

## CHAPTER 17: ARCHAEOLOGY AND CULTURAL HERITAGE

### Technical Summary

An archaeological assessment was undertaken to determine the potential for submerged artefacts, wrecks and coastal remains through a desk based study and interpretation of geophysical and geotechnical survey data. A number of wrecks were identified within the study area and other geophysical anomalies were identified that could be of archaeological potential.

As archaeological and cultural heritage features are finite, any impacts upon them would be permanent and significant. However, it is expected that all impacts can be mitigated. All sites of cultural heritage interest included in the assessment will be avoided where possible. A Written Scheme of Investigation and Protocol for Archaeological Discoveries will be prepared to mitigate construction effects in the event of any unexpected archaeological discoveries during installation. Infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities impacting the identified locations of cultural heritage interest.

Overall, no impacts are assessed to be significant in EIA and no cumulative impacts are anticipated with other projects.

### INTRODUCTION

- 17.1. This chapter of the Environmental Statement (ES) describes the potential impacts associated with the Seagreen Project (Project Alpha, Project Bravo, the Transmission Asset Project and the meteorological masts and wave buoys for which Marine Licences are being sought) upon cultural heritage assets and a proposed a strategy to mitigate any such impacts.
- 17.2. The Seagreen Project may have both direct and indirect impacts upon the physical fabric of offshore assets. The assessment has considered the potential impact of the Seagreen Project on the following cultural resources:
  - designated cultural heritage assets, comprising designated wrecks, scheduled monuments and non-designated cultural heritage assets;
  - undesignated cultural heritage assets, including maritime losses such as wrecks, aircraft and their associated debris; and
  - submerged archaeology and palaeoenvironmentally significant deposits.
- 17.3. All figures referred to in this chapter can be found in ES Volume II: Figures. The Firth of Forth Round 3 Offshore Windfarm Phase 1 – Maritime Cultural Heritage Baseline Report referred to in this chapter hereafter as Appendix L1, can be found in ES Volume III: Appendices. This chapter of the ES has been produced by Headland Archaeology (UK) Ltd.

### CONSULTATION

- 17.4. Table 17.1 summarises issues that were highlighted by Historic Scotland in the Scoping Opinion (Marine Scotland, January 2011) and indicates which sections of the chapter address the issues raised. In addition, a meeting between Seagreen and Historic Scotland was undertaken on the 16 August 2011 to discuss and agree the approach and methodology for the marine archaeology and cultural heritage assessment and associated mitigation.
- 17.5. Following the revisions to the Project Alpha and Project Bravo site boundaries further consultation was sought with Historic Scotland with regard to the impacts on the setting of key onshore and island cultural heritage receptors. The revision of the site boundaries extended the distances to the onshore cultural heritage receptors being considered. As a

result of the project boundary changes it was agreed with Historic Scotland (email dated 27 April 2012) that there would be no significant setting impacts and therefore the impact on setting would not be taken forward to impact assessment. It was further agreed that although the impact on setting would not be taken forward to impact assessment, the baseline prepared for the setting assessment would, for completeness, be included in this chapter.

**Table 17.1 Summary of consultation and issues**

| Date | Consultee         | Issue   | Relevant Chapter Section   |
|------|-------------------|---|--|
| 2011 | Historic Scotland | Direct impacts on undesignated wrecks in the survey area and various recorded maritime cultural heritage assets.  | Impact assessment – Construction Phase<br>Impact Assessment – Operation<br>Impact Assessment – Decommissioning |
| 2011 | Historic Scotland | Indirect impacts to assets on the seabed or at the coasts edge, and possibly beyond, that may be caused by alteration to tidal currents, sedimentary regimes and changes to the chemical balance of the water and seabed sediments. | Impact assessment – Construction Phase<br>Impact Assessment – Operation<br>Impact Assessment – Decommissioning |
| 2011 | Historic Scotland | A cumulative impact assessment should be undertaken.  | Impact Assessment – Cumulative and In-Combination  |
| 2011 | Historic Scotland | Archaeological analysis of the geological borehole data gathered for the study area.  | Paragraphs 17.32 – 17.41   |
| 2011 | Historic Scotland | Impacts on the setting of terrestrial and coastal assets should be considered, such as the Bell Rock Lighthouse.  | Impact assessment – Construction Phase<br>Impact Assessment – Operation<br>Impact Assessment – Decommissioning |

## ASSESSMENT METHODOLOGY

### Study Area

17.6. The Study Area for the cultural heritage review incorporates three spatial scales for the Seagreen Project (Figure 17.1). These include:

- Immediate Study Area (ISA) – this comprises the footprint of the Seagreen Project and a 1km buffer zone from the Project boundary;
- Regional Study Area (RSA) – comprising a further arbitrary 5km buffer zone around the Seagreen Project in order to identify the archaeological potential of the ISA; and
- Wider Study Area (WSA) – comprising a 25km, 35km, and 35km+ buffer zone established from the Seagreen Project boundary for the assessment of potential impacts on the setting of onshore and island cultural heritage assets (see paragraphs 17.7 – 17.8 below).

- 17.7. The nature of the Study Area parameters for the assessment on the setting of onshore and island cultural heritage receptors has evolved through a subsequent Project Alpha and Project Bravo boundary revision, described in Chapter 3: Site Selection and Alternatives in this ES (noted in paragraph 17.5). The Study Area parameters were established using the zone of theoretical visibility (ZTV) established as part of the Seascape, Landscape, and Visual Impact Assessment (SLVIA) (see Chapter 16: Seascape, Landscape, and Visual Impact Assessment in this ES).
- 17.8. The initial Study Area comprised three buffer zones established from the Project Alpha and Project Bravo site boundaries, the first extended to 25km, the second to 35km, and the third beyond 35km.
- 17.9. The subsequent boundary revision for Project Alpha and Project Bravo moved the projects further away from the coast, resulting in the relocation of these buffers to the east. As the Projects moved further away from the coast, the inter visibility with potential onshore cultural heritage receptors was reduced. The boundary buffers remained at 25km, 35km and 35km+ as noted above. Further discussion with regards the cultural heritage assets considered for the initial assessment is presented below in paragraphs 17.41 – 17.46.
- 17.10. It should be noted that in general the terrestrial boundary for the Seagreen Project is delineated by the Mean High Water Spring (MHWS) tidal limit. All onshore works (being assessed as part of a separate Environmental Impact Assessment (EIA)) terminate at Mean Low Water Spring (MLWS). This results in an overlap of study areas between the offshore and onshore developments. This approach follows that adopted for previous Round 1 and Round 2 Offshore Wind Farms (OWFs).

### Data Collection and Survey

- 17.11. The cultural heritage baseline review comprises the results of a desk based study; a site visit to the foreshore and inter-tidal zone associated with the Transmission Asset Project; and the analysis and assessment of marine geophysical and geotechnical survey data (see table 17.2). The data was gathered in order to identify all cultural heritage assets within the Study Area (see Figure 17.2) including the potential for the discovery of previously unrecorded archaeology and cultural heritage assets. Full details of archaeology and cultural heritage review are given in Appendix L1.
- 17.12. All sites identified in the assessment are accompanied by a unique number and the prefix HA (Project Alpha and Project Bravo) and CR (Transmission Asset Project). The sources consulted are illustrated in Table 17.2 below.

**Table 17.2 Summary of key data and surveys**

| Title                                      | Source  | Year | Reference  |
|--|---|------|--|
| Designated Cultural Heritage               | Historic Scotland   | 2011 | Database of designated sites; Listed Buildings; designed Landscapes & Gardens; Inventory Battlefields  |
| Maritime Records                           | The Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) | 2011 | Maritime Database PASTMAP; Canmore   |
| NMRS                                       | National Monuments Record of Scotland (NMRS)                                      | 2011 | PASTMAP; Canmore   |
| SMR  | Moray and Angus Sites and Monuments Record (SMR)                                  | 2011 | Archaeological records for Angus Historic Environment Record (HER) held locally in the Aberdeenshire HER   |
| SeaZone                                    | UK Hydrographic Office Wrecks and Obstructions Database                           | 2011 | SeaZone wrecks and obstructions layer and add-on from hydro-spatial data   |
| Phase 1 Geophysical Survey Data            | GEMS  | 2010 | GEMS, 2010. 'Geophysical Results Report, Phase 1. Firth of Forth Offshore (Round 3) Wind Farm, Development Project'. Unpublished report prepared for Seagreen Wind Energy Limited.   |
| Export Cable Route Geophysical Survey Data | Osiris Reports  | 2011 | Osiris Projects, 2011. 'Firth of Forth Offshore Wind Farm Export Cable Geophysical Survey – C11020 Volume 2 – Report'. Unpublished report prepared for Seagreen Wind Energy Limited. |
| Geotechnical Data                          | GEMS  | 2011 | GEMS, 2011. 'Geotechnical Results Report, Phase 1. Firth of Forth Offshore (Round 3) Wind Farm, Development Project'. Unpublished report prepared for Seagreen Wind Energy Limited.  |

### Approach to Assessment

- 17.13. The construction, operation and decommissioning of the Seagreen Project and associated activities, including the deployment of construction and operational vessels, have the potential to damage or destroy cultural heritage assets. This may occur either as a result of the design or as an accidental consequence of development activities. The effects may be direct or indirect.
- 17.14. The potential indirect effects on the setting of onshore and island cultural heritage assets was considered initially, prior to the revisions in the Project Alpha and Project Bravo boundaries. The details of the initial baseline are presented in paragraphs 17.41 – 17.46. A large number of designated assets lie within the preliminary ZTV of the proposed OWFs. Of the three buffer zones established within the WSA, only those assets identified by consultees were considered beyond the 35km buffer zone.

17.15. Following the Project Alpha and Project Bravo boundary refinement (see Chapter 3: Site Selection and Alternatives in this ES) that extended the distances of onshore cultural heritage assets identified in the baseline assessment from the Alpha and Bravo Projects, further consultation was initiated with Historic Scotland (highlighted above in paragraph 17.4). It was agreed that as a result of the project boundary changes there would be no significant impacts and that the potential for indirect impacts on the setting of onshore cultural heritage assets identified in the baseline assessment would not be taken forward to impact assessment. It was agreed however that the cultural heritage sites identified in the initial baseline review would be included in the ‘Existing Environment’ Section of this chapter. The type and description of effects used for the purpose of the assessment are presented in Table 17.3 below.

**Table 17.3 Cultural Heritage Asset Impact Description**

| Type of Impact    | Description   |
|-------------------|---|
| Direct Impact     | <p>Direct primary impacts on archaeology and cultural heritage assets during construction could comprise damage, disturbance, or destruction of submerged prehistoric archaeology, shipwrecks, and crashed aircraft from Seabed preparation prior to installation; Installation of turbine foundations/ substructures; Installation of offshore substation and collector platforms; Installation of meteorological masts; Placing of scour protection; Installation of turbine array cabling, inter-connecting cabling; Seabed preparation and installation of export cable; Installation of cable in the intertidal zone and directional drilling ducts around Mean High Water Springs (MHWS).</p> <p>Direct secondary impacts are those associated with the primary activity. These might include the direct effects of the deployment of jack-up legs or anchoring of vessels during construction, operation and decommissioning activities. It is noted that although secondary impacts are considered separately from direct impacts in the COWRIE guidance (COWRIE, 2007) the direct impacts for this assessment are considered together.</p> |
| Indirect Impact   | <p>Indirect effects are those which are not a result of the Project Alpha, Project Bravo or Transmission Asset Project directly and can be associated with other induced changes, for example changes to wave and tidally induced currents or sediment transport regimes, which can result in increases in erosion of, or disturbance to archaeological sites. Indirect effects also include the disturbance or destruction of relationships between structures, features, deposits, and artefacts and their wider surroundings, such as effects on the setting of onshore and island cultural heritage assets.</p>   |
| Cumulative Impact | <p>Cumulative impacts include those within the Seagreen Project such as interference through development activities upon a relict landscape surface or deposit. Impacts outside the offshore site and export cable route may include the effects of several developments within the same locality on the cultural heritage resource.</p>  |

*EIA Methodology for the Assessment of Sensitivity of cultural heritage assets*

17.16. Sensitivity is considered to be the vulnerability of a receptor to a specific change in the baseline conditions. In terms of archaeological or heritage receptors, sensitivity is considered to primarily refer to the rarity or value of the asset. Cultural heritage assets do not have any adaptability or recoverability and are therefore sensitive to change.

- 17.17. The sensitivity of a cultural heritage asset to an effect reflects the level of importance assigned to it. This is the product of a number of factors, including:
- the potential of the asset as a resource of archaeological data;
  - the association of the asset with significant historical events;
  - the role of the asset as a local focal point with cultural associations; and
  - the aesthetic value of the asset.
- 17.18. Official designations applied respectively to cultural heritage assets have been taken as indicators of importance and value as they reflect these factors. Sensitivity is assigned to undesignated cultural heritage assets according to the professional judgment of the assessor.
- 17.19. The criteria used for defining a cultural heritage asset’s sensitivity to direct and indirect physical impacts is summarised in Table 17.4 below.

**Table 17.4 Definition of terms relating to the sensitivity of archaeological and cultural heritage asset**

| Value / Sensitivity | Definition  |
|---------------------|---|
| High                | Designated wrecks;<br>Scheduled monuments;<br>Category A-listed buildings;<br>Inventory gardens and designed landscapes;<br>Inventory battlefields;<br>Undesignated assets of national importance;<br>Maritime losses where the position is known and positively identified; and<br>Targets of high archaeological potential indicative of wreckage identified in the geophysical survey analysis |
| Medium              | Category B listed buildings;<br>Conservation areas;<br>Targets of medium archaeological potential that may be indicative of wreckage or debris identified in the geophysical survey analysis;<br>Obstructions that could be indicative of wreckage or submerged features; and<br>Undesignated assets of regional importance.  |
| Low                 | Category C(S)-listed buildings;<br>Undesignated assets of local importance; and<br>Targets of low archaeological potential and likely to be natural features identified in the geophysical survey.  |
| Negligible          | Assets of less than local importance.   |

*EIA Methodology for the Assessment of Magnitude of potential impacts*

- 17.20. The magnitude of the impact may be large, for instance where there is a total loss or major alteration of the cultural heritage asset; medium, for example the loss or alteration to one or more key elements or features of a cultural heritage asset; or small, where there is a slight but perceptible alteration of the cultural heritage asset. The criteria used for assessing the magnitude of impacts on cultural heritage is summarised in Table 17.5 below.

**Table 17.5 Definition of terms relating to the magnitude of historic environment receptors**

| Magnitude  | Definition  |
|------------|---|
| High       | Total loss or major alteration of the cultural heritage asset.<br>Impact certain or likely to occur.                      |
| Medium     | Loss of, or alteration to, one or more key elements of the cultural heritage asset.<br>Impact certain or likely to occur. |
| Low        | Slight alteration of the cultural heritage asset.<br>Impact will possibly occur.  |
| Negligible | Very slight or negligible alteration of the cultural heritage asset<br>Impact unlikely or rarely to occur.                |
| No change  | No loss of extent or alteration to characteristics, features or elements of the cultural heritage asset.                  |

- 17.21. The significance of an effect on a cultural heritage asset is assessed by combining the magnitude of the effect and the value and sensitivity (to change) of the cultural heritage asset. The evaluation of significance matrix presented in Table 17.6 below, provides a guide to decision making, but is not a substitute for professional judgment and interpretation, particularly where the sensitivity or effect magnitude levels are not clear or are borderline between categories. Predicted effects of major or moderate significance are considered significant for the purpose of the impact assessment on cultural heritage.

**Table 17.6 Evaluation of Significance**

| Value / Sensitivity | Magnitude |            |            |            |
|---------------------|-----------|------------|------------|------------|
|                     | High      | Medium     | Low        | Negligible |
| High                | Major     | Major      | Moderate   | Minor      |
| Medium              | Major     | Moderate   | Minor      | Negligible |
| Low                 | Moderate  | Minor      | Negligible | Negligible |
| Negligible          | Minor     | Negligible | Negligible | Negligible |

- 17.22. As can be seen from Table 17.6 impacts can range from major to negligible. An impact of moderate or major significance would be considered to be significant in relation to the EIA Regulations.

## EXISTING ENVIRONMENT

- 17.23. The following section outlines the nature of the existing cultural heritage baseline within the Seagreen Project. This assessment has been conducted in line with industry best practice following all relevant policy and guidance, International and European charters and conventions, UK and Scottish legislation, Scottish national planning policy and all relevant regional and local planning guidance. Full details of these legislative and guidance procedures are given in Appendix L1.



## Bathymetry

### *Project Alpha and Project Bravo*

- 17.24. The Alpha and Bravo Projects lie within the outer Firth of Forth and Firth of Tay area of the North Sea. Thick sequences of Quaternary sediments of up to 1,000m have been deposited here, which contain evidence of at least five major glacial episodes over a period of two millennia (Sutherland, 1984). There are four main geological units identified across both areas of the RSA established in Chapter 7: Physical Environment of this ES, which covers both the ISA and RSA for the archaeology and cultural heritage assessment; Holocene sediments, the Forth Formation, the Wee Bankie/ Marr Bank Formation and the Aberdeen Ground Formation. Towards the west boundary of Project Alpha a more disordered formation of sediments and bedrock occurs (see Chapter 7: Physical Environment of this ES).
- 17.25. Triassic bedrock underlies the Quaternary geology across the entire site and is the deepest unit documented from geophysical and geotechnical surveys. A deeply eroded trough, orientated north-south in the bedrock, identified in the central area of the ISA has been in-filled with later quaternary sediments. Aberdeen Ground Formation deposits have been identified as a channel deposit and as sheet-like layers resting between Marr Bankie/ Wee Bankie Formations and underlying Triassic bedrock. Though the Aberdeen Ground Formation are not continuously present over both the Project Alpha and Project Bravo sites, it also appears as a north-south channel of up to 75m depth below seabed in Project Bravo area, and as a deep cut and fill immediately east of the trough (Chapter 7: Physical Environment of this ES). The Wee Bankie Formation is present as a sheet like deposit throughout most of the Project Alpha site and grading into the Marr Bank Formation in the Project Bravo site area.
- 17.26. Holocene deposits transgression resulted in the extensive reworking of the Quaternary deposits and their subsequent deposition as near contemporary (Holocene) seabed sediments. These deposits are extensive across the Project Alpha and Project Bravo sites and form generally north-south trending channels at depths of up to 22m. They are generally composed of sands and finer sediments with some areas of gravel beds (see Chapter 11: Benthic Ecology and Intertidal Ecology of this ES).

### *Transmission Asset Project*

- 17.27. The solid geology of the ECR corridor comprises a thick sequence of sandstones, siltstones and mudstones of Lower (Emsian) and Upper (Famennian) Devonian ages. These Devonian rocks are, in turn, overlain by undifferentiated Permo-Triassic rocks. These rocks are overlain by Pleistocene deposits of Quaternary age, comprising variable materials ranging from soft clayey silts/ silty clays of the Forth Formation, mainly present in the western area of site, to possibly hard gravelly clays/ clayey gravels of the Wee Bankie Formation, which can be up to 40m thick (see Chapter 7: Physical Environment of this ES).
- 17.28. Above these quaternary deposits Holocene silty and gravelly sands to sandy gravels are present, generally less than 2m in thickness. These sediments are interpreted as ranging from very silty fine to coarse grained sands, with variable shell content, to coarser grained sandy gravels, with occasional cobbles and (generally small) boulders (see Chapter 11: Benthic Ecology and Intertidal Ecology of this ES).



## Desk Based Review

### Project Alpha ISA

- 17.30. The status of shipwrecks identified from the UKHO and SeaZone records are either ‘Live’, where the wreck is known or thought to exist at the coordinate assigned; ‘Dead’, where the wreck is known to have been lost in this general area but the of wreck has not been identified in its recorded location despite repeated surveys; or ‘Lift’ where the vessel has been recovered or salvaged.
- 17.31. The archaeology and cultural heritage desk based review established that there are no Designated Wrecks or other cultural heritage assets with legal designations within the Project Alpha ISA. One ‘Dead’ wreck (HA1003) and one ‘Lift’ wreck (HA1005) were identified in the Project Alpha ISA; HA1003 is located in the Project Alpha site, and HA1005 is within the adjacent 1km buffer (Table 17.7, Figure 17.3). Due to the ‘Dead’ and ‘Lift’ status of the sites highlighted above they will not be taken forward to impact assessment.

**Table 17.7 Offshore cultural heritage assets within the Project Alpha ISA with known locations including UKHO ‘dead’ entries.**

| HANo. | Name                 | UKHO No. | NMRS No. | UTM30NmE | UTM30NmN | Status |
|-------|----------------------|----------|----------|----------|----------|--------|
| 1003  | <i>Michael Scott</i> | 03164    | -        | 580593   | 6281041  | Dead   |
| 1005  | <i>Eskedene</i>      | 065458   | -        | 571402   | 6280874  | Lift   |

### Archaeological Assessment of Marine Geophysical Data

- 17.32. Anomalies or targets identified during the archaeological assessment of marine geophysical data have been defined as having high, medium or low archaeological potential. A target of high archaeological potential is an anomaly that has been identified as a known archaeological asset that is clearly recognisable as a well preserved feature such as a relict prehistoric surface or deposit; or maritime loss such as a vessel or aircraft (or parts of) and any associated debris. A target of medium archaeological potential is an anomaly that exhibits characteristics likely to represent the remains of an archaeological asset such as a relict prehistoric surface or deposit; or maritime loss such as a vessel or aircraft including any associated debris; or fragments of the same. A target of low archaeological potential is an isolated or fragmentary anomaly that is recognised to be of some archaeological interest but likely to represent a natural feature. Only targets of high and medium potential have been included in the baseline and carried forward for assessment.
- 17.33. The archaeological analysis and review of the geophysical data covering the Project Alpha ISA identified a total of 14 targets of medium archaeological potential; 12 targets of medium archaeological potential within the Project Alpha site and a further two targets of medium archaeological potential within the 1km buffer (Table 17.8, Figure 17.4). It is possible that target HA64 may be related to or indicate the correct location of the recorded ‘Dead’ wreck HA1003 noted above.

**Table 17.8 Targets of high and medium archaeological potential identified in the Project Alpha ISA.**

| HANo. | Site Description          | Sidescan Potential | UTM30NmE | UTM30NmN |
|-------|---------------------------|--------------------|----------|----------|
| 14    | Group possible debris     | Medium             | 567478.  | 6282036  |
| 25    | Debris                    | Medium             | 565719   | 6281505  |
| 43    | Buried debris             | Medium             | 567247   | 6280890  |
| 14    | Group possible debris     | Medium             | 567478.  | 6282036  |
| 25    | Debris                    | Medium             | 565719   | 6281505  |
| 43    | Buried debris             | Medium             | 567247   | 6280890  |
| 47    | Possible debris           | Medium             | 569961   | 6281211  |
| 64    | Depression/ buried object | Medium             | 580680   | 6280616  |
| 77    | Debris on seabed          | Medium             | 569723   | 6277631  |
| 106   | Debris                    | Medium             | 566229   | 6271993  |
| 112   | Linear Debris             | Medium             | 556104   | 6276065  |
| 132   | Debris                    | Medium             | 573786   | 6270058  |
| 225   | Linear debris             | Medium             | 568335   | 6279641  |
| 230   | Linear debris             | Medium             | 583236   | 6282260  |
| 248   | Linear debris             | Medium             | 564456   | 6278244  |
| 268   | Debris                    | Medium             | 583479   | 6281600  |
| 365   | Linear debris             | Medium             | 567112   | 6274882  |

### Project Bravo ISA

17.34. The desk based review established that there are no Designated Wrecks or other cultural heritage assets with legal designations within the Project Bravo site. Three 'Live' wrecks (where the position is confirmed) were identified from the SeaZone dataset within the Project Bravo site (HA1001, HA1004 and HA1008, Table 17.9), shown in Figure 17.3. On comparing the geophysical targets identified during the data review, it is likely that high potential targets HA175, HA176 and HA177 are the same anomaly identified on different files and that the targets correspond with 'Live' wreck HA1001, while high potential target HA409 appears to correspond with 'Live' wreck HA1004 (see Figure 17.4 and Figure 17.5). One 'Dead' wreck (HA1002) was also identified in the Project Bravo site. As has already been established above, the 'Dead' status of a wreck refers to the position of wreck remains that were identified during initial survey but have not been identified in subsequent surveys.

**Table 17.9 Offshore cultural heritage assets within the Project Bravo ISA with known locations including UKHO 'dead' entries.**

| HANo. | Name                          | UKHO No. | NMRS No. | UTM30NmE | UTM30NmN | Status |
|-------|-------------------------------|----------|----------|----------|----------|--------|
| 1001  | <i>HMS St Briac</i>           | 070459   | -        | 588376   | 6268388  | Live   |
| 1002  | <i>HMS Exmouth (possibly)</i> | 065549   | -        | 584999   | 6268185  | Dead   |
| 1004  | Unknown                       | 070465   | -        | 577240   | 6264891  | Live   |
| 1008  | Unknown                       | 03161    | -        | 572132   | 6264185  | Live   |

## Archaeological Assessment of Marine Geophysical Data

17.35. The archaeological analysis and review of the geophysical identified five targets of high archaeological potential and four targets of medium archaeological potential, all of which are located within the Project Bravo site and 1km buffer of the ISA (Table 17.11 & 17.12, Figure 17.4). Of note is the correlation between targets HA175, HA176 and HA177 and the 'Live' wreck HA1001, and also between target HA409 and 'Live' wreck HA1004 (see Figure 17.5).

**Table 17.10 Targets of high and medium archaeological potential identified in the Project Bravo ISA.**

| HANo. | Site Description    | Sidescan Potential | UTM30NmE | UTM30NmN |
|-------|---------------------|--------------------|----------|----------|
| 81    | Curvilinear feature | Medium             | 587742   | 6280533  |
| 88    | Aircraft?           | High               | 589108   | 6277960  |
| 101   | Debris              | Medium             | 585929   | 6276473  |
| 118   | Debris              | Medium             | 579224   | 6272921  |
| 133   | Debris              | Medium             | 575865   | 6270475  |
| 175   | Wreck               | High               | 588375   | 6268388  |
| 176   | Wreck               | High               | 588437   | 6268346  |
| 177   | Wreck debris        | High               | 588437   | 6268287  |
| 409   | Wreck               | High               | 577240   | 6264891  |

### *Transmission Asset Project ISA*

- 17.36. Part of the transmission asset infrastructure will be placed within the site boundaries of Project Alpha and/or Project Bravo. The baseline environment within these areas is therefore as described previously.
- 17.37. The desk based assessment established that there are no Designated Wrecks or other cultural heritage assets with legal designations within the Transmission Asset Project ISA. Seven 'Live' wrecks and five 'Dead' wrecks from the SeaZone dataset were identified within the ECR corridor (Table 17.11), shown in Figure 17.6. Due to the 'Dead' status (position of wreck not identified in repeated surveys) of the five sites highlighted below they will not be taken forward to impact assessment.

**Table 17.11 Offshore cultural heritage assets within the Transmission Asset Project ISA with known locations including UKHO ‘dead’ entries.**

| HANo. | Name                     | UKHO No. | NMRS No. | UTM30NmE | UTM30NmN | Status |
|-------|--------------------------|----------|----------|----------|----------|--------|
| 1011  | Unknown                  | 03041    | -        | 551770   | 6273083  | Live   |
| 1012  | Unknown                  | 00189    | 102794   | 538553   | 6269461  | Live   |
| 1015  | <i>Primrose</i>          | 03040    | -        | 551925   | 6272990  | Dead   |
| 1016  | Unknown                  | 00195    | -        | 538733   | 6271133  | Live   |
| 1020  | Unknown                  | 00171    | -        | 530759   | 6265891  | Live   |
| 1021  | <i>Margaret Rae</i>      | 057569   | -        | 545957   | 6272635  | Live   |
| 1023  | <i>Canginian</i>         | 03038    | 102791   | 524018   | 6262306  | Dead   |
| 1025  | Unknown                  | 071939   | -        | 543909   | 6271225  | Live   |
| 1027  | <i>Hoche</i>             | 03032    | 102787   | 538823   | 6269315  | Live   |
| 1028  | <i>Anu</i>               | 03030    | -        | 520433   | 6261770  | Dead   |
| 1029  | Aircraft                 | 03031    | -        | 519402   | 6261762  | Dead   |
| 1040  | Obstruction/<br>Aircraft | 03179    | -        | 562347   | 6271452  | Dead   |

### Archaeological Assessment of Marine Geophysical Data

17.38. The archaeological assessment, analysis and review of the geophysical data covering the ECR ISA identified nine targets of high archaeological potential and 18 targets of medium archaeological potential, all of which are located within the Transmission Assets Project ISA (Table 17.12, Figure 17.7 and Figure 17.8). Of note is the correlation between high archaeological potential targets CR18, CR19, CR28, CR47 and CR60 and ‘Live’ wreck HA1025; between high archaeological potential targets CR10 and CR12 and ‘Live’ wreck HA1011, and between high archaeological potential target CR62 and ‘Live’ wreck HA1027 (see Figure 17.5). There is also a correlation between medium archaeological potential target CR6 and ‘Live’ wreck HA1021.

**Table 17.12 Headland High and Medium targets recorded in the Transmission Asset Project ISA.**

| HANo. | Site Description | Sidescan Potential | UTM30NmE | UTM30NmN |
|-------|------------------|--------------------|----------|----------|
| 6     | Debris           | Medium             | 538510.  | 6269456  |
| 9     | Wreck            | Medium             | 551770   | 6273083  |
| 10    | Wreck            | High               | 551846   | 6273040  |
| 12    | Wreck            | High               | 551826   | 6273287  |
| 18    | Wreck            | High               | 530669   | 6265811  |
| 19    | Debris           | High               | 530806   | 6265914  |
| 26    | Debris           | Medium             | 530683   | 6265932  |
| 28    | Wreck            | High               | 530747   | 6265803  |
| 29    | Debris           | Medium             | 524017   | 6262695  |
| 30    | Debris           | Medium             | 524018   | 6262306  |
| 31    | Debris           | Medium             | 524011   | 6262233  |
| 32    | Debris           | Medium             | 524069   | 6262283  |
| 34    | Debris           | Medium             | 524105   | 6262315  |
| 35    | Debris           | High               | 524056   | 6262264  |
| 36    | Debris           | Medium             | 523983   | 6262262  |
| 37    | Debris           | Medium             | 523994   | 6262292  |
| 38    | Debris           | Medium             | 524032   | 6262305  |
| 47    | Wreck            | High               | 530759   | 6265891  |
| 56    | Debris           | Medium             | 524363   | 6262075  |
| 57    | Debris           | Medium             | 523998   | 6262258  |
| 60    | Wreck            | High               | 530759   | 6265890  |
| 61    | Debris           | Medium             | 528448   | 6264286  |
| 62    | Debris           | High               | 524043   | 6262278  |
| 65    | Debris           | Medium             | 524025   | 6262247  |
| 306   | Linear Debris    | Medium             | 556786   | 6274000  |
| 340   | Linear Debris    | Medium             | 558720   | 6273883  |
| 345   | Linear Debris    | Medium             | 558535   | 6273536  |

### *Potential for submerged archaeology and palaeo-environments*

17.39. The geoarchaeological and geotechnical assessment of the geotechnical survey borehole logs from within the ISA (borehole locations are shown in Figure 17.9) has established that the area of the Seagreen Project within the outer Firth of Forth and North Sea basin has been either under ice or submerged throughout the late Glacial/ early Holocene. This has resulted in a lack of organic sediments of palaeoenvironmental interest from this period, such as peats, as these have not had the opportunity to form. The potential for the discovery of relict land surface deposits and features of archaeological interest therefore is regarded as low. Despite this, there is limited potential for the discovery of residual artefacts in the marine sediments such as lithics.

17.40. No geotechnical survey data is available for the Transmission Asset Project at the time of writing.

### *Potential for unrecorded maritime cultural heritage assets*

17.41. The assessment identified a number of recorded maritime and aircraft losses within the Project Alpha and Project Bravo ISA and the Transmission Asset Project ISA, a number of which have known positions and which have been confirmed in the archaeological assessment of geophysical data (see Figure 17.2). The assessment also identified a significant number of maritime loss events, both vessels and aircraft, within the RSA, which covered the wider outer Forth and North Sea basin in proximity to the Seagreen Project (see Appendix L1). Further, there are a large number of maritime losses listed in the NMRS dataset with arbitrary or tentative locations recorded within the RSA. As such, the potential for the discovery of unrecorded cultural heritage assets within the proposed OWF sites and ECR corridor therefore is regarded as moderate.

### **Onshore Cultural Heritage Assets**

17.42. Following the discussion above regarding the consideration of potential setting impacts on onshore and island cultural heritage assets (see Figure 17.10), the following presents information on those cultural heritage sites identified in the initial baseline review for the original Project Alpha and Project Bravo site boundaries.

17.43. Within the 25km buffer of the original Project Alpha and Project Bravo study area a total of 25 scheduled monuments, 21 Category A listed buildings, one inventory historic garden and design landscape and three conservation areas were identified within the ZTV.

17.44. Within the 35km buffer of the original Project Alpha and Bravo study area for the 80 scheduled monuments, 21 Category A listed buildings, five historic gardens and designed landscapes and six conservation areas were identified within the ZTV.

17.45. While many of these assets have views of the sea or are visible from the sea, the seascape was considered relevant to the setting of just a limited number of assets, where it contributed to their cultural significance. These assets included the Iron Age promontory forts that are located along the Angus coast; West Mains of Ethie (SM5586), Ethie Mains Fort (SM5611), Prail Castle Fort (SM5587), Buckiemill Fort (SM5591), Maiden Castle Fort (SM2872), Lud Castle (SM2876), Castle Rock Fort Auchmithie (SM2875); all of which are scheduled monuments. Also identified within the 25km buffer of the original boundaries of Project Alpha and Bravo was the Category A-listed Bell Rock Lighthouse (LB45197) built on a rock approximately 17km from the coast, where the setting of this asset is dominated by the surrounding seascape.

17.46. The remaining cultural heritage assets identified did not have as fundamental a relationship with the seascape. It was therefore proposed that detailed assessments would only be carried out for the eight cultural heritage assets highlighted above which have particular associations with the seascape.

### *Project Alpha and Project Bravo boundary refinement*

17.47. As stated in paragraph 17.15, following the Project Alpha and Project Bravo boundary refinement, it was agreed that there would be no significant impacts on the setting of any onshore cultural heritage assets identified in the baseline assessment and that the potential for indirect impacts would not be taken forward to impact assessment.

## ASSESSMENT OF IMPACTS – WORST CASE SCENARIO

17.48. Full details on the range of options being considered by Seagreen are provided throughout Chapter 5: Project Description of this ES. The assessment of potential impacts arising from construction, operation and decommissioning of the proposed Seagreen Project is based on the Seagreen Rochdale Envelope parameters which have been considered to assess the realistic worst case design scenarios on archaeology and cultural heritage receptors. The principal considerations include:

- foundation/ substructure options for wind turbine generators (WTGs), offshore substation platforms (OSPs) and permanent meteorological masts;
- array cabling extent and installation techniques;
- size of WTGs and likely extent of layout; and
- transmission Asset Project and installation techniques.

17.49. No pre-defined layouts have been proposed for Project Alpha and Project Bravo. There will be a maximum of 75 WTG's in Project Alpha and 75 WTG's in Project Bravo, a maximum of three OSP's in Project Alpha and two OSP's in Project Bravo (i.e. up to five collectively across the Transmission Asset Project), and a maximum of three meteorological masts within each OWF Project Area within the worst case assessment, Therefore with the exception of an additional OSP in Project Alpha, the worst case scenario for both projects is considered to be analogous (Table 17.13a includes both Project Alpha and Project Bravo parameters; Project Bravo exceptions are in *italic*).

17.50. All worst cases for direct impacts assume the greatest extent of seabed take, termed temporary zone of influence in the Rochdale Envelope parameters. The details of each impact and the associated worst case parameters for Project Alpha, Project Bravo and the Transmission Asset Project are presented in Tables 17.17a and 17.17b overleaf.

**Table 17.13 a Worst case scenario for Project Alpha and Project Bravo assessment**

| Effect   | Worst case scenario  | Justification   |
|--|--|---|
| <b>Construction</b>  |  |   |
| Direct primary impacts on cultural heritage assets due to installation of infrastructure | Max: 75 x WTG's with Conical GBS (8 x WTG GBS dimensions 72m in 60m water depth, 67 x WTG GBS dimensions 52m in 50m water depth) | The Conical GBS foundations/ substructures for WTG's have a larger seabed temporary zone of influence than any of the foundations under consideration (12,854m <sup>2</sup> ). Further, the GBS foundations require a ballast of 21,860m <sup>3</sup> . The total area of seabed affected is 8x 12,854m plus 67 x 8,872m <sup>2</sup> = 69,7256m <sup>2</sup> |
|  | Meteorological masts: 3 x meteorological masts foundations/ substructures (GBS dimensions 52m in 50m water depth)                | The Conical GBS foundations/ substructures for meteorological masts have a larger seabed temporary zone of influence than any of the foundations/ substructures under consideration (8,872m <sup>2</sup> ). The total area of seabed affected is 3x 8,872m <sup>2</sup> = 26,616m <sup>2</sup>  |



| Effect  | Worst case scenario  | Justification  |
|---|--|--|
|   | <p>Array Cables: Estimated Total Trenched (plough or jet) Cable Length Max: 355km with a trench width of 3m and assumed max. depth of 2.1m; with a Temporary Zone of Influence of 10.m</p>   | <p>For array cabling the maximum footprint is established by multiplying the total array cable length by trench Temporary Zone of Influence. This equates to 35,5000m x 10m = 3,550,000m<sup>2</sup></p>   |
|   | <p>Array Cables Estimated total rock or mattress protected length Max: 35.5km, rock or mattress protection width 7m and height of 1m.</p>  | <p>Rock/ mattress protection only considered for maximum range.</p>  |
|   | <p>OSPs: Scenario 1<br/>           Project Alpha: 1 x 1075MW HVDC converter using GBS (100m x 75m) and 2 x HVAC collector OSPs using GBS (40m x 40m).<br/> <i>Project Bravo: 2 x HVAC collector OSPs using GBS (40m x 40m).</i></p>  | <p>Project Alpha :This option would include three OSP's</p> <ul style="list-style-type: none"> <li>• HVDC converter x 1 (20,739m<sup>2</sup> Temp. Zone of Influence)</li> <li>• HVAC collector x 2 (6,955 m<sup>2</sup> Temp. Zone of Influence) The combined total Temporary Zone of Influence of the 3 OSP's in this case is 34,649 m<sup>2</sup></li> </ul> <p><i>Project Bravo: This option would include two OSPs:</i></p> <ul style="list-style-type: none"> <li>• HVAC collector x 2 (6,955 m<sup>2</sup> Temp. Zone of Influence) The combined total Temporary Zone of Influence of the 2 OSP's in this case is 13,910 m<sup>2</sup></li> </ul> |
| <p>Direct secondary impacts on archaeology and cultural heritage due to activities associated with installation of infrastructure</p> | <p>Anchoring/ Jack up barges. Damage to cultural heritage assets from vessels/ plant during construction. Deployment of six jack-up legs for a single vessel, with each leg covering 4.5m x 4.5m square with a typical penetration of 2m = 40.5m<sup>3</sup></p>   | <p>Given the site conditions and operational depths it is envisaged that either dynamic positioning or the deployment of jack-up legs will be used. The impact of the jack-up legs on the seabed constitutes the worst case and this could be multiplied with the deployment of several vessels at any one time.</p>   |
| <p>Indirect impacts on Cultural heritage assets due to physical processes and effect on sediment regimes</p>                          | <p>Seabed preparation works across the footprint area of the conical GBS to a maximum depth of 5m at up to 8 locations and maximum depth of 3m at the 67 other locations</p> <p>Cable burial achieved using jetting ROV within the 36 month offshore cabling activity programme (from the 3rd Quarter 2016 to the 3rd Quarter 2019).</p> <p>Release of 1,112,405m<sup>3</sup> of seabed material side-cast to seabed adjacent to foundation during seabed preparation works.</p> | <p>The worst case scenario is represented by that which could result in the maximum volume of arising (and therefore, maximum volume of material that could potentially be brought into suspension).</p>   |

| Effect   | Worst case scenario  | Justification  |
|--|--|--|
| <b>Operation</b>   |  |  |
| Indirect impacts on Cultural heritage assets due to physical processes and effect on sediment regimes                          | The worst case scenario would result in the maximum amount of sediment being released in the shortest time.<br><br>Scour volume of up to 4,877m <sup>3</sup> per WTG GBS substructure/ foundation and up to 4,032 m <sup>3</sup> per OSP substructure/ foundation under a worst case 1 in 50 year storm. Total scour volume per project of 356,044m <sup>3</sup> . | As above   |
| Direct secondary impacts on archaeology and cultural heritage due to activities associated with installation of infrastructure | Operation/ Maintenance: The worst case scenario will provide for the plant that will have the maximum seabed disturbance from anchoring during maintenance / emergency activities. The maximum number of service vessels required (Max 8) and the average number of vessel trips to site per annum:  | Higher number of service vessels may result in largest amount of anchoring activities that may impact on cultural heritage assets. The higher the number of vessel trips to site may result in the highest level of anchoring activities that may impact on cultural heritage assets.  |
| <b>Decommissioning</b>   |  |  |
| Direct impacts on cultural heritage assets due to removal of infrastructure  | Removal of all structures associated with the wind farm, requiring jack-up movements in line with those presented in construction (which could impact on previously undisturbed features.  | The worse case scenario that would result in the maximum level of disturbance to the archaeological resource would be to remove all structures rather than to leave the structures in place as the deployment of jack-up legs from vessels during decommissioning on site has the potential to disturb unrecorded archaeological features. |

**Table 17.13b Worst case scenario for Transmission Asset Project assessment (Note the OSPs have been assessed as part of Project Alpha and Project Bravo above and hence are not assessed here).**

| Effect   | Worst case scenario  | Justification   |
|--|--|---|
| <b>Construction</b>  |  |   |
| Direct primary impacts on known cultural heritage assets and unrecorded cultural heritage assets due to installation of infrastructure | Export Cable Scenario 4: Maximum number of trenches = 6.<br><br>Estimated total trenched (plough or jet) cable length Max: 530 km with a trench width of 3m and assumed max. depth of 3m; with a Temporary Zone of Influence of 15m. | For export cabling the maximum 'seabed take' is established by multiplying the total cable length by the trench width (Temporary Zone of Influence). This equates to 530,000m x 15m = 7,950,000m <sup>2</sup> . |
| Direct secondary impacts on archaeology and cultural heritage due to activities associated with installation of infrastructure         | Anchoring of cable lay vessel and support vessels. Damage to cultural heritage assets from vessels / plant during construction.  | The impact of vessel anchoring on the seabed constitutes the worst case and this could be multiplied with the deployment of several vessels at any one time.  |

| Effect  | Worst case scenario   | Justification   |
|---|---|---|
| <p>Indirect impacts on Cultural heritage assets due to physical processes and effect on sediment regimes</p>              | <p><u>Infrastructure within the Project Alpha and Project Bravo site boundaries</u></p> <p>The worst case scenario is that the maximum amount of sediment being released in the shortest time.</p> <p>The greater the amount of sediment released the higher the potential for contaminant release.</p> <p>The greatest amount of material release is predicted to be 56,000m<sup>3</sup> which could be released over a 36 month period.</p> <p><u>ECR corridor</u></p> <p>The greatest amount of material release is predicted to be 4,770,000m<sup>3</sup> which could be released over a 24 month period.</p> | <p>The worst case scenario is represented by that which could result in the maximum volume of arising (and therefore, maximum volume of material that could potentially be brought into suspension).</p>  |
| <b>Operation</b>  |   |   |
| <p>Indirect impacts on cultural heritage assets during maintenance operations</p>   | <p>The worst case scenario would result in the maximum amount of sediment being released in the shortest time.</p> <p>The greater the amount of sediment released the higher the potential for contaminant release.</p>   | <p>The worst case scenario is represented by that which could result in the maximum volume of arising (and therefore, maximum volume of material that could potentially be brought into suspension).</p>  |
| <p>Secondary impacts on archaeology and cultural heritage due to activities associated with operation and maintenance</p> | <p>The worst case scenario will provide for the plant that will have the maximum seabed disturbance from anchoring during maintenance / emergency activities. The maximum number of service vessels required (Max 8) and the average number of vessel trips to site per annum.</p>  | <p>Higher number of service vessels may result in largest amount of anchoring activities that may impact on cultural heritage assets. The higher the number of vessel trips to site may result in the highest level of anchoring activities that may impact on cultural heritage assets.</p>  |
| <b>Decommissioning</b>  |   |   |
| <p>Direct Impacts on cultural heritage assets</p>   | <p>Removal of all structures associated with the transmission infrastructure project, requiring vessel anchoring activities.</p>  | <p>The worst case scenario that would result in the maximum level of potential disturbance to the archaeological resource would be to remove all export cables rather than to leave the structures in place as the deployment of anchors from vessels during decommissioning on site has the potential to disturb unrecorded archaeological features.</p> |

## IMPACT ASSESSMENT – CONSTRUCTION PHASE

17.51. This section assesses potential impacts during construction of the Seagreen Project.

### Project Alpha

#### *Direct impacts on archaeology and cultural heritage assets*

- 17.52. Potential issues in association with direct impacts on archaeological and cultural heritage assets were highlighted in the Scoping Opinion response provided by Historic Scotland (see Table 17.1). The source data consulted to help identify the cultural heritage assets considered here have been provided in Table 17.2; the types and details of assets are presented in the ‘Existing Environment’ Section of this chapter; and the types of impacts include those highlighted in Table 17.3 above and the effects provided in the worst case parameters in Table 17.13a.
- 17.53. The desk based assessment established that there are no Designated Wrecks or other cultural heritage assets with legal designations within the Project Alpha study area.
- 17.54. Sites HA14, HA25, HA43, HA47, HA64, HA77, HA106, HA112, HA132, HA225, HA230, HA248, HA268 and HA365 are sidescan sonar targets of medium potential (see Appendix L1 for potential criteria, Figure 17.4) and have been classified as sites of medium sensitivity within this assessment. This initial assessment is based on the anthropogenic characteristics of the anomalies and the likelihood that they represent remains likely to be associated with wreckage or submerged cultural heritage remains. While the likelihood of the impact may be low, the potential magnitude of the impacts in the absence of mitigation could be high as there is the potential for a direct primary impact on archaeological and cultural heritage assets. These include the installation of the OWF components and infrastructure such as turbine foundations/ substructures, array cabling, WTGs, and Meteorological Masts. In addition, there is the potential for direct secondary impacts on archaeological and cultural heritage assets associated with these activities; such as the deployment of jack-up legs and the anchoring of vessels during construction. Any direct impact could result in the loss of one or more key components of a cultural heritage asset. The significance of the impact is therefore regarded as major adverse and **significant**. This is particularly the case given the unique and irreplaceable nature of the archaeology and cultural heritage resource, where a potential direct impact, regardless of the magnitude or duration of the impact, is permanent and irreversible.
- 17.55. The predicted confidence in the assessment of significance of the impact for all the sites identified above is medium to low, pending further investigation (for example during pre-construction surveys) and confirmation of the nature and characteristics of the identified sites; it is important to stress that each potential impact should be regarded on a site-by-site basis, and the predicted confidence must be viewed as precautionary with regard to the potential for the discovery of as yet unrecorded cultural heritage assets (see paragraph 17.41). It is possible that the sensitivity and significance of impact could change as a result of further investigation.

## Mitigation

- 17.56. The following mitigation measures in connection with direct impacts on archaeology and cultural heritage assets will be implemented by Seagreen.

### Mitigation

All sites of cultural heritage interest included in this assessment will be avoided where possible. At present the following mitigation is proposed:

In order to mitigate the risk of damage to any unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Archaeological Service to mitigate construction effects in the event of any unexpected archaeological discoveries during installation (see Appendix L1 for more information).

Where cultural heritage assets may potentially be subject to direct effects, infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as WTG and array cable installation, and anchoring or deployment of jack-up legs. Exclusion zones of at least 50m will be established around those of medium sensitivity HA14, HA25, HA43, HA47, HA64, HA77, HA106, HA112, HA132, HA225, HA230, HA248, HA268 and HA365.

These measures will form part of the Construction Environmental Management Plan (CEMP).

## Residual Impact

- 17.57. Following the application of the mitigation measures outlined above it is likely that cultural heritage assets can be avoided, where known, and in the event that unrecorded assets are uncovered, appropriate measures are in place to deal effectively with any such eventuality. As such, the residual impacts of the Project on the archaeology and cultural heritage resource during construction would be reduced to negligible and **not significant**.

### *Indirect impacts on archaeological and cultural heritage assets*

- 17.58. Potential issues in association with indirect impacts on archaeology and cultural heritage assets were also highlighted in the Scoping Opinion response provided by Historic Scotland (see Table 17.1). The source data consulted to help identify the cultural heritage assets considered here have been provided in Table 17.2; the types and details of assets are presented in the 'Existing Environment' Section of this chapter; and the types of impacts include those highlighted in Table 17.3 above and the effects provided in the worst case parameters (Table 17.13a).
- 17.59. There is the potential for alterations in sediment transport regimes to have an indirect effect on archaeology and cultural heritage assets; this might include the further uncovering of known assets or the exposure of hitherto unrecorded assets.
- 17.60. In order to establish the level of potential impact on archaeology and cultural heritage assets through alterations in sediment regimes the results of the assessment of physical processes associated with Project Alpha, were considered (for more detail please see Chapter 7: Physical Environment).
- 17.61. The main types of construction activities associated with increased sediment suspension and deposition for Project Alpha include the installation of GBS foundations (for WTGs and OSPs) and array cables. Chapter 7: Physical Environment of this ES established that dispersal of sediment is likely to be of short duration and occur along the main axis of tidal current flow (NNE to SSW). Sediment concentrations are considered to be localised and relatively low compared to background values (natural variability). Even when consideration has been given to the spring-neap tidal cycle where the critical threshold for

motion can be exceeded, sediment will not become widely dispersed in high concentrations. The assessment of the effects of installation on suspended sediment concentrations and transport within Chapter 7: Physical Environment concluded that the impact of GBS preparation and installation of array cables would result in a low magnitude effect in relation to sediment transport and deposition on the seabed.

- 17.62. Potential impacts above have all been described as of low magnitude and therefore the magnitude of impact on archaeology and cultural heritage assets is likely to be at worst, low. The sensitivity of the identified archaeology and cultural heritage assets are considered to be medium to high. Based on the significance of the potential impact identified in the matrix in Table 17.6 above there would be at worst an indirect impact of minor adverse and **not significant** on archaeology and cultural heritage assets.
- 17.63. As with direct impacts outlined above, the predicted confidence in the assessment of significance of the indirect impacts is medium to low, pending further investigation; for example during pre-construction surveys to indicate the nature of sediment regimes prior to construction, and periodic monitoring throughout the life of Project Alpha to assess any change. This would allow for the confirmation of the nature and characteristics of identified sites and those that may be revealed as a result of sediment movement. It is possible that the sensitivity and significance of impact could change as a result of further investigation.

### Mitigation

- 17.64. The following mitigation measures in connection with indirect impacts on archaeology and cultural heritage assets will be implemented by Seagreen and are presented below.

**Mitigation**

All sites of cultural heritage interest included in this assessment will be avoided where possible. At present the following mitigation is proposed:

In order to mitigate the risk of damage to any recorded or unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Archaeology Service to mitigate construction effects in the event of any unexpected archaeological discoveries during installation (see Appendix L1 for more information).

### Residual Impact

- 17.65. Following application of these mitigation measures the magnitude of these impacts should be reduced to negligible, resulting in a negligible and **not significant** impact.

### Project Bravo

#### *Direct impacts on archaeological and cultural heritage assets*

- 17.66. As with Project Alpha the potential for direct impacts to occur has been highlighted in the Scoping Opinion response provided by Historic Scotland (see Table 17.1). The details of the types of impact have already been established in the discussion for Project Alpha in paragraphs 17.51 to 17.57 above, where the only difference noted here are the specific sites and assets located in the Project Bravo ISA (Project site and adjacent 1km buffer). The source data consulted to help identify the cultural heritage assets considered here have been provided in Table 17.2; the types and details of assets are presented in the ‘Existing Environment’ Section of this chapter, and the types of impacts include those highlighted in Table 17.3 above and the effects provided in the worst case parameters (Table 17.13a).

- 17.67. The desk based assessment established that there are no Designated Wrecks or other cultural heritage assets with legal designations within the Project Bravo site.
- 17.68. Sites HA1001, HA1004 and HA1008 (wrecks identified in the SeaZone data) are classified as sites of high sensitivity within this assessment due to the positive identification of the assets as verified wreck remains. As such, the potential magnitude of the impacts in the absence of mitigation could be high, similar to those direct impacts identified in paragraphs 17.51 to 17.57 above. The significance of the impact is therefore regarded as major adverse and **significant**.
- 17.69. Sites HA81, HA88, HA101, HA118, HA133, HA175, HA176, HA177 and HA409 (sidescan sonar targets of medium potential – see Appendix L1 for potential criteria) are classified as sites of medium sensitivity within this assessment. The potential magnitude of the impacts in the absence of mitigation could be high. The significance of the impact is therefore regarded as major adverse and **significant**.
- 17.70. As highlighted with Project Alpha, the predicted confidence in the assessment of impact significance for all the sites identified above is medium to low, pending further investigation (for example during pre-construction surveys) and confirmation of the nature and characteristics of the identified sites. It is possible that the sensitivity and significance of impact could change as a result of further investigation.

### Mitigation

- 17.71. The following mitigation measures in connection with direct impacts on archaeology and cultural heritage assets will be implemented by Seagreen and are presented below. They follow the same format as those presented for Project Alpha.

#### Mitigation

All sites of cultural heritage interest included in this assessment will be avoided where possible. At present the following mitigation is proposed:

In order to mitigate the risk of damage to any unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Archaeology Service to mitigate construction effects in the event of any unexpected archaeological discoveries during installation (see Appendix L1 for more information).

Where cultural heritage assets may potentially be subject to direct effects, infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as WTG and cable installation, and anchoring or deployment of jack-up legs. Exclusion zones of at least 100m will be established around HA1001, HA1004 and HA1008. Exclusion zones of at least 50m will be established around those of medium sensitivity HA81, HA88, HA101, HA118, HA133, HA175, HA176, HA177 and HA409.

These measures will form part of the CEMP.



## Residual Impact

- 17.72. In line with Project Alpha, following the application of these mitigation measures the magnitude of these impacts should be reduced to negligible, resulting in a negligible and **not significant** impact.

### *Indirect impacts on archaeological and cultural heritage assets*

- 17.73. In addition to the direct impacts noted above, potential issues in association with indirect impacts on archaeological and cultural heritage assets for Project Bravo will be the same as that established for Project Alpha.
- 17.74. As established for Project Alpha, there is the potential for alterations in sediment transport regimes to have an indirect effect on archaeology and cultural heritage assets identified above; this might include the further uncovering of known assets or the exposure of hitherto unrecorded assets.
- 17.75. In order to establish the level of potential impact on archaeology and cultural heritage assets through alterations in sediment regimes the results of the assessment of physical processes associated with the Projects were considered (for more detail see Chapter 7: Physical Environment).
- 17.76. The main types of construction activities associated with increased sediment suspension and deposition for Project Bravo are the same as those for Project Alpha (see paragraphs 17.58 to 17.65). Chapter 7: Physical Environment established that dispersal of sediment is likely to be of short duration and occur along the main axis of tidal current flow (NNE to SSW). Sediment concentrations are considered to be localised and relatively low compared to background values (natural variability). The assessment of the effects of GBS installation on suspended sediment concentrations and transport within Chapter 7: Physical Environment concluded that the magnitude of impact of GBS preparation and installation of array cables would be negligible.
- 17.77. Potential impacts above have all been described as of negligible magnitude and therefore the magnitude of impact on archaeology and cultural heritage assets is also likely to be negligible, especially given that effects are likely to be localised and of short duration. The sensitivity of the identified archaeology and cultural heritage assets are considered to be medium to high, based on the characteristics of the assets as highlighted for direct impacts within the Project Alpha site in paragraphs 17.51 to 17.57 above. Based on the significance of the potential impact identified in the matrix in Table 17.6 above there would be an indirect impact of minor adverse and **not significant** (at worst) on archaeology and cultural heritage assets. This would not be considered to be a significant impact in relation to the EIA Regulations.
- 17.78. The predicted confidence in the assessment of impact significance is medium to low, pending further investigation (for example during pre-construction surveys and periodic monitoring) and confirmation of the nature and characteristics of the identified sites. It is possible that the sensitivity and significance of impact could change as a result of further investigation.

## Mitigation

- 17.79. The following mitigation measures in connection with indirect impacts on archaeology and cultural heritage assets will be implemented by Seagreen and are presented below.

### Mitigation

All sites of cultural heritage interest included in this assessment will be avoided where possible. At present the following mitigation is proposed:

In order to mitigate the risk of damage to any recorded or unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Archaeology Service to mitigate construction effects in the event of any unexpected archaeological discoveries during installation (see Appendix L1 for more information).

These measures will form part of the CEMP.

## Residual Impact

- 17.80. Following application of these mitigation measures the magnitude of these impacts should remain negligible, making it negligible and **not significant**. This would not be considered to be a significant impact in relation to the EIA Regulations.

## Transmission Asset Project

### *Infrastructure within the Project Alpha and Project Bravo site boundaries*

- 17.81. Following from Project Alpha and Project Bravo potential issues in association with direct and indirect impacts on archaeological and cultural heritage assets associated with the Transmission Asset Project were highlighted in the Scoping Opinion response provided by Historic Scotland (see Table 17.1). Similar to Project Alpha and Project Bravo the source data consulted to help identify the types and details of assets are presented in the 'Existing Environment' Section of this chapter. The types of impacts include those highlighted for Project Alpha and Project Bravo above, and similarly, the specific worst case parameters relevant to the Transmission Asset Project infrastructure within these sites is provided in Table 17.13b.

## Direct and indirect impacts on archaeology and cultural heritage assets

- 17.82. The potential direct and indirect impacts of the construction of the transmission asset infrastructure within the site boundaries of Project Alpha and Project Bravo are considered to be, at worst, the same as those highlighted above for the Project Alpha and Project Bravo impact assessments. It is noted that Chapter 7: Physical Environment has indicated that it is likely that the effects upon the sediment distribution patterns will be negligible and not significant.

## Mitigation

- 17.83. The following mitigation measures in connection with direct, indirect and secondary impacts on archaeology and cultural heritage assets will be implemented by Seagreen and are presented below.

### Mitigation

Mitigation proposed is the same as the Project Alpha and Project Bravo impact assessments presented above.

## Residual Impact

- 17.84. Following application of these mitigation measures the magnitude of these impacts should be reduced to negligible, resulting in a negligible impact and **not significant**.

## Infrastructure within the ECR corridor

### Direct impacts on archaeological and cultural heritage assets

- 17.85. As discussed with direct impacts for Project Alpha and Project Bravo (see above), there is the potential for direct impacts to occur during the installation and burial of the export cable, including such activities within the inter-tidal zone. As with Project Alpha and Project Bravo, the issue was highlighted in the Scoping Opinion response provided by Historic Scotland (see Table 17.1). The types of impacts include those highlighted for Project Alpha and Project Bravo (see paragraphs 17.51 to 17.57) above and the effects provided in the worst case parameters in Table 17.13b.
- 17.86. The desk based assessment established that there are no Designated Wrecks or other cultural heritage assets with legal designations within the ECR corridor area.
- 17.87. Sites HA1011, HA1012, HA1016, HA1020, HA1021, HA1025 and HA1027 (wrecks identified in the SeaZone data) are classified as sites of high sensitivity within this assessment. The potential magnitude of the impacts in the absence of mitigation could be high. The significance of the impact is therefore regarded as major adverse and **significant**. The criteria and rationale for determining the sensitivity of the cultural heritage asset and the magnitude of the impact are the same as those highlighted above for Project Alpha and Project Bravo; and are also applicable to the sites identified in paragraph 17.87 below.
- 17.88. Sites HA10, HA12, HA18, HA19, HA28, HA35, HA47, HA60 and HA62 (sidescan sonar targets of high potential – see Appendix L1 for potential criteria) are classified as sites of high sensitivity within this assessment. The potential magnitude of the impacts in the absence of mitigation could be high. The significance of the impact is therefore regarded as major and potentially **significant**. Sites HA6, HA9, HA26, HA29, HA30, HA31, HA32, HA34, HA36-HA38, HA56, HA57, HA61, HA65, HA306, HA340 and HA345 (sidescan sonar targets of medium potential) are classified as sites of medium sensitivity within this assessment. The potential magnitude of the impacts in the absence of mitigation could be high. The significance of the impact is therefore regarded as major adverse and **significant**.
- 17.89. As discussed above for Project Alpha and Project Bravo the predicted confidence in the assessment of impact significance for all the sites identified above is low to medium.

## Mitigation

- 17.90. The following mitigation measures in connection with direct impacts on archaeology and cultural heritage assets will be implemented by Seagreen and are presented below.

### Mitigation

All sites of cultural heritage interest included in this assessment will be avoided where possible. At present the following mitigation is proposed:

In order to mitigate the risk of damage to any unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Archaeology Service to mitigate construction effects in the event of any unexpected archaeological discoveries during installation (see Appendix L1 for more information).

Where cultural heritage assets may potentially be subject to direct effects, infrastructure will be micro-sited/ re-routed and temporary exclusion zones will be implemented to prevent invasive activities, such as OSP and cable installation, and anchoring or deployment of jack-up legs. Exclusion zones of at least 100m will be established around those of high sensitivity HA10, HA12, HA18, HA19, HA28, HA35, HA47, HA60 and HA62. Exclusion zones of at least 50m will be established around those of medium sensitivity HA6, HA9, HA26, HA29, HA30, HA31, HA32, HA34, HA36-HA38, HA56, HA57, HA61, HA65, HA306, HA340 and HA345.

These measures will form part of the CEMP.

## Residual Impact

- 17.91. Following application of these mitigation measures the magnitude of these impacts should be reduced to negligible, resulting in a negligible impact and **not significant**.

## Indirect impacts on archaeological and cultural heritage assets

- 17.92. Potential issues in association with indirect impacts on archaeological and cultural heritage assets associated with the construction and installation of the transmission asset infrastructure, including all associated activities, are the same as those outlined above for Project Alpha and Project Bravo (see above). Similarly, the source data consulted to help identify the cultural heritage assets considered here are the same; and the types and details of assets are presented in the 'Existing Environment' Section of this chapter. The types of impacts beyond those indicated for Project Alpha and Project Bravo are presented in the worst case parameters in Table 17.13b.
- 17.93. There is the potential for alterations in sediment transport regimes to have an indirect effect on archaeology and cultural heritage assets identified above in paragraphs 17.58 to 17.65; this might include the further uncovering of known assets or the exposure of hitherto unrecorded assets.
- 17.94. In order to establish the level of potential impact on archaeology and cultural heritage assets through alterations in sediment regimes the results of the assessment of physical processes associated with the Projects were considered (for more detail see Chapter 7: Physical Environment).
- 17.95. The main types of construction activities associated with increased sediment suspension and deposition for the Transmission Asset Project include the installation of up to six cables buried by jet or plough to a maximum depth of up to 3.0m. Chapter 7: Physical Environment in this ES established that dispersal of sediment is likely to be of short duration and localised, the extent of dispersal of which will be dependent on the direction

of tidal current flow and sediment grain size. The assessment of the effects of GBS installation on suspended sediment concentrations and transport within Chapter 7: Physical Environment predicts that the potential magnitude of impact of the ECR installation would be low.

- 17.96. Similar to Project Alpha the potential impacts above have all been described as of low magnitude and therefore the magnitude of impact on archaeology and cultural heritage assets is also likely to be low. The sensitivity of the identified archaeology and cultural heritage assets are considered to be medium to high, in line with direct impacts. Based on the significance of the potential impact identified in the matrix in Table 17.6 above there would be at worst an indirect impact of moderate and **significant** on archaeology and cultural heritage assets. However, given the highly localised and the limited duration of the effect in the predicted changes in sediment regimes, and the localised nature of the identified assets the likely significance, based on professional judgment, is considered to be minor adverse or negligible and **not significant**.
- 17.97. As with Project Alpha and Project Bravo, the predicted confidence in the assessment of indirect impact significance is medium to low, pending further investigation (for example during pre-construction surveys and any monitoring activities (both offshore and in the inter-tidal zone) and confirmation of the nature and characteristics of the identified sites. As already stated, it is possible that the sensitivity and significance of impact could change as a result of further investigation.

### Mitigation

- 17.98. The following mitigation measures in connection with indirect impacts on archaeology and cultural heritage assets will be implemented by Seagreen and are presented below.

**Mitigation**

All sites of cultural heritage interest included in this assessment will be avoided where possible. At present the following mitigation is proposed:

In order to mitigate the risk of damage to any recorded or unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Archaeology Service to mitigate construction effects in the event of any unexpected archaeological discoveries during installation (see Appendix L1 for more information).

These measures will form part of the CEMP.

### Residual Impact

- 17.99. Following application of these mitigation measures the magnitude of these impacts should be remain low, resulting in negligible impact and **not significant**.

## IMPACT ASSESSMENT – OPERATION

- 17.100. Potential direct and indirect impacts on archaeology and cultural heritage assets considered here include those highlighted in the construction impact assessment above and the effects noted in the worst case parameters in Table 17.13a and 17.13b. Given that all direct primary impacts will have occurred during the construction phase for Project Alpha, Project Bravo and the Transmission Asset Project only direct secondary and indirect impacts will be considered for the operational phase.

## Project Alpha

### *Direct secondary impacts on archaeology and cultural heritage assets*

17.101. The offshore operation phase may result in secondary direct impacts on the sites of cultural heritage interest identified in the direct impacts during construction noted above. Potential effects may include the effects of the deployment of jack-up legs and the anchoring of maintenance vessels and associated activities. In line with the construction phase, the identified sites are of high to medium sensitivity and in the absence of mitigation the magnitude is considered to be high. The significance of the potential effect in the absence of mitigation is therefore regarded as major adverse and **significant**.

### *Indirect impacts on archaeological and cultural heritage assets*

17.102. There is the potential for indirect effects of Project Alpha on archaeology and cultural heritage assets through change and alterations in sedimentary regimes caused primarily by the development of scour holes around the base of WTG and OSP foundations/ substructures, and the presence of rock berms or matting along unburied sections of array cable. Chapter 7: Physical Environment has concluded that the magnitude of effect even in the absence of scour protection associated with the worst case GBS foundation is considered to be of low magnitude.

17.103. The potential impact noted above has been described as of low magnitude and therefore, like the construction phase, the magnitude of impact on archaeology and cultural heritage assets is also likely to be low. The sensitivity of the identified archaeology and cultural heritage assets are considered to be medium to high, in line with the construction phase for Project Alpha and Project Bravo noted above. Based on the significance of the potential impact identified in the matrix in Table 17.6 above there would be an indirect impact of, at worst, moderate and **significant** on archaeology and cultural heritage assets. However, given that the extent of the scour is localised to each foundation, and that the magnitude of the impact with the introduction of scour protection is reduced to no effect (see Chapter 7: Physical Environment), then the likely significance of indirect impacts on archaeology and cultural heritage, based on professional judgment, is considered to be negligible and **not significant**.

## Mitigation

17.104. Mitigation is considered to be the same as that presented for the construction phase, the details for which are provided below.

### **Mitigation**

All sites of cultural heritage interest included in this assessment will be avoided where possible. At present the following mitigation is proposed:

In order to mitigate the risk of damage to any recorded or unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Archaeology Service to mitigate operational effects in the event of any unexpected archaeological discoveries during installation (see Appendix L1 for more information).

These measures will form part of the CEMP.

## Residual Impact

17.105. Residual impacts following mitigation are considered to be the same as those for the construction phase where the residual impacts were regarded to be negligible and **not significant**.



## Project Bravo

### *Direct secondary impacts on archaeology and cultural heritage assets*

17.106. As highlighted for Project Alpha above (paragraph 17.100), the offshore operation phase may result in direct secondary impacts on the sites of cultural heritage interest identified in the secondary impacts during the construction phase noted above. Potential effects may include the effects of anchoring of maintenance vessels and associated activities. Similar to the assets identified for Project Alpha the identified cultural heritage sites are of high to medium sensitivity and in the absence of mitigation the magnitude is considered to be high. The significance of the potential impact is therefore regarded as major adverse and **significant**.

### *Indirect impacts on archaeological and cultural heritage assets*

17.107. The potential for indirect effects of Project Bravo on archaeology and cultural heritage assets through change in hydrodynamics and alterations in sedimentary regimes is considered to be at worst the same as that highlighted for Project Alpha as noted above (paragraph 17.101). As with Project Alpha, Chapter 7: Physical Environment also concluded that the magnitude of effect in the absence of scour protection associated with the worst case GBS foundation is considered to be of low magnitude.

17.108. The potential impact noted above has been described as of low magnitude and therefore, like the construction phase, the magnitude of impact on archaeology and cultural heritage assets is also likely to be low. The sensitivity of the identified archaeology and cultural heritage assets are considered to be medium to high, in line with the construction phase for Project Alpha and Project Bravo noted above. Based on the significance of the potential impact identified in the matrix in Table 17.6 there would be an indirect impact of, at worst, moderate and **significant** on archaeology and cultural heritage assets. As with Project Alpha, the extent of the scour is likely to be localised to each foundation, and the magnitude of the impact with the introduction of scour protection is reduced to no effect (see Chapter 7: Physical Environment), then the likely significance of indirect impacts on archaeology and cultural heritage, based on professional judgment, is considered to be negligible and **not significant**.

## Mitigation

17.109. Similar to Project Alpha noted above (see paragraph 17.104) mitigation and measures are considered to be the same and are highlighted below.

### **Mitigation**

All sites of cultural heritage interest included in this assessment will be avoided where possible. At present the following mitigation is proposed:

In order to mitigate the risk of damage to any recorded or unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Archaeology Service to mitigate operational effects in the event of any unexpected archaeological discoveries during installation (see Appendix L1 for more information).

These measures will form part of the CEMP.

## Residual Impact

17.110. The potential residual impacts, like Project Alpha, following the proposed mitigation are regarded to be of negligible and **not significant**.



## Transmission Asset Project

### *Infrastructure within the Project Alpha and Project Bravo site boundaries*

17.111. Potential direct secondary and indirect impacts on archaeology and cultural heritage assets considered here include those highlighted in the construction impact assessment above and the effects noted in the worst case parameters in Tables 17.13a and 17.13b above.

### Direct secondary impacts on archaeology and cultural heritage assets

17.112. The offshore operation phase for the Transmission Asset Project may result in direct secondary impacts on sites of cultural heritage interest, similar to those identified during the construction phase noted above. As with Project Alpha and Project Bravo the potential effects include the installation of OSP foundations/substructures and the effects of anchoring of maintenance vessels and associated activities. Similar to the archaeology and cultural heritage assets identified for Project Alpha and Project Bravo the identified cultural heritage sites are of high to medium sensitivity and in the absence of mitigation the magnitude is considered to be high. The significance of the potential impact is therefore regarded as major adverse and **significant**.

### Indirect impacts on archaeological and cultural heritage assets

17.113. The potential for indirect effects of the transmission asset infrastructure on archaeology and cultural heritage assets through change in hydrodynamics and alterations in sedimentary regimes is considered in Chapter 7: Physical Environment. The assessment concluded that the magnitude of effects on sedimentary regimes will be considerably less than that established for Project Alpha and Project Bravo. Chapter 7: Physical Environment also concluded that even in the absence of scour protection associated with the worst case GBS foundation, the magnitude of effect from scour hole development is considered to be negligible.

17.114. The potential magnitude of effect has been described as negligible. As such the magnitude of impact on archaeology and cultural heritage assets is also likely to be negligible. The sensitivity of the identified archaeology and cultural heritage assets are considered to be medium to high, in line with the construction phase for Project Alpha and Project Bravo noted above. Based on the significance of the potential impact identified in the matrix in Table 17.6 there would be an indirect impact of, at worst, minor adverse and **not significant** on archaeology and cultural heritage assets; based on the localised extent of the scour to each of the five OSP foundations (see Chapter 7: Physical Environment).

### Mitigation

17.115. The following mitigation measures in connection with both direct secondary and indirect impacts on archaeology and cultural heritage assets will be implemented by Seagreen and are presented below.

#### **Mitigation**

Mitigation proposed is the same as the Project Alpha and Project Bravo impact assessments presented above (see paragraphs 17.104 and 17.109).

### Residual Impact

17.116. Following application of these mitigation measures, the magnitude of all potential operational impacts noted above should be reduced to negligible, resulting in an impact of negligible and **not significance**. This would not be considered to be a significant impact in relation to the EIA Regulations.

## Infrastructure within the ECR corridor

### Direct secondary impacts on archaeology and cultural heritage assets

17.117. The offshore operation phase for the Transmission Asset Project may result in direct secondary impacts on sites of cultural heritage interest. The principal impacts include the anchoring of maintenance vessels and associated activities. The archaeology and cultural heritage assets identified for potential indirect impacts are the same as those highlighted for construction impacts noted above. This is also true of the sensitivity of the identified cultural heritage sites which are considered to be of high to medium sensitivity. In the absence of mitigation the magnitude of the impact is considered to be high. The significance of the potential impact is therefore regarded as major adverse and **significant**; in line with that established for the Transmission Asset Project in the construction phase.

### Indirect impacts on archaeological and cultural heritage assets

17.118. The potential for indirect effects of the transmission asset infrastructure on archaeology and cultural heritage assets through change in hydrodynamics and alterations in sedimentary regimes has been considered. For areas of the ECR where the cable has been buried there are considered to be no significant indirect effects on identified and unrecorded archaeology and cultural heritage assets. Where the cable has been surface laid and protected with rock berms or mattresses, there is the potential for indirect impacts on archaeology and cultural heritage assets due to changes in the sediment regime. Chapter 7: Physical Environment stated that there is a potentially significant effects on sedimentary regimes and geomorphological interests should rock berm or mattressing protection be employed in the inter-tidal zone or shallow nearshore zone (<7m chart datum). However it was highlighted that the need for cable protection in these zones was unlikely due to the nature of the sediments in this area.

17.119. The potential magnitude of effect above has been described as medium adverse. As such the magnitude of impact on archaeology and cultural heritage assets could also be medium adverse. As identified for Project Alpha and Project Bravo above, the sensitivity of the identified archaeology and cultural heritage assets within this nearshore section of the ECR are considered to be medium to high. Based on the significance of the potential impact identified in the matrix in Table 17.6 there would be an indirect impact of, at worst, major adverse significance on archaeology and cultural heritage assets. However, given that the requirement for cable protection measures in the inter-tidal and nearshore zones is unlikely as it is expected that the cable will be buried in this area, using professional judgment, the potential for significant indirect impacts on archaeology and cultural heritage assets could be reduced to low adverse significance at worst. This is also dependant on the locations, lengths and orientation of any protection and the length of time required for the sediment regime to stabilise (Chapter 7: Physical Environment). The impact is also dependent on the location of known cultural heritage assets in relation to the cable protection and the likelihood for the discovery of unrecorded assets. While it is not possible to quantify the latter eventuality, the instigation of the mitigation measures highlighted below should reduce any potential significant impact to negligible (see paragraph 17.120).

17.120. In water depths below 7m chart datum Chapter 7: Physical Environment established that the effects on sediment regimes through the placement of rock or mattress protection would have a low adverse magnitude in areas of mobile bedforms; and a negligible effect in areas devoid of mobile bedforms. As such the magnitude of impact on archaeology and cultural heritage assets could also be low adverse, at worst. As identified for direct secondary impacts above, the sensitivity of the identified archaeology and cultural heritage assets within the ECR below 7m chart datum are considered to be medium to high. In the absence of mitigation and based on the significance of the potential impact identified in the matrix in Table 17.6 there would be an indirect impact of, at worst, moderate adverse significance on archaeology and cultural heritage assets. As with potential impacts within the inter-tidal zone or shallow nearshore zone (<7m chart datum) noted above, the mitigation measures highlighted below should reduce any potential significant impact to negligible (see paragraph 17.120).

### *Mitigation*

17.121. The following mitigation measures in connection with both direct secondary and indirect impacts on archaeology and cultural heritage assets will be implemented by Seagreen and are presented below.

#### **Mitigation**

Mitigation proposed is the same as that established for the Infrastructure within the Project Alpha and Project Bravo site boundaries impact assessment presented above.

### *Residual Impact*

17.122. Following application of these mitigation measures, the magnitude of all potential operational impacts noted above should be reduced to negligible, resulting in an impact of negligible and **not significant**.

## **IMPACT ASSESSMENT – DECOMMISSIONING**

17.123. Direct and indirect impacts arising from the decommissioning of the Project Alpha, Project Bravo and Transmission Asset Project are considered to be analogous to those arising in the construction phase and are not discussed further.

## **IMPACT ASSESSMENT – CUMULATIVE AND IN-COMBINATION**

17.124. This section presents the results of the assessment of the potential cumulative effects upon cultural heritage assets arising from the proposed Seagreen Project; together in the first instance, and then in conjunction with other existing or reasonably foreseeable marine developments and activities in the Firth of Forth region. Seagreen’s approach to the assessment of cumulative effects is described in Chapter 6: EIA Process of this ES.

17.125. Cultural heritage is defined here as all Designated Wrecks, as well non-designated cultural heritage assets highlighted in the baseline section above in the ‘Existing Environment’ Section of this ES, and identified as at risk from potential impacts. This includes inter-tidal remains to the MHWS tidal limit, submerged archaeology and palaeoenvironments, and maritime archaeology and cultural heritage assets such as wreck losses, aircraft crash sites, and their respective associated debris.

17.126. Direct cumulative effects on cultural heritage assets such as wrecks and aircraft and associated debris are considered unlikely as there would be little chance of more than one project having an impact on the same cultural heritage receptor due to the often localised nature of such remains. Similarly, the low potential for the presence of submerged features and deposits of palaeoenvironmental and archaeological interest across a large spatial extent within the Seagreen Project (see Appendix L1) and the wider Firth of Forth region also reduce the likelihood of direct cumulative effects. As such, only physical indirect cumulative effects will be considered in this assessment.

### Seagreen Project cumulative impacts

17.127. The following section highlights the impacts considered for each of the individual projects, so that the development of the Seagreen Project can be seen in terms of its cumulative impacts on archaeology and cultural heritage. As stated above, the potential cumulative impacts within the Seagreen Project arise from indirect impacts on archaeology and cultural heritage assets

17.128. The potential indirect cumulative impacts as a result of construction of Project Alpha, Project Bravo and the Transmission Asset Project are likely to be temporary, even where there may be construction overlap of the individual Seagreen Projects. As such, the magnitude of the potential changes in the sediment regimes for the projects is regarded as low to negligible. As a result the magnitude of effect on archaeology and cultural heritage is considered to be low to negligible.

17.129. The sensitivity of the identified archaeology and cultural heritage assets to impacts are considered to be medium to high. Therefore it is likely that the cumulative impact of the Seagreen Project will be negligible to minor adverse and **not significant**.

17.130. The predicted confidence in the assessment of significance of the cumulative impacts is medium to low, pending further investigation (for example during pre-construction surveys and periodic monitoring) and confirmation of the nature and characteristics of the identified sites. It is possible that the sensitivity and significance of impact could change as a result of further investigation.

### Seagreen cumulative impact with other schemes

17.131. As with the Seagreen cumulative impacts above the main potential cumulative impacts to archaeology and cultural heritage as a result of the Seagreen Project and other schemes are likely to be indirect impacts on archaeology and cultural heritage assets

17.132. The developments considered relevant with regards to the cumulative impacts on archaeology and cultural heritage include two OWFs in the Firth of Forth region which are currently in the planning process. These projects will or have already been subject to project specific impact assessment, which in-combination will help ensure that any impacts on the archaeology and cultural heritage are addressed and appropriate mitigation implemented accordingly. These projects include:

- Marine Renewable Projects;
- Inch Cape OWF (approximately 10km west of Project Alpha); and
- Neart na Gaoithe OWF (approximately 30km to the southwest).

- 17.133. Given the limited number of identified developments in the Firth of Forth region (see Chapter 20: Other Marine Users and Activities) there are few activities that could have a significant cumulative impact upon archaeology and cultural heritage. Similar to the Seagreen Project impacts upon archaeology and cultural heritage, effects through increases in the changes in sediment regimes will be highly localised where there is little likelihood of interaction of indirect cumulative impacts; especially as construction impacts will not necessarily overlap with those of Inch Cape and Neart na Gaoithe OWFs and the relatively large distances of these developments from the Seagreen Project. This is also the case with regards the potential for a significant indirect impact on the setting of onshore and island cultural heritage assets, where in addition to the distances between projects, there are also significant distances between the projects and the adjacent coastline. As such there is minimal potential for the indirect impact to extend cumulatively to these developments.
- 17.134. In respect of potential indirect cumulative impacts therefore the significance of impact is likely to be no greater than that identified for the Seagreen Project, and is considered to be negligible and **not significant**.

### Seagreen cumulative impact including Phases 2 and 3

- 17.135. Seagreen Phases 2 and 3 encompass five potential offshore wind farm sites and connection to the National Grid via three export cables running from the south-western boundary of the Round 3 Zone and coming together at a single landing point near Torness. The Phases 2 and 3 development consent application submissions are scheduled for 2014 and 2016.
- 17.136. While a Scoping exercise has been completed for Phases 2 and 3 (Seagreen, 2011), it is still clear that the current understanding of the archaeology and cultural heritage baseline only extends to those maritime losses that are recorded through the UK Hydrographic Office SeaZone dataset and the tentative losses recorded in the RCAHMS Maritime database. As such, further desk based assessment and impact assessment will be required, similar to those carried out for the Seagreen Projects under consideration here. On this basis and pending a fuller understanding of the baseline conditions the sensitivity of archaeology and cultural heritage within Seagreen Phases 2 and 3 is likely to be at least medium. The magnitude of any potential impact is likely to be low to negligible, in line with Project Alpha and Project Bravo, and the magnitude therefore is considered to be low at best. The significance of impacts from Phases 2 and 3 are likely to be minor adverse to negligible and **not significant**. Therefore any cumulative impact is also likely to be minor adverse to negligible and **not significant**.
- 17.137. At present there is very limited detail available for the baseline environment and project parameters associated with Phase 2 and Phase 3 to give any degree of confidence in the outline assessment made here.

## ENVIRONMENTAL STATEMENT LINKAGES

- 17.138. The inter-relationships between archaeology and cultural heritage and other physical, environmental and human parameters are inherently considered throughout the assessment of impacts as a result of the receptor lead approach to the assessment (see Table 17.14). For example, archaeology and cultural heritage has the potential to be influenced by changes in sediment regimes as a result of effects on physical processes from the proposed development. The potential impacts as a result of this indirect effect have been discussed within this chapter based on the findings of the assessments made in Chapter 7: Physical Environment.

**Table 17.14 ES Linkages**

| Inter-relationship   | Relevant section   | Linked chapter   |
|--|--|--|
| Indirect impacts on archaeology and cultural heritage from changes in sediment regimes | Paragraphs 17.57 – 17.64<br>Paragraphs 17.72 – 17.79<br>Paragraphs 17.91 – 17.98<br>Paragraphs 17.101 – 17.104<br>Paragraphs 17.106 – 17.109<br>Paragraphs 17.112 – 17.115<br>Paragraphs 17.117 – 17.121<br>Paragraphs 17.127 & 17.132 | Influencing parameter: Chapter 7 Physical Environment.                   |
| Indirect impacts on the setting of onshore and island cultural heritage assets         | Paragraphs 17.41 – 17.46   | Influencing parameter: Chapter 16 Seascape, Landscape and Visual Impact. |

## OUTLINE MONITORING

17.139. As stated above as part of proposed mitigation measures a WSI will be prepared, for both the onshore inter-tidal works and offshore works, setting out a procedure for dealing with any features that appear to be of archaeological and cultural heritage importance should any such features be discovered in the course of the construction, operation and decommissioning of the Seagreen Project. The WSI will ensure compliance with the relevant legislation and will be finalised and agreed in consultation with the Historic Scotland and the Aberdeenshire Council Advisor Archaeological Service ((who provide guidance to Angus Council on archaeological issues) prior to construction works commencing.

## SUMMARY

17.140. The following provides a summary of chapter and tabulate impacts, mitigation and residual impact.

Table 17.15a Summary of Project Alpha Impacts

| Description of Effect  | Impact                    | Potential Mitigation Measures   | Residual Impact                       |
|--|---------------------------|---|---------------------------------------|
| <b>Construction phase</b>  |                           |   |                                       |
| Direct impact on archaeology and cultural heritage due to installation of infrastructure | Moderate to major adverse | <p>All sites of cultural heritage interest included in this assessment will be avoided where possible.</p> <p>Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Heritage Advisor to mitigate construction effects in the event of any unexpected archaeological discoveries during installation.</p> <p>Infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities.</p> <p>These measures will form part of the CEMP.</p> | Negligible ( <b>Not Significant</b> ) |
| Indirect impact on archaeology and cultural heritage due to physical processes           | Minor adverse             | <p>Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Aberdeenshire Council Heritage Advisor to mitigate construction effects in the event of any unexpected archaeological discoveries during installation.</p>  | Negligible ( <b>Not Significant</b> ) |



| Description of Effect                                | Impact                    | Potential Mitigation Measures | Residual Impact              |
|--|---------------------------|-------------------------------|------------------------------|
| <b>Operation Phase</b>                               |                           |                               |                              |
| Indirect impact on archaeology and cultural heritage | Negligible                | Same as Construction          | Negligible (Not Significant) |
| <b>Decommissioning Phase</b>                         |                           |                               |                              |
| Impacts on archaeology and cultural heritage         | Moderate to major adverse | Same as Construction          | Negligible (Not Significant) |

**Table 17.15b Summary of Project Bravo Impacts**

| Description of Effect  | Impact                    | Potential Mitigation Measures | Residual Impact              |
|--|---------------------------|-------------------------------|------------------------------|
| <b>Construction Phase</b>  |                           |                               |                              |
| Direct impact on archaeology and cultural heritage due to installation of infrastructure | Moderate to major adverse | Same as Project Alpha         | Negligible (Not Significant) |
| Indirect impact on archaeology and cultural heritage due to physical processes           | Minor adverse             | Same as Project Alpha         | Negligible (Not Significant) |

| Description of Effect                                | Impact                    | Potential Mitigation Measures | Residual Impact              |
|--|---------------------------|-------------------------------|------------------------------|
| <b>Operation Phase</b>                               |                           |                               |                              |
| Indirect impact on archaeology and cultural heritage | Negligible                | Same as Project Alpha         | Negligible (Not Significant) |
| <b>Decommissioning Phase</b>                         |                           |                               |                              |
| Impacts on archaeology and cultural heritage         | Moderate to major adverse | Same as Project Alpha         | Negligible (Not Significant) |

Table 17.15c Summary of Transmission Asset Project

| Description of Effect  | Impact                      | Potential Mitigation Measures           | Residual Impact              |
|--|-----------------------------|---|------------------------------|
| <b>Construction Phase</b>  |                             |   |                              |
| Direct impact on archaeology and cultural heritage due to installation of infrastructure | Moderate to major adverse   | Same as Project Alpha and Project Bravo | Negligible (Not Significant) |
| Indirect impact on archaeology and cultural heritage due to physical processes           | Minor adverse to Negligible | Same as Project Alpha and Project Bravo | Negligible (Not Significant) |

| Description of Effect  | Impact                      | Potential Mitigation Measures           | Residual Impact              |
|--|-----------------------------|---|------------------------------|
| <b>ECR</b>   |                             |   |                              |
| Direct impact on archaeology and cultural heritage due to installation of infrastructure | Moderate to major adverse   | Same as Project Alpha and Project Bravo | Negligible (Not Significant) |
| Indirect impact on archaeology and cultural heritage due to physical processes           | Minor adverse or Negligible | Same as Project Alpha and Project Bravo | Negligible (Not Significant) |
| <b>Operation Phase</b>   |                             |   |                              |
| Impacts on archaeology and cultural heritage   | Minor adverse               | Same as Project Alpha and Project Bravo | Negligible (Not Significant) |
| <b>Decommissioning Phase</b>   |                             |   |                              |
| Impacts on archaeology and cultural heritage   | Moderate to major adverse   | Same as Project Alpha and Project Bravo | Negligible (Not Significant) |

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