

## Non-Technical Summary

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## INTRODUCTION

This document provides a Non-Technical Summary (NTS) of the Environmental Impact Assessment (EIA) Report produced to support applications for consent to construct and operate two offshore wind farms (OWFs), Seagreen Alpha and Seagreen Bravo.



These OWFs (the wind turbines, their foundations and associated array cabling), were awarded consents by the Scottish Ministers in 2014 together with the associated infrastructure of the Offshore Transmission Asset (Offshore Substation Platforms [OSPs], their foundations and the Offshore Export Cables), to facilitate the export of renewable energy to the national electricity transmission grid (hereafter referred to as the 'Grid'). Together the OWFs and Offshore Transmission Asset are referred to as the 'originally consented Project'.

Seagreen Wind Energy Limited (hereafter referred to as 'Seagreen') is now applying for additional consents for an optimised design for the OWFs based on fewer, larger, higher capacity wind turbines and monopile foundations that have become available on the market since the 2014 consents were granted. The optimised OWFs for which development consent is now being sought are referred to as the 'optimised Seagreen Project'. This does not include the Offshore Transmission Asset as these assets remain as licenced in 2014 and the components are therefore not re-assessed in the current EIA Report.

This NTS includes:

- Brief information on the Applicant;
- The background to the project and project approach;
- A description of the project and its components;
- A summary of the EIA process;
- Summaries of the scope and findings of the technical assessments reported in the EIA Report; and
- A summary conclusion.

## SEAGREEN WIND ENERGY LIMITED

Seagreen Wind Energy Ltd is a joint venture (JV) between SSE Renewables Developments (UK) Limited (SSER) and Fluor Limited (Fluor). Seagreen combines the extensive renewables development, asset management and operations experience of one of the UK's leading energy companies, with the offshore project delivery expertise of one of the world's largest publicly owned engineering, procurement, construction and maintenance (EPCM) services companies.

## THE SEAGREEN PROJECT

### Project Background and Existing Consents

In 2010, Seagreen Wind Energy Limited, (the parent company of Seagreen Alpha Wind Energy limited [SAWEL] and Seagreen Bravo Wind Energy limited [SBWEL]) was awarded exclusive development rights to the Firth of Forth Round 3 Offshore Wind Farm Development Zone (Zone 2) by the Crown Estate, under its third round of offshore wind licencing arrangements.

In 2012, SAWEL and SBWEL, on behalf of Seagreen, submitted an application for development consent to construct and operate two OWFs, Seagreen Alpha and Seagreen Bravo within the Firth of Forth Development Zone. The associated infrastructure required to facilitate the export of power to the national electricity transmission grid (the Transmission Asset), was also included within that application.

Consent for Seagreen Alpha and Seagreen Bravo OWFs and the Offshore Transmission Asset was awarded by Scottish Ministers in October 2014. The consents were confirmed in November 2017, following legal challenge by the RSPB to the consent award decision. The consents received in 2014 and confirmed in 2017 are hereafter referred to as 'the original consents' and the original development for which consent was sought (Seagreen Alpha and Seagreen Bravo), are hereafter referred to as 'the originally consented projects'.

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 in principle by Angus Council in 2013. Planning permission in principle for the Onshore Transmission Asset was extended by Angus Council in December 2016, following re-application by Seagreen.

The original consents and licences received in 2014, including those varied in August 2018, are not affected by the current applications for the optimised Seagreen Project and therefore remain valid. It is Seagreen's intention to construct either the originally consented Project, or the optimised Seagreen Project presented within this EIA Report. No changes are proposed to the Offshore Transmission Asset, this remains as licensed in 2014 and therefore those components have not been re-assessed.

### The Optimised Seagreen Project

Since submission of the original consents applications, advances have been made in design and technology within the offshore wind farm industry, including increases in wind turbine size and capacity, improvements to foundation design and energy optimisation. To enable such advances to be included within the project design, Seagreen is seeking new consents for optimised projects within the same boundaries as the originally consented projects.

The optimised Seagreen Project will be the first to be taken forward for development by Seagreen in the Firth of Forth Zone. At its closest point the Project lies approximately 27km offshore, east of the Angus coastline in the North Sea, in the outer Firth of Forth and Firth of Tay region. In total, the Project covers an area of approximately 391km<sup>2</sup>.

The Project area of the OWFs considered within the optimised application is the same as that considered within the originally consented project. The location and boundary of the Zone, Project Alpha and Project Bravo are shown in NTS Figure 1 at the end of this document.

## The Capacity Variation

In March 2018 Seagreen submitted an application to Marine Scotland to vary the existing 2014 consents for the Project Alpha and Project Bravo OWFs to remove the consented OWF capacity limits to allow the installation of higher rated WTGs. This application was supported by an assessment Application Report which considered the implications of the use of higher capacity WTGs on the environment. It was concluded that this would have no implications for the environmental effects of the projects, as none of the consented physical parameters of the wind farms would change. The conclusions of the 2012 Offshore ES and 2013 ES Addendum therefore remain valid and no further EIA was required. The application was approved by Scottish Ministers in August 2018 and the removal of the capacity limit will allow higher capacity WTGs to be constructed under the existing 2014 consent parameters.

## The Need for Renewable Energy

The central aim of the UK Governments energy policy is to establish a portfolio of energy supplies that is diverse, sustainable and secure and is offered at competitive prices. Underpinning this policy goal is a commitment to reduction of carbon dioxide (CO<sub>2</sub>) emissions by 60% by 2050. The development of renewable energy plays a fundamental role in UK Government strategy for delivering reduced emissions. This is reflected in the UK Government target that 20% of the UK's electricity supply should come from renewable sources by 2020.

The Scottish Government has gone much further than any other European Union country in support of renewable energy and has committed to generating an equivalent of 100% of electricity demand from renewable sources by 2020. Furthermore, the Scottish Government has made legally binding commitments through the Climate Change (Scotland) Act 2009, which sets a greenhouse gas emissions (GHG) target, for a reduction of 80% from 1990 levels by the year 2050. Scotland is currently in the process of finalising its third Climate Change Plan, setting out proposals and policies to lower emissions by 66% by 2032. Additional proposals are in place for a Climate Change Bill, which will set even more ambitious targets for the reduction of GHG.

The optimised Seagreen Project will contribute to combatting climate change by reducing GHG emissions from the electricity generation sector. There are multiple benefits associated with the optimised Seagreen Project, including:

- The production of approximately 1.5 gigawatts (GW - 1GW is equal to one billion [10<sup>9</sup>] watts or 1 gigawatt = 1000 megawatts) of clean energy - the equivalent to nearly one third of Scotland's existing renewable capacity;
- Very low lifetime CO<sub>2</sub> emissions per unit of electricity generated;
- Address climate change through a move to a low-carbon generation mix for a secure energy future;
- Provide an indigenous source of clean energy;
- Contribution to new energy infrastructure; and
- Contribution to sustainable economic growth.

## PURPOSE OF EIA REPORT

The purpose of this EIA Report is to support an application for two Section 36 Consents under the Electricity Act 1989 and two Marine Licences under the Marine and Coastal Access Act 2009 and Marine (Scotland) Act 2010, for optimised OWF projects within the same application boundaries as the originally consented projects. Therefore, this EIA Report assesses those components of the proposed optimised Project Alpha and Project Bravo OWFs that have not previously been considered.

This report describes the potential impacts of the optimised Project parameters throughout construction, operation and decommissioning for both Project Alpha and Project Bravo alone and in combination with other wind farm and infrastructure projects. For completeness, potential impacts of the originally consented projects, including the Transmission Asset project, are set out in Chapter 17 along with a summary of the impacts from the optimised Seagreen Project. Any differences between impacts of the originally consented project and the optimised Seagreen Project are also explained within each of the Technical Chapters (Chapters 8 to 15).

A Habitats Regulations Appraisal (HRA) has been prepared for the optimised Seagreen Project using the updated design parameters to provide Scottish Ministers with the information necessary to determine whether the development of the optimised Seagreen Project will have an adverse effect on the integrity of any European sites. This HRA is included in this EIA Report in Chapter 16.

## PROJECT DESCRIPTION

The optimised Seagreen Project comprises Project Alpha and Project Bravo OWFs with a maximum of 70 Wind Turbine Generators (WTGs) in each Project and a maximum of 120 WTGs in total across both sites.

The optimised Seagreen Project has reduced infrastructure compared to the originally consented Project (2014) which included up to 75 WTGs in both Project Alpha and Project Bravo (up to 150 in total) and up to six meteorological masts.

These projects comprise the following:

- Up to 70 wind turbine generators in each, with a total number of 120 turbines across both projects;
- Subsea array cables;
- Up to three wave buoys each;
- Scour protection and cable protection (where appropriate); and
- All foundations, substructures, fittings and cable crossings.

The 'Transmission Asset Project' which includes the OSPs, OSP foundations, OSP interconnector cables and export cables to transport the power generated by the OWFs to the Grid was licensed separately. No further changes are proposed and consequently, there is no further assessment of those assets within this EIA Report.

Plate 1 provides an overview of project components (including those already licensed) for context. The location and boundary of the Zone, Project Alpha and Project Bravo are shown in NTS Figure 1.

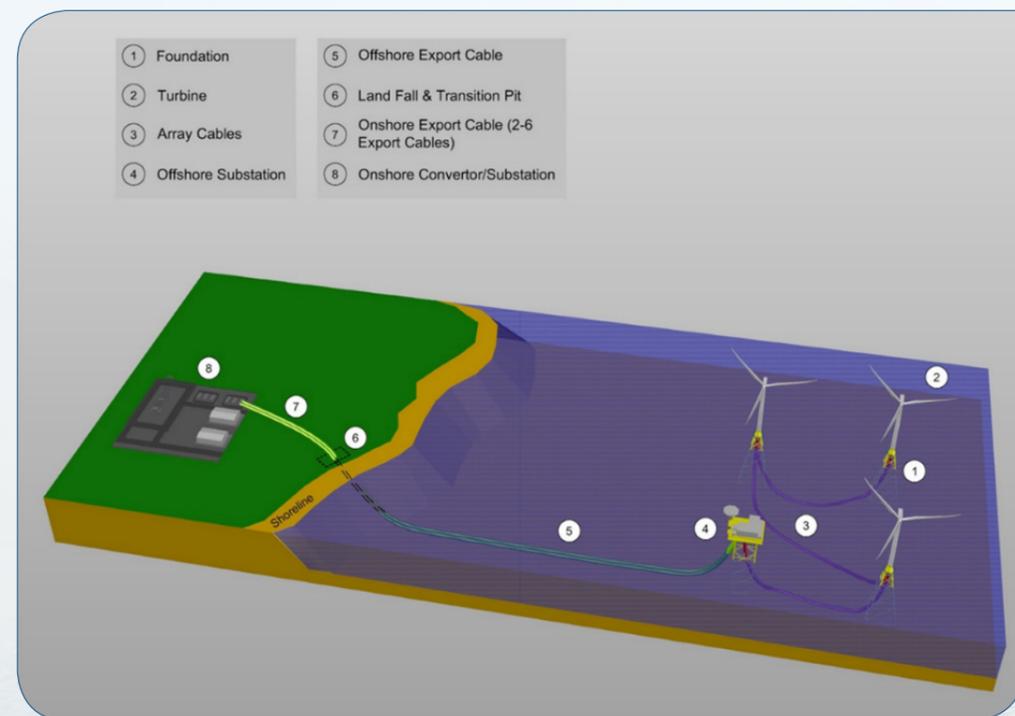
The key design parameters for the optimised Seagreen Project are summarised in Table 1. Design parameters are provided for Project Alpha, Project Bravo and where relevant, for the wind farms combined. Those design parameters which have been optimised since the original consents are highlighted for ease of reference.

In summary the key design parameters that have been changed are:

- The maximum combined number of WTGs has reduced from 150 to 120;
- The 2014 consented rotor diameter is 167m and the proposed rotor diameter for the optimised Seagreen project is up to 220m;
- The 2014 consented blade tip height is 209.7m and the proposed blade tip height for the optimised Seagreen project is up to 280m;
- The 2014 consented minimum blade tip clearance is 29.8m and the proposed blade tip clearance for the optimised Seagreen project is 32.5m; and
- The 2014 foundation options have been expanded to include the introduction of a monopile foundation option at up to 70 locations.

The above design parameters and information forms the basis of the assessment undertaken within this EIA Report.

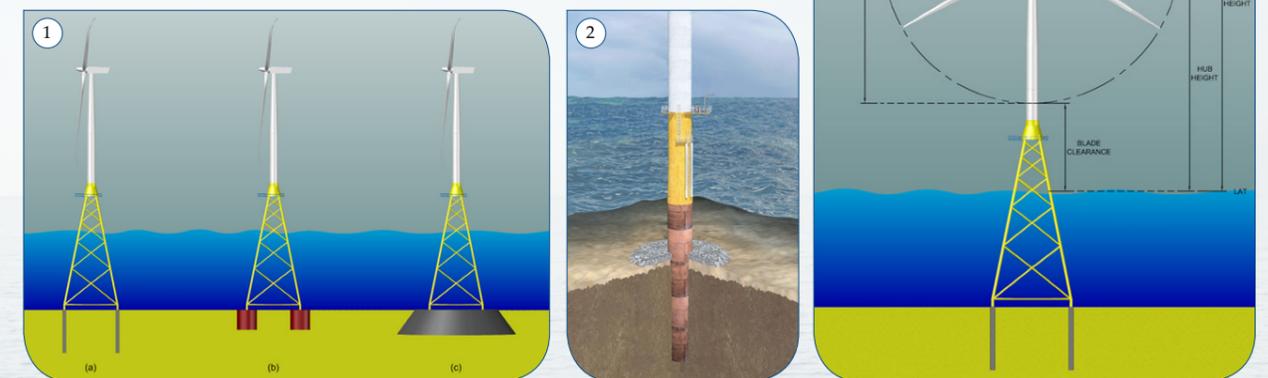
**Plate 1. Illustration of the Seagreen Project Components**



**Table 1. Key Parameters of Optimised Project Alpha and Project Bravo**

Key Parameter	Optimised Design Envelope		
	Project Alpha	Project Bravo	Combined
Area (km <sup>2</sup> )	197	194	391
Distance from shore (closest point) (km)	27	38	27
Maximum number of Wind Turbine Generators (WTGs)	70	70	120
Maximum rotor diameter	220	220	220
Maximum hub height above lowest Astronomical Tide (LAT) (m)	170	170	170
Maximum blade tip height above LAT (m)	280	280	280
Minimum blade tip clearance above LAT (m)	32.5	32.5	32.5
Minimum separation distance between turbines (m)	1000	1000	1000
Colour of WTG	Pale matt grey/off-white colour and will include aviation lighting		
Max number of Gravity Base Structure (GBS) foundations	70	70	120
Max number of pin piled jacket foundations	70	70	120
Max number of suction caisson jacket foundations	70	70	120
Maximum number of monopile foundations	70	35	70
Scour protection	Maximum volume of scour protection for the optimised project for GBS foundation option is 900,000m <sup>3</sup> (less than GBS WCS scenario assessed in the 2012 Offshore ES: 1,734,000m <sup>3</sup> )		
Wave buoys	Up to six		

1. Tubular jacket with (a) tubular pin piles, (b) suction caisson piles and (c) possible GBS hybrid
2. Example of a single steel monopile together with the transition piece and scour protection
3. Illustration of WTG dimensions



## SITE SELECTION AND ALTERNATIVES CONSIDERED

Seagreen undertook a site selection process to identify the location of the optimised Seagreen Project with respect to environmental and engineering factors. This site selection process comprised of the following stages;

- Initial zone selection in 2008, undertaken by The Crown Estate following their SEA and Round 3 (R3) zone identification process, which identified the Firth of Forth Zone shown on Figure 1;

Followed by the subsequent stages undertaken by Seagreen:

- Identification of three development Phases within the Firth of Forth Zone;
- Zone Appraisal and Planning (ZAP - a discretionary, non-statutory process to aid developers in managing development risks within their zones [The Crown Estate, 2010]); and
- Identification of the Project Alpha and Project Bravo sites within the Phase 1 development area of the Zone.

The process of Round 3, ZAP, EIA and site/design refinement that Seagreen has undertaken, both before and after 2012, has led to the identification of sites and designs that can be considered as optimal and this gives confidence that there are no obvious alternatives i.e. that are technically and commercially feasible, that could lead to better outcomes. Further details of the site selection process are set out in Chapter 3 (Site Selection and Alternatives) of this EIA Report.

The increased output per turbine that is now achievable means that a reduction in turbine numbers is possible while still delivering the required energy output. A reduction in turbine numbers (compared with the originally consented Project) would result in a need for fewer foundations, fewer turbines and turbines of a higher blade tip and correspondingly increased blade clearance. This is considered beneficial from environmental, technical and commercial perspectives.

## PROJECT PROGRAMME

The optimised Seagreen Project is in the initial stages of development, an outline indicative programme for OWF construction is shown in Table 2. The offshore construction period for the optimised Seagreen Project is anticipated to take place over a maximum of four years.

**Table 2. Optimised Seagreen Project: Indicative OWF Construction Programme**

	Year 1	Year 2	Year 3	Year 4
Foundation/Substructures				
Array Cable Installation				
WTG Installation				
Commissioning				

## THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

### Overview

Environmental Impact Assessment (EIA) is an iterative tool for examining and assessing the impacts and effects of the construction, operation and decommissioning stages of a development on the environment. The purpose of an EIA is to carry out an independent assessment of the 'likely significant effects' of a project, both adverse and beneficial. It is a systematic and evidence based process and comprises the following broad stages:

- Scoping of issues to be considered within the EIA;
- Collection of baseline data, through surveys, consultation and desk based study, to describe and characterise the existing environmental conditions, as a basis for the impact assessment process;
- Identification and assessment of potential environmental impacts and conclusions on the likely significance of impacts identified; and
- Identification of mitigation measures and monitoring, or management strategies that can be applied, to avoid, reduce, or remove identified adverse impacts and the subsequent assessment of residual impact significance.

### Scoping

In 2017, Seagreen undertook a scoping exercise to identify the key issues that needed consideration within the EIA. This included consultation with a wide range of statutory and non-statutory organisations and individuals, and a Scoping Opinion from Marine Scotland Licensing Operations Team (MS-LOT, 2017).

The scope of this EIA has been shaped by the 2012 Offshore ES. The Marine Scotland 2017 Scoping Opinion confirms that the 2012 Offshore ES has previously assessed the potential significant impacts of the full design envelope and the range of design parameters for the originally consented Project, and that where those design parameters remain unchanged, there is no need for further assessment. Accordingly, this EIA considers the potential impacts of the optimised design parameters on relevant receptors.

Following receipt of the 2017 Scoping Opinion, further specific consultation has been undertaken with Marine Scotland, statutory consultees and key stakeholders in relation to assessment methodologies for this EIA. The consultation has been focussed on detailed technical assessment methodologies and the details and outcomes of this consultation are described within the relevant Technical Chapters (Chapters 8 to 15) of this EIA Report.

Based on the 2017 Scoping Opinion and subsequent consultation the following parameters (topics) have been considered in the EIA:

- Ornithology;
- Natural Fish and Shellfish;
- Marine Mammals;
- Commercial Fisheries;
- Shipping and Navigation;
- Seascape, Landscape and Visual Amenity;
- Military and Civil Aviation; and
- Socio-economics.

Details on the receptors and assessments scoped in for each of the above parameters is provided in Chapter 7 (Scope of EIA Report) and in each of the Technical Chapters (Chapter 8 to 15) of this EIA Report.

### Assessing Impact Significance

Impact significance is determined using a combination of the sensitivity of the receptor and the magnitude of the potential impact. The magnitude and sensitivity of receptors are defined as either Negligible, Low, Medium or High.

Following identification of receptor value and sensitivity and magnitude of effect, the significance of impact is determined using the Impact Assessment Matrix (IAM), set out in Table 3 below.

**Table 3. Significance of Impact – Impact Assessment Matrix**

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

The matrix above has been applied to most of the assessments within the EIA Report. Where an assessment does not follow this approach, it is set out and described within the relevant chapter.

Potential impacts identified as major or moderate are generally considered to be significant in EIA terms and mitigation may be required, while impacts identified as minor or negligible are generally considered to be not significant in EIA terms. For the purposes of this EIA report, impacts assessed are considered adverse (negative) unless otherwise stated.

### Mitigation and Residual Impacts

Throughout the design evolution process and with consideration to the findings of the 2012 Offshore ES, measures have been taken to avoid potentially significant impacts wherever possible and practical to do so.

Mitigation measures that are incorporated into the design of the project are referred to as ‘environmental measures incorporated into the Project’. These measures are intended to prevent, reduce and where possible offset any significant adverse impacts on the environment. These are effectively ‘built in’ to the impact assessment and as such, the assessment includes consideration of these measures.

Where potentially significant adverse impacts have not been eliminated by project design, or built in mitigation, further mitigation measures, which are additional may be required. These measures are referred to as ‘additional mitigation’. These measures are determined by the relevant technical experts and agreement with relevant stakeholders has been sought wherever possible.

Following the identification of additional mitigation measures, impacts are reassessed and residual impact significance is identified. The assessment of residual impact occurs following the identification and consideration of any additional mitigation and this process is presented and summarised within each Technical Chapter (Chapters 8 to 15) of this EIA Report.

### Consultation

Under the EIA Regulations, consultation must be undertaken with particular regulators and other bodies known as statutory consultees. Consultation has been undertaken to agree the scope of this EIA Report and the approach for specific technical topics within the EIA Report, the approach to assessment, methods of analysis and presentation of information. Consultation will be ongoing throughout the life of the Seagreen Project.



Public consultation and community engagement has taken place both for the original application and for the optimised Seagreen Project. Two rounds of exhibitions were held in January 2011 and May 2012.

A third round was held in February and March 2018 to present the optimised design parameters. Members of the Seagreen team were available to answer questions at each of the public information days. The dates and locations of the 2018 information days are detailed in Table 4 below.

**Table 4. Spring 2018 Public Information Days**

Location	Venue	Date
Arbroath	Community Centre	26 February 2018
Carnoustie	The Station Hotel	27 March 2018
Montrose	Town Hall	27 February 2018

## SUMMARY OF ENVIRONMENTAL IMPACTS

### Introduction

The following sections summarise the potential environmental impacts associated with the optimised Seagreen Project, as detailed in the EIA Report. Each summary is split into 'Scope of Assessment' which describes what has been considered and 'Summary of Assessment' which describes the key findings of the assessment and discusses mitigation measures, where relevant.

### Ornithology

#### Scope of Assessment

The ornithology assessment considers the potential effects of disturbance and displacement (birds moving from an area they use due to the project) on kittiwake, guillemot, razorbill and puffin and collision mortality (potential bird deaths due to collisions with wind turbines) on gannet, kittiwake and herring gull.

In accordance with the 2017 Scoping Opinion from Marine Scotland these potential impacts and receptors are scoped in due to changes in the wind turbine design, namely the inclusion of a larger rotor diameter to that previously considered, availability of further survey data for the site and updated methods relating to the assessment of displacement and collision mortality impacts.

All other potential impacts on birds are scoped out because the findings of the assessments completed for the 2012 Offshore ES are considered to remain valid.

Additional survey data was collected from the areas of Project Alpha and Project Bravo during the 2017 breeding season using a boat-based survey method. This was to better understand the current environment. On this occasion, the methods were extended to include more accurate estimation of the flight heights of birds and to survey a larger area than that surveyed in 2011/2012, including a buffer around the proposed wind farm areas. These survey data have been used to update, interpret and verify the results of surveys undertaken to inform the assessment of impacts on offshore ornithology in the 2012 Offshore ES.



Common Guillemots © Martin Perrow



Juvenile Black-legged Kittiwake



Northern Gannets

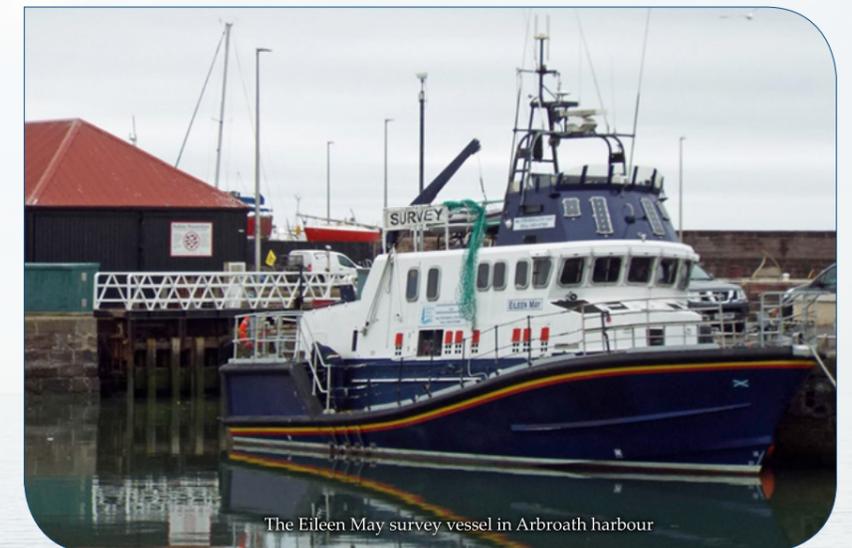
### Summary of Assessment

The reduction in turbine numbers from 150 for the originally consented project to 120 for the optimised Seagreen Project, combined with the increased separation distance between turbines (from 610m to 1000m) reduces potential collision risk and displacement for birds. To further reduce the potential impact of collision risk for birds, Seagreen implemented a design change during this EIA process. The minimum distance between the tip of turbine blades and the sea surface (minimum blade tip clearance) was increased from 29.8m to 32.5m (above Lowest Astronomical Tide). This change increases the area below the turbine blades in relation to bird flight.

The significance of potential impacts due to disturbance and displacement from the optimised Project Alpha and optimised Project Bravo remain the same as those previously assessed, despite the calculation of those effects over a larger area than was previously assumed, due to the addition of the 2km buffer surveyed. No significant displacement impacts are predicted on any species due to those projects alone or cumulatively with one another or any other relevant projects.

The potential magnitude of impacts due to collision mortality from Project Alpha and Project Bravo are generally lower than those previously assessed. The use of fewer, larger turbines typically reduces the risk of collision for seabirds, notwithstanding changes in assessment methodology, which now includes consideration of non-breeding season effects, for example. For gannet, kittiwake and herring gull no significant impacts are predicted due to collision mortality arising from these projects, either alone or combined, or cumulatively with other relevant projects and therefore no additional mitigation measures are proposed.

An ornithology monitoring plan will be developed to validate the findings of the EIA. The monitoring plan will be agreed with Marine Scotland and Seagreen will continue to consult with relevant stakeholders to inform the selection of the most appropriate monitoring methods for ornithological receptors.



The Eileen May survey vessel in Arbroath harbour

## Natural Fish and Shellfish Resource

### Scope of Assessment

Scoping in 2017 identified that the proposed use of monopile foundations for the optimised Seagreen Project may potentially increase the magnitude of underwater noise, which could have adverse impacts on fish and shellfish populations. The greater noise propagation effects would be associated with the piling hammer energy required to install monopile foundations compared to the lower hammer energies required to install pin piles for jacket foundations, which were assessed in the 2012 Offshore ES. In line with the 2017 Scoping Opinion and further discussions with Marine Scotland, the assessment is focused on herring, a species sensitive to underwater noise, which spawns a short distance to the north of the optimised Seagreen Project area (approximately 6km at the closest point).

Understanding the existing environment has been informed by the 2012 Offshore ES and has been updated as appropriate, particularly in relation to Atlantic salmon, in line with the 2017 Scoping Opinion.

### Summary of Assessment

The assessment is based on the worst case scenarios in terms of turbine foundation design, with the installation of monopile foundations being the worst case in terms of the area of potential underwater noise impacts. Installation of jacket pin pile foundations is the worst case in terms of the duration of potential underwater noise impacts.

The impact assessment demonstrates that no significant impacts to any fish or shellfish species are predicted. Physical injury and potential mortality impacts as a result of piling are expected to be Negligible while behavioural impacts, including to herring engaged in spawning behaviour, are expected to be not more than Minor and therefore not significant in EIA terms. This applies to the optimised Project Alpha and the optimised Project Bravo in isolation, both projects combined and cumulatively with other regional wind farm developments.

In line with the 2017 Scoping Opinion, the assessments also considered the potential impacts on fish and shellfish receptors due to particle motion effects (an effect caused by underwater noise) and potential impacts on important shellfish species (nephrops and scallops) through smothering effects (the covering of shellfish with sediments). Further consideration demonstrated that these effects were unlikely to give rise to significant impacts and the conclusions of the 2012 Offshore ES remain valid and there would be no significant impact predicted.

No significant impacts were predicted for fish and shellfish receptors and therefore no additional mitigation measures were identified, however, potential monitoring proposals were identified relating to potential cumulative impacts of disturbance for herring. This is in respect of potential consecutive installation of piled foundations between the optimised Seagreen Project and neighbouring wind farms Neart na Gaoithe and Inch Cape. Should the need for consecutive piling be identified a collaborative approach to monitoring with other projects would be investigated.

## Marine Mammals

### Scope of Assessment

In line with the 2017 Scoping Opinion, the assessment considered the potential effects of underwater noise from pile driving of monopile and pin pile (jacket) foundations on bottlenose dolphin, harbour seal, grey seal, harbour porpoise, minke whale and white beaked dolphin. These impacts were scoped in to the assessment due to the inclusion of monopile foundations, and updated best practice guidance relating to the assessment of underwater noise impacts for marine mammals. All other potential impacts on marine mammals were scoped out of the assessment, as the design parameters remain unchanged from the assessments completed for the 2012 Offshore ES and the conclusions of the previous assessment therefore remain valid.

Marine mammal activity within the optimised Seagreen Project area was assessed using a combination of boat based and aerial surveys undertaken from December 2009 to November 2011 and additional surveys undertaken May to August in 2017, existing published data sources and a series of technical analysis tools.

### Summary of Assessment

The assessment considered permanent impacts to marine mammal hearing (known as Permanent Threshold Shift) and disturbance impacts due to underwater noise from foundation installation.

Environmental measures are incorporated into the project design to avoid or reduce the impacts of underwater noise on marine mammals. The specific measures will be detailed in a Piling Strategy to be approved by Marine Scotland and are proposed to include the use of a soft-start procedures/ramp-up in hammer energy (where piling is started gradually to enable marine mammals to move away from the piling area), and the use of Acoustic Deterrent Devices (ADDs) to deter marine mammals from the construction area.

The assessment concluded that with or without the use of ADDs incorporated into the construction method, no significant impacts to any marine mammal species are predicted. This applies to the optimised Project Alpha and the optimised Project Bravo in isolation, both projects combined and cumulatively with other regional wind farms and other projects and therefore no additional mitigation measures were identified.



Grey Seal (Source: SMRU)



Harbour Seal (Source: SMRU)

## Commercial Fisheries

### Scope of Assessment

Seagreen has undertaken early engagement with local fishermen through public consultation meetings and regular dialogue. This has provided a high level of understanding of the fishing activity within the optimised Seagreen Project site and the surrounding area. This has been supplemented with fisheries landings and effort data which has been provided by the Marine Management Organisation (MMO).

The predominant fishing activity within the boundaries of the optimised Project Alpha and optimised Project Bravo is scallop dredging. Trawling for squid and creeling for lobster and crabs also occurs in the immediate area of the sites, however, to a much lesser extent. The wider area around Project Alpha and Project Bravo also supports Nephrops and whitefish fisheries.

The following potential impacts on commercial fisheries were considered:

- Impacts on commercially exploited fish and shellfish species (during construction phase);
- Temporary loss or restricted access to traditional fishing grounds (during construction phase);
- Displacement of fishing activity into other areas (during construction and operation phases);
- Safety issues for fishing vessels (during construction and operation phases);
- Increased steaming times to fishing grounds (during construction and operation phases);
- Interference with fishing activity (during construction and operation phases); and
- Complete loss or restricted access to traditional fishing grounds (during operation phase).

### Summary of Assessment

Potential impacts on commercially exploited fish and shellfish are predicted to be Minor and therefore not significant in EIA terms. This conclusion is supported by the findings of Chapter 9 (Natural Fish and Shellfish Resource) and the 2012 Offshore ES which considered potential impacts on commercial species populations.

With regards to the potential impacts on fishing activity listed above, the majority of the impacts are predicted to be minor, with no requirement for additional mitigation measures. Potential impacts of moderate significance are predicted on local scallop dredgers through temporary loss or restricted access to traditional fishing grounds and displacement during construction.

Additional mitigation has therefore been proposed in respect of local scallop dredgers during the construction of the project, to minimise potential loss, or restricted access to fishing grounds within the optimised Project Alpha and optimised Project Bravo sites. In addition, in the case of the lobster and crab fishery, it has been recognised that there may be occasions when certain vessels may need to relocate their gear as a result of construction activity in the project sites. In these instances, Seagreen will follow policy as specified in the Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) Guidelines (2015) of appropriate evidence based mitigation.

In terms of potential cumulative impacts, it is anticipated that other projects which could contribute to a cumulative impact on the lobster and crab fishery during construction will take a similar approach to mitigation to ensure such impacts are effectively managed.

Proposed mitigation measures will be incorporated within the Fisheries Management and Mitigation Plan of the optimised Seagreen Project following consultation with relevant stakeholders.

## Shipping and Navigation

### Scope of Assessment

A Navigational Risk Assessment (NRA) was undertaken to support the Shipping and Navigation assessment in the 2012 Offshore ES. The optimised Seagreen Project has the same area and is within the same application boundaries as the originally consented Project and through consultation with the Maritime and Coastguard Agency (MCA) it was confirmed that a new NRA was not required. However, data collected to inform the 2012 Offshore ES was required to be updated in accordance with MCA guidelines, to inform the assessment of impacts for this EIA.

This update included a desk study to identify navigational features and marine incidents within the vicinity of the optimised Seagreen Project and a marine traffic validation survey of Automatic Identification System (AIS) data collected from coastal receivers in 2017.

Few navigational features were identified with only the Inch Cape Offshore Wind Farm site and chartered wrecks being located within the study area. The marine traffic survey identified cargo vessels, tankers and 'other' vessels as the main vessel types within the area, as well as fishing vessel and recreational craft activity. On average there was a minor increase in the number of vessels recorded during the summer period compared to the winter period. Other data sources used to inform the baseline include the RYA Coastal Atlas, satellite and sightings fishing data, marine incident data, Admiralty Sailing Directions and UK Admiralty Charts.

The following potential construction impacts on commercial vessels, commercial fishing vessels and recreational vessels were assessed:

- Vessel displacement due to construction activities;
- Encounters and collision with construction vessels;
- Encounters and collision with other vessels; and
- Allision risk (where a moving object or vessel runs into a stationary object or vessel) with partially constructed OWF components and infrastructure.

Operational impacts on commercial vessels, commercial fishing vessels and recreational vessels assessed include:

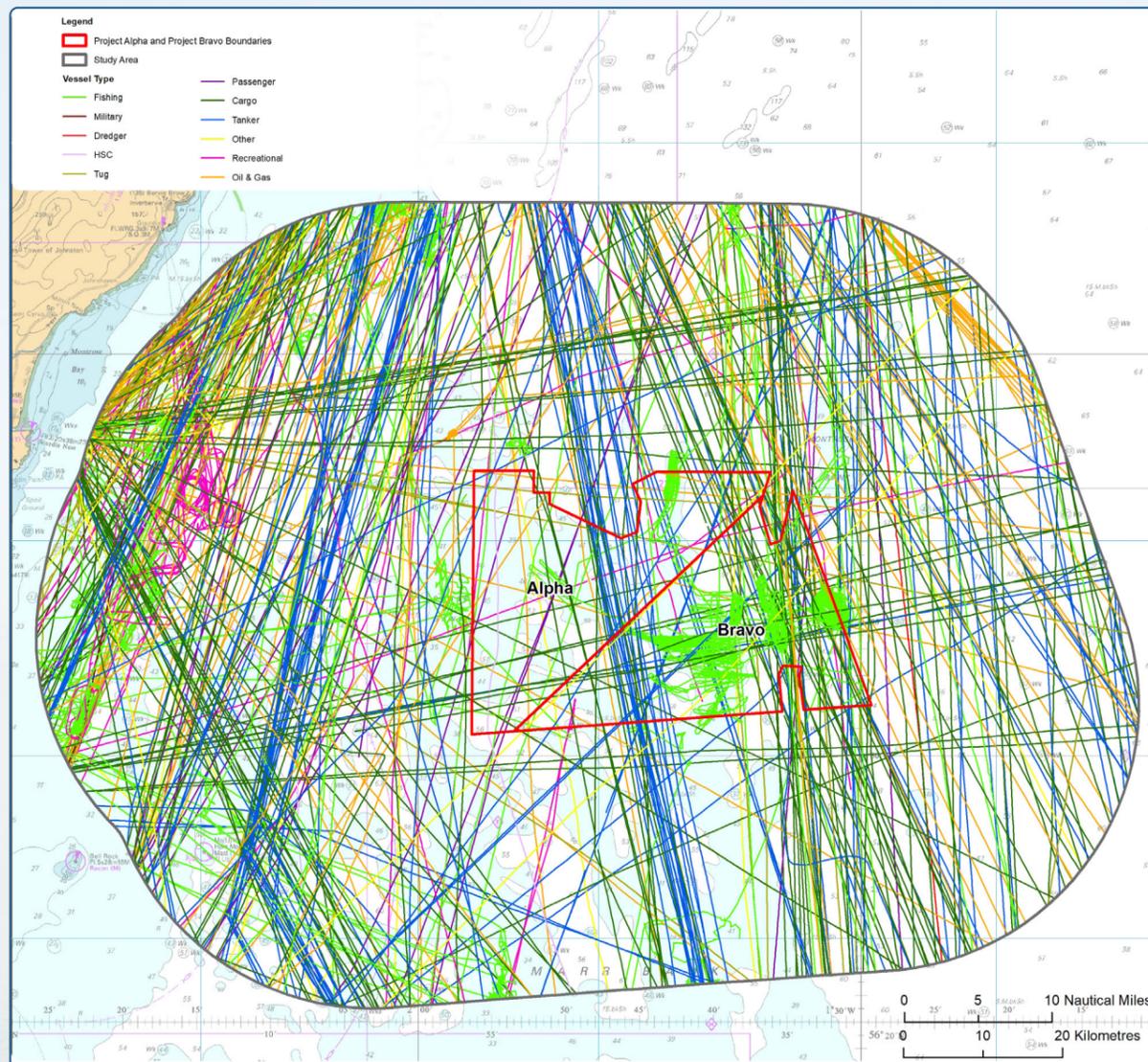
- Vessel displacement; and
- Encounters, collision and allision risk, due to the presence of OWF components and infrastructure.

Other operational impacts assessed include diminishment of emergency response resources on Search and Rescue (SAR) operations. The cumulative impact assessment considered the potential impacts of vessel displacement, encounters and collision risk and allision risk.

### Summary of Assessment

The outcomes of the impact assessment concluded that the potential impacts of the optimised Project Alpha and optimised Project Bravo in isolation, both projects combined and cumulatively with other projects on the identified receptors are Not Significant. The outcomes of the impact assessment have therefore been identified as the same as or reduced when compared to the 2012 Offshore ES and therefore no additional mitigation was identified.

**Plate 2. Map of shipping routes and vessel types from 2017 marine traffic validation survey (Source: Anatec)**



## Seascape, Landscape and Visual Amenity

### Scope of Assessment

This assessment has considered the potential effects upon both seascape and landscape character and visual amenity that may arise from the optimised Seagreen Project. The scope of the assessment has been informed by and is consistent with the 2017 Scoping Opinion and was further agreed through consultation with relevant local planning authorities. This assessment has considered the following potential impacts:

- Direct impacts or physical changes to seascape;
- Indirect impacts on the character and quality of the seascape (for example through the development of offshore wind turbine generators (WTGs) causing changes in the perception of the seascape);
- Direct impacts on the visual amenity of visual receptors (for example, changes in available views of the sea and their content due to the development of OWFs); and
- Indirect impacts on visual receptors in different places (for example an altered visual perception, leading to changes in public attitude, behaviour and how they value or use a place).

### Summary of Assessment

The assessment predicts that the optimised Project Alpha will have two significant effects on visual amenity at viewpoints at St Cyrus and Braehead of Lunan. These effects result from the Project Alpha wind farm being visible from these viewpoints. No significant impacts are predicted for Project Bravo and this finding is consistent with the originally consented Project.

The optimised Seagreen Project is also predicted to combine with a number of other onshore and offshore wind farms, as well as other projects, to contribute to cumulative and in-combination effects. While two viewpoints have been assessed to have Moderate cumulative effects (St Cyrus and Braehead of Lunan) this is not considered to be Significant for this SLVIA and is comparable to the originally consented project. Elsewhere, including cumulative effects on Regional Seascape Units (RSCUs) there are no significant effects predicted.

The distance of the optimised Seagreen Project from the nearest coastline (approximately 30km), combined with its siting in the same location as the originally consented project, where the principle of offshore wind farm development has effectively already been accepted through the existing consents, means that there are no additional significant effects upon either the seascape, or landscape environment, or visual amenity, as a result of the optimised Seagreen Project.

## Military and Civil Aviation

### Scope of Assessment

The Military and Civil Aviation assessment focussed on the potential for the design changes to impact upon civil and military radar and aviation. In line with the 2017 Scoping Opinion the assessment considered the potential for impacts to the following:

- Military Air Traffic Control (ATC) Radar;
- Military Air Defence Radar;
- NATS (Civil) En-Route Radar (including Lowther Hill);
- Low Flying Aircraft; and
- Helicopter Routes and Offshore Platforms.

Wind turbines can have significant impacts on radar systems, for example through ‘clutter’ whereby moving turbine blades can appear on radar systems and appear as false targets. Seven radar provide coverage over the part of the North Sea that could potentially be affected by the wind turbines. The radar are located throughout eastern Scotland and northern England. Radar Line of Sight (RLOS) assessments were undertaken to determine whether the turbines are likely to be detected by radar.

Neither the optimised Project Alpha nor optimised Project Bravo are in close proximity to Helicopter Main Routes or offshore platforms, with the closest route (HMR116) being more than 30 nautical miles (55km) away.

### Summary of Assessment

The civil NATS En-Route radar at Perwinnes is likely to detect the turbines of the optimised Seagreen Project while its two radar at Allanshill and Lowther Hill are unlikely to be affected, due to intervening terrain between radar and turbines. A Transponder Mandatory Zone (TMZ) is proposed to mitigate the effects of the optimised Seagreen Project on the NATS radar at Perwinnes. This will include blanking of the Perwinnes radar. With the application of this proposed mitigation the residual impact on the NATS radar will be acceptable and therefore not significant.

The Ministry of Defence (MOD) ATC radar at Leuchars Station (formerly Royal Air Force [RAF] Leuchars) is likely to detect the turbines, as are the MOD Air Defence radars at Brizlee Wood and Buchan. These impacts will require mitigation. Mitigation proposed will limit the wind turbines’ impact on these radars making their impacts acceptable and therefore not significant. No significant impacts are anticipated for helicopter routes or offshore platforms as none are identified in proximity to the project.

Consultation is ongoing with both NATS and the MOD. This has involved sharing wind turbine data, agreeing the affected radar and mitigation discussions. This consultation will be continued to ensure appropriate mitigation solutions are agreed, prior to construction and operation of the project.

## Socio-economics

### Scope of Assessment

The socio-economics assessment focussed on the impact that the optimised Seagreen Project would have on the Scottish and UK economies and the socio-economic context in which the project would operate. The chapter did not consider tourism and recreation impacts that were considered in the 2012 Offshore ES, because the changes to onshore visibility of the optimised Seagreen Project are minimal and the conclusions of this assessment are still considered to be valid.

New baseline information has been collected since the 2012 Offshore ES to reflect changes to the socio-economic, policy and industrial context that have occurred in this time. In particular, the increase in activity in the offshore wind energy sector in the UK in this time period has resulted in the development of the supply chain and subsequently a greater understanding of the economic opportunities that the offshore wind energy sector can create for the Scottish and UK economies.

### Summary of Assessment

Given the scale of the optimised Seagreen Project there are expected to be significant beneficial impacts upon the Scottish economy during the development and construction of the project, including direct impacts upon employment. These opportunities are likely to occur in the manufacturing, construction and professional and scientific sectors.

During the operational lifetime of the optimised Seagreen Project there are likely to be continual positive economic impacts upon the Scottish and UK economies. However, these impacts are not considered to be significant due to the relative insensitivity of these economies.

The additional impacts associated with the cumulative developments of other local offshore wind farm projects have been assessed as being beneficial but minor and therefore not significant

The economic impacts quantified for both the Scottish and UK economies are greater than those described in the 2012 Offshore ES. This is due to a greater level of installed capacity and therefore investment required in the optimised Seagreen Project. No adverse impacts on socio-economics are predicted.

## HABITAT REGULATIONS APPRAISAL (HRA)

The EU Habitats and Birds Directives, require that certain habitats and species are given legal protection through a network of protected sites, the Natura 2000 network of sites. The Habitats and Birds Directives are transposed into domestic law in Scotland. The Natura 2000 network includes Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), collectively known as European sites in Scottish law.

The competent authority (in this case the Scottish Ministers) must consider whether a plan or project has the potential to have an adverse effect on the integrity of a European site. The process by which the developer provides the Scottish Ministers with the necessary information for them to complete an assessment appropriate to the requirements of the Habitats and Birds Directives is known as a Habitats Regulations Appraisal (HRA). Under this process, where a likely significant effect is identified for a plan or project, either alone, or in combination with other plans or projects, an Appropriate Assessment (AA) is required to assess the implications with regards to the conservation objectives of the European site.

To support the application for the optimised Seagreen Project, an HRA has been undertaken, to assist Marine Scotland on behalf of Scottish Ministers, as competent authority in undertaking an AA. The HRA is based on the 2017 Scoping Opinion provided by MS-LOT which scoped in those European sites, qualifying interests and impacts that should be considered. Seagreen also undertook consultation with Scottish Natural Heritage (SNH) and other key consultees in relation to the scope of the HRA.

Accordingly, the HRA includes the following European sites:

- Berwickshire and North Northumberland Coast SAC;
- Isle of May SAC;
- Firth of Tay and Eden Estuary SAC;
- Moray Firth SAC;
- Buchan Ness to Collieston Coast SPA;
- Forth Islands SPA;
- Fowlsheugh SPA;
- St Abb's Head to Fast Castle SPA; and
- Outer Firth of Forth and St Andrews Bay Complex proposed SPA (pSPA).

The scope of the HRA considers the following effects:

- Underwater noise disturbance – in respect of bottlenose dolphin, grey seal and harbour seal;
- Displacement – in respect of puffin, guillemot, razorbill, and kittiwake;
- Barrier effect – in respect of puffin, guillemot, razorbill and kittiwake; and
- Collision mortality – in respect of gannet, kittiwake and herring gull.

With regards to marine mammals and underwater noise disturbance the assessment predicts that the optimised Seagreen Project alone, or in-combination with other plans and projects, will have no population consequences for the designated grey seal and harbour seal populations of the Isle of May, Berwickshire and North Northumberland Coast and Firth of Tay and Eden Estuary SACs.

The optimised Seagreen Project alone, or in-combination with other plans and projects is predicted to have no significant long term effect on the designated bottlenose dolphin population of the Moray Firth SAC.

For the scenarios described within the HRA, no adverse effects on the integrity of any SPA/pSPA are predicted because the qualifying interests will remain viable components of the sites assessed with respect to the predicted impacts associated with Project Alpha and Project Bravo combined.

Therefore, the HRA concludes that the optimised Seagreen Project, both alone and in-combination with other plans and projects, is predicted to result in no adverse effects on the integrity of European sites.

## CONCLUSION

Since consent award of the originally consented projects in 2014, advances have been made in design and technology within the offshore wind farm industry, including increases in wind turbine size and capacity, improvements to foundation design and energy optimisation. To enable such advances to be included within the project design, Seagreen is seeking additional consents for optimised projects within the same boundaries as the originally consented projects.

This EIA has assessed the potential impacts of the optimised Seagreen Alpha OWF project and the optimised Bravo OWF project (the optimised Seagreen Project) on relevant environmental parameters scoped into the assessment.

Across all topics assessed, conclusions of impact significance are comparable or reduced compared to the 2012 Offshore ES. Where significant impacts are identified, for commercial fisheries or military and aviation radar, appropriate mitigation has been identified and will be applied to ensure any such impacts are managed or reduced wherever possible.

The conclusion of this EIA Report is that given the successful implementation of the stated mitigation measures committed to by Seagreen, combined with ongoing dialogue with interested stakeholders and the regulatory authorities, the predicted adverse impacts for the optimised Seagreen Project are considered to be acceptable. The precautionary nature of the assessment approach, based on worst-case scenarios, also means that, in reality, any impacts are likely to be less than predicted. Significant beneficial impacts for the Scottish economy are also predicted during the development and construction of the project, including direct impacts upon employment.

## REFERENCES

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- IEMA (2013) The Guidelines for Landscape and Visual Impact Assessment (2013), Third Edition. Landscape Institute with the Institute of Environmental Management and Assessment (IEMA)
- MS-LOT (2017) Scoping Opinion for the proposed section 36 consent and associated marine licence application for the revised seagreen phase 1 offshore project. 15 September 2017.
- Seagreen (2017) Seagreen Phase 1 Offshore Project Scoping Report Round 3: Firth of Forth.
- Seagreen (2012) Seagreen Phase 1 Offshore Project Environmental Statement.
- Seagreen (2013) Addendum to Seagreen Phase1 Offshore Environmental Statement (Information to inform Appropriate Assessment).
- The Crown Estate (2010). Round 3 zone appraisal and planning - A strategic approach to zone design, project identification and consent. Prepared by Emu Ltd. Available at: [http://www.thecrownestate.co.uk/media/122852/r3\\_zone\\_appraisal\\_and\\_planning.pdf](http://www.thecrownestate.co.uk/media/122852/r3_zone_appraisal_and_planning.pdf) [Accessed 15/03/2012]

## FURTHER INFORMATION

Copies of the ES may be obtained from Seagreen (0141 224 7192 or [info@seagreenwindenergy.com](mailto:info@seagreenwindenergy.com)) at a charge of £10 for a copy on CD and £660 per hard copy. Copies of this non-technical summary are available free of charge.

Any representations to the application should be made by email to: The Scottish Government, Marine Scotland Licensing Operations Team mailbox at [Seagreen.Representations@gov.scot](mailto:Seagreen.Representations@gov.scot) or by post to: The Scottish Government, Marine Scotland Licensing Operations Team, Marine Laboratory, 375 Victoria Road, Aberdeen, AB11 9DB, identifying the proposal and specifying the grounds for representation.

The EIA Report can be viewed during the statutory consultation period at the locations below:

**ANGUS COUNCIL  
MONTROSE ACCESS  
OFFICE**

Town House  
High Street  
Montrose  
DD10 8QW

**ARBROATH  
LIBRARY**

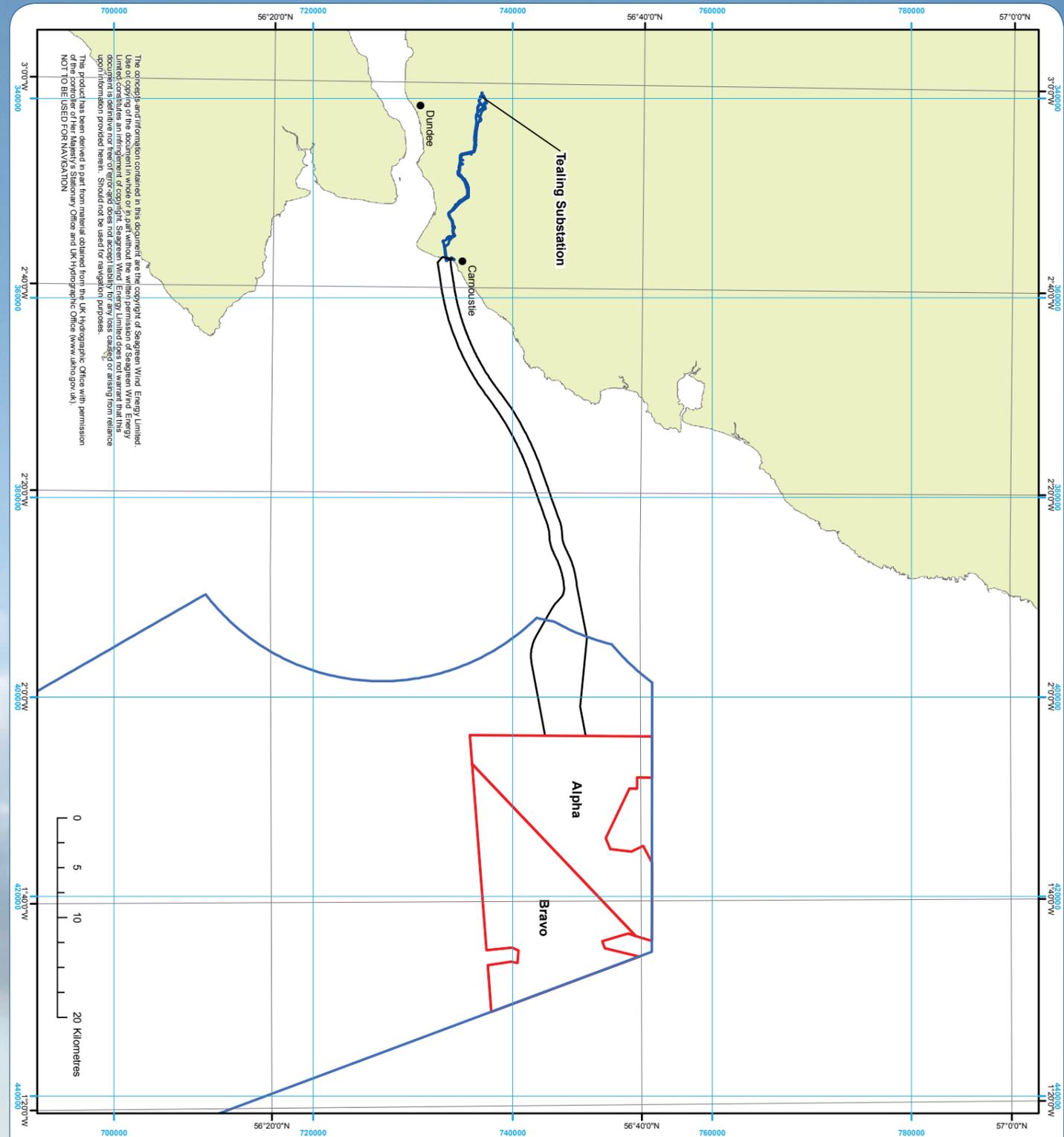
Hill Terrace  
Arbroath  
DD11 1AH

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21 High Street  
Carnoustie  
DD7 6AN

**DUNDEE CENTRAL  
LIBRARY**

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Dundee  
DD1 1DB



**Legend**

- Project Alpha and Project Bravo Boundaries
- Firth of Forth Round 3 Zone 2
- Offshore Export Cable Route Corridor
- Onshore Export Cable Route

**Coordinate System**  
 British National Grid (OSGB36)  
 Projection: Transverse Mercator  
 Spheroid: Airy 1830  
 Scale Factor: 0.9996  
 Latitude Of Origin: 49.0000  
 False Easting: 400000.0000  
 False Northing: 100000.0000  
 Reference Spheroid: OSGB36

**Project:**  
 Firth of Forth Offshore Wind Farm

**Figure/Drawing Title:**  
 SEAGREEN ONSHORE AND OFFSHORE  
 PROJECT BOUNDARIES

**Figure/Drawing Number:** NTS FIGURE 1

**UNLESS THE REVISION IS 8 OR HIGHER THE DRAWING IS NOT TO BE USED FOR DESIGN OR CONSTRUCTION**

REV	DATE	DESCRIPTION	BY	CHKD	REV	ENG
00	05 JUN 18	FOR FORML SUBMISSION	LH	NB	LR	AL
A0	24 MAY 18	FOR REVIEW	LH	NB	LR	AL

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**REGISTERED OFFICE:**

Seagreen Wind Energy Limited  
1 Forbury Place  
43 Forbury Road  
Reading, RG1 3JH  
Company No. 06873902

[www.seagreenwindenergy.com](http://www.seagreenwindenergy.com)