26 OFFSHORE TRANSMISSION WORKS MARINE ARCHAEOLOGY AND CULTURAL HERITAGE

26.1 INTRODUCTION

1. This Section of the ES evaluates the likely significant effects of the Offshore Transmission Works (OfTW) on marine archaeology and cultural heritage. The assessment has been undertaken by Headland Archaeology.

2. This Section of the ES is supported by the following documents:

- Appendix 26.1: Gazetteer and Concordance; and
- Annex 26A: Archaeology and Cultural Heritage Baseline Technical Report.

3. Cultural heritage assets are referred to by Headland Archaeology (HA) numbers listed in Appendix 26.1.

4. This Section includes the following elements:

- Assessment Methodology and Significance Criteria;
- Baseline Description;
- Development Design Mitigation;
- Assessment of Potential Effects;
- Mitigation Measures and Residual Effects;
- Summary of Effects;
- Statement of Significance; and
- References.

5. The cumulative effects of the OfTW are assessed in Section 15: Marine Archaeology and Cultural Heritage which assesses the marine archaeology and cultural heritage effects of the Wind Farm.

26.1.1 POLICY AND PLANS

6. This assessment is conducted in line with industry best practice. Particular reference is made to the following.

- Historic Environment Guidance for the Offshore Renewable Energy Sector (COWRIE/Wessex Archaeology, 2007);
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (COWRIE/Oxford Archaeology, 2007);
- The Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Developers (JNAPC, 2007); and
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (COWRIE/EMU Ltd., 2011).

7. All relevant International and European Charters and Conventions, UK & Scottish Legislation, and Scottish Planning Policy are detailed in Appendix C in Annex 26A.

26.2 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

26.2.1 CONSULTATION

8. In order to produce an informed assessment, contact was initiated with statutory authorities including Historic Scotland and the Moray Council Archaeologist.

Table 26.1 Summary of Consultation Responses

Consultee	Summary of Consultation Response	Headland Archaeology Response
Historic Scotland	As the regulator for cultural heritage in Scottish jurisdiction, Historic Scotland commented with regard to the potential effects of the OfTW in relation to the marine assets within their statutory remit; comprising designated wrecks and Scheduled Monuments.	This has been noted where the advice from Historic Scotland has been integrated into the established assessment methodology
Historic Scotland	Historic Scotland recommends that archaeological analysis of geophysics is undertaken consistent with guidelines set out in Historic Environment guidance for the offshore renewable energy sector; and Historic Scotland encouraged the analysis of any geotechnical surveys which are gathered for other purposes as part of the EIA process, and requested that the results be archived through the Royal Commission on the Ancient and Historical Monuments of Scotland.	The assessment has been conducted in line with industry best practice guidance including the JNAPC Code of Practice for Seabed Development; Historic Environment Guidance for the Offshore Renewable Energy Sector (COWRIE/Wessex Archaeology, 2007); and Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (COWRIE/EMU Ltd., 2011).
The Moray Council Archaeologist	The Moray County Archaeologist did not have any comments with regard to the OfTW	Noted.

26.2.2 SCOPE OF ASSESSMENT

9. The assessment has considered the effects of the OfTW upon the following:

- Designated cultural heritage assets, comprising Designated Wrecks, Scheduled Monuments and non-designated cultural heritage assets; and
- Undesignated submerged archaeology, including maritime losses such as wrecks, aircraft and their associated debris and palaeoenvironmentally significant deposits.

26.2.2.1 Elements Scoped out of the Assessment

10. The assessment has only considered the physical effects on cultural heritage assets during construction and operation and does not include indirect effects on the setting of key onshore receptors as the cable will be buried and therefore not visible. In addition decommissioning effects have not been considered within this

assessment as the effects are essentially the same as those for the construction phase.

26.2.3 GEOGRAPHICAL SCOPE

11. Two Study Areas have been used in the assessment of physical effects. The Inner Study Area consists of the OfTW corridor while the Outer Study Area includes a 1 km buffer of the OfTW corridor. These Study Areas are illustrated on Figure 26.1-3.All cultural heritage assets within the Inner Study Area and the Outer Study Area are considered for potential physical effects.

26.2.4 BASELINE SURVEY METHODOLOGY

12. This cultural heritage assessment comprises the results of a baseline desk based survey and site visit to the proposed landfall location, with analysis and assessment of marine geophysical and geotechnical survey data in order to identify all potential cultural heritage assets within the Study Areas.

26.2.4.1 Desk Based Surveys

13. The desk based study was based on readily available and relevant documentary sources (Annex 26A). The following archives were referred to:

- Databases of designated cultural heritage assets maintained by Historic Scotland including designated wrecks;
- National Monuments Record of Scotland (NMRS) held by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) including maritime losses;
- UK Hydrographic Office Wrecks and Obstructions Database (SeaZone);
- Ministry of Defence (military remains only);
- Receiver of Wreck (ROW);
- Moray Council Historic Environment Team (HCHET) Historic Environment Record (HER); and
- National Library (for historic charts and maps only).

26.2.5 SITE VISIT

14. A site visit of the foreshore and inter-tidal areas in the vicinity of the cable landfall locations was completed between the 18th and 22nd July 2011. The baseline condition of known or identified features was noted, as were key views from each cultural heritage asset location. Photographs from the field visit were also compiled for the baseline record.

26.2.5.1 Geophysical Survey Analysis

15. A geophysical survey of the OfTW corridor was undertaken by Gardline Geosurvey Ltd. and was subsequently made available for archaeological analysis and assessment (Appendix 26.1 and Appendix 26.2).

16. The aim of this marine geophysical archaeological assessment was to identify any cultural heritage assets recorded from the surveyed area and to inform the baseline study and EIA for the Project. Marine geophysical survey data was collected using sidescan sonar, magnetometer, sub-bottom profiler and multi-beam bathymetry.

Geophysical targets were identified and given a high, medium or low archaeological potential rating based on the characteristics of the anomalies.

26.2.5.2 Geotechnical Survey Analysis

17. A geotechnical survey of the OfTW Corridor was undertaken by Gardline Geosciences Limited and an archaeological assessment of the palaeoenvironmental potential of the OfTW Corridor carried out (Annex 26A). A total of 31 Core Penetration Logs (CPT) and 31 Vibrocore (VC) logs were assessed along the OfTW Corridor. The information for the borehole and grab sample logs was gathered and supplied. The logs were assessed in order to gauge whether the deposits contained any sediments with palaeoenvironmental potential; in particular peats or sediments with high organic contents such as organic silts.

26.2.6 METHODOLOGY FOR THE ASSESSMENT OF EFFECTS

26.2.6.1 Worst Case

18. The Rochdale Envelope parameters for the Project are presented in Section 7: Project Description. The OfTW corridor includes a single route towards the landfall near Portgordon (Figures 26.1-3).

19. The worst case scenario for cultural heritage has been considered for the OfTW in relation to the maximum number of cables (AC and DC), expected cable corridor width, number of trenches and maximum width and depth of the trench, which are directly related to the OfTW corridor.

Table 26.2 Worst Case Scenarios Tested DC and AC

Potential Effect	Worst Case / Scenario Assessed
OfTW: Construction Phase	
Direct physical effects on the sea bed as a result of OfTW construction.	3 Cable Trenches.
	Maximum distance between trenches of approximately four times water depth.
	Maximum Width of Cable Trench of 3 m.
	Maximum Depth of Cable Trench of 2.5 m.
	Maximum length of OfTW 65km.

20. For AC and DC OfTW, the number of cables, the cable corridor width, the maximum number of trenches required and the maximum width of trenches required for installation are identical for all Rochdale Envelope parameters.

26.2.6.2 Construction Effects

21. The installation of cables and associated activities including the deployment of construction vessels has 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 construction activities, such as the anchoring of craft involved in installation. The effects may be direct, for instance where an archaeological deposit is removed during ground works; indirect, for example disturbance of sediments in the

offshore areas may lead to covering of nearby archaeological remains; or secondary, such as vessel anchoring activities during installation. The type and description of effects used for the purpose of the assessment are presented in Table 26.3.

Table 26.3 Type of Effect

Type of Effect	Description
Direct Effect	Direct effects on archaeological sites, features, deposits and artefacts that may be affected by the OfTW. These works might include trenching and the associated area of influence on the seabed.
Indirect Effect	Potential damage to archaeological sites and features within the OfTW corridor may be caused by indirect effects. These might include interrelating effects such as changes to the sediment regime within the area. Some indirect effects may be beneficial, for instance the burial of sites and features by increased sedimentation.
Secondary Effect	Secondary effects on archaeological sites, features and artefacts that may be affected within the OfTW corridor. These might include the effects of the anchoring of installation and operational vessels and associated activities during the pre-installation and installation operations.

26.2.6.3 Sensitivity

22. 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 its potential as a resource of archaeological data, its association with significant historical events, its role as a local landmark with cultural associations and its aesthetic value.

23. Official designations applied respectively to cultural heritage assets have been taken as indicators of importance as they reflect these factors. Sensitivity is assigned to undesignated cultural heritage assets according to the professional judgment of the assessor.

24. The criteria used for defining a cultural heritage asset's sensitivity to direct and indirect physical effects and then assessing the magnitude of those effects is summarised in Table 26.4.

Table 26.4 Sensitivity of Cultural Heritage Assets

Sensitivity to Effect	Definition
High	Cultural heritage assets of international/ national importance. Designated wrecks and scheduled monuments. Maritime losses where the position is known and positively identified. Targets of high archaeological potential identified in the geophysical survey.
Medium	Cultural heritage assets of regional importance. Targets of medium archaeological potential identified in the geophysical survey. Obstructions that could be indicative of wreckage or submerged features.
Low	Targets of low potential identified in the geophysical survey.

26.2.6.4 Magnitude

25. In determining the magnitude of effect, the values of the asset affected are first defined. This allows the identification of key assets and provides the baseline against which the magnitude of change can be assessed; the magnitude of effect being proportional to the degree of change in the asset's baseline value. The criteria used for assessing the magnitude of effects on cultural heritage is summarised in Table 26.5.

Table 26.5 Magnitude of Effects on Cultural Heritage Assets

Magnitude of Effect	Definition
Large	Total loss or major alteration of the cultural heritage asset
Medium	Loss of, or alteration to, one or more key elements of the cultural heritage asset.
Small	Slight alteration of the cultural heritage asset
Negligible	Barely perceptible alteration of the cultural heritage asset

26.2.7 ASSESSMENT OF SIGNIFICANCE

26. The significance of an effect on a cultural heritage asset is assessed by combining the magnitude of the effect and the sensitivity of the cultural heritage asset. The evaluation of significance presented in Table 26.6 provides a guide to decision making, but is not a substitute for professional judgement 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 in terms of the EIA Regulations for the purpose of the assessment of effects on cultural heritage.

Table 26.6 Criteria for Assessing the Significance of Effects on Cultural Heritage Assets

Sensitivity or Value of Resource or Receptor	Magnitude of Effect			
	Negligible	**Small**	**Medium**	**Large**
Low	Negligible	Negligible	Minor	Moderate
Medium	Negligible	Minor	Moderate	Major
High	Negligible	Moderate	Major	Major

26.2.8 ASSESSMENT LIMITATIONS

27. No data gaps or uncertainty arose during the course of this assessment.

26.3 BASELINE CONDITIONS

28. From the surveys undertaken and described above the following description of the existing cultural heritage environment has been made.

29. The area of the Moray Forth has been undergoing isostatic uplift since the end of the last glacial period and it is estimated that the area of the Inner Moray Firth may have undergone as much as 42 m of uplift since c. 9,600 BP (Haggart, 1982). Holocene relative sea level change has been investigated across sites in northeast Scotland and show a broad trend of falling sea level from the Late Glacial Maximum of c. 15,000 BP to around 10,000 BP to levels below that of present day sea level; the early-Holocene minimum (Shennan et al, 2000; Shennan and Horton, 2002). This is followed by a period of sea level rise, until around 5000 BP when sea level began to fall, with this trend continuing in the area to the present (Shennan and Horton, 2002). It is thought that the driving cause for this sea level fall within this area is isostatic uplift (Lambeck, 1992).

30. The OfTW corridor is known from previous studies (e.g. Flemming, 2004) to have been largely restricted in the past to glacial and marine conditions; therefore never becoming terrestrialised within the last 12,000 years. Relative sea level change in the area, combined with glacial isostatic uplift, has meant that the Outer Moray Firth has remained either under ice sheets or submerged by the North Sea since the last glacial period. This means that there have been no opportunities for terrestrial deposits of palaeoenvironmental interest, such as peats to develop.

31. The solid geology directly beneath the OfTW corridor is composed of a thick sequence of sandstones and mudstones of Lower Cretaceous Age (Cullen & Regan, 2010). This is overlaid with Pleistocene deposits of Quaternary age made up of soft clayey silts to hard gravely clays. The silts are recorded to be <10m, if present at all, with gravels reaching depths of up to 50m in parts likely to represent glacial tills. Above these Quaternary deposits are thin surface sediments of sands and gravels accrued during from the Holocene period. The pre-Holocene sediment deposits in the inner Moray Firth have been recorded up to a maximum depth of 47m from borehole evaluations from the British Geological Survey (BGS). These shallow boreholes from the inner Moray Firth date as far back as mid-last Glaciation and reveal seven units of stratigraphy providing further evidence for the geomorphology of the region. There have been no reported Palaeolithic finds or deposits of archaeological significance in the vicinity of the Inner and Outer Study Area.

32. Superficial geology along the OfTW corridor is variable, with one of three main soil types. The uppermost stratum is a medium dense to very dense sand with variable amounts of silt and gravel. This layer overlays a very soft to stiff clay, which in turn overlies bedrock.

33. Seabed sediments comprise shelly sand, between Kilometre Point (KP) 0 and KP13.980, with numerous minor depressions filled with more gravelly sediment. Areas of megaripples are present between KP14.5 and KP15.7. At KP29.465 numerous ribbons of gravel are present crossing the OfTW corridor. These ribbons of gravel progress to an area of gravelly shelly sand between KP31.385 and KP32.29. From KP 32.29 to KP45.475 the seabed sediments comprise soft clay with various minor partings of sand and silt. There are a number of pockmarks present in this region of soft clay. Occasional boulders/debris and frequent patches of gravelly sand are also recorded. At KP53.785 seabed sediments change to gravelly sand and remain so until KP62. A number of large boulder fields and areas with numerous boulders and cobbles are present along this section. Between KP62 and the landfall at KP64.7, seabed sediments comprise a mixture of gravelly sand with frequent boulders and cobbles and sand with frequent boulders and cobbles.

34. A flint scraper recovered from a borehole core sample taken on the Viking Bank off Shetland some distance to the north in the North Sea represents the only prehistoric find from a maritime context discovered to date (Fleming, 2004). A number of lithic scatters have been identified along the north east coast at Keiss and in the Yarrows basin. This evidence suggests that settlement was occurring at coastal locations from the later Mesolithic period onwards, and that tool manufacturing had occurred over a prolonged period of time throughout prehistory in the area (Pannett and Baines, 2002).

35. In addition, there is a dense concentration of prehistoric sites known from coastal locations to the west of the Study Area on the northeast coast. The Cairn of Get and Hill O'Many Stanes near Wick suggest ritual activity from the Neolithic into the Bronze Age close to Moray Firth, which was presumably associated with settlement, evidence for which is less readily apparent. At Freswick, a shell midden of limpet shells and fish bones was excavated and suggested to be the site of a Bronze Age encampment that overlay a Mesolithic layer containing flakes, cores and scrapers (Lacaille, 1954). Iron Age activity appears to have been widespread along this area of coast. Up to 200 brochs have been identified in Caithness, many having widespread views of the seascape including Borrowston Broch (Hill of Ulbster), Watenan Fort (SM 907) and Tulloch (Usshilly) Broch and field system (SM 599).

36. Archaeological and documentary evidence for Roman occupation in Scotland is well documented and discussion with regard to the utilisation of the sea around Scotland has also been postulated (Martin, 1991). There is no question that both military and merchant maritime traffic would have been extensively employed during this period, connecting with the many Roman fort networks on the major east coast Firths; notably Cramond on the Forth and Carpow on the Tay, and possibly maritime nodal points such as Aberdeen.

37. The Early Medieval and Medieval Period witnessed increasing contact between cultural groups throughout the British Isles, especially in relation to the spread of Christian culture and the written record from this period makes constant reference to sea journeys undertaken by those involved with the church. Monastic

foundations on the east coast of Scotland are well represented, particularly the monastery at Portmahomack (Carver, 2008) c.45 km to the west of the study area at the mouth of the Dornach Firth.

38. Documentary sources state that the North Sea was frequently navigated by Danish and Norse Vikings, Orkney becoming a base in their expansion south and west from Norway. There are a number of accounts of maritime travel by the Vikings from Orkney, including an account from the 13th century when King Haakon Haakonson arrived in Orkney with a fleet of over 100 ships (Ó Cróinín, 2005). Place names show that Caithness was an area for Norse activity, Wick being an example. Excavations at Freswick Links revealed evidence of a Norse settlement from at least the 11th century. Investigation of eroding deposits along the cliff revealed traces of buildings and midden debris comprised of sufficient fish bone to suggest that fishing may have been undertaken here on a commercial scale in the middle ages.

39. The post-Medieval period saw a steady increase in coastal activity where military activity and the expansion of world-wide trade meant further growth in the volume of shipping. Fishing has also been a significant industry in the area. Gordon's map of the Counties of Scotland (1580- 1652) depicts a number of villages at the proposed landfall sites. During the 18th and 19th centuries there were major increases in the populations of Wick, Fraserburgh and Lossiemouth, while fishing villages and port facilities emerged at Portgordon, Whaligoe and Lybster, driven mainly by the growth of herring fishing. The new harbour at Portgordon built in 1874 replaced an earlier wooden harbour. It is not surprising therefore, that many of the reported losses in this area are of smaller fishing vessels of various designs. It was not until the 20th century that metal hulls came into use in the herring trade and many of the earlier losses of wooden vessels are likely to be highly degraded and difficult to detect.

40. From the 18th century onwards records began to be kept of ship losses and from the middle of the 19th century these records became far more comprehensive. This is reflected in the National Monuments Record for Scotland (NMRS) data collected that shows over 1,500 wrecks in the Moray Firth/ North Sea area alone. Many of the recorded losses occurred during major storms, including the Great Storm of 1800 and other famous storms in 1852, 1874, 1875 and 1876. In the 1875 storm at least 15 vessels were lost and in 1876 there appears to have been at least 31 sinking's (Ferguson, 1991). So severe were these losses that they encouraged the adoption of steam power for cargo vessels and by the end of World War I most of the larger vessels in the area were steam powered.

41. The majority of identified shipwrecks in the seas of the Outer Moray Firth are as a result of military activity during World War I and World War II. Initial losses during WWI were caused by the extinguishing of coastal lights which resulted in numerous wrecks concentrated along the shoreline. In the latter half of 1917 a submarine offensive was launched by the German Navy which resulted in the sinking of at least eleven ships in the Outer Moray Firth (Ferguson, 1991). Records for shipping casualties are somewhat incomplete between 1939 and 1945 due to censorship, but approximately 50 merchant vessels were sunk off the northeast

coast as well as numerous military boats, ships, submarines and allied and German aircraft losses. WWII losses are concentrated around Rattray Head and the eastern approaches to the Moray Firth (Ferguson, 1991).

42. There is a moderate concentration of offshore aircraft losses along the north-east coast of Scotland resulting from military operations. There were several airbases in the area including Royal Air Force (RAF)Lossiemouth to the west of the proposed landfall sites. The RAF base at Lossiemouth was built in 1938 and although mainly a training unit for Bomber crews during World War II, some operational raids were launched from there. In the 1980s the wreck of a four engine aircraft observed during an inspection of a submarine oil pipeline off Helmsdale in the Moray Firth has been identified as a Liberator Bomber that had gone down in 1945 with the loss of six lives. A number of aircraft are recorded in the NMRS as having gone down in the Moray Firth, however exact locations are not known.

26.3.1 CULTURAL HERITAGE ASSETS WITHIN THE INNER STUDY AREA

43. There are no designated cultural heritage assets or previously recorded undesignated cultural heritage assets within the Inner Study Area (Figure 26.1-3).

44. In total one target of high archaeological potential and 18 targets of medium archaeological potential were identified during the archaeological assessment of marine geophysical survey data within the Inner Study Area (Table 26.7 and Gazetteer and Concordance in Appendix 26.1). The target of high archaeological potential has been positively identified as a previously unknown and unrecorded wreck and is considered as of high sensitivity in this assessment. The remaining 18 targets of medium archaeological potential are unknown anomalies that could be indicative of unrecorded wreckage or submerged features. They are therefore considered to be of medium sensitivity within this assessment (Figure 26.1-3).

Table 26.7 Table of Cultural Heritage Assets within the Inner Study Area

Headland Archaeology Number	Name	Type	Sensitivity
17	Linear debris	Sonar Target	Medium
20	Linear debris	Sonar Target	Medium
28	Linear debris	Sonar Target	Medium
33	Linear debris	Sonar Target	Medium
52	Debris	Sonar Target	Medium
61	Linear debris	Sonar Target	Medium
63	Debris	Sonar Target	Medium
68	Wreck	Sonar Target & Magnetometer Target	High
87	Debris	Sonar Target	Medium
90	Possible Debris	Sonar Target	Medium
102	Possible debris	Sonar Target	Medium
121	Linear Debris	Sonar Target	Medium
126	Linear Debris	Sonar Target	Medium
127	Linear Debris	Sonar Target & Magnetometer Target	Medium
133	Linear Debris	Sonar Target	Medium
135	Possible Debris	Sonar Target	Medium
143	Linear Debris	Sonar Target	Medium
154	Debris	Sonar Target	Medium
156	Debris	Sonar Target	Medium

45. A further 149 targets considered to be of low archaeological potential were identified within the Inner Study Area. This classification was based on the shape, strength of reflection and in most cases uniqueness on the seabed in relation to the surrounding seabed characteristics. These are classed to be of low sensitivity within this assessment.

26.3.2 CULTURAL HERITAGE SITES WITHIN THE OUTER STUDY AREA

46. There are no designated cultural heritage assets within the Outer Study Area. There are eight wrecks charted by the United Kingdom Hydrographic Office (UKHO) within the Outer Study Area (HA1001- HA1008, Table 26.8). There are five reported losses with confirmed locations within the offshore outer study area recorded in the National Monuments Record of Scotland. These losses correspond with the UKHO SeaZone entries (HA1003- HA1007) and are therefore assigned the same Headland Archaeology numbers in this report (Figure 26.1-3). These are considered to be of low to high sensitivity dependant on the 'live' or 'dead' status of the record and the nature of the anomaly.

Table 26.8 Cultural Heritage Assets within the Outer Study Area

Headland Archaeology Number	UKHO No.	Name	NGR	Status	Sensitivity
1001	00897	Sunbeam (Possibly)	496719.788 6439047.215	Live	High
1002	00895	Day Jet	498924.265 6428676.953	Dead	Medium
1003	02119	Unknown Craft	497031.018 6422183.054	Live	High
1004	02116	Unknown Craft	498756.869 6418503.008	Dead	Medium
1005	02096	John Dunkin	497192.683 6417336.969	Live	High
1006	02117	Unknown Aircraft	497335.503 6410124.405	Live	High
1007	02103	Pharon	496730.233 6395306.391	Dead	Low
1008	02068	Bpt No 31	496876 6391921	Live	High

26.3.3 POTENTIAL FOR UNRECORDED CULTURAL HERITAGE SITES IN THE STUDY AREA

47. The relatively large number of recorded maritime losses in the area of the OfTW corridor suggests a medium potential for the discovery of unrecorded cultural heritage assets, particularly along the coast in the vicinity of the cable landfall around Portgordon. Eight wrecks have been identified from the UKHO and NMRS datasets within the Outer Study Area. The NMRS data records more than 1,500 wrecks as having been lost in the Moray Firth/North Sea area, the majority of which the precise location is unknown.

48. The assessment of geophysical survey data has been undertaken and targets of archaeological potential have been identified. However, despite comprehensive geophysical assessment using the latest survey methods, any wooden wreck or debris which was buried at the time of the surveys may not have been detected by the magnetometer or acoustic survey techniques used, and therefore there remains low potential for the presence of undiscovered wrecks or other unknown cultural features within the OfTW corridor.

49. No organic sediments such as peats or organic silts were identified in the geotechnical survey analysis. The potential for the presence of organic archaeological remains is low; although the presence of residual flints and lithic artefacts within the marine sediments remains a possibility.

26.4 DEVELOPMENT DESIGN/EMBEDDED MITIGATION

50. All identified and potential cultural heritage assets within the OfTW have been avoided through the development design process; with the furnishing of

appropriate exclusion zones to guard against physical/direct effects, i.e. potential damage to or loss of an asset.

26.5 ASSESSMENT OF POTENTIAL EFFECTS

26.5.1 CONSTRUCTION

26.5.1.1 Direct Effects

51. No known cultural heritage assets are located within the area likely to be directly affected by the OfTW, and therefore there will be no direct effects on known cultural heritage assets.

52. There is low potential for direct effects on unknown previously unrecorded archaeological remains, however in the absence of mitigation, these effects have the potential to be major and therefore significance in terms of the EIA Regulations.

26.5.1.2 Indirect Effects

53. Changes to the sedimentary regime as a result of the construction of the OfTW have been assessed as not significant (Section 21: OfTW Physical Processes and Geomorphology) and are of a magnitude not considered likely to have any effects on any cultural heritage receptors, therefore there will be no indirect effects.

26.5.1.3 Secondary Effects

54. Sites HA68, HA1001, HA1003, HA1005, HA1006, and HA1008 are considered to be of high sensitivity within the assessment. The potential magnitude of the secondary effect on these assets, as a result of OFTW construction is large, with the potential for major alteration or total loss of an asset. In the absence of mitigation, there is therefore potential for a major effect upon these sites which would be significant in terms of the EIA Regulations.

55. Sites HA17, HA20, HA28, HA33, HA52, HA61, HA63, HA87, HA90, HA102, HA121, HA126, HA127, HA133, HA135, HA143, HA154, HA156, HA1002 and HA1004, are all considered to be of medium sensitivity within this assessment. The potential magnitude of the secondary effect on all identified assets of medium sensitivity in this assessment would be medium with the potential for loss of, or alteration to, one or more key elements of the cultural heritage asset. In the absence of mitigation, there is therefore potential for a moderate effect upon these sites which would be significant in terms of the EIA Regulations.

56. Site HA1007 is considered to be of low sensitivity within this assessment. The potential magnitude of the secondary effect on all identified assets of low sensitivity in this assessment would be medium. In the absence of mitigation, there is therefore potential for a minor effect upon this site which would not be significant in terms of the EIA Regulations.

57. There is potential for secondary effects on unknown previously unrecorded archaeological remains, however in the absence of mitigation, these effects have the potential to be of large magnitude and significant in terms of the EIA Regulations.

26.5.2 OPERATIONAL EFFECTS

58. Changes to tidal currents, sedimentary regimes, or water quality during operation of the OfTW have been assessed as being within the range of natural variability (Section 21: OfTW Physical Processes and Geomorphology). It is therefore considered that there will be no effect on cultural heritage assets as a result of the operational phase of the OfTW.

26.6 MITIGATION MEASURES AND RESIDUAL EFFECTS

26.6.1 CONSTRUCTION

59. Direct physical effects on the nine sites of potential cultural heritage interest identified in this assessment will be avoided where possible. Should it not be possible to avoid sites of cultural heritage interest, a full programme of archaeological investigation which may include diver survey or ROV investigation will be undertaken to identify the nature and extent of these sites. Subject to these investigations an appropriate mitigation strategy will be agreed upon with Historic Scotland.

60. All sites of cultural heritage interest included in this report will be avoided where possible with the implementation of temporary exclusion zones and the micro-siting and re-routing of the OfTW cable. In addition, data gathered as part of pre and post-installation geophysical and geotechnical survey should be made available for archaeological assessment.

61. Where cultural heritage assets may potentially be subject to secondary effects, temporary exclusion zones will be implemented to prevent these resulting from invasive activities, such as cable installation and associated anchoring activites. Exclusion zones of at least 100 m will be established around sites identified as being of high sensitivity in this assessment while an exclusion zone of a minimum 50 m will be established around those of medium sensitivity. In the event that dynamic positioning systems are used for operational vessels, these mitigation proposals may be deemed unnecessary and appropriate alternative archaeological mitigation agreed with Historic Scotland.

62. In order to mitigate the risk of damage to any previously unrecorded archaeological remains, an archaeological Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Moray Council Archaeologist to mitigate direct or secondary effects in the event of any unexpected discoveries of archaeological remains during installation.

63. Should it not be possible to avoid known sites of cultural heritage interest, a full programme of archaeological investigation which may include diver survey or ROV investigation will be undertaken to identify the nature and extent of these sites. Subject to these investigations an appropriate mitigation strategy will be agreed upon with Historic Scotland.

64. It is considered that through the programme of mitigation offered for construction, such as temporary exclusion zones and the implementation of a WSI (Written Scheme of Investigation) and Protocols and Procedures, that all potential effects

will be reduced to negligible, and therefore not significant in terms of the EIA Regulations.

26.6.2 OPERATION

65. No mitigation is proposed for the operational phase of the OfTW as no effects are predicted on the cultural heritage resource.

26.7 MONITORING AND ENHANCEMENTS

66. No monitoring is required and no enhancements are proposed.

26.8 SUMMARY OF EFFECTS

67. A desk based study and archaeological assessment of geophysical and geotechnical survey data have been carried out in order to identify potential cultural heritage assets that may be affected by the OfTW and to establish their current condition. This work also provided information upon which to base the assessment of archaeological potential.

68. There are no known cultural heritage assets within the Inner Study Area. There is one known wreck from the UKHO database within the Outer Study Area. There remains low potential for the discovery of unrecorded cultural heritage assets.

69. The archaeological geophysical assessment identified one site of high archaeological potential that has been positively identified as a previously unrecorded wreck of unknown origin and 18 sites of medium archaeological potential within the Inner Study Area.

70. The archaeological geotechnical assessment indicated that the potential for the presence of organic archaeological artefacts is regarded as low, however the presence of residual flints and lithic artefacts located within the marine sediments remains a possibility.

71. Potentially significant construction effects will be mitigated as far as possible through the establishment of exclusion zones, micro-siting and re-routing, and pre-installation and post-installation investigations.

72. Mitigation of potential significant effects will involve the introduction of a WSI and protocols and procedures for any unexpected archaeological discoveries.

73. Any proposed mitigation measures are subject to approval by Historic Scotland and the Moray Council (to the low water mark).

Table 26.9 Summary of Effects on Marine Archaeology and Cultural Heritage Assets

Predicted Effect	Level of Effect/ Significance	Monitoring, Enhancement or Mitigation Proposed	Residual Effect/ Significance
Construction Effects			
Direct Effects	Major/ Significant	Archaeological WSI and reporting protocol to be established and followed during installation. Diver survey or ROV investigation will be undertaken to identify the nature and extent of sites that cannot be avoided.	Negligible, Not significant
Indirect Effects	Negligible / Not significant	Archaeological WSI and reporting protocol to be established and followed during installation.	Negligible, Not significant
Secondary Effects	Major/ Moderate /Significant	All sites are avoided by cable route where practicably possible. Exclusion zones established around wrecks and sites. Anchor patterns will be designed to avoid known wrecks and targets. Archaeological WSI and reporting protocol to be established and followed during installation. Diver survey or ROV investigation will be undertaken to identify the nature and extent of sites that cannot be avoided.	Negligible, Not significant
Operational Effects			
Direct. Indirect and Secondary Effects	Negligible / Not significant	None.	Negligible, Not significant

26.9 STATEMENT OF SIGNIFICANCE

74. The potential effects of the proposed OfTW cable upon recorded and unrecorded cultural heritage assets have been considered. It has been established that there is low potential for the discovery of unknown unrecorded cultural heritage assets within the OfTW corridor.

75. The assessment of the construction effects has highlighted that there will be negligible direct and indirect effects on identified and potential cultural heritage assets. A total of 26 sites have been identified that may be subject to secondary effects, and in the absence of mitigation are regarded to be of moderate to major effects, and significant in terms of the EIA Regulations. However, following the implementation of the proposed mitigation measures the effects are considered to be negligible and not significant.

76. The assessments of the operational effects have concluded that there will be a negligible effect on cultural heritage assets and therefore the effects are not significant.

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26.10.3 DATABASES OF CULTURAL HERITAGE ASSETS CONSULTED

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APPENDIX 26.1: GAZETTEER AND CONCORDANCE OF CULTURAL HERITAGE ASSETS WITH KNOWN LOCATIONS WITHIN THE OFFSHORE STUDY AREA

HA	Name	SeaZone ID	NMRS ID	Status	Description	DD Long/ DD Lat	UTM30NmE/ UTM30NmN
HA1001	Sunbeam (Possibly)	00897	-	Live	Sunbeam was a British Merchant sailing vessel (Schooner)of 132grt. On the 4th July 1915 when 17 miles S by E from Wick, Scotland she was captured by German submarine U-25 and sunk by gunfire. Found by multi-beam in a general depth of 42 m. LENGTH 25MTRS, WIDTH 10MTRS, HT 2.5MTRS. NO MAGNETIC ANOMALY. HIGLY DEGRADED		496719.788 6439047.215
HA1002	Day Jet	00895		Dead	Aircraft ditched in the Moray Firth not found by survey		498924.265 6428676.953
HA1003	Unknown Craft	02119	101775	Live	A small wreck, about 20 metres (65 feet) long, was examined on the 21 November 1987. The least echosounder depth was 74 in a general depth of 77 metres. The side scan sonar indicated a height of 2.6 metres. Found by echo-sounder		497031.018 6422183.054
HA1004	Unknown Craft	02116	101773	Dead	August 1986. Possible wreckage is reported by a local fishing skipper.		498756.869 6418503.008
HA1005	John Dunkin	02096	101769	Live	John Dunkin FV was a British Strath Class Trawler of 215 tons built in 1918 by Fleming & Ferguson, Paisley, Yard No 448 as the PEKIN. From 1918 to 1921 she was owned by the Admiralty but from May 1919 she was loaned to the United States Navy for post war mine clearing (based at Kirkwall). She was renamed JOHN SUNKIN. Sold for mercantile use 1921. Official Number 143875. Purchased by John Boyle, Glasgow in 1931 and purchased by W. Livingstone, Aberdeen in 1940. In 1941 she was sunk by German bombing 13 miles N by E of Buckie. One crewman was lost. This trawler sank 13 miles N by E from Buckie on11/02/194S. The wreck of the JOHN DUNCAN was reported at 57 53 50N, 003 02 34W by a local fishing skipper.		497192.683 6417336.969

HA	Name	SeaZone ID	NMRS ID	Status	Description	DD Long/ DD Lat	UTM30NmE/ UTM30NmN
HA1006	Unknown Aircraft	02117	101711	Live	On 6 August 1986 the wreck of an aircraft was reported by a local fishing skipper at 57 50 00N, 003 02 36W, position unreliable.		497335.503 6410124.405
HA1007	Pharon	02103	202207	Dead	Fishing Vessel, approximate location, reported sinking 10/05/1981		496730.233 6395306.391
HA1008	Bpt No 31	02068	None	Live	This British battle target practice has been located within the intertidal zone. The wreckage lies in an area of 7 m x 2 m and orientated N- S. Metal ribs are exposed 0.3 m above the sand during low water. Other wreckage less than 1 m in size lies 25 m to the east.		496876.409 6391921.638

APPENDIX 26.2: GAZETTEER OF GEOPHYSICAL TARGETS OF HIGH AND MEDIUM ARCHAEOLOGICAL POTENTIAL IDENTIFIED BY HEADLAND ARCHAEOLOGY WITHIN THE OFFSHORE STUDY AREA

HA No.	Description	Potential	Geophysical Length	Geophysical Width	Geophysical Height	DDM_Long	DDM_Lat	UTM30NmE	UTM30NmE
17	Linear debris	Medium	5.32	1.35	0.06	-2 57.4563	57 40.2704	497470.56	6392102.62
20	Linear debris	Medium	22.61	2.53	0.11	-2 57.7436	57 40.1162	497753.5	6391816.63
28	Linear debris	Medium	11.62	1.31	0.1	-2 57.9523	57 40.3100	497963.84	6392176.34
33	Linear debris	Medium	2.41	2.14	1.32	-2 57.5535	57 40.2649	497567.7	6392092.86
52	Debris	Medium	11.01	4.53	0.94	-2 58.3360	57 40.7144	498347.52	6392925.68
61	Linear debris	Medium	12.76	5.15	0.54	-2 58.3890	57 41.0521	498398.56	6393553.55
63	Debris	Medium	4.43	1.56	0.58	-2 58.2978	57 41.6155	498309.52	6394711.45
68	Wreck	High	24.09	7.82	2.38	-2 58.3972	57 41.0879	498407.62	6393620.09
87	Debris	Medium	1.47	1.35	0.1	-2 58.6594	57 47.4975	498671.59	6405511.5
90	Possible Debris	Medium	4.26	1.79	0.61	-2 58.3015	57 41.6502	498311.99	6394662.17
102	Possible debris	Medium	12.89	1.93	0.18			498267.34	6393862.75
121	Linear Debris	Medium	5.96	3.14	0.13	-2 57.8002	58 01.1820	497834.03	6430902.59
127	Linear Debris	Medium	3.02	1.19	0.18	-2 57.7949	57 41.6449	497808.31	6394651.85
133	Linear Debris	Medium	8.09	1.5	0.18	-2 58.9662	58 08.1409	498987.44	6443815.26
135	Linear Debris	Medium	4.57	2.16	0.43	-2 57.0435	58 01.2755	497089.34	6431077.84
136	Possible Debris	Medium	2.26	0.88	0.09	-2 57.3409	57 58.6170	497379.11	6426144.86
143	Linear Debris	Medium	5.99	2.14	0.32	-2 57.0389	58 01.2681	497084.81	6421066.66
154	Debris	Medium	7.35	3.07	0.13	-2 58.9604	58 08.1387	498979.07	6443812.46
156	Debris	Medium	8.1	0.68	0.16	-2 58.9625	58 08.1371	498979.17	6443807.59