Contents

List of Tables

List of Figures

Glossary

Archaeological Site	A location where human activities once took place and left some form of material evidence.
Archaeology	The study of the development of the human species and its environment through their material remains.
Archive	All parts of the archaeological record, including finds and digital records as well as written, drawn and photographic documentation.
Artefact	Any object or part of an object which has been made, used or modified in some way by human beings. Common examples include tools, utensils, art, food remains, and other products of human activity.
Feature	Evidence of human activities visible as disturbances in the soil. Such disturbances are produced by digging pits for storage, setting posts for houses, or by constructing a hearth for cooking. These disturbances are often distinguished by soil discolorations or non-natural formations of stone, shell, bone, soil, coal, wood, etc.
Iron Age	A cultural stage characterised by the first use of iron as the main metal. In the UK the Iron Age dates to the period between c. 700 BC and 43 AD.
Mesolithic	The Mesolithic dates from +/- 8,500 years BC and is characterised by the appearance of the first modern humans in Scotland, practising a hunter-gatherer lifestyle. The relationship between the land and sea was significantly different during this period.
Palaeoenvironmental	Relating to past environmental/climatic conditions.
Palaeolithic	The earliest of three subdivisions of the Stone Age, preceding the Mesolithic and Neolithic. It lasted several million years, from the first appearance of stone tools to the Mesolithic microlith-using hunter-gatherers of the most recent postglacial period (+/- 8,500 years BC), and is normally divided into Lower, Middle and Upper phases.
Prehistoric	The period prior to written records for any given area which is revealed by archaeological methods and interpreted with the help of anthropological and historical analogies.
Receptor	Means any sites or objects which may be affected by activities related to the Project.

Abbreviations and Acronyms

COWRIE	Collaborative Offshore Wind Research Into the Environment
JNAPC	Joint Nautical Archaeology Policy Committee
ASA	Archaeological Study Area
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MOD	Ministry of Defence
OSP	Offshore Service Platform
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland
UKHO	United Kingdom Hydrographic Office
WA	Wessex Archaeology

17 Cultural Heritage and Marine Archaeology

17.1 Introduction

1 This chapter presents an assessment of the impacts upon cultural heritage receptors of the Development Area and Offshore Export Cable Corridor. The assessment includes a consideration of the potential for currently unknown receptors to exist within the Development Area and Offshore Export Cable Corridor. This chapter reports an assessment of the direct and indirect impacts upon all known cultural heritage as a result of the proposed offshore works and also includes an assessment of setting impacts upon selected cultural heritage receptors.

2 This chapter is accompanied by *Appendix 17A: Cultural Heritage and Marine Archaeology Baseline* and *Appendix 17B: Bell Rock Lighthouse Figures*. *Appendix 17A* provides full baseline detail for cultural heritage and includes the following supporting Annexes:

- *Annex 17A.1: Legislation And Guidance;*
- *Annex 17A.2: Intertidal Features of Cultural Heritage Interest;*
- *Annex 17A.3: Known Wrecks And Geophysical Anomalies; and*
- *Annex 17A.4: Historic Records of Casualties.*

3 This chapter also shares direct linkages with the following ES chapters and makes reference to their content where relevant:

- *Chapter 10: Metocean and Coastal Processes*; and
- *Chapter 16: Seascape, Landscape and Visual.*

17.2 Consultation

4 Scoping responses relating to cultural heritage from Historic Scotland (HS) and Marine Scotland (MS) were received as part of MS's response (21 January 2011). In addition to the formal Scoping Opinion, further informal consultation has been undertaken in relation to the assessment of the impacts of the Wind Farm and OfTW with relevant stakeholders.

5 For example, correspondence from HS (10 January 2011) with regard to cumulative impacts was also received. In an email dated 12 November 2011 HS provided details of assets to be included in assessment for visual impacts on the setting of cultural heritage receptors within this ES. The information received through this consultation, together with the formal Scoping Opinion and recognised best practice, has informed the methodology and scope for the assessment of the impacts on cultural heritage receptors presented in this chapter.

6 Full details of scoping responses are given in Table 17.1 below.

Table 17.1: Scoping and Consultation Responses and Actions

Consultee	Consultation Response	Project Response
Scoping		
Marine Scotland (MS) (The Scottish Government)	General Principles The ES should address the predicted impacts on the historic environment and describe the mitigation proposed to avoid or reduce impacts to a level where they are not significant. Direct impacts on the resource itself and indirect impact on its setting must be addressed in the Environmental Impact Assessment (EIA).	Impacts are assessed in *Section 17.7* and *Section 17.8*. Mitigation is addressed in *Section 17.5* and *17.11*. Impacts on the setting of terrestrial assets resulting from offshore construction have also been considered (*Section 17.7*).
Historic Scotland (HS)	HS noted various undesignated wrecks within and outwith the Development Area and requested that impacts upon them should be assessed with the involvement of archaeologists and the relevant Council Archaeology Services.	Baseline data on undesignated wrecks is outlined in detail in *Appendix 17A*, *Section 17A.4* and summarised in *Section 17.6*. Impacts upon these wrecks have been assessed in *Section 17.7* and *Section 17.8*. These impacts have been assessed in this chapter in consultation with HS and Fife and Angus Councils.
	HS noted an archaeological analysis of geophysical data will be completed – these results should be archived through the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS).	Archaeological analysis has been undertaken of sidescan, magnetometer, multibeam and sub-bottom data across the Development Area and Offshore Export Cable Corridor. Full details are included in *Appendix 17A* which will be archived with the RCAHMS after submission of this ES.
	HS requested that their technical guidance note on setting be referenced.	Guidance note referenced as requested (*Section 17.7.3*).
	In their letter on cumulative impacts (10 January 2012) HS noted that assessment of cumulative setting effects on historic environment features should not be limited to publicly accessible features.	In determining receptors for assessment of setting impacts, receptors with no public access have been considered.
	HS proposed that exclusion zones be considered as mitigation for physical impact and that zones larger than 50 m should be considered if necessary for specific receptors.	Exclusion zones have been included as part of the proposed mitigation for physical impacts in both the marine and intertidal zones (*Section 17.11.3*).

Consultee	Consultation Response	Project Response
12/06/2012 Meeting in Edinburgh with Historic Scotland		
Historic Scotland	The following points were agreed: No further viewpoints in addition to those used in the Seascape, Landscape and Visual Impact Assessment (SLVIA) would be required from any specific historic receptors.	*Chapter 16* viewpoints were used for the setting impact assessment (see *Section 17.7.3*).
	It was agreed that a viewpoint from Bell Rock Lighthouse itself would not be necessary, provided one from Bell Rock Lighthouse Signal Tower was provided. However, HS commented that the assessment from Bell Rock would be important as part of the EIA.	The Bell Rock Lighthouse Signal Tower viewpoint has been used in the setting impact assessment alongside a wire line visualisation from the Bell Rock Lighthouse itself (*Appendix 17B*, Figure 17B.1 to 17B.4).
Historic Scotland, Fife Council and Angus Council.	HS (email 12/11/2012) confirmed that they wished to see the following assets included in an assessment of visual impacts on the setting of cultural heritage receptors within this ES: Bell Rock Lighthouse Signal Tower, Ladyloan (HB no. 21230); Bell Rock Lighthouse (HB no. 45197); Tentsmuir Coastal Defences (Index no. 9712); St Andrews Castle (Index no. 90259)/St Andrews Cathedral and adjacent ecclesiastical remains (Index no. 90260); Crail Airfield, pillbox, Foreland Head (Index no. 6461). The archaeological services of Fife Council and Angus Council were contacted with this list (13/12/2012) and in both cases their responses did not include any further receptors for consideration (e-mails dated 14/12/2012 and 17/12/2012 respectively).	These assets have been subject to detailed setting assessment (*Section 17.7.3*). The landscape and visual aspects of terrestrial receptors have been considered as part of *Chapter 16* (*Section 16.4.6*).
Scottish Natural Heritage (SNH)	SNH highlighted that some Gardens and Designed Landscapes (GDLs) may have coastal, seaward views that are part of the reason for their listing.	GDLs have been considered in *Chapter 16* (*Section 16.11.8*).

17.3 Policy and Plans

7 In addition to the consultation responses, the following legislation, charters, conventions and planning documents have been considered in the preparation of this chapter:

- *Marine (Scotland) Act 2010* - this provides for the establishment of national and regional marine plans and for offshore sites of national importance to be designated as Historic Marine Protected Areas.
- *Protection of Wrecks Act 1973* – this provides legal protection for designated wrecks and related material of national importance (this is currently being phased out but still applies at the time of writing – February 2013).
- *Ancient Monuments and Archaeological Areas Act 1979 (AMAA 1979)* – this provides legal protection for heritage assets of national importance (usually onshore but can also include marine assets).
- *Protection of Military Remains Act 1986* (PMRA 1986) – this provides protection for the wreckage of military aircraft and designated military vessels of any nationality. The Merchant Shipping Act 1995 – this defines the ownership of underwater finds considered to be 'wreck'.
- *Scottish Historic Environment Policy 2011* (Historic Scotland, 2011) - this sets out Scottish Ministers' policies, providing direction for HS and a policy framework that informs the work of a wide range of public sector organisations.
- *Scotland's Draft National Marine Plan* (due to be issued in 2014) – this is currently available in pre-consultation draft (Scotland's National Marine Plan: Pre-Consultation Draft, Scottish Government, 2011). The draft includes statements on mitigation of offshore development on cultural heritage as well as an "Interaction Matrix" (Section 10.5 and 10.6) which describes the degree of interaction between developments and receptors. Historic assets are considered to have a high degree of interaction with dredging, shipping and renewables construction among others.
- *The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997* – this contains the bulk of built heritage conservation planning law for Scotland. It requires Scottish Ministers to compile lists of buildings of archaeological or historic importance and provides for the designation of conservation areas. This Act has been amended by The Historic Environment (Amendment) (Scotland) Act 2011.
- *Planning Advice Note (PAN) 2/2011: Planning and Archaeology* (Scottish Government, 2011b) – this provides advice to planning authorities and developers on dealing with archaeological remains with an emphasis which is proportionate to the relative value of the remains and of the developments under consideration.
- *The UK Marine Policy Statement* (UKMPS) 2011 - the only marine policy document currently in place for this geographical area. It provides the framework for preparing Marine Plans and taking decisions affecting the marine environment.

- *The Valetta Convention, European Convention on the Protection of Archaeological Heritage (Revised)* (European Community, 1992) - this requires the state to develop and maintain inventories of on and offshore cultural heritage assets.
- *The International Council on Monuments and Sites, Charter on the Protection and Management of Underwater Cultural Heritage, 1996* - this charter aims to provide decision-makers, such as curators and archaeologists, with criteria for assessing and managing marine archaeological projects.
- *The United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention on the Protection of the Underwater Cultural Heritage, 2001* - this convention provides that a States Party shall use the best practicable means to prevent or mitigate any adverse effects that might arise from activities under its jurisdiction incidentally affecting underwater cultural heritage sites.

8 A full review of relevant legislation and guidance is given in *Annex 17A.1: Legislation and Guidance*. Numerous relevant guidance documents have also been published and are listed under Guidance and Methods in *Section 17.4.1* below.

17.4 Assessment Methodology

17.4.1 Guidance and Methods

9 This section summarises the methodology adopted in the assessment of effects on cultural heritage and marine archaeology.

10 The following relevant guidance documents have informed the Environmental Impact Assessment (EIA):

- *JNAPC Code of Practice for Seabed Development (*The Crown Estate, Joint Nautical Archaeology Policy Committee (JNAPC), 2008).
- *Historic Environment Guidance for the Renewable Energy Sector* (Wessex Archaeology, 2007, Collaborative Offshore Wind Research into the Environment (COWRIE)).
- *Guidance for Assessment of Cumulative Impact on the Historic Environment from Offshore Renewable Energy* (Oxford Archaeology, 2008, COWRIE).
- *Standard and Guidance for Archaeological Desk-Based Assessment* (Institute for Archaeologists, revised 2011).
- *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate, 2010a (prepared by Wessex Archaeology).
- *Round 3 Offshore Renewables Projects Model Clauses for Archaeological Schemes of Investigation* (The Crown Estate, 2010b (prepared by Wessex Archaeology)).
- *Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector* (Gribble, J and Leather, S, 2011, COWRIE).
- *Managing Change in the Historic Environment: Setting* (HS, 2010).

17.4.2 Definition of Study Area

11 In addition to the defined terms Development Area and Offshore Export Cable Corridor an additional term, Archaeological Study Area (ASA) has been created for the purpose of defining the study areas underpinning the cultural heritage impact assessment. ASA is used to describe a buffered zone around (and including) the Development Area and the Offshore Export Cable Corridor. Figure 17.1 (below) shows the overall extent of the Development Area ASA and the Offshore Export Cable Corridor ASA.

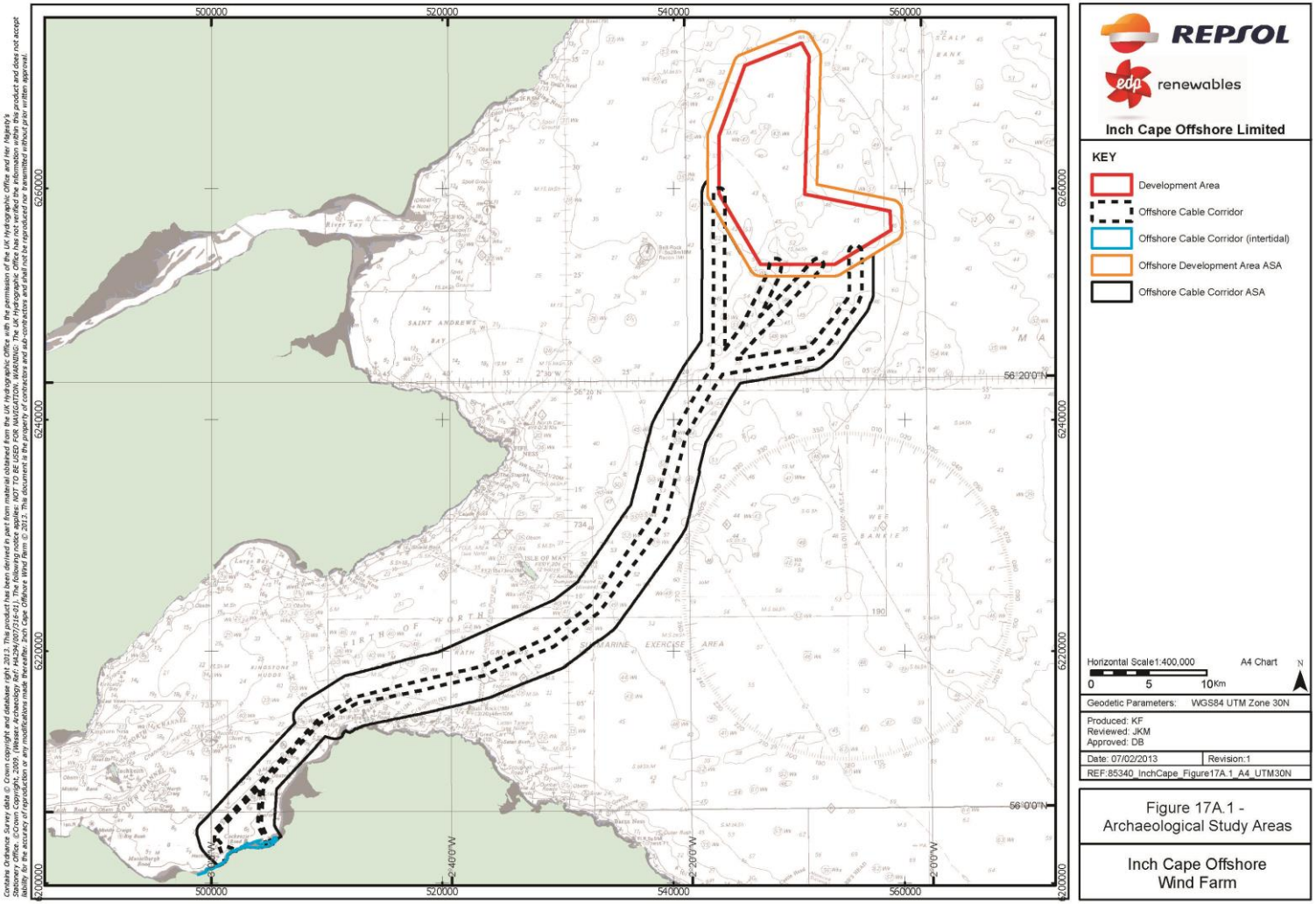
12 The buffer to the Development Area and Offshore Export Cable Corridor has been added to account for the potential of scour and sedimentation beyond the Development Area and Offshore Export Cable Corridor; the uncertain spatial accuracy of offshore cultural heritage records; and, the potential for cultural heritage features outside the Development Area and Offshore Export Cable Corridor to extend over larger areas than currently known. The term ASA has been included when referring to this buffered area as follows:

- Development Area ASA (including a one kilometre buffer); and
- Offshore Export Cable Corridor ASA (including a one kilometre buffer except where this would overlap with the Development Area ASA and also excluding all areas above Mean High Water Springs (MHWS)).

13 The Offshore Export Cable Corridor ASA also includes the intertidal zone between Mean Low Water Springs (MLWS) and MHWS where the Offshore Export Cable will come ashore. It is necessary to include the intertidal zone as part of this ES as it falls under the marine planning regime. As part of the data gathered and assessments undertaken in support of an onshore planning submission, further consideration of the terrestrial and inertial cultural heritage potential will be undertaken. This will provide further context for the cultural heritage features above the MHWS.

14 The coverage of geophysical survey data extends to 500 m beyond the Development Area (i.e. approximately half of the extent of the Development Area ASA) and this data has also been reviewed. No such survey buffer was used for the Offshore Export Cable Corridor as the Export Cable will only occupy a very small part of the Offshore Export Cable Corridor. Note that the data gathering buffers described by the term ASA are unrelated to any buffering of geophysical survey coverage.

Figure 17.1: Archaeological Study Areas



17.4.3 Data Sources

Data Sources – Desk Based Study and Site Visit

15 The following marine and maritime data and archives were consulted during the desk-based assessment:

- The United Kingdom Hydrographic Office (UKHO) Wreck Database for records of shipwrecks and navigational hazards.
- SeaZone Hydrospatial data.
- Maritime records held by RCAHMS, including shipping and aircraft casualties.
- Modern Admiralty and geological charts.
- *The Ministry of Defence (MOD) with respect to the Protection of Military Remains Act 1986.*
- Historic Scotland [online]. Data from HS was also downloaded (03 May 2012) including Battlefields, Conservation Areas, Scheduled Monuments and Listed Buildings.
- Written sources, including academic papers and other offshore wind farm environmental statements that are in the public domain.
- Secondary sources relating to known and potential wreck sites and other archaeological remains, held by Wessex Archaeology (WA).
- Visits to a number of selected cultural heritage receptors, identified in consultation with the local council archaeologists and HS, were carried out on the 19 December 2012 in order to examine the setting and identified key views.

Data Sources – Geophysical Survey

16 In order to support the impact assessment a full archaeological assessment was carried out on three sets of marine geophysical data covering the Development Area ASA and Offshore Export Cable Corridor ASA in the marine zone. The Development Area ASA dataset was acquired in 2010 and sidescan sonar, sub-bottom profiler (sparker), magnetometer and multibeam bathymetry data were assessed. The Offshore Cable Corridor ASA datasets were acquired in two surveys in March 2012 and August/September 2012 respectively. Sidescan sonar, sub-bottom profiler (sparker), magnetometer and multibeam bathymetry data from these two surveys were also assessed. Full technical details of the surveys and their suitability for cultural heritage purposes are included in *Appendix 17A (Section 17A.2.5)*.

Data Sources – Intertidal

17 The data sources for the Offshore Export Cable Corridor ASA include all those considered for the Development Area ASA and a number of additional sources relating to the intertidal zone. These include data on intertidal cultural heritage features from the East Lothian Historic Environment Record (East Lothian Council 2012, accessed on 03 May 2012) maintained by East Lothian Council and the archive of terrestrial sites, monuments and buildings maintained by RCAHMS (retrieved 18 November 2011). These databases include

the results of a cultural heritage Coastal Assessment Survey (James, 1996) undertaken across the intertidal zone in 1996. A summary of data gathered on both known and potential cultural heritage resources within the Offshore Cable Corridor ASA is given in *Section 17.6*, below.

18 Full details are given in *Appendix 17A (Section 17A.7)*.

17.4.4 Impact Assessment Methodology

19 Potential impacts from the construction, operation and decommissioning of the Wind Farm and Offshore Transmission Works (OfTW) are identified and their significance assessed with regard to the sensitivity of receptors and the magnitude of the effect.

20 For the purposes of impact assessment and mitigation features of cultural heritage interest in the Development Area ASA and the marine part of the Offshore Export Cable Corridor ASA have been classified into three categories:

- A1: Anthropogenic origin of archaeological interest;
- A2: Uncertain origin of possible archaeological interest; and
- A3: Historic record of possible archaeological interest with no corresponding geophysical anomaly.

21 Direct and indirect impacts on all receptors have been considered. Direct impacts on archaeological receptors can occur during any development or related activity that disturbs the sea floor or cuts through seabed or intertidal deposits. Archaeological receptors with degrees of elevation, such as wrecks, may also be impacted by development or activities that occur within the water column. Direct impacts may have a significant effect upon both the receptor itself (archaeological deposits and material) and to the relationships between receptors and their wider environment (the physical setting or context of receptors). The examination of these relationships is often crucial to developing a full understanding of a receptor.

22 Indirect physical impacts on cultural heritage features may occur where changes to normal tide, current and sedimentation patterns lead to physical effects on receptors. These may lead to adverse effects on the receptor where protective cover is removed or positive effects where protection is increased. Setting impacts on cultural heritage receptors are often considered to be indirect. These can occur where the visible elements of the Wind Farm and OfTW are intervisible with cultural heritage receptors and can also include non-visual changes. In order to assess setting impacts the setting of that receptor must first be defined.

23 It is noted that a crucial factor in the assessment of physical impacts on cultural heritage features is the extent of ground disturbance. All damage to archaeological sites or material is effectively permanent and recovery is limited to stabilisation or re-burial, limiting further impact. The exceptions to this are with regard to setting impacts from which full recovery is possible.

24 The importance of an archaeological receptor is assessed by examining the receptor's age, type, rarity, survival and/or condition, fragility and/or vulnerability, group value, documentation, associations, scientific potential and outreach potential. These factors help to characterise a site or feature, to assess how representative it is in comparison to other, similar sites, and to assess its potential to contribute to knowledge, understanding and outreach. In most cases, statutory protection is only provided to a site or feature judged to be the best known or an above average example in regard to these factors.

Setting Impacts

25 The methodology for assessment of setting impacts upon the cultural heritage significance of the selected receptors has been undertaken in line with *Managing Change in the Historic Environment: Setting* (HS, 2010). The approach taken is to:

- identify the cultural heritage assets that might be affected;
- define the setting of each asset (without reference to the development); and
- assess how the development would impact upon this defined setting.

26 Once an impact has been identified the final stage in this chapter is to consider the significance of any impact in EIA terms.

27 Although many of the viewpoint locations are the same for this chapter and for visualisations found in *Chapter 16*, it should be noted that the methodology for assessment of cultural heritage setting impacts is distinct from aesthetic heritage setting impacts and is undertaken in line with discipline-specific guidance (e.g. HS, 2010). The setting assessment included in this chapter has been carried out to identify where changes in setting have a potential to impact upon the cultural heritage significance of assets as distinct from the aesthetic land and seascapes. Therefore there is no direct correlation between the magnitude and significance of setting impacts identified in the separate chapters.

28 The cultural heritage assets have been defined through a process of consultation and discussion outlined in *Section 17.2*. The setting of assets has been established through site visits to all assets considered with the exception of the Bell Rock Lighthouse. In the case of the Bell Rock Lighthouse, wirelines have been used to inform the assessment. Setting as defined in the HS guidance is not limited to visual factors. Setting includes the way in which the surroundings of an historic asset or place contribute to how it is experienced, understood and appreciated. However, the distances involved between the receptors and the Development Area mean that assessment of impacts upon the setting of these assets is considered to be limited to visual impacts. Assessment of the setting impacts on cultural heritage assets is ultimately rooted in the professional judgement of the assessor but it is possible to highlight a number of key factors that have been considered in defining setting. Setting factors considered to be of particular importance in the environment of the Development Area include the key vistas that give an asset a context, particularly where these relate to a direct link with the seascape; the prominence of the cultural heritage asset or its place in views throughout the surrounding area and the character of the surrounding landscape; and the relationships between built and natural features. Assessment of the

magnitude of setting effects on a cultural heritage asset is therefore complex and is not simply a function of the proximity of the development in question.

29 With the exception of the Bell Rock Lighthouse, locations immediately adjacent to the cultural heritage assets considered in this chapter have been considered in *Chapter 16* for aesthetic setting impacts. Correspondence with the viewpoints in *Chapter 16* is listed in Table 17.6: Types of anomalies within Development Area ASA.

17.4.5 Significance Criteria

30 For the purposes of this impact assessment, the main factors considered relevant when defining the sensitivity of receptors are outlined in Table 17.2: Receptor Sensitivity (below).

Table 17.2: Receptor Sensitivity

Sensitivity	Definition
High	Feature of International or National Importance or above average example and/or high/significant potential to contribute to knowledge and understanding and/or outreach.
	Includes all wrecks of ships and aircraft with statutory protection under the PWA 1973, AMAA 1979 or PMRA 1986, plus as-yet undesignated sites that are demonstrably of equivalent significance.
	Known submerged prehistoric features with the confirmed presence of largely in situ artefactual material or demonstrable potential to include artefactual material.
	With regard to setting impacts, assets are considered to have a High Sensitivity if they retain a clearly defined setting that can easily be appreciated on the ground and that is central to their cultural heritage significance.
Moderate	Feature of Regional or Local Importance or average example and/or moderate potential to contribute to knowledge and understanding and/or outreach.
	Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have regional/local importance or moderate potential based on a formal assessment of their importance in terms of build, use, loss, survival and investigation ('BULSI' system, Wessex Archaeology, 2011a).
	Other submerged palaeo-landscape features and deposits likely to date to periods of prehistoric archaeological interest. Isolated examples of palaeo-environmental material may also be of Moderate Sensitivity.
	With regard to setting impacts, assets are considered to have a Moderate Sensitivity if their current setting is a factor contributing to their cultural heritage significance.
Low	A poor example of its type and/or little or no potential to contribute to knowledge and understanding and/or outreach. Assets with little or no surviving archaeological interest.
	With regard to setting impacts, assets are considered to have a Low Sensitivity if their current setting makes little or no contribution to their cultural heritage significance.

31 The magnitude of the effect of potential impacts on cultural heritage receptors will be assessed as defined in Table 17.3 below.

Table 17.3: Factors in the Assessment of the Magnitude of Effect

Magnitude	Factors in the Assessment of the Magnitude of Effect
High	Change to most or all key archaeological materials, such that the resource is totally altered.
	Comprehensive changes to setting.
Moderate	Changes to many key archaeological materials, such that the resource is clearly modified.
	Considerable changes to setting that affect the character of the asset.
Low	Very minor changes to archaeological materials or setting.
Negligible	No change

32 In line with standard EIA practice, the sensitivity of receptors, as defined in Table 17.2: Receptor Sensitivity is considered against the magnitude of effect (Table 17.3) to determine the significance of impact on archaeological receptors (see Table 4.5 in *Chapter 4: Process and Methodology*).

33 In accordance with the UKMPS, while designation indicates that a receptor has been identified as being of high value, non-designated heritage assets are not necessarily of lesser importance. Very few offshore archaeological sites are designated due to a lack of knowledge of an asset through limitations in accessibility and available data in identifying potential sites. Therefore, non-designated receptors that can be demonstrated to be of equivalent significance to designated sites should be considered subject to the same policies as for designated heritage assets.

34 The nature of the archaeological resource is such that there is a high level of uncertainty concerning remains on the sea bed. It is often the case that data concerning the nature and extent of sites is out of date, limited, or lacking and the Precautionary Principle is often necessarily applied to aspects of archaeological impact assessment.

35 Guidance on use of the Precautionary Principle (Wessex Archaeology, 2007) states that it should be applied on the basis of the evidence available at the time of decision-making, when:

- there is good reason to believe that the historic environment may be subject to harmful effects; and
- the level of scientific uncertainty about the consequences or likelihood of these effects is such that risk cannot be assessed with sufficient confidence to inform decision-making.

17.5 Design Envelope and Embedded Mitigation

36 The potential development parameters and scenarios are defined as a Design Envelope and presented in *Chapter 7: Description of Development*. The assessment of potential impacts on cultural heritage is based upon the worst case scenario as identified from this Design Envelope, and is specific to the potential impacts assessed in this chapter.

37 Key parameters for the worst case scenario for each potential impact are detailed in Tables 17.4 and 17.5 below. For this assessment these include consideration of structures and activities producing the greatest spatial extent of seabed disturbance and greatest volume of seabed and sub-seabed sediment removal.

Table 17.4: Worst Case Scenario Definition – Development Area

Potential Impact	Design Envelope Scenario Assessed
Disruption of the seabed affecting archaeological features including changes to hydrographic and sedimentary regimes	Total seabed area disturbed is 5.54 km^2, equating to 3.69 % of the Development Area resulting from; • seabed preparation for 213 WTGs with gravity base substructures (GBS) selected as having the largest disturbance footprint (125 m dredge affected diameter) • seabed preparation for five OSPs with GBS selected as having the largest area disturbance footprint (300 m dredge affected diameter) • seabed preparation for three met masts with GBS selected as having the largest area disturbance footprint (125 m dredge affected diameter) • 353 km inter-array cable installation with a trench affected width of 6 m as the widest possible area of disturbance • jack up vessel with disturbance footprint per jack up vessel of 600 m^2 and three visits per foundation installation/decommissioning required for WTGs, OSPs and Met Masts • vessel anchorage disturbance from 5 m^2 anchor footprints deployed at 500 m intervals along the 353 km of inter array cable Model outputs of anticipated worst case SSC, deposition and sediment transportation from energetic means (cable) and dredging (foundations) are detailed in *Chapter 10 Section 10.5*. *Chapter 10* also describes the methodology by which worst case has been identified. Assessment includes; • suspended sediments arising from seabed preparations and installations for 213 WTGs, 5 OSPs and 3 met masts with GBS substructure/foundation types • suspended sediments arising from inter-array cable burial using energetic means (excavated trench 353 km long, one metre wide and two metres depth) as recognised as representing the worst case as describe in *Section 10.1.3* Model outputs of predicted scour effects (see Section 10.5) resulting from WTGs, met masts and OSPs. Jacket foundations with no scour protection have been identified as being the worst case for impacts on scour and associated sediment transportation.
Impacts on the setting of cultural heritage assets	There will be 213 WTGs with a maximum blade tip height of 215 m. The worst case scenario is that these will be arranged in a grid on jacket foundations and that five OSPs will be required. The worst case scenario assumes the maximum correspondence between WTGs and known receptors.

Table 17.5: Worst Case Scenario Definition – Offshore Export Cable Corridor

Potential Impact	Design Envelope Scenario Assessed
Disruption of the seabed affecting archaeological features	Subtidal area of seabed disturbed across export cable corridor is 3.02 km^2 (3.0% of Offshore Export Cable Corridor) resulting from the Export Cable installation: • AC selected as worst case as it utilises the largest possible number of cables i.e. six. DC options utilises less cables than AC. • maximum cable length for each of the six cables is 83 km. • each of the six cables are installed in a separate trench resulting in six trenches in total. Intertidal area disturbed at the Cockenzie beach landfall option is 2,216 m^2 which equates to 2.0% of total beach area (measured from the Cockenzie Power station to East Cuthill Rocks) resulting from: • the cable corridor width which is disturbed by installation equipment which is 6 m for each of the six trenches i.e. 36 m in total. • Two jointing pits estimated at 100 m^2 each within the intertidal area. • Tidal range at widest point of the beach, and therefore cable length across the intertidal area of 56 m. Intertidal Area disturbed at Seton Sands beach landfall option is 14,636 m^2 which equates to 1.1% of total beach area measure from Wrecked Craigs to Fenny Ness resulting from: • the cable corridor width which is disturbed by installation equipment which is six metres for each of the six trenches. • Two jointing pits estimated at 100 m^2 each. • Tidal range at widest point of the beach, and therefore cable length across the intertidal area of 401 m. Mechanical Cutting utilised in any of the intertidal areas where there are rocky habitats

38 A range of Embedded Mitigation measures to minimise environmental effects are captured within the Design Envelope (see *Chapter 4*, *Section 4.5.2*). The assessment of effects on cultural heritage and marine archaeology has taken account of the following Embedded Mitigation measures:

- Mitigation relating to effects of the Wind Farm and OfTW on the setting of cultural heritage receptors will be as per SVLA mitigation described in Chapter 16, Section 16.10 and include:
    - WTGs will be placed in a regular grid subject to micro siting requirements;
    - WTGs will all be of similar dimensions to hub height and blade tip subject to WTG and substructure design and installation specification;

- The WTGs will all be pale grey in colour with a semi-matt finish. This tends to reduce the distance over which the WTGs are visible, especially in dull or overcast conditions, which often occur. As offshore WTGs are often viewed against the sky, pale grey is the most appropriate colour as it is closest to that of the lower part of the sky under the most frequent UK weather conditions.

39 These measures would be delivered as part of the Project (see *Appendix 7A: Draft Environmental Management Plan*).

40 Aspects of the Wind Farm and OfTW that are not included in the Tables above are not considered to be relevant to the assessment of impacts to archaeological receptors.

17.6 Baseline Environment

17.6.1 Baseline Data

41 In order to accommodate the different nature of marine and terrestrial heritage features, the cultural heritage features have been split into three groups on the Figures and in the Annexes to *Appendix 17A*. Records of known terrestrial (intertidal) features of cultural heritage interest are given a numerical sequence beginning **WA 1000**. These are listed in *Annex 17A.2*. Below the MLWS mark, marine features of cultural heritage interest have been split into two groups. Records with known locations were combined with the results of the geophysical survey and were given a numerical sequence beginning **WA 7000**. These are listed in *Annex 17A.3*. The second group comprised historic records of casualties, which are approximate locations recorded in the RCAHMS database. These records are referred to by their Canmore ID (RCAHMS) numbers and are listed in *Annex 17A.4*.

17.6.2 Development Area ASA

42 A summary of data gathered on both known and potential cultural heritage resources in the Development Area ASA is given below. Full details are given in *Appendix 17A*.

Cultural Heritage Assets with Known Locations within the Development Area ASA (WA 7000s)

43 Marine cultural heritage assets with known locations within the Development Area ASA are shown on Figure 17.2.

44 A total of 135 marine geophysical anomalies ranging from previously known shipwrecks to unidentifiable features of possible anthropogenic origin have been identified in the marine geophysical data within the Development Area ASA. These have been broken down by type as indicated in Table 17.6: Types of anomalies within Development Area ASA below.

Table 17.6: Types of Anomalies within Development Area ASA

Anomaly Classification	Number of Anomalies
Recorded Wreck/Obstruction	4
Wreck	4
Debris	37
Seafloor Disturbance	2
Dark Reflector	78
Magnetic	10
Total	**135**

Confirmed Wreck Sites (A1 Anomalies: Anthropogenic Origin of Archaeological Interest)

45 There are four confirmed wreck sites within the Development Area ASA and one area of debris (**WA 7051**) which may represent a wreck. Two of the wreck sites (**WA 7041** and **WA 7044**) lie within the Development Area and two (**WA 7001** and **WA 7132**) lie within the Development Area ASA, 900 m and 700 m from the Development Area respectively.

46 Anomaly **WA 7001** (*Appendix 17A*, Figure 17A.12) is a distinct large wreck situated at the northeast edge of the geophysical survey area. This wreck lies in the Development Area ASA, over 900 m outside the Development Area.

47 Anomaly **WA 7041** (*Appendix 17A*, Figure 17A.13) lies within the Development Area ASA and is a compact area of several linear and curvilinear dark reflectors showing the outline of a wreck. The anomaly is a diffuse oval shape with dimensions of 33 m x 7 m and with a height of three metres. The wreck appears to be slightly broken up. A strong magnetic contact of 735nT indicates that the wreck is of metal construction.

48 Anomaly **WA 7044** (*Appendix 17A*, Figure 17A.14) lies within the Development Area ASA. It is a wreck measuring approximately 55 m x 35 m with a clear rounded shadow at one end of the anomaly giving an object height of three metres. The wreck comprises two large diffuse curvilinear features, approximately parallel to each other and suggesting that the wreck is substantially buried in sediment.

49 Anomaly **WA 7132** (*Appendix 17A*, Figure 17A.15) is an intact upright wreck approximately 80 m x 14 m and standing to a maximum height of six metres. The bow of the ship is clearly visible, although visual detail degrades toward the stern. There are several smaller associated linear and circular dark reflectors which are also interpreted as wreck debris. There are UKHO and RCAHMS records nearby but it has not been possible to make a clear identification of the vessel. This wreck lies in the Development Area ASA, over 700 m outside the Development Area.

50 **WA 7051** (*Appendix 17A*, Figure 17A.8) is within the Development Area ASA and is interpreted as debris but has been given an archaeological discrimination of A1 as it could potentially be a wreck. It is a discrete area measuring 21 x 18 m and contains several linear and circular shaped dark reflectors along its length, of which the largest stands to a height of 0.5 m. There is no associated magnetic anomaly.

Seabed Anomalies of Uncertain Origin of Possible Archaeological Interest (A2 Anomalies)

51 In addition to the wreck and possible wreck sites noted above a further 126 anomalies have been interpreted as of uncertain origin of possible archaeological interest and have been classified as A2 (Figure 17.2).

52 There are eight anomalies classified as debris (two or more anomalies grouped together or small anomalies showing possible structural detail); 106 anomalies classified as dark reflectors, and 10 magnetic anomalies which do not have associated sidescan sonar anomalies.

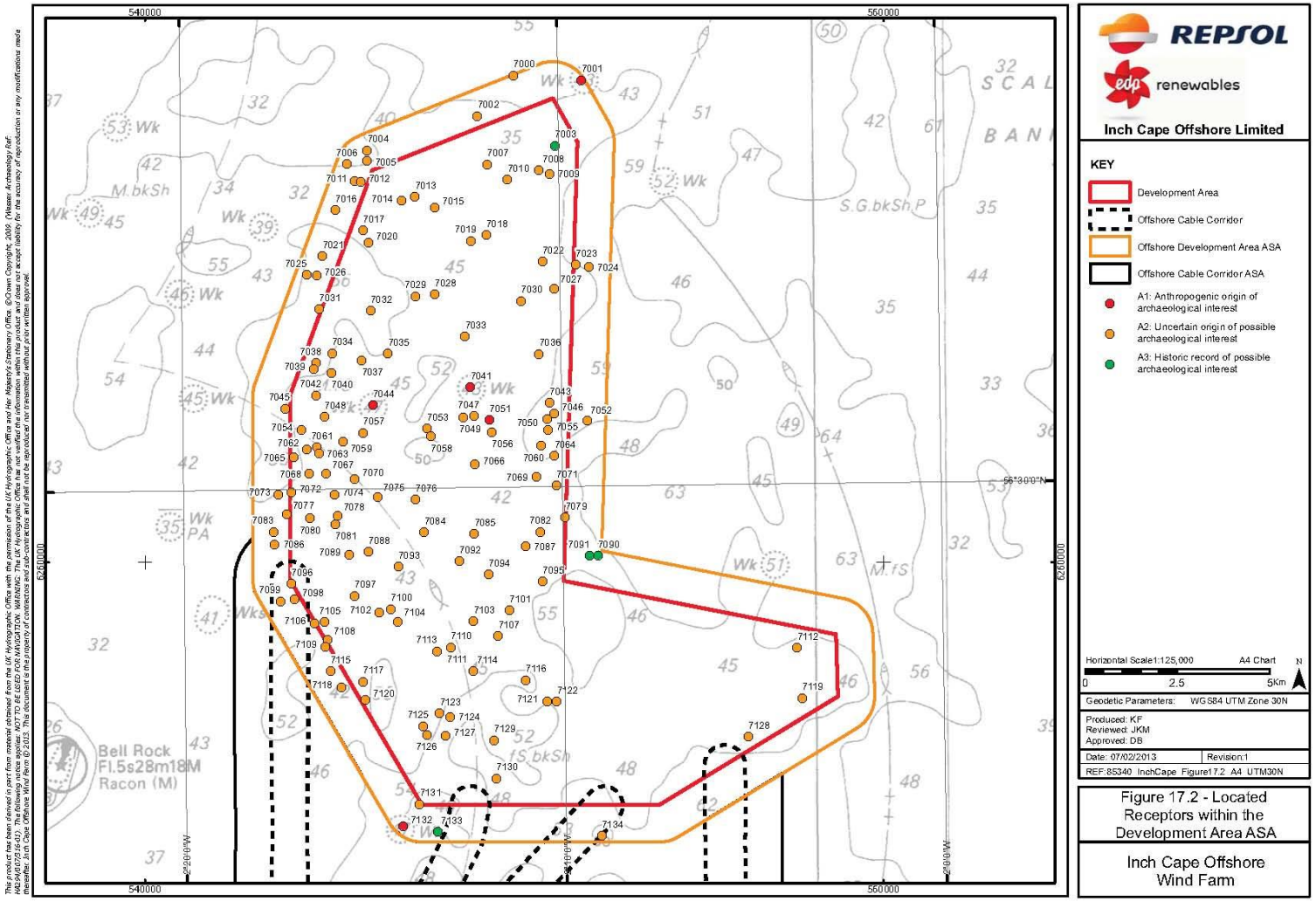
53 Two areas of seafloor disturbances (**WA 7098**, **WA 7120**) have also been defined. These appear to be debris of anthropogenic origin covered over by sediments.

Historic Record of Possible Archaeological Interest (A3 Anomalies)

54 Four previously recorded wrecks/obstructions, classified as A3, have been identified within the Development Area ASA (**WA 7003**, **WA 7090**, **WA 7091**, and **WA 7133**). No geophysical anomalies were noted at these locations but they have been retained as locations due to the possibility that previously exposed features may have been covered up by shifting sediments.

55 A full list and description of these anomalies can be found in *Annex 17A.3*.

Figure 17.2: Located Receptors within the Development Area ASA



Cultural Heritage Assets Considered with Respect to Setting Effects

56 Although the Wind Farm and OSPs will be visible from a large number of coastal cultural heritage sites, given the large distance from nearby coastlines and islands there is no potential in most cases for significant visual effects upon the setting of these receptors. Only those receptors considered as having settings relating closely to the sea have been assessed. Through consultation with HS, Fife Council and Angus Council (see Table 17.1), a shortlist of receptors has been identified (Figure 17.3), and these are listed in Table 17.7 below. In the majority of cases these locations coincide with representative viewpoints considered in *Chapter 16*, where visualisations and wirelines have also been included (although, as noted in *Section 17.4.4* the setting impact assessment methodology is based on different guidance in this chapter). SLVIA viewpoint numbers from *Chapter 16* for cross-reference with those visualisations and wirelines are included in Table 17.7.

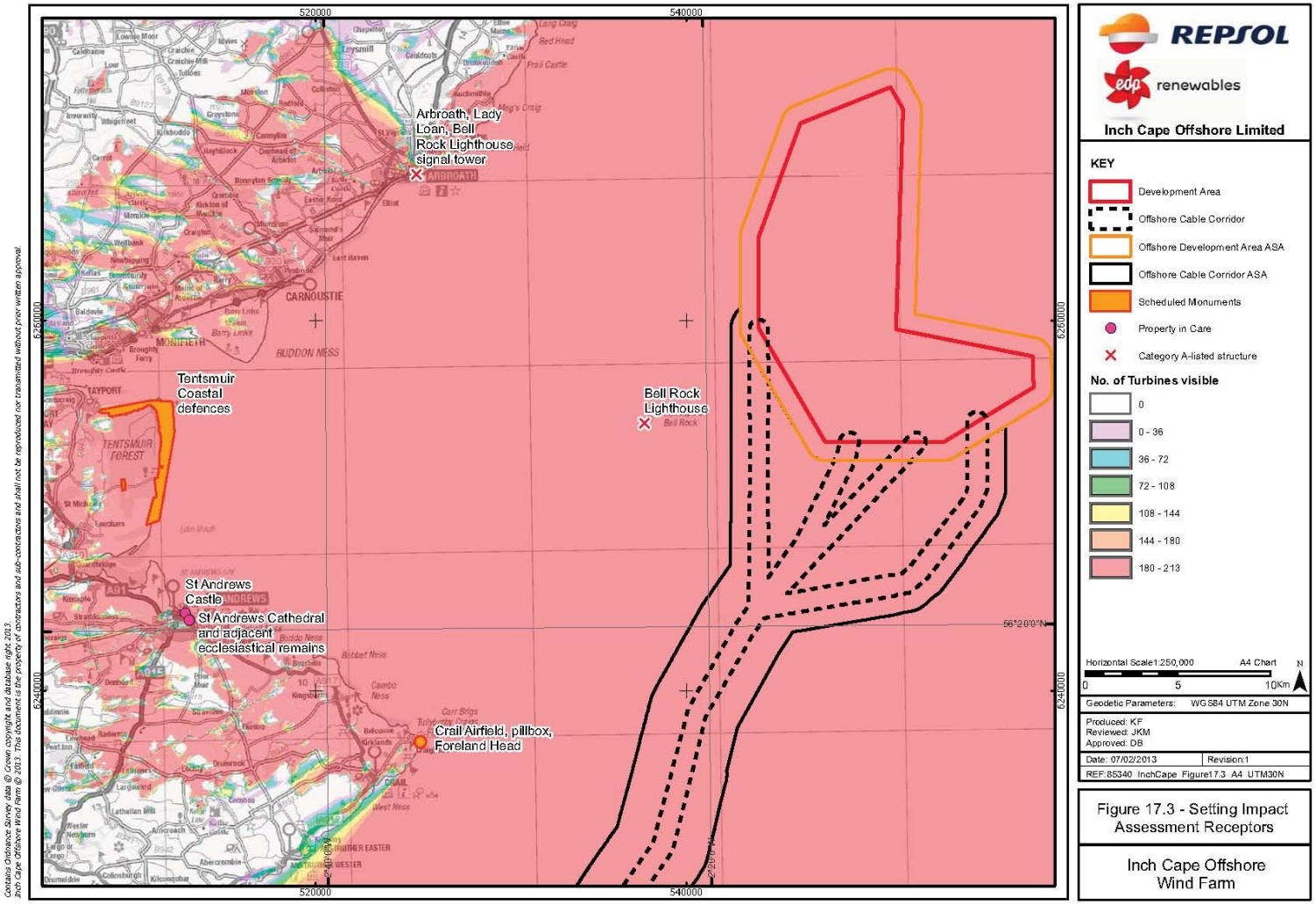
57 All of the assets in Table 17.7 have been taken forward for detailed setting impact assessment in *Section 17.7.3.*

Table 17.7: Cultural Heritage Assets Considered with Respect to Setting Effects

Name	Designation	Description	Reference Numbers	Distance to Development Area	SLVIA Viewpoint
Bell Rock Lighthouse Signal Tower, Ladyloan	Category A-listed structure	The Bell Rock Lighthouse Signal Tower is a castellated group of twin lodges and Signal Tower in a classical style, built in 1813. The structure now functions as a museum and houses exhibitions on lives of the fishermen of the area, "Arbroath Smokies" and the story of the building of the lighthouse including historical artefacts from the lighthouse itself. The buildings were constructed to serve as the shore station of the lighthouse and housed its keepers and their families until 1955. The signal tower itself was built to facilitate signalling between the lighthouse and the shore. This was undertaken by a variety of means and at times involved the use of telescopes, flags, pigeons and a large copper signal-ball. The building complex has been kept in a condition very similar to its original design.	HB no. 21230	18.8 km	11 (Figure 16.45, Figure 16.45a, Figure 16.45b)
Bell Rock Lighthouse	Category A-listed structure	The Bell Rock Lighthouse was built between 1807 and 1811 by Robert Stephenson. It is a curved 36 m tall tapering masonry tower with base courses set into rock, and is the first lighthouse ever constructed on a half-tide rock. Although the internal fittings of the lighthouse have all been replaced there have been only minor alterations to the exterior since the lighthouse was built. These include minor external additions and renewal of the lantern and gallery. The lighthouse was de-manned in 1988 and is now fully automated.	HB no. 45197	7.9 km	Not included in the SLVIA Viewpoints (see *Appendix 17B*; Figures 17B.1 to 17B.4)
Tentsmuir Coastal Defences	Scheduled Monument	Tentsmuir Coastal Defences are a complex of World War II (WWII) coastal defences built because the low sandy coast line of the area was considered to be at risk area from a sea-borne invasion. The scheduled area is in two parts, a large coastal strip of over 500 hectares, extending over 6,600 metres from north to south, and 4,000 metres from east to west. This area contains a wide variety of defences most of which are dispersed along the back-beach of the prograding shoreline east of Tentsmuir Forest including anti-glider posts, lines of anti-tank blocks, command posts, quadrant towers and pill boxes. Inland to the west of this is the site of a former army camp built	Index no. 9712	32 km	16 (Figure 16.50, Figure 16.50a, Figure 16.50 b)

		for those who constructed and monitored the line, many of whom were Polish. The camp is situated within forest and 590 m on its north-south axis and 190 m on its east-west axis.			
St Andrews Cathedral and adjacent ecclesiastical remains	Scheduled Monument	St Andrews Cathedral is a Property in Care, a Category A-listed building and a scheduled monument. The site consists of a large walled complex of buildings including a partially ruined cathedral. The cathedral occupies a prominent position in St. Andrews on an elevated site overlooking the harbour and dominating views of the town, particularly through the high visibility of its towers.	Index no. 90260, HB no.s 40585, 40586, 40587, 40588, 40589, 40592	34.5 km	18 (Figure 16.52, Figure 16.52a, Figure 16.52b)
St Andrews Castle	Scheduled Monument	St Andrews Castle is a Property in Care, a Category A-listed building and a scheduled monument. It was first mentioned in 1200 but the present fabric largely dates to the 14th to 16th centuries. It takes the form of a partially ruined tower with an enclosure. The castle is built on a slight promontory of the rocky shoreline a few hundred metres to the north of the cathedral.	Index no. 90259, HB no. 40599	34.5 km	18 (Figure 16.52, Figure 16.52a, Figure 16.52b)
Crail Airfield, pillbox, Foreland Head	Scheduled Monument	This is a concrete pillbox of WWII date at the tip of Fife Ness. It comprises a pillbox with stone walls, steel lintels, and a concrete roof into which stone was set for camouflage.	Index no. 6461	27.2 km	23 (Figure 16.57, Figure 16.57a, Figure 16.57b)

Figure 17.3: Setting Impact Assessment Receptors



17.6.3 Offshore Export Cable Corridor ASA

Cultural Heritage Assets with Known Locations within the Offshore Export Cable Corridor ASA (WA 7000s)

58 Marine cultural heritage assets with known locations within the Offshore Export Cable Corridor ASA are shown on Figure 17.4, Figure 17.5 and Figure 17.6.

59 A total of 378 marine geophysical anomalies ranging from previously known shipwrecks to unidentifiable features of possible anthropogenic origin have been identified in the marine geophysical data within the Development Area ASA. These have been broken down by type in Table 17.8.

Table 17.8: Types of Anomalies within the Offshore Export Cable Corridor ASA

Anomaly Classification	Number of Anomalies
Recorded Wreck/Obstruction	2
Wreck	2
Debris	47
Seafloor Disturbance	3
Depression	1
Dark Reflector	79
Magnetic	244
Total	**378**

Confirmed Wreck Sites (A1 Anomalies: Anthropogenic Origin of Archaeological Interest)

60 There are two wreck sites within the Offshore Export Cable Corridor ASA. Both of these lie within the Offshore Export Cable Corridor.

61 **WA 7195** (*Appendix 17A*, Figure 17A.16) consists of two discrete areas identified and recorded as a single wreck and given an archaeological discrimination of A1. Only one part of this appears to have been recorded previously and it is identified in the UKHO records as the SS *Fylgia*, formerly known as the *Talavera*. It is not stated in the records how the identification was made. The SS *Fylgia* was a Swedish registered vessel built in 1889 in Newcastle-Upon-Tyne. Its recorded dimensions were 81.1 m long with a beam of 11.3 m and a draught of 4.9 m. It was sunk on passage from Gothenburg to Rouen after being torpedoed by UC-49 in 1918.

62 **WA 7376** (*Appendix 17A*, Figure 17A.17) is a large but well-defined area of debris approximately 1000 m x 275 m containing a spread of small pieces of debris (at least 14 are

visible on sidescan sonar data). The location of this debris matched an RCAHMS entry derived from an entry in Whitaker (1998) of a wreck, the *Malta*, a wooden steam trawler which sank in 1891 after a collision off Fidra. The record states that the vessel broke up and the remains appear to be consistent with this description. The large area of dispersal of the identified anomalies measures over one kilometre in length and while not all of the dark reflectors are necessarily debris from this wreck they do lie in a discrete location on their own and have therefore been grouped together under a single entry.

Seabed Anomalies of Uncertain Origin of Possible Archaeological Interest (A2 Anomalies)

63 In addition to the wreck and possible wreck sites mentioned above a further 374 anomalies have been interpreted as of uncertain origin of possible archaeological interest and have been classified as A2 (see Figure 17.4, Figure 17.5 and Figure 17.6 below). These include debris, seafloor disturbances, depressions and dark reflectors. However, the majority of A2 anomalies are magnetic in nature.

Historic Record of Possible Archaeological Interest (A3 Anomalies)

64 Two previously recorded wrecks have been included for which no corresponding geophysical anomaly has been identified. These have been included as they may still be in place but have become buried in mobile sediments rendering them no longer visible or detectable at the surface of the seabed.

65 **WA 7141** is the location of a piece of wreckage, thought to represent either trawling gear or possibly an aircraft that was noted at this location during a survey in 1995. The anomaly was recorded by underwater remote camera and noted to be approximately four metres long, one metre wide and 0.5 m high. It is also described as 'broken in half' although no further clarification is given. A subsequent resurvey of the area as part of the Civil Hydrography Programme in 2008 failed to find any trace of wreckage at this point and the UKHO entry was amended to dead as it is no longer considered as a navigational hazard.

66 **WA 7425** is recorded as a wreck in the RCAHMS database, lying within the Offshore Export Cable Corridor of the Offshore Cable Corridor ASA. The record in the database is based on an entry in Larn and Larn (1998). It is unclear which record in Larn and Larn relates to this entry but the possible candidates all seem to be derived from a superseded version of the UKHO database and this has therefore been considered as a located record. There was no geophysical anomaly visible at this location or in the immediate vicinity.

67 A full list and description of these anomalies can be found in *Annex 17A.3*.

Intertidal Cultural Heritage

68 Intertidal cultural heritage assets with known locations within the Offshore Export Cable Corridor ASA are shown on Figure 17.7.

69 The baseline data for the Offshore Export Cable Corridor ASA also includes the intertidal element of the cable landfall. Baseline data on known cultural heritage receptors and

assessment of the potential for unknown receptors has been made here only for assets falling partially or completely between the MHWS and MLWS.

70 There are a total of 10 known cultural heritage assets within the intertidal element of the Offshore Export Cable Corridor ASA. These include a small number of prehistoric finds including a worked flint (**WA 1003**) and various pieces of Iron Age metalwork (**WA 1008**, **WA 1010**) thought to relate to a hoard buried on the beach. There are three harbours within the intertidal zone, two of which are still in use. Although most of the physical remains of these harbours lies above the MHWS mark they are included here as they extend into the intertidal zone. All three were first constructed in the 16th/17th centuries. The two harbours still in use are the focus of the Cockenzie and Port Seton Conservation Areas (**WA 1004**, **WA 1007**). Morrison's Haven (**WA 1002**) is the site of a medieval harbour, built in the 16th century by the monks of Newbattle. It fell out of use during WWII and has since been largely covered by an area of mining spoil known locally as 'the cast' although a significant part of the structure appears to be intact within the spoil heap.

71 There are also a number of industrial archaeological features in the intertidal element of the Offshore Export Cable Corridor ASA. These include rock-cut salt pans (**WA 1005**, **WA 1006**) with associated remains of walls; a disused circular domed cement structure (**WA 1001**) which formerly served as a cap for an air shaft from Prestongrange Colliery; and two lines of wooden posts running across the beach at Seton Sands perpendicular to the coast (**WA 1009**). It has been suggested that these may be the remains of poles for drying fishing nets but they may also represent anti-glider defences of WWII date.

17.6.4 Potential for Further Unknown Cultural Heritage Features

72 It is not possible to identify all archaeological sites within the Development Area ASA and Offshore Export Cable Corridor ASA through remote sensing and review of available baseline data. The review of baseline data presented in *Appendix 17A* (*Sections 17A.3-17A.6)* has identified a potential for the following categories of currently unknown cultural heritage receptors to be present:

- Prehistoric;
- Maritime; and
- Aviation.

Prehistoric

73 The potential for archaeological features relating to submerged prehistoric landscapes has been considered across the Development Area ASA and Offshore Export Cable Corridor ASA. This relates to the very low potential for reworked pre-Devensian Palaeolithic material and a low potential for reworked and *in situ* Devensian Palaeolithic material. By the Mesolithic period, relative sea-level was higher than at present across the Firth of Forth and there is no potential for *in-situ* terrestrial archaeological sites in the marine zone from the Mesolithic onwards. However, the proximity of upper sediments of the Forth Formation (Units 4, 4a and 4b) to the coast and river Forth and Tay estuaries means they could contain derived

archaeological artefacts alongside palaeoenvironmental indicators preserved within the silts and clays. This potential is considered to be extremely low and has not been considered further. A detailed breakdown of this potential is given in *Section 17A.3.3*.

Maritime

74 Although there are a significant number of recorded historic losses in the Firth of Forth and North Sea it is likely that the extensive geophysical survey undertaken across the Development Area ASA and Offshore Export Cable Corridor ASA has confirmed or established the locations of all shipwrecks and debris. Although there is a potential for further shipwrecks not picked up on the geophysical data to be present in both the Development Area ASA and the Offshore Export Cable Corridor ASA, the generally shallow depth of mobile sediments, particularly within the Offshore Export Cable Corridor ASA, suggests that this potential is low. A detailed breakdown of the potential for maritime cultural heritage features is given in *Appendix 17A* (*Section 17A.5)*.

Aviation

75 A single reported loss of an aircraft has been noted in the vicinity of the Development Area ASA. This is a Bristol Beaufighter VI which crashed into the sea 1.5 miles north-east of North Berwick on 15 June 1944. Although the wreckage has never been found the record illustrates the potential in this area. Although the Development Area ASA lies outside of the areas of highest aircraft activity during WWII, the area would still have seen significant activity. There were a number of active airfields in the locality including Hatton in Angus, Leuchars and Crail in Fife, and Drem and East Fortune in East Lothian. The more lightweight construction of aircraft means they are less likely to be traced in geophysical survey data. However, given the likely density of aircraft losses there is considered to be a low potential for undiscovered aircraft remains to be impacted by the Wind Farm and OfTW in both the Development Area ASA and the Offshore Export Cable Corridor ASA. A detailed breakdown of the potential for maritime cultural heritage features is given in *Appendix 17A* (*Section 17A.5*).

76 A potential for currently unknown archaeological features has been identified within the intertidal element of the Offshore Export Cable Corridor ASA. This stretch of East Lothian coastline has a high archaeological potential and has been extensively settled throughout human history. The intertidal archaeological sites in the wider area attest to a variety of activities, including salt panning, pottery manufacture, coal mining and related maritime activities such as fishing.

77 A detailed breakdown of this potential is given in *Appendix 17A* (*Section 17A.6.2*).

Figure 17.4: Located Receptors in the Offshore Export Cable Corridor ASA (North)

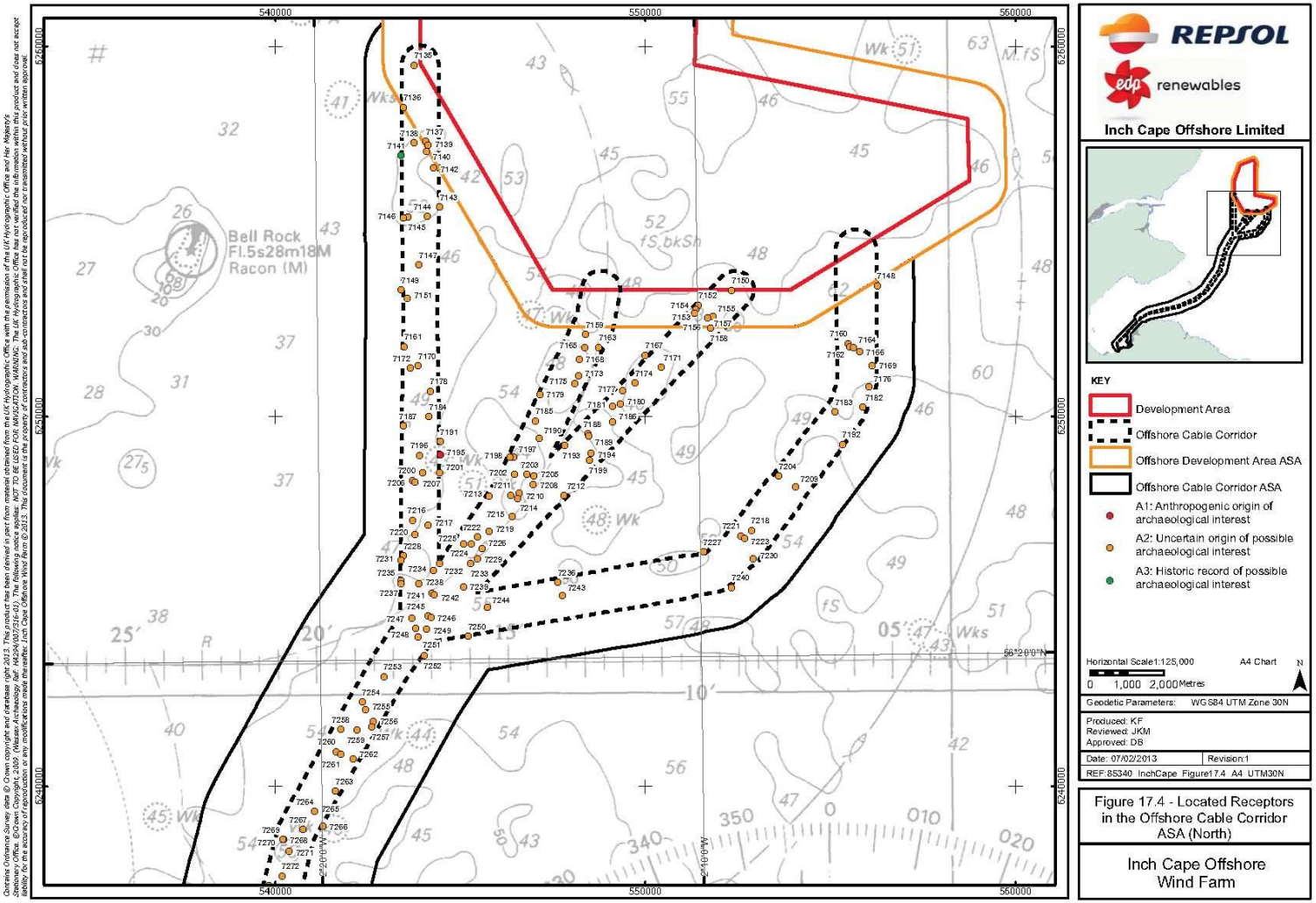


Figure 17.5: Located Receptors in the Offshore Export Cable Corridor ASA (Central)

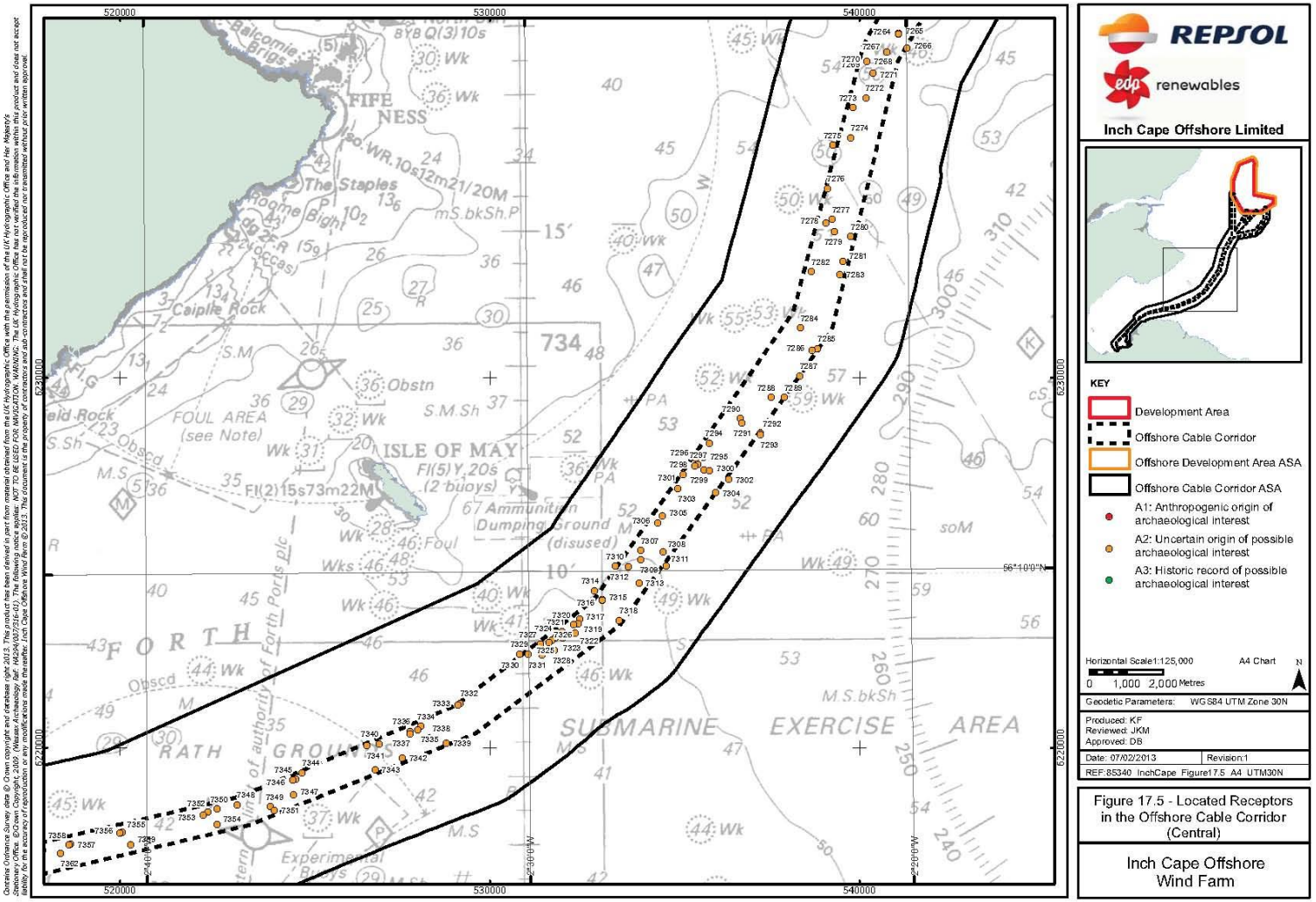


Figure 17.6: Located Receptors in the Offshore Export Cable Corridor ASA (South)

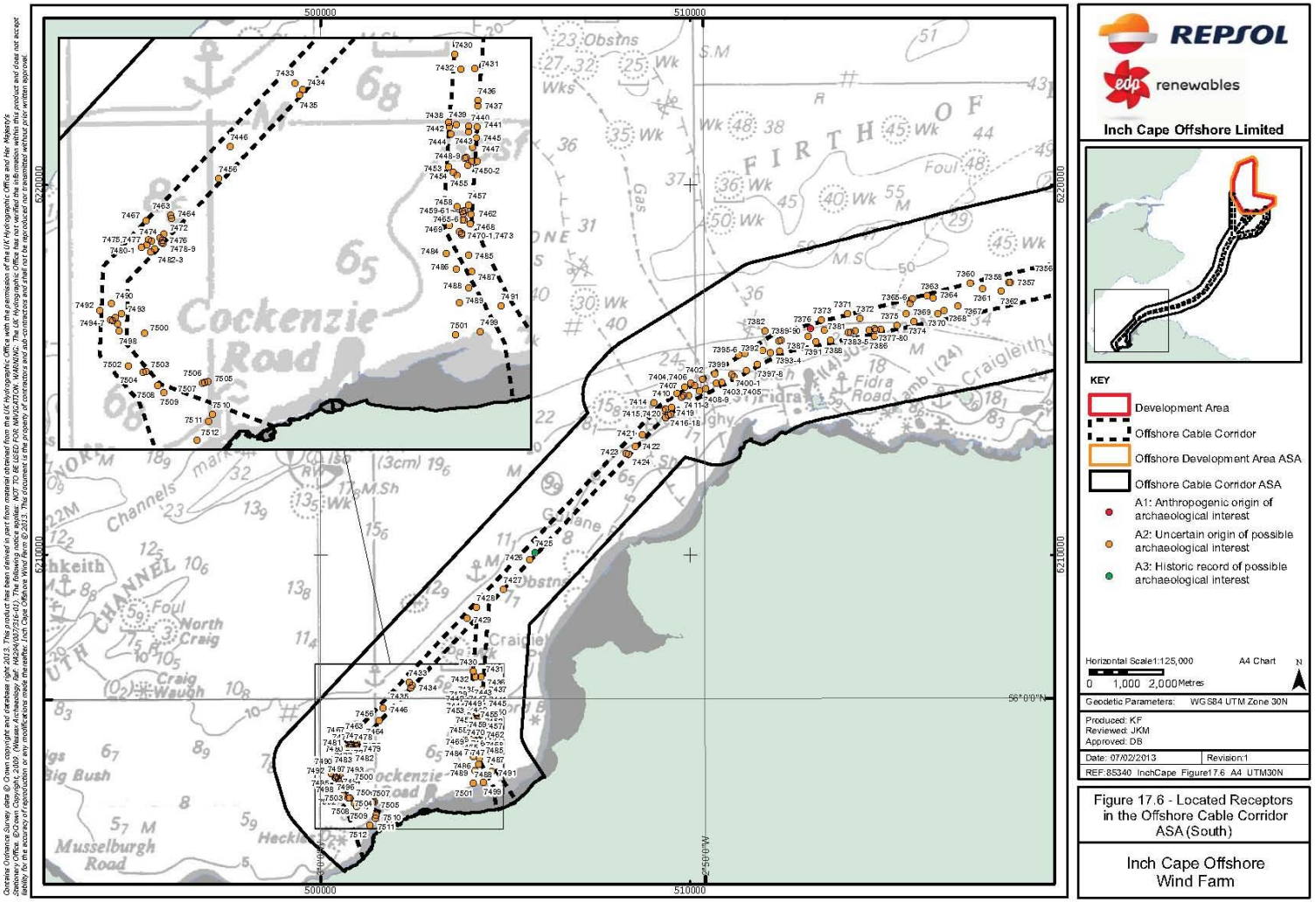
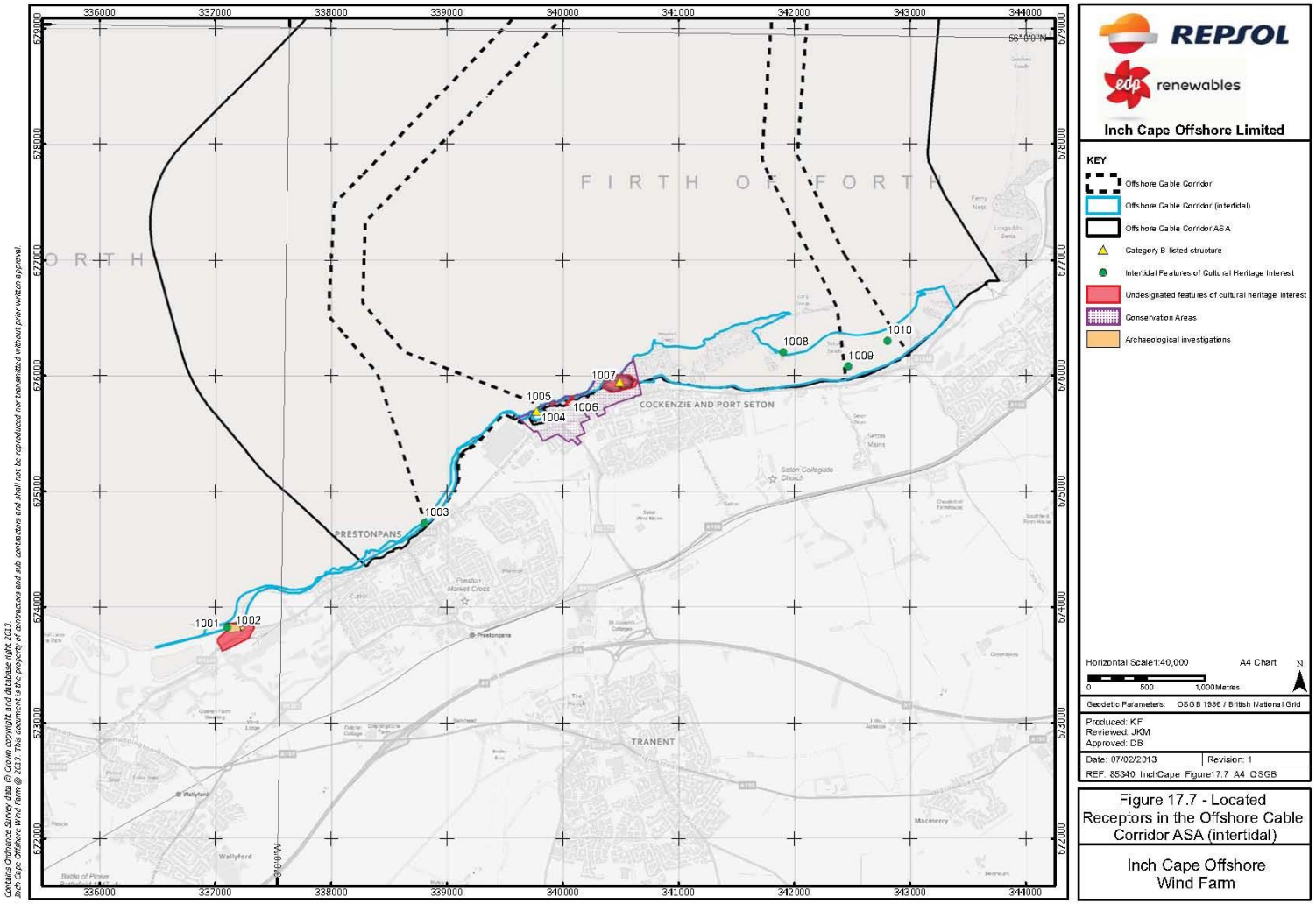


Figure 17.7: Located Receptors within the Offshore Export Cable Corridor ASA (Intertidal)



17.6.5 Baseline without the Project

78 The cultural heritage baseline without the Project will be a combination of slow sediment change and deterioration of discrete cultural heritage receptors in the marine environment. Change in the intertidal environment is likely to be minimal.

79 Without the Project, sediment change to marine cultural heritage receptors is likely to result mainly from natural processes. This may result in the removal or build-up of protective sediments on discrete cultural heritage receptors or the erosion of sediments considered to have an intrinsic cultural heritage interest due to the information they contain on past environments.

80 Without the Project the natural processes of deterioration of some submerged cultural heritage features will continue. Exposed features such as wrecks will gradually deteriorate due to corrosion, the action of marine life, and through anthropogenic impacts such as fishing, diving or offshore development (more detail on fishing is available in *Chapter 18: Commercial Fisheries*). Natural decay is predictable to some extent and is generally a slow and prolonged process. This is described in more detail in *Section 10.2.6*. Some cultural heritage receptors are less susceptible to these processes due to protective sediment cover.

81 Change to the seascape may result in effects upon the setting of terrestrial cultural heritage features. Such changes might include further construction of offshore developments in the Outer Firth of Forth. This issue has been discussed in more detail in the "Forces for Change" sections of the seascape character assessment, which is included as *Appendix 16D*.

17.7 Impact Assessment - Development Area

17.7.1 Approach

82 This section considers the source and nature of the effects of the Project on the cultural heritage resource and the degree to which archaeological receptors (listed in *Table 17.9*) are exposed to and affected by the Wind Farm. The impact assessment is considered in relation to the construction, operation and decommissioning of the Development Area ASA.

Table 17.9: Cultural Heritage Receptors - Development Area ASA

Receptor (setting)	Receptor (Marine)
Bell Rock Lighthouse Signal Tower, Ladyloan	A1 and A3 marine geophysical anomalies
Bell Rock Lighthouse	All A2 marine geophysical anomalies
Tentsmuir Coastal Defences	Unknown maritime receptors
St Andrews Cathedral and adjacent ecclesiastical remains	Unknown aviation receptors
St Andrews Castle	-

Receptor (setting)	Receptor (Marine)
Crail Airfield, pillbox, Foreland Head	-

17.7.2 Effects of Construction

83 Potential direct effects within the Development Area ASA comprise both direct damage to archaeological deposits and material and the disturbance or destruction of relationships between deposits and material and their wider surroundings.

84 Potential direct effects during construction comprise damage, disturbance or destruction of submerged prehistoric archaeology, shipwrecks and crashed aircraft from:

- Seabed preparation prior to foundation installation;
- Installation of foundations for WTGs, OSPs and met masts;
- Installation of inter-array cables (burial through ploughing, trenching or rock cutting); and
- Seabed contact by the legs of jack-up crane vessel and/or anchors of other vessels.

Magnitude of Effects

85 A key consideration with regard to archaeological receptors is that all direct effects are permanent. Once a receptor is destroyed or damaged or its context is altered, it is not possible to repair or reinstate that receptor. Hence, the impact from the temporary footprint of a jack up barge is of the same magnitude as a WTG foundation with a long term presence.

86 Cultural heritage receptors range in size from particles of palaeoenvironmental data through to single artefacts, and artefact scatters to sites and landscapes. As such, any of the sources of direct effect listed above have the potential to remove entire receptors as well as damaging a receptor or its relationship with the wider environment.

87 Direct impacts on cultural heritage features (including currently unknown maritime and aviation features and A1 and A3 locations) in the Development Area ASA due to construction impacts is considered to be of High Magnitude even where those receptors lie outwith the Development Area (due to the potential for damage through anchoring of vessels and similar activities).

Sensitivity of Receptor

88 There are no assets within the Development Area ASA that are currently subject to statutory protection, but the potential exists for such sites to be present in the form of wrecks of military aircraft that were lost on active service. Any such find would be automatically protected by the *PMRA 1986*. The importance of these potential receptors must be regarded as very high.

89 All archaeological receptors subject to direct physical impacts in the Development Area ASA have the potential to be damaged or destroyed if they are directly impacted during the construction of the Wind Farm. All physical impacts on archaeological features or material are permanent and recovery is limited to stabilisation or re-burial, limiting further impact. As such, the recoverability of any archaeological receptors should be regarded as negligible indicating that all sites and material should be regarded as vulnerable.

90 As stated in the methodology the 'BULSI' (Build, Use, Loss, Survival and Investigation) system (Wessex Archaeology, 2011a) can be consulted when assessing the special interest of wreck sites and could equally be applied to non-military aviation features. On the basis of the paucity of located wrecks in Scottish waters dating to before the middle of the 19thcentury (Wessex Archaeology, 2011b), vessels from before this period are likely to be considered high value receptors due to their rarity and subsequent national or international importance. Wrecks dating from the later 19thcentury onwards are more plentiful in the known archaeological resource. However, despite their abundance, the special interest of wrecks from this period should not be discounted and there are a number of factors which might enhance the interest of these wrecks. The rarity of aviation sites suggest that these sites would be considered to be of high value.

91 Assessment of receptor sensitivity has been undertaken in line with the precautionary principle (see Methodology, Significance Criteria in *Section 17.4.5*). None of the A1 anomalies (including confirmed shipwreck locations) in the Development Area ASA have been positively identified and they all have a potential to be of national or international significance. Therefore all have been assigned a High Sensitivity. The current level of data available for A2 geophysical anomalies of possible anthropogenic origin and for currently unknown maritime and aviation features is also insufficient to assess sensitivity. As such the importance of these receptors must be regarded as High until further information becomes available. A3 records represent previously reported locations of shipwrecks which could not be confirmed through review of the geophysical data. These have also been assigned a High Sensitivity on the basis of the available details and the fact that remains may well be present but have subsequently become buried.

Significance of Impacts

92 Due to the absence of complete information such as confirmed identification and dating of wrecks, all charted wrecks and aircraft, uncharted wrecks and geophysical anomalies of potential anthropogenic origin in both the Development Area ASA are considered to be of High Sensitivity. It is therefore considered that direct effects of High Magnitude on these receptors have the potential to result in impacts of Major Adverse Significance in the absence of mitigation. To a large extent this is a result of a worst case scenario assessment due to lack of sufficient information and is typical of cultural heritage impact assessment for offshore developments.

93 All indirect effects will result in impacts which are Minor. As changes in scour and sedimentation, which may cause increased erosion/protection, are predicted to be limited, as described in (*Section 10.5*), effects of the impacts are assessed as not significant.

Setting Impacts

94 Setting impacts on cultural heritage features during construction are considered to be not significant as they are too short term to warrant consideration and have only been assessed with regard to operational effects (*Section 17.7.3*).

17.7.3 Effects of Operation and Maintenance

95 Predicted direct effects during the operation of the Wind Farm comprise damage, disturbance or destruction of submerged prehistoric archaeology, shipwrecks and crashed aircraft from:

- Anchors of vessels deployed during periodic overhauls and scheduled and unscheduled maintenance; and
- Seabed contact of the legs of jack-up crane vessels in the event of WTG component replacement.

96 Predicted indirect effects can include setting impacts as well as changes to currents, sediment transport and erosion patterns. Predicted indirect effects comprise:

- Effects on the setting of terrestrial cultural heritage receptors;
- Increased erosion to submerged prehistoric archaeology, shipwrecks and crashed aircraft uncovered as a result of changes in scour or sedimentation; and
- Increased protection afforded to submerged prehistoric archaeology, shipwrecks and crashed aircraft buried as a result of changes in scour or sedimentation.

97 The magnitude of physical effects and the sensitivity of receptors to them is the same as that outlined above for the construction phase.

98 Direct physical impacts to features of cultural heritage interest will result in effects of Major Adverse Significance in the absence of mitigation.

99 The magnitude of all indirect effects on archaeological sites and findspots during operation has been assessed. Modelling of the impact of Wind Farm construction upon hydrographic and sedimentary regimes undertaken as part of Development Area specific studies (see *Section 10.5.2*) indicates little change with hydrographic and sedimentary regimes, suggesting that effects will be of Low Magnitude for all marine cultural heritage receptors even where those features are of High Sensitivity. It is considered that the indirect impacts on cultural heritage features from the operation of the Wind Farm will be not significant.

100 There is a potential for setting effects to occur where the Wind Farm and OSPs, including maintenance vessels in the Development Area are visible from terrestrial cultural heritage receptors. The receptors subjected to detailed setting assessment here have been selected at the request of HS and no further receptors have been highlighted by Fife or Angus Council Archaeological Services (see Table 17.7).

Bell Rock Lighthouse Signal Tower, Ladyloan (HB no. 21230)

101 The Signal Tower is Category A-listed and is also linked in an 'A' group with the Bell Rock Lighthouse to mark the functional relationship between the subjects. The setting of the Signal Tower is considered to be the open coastal location with an appreciable relationship with the adjacent town of Arbroath. The key view from the tower is the intervisibility with the lighthouse although this can only be appreciated in optimal weather conditions. The Signal Tower retains a clearly-defined setting that forms a central part of its cultural heritage significance and it is therefore considered that the structure has a High Sensitivity to effects upon this defined setting.

102 In optimal weather conditions the WTGs will be visible in the view from the Bell Rock Lighthouse Signal Tower to the Bell Rock Lighthouse and will lie to west of it, occupying part of the horizon and appearing above the entrance to the harbour. However given the distance of over 18 km between the Signal Tower and lighthouse and the very focused nature of that view it is considered that the Wind Farm will not dominate or detract from this view. It is considered the effect upon setting will be of Negligible Magnitude leading to an impact of Minor/Moderate.

Bell Rock Lighthouse (HB no. 45197)

103 The Bell Rock Lighthouse is Category A-listed and is also linked in an 'A' group with the Bell Rock Lighthouse Signal Tower, in Arbroath, to mark the functional relationship between the subjects (see separate entry). The Bell Rock Lighthouse is sited on a half-tide complex of reefs with panoramic views of the sea. Significant remains of structural elements surviving from the period of its construction can still be noted nearby including elements of a cast-iron railway and the site of a beacon house erected to house the workers on an adjacent spot on the reef. The closest land to the lighthouse is over 18 km distant.

104 The key elements of the setting of the Bell Rock Lighthouse are considered to be the open views of the sea around it, the reefs on which it was built (including related structural elements and landing points still in occasional use) and the view towards the Bell Rock Lighthouse Signal Tower. When these elements are considered together it is apparent that the lighthouse retains a clearly-defined setting that can easily be appreciated on the ground and that the setting forms a central part of its cultural heritage significance. It is therefore considered that the lighthouse has a High Sensitivity to impacts upon its defined setting.

105 The Development Area will be visible to the east of the lighthouse at a distance of just under eight kilometres. A wireline (Figure 17B.1) has been produced to demonstrate how the Wind Farm and OSPs will appear from the lighthouse. This demonstrates that Wind Farm and OSPs will appear as a contiguous group of WTGs on the horizon. It will appear as a modern element in views directly to the east. The WTGs will occupy a small fraction of the sea view around the lighthouse and will not detract from its open and panoramic quality. Although this assessment is based upon a WTG tip height of 215 m and the lighthouse is 36 m tall, at this distance the lighthouse will not appear to be overshadowed, surrounded or competing in scale with the WTGs. Key views from the lighthouse to the surrounding reef will be

unaffected. The key view to the signal tower has been considered as part of the setting assessment below but is also considered to be unaffected. Although the lighthouse is considered to have a High Sensitivity to effects on its defined setting it is considered that the impact on the setting of the Bell Rock Lighthouse will be of Negligible Magnitude and will therefore have a Minor/Moderate impact see *Appendix 17B* for the following visualisations:

- Figure 17B.1: View from the Bell Rock Lighthouse (wireline);
- Figure 17B.2: View from Bell Rock Lighthouse Cumulative View A (wireline);
- Figure 17B.3: View from Bell Rock Lighthouse Cumulative View B (wireline); and
- Figure 17B.4: View from Bell Rock Lighthouse Cumulative View C (wireline).

Tentsmuir Coastal Defences (Index no. 9712)

106 The entry for Tentsmuir Coastal Defences in the register of Scheduled Monuments (Historic Scotland, 2013a) states that:

> *'the monument is of national importance as one of the best preserved stretches of coastal defences dating from the period of WWII in Scotland, and as a complex of defences in which a widely representative range of defensive types is still to be seen.'*

107 The original setting of the defences is largely intact although many of the defences themselves have decayed, have been removed or are now covered by sand. A significant proportion of the identified remains of the coastal defences have open views of the sea across dunes and intertidal sands. Despite the relatively good preservation of this area relative to similar examples, there are large areas within the scheduled extent of the coast where no coastal defences are apparent. The key elements of the setting of the coastal defences here are the views to other parts of the defences, i.e. north and south along the coast and westwards towards the camp. It is also considered that the generally open nature of the seaward views of the coastal parts of the monument is relevant to its setting. This asset is considered to have a High Sensitivity to setting effects.

108 The WTGs and OSPs will be visible from east-facing coastal parts of the scheduled area at a distance of 32 km over a relatively small area on the horizon. Construction of the Wind Farm and OSPs will introduce an additional modern element to the views to the east. Given the distance it is considered that the impact on the setting of this asset will be of Low Magnitude leading to a Moderate impact.

St Andrews Cathedral and Adjacent Ecclesiastical Remains (Index no. 90260, HB no.s40585, 40586, 40587, 40588, 40589, 40592)

109 Key elements of the setting of St Andrews Cathedral are considered to be its position in relation to the adjacent town and views within the walled enclosure. Views from within the cathedral precinct are very limited at ground level due to the high walls although there is some visibility towards the town. Key views from the cathedral to locations outside the precincts include the view of St Andrews Castle and the nearby harbour. The views of both

these features are key in appreciating the historic context of the site. Key views towards the cathedral include the view from the harbour and seafront as well as the views of the cathedral from other parts of the town. This asset is considered to have a High Sensitivity to setting effects.

110 The Wind Farm and OSPs will be visible in views from outside the precinct walls to the east and from the tops of two surviving cathedral towers. It will appear on a small part of the horizon to the north east at a distance of 34 km. Given the distance it is considered that the impact on the setting of this asset will be of Low Magnitude leading to an impact of Moderate.

St Andrews Castle (Index no. 90259, HB no.40599)

111 Key elements of the setting of St Andrews Castle are considered to be its position in relation to the adjacent town. Key views from the castle to other locations include the view of St Andrews Cathedral. The view of the cathedral is central to the historic context of the castle. Key views towards the castle include the view from the landward side of the castle by its entrance. Views from the cathedral are considered under the entry for the castle. This asset is considered to have a High Sensitivity to setting effects.

112 The Wind Farm and OSPs will be visible in views from the walls of the castle to the east. It will appear on a small part of the horizon to the north east at a distance of 34 km. Given the distance it is considered that the impact on the setting of this asset will be of Low Magnitude leading to an impact of Moderate.

Crail Airfield, Pillbox, Foreland Head (Index no. 6461)

113 The entry for the pillbox at Foreland Head in the register of Scheduled Monuments (Historic Scotland 2013b) states that:

> *'the monument is of national importance for its group value as part of the defences of the Crail Airfield complex. As such it is part of a complex which is probably the finest of its class in Scotland, and serves to illustrate in concrete form the intense effort which went into defensive construction during the earlier years of WWII.'*

114 The principal elements of the setting are considered to be the coastal setting of the pillbox. This setting has been somewhat degraded by the construction of a modern lighthouse immediately adjacent to it in 1975. The pillbox is not a prominent feature and the views from inside it are very constrained but there are extensive and open views from the exterior. It is considered that the pillbox has a Low Sensitivity to setting effects.

115 The Wind Farm and OSPs will be visible as a modern element occupying a small area on the horizon to the north-east of the pillbox at a distance of over 27 km. It is considered that the effect on the setting of the pillbox will be of Low Magnitude leading to an impact of minor.

116 A summary of the effects on the setting of cultural heritage assets is provided below in Table 17.10.

Table 17.10: Summary of Effects on the Setting of Cultural Heritage Assets

Name	Sensitivity	Magnitude of Change	Effect	SLVIA Viewpoint
Bell Rock Lighthouse Signal Tower, Ladyloan	High	Negligible	Minor/Moderate	11 (Figure 16.45, Figure 16.45a, Figure 16.45b)
Bell Rock Lighthouse	High	Negligible	Minor/Moderate	Not included in SLVIA (see *Appendix* 17B; Figures 17B.1 – 17B.4)
Tentsmuir Coastal Defences	High	Low	Moderate	16 (Figure 16.50, Figure 16.50a, Figure 16.50 b)
St Andrews Cathedral and adjacent ecclesiastical remains	High	Low	Moderate	18 (Figure 16.52, Figure 16.52a, Figure 16.52b)
St Andrews Castle	High	Low	Moderate	18 (Figure 16.52, Figure 16.52a, Figure 16.52b)
Crail Airfield, pillbox, Foreland Head	Low	Low	Minor	23 (Figure 16.57, Figure 16.57a, Figure 16.57b)

117 In summary, following this assessment the effects upon the setting of cultural heritage receptors are judged to be not significant with regard to the methodology presented above.

17.7.4 Effects of Decommissioning

118 The potential effects of decommissioning are considered to be equivalent to and potentially lower than the worst case effects assessed for the construction phase. The approach to decommissioning is described in Section *7.12*. A decommissioning plan will be prepared in accordance with the requirements of the Energy Act 2004 (see *Section 3.2.5*) and will be subject to approval from Department of Energy and Climate Change prior to implementation

119 The effects of decommissioning on the setting of cultural heritage sites will be to remove all impacts arising from the Wind Farm and OSPs.

Setting Impacts

120 Setting impacts on cultural heritage features during decommissioning are considered to be not significant due to the temporary nature of these works.

17.8 Impact Assessment - Offshore Export Cable Corridor ASA

17.8.1 Approach

121 This section considers the source and nature of the effects on the cultural heritage resource and the degree to which archaeological receptors (listed in *Table 17.11*) are exposed to and affected by the Offshore Export Cable. The impact assessment is considered in relation to the construction, operation and decommissioning of the Offshore Export Cable Corridor ASA.

Table 17.11: Cultural Heritage Receptors - Offshore Export Cable Corridor ASA

Receptor (intertidal)	Receptor (marine)
Known intertidal receptors	A1 and A3 marine geophysical anomalies
Unknown intertidal receptors	All A2 marine geophysical anomalies
	Unknown maritime receptors
	Unknown aviation receptors

17.8.2 Effects of Construction

122 Potential direct effects within the Offshore Export Cable Corridor ASA comprise both direct damage to archaeological deposits and material and the disturbance or destruction of relationships between deposits and material and their wider surroundings.

123 Potential direct effects during construction comprise damage, disturbance or destruction of submerged prehistoric archaeology, shipwrecks and crashed aircraft from:

- Installation of Export Cables (burial through ploughing, trenching or rock cutting) in both the marine and intertidal zone;
- Seabed contact by anchors.

124 Indirect impacts relating to changes in scour and sedimentation are considered to be not significant with regard to the construction phase.

Magnitude of Effects

125 Direct effects on cultural heritage features (including currently unknown maritime and aviation features and A1 and A3 locations) in the Offshore Export Cable Corridor ASA due to construction impacts are considered to be of high magnitude even where those receptors lie outwith the Development Area (due to the potential for damage through anchoring of vessels and similar activities).

126 Effects on both known and potential cultural heritage receptors in the intertidal element of the Offshore Export Cable Corridor ASA are also considered to be of high magnitude due to the potential for partial or complete removal of heritage assets.

Sensitivity of Receptor

127 There are no assets within the Offshore Export Cable Corridor ASA that are currently subject to statutory protection, but the potential exists for such sites to be present in the form of wrecks of military aircraft that were lost on active service. Any such find would be automatically protected by the *PMRA 1986*. The importance of these potential receptors must be regarded as very high.

128 All archaeological receptors subject to direct physical impacts in the Offshore Export Cable Corridor ASA have the potential to be damaged or destroyed if they are directly impacted during the construction of the Offshore Export Cable. All physical impacts on archaeological features or material are permanent and recovery is limited to stabilisation or re-burial, limiting further impact. As such, the recoverability of any archaeological receptors should be regarded as negligible indicating that all sites and material should be regarded as vulnerable.

129 As stated in the methodology the 'BULSI' system (Wessex Archaeology, 2011a) can be consulted when assessing the special interest of wreck sites and could equally be applied to non-military aviation features. On the basis of the paucity of located wrecks in Scottish waters dating to before the middle of the 19th century (Wessex Archaeology 2011b), vessels from before this period are likely to be considered high value receptors due to their rarity and subsequent national or international importance. Wrecks dating from the later 19thcentury onwards are more plentiful in the known archaeological resource. However, despite their abundance, the special interest of wrecks from this period should not be discounted and there are a number of factors which might enhance the interest of these wrecks. The rarity of aviation sites suggest that these sites would be considered to be of high value.

130 Assessment of receptor sensitivity has been undertaken in line with the precautionary principle (see Methodology in *Section 17.4.5*). None of the A1 anomalies (including confirmed shipwreck locations) in the Offshore Export Cable Corridor ASA have been positively identified and they all have a potential to be of national or international significance. Therefore all have been assigned a high sensitivity. The current level of data available for A2 geophysical anomalies of possible anthropogenic origin and for currently unknown maritime and aviation features is also insufficient to assess sensitivity. As such the importance of these receptors must be regarded as High until further information becomes available. A3 records represent previously reported locations of shipwrecks which could not be confirmed through review of the geophysical data. These have also been assigned a High Sensitivity on the basis of the available details and the fact that remains may well be present but have subsequently become buried.

Significance of Impacts

131 Due to the absence of complete information such as confirmed identification and dating of wrecks, all charted wrecks and aircraft, uncharted wrecks and geophysical anomalies of potential anthropogenic origin in the Offshore Export Cable Corridor ASA are considered to be of High Sensitivity. It is therefore considered that direct effects of High Magnitude on

these receptors have the potential to result in impacts of Major Adverse Significance in the absence of mitigation. To a large extent this is a result of a worst case scenario assessment due to lack of sufficient information and is typical of cultural heritage impact assessment for offshore developments.

132 All indirect effects will result in impacts which are Minor. As changes in scour and sedimentation, which may cause increased erosion/protection, are predicted to be limited (as described in *Section 10.6.1*) the effects of the impacts are likely to be assessed as not significant with regard to the methodology presented above.

17.8.3 Effects of Operation and Maintenance

133 Predicted direct effects during the operation of the Wind Farm comprise damage, disturbance or destruction of submerged prehistoric archaeology, shipwrecks and crashed aircraft from:

- Anchors of vessels deployed during periodic overhauls and scheduled and unscheduled maintenance.

134 Predicted indirect effects can include setting impacts as well as changes to currents, sediment transport and erosion patterns. Predicted indirect effects comprise:

- Increased erosion to submerged prehistoric archaeology, shipwrecks and crashed aircraft uncovered as a result of changes in scour or sedimentation; and
- Increased protection afforded to submerged prehistoric archaeology, shipwrecks and crashed aircraft buried as a result of changes in scour or sedimentation.

135 The magnitude of physical effects and the sensitivity of receptors to them is the same as that outlined above for the construction phase (see *Section 17.8.2*).

136 Direct physical impacts to features of cultural heritage interest will result in effects of Major Adverse Significance in the absence of mitigation.

137 The magnitude of all indirect effects on archaeological sites and findspots during operation has been assessed. Modelling of the impact of construction upon hydrographic and sedimentary regimes (see *Section 10.6*) indicates little change with hydrographic and sedimentary regimes, suggesting that effects will be of Low Magnitude for all marine cultural heritage receptors even where those features are of High Sensitivity. It is considered that the indirect impacts on cultural heritage features from the operation of the Wind Farm will be not significant.

17.8.4 Effects of Decommissioning

138 The potential effects of decommissioning are considered to be equivalent to and potentially lower than the worst case effects assessed for the construction phase. The approach to decommissioning is described in *Section 7.12.* A decommissioning plan will be prepared in accordance with the requirements of the *Energy Act 2004* (see *Section 3.2.5*) and will be

subject to approval from Department of Energy and Climate Change prior to implementation.

139 The effects of decommissioning on the setting of cultural heritage sites will be to remove all impacts arising from the Wind Farm.

17.9 Impact Interactions

140 The potential for individual impacts identified through the impact assessment above to interact and create new, or more significant impacts on cultural heritage receptor has been assessed. No such interactions have been identified.

141 This chapter has identified linkages between different areas or disciplines covered in this ES. Potential impacts on SLVIA receptors both within the Development Area and the SLVIA Study Area have been fully assessed in *Chapter 16* and are also referenced where appropriate.

142 The cumulative effects of the Wind Farm and OfTW, in conjunction with other schemes are separately addressed within the cumulative section below (*Section 17.10*).

17.10 Cumulative Impact

17.10.1 Developments considered

143 Other marine activities considered as part of the cumulative impact assessment have been included on the basis that they have the potential to have a visual or physical impact on the setting of cultural heritage receptors. Types of activities considered include:

- Separate elements of the Project;
- Other wind farms;
- Operational marine aggregate extraction areas;
- Sub-sea cables; and
- Commercial fisheries within the Development Area ASA and Export Cable Corridor ASA.

144 This assessment has been carried out with respect to existing and consented wind farms, inclusions have been agreed as part of consultation detailed in *Section 16.3*. The developments considered for physical impacts on cultural heritage are those closest to the Development Area and Offshore Export Cable Corridor.

17.10.2 Effects of Construction

145 Direct physical impacts on cultural heritage receptors, due to similar effects from different elements of the Wind Farm (including the Development Area and the Offshore Export Cable Corridor) or in combination with those from other activities will in most cases be limited by the spatial extent of those receptors. Discrete archaeological sites (prehistoric, maritime or aviation), whether known or unknown, will be too small to be subject to impact interactions arising from combined effects of the Wind Farm and OfTW with other developments and

activities in the area. This is considered to be an effect of Negligible Magnitude on a receptor of High Sensitivity leading to an impact of Minor/Moderate.

146 It is conceivable that effects might arise from cumulative impacts influencing and acting upon receptors which cover large areas. No significant cultural heritage receptors of this nature have been identified. Indirect physical effects on cultural heritage may include alterations to the tidal regimes leading to long term effects on patterns of sediment transport within the Development Area. Modelling of the effect of construction upon hydrographic and sedimentary regimes undertaken for the Project (see *Chapter 10*) predicts that changes to scour and sedimentation are anticipated to lie within the boundaries of natural variation and will be highly localised. Therefore, no cumulative construction impacts for indirect physical processes with respect to cultural heritage have been identified.

17.10.3 Effects of Operation and Maintenance

147 No cumulative direct or indirect physical effects on cultural heritage receptors have been identified. Cumulative effects on cultural heritage receptors arising from the operation and maintenance of the Project are likely to relate to changes in the setting of onshore cultural heritage.

Setting Impacts

148 The developments considered for setting impacts on cultural heritage are the same as those identified for SLVIA and are listed by name in Table 17.12 below. The final agreed list of cumulative sites to be included in the assessment was circulated to consultees and stakeholders on 27 September 2012. These have been considered through analysis of the wirelines generated for them (Table 17.10).

Table 17.12: Agreed list of Cumulative Wind Farm Developments Included for Analysis

Cumulative site	Status	Number of WTGs	Blade tip height (m)	Approximate distance (km) and direction to the WTGs and OSPs
Clochnahill	Consented	4	81	39.7 km north
Hillhead of Auquhirie	Consented	3	93	39.9 km north
Jack's Bank	Consented	3	100	40.0 km north
Droop Hill	Consented	2	100	39.0 km north
St John's Hill	Consented	9	80	32.5 km north
Kinneff	Application	1	77	31.8 km north
Ferniebrae	Application	1	67	37.8 km north
Tullo Farm	Existing	7	100	30.0 km north

Cumulative site	Status	Number of WTGs	Blade tip height (m)	Approximate distance (km) and direction to the WTGs and OSPs
Tullo Farm Extension	Application	4	100	31.0 km north
Easter Tulloch	Consented	5	100	30.0 km north
North Tullo	Consented	3	100	31.0 km north
Brownieleys	Application	3	100	30.7 km north
Brigton Farm	Application	1	81	33.0 km north
Steelstrath Farm	Application	1	84	34.0 km north north-west
Whitefield of Dun	Consented	1	67	28.8 km north north-west
Hill of Stracathro	Application	1	79	30.0 km north north-west
Woodside	Refused	1	78	36.0 km north-west
Pickerton Farm	Application	1	77	30.0 km north-west
Govals	Application	6	87	42.0 km west
Frawney	Application	5	100	41.4 km west
Dodd Hill	Application	5	126	38.0 km west
Kenly	Application	6	100	32.7 km south-west
Lingo	Application	5	100	37.0 km south-west
Balmouth/Bonerbo/Drumrack Farms	Application	3	67	36.7 km south-west
Mains of Bridgeton	Application	1	77	25.0 km north
Nathro Hill	Application	17	135	42.9 km north-west
Glaxo Smith Kline	Refused	2	132	19.0 km north north-west
Balnacake	Application	3	68	32.5 km north-west
Finavon House	Application	3	100	37.7 km north-west
Corse Hill	Refused	7	126	22.0 km west
Tealing Airfield	Consented	1	86	42.0 km west
Michelin Tyre Factory	Existing	2	121	37.6 km west
Port of Dundee	Scoping	3	127	39.0 km west

Cumulative site	Status	Number of WTGs	Blade tip height (m)	Approximate distance (km) and direction to the WTGs and OSPs
Neart na Gaoithe	Application	80	197	10.8 km south
Round 3 Phase 1	Application	150	209.7	12.2 km north-east

149 A list of developments excluded from cumulative assessment is given in *Appendix 16B*, Table 16B.2.

150 Setting impacts on cultural heritage receptors arising from the Project in combination with other developments have been considered. For those receptors considered to have a potential for setting impacts, cumulative visualisations have been prepared (see Table 17.7). Cumulative wirelines have been produced for the Bell Rock Lighthouse and are included as *Appendix 17B*, Figures 17B.1 – 17B.4. Visualisations for all other cultural heritage sites considered for operational setting impacts above have been included in *Chapter 16*. The visualisations demonstrate, in all cases where other developments are considered to have a potential to combine setting impacts with the Wind Farm and OSPs, these developments will appear either behind the WTGs and OSPs and will be obscured by it or will appear on the horizon adjacent to it. It is considered that in all cases the increased presence of the Project together with adjacent wind farms will lead to an effect of Low Magnitude on receptors of High Sensitivity leading to impacts which are Moderate. Cumulative effects on Crail airfield pillbox are considered to be of Low Magnitude on a receptor of Low Sensitivity and the resulting impact is considered to be Minor. In all cases the resulting impacts are considered to be not significant with regard to the methodology presented above.

17.10.4 Effects of Decommissioning

151 No cumulative impacts have been identified with regard to decommissioning.

17.11 Mitigation

152 The cultural heritage and archaeology assessment has assessed worst case scenario impacts of the Project in isolation and cumulatively. This assessment has concluded that impacts on receptors within the Study Area from some Project related activities will be of major significance.

153 Based on the outputs from this impact assessment, it has been concluded that the Embedded Mitigation detailed in Section 17.5 should be supplemented with Addition Mitigation as follows:

- A Project specific Written Scheme of Investigation (WSI) will be prepared, in consultation with Historic Scotland, once the final layout of the Wind Farm and OfTW infrastructure is established. This document will be incorporated into the final Environmental

Management Plan (EMP). The WSI will set out the design and implementation of a programme of detailed mitigation works. This will comply with guidance current at the time of its development (presently Wessex Archaeology, 2007).

- Mitigation strategies for known shipwreck sites will include maintenance of appropriate buffer zones between Project infrastructure including WTGs, OSPs, met masts, inter-array and Export Cables and known shipwrecks.
- Analysis of pre-construction survey data will be undertaken to refine the identified potential marine archaeology assets at infrastructure locations. Appropriate micro-siting allowance for identified assets will be agreed in consultation with Historic Scotland.
- Both the micro-siting allowance and exclusion zones will be detailed in the WSI described above. This will reduce any potential impacts on marine archaeology.
- The Written Scheme of Investigation (WSI) will include a Protocol for Archaeological Discoveries (PAD) which will be prepared in consultation Historic Scotland. This will mitigate the risk of damage to any previously unrecorded archaeological remains.
- Mitigation relating to effects of the Wind Farm and OfTW on the setting of cultural heritage receptors will be as per SVLA mitigation described above.

154 Residual impacts relating following the implementation of the Additional Mitigation are detailed in *Section 17.12* below.

17.12 Conclusions and Residual Impacts

155 The assessment has considered the effects of the Wind Farm and OfTW on cultural heritage receptors.

156 There are four confirmed wreck sites within the Development Area ASA and one area of debris which may represent a wreck (Figure 17.2, Figure 17.4, Figure 17.5, Figure 17.6). Two of these are in the Development Area ASA and are a considerable distance from the Development Area. There are two confirmed wreck sites within the Offshore Export Cable Corridor ASA. In addition four previously recorded wrecks/obstructions have been identified within the Development Area ASA and two in the Offshore Export Cable Corridor ASA. Some of these are in the Development Area ASA and are a considerable distance from the Development Area. Where survey data covered these features no geophysical anomalies were noted but they have been retained as locations due to the possibility that previously exposed features may have been covered up by shifting sediments. A further 135 anomalies have been identified in the Development Area ASA and 378 in the Offshore Export Cable Corridor ASA as being of uncertain origin of possible archaeological interest and have been classified as A2.

157 No mitigation has been proposed for indirect physical impacts. Mitigation has been proposed for all direct physical impacts. This includes Archaeological Exclusion Zones around known marine and intertidal cultural heritage features and programmes of mitigation works where physical impacts are unavoidable. It is proposed that details of these mitigation programmes be detailed in a scheme specific WSI. It has also been proposed that Reporting

Protocols for archaeological remains be implemented through the construction, operation and decommissioning of the Wind Farm and OfTW. In all cases the Post-mitigation effects on receptors subject to direct physical impacts are considered to be Minor.

158 It is expected that the implementation of these approaches to mitigation based on the assessment outlined above, will mean that the residual effects of the development on any cultural heritage receptors will be Minor (see Table 17.13 for summary of effects and mitigation).

Table 17.13: Summary of Effects and Mitigation

Effect	Receptor	Pre-Mitigation Impact	Mitigation	Post-Mitigation Impact
Construction				
Damage to or removal of heritage features resulting from direct physical impacts.	Known maritime features (A1), unconfirmed locations of shipwrecks (A3) and known intertidal heritage assets.	Major Adverse Significance	Implementation of Written Scheme of Investigation	Minor
Damage to or removal of features.	Unknown maritime, aviation and intertidal heritage features.	Major Adverse Significance	Reporting Protocols, programme of mitigation works.	Minor
Operation and Maintenance				
Damage to or removal of features.	Known maritime features (A1) and unconfirmed locations of shipwrecks (A3).	Major Adverse Significance	Implementation of Written Scheme of Investigation	Minor
Damage to or removal of features.	Unknown maritime and aviation features.	Major Adverse Significance	Reporting Protocols, programme of mitigation works	Minor

Effect	Receptor	Pre-Mitigation Impact	Mitigation	Post-Mitigation Impact
Setting changes.	Bell Rock Lighthouse Signal Tower, Bell Rock Lighthouse, Tentsmuir Coastal Defences, St Andrews Cathedral and adjacent ecclesiastical remains, St Andrews Castle and Crail Airfield pillbox.	Low to Moderate Significance	None	Minor to Moderate
Decommissioning				
Damage to or removal of features.	Known maritime features (A1) and unconfirmed locations of shipwrecks (A3).	Major Adverse Significance	Implementation of Written Scheme of Investigation	Minor
Damage to or removal of features.	Unknown maritime and aviation features.	Major Adverse Significance	Reporting Protocols	Minor

17.12.1 Setting Impacts

159 Setting impacts have been considered for a number of designated coastal heritage assets established through consultation with HS and Fife and Angus Councils. A total of six receptors were assessed through the use of site visits, wirelines and visualisations. Impacts on setting have been established in the case of Bell Rock Lighthouse, Bell Rock Lighthouse Signal Tower and Crail Airfield pillbox; in each case these are considered to be Minor. Impacts on setting have been assessed for Tentsmuir Coastal Defences, St Andrews Cathedral and adjacent ecclesiastical remains, and St Andrews Castle and in each case considered to be Moderate. In all of these cases the impacts to the setting of these receptors is considered to be not significant with regard to the methodology presented above. Although intervisibility with the Wind Farm and OfTW is possible in each case, no significant impacts have been identified on their settings. No mitigation has been proposed for indirect setting impacts. The effects of decommissioning on the setting of cultural heritage sites will be to remove all impacts arising from the Wind Farm and OfTW.

17.13 Cumulative Impacts

17.13.1 The Project

160 Cumulative construction impacts for direct and indirect physical processes with respect to cultural heritage in all phases are considered to be not significant.

17.13.2 The Project with Other Projects

161 An assessment has been made of the potential for impacts of the Project on cultural heritage assets in combination with other projects. An impact of Low has been identified in the case of cumulative setting impacts on cultural heritage receptors (Table 17.14 below); no mitigation has been proposed.

Table 17.14: Summary of Significance of Cumulative Impacts on Cultural Heritage Assets

Impacts	Sensitivity	Magnitude of Change	Effect
Direct physical impacts (Construction, Operation and Decommissioning).	High	Low	Minor/Moderate
Operational setting impacts.	High/Low	Low	Moderate

162 The assessment of cumulative impacts summarised in Table 17.14 highlights that the identified significance of effect for impacts on cultural heritage assets is considered not to be significant with regard to the methodology outlined in *Section 17.4*.

References

East Lothian Council (2012). *East Lothian* Historic Environment Record http://www.johngraycentre.org/collections/her/ [Accessed 3 May 2012].

EMU Ltd. (2011).*Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector*. Commissioned by COWRIE Ltd (Project ref: GEOARCH-09). Available at: http://www.thecrownestate.co.uk/media/354783/2011-01%20Offshore%20Geotechnical%20Investigations%20and%20Historic%20Environment%20Analysis%20-%20Guidance%20for%20the%20Renewable%20Energy%20Sector.pdf [Accessed 27 March 2013].

European Community (1992). *European Convention on the Protection of the Archaeological Heritage (Revised)*. Available at: http://conventions.coe.int/Treaty/en/Treaties/Html/143.htm

Great Britain Parliament (1973). *Protection of Wrecks Act 1973*. Available at: http://www.legislation.gov.uk/ukpga/1973/33

Great Britain Parliament (1979). *Ancient Monuments and Archaeological Areas Act 1979*. Available at: http://www.legislation.gov.uk/ukpga/1979/46/contents

Great Britain Parliament (1986). *Protection of Military Remains Act 1986*. Available at: http://www.legislation.gov.uk/ukpga/1986/35/contents

Great Britain Parliament (1995). *The Merchant Shipping Act 1995*. Available at: http://www.legislation.gov.uk/ ukpga/1995/21/contents

Gribble, J. and Leather, S. for EMU Ltd. (2011). *Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector*. Commissioned by COWRIE Ltd (project reference GEOARCH-09).

Her Majesty's Government (2011). *UK Marine Policy Statement*. Available at: http://www.defra.gov.uk/publications/files/pb3654-marine-policy-statement-110316.pdf

Historic Scotland (2001). *Scottish Historic Environment Policy 2011*. Available at: http://www.historic-scotland.gov.uk/shep-dec2011.pdf

Historic Scotland (2010). *Managing Change in the Historic Environment: Setting* [online]. Available at: http://www.historic-scotland.gov.uk/setting-2.pdf

Historic Scotland [online]. Accessed 3 May 2012. Available at: http://www.historic-scotland.gov.uk

Historic Scotland (2013a). *Scheduled Monuments: Tentsmuir Coastal defences*. Available at: http://data.historic-scotland.gov.uk/pls/htmldb/f?p=2300:35:660959500264711::NO::P35_SELECTED_MONUMENT:9712

Historic Scotland (2013a). *Scheduled Monuments: Crail Airfield Pillbox, Foreland Head. Available at:* http://data.historic-scotland.gov.uk/pls/htmldb/f?p=2300:35:1034097294891920::NO::P35_SELECTED_MONUMENT:6461

Institute for Archaeologists (1994, revised 2011). *Standard and Guidance for Archaeological Desk-based Assessment*. Institute for Archaeologists.

International Council on Monuments and Sites (1996). *Charter on the Protection and Management of Underwater Cultural Heritage (1996)*. Ratified by the 11th ICOMOS General Assembly in Sofia, Bulgaria, October 1996. Available at: http://www.icomos.org/charters/underwater_e.pdf

James, H. F. (1996). *Coastal Assessment Survey: The Firth of Forth from Dunbar to the Border of Fife*. Available at: http://www.scapetrust.org/pdf/Forth1/forth1.pdf and http://www.scapetrust.org/pdf/Forth2/forth2.pdf

Joint Nautical Archaeology Policy Committee (1995). *Code of Practice for Seabed Developers*. Available at: http://www.jnapc.org.uk/Code%20of%20Practice%20No.2.pdf

Larn, B. and Larn, R. (1998). *Shipwreck index of the British Isles Vol 4: Scotland*. Lloyd's register of shipping, London.

Oxford Archaeology (2008). *Guidance for Assessment of Cumulative Impact on the Historic Environment from Offshore Renewable Energy*. Commissioned by COWRIE Ltd (Project reference CIARCH-11-2008).

Scottish Government (2011a). *Scotland's National Marine Plan: Pre-Consultation Draft*. Available at: http://www.scotland.gov.uk/Resource/Doc/346796/0115349.pdf

Scottish Government (2011b). *Planning Advice Note (PAN) 2/2011: Planning and Archaeology*. Available at: http://www.scotland.gov.uk/Resource/Doc/355385/0120020.pdf

Scottish Parliament (1997). *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*. Available at: http://www.legislation.gov.uk/ukpga/1997/9/contents

Scottish Parliament (2010). *Marine (Scotland) Act 2010*. Available at: http://www.legislation.gov.uk/asp/2010/5/contents

Scottish Parliament (2011). *The Historic Environment (Amendment) (Scotland) Act 2011 (Commencement No. 2) Order 2011*. Available at: http://www.legislation.gov.uk/ssi/2011/372/contents/made

The Crown Estate, Joint Nautical Archaeology Policy Committee (2008). JNAPC Code of Practice for Seabed Development. Available at: http://www.jnapc.org.uk/jnapc_brochure_may_2006.pdf

The Crown Estate (2010a). *Protocol for Archaeological Discoveries: Offshore Renewables Projects*. Available at: http://www.thecrownestate.co.uk/media/122838/pad_offshore_renewables.pdf

The Crown Estate (2010b). *Model Clauses for Archaeological Schemes of Investigation – Offshore Renewables Projects*. Available at: http://www.thecrownestate.co.uk/media/206123/wsi_renewables.pdf

United Nations Educational, Scientific and Cultural Organization (2001). *Convention on the Protection of the Underwater Cultural Heritage*. Available at: http://unesdoc.unesco.org/images/0012/001260/126065e.pdf

Wessex Archaeology (2007). *Historic Environment Guidance for the Offshore Renewable Energy Sector*. Commissioned by COWRIE Ltd. (Project reference ARCH 11-05). [Online] Available at:

Wessex Archaeology(2011a).*Assessing Boats and Ships 1860 - 1950: Methodology Report*. Unpublished report 70861.04 [Online]. Available at: http://archaeologydataservice.ac.uk/archives/view/ boatsandships_eh_2011/ [Accessed 10 January 2012].

Wessex Archaeology (2011b). *Characterising Scotland's Marine Archaeological Resource*. Unpublished report 76930.04. [Online]. Available at: http://www.wessexarch.co.uk/reports/76930/characterising-scotlands-marine-resource [Accessed 10January 2012].

Whittaker, I. G. (1998). *Off Scotland: a Comprehensive Record of Maritime and Aviation Losses in Scottish waters.* C-ANNE Publishing, Edinburgh.