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Integrity Independence Innovation

A Zonal Approach to Foundation Design
[we need to talk about the soil...]

Foundation Ex
Bristol
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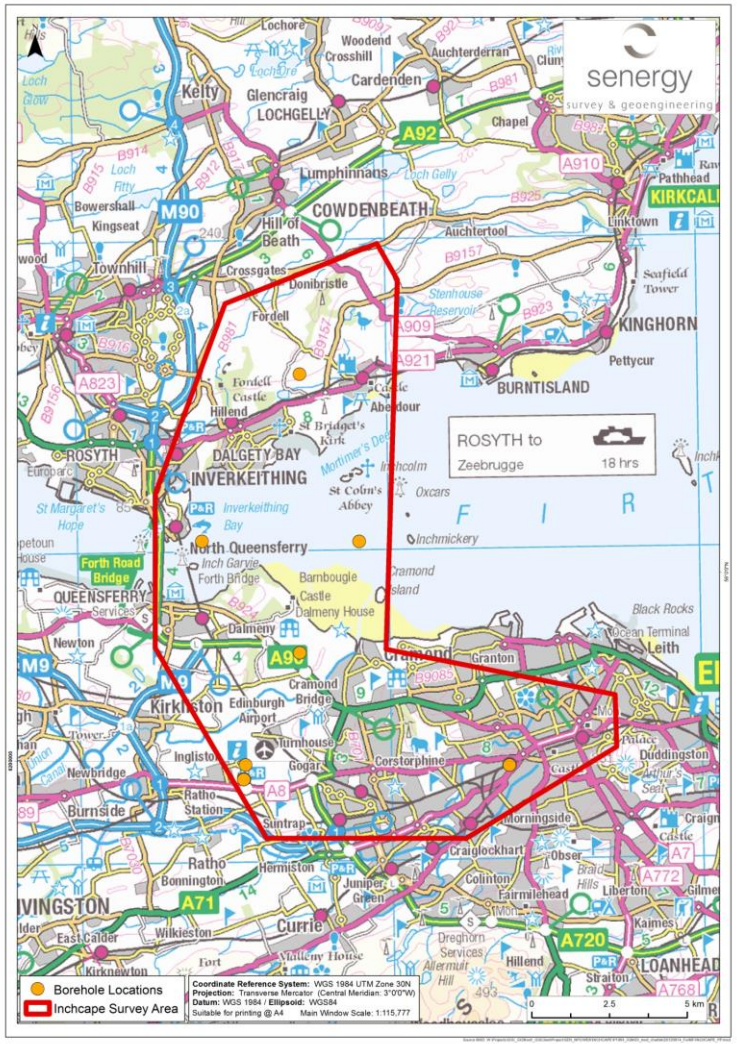
GBP 39.65/MWh

Challenges to cost reduction

- Very large development areas
- Site Investigation data is expensive
- Early expenditure is ‘at risk’
- Is your layout fixed when you start? (Probably not)
- Do you need to do a survey to choose your concept – do you need another survey to optimize your concept?
- Availability of contractors
- Aggressive development Timelines
- Timing is everything – late ground data could be worse than no ground data…

Real risk or waste of money?

Offshore wind farms are big



Inch Cape = 150 km^2

Sofia = 593 km^2

We need to talk about the soil

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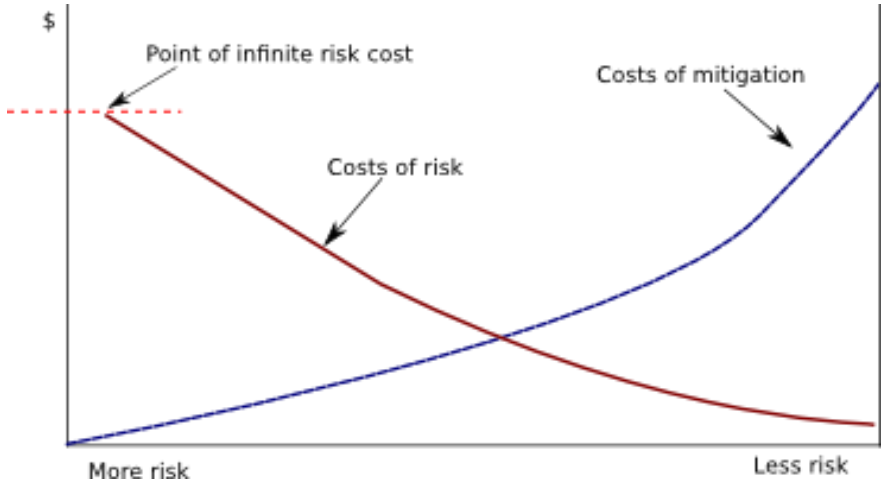
REDUCE COST

RISK

CONFIDENCE



SMARTER SURVEY!

Competing requirements

The Ground Model

"A ground model is a database of information that includes the structural geology, geomorphology, sedimentology, stratigraphy, geohazards and geotechnical properties of a site. Creation of a ground model is an industry standard approach to collating all available site information. This resource is used to identify all relevant unknowns and project hazards, to direct investigations and to inform the foundation design and installation methods for a field development."

".....The Ground Model is a key input to geotechnical design parameters for a site and to an understanding of how these may vary across a site. "

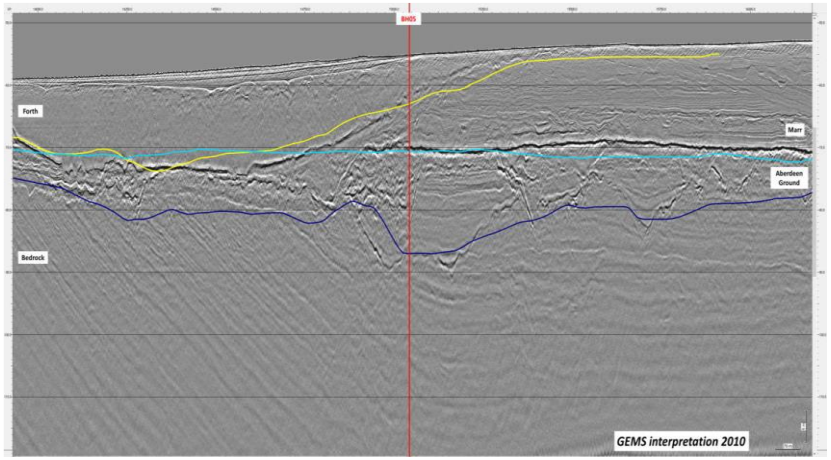
Guidance Notes for the Planning and execution of geophysical and geotechnical ground investigations for offshore renewable energy developments. SUT Offshore Site Investigation and Geotechnics 2014 (currently under review)

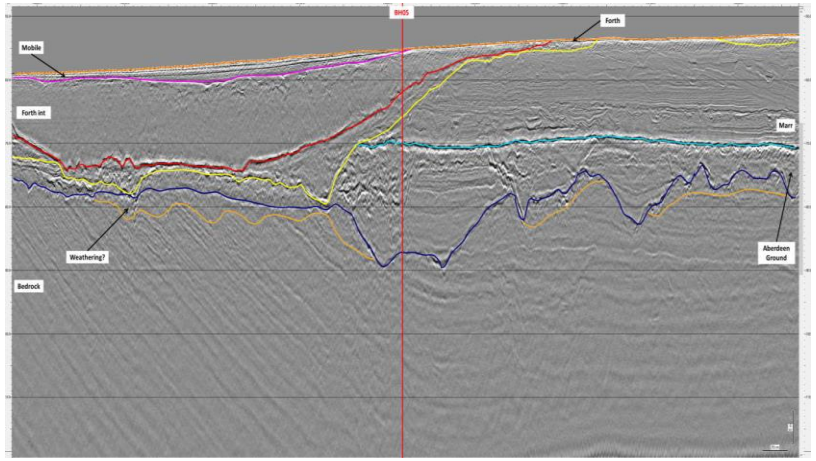
- Starts as a desk top study - what should you really worry about?
- Develops with the project
- Iterative process – confidence increases with more data.
- Used to define site investigation strategy - focus?

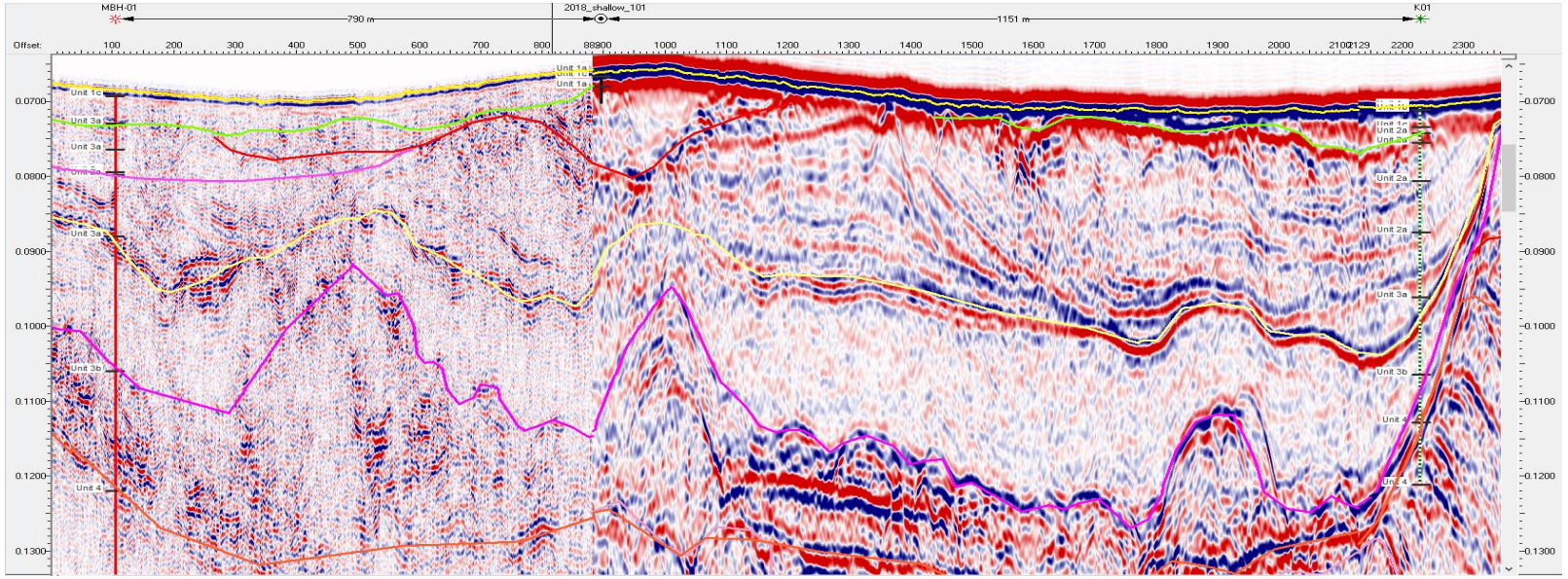
Geophysics (2D and/or 3D??)

- Large spatial coverage (site wide?)
- Traditionally 2D on widely spaced lines
- New techniques achieving higher resolution
- Takes a comparably long time to process and interpret data
- The right specification , the right people, the right supervision
- Use to validate / refine the ground model
- Use to optimize your expensive (and hard to get) boreholes

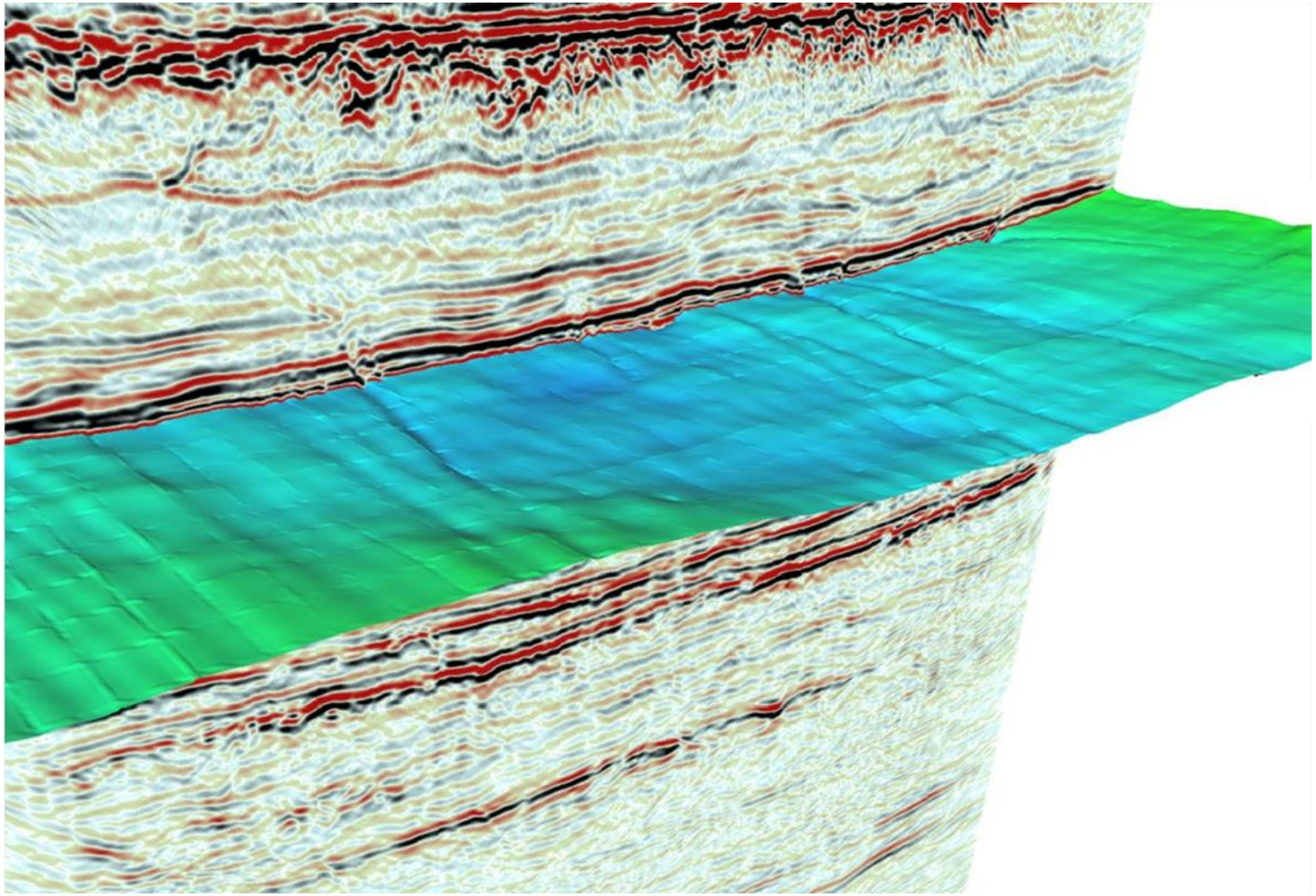
Geophysics (2D and/or 3D??)







3D UHR –Future-proofing the model?



Ground Investigations

- Boreholes to an optimum depth
- Once your concept is defined, this is relatively easy to agree on
- Specify the right survey (easy to do right, even easier to get wrong)
- Get designer buy-in (but make sure your goals are aligned)
- Update the Ground Model
- Do you **really** need a borehole at each WTG location?

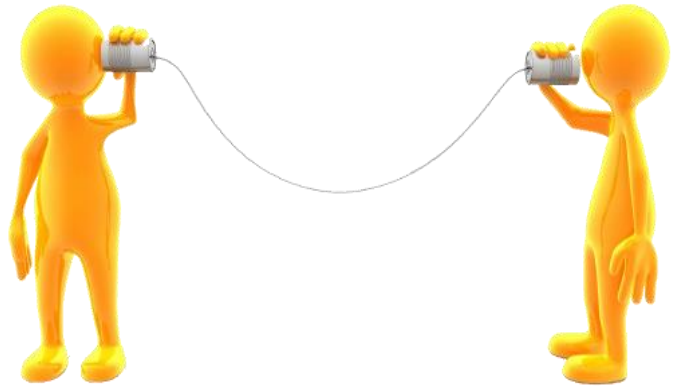
Some home truths

- Good site surveys are expensive, time consuming and difficult to perform – but getting it wrong is easy and can be massively expensive
- Layout changes can impact confidence in soils data
- Not all contractors and vessels are equal
- Don’t let your bad planning dictate your contractor
- Do the survey you want to do – not the one your (available) contractor wants to do/can do

Conclusions

- Getting good quality soils data is expensive and time consuming so need to get it right!
- Should be viewed as a smart investment
- A phased approach with suitable time to analyse and optimise
- Look to futureproof your soils data
- We can do our bit but don't forget -

Soils Matter……

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