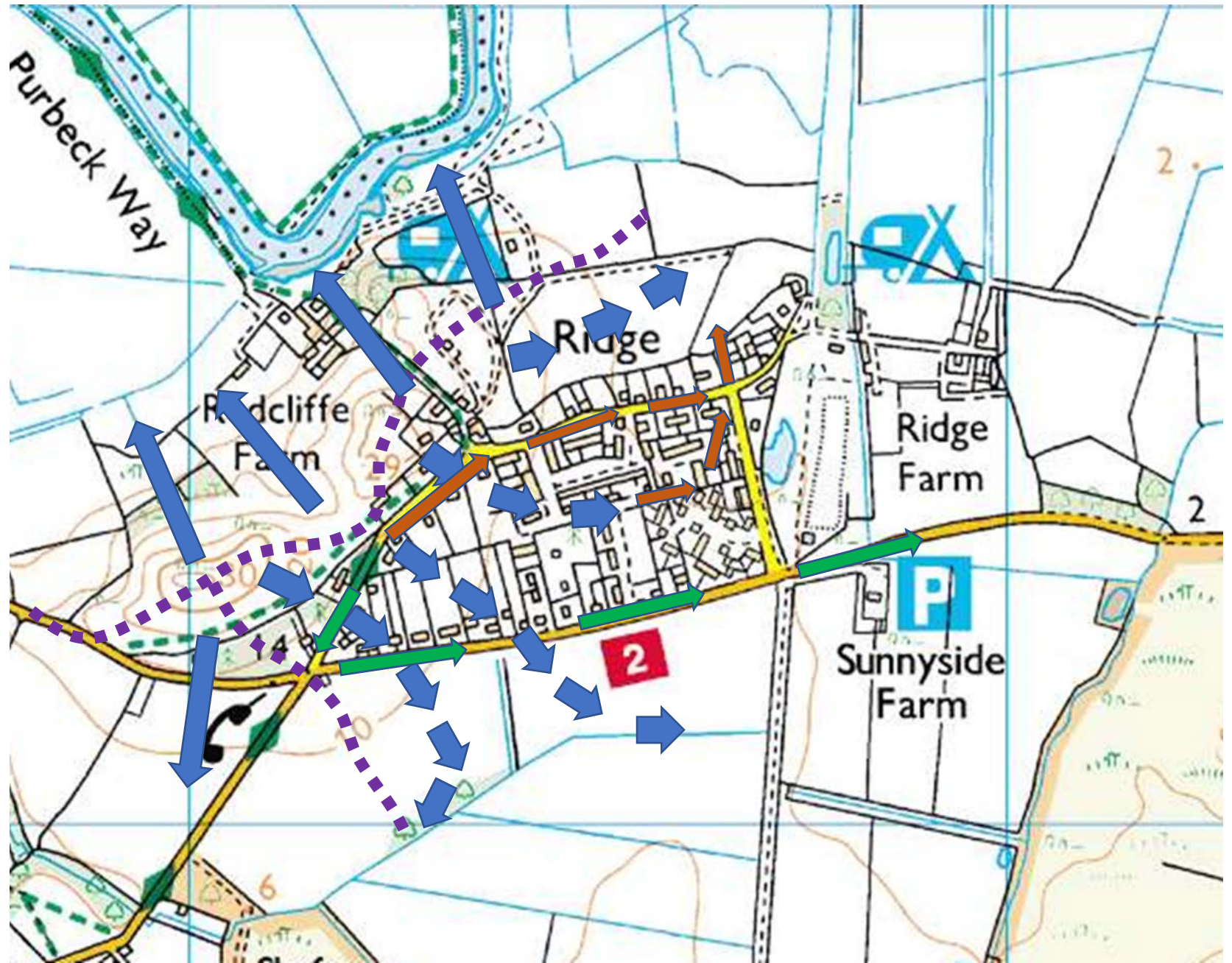
Ridge - Groundwater Preliminary Evaluation

# Introduction and objectives

- This presentation is intended to set out our current understanding of drainage and groundwater beneath Ridge and the relationship these may have with our proposed scheme
- We have adapted and developed our investigations according to concerns raised by the community
- This presentation offers a sneak preview of the work carried out and represents an insight into our studies and site investigations to date
- We are continuing to gather data and our interpretation may be expected to evolve further

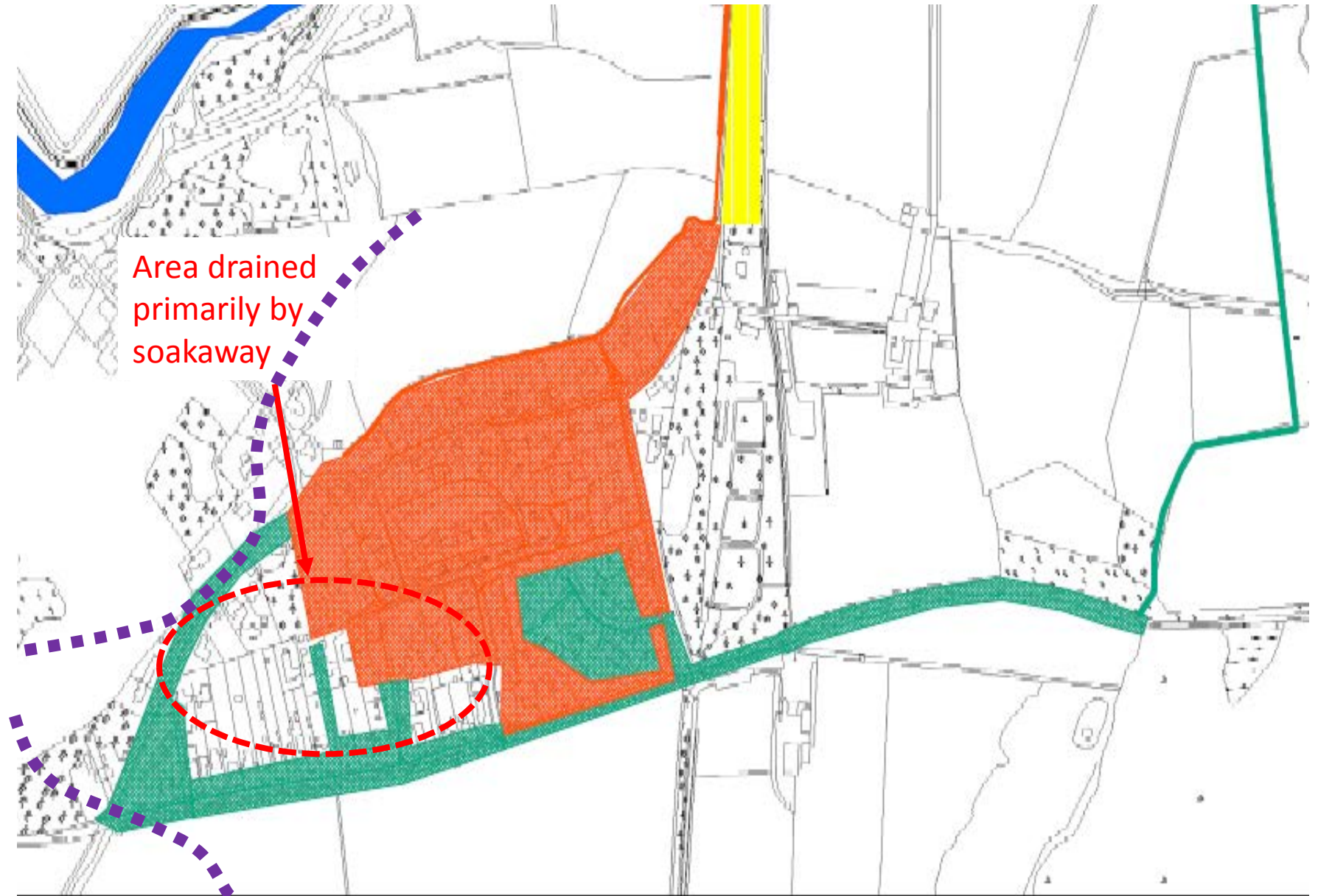
# Surface Drainage

- Hydrological catchment
- Natural “off slope” drainage
- Surface water drainage impacts/ intercepts natural overland flow



## Surface water drainage catchments

- Road and roof drainage
- Soakaways to western part at top end of SW catchment
- Soakaways capture surface water runoff and recharge underlying shallow aquifer



# Geology- summary of underlying deposits

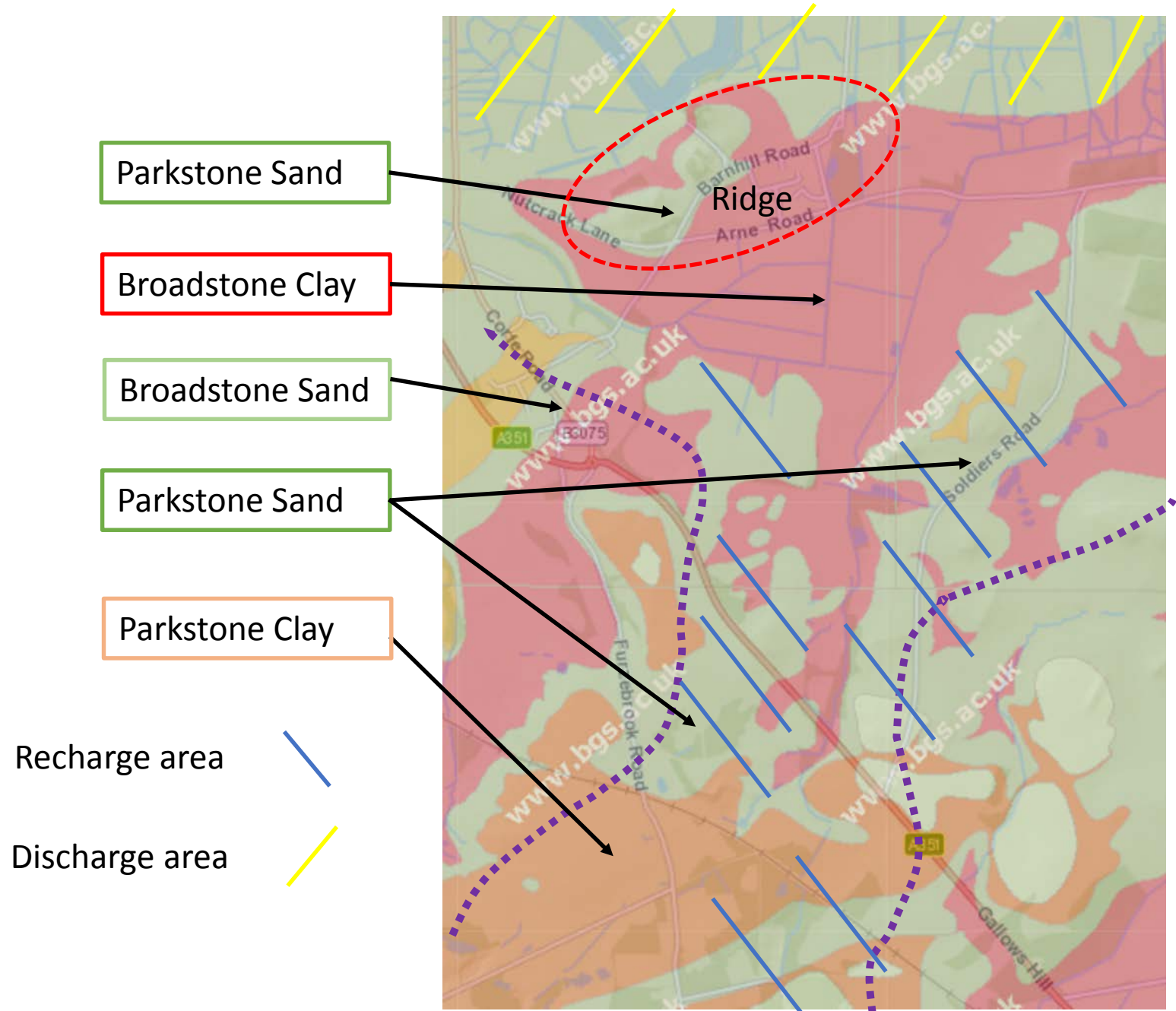
Superficial deposits	
Unit	Occurrence
Topsoil	Thin, widespread
Made Ground [MGR]	Embankments etc some “disturbed ground” beneath Ridge
Head [HEAD]	“In situ” product of weathering and erosion... beneath Ridge
Peat [PEAT]	Beneath Arne Moors only
Tidal Flat Deposits: granular, non cohesive [TDFG]	Beneath Arne Moors
Tidal Flat Deposits: cohesive [TDFC]	Beneath Arne Moors

Bedrock - Poole Formation	
Unit	Occurrence
Parkstone Clay Member	Not present
Parkstone Sand Member	To West of Ridge
Broadstone Clay Member [BRTC]	Widespread beneath Ridge and Arne Moor
Broadstone Sand Member [BROS]	Beneath Arne Moor May be interbedded and undifferentiated
Oakdale Clay Member [OAKC]	
Oakdale Sand Member	

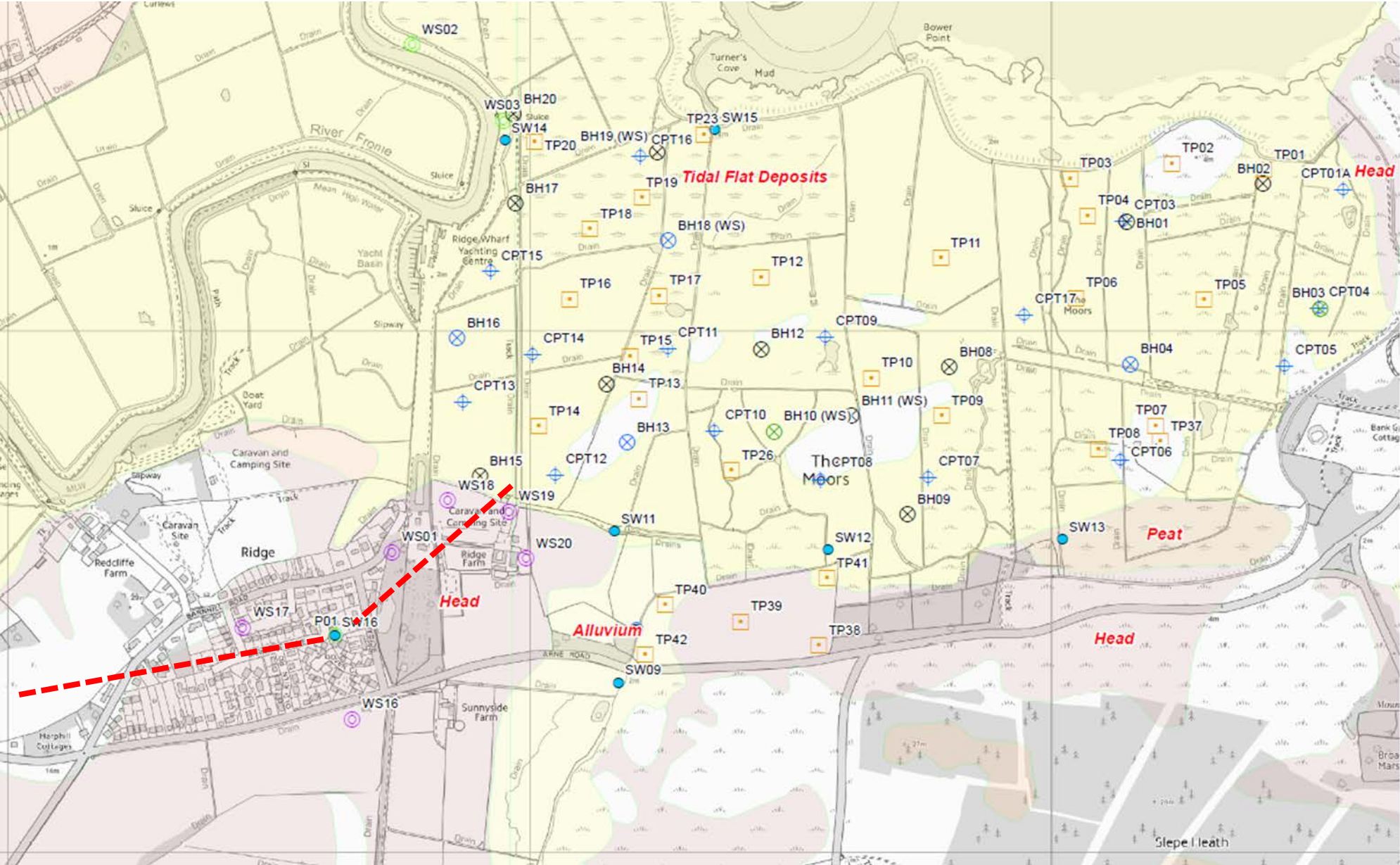
# Hydrogeology

## - Regional perspective

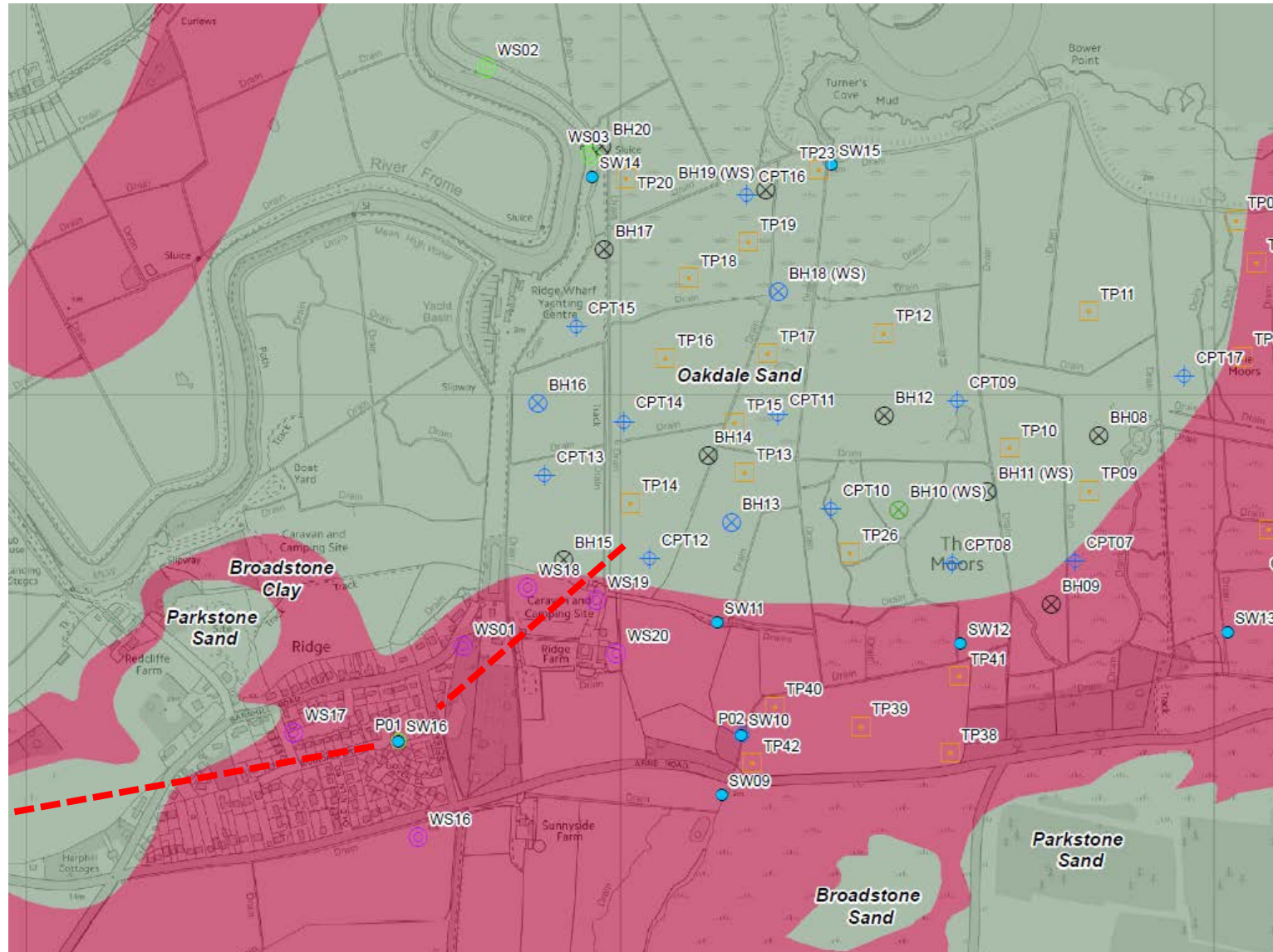
- Poole Formation - minor aquifer
- Succession of interbedded sands and clays, variable thickness and depth
- Recharge across outcrop to south and within the upper catchment of the Furzebrook
- Discharge northward toward Poole Harbour
- Clay layers “confine” lower parts of the sand aquifer such that water in the lower parts is under pressure
- When clays are “punctured” by boreholes, water under pressure rises to surface



# Superficial Deposits

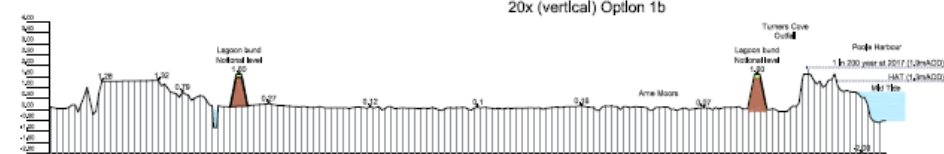
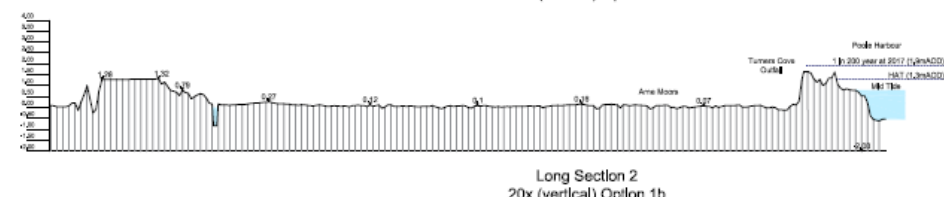
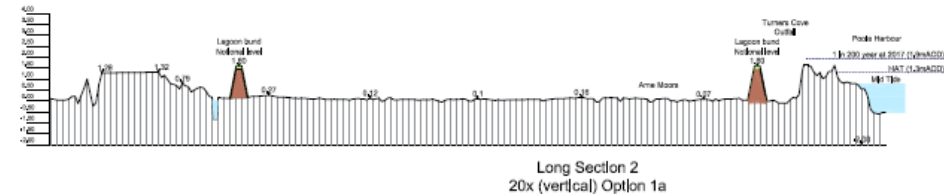
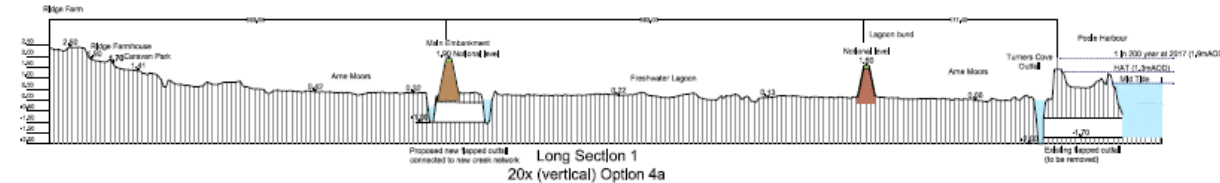
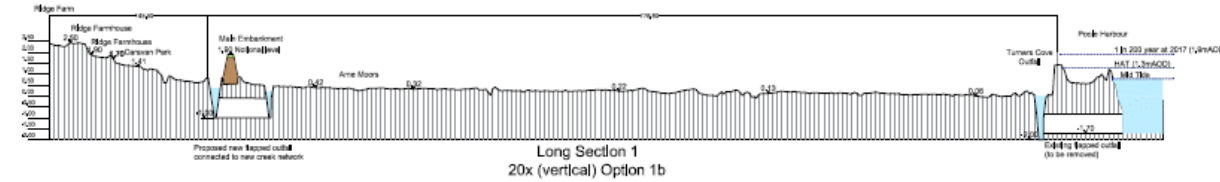
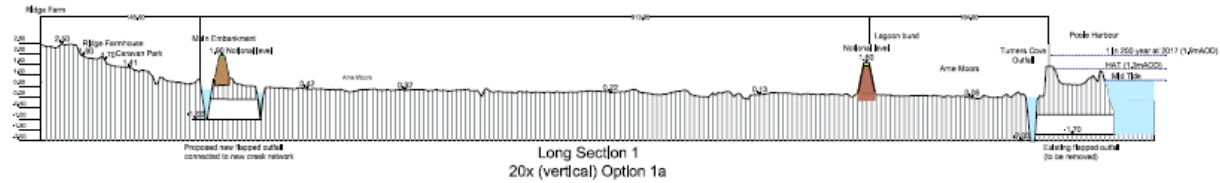


# Bedrock

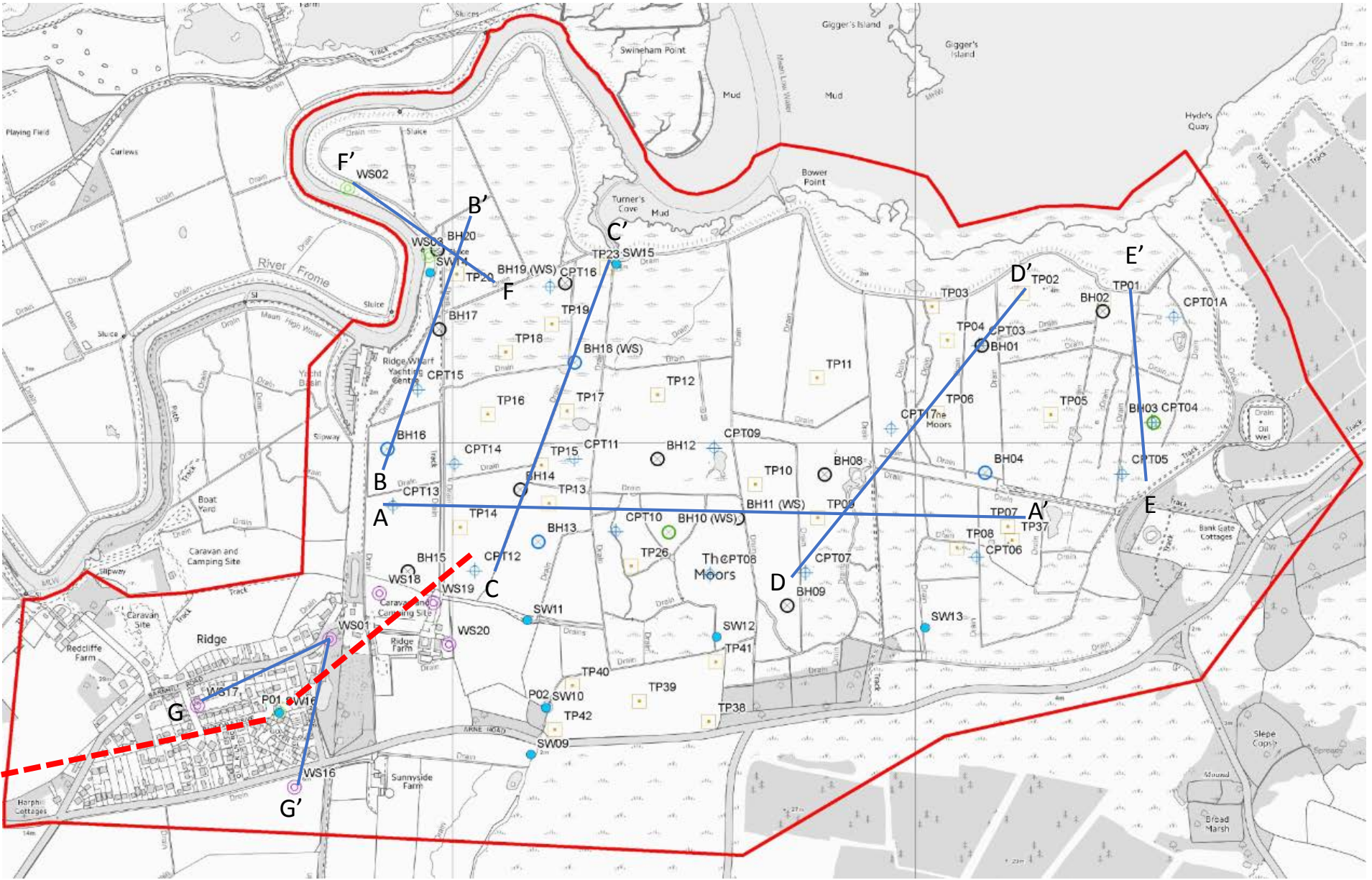




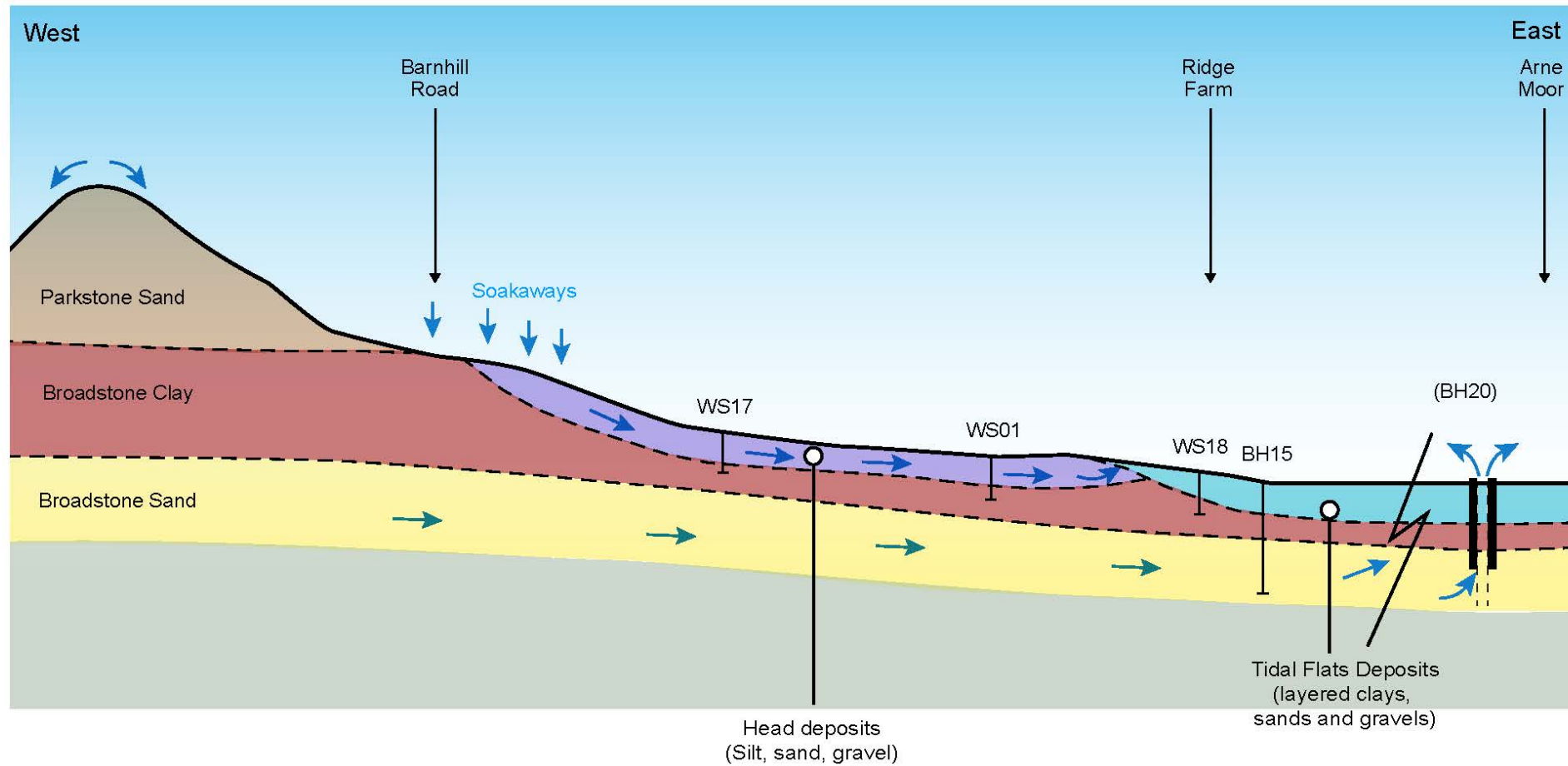
# Site topographic sections



# Lines of geological cross sections

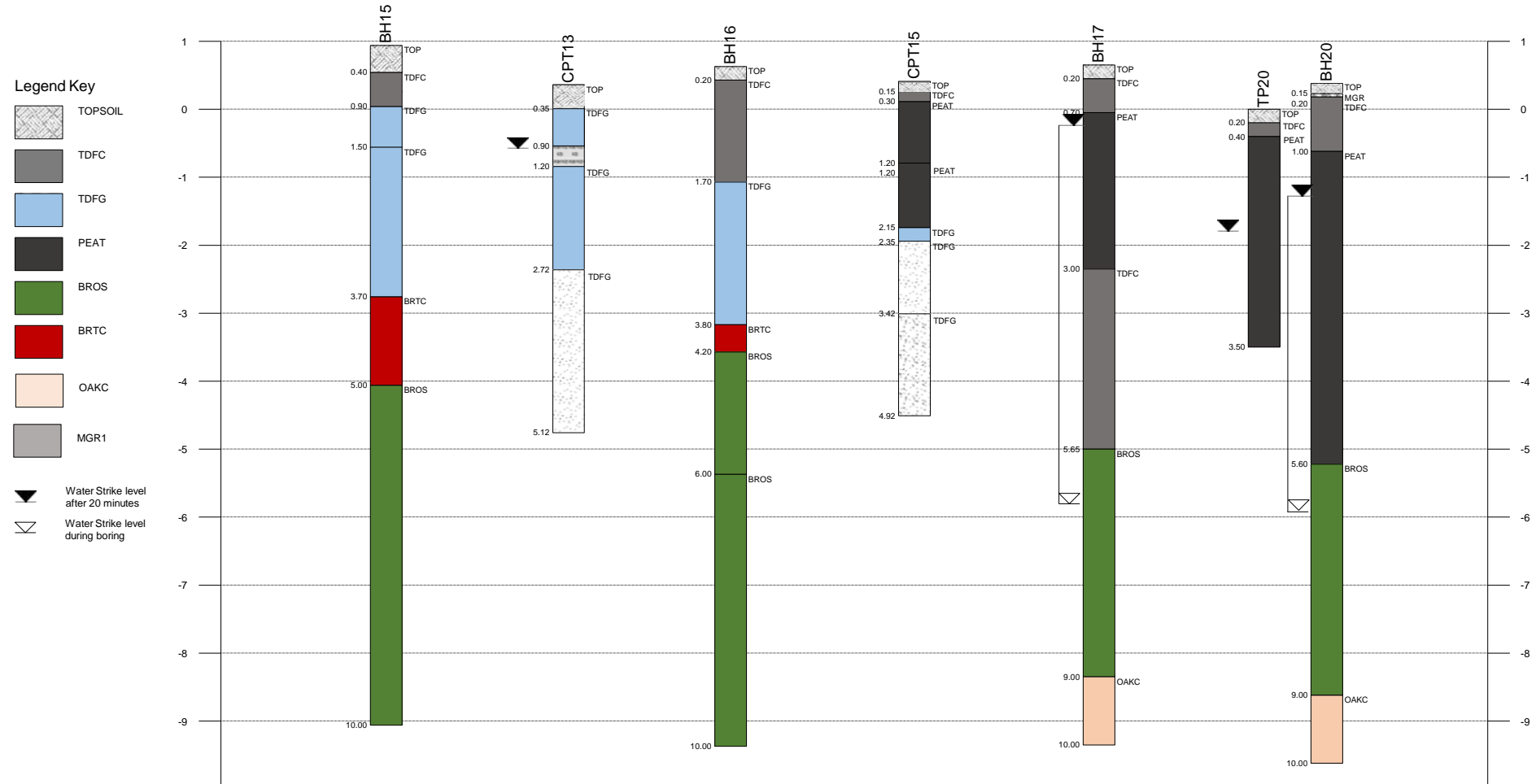


# Initial conceptual understanding (schematic section)





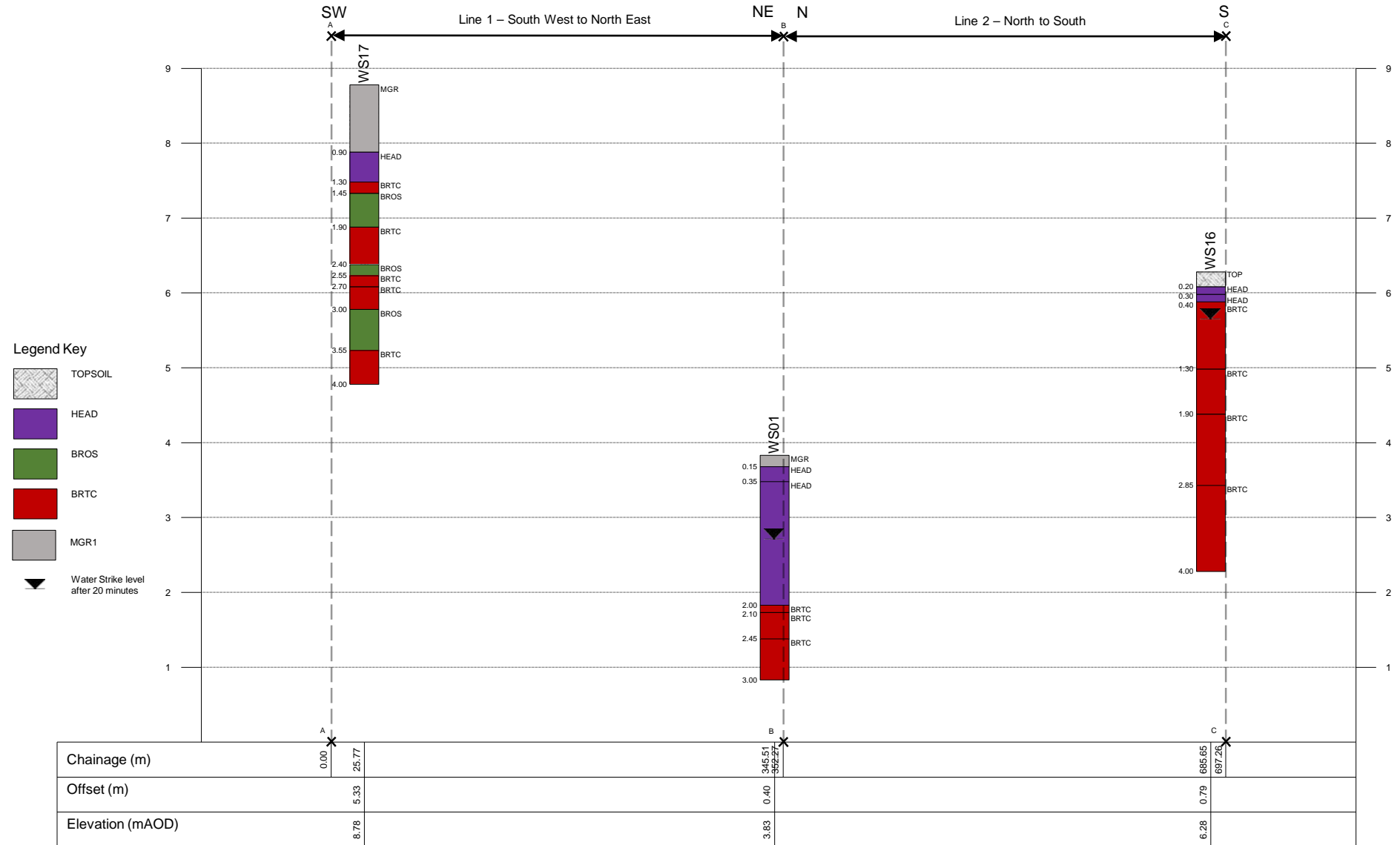
### Cross Section B – B' - S-N, West of Arne Moors Site



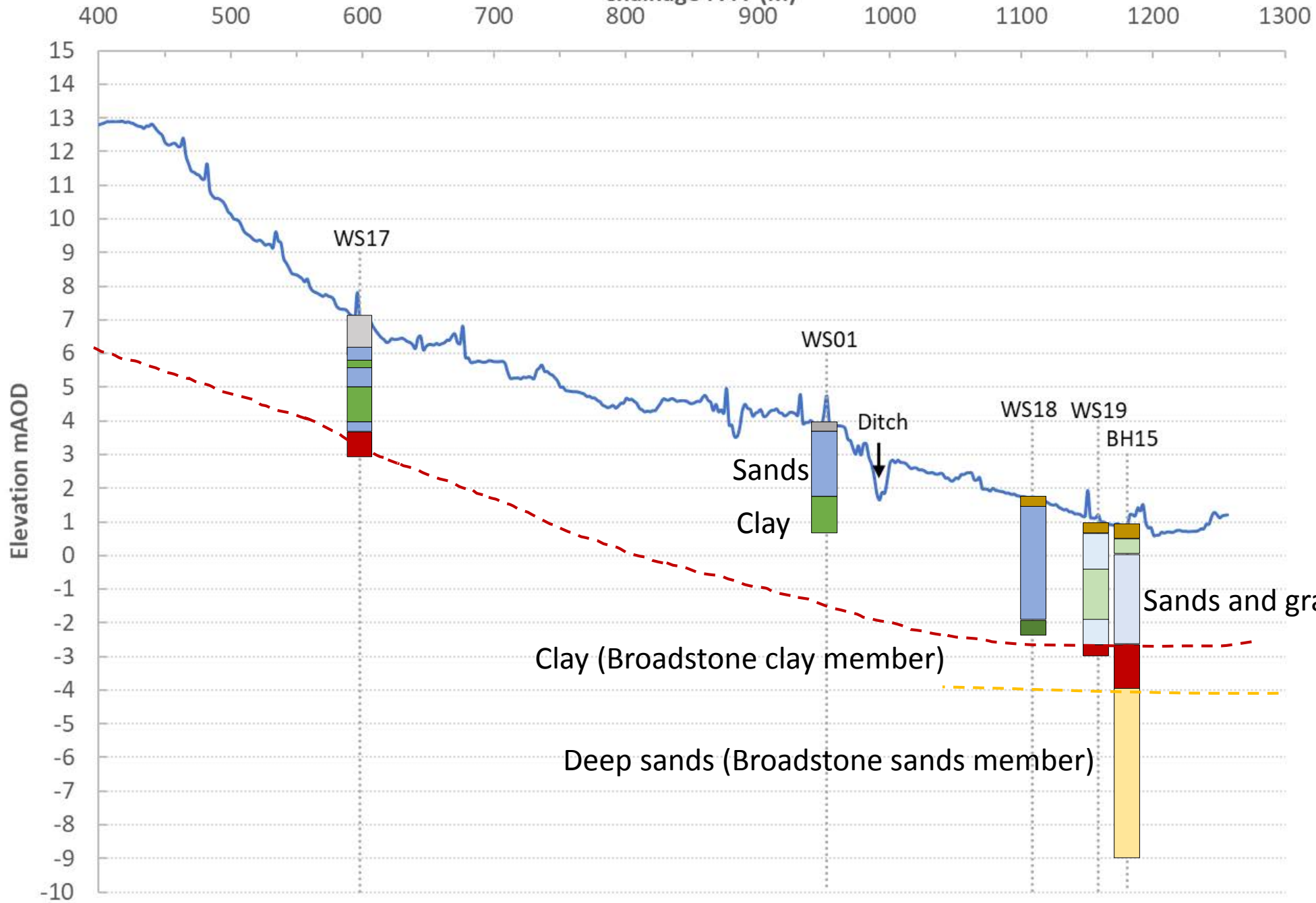
Chainage (m)	0.00	16.88	16.88	151.78	151.78	271.68	271.68	407.63	407.63	544.16	544.16	666.39	666.39	712.83	712.83	726.11	726.11
Offset (m)		24.62		29.63		60.40		17.19		9.19		26.83		21.79			
Elevation (mAOD)	0.94		0.36		0.63		0.41		0.65		0.00		0.38				



### Cross Section G-G' – South West to North East (Line 1) and North to South (Line 2) in Ridge Village



Chainage A-A' (m)

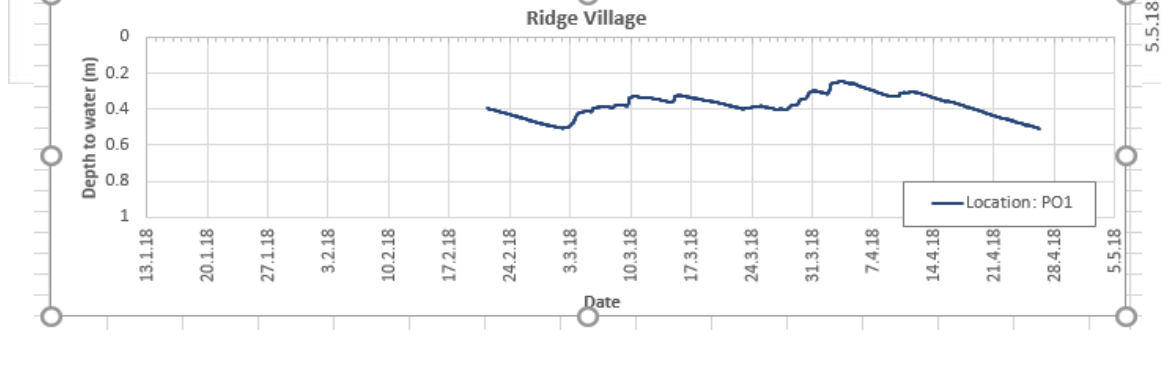
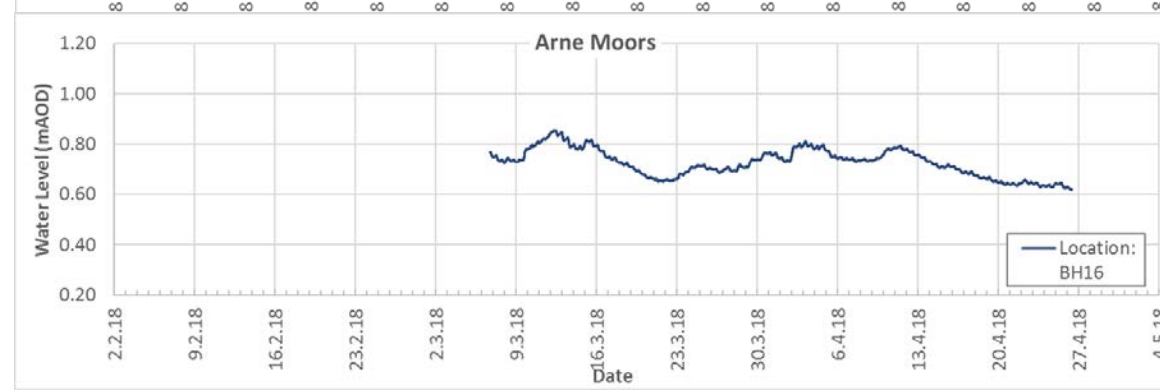
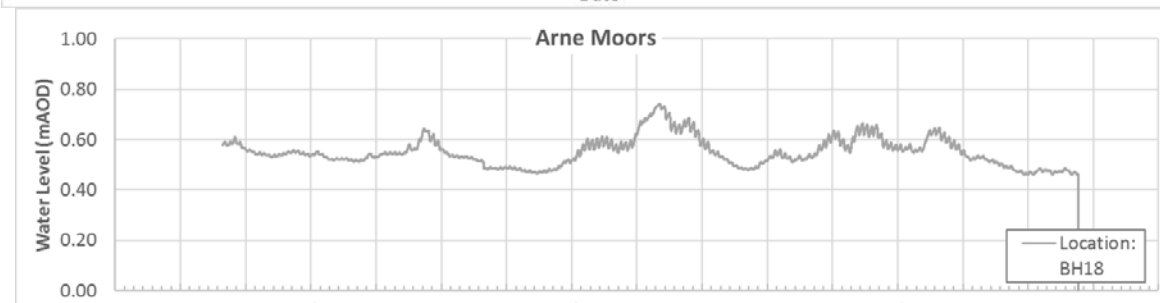
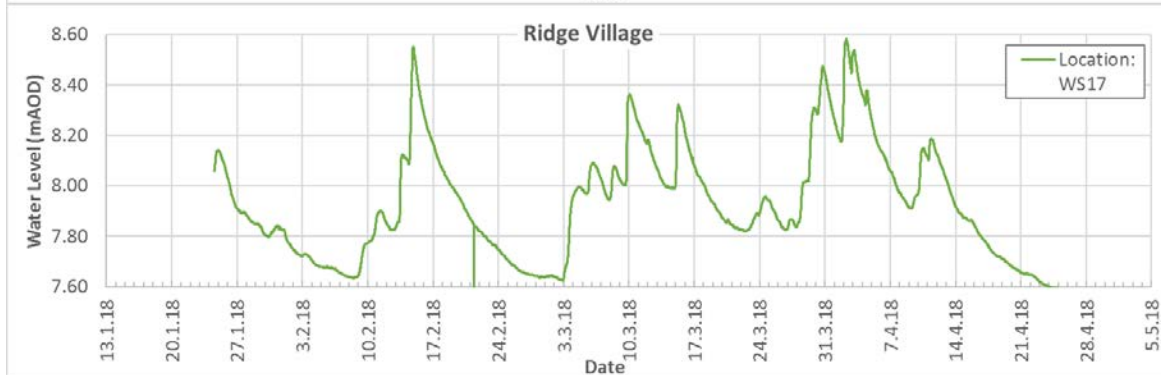
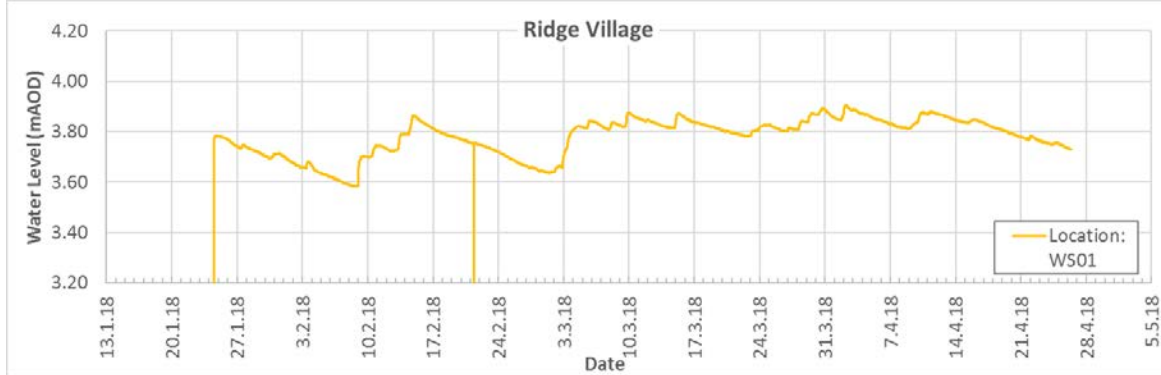
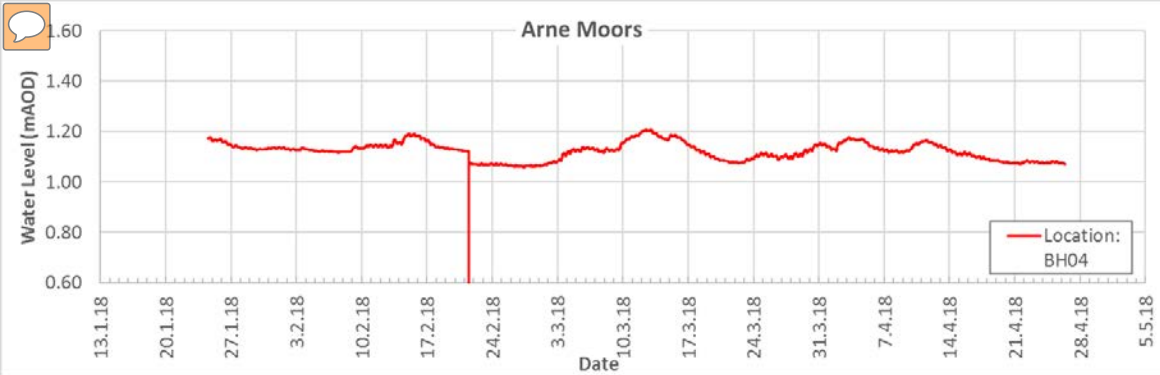


- Legend Key
- Topsoil
  - Made ground
  - Sands (Head deposits)
  - Clays (Head deposits/Alluvium)
  - Sands and gravels (Tidal Flat Deposits)
  - Clays (Tidal Flat Deposits)
  - Clay (Broadstone clay)
  - Sands (Broadstone sands)

# Ground Investigation - Monitoring well locations



Installed water level loggers

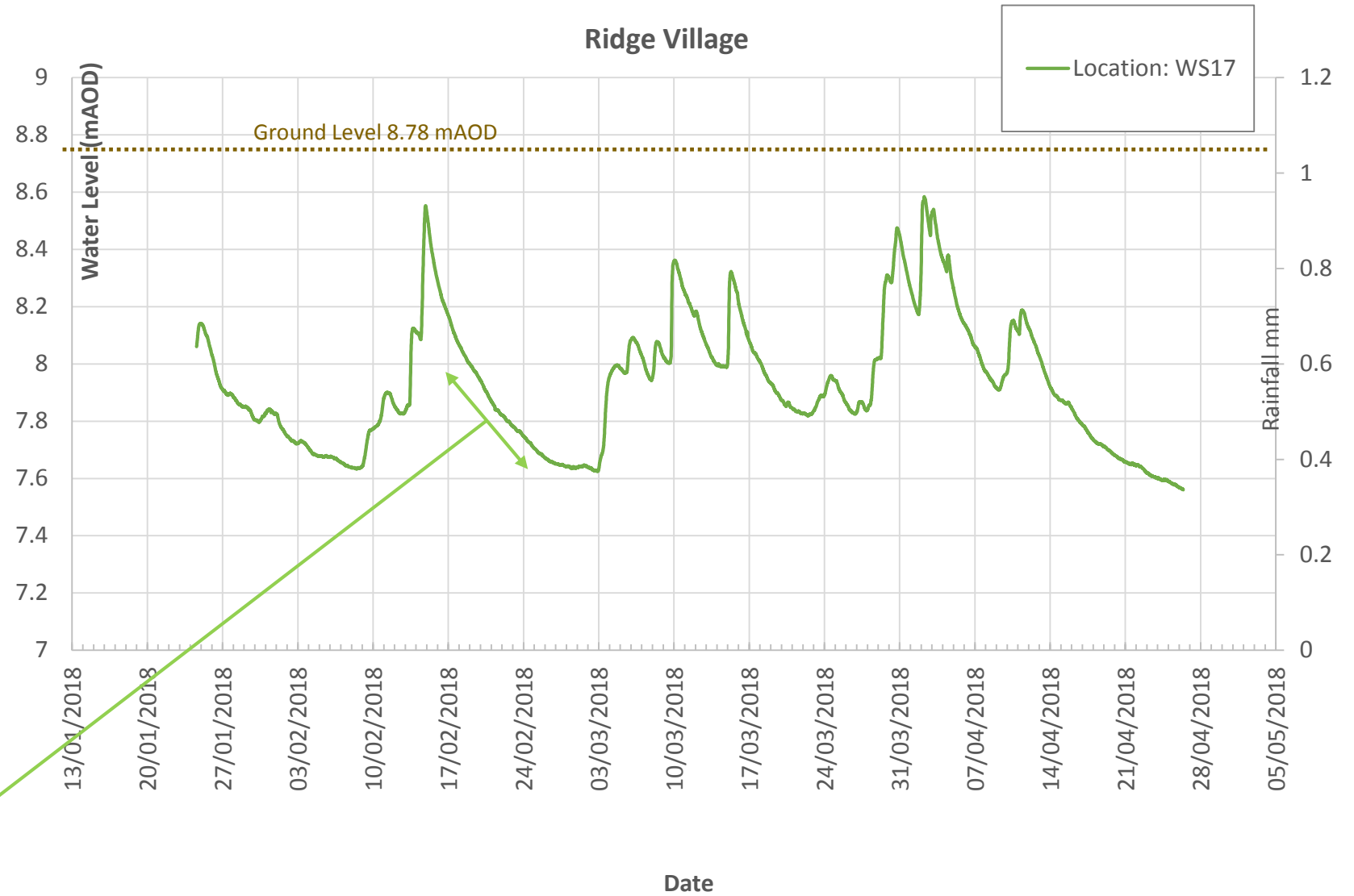






# Well Hydrograph- Ridge

- Logger recorded groundwater levels response
- 3 months data
- We are continuing to capture data
- Water levels within 0.3m from surface



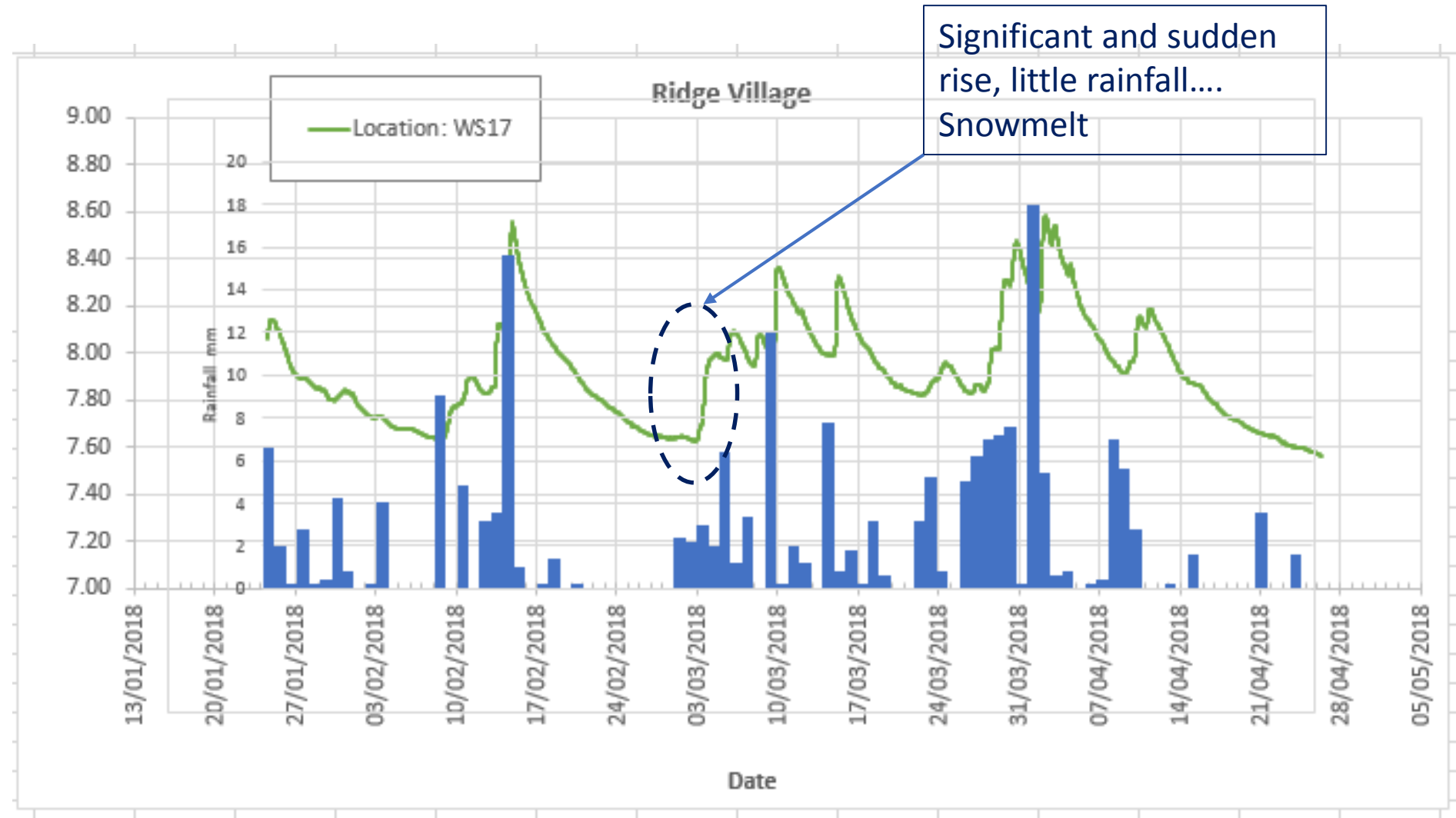
Typical groundwater recession curve



# Well Hydrograph Ridge vs Swanage rainfall (mm)

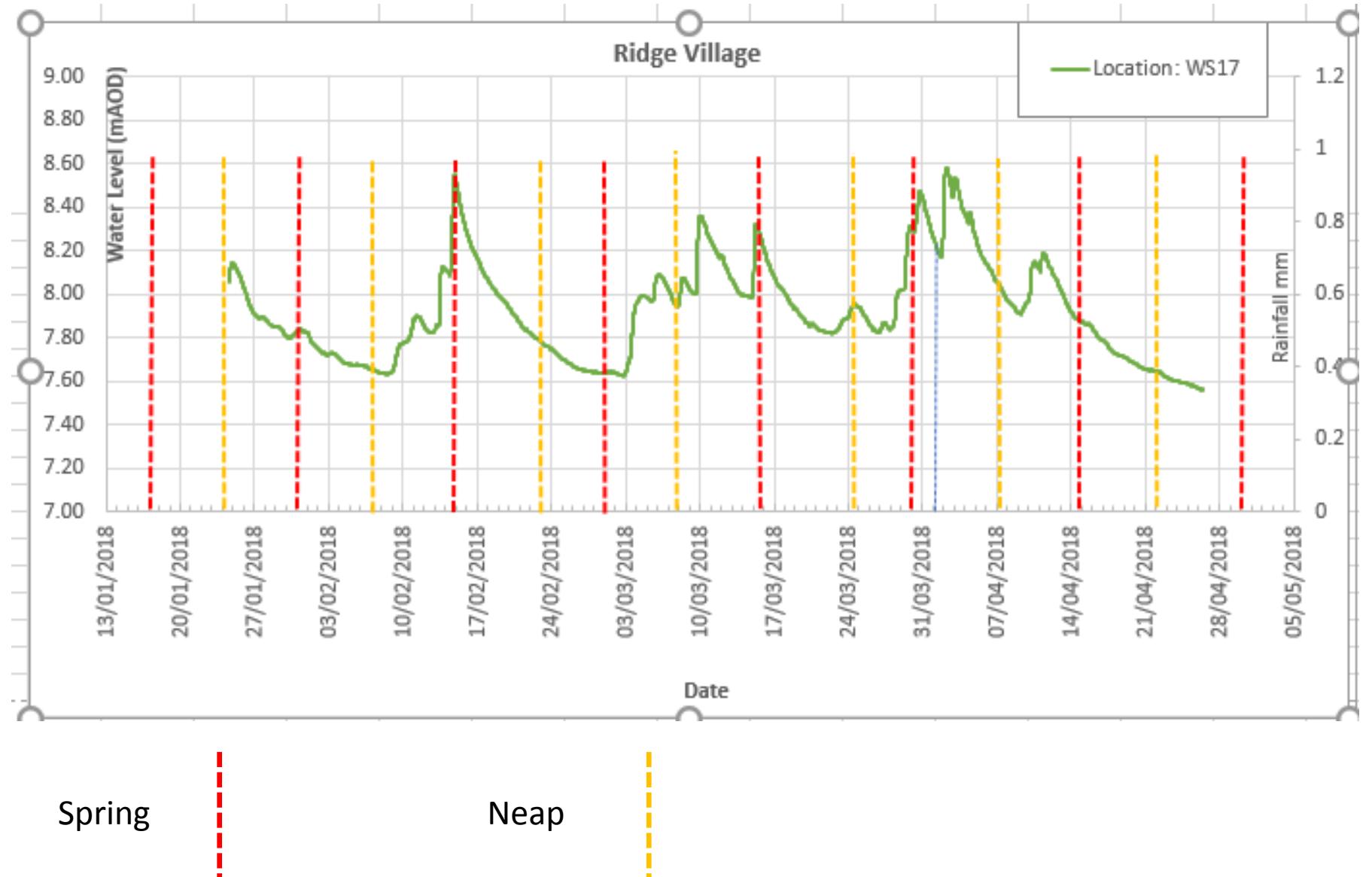
Smaller rainfall events  
( $< c.5\text{mm}$ ) little impact

Larger or cumulative  
events. Rapid  
response in  
groundwater levels



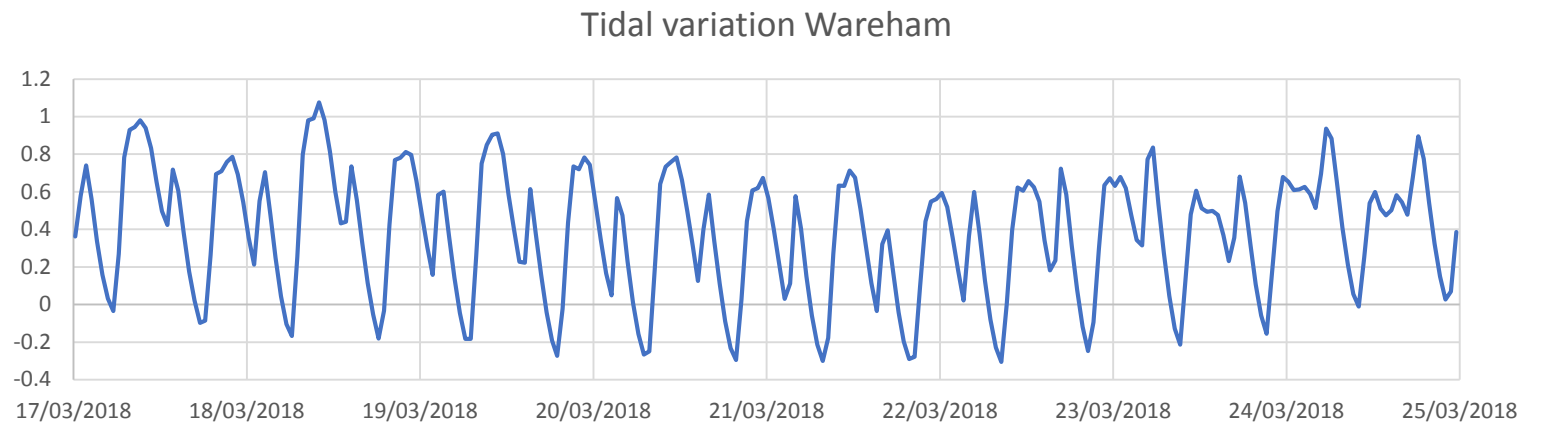
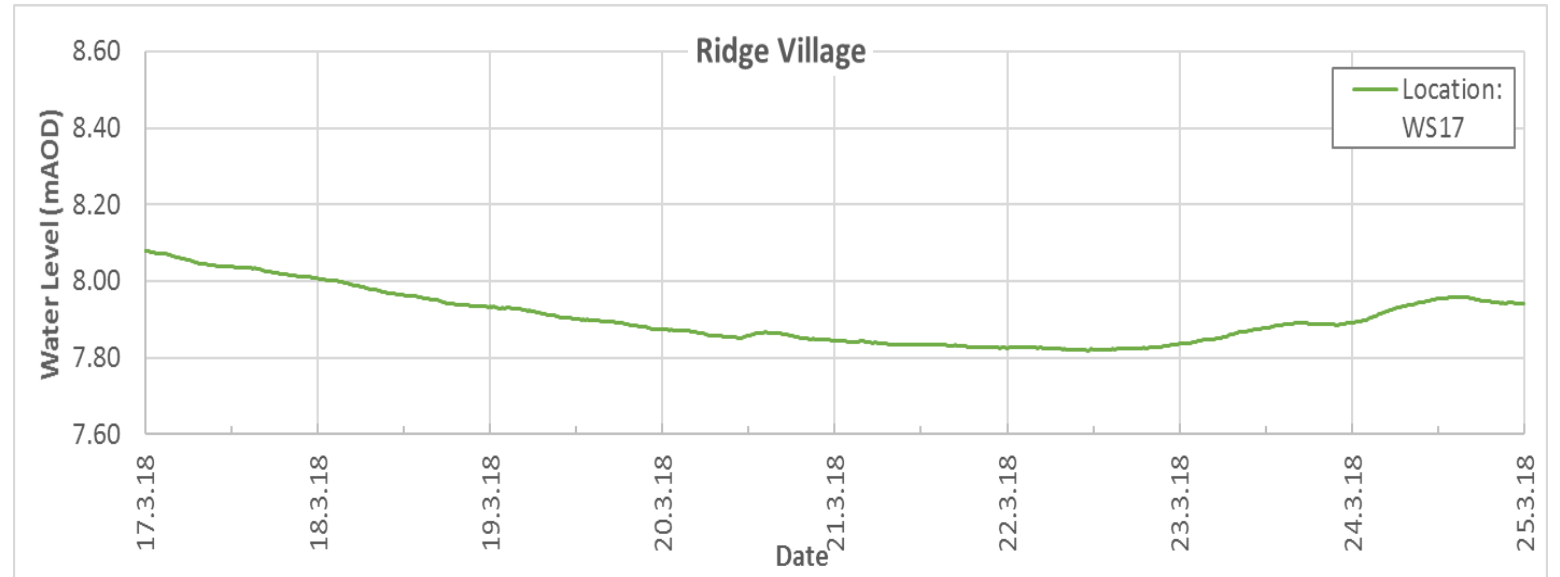
Groundwater response vs, tidal cycles

Spring and neap tidal cycles exert no apparent pattern of response in the well hydrograph



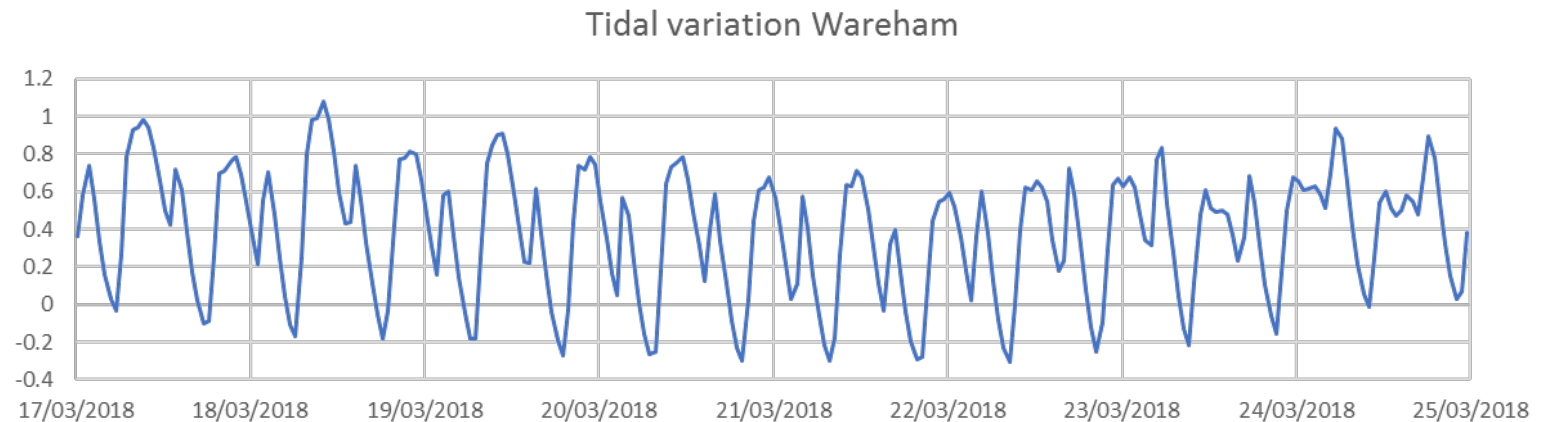
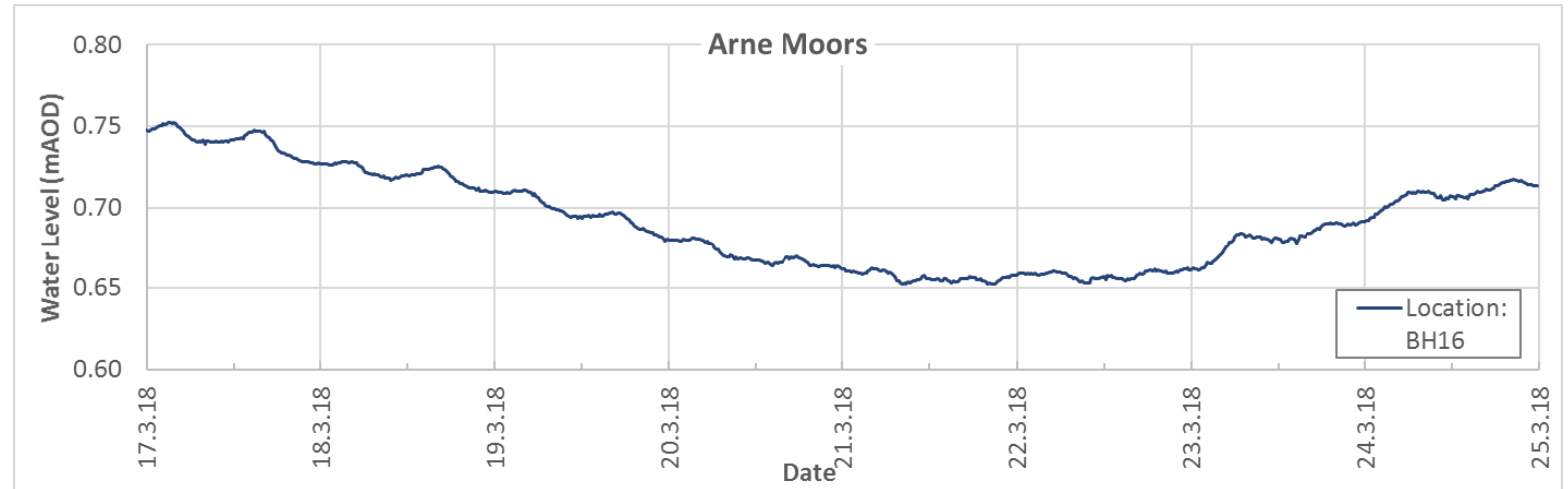
# Ground Investigation - well hydrographs- detail (one week of data)

- Is there a diurnal influence at Ridge
- Wareham tidal range typically 1- 1.2m
- No evident tidal effect at Ridge WS17



# Ground Investigation - well hydrographs- detail (one week)

- Is there a tidal effect further on to Arne Moor?
- Possible minor tidal effect (1- 2 cm?) at BH16
- Relationship appears to be inverse (i.e. a tidal low results in an increase in water level)
- This is suggestive of a pressure response not direct connectivity
- BH16 close to tidal channel/ harbour
- Response zone at 2-4m depth in “upper aquifer”



# Ground Investigation - well hydrographs- detail (one week – Arne Moor)

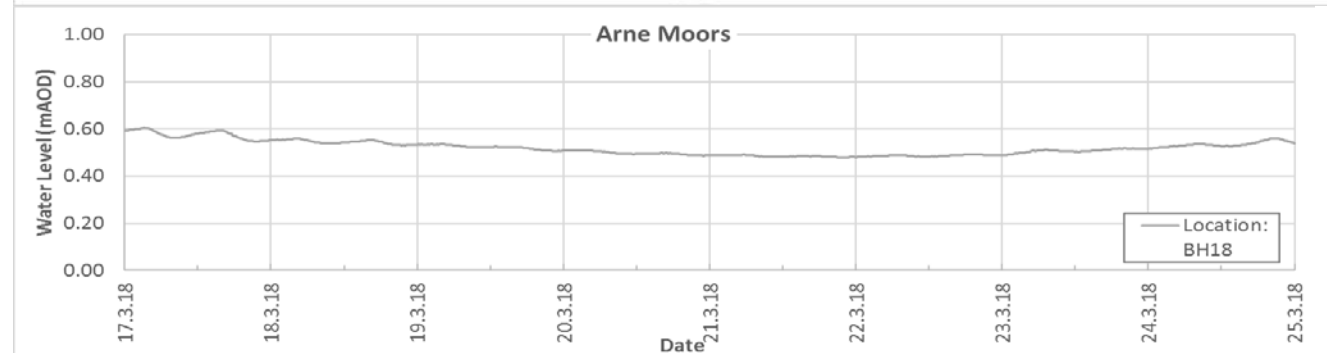
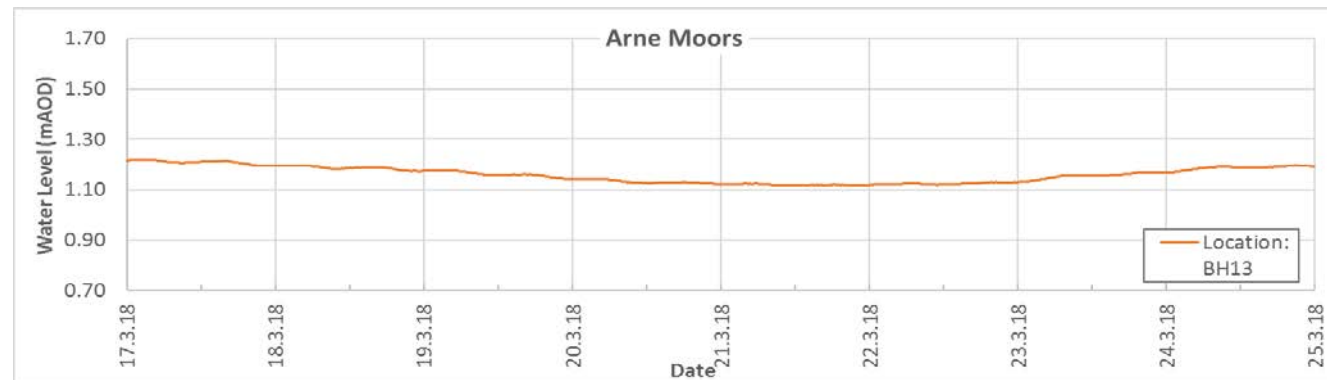
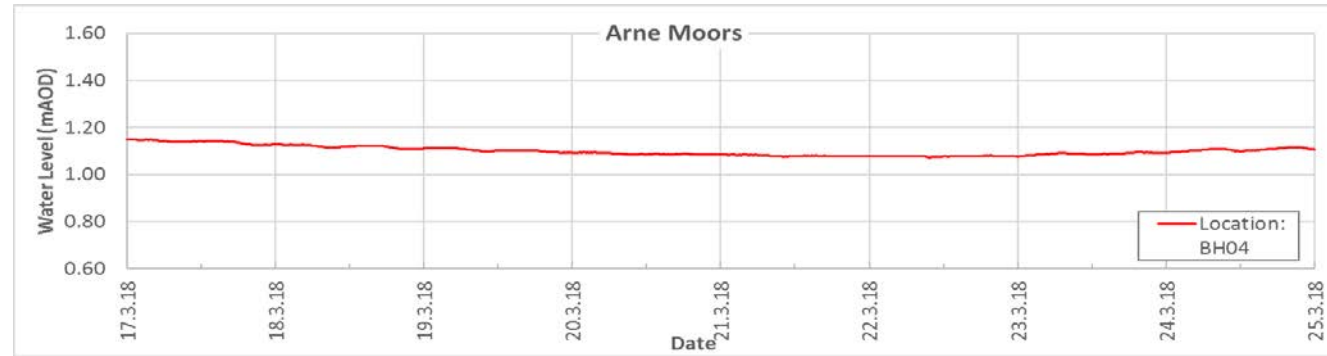
- Is there a tidal effect elsewhere on Arne Moor?
- Data over 1 week suggests little influence on any of the well hydrographs (vs a tidal range of 1- 1.2m)
- Response zones are:

BH 04            0.5-9.5m

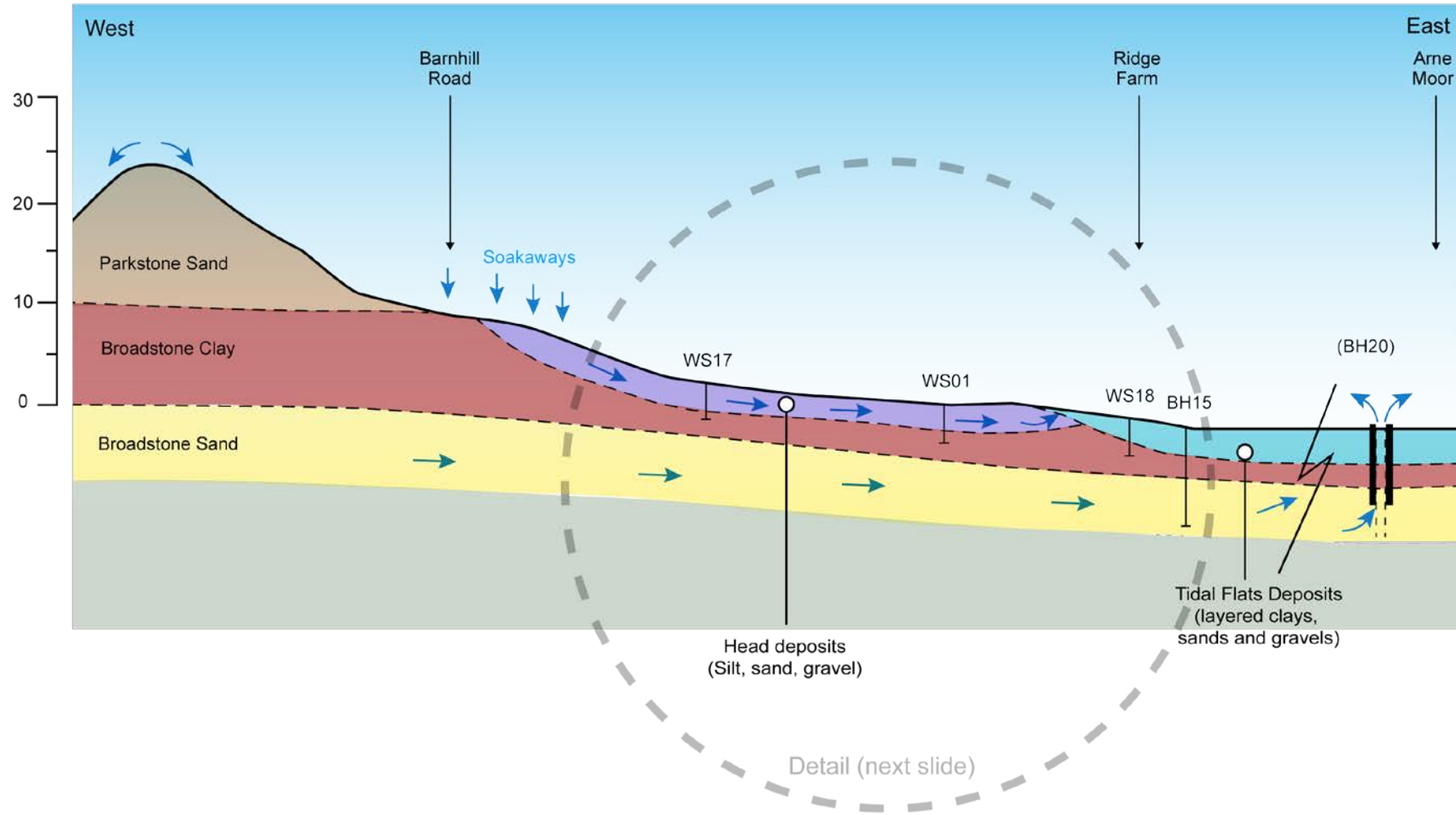
BH 13            1.5 – 10m

BH 18            3.5 – 9m

Note: All these are in the “lower” aquifer. A separate upper aquifer does not occur in these locations

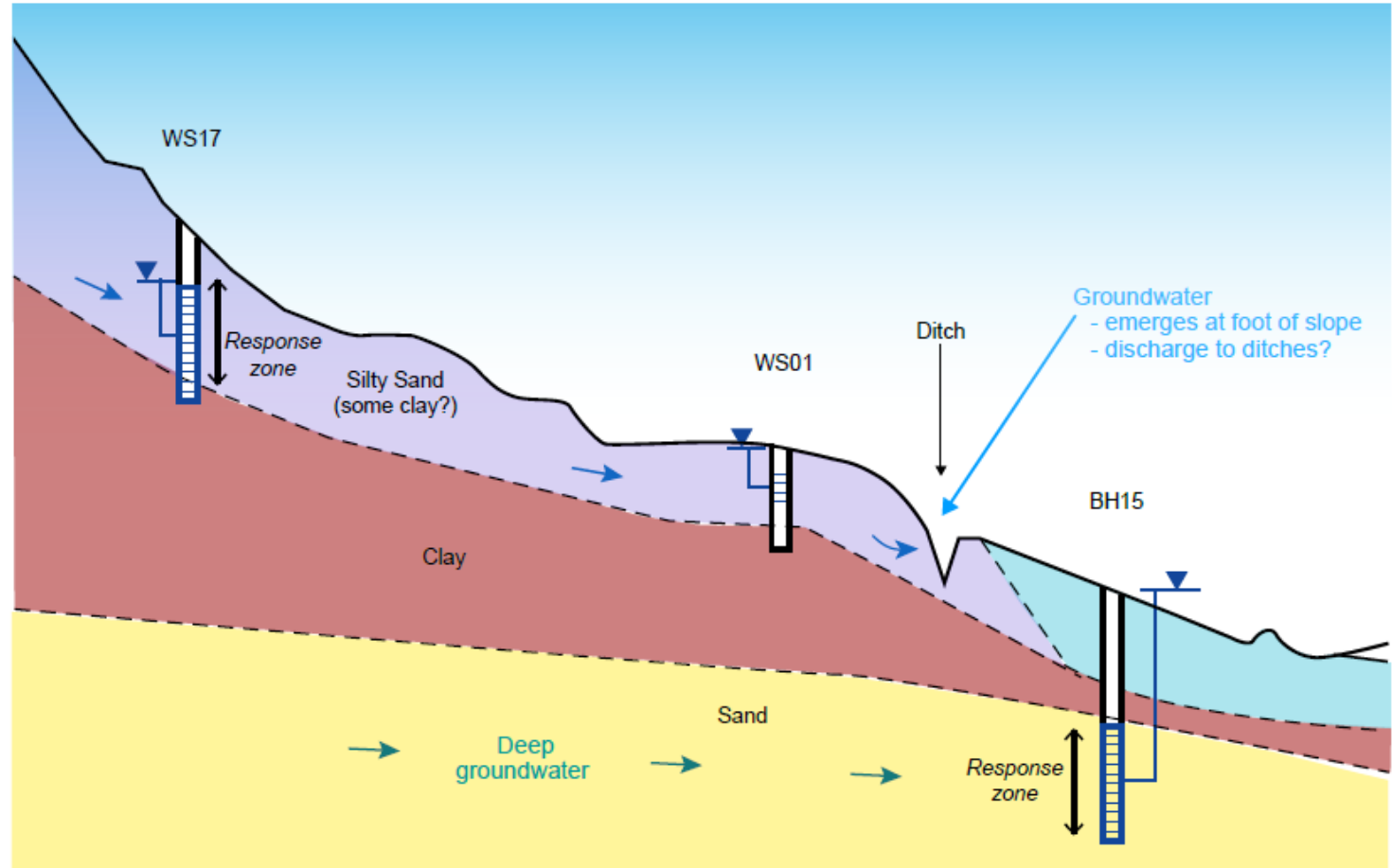


# Initial conceptual understanding section (schematic)



# Schematic- detail

We are examining this understanding, gathering more detailed information on the groundwater regime





# Summary (1)

- Our investigations at Ridge are ongoing, these are preliminary findings only
- The geology beneath Ridge broadly comprises a layered system of superficial “Head” deposits overlying Broadstone Clay of the Poole Formation, in turn overlying Broadston sand
- Younger units (Parkstone Sand Member) of the Poole Formation are exposed in the high ground West of Ridge village
- Beneath Arne Moors, layered geological systems also occur comprising near surface superficial deposits of Tidal Flat deposits (both clays and sands/ gravels), with some peat further into the Moor
- Poole Formation strata (Broadstone Clay over Broadstone/ Oakdale Sands) occur beneath the superficial deposits beneath Arne Moors

# Summary (2)

- Groundwater beneath Ridge is locally recharged by rainfall, flow from the higher ground, soakaways and possibly leaking drainage
- Groundwater occurs in the superficial deposits of “Head” at shallow depth
- Its downward movement is constrained by layers of clay and it tends to move laterally, perhaps discharging at the foot of slopes (e.g. to the north where) it may be collected by surface drains
- Connectivity with the deeper aquifer beneath Ridge is limited by the underlying Broadstone Clay



# Summary (3)

- Groundwater monitoring at Ridge shows groundwater at shallow depth, with a rapid response to rainfall recharge
- Groundwater beneath Arne Moors, in part, comprises a two layer system (upper, lower) separated by clay and/or peat
- The lower (Broadstone sand) aquifer, confined by the overlying clay is “pressurised” from regional recharge
- When penetrated by boreholes the groundwater rises, sometimes to above the surface (artesian conditions)
- The groundwater response of both upper and lower aquifers beneath Arne Moors is markedly more muted than the response at Ridge
- There is currently no significant evidence to suggest that groundwater beneath Ridge is hydraulically “connected” to groundwater beneath Arne Moors
- We are gathering further evidence (continued monitoring with loggers, water quality data etc.) to further clarify our understanding of the groundwater and drainage regime

Thank You

Mike Barker

Principal Hydrogeologist



**JACOBS**<sup>®</sup>

**ch2m**<sup>®</sup>