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# Seagreen Alpha and Bravo Offshore Wind Farms Alternative Landfall Cable Installation Marine Licence Application – Consenting Approach



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## 1. Introduction

Seagreen Wind Energy Ltd (Seagreen) is developing the Seagreen Alpha and Seagreen Bravo offshore wind farms off the east coast of Scotland in the outer Firth of Forth and Firth of Tay area (Figure 1.1). The projects received consent under Section 36 of the Electricity Act 1989 from the Scottish Ministers in 2014 (the S.36 Consents) (subsequently varied to remove capacity limits, August 2018) and were granted three Marine Licences from the Scottish Ministers in 2014, one for Seagreen Alpha, one for Seagreen Bravo, and one for the Offshore Transmission Works (OfTW). The Onshore Transmission Asset (the onshore export cable from landfall at Carnoustie to a new substation at Tealing) was subject to a separate planning application under the Town and Country Planning (Scotland) Act 1997 and was granted Planning Permission in principle by Angus Council in January 2013. This was extended by Angus Council in December 2016, following re-application by Seagreen.

Seagreen Alpha and Seagreen Bravo will together comprise up to 150 wind turbine generators (WTGs) with associated foundations, inter-array cables, offshore substation platforms (OSPs) and meteorological masts. The OfTW cable corridor makes landfall at Carnoustie, in Angus (Figure 1.2).

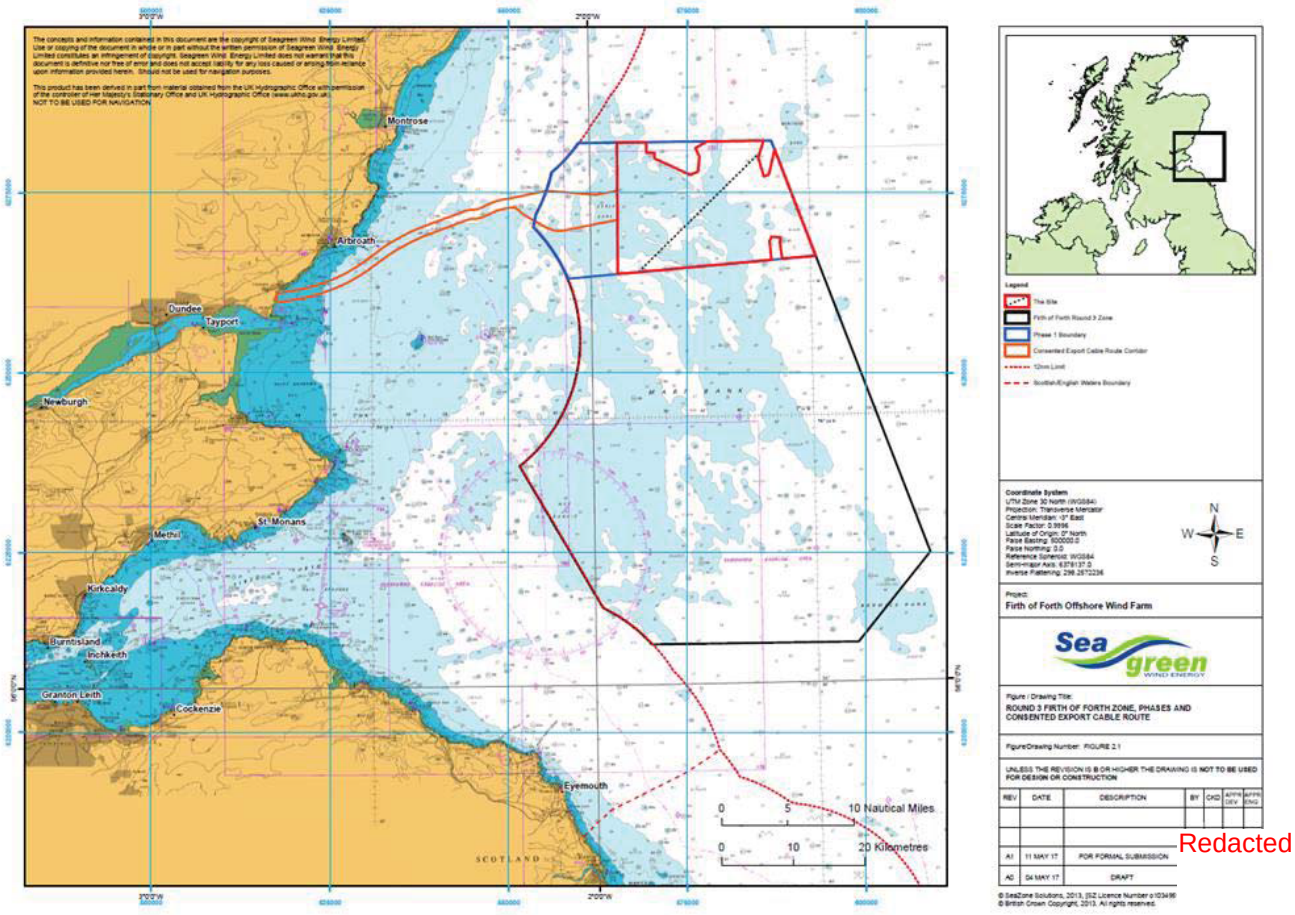


*Figure 1.1: Firth of Forth Zone, Seagreen Alpha and Seagreen Bravo Offshore Wind Farms and the Export Cable Route Corridor.*

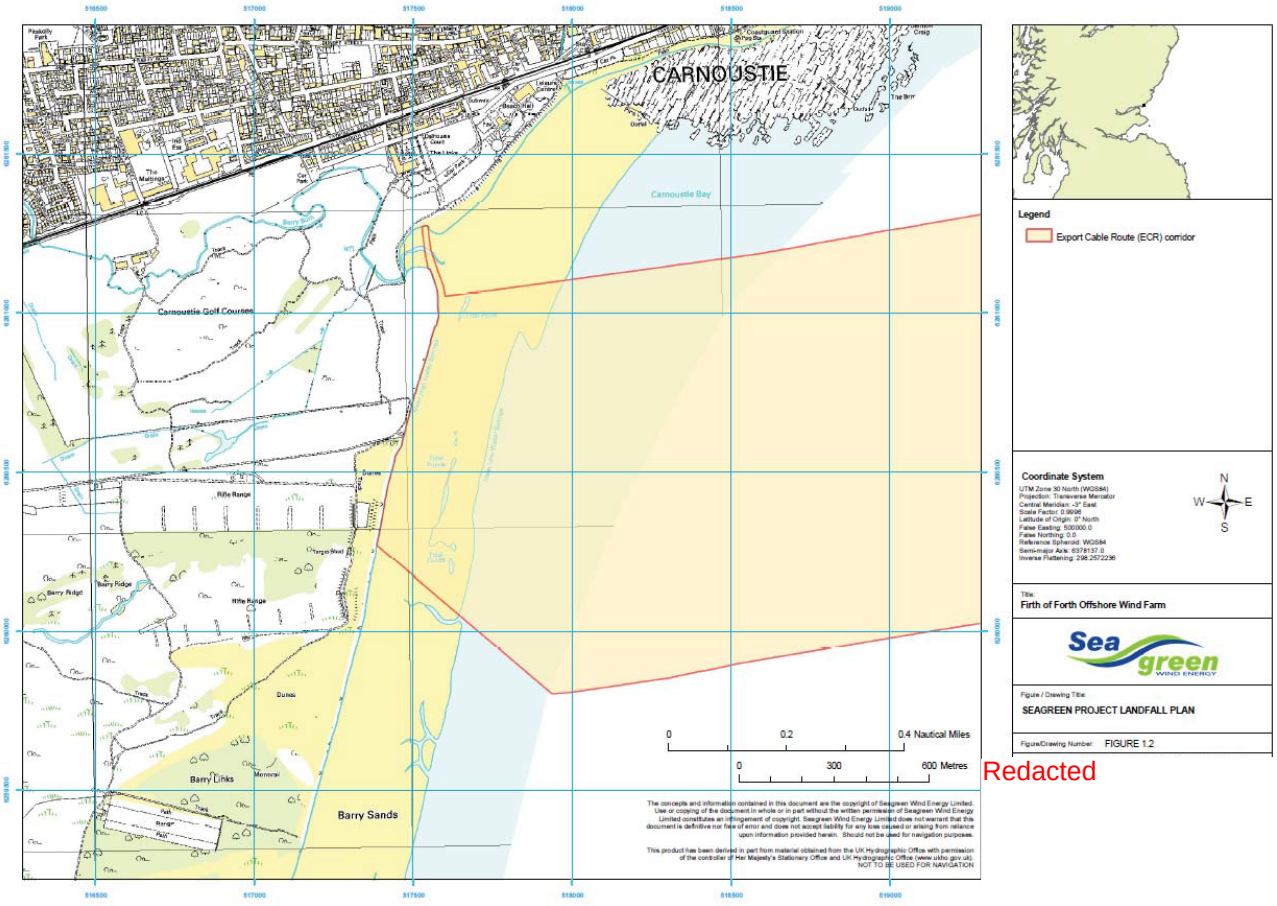


*Figure 1.2: Seagreen Export Cable Route Corridor Landfall*

The landfall at Carnoustie consists of a sandy beach backed by a rock revetment. The rock revetment was installed as a coastal defence measure along the coast from Carnoustie, to just north of Buddon Ness to the south. The rock revetment is approximately 3.5 km in length and 30 m wide. The distance between the charted Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS) is approximately 250 m (Figure 1.3 and see also further discussion in Section 2.2).

The existing OfTW Marine Licence (Licence Number 04678/14/0) as updated in 2019 (Licence Number 04678/19/0) (in Part 2, Section 2.2) permits the installation of up to six export cables between the Seagreen Alpha and Seagreen Bravo OWFs and the landfall. The OfTW Marine Licence states the following in relation to the landfall:

> '*Export cable installation at intertidal area will be by Horizontal Directional Drilling ("HDD") under the coastal defence from above MHWS and continued by ploughing or mechanical trenching across the intertidal area to meet the offshore works.*'

Seagreen is applying for consent for an alternative landfall cable installation methodology, in addition to the already consented HDD installation methodology, although only one installation methodology will be implemented. This alternative method is for ploughing or mechanical trenching (also termed 'open cut' trenching), between the original proposed landward entrance points of the

HDD (approximately 100 m above MHWS), through the rock revetment, down to a depth of 2.5 m (LAT) (approximately 190 m below charted MLWS). It should be noted that the key changes between the alternative methodology and the consented methodology is that the works will undertake trenching through the revetment as opposed to HDD under the revetment and that an additional option is being proposed to excavate a single trench, to accommodate up to three cables (as opposed to installation of up to six cables as consented). The application aims to address potential impacts related to these changes while also considering the potential impacts of activities associated with construction of the landfall. This approach is being taken in order to ensure that a holistic and robust assessment of potential effects is undertaken.

Under the Marine (Scotland) Act 2010, a Marine Licence is required if a person or organisation intends to carry out marine construction works within the Scottish marine area seaward of MHWS and therefore a Marine Licence is required for the alternative cable installation methodology up to the point of MHWS. Separate approval from Angus Council is also required and this being sought under a new onshore planning application.

The Marine Licence application boundary for the alternative landfall cable installation methodology is shown in Figure 1.3, and includes the rock revetment and the intertidal and subtidal zones. The works landward of the rock revetment are subject to separate onshore planning approval from Angus Council and do not form part of this Marine Licence application.

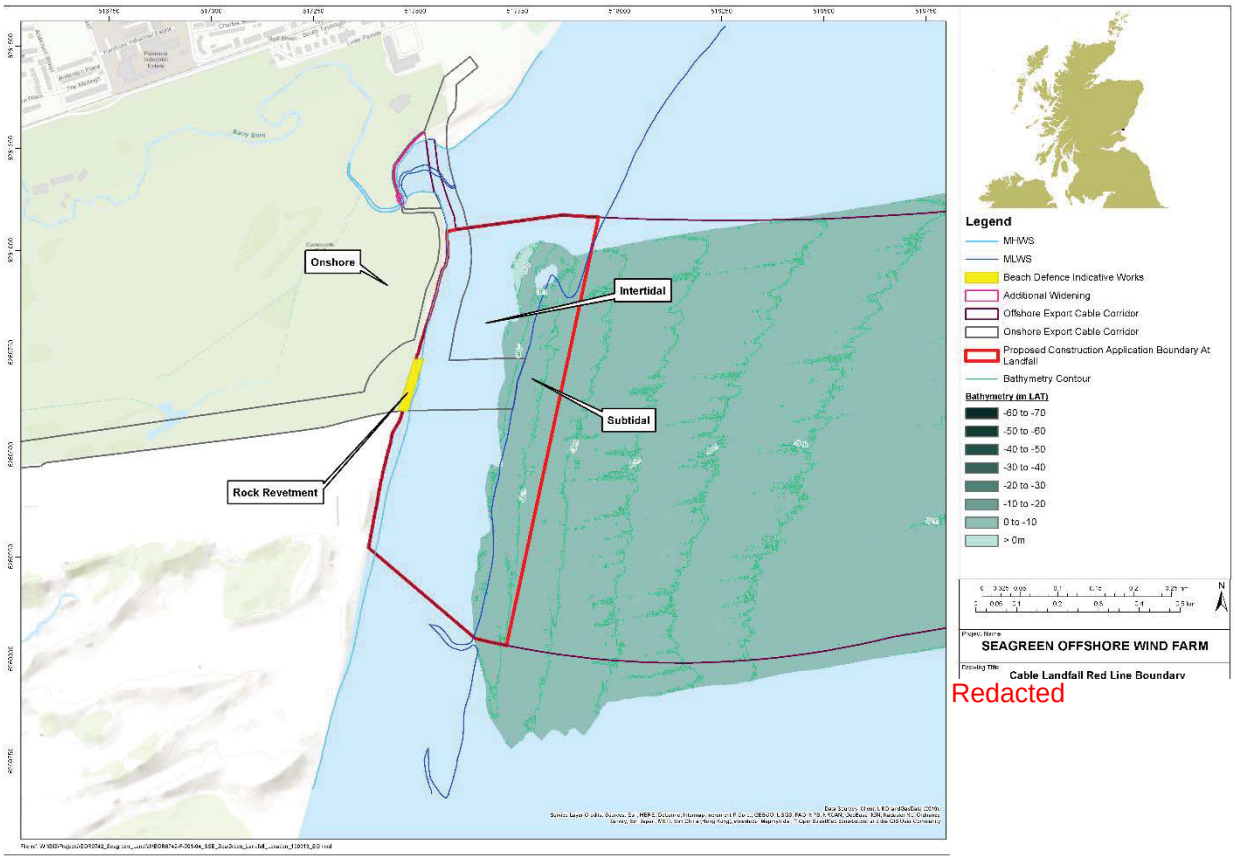


*Figure 1.3: Cable Landfall Red Line Boundary and Local Bathymetry.*

Marine Scotland Licensing Operations Team (MS-LOT) was notified of the intention to submit a Marine Licence application for the alternative methodology at the end of 2018 and regular bi-weekly calls are held with MS-LOT regarding the Seagreen project. Further consultation on this application is planned as it progresses. Given the location of the works, in close proximity to the Barry Links Special Area of Conservation (SAC)/Site of Special Scientific Interest (SSSI), the Firth of Tay and Eden Estuary SAC and Special Protection Area (SPA) and the Outer Firth of Forth and St Andrews Bay Complex proposed SPA (pSPA) (see Figure 4.1), consultation will also take place with Scottish Natural Heritage (SNH). In addition, Angus Council was notified of the intention to remove and replace a small section of the rock revetment at a meeting in October 2018. Consultation with SEPA is also being undertaken with respect to necessary breaching and reinstatement of the rock revetment.

This Consenting Approach document has been developed to describe Seagreen's intended approach for preparing a Marine Licence application, for the alternative cable installation method at the landfall and to inform the scope of an Environmental Report to support the application. The purpose of the document is twofold:

1. To set out and explain the consenting approach, with reference to the requirements of The Marine (Scotland) Act 2010, The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and the Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013; and

2. To set out the proposed scope of the supporting Environmental Report to be submitted to MS-LOT and their advisors.

This document has been prepared in support of the proposed Marine Licence application only. Onshore planning approval is also being progressed and discussed separately with Angus Council. However, for completeness, and to allow for consideration of cumulative effects, this document describes the full extent of the alternative methodology.

The structure of this document is as follows:

1. **Section 2, Project Description:** this section outlines the need for the alternative methodology, provides a description of the methodology and the licensable activities that will be the subject of the application, and sets out a summary of the management measures;
2. **Section 3, Approach to Consent:** this section sets out the overarching approach and programme for the consenting process, including consideration of the need for Environmental Impact Assessment (EIA) and Pre Application Consultation (PAC); and
3. **Section 4, Scope of Environmental Report:** this section provides details of the scope of the Environmental Report that will accompany the Marine Licence application, including the data sources to be utilised, the receptors to be considered, and the potential impacts to be assessed, including cumulative effects.

Seagreen is seeking confirmation from MS-LOT on the Approach to Consent and the Scope of the Environmental Report, as set out in this document.

# 2. Project Description

## 2.1 Background

The following sections provide an overview of the consented Seagreen Alpha and Seagreen Bravo projects, an outline of the consented cable landfall installation methods, and a comparison of the consented methods with the proposed alternative cable landfall installation method that is the subject of this document.

### 2.1.1 Seagreen Alpha and Seagreen Bravo Overview

The Seagreen Alpha and Seagreen Bravo offshore wind farms will together comprise up to 150 WTGs with associated foundations, inter-array cables, OSPs and meteorological masts. The OfTW export cable route corridor extends from the offshore wind farm project areas to the landfall at Carnoustie, approximately 27 km and 38 km from the Seagreen Alpha and Seagreen Bravo project areas respectively. The original application provided for up to six export cables to be installed within the offshore export cable route corridor between the Seagreen Alpha and Seagreen Bravo project areas and the landfall (Seagreen, 2012, Chapter 5: Project Description).

### 2.1.2 Existing Offshore Consent relevant to the Landfall

The original application specified that HDD would be used to install ducts from the transition pit location (located above MHWS) under the rock revetment. In the intertidal area or the shallow subtidal water, the application noted that a backhoe excavator may be used to dig a trench at each duct entrance, with the cables installed in the trenches up to the entrance to the ducts, and then drawn through the ducts to the transition pit by winches. The cables would be pulled to shore through the ducts from an offshore vessel (Seagreen, 2012, Chapter 5: Project Description). The application noted that beach access may be required for the works to be undertaken particularly for trench excavation (Seagreen, 2012, Chapter 5: Project Description).

As noted in Section 1, the OfTW Marine Licence specifies that export cable installation within the intertidal area will be by HDD under the rock revetment from above MHWS and continued by ploughing or mechanical trenching across the intertidal area to meet the offshore works.

### 2.1.3 Existing Onshore Consent relevant to the Landfall

The Planning Permission in Principle received from Angus Council in January 2017 allows for the direct burial of up to six cables (in ducts) from MLWS using jetting, ploughing or trenching, up to the point where it connects with the HDD that will be used to cross the rock revetment and to connect with the transition joint bays located above MHWS. The consented landfall installation method between the transition joint bays and MLWS therefore comprised a combination of HDD (from the transition joint bays through the rock revetment) and jetting/trenching/ploughing through the intertidal to the point where it connects with the offshore cable.

### 2.1.4 Proposed Alternative Cable Landfall Methodology

As noted in Section 2.1.2, the existing OfTW Marine Licence specifies that export cable installation at the landfall will be by HDD under the rock revetment and by ploughing or trenching across the intertidal and nearshore subtidal zones to meet the offshore works. Seagreen wishes to consent an

alternative cable installation method that will permit open cut trenching through the rock revetment and will continue through the intertidal and nearshore subtidal zones (either as a single trench accommodating all three cables or a total of three trenches accommodating one cable per trench) to meet the offshore works.

The alternative methodology represents a change to the consented methodology and to the number of cables that are to be installed. This alternative method is for open cut trenching between the original proposed landward entrance points of the HDD (approximately 100 m above MHWS, through the rock revetment, the intertidal and nearshore subtidal zones, down to a depth of 2.5 m LAT (which is reached at approximately 190 m below MLWS, see Figure 1.3). The proposal is to excavate up to three trenches (instead of six) in which up to three high-density polyethylene (HDPE) pipes (800 mm Outside Diameters) will be installed (see Figure 2.1), from the original HDD landward entrance points down to the subtidal area.

The HDPE pipes will be installed in the trenches, which will be backfilled, and left in situ until the cable pull-in at a later date. It is anticipated that the three cables will be pulled through the three HDPE pipes in a similar manner to that proposed in the original application, however for completeness cable pull-in is also included in the scope of this document. A spare HDPE pipe will be installed within the rock revetment (i.e. four in total under the rock revetment) to avoid any future disturbance to the rock revetment in the event of cable failure. All other areas (including landward of the rock revetment, intertidal and subtidal zones) will have three HDPE pipes installed.

*Figure 2.1: Trench Installation of Landfall HDPE Pipes into which Cables will be Pulled.*

The key differences between the alternative methodology and the consented methodology are the reduction in the number of cables from six to three, the change from HDD to trenching through the rock revetment and the inclusion of an option to install all three cables within a single trench across the intertidal and subtidal zones to a depth of 2.5 m LAT. For completeness the application will also cover excavation of three individual trenches (one for each cable) across the intertidal and subtidal zones to a depth of 2.5 m LAT. Onshore consent approvals are being progressed separately.

## 2.2 Site Visit Observations

The distance between the charted MHWS and MLWS at the cable landfall location (based on OSOpen data) is approximately 250 m (Figure 1.3). However, during a recent site visit to the landfall location shortly after low tide, the intertidal area was observed to much narrower. This can be seen in Figure 2.2 and was estimated to be between 10 m and 20 m from the toe of the rock revetment, 29 minutes after low tide[1].

*Figure 2.2: Photo of Low Water at Landfall Location 9.13am 20th February 2019, 29 minutes after Low Water (8:44am) at 0.78 m above CD.*

This affects the assessment of the alternative methodology in terms of understanding the length of the intertidal zone and in determining a potential worst case scenario for assessment. For the purposes of this document, the charted data is used with commentary provided where the observed situation has the potential to influence the assessment undertaken. This approach has been utilised in Section 3, Section 4 and Appendix 1.

## 2.3 Alternative Cable Installation Methodology

The following sections consider the full extent of the cable installation methodology, with the worst case scenario presented in Table 2.1 and details of the vessels and plant that may be utilised set

[1] Tide data taken from https://www.tidetimes.org.uk/river-tay-bar-tide-times-20190220

out in Table 2.2. Section 2.4 then considers which of these activities are licensable under the Marine (Scotland) Act 2010 and hence subject to a Marine Licence application.

The alternative methodology is for open cut trenching between the original proposed landward entrance points of the HDD (approximately 100 m above MHWS), through the rock revetment, down to a depth of 2.5 m (LAT) (approximately 190 m below MLWS).

The open cut trenching will cover four distinct zones (see Figure 1.3), namely onshore (landward of the rock revetment, covered by terrestrial planning consents); the rock revetment (MHWS is approximately half way up the face of the rock revetment, covered by both terrestrial planning consents and the proposed Marine Licence application); intertidal zone (covered by both terrestrial planning consents and the proposed Marine Licence application) and the subtidal zone (also covered by the proposed Marine Licence application). The entire length from the rock revetment to 2.5m LAT is 360m. From that point, the trenching will continue offshore under the existing OfTW Marine Licence.

### 2.3.1 Rock revetment

The proposal is to excavate a single open trench through the rock revetment, in which up to four HDPE pipes will be installed (see Figure 2.1 for an example of a HDPE pipe). It should be noted that the fourth pipe will be installed to provide a spare should a further cable need to be pulled through at a later date (e.g. in the event of a cable failure), to avoid further removal of, or disturbance to, the rock revetment. All other areas will only have three HDPE pipes installed (e.g. onshore, intertidal and subtidal).

Open cut trenching will require temporary removal of a section of the rock revetment, so that the HDPE pipes can be installed underneath. The trench will be up to 70 m in width at the top (30 m at base; a trapezoid trench to provide stability), 32 m in length and 10 m deep with a 1 in 3 gradient and is likely to be excavated using a rock grapple (see Table 2.2). A width of 70 m is required based on installation of the four HDPE pipes at suitable separation distance to avoid electrical interference while also reducing environmental impact where possible; and a length of 32 m is based on the length of the revetment from onshore to the toe of the rock revetment in the intertidal zone. Temporary sheet piling may be required to maintain safe working conditions until the trench work is completed. A further 2 m below the base of the rock revetment will be excavated into which the pipes will be placed within the trench at 5 to 10 m spacing. The pipes will have 1 m cover below the rock revetment base. Following placement of the pipes, concrete will be poured over the pipes for stabilisation underneath the rock revetment.

The rock revetment will then be reinstated using the material originally removed from the rock revetment. Initial inspection has determined that some of the rock may need to be replaced due to deterioration of the rock material since the rock revetment was installed. Therefore, up to a maximum of 6,000 $m^3$ of additional rock may be required in order to reinstate the rock revetment. Rock may be delivered to the landward side of the rock revetment for use in reinstatement activities. However, due to the narrow intertidal area identified during site visits it may be that rock is delivered by sea using a barge. Rock material would then be moved onto the rock revetment using a crane mounted on the barge. Rock materials removed from the rock revetment will, where practicable, be reused during reinstatement.

Material excavated from the rock revetment that is suitable for re-use will be stockpiled onshore until the rock revetment is reinstalled. Alternatively, the material may be crushed for re-use on site. Where the material is not suitable for re-use it will be transported to a licenced onshore disposal site. Storage, crushing activity and any transport to a licenced disposal site will be covered by the onshore planning approval process being progressed with Angus Council. Removal and reinstatement of the rock revetment will be covered by both the Marine Licence application and the onshore planning approval process.

The temporary removal and reinstatement of a section of the rock revetment is anticipated to be undertaken in the following order:

- Remove rock armour;
- Remove Geofabric rock under layer;
- Excavate cable pipe trench;
- Install sheet piling;
- Install HDPE pipes;
- Install concrete cap over HDPE pipes at rock revetment toe;
- Remove sheet piles;
- Replace Geofabric rock under layer; and
- Replace and reinstate rock armour.

The removal of the rock revetment will be designed to prevent breach by seawater. Additional mitigation may include measures such as monitoring the storm surge forecast and weather forecast prior to and during construction activity to prevent surges from breaching the rock revetment during construction operations. Once reinstated the rock revetment will be returned to its original profile.

It should be noted that access to the intertidal and rock revetment areas for vehicles and materials is limited by tidal conditions, therefore all equipment and materials may be transported by sea. However, transport by road, across the rock revetment and the intertidal zone is also being considered for the transport of materials and to undertake the works.

### 2.3.2 Landward of the rock revetment (Onshore)

Landward of the rock revetment, the proposal is to install three HDPE pipes, one pipe in each of three trenches. The trenches will be excavated to provide a minimum of 2 m cover to the pipes using an excavator. The HDPE pipes will be surrounded with predefined quality sand wrapped in geotextile. Working areas of up to 30m width will be established running parallel to each side of the cable pipe trench, from the onshore pipe ends to the rock revetment, including vehicle access and any storage.

To aid successful reinstatement of the as found soil layers, each layer of material will be removed and stored in a designated area, marked and kept separate from mixing with other layers. Tarpaulin or similar cover will be laid down prior to storing material. The trench will be backfilled with each layer in reverse order to which it was removed, to maintain any original soil type layering

and profile. For each layer or for each 0.5 m depth, the material will be compacted to reduce subsidence.

The cable pipe trenches will interface with the land cable at a cover depth of around 1.2 m at the three interface joints located onshore above MHWS. Each interface joint will require a joint pit 10 m x 5 m x 2 m deep. Pipe trenches will need to pass under the existing sewer and mains water services landward of the rock revetment.

Onshore planning approvals for the landward portion of the works will be progressed separately with Angus Council.

### 2.3.3 Intertidal and subtidal to 2.5 m (LAT)

From the toe of the rock revetment, up to three HDPE pipes will be installed across the intertidal and subtidal zones down to a depth of 2.5 m (LAT) (total length of section 360 m) in either a single trench (Option 1) or up to three trenches (Option 2), as follows:

1. Option 1: installation of up to three HDPE pipes within a single trench excavated to 3 m deep, 20 m wide at base and 30 m wide at top. The trench will be excavated to provide a minimum of 2 m cover to the three HDPE pipes at 5 m minimum spacing. Option 1 may require approximately 200 m of sheet piling either side of the trench (400 m in total) in the subtidal zone (which may also extend into the intertidal zone) and working areas 30 m wide either side of the trench (60 m wide in total); or

2. Option 2: installation of up to three HDPE pipes within up to three trenches excavated to 3 m deep, 2 m wide at base and 3 m wide at the top. The trenches will be excavated to provide a minimum of 2 m cover to the three HDPE pipes at 25 m spacing. Option 2 may require approximately 200 m of sheet piling either side of each trench (400 m per trench, 1,200 m in total) in the subtidal zone (which may also extend into the intertidal zone) and working areas 30 m wide on the outer trenches only with 25 m working areas in between each trench (110 m wide in total).

The trench(es) will be excavated by elevated or barge/jack-up mounted backhoe excavators allowing excavation work to be carried out at all states of the tide. In some cases (i.e. within areas permanently submerged), temporary sheet piling may be required to maintain safe working conditions until the trench work is completed and backfilled. Sheet piling will be installed using vibro-piling (as opposed to impact piling). For the sections of trench which are dry at low tide, excavation could be undertaken, and the trench sides supported with trench boxes. Trench boxes are used as a temporary earth retaining structure to shore up the sides of a trench while material is excavated from within and can allow the sides of a trench to be cut vertical or near vertical.

During excavation of the trenches within the intertidal zone, to aid successful reinstatement of the as found sediment layers, each layer of material will be removed and stored in berms to the side of the trench with individual layers kept separate to aid reinstatement once works are complete. The berms created to the side of the trenches will be flattened on a regular basis to ensure they do not become too high.

HDPE pipe sections will be preassembled and floated to site, lowered into position in the trench and then joined to the previous section. The pipes may then be secured using concrete collars before the trenches are backfilled to ensure the HDPE pipes stay in position and are buried at the correct depth. In the intertidal zone the trench section will be backfilled using the excavated material maintaining any original sediment layering and profile as far as reasonably practicable and compacted where necessary to avoid subsidence. In the subtidal zone, the trench will be allowed to backfill naturally.

On completion, the seaward end of the pipes (at a depth of 2.5 m LAT, approximately 190 m from MLWS) will be fitted with a messenger line and left temporarily capped on the seabed to allow cable pull-in later. Temporary ballast (e.g. concrete bags/clamps or rock nets/bags of gravel) may be attached to the pipe ends for stabilisation. The pipe ends will be fully buried to a depth allowing 2 m of material above the top of the pipe following cable pull-in and completion of cable installation.

### 2.3.4 Cable Pull-In

The cable pull-in will be conducted both onshore and offshore. It is currently anticipated that a winch will be installed at the landward end of the HDPE pipes and attached to the messenger line and the temporary cap on the seaward end of the HDPE pipes removed. The messenger line will then be attached to the end of the cable which is stored on an offshore vessel. The cable will then be pulled through the HDPE pipe by the winch until the cable reaches the jointing bay.

### 2.3.5 Post-installation surveys

To ensure the HDPE pipes are buried to the desired depth, a survey of the HDPE pipe depths will be carried out within all four zones (onshore, rock revetment, intertidal and subtidal) prior to backfilling of the trenches. Following reinstatement, a topographical survey will be carried out to identify and map the contours of the ground/seabed and to confirm reinstatement to the correct profile, again within all four zones.

*Table 2.1: Worst case scenario2 (Source, Seagreen 2019b).*

| Description | Details | Comments |
|---|---|---|
| Number of interface joint pits – onshore | 3 | Pipes for Export Cable 1 (EC1), Export Cable 2 (EC2) and Export Cable 3 (EC3) |
| Number of trenches – onshore | 3 | |
| Number of trenches through rock revetment | 1 | |
| Number of HDPE pipes through rock revetment | 4 (3 plus 1 spare) | |
| Number of trenches: intertidal and subtidal (**Option 1**) | 1 | Will contain all three cables EC1, EC2 and EC3 in a single trench, each cable within its own HDPE pipe |
| Number of trenches: intertidal and subtidal (**Option 2**) | 3 | Three individual trenches each containing one cable (EC1, EC2 or EC3) within its own HDPE pipe |
| Dimension of trenches – onshore | EC1: 1 m x 100 m x 3 m<br>EC2: 1 m x 100 m x 3 m<br>EC3: 1 m x 100 m x 3 m | Width (at top) x length x depth<br>Based on each trench being ~100 m long from MHWS to interface joint pits. Length subject to location of interface joint pits<br>Depth 3 m to provide 2 m cover to pass under existing services. |
| Dimension of trench – rock revetment | EC1, EC2 and EC3:<br>70 m x 32 m x 10 m<br>Note: Bottom width = 30 m (trapezoid trench to avoid slippage of trench sides)<br>70 m width includes working areas | Width x length (at top) x depth<br>Pipes at 5-10 m spacing<br>Concrete encased at toe of rock revetment. HDPE Pipes 2 m deep.<br>Re-use of removed materials. Potential for additional rock (6,000 $m^3$) imported for rebuild to 1 |

[2] Note the durations, depths and widths in the table are approximates at this stage and subject to change.

| Description | Details | Comments |
|---|---|---|
| | | in 3 gradient. Sea or land transport to be determined. |
| Dimensions of trench: intertidal and subtidal (**Option 1**) | Trench for EC1, EC2 and EC3: 30 m x 360 m x 3 m<br>Note: Bottom width = 20 m (trapezoid trench to avoid slippage of trench sides)<br>Subtidal Only<br>30 m x 190 m x 3 m | Width (at top) x length x depth<br>To provide a minimum 5 m spacing of HDPE pipes and 2 m cover.<br>Up to 400 m sheet piling required.<br>Subtidal distance from MLWS to 2.5m LAT = 190m |
| Dimensions of trenches: intertidal and subtidal (**Option 2**) | EC1: 3 m x 360 m x 3 m<br>EC2: 3 m x 360 m x 3 m<br>EC3: 3 m x 360 m x 3 m<br>Note: Bottom width = 2 m (trapezoid trench to avoid slippage of trench sides)<br>Subtidal only<br>EC1: 3 m x 190 m x 3 m<br>EC2: 3 m x 190 m x 3 m<br>EC3: 3 m x 190 m x 3 m | Width (at top) x length x depth<br>To provide a minimum 25 m spacing of HDPE pipes and 2 m cover.<br>Up to 400 m sheet piling per trench required, 1,200 m in total.<br>Subtidal distance from MLWS to 2.5 m LAT = 190 m |
| Plan area of joint pits – onshore | EC1: 50 $m^2$<br>EC2: 50 $m^2$<br>EC3: 50 $m^2$ | Three joint pits each 10 m x 5 m |
| Plan area of trenches – onshore | EC1: ~100 $m^2$<br>EC2: ~100 $m^2$<br>EC3: ~100 $m^2$ | Subject to final location of interface joint pits. |
| Plan area of rock revetment trench | 2,100 $m^2$ | |
| Plan area of trench: intertidal and subtidal (**Option 1**) | 10,800 $m^2$<br>Subtidal only = 5,700 $m^2$ | Trapezoidal trench for 3 HDPE pipes minimum 5 m spacing, 2 m cover. |

| Description | Details | Comments |
|---|---|---|
| Plan area of trenches: intertidal and subtidal (**Option 2**) | EC1: 1,080 $m^2$<br>EC2: 1,080 $m^2$<br>EC3: 1,080 $m^2$<br>Subtidal only<br>EC1: 570 $m^2$<br>EC2: 570 $m^2$<br>EC3: 570 $m^2$ | Values for intertidal and subtidal (trapezoidal trenches) have taken the width at top to estimate the volume. The width of trench at the base will be less than at the top. Therefore, the greater value has been used to provide a slight overestimate. |
| Volume of material excavated | Onshore joint pits 2 m deep to include concrete plinth:<br>EC1: 150 $m^3$<br>EC2: 150 $m^3$<br>EC3: 150 $m^3$<br><br>Onshore trenches:<br>EC1: 300 $m^3$<br>EC2: 300 $m^3$<br>EC3: 300 $m^3$<br><br>Rock revetment:<br>22,400 $m^3$<br><br>Intertidal and subtidal: (**Option 1)**<br>32,400 $m^3$<br><br>Intertidal and subtidal: (**Option 2**)<br>9,720 $m^3$ | All values rounded to nearest whole cubic metre.<br><br>Includes rock materials replenishment up to 6,000 $m^3$. Up to 23,000 $m^3$ temporary storage onshore required.<br><br>Includes side slopes – final volumes subject to ground conditions but within the estimate provided.<br><br>Includes side slopes – final volumes subject to ground conditions but within the estimate provided. |

| Description | Details | Comments |
|---|---|---|
| | Subtidal only (**Option 1**)<br>17,100 $m^3$<br><br>Subtidal only (**Option 2**)<br>5,130 $m^3$ | Subtidal distance from MLWS to 2.5 m LAT = 190 m |
| Working area onshore | (30 m + 30 m) x 100<br>Including working areas total plan area affected onshore = 6,450 $m^2$ | 30 m either side of the trench |
| Working areas intertidal | (30 m + 30 m) x 170 m (**Option 1**)<br>(30 m + 25 m + 25 m + 30 m) x 170 m (**Option 2**) | 30 m either side of the single trench (60 m width in total, 90 m width including trench) (**Option 1**).<br>30 m either side of the outer two trenches with 25 m working areas between trenches one and two and between trenches two and three (110 m width in total, 119 m width including trenches) (**Option 2**). |
| Total area temporarily disturbed | Including working areas, total plan area temporarily affected = 21,000 $m^2$ (**Option 1**) or 21,940 $m^2$ (**Option 2**). | Conservative estimate, with working area running parallel to either side of the trench.<br>Working areas not considered for subtidal as cables installed via offshore vessel. However, there may be some additional disturbance through jack up vessel / barge spud cans |
| Storage areas onshore (landward of MHWS) (covered by onshore application) | Two 30 m x 30 m areas | Approximate estimate. |

*Table 2.2: Vessels and Plant.*

| Type | Description |
|---|---|
| Backhoe excavators, dumpers, crane/long reach excavator with rock grapple (onshore (except backhoe excavators) and rock revetment) |  Whilst the exact details will not be known until contractors have been appointed, it is likely that backhoe excavators (shown in the diagram below), dumpers and cranes/long reach excavators would be required. |
| Elevated backhoe excavator and barge/jack-up mounted backhoe excavator (subtidal) | In the subtidal zones elevated excavator and/or a barge-mounted backhoe excavator. The images below show examples of an elevated backhoe excavator (left) and a barge-mounted backhoe excavator (right).   |
| Crawler crane and clamshell bucket / rock grapple (rock revetment) |  Due to the limited reach of a long reach excavator, it may be necessary for some rock removal and placement to be carried out using a crawler crane and clamshell bucket or rock grapple (shown in the photo).<br><br>Figure courtesy of Arch Henderson. |
| Barge | The delivery method for any additional rocks for the rock revetment is to be determined. One option is to use a barge at high tide to deliver the rock material to the rock revetment and crane off rock material to be used on the rock revetment. |
| Truck | The delivery method for any additional rocks for the rock revetment is to be determined. One option is to deliver rock onshore via road transport and move it to the rock revetment using a land-based crane or to deliver the rock to the seaward face of the revetment via truck at low tide. This will depend on the available intertidal area during low tide (see Section 2.2). |

## 2.4 Licensable marine activities

The alternative cable landfall installation activities which are licensable marine activities under the Marine (Scotland) Act 2010 are summarised below. These include activities within the rock revetment, intertidal and subtidal zones only. These activities will form the focus of the Environmental Report to be submitted in support of the Marine Licence application. However as certain non-licensable activities can increase the duration and extent of the impact (e.g. use of vessels/plant and presence of human activity during surveys leading to disturbance effects), these wider activities will also be considered in the overall assessment to be presented in the Environmental Report where relevant. The following activities are considered to be licensable under the Marine (Scotland) Act 2010 and will be considered within the Environmental Report that supports the Marine Licence application:

- Temporary removal and reinstatement and, if necessary, additional deposit of material at the rock revetment;
- Temporary removal and storage of material in the intertidal and subtidal zones;
- Creation of working areas on the rock revetment;
- Creation of working areas in the intertidal zone;
- Open cut trenching and HDPE pipe installation through the rock revetment;
- Open cut trenching and HDPE pipe installation in the intertidal and subtidal zones;
- Backfilling of the trench(es) in the intertidal and subtidal zones; and
- Cable pull-in.

## 2.5 Management measures

There are a number of management measures which have been designed-in to the methodology to reduce potential effects on the environment. These are summarised below and will be further described within the Environmental Report.

- Selection of appropriate construction plant: to reduce the potential for over-excavation and reduce delays during construction.
- Working and stockpiling areas: working and stockpiling areas would be kept to a minimum size during the construction phase.
- Soil handling: excavation of material along each trench would be undertaken in separate sediment layers and material of different grades would be stored separately within temporary stockpile areas. In the intertidal area, berms will be created to store the material which will be flattened to ensure that the berms do not become too high.
- Intertidal reinstatement: reinstatement in the intertidal zone will be undertaken on a ‘layer by layer’ basis in reverse order to the excavation sequence. This reduces potential for adverse effects on the sediment structure and profile within the affected area.
- Rock revetment reinstatement: the rock revetment will be reinstated following completion of the works. Initial inspection has determined that some additional rock may be needed. Rock materials removed from the rock revetment will, where practicable, be reused during reinstatement if this is possible.

- It is anticipated that any consent for the alternative landfall cable installation method would be subject to conditions including the requirement for pre-construction consents management plans, to ensure good industry practice is adhered to in relation to environmental management, pollution prevention and waste management. These are likely to include an Environmental Management Plan (EMP) and Marine Pollution Contingency Plan (MPCP).
- Bunding and drip catchment for hydraulic oils and fuels will be employed.

In addition to these specific measures, there are also industry standard measures that will be in place to further mitigate impacts on a wide range of receptors, including Fisheries Liaison, Notices to Mariners and adherence to pollution prevention and waste management legislation. These measures will be detailed within the Environmental Report.

### 2.6 Timescales and duration

Indicative timescales for the alternative cable landfall works are provided below in Figure 2.3.

The activities listed in Section 2.4 including installation of the HDPE pipes from the onshore joint pits, through the rock revetment, intertidal and subtidal zones to a depth of 2.5 m LAT is expected to take place over a period of up to four months (excluding any weather downtime e.g. due to storms or adverse weather). The works to remove, trench through and install the HDPE pipes within the rock revetment, including reinstatement will take approximately eight weeks. A further eight weeks will then be required to trench through the intertidal and subtidal area, including excavation of material, installation of sheet piling, laying of HDPE pipes, backfilling and reinstatement of the site.

For sheet piling activities, it would likely require one week (seven days) to install the sheet piles in the rock revetment trench, with seven days also required to install the 400 m of sheet piles required for Option 1. Up to 21 days may be required to install the 1,200 m of sheet piles for the three trenches for Option 2. It should be noted that installation periods for sheet piling are not continuous piling days but are installation periods within which piling days will take place and during sheet pile installation there will be periods when piling is not taking place. For example, piling will only occur during daylight hours

The pull-in operations of the three cables is expected to take place over a period of two to three weeks working time, with the actual pull-in of the cables from a vessel offshore to the onshore cable jointing bays lasting approximately two days per cable (6 days in total). However, the period between HDPE pipe installation and the pull-in of the cable lengths is subject to seasonal conditions (e.g. weather) and the availability and delivery time of the cable lengths from the cable manufacturer. The cable pull-in will be undertaken separately to the installation of the HDPE pipes through which the cables will be pulled.

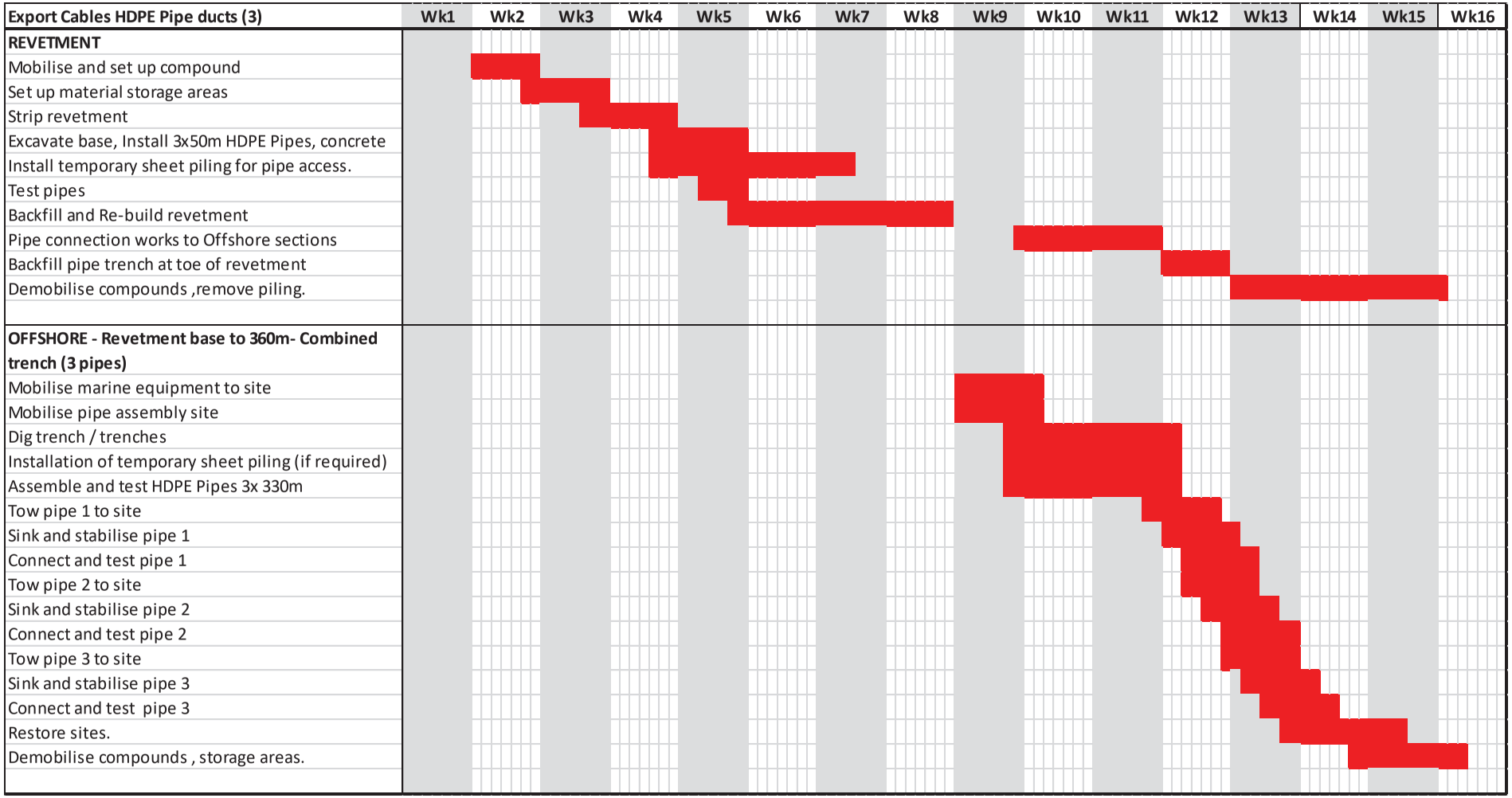


*Figure 2.3: Indicative Programme. NOTE: Indicative only - season and delivery times of pipes and cables will significantly affect work progress. Offshore and onshore works can be concurrent.*

# 3. Approach to Consent

## 3.1 Consenting Regimes

The alternative cable installation works would involve the installation of three cables via open cut trenching between the original proposed landward entrance points of the HDD (approximately 100 m above MHWS), through the rock revetment, down to depth of 2.5 m LAT (approximately 190 m below charted MLWS). A new Marine Licence application is required to cover the alternative landfall cable installation methodology. The boundary of the proposed Marine Licence application is the same as the boundary for the consented cable landfall/export cable corridor from MHWS to a point 2.5 m LAT, allowing for sufficient overlap of the works area with offshore installation activities. The total length of the cable installation works to be covered by the Marine Licence application is approximately 390 m per cable (30 m through the rock revetment plus 360 m from the toe of the rock revetment), which includes activities across the subtidal and intertidal zones and through the rock revetment. Seagreen is also seeking separate approval for the section of the works falling landward of MLWS from Angus Council.

The following sections set out the approach for the marine consenting process, with reference to The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the '2017 EIA Regulations') and The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013. Schedule 3 of the 2017 EIA Regulations includes additional environmental considerations as part of the selection criteria for screening EIA projects. These include the need to consider the risks of major accidents and/or disasters, including those caused by climate change, and the risk to human health. These aspects are considered further in the following sections.

## 3.2 Consideration of the need for EIA

### 3.2.1 Overview

Seagreen has determined that an Environmental Impact Assessment (EIA) under the 2017 EIA Regulations is not required to support the Marine Licence application for the reasons described below.

The proposed works represent a change to an authorised project and therefore are considered to fall under the description of projects provided at Paragraph 13 of Schedule 2 of the 2017 EIA Regulations (i.e. a change to an installation for the harnessing of wind power for energy production (wind farms) where those works are already authorised), whereby an EIA is required where the change may have significant adverse effects on the environment. The 2017 EIA Regulations specify that in making a determination as to whether or not a Schedule 2 project is an EIA project, the relevant criteria set out in Schedule 3 must be considered together with the results of any relevant assessment. These criteria cover the characteristics of the works, the location of the works and the characteristics of the potential impact. Each of these are addressed in turn within the following sections.

### 3.2.2 Characteristics of the works

The 2017 EIA Regulations specify that the following characteristics must be considered:

- the size and design of the works;
- cumulation with other existing works and/or approved works;
- the use of natural resources, in particular land, soil, water and biodiversity;
- the production of waste;
- pollution and nuisances;
- the risk of major accidents and/or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge; and
- the risks to human health (for example due to water contamination or air pollution).

In terms of the **size and design of the works**, the size of the project is relatively small in the context of the overall scale of the consented Seagreen Alpha and Seagreen Bravo projects and when compared to the total area of Carnoustie Bay. The proposed works will take place within the existing consented OfTW corridor and involves the installation of three approximately 390 m sections (30m through the rock revetment and 360m through the intertidal and subtidal) of cable at the landfall (with one spare cable pipe installed through the revetment). As set out above, the key differences between the proposed works and the consented works is a reduction in the number of cables to be installed, from six to three, the change from HDD to trenching through the rock revetment and the inclusion of an option to install all three cables within a single trench across the intertidal and subtidal zones to a depth of 2.5 m LAT.

The proposal is to excavate a single trench through the revetment up to 30 m in length (measured across the shore) and 70 m in width (measured along the coastline) and either a single trench of up to 30 m in width (Option 1) or three individual trenches of up to 3 m in width (Option 2) across the intertidal and subtidal zones. The design of the works has sought to minimise environmental effects by building in contingency to the rock revetment works (through the spare cable pipe), ensuring appropriate removal, storage and replacement of sediment layers and through reinstatement of the rock revetment.

In terms of **cumulation with other existing works**, other plans and projects in the vicinity of the landfall include the Barry Buddon Military Practice and Exercise Area (PEXA) and Training Camp, and an aggregate (sand and gravel) resource area, which overlap with the proposed Seagreen alternative cable installation methodology application boundary. Both projects are considered to be part of the baseline and are therefore not considered likely to contribute to cumulative effects with the alternative cable landfall installation works. There are no other proposed or existing cable or pipeline installation projects at the cable landfall. The other Forth and Tay offshore wind farms make landfall at other locations along the east coast of Scotland (Marine Scotland, 2018), with Neart na Gaoithe making landfall at Thortonloch (61 km to the south) and Inch Cape at Cockenzie (60 km to the south). The Seagreen Environmental Statement (ES) (Seagreen, 2012) did not identify any significant cumulative effects at the landfall. The alternative cable landfall installation methodology forms part of the wider Seagreen Alpha and Bravo project and no significant cumulative effects are anticipated on any environmental receptor with the wider OfTW cable installation activities.

In terms of the **use of natural resources**, installation of the cable using trenching methods would necessitate the removal of material during excavation of the cable trench, however this would be temporary during the construction phase and the material would either be reinstated (intertidal) or allowed to backfill naturally (subtidal) and surveyed to ensure reinstatement to a similar profile. Rock material removed from the revetment will be stockpiled for reinstatement. Where material is not suitable for re-use it will be transported to a licensed onshore disposal site. Up to 6,000 $m^3$ of additional rock may be required for the reinstatement of the revetment which represents a relatively small volume of material in comparison to the material already present within the 3.5 km long rock revetment. Therefore, the installation methodology would not result in the long-term exploitation of significant volumes of natural resources and where practicable rock on the revetment will be reused. Therefore, no significant adverse effects on the environment through the use of natural resources are anticipated.

Regarding **production of waste and pollution and nuisances**, all wastes will be managed in line with an Environmental Management Plan (EMP) which will be prepared for the works. The EMP will include waste management measures to minimise, reuse, recycle and dispose of waste streams in compliance with relevant waste legislation. Marine pollution prevention and contingency planning measures will also be set out in a Marine Pollution Contingency Plan (MPCP) which will be prepared for the works. The EMP and MPCP will likely form a consent requirement of any awarded Marine Licence for the alternative cable landfall methodology. Nuisance will be controlled by planning conditions through the submission and approval of an EMP which will contain proposed measures for the mitigation of construction noise and vibration, and dust. Due to the measures in place to control and/or manage waste, pollution and nuisance, which are expected to be secured by consent conditions, significant adverse effects on the environment are not predicted.

Regarding **risk of major accidents and/or disasters, including those caused by climate change**, Seagreen will require all contractors and subcontractors to complete adequate risk assessments for all aspects of the installation activities and these requirements will be captured within a Construction Method Statement which will be prepared for the works (and again is likely to be secured through any awarded Marine Licence for the alternative cable landfall methodology). The project will be a notifiable project for the purposes of the Construction (Design and Management) Regulations 2015 (CDM Regulations), and Seagreen will require compliance with the CDM Regulations in the design of the project and through the completion of the installation process through conditions of contract. Management standards in line with ISO 9001, 14001 and OHSAS 18001 will be applied for the overall Seagreen project management system, and the management systems of all contractors will be required to concur with the same principles.

In relation to **risks to human health**, Seagreen will require compliance with the Control of Substances Hazardous to Health Regulations 2002 (COSHH Regulations) through conditions of contract in ensuring that the risk to health from workplace exposure to hazardous substances is appropriately assessed and that exposure is prevented or, where this is not reasonably practicable, adequate controls are implemented and exposure monitored and managed to within acceptable levels, in line with relevant regulations. Health and Safety regulations will be adhered to at all times and relevant HSE Management tools implemented, to ensure the safety of the workforce and the general public.

In summary, in consideration of the characteristics of the works as set out in the 2017 EIA Regulations, the alternative cable landfall installation project is relatively small in the context of the overall scale of the consented Seagreen Alpha and Seagreen Bravo projects and in the context of the area of the wider Carnoustie Bay, and considering that the proposal is to install up to three cables instead of six as originally consented, and is not likely to result in significant cumulative effects with other plans and projects. Use of natural resources will be minimal in relation to the potential additional material for the rock revetment (6,000 $m^3$), and within the intertidal and subtidal zones use of natural resources will be temporary and reversible with any removed material being backfilled following completion (intertidal) or allowed to backfill naturally (subtidal). The works will be short term only (up to four months) and measures will be put in place to control and manage waste, pollution and nuisance, risk of accidents and risk to human health. For the reasons outlined above, it is considered that the characteristics of the project are not likely to result in significant adverse effects on the environment.

### 3.2.3 Location of the works

The 2017 EIA Regulations specify that the environmental sensitivity of geographical areas likely to be affected by works must be considered having regard to the following:

- the existing and approved land use;
- the relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and its underground;
- the absorption capacity of the natural environment, paying particular attention to the following areas:
  - wetlands, riparian areas, river mouths;
  - coastal zones and the marine environment;
  - mountain and forest areas;
  - nature reserves and parks;
  - European sites and other areas classified or protected under national legislation;
  - areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure;
  - densely populated areas;
  - landscapes and sites of historical, cultural or archaeological significance.

The cable landfall is located approximately 0.5 km to the south of Carnoustie in Angus. The indicative works area overlaps with the Outer Firth of Forth and St Andrews Bay Complex pSPA (subtidal works area only) and is located adjacent to the Firth of Tay and Eden Estuary SAC, SPA and Ramsar site and the Barry Links SAC, SSSI and Geological Conservation Review (GCR) site (see Figure 4.1). The subtidal works area covers only a very small proportion (<0.0005%) of the total 2,721 $km^2$ area of this marine pSPA (SNH, 2016). The proposed alternative cable landfall works do not require excavation through the Firth of Tay and Eden Estuary SAC, SPA and Ramsar site or the Barry Links SAC, SSSI and GCR site although these sites do fall within the alternative cable landfall application boundary (see Figure 4.1).

As such, Seagreen has considered the **environmental sensitivity** of the landfall location in relation to these designations. A review of potential impacts and resultant effects is provided in Section 4 and Appendix 1 of this document. This review, having regard to the **existing and approved use**, the **relative abundance, availability, quality and regenerative capacity of natural resources in the area**, and the **absorption capacity of the natural environment (with reference to coastal zones and European and nationally designated sites)**, concluded that, due to the minimal overlap with the Outer Firth of Forth and St Andrews Bay Complex pSPA, the lack of any direct overlap with any other designated site, the relatively small area of disturbance in comparison to the wider Carnoustie Bay, the localised nature of the effects arising from the works, and the short-term (up to four months) and temporary (all areas restored to their natural profile) nature of potential effects, there will be no significant adverse effects on the environment.

### 3.2.4 Characteristics of the potential impact

The 2017 EIA Regulations specify that the likely significant effects of the works on the environment must be considered with regard to the impact of the works taking into account the following:

- the magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);
- the nature of the impact;
- the transboundary nature of the impact;
- the intensity and complexity of the impact;
- the probability of the impact;
- the expected onset, duration, frequency and reversibility of the impact;
- the cumulation of the impact with the impact of other existing and/or approved works;
- the possibility of effectively reducing the impact.

The potential environmental impacts scoped into the proposed Environmental Report are presented in Section 4 of this document. Seagreen has carried out a review of each of these potential impacts in relation to the **magnitude and spatial extent** of the impact, the **nature** of the impact, the **intensity and complexity** of the impact and the **probability, duration, frequency and reversibility** of the impact, to determine whether or not the impact is likely to have a significant adverse effect on the environment. This review is presented in Appendix 1 of this document and concludes that none of the potential impacts are likely to result in significant adverse effects.

In terms of the **transboundary nature of the impact**, due to the localised extent of the works and the localised nature of the impacts, it is considered that there will not be any impacts on any other European Economic Area (EEA) state from these works.

In terms of the **cumulation of the impact** with other existing and/or approved works, as noted above, no significant cumulative effects are anticipated.

In terms of **effectively reducing the impact**, the management measures presented in Section 2.5 will ensure that any potential effects will be effectively managed. It is also important to note that the proposed works will take place within the existing consented OfTW corridor and the key changes between the alternative methodology and the consented methodology is that the works will

undertake trenching through the revetment as opposed to HDD under the revetment and that an option is being considered for excavating a single trench to accommodate up to three cables, which represents a reduction in the number of cables compared to six cables as consented.

#### 3.2.5 Conclusion

In summary, having considered the matters outlined within Schedule 3 of the 2017 EIA Regulations in terms of the characteristics and location of the project and the characteristics of the potential impacts, Seagreen has determined that the proposed alternative cable installation works are not likely to have significant adverse effects on the environment, and therefore an EIA is not required.

### 3.3 Consideration of the need for Pre-Application Consultation (PAC)

Applicants for Marine Licences for certain prescribed classes of activities are required to carry out pre-application consultation (PAC) under The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013 (the "PAC Regulations"). One of the prescribed classes of activities is the deposit of a submarine cable in the sea or on or under the seabed from a vehicle, vessel, aircraft, marine structure or floating container, but only where that cable:

1. exceeds 1,853 metres in length; and
2. crosses the intertidal boundary.

As described in Section 2.3, the three export cables to be installed via trenching will be approximately 390 m in length (30m through the rock revetment and 360 m through the intertidal and subtidal, 1,170 m in total for all three cables, or 1,200 m including the spare cable pipe through the revetment), therefore the first of these criteria is not met. The cables do cross the intertidal boundary, however the PAC Regulations state that both criteria need to be met for the works to be a prescribed class of activity.

Seagreen therefore considers that formal PAC under the PAC Regulations is not required. Nevertheless, pre-application consultation will take place with SNH, Angus Council and SEPA in relation to potential environmental effects and consideration of the temporary removal of the revetment and their comments will be taken into account during the development of the application.

## 4. Scope of Environmental Report

### 4.1 Overview

As noted in the previous sections, Seagreen proposes that the Marine Licence application for the alternative cable installation method is accompanied by a concise environmental assessment, presented in an Environmental Report. No significant adverse effects on the environment are anticipated as a result of the proposed works. This section therefore sets out the environmental receptors and potential impacts on those receptors that are proposed to be scoped into the Environmental Report, in addition to those receptors and impacts that can be scoped out, with justification provided, for agreement with MS-LOT. Each potential impact heading is presented in bold text as a bullet point. The assessments will be based on existing environmental information available from the Seagreen Alpha and Seagreen Bravo ES (Seagreen 2012), the ES Addendum

(Seagreen 2013), the ES for the optimised design (Seagreen, 2018) recent post-consent surveys and other publicly available sources where relevant.

A summary of the environmental receptors or 'topics' considered is presented in Table 4.1 below.

*Table 4.1: Topics scoped into or out of Environmental Report.*

| Topic | Scoped In / Out | Justification |
|---|---|---|
| Nature Conservation Designations and Other Designations | Scoped In | The indicative alternative cable landfall works area overlaps with small proportion of the Outer Firth of Forth and St Andrews Bay Complex pSPA and is adjacent to the Firth of Tay and Eden Estuary SAC, SPA and Ramsar site and Barry Links SSSI and GCR site.<br>There is a designated bathing water in Carnoustie Bay.<br>For further details see Section 4.2. |
| Physical Environment and Water Environment | Scoped In | The proposed alternative cable landfall works have the potential to affect sediment transport processes, suspended sediment concentrations and the geomorphology of the Barry Links SSSI and GCR.<br>For further details see Section 4.3 and Appendix 1. |
| Benthic Ecology and Intertidal Ecology | Scoped In | The proposed alternative cable landfall works have the potential to result in effects from temporary habitat disturbance and from changes in suspended sediment concentrations.<br>For further details see Section 4.4 and Appendix 1. |
| Natural Fish and Shellfish Resource | Scoped In | The proposed alternative cable landfall works have the potential to result in effects from temporary habitat disturbance, from changes in suspended sediment concentrations and disturbance due to underwater noise.<br>For further details see Section 4.5 and Appendix 1. |
| Marine Mammals | Scoped In | The proposed alternative cable landfall works have the potential to result in effects from disturbance due to underwater noise.<br>For further details see Section 4.6 and Appendix 1. |
| Ornithology | Scoped In | The proposed alternative cable landfall works have the potential to result in effects from disturbance. |

| Topic | Scoped In / Out | Justification |
|---|---|---|
| | | For further details see Section 4.7 and Appendix 1. |
| Commercial Fisheries | Scoped Out | Commercial fisheries have been scoped out due to the shallow waters (2.5 m LAT or less) and the likely lack of fishing activity close to shore.<br>For further details see Section 4.8 and Appendix 1. |
| Shipping and Navigation | Scoped Out | Shipping and navigation has been scoped out due to the shallow waters (2.5 m LAT or less) and the low probability of vessel traffic close to shore.<br>For further details see Section 4.9 and Appendix 1. |
| Archaeology and Cultural Heritage | Scoped In | The proposed alternative cable landfall works have the potential to affect marine archaeology through direct impact to the seabed/foreshore or through finds of archaeological interest being identified during trenching activities.<br>For further details see Section 4.10 and Appendix 1. |
| Aviation, Military and Communications | Scoped In | The proposed alternative cable landfall works have the potential to affect activities within the MOD Barry Buddon firing range.<br>For further details see Section 4.11 and Appendix 1. |
| Other Marine Users and Activities | Scoped In | The proposed alternative cable landfall works have the potential to affect the activities of infrastructure and other user receptors in the vicinity, including recreational receptors.<br>For further details see Section 4.12 and Appendix 1. |
| Seascape, Landscape and Visual Amenity | Scoped Out | Seascape, landscape and visual amenity has been scoped out of the Environmental Report on the basis that the ES (Seagreen, 2012) considered project impacts to be not significant and on the basis that the alternative cable landfall works are temporary, reversible and over a short period of time (four months) and are unlikely to increase the magnitude of potential impacts at the landfall.<br>For further details see Section 4.14 |

| Topic | Scoped In / Out | Justification |
|---|---|---|
| Air Quality | Scoped Out | Air quality has been scoped out of the Environmental Report on the basis that good practice measures will be in place to reduce dust and emissions, as discussed in Section 2.5 and 3.2.2. Air quality was also scoped out of the ES (Seagreen, 2012) and it is highly unlikely that the alternative methodology will increase potential effects. |
| Human Health | Scoped Out | Seagreen will require compliance with the COSHH Regulations as discussed in Section 3.2.2 in ensuring that the risk to health is appropriately assessed and that exposure is prevented or, where this is not reasonably practicable, adequate controls are implemented and exposure monitored and managed to within acceptable levels in line with relevant regulations. Health and Safety regulations will be adhered to at all times and relevant HSE Management tools implemented to ensure the safety of the workforce and the general public. Therefore significant effects to human health are not expected and it is scoped out of the assessment. |
| Climate Change | Scoped Out | Consideration will be given to the design of the rock revetment reinstatement in relation to climate change and flood defence. This will be discussed and confirmed with SEPA. Any effects from the presence of vessels and vehicles and emissions will be small scale and temporary and are unlikely to add significantly to any risks related to climate change. |
| Flood Risk | Scoped In | Flood risk will be considered within the onshore application, with respect to potential effects on onshore receptors. The results of the assessment undertaken to support the onshore application will be summarised and presented in the Environmental Report and any implications for receptors seaward of MHWS will be considered.<br>SEPA are being consulted on the proposed works and any concerns in relation to flood risk with respect to breaching the rock revetment will be addressed. |

### 4.2 Nature Conservation Designations

As noted in Section 3.2.3 and shown in Figure 4.1, the alternative cable landfall application boundary overlaps with the Outer Firth of Forth and St Andrews Bay Complex pSPA and the subtidal section of the works will occur within the pSPA boundary. The Outer Firth of Forth and St Andrews Bay Complex pSPA is proposed to be designated for a variety of bird populations of European importance including Arctic tern *Sterna paradisaea*, Atlantic puffin *Fratercula arctica*, common tern *Sterna hirundo*, Manx shearwater *Puffinus puffinus* and northern gannet *Morus bassanus* during the breeding season; black-headed gull *Chroicocephalus ridibundus*, common eider *Somateria mollissima*, common goldeneye *Bucephala clangula*, common gull *Larus canus*, common scoter *Melanitta nigra*, little gull *Hydrocoloeus minutus*, long-tailed duck *Clangula hyemalis*, razorbill *Alca torda*, red-breasted merganser *Mergus serrator*, red-throated diver *Gavia stellata*, Slavonian grebe *Podiceps auritus* and velvet scoter *Melanitta fusca* during the non-breeding season; and guillemot *Uria aalge*, European shag *Phalacrocorax aristotelis*, herring gull *Larus argentatus* and kittiwake *Rissa tridactyla* during the breeding season and non-breeding season. The pSPA is an extensive proposed marine protected area off the south-east coast of Scotland stretching from Arbroath in the north to St Abb's Head in the south, encompassing the Firth of Forth, the outer Firth of Tay and St Andrews Bay, and covers an area of 2,721 km$^2$ (SNH, 2016).

In addition, the southern section of the alternative cable installation works application boundary overlaps the Firth of Tay and Eden Estuary SAC, SPA and Ramsar site (Figure 4.1) although it is likely that the works themselves will not take place within the designated sites given the location of the proposed breach of the rock revetment as shown in Figure 4.1 and the location of the offshore export cable corridor. The Firth of Tay and Eden Estuary SAC is designated for the Annex I habitats Estuaries, Sandbanks which are slightly covered by sea water all the time, and Mudflats and sandflats not covered by seawater at low tide; and the Annex II species Common seal *Phoca vitulina*. The Firth of Tay and Eden Estuary SPA and Ramsar site is designated for supporting populations of European importance of little tern *Sterna albifrons* and marsh harrier *Circus aeruginosus* during the breeding season; bar-tailed godwit *Limosa lapponica* in the over-wintering period; migratory greylag goose *Anser anser*, pink-footed goose *Anser brachyrhynchus* and redshank *Tringa totanus* in the over-wintering period; and is designated as a wetland of international importance and for supporting a waterfowl assemblage.

The southern section of the alternative cable installation works application boundary also overlaps with the Barry Links SSSI and GCR site (see Figure 4.1), although for the same reasons noted above it is unlikely that the works themselves will take place within the designated sites. The Barry Links SSSI and GCR site is designated for its sand dunes, vascular plants, bryophytes, invertebrates, breeding birds and landforms; and the Barry Links SAC, designated for embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaria*, fixed coastal dunes with herbaceous vegetation, Atlantic decalcified fixed dunes and humid dune slacks. The sand dune system is one of the largest on the east coast of Scotland and forms a peninsula on the northern edge of the Tay at the mouth of the estuary. It is a complex site which provides a valuable example of an active dune system and a full range of dune habitats which support a wide range of plants, mosses, liverworts and invertebrates (Barry Links SSSI Citation Document).

In addition to sites in close proximity to the landfall other SACs from further afield may need consideration. These include SACs for marine mammals which may forage in the vicinity of the landfall and SACs for Atlantic salmon which pass close to the proposed works. These include the Moray Firth SAC designated for its population of bottlenose dolphin *Tersiops truncates*, the Isle of May SAC and Berwickshire and North Northumberland Coast SAC, both designated for their populations of grey seal *Halichoerus grypus*. The River Tay SAC, River Dee SAC, River South Esk SAC where Atlantic salmon *Salmo salar* is a primary feature and the River Teith SAC which is a tributary of the River Forth and where salmon is a qualifying feature are also relevant as salmon may migrate past the coast on the way to and from feeding grounds. In addition to salmon, river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* are a primary feature of the River Teith SAC and a qualifying feature of the River Tay SAC and also migrate to sea during their life cycle.

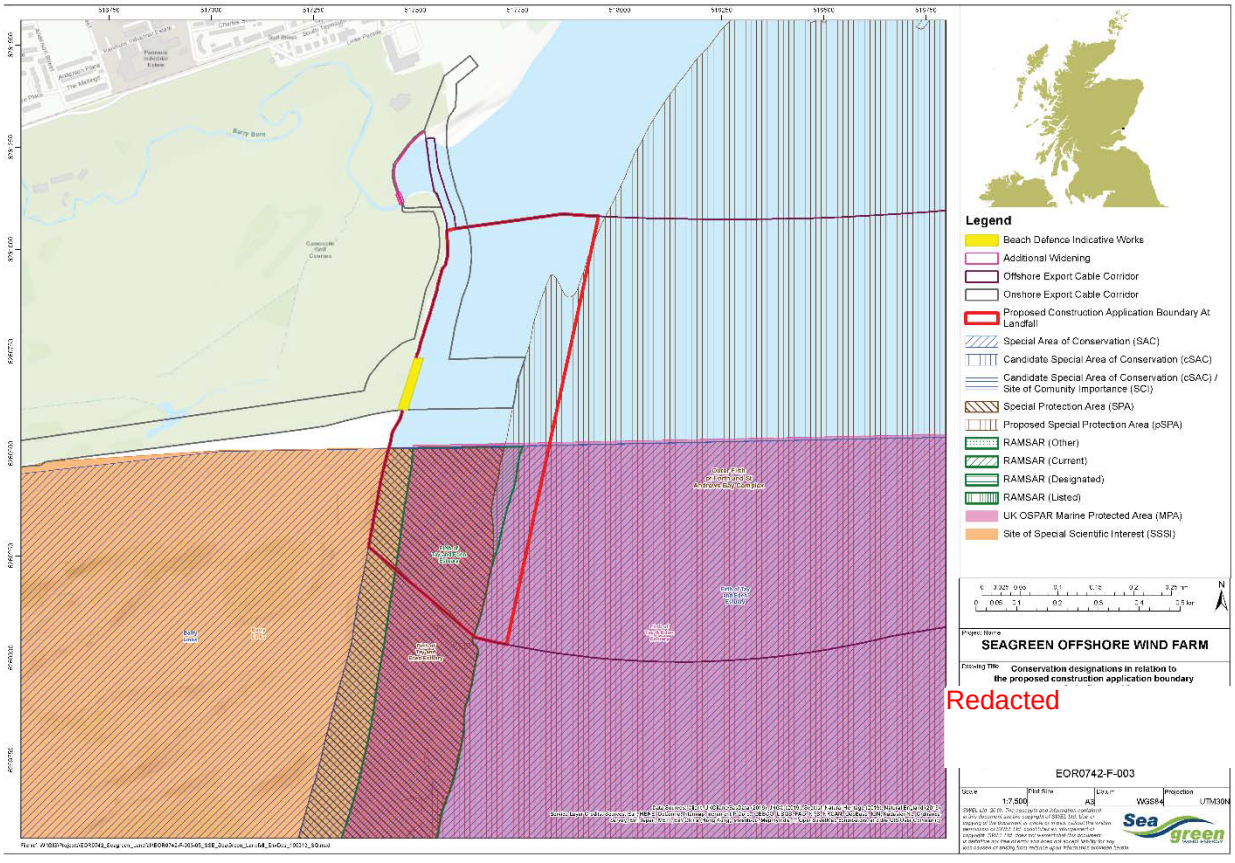


*Figure 4.1: Designated sites in relation to the proposed alternative cable installation works application boundary.*

Habitats Regulations Appraisal Screening on those European sites with the potential to interact with the licensable marine activities will be provided within the Environmental Report. However, based on the conclusions drawn in Appendix 1 the proposed works are not expected to result in any Likely Significant Effects.

## 4.3 Other Designations

There is a designated bathing water in Carnoustie Bay which is classified as being of good quality (SEPA, 2016). The Carnoustie bathing water is situated to the south of, and accessible from, the town of Carnoustie. It is in a relatively small and shallow bay approximately 0.7 km in length that slopes gently towards the water and is located approximately 122 m from the proposed alternative cable installation works application boundary and approximately 148 m from the consented offshore export cable route corridor (Figure 4.2). During high and low tides the approximate distance to the water's edge can vary from 0 to 300 m. At high tide the water reaches the sea wall on some parts of the beach leaving no sand visible (SEPA, 2015).

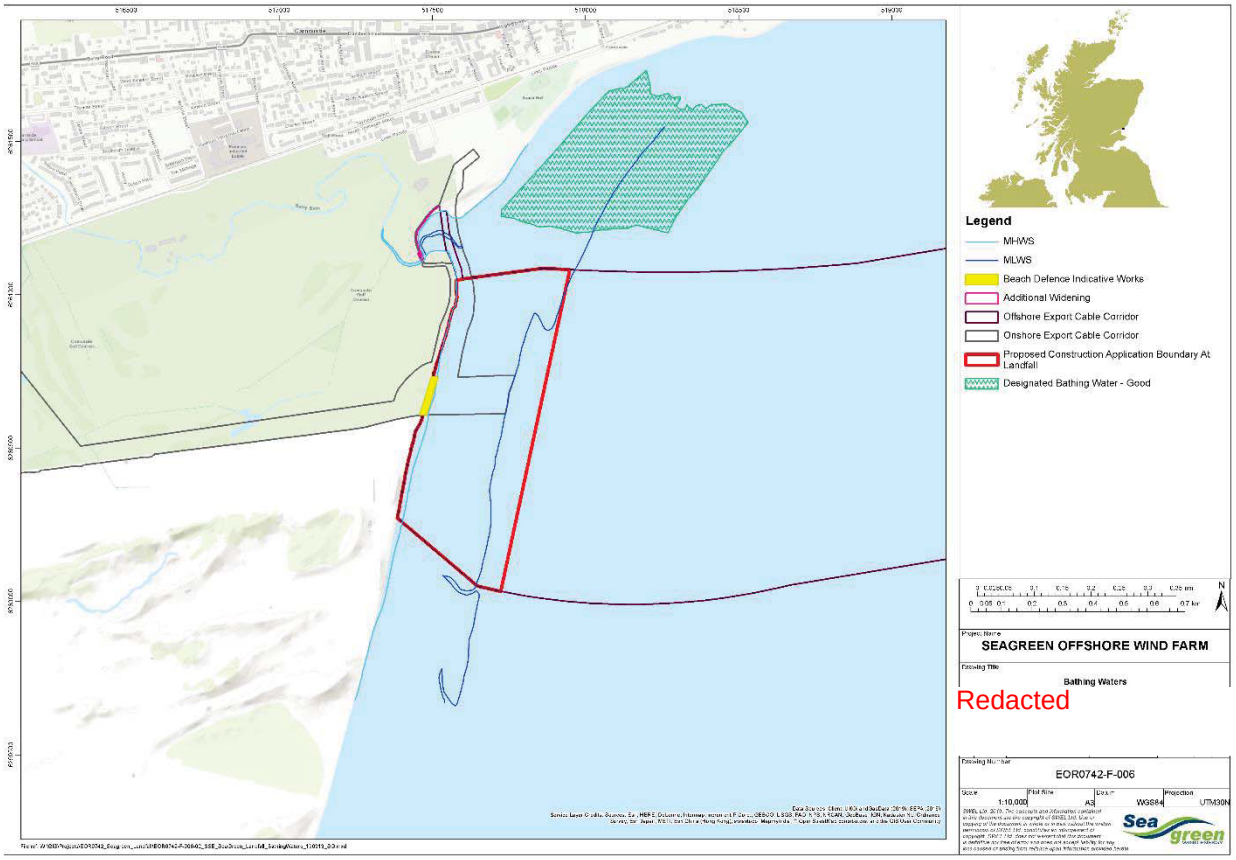


*Figure 4.2: Carnoustie designated bathing water.*

## 4.4 Physical Environment and Water Environment

### 4.4.1 Data sources

The following data sources will be utilised to inform the assessment of potential impacts on the Physical Environment within the Environmental Report:

- Seagreen (2012) Environmental Statement Volume I, September 2012 (Chapter 7: Physical Environment, Chapter 8: Water and Sediment Quality) and supporting technical appendices; and

- Marine Scotland Information web portal (http://marine.gov.scot/).

### 4.4.2 Overview of baseline environment

The Barry Links SAC is designated for coastal dune heathland, shifting dunes, dune grassland, humid dune slacks and shifting dunes with marram. This site is also designated as a SSSI for notable bryophytes, geomorphology, other invertebrates and supralittoral sediment (Seagreen, 2016b, Chapter 9: Ecology and Ornithology). Geomorphology at Barry Links is strongly influenced by sediment transport and tidal conditions in the Tay. The flood tide flows south along the shore to the east of Buddon Links and the ebb flows east out of the Tay and then northwards over the Gaa Sands, with an anticlockwise eddy forming which sweeps back to the east shore of Buddon Ness from the north. On both the ebb and flood tides, sediment is swept southwards along the east shore of the Barry Links towards Buddon Ness. As the ebb tide is stronger than the flood tide on the western shore of Buddon Ness, sediments are swept eastwards towards Buddon Ness. The recent erosion and coastal retreat at Barry Links can be attributed to this anticlockwise eddy. Drift of beach sediment within Carnoustie Bay occurs in a north to south direction, however, coastal retreat has been found to be slowing particularly to the north of Carnoustie with coastal erosion limited to episodic storm events (Seagreen, 2012, Chapter 7: Physical Environment). At the cable landfall, the upper beach above MHWS consists entirely of the rock revetment which has replaced the crest of the backing dune and its landward slope (Seagreen, 2012, Chapter 7: Physical Environment).

### 4.4.3 Impacts Scoped In

The Environmental Report will contain an assessment of the following potential impacts:

- **Cable installation activities may disturb geomorphological features of the Barry Links SAC, SSSI and GCR**

This potential impact has been scoped into the assessment as the creation of either one (Option 1) or three (Option 2) trenches across the intertidal zone with associated working areas and temporary storage areas has the potential to indirectly impact on these features.

- **Cable installation activities may affect sediment transport processes**

This potential impact has been scoped into the assessment because there is potential for the presence of the trenches (and any associated sheet piling) across the intertidal zone to interrupt alongshore sediment transport, which generally moves from north to south (Seagreen, 2012, Chapter 7: Physical Environment).

- **Cable installation activities in the intertidal and subtidal zones may increase suspended sediment concentration (SSC) within the water column and deposit material on seabed**

This potential impact has been scoped into the assessment because the trenching activities will disturb sediments from the sea bed and intertidal shore.

- **Flood Risk**

Flood risk will be considered as part of the onshore application, with respect to potential effects on onshore receptors. However, results of the assessment undertaken to support the onshore application will be summarised and presented in the Environmental Report and any implications for receptors seaward of MHWS will be considered.

## 4.5 Benthic Ecology and Intertidal Ecology (including Annex I habitats)

### 4.5.1 Data sources

The following data sources will be utilised to inform the assessment of potential impacts on Benthic Ecology (including Annex I habitats) within the Environmental Report:

- Seagreen (2012) Environmental Statement Volume I, September 2012 (Chapter 11: Benthic Ecology and Intertidal Ecology) and supporting technical appendices;
- IECS (2012) Firth of Forth (Round 3) Offshore Wind Farm Development: Survey Report Benthic Services – Export Cable Route. Report to Seagreen Wind Energy Ltd. 12th July 2012;
- Envision Mapping (2012) Firth of Forth OSWF: Phase 1 & ECR Habitat Mapping Analysis Firth of Forth OSWF Habitat Mapping. Report to Seagreen Wind Energy Ltd;
- Strategic Environmental Assessment (SEA) Region 5 (Eleftheriou *et al*., 2004);
- Bates, C.R., Moore, C.G., Malthus T., Mair J.M. and Karpouzli, E., (2004) Broad scale mapping of habitats in the Firth of Tay and Eden Estuary, Scotland, Scottish Natural Heritage Commissioned Report No. 007;
- Eleftheriou, A. and Robertson, M.R. (1988) The Intertidal Fauna of Sandy Beaches – A Survey of the East Scottish Coast, Scottish Fisheries Research Report Number 38 1988ISSN 0308 8022; and
- Marine Scotland Information web portal (http://marine.gov.scot/).

### 4.5.2 Overview of baseline environment

The intertidal area in the vicinity of the proposed cable installation works is not described as species rich or habitat diverse. The artificial substrata of the rock revetment as well as areas of exposed bedrock or washed up timber support high diversity of species and habitats. The rock revetment is colonised by yellow/orange and grey lichens (e.g. *Xanthoria parietina* and *Caloplaca marina*), black lichens (e.g. *Verrucaria maura*), with winkles (*Littorina saxatilis* and *Melarhaphe neritoides*), limpet (*Patella vulgata*), barnacle (*Semibalanus balanoides*) and mussel (*Mytilus edulis*). The mobile and exposed sediments of the sandy beach are very species poor, lacking benthic fauna and macrofauna. The lower eulittoral sediments are dominated by polychaetes. Tidal pools are also species poor, only supporting fish and mobile species caught by the falling tide, however, the sand mason worm (*Lanice conchilega*) is occasionally found (Seagreen, 2012, Chapter 11: Benthic Ecology and Intertidal Ecology).

### 4.5.3 Impacts Scoped In

The Environmental Report will contain an assessment of the following potential impacts:

- **Cable installation activities may result in temporary intertidal and subtidal habitat loss/disturbance**

This potential impact has been scoped into the assessment, as the excavation of either one (Option 1) or three (Option 2) trenches across the intertidal and subtidal zones, together with associated working areas, will create a direct footprint of disturbance for intertidal and subtidal benthic communities.

- **Removal and replacement of the rock revetment may result in temporary habitat loss/disturbance**

This potential impact has been scoped into the assessment as the removal of a section of the rock revetment and temporary storage of material on other areas of the revetment will create a direct footprint of disturbance for colonising benthic communities.

- **Cable installation activities in the intertidal and subtidal zones may result in temporary increases in SSC and associated sediment deposition**

This potential impact has been scoped into the assessment as the excavation of either one (Option 1) or three (Option 2) trenches within the intertidal and subtidal area, and the removal of either 32,400 $m^3$ (Option 1) or 9,720 $m^3$ (Option 2) of sediment may result in temporary elevations in SSC in the water column in the subtidal zone and potentially in the intertidal zone in the event that the works are not undertaken at low water (i.e. in the dry). Increased SSC may also then result in the deposition of sediment on the sea bed, leading to smothering of benthic communities.

### 4.5.4 Impacts Scoped Out

It is proposed that the following impacts are scoped out:

- **Cable installation activities may result in seabed disturbances leading to the release of sediment contaminants**

The potential for cable installation activities to result in the resuspension of sediment-bound contaminants and subsequent adverse effects on benthic ecology has been scoped out of the assessment. This is on the basis that the sediments present in the intertidal zone in the proposed construction area are predominantly sands (i.e. low fines) and are therefore unlikely to act as a significant sink for contaminants. The magnitude of any impact is likely to be negligible and no further assessment is considered to be required.

- **Cable installation activities may result in accidental release of pollutants**

The potential for accidental release of pollutants affecting benthic ecology receptors has been scoped out of the assessment, on the basis of the management measures which include pollution prevention and control measures. The management measures reduce the likelihood of impact to a negligible level and no further assessment is considered to be required.

## 4.6 Natural Fish and Shellfish Resource

### 4.6.1 Data sources

The following data sources will be utilised to inform the assessment of potential impacts on Natural Fish and Shellfish Resource within the Environmental Report:

- Seagreen (2012) Environmental Statement Volume I, September 2012 (Chapter 12: Natural Fish and Shellfish Resource) and supporting technical appendices;
- Seagreen (2013a) Environmental Statement Addendum (Chapter 4: Fish and Shellfish);
- Seagreen (2013b) Seagreen Phase 1 Offshore Project Habitats Regulations Appraisal, Information to Inform Appropriate Assessment;
- Seagreen (2018) Environmental Impact Assessment Report, Optimised Project Design (Chapter 9: Natural Fish and Shellfish Resource) and supporting technical appendices;
- Strategic Environmental Assessment (SEA) Region 5 (Eleftheriou *et al*., 2004);
- Coull., K.A., Johnstone, R. and Rogers, S.I., (1998) Fisheries Sensitivity Maps in British Waters. Published and distributed by UKOOA Ltd;
- Ellis, J.R., Milligan, S., Readdy, L., South, A., Taylor, N. and Brown, M., (2010) Mapping spawning and nursery areas of species to be considered in Marine Protected Areas (Marine Conservation Zones);
- Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J., (2012) Spawning and nursery grounds of selected fish species in UK waters. Cefas Science Series, Technical Report 147; and
- Marine Scotland Information web portal (http://marine.gov.scot/).

### 4.6.2 Overview of baseline environment

ICES Rectangles 41E7 and 42E7 are in the vicinity of the proposed work area, however, it is unlikely that many of the species found within these rectangles will be found in any great numbers close to shore. This area provides spawning and nursery areas for herring, whiting, *Nephrops*, cod, sandeel, plaice and lemon sole, as well as nursery areas for spurdog, tope shark, common skate, blue whiting, ling, hake, anglerfish, mackerel, sprat and saithe (Coull et al, 1998; Ellis et al, 2012). King scallop (*Pecten maximus*) and queen scallop (*Aequipecten opercularis*) are also present in the area (Seagreen, 2018, Chapter 9: Natural Fish and Shellfish Resource). Migratory, or diadromous, fish are also present. Atlantic salmon (*Salmo salar*) are Annex II species present in the River Tay and River South Esk. Most fish leave rivers around mid-April to end of May (Seagreen, 2018, Chapter 9: Natural Fish and Shellfish Resource).

### 4.6.3 Impacts Scoped In

The Environmental Report will contain an assessment of the following potential impacts:

- **Cable installation activities in the subtidal zone may result in temporary subtidal habitat loss/disturbance**

This potential impact has been scoped into the assessment as the excavation of either one (Option 1) or three (Option 2) trenches within the nearshore area will result in direct disturbance to subtidal sediments and may result in potential effects on fish and shellfish species. The effect of this impact on marine fish species, shellfish populations and diadromous fish species will be considered in the Environmental Report.

- **Cable installation activities in the subtidal zone may result in temporary increases in SSC and associated sediment deposition**

This potential impact has been scoped into the assessment as the excavation of either one (Option 1) or three (Option 2) trenches within the nearshore subtidal area may result in temporary elevations in SSC in the water column which may have adverse effects on fish and shellfish, particularly sensitive life stages such as eggs and larvae. The subsequent deposition of sediment on the sea bed may also result in adverse effects on fish and shellfish through smothering of shellfish species and smothering of spawning or nursery grounds for sensitive species.

- **Cable installation activities may result in underwater noise**

This potential impact has been scoped into the assessment as the excavation of either one (Option 1) or three (Option 2) trenches within the nearshore subtidal area and the potential use of sheet piling at the rock revetment and in the subtidal zone has the potential to generate underwater noise which may have adverse effects on sensitive fish and shellfish receptors.

#### 4.6.4 Impacts Scoped Out

It is proposed that the following impacts are scoped out:

- **Cable installation activities may result in seabed disturbances leading to the release of sediment contaminants**

The potential for cable installation activities to result in the resuspension of sediment-bound contaminants and subsequent adverse effects on fish and shellfish ecology has been scoped out of the assessment. This is on the basis that the sediments present in the intertidal zone in the proposed construction area are predominantly course sands (i.e. low fines) and are therefore unlikely to act as a significant sink for contaminants. The magnitude of any impact to fish and shellfish receptors is likely to be negligible and no further assessment is considered to be required.

- **Cable installation activities may result in accidental release of pollutants**

The potential for accidental release of pollutants affecting fish and shellfish ecology receptors has been scoped out of the assessment, on the basis of the management measures which include pollution prevention and control measures. The management measures reduce the likelihood of impact to a negligible level and no further assessment is considered to be required.

### 4.7 Marine Mammals

#### 4.7.1 Data sources

The following data sources will be utilised to inform the assessment of potential impacts on Marine Mammals within the Environmental Report:

- Seagreen (2012) Environmental Statement Volume I, September 2012 (Chapter 13: Marine Mammals) and supporting technical appendices;
- Seagreen (2013a) Environmental Statement Addendum (Chapter 3: Marine Mammals);
- Seagreen (2013b) Seagreen Phase 1 Offshore Project Habitats Regulations Appraisal, Information to Inform Appropriate Assessment;
- Seagreen (2016a) Seagreen Phase 1 Onshore Transmission Works Habitats Regulations Appraisal Screening Report (Chapter 3: Special Areas of Conservation);
- Seagreen (2018) Environmental Impact Assessment Report, Optimised Project Design (Chapter 10: Marine Mammals) and supporting technical appendices;
- Paxton *et al*. (2016) Revised Phase III Joint Cetacean Protocol (JCP) Data Resource. JNCC Report and Advisory Note. No. 517. March 2016;
- NOAA (2016) Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. National Marine Fisheries Service (NOAA); and
- Marine Scotland Information web portal (http://marine.gov.scot/).

### 4.7.2 Overview of baseline environment

Harbour seal are found in nationally important numbers (2% of UK population) during the breeding season in the Firth of Tay and Eden Estuary SAC (JNCC, 2019). The most recent count of harbour seal during the August moult count (2011-2016) for the East Scotland Management Unit (MU) was 368. Most of these were counted in the Firth of Forth with a small number counted in the Firth of Tay. The population in the Firth of Tay and Eden Estuary SAC was estimated at 71 in 2016 (Seagreen, 2018, Chapter 10: Marine Mammals). The East Coast Scotland MU grey seal population size has been estimated at 10,891 (for count period 2008-2016), with the majority of grey seals counted in the Firth of Tay and Eden Estuary SAC located in the Abertay and Tentsmuir area (during August surveys).

There are populations of bottlenose dolphin, harbour porpoise and minke whale present within the vicinity of the proposed works, with occasional sightings of white-beaked dolphin. The density of animals (harbour and grey seals) within Carnoustie Bay is relatively low in comparison to other areas of the east coast of Scotland (Duck *et al*., 2015; Marine Scotland, 2017). The closest harbour seal haul out to Carnoustie Bay is at Buddon Ness which lies approximately 3 km to the south with the main portion of the population being found some 15 km to the east within the Tay Estuary. The main proportion of the grey seal population is further to the south, with main haul-outs around Tentsmuir, approximately 7 km to the southwest of the proposed works.

### 4.7.3 Impacts Scoped In

The Environmental Report will contain an assessment of the following potential impacts:

- **Cable installation activities may result in noise disturbance of marine mammals**

This potential impact has been scoped into the assessment as there is the potential for sheet piling to be used at the rock revetment and in the subtidal zone to support the trench sides. Installation of

the sheet piles will generate underwater noise which may have adverse effects on marine mammals. Vessel and plant will also generate noise during construction and this has the potential to disturb marine mammals in the vicinity of the works.

### 4.7.4 Impacts Scoped Out

It is proposed that the following impacts are scoped out:

- **Vessel traffic associated with cable installation activities may result in collision risk**

This impact has been scoped out of the assessment on the basis that collision between machinery/vessels and marine mammals in the nearshore area is very unlikely. Cable installation activities will take place in very shallow water and harbour seals (designated species of the Firth of Tay and Eden Estuary SAC) predominantly haul out within Firth / Estuary areas, rather than on the open coastline. Grey seals from the Isle of May SAC and Berwickshire and Northumberland Coast SAC may forage close to shore and bottlenose dolphin from the Moray Firth SAC are also likely to be close to the landfall as they forage up and down the east coast of Scotland. Vessels will be confined to a very small area in the nearshore subtidal zone, down to a depth of 2.5 m LAT (approximately 360 m from MHWS and 190 m from MLWS) and vessels will only be present for a relatively short period (a maximum of 8 weeks). Marine mammals are highly mobile and would be able to avoid any vessels. Given the short period over which vessels will be present, the proximity to shore, and the high mobility of marine mammals, the magnitude of the potential impact is considered to be negligible and no further assessment is considered to be required.

- **Increased SSC from cable installation activities may impair the foraging ability of marine mammals**

The potential for increased SSC from cable installation activities to impair the foraging ability of marine mammals has been scoped out of the assessment. This is on the basis that elevations in SSC in the nearshore area are anticipated to be of small magnitude (i.e. restricted in extent and concentration), intermittent and of short duration and temporary (over a period of 8 weeks in the intertidal and subtidal zones, see Section 2.6) with a rapid return to background concentrations following completion of excavation works. Marine mammals are also highly mobile and would be able to avoid any areas of temporarily increased SSC and exploit prey resources in the wider area. The effect is anticipated to be negligible and no further assessment is considered to be required.

- **Cable installation activities may lead to changes in the fish and shellfish community (i.e. prey)**

The potential for cable installation activities in the nearshore to lead to changes in the abundance/distribution of prey species for marine mammals has been scoped out of the assessment. This is on the basis that, as discussed in Appendix 1, no significant adverse effects on fish and shellfish receptors are predicted as a result of the proposed works. Therefore, any subsequent effects on marine mammals are anticipated to be negligible and no further assessment is considered to be required.

- **Cable installation activities may result in accidental release of pollutants**

The potential for accidental release of pollutants affecting marine mammals has been scoped out of the assessment, on the basis of the management measures which include pollution prevention and control measures. The management measures reduce the likelihood of impact to a negligible level and no further assessment is considered to be required.

## 4.8 Ornithology

### 4.8.1 Data sources

The following data sources will be utilised to inform the assessment of potential impacts on birds within the Environmental Report:

- Seagreen (2012) Environmental Statement Volume I, September 2012 (Chapter 10: Ornithology) and supporting technical appendices;
- Seagreen (2013a) Environmental Statement Addendum (Chapter 2: Ornithology);
- Seagreen (2013b) Seagreen Phase 1 Offshore Project Habitats Regulations Appraisal, Information to Inform Appropriate Assessment;
- Seagreen (2016b) Environmental Statement Volume I, June 2016, Chapter 9: Ecology and Ornithology and supporting technical Appendix 9.4: Intertidal Bird Survey and Appendix 9.8: Overwintering Bird Survey 2015-2016;
- Seagreen (2016c) Seagreen Phase 1 Onshore Transmission Works Habitats Regulations Appraisal Screening Report (Chapter 4: Special Protected Areas); and
- Seagreen (2018) Environmental Impact Assessment Report, Optimised Project Design (Chapter 7: Ornithology) and supporting technical appendices.

### 4.8.2 Overview of baseline environment

The Outer Firth of Forth and St Andrews Bay Complex pSPA is proposed to be designated for a variety of bird populations of European importance including Arctic tern, Atlantic puffin, common tern, Manx shearwater, northern gannet, black-headed gull, common eider common goldeneye, common gull, common scoter, little gull, long-tailed duck, razorbill, red-breasted merganser, red-throated diver, Slavonian grebe, velvet scoter, guillemot, European shag, herring gull and kittiwake (SNH, 2016). The Firth of Tay and Eden Estuary SPA and Ramsar site supports breeding marsh harrier and little tern, and overwintering populations of bar-tailed godwit, greylag goose, pink footed goose and redshank. It also supports an internationally important assemblage of overwintering waterfowl including cormorant, pink-footed goose, greylag goose, shelduck, eider, long-tailed duck, common scoter, velvet scoter, goldeneye, red-breasted merganser, oystercatcher, grey plover, sanderling, dunlin, black-tailed godwit, bar-tailed godwit and redshank.

During an intertidal survey between 2015 and 2016 (Seagreen, 2016b) a total of 41 different bird species were recorded, 16 of which were species associated with the Firth of Tay and Eden Estuary SPA and Ramsar site and 14 of which were species associated with the Outer Firth of Forth and St Andrews Bay Complex pSPA. The most common species were observed to be a mixed assemblage of seagulls, waders, ducks and divers occurring across the intertidal area of the landfall. For all species recorded, the distribution across the survey area was generally even with no distinct clusters of activity, other than for a rocky area towards the north where many species

(e.g. oystercatcher) were observed to be roosting. However, across the intertidal area these species were recorded as being evenly distributed. Birds are also regularly disturbed by other activities such as shooting at the Barry Sands firing range and by dog walkers (Seagreen, 2016b).

#### 4.8.3 Impacts Scoped In

The Environmental Report will contain an assessment of the following potential impacts:

- **Cable installation activities may result in temporary disturbance or displacement of birds**

This impact has been scoped into the assessment as cable installation activities in the intertidal and subtidal zones have the potential to result in temporary disturbance and displacement of birds due to the presence of vessels and plant, resulting primarily in visual and noise disturbance effects.

#### 4.8.4 Impacts Scoped Out

It is proposed that the following impacts are scoped out:

- **Cable installation activities may result in temporary habitat loss for prey species**

The potential for cable installation activities to result in temporary habitat loss for prey species has been scoped out of the assessment, on the basis that there will be minimal loss of benthic habitats utilised by bird species to forage and other habitat will be available in Carnoustie Bay and the wider Angus and Fife coast. The total area of habitat affected by trenching within the intertidal and subtidal zones is approximately 10,800 $m^2$ (Option 1) or 3,240 $m^2$ (Option 2) and represents a relatively small proportion of the wider habitats available for birds to forage. The trenches will be backfilled following cable installation, and the dynamic nature of the intertidal and subtidal zones will ensure rapid reinstatement of the benthic environment. For these reasons, no further assessment is considered to be required.

### 4.9 Commercial Fisheries

#### 4.9.1 Overview of baseline environment

The predominant fishing activity along the export cable route corridor is dredging for scallops *Pecten maximus*, with lower levels of activity attributed to bottom otter trawling targeting nephrops and squid *Loligo sp*., as well as creelers targeting lobster *Homarus gammarus* and crabs *Cancer pagurus* and *Necora puber* (Seagreen, 2012, Chapter 14: Commercial Fisheries). Inshore areas recorded negligible whitefish fisheries activity (Seagreen, 2012: Chapter 14: Commercial Fisheries; Seagreen, 2018: Chapter 11: Commercial Fisheries) and there is a higher density of fishing vessel activity on the eastern part of the export cable route corridor when compared with the western part towards the landfall at Carnoustie (Seagreen, 2012: Chapter 15: Shipping and Navigation).

Scallop dredging activity along the export cable route corridor is concentrated in areas immediately adjacent to the Seagreen Alpha and Seagreen Bravo project areas and along the mid-section of the export cable route corridor. There is negligible activity recorded in the inshore section of the route. There is limited fishing activity for vessels targeting nephrops along the export cable route corridor, with activity concentrated along the western section of the route and in areas adjacent to

the landfall. There is also an artisanal summer fishery in the Forth and Tay area for mackerel, targeted by small, inshore vessels operating hand lines and jiggers. Local creel vessels may target mackerel during the summer months whilst also setting creels for lobster and crab.

### 4.9.2 Justification for Scoping Out

It is proposed that potential impacts on Commercial Fisheries receptors, including disruption and snagging risk, is scoped out of the Environmental Report. The proposed cable installation activities will take place out to 2.5 m water depth, which is very close to shore for commercial fishing activity and this area is unlikely to be targeted by many, if any, vessels. Whilst there is some fishing activity within the vicinity of the landfall most of this occurs in rocky areas to the north with no activity identified in the immediate area (Seagreen, 2012: Chapter 14: Commercial Fisheries, see Figure 4.3). In addition, the impacted area will be very small and is unlikely to be prime fishing grounds. Squid, lobster and crab fishing occurs in inshore waters, using small vessels although this activity along the export cable route is focused on areas away from the landfall and further offshore (Seagreen, 2012: Chapter 14: Commercial Fisheries; Seagreen, 2018: Chapter 11: Commercial Fisheries). Potential impacts on Commercial Fisheries receptors have also been scoped out on the basis of the management measures including Fisheries Liaison and Notices to Mariners, which will reduce the magnitude of any impact and no further assessment is considered to be required.

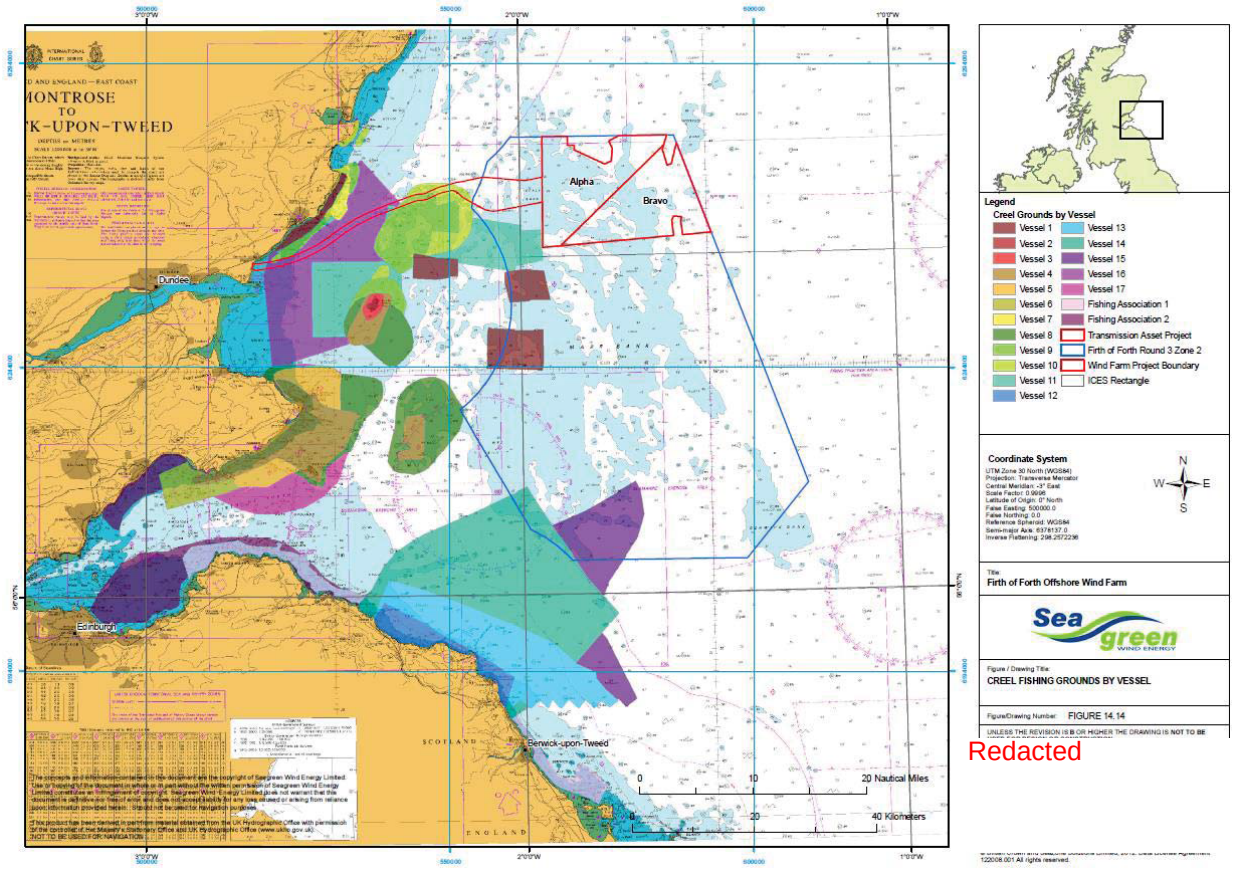


*Figure 4.3: Creel Fishing Ground by Vessel (Figure 14.14 taken from Seagreen, 2012: Chapter 14: Commercial Fisheries)*

A high intensity inshore area to the immediate north of the landfall site has been recorded over rocky ground, which is the ideal habitat of crustacea such as lobster. However, the inshore area immediately in the vicinity of the landfall is not reported to be fished by vessels (Seagreen 2012: Chapter 14: Commercial Fisheries) and with a sandy substrate the landfall area is unlikely to be prime habitat for crabs and lobster.

## 4.10 Shipping and Navigation

### 4.10.1 Overview of baseline environment

Navigational features in close proximity to the landfall include the Barry Buddon Military PEXA D604 (weapons firing and demolition) off Buddon Ness on the northern side of the River Tay. Other features include the River Tay Pilotage station, a charted spoil ground, an anchorage off the coast of Buddon Ness and a charted foul 1 NM south of the export cable route corridor, however none of these features are in proximity to the landfall (Seagreen, 2012: Chapter 15: Shipping and Navigation).

Vessels intersecting the export cable route corridor (Figure 4.4) are generally headed in a north east to south west direction to/from the Firth of Forth or in a north west to south east direction to/from Montrose.

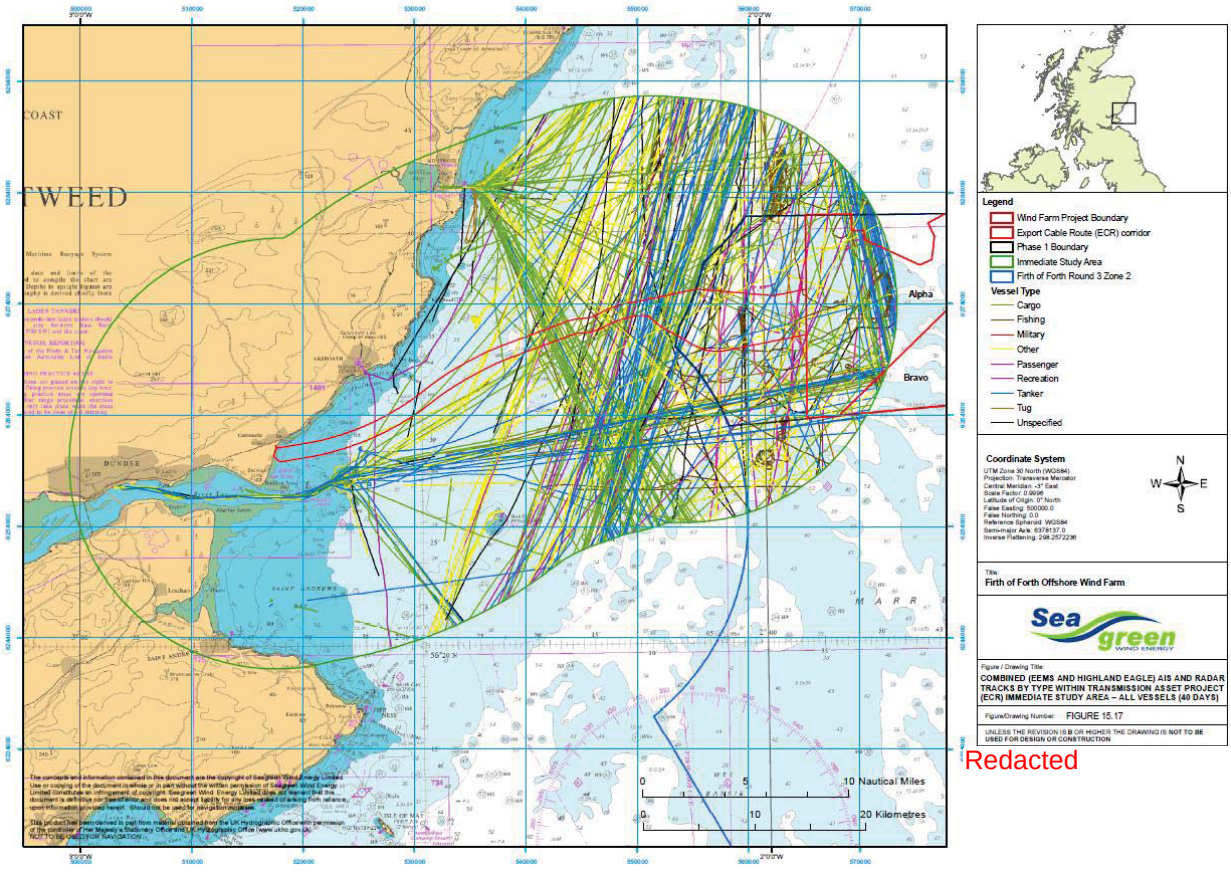


*Figure 4.4: AIS and radar tracks by type within export cable route corridor study area (Figure 15.17 taken from Seagreen, 2012: Chapter 15: Shipping and Navigation).*

The closest anchorage is located 0.8 NM to the south of the export cable route corridor and there are no anchorage areas close to the landfall (Seagreen, 2012: Chapter 15: Shipping and Navigation). Recreational vessels intersect the export cable route corridor either headed between north eastern Scotland (Stonehaven/Peterhead) and the Firth of Tay and Firth of Forth or headed to/from Arbroath. The export cable route corridor intersects a 'general sailing' area within approximately 3 NM of the coast. There is a sailing and boating club at Arbroath which holds a number of events and races during the summer. However, the vast majority of vessel traffic is further offshore than the proposed landfall works (Seagreen, 2012: Chapter 15: Shipping and Navigation) and in water depths greater than 2.5 m LAT.

Marine traffic survey data (2017) showed that presence of vessels in the vicinity of the proposed works was low. There are no anchorage areas, spoil grounds or licensed marine aggregate dredging areas within the vicinity (Seagreen, 2018: Chapter 12 Shipping and Navigation). There is some use of the waters by recreational users through activities such as sea kayaking and windsurfing.

#### 4.10.1 Justification for Scoping Out

It is proposed that potential impacts on Shipping and Navigation receptors is scoped out of the Environmental Report, including obstructions and snagging risk. The proposed cable installation activities will take place in shallow water out to 2.5 m water depth where very little shipping activity takes place. The management measures, such as Notices to Mariners, will reduce the magnitude of any impact and no further assessment is considered to be required.

### 4.11 Archaeology and Cultural Heritage

#### 4.11.1 Data sources

The following data sources will be utilised to inform the assessment of potential impacts on Archaeology and Cultural Heritage within the Environmental Report:

- Seagreen (2012) Environmental Statement Volume I, September 2012 (Chapter 17: Archaeology and Cultural Heritage);
- Headland Archaeology (2012) Firth of Forth Round 3 Offshore Wind Farm Phase 1 Maritime Cultural Heritage Baseline Technical Report; and
- Latest datasets available from the Marine Scotland Information web portal (http://marine.gov.scot/), including Losses and Wrecks datasets (November 2018); Sites and vessels designated under the Protection of Military Remains Act 1986; and Historic Marine Protected Areas (HMPAs).

#### 4.11.2 Overview of baseline environment

The nearest recorded wreck location to the landfall is approximately 2 km to the north east and outside of the export cable route corridor (see Figure 4.5).

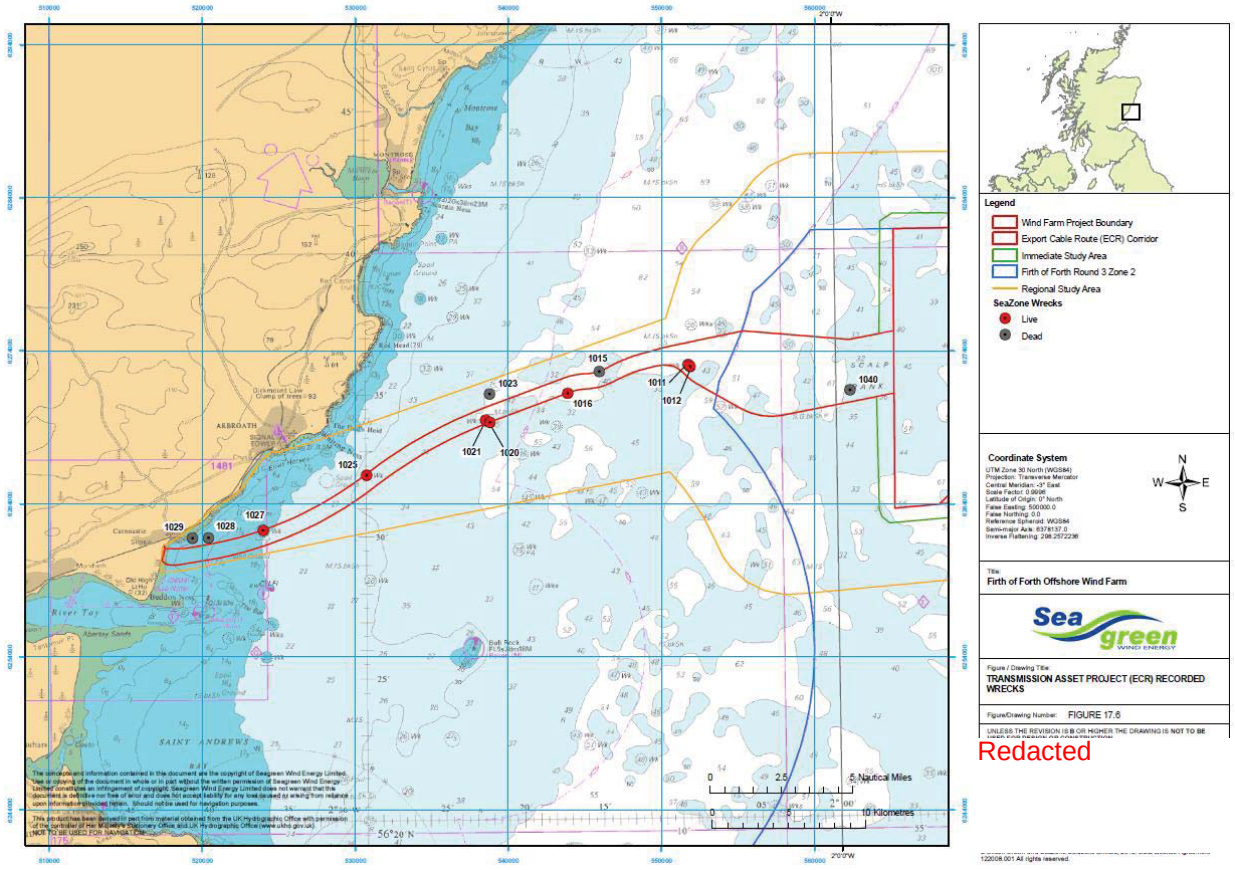


*Figure 4.5: Recorded wrecks in the vicinity of the export cable route corridor (Figure 17.6 taken from Seagreen 2012: Chapter 17: Archaeology and Cultural Heritage).*

There are no Designated Wrecks or other cultural heritage assets with legal designations within the export cable route corridor. Seven 'Live' wrecks[3] and five 'Dead' wrecks[4] were identified within the export cable route corridor (Seagreen 2012: Chapter 17: Archaeology and Cultural Heritage).

There are a number of recorded maritime and aircraft losses within the OfTW study area considered in the ES, a number of which have known positions, and which have been confirmed in the archaeological assessment of geophysical data (Seagreen, 2012: Chapter 17: Archaeology and Cultural Heritage). A significant number of maritime loss events, both vessels and aircraft have been identified in the wider outer Forth and North Sea basin in proximity to the Seagreen Alpha and Seagreen Bravo project areas. Further, there are a large number of maritime losses listed with arbitrary or tentative locations recorded within the region. The potential for the discovery of unrecorded cultural heritage assets within the export cable route corridor was regarded as moderate (Seagreen, 2012: Chapter 17: Archaeology and Cultural Heritage).

3 Where the wreck is known or thought to exist at the assigned coordinates

4 Where the wreck is known to have been lost in this general area, but the wreck has not been identified in its recorded location, despite repeated surveys

The geoarchaeological and geotechnical assessment of the geotechnical survey borehole logs suggested that the potential for the discovery of relict land surface deposits and features of archaeological interest is low and there is limited potential for the discovery of residual artefacts.

#### 4.11.3 Impacts Scoped In

The Environmental Report will contain an assessment of the following potential impacts:

- **Cable installation activities may affect marine archaeology**

This potential impact has been scoped into the assessment as cable installation activities in the intertidal and subtidal zones have the potential to affect marine archaeology through direct impact to the seabed/foreshore. This includes direct impact from the installation activities, and from the deployment of plant/equipment and vessel moorings. It is also possible that finds of archaeological interest may be identified during the trenching activities.

### 4.12 Aviation, Military and Communications

#### 4.12.1 Data sources

The following data sources will be utilised to inform the assessment of potential impacts on Aviation, Military and Communications within the Environmental Report:

- Seagreen (2012) Environmental Statement Volume I, September 2012 (Chapter 18: Military and Civil Aviation and Chapter 20: Other Marine Users and Activities);
- Seagreen (2018) Optimised Seagreen Phase 1 Project Environmental Impact Assessment Report (Chapter 14: Military and Civil Aviation);
- NATS Aeronautical Information Package; and
- Latest datasets available from the Marine Scotland Information web portal (http://marine.gov.scot/).

#### 4.12.1 Overview of baseline environment

The application area overlaps with the Ministry of Defence (MOD) Barry Buddon firing range complex (Figure 4.6). The southern area of the Barry Sands has restricted access due to the MOD Barry Buddon firing range, which overlaps with a section of the OfTW cable corridor (see Figure 4.6 and Seagreen 2012, Chapter 20: Other Marine Users and Activities). However, the breach of the rock revetment will not occur within the restricted area.

#### 4.12.2 Impacts Scoped In

The Environmental Report will contain an assessment of the following potential impacts:

- **Cable installation activities may affect military activities**

This potential impact has been scoped into the assessment as cable installation activities have the potential to affect activities taking place within the Barry Buddon firing range.

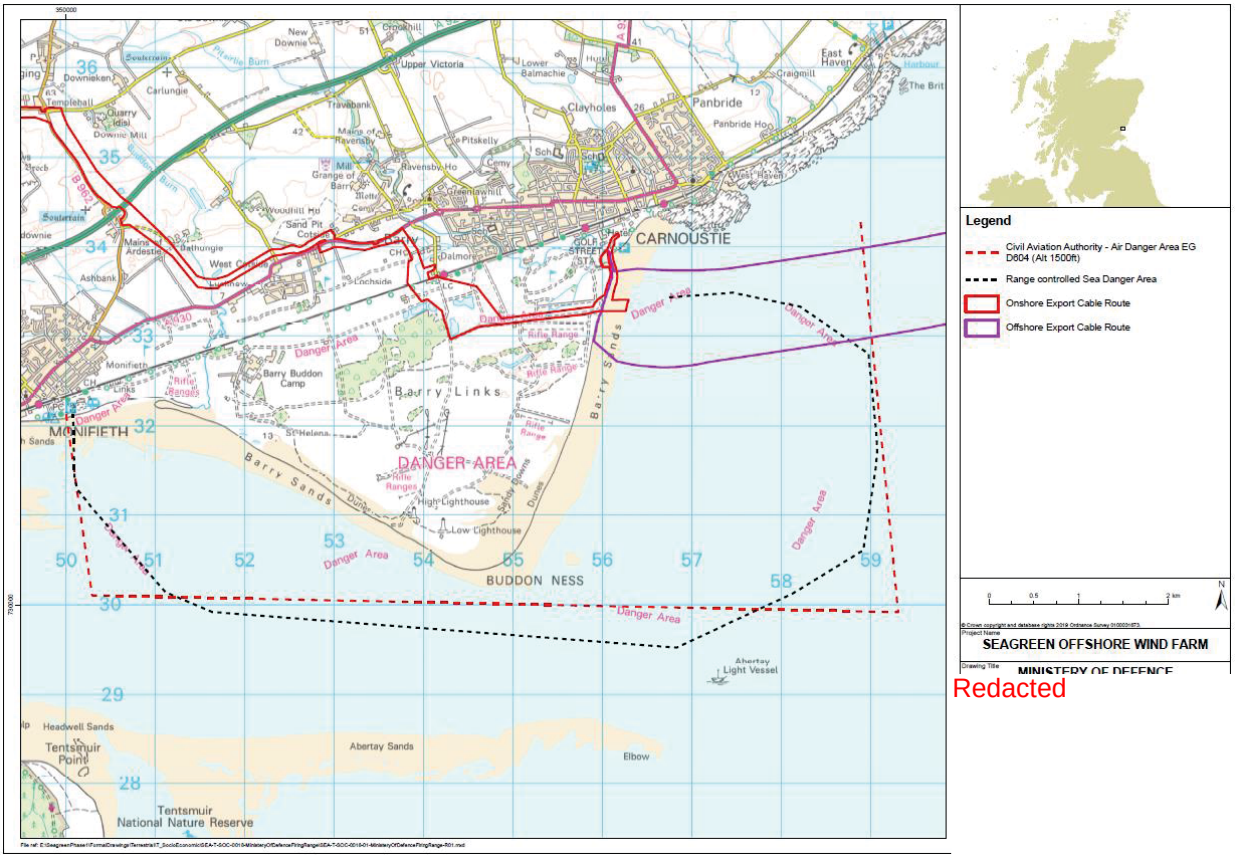


*Figure 4.6: Ministry of Defence (MoD) Firing Range*

### 4.12.3 Impacts Scoped Out

It is proposed that the following impacts are scoped out:

- **Cable installation activities may affect military and civil aviation and communications**

It is proposed that potential impacts to military and civil aviation and communications receptors are scoped out of the Environmental Report. The ES concluded that there would be no impacts upon military and civil aviation during the construction or operational phases of the OfTW (Seagreen, 2012). There is no direct impact pathway between the alternative cable installation works and airports, radar or offshore helicopter operations.

## 4.13 Other Marine Users and Activities

### 4.13.1 Data sources

The following data sources will be utilised to inform the assessment of potential impacts on Other Marine Users and Activities within the Environmental Report:

- Seagreen (2012) Environmental Statement Volume I, September 2012 (Chapter 19: Socio Economics, Tourism and Recreation and Chapter 20: Other Marine Users and Activities);
- Seagreen (2018). Optimised Seagreen Phase 1 Project Environmental Impact Assessment Report (Chapter 15: Socio Economics); and

- Latest datasets available from the Marine Scotland Information web portal (http://marine.gov.scot/).

#### 4.13.2 Overview of baseline environment

There are no oil and gas activities or aggregate extraction license areas or dredging activities in the vicinity of the proposed work. The closest open marine disposal site is 10.5 km from the proposed works (NMPI, 2019). There are no active or disused subsea communications or power cables within the vicinity (Seagreen 2018; Seagreen 2012; KIS-ORCA, 2019). The Barry Sands, Carnoustie Bay, Monifeith, Lunan Bay, Montrose Bay, Arbroath Beach and Tentsmuir beaches are used for recreational activities. Carnoustie Bay is identified as an area suitable for swimming, sailing, windsurfing, fishing, sea kayaking and surfing (Seagreen 2012, Chapter 20: Other Marine Users and Activities) and is also designated as a bathing water of good quality (see Figure 4.2). The designated bathing waters are approximately 122 m from the alternative cable installation works application boundary and approximately 148 m from the landfall.

#### 4.13.3 Impacts Scoped In

The Environmental Report will contain an assessment of the following potential impacts:

- **Cable installation activities may affect the activities of other marine user receptors in the vicinity**

This potential impact has been scoped into the assessment as cable installation activities in the intertidal and subtidal zones have the potential to affect the activities of other marine user receptors in the vicinity, including recreational receptors.

### 4.14 Seascape, Landscape and Visual Amenity

#### 4.14.1 Overview of baseline environment

The landfall area is low lying and has a strong horizontal emphasis, heightened on the coastal edge by extensive rocky platforms interspersed with lengths of sandy beach. Low dunes and coniferous plantations add small scale vertical elements in some areas. Generally the seascape has quite a simple pattern (Seagreen 2012, Chapter 16: Seascape, Landscape and Visual Amenity). There are also few man-made focal points on the coast. Inland, there are various overhead lines which are prominent within the flat, low-lying landscape. Shipping movements are less prominent, but this is nevertheless a relatively busy seascape. There is commercial and recreational activity associated with Arbroath Harbour to the north, both inland and at sea, and recreational activity along the whole of the coastline, including water-based sports and activities such as sailing. The area is highly modified in urban areas and agricultural land and golf courses form much of the immediate hinterland. The nearest landscape designation is the high sensitivity Guynd Historic Gardens and Designed Landscapes (HGDL) located approximately 7km to the north of the landfall (Seagreen 2012, Chapter 16: Seascape, Landscape and Visual Amenity). However, Seagreen (2012) identified the landfall as lying within an area of medium sensitivity.

### 4.14.2 Justification for Scoping Out

Seascape, landscape and visual amenity has been scoped out of the Environmental Report on the basis that the ES (Seagreen, 2012) considered project impacts including excavation of the intertidal area and the presence of vessels and plant to be not significant. The alternative cable landfall works are unlikely to increase the magnitude of potential impacts at the landfall. In addition, any effects will be short term (approximately four months), temporary (the rock revetment, intertidal and subtidal zones will all be returned to their original profile) and there will be no new permanent structures constructed as part of the works seaward of MHWS.

## 4.15 Cumulative Effects

Other plans and projects in the vicinity of the landfall include the Barry Buddon Military Practice and Exercise Area (PEXA) and Training Camp, and an aggregate (sand and gravel) resource area, which overlap with the proposed Seagreen alternative cable installation methodology application boundary. Both projects are considered to be part of the baseline (and will be considered under Military, Aviation and Communication and Other Marine Users and Activities as noted above) and are therefore not considered likely to contribute to cumulative effects with the alternative cable landfall installation works. There are no other proposed or existing cable or pipeline installation projects at the cable landfall (Marine Scotland, 2018). The ES (Seagreen, 2012) did not identify any significant cumulative effects at the landfall.

The alternative cable landfall installation methodology forms part of the wider Seagreen Alpha and Bravo projects and no significant cumulative effects are anticipated on any environmental receptor with the wider Seagreen construction activities. However, the Environmental Report will need to consider the potential for cumulative effects arising from other Seagreen construction activities as follows:

- Installation works associated with other phases of the Seagreen OfTW construction, including the remaining OfTW installation works.

Due to the distance between the OfTW landfall works and the offshore wind farm site (approximately 70 km), cumulative effects arising from this phase of the works have been scoped out.

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## Appendix 1: Review of potential for significant adverse effects on the environment

This Appendix sets out the results of a review prepared by Seagreen to consider whether or not the potential impacts scoped into the assessment (as presented in Section 4) are likely to have a significant adverse effect on the environment, with specific reference to The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the '2017 EIA Regulations'). Seagreen has carried out this review considering the characteristics of the potential impact in terms of the **magnitude and spatial extent** of the impact, the **nature** of the impact, the **intensity and complexity** of the impact, and the **probability**, **duration, frequency** and **reversibility** of the impact. The conclusions of this review were summarised in Section 3.2.4, and support the position that the proposed works are not an EIA project. Seagreen proposes that the Marine Licence application is supported by a concise Environmental Report, which will provide an assessment of each potential impact scoped into the assessment.

**Physical Environment and Water Environment**

- **Cable installation activities may disturb geomorphological features of the Barry Links SAC, SSSI and GCR**

It is considered that this potential impact is not likely to have a significant adverse effect on the environment, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. In terms of the magnitude and spatial extent of the impact, the worst case scenario is represented by Option 2, with a total area affected by trenching activities within the intertidal and subtidal zones and associated working areas in the intertidal zone of up to 21,940 $m^2$ (0.022 $km^2$) (see Table 2.1). However, installation activities will not take place across the entire length of the intertidal and subtidal zones for the full installation period, with many areas either remaining un-impacted, or able to recover for a period of time after initial impacts have occurred.

Although the final export cable route across the intertidal area has not been confirmed, the proposed location for the trench through the revetment is located to the north of the boundary of the Barry Links Special Area of Conservation (SAC),Site of Special Scientific Interest (SSSI) and Geological Conservation Review (GCR) site (see Figure 1.3) and therefore cable installation activities are unlikely to directly disturb these sites. The upper beach consists of the rock revetment (MHWS extends half way up the rock revetment) which has replaced the crest of the backing dune and its landward slope (Seagreen, 2012, Chapter 7: Physical Environment) therefore effects on dune features are not anticipated. In terms of the nature, duration, frequency and reversibility of the impact, disturbance will be temporary and relatively short term (up to four months), occurring over one installation event (Option 1) or over one installation event per cable (Option 2), and reversible, since it is expected that the behaviour characteristics of the directly affected areas will be reinstated naturally within a few tidal cycles. For these reasons, and due to the management measures set out in Section 2.5, it is considered that there will be no significant adverse effects on the Barry Links SAC, SSSI and GCR.

In Section 2.2 it was noted that the intertidal zone has the potential to be shorter than suggested by the charted data (see Figure 1.3). However, as the distance from the toe of the rock revetment to a depth of 2.5 m LAT is considered to be 360 m long as a worst case the potential area affected remains 21,940 $m^2$ and the assessment above does not change.

- **Cable installation activities may affect sediment transport processes**

It is considered that this potential impact is not likely to have a significant adverse effect on the environment, taking into account the criteria in Schedule 3 of the 2017 EIA regulations, for the following reasons. In terms of the magnitude and spatial extent of the impact, cable installation activities will involve the excavation of either one (Option 1) or three (Option 2) trenches across the intertidal (170 m length) and subtidal (190 m length) zones with the potential for sheet piling in the rock revetment and subtidal areas and trench boxes in areas of dry ground. The net longshore drift of beach sediment within Carnoustie Bay is north to south (Seagreen, 2012, Chapter 7: Physical Environment). In terms of the nature, duration, frequency and reversibility of the impact, effects will be temporary and relatively short term (up to four months), occurring over one installation event (Option 1) or over one installation event per cable (Option 2). Any effects on sediment transport processes are likely to be minor. Effects will also be reversible, as the rock revetment will be reinstated, the intertidal area will be backfilled on completion of the works and the subtidal area will be allowed to backfill naturally. In addition, it is expected that the behaviour characteristics of the directly affected areas will be reinstated naturally within a few tidal cycles (Seagreen, 2012, Chapter 7: Physical Environment). Therefore, it is considered that there will be no significant impact upon longshore sediment transport processes within Carnoustie Bay as a result of the temporary presence of trenches.

- **Cable installation activities in the intertidal and subtidal zones may increase SSC within the water column and deposit material on the seabed**

It is considered that this potential impact is not likely to have a significant adverse effect on the environment, taking into account the criteria in Schedule 3 of the 2017 EIA regulations, for the following reasons. In terms of the magnitude and spatial extent of the impact, increases in SSC are likely to be localised, with deposition occurring within a short distance either side of the trench. In terms of the nature, duration, frequency and reversibility of the impact, increases in SSC will be temporary and occur over a relatively short duration of trenching and backfilling activity, occurring over one installation event (Option 1) or over one installation event per cable (Option 2). Effects will also be reversible, with SSC likely to return to baseline levels relatively quickly following completion of works (Seagreen, 2012, Chapter 7: Physical Environment). The location of the trenching in the intertidal and subtidal zones is an area of breaking wave activity where sediment transport is most likely to occur (although this natural process is limited in magnitude) and hence there would be relatively high SSC levels in these zones under baseline conditions. The temporary and localised increase in SSC and associated deposition is not likely to be beyond the range of conditions naturally experienced due to varying wave climate under baseline conditions (Seagreen, 2012, Chapter 7: Physical Environment).

- **Flood Risk**

Flood risk will be considered as part of the onshore application. However, results of the assessment undertaken to support the onshore application will be summarised and presented in the Environmental Report and any implications for receptors seaward of MHWS will be considered.

**Benthic Ecology and Intertidal Ecology**

- **Cable installation activities may result in temporary intertidal and subtidal habitat loss/disturbance**

It is considered that this potential impact is not likely to have a significant adverse effect on intertidal and subtidal ecology, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. The magnitude and spatial extent of the impact is considered to be relatively small in the context of similar habitats in the wider area (Seagreen, 2012, Chapter 11: Benthic ecology and Intertidal Ecology). The worst case scenario is represented by Option 2, with a total area of temporary habitat loss/disturbance resulting from trenching activities and associated working areas within the intertidal and subtidal zones of up to 21,940 $m^2$ (0.022 $km^2$). In terms of the nature, duration, frequency and reversibility of the impact, habitat loss/disturbance will be temporary and will take place over a relatively short duration (up to four months), occurring over one installation event (Option 1) or over one installation event per cable (Option 2). Effects will also be reversible, with trenches in the intertidal zone being backfilled on completion of the works and trenches in the subtidal zone allowed to backfill naturally.

Benthic communities at the cable landfall were not identified as being particularly diverse or species rich and there was a lack of any species or habitats that were of particular conservation concern (Seagreen, 2012, Chapter 11: Benthic Ecology and Intertidal Ecology). These communities are anticipated to recover following cessation of the works with no long-term adverse effects. Therefore, it is considered that there will be no significant adverse effects on the benthic intertidal and subtidal communities from this impact.

In Section 2.2 it was noted that the intertidal zone has the potential to be shorter than suggested by the charted data (see Figure 1.3). However, as the distance from the toe of the rock revetment to a depth of 2.5 m LAT is considered to be 360 m long as a worst case the potential area affected remains 21,940 $m^2$ and the assessment above does not change.

- **Removal and replacement of the rock revetment may result in temporary habitat loss/disturbance**

It is considered that this potential impact is not likely to have a significant adverse effect on intertidal benthic ecology, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. The magnitude and spatial extent of the impact is considered to be relatively small in the context of similar habitats along the length of the rock revetment. The total area of disturbance resulting from the removal of a section of the revetment is up to 2,100 $m^2$ although only a portion of the rock revetment is covered at high tide therefore the area affected considering benthic communities is likely to be smaller. Removed rock material will either be transported and placed on the existing revetment to the north, reused for reinstatement, or taken to a licensed onshore disposal site if not suitable for reuse. An additional 6,000 $m^3$ of rock may be required to complete the revetment reinstatement and refurbishment, providing some additional surfaces for colonisation. In terms of the nature, duration, frequency and reversibility of the impact, habitat loss/disturbance will be temporary and will take place over a relatively short duration (up to four months), occurring over one installation event. In addition, a fourth HDPE pipe

will be installed in the rock revetment as a spare to avoid future disturbance. Effects will also be reversible, with the revetment reinstated following completion of works.

The rock revetment is largely colonised by lichens, winkles *Litorina saxatilis* and *Melarhaphe neritoides*, the limpet *Patella vulgata*, the barnacle *Semibalanus balanoides* and mussel *Mytilus edulis* (Seagreen, 2012, Chapter 11: Benthic Ecology and Intertidal Ecology). These communities are anticipated to recover following cessation of the works through colonisation from adjacent areas of the revetment with no long-term adverse effects. Therefore, it is considered that there will be no significant adverse effects on benthic communities from this impact.

- **Cable installation activities in the intertidal and subtidal zones may result in temporary increases in SSC and associated sediment deposition**

It is considered that this potential impact is not likely to have a significant adverse effect on intertidal and subtidal benthic ecology, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. The magnitude and spatial extent of the impact is considered to be relatively small in the context of the available intertidal and subtidal area of Carnoustie Bay. The worst case scenario is represented by Option 1, with up to 17,100 $m^3$ of sediment removed from the 190 m long subtidal zone during trench excavation activities. However, as the excavation will occur over a number of days the amount released into the subtidal zone will be substantially less than this volume each day and is unlikely to result in significant additional SSC in the water column. Due to the relatively coarse nature of the intertidal sediments (sand), they are anticipated to settle back to the sea floor very rapidly and localised to the site of initial disturbance (Seagreen, 2012, Chapter 7: Physical Environment). Intertidal excavation works will occur at low water (i.e. in the dry), and this will limit the potential for the suspension of sediments in the water column (and associated deposition). In terms of the nature, duration, frequency and reversibility of the impact, increases in SSC will be temporary and intermittent, and will take place over a relatively short duration of trenching and backfilling activity, occurring over one installation event (Option 1) or over one installation event per cable (Option 2). Effects will also be reversible, on the basis that levels of SSC are likely to rapidly return to background concentrations following cessation of the excavation works.

The location of the trenching in the intertidal and subtidal zones is an area of breaking wave activity where sediment transport is most likely to occur (although this natural process is limited in magnitude) and hence there would be relatively high SSC levels in these zones under baseline conditions. The temporary and localised increases in SSC and associated deposition in the subtidal zone is not likely to be beyond the range of conditions naturally experienced due to varying wave climate under the baseline conditions (Seagreen, 2012, Chapter 7: Physical Environment). Therefore, it is considered that there will be no significant adverse effects on the benthic intertidal and subtidal communities as a result of increased SSC and sediment deposition associated with the works.

In Section 2.2 it was noted that the subtidal zone has the potential to be longer than suggested by the charted data (see Figure 1.3). Therefore, the distance from MLWS to a depth of 2.5 m LAT has the potential to be greater than 190 m and could be up to 340 m long as a worst case (assuming the intertidal zone is only 20 m in length). This would mean that the worst case scenario (represented by Option 1) is for up to 30,600 $m^3$ of sediment removed from a 340 m long subtidal

zone. This scenario would not change the conclusions presented above on the basis that the volume of sediment released into the water column on a daily basis will be substantially less than the total volume and considering that any increases in SSC will be temporary and localised, taking place over a relatively short duration and effects will also be reversible with levels of SSC rapidly returning to background concentrations. In addition, the temporary and localised increases in SSC and associated deposition in the subtidal zone is not likely to be beyond the range of conditions naturally experienced due to varying wave climate under baseline conditions (Seagreen, 2012, Chapter 7: Physical Environment).

**Natural Fish and Shellfish Resource**

- **Cable installation activities may result in temporary subtidal habitat loss/disturbance**

It is considered that this potential impact is not likely to have a significant adverse effect on fish and shellfish ecology, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. The magnitude and spatial extent of the impact is considered to be relatively small in the context of similar habitats in the wider area. The worst case scenario is represented by Option 1, with a total area of temporary habitat loss/disturbance resulting from trenching activities and associated working areas within the subtidal zone of up to 5,700 $m^2$. In general, the nursery and spawning grounds that extend into the nearshore area are extensive and cover large areas within the Outer Firth of Forth and Firth of Tay and the wider North Sea. Therefore, only a small proportion of any spawning grounds which coincide with the landfall are likely to be affected (Seagreen, 2012, Chapter 12: Natural Fish and Shellfish Resource).

The key rivers for migratory salmon are all some distance away from the landfall, the closest being the River Tay, some 15 km to the south. While some adults may pass close to the landfall location, recent evidence suggests smolts head directly out to sea on leaving their natal river (Newton *et al*., 2017) and are unlikely to be in the vicinity of the works in any great numbers, or for any great length of time. In terms of the nature, duration, frequency and reversibility of the impact, habitat loss/disturbance will be temporary and will take place over a relatively short duration (up to four months), occurring over one installation event (Option 1) or over one installation event per cable (Option 2). Effects will also be reversible, on the basis that the trenches will be allowed to backfill naturally following the installation of the cable. Therefore, it is considered that there will be no significant adverse effects on fish and shellfish receptors, or their spawning and nursery grounds, as a result of the works.

In Section 2.2 it was noted that the subtidal zone has the potential to be longer than suggested by the charted data (see Figure 1.3). Therefore, the distance from MLWS to a depth of 2.5 m LAT has the potential to be greater than 190 m and could be up to 340 m long as a worst case (assuming the intertidal zone is only 20 m in length). This would mean that the worst case scenario (represented by Option 1) is for up to 10,200 $m^2$ of temporary habitat loss/disturbance. This scenario would not change the conclusions presented above on the basis that habitat loss/disturbance would be temporary and take place over a relatively short duration (up to four months), occurring over one installation event (Option 1) or over one installation event per cable (Option 2). Effects will also be reversible, on the basis that the trenches will be allowed to backfill naturally following the installation of the cable.

- **Cable installation activities in the subtidal zone may result in temporary increases in SSC and associated sediment deposition**

It is considered that this potential impact is not likely to have a significant adverse effect on fish and shellfish receptors, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. The magnitude and spatial extent of the impact is considered to be small, given that the volume of sediment potentially disturbed in the nearshore environment will be minimal (from MLWS down to 2.5 m LAT). The worst case scenario is represented by Option 1, with up to 17,100 $m^3$ of sediment removed from the subtidal zone (190 m in length) during trench excavation activities, although the amount of sediment released in any one day will be significantly less than this. In terms of the nature, duration, frequency and reversibility of the impact, potential increases in SSC will be temporary and will take place over relatively short duration (up to four months). Effects will also be reversible, on the basis that levels of SSC are likely to rapidly return to background concentrations following cessation of excavation works. Due to the relatively coarse nature of the nearshore sediments, they are anticipated to settle back to the sea floor very rapidly and in close proximity to the site of initial disturbance (Seagreen, 2012, Chapter 7: Physical Environment). Increases in SSC and associated deposition is not likely to be beyond the range of conditions naturally experienced due to varying wave climate under the baseline conditions.

In general the nursery and spawning grounds that extend into the nearshore area are extensive and cover large areas within the Outer Firth of Forth and Firth of Tay and the wider North Sea. Therefore, only a small proportion of any spawning grounds which coincide with the landfall are likely to be affected by increased SSC in the water column and subsequent deposition on the seabed (Seagreen, 2012, Chapter 12: Natural Fish and Shellfish Resource). Migration of Atlantic salmon takes place throughout the year with smolt downstream migration from rivers (Tay, Forth, Dee, Eden and North and South Esk) occurring between April and May (Seagreen, 2012, Chapter 12: Natural Fish and Shellfish Resource) and adults returning throughout the year with peaks in migration in late summer and early autumn. Mobile fish species will be able to avoid localised areas disturbed by increased SSC. Therefore, it is considered that there will be no significant adverse effects on fish and shellfish receptors as a result of increased SSC and sediment deposition associated with the works.

In Section 2.2 it was noted that the subtidal zone has the potential to be longer than suggested by the charted data (see Figure 1.3). Therefore, the distance from MLWS to a depth of 2.5 m LAT has the potential to be greater than 190 m and could be up to 340 m long as a worst case (assuming the intertidal zone is only 20 m in length). This would mean that the worst case scenario (represented by Option 1) is for up to 30,600 $m^3$ of sediment removed from a 340 m long subtidal zone. This scenario would not change the conclusions presented above on the same basis as described for benthic ecology and intertidal ecology above, in that any effects will be reversible, temporary and occur over a relatively short space of time.

- **Cable installation activities may result in underwater noise**

It is considered that this potential impact is not likely to have a significant adverse effect on fish and shellfish receptors, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. The magnitude and spatial extent of the impact from excavation activities is considered to be small on the basis of noise modelling (Seagreen, 2012) which demonstrated that

that the effect ranges associated with cable installation activities (including trenching) will be very small and limited to the immediate vicinity of the area where works are being carried out at a given time. The magnitude and spatial extent of the impact from sheet piling may be greater, due to the increased levels of noise produced in shallower water. The proposed activities are not in the vicinity of any spawning or nursery grounds of species that are sensitive to noise (e.g. herring, the nearest herring spawning ground is much further to the north, see Figure A1.1).

Adult salmon may be in the vicinity during sheet piling activity, but the magnitude of sound generated is expected to be relatively small scale and significantly smaller than that predicted for foundation piling at the offshore wind farm. Popper *et al*., (2014) suggest that there is a low risk of behavioural effects from noise from hammer piling beyond hundreds of metres for salmon, which is considered to be of medium sensitivity to sound. In addition, modelling of vibro-piling noise undertaken by Subacoustech (2015) for the Beatrice offshore wind farm suggests that noise levels generated by vibro-piling, which will be used to drive in the sheet piles in the rock revetment and subtidal zone (i.e. as opposed to impact piling), are substantially below injury thresholds for marine mammals (and therefore also fish) and that any lethal effects will only occur within 1 m of the piling activity. There is very little risk of lethal effect or physical injury from vibro-piling noise. Further, Subacoustech (2015) suggest that behavioural effects are only likely to occur out to hundreds of metres for marine mammals and it is therefore likely the same will apply for fish species. Therefore, it is anticipated that there will be no significant adverse effects on fish and shellfish receptors as a result of underwater noise generated during the works.

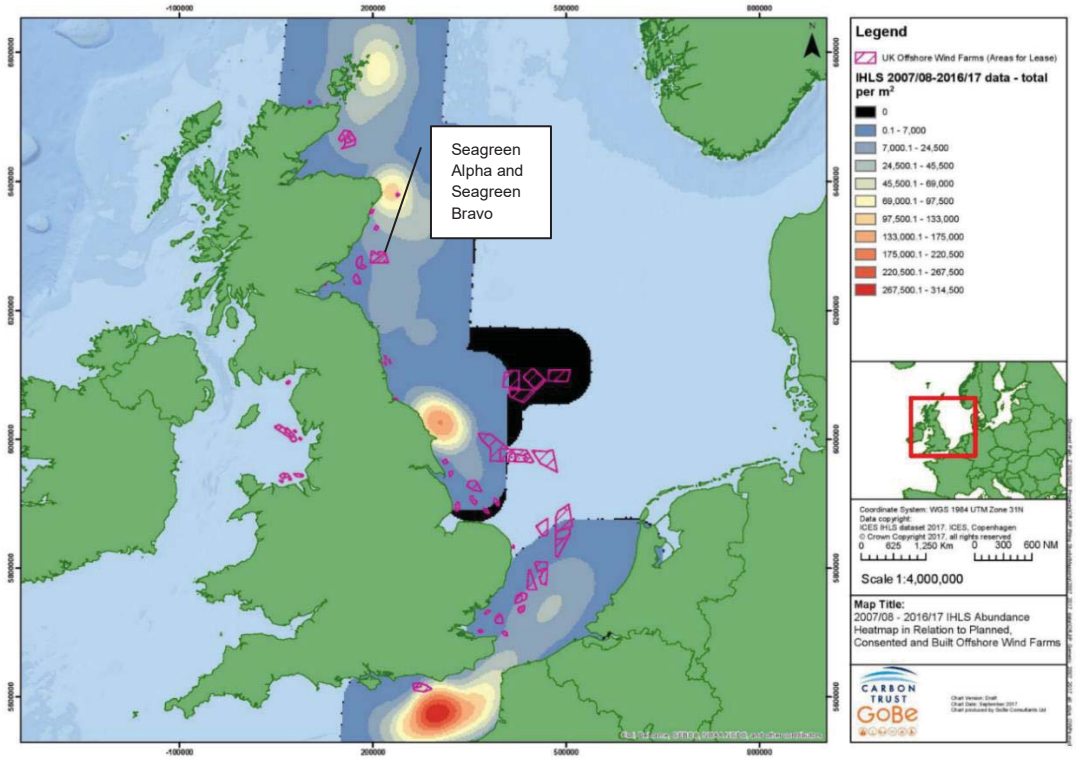


*Figure A1.1: IHLS 10 year data in relation to planned, consented and built offshore wind farms. Source Boyle and New, 2018.*

**Marine Mammals**

- **Cable installation activities may result in noise disturbance**

It is considered that this potential impact is not likely to have a significant adverse effect on marine mammals, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. The magnitude and spatial extent of the impact from excavation activities is considered to be small on the basis that the works will be restricted to shallow, nearshore waters (i.e. 2.5 m LAT (360 m from MHWS and 190 m from MLWS) where marine mammals are unlikely to be routinely present) and that noise modelling (Seagreen, 2012) has demonstrated that the effect ranges associated with cable installation activities (e.g. vessel activity and cable laying) are highly localised and limited to the immediate vicinity of the area where works are being carried out (up to a maximum of 16 m for vessel noise and 40 m for cable laying (Seagreen, 2012)).

The magnitude and spatial extent of the impact from sheet piling in the rock revetment and shallow subtidal areas may be greater than that from the excavation activities detailed above. However, modelling of vibro-piling noise undertaken by Subacoustech (2015) for the Beatrice offshore wind farm suggests that noise levels generated by vibro-piling are substantially below injury thresholds for marine mammals and that any lethal effects will only occur within 1 m of the piling activity. Further, Subacoustech (2015) suggest that behavioural effects are only likely to occur out to hundreds of metres for marine mammals, with behavioural avoidance occurring up to hundreds of metres for minke whale (410 m) and harbour porpoise (100 m) and within tens of metres for bottlenose dolphin (43 m) and harbour seal (46 m). In addition, a field study by Graham et al. (2017) demonstrated that harbour porpoise and bottlenose dolphin in the Moray Firth were not completely displaced by impact or vibration piling in a coastal habitat. Only bottlenose dolphins showed a measurable (but weak) behavioural response to both impact and vibration piling, reducing the amount of time that they spent around the construction works during piling.

The potential for injury or behavioural effects is of particular relevance to the seal populations of the Firth of Tay and Eden Estuary SAC which lies adjacent to the boundary of the proposed works and animals that may forage from the Isle of May SAC (grey seals), Berwickshire and Northumberland Coast SAC (grey seal) and the Moray Firth SAC (bottlenose dolphin). The density of animals (harbour and grey seals) within Carnoustie Bay is relatively low. The most recent records suggest between three and 10 individuals in the area around Buddon Ness for harbour seals and two to 10 individuals in the same area for grey seals (Duck *et al*., 2016; Marine Scotland, 2017). The closest harbour seal haul out site to Carnoustie Bay is at Buddon Ness which lies approximately 3 km to the south with the main portion of the population being found some 15 km to the east within the Tay Estuary. The main proportion of the grey seal population is further to the south, with main haul-out sites around Tentsmuir, approximately 7 km to the southwest of the proposed works. SMRU (2011) suggests that up to 35 individual bottlenose dolphin from the Moray Firth SAC population were observed in the vicinity of the landfall location in 2009 and 2010, although most sightings were further offshore than the landfall location (see Figure 2 in SMRU, 2011). The latest East Coast Marine Mammal Acoustic Study (ECOMMAS) data for the closest array to Carnoustie (at Arbroath, 10 km to the north east) suggests animals are up to 5 km offshore, although this may be more related to the position of the acoustic receivers than the distribution of the animals. Other marine mammal species observed during surveys of the

Seagreen Alpha and Seagreen Bravo project areas and OfTW include harbour porpoise *Phocoena phocoena* and white-beaked dolphin *Lagenorhynchus albirostris*.

Seals and other marine mammals may avoid the proposed works area due to the presence of construction vessels and from plant operating on the beach. In terms of the nature, duration, frequency and reversibility of the impact, elevations in underwater noise will be temporary and intermittent and will take place over a short duration (up to four months for vessel and plant activity and up to 21 days for sheet piling). Effects will also be reversible, with normal behaviour likely to rapidly resume following cessation of the works. Based on the low density of both harbour and grey seals and bottlenose dolphin in the area and the short duration of sheet piling activity it is considered that there will be no significant adverse effects on marine mammals as a result of underwater noise generated during the works.

**Ornithology**

- **Cable installation activities may result in temporary disturbance or displacement of birds**

It is considered that this potential impact is not likely to have a significant adverse effect on the environment, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. In terms of the magnitude and spatial extent of the impact, birds will be affected by the presence of machinery/vessels during active trenching/installation operations in the intertidal and subtidal zones and potential sheet piling activity at the rock revetment and in the subtidal zone. Therefore, the area over which disturbance could occur will be small (extending over species-specific buffer distances from active plant). In terms of the nature, duration, frequency and reversibility of the impact, disturbance/displacement effects will be temporary, taking place over a relatively short duration (up to four months), occurring over one installation event (Option 1) or over one installation event per cable (Option 2). Effects will also be reversible with birds returning to the area on cessation of activities.

During an intertidal survey between 2015 and 2016 (Seagreen, 2016b) a total of 41 different bird species were recorded, 14 of which were species associated with the Outer Firth of Forth and St Andrews Bay Complex pSPA and 16 of which were species associated with the Firth of Tay and Eden Estuary SPA and Ramsar site either as qualifying features or as an assemblage species. The most common species were observed to be a mixed assemblage of seagulls, waders, ducks and divers occurring across the intertidal area of the landfall. For all species recorded, the distribution across the survey area was generally even with no distinct clusters of activity other than for a rocky area towards the north where many species (e.g. oystercatcher) were observed to be roosting. However, across the intertidal area these species were recorded as being evenly distributed (Seagreen, 2016b). Birds are also regularly disturbed by other activities such as shooting at Barry Sands and by dog walkers (Seagreen, 2016b). Given the distribution across the sandy beach and throughout the wider area it is considered that there will be no significant adverse effects on birds as a result of the works.

**Commercial Fisheries**

As described in Section 4.9, it is proposed that potential impacts on Commercial Fisheries receptors, including disruption and snagging risk, is scoped out of the Environmental Report.

**Shipping and Navigation**

As described in Section 4.10, it is proposed that potential impacts on Shipping and Navigation receptors is scoped out of the Environmental Report, including obstructions and snagging risk.

**Archaeology and Cultural Heritage**

- **Cable installation activities may affect marine archaeology**

It is considered that this potential impact is not likely to have a significant adverse effect on marine archaeology, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. The nearest recorded wreck location to the landfall is approximately 2 km to the north east and outside of the export cable route corridor (see Section 4.11). While there is still potential for new finds and material to be discovered the magnitude of the impact is considered to be small on the basis that mitigation for marine archaeology will be secured through a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD), prepared for the alternative cable landfall works. This will include the establishment and avoidance of Archaeological Exclusion Zones (AEZs) and the means of reporting any potential discoveries to the project archaeologist during the works.

The spatial extent of the impact will be limited to a short section of the intertidal and subtidal cable route. In terms of the nature, duration, frequency and reversibility of the impact, any impact on marine archaeology would be permanent and irreversible, however, as noted above mitigation will ensure direct impact is avoided. The period over which there is potential for impact to occur is of short-term duration (up to four months). Therefore, it is considered that there will be no significant adverse effects on marine archaeology during the works.

**Aviation, Military and Communications**

- **Cable installation activities may affect military activities**

It is considered that this potential impact is not likely to have a significant adverse effect on the relevant receptors, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. In terms of the magnitude and spatial extent of the impact, the application area overlaps with the MOD Barry Buddon firing range complex, which extends out through the intertidal region to the MLWS tidal line. In terms of the nature, duration, frequency and reversibility of the impact, any potential interaction between activities will be managed via the communications protocol to be developed by Seagreen and the MOD, as required by the existing OfTW Marine Licence, which is also likely to be a condition of any Marine Licence for the alternative cable landfall works. Therefore, it is considered that there will be no significant adverse effects on military activities during the works.

**Other Marine Users and Activities**

- **Cable installation activities may affect the activities of other marine user receptors in the vicinity**

It is considered that this potential impact is not likely to have a significant adverse effect on other marine user receptors, taking into account the criteria in Schedule 3 of the 2017 EIA Regulations, for the following reasons. The magnitude and spatial extent of the impact will be limited to a short

section of the intertidal and subtidal cable route, with any potential exclusion of other activities limited to a small area associated with the presence of any marked off working areas (intertidal) and advisory clearance distances (subtidal) around the cable installation works. The works area does not directly overlap with the designated bathing water adjacent to the town of Carnoustie (see Figure 4.2). Any effects to water quality will be minor due to the relatively small volumes of sediment released into the water column and due to the relatively coarse nature of the sediments which are likely to settle in close proximity to the area of disturbance. The magnitude of the impact is also considered to be small on the basis of the mitigation measures that will be implemented to reduce effects on other sea users during the works, including notification through Notices to Mariners and local site notices (in terms of recreational receptors and bathers using the designated bathing waters). In terms of the nature, duration, frequency and reversibility of the impact, any effects will be temporary, short-term (up to four months), occurring over one installation event (Option 1) or over one installation event per cable (Option 2) and are reversible. Therefore, it is considered that there will be no significant adverse effects on other marine user receptors during the works.

**Seascape, Landscape and Visual Amenity**

As described in Section 14, it is proposed that potential impacts on Seascape, Landscape and Visual Amenity receptors are scoped out of the Environmental Report.