JET Connectivity Scotland Marine Licence Application for Moorings Supporting Information

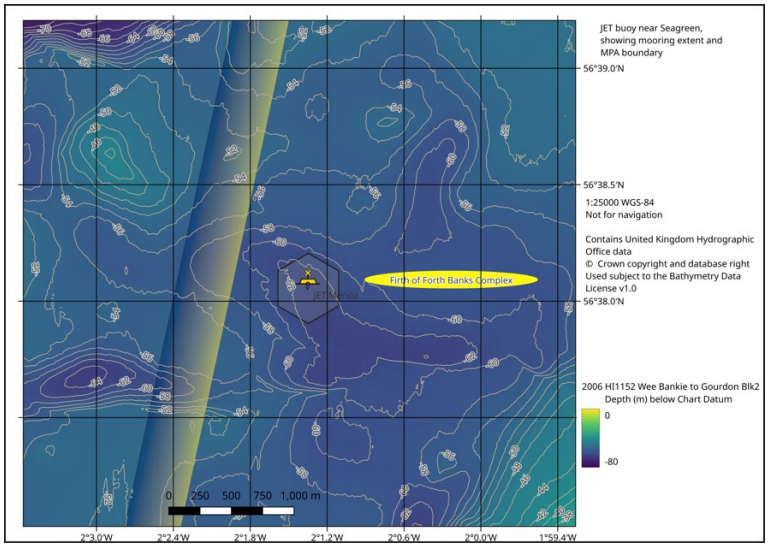
Background Project Information

This project builds upon JET Engineering System Solutions (JET-ESS) existing 5G buoy technologies and capabilities to develop a first-of-kind deployable multi-sensor 5G floating network to the offshore wind sector, enabling high-speed communications and integrated edge-processing multi-sensor payloads. This project aims to deliver a deployable linear multi-hop network, enabling multi-dimensional situational awareness and communication channels at sea, to fast-track the assessment and installation phases of wind farm development. The proposed buoy network fulfils the current market-pull in a previously unexploited avenue of offshore wind farm assessment and installation, removing the reliance on costly/slow satellite communication channels, manned vessels and aerial solutions.

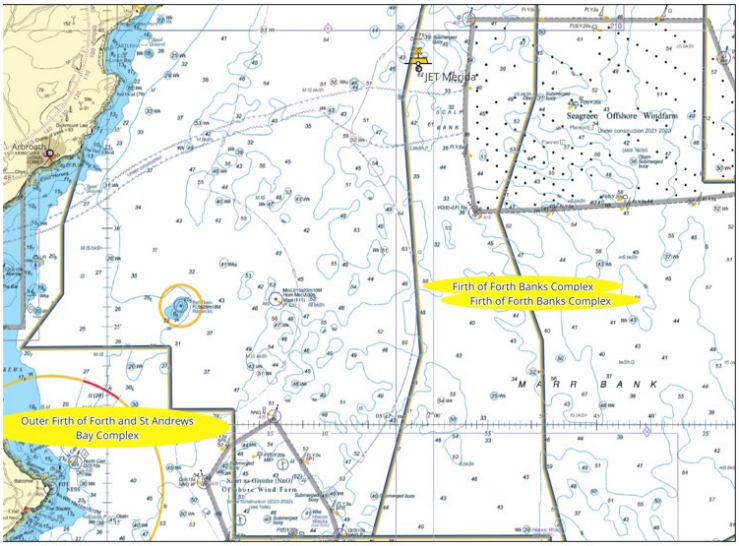
Buoy Location and Supporting Maps

The deployment system will consist of 3 Anchors and associated Chains, which will connect in 3 places (one to each Floatation Vessel) and will reside within the polygon of coordinates surrounding the Buoy position. The approx. co-ordinates are provided in the application.

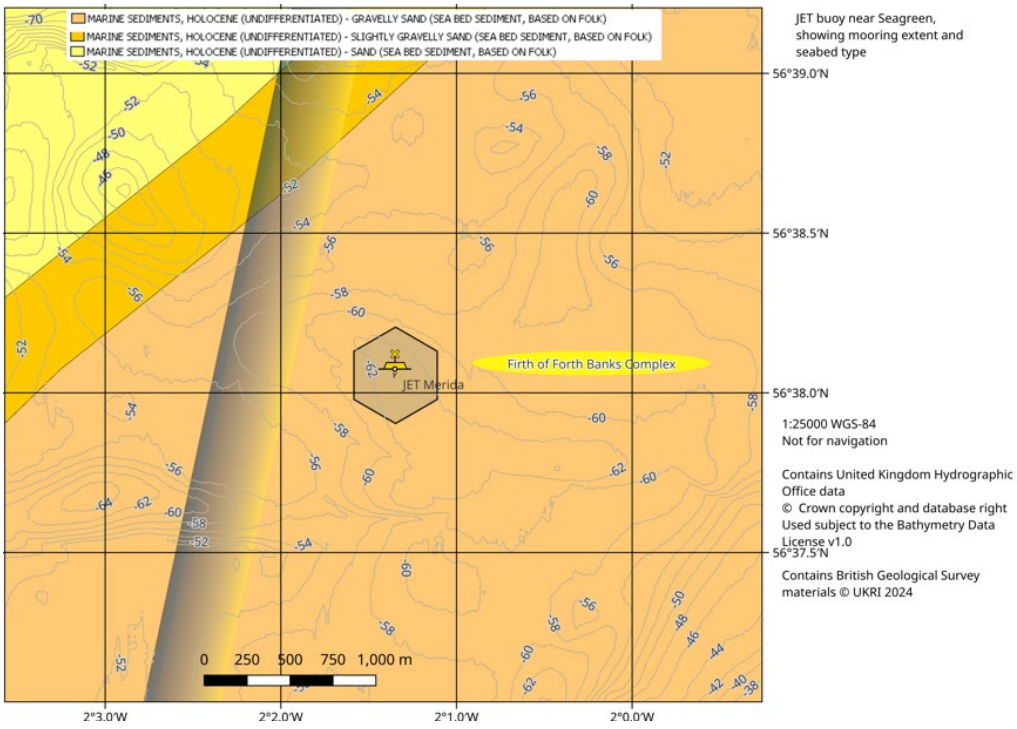
Given our location approx. 24km offshore, we believe the following maps are useful for section 5(g) of the application.



Small-scale chart extract to show relationship to shore, nearby ports and the Seagreen windfarm. Also shows the Firth of Forth Banks complex MPA.



Detailed site map, using Hydrographic Office bathymetry to show the extent of the mooring system in relation to the undersea topography, and the distance to the MP boundary. (Contours derived by JET).



Site map overlaid onto BGS seabed sediment data.

Our location is chosen based on these considerations:

- As close as possible to some part of western edge of the Seagreen windfarm (for reasons related to the 5G radio signal)
- In shallower water, to simplify the mooring and to reduce the area of seabed potentially affected by the mooring.
- Not to impede any fishing activity from local fisherman.

Scotland Marine Plan Considerations – Offshore Waters

All policies of the Scotland Marine Plan have been considered and only applicable policies have been referenced and commented on as per below:

- 7. Aquaculture
- 11. Offshore Wind and Marine Renewable Energy
- 13. Shipping, Ports, Harbours and Ferries

Use of Anti-Fouling Paint

The buoy is painted in a bright yellow anti-fouling paint so as to prevent the build of up of and marine life, in particular to avoid disruption to this marine life if and when the buoy is removed/moved.

Visibility from Nearest Shore

The unaided human eye can resolve objects 1 arc minute across. The buoy is 15m across the drum (max 1.5m asl) and 14m asl to the top mark. At the nearest point of land (Johnshaven, 24km away) the eye can just resolve objects 12m apart. Thus, persons 30m asl or higher would have a sea horizon that makes the top of the drums potentially visible - and 20/20 vision could see them. In most of the town and nearby beaches, only the container and panels would be above the horizon, and below the size to be see clearly (if at all).

Detection by Mariners

The primary method to deconflict fixed infrastructure and vessels is up to date charts, used skilfully in a vessel who knows her own position and course. In these ideal conditions, our buoy presents no hazard as long as it remains on station. The rest of this section considers how mariners can detect and avoid the buoy, without knowledge of location.

For mariners in daylight - crew seated in an open recreational or inshore fishing vessel might have an eye height of 1m asl - so a sea horizon at 3.6km. The base of the (bright yellow) container is 2.9m asl (horizon 6km), with the dark solar panels (3.5m wide) above. At 8km the buoy reaches the limit of unaided human vision, and (in a flat sea) would also be fully visible above the horizon. It's reasonable to hope larger vessels would have binoculars to hand on the bridge - thus detecting the buoy at >3nm or 5.5 km (in good visibility) should be reliable, and this would be sufficient distance to alter course even in larger vessels. Thus, we consider detecting the buoy in fair visibility by day is low risk.

At night the buoy carries dual-redundant synchronised yellow warning lights 11m asl, each with a nominal 5nm range (and a sea horizon at 6.3nm). In favourable conditions they might be seen beyond 5nm. The lanterns can flash any of the standard patterns - Fl(5) Y.20s is the common pattern for special marks, and the nearest existing light with this pattern is over 9nm away inside the Seagreen wind farm. Thus, we consider unambiguous detection of the buoy at night in fair visibility is low risk.

In poor visibility the buoy structure is largely metal, with the container side (2.4x2.4m) having multiple corrugations. This will generate decent reflections for both S and X band radars - and a radar reflector can be added if needed. (We acknowledge many recreational vessels do not carry or always operate radar).

Most commercial and many recreational vessels will be carrying AIS receiving equipment - and the buoy will carry a class B+ (SOTDMA) AIS transponder, with its antenna at 10m asl. This should be received out to 10nm from the buoy The vessel name will end 'BUOY' - thus ensuring bridge personnel are aware this is a static object. We will notify the Hydrographic Office once deployment dates are confirmed also so maps can be updated.

Location Relative to Likely Navigation Tracks

The buoy's location is believed not to impede plausible navigation tracks for other vessels that have to navigate around the Seagreen wind farm. (All this section ignores vessels with business at or inside Seagreen.) As a key issue, MNP para 13.12 requires that nothing be done that might tempt shipping to move to English ports, and we consider our location meets this key issue. Most routes do not approach the buoy or are already constrained by the Seagreen Windfarm.

Routes considered include:

Start	End	Notes
Kinnaird Head	Montrose, Tay ports	Likely to be W of the buoy
Kinnaird Head	Fife Ness for Forth ports	Likely to be W of the buoy
Kinnaird Head	Berwick and ports to the south	Likely to be E of Seagreen
Dundee	Stavanger, Kristiansand	Rounds the NW corner of Seagreen. Might need a minor deviation to round the buoy to its north.
Dundee	Gothenburg, Esbjerg	Stays S of Seagreen

There's no obvious reason why cargo traffic would route tight to the western edge of Seagreen.

We would suggest that the buoy is marked on charts using the 'superbuoy' symbol (UK Chart 5011 or US Chart No.1, Q 26), in order to alert mariners of the buoy's size (and thus also of the likely area of moorings). We have used this symbol on the attached maps.

Additional Information

The intended deployment for the buoy is initially for 12 months from granting of License. We would hope that this would be extended post 12 months depending on trial results

The buoy in its current guise is still a R&D project. The initial 12 months will be to conduct a series of test which will include the gathering of Ocean data and for communications for the Offshore Wind Community.

The moorings for the buoy are still in the design phase but will consist of 3 Delta Flipper Anchors.

With regards to removal/de-commissioning, the whole buoy structure would be disconnected from its moorings and towed back to port. The Delta Flipper Anchors would also be removed. Once back in port the buoy would be extracted from the water and put on land for further works or dismantlement. At the present time this would be carried out at Forth Ports Dundee site.

Pictures for Ref