



# Review of Archaeological Exclusion Zones

October 2015

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# Beatrice Offshore Wind Farm

## Review of Archaeological Exclusion Zones

### Consultation Document

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## 1 Terms and definitions used in this report

**AEZ:** Archaeological Exclusion Zone

**APEM Ltd:** An independent environmental consultancy specialising in freshwater and marine ecology and aerial surveys

**Archaeological feature:** A feature of anthropogenic origin

**BOWL:** Beatrice Offshore Windfarm Ltd. A partnership of SSE Renewables (50%), Repsol Nuevas Energias UK (25%) and Copenhagen Infrastructure Partners (25%)

**Development:** Beatrice Offshore Wind Farm (**OWF**) and Offshore Transmission Works (**OfTW**)

**Ground-truthing:** Survey using **ROV** on the seabed to identify the nature of geophysical targets

**HS:** Historic Scotland. The statutory body for archaeology and cultural heritage within Scotland, including marine archaeology from the mean high water mark out to 200 nautical miles (nm) offshore. Advisors to **Marine Scotland on behalf of Scottish Ministers**

**ISA:** Inner Study Area. Comprises the **OWF** development area and the **OfTW** corridor

**Licensing Authority:** The authority responsible for licensing activities that impact upon the seabed, in this case **MS-LOT**

**MSDS:** MSDS Marine is a Marine and Coastal Archaeological Contractor specialising in the management and support of archaeological projects

**MS-LOT:** Marine Scotland – Licensing Operations Team (**the Licensing Authority**)

**OfTW:** Offshore Transmission Works. Offshore Transmission Works including Offshore Transformer Modules (OTMs) and export cables to landfall

**OSA:** Outer Study Area. Comprises the 1km buffer zone around both the OWF development area and around the **OfTW** corridor

**OTM:** Offshore Transformer Module. An alternating current (AC) OSP which is a standalone modular unit that utilises the same substructure and foundation design as a wind turbine generator

**OWF:** Offshore Wind Farm. Offshore Wind Farm array development area

**Project:** Construction, operation, maintenance and monitoring of the **Development**.

**Relevant Authority:** The Relevant Authorities are **Marine Scotland** on behalf of Scottish Ministers and most notably **MS-LOT** and **Historic Scotland**

**ROV:** Remotely-Operated Vehicle. Used to ground-truth geophysical targets

**SSS:** Side-Scan Sonar. Used to undertake geophysical survey

**Target:** An anomaly on the seabed identified in the geophysical survey data that may be an archaeological feature

**The Crown Estate:** The body responsible for managing the seabed and foreshore in UK territorial waters, and the lease provider for offshore developments within UK jurisdiction

**UKHO:** United Kingdom Hydrographic Office

**Wreck:** Encompasses a wide variety of material that has been deposited on the seabed as a direct result of once being aboard or part of a vessel

## 2 Introduction

- 1 The Beatrice Offshore Wind Farm received consent under Section 36 of the Electricity Act 1989 from Scottish Ministers on 19th March 2014 ('the S.36 Consent') and was issued two Marine Licences from Scottish Ministers on 2nd September 2014; one for the Offshore Wind Farm (OWF) and one for the Offshore Transmission Works (OfTW).
- 2 Both the OWF and OfTW corridor have been subject to archaeological assessment, including Desk-Based Assessment (DBA) (Headland 2011a; 2011b), Written Schemes of Investigation (WSI) (Headland 2010; 2015), geophysical and geotechnical assessments (Headland 2011c; 2011d; 2011e; 2011f) and Environmental Statement (ES) chapters (Headland 2011g; 2011h).
- 3 Beatrice Offshore Wind Limited (BOWL) appointed APEM Ltd/ MSDS to undertake seabed surveys within the Offshore Wind Farm (OWF) and Offshore Transmission Works (OfTW) corridor. The seabed surveys undertaken in July 2015 included a ground-truthing survey using a remotely-operated vehicle (ROV) to identify the nature of targets on the seabed identified in the geophysical survey data as possibly of archaeological interest. APEM/ MSDS ground-truthed 13 of the 39 AEZs identified in the WSI and PAD (Headland 2015) because these targets could potentially impact on the design and construction of the OWF and OfTW (Appendix 1, Map 1: Ground-truthed Archaeological Targets). The following targets were ground-truthed:
  - 13 targets which have been assigned Archaeological Exclusion Zones (AEZs), three within the OWF site and 10 within the OfTW corridor; and
  - 19 geophysical seabed anomalies within the OWF site identified as boulders from recent geophysical survey results.

## 3 Aims and objectives

- 4 This report aims to:
  - a. Review the ground-truthing survey results (APEM & MSDS, 2015) and assess the veracity of the conclusions.
  - b. Re-assess the 13 AEZs (HA17, HA20, HA22, HA28, HA33, HA63, HA87, HA111, HA126, HA127, HA135, HA136, & HA156) (Appendix 1, Map 1: Ground-truthed Archaeological Targets) in light of the evidence presented in the recent ground-truthing survey (APEM & MSDS 2015) with a view to recommending their removal, amendment, or enforcement as deemed appropriate.
  - c. Assess the 19 geophysical targets investigated by the ground-truthing survey to recommend further action, if required.

## 4 Methods

### 4.1 Previous assignment of AEZs

- 5 AEZs are the principal means by which any sites or deposits of known or potential archaeological interest are preserved *in situ*. The AEZs within both the OWF and



OfTW were established based on the results of the completed archaeological assessments listed above (paragraph 2). Any alteration to these AEZs must be agreed in consultation with Historic Scotland (HS) and with Marine Scotland Licensing Operations Team (MS-LOT).

- 6 These AEZs were established in line with current industry guidelines including COWRIE (2007) and the Crown Estate (2010), which stipulate that AEZs should be assigned to all known sites and geophysical targets of high or medium potential.
- 7 Geophysical targets were assigned potential values based on the following table (Headland 2011c; 2011d):

Potential of Target	Character of Target
HIGH	A target that is identified as a known archaeological asset or in the vicinity of such; or a target that is clearly recognisable as a well preserved feature or maritime loss such as a vessel or aircraft (or parts of) and any associated debris. These targets are usually assigned a circular AEZ of 100m diameter centred on the target.
MEDIUM	A target that exhibits characteristics likely to represent the remains of a feature or maritime loss such as a vessel or aircraft or fragments of the same; including any associated debris. . These targets are usually assigned a circular AEZ of 50m diameter centred on the target.
LOW	An isolated or fragmentary target that is recognised to be of some interest but may represent a particularly small or fragmentary archaeological or natural feature. These targets are not usually assigned an AEZ.

- 8 The 13 targets with AEZs featured in this assessment fall within the medium category i.e. they were assessed as of medium archaeological potential.

#### **4.2 Ground-truthing**

- 9 The ground-truthing survey assessed the 13 medium potential targets assigned AEZs (see Map 1 in Appendix 1). The objective of the survey was to identify the nature of the targets in order to enable a reassessment of the validity of their respective AEZs. The ground-truthing survey also assessed a further 19 geophysical targets owing to their close proximity to planned construction locations in the OWF site. The objective was to identify the nature of these targets in order determine if they would impact planned construction activities.
- 10 The survey was carried out from the survey vessel Coral Wind, a 14m catamaran, using an Outland 1000 ROV fitted with fore and aft cameras, a Trittech Micron 360 degree sonar and a Trittech MicronNav tracking system (APEM & MSDS 2015).
- 11 Each target area was confirmed using the survey vessel's echosounder to scan the recorded location. The vessel was then positioned within 50m (and often within 20m) of the recorded contact position of each target being investigated using the vessel's

Differential Global Positioning System (DGPS) and the co-ordinates of the targets (APEM & MSDS 2015).

- 12 The ROV was deployed by hand over the stern of the vessel and was guided to the target position by the pilot using the MicronNav tracking system (APEM & MSDS 2015).
- 13 Once the ROV reached the desired location a 360 degree sweep of the target area was performed. In the event that the target was not immediately identified, a combination of the ROVs tracking and vessel sonar systems were used to locate the target. If the target was still not identified a wider search of the area was undertaken. Consequently, a thorough search of the target location was undertaken (APEM & MSDS 2015).
- 14 Live video feed was used to facilitate navigation by the ROV pilot and to visually inspect the seabed in the target areas in order to identify potential targets. Copies of the video feed were used for producing images of any identified targets (APEM & MSDS 2015).

#### **4.3 Assessment of the ground-truthing survey**

- 15 The veracity of the ground-truthing survey and any recommendations for the alteration of AEZs are based on a comparison between the original geophysical survey data images and the ground-truthing video and still images.
- 16 Comparisons were made between the shape and height of each target in the geophysical survey data and the video and still images of the likely target as recorded by the ROV. This comparison was used to determine whether the geophysical target had been adequately identified.

## **5 Results**

### **5.1 Ground-truthing**

- 17 The results of the ground-truthing survey of the 13 AEZ targets presented here include assessments both by Headland and by the contractors responsible for the ground-truthing survey (APEM & MSDS 2015).
- 18 Of these 13 targets, eight are considered to have been positively identified during the ground-truthing survey. At the remaining five locations no obvious feature that corresponded with the potential archaeological target identified in the geophysical survey data was identified by the ROV.

#### ***Positively identified targets***

- 19 Each of the eight positively identified targets are presented below, categorized by their location, either in the OWF or OfTW. In each case, Headland Archaeology is satisfied that these targets and the AEZs assigned to them have been adequately investigated and that features corresponding to the geophysical targets have been identified.



## **OWF**

- 20 Two targets are located in the OWF

## **HA22**

- 21 The Beatrice archaeological geophysical survey assessment describes HA22 as a potential debris field which has dimensions of 40.4m x 8.1m x 2.6m, with individual targets being far smaller. The debris field is considered a single target assessed as being of medium archaeological potential (Headland 2011c).
- 22 The ground-truthing survey identified, 'a large area of boulders...the positioning of which correlated with the SSS image' (MSDS 2015).

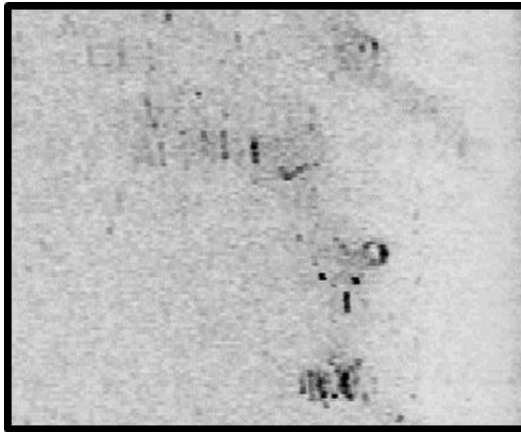


Figure 1: HA22 Geophysical target



Figure 2: HA22 Still image from ROV footage

- 23 The ROV image (Figure 2) clearly presents an image that, in association with the identification during the ground-truthing survey of a large area of boulders, would account for the geophysical target shown in Figure 1. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.

## **HA136**

- 24 The Beatrice archaeological geophysical survey assessment describes HA136 as two associated pieces of debris measuring 7.4m x 3.0m x 1.1m and assigned the associated debris a single target assessed as being of medium archaeological potential (Headland 2011c).
- 25 The ground-truthing survey identified 'two clusters of boulders...that correspond to the SSS image...' and noted a trawl net snagged on one of the boulders (APEM & MSDS 2015).



Figure 3: HA 136 Geophysical target      Figure 4: HA 136 Still image from ROV footage

- 26 The boulders shown in the ROV footage (Figure 4), in association with the identification during the survey of two clusters of boulders, adequately accounts for the targets shown in the geophysical image (Figure 3). Moreover, the large diffuse reflection (the darker area in figure 3) could plausibly be interpreted as the acoustic signature of the trawling net identified in the ground-truthing survey. Therefore, subject to the approval of HS and MS-LOT, It is recommended that this AEZ be removed.

### **OfTW**

- 27 Six targets are located in the OfTW:

### **HA63**

- 28 The Beatrice archaeological geophysical survey assessment describes HA63 as debris measuring 4.4m x 1.6m x 0.6m and assessed the target as being of medium archaeological potential (Headland 2011d).
- 29 The ground-truthing survey identified, '...a large boulder in an area of cobble seabed...The identified boulder was the only prominent feature in the area' (APEM & MSDS 2015).

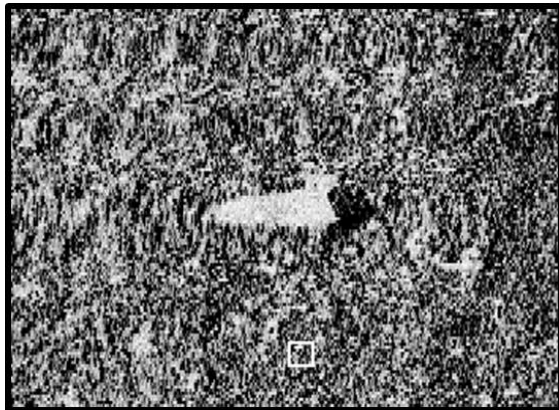


Figure 5: HA63 Geophysical target

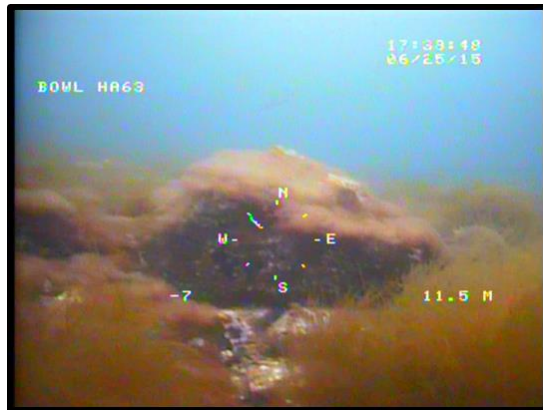


Figure 6: HA63 Still image from ROV footage

- 30 The large upstanding boulder identified in the ROV footage (Figure 6) has a strong correlation with the geophysical target (Figure 5) and would account for the acoustic shadow represented by the white 'smear' in the geophysical image. Therefore, subject to the approval of HS and MS-LOT, It is recommended that this AEZ be removed.

## HA87

- 31 The Beatrice archaeological geophysical survey assessment describes HA87 as debris measuring 1.5m x 1.4m x 0.1m and assessed the target as being of medium archaeological potential (Headland 2011d).
- 32 The ground-truthing survey identified, '...a large isolated boulder in an area of course infra-littoral gravelly sand...Close to the contact was a long length of combination trawl cable laid out in a 'U' shape suggesting it was lost as a result of a snag...' (APEM & MSDS 2015).

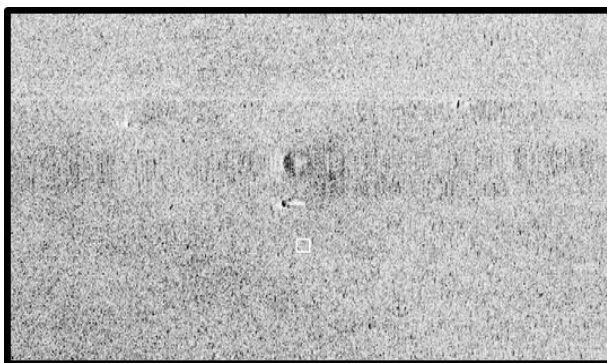


Figure 7: HA87 Geophysical target

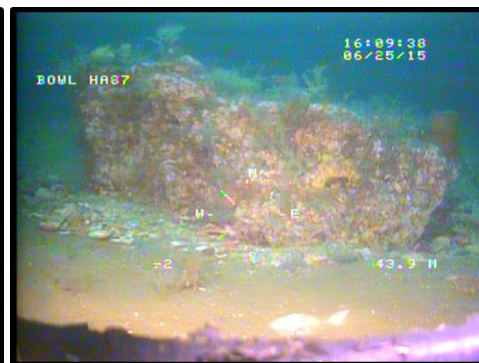


Figure 8: HA87 Still image from ROV footage

- 33 The ROV footage (Figure 8) of a large isolated boulder clearly has a strong correlation with the geophysical target shown in Figure 7. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.



## HA126

- 34 The Beatrice archaeological geophysical survey assessment describes HA126 as a dark reflector with geophysical dimensions of 3.19m long, 1.22m wide and 0.22m high (Headland 2011d).
- 35 The ground-truthing survey identified, ‘...smaller boulders present in the general area, however it is unlikely they would produce the signature shown in the SSS image. A length of combination trawl cable is doubled alongside the contact.’ (APEM & MSDS 2015).

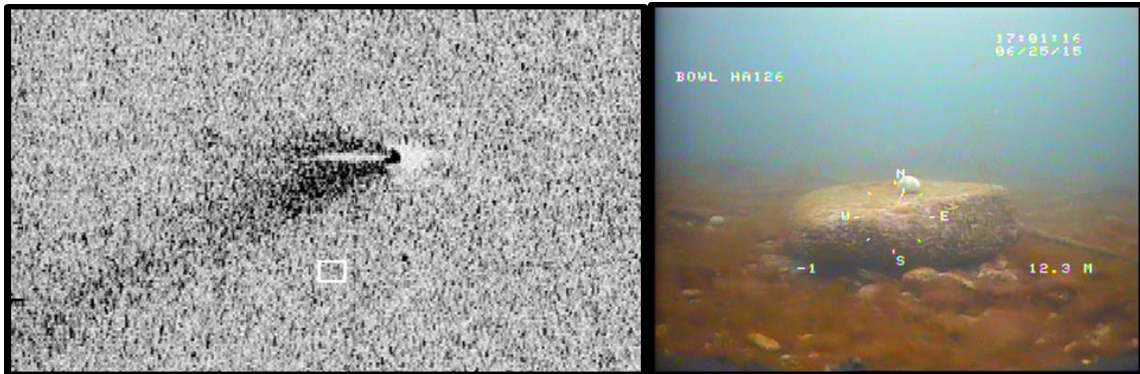


Figure 9: HA126 Geophysical target      Figure 10: HA126 Still image from ROV footage

- 36 The discrete boulder seen in the ROV footage (Figure 10) correlates to the geophysical target shown in Figure 9, displaying an acoustic shadow. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.

## HA127

- 37 The Beatrice archaeological geophysical survey assessment describes HA127 as linear debris measuring 3.0m x 1.2m x 0.2m and assessed the target as being of medium archaeological potential (Headland 2011d).
- 38 The ground-truthing survey identified a, ‘...prominent and large boulder in an area of cobble and smaller boulders...’ (APEM & MSDS 2015).



Figure 11: HA127 Geophysical target      Figure 12: HA127 Still image from ROV footage

- 39 The prominent, large, distinctive boulder seen in the ROV footage (Figure 12) has a strong correlation with the isolated geophysical target shown in Figure 11, displaying an acoustic shadow. Therefore, subject to the approval of HS and MS-LOT, it is recommended that the AEZ be removed.

### HA135

- 40 The Beatrice archaeological geophysical survey assessment describes HA135 as possible debris measuring 4.6m x 2.2m x 0.4m and assessed the target as being of medium archaeological potential (Headland 2011d).
- 41 The ground-truthing survey identified, '...a large isolated boulder...[lying on]...infra-littoral sand...' (APEM & MSDS 2015).

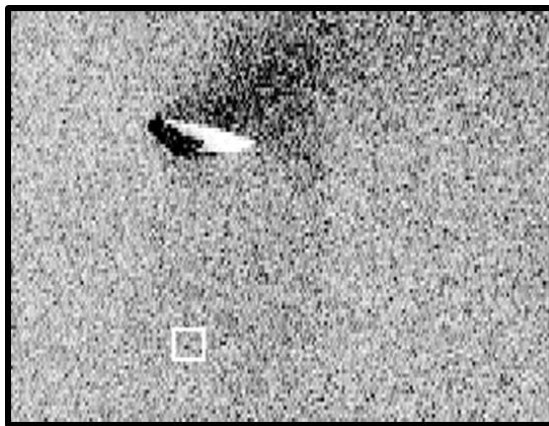


Figure 13: HA135 Geophysical target      Figure 14: HA135 Still image from ROV footage

- 42 The large isolated boulder identified in the ROV footage (Figure 14) has a strong correlation with the isolated geophysical target shown in Figure 13. The upstanding nature of the boulder would account for the strong acoustic shadow (the white area) on the geophysical image. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.

### HA156

- 43 The Beatrice archaeological geophysical survey assessment describes HA156 as debris measuring 8.1m x 0.7m x 0.2m and assessed the target as being of medium archaeological potential (Headland 2011d).
- 44 The ground-truthing survey identified, '...a long and relatively straight rock protruding from a sandy seabed...' (APEM & MSDS 2015).



Figure 15: HA156 Still image from ROV footage

- 45 The long straight rock identified in the ground-truthing survey as shown in the ROV footage (Figure 15) is more than likely an element of the of the target described as 'debris' in the Beatrice archaeological geophysical survey assessment (Headland 2011d). Such a feature could certainly be misconstrued as anthropogenic debris in the geophysical survey data but the dimensions appear to correlate with this image and thus would suggest a geological feature. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.

#### ***AEZs within which no obvious target was identified***

- 46 The results of the ground-truthing investigation of the five remaining targets (of the 13 targets assigned AEZs) was less emphatic with no obvious feature identified in the survey which corresponded with the geophysical target. No identifiable targets could be picked up at these locations using the survey vessel's echosounder. Consequently, the locations of the archaeological targets were fully investigated using the ROV to ensure that no corresponding features were present (Headland 2011c; 2011d).
- 47 There was a four to five year gap between undertaking the geophysical surveys and undertaking the ground-truthing survey, as such the failure to identify a corresponding feature could be explained in a number of ways:
- a. the feature could have been reburied by the movement of mobile sea beds;
  - b. the feature could have been moved by natural or mechanical forces i.e. by strong currents or by fishing nets; or
  - c. the feature may have been ephemeral or delicate and may have deteriorated in the intervening period.
- 48 As in the previous section, each of these targets are presented by their location, either in the OWF or the OfTW.



## **OWF**

49 One target is located in the OWF:

## **HA111**

- 50 The geophysical assessment describes HA111 as debris measuring 18.6m x 6.7m x 0.4m and assessed the target as of medium archaeological potential (Headland 2011c).
- 51 The ground-truthing survey did not locate a corresponding feature and the report suggests that the target has either moved from the area or has become buried in mobile sediments (APEM & MSDS 2015).

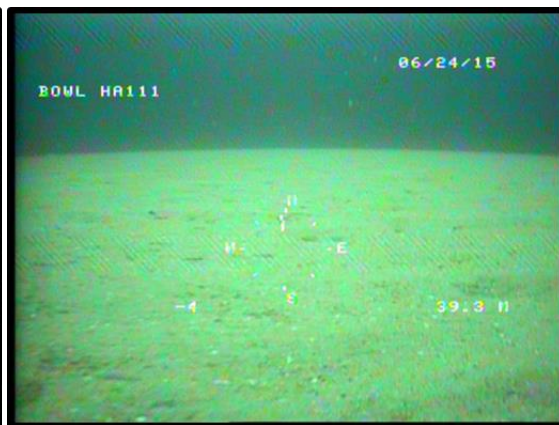
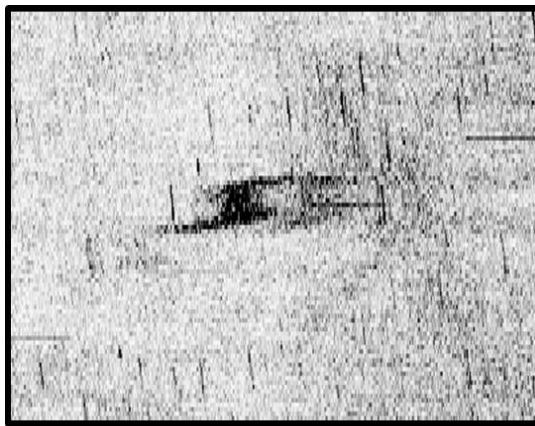


Figure 16: HA111 Geophysical target      Figure 17: HA111 Still image from ROV footage

- 52 It is unlikely that such a large target, measuring 18.6m x 6.7m, could have been missed in the ROV survey, or that it could have moved significantly in the intervening period. It is possible that it could have become reburied but in this scenario one would expect to see a raised area of seabed whereas the ROV footage shows a flat seabed. Such a large target should be clearly discernible on the otherwise featureless seabed. It seems more likely therefore that the original target was a fishing net or other debris snagged on a much smaller target which has subsequently become detached in the intervening period. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.

## OfTW

53 Four targets are located in the OfTW:

## HA17

54 The Beatrice archaeological geophysical survey assessment describes HA17 as linear debris measuring 5.2m x 1.4m x 0.1m and assessed the target as being of medium archaeological potential (Headland 2011d).

55 The ground-truthing survey did not locate a corresponding feature and the report suggests that the target was probably '...geological in origin and has either moved or been buried' (APEM & MSDS 2015).

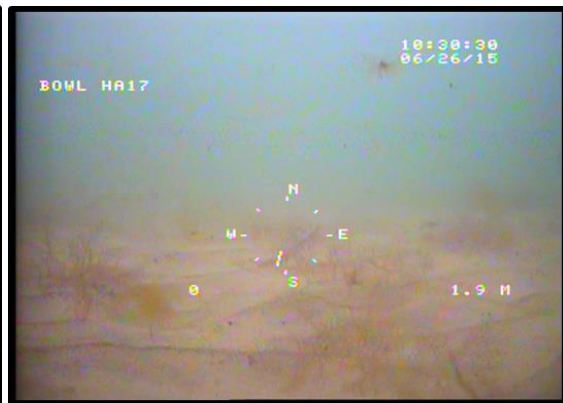


Figure 18: HA17 Geophysical target

Figure 19: HA17 Still image from ROV footage

56 Headland would concur that a low feature such as this, standing 0.1m high, could well have been reburied in the intervening period between the geophysical and ground-truthing surveys. Headland would further concur that the geophysical target is most likely geological in nature. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.

## HA20

57 The geophysical assessment describes HA20 as linear debris measuring 22.6m x 2.5m x 0.1m and assessed the target as being of medium archaeological potential (Headland 2011d).

58 The ground-truthing survey did not locate a corresponding feature and the report suggests that the target was probably '...geological in origin and has either moved or been buried' (APEM & MSDS 2015).

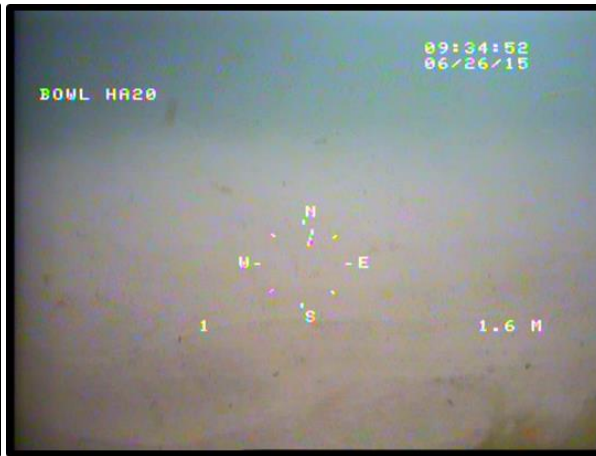
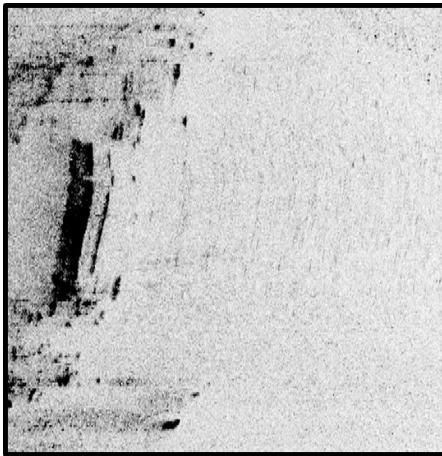


Figure 20: HA20 Geophysical target      Figure 21: HA20 Still image from ROV footage

59 It is unlikely that such a large feature, measuring 22.6m x 2.5m, could have been overlooked by the ground-truthing survey, particularly in a 30m search area. It is more likely that a low-lying feature such as this, standing 0.1m high, has been reburied, particularly in water depths of only 1.6m, where natural forces are highly dynamic and seabed sediments highly mobile. Moreover, the geophysical image is more synonymous with a geological feature. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.

## HA28

60 The Beatrice archaeological geophysical survey assessment describes HA28 as linear debris measuring 11.6m x 1.3m x 0.1m and assessed the target as being of medium archaeological potential (Headland 2011d).

61 The ground-truthing survey reported that, '...no evidence of any upstanding features was identified...' and further states, '...it is likely that any feature which may have been present would have been geological in origin and has either been moved or buried...' (APEM & MSDS 2015).



Figure 22: HA28 Geophysical target

Figure 23: HA28 Still image from ROV footage



- 62 This is a sizeable feature that would be difficult to miss in a 30m radius search area so it is highly unlikely to have been overlooked by the ground-truthing survey. However, such a low-lying feature, standing 0.1m high, is more likely to have been reburied in the mobile sediments as can be seen in Figure 23. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.

### HA33

- 63 The Beatrice archaeological geophysical survey assessment describes HA33 as linear debris measuring 2.4m x 2.1m x 1.32m and assessed the target as being of medium archaeological potential (Headland 2011d).
- 64 The ground-truthing survey identified, ‘...two low-lying pieces of exposed rock...within the general area...’ (APEM & MSDS 2015).

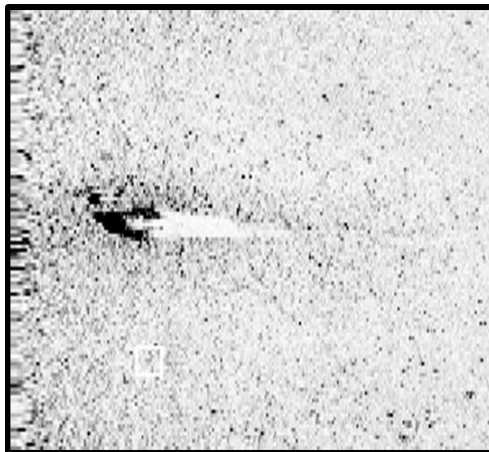


Figure 24: HA33 Geophysical target

Figure 25: HA33 Still image from ROV footage

- 65 The geophysical image appears to show isolated rocks protruding quite significantly from the surrounding seabed as evidenced by the long acoustic shadow, which suggests a standing height of some 1.32m. As stated previously, such a target would be difficult to overlook in the ground-truthing survey and it would appear unlikely that an object could have been buried to such an extent without producing an easily identifiable mound. It seems most likely that this anomaly has been moved. Therefore, subject to the approval of HS and MS-LOT, it is recommended that this AEZ be removed.

### **Geophysical Targets**

- 66 In addition to the ground-truthing survey of the archaeological targets above, BOWL commissioned ground-truthing of 19 geophysical anomalies within the OWF site, identified as boulders that did not require archaeological ground-truthing. These 19 geophysical targets were ground-truthed to understand the nature of the targets and any potential impacts on the project design or planned construction activities. 18 of the contacts were identified as geological, but one (A17) was identified as being of

anthropogenic origin (APEM & MSDS 2015). The location of this target is shown in Map 1 in Appendix 1.



Figure 26: Still image from ROV footage of possible iron object

67 A17 was a geophysical anomaly located within the OWF area which the ground-truthing survey identified as an iron or steel conical-shaped object. Given the limited marine growth, the absence of corrosion, the sharp lines and the use of bolts rather than rivets Headland believes this object is relatively modern, probably associated with the oil and gas industry. Headland believes this to be of low archaeological potential and would therefore recommend, subject to the approval of HS and MS-LOT, that that this object does not warrant the imposition of an AEZ.

## 6 Conclusions

### 6.1 Alteration of AEZs

#### ***Positively identified targets***

68 Subject to the approval of HS and MS-LOT, Headland recommends the removal of the AEZs assigned to all eight of the targets positively identified (HA22; HA63; HA87; HA126; HA127; HA135; HA136; & HA156), as Headland is confident that they are geological in origin.

#### ***AEZs within which no obvious target was identified***

69 Given the survey methods used (outlined above; APEM & MSDS 2015) to locate the features associated with the geophysical targets within the AEZs where no obvious feature was apparent Headland is confident that no obvious exposed archaeological feature exists at those locations.

70 While absence of evidence is not conclusive evidence of absence, the inability of the ground-truthing survey to locate any features that correlated with, often quite large,

geophysical targets, despite extensive investigation of each AEZ, suggests that there is little or no case to retain the associated AEZs.

- 71 As the ground-truthing survey found no objects or features corresponding with any of the remaining geophysical targets, for the reasons outlined above, subject to the approval of HS and MS-LOT, Headland recommends the removal of the AEZs surrounding all five targets (HA17; HA20; HA28; & HA33; & HA111) for which ground-truthing investigations could find no obvious target. As stated any potential targets are likely to have moved or have been reburied. Given that the all the targets assessed as of medium archaeological potential have been shown by the ground-truthing survey to be geological in nature it is highly probable that these remaining targets are also geological.

### ***Geophysical Targets***

- 72 Given that the one anthropogenic object discovered during the ground-truthing survey of geophysical targets appears to be modern detritus (A17), probably from the oil and gas industry, Headland believes that, subject to the approval of HS and MS-LOT, the implementation of an AEZ is not required (see Figure 26).



## 7 References

COWRIE & Wessex Archaeology 2007. *Historic Environment Guidance for the Offshore Renewable Energy Sector*. Commissioned by COWRIE Ltd (project reference ARCH-11-05).

Headland Archaeology 2010. *Geotechnical & Sampling Guidance and Protocol for Archaeological Discoveries*. Unpublished client report.

Headland Archaeology, 2011a. *Beatrice Offshore Wind Farm Archaeological Desk Based Assessment*. Unpublished client report.

Headland Archaeology 2011b. *Beatrice Offshore Wind Farm Archaeological Desk Based Assessment: Offshore Transmission Work*. Unpublished client report.

Headland Archaeology 2011c. *Beatrice Offshore Wind Farm Archaeological Geophysical Survey Assessment*. Unpublished client report.

Headland Archaeology 2011d. *Beatrice Offshore Wind Farm Archaeological Geophysical Survey Assessment: Offshore Transmission Works*. Unpublished client report.

Headland Archaeology 2011e. *Beatrice Offshore Wind Farm Archaeological Assessment of Geotechnical Data*. Unpublished client report.

Headland Archaeology 2011f. *Beatrice Offshore Wind Farm Archaeological Assessment of Geotechnical Data: Offshore Transmission Work*. Unpublished client report.

Headland Archaeology 2011g. *Maritime Archaeology & Cultural Heritage*. Chapter 31. Beatrice Offshore Wind Farm.

Headland Archaeology 2011h. *OFTW Corridor Marine Archaeology and Cultural Heritage*. Chapter 27 in Beatrice Offshore Project Environmental Statement.

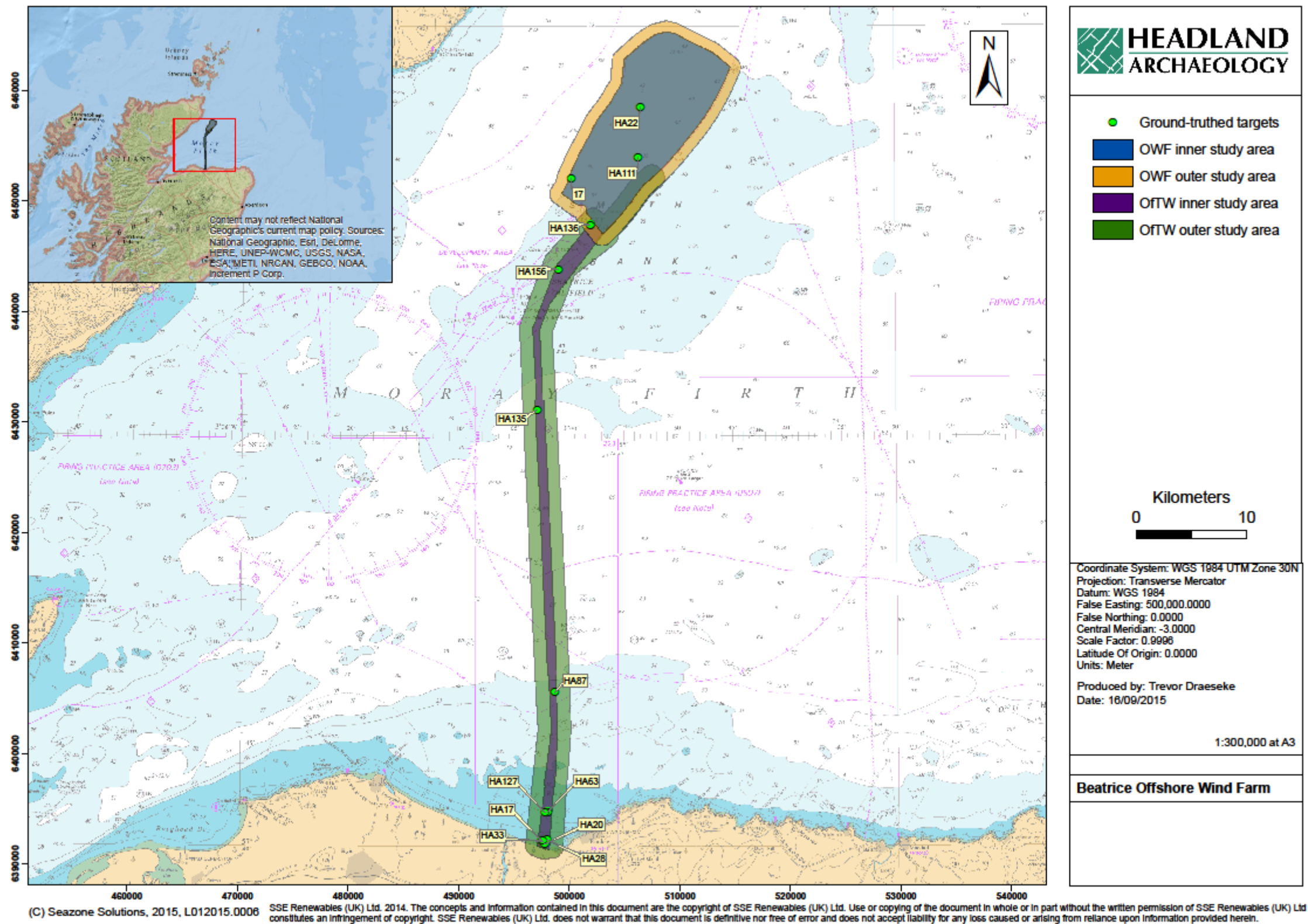
Headland Archaeology 2015. *Beatrice Offshore Wind Farm Marine Archaeological Written Scheme of Investigation & Protocol for Archaeological Discoveries*. Unpublished client report.

APEM & MSDS 2015. *Beatrice Offshore Wind Farm Archaeological Ground Truthing Report*. Unpublished client report.

The Crown Estate & Wessex Archaeology 2010. *Model Clauses for Archaeological Written Schemes of Investigation: Offshore Renewables Projects*. Commissioned by The Crown Estate.

The Crown Estate 2014. *Protocol for Archaeological Discoveries: Offshore Renewables Projects*. Published by Wessex Archaeology, Salisbury, on behalf of The Crown Estate.

## 8 Appendix 1: Map



Map 1: Ground-truthed Archaeological Targets