

# Developing the world's largest offshore wind project: Dogger Bank

Lee Clarke, General Manager Forewind

SNS 2013 | The Sea of Opportunity

Norwich, 6 Mar 2013



- Forewind is a consortium of leading energy companies: RWE, SSE, Statkraft, Statoil
- Forewind is committed to securing all necessary consents required for the construction and development of safe, economically viable offshore wind capacity on Dogger Bank.



### Dogger Bank key facts:

- Capacity: 7.2GW (first six projects)
- Area: 8660km<sup>2</sup>, largest zone, equivalent size to North Yorkshire.
- Distance: 125-290 km from shore.
- Depth: 18-63 m; c.4 GW in <30m water depth, c.8 GW in <35m water depth; shallow compared with other Round 3 zones.
- Wind: High wind speeds of >10 m/s average wind speed across the zone.
- History: A "dogger" was a type of Dutch fishing boat that commonly worked in the North Sea in the seventeenth century.

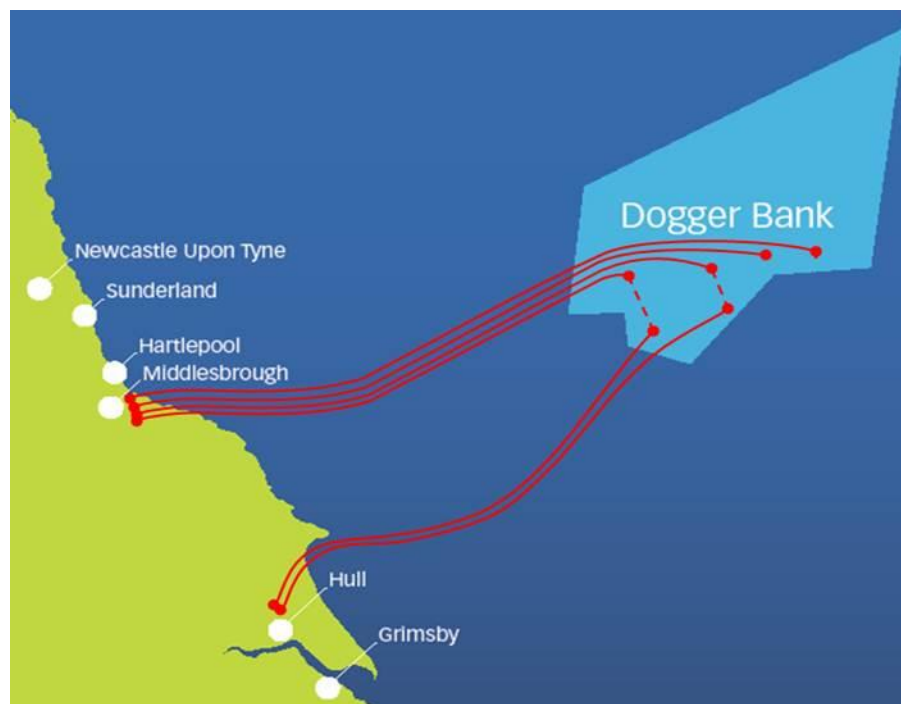
# Approach to consenting

- There is always time to work safely!
- Zone appraisal
- Stakeholder engagement
- World-class data collection and interpretation
- Firm grid connection locations
- Community consultation
- Industry-leading wind-farm design and optimisation tools
- Combined consents
  
- Forewind is able to draw on the strengths of its parent companies – combining extensive international experience of offshore project delivery and renewables development, construction, asset management and operations, with utility expertise spanning the complete power value chain.



- Each Dogger Bank project up to 1.2 GW offshore, linked to National Grid via 1GW connections.
- Dogger Bank Creyke Beck A&B  
Forewind's first two projects, connection near Cottingham, East Yorkshire – planning application expected this summer.
- Dogger Bank Teesside A&B  
Connecting at Lackenby on Teesside – planning application expected spring 2014.
- Dogger Bank Teesside C&D  
Two further projects also connecting on Teesside – planned for submission one year after Teesside A&B.
- Zone appraisal work has identified the possibility for up to eight projects, with a total capacity over 9 GW.

Project	Connection point	Connection date
Creyke Beck A	Creyke Beck, Yorkshire	Apr 2016 / 2017
Teesside A	Lackenby, Teesside	Apr 2017
Teesside B	Lackenby, Teesside	Apr 2018
Creyke Beck B	Creyke Beck, Yorkshire	Apr 2019
Teesside C	Tod Point, Teesside	Apr 2019
Teesside D	Tod Point, Teesside	Apr 2020



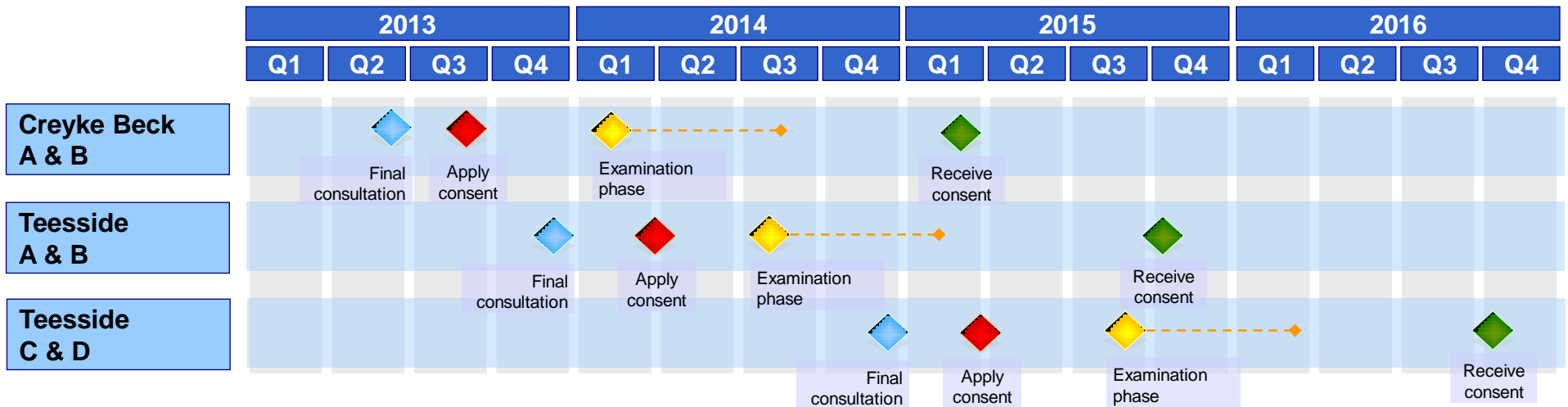
Forewind has secured the best available grid connection points for 6 GW of capacity.

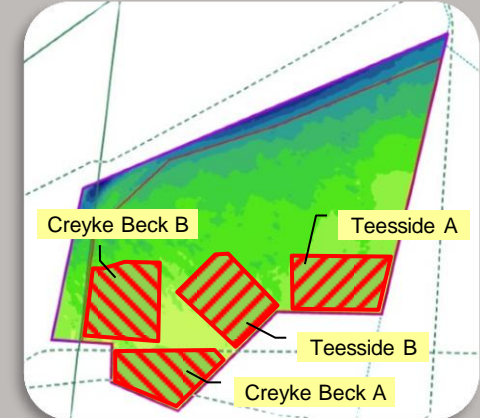
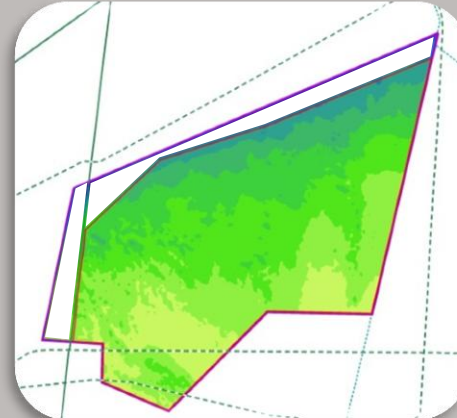
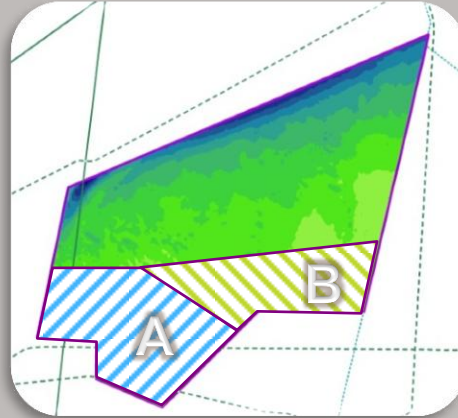
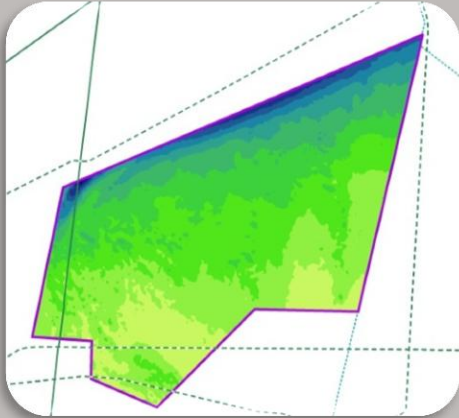
# Consenting timetable

- Each Dogger Bank project is a Nationally Significant Infrastructure Project (NSIP).
- Development Consent Order (DCO) applications include onshore and offshore aspects.
- Examined by The Planning Inspectorate.
- Determined by the relevant Secretary of State, currently Department of Energy & Climate Change (DECC).
- Stakeholder consultation, key element of development process.



*Ed Davey, Secretary of State for Energy & Climate Change*





## Zone

- Coarse zone-wide surveys.
- Zone appraisal workshops with stakeholders at start of programme.
- Consent “heat map” and hard constraints identified.
- Relative cost of energy crudely modelled.

## Survey tranches

- Most promising areas prioritised for detailed surveying; first area “A” then “B”.
- Onshore grid connections agreed.
- Cable routes to shore identified, starting with reconnaissance survey grids.

## Developable area

- Area of high fishing intensity, bird density, and more complicated geology to west of Zone excluded.
- Deeper water, with slope habitat to north of Zone excluded.

## Project areas

- Narrowing down from zone to tranche to specific project areas.
- Based on detailed environmental assessment and detailed wind resource modelling.
- Stakeholder engagement and consultation throughout.



## Ornithology and Marine Mammals

- Boat-based and aerial surveys since 2010 - more than two years of survey data will have been acquired.
- Boat: 2400 line km per month
- Aerial: several days per month, two aircraft (on-going)

## Geophysics

- Coarse zone wide survey – 7,000 line km covering 8,660 km<sup>2</sup>.
- Detailed survey, two campaigns – 40,000 line km (covering 3,500 km<sup>2</sup>).
- Cable corridor surveys to Yorkshire and Teesside.
- Next tranche of surveying (for Projects 5 & 6) to commence in 2013.

## Geotechnical

- 84 boreholes and 174 cone penetration tests over three separate campaigns.
- Dedicated investigation of seismic anomalies.
- Sophisticated geological modelling (with British Geological Survey and Norwegian Geotechnical Institute).

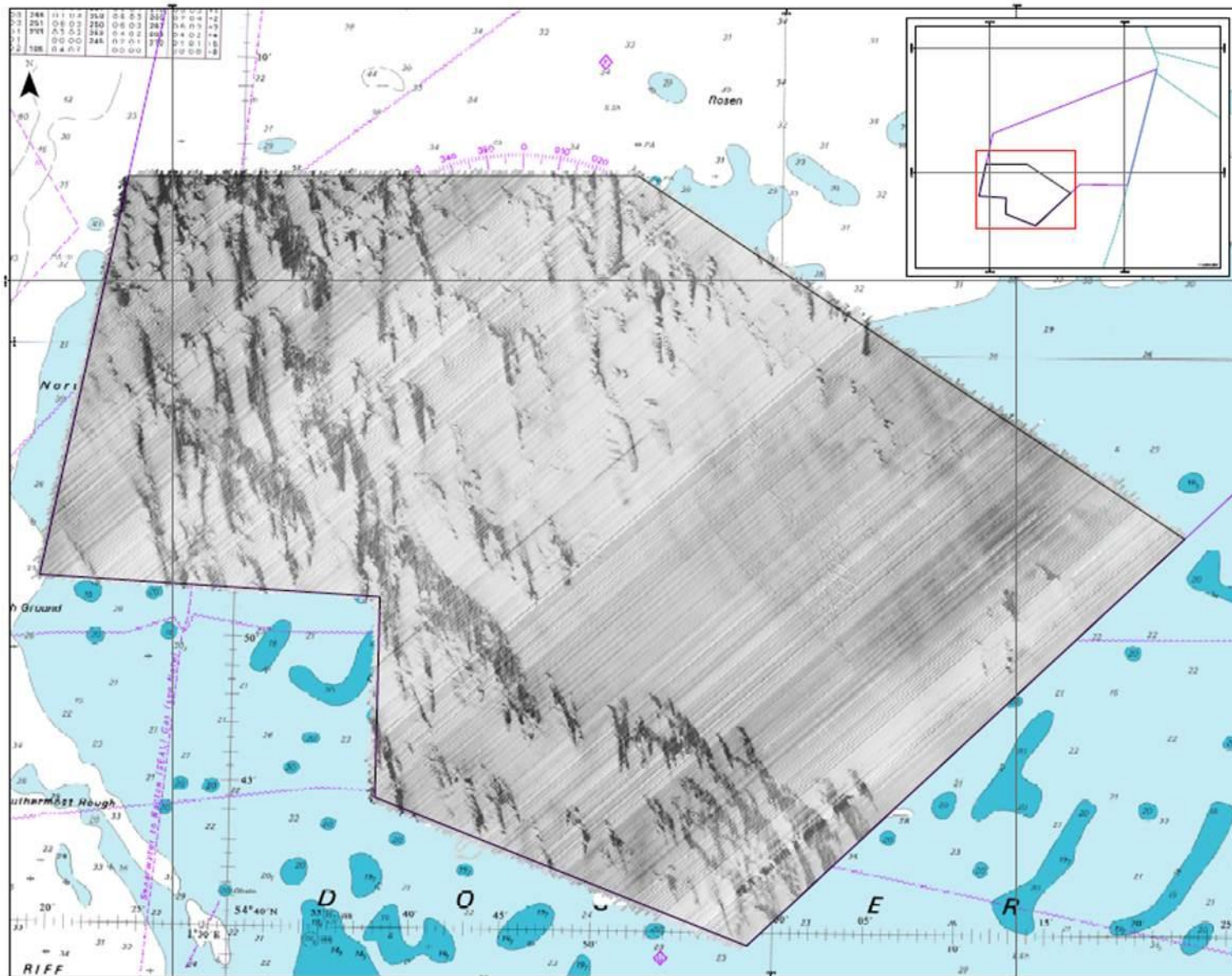
## Benthic

- 106 camera sites, 103 macrofaunal sampling sites, 15 chemical sampling sites in first season.
- 82 camera sites, 44 macrofaunal sampling sites, 6 chemical sampling sites on Yorkshire cable route.
- Similar campaign season for Teesside 2012.
- Multiple fish surveys, both zone and cable routes.

## Met ocean

- Two buoys to acquire oceanographic and meteorological data installed Autumn 2010.
- LIDAR installed on RWE Cavendish platform, Summer 2011.
- Acoustic doppler current profiler (ADCP) installed.
- Two innovative met masts currently being installed.

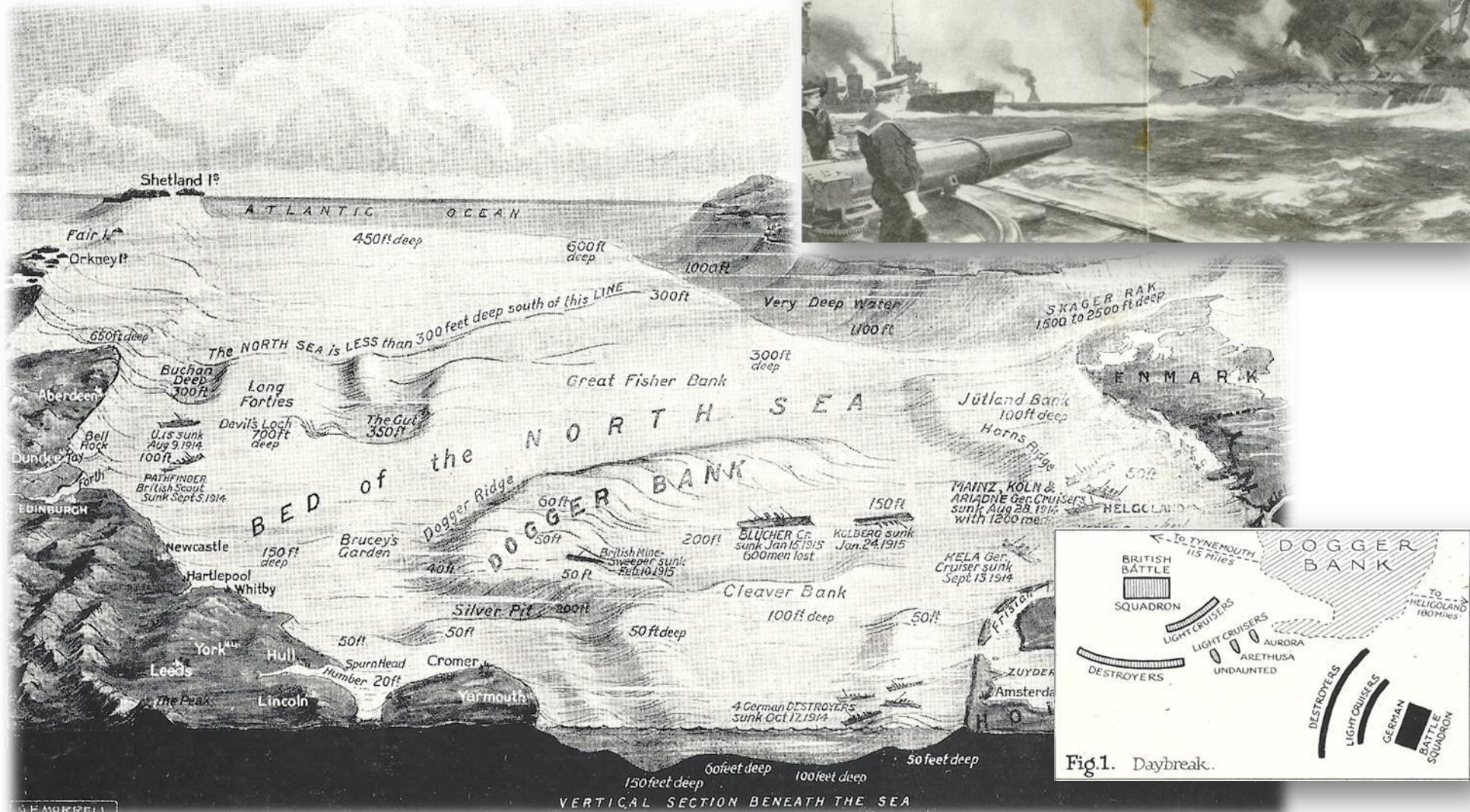
# Unparalleled data: side scan sonar





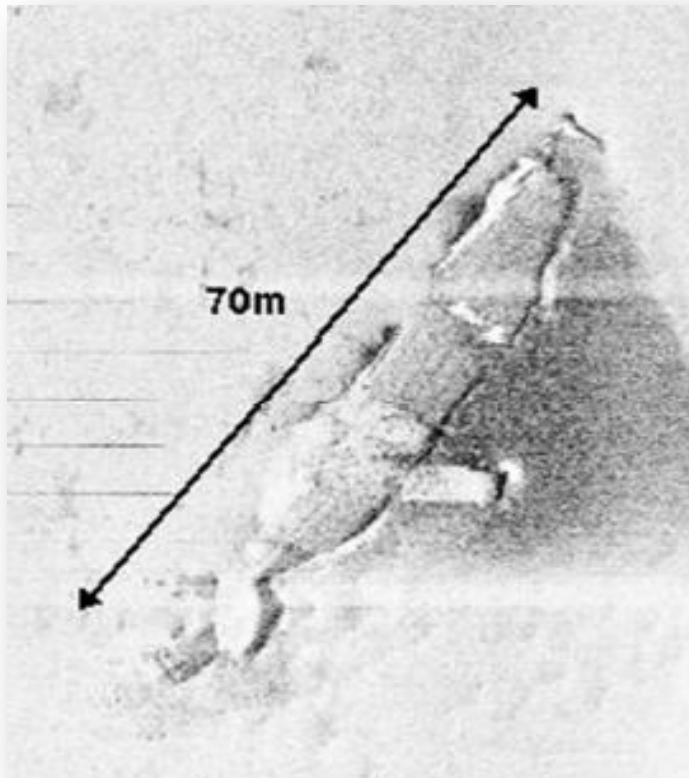
# Cultural heritage – battles and wrecks (1916)

THE GRAPHIC, FEBRUARY 19, 1916

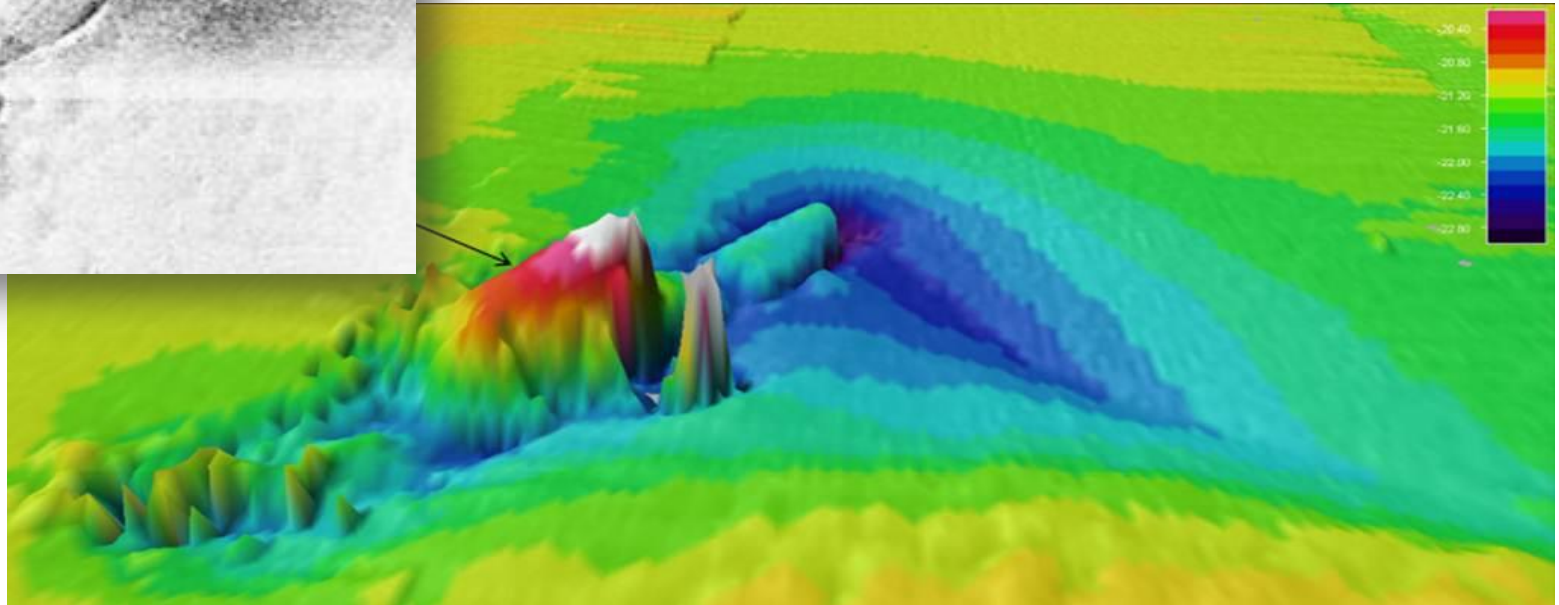


A pictorial plan of the bed of the North Sea, showing the submerged range of hills known as the Dogger Bank, which figured prominently in the war.

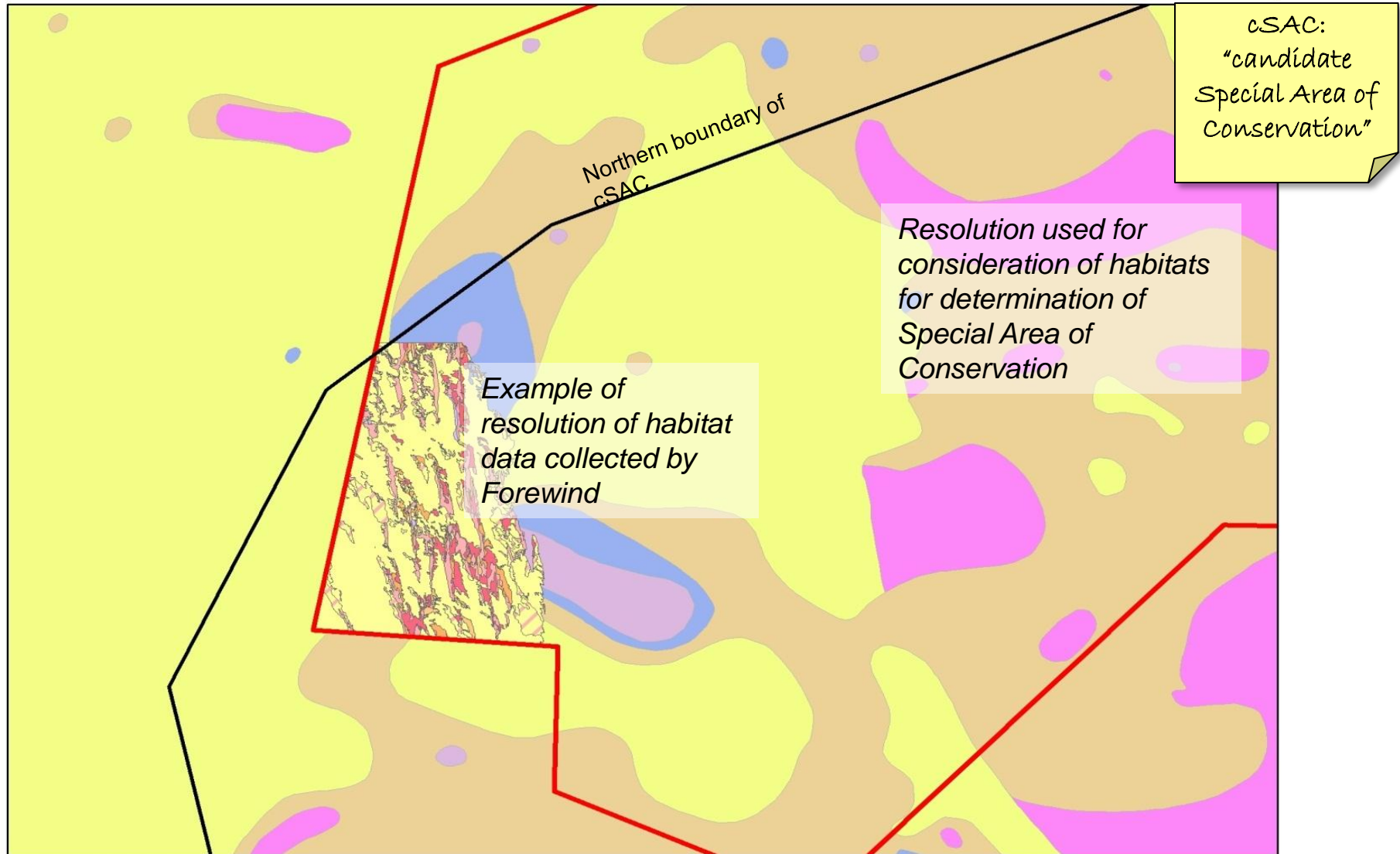
# Unparalleled data: unidentified wrecks

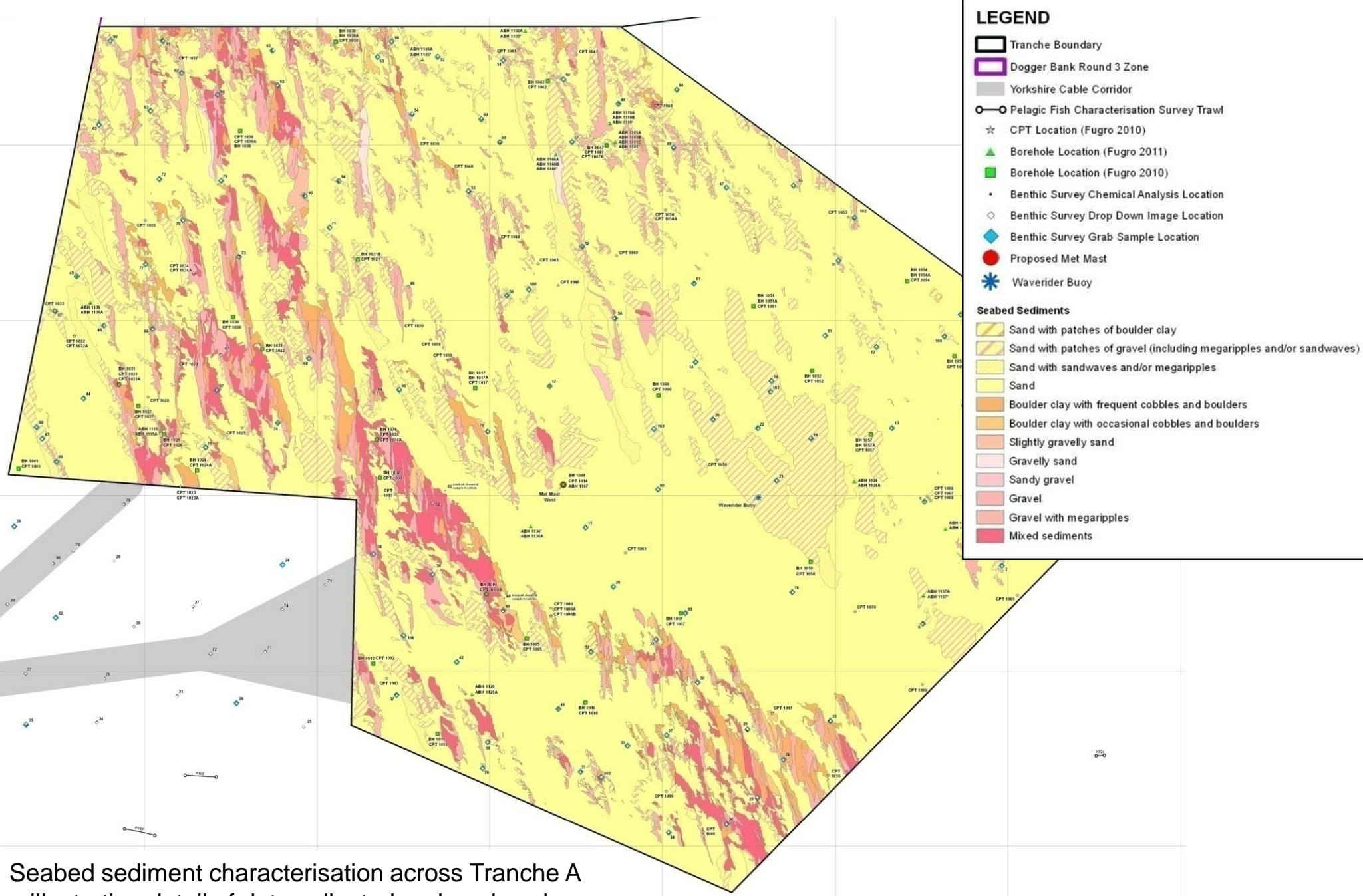


*Possibly the wreck of German submarine, U66, although it was reported sinking NNW of this position.*



# Unparalleled data: cSAC base data compared with new data





Seabed sediment characterisation across Tranche A – illustrating detail of data collected and analysed

# Unparalleled data: birds and marine mammals



MV Vigilant, survey vessel (Gardline)

- Probably the largest marine bird and mammal survey ever!
- Over 2½ years of boat-based surveying.
- Cutting edge high-definition aerial surveying; on-going.

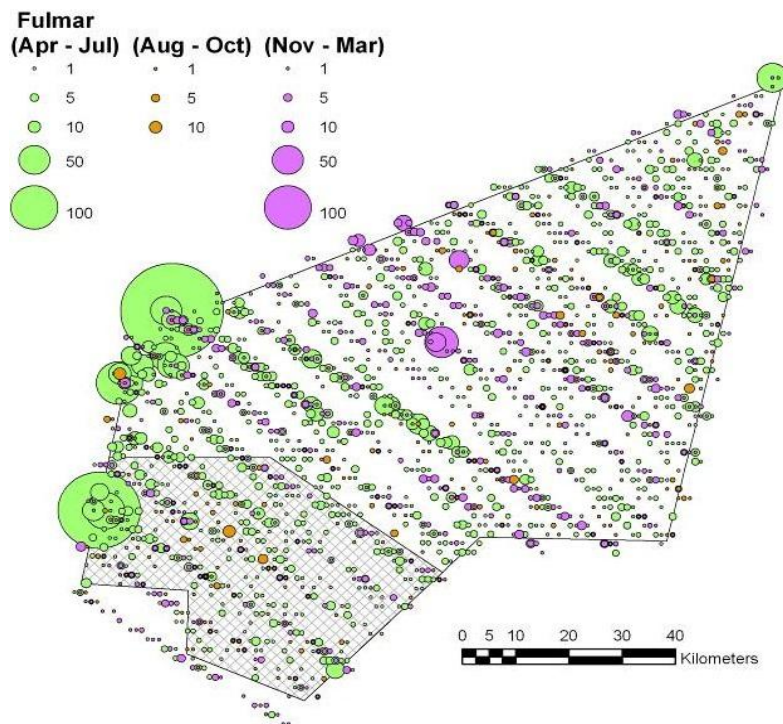


Kittiwake, most common bird recorded



Forewind ornithologist on vessel

## Example bird distribution plot:



White-beaked dolphin



Surveys by air (HiDef Aerial Surveying Ltd)



Minke whale

- Relevant aspects of the project must be described for environmental assessment. The consenting approach to be used by Forewind is called a “Rochdale Envelope”.
- Range of options described – final project must build within that “envelope”.
- Assess “realistic worst case” assumptions - intended to cover anything the shareholders might want to build, but not too conservative as this would increase consent risks.



## **Project description overview:**

Offshore project components (one project):

- Capacity up to 1200MW
- Up to 300 turbines
- 1 to 4 AC collector substations
- 1 DC converter substation
- Up to 2 accommodation or helicopter platforms
- Up to 5 met masts
- Up to 10 vessel mooring buoys
- Minimum construction duration 3 years
- Maximum construction duration 6 years

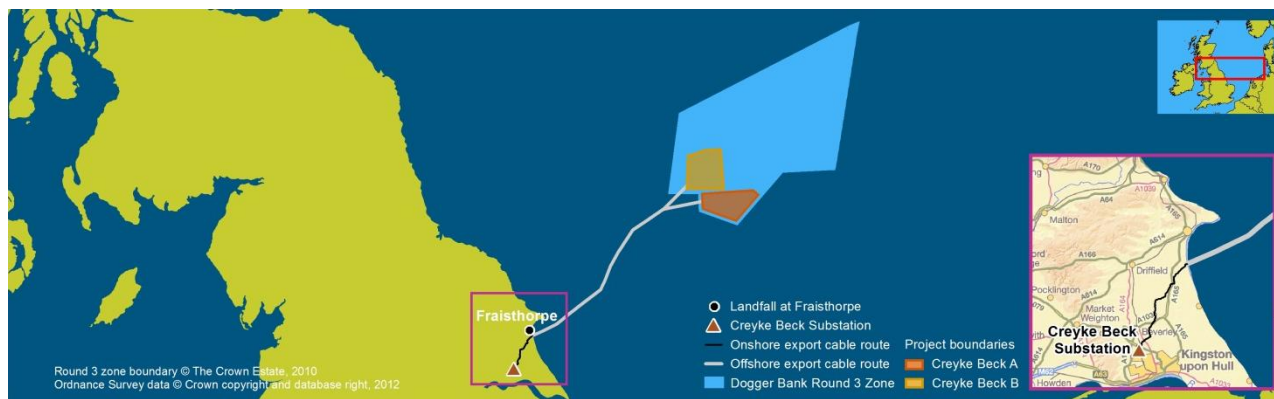
Cumulative impact assumptions:

- Up to 6 projects in construction simultaneously
- Up to 8 piling rigs in operation simultaneously
- Maximum zonal construction duration 20 years



- Forewind, in partnership with HETA, has developed an innovative careers education engagement programme called Champions for Wind.
- Raising awareness amongst teenagers about potential careers in offshore wind energy.
- Excellent results from first phase, launched in Yorkshire, tangible increase in knowledge of offshore wind industry amongst both teachers and the 600 students involved to date.
- New programme recently kicked-off in Teesside, with a further 900 students involved in the coming school year.
- Forewind aims to meet the needs of local community, whilst also supporting the wind industry – boosting the number of motivated young people entering the sector.

# Summary of progress: Dogger Bank Creyke Beck A&B



- Good progress on first two projects.
- On-track for final round of consultation in April 2013.
- All environmental surveys and draft environmental statement completed – impact assessment finished, subject to feedback from consultation.
- Submission of planning application and development consent order scheduled for end-August.

Date	Activity
Q4 2011	First stage of statutory consultation
2011 - 2012	Environmental surveys and reporting
Q2 2013	Second stage of statutory consultation
Aug 2013	Submit applications for development consent order(s)
2015 - 2017	Pre-construction phase
2016 - 2021	Construction
2017 onwards	Operation



# Summary of progress: Dogger Bank Teesside A&B



Date	Activity
Q2 2012	First stage of statutory consultation
2012 - 2013	Environmental surveys and reporting
Q3 2013	Second stage of statutory consultation
Q1 2014	Submit applications for development consent order(s)
2015 - 2017	Pre-construction phase
2016 - 2021	Construction
2017 onwards	Operation

- Lessons from Creyke Beck project incorporated.
- Scoping consultation completed.
- Environmental surveys, onshore and offshore well underway. Impact assessment work started.
- Consultation with statutory bodies on-going. Community stakeholder discussions commencing.
- Final consultation phase in Q3 2013.
- Submission of planning application and development consent order scheduled for end-March 2014.



- Forewind exists to achieve development consent for Dogger Bank projects. Our expertise is taking projects through this early phase.
- Despite the tough economic climate, in partnership with the Crown Estate, shareholders have to date already invested over £70m developing the Zone.
- Each Dogger Bank project will require a massive investment, in the order of £3bn – £4bn.
- Forewind's shareholder companies will each take the role of lead operator, guiding individual projects once consent is received, to financial close and then into construction and operation.
  
- Britain is a world leader in offshore wind, but the future will depend in part on Government energy policy and partly on cost reductions.
- Forewind is playing its part by making sure we plan and consent the most viable projects we can for Dogger Bank – projects that will be safe, have low environmental impact, and are economic.