MGN 543 and Methodology Checklist
Optimised Seagreen Project

(Appendix 12F)

Prepared by	Anatec Limited
Presented to	Seagreen Wind Energy Limited
Date	20 06 2018
Revision Number	03
Document Reference	A4078-SWEL-MGN-3 App 12F

	Aberdeen Office	**Cambridge Office**
Address	10 Exchange Street, Aberdeen, AB11 6PH, UK	Braemoor, No. 4 The Warren, Witchford Ely, Cambs, CB6 2HN, UK
Tel	01224 253700	01353 661200
Fax	0709 2367306	0709 2367306
Email	aberdeen@anatec.com	cambs@anatec.com

Revision Number	Date	Summary of Change
00	04 May 2018	Initial Draft
01	29 May 2018	Comments Review
02	15 June 2018	Further Comment Review
03	20 June 2018	Final Submission

Table of Contents

Table of Tables

Abbreviations Table

Abbreviation	Definition
AIS	Automatic Identification System
ATBA	Area to be Avoided
AtoN	Aids to Navigation
BERR	Department for Business, Enterprise and Regulatory Reform
CA	Cruising Association
CAA	Civil Aviation Authority
COLREGs	International Regulations for Preventing Collisions at
CoS	Chamber of Shipping
DSC	Digital Selective Calling
DSLP	Development and Specification Layout Plan
EIA	Environmental Impact Assessment
ERCoP	Emergency Response and Cooperation Plan
ES	Environmental Statement
ESRI	Environmental Systems Research Institute
ETRS89	European Terrestrial Reference System 1989
GIS	Geographical Information System
GLA	General Lighthouse Authority
GMDSS	Global Maritime Distress and Safety System
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IMO	International Maritime Organization
LMP	Lighting and Marking Plan
m	Metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MoD	Ministry of Defence
MSI	Maritime Safety Information

Abbreviation	Definition
nm	Nautical Mile
NLB	Northern Lighthouse Board
NRA	Navigational Risk Assessment
OREI	Offshore Renewable Energy Installation
OWF	Offshore Wind Farm
PEXA	Practice and Exercise Area
PNT	Positioning, Navigation and Timing
RNLI	Royal National Lifeboat Institution
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yachting Association
SAR	Search and Rescue
SFF	Scottish Fishermen's Federation
SOLAS	Safety of Life at Sea
UKHO	United Kingdom Hydrographic Office
VHF	Very High Frequency
VTS	Vessel Traffic Service
WGS84	World Geodetic System 1984
WTG	Wind Turbine Generator

1 Introduction

As set out in Chapter 1 (Introduction) of the Environmental Impact Assessment (EIA) Report, the original Seagreen Project (herein referred to as the originally consented Project) received development consents from Scottish Ministers in 2014. This was confirmed in November 2017, following legal challenge by the Royal Society for the Protection of Birds (RSPB) to the consent award decision. Seagreen is now applying for additional consents for an optimised design (herein referred to as the optimised Seagreen Project), based on fewer, larger, higher capacity Wind Turbine Generators (WTGs) that have become available, since the 2014 consent decision, and inclusion of monopiles as a foundation option.

The optimised Seagreen Project comprises the Seagreen Alpha Offshore Wind Farm (OWF) (herein referred to as 'Project Alpha') and, Seagreen Bravo OWF (herein referred to as 'Project Bravo'). It is noted that the Offshore Transmission Asset has been licensed separately, no changes are proposed and therefore this is not considered further within this assessment. A full description of the optimised Seagreen Project is provided in Chapter 5 (Project Description) of the EIA Report.

This appendix of the EIA Report (Chapter 12 (Shipping and Navigation)) presents a checklist developed by the Maritime and Coastguard Agency (MCA) in conjunction with Marine Guidance Note (MGN) 543 (MCA, 2016). This checklist is designed as an aid for developers when completing and submitting Navigational Risk Assessments (NRA), as part of the shipping and navigation chapter of an EIA report.

Additionally, the MCA has developed a separate methodology checklist based upon the *Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms* (MCA, 2015). This appendix provides the MGN and methodology checklists for the optimised Seagreen Project, including comments specific to each element of the checklists and, where appropriate, references to where elements have been addressed within the EIA Report (Chapter 12 (Shipping and Navigation)) and its appendices.

2 MGN 543 Checklist

Table 2.1 shows the completed MGN 543 checklist.

Table 2.1 MGN 543 Checklist

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
Annex 1 : Considerations on Site Position, Structures and Safety Zones		
1. Site and Installation Co-ordinates. Developers are responsible for ensuring that formally agreed co-ordinates and subsequent variations of site perimeters and individual OREI structures are made available, on request to interested parties, at relevant project stages, including application for consent, development, array variation, operation and decommissioning. This should be supplied as authoritative Geographical Information System (GIS) data, preferably in Environmental Systems Research Institute (ESRI) format. Metadata should facilitate the identification of the data creator, its date and purpose, and the geodetic datum used. For mariners' use, appropriate data should also be provided with latitude and longitude coordinates in World Geodetic System 1894 (WGS84) (European Terrestrial Reference System 1989 (ETRS89)) datum.		Seagreen will make the formally agreed co-ordinates, and any subsequent variations, available to interested parties at the relevant project stages.
2. Traffic Survey. Includes:		
All vessel types	✓	An Automatic Identification System (AIS) marine traffic survey validation has been undertaken in 2017 (Appendix 12B (AIS Marine Traffic Validation)) (2018) which analyses the various vessel types observed. This includes the identification of main routes passing within and in proximity to the optimised Seagreen Project, which have been characterised by vessel type, as well as by vessel size and numbers. It is used in combination with other sources including the existing marine traffic surveys, to identify all vessel types operating within the area.
At least 28 days duration, within either 12 or 24 months prior to submission of the Environmental Statement (ES)	✓	The AIS marine traffic survey validation (2018) (Appendix 12B (AIS Marine Traffic Validation)) comprises 28 days of data recorded in February/March and July/August 2017. Other existing marine traffic surveys (2011) (Appendix 12C (Project Alpha and Project Bravo 2012 NRA)) provide an expanded seasonal data set and cover annual variations.

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
Multiple data sources	✓	In addition to the AIS marine traffic survey validation (2018) (Appendix 12B (AIS Marine Traffic Validation)), the vessel traffic in proximity to the optimised Seagreen Project has also been characterised using existing marine traffic surveys (2011) (Appendix 12C (Project Alpha and Project Bravo 2012 NRA)), satellite and sightings (fishing) data (2016 and 2017) (Marine Scotland), Anatec ShipRoutes, UK Coastal Atlas of Recreational Boating (Royal Yachting Association (RYA), 2016), regular operator (Appendix 12E (Regular Operator Consultation), statutory and local consultation (Table 12.1 of the EIA Report (Chapter 12 (Shipping and Navigation)).
Seasonal variations	✓	The AIS marine traffic survey validation (2018) (Appendix 12B (AIS Marine Traffic Validation)) uses data over two distinct periods, 14 days in February/March and 14 days in July/August 2017, with these periods designated as winter and summer periods, respectively. Other data sets, such as Marine Scotland's sightings and satellite (2016 and 2017) (Marine Scotland), provide a much wider seasonal and annual picture.
MCA consultation	✓	Consultations with key marine and navigational stakeholders are summarised in Table 12.1 of the EIA Report (Chapter 12 (Shipping and Navigation)), including the MCA, Northern Lighthouse Board (NLB) (the GLA for the region), CoS, RYA Scotland, Scottish Fishermen's Federation (SFF), Cruising Association (CA), Transport Scotland (Ports and Harbours) and Forth Ports. There is a Fisheries Liaison Officer in post. We have also undertaken regular operator consultation. This is presented in Appendix 12E (Regular Operator Consultation).
General Lighthouse Authority (GLA) consultation	✓	
Chamber of Shipping (CoS) consultation	✓	
Recreational and fishing vessel organisations consultation	✓	
Port and navigation authorities consultation, as appropriate	✓	
Assessment of the cumulative and individual effects of (as appropriate):		

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
i. Proposed OREI site relative to areas used by any type of marine craft.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and its appendices provide an overview of the main navigational features in proximity to the optimised Seagreen Project, including areas used by vessels. It was noted that there were no Military Practice and Exercise Areas (PEXA), anchorage areas, charted spoil grounds, licensed aggregate dredging areas or oil and gas surface platforms within the study area.
ii. Numbers, types and sizes of vessels presently using such areas	✓	The AIS marine traffic survey validation (2018) (Appendix 12B (AIS Marine Traffic Validation)) and other sources characterises the vessels presently operating in proximity to the optimised Seagreen Project in terms of numbers, type and size. Section 8 and section 12 of Appendix 12A (NRA Addendum) assess the impact of the optimised Seagreen Project in isolation and cumulatively on vessel presence in proximity in particular providing likely route deviations (based on data from Appendix B (AIS Marine Traffic Validation)) that will arise during the operational phase.
iii. Non-transit uses of the areas, e.g. fishing, day cruising of leisure craft, racing, aggregate dredging, etc.	✓	Non-transit vessels such as fishing vessels and recreational vessels have been analysed in the AIS marine traffic survey validation (2018) (Appendix 12B (AIS Marine Traffic Validation)). Impacts relating to these vessel types have then been assessed, where appropriate, in the EIA Report (Chapter 12 (Shipping and Navigation)) and the NRA Addendum (Appendix 12A (NRA Addendum)). There are no active marine aggregate dredging areas within Scottish waters.
iv. Whether these areas contain transit routes used by coastal or deep-draught vessels on passage.	✓	The AIS marine traffic survey validation (2018) (Appendix 12B (AIS Marine Traffic Validation)) and the NRA addendum (Appendix 12A (NRA Addendum)) identifies main routes passing in proximity to the optimised Seagreen Project, which have been characterised by vessel type, as well as by vessel size and numbers. A draught analysis is also undertaken within the AIS marine traffic survey validation (2018) (Appendix 12B (AIS Marine Traffic Validation)).
v. Alignment and proximity of the site relative to adjacent shipping lanes	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) provides an overview of the main

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
vi. Whether the nearby area contains prescribed routeing schemes or precautionary areas	✓	navigational features in proximity to the optimised Seagreen Project. It was noted that most of the features listed are not located in proximity to the optimised Seagreen Project. Consequently no impacts have been assessed in relation to these features. Features which were observed in the EIA Report (Chapter 12 (Shipping and Navigation)) in proximity to the optimised Seagreen Project include: ▪ Areas used for anchorage (based upon Appendix 12B (AIS Marine Traffic Validation) (2018); ▪ Existing fishing grounds; ▪ Proposed offshore wind farms. These features have been assessed, where required, in the EIA Report (Chapter 12 (Shipping and Navigation)) and its appendices. Although not in proximity to port jurisdiction or VTS, Seagreen have liaised with Forth Ports given that vessels in proximity to the site are often bound to/from Forth Ports.
vii. Whether the site lies on or near a prescribed or conventionally accepted separation zone between two opposing routes	✓	
viii. Proximity of the site to areas used for anchorage, safe haven, port approaches and pilot boarding or landing areas.	✓	
ix. Whether the site lies within the jurisdiction of a port and/or navigation authority.	✓	
x. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.	✓	
xi. Proximity of the site to offshore firing/bombing ranges and areas used for any marine military purposes.	✓	
xii. Proximity of the site to existing or proposed offshore oil / gas platform, marine aggregate dredging, marine archaeological sites or wrecks, Marine Protected Area or other exploration/exploitation sites	✓	
xiii. Proximity of the site to existing or proposed OREI developments, in co-operation with other relevant developers, within each round of lease awards.	✓	
	✓	
	✓	
xvi. Researched opinion using computer simulation techniques with respect to the displacement of traffic and, in particular, the creation of 'choke points' in areas of high traffic density and nearby or consented OREI sites not yet constructed.	✓	Section 10 and 11 of Appendix 12A (NRA Addendum) outline the results of allision and collision risk modelling undertaken for the optimised Seagreen Project (based on 2017 data from Appendix 12B (AIS Marine Traffic Validation)). The methodology for the modelling process is outlined in Section 9 of Appendix 12A (NRA Addendum).

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
xvii. With reference to xvi. above, the number and type of incidents to vessels which have taken place in or near to the proposed site of the OREI to assess the likelihood of such events in the future and the potential impact of such a situation.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) summarises the marine incidents which have occurred in proximity to the optimised Seagreen Project based upon historical data. These are discussed in more detail in Section 6 of Appendix 12A (NRA Addendum). This includes breakdowns of the historical data (1994-2014 Marine Accident Investigation Branch (MAIB) and 2005-2014 Royal National Lifeboat Institution (RNLI)) in terms of the number and type of incidents.
3. OREI Structures – the following should be determined:		
a. Whether any feature of the OREI, including auxiliary platforms outside the main generator site, mooring and anchoring systems, inter-device and export cabling could pose any type of difficulty or danger to vessels underway, performing normal operations, including fishing, anchoring and emergency response.	✓	Impacts to commercial vessels, fishing vessels, recreational vessels, and Search and Rescue (SAR) resources are assessed within the EIA Report (Chapter 12 (Shipping and Navigation)).
b. Clearances of wind turbine blades above the sea surface are not less than 22 metres (m) above Mean High Water Springs (MHWS).	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outline embedded mitigation measures, including a blade clearance of 32.5m which is significantly higher than the minimum 22m above MHWS required by MGN 543 and RYA requirements.
c. Underwater devices: i. changes to charted depth ii. maximum height above seabed iii. Under Keel Clearance	✓	Issues relating to under keel clearance and reductions in water depth will be covered within a risk assessment of cable burial depths to be undertaken post-consent. This is included as a consent condition of the originally consented project relevant to shipping and navigation within the EIA Report (Chapter 12 (Shipping and Navigation)).
d. The burial depth of cabling and changes to charted depths associated with any protection measures.	✓	
4. Assessment of Access to and Navigation Within, or Close to, an OREI. To determine the extent to which navigation would be feasible within the OREI site itself by assessing whether:		

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
a. Navigation within or close to the site would be safe: i. by all vessels, or ii. by specified vessel types, operations and/or sizes. iii. in all directions or areas, or iv. in specified directions or areas. v. in specified tidal, weather or other conditions.	✓	Section 11 of Appendix 12A (NRA Addendum) outlines the results of allision and collision risk modelling undertaken for the optimised Seagreen Project (based on 2017 data from Appendix 12B (AIS Marine Traffic Validation)), including the risk of a vessel alliding with a structure. This assessment accounts for different vessel types and sizes and considers both powered and drifting scenarios. Figure 11.2 and 11.3 of Appendix 12A (NRA Addendum) illustrate the location of the highest allision risk areas of the optimised Seagreen Project.
b. Navigation in and/or near the site should be: i. prohibited by specified vessels types, operations and/or sizes. ii. prohibited in respect of specific activities, iii. prohibited in all areas or directions, or iv. prohibited in specified areas or directions, or v. prohibited in specified tidal or weather conditions, or simply vi. recommended to be avoided.	✓	Section 13 of Appendix 12A (NRA Addendum) outlines embedded mitigation measures, including an application for rolling safety zones during construction, periods of major maintenance during operation, and during decommissioning. Smaller "pre-commissioning" safety zones are also considered. Apart from these safety zones, there are not anticipated to be any restrictions on vessels transiting through the optimised Seagreen Project.
c. Exclusion from the site could cause navigational, safety or routeing problems for vessels operating in the area e.g. by preventing vessels from responding to calls for assistance from persons in distress.	✓	Search and Rescue (SAR) related impacts have been assessed within the EIA Report (Chapter 12 (Shipping and Navigation)) and the maritime incident baseline (1994-2014 MAIB and 2005-2014 RNLI) has been assessed in Appendix 12A (NRA Addendum).
d. Relevant information concerning a decision to seek a safety zone for a particular site during any point in its construction, extension, operation or decommissioning should be specified in the ES accompanying the development application.	✓	Section 13 of Appendix 12A (NRA Addendum) outlines embedded mitigation measures, including an application for rolling safety zones during construction, periods of major maintenance during operation, and during decommissioning. Smaller "pre-commissioning" safety zones are also considered.
Annex 2: Navigation, collision avoidance and communications		
1. The Effect of Tides and Tidal Streams. It should be determined whether:		

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
a. Current maritime traffic flows and operations in the general area are affected by the depth of water in which the proposed installation is situated at various states of the tide i.e. whether the installation could pose problems at high water which do not exist at low water conditions, and vice versa.	✓	Section 9.3.4 of Appendix 12 (NRA Addendum) notes that tidal streams have been used as input to the assessment (United Kingdom Hydrographic Office (UKHO) Admiralty Chat 1407). The data used in Appendix 12B (AIS Marine Traffic Validation) (2018) accounts for seasonal variation and therefore also tidal variations. No impacts due to tidal flow or rise have been identified, based on marine stakeholder feedback and expert judgement.
b. The set and rate of the tidal stream, at any state of the tide, has a significant effect on vessels in the area of the OREI site.	✓	
c. The maximum rate tidal stream runs parallel to the major axis of the proposed site layout and, if so, its effect.	✓	
d. The set is across the major axis of the layout at any time, and if so, at what rate.	✓	
e. In general, whether engine failure or other circumstance could cause vessels to be set into danger by the tidal stream.	✓	Section 11.2 of the Appendix 12A (NRA Addendum) provides details of vessel to structure allision modelling undertaken (based on 2017 data from Appendix 12B (AIS Marine Traffic Validation)), which includes a drifting scenario based upon tidal streams.
f. The structures themselves could cause changes in the set and rate of the tidal stream.	✓	No impacts due to tidal flow or rise have been identified, based on marine stakeholder feedback and expert judgement.
g. The structures in the tidal stream could be such as to produce siltation, deposition of sediment or scouring, affecting navigable water depths in the wind farm area or adjacent to the area.	✓	No impacts relating to siltation or deposition (impacting shipping and navigation) were identified, based on marine stakeholder feedback and expert judgement.
a. Current maritime traffic flows and operations in the general area are affected by the depth of water in which the proposed installation is situated at various states of the tide i.e. whether the installation could pose problems at high water which do not exist at low water conditions, and vice versa.	✓	No impacts due to tidal flow or rise have been identified, based on marine stakeholder feedback and expert judgement.
2. Weather. It should be determined whether:		
a. The site, in normal, bad weather, or restricted visibility conditions, could present difficulties or dangers to craft, including sailing vessels, which might pass in close proximity to it.	✓	Section 9.3 of Appendix 12A (NRA Addendum) includes consideration of weather data. Wind directions and visibility have been used as input to the assessment.
b. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.	✓	No impacts related to vessels under sail have been identified, based on marine stakeholder feedback and expert judgement.

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
c. In general, taking into account the prevailing winds for the area, whether engine failure or other circumstances could cause vessels to drift into danger, particularly if in conjunction with a tidal set such as referred to above.	✓	Section 11.2 of Appendix 12A (NRA Addendum) provides details of vessel to structure allision modelling undertaken (based on 2017 data from Appendix 12B (AIS Marine Traffic Validation)), which includes a drifting scenario based upon wind and tidal streams.
3. Collision Avoidance and Visual Navigation. It should be determined whether:		
a. The layout design will allow safe transit through the OREI by SAR helicopters and vessels.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12 (NRA Addendum) outlines embedded mitigation measures, including the creation of a Development and Specification Layout Plan (DSLP) which will be agreed with Marine Scotland, who will consult with several statutory stakeholders including the MCA.
b. The MCA's Navigation Safety Branch and Maritime Operations branch will be consulted on the layout design and agreement will be sought.	✓	
c. The layout design has been or will be determined with due regard to safety of navigation and SAR.	✓	
d.i. The structures could block or hinder the view of other vessels under way on any route.	✓	No significant visual obstructions to Aids to Navigation (AtoNs) are anticipated following consideration of the baseline.
d.ii. The structures could block or hinder the view of the coastline or of any other navigational feature such as aids to navigation, landmarks, promontories, etc.	✓	
4. Communications, Radar and Positioning Systems. To provide researched opinion of a generic and, where appropriate, site specific nature concerning whether:		
a. The structures could produce radio interference such as shadowing, reflections or phase changes, and emissions with respect to any frequencies used for marine positioning, navigation and timing (PNT) or communications, including Global Maritime Distress and Safety System (GMDSS) and AIS, whether ship borne, ashore or fitted to any of the proposed structures, to: i. Vessels operating at a safe navigational distance. ii. Vessels by the nature of their work necessarily operating at less than the safe navigational distance to the OREI, e.g. support vessels, survey vessels, SAR assets. iii. Vessels by the nature of their work necessarily operating within the OREI.	✓	Impacts on marine radar and other forms of position fixing and communications are assessed within 2012 NRA (Appendix 12C (Project Alpha and Project Bravo 2012 NRA)).

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
b. The structures could produce radar reflections, blind spots, shadow areas or other adverse effects: i. Vessel to vessel; ii. Vessel to shore; iii. VTS radar to vessel; iv. Racon to/from vessel.	✓	
c. The structures and generators might produce sonar interference affecting fishing, industrial or military systems used in the area.	✓	
d. The site might produce acoustic noise which could mask prescribed sound signals.	✓	
e. Generators and the seabed cabling within the site and onshore might produce electro-magnetic fields affecting compasses and other navigation systems.	✓	Electromagnetic interference related impacts are not anticipated for the optimised Seagreen Project. It is noted that the Offshore Transmission Asset has been licensed separately.
5. Marine Navigational Marking. It should be determined:		
a. How the overall site would be marked by day and by night throughout construction, operation and decommissioning phases, taking into account that there may be an ongoing requirement for marking on completion of decommissioning, depending on individual circumstances.	✓	The EIA Report (Chapter 12 (Shipping and Navigation))) outlines original consent conditions relevant to shipping and navigation, including a Lighting and Marking Plan (LMP) which will be created post-consent once the final WTG layout has been agreed, and present the lighting and marking that will be implemented during each phase of the development. Lighting and marking will be in line with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) O-139 (IALA, 2013) and will be agreed with relevant stakeholders, including the NLB.
b. How individual structures on the perimeter of and within the site, both above and below the sea surface, would be marked by day and by night.	✓	
c. If the specific OREI structure would be inherently Radar conspicuous from all seaward directions (and for SAR and maritime surveillance aviation purposes) or would require passive enhancers.	✓	Marine Radar and other forms of position fixing and communication systems related impacts have been considered within the 2012 NRA (Appendix 12C (Project Alpha and Project Bravo 2012 NRA)).
d. If the site would be marked by additional electronic means e.g. Racons	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) outlines original consent conditions relevant to shipping and navigation, including an LMP which will be created post-consent once the final WTG layout has been agreed, and present the lighting and marking that will be implemented during each phase of the development. Lighting and marking will be
e. If the site would be marked by an AIS transceiver, and if so, the data it would transmit.	✓	
f. If the site would be fitted with audible hazard warning in accordance with IALA recommendations.	✓	

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
g. If the structure(s) would be fitted with aviation lighting and, if so, how these would be screened from mariners or guarded against potential confusion with other navigational marks and lights.	✓	in line with IALA O-139 and will be agreed with relevant stakeholders, including the NLB and Civil Aviation Authority (CAA) (where appropriate). Consideration will also be given for the inclusion of additional electronic Aids to Navigations, including Racons.
h. Whether the proposed site and/or its individual generators complies in general with markings for such structures, as required by the relevant GLA in consideration of IALA guidelines and recommendations.	✓	
i. The aids to navigation specified by the GLAs are being maintained such that the 'availability criteria', as laid down and applied by the GLAs, is met at all times.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outlines embedded mitigation measures, including the implementation and maintenance of permanent Aids to Navigation based upon the requirements set out in IALA O-139.
j. The procedures that need to be put in place to respond to casualties to the aids to navigation specified by the GLA, within the timescales laid down and specified by the GLA.	✓	
k. The ID marking will conform to a spreadsheet layout, sequential, aligned with SAR lanes and avoid the letters O and I.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) outlines consent conditions of the originally consented project, relevant to shipping and navigation, including an LMP which will be created post-consent once the final WTG layout has been agreed, and will present the ID marking to be implemented. This will conform to a spreadsheet layout as specified.
l. Working lights will not interfere with Aids to Navigation or create confusion for the Mariner navigating in or near the OREI.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outlines consent conditions or the originally consented project, relevant to shipping and navigation, including an LMP which will be created post-consent once the final WTG layout has been agreed, and present the lighting and marking that will be implemented during each phase of the development. Lighting and marking will be in line with IALA O-139 and will be agreed with relevant stakeholders, including the NLB. Consideration will be given to the potential for light confusion to passing mariners.
6. Hydrography. In order to establish a baseline, confirm the safe navigable depth, monitor seabed mobility and to identify underwater hazards, detailed and accurate hydrographic surveys are included or acknowledged for the following stages and to MCA specifications:		

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
i. *Pre-consent:* The site and its immediate environs extending to 500m outside of the development area shall be undertaken as part of the licence and/or consent application. The survey shall include all proposed cable route(s).	✓	The required hydrographic data will be provided by Seagreen Wind Energy Limited.
ii. *Post-construction:* Cable route(s).	✓	
iii. *Post-decommissioning of all or part of the development:* Cable route(s) and the area extending to 500m from the installed generating assets area.	✓	
Annex 3: MCA template for assessing distances between wind farm boundaries and shipping routes		
"Shipping Route" template and Interactive Boundaries. Where appropriate, the following should be determined:		
a. The safe distance between a shipping route and turbine boundaries.	✓	Section 8 of Appendix 12A (NRA Addendum) considered a passing distance of one nautical mile (nm) from the optimised Seagreen Project structures when deviating vessels. This is in line with typical passing distance seen for existing wind farm developments.
b. The width of a corridor between sites or OREIs to allow safe passage of shipping.	✓	Cumulative assessment has been undertaken within the EIA Report (Chapter 12 (Shipping and Navigation)) and all impacts assessed have been identified as not significant. Cumulative routeing deviations have been assessed in Section 12 of Appendix 12A (NRA Addendum).
Annex 4: Safety and mitigation measures recommended for OREI during construction, operation and decommissioning		
Mitigation and safety measures will be applied to the OREI development appropriate to the level and type of risk determined during the EIA. The specific measures to be employed will be selected in consultation with the MCA and will be listed in the developer's ES. These will be consistent with international standards contained in, for example, the International Convention for the Safety of Life at Sea (SOLAS) (International Maritime Organization (IMO), 1974) and **could include any or all** of the following:	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outline embedded mitigation measures. These are based upon the relevant guidance and have been agreed with the MCA and NLB. It is noted that among these embedded mitigation measures is compliance with international maritime regulations, including the International Regulations for Preventing Collisions at Sea (COLREGs) (IMO, 1972) and the SOLAS (IMO, 1974).
i. Promulgation of information and warnings through notices to mariners and other appropriate Maritime Safety Information (MSI) dissemination methods.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outline embedded mitigation measures, including the promulgation of information to relevant stakeholders through Notice to Mariners and Kingfisher bulletins.

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
ii. Continuous watch by multi-channel Very High Frequency (VHF), including Digital Selective Calling (DSC).	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outline embedded mitigation measures, including a Marine Coordination Centre where project vessel traffic will be monitored by AIS during construction and operation. Guard vessels will also provide monitoring when during construction and decommissioning when deemed appropriate through a risk assessment.
iii. Safety zones of appropriate configuration, extent and application to specified vessels[1]	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outline embedded mitigation measures, including an application for rolling safety zones during construction, periods of major maintenance during operation, and during decommissioning. Smaller "pre-commissioning" safety zones are also considered.
iv. Designation of the site as an Area to be Avoided (ATBA).	✓	Apart from the safety zones described above, there are not anticipated to be any restrictions on vessels transiting through the optimised Seagreen Project.
v. Provision of Aids to Navigation as determined by the GLA.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outline embedded mitigation measures, including the implementation and maintenance of permanent Aids to Navigation based upon the requirements set out in IALA O-139. This will be agreed with the NLB (the GLA for the region), as well as the CAA, MCA and Ministry of Defence (MoD).
vi. Implementation of routeing measures within or near to the development.	✓	Given the levels of traffic observed passing the sea area containing the optimised Seagreen Project in the AIS marine traffic survey validation (2018) (Appendix 12B (AIS Marine Traffic Validation)) and the results of the routeing assessment in Appendix 12A (NRA Addendum) (based on 2017 data from Appendix 12B (AIS Marine Traffic Validation))), it is not considered necessary that any routeing measures will be required.

[1] As per *SI 2007 No 1948 "The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007* (BERR, 2007).

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
vii. Monitoring by Radar, AIS, CCTV or other agreed means.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outline embedded mitigation measures, including a Marine Coordination Centre where project vessel traffic will be monitored by AIS during construction and operation. Guard vessels will also provide monitoring during construction and decommissioning when deemed appropriate through a risk assessment.
viii. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of safety zones.	✓	An appropriate means of safety zone monitoring will be agreed with the MCA, noting that guard vessels will be considered when deemed appropriate during construction and decommissioning as per embedded mitigation measures outlined in the EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum).
ix. Creation of an Emergency Response Cooperation Plan (ERCoP) with the MCA's Search and Rescue Branch for the construction phase onwards.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outline embedded mitigation measures, including an ERCoP which will be provided to the MCA for approval post-consent. The ERCoP will provide details of emergency response plans in place for the optimised Seagreen Project.
x. Use of guard vessels, where appropriate.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) (outline embedded mitigation measures, including the use of guard vessels when deemed appropriate through risk assessment.
xi. Any other measures and procedures considered appropriate in consultation with other stakeholders.	✓	Any additional mitigation measures required are outlined as part of the risk assessment undertaken in the EIA Report (Chapter 12 (Shipping and Navigation)).
Annex 5: Standards, procedures and operational requirements in the event of search and rescue, maritime assistance service counter pollution or salvage incident in or around an OREI, including generator/installation control and shutdown.		
The MCA, through HM Coastguard, is required to provide SAR and emergency response within the sea area occupied by all offshore renewable energy installations in UK waters. To ensure that such operations can be safely and effectively conducted, certain requirements must be met by developers and operators.		

Issue: Offshore Renewable Energy Installation (OREI) Response	Yes/No	Comments
a. An ERCoP will be developed for the construction, operation and decommissioning phases of the OREI.	✓	The EIA Report (Chapter 12 (Shipping and Navigation)) and Section 13 of Appendix 12A (NRA Addendum) outline embedded mitigation measures, including an ERCoP which will be provided to the MCA for approval post-consent. The ERCoP will provide details of emergency response plans in place for the optimised Seagreen Project.
b. The MCA's guidance document *Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for Search and Rescue and Emergency Response* (MCA, 2016) for the design, equipment and operation requirements will be followed.	✓	The MCAs guidance document Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for Search and Rescue and Emergency Response will be considered. It is noted that MGN 543, including the SAR annex has been included as an embedded mitigation measure in the EIA Report (Chapter 12 (Shipping and Navigation)) and section 13 of Appendix 12A (NRA Addendum).

3 Methodology Checklist

Table 3.1 shows the completed MGN 543 checklist.

Table 3.1 Methodology Checklist

Issue: OREI Response	Yes/No	Comments
A1: Reference Sources – Lessons learned	✓	**Lessons Learned** NRA (Appendix 12C (Project Alpha and Project Bravo 2012 NRA) (2012) and Addendum (Appendix 12A (NRA Addendum)) (2018)
B1: Base case traffic densities and types	✓	**2017 Validation Survey Results** **2017 Validation Survey Type Analysis** Appendix 12B (AIS Marine Traffic Survey Validation) (2018) Existing Marine Traffic Surveys Appendix 12C (Project Alpha and Project Bravo 2012 NRA) (2012) and Appendix 12A (NRA Addendum) (2018)
B2: Future traffic densities and types	✓	**Post Wind Farm Routeing Analysis** Appendix 12C (Project Alpha and Project Bravo 2012 NRA) (2012) and Appendix 12A (NRA Addendum) (2018)
B3: The marine environment		
B3.1: Technical and operational analysis	✓	**Assessment of Impacts – Worst Case Scenario** **Environmental Measures Incorporated in the Project** EIA Report 12 (Shipping and Navigation) (2018)
B3.2: Generic TOA	✓	**Methodology** EIA Chapter 12 (Shipping and Navigation) (2018) **2017 Validation Survey Methodology** Appendix 12B (AIS Marine Traffic Survey Validation) (2018)
B3.3: Potential accidents	✓	**Seagreen Project in Isolation Assessment** Appendix 12A (NRA Addendum) (2018) **Impact Assessment** EIA Report 12 (Shipping and Navigation) (2018)
B3.4: Affected navigational activities	✓	**Impact Assessment** EIA Report 12 (Shipping and Navigation) (2018)
B3.5: Effects of OREI structures	✓	
B3.6: Development phases	✓	
B3.7: Other structures & features	✓	**Baseline Conditions** **Impact Assessment (Cumulative)** EIA Report 12 (Shipping and Navigation) (2018)
B3.8: Vessel types involved	✓	**2017 Validation Survey Type Analysis** Appendix 12B (AIS Marine Traffic Survey Validation) (2018)
B3.9: Conditions affecting navigation	✓	**Collision and Allision Risk Modelling Overview** Appendix 12A (NRA Addendum) (2018)
B3.10: Human actions	✓	**Impact Assessment** EIA Report 12 (Shipping and Navigation) (2018)

Issue: OREI Response	Yes/No	Comments
C1: Hazard Identification	✓	**Hazard Log** Undertaken as part of the 2012 NRA process and appended to the EIA Report (Appendix 12D (2012 Hazard Log)) (2012).
C2: Risk Assessment	✓	**Impact Assessment** EIA Report 12 (Shipping and Navigation) (2018) **Hazard Log** Undertaken as part of the 2012 NRA process and appended to the EIA (Appendix 12D (2012 Hazard Log)) (2012).
C3: Influences on level of risk	✓	**Baseline Conditions** **Environmental Measures Incorporated in the Project** **Assessment of Impacts – Worst Case Scenario** EIA Report 12 (Shipping and Navigation) (2018) **2017 Validation Survey Type Analysis** Appendix 12B (AIS Marine Traffic Validation) (2018)
C4: Tolerability of risk	✓	**Impact Assessment** EIA Report 12 (Shipping and Navigation) (2018) **Hazard Log** Undertaken as part of the 2012 NRA process and appended to the EIA Report (Appendix 12D (2012 Hazard Log)) (2012).
D1: Appropriate risk assessment	✓	**Assessment of Impacts – Worst Case Scenario** **Environmental Measures Incorporated in the Project** **Baseline Conditions** **Impact Assessment** EIA Report 12 (Shipping and Navigation) (2018)
D2: MCA acceptance for assessment techniques and tools	✓	**Impact Assessment** EIA Report 12 (Shipping and Navigation) (2018) **Hazard Log** Undertaken as part of the 2012 NRA process (Appendix 12D (2012 Hazard Log)) (2012).
D3: Demonstration of results	✓	
D4: Area traffic assessment	✓	**Assessment of Impacts – Worst Case Scenario** **Environmental Measures Incorporated in the Project** **Impact Assessment** EIA Report 12 (Shipping and Navigation) (2018) **2017 Validation Survey Results** **2017 Validation Survey Type Analysis** Appendix 12B (AIS Marine Traffic Validation) (2018) **Seagreen Project in Isolation Assessment** **Cumulative Assessment** Appendix 12A (NRA Addendum) (2018) **Hazard Log** Undertaken as part of the 2012 NRA process (Appendix 12D (2012 Hazard Log)) (2012).

Issue: OREI Response	Yes/No	Comments
D5: Specific traffic assessment	✓	**Assessment of Impacts – Worst Case Scenario** **Environmental Measures Incorporated in the Project** **Baseline Conditions** **Impact Assessment** EIA Report 12 (Shipping and Navigation) (2018) **2017 Validation Survey Results** **2017 Validation Survey Type Analysis** Appendix 12B (AIS Marine Traffic Validation) (2018) **Hazard Log** Undertaken as part of the 2012 NRA process and appended to the EIA Report (Appendix 12D (2012 Hazard Log)) (2012).
E1: Risk control log	✓	**Hazard Log** Undertaken as part of the 2012 NRA process and appended to the EIA Report (Appendix 12D (2012 Hazard Log)) (2012).
E2: Marine stakeholders	✓	**Consultation** Appendix 12A (NRA Addendum) (2018) EIA Report 12 (Shipping and Navigation) (2018)
F1: Hazard identification checklist	✓	**Hazard Log** Undertaken as part of the 2012 NRA process and appended to the EIA Report (Appendix 12D (2012 Hazard Log)) (2012). Outputs of EIA also identify control measures required.
F2: Risk control checklist	✓	