Pentland Floating Offshore Wind Farm

Pentland Floating Offshore Wind Farm EIA Scoping Report

Highland Wind Limited

Assignment Number: A100671-S00
Document Number: A-100671-S00-REPT-001

Xodus Group
8 Garson Place, Stromness
Orkney, UK, KW16 3EE

T +44 (0)1856 851451
E info@xodusgroup.com
www.xodusgroup.com

CONTENTS

1 INTRODUCTION 1

1.1 Company Background 1
1.2 Project Overview 1
1.3 Location and Extent 4
1.4 Project Objective 5

2 LEGISLATIVE CONTEXT AND REGULATORY REQUIREMENTS 7

2.1 International Legislation 7
2.2 European Legislation 7
2.3 Scottish Marine Policy and Legislation 7
2.4 Consenting Legislation 10
2.5 Environmental Impact Assessment Legislation 11
2.6 Habitats Regulations 11
2.7 Pre-Application Consultation 12
2.8 Other Permits and Licencing Requirements 12
2.9 Consenting of Original and Updated Project 13

3 SITE SELECTION 14

3.1 Original Site Selection 14
3.2 Site Selection Considerations Relevant to the Updated Project 14

4 STAKEHOLDER ENGAGEMENT 17

4.1 Engagement to Date 17
4.2 Stakeholder Engagement Undertaken by Dounreay Trì Ltd and Hexicon 17
4.3 Stakeholder Engagement Undertaken for PFOWF 17

5 PROJECT DESCRIPTION 21

5.1 Key Project Components 21
5.2 Offshore Infrastructure 22
5.3 Onshore Works 38
5.4 Construction Programme 42
5.5 Decommissioning 43
5.6 Safety Zones, Marking and Lighting 47

6 APPROACH TO SCOPING AND EIA 50

6.1 Introduction 50
6.2 Scoping Assessment Methodology 50
6.3 Cumulative Impacts 50
6.4 Transboundary Impacts 52
6.5 Monitoring 52

6.6 Structure of Assessments 53

7 OFFSHORE PHYSICAL ENVIRONMENT 54

7.1 Introduction 54
7.2 Marine Physical Processes 54
7.3 Water and Sediment Quality 65

8 OFFSHORE BIOLOGICAL ENVIRONMENT 75

8.1 Introduction 75
8.2 Benthic Ecology 75
8.3 Fish and Shellfish Ecology 84
8.4 Marine Mammals and Other Megafauna 96
8.5 Ornithology 110

9 OFFSHORE HUMAN ENVIRONMENT 127

9.1 Introduction 127
9.2 Commercial Fisheries 127
9.3 Shipping and Navigation 141
9.4 Aviation and Radar 151
9.5 Seascape, Landscape and Visual Impact Assessment 162
9.6 Archaeology and Cultural Heritage 187
9.7 Other Users of the Marine Environment 195
9.8 Socio-Economics, Recreation and Tourism 205

10 ONSHORE PHYSICAL ENVIRONMENT 212

10.1 Introduction 212
10.2 Geology, Physical Processes and Land Use 212

11 ONSHORE BIOLOGICAL ENVIRONMENT 228

11.1 Introduction 228
11.2 Terrestrial Ornithology 228
11.3 Terrestrial Ecology 241

12 ONSHORE HUMAN ENVIRONMENT 255

12.1 Introduction 255
12.2 Onshore Archaeology and Cultural Heritage 255
12.3 Air Quality 264
12.4 Landscape and Visual Amenity 271
12.5 Traffic and Transport 287
12.6 Other Issues 299

13 SUMMARY OF POTENTIAL IMPACTS 313

14 SUGGESTED STRUCTURE OF THE EIA REPORT 334

15 REFERENCES 336

15.1 Upfront Section References 336
15.2 Offshore Physical Environment 337
15.3 Offshore Biological Environment 337
15.4 Offshore Human Environment 342
15.5 Onshore Physical Environment 343
15.6 Onshore Biological Environment 344
15.1 Onshore Human Environment 346

ACRONYMS LIST

AADF	Annual Average Daily Flow
ACOPS	Advisory Committee on Protection of the Sea
AIS	Automatic Identification System
AMDS	Acoustic Mitigation Devices
ARC	Amphibian and Reptile Conservation
ASFB	Association of Salmon Fishery Boards
BAC	Background Assessment Concentration
BAT	Best Available Technique
BATNECC	Best Available Technique Not Entailing Excessive Cost
BEIS	Business Energy and Industrial Strategy
BGS	British Geological Survey
BODC	British Oceanographic Data Centre
BP	Before Present
BPEO	Best Practicable Environmental Option
BSI	British Standard Institution
BTO	British Trust for Ornithology
CAA	Civil Aviation Authority
CALM	Catenary Anchor Leg Mooring
Cefas	Centre for Environment Fisheries and Aquaculture Science
CES	Crown Estate Scotland
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CIP	Copenhagen Infrastructure Partners
CIRCA	Construction Industry Research and Information Association
CJB	Cable Joint Bay
COWRIE	Collaborative Offshore Wind Research into the Environment
DAFOR	Dominant, Abundant, Frequent, Occasional, Rare
DC	Direct Current
DDC	Dounreay Demonstration Centre
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment Food & Rural Affairs
DPO	Draft Plan Option
DSRL	Dounreay Site Restoration Ltd
DTI	Department of Trade and Industry
EC	European Council
EEZ	Exclusive Economic Zone
EHWS	Extreme High Water Springs
EIA	Environmental Impact Assessment
ELWS	Extreme Low Water Springs
EMF	electro-magnetic fields
ENA	Energy Networks Association
EPS	European Protected Species
ES	Environmental Statement
ESAS	European Seabirds at Sea
EU	European Union
EUNIS	European Union Nature Information System
FAD	Fish Aggregation Device
FEED	Front-End Engineering and Design
FES	Final End State
FSS	Food Standards Scotland
GEN	General Planning Principles
GIS	Geographic Information System

GPP	Guidance for Pollution Prevention
GWDE	Groundwater Dependant Terrestrial Ecosystems
HBRG	Highland Biological Recording Group
HDD	Horizontal Directional Drilling
HER	Historic Environment Record
HES	Historic Environment Scotland
HGV	Heavy Goods Vehicle
HIE	Highlands and Islands Enterprise
HLA	Historic Land Use Assessment
HRA	Habitats Regulations Appraisal
HSE	Health and Safety Executive
HVAC	High Voltage Alternating Current
IAQM	Institute of Air Quality Monitoring
ICES	International Council for the Exploration of the Sea
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEA	Institute of Environmental Assessment
IEMA	Institute of Environmental Management and Assessment
IES	Interim End State
IHT	Institution of Highways and Transportation
INSPIRE	Impulse Noise Sound Propagation and Impact Range Estimator
IRENA	International Renewable Energy Agency
ISO	International Standards Organization
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
JTB	Joint Transmission Bay
Km	Kilometre
kV	Kilovolt
LCoE	Levelized Cost of Energy
LEDS	Liquid Effluent Diffuser System
LSE	Likely Significant Effects
m	Metre
m/s	Metres per second
MarLIN	Marine Life Information Network
MCA	Maritime and Coastguard Agency
MEA	Marine Environmental Appraisal
Mg/l	Milligrams per litre
MHWS	Mean High Water Springs
MLWS	Mean Low Water Spring
MPA	Marine Protected Area
mph	Miles per hour
MS	Marine Scotland
MSFD	Marine Strategy Framework Directive
MSI	Marine Scotland Interactive
MS-LOT	Marine Scotland - Licensing Operations Team
MSS	Marine Scotland Science
MW	Megawatts
NDA	Nuclear Decommissioning Authority
NLB	Northern Lighthouse Board
NMP	National Marine Plan
NMPI	National Marine Plan Interactive
NRTE	Naval Reactor Test Establishment
NTSLF	National Tidal and Sea Level Facility
NVC	National Vegetation Classification
NVZ	Nitrate Vulnerable Zone
OESEA	Offshore Energy Strategic Environmental Assessment

OHL	Overhead Line
OREI	Offshore Renewable Energy Installations
OS	Ordnance Survey
OSPAR	Oslo / Paris Convention
PAC	Pre-Application Consultation
PAM	Passive Acoustic Monitoring
PFOW	Pentland Firth and Orkney Waters
PFOWF	Pentland Floating Offshore Wind Farm
PMF	Priority Marine Feature
PPG	Pollution Prevention Guidelines
PRAG	Particles Retrieval Advisory Group
PFOWF	Pentland Floating Offshore Wind Farm
RBMP	River Basin Management Plan
REZ	Renewable Energy Zone
RLG	Regional Locational Guidance
ROV	Remotely Operated Vehicles
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SALM	Single Anchor Leg Mooring
SCADA	Supervisory Control and Data Acquisition
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen’s Federation
SHET	Scottish Hydro Electric Transmission
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPAR	Single Point Mooring and Reservoir
SPEAR	Simple Propagation Estimator and Ranking
SPM	Suspender Particle Matter
SSE	Scottish and Southern Energy
SSSI	Sites of Special Scientific Interest
SW	Scottish Water
TCE	The Crown Estate
THC	The Highland Council
TLP	Tension Leg Platform
TRL	Technology Readiness Level
UK	United Kingdom
UKBAP	UK Biodiversity Action Plan
UKHO	United Kingdom Hydrographic Office
UKTAG	United Kingdom Technical Advisory Group
WHO	World Health Organisation
WLA	Wild Land Area
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generators

1 INTRODUCTION

1.1 Company Background

Copenhagen Infrastructure Partners (CIP) is a Danish fund management company, focused on energy infrastructure including offshore wind, onshore wind, solar photovoltaics (PV), biomass and energy-from-waste, transmission and distribution. It was founded in 2012 and currently has approximately EUR 10 billion under management. CIP is a major investor in the offshore wind sector and has significant investments in a number of offshore wind projects around the world including a 35% stake in the Beatrice Offshore Wind Farm in Scotland. Copenhagen Offshore Partners (COP), which conducts offshore wind development activities on behalf of the funds managed by CIP, has recently opened an office in Edinburgh to support the funds' increasing engagement in Scotland. This project is being brought forward by a Special Purpose Vehicle (SPV), formed with CIP acting as the majority shareholder, herein referred to as 'Highland Wind Limited'

1.2 Project Overview

Highland Wind Limited is proposing to demonstrate a floating offshore wind farm with an installed capacity of up to 100 megawatts (MW) approximately 6 km off the coast of Dounreay, Caithness. The aim of the Project, referred to hereafter as the 'Pentland Floating Offshore Wind Farm (PFOWF)' or 'the Project', is to test and demonstrate a technology solution for floating offshore wind in Scotland. The Project is an update to the Dounreay Trì Project that was consented by a subsidiary of Hexicon AB, a leading Swedish floating offshore wind farm developer. The previous project was granted key consents and a site lease in 2017. A new consent application will be made for the updated project, reflecting the revised development proposal.

This Scoping Report is based on the previous Dounreay Trì Project Scoping Report (Dounreay Trì Limited, 2015) and has been updated where appropriate based on the findings of the previous Dounreay Trì Project Environmental Impact Assessment (EIA), presented within the Environmental Statement (ES) (Dounreay Trì Limited, 2016), taking into account the updated PFOWF design requirements. This Scoping Report builds on considerable previous stakeholder engagement undertaken by the previous developer, and has, where possible, scoped out impacts based on the findings of the previous ES, 2016.

The design life of the turbines and other major components of the Project is expected to be a minimum of 25 years. Therefore, the requested duration of the Section 36 consent and the Marine License is 25 years.

1.2.1 Original Project Proposal

The proposal for the original Dounreay Trì Project consisted of:

- A two-turbine offshore wind farm with an installed capacity of between 8 to 12 megawatts (MW), approximately 6 km off Dounreay, Caithness;
- A single export cable to bring the power to shore immediately to the west of the Dounreay Nuclear Site fence line; and
- Subject to a connection offer from Scottish and Southern Energy Power Distribution (SSEPD), the associated onshore electrical infrastructure to connect the Project at, or near, the existing Dounreay 132/33/11kV substation.

In order to support the original Dounreay Trì Project EIA process, stakeholder engagement was undertaken by the previous developer which helped the Dounreay Trì Project to achieve consent. This updated Project will build upon the outcomes from the previous stakeholder engagement but will also carry out an independent thorough stakeholder engagement process, as detailed in Section 4.

1.2.2 Updated Project Proposal

The updated Project (Pentland Floating Offshore Wind Farm) will be in the same location and will consist of a number of floating wind turbines with a generating capacity up to 100 MW. The offshore generation asset will be connected to the power distribution system at a suitable grid connection point on or near the Caithness coast.

Table 1-1 PFOWF Proposed Parameters

Parameter	Updated Project
Search area*	25 km^2
Total installed capacity	up to 100 MW
Number of positions	6 - 10 floating substructures and turbines
Wind Turbine Generator capacity	10 - 16 MW
Rotor diameter	170 - 240 m
Upper tip height	192 - 270 m
Hub height	107 - 150 m
Minimum Blade Clearance from sea-level**	22 m
Onshore substation – footprint area	60 m x 100 m = 6000 m^2 = 0.6 hectares

** The Search Area covers the same footprint as the proposed Marine License Area (as highlighted in Figure 3-1)*

*** Depending on the floating technology and mooring system adopted the entire system may rise and fall with the tide. Regardless of the technology the minimum blade clearance from sea-level will be factored into the system design and maintained.*

1.2.3 Pentland Floating Offshore Wind Demonstrator

Highland Wind Limited is currently exploring the option of utilising the existing Section 36 and Deemed Planning consent for the Dounreay Trì Project obtained in 2017 to construct and operate a demonstration project in advance of the wider Pentland Floating Offshore Wind Farm array. This Demonstrator would be constructed within the previous Marine License Area, approximately 6 km from the coast and would ultimately form part of the wider PFOWF array in the event it goes ahead. The onshore infrastructure would also be located within the area previously consented for the Dounreay Trì Project, located at or near to the existing Dounreay 132/33/11kV substation. It should be noted that the Demonstrator and wider PFOWF array will be consented and constructed separately, and as such the Demonstrator project is not considered in detail within this Report.

The final details of the Demonstrator have not been determined at this point. However, the design parameters for the Demonstrator will be kept within those as defined in the existing Dounreay Trì consent. The Demonstrator project infrastructure will be consented and constructed separately from the broader PFOWF project both in terms of offshore and onshore installations. In accordance with current planning, the Demonstrator has a planned construction in 2023. Thus, the export cable and the onshore grid connection for the Demonstrator is planned to be installed prior to the offshore and onshore infrastructure for the array project.

Whether the Demonstrator commences or not, the maximum number of turbines and energy generation capacity that will eventually be deployed at the project site will ultimately be the same. The proposed Demonstrator has been considered within Section 6, as the cumulative assessment section of the relevant receptor chapters of this Report.

Highland Wind Limited is currently in consultation with Marine Scotland to inform the requirement to vary the existing Dounreay Trì Project consent via a Section 36C application under The Electricity Generating Stations (Applications for Variation of Consent) (Scotland) Regulations 2013 ('the 2013 Regulations') to construct and operate the proposed Demonstrator. It is currently envisaged that the Demonstrator would be constructed and operational by mid-2023.

1.3 Location and Extent

Figure 1-1 shows the offshore and onshore elements of the Project, with coordinates for the proposed Marine Lease Area including export cable corridor detailed in Table 1-2.

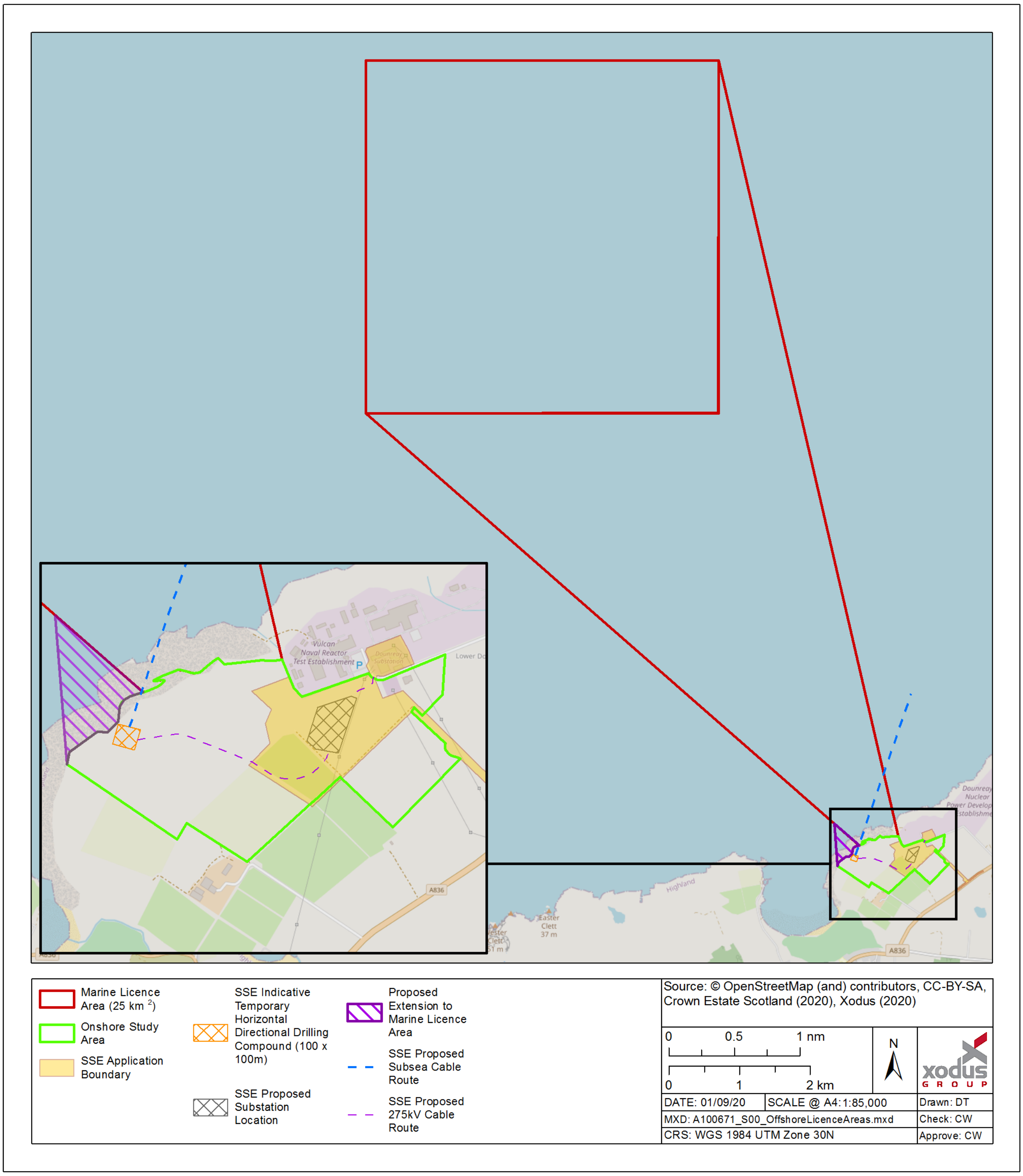


Figure 1-1 Location and Extent of the Project

Table 1-2 Coordinates for the Marine Licence Area including Export Cable Corridor

Point	Latitude	Longitude
Marine Licence Area		
NW	58°40’25.6	3°53’36.0
NE	58°40’27.7	3°48’25.7
SE	58°37’46.0	3°48’22.0
SW	58°37’44.0	3°53’31.9
Export cable corridor		
NW	58°37’44.0	3°53’31.9
NE	58°40’27.7	3°48’24.7
SE	58°37’46.0	3°45’34.3
SW	58°34’28.9	3°46’14.2

1.4 Project Objective

The primary objective of the Project is to test and demonstrate a technology solution for floating offshore wind in Scotland. Highland Wind Limited will adopt a technology agnostic approach to the development of this project, with the optimal technical, environmental and commercial solution being selected. In determining the technology to be deployed, the capabilities of the local supply chain in Scotland will be considered with the aim of developing a strong local supply chain for floating wind in Scotland.

Highland Wind Limited is working closely with a number of floating platform technology providers. The company also has a technology roadmap in place considering both technology and commercial readiness for not only floating platforms, but all the elements that will be required to successfully commercialise floating offshore wind, ranging from dynamic cabling to project financing.

Highland Wind Limited plans to deploy technology on the Project that will be at least Technology Readiness Level (TRL) 6, according to typical definitions (such as the United Kingdom Government) “Technology basic validation in a relevant environment/pilot scale”.

Reference Figure 1-2 below, “commercial readiness” is also a key feature of the project. The opportunity to deploy multiple “demonstration” units of the same technological design will not only increase the TRL of the floating concept, but also Commercial Readiness Index (CRI) level as defined by the Australian Renewable Energy Agency (ARENA) (and adopted by International Energy Agency (IEA)).

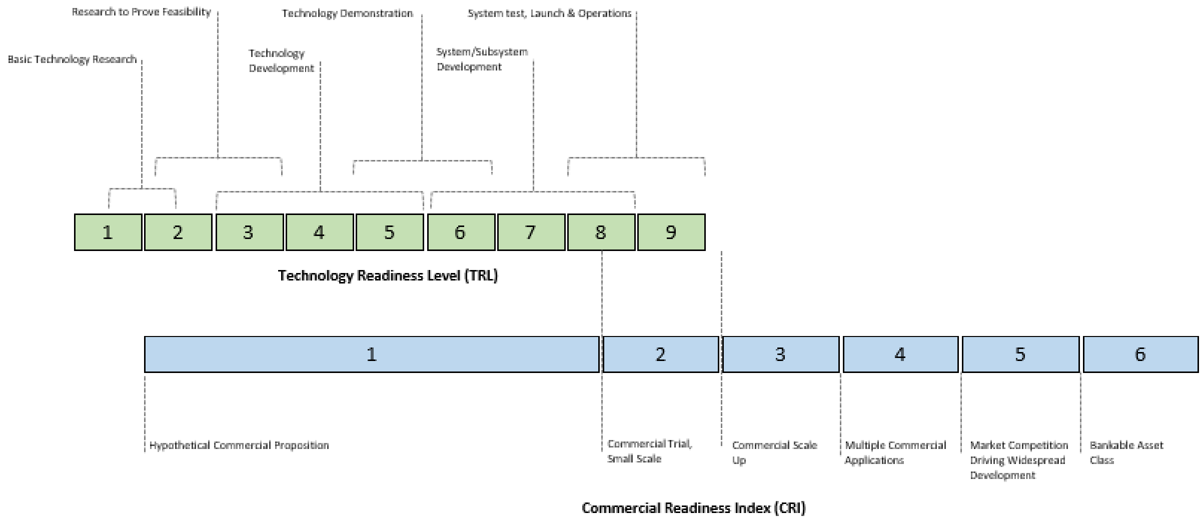


Figure 1-2 TRL and CRI (inspired by ARENA, 2014. "Commercial Readiness Index for Renewable Energy Sectors")

Highland Wind Limited firmly believes that this project will be an enabler for larger scale developments resulting from the current ScotWind Leasing Round. The fixed-bottom Beatrice Demonstrator, which was deployed immediately prior to the Scottish Territorial Waters Leasing Round in 2008, helped de-risk the large-scale projects that followed as a result of demonstrating the technology at small scale. Highland Wind Limited is of the view that this project will have a similar impact on the ScotWind Leasing Round, and in turn provide opportunities for the local supply chain to service the domestic floating offshore wind market. This in turn will result in export opportunities in relation to the global floating offshore wind market.

A typical process for the introduction of a new technology is illustrated in Figure 1-3. The opportunity to deploy multiple units of the same technological design on the Project will enable both the technology and certain aspects of the commercialisation to be tested and demonstrated.

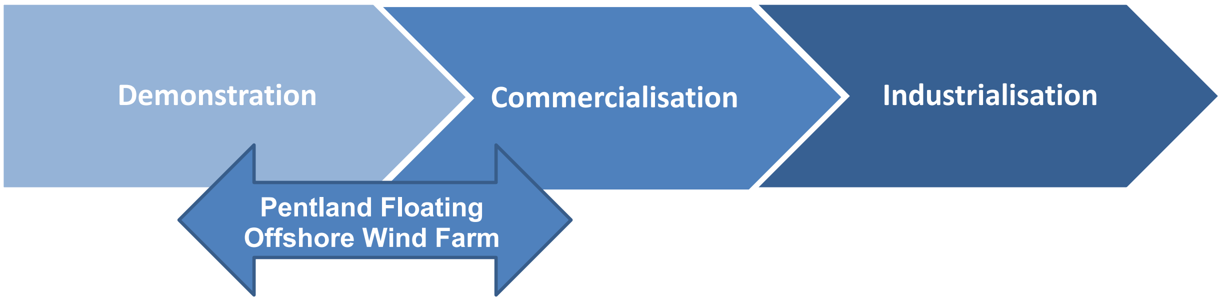


Figure 1-3 Commercialisation of Pentland Floating Offshore Wind Farm

2 LEGISLATIVE CONTEXT AND REGULATORY REQUIREMENTS

2.1 International Legislation

The United Kingdom (UK) is a signatory to the Kyoto Protocol, the protocol commits state parties to reduce greenhouse gas emissions. The protocol came into effect in 2005 and its commitments were transposed into UK law by the Climate Change Act 2008, which requires the net UK carbon account for the year 2050 to be 80% lower than the 1990 baseline.

The Paris Agreement sets out a global framework to avoid dangerous climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C. It also aims to strengthen countries' ability to deal with the impacts of climate change and support them in their efforts.

The Paris Agreement, in full "Paris Agreement Under the United Nations Framework Convention on Climate Change", is the first-ever universal, legally binding global climate change agreement, adopted at the Paris climate conference (COP21). The international treaty aims to reduce the emission of gases that contribute to global warming by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C. The Paris Agreement set out to improve upon the Kyoto Protocol. It entered into force on November 4, 2016, and has been signed by 197 countries, and ratified by 187, including the UK, as of November 2019.

2.2 European Legislation

2.2.1 Brexit

As of 31st January 2020, the UK is no longer a member of the European Union (EU) as a result of a process known as Brexit. Currently the UK is in a transition period which is set to last until 31st December 2020. Throughout the transition period, the UK is still required to implement all EU policies and legislation. If at the end of the transition period a no deal situation remains between the EU and the UK, the UK has committed to implement international environmental obligations in accordance with the EU (Withdrawal) Act 2018 and to maintain environmental commitments and legislation already made following the departure of the UK. On this premise the existing EU renewable energy targets for the UK, including the EU Renewable Energy Directive 2009/28/EC and the recast Renewable Energy Directive 2018/2001/EU will remain applicable. It is unknown if and how any new EU environmental legislation or updates to existing directives will be transposed into UK law.

2.2.2 European Union Renewable Energy Directive

The UK has committed to sourcing 15% of its total energy needs from renewable sources by 2020 under the 2009 Directive on Renewable Energy (2009/28/EC) including electricity, heat and transport and 32% of its total energy needs from renewable sources by 2030 under the recast Renewable Energy Directive 2018/2001/EU. The UK and Scottish Governments have also made legally binding commitments through the Climate Change Act 2008 and the Climate Change (Scotland) Act 2009.

2.3 Scottish Marine Policy and Legislation

2.3.1 Context

The challenges of climate change, energy supply and security of supply are driving policy on renewable energy developments. There are now a significant number of national and international policies, strategies and regulations relating to climate change and the development of renewable energy in Europe, the UK and Scotland.

There are four key drivers for the shift in energy production to low carbon sources, including renewable energy, in the UK and Scotland which are:

- The need to tackle climate change;
- The need to secure energy supply;
- The need for new energy infrastructure; and
- The need to maximise economic opportunities.

2.3.2 Scottish Targets for Reducing Emissions

The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 sets targets for the reduction of greenhouse gases emissions. The Act will allow Scotland to contribute to the global effort in delivery on the Paris Agreement. In Scotland the Emissions Reductions Targets include a reduction of all greenhouse gases to net-zero by 2045 with interim targets for reductions of at least 75% by 2030 and 90% by 2040.

2.3.3 The Scottish Energy Strategy

Scotland's Energy Strategy: The Future of Energy in Scotland (Scottish Government, 2017) sets out a vision for the energy system in Scotland until 2050. The strategy sets a 2030 target for the equivalent of 50% of the energy for Scotland's heat, transport and electricity consumption to be supplied by renewable sources.

2.3.4 National Marine Plan

In March 2015, the Scottish Government published ‘Scotland’s National Marine Plan – a Single Framework for Managing our Seas’ (the NMP) (Scottish Government, 2015). The National Marine Plan 2015 sets out strategic policies for the sustainable development of Scotland's marine resources out to 200 nm. It is required to be compatible with the UK Marine Policy Statement and existing marine plans across the UK, in particular where there is interaction between England inshore and offshore marine plans and Northern Ireland Marine Plans.

2.3.5 Marine Plan for Offshore Wind Energy

The first Sectoral Marine Plan for Offshore Wind Energy (Blue Seas Green Energy) (Marine Scotland, 2011) was adopted in 2011. In July 2013 Marine Scotland published the Draft Sectoral Marine Plan for Offshore Wind Wave and Tidal energy in Scotland. It identified potential future options for commercial scale (potential to generate greater than 100MW) offshore wind energy developments. These draft plans were never formally adopted by Scottish Ministers, but the draft options were included in the National Marine Plan and are retained on Marine Scotland Maps for reference (Scottish Government, 2019).

In November 2017, Crown Estate Scotland (CES) announced their intention to run a further leasing round for commercial scale offshore wind energy projects in Scottish Waters. To inform the spatial development of this leasing round, Marine Scotland, as Planning Authority for Scotland’s Seas is required to undertake a planning exercise, in accordance with relevant EC, UK and Scottish legislation.

The Sectoral Marine Plan for Offshore Wind energy was published in October 2020 (Scottish Government, 2020). The Plan aims to identify the most sustainable options for the future development of commercial-scale offshore wind energy in Scotland.

The Plan seeks to contribute to the achievement of Scottish and UK climate change policy objectives and targets, through the provision of a spatial strategy which seeks to maximise the benefits for Scotland, our communities and our people, whilst minimising the potential adverse effects on other marine users, economic sectors and the environment resulting from further commercial offshore wind development. The development of the Plan included a full Sustainability Appraisal (encompassing a Strategic Environmental Assessment, a Habitats Regulations Appraisal and a Social and Economic Impact Assessment) as well as significant planning and stakeholder engagement.

A consultation period was held to gather responses to the draft Plan which closed on 25 March 2020. Subsequently, a Consultation Analysis Report for the draft Plan was published in July 2020 (Scottish Government, 2020a). The report summaries and analyses the responses received during the consultation period.

2.3.6 Regional Marine Plan

Regional marine plans are currently in the process of being prepared within those Scottish Marine Regions where there is an established Regional Marine Planning Partnership. The planning competence of these Regional Marine Planning Partnerships extends out to 12 nm. Regional marine plans are required to be developed in accordance with the National Marine Plan (unless relevant considerations indicate otherwise).

The Project falls under the North Coast Region. However, at this time no Regional Marine Plan for the North Coast has been developed.

Nonetheless, the Pilot Pentland Firth and Orkney Waters Marine Spatial Plan (Scottish Government, 2016), developed by Marine Scotland (MS), Orkney Islands Council and the Highland Council (THC), sets out an integrated planning policy framework to guide marine development and activities and management decisions, whilst ensuring the quality of the marine environment is protected. As this Plan is anticipated to inform the development of the North Coast Regional Marine Plan, the Applicant will refer to this Plan, to ensure best practice in delivering its planning policy framework.

2.3.7 National Planning Framework 3

Published in June 2014, National Planning Framework 3 (NPF3) provides a statutory framework for Scotland's long-term spatial development priorities for the next 20 to 30 years. Statutory development plans must have regard to the NPF, and Scottish Ministers expect planning decisions to support its delivery.

Orkney, Pentland Firth and North Caithness is identified as an area of coordinated action in NPF3; a location of particular significance to the delivery of the Scottish Government's low carbon strategy. NPF3 states that the area is an internationally renowned historic and natural environment, with significant future prospects for growth and innovation. There are unparalleled opportunities for marine renewable energy development, generating significant new business and employment opportunities for the surrounding coastal and island communities.

The delivery of the next version of the NPF, NPF4 commenced in 2018 with a view to adoption expected in 2020. The Planning (Scotland) Act 2019 came into force on the 25th July 2019. At the time of writing early engagement for the NPF4 was undertaken with public engagement on a "call for ideas" concluding on 30 April 2020. The Analysis of Responses to the Call for Ideas (Scottish Government, 2020b) was published in August 2020. All of the evidence collected to date will inform the interim position statement, to be published later in the autumn, and draft NPF4, which is scheduled for publication in autumn 2021.

2.3.8 Scottish Planning Policy

On 23rd June 2014, the Scottish Government published the new Scottish Planning Policy (SPP). SPP sets out Scottish Government policy on how nationally important land use matters should be addressed and outlines Governmental priorities for land use planning. SPP should therefore be afforded significant weight in the determination process for planning applications, however SPP acknowledges that "it is for the decision-maker to determine the appropriate weight in each case". SPP 2014 sits alongside other key Scottish Government documents including the National Planning Framework 3 and Circulars. The SPP emphasises the merits of sustainable development and the need to deliver heat and electricity in a low carbon manner through supportive policies in Development Plans. For example, the SPP (paragraphs 152 to 192) details how the Scottish Government expects the planning system to facilitate the delivery of a low carbon economy, specifically through the development of electricity generation technologies which will help contribute to reducing greenhouse gas emissions. It is clear from SPP that the Scottish Government is committed to developing further renewable energy projects.

2.4 Consenting Legislation

As the Project is a generating station with a capacity of greater than 1 MW, it requires the following consents, licences and permissions:

> A Section 36 consent under the Electricity Act 1989;

> A Marine Licence under the Marine (Scotland) Act 2010 as the development is within 12 nm of the coast; and

> Planning permission under the Town and Country Planning (Scotland) Act 1997 for all Project infrastructure located landward of mean low water springs (MLWS).

Each of these consents, licences and permissions are described below.

Should additional pre-construction licences be required, these will be discussed and agreed with the relevant consenting authority during the pre-construction phase of the Project.

2.4.1 Section 36 of the Electricity Act 1989

To construct and operate an electricity generating station, such as a wind farm, with a capacity greater than 1 MW in Scottish Territorial Waters, consent is required under Section 36 of the Electricity Act 1989 (as amended). An application for consent under Section 36 in Scottish Territorial Waters is made to the Marine Scotland - Licensing Operations Team (MS-LOT) on behalf of the Scottish Ministers.

The Application shall be for the construction and operation of a number of floating wind turbines with a generating capacity up to 100 MW, within Scottish Territorial Waters. The application shall be supported by a single EIA Report, prepared in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, as amended. Section 36 consent will allow for the installation, operation and maintenance of wind turbines and inter-array cables associated with the Project.

2.4.2 Marine Licence

The Marine (Scotland) Act 2010 which applies to Scottish Territorial Waters (between 0 and 12 nm from MHWS) states that a Marine Licence is required to construct, alter or improve any works, or deposit any object in or over the sea, or on or under the seabed. As the Development is seaward of the MHWS and lies within 12 nm of the coast, a Marine Licence will be required to deposit the anchors, mooring lines and install the export cable(s) in/on the seabed.

As with the Section 36 application above, the Marine Licence application will be made to MS-LOT. The EIA Report shall also be prepared in accordance with the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017, as amended.

2.4.3 Town and Country Planning

The Town and Country Planning (Scotland) Act 1997 (as amended by the Growth and Infrastructure Act 2013) allows for Scottish Ministers to 'deem' planning permission for onshore elements of offshore electricity generation schemes granted consent under Section 36 of the Electricity Act, which is the intention for this Project. As such, it is the intention at this stage that a separate planning application shall not be submitted to the Highland Council, rather deemed consent for the associated onshore infrastructure shall be sought as part of the Section 36 application. The Highland Council will thus become a Statutory Consultee to MS-LOT. It is currently anticipated that the applications will be made in 2021.

2.5 Environmental Impact Assessment Legislation

Requirements for EIA are defined in the EIA Directive (85/337/EEC codified by EIA Directive 2011/92/EU and then amended by EU Directive 2014/52/EU) which has been transposed into Scottish law. The purpose of the EIA Directive is to ensure that the potential effects of a project on the environment are taken in consideration before development consent is granted. If a development is deemed to have potential to cause a significant effect on the environment by virtue of its scale, size and location, then an EIA is required the results of which must be provided by the developer to the decision maker in the form of an EIA Report. The competent authority cannot grant consent for an EIA development without considering the EIA Report.

The requirements of the EIA Directive are enacted through relevant UK legislation for electricity generation projects requiring consent under Schedule 36 of the Electricity Act 1989 by the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) and in relation to marine licensing by The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended). Both sets of Regulations set out the statutory process and minimum requirements for EIA, to which the Project will adhere.

An EIA is specifically required (Schedule 2 of the Marine Works EIA 2017 (Scotland) Regulations) for installations for the harnessing of wind power for energy production (wind farms) if:

> The development involves the installation of more than two wind turbines; or

> The hub height of any wind turbine or height of any other structure exceeds 15 m.

The Project will consist of more than two wind turbines, with a hub height over 15 m, and therefore requires an EIA to be undertaken. The main stages in the EIA process, which the Project will follow, are:

> Scoping to determine the content of the EIA Report and the matters to be addressed by the EIA (as presented in this Scoping Report);

> Data review involving compiling and reviewing available data and/or undertaking of baseline surveys to generate site-specific data;

> Assessment and design iteration whereby the likely significant effects of the Project during the construction, operation and maintenance, and decommissioning stages of its life are assessed. Feedback is provided to the design and engineering team(s) to modify the development in order to avoid, prevent, reduce or, as a last resort, offset any significant adverse effects on the environment;

> Assessment of the construction methodology and the final design of the Project;

> Identifying any residual effects and any further mitigation requirements; and

> Preparing the EIA Report.

2.6 Habitats Regulations

The Council Directive 92/43/EEC (the Habitats Directive) was adopted in 1992. The aim of the Directive is to maintain or restore natural habitats and wild species listed on the Annexes at a favourable conservation status. This protection is granted through the designation of European Sites and European Protected Species (EPS).

The European Directive (2009/147/EC) on the conservation of wild birds (The Birds Directive) provides a framework for the conservation and management of wild birds within Europe. The Directive affords rare and vulnerable species listed under Annex I of the Directive, and regularly occurring migratory species, protection through the identification and designation of Special Protection Areas (SPAs).

The Directives have been transposed into Scottish Law by various regulations, those of relevance to the Project include:

- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended); and
- The Conservation of Habitats and Species Regulations 2017.

These are hereafter referred to as the 'Habitats Regulations'.

The Habitat Regulations require that where a plan or project that is not directly connected with, or necessary to the management of a Natura 2000 site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.

Marine Scotland (as the 'Competent Authority') must consider whether the Project is likely to have significant effects on the conservation objectives of the sites considered in the Habitats Regulations Appraisal (HRA), and, where Likely Significant Effects (LSE) cannot be excluded at the screening stage, and in the absence of mitigation measures, an 'Appropriate Assessment' of the implication of the plan or project must be undertaken by the Competent Authority before consent may be given for the proposed Project.

The EIA Report will be accompanied by a separate, shadow HRA report. The outcome of any Appropriate Assessment would be determined by the Competent Authority and would be produced prior to determination of the application.

The Habitats Regulations present a different legal test to the EIA Regulations. As a result, the HRA will be screened separately from this Scoping Report, however the European sites which are in the vicinity of the Site are discussed throughout the assessment chapters.

2.7 Pre-Application Consultation

Where activity is planned within the Scottish Territorial Waters, the Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013 (hereafter referred to as the PAC Regulations) apply. Additionally, there are further PAC requirements for 'major' onshore developments. The classes of 'major' development are as defined in The Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009. There are no statutory requirements for consultation during the pre-application stage for Section 36 consent applications, however the principles of the PAC Regulations will be followed for all offshore and onshore components of the Project.

Public consultation will be carried out for the onshore and offshore elements at the same events[1] to give 3rd parties a full understanding of the whole project. The PAC Regulations require Applicants for a 'prescribed class' of activity to notify the Maritime and Coastguard Agency (MCA), Northern Lighthouse Board (NLB), NatureScot, Scottish Environment Protection Agency (SEPA), and any delegate for a relevant marine region.

Applicants must hold at least one pre-application event at which these bodies are notified, and members of the public may provide comments to the applicant. Applicants must publish in a local newspaper a notice containing a description of the activity, detail where further information may be obtained, the date and place of the event, how and when comments should be submitted to the applicant. A PAC report must be submitted alongside the Marine Licence application.

2.8 Other Permits and Licencing Requirements

Other Permits and Licencing will be required during project development including, but not limited to:

- European Protected Species Licence;

[1] *The format of consultation events may be depended on any restrictions enforced due to COVID-19 at the time of the scheduled event.*

- Safety Zone Applications; and
- Decommissioning Programmes.

2.9 Consenting of Original and Updated Project

2.9.1 Original Development Proposal

Key consents for the previous project were granted in 2017 based on a 25km^2 area, including:

- Consent under Section 36 of the Electricity Act 1989;
- A declaration under s.36A of the Electricity Act 1989;
- A direction under s.57(2) of the Town and Country Planning (Scotland) Act 1997 for ancillary onshore development; and
- Two Marine Licenses under Part 4 of the Marine (Scotland) Act 2010 for the construction and operation of an offshore generating station. Variations to the two Marine Licenses were granted in 2019[2].

2.9.2 PFOWF Development Proposal

The Project will apply for the necessary consents based on this increased area, including:

- Marine Licence under Part 4 of the Marine (Scotland) Act 2010 and Part 4 of the Marine and Coastal Access Act 2009;
- Consent under S.36 of the Electricity Act 1989;
- Deemed planning for onshore infrastructure (a statutory provision in the Growth and Infrastructure Act 2013, amending s57 of the Town and Country Planning (Scotland) Act 1997).
- Safety Zone applications (Energy Act 2004, as amended by the Scotland Act 2016); and
- Decommissioning programme (Energy Act 2004, as amended by the Scotland Act 2016).

[2] *The marine licence variations were undertaken as the original marine licences held by Dounreay Tri Ltd were assigned to "Highland Floating Wind Ltd" in 2019. Therefore, licence variations were required to assign the consents to the new company.*

3 SITE SELECTION

3.1 Original Site Selection

In August 2014, as part of the previous Dounreay Trì Project, Hexicon sought to locate a site in Scottish waters to demonstrate their multi-turbine platform. Marine Scotland (2014) had published the *Potential Scottish Test Sites for Deep Water Floating Wind Technologies - Regional Locational Guidance* (RLG). The Regional Locational Guidance (RLG) identified eleven sites which were considered suitable for floating wind. Ultimately, only three sites identified in the RLG met Hexicon's criteria:

> North East Aberdeen;
> North Coast (Dounreay); and
> Southern Moray Firth.

These three sites were examined in greater detail using publicly available information and the results presented at a Site Selection Workshop, hosted by Marine Scotland and attended by Scottish marine stakeholders, in Edinburgh on the 10th of October 2014.

On the basis of the information available at the time and feedback from the workshop, the Southern Moray Firth Site appeared to be unsuitable for development. A deep trench lay landward of the site and presented a significant technical constraint. Furthermore, this trench area is now proposed for designation under the Southern Trench possible Marine Protected Area (pMPA) for the conservation of minke whales, burrowed muds, fronts and shelf deeps (NatureScot, 2019).

The North East Aberdeen Site lay approximately 23 km from shore, significantly increasing the length and cost of the export cable. Furthermore, the site and export cable corridor lay within ground that is fished by a range of gear types, including scallop dredgers, which could damage subsea cables, therefore presenting a significant risk.

Hexicon chose the Dounreay Site which was located south of the shipping traffic. The Dounreay Site was selected for the following reasons:

> The site had suitable water depths, close to shore thus reducing the export cable length and costs compared with other sites;
> The substrate was gravelly sand;
> The average wind speed was good and had been calibrated with data from RES's Forss Wind Farm;
> On the basis of discussions with Scottish Fishermen's Federation (2014), the site is located out-with intensively fished areas; and
> Marine Scotland had completed a geophysical survey during the summer of 2014, including sub bottom profile of the site. This information was publicly available and could be used to inform project development.

3.2 Site Selection Considerations Relevant to the Updated Project

The Project is to be located in the same offshore area as was considered in the original Dounreay Trì Project. This offshore area is referred to as the "Offshore Study Area" and encompasses both the Wind Turbine Generator (WTG) Site and the Export Cable Corridor, as shown in Figure 3-1. The Offshore Study Area also coincides with the proposed Marine Licence Area, as highlighted in Figure 1-1.

Nonetheless, in order to reflect the requirement for an increased onshore area, referred to as the "Onshore Study Area", the Offshore Study Area will be increased at the landfall location to accommodate this increase in area, as highlighted in Figure 3-1.

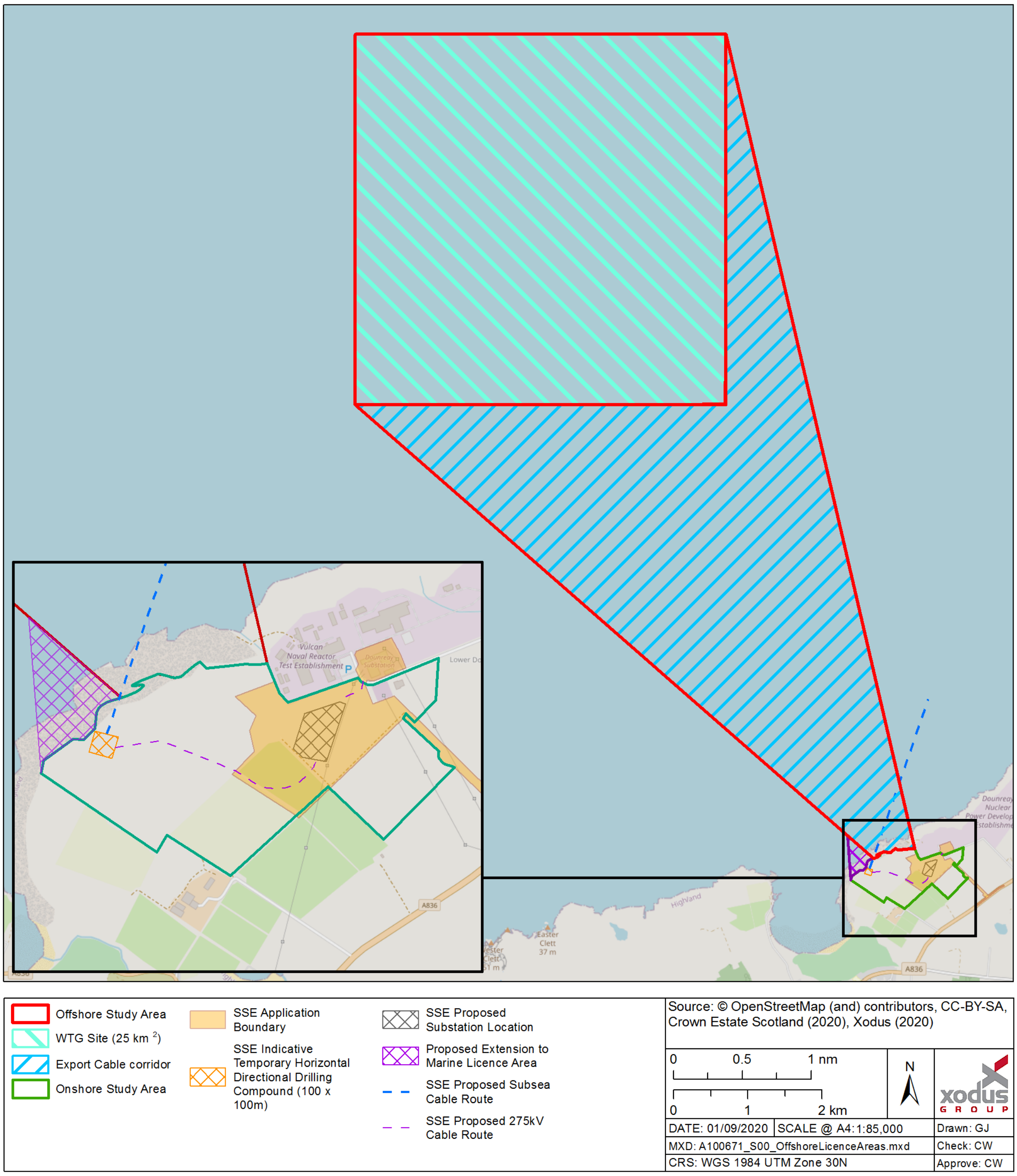


Figure 3-1 Offshore Study Area and Onshore Study Area Boundaries for the Project

An increased Onshore Study Area has been progressed in light of the approved application by Scottish Hydro Electric Transmission (SHE-T) (19/01092/FUL) for the construction of a 275/220 kV electricity substation adjacent to the west of the Dounreay facility and the consented SHE-T Orkney to Caithness Transmission Connection. As such, the Onshore Study Area has been slightly extended to the west to accommodate the potential need to avoid this proposed infrastructure, to minimise any required cable crossings and to minimise the potential for cumulative impacts. The Onshore Study Area and cable routeing options are considered further in Section 5.3.

The exact siting and final design of both onshore and offshore infrastructure has yet to be decided and will ultimately be determinant upon design optimisation process and grid connection option adopted, respectively.

4 STAKEHOLDER ENGAGEMENT

4.1 Engagement to Date

Going forward, the Applicant will consult with the public prior to submitting consent applications. The Applicant will provide advance notice of any public consultation events in local press.

The following sections detail the engagement that has been undertaken to date.

4.2 Stakeholder Engagement Undertaken by Dounreay Trì Ltd and Hexicon

Extensive stakeholder engagement was undertaken for the previous Dounreay Trì Project by Dounreay Trì Ltd and Hexicon between 2014 – 2016, which ultimately aided in the Dounreay Trì Project being granted consent. Stakeholders were engaged through all the major phases of the Dounreay Trì Project, the consultations included:

> A number of site selection consultations and workshops undertaken with statutory consultees and key stakeholders to ensure all considerations were accounted for through the site selection process;

> Consultation on the contents of the Dounreay Trì Project Scoping Report. Consultation requests were made to NatureScot (formerly named 'Scottish Natural Heritage' (SNH)), Scottish Environment Protection Agency (SEPA), the Northern Lighthouse Board (NLB), the Maritime and Coastguard Agency (MCA), The Highland Council (THC), the Orkney Islands Council, and various other bodies whom the Scottish Ministers considered likely to have an interest in the proposed application. 57 consultees were contacted and total of 26 responses were received.

> Various consultations with statutory consultees and industry experts on survey requirements and survey methodologies to be employed for the Dounreay Trì Project EIA process;

> Multiple consultations with the Crown Estate to determine leasing options, development, technology and financial plans;

> A stakeholder drop-in session was held for stakeholders representing tourism and recreation, commercial fisheries, local industry and community interests; and

> Finally, a pre-application, public consultation event was held in 2016. The event was advertised in both the John O'Groats Journal and the Caithness Courier.

4.3 Stakeholder Engagement Undertaken for PFOWF

It is Highland Wind Limited's aim to uphold the high standards set for undertaking stakeholder engagement demonstrated for the previous Dounreay Trì Project. Highland Wind Limited is committed to undertaking robust and effective stakeholder engagement and are in the process of developing a Stakeholder Engagement Strategy, to guide stakeholder engagement going forward. This Stakeholder Engagement Strategy will be a living document which will be continually updated to reflect the current phase of the Project's development.

Table 4-1 sets out the key meetings and dialogue undertaken for the Project to date.

Table 4-1 Meetings and Engagement Undertaken for the Project to Date

Meeting	Date	Purpose
Marine Scotland, RSPB, NatureScot	04th June 2020	Introductory meeting covering the key technical aspects of the project, the proposed environmental surveys strategy and the associated timeline.
Highland Council	18th August 2020	To introduce the Project and discuss the development programme.

Meeting	Date	Purpose
Highland Council, SEPA, NatureScot, Marine Scotland	09th September 2020	Highland Council Major Development Pre-Application Advice Meeting
Scottish Fishermen's Federation (SFF)	23rd September 2020	Follow-up meeting following submission of the Briefing Letter.
Scrabster Harbour	23rd September 2020	Follow-up meeting following submission of the Briefing Letter.
Maritime and Coastguard Agency (MCA)	01st October 2020	To introduce the Project and discuss technical aspects, including operational safety zones.

4.3.1 Pre-Application Advice Meeting

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees on the 07th of October 2020. Responses contained within the pre-application advice pack have been used to inform topic specific considerations contained within this report and are summarised, as such, in each relevant section contained herein.

4.3.2 Pre-Application Briefing Letter

Although there are no statutory requirements for consultation during the pre-application stage for Section 36 consent applications, to inform relevant stakeholders of the updated project, a briefing letter was distributed to the consultee list as set out in below on the 9th and 10th of September 2020. The briefing letter provided an opportunity to inform and engage stakeholders of the project at an early stage and allow an opportunity for them to feedback or request a meeting to discuss the project proposals further. All relevant feedback has been considered within this Scoping Report and will be used to inform the EIA process going forward.

Table 4-2 Circulation List for Briefing Letter

Distribution List	
Bettyhill, Strathnaver and Altnaharra Community Council	Historic Environment Scotland
Birsay Community Council	Joint Nature Conservation Committee (JNCC)
Brims Tidal Array	Joint Radio Company
British Telecom	Landowners
Caithness District Salmon Fishery Board	Marine and Coastguard Agency (MCA)
Caithness West Community Council	Marine Scotland – Licensing and Operations Team
Castletown Community Council	Marine Scotland – Planning and Policy
Chamber of Shipping	Marine Scotland – Science
Civil Aviation Authority (CAA)	Melvich Community Council
Community Inshore Fisheries Alliance (CIFA)	MeyGen

Distribution List	
Crown Estate Scotland (CES)	National Grid
Defence Infrastructure Organisation (DIO)	National Inshore Fishery Groups
Dounreay Site Restoration Limited (DSRL)	NatureScot
Dounreay Stakeholder Working Group	North Shore Surf Club
Dunnet and Canisbay Community Council	Northern District Salmon Fishery Board
Durness Community Council	Northern Lighthouse Board (NLB)
Durness Development Group	Nuclear Decommissioning Authority (NDA)
Fisheries Management Scotland	National Air Traffic Services (NATS)
Graemsay, Hoy and Walls Community Council	National Grid
Harray and Sandwick Community Council	National Inshore Fishery Groups
Highlands and Islands Airports	NatureScot
Highlands and Islands Enterprise	North Shore Surf Club
Northern District Salmon Fishery Board	Scottish Government - Planning & Architecture Division
Northern Lighthouse Board (NLB)	Scottish Pelagic Fishermen's Association
Nuclear Decommissioning Authority (NDA)	Scottish Sea Farms
Northern Lighthouse Board (NLB)	Scottish Sub Aqua Club
Nuclear Decommissioning Authority (NDA)	Scottish Water
Oil & Gas UK	Scottish Wildlife Trust
Oil and Pipelines Agency	Scrabster Fishery Office
OpenHydro	Scrabster Harbour Trust
Orkney Ferries	Seafish
Orkney Fisheries Association	South Ronaldsay and Burray Community Council
Orkney Island Council	Sport Scotland
Orkney Island Council Marine Services	SSE Transmission
Orkney Island Sea Angling Association	Strathy and Armadale Community Council
Orkney Sailing Club	Stromness Community Council
Pentland Canoe Club	The Highland Council
Pentland Firth Yacht Club	Thurso Community Council
Reay Golf Course	Tongue Community Council
RNLI (Lochinver)	Transport Scotland
RNLI (Thurso)	UK Hydrographic Office (UKHO)
Royal Society for the Protection of Birds (RSPB)	VisitScotland
Royal Yachting Association (RYA) Scotland	Vulcan

Distribution List	
Scottish Creel Fishermen's Federation	Whale & Dolphin Society (WDS)
Scottish Environmental Protection Agency (SEPA)	Wick Harbour Authority
Scottish Fishermen's Federation	

4.3.3 Future Stakeholder Engagement

Consultation with regards to the Project, will continue following the submission of this Scoping Report. Highland Wind Limited intend to set up meetings with key stakeholders, either as one-to-one sessions or group meetings, to discuss the proposed scope of the EIA, share key information and local knowledge and discuss any concerns or issues relating to the Project that would need to be considered as part of the EIA process. Highland Wind Limited intend to host further public information events, as appropriate as the Project progresses.

Details of all stakeholder activities and responses / feedback from those activities are recorded in a stakeholder database. The EIA Report will also include a specific chapter on stakeholder engagement which will provide more information on the stakeholder engagement activities carried out as part of the EIA process, information / feedback received from these activities and details of how concerns or issues raised have been taken into account in the EIA process.

Consultation will continue beyond the submission of the EIA Report. Assuming successful award of Project consent, licence condition implementation, including the development of appropriate environmental monitoring protocols, will generally require continuing engagement and consultation with the regulators and their statutory consultees. In addition, Highland Wind Limited will continue its communications with the local residents to keep them informed of the Project process and key milestones.

5 PROJECT DESCRIPTION

5.1 Key Project Components

The Project will have an installed capacity of up to 100 MW and will connect to the grid at Dounreay – either to the existing 132 kV substation or the 275 kV Dounreay West substation which is consented but is yet to be constructed (planned completion Q3 2022). The Project will have between 6 to 10 wind turbine generators (WTGs) installed on floating substructures. The wind farm will be wholly located within the site area identified in Figure 3-1 with subsea export cables exporting the renewable electricity ashore (Figure 5-1).

5.1.1 Design Envelope

This Project has adopted a design envelope approach. This is because at this early stage it is not possible to finalise the project design due to the procurement and supply chain considerations of using emerging technologies; the timing of investment decisions; and further site investigations. The Design Envelope remains indicative and will be refined following environmental surveys, technical and engineering studies and discussions with stakeholders and the community, as part of the EIA process. The Design Envelope includes the components and all permanent and temporary works required to generate or transmit electricity to the National Grid. This Scoping Report presents the design parameters which represent the worst-case scenario for the receptors that are likely to be impacted by this development. The key components for the Project are outlined below, providing the first version of the Design Envelope to be further developed and detailed during the EIA.

The main offshore components will include:

- 6 - 10 offshore wind turbines;
- Floating substructures (with either 1 or 2 WTGs per structure);
- Mooring;
- Anchors;
- Inter-array cables (dynamic and static); and
- Export cables (continuation of inter-array cables to bring power ashore).

The main onshore components will include:

- Landfall;
- Cable transition joint bay;
- Joint bays;
- Onshore export cables;
- Onshore substation compound;
- Grid connection works;
- Temporary construction compound; and
- Access routes.

Figure 5-1 provides an overview of the key Project components.

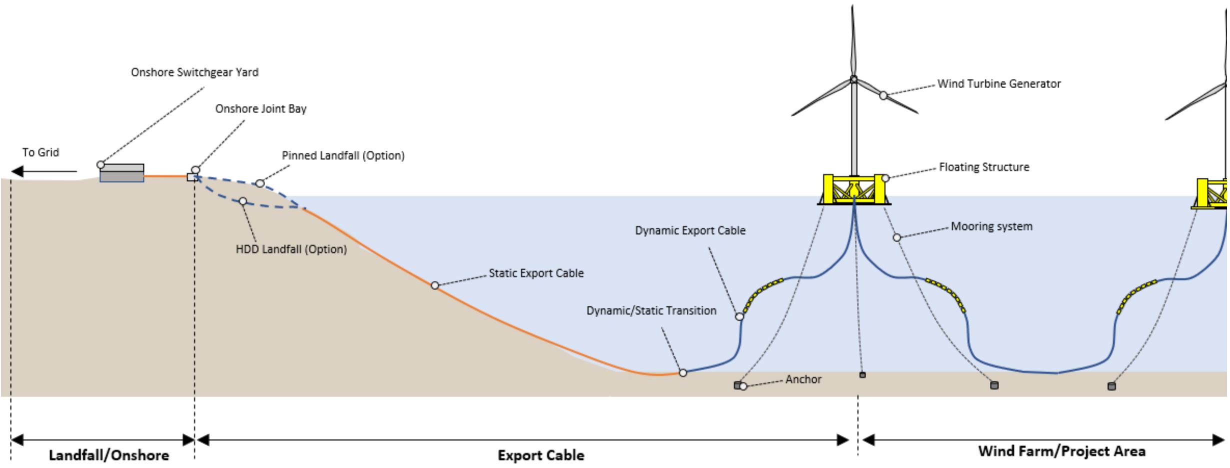


Figure 5-1 Key Project Components

5.2 Offshore Infrastructure

5.2.1 Wind Turbine Generators (WTGs)

The WTG envelope must provide enough flexibility to accommodate innovations to currently available turbine technologies. As such the Project is considering a range of turbine options and associated dimensions against which the environmental impacts of the Project can be assessed. The final WTG envelope will be subject to reviews conducted throughout the EIA and design process. Comments from stakeholders will also be considered as part of such reviews. Based on individual turbine capacity, the site will have between 6 and 10 turbines.

5.2.1.1 WTG layout

The WTG layout will be determined once the design optimisation process has been completed. This is an iterative process balancing a number of key development sensitivities including WTG model choice and wind direction, geophysical characteristics, metocean conditions, benthic habitats, floating substructure and anchor design and navigational safety considerations.

Taking these considerations into account, the layout will either be (as shown in Figure 5-2):

> Grid configuration: the rows of WTGs are positioned downwind and crosswind; or

> Offset grid configuration: the WTGs are offset in the crosswind rows, perpendicular to the prevailing wind direction.

The distance between rows of WTGs might vary in a down wind direction to maximise the efficiency of energy capture. Within the grid, each individual WTG will be micro-sited to consider any technical constraints and positioning accuracy. The indicative minimal spacing included as a design parameter incorporated in the WTG layout is 800 m.

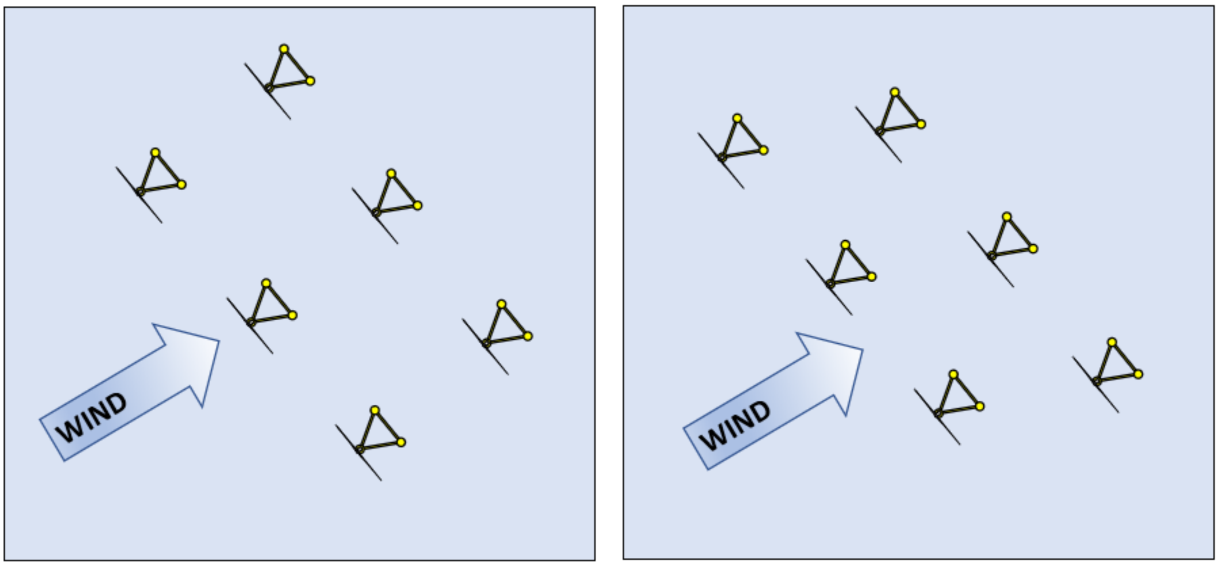


Figure 5-2 Diagram of Windfarm Layout with Grid Configuration (left) and Offset Grid Configuration (right)

Each wind turbine operates automatically. Each turbine can yaw – the nacelle rotates to face the rotor blades into the wind. The rotor blades can also pitch – the blades can rotate into or out of the wind depending on the wind speed. Each turbine is self-starting when the wind speed reaches an average of about 3 to 5 m/s (about 10 mph). The output increases with the wind speed until the wind speed reaches typically 10 to 13 m/s (about 25 mph). At this point, the power is regulated at rated (maximum) power. When the maximum operational wind speed is reached, typically 25 to 30 m/s (about 60 mph), the wind turbine will cut-out, either fully or gradually, in order to limit loading. If the high wind speed cut out is gradual, the wind turbine will continue to generate some power through to higher wind speeds, the maximum being dependent on the wind turbine design. A SCADA (Supervisory Control and Data Acquisition) computer system monitors and controls the output from each wind turbine. An integrated alarm system will be triggered automatically in the event of a fault.

Figure 5-3 below shows an illustrative WTG with definitions of the numeric parameters referenced within Table 5-1. The exact dimension of the WTG cannot be finalised at this stage due to procurement and supply chain considerations of emerging technology (both on floating and turbine technologies) and the requirement for further clarity on consenting and grid availability however, Table 5-1 details a range on scenario's based on currently available and an informed estimate of future WTG technologies.

Table 5-1 Summary of WTG Scenarios

Design Parameter	Smaller WTG scenario	Large WTG scenario
Number of turbines	10	6
Minimum Blade Clearance from sea-level[3]	22 m	22 m
Hub height	107 m	Up to 150 m
Rotor diameter	170 m	Up to 240 m
Rotor tip height	192 m	Up to 270 m

[3] *Depending on the floating technology and mooring system adopted the entire system may rise and fall with the tide. Regardless of the technology the minimum blade clearance from sea-level will be factored into the system design and maintained.*

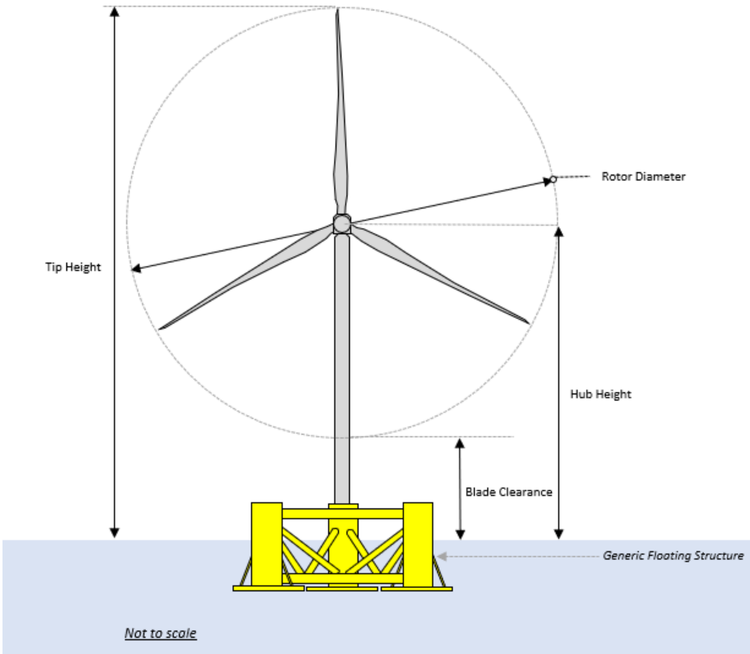


Figure 5-3 Illustration of the Design Parameter Definition for a WTG

5.2.2 Floating Substructures

The WTGs will be supported by a floating substructure, the specific technology and make-up of which has not yet been selected. There are over 40 floating WTG structure concepts currently at varying stages of development in the industry. These have been summarised into characteristic design options to capture the envelope consisting of spar, semis-submersible/barge and tension leg platform (TLP) as shown in Figure 5-4.

An overview of the options for WTG floating substructure is presented in Table 5-2. Each floating technology has varying dimensions as a result of the differing approach to meeting the unique engineering challenges associated with floating turbines, turbine sizes and project specific requirements. Typical dimensions for each of the floating technologies can be estimated based on existing designs from both concept and demonstration scale examples. Indicative dimensions for each floating technology are presented in Table 5-2. Due to the immature nature of the floating wind turbine industry the dimensions of any final design may vary significantly from current estimates based on the emergence of new technologies and approaches in all aspects of the design, manufacturing and installation processes. As such Table 5-2 aims to outline the maximum anticipated dimensions for each of the floating technologies, based on the larger WTG scenario presented in Section 5.2.1.

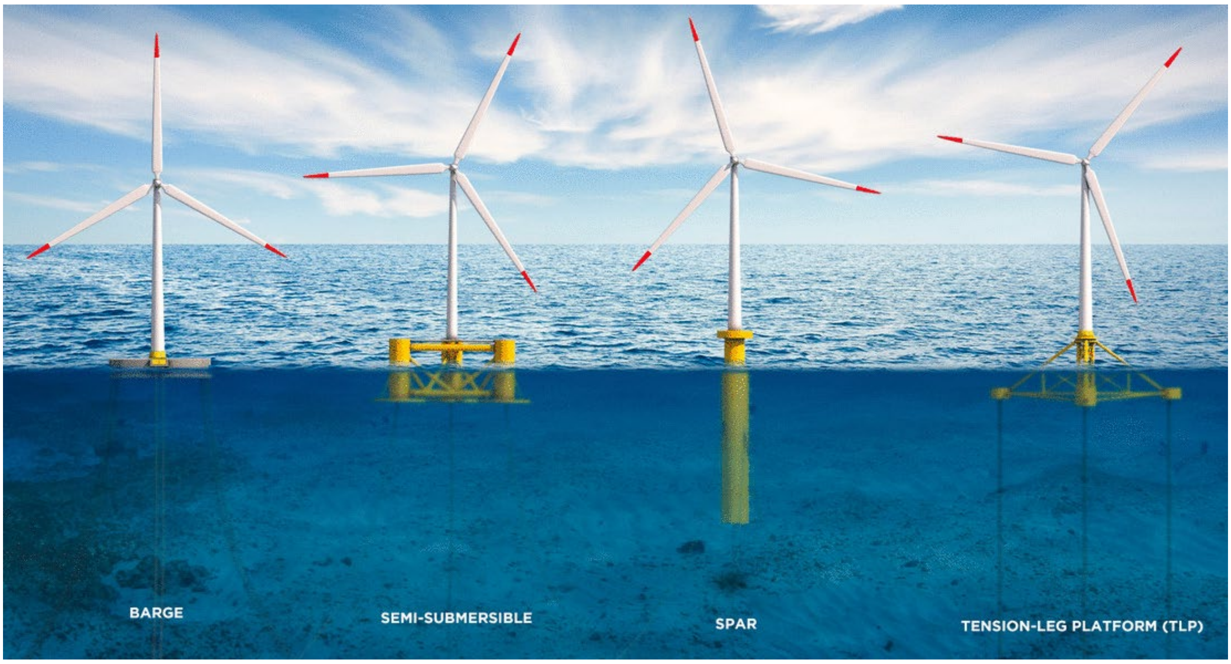
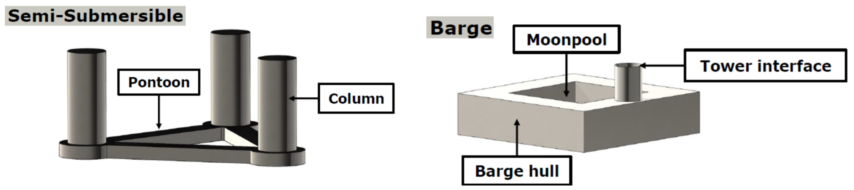


Figure 5-4 Illustration of Characteristic Floating Substructure Designs (Image from WindEurope)

Table 5-2 Floating Substructure Features and Indicative Dimensions

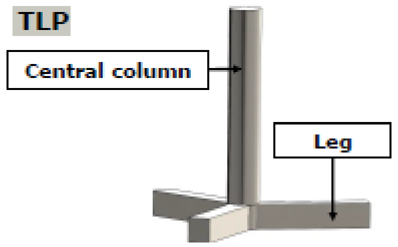
<table>
<tr><th>Floating sub structure</th><th>Description</th><th>Indicative dimensions per sub structure</th></tr>
<tr><td>Spar</td><td>Cylindrical ballast-stabilised structure, which achieves stability through its low centre of gravity. Typically, a steel or concrete cylinder with a relatively small radius, which uses water and/or solid ballast to keep the centre of gravity below the centre of buoyancy.</td><td><table>
<tr><td>Max Length (L) (m)</td><td>139.5</td></tr>
<tr><td>Max Breadth (B) (m)</td><td>23.25</td></tr>
<tr><td>Max Height (H) (m)</td><td>23.25</td></tr>
<tr><td>Operational structure height above sea level (m)</td><td>15</td></tr>
<tr><td>Max Footprint (m^2)</td><td>3,243</td></tr>
</table></td></tr>
<tr><td>Barge/Semi-submersible</td><td>A buoyancy stabilised platform which floats semi-submerged on the surface of the ocean whilst anchored to the seabed. The structure gains its stability through the buoyancy force associated with its large (relative to the spar solution) footprint and geometry which ensures the wind loadings on the structure and turbine are countered/dampened by the equivalent buoyancy force on the opposite side of the structure.



(Image from Ramboll)

The project will also consider a semi-submersible substructure that supports two inclined WTGs. In this case the floating substructure technology philosophy remains the same, only that the design is adapted to accommodate the specific design requirements associated with the different loading scenarios. A typical image of a two-turbine floating structure can be seen below.

</td><td><table>
<tr><td>Max Length (L) (m)</td><td>124</td></tr>
<tr><td>Max Breadth (B) (m)</td><td>124</td></tr>
<tr><td>Max Height (H) (m)</td><td>54.25</td></tr>
<tr><td>Operational structure height above sea level (m)</td><td>15</td></tr>
<tr><td>Max Footprint (m^2)</td><td>15,376</td></tr>
</table></td></tr>
<tr><td>Tension Leg Platform (TLP)</td><td>A TLP is a semi-submerged buoyant structure, anchored to the seabed with tensioned mooring lines. The combination of the structure buoyancy and tension in the anchor/mooring system provides the platform stability. This system stability (as oppose to the stability coming from the floating structure itself) allows for a smaller and lighter floating structure.



(Image from Ramboll)</td><td><table>
<tr><td>Max Length (L) (m)</td><td>77.5</td></tr>
<tr><td>Max Breadth (B) (m)</td><td>77.5</td></tr>
<tr><td>Max Height (H) (m)</td><td>77.5</td></tr>
<tr><td>Operational structure height above sea level (m)</td><td>15</td></tr>
<tr><td>Max Footprint (m^2)</td><td>6,006</td></tr>
</table></td></tr>
</table>

5.2.3 Mooring Options

The Carbon Trust Phase 1 Floating Wind Joint Industry Project Summary Report (Carbon Trust, 2018) identified an industry wide need for innovation in the areas of floating wind moorings. As such the Project needs to maintain flexibility to capitalise on innovations in this area such as sensor technologies and autonomous underwater vehicles amongst other unforeseeable technological advances. Ultimately the final design of the mooring system will be selected as part of the overall 'system' optimisation during the front-end engineering design (FEED) and detailed design phase.

Floating offshore wind turbines need to maintain their position even during the most extreme events or energetic storms. The mooring and anchoring systems are responsible for the station-keeping of the floating structure. Mooring options fall under the following categories:

> **Spread mooring -** groups of mooring lines are attached to the corners of the platform extremities, holding a stable platform heading. Examples include catenary mooring, multi catenary mooring and taut spread mooring.

> **Single point mooring –** used primarily for ship shaped platforms, where they allow the platform to weathervane. A wide variety of single point mooring systems exist including turret mooring, catenary anchor leg mooring (CALM), Single anchor leg mooring (SALM), articulated leg column, single point mooring and reservoir (spar) and fixed tower mooring.

The most common mooring configurations are taut spread mooring systems (which are used in TLPs) and catenary mooring systems (which are used in spar buoys and semi-submersibles platforms). Some concepts will also adopt a semi-taut mooring system.

> **Taut spread mooring**: Made by synthetics fibres or wire, which use the buoyancy of the floater and firm anchor to the seabed to maintain high tension for floater stability.

> **Catenary mooring**: Steel chains and/or wires and in some cases synthetic elements whose weight and curved shape holds the floating platform in place. Lower section of mooring chain rests on the seafloor, supporting the anchor and acting as a counterweight in stormy conditions.

> **Semi-taut mooring**: Synthetic fibres or wires usually incorporated with a turret system, where a single point on the floater is connected to a turret with several semi-taut mooring lines connecting to the seabed.

The vast majority of mooring systems can be broken down into 3 key components (Figure 5-5):

> Anchor (see Section 5.6.3).

> Mooring line comprising of the following single or combined material solutions:
  - Steel Chains
  - Steel Wire Ropes (multiple configurations)
  - Synthetic Fibres (Nylon, Polyester, Polypropylene, Kevlar, High Density Polyethylene).

> Various connectors solutions (both to anchor and floating structure).

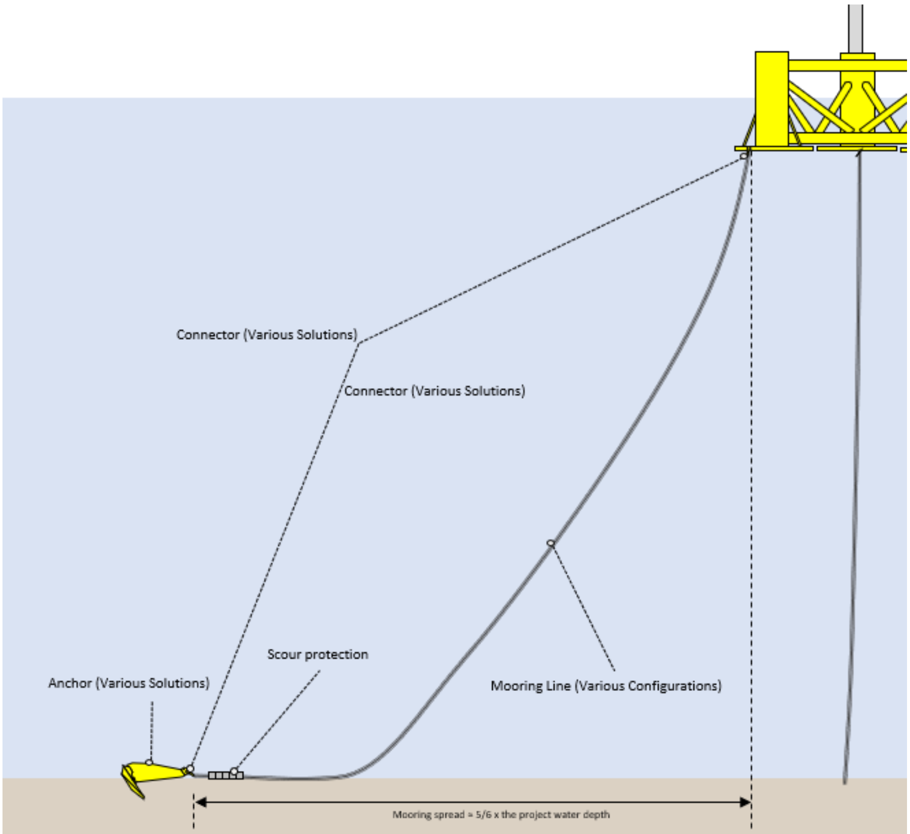


Figure 5-5 Key Components of a Typical Mooring System

Figure 5-6 illustrates an example mooring layout. One possible mooring system optimisation is the use of shared mooring anchor points as seen in Figure 5-6. This approach can lead to a potential reduction in material and installation costs, whilst also reducing the level of seabed disturbance. However, this approach is subject to technical feasibility.

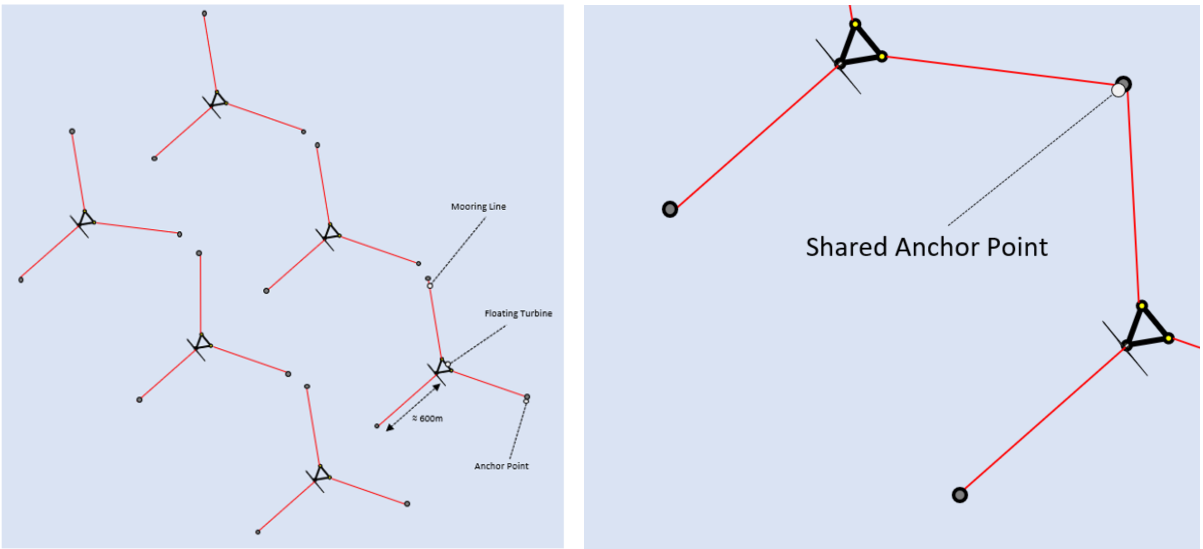


Figure 5-6 Example of a Mooring Layout (left) and Shared Anchor Point (right)

For applications where water depths are below 150 m, so called ‘steep wave’ mooring systems or similar may be applicable, relying on the interplay between a clump mass and a buoyant member for compliance as illustrated in Figure 5-7. This approach may reduce the overall footprint of the floater mooring system but again would be subject to technical and commercial feasibility.

Figure 5-7 ‘Steep Wave’ Mooring System for Water Depths Below 150 m

The exact dimension and configuration of the mooring system cannot be finalised at this stage due to procurement and supply chain considerations of emerging technology. However, Table 5-3 below details the general characteristics of the considered mooring system.

Table 5-3 Indicative Design Envelope for Mooring Systems

General Characteristics of Mooring Systems	
Material of the mooring lines	Chains, cables or synthetic rope (or a combination of technologies)
Number of mooring lines and anchors (per structure)	3 - 6
Typical spread radius based on maximum water depth of 102 m	≈ 600 m
Other	Option for sharing of anchor points

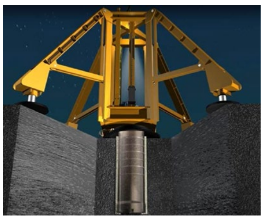
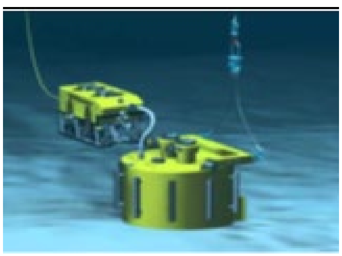
5.2.4 Anchors

There are a number of anchoring solutions available, depending on the mooring configuration, seabed conditions, and holding capacity required. Catenary mooring configurations will often use drag-embedded anchors to handle the horizontal loading, though piled and gravity anchors are still applicable, while taut-leg moorings will typically use either suction piles or gravity anchors to cope with the large vertical loads placed on the mooring and anchoring system. The size of the anchor is also variable, with larger and heavier anchors able to generate a greater holding capacity.

Ultimately, anchor choice will be project and site specific, often dictated by the seabed conditions. However, it can be confirmed that the Project will not utilise hammer driven piles for anchoring. An overview of different anchor options and their suitability with different mooring types is presented in Table 5-4. The exact dimension and configuration of the anchor system cannot be finalised at this stage due to procurement and supply chain considerations of emerging technology.

Table 5-4 Overview of Anchor Options and Suitability with Different Mooring Types

Anchor Type	Description	Image
Gravity	Buried to a depth depending on the weight, geometry and soil characteristics of the site. The holding potential of the anchor is proportional to	

Anchor Type	Description	Image
	the weight. Gravity anchors require medium to hard soil conditions.	 (Image from FMGC)
Drag embedment	Installed by being dragged along the seabed until it reaches the required depth and holding capacity. It uses soil resistance to hold the anchor in place. Best suited for cohesive sediments and function best when they fully submerged into the seabed. Where the seabed is stiff clay or sandy, there can be limited penetration. Drag embedment anchors are not suited for any vertical loading. Mainly used for catenary moorings where the mooring line is horizontal to the seabed.	 (Image from Vryhof)
Vertical load	Vertical load anchors are similar to drag anchors and are installed by dragging along the seabed. In contrast to drag anchors, vertical load anchors can withstand both horizontal and vertical loading.	 (Image from Vryhof)
Drilled piles	Depending on the soil conditions a drilled pile mooring system could be needed at an offshore location. Instead of driving a pile into the seabed a pile or ground anchor is drilled into the seabed using a subsea drill rig.	 (Image from Blade Offshore Remote Drilling (BORD))
Suction bucket	Suction bucket technology (also known as suction anchors, suction piles or suction caissons). involves an upside-down bucket that is sucked into the seabed by pumping out the water. It was developed in the oil and gas industry in recent decades and was used as the anchors at the Hywind floating offshore windfarm in Scotland. The main benefit of suction buckets is the avoidance of piling and the associated noise impacts. It is only feasible in particular seabed types, including sands and clays.	 (Image from Oceaneering)

Anchor Type	Description	Image
Screw piles	Screw (helical) piles are foundations that are screwed into the ground. Screw piles generate less noise and vibration during installation than driven piles. However, their use is subject to the seabed sediment conditions.	

5.2.5 Dynamic Inter-Array Cables

The array cables collect the power from the wind turbines and can either connect to an offshore substation or transmit power direct to shore if technically and economically feasible. In the case of this Project the sites proximity to shore removes the necessity for an offshore substation platform.

It is planned that the inter-array cables will not be greater than 66 kV, however higher voltages may deliver further levelized cost of energy (LCoE) reductions, as such the Project needs to remain flexible to adapt to future innovations in this area.

One of the key design differences between the design of the array/export cable between a fixed bottom and floating turbine is the dynamic nature of the cables. The cable system must be able to accommodate the movement of the floating substructure without imparting any direct loads on the cables (i.e. acting as a form of mooring). As such, the cable design often adopts a 'lazy-s' configuration using buoyancy modules attached to a portion/midpoint of the cable. Although other configurations may be adopted, the 'lazy-s' allows the cable configuration to expand and contract in shape in response to the movements of the floater. An illustration of this can be seen in the typical dynamic cable arrangement illustration in Figure 5-8.

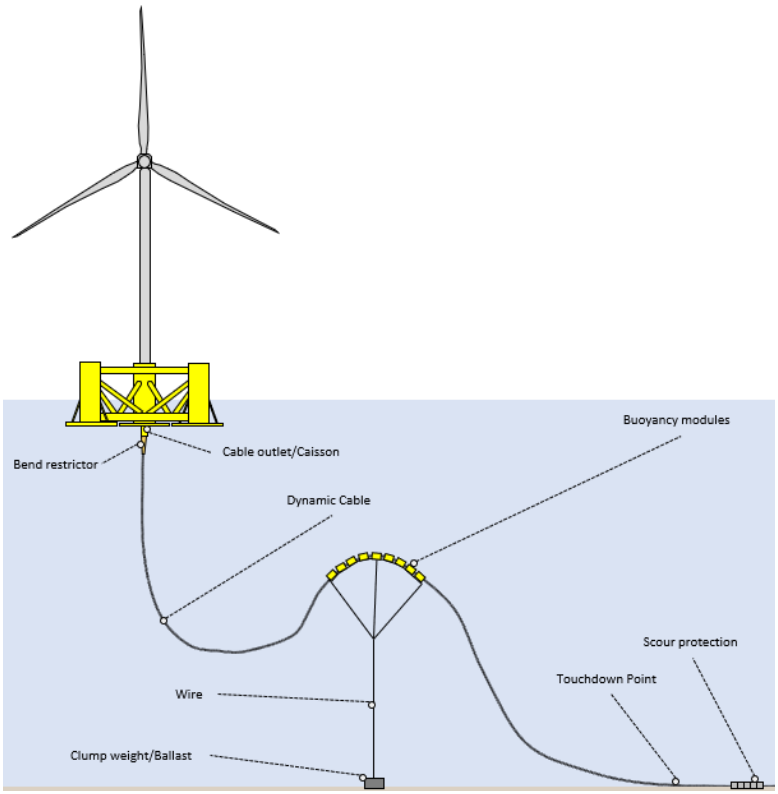
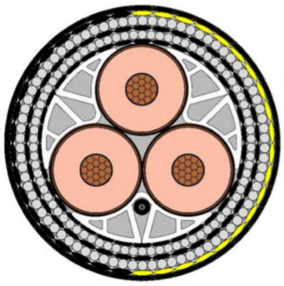
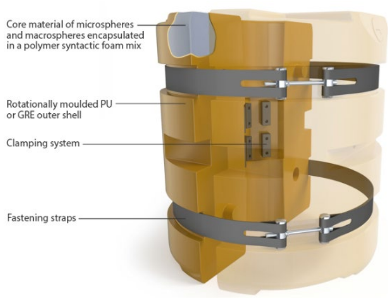


Figure 5-8 Typical Dynamic Cable Arrangement

Table 5-5 Dynamic Cable Array Features

Cable Feature	Description	Image
Dynamic cable	Typically consists of the following composition in order of inside to outside (It should be noted that there can be variance in the cable make-up depending on the specific supplier and/or project specific requirements/design): > 3-phase conductor (typically copper) > Conductor insulation > Conductor sheath > Filler > Optical fibre > Inner sheath (bedding) > Armor wire (multiple layers depending on design) > Outer jacket	
Buoyancy module	The buoyancy modules are typically clamped to the cable during installation and serve to support the weight of the cable catenary in the water column and are designed and positioned to provide the 'lazy-s' configuration in the water column. The number of modules required will be driven by a combination of factors such as: > Water depth > Desired configuration > Environmental conditions > Metocean conditions > Dynamic cable specification amongst other drivers > Floating sub-structure movement	 (Image from Balmoral Offshore)
Band restrictor	Used to reduce the fatigue in the inter-array/export cables at pinch points within the systems physical design. This is particularly pertinent in the case of the floating turbine design as there are two moving components, the cable systems and the floating structure, as opposed to just the cable system in the case of the fixed bottom turbine arrangement. In the case of the dynamic cable design a bend restrictor may be used at the exit point of the cable from the floating structure and at the touchdown/tie-down point of the cable	 (Image from Balmoral Offshore)

Cable Feature	Description	Image
	on the seabed although this is designed on a project by project basis. The bend stiffener material type is typically non-toxic polymers.	

Much like the mooring systems, there is significant scope for innovation in the area of dynamic cables in the offshore wind industry, as such the Project needs to maintain flexibility to capitalise on innovations in this area. The overall design and specification will contain the components, or some of the components, outlined in Table 5-5 above however the specific design will be developed during the FEED and detailed design phase. Figure 5-9 and Table 5-6 provide details of the design envelope associated with the dynamic cables.

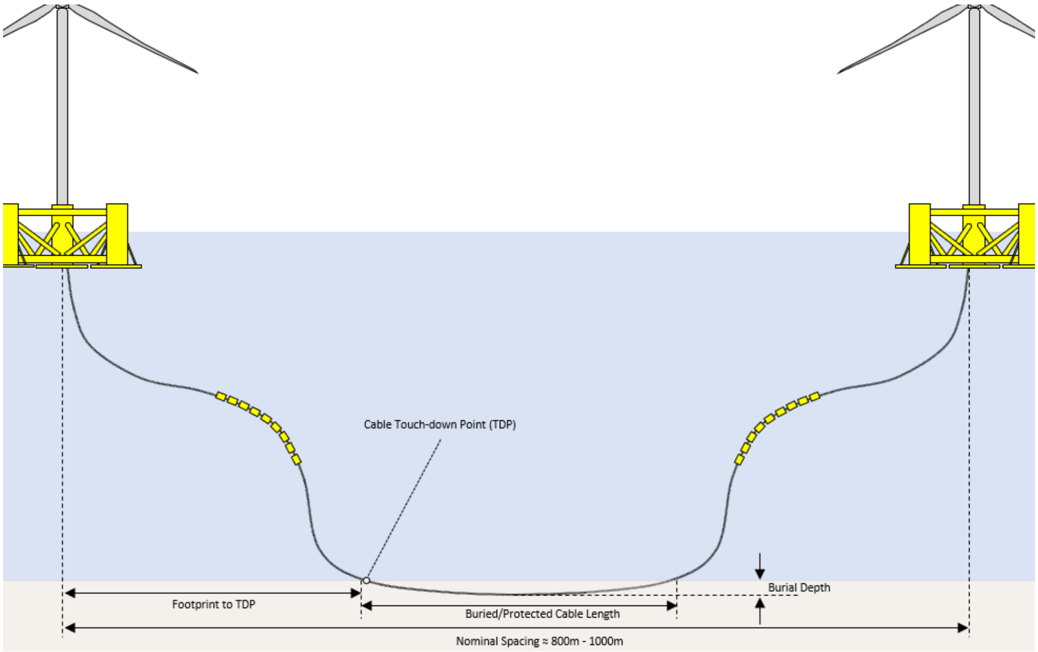


Figure 5-9 Dynamic Inter Array Cable Dimensional Characteristics

Table 5-6 Indicative Design Envelope for the Dynamic Inter Array Cable

Parameter	Value (Maximum or Range)
Voltage	Up to 66 kV
Cable length	Up to 25 km*
Cable footprint to touchdown point	400 m
Cable burial/protection (%age of cables buried)	20% (if deemed a requirement) **
Trench affected wind per cable	10-15 m***
Trench depth	Typically, 1-1.5 m****

** Inter-array cable length of 25 km incorporates the combined length of two cables and additional length to account for dynamic cable movement.*
***from touchdown point*
**** The area of the seabed that may experience some level of compaction or disturbance due to the footprint of the cable laying equipment.*
***** The exact trench depth will be based on a risk assessment based on seabed conditions and may vary.*

5.2.6 Export cables

The export cable will share many of the key components of the dynamic inter array cable as discussed in Section 5.2.5 and Table 5-5. The following are key differences:

- Export cable cross sectional area will likely be greater and may have a higher voltage capacity;
- As a result of the above the installation ancillaries (bend restrictors, buoyancy modules) may be larger to accommodate the greater dimensions and associated weight;
- Export cable will have a Dynamic to Static transition in its makeup;
- Export cable length will be significantly longer than that of the inter-array cable;
- Where possible, the export cable route will be buried or protected in line with a cable burial risk assessment; and
- The landfall end of the export cable will be installed with a specifically designed pulled head to facilitate the pull of the export cable into the onshore joint bay.

As per the dynamic inter-array cables detailed in Section 5.2.5, there is significant scope for innovation in the area of dynamic cables in the offshore wind industry, as such the Project needs to maintain flexibility to capitalise on innovations in this area. The overall design and specification will contain the components, or some of the components, outlined in Section 5.2.5 and the bullet list, above however the specific design will be developed during the FEED and detailed design phase. Figure 5-10 and Table 5-7 provide details of the design envelope associated with the export cable.

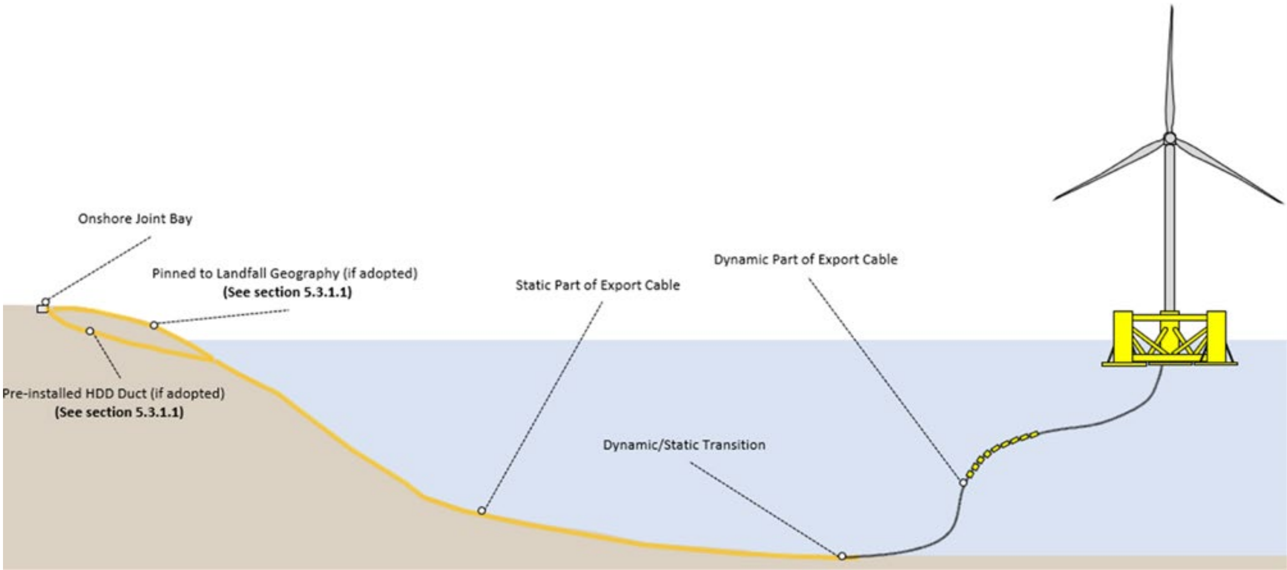


Figure 5-10 Key Elements of a Floating Wind Farm Export Cable

Table 5-7 Indicative Design Envelope for the Export Cable

Parameter	Value (Maximum or Range)
Voltage	Up to 110 kV
Cable Length	10 km*
Cable Burial (% buried/protected)	80-100%**

Parameter	Value (Maximum or Range)
Number of cables/trenches	Up to 2
Trench Affected Width per cable	10-15 m***
Trench Depth	Typically, 1 - 1.5 m

** There may be a requirement for two export cables which could result in a cable length of 20 km plus a 5km contingency length, representing a total maximum length of 25 km.*
*** Cable protection will typically take the form of concrete mattresses or rock placement. Although other options will be considered where appropriate.*
****The area of the seabed that may experience some level of compaction or disturbance due to the footprint of the cable laying equipment.*

5.2.7 Offshore Installation and Commissioning

5.2.7.1 WTGs and floating substructure

Specific details on installation will vary depending on the specific floating technology adopted and may change due to improvements in both the technology and supply chain. Components will be manufactured at a location dependant on technology and local supply chain offerings. If not fabricated at the assembly location the components will be transported to the port of embarkation. The structure will be assembled at the quayside either onshore or on a semisubmersible barge depending on technology specific installation requirements. The wind turbine is assembled and installed on the structure at the quayside using a crane. Quayside pre-commissioning will take place to reduce offshore operations to a minimum. The complete wind turbine and structure assembly is towed to site where it is hooked to the pre-installed mooring system. The power cable (sometimes pre-installed) is laid and hooked up to the WTG. The WTG is then commissioned and released for automatic, unattended operation.

5.2.7.2 Mooring system

The mooring installation and commissioning sequence will vary significantly depending on the mooring design adopted. Typically, to ensure efficient installations and avoid any vessel simultaneous operations, the mooring system will be installed and wet-stored[4] prior to the floating assembly arriving in field. The installation operation will vary depending on the type of mooring design both in material (chain, fibre rope, hybrid etc) and configuration (Catenary, Taut etc.), the options of which are detailed in Section 5.2.3.
A general installation sequence will involve anchor installation prior to mooring installation, moorings will then be hooked to these pre-installed anchors and in some cases, hooked up to buoys which will act as future installation aids for floating assembly hook-up. Upon arrival of floating assembly, the structure will be manoeuvred into the correct location. Tugboats will be used to steer the structure into position/orientation while the previously installed mooring is connected to the floating structure.

5.2.7.3 Anchors and scour protection

The anchor installation methodology will heavily depend on the specific methodology adopted. For the more technologically basic solution such as gravity and drag anchors the installation equipment will typically limited to a crane and installation vessel. For the drilled and screw pile solutions more specialist equipment is required such as work class Remotely Operated Vehicles (ROV's) and screw piling spreads on the installation vessel.

Depending on the anchor solution selected there may also be a requirement to install scour protection to prevent the structure being undermined by sediment processes and seabed erosion. This requirement can be driven by the definition of such a requirement during the design process or in reaction to the identification of an issue as part of the periodic inspections. Typical scour protection solutions include:

- Rock placement.

[4] Wet- storage of mooring systems or dynamic cables is where the mooring lines are laid on the seabed ahead of being connected to the floating structure.

> Concrete mattress protection.

> Sand/grout filled bags.

> Artificial seaweeds.

> Partial or full backfill using previous excavated seabed.

5.2.7.4 Dynamic inter-array cable

A typical installation sequence for the installation of the inter-array cabling (also relevant for export cabling) is as follows.

Pre-lay surveys of proposed cable corridors will be undertaken to identify any requirement for obstacle removal. If required identified obstacles will be removed along the proposed cable route (for the section of dynamic cabling laid on the seabed). The cable is loaded onto the installation vessel which will include a carousel or reel drive system and tensioner/ lay spread. The vessel moves to the site of the pre-installed floating structure where the cable is pulled into the floating structure and secured. The cable (with buoyancy modules) is then deployed into the water column. The second end of the cable is then deployed and pulled and secured into another floating structure. Scour protection is then installed for seabed sections (e.g. rock placement, concrete mattresses, sand-grout bags) if required. The cable is then commissioned, ensuring cable integrity was maintained during installation. The process is then repeated for all WTG arrays.

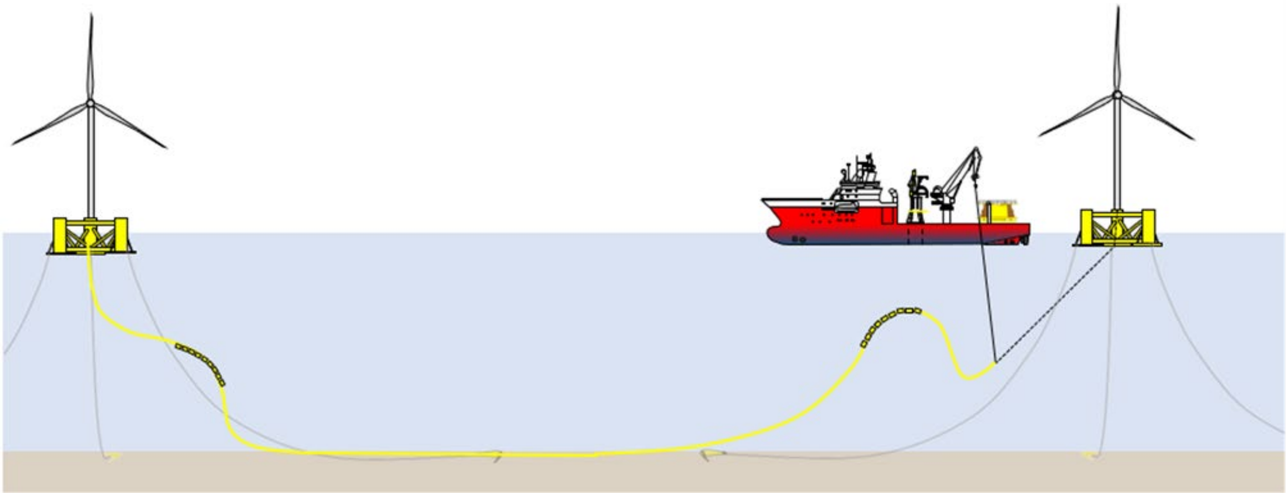


Figure 5-11 Inter-array Cable Installation

5.2.7.5 Export cable installation and commissioning

The necessary onshore preparations need to have been completed in advance of the export cable installation works. These steps are described in Section 5.3. Following onshore readiness, a typical export cable installation will begin with debris clearance as described in Section 5.2.6. Any pre-trenching works required as part of the design will then be undertaken. The onshore end of the cable is connected to the onshore winch wire (through pre-installed HDD if applicable) and pulled to the onshore area. Once secured the installation vessel will move along the cable route paying out the export cable to the seabed or trench ensuring cable integrity is maintained. The in-field end of the cable is installed onto the floating structure in line with the steps outlined for the dynamic cable in Section 5.2.5. Commissioning will then take place and installation of protection systems as necessary (described in Section 5.3.2).

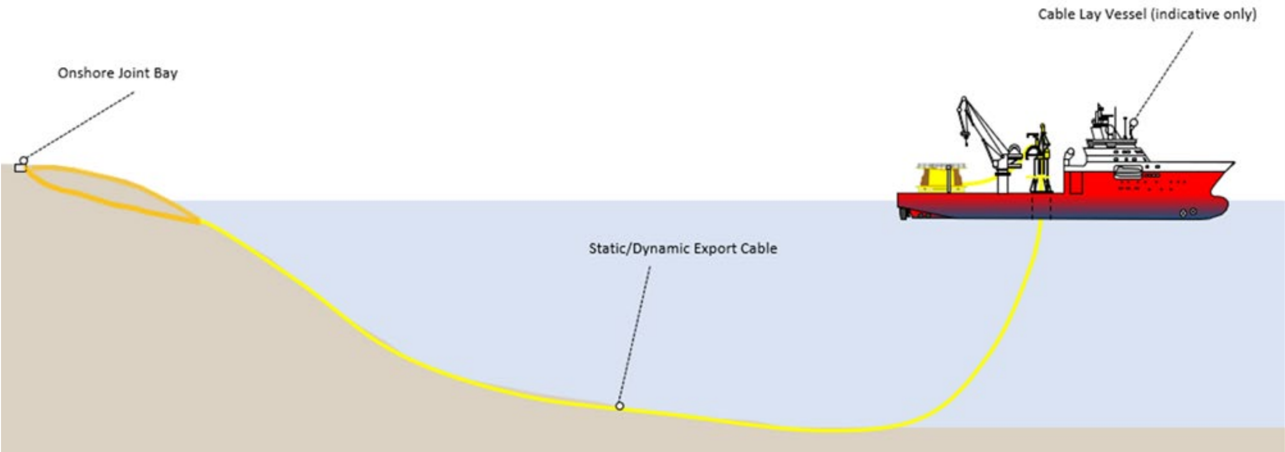


Figure 5-12 Export Cable Installation

5.2.8 Safety Requirements

The Project will be designed and constructed to satisfy the safety requirements of the Maritime and Coastguard Agency (MCA) as well as the marking, lighting and fog-horn specifications of the Civil Aviation Authority (CAA) and the Northern Lighthouse Board (NLB). At present, requirements specify that the turbines must be marked with lights that are visible from 2 nm and from all angles during construction.

When in operation, the platform shall be marked with clearly visible unique identification characters, which will be visible from all sides and comply with applicable requirements in Maritime and Coastguard Agency Marine Guidance Notice MGN 543. Currently these recommend that they should be visible from at least 150 m from the structure and that lighting for this purpose be hooded or baffled so as to avoid unnecessary light pollution or confusion with navigation marks. The colour scheme of the turbine tower, nacelle and blades is likely to be light grey RAL 7035, white RAL 9010 or equivalent.

5.2.9 Offshore Operations and Maintenance

5.2.9.1 WTGs and floating sub structures

The overall in-service inspection, maintenance and monitoring of the wind turbine will be carried out in accordance with normal practices for fixed-structure wind turbines and according to the service requirements provided by the wind turbine manufacturer.

The accessibility criteria for the floating substructures are expected to be the same as that of fixed bottom installations. The primary means of access will be from vessels whereby the floating structure will host one or more access systems (typically ladders) tailored to certain vessels. Helicopter access is also an option under consideration. The specific access system/technique will be confirmed during the FEED and detailed design phase.

For repairs that cannot reasonably be completed on site, towing to port may be required. The floating substructure, mooring and inter-array/export cable arrangements will be designed to enable the safe and efficient disconnection of the structure from its moored position. The structure will also be designed to allow for towing with conventional tugs between the offshore site and port. The following sequence is envisaged for a major component changeout:

> The turbine is shut down and is isolated from the array cable.

> The power cable is disconnected from the turbine; the cable end is suitably stored.

- The mooring system is disconnected from the turbine.
- The complete wind turbine and structure assembly is towed to the O&M port for repair.
- Following quayside repair a repeat of the relevant steps of the installation sequence will be completed to bring the turbine back into operation.

If significant advances in vessel and crane technologies are made it may be possible to complete major component changeouts in-field.

5.2.9.2 Moorings and anchors

The mooring monitoring, inspection and maintenance will be in line with the industry guidelines adapted to suit the Project specific needs based on a risk-based approach. This will include conventional periodic visual (ROV) inspections of the entire mooring system checking the condition of:

- Anchor condition (specific inspection informed by selected technology) for evidence of displacement and scour;
- Mooring line condition including corrosion (particularly at the point of the seabed) and marine growth amongst other technology specific considerations; and
- Connection points for wear, corrosion, functionality i.e. free rotation in case of swivel connector.

The Carbon Trust Phase 1 Floating Wind Joint Industry Project Summary Report identified an industry wide need for innovation in the areas of floating wind moorings as such the Project needs to maintain flexibility to capitalise on innovations in this area such as sensor technologies and autonomous underwater vehicles amongst other unforeseeable technological advances.

5.2.9.3 Dynamic inter-array cable and export cable

Maintenance activities expected to take place on the cables during the operational phase include but are not limited to:

- Cable repair by recovering the cable from its trench/water column and making the necessary repairs i.e. splicing in a new section etc.;
- Cable route inspection, both seabed and water column;
- Reburial of sections of cable which have become exposed; and
- Placement of scour protection over sections of the cable identified as in need of protection.

5.3 Onshore Works

5.3.1 Onshore Cable – Landfall to Grid Connection

The onshore infrastructure will comprise:

- A cable landfall between the boundary of the Dounreay nuclear facility (east) and the border with the White Geos as identified in Figure 5-13 below.
- A cable joint transition bay where offshore and onshore cables are spliced together (although the requirement for a cable joint transition bay will depend on the distance between landfall and substation);
- An onshore cable buried to a depth of approximately 1 m, subject to ground conditions, landowner requirements and cable characteristics; and
- The development will connect to either:

- Option 1: The existing SSE Dounreay transmission substation as per the initial development application as identified in Figure 5-13 below This option would be exercised if the grid connection application was rejected or the new substation was not built.
- Option 2: A grid connection has been requested at, or near, the Dounreay West 275/132 kV Substation and Dounreay Nuclear Facility which is currently in the development stage with a planned completion date of Q3 2022. This is currently the preferred option if installed at the time of project construction.

The required Project infrastructure (project substation/switchgear) and location will depend on the grid connection option adopted.

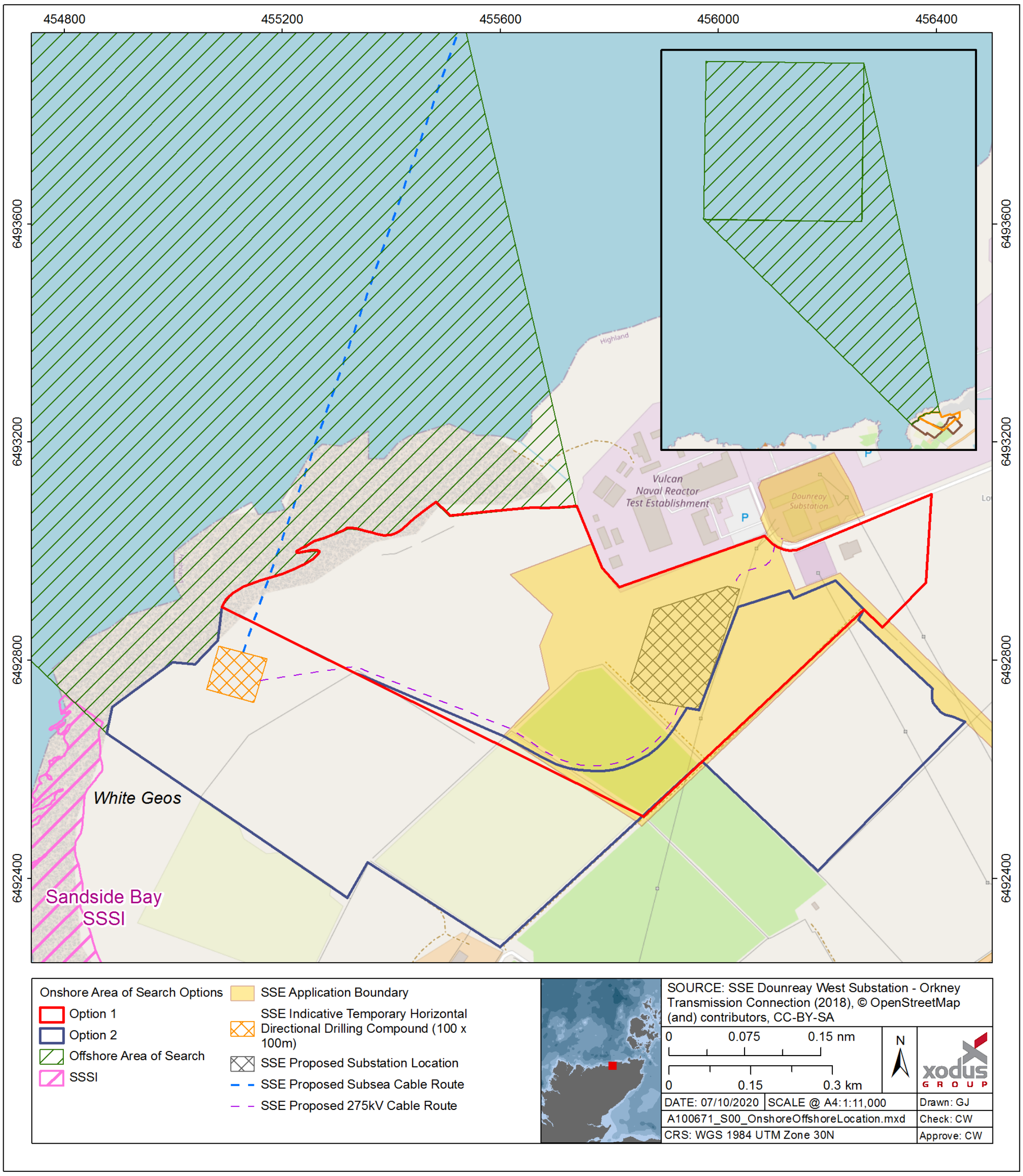


Figure 5-13 PFOWF Onshore Landfall Area

5.3.1.1 Cable landfall

The landfall is an interface between the offshore and onshore aspects of the offshore wind farm. The construction work will typically involve both offshore elements as well as onshore elements.

There are two options for the export cable landfall cable at, or near, Sandside Bay:

> **Option 1: Horizontal Directional Drilling (HDD)** – at a point between Sandside Bay and Dounreay nuclear facility. HDD involves drilling small pilot hole(s) from the landward side to a point below MLWS. The hole is widened to accommodate a conduit pipe through which the cable is pulled. Once installed the cable is fed into the cable joint transmission bay. HDD requires a temporary landward working area of up to 1,000 m^2 per cable during construction to accommodate the drilling equipment and ancillary plant. This will be above MHWS. Once installed the working area is restored to pre-construction conditions; or

> **Option 2: Pinning –** pinning the cable to the disused Dounreay cooling water intake, at Dounreay. The Dounreay cooling water intake is cut through bedrock. A cable duct could be pinned or screwed to the bedrock wall at low tide, and the cable pulled through the duct, utilising the existing route to shore formed by the water intake channel. There is the potential that pinning at this location may result in crossing the planned SHE-T Orkney – Caithness Interconnector (if installed at the time of project construction).

5.3.1.2 Joint transition bay

At the cable landfall point, a concrete joint transmission bay (JTB) may be required to house the joint between the offshore export cable and onshore cable. The JTB would be located above MHWS and comprise an area approximately 2 m wide, 5 m long and 1 m deep with a level concrete floor and walls. The purpose of the JTB is to allow a firm, solid base for cable jointing which can be covered by a tent or container to allow the necessary environmental conditions. Following connection of the cables, the JTB may be backfilled to protect the joint. The area will then be reinstated.

5.3.1.3 Onshore cable

The onshore cable will be installed in excavated trenches along the cable route. The overall distance of the onshore cable will depend on the grid connection option, landfall location and location of the Project infrastructure but is anticipated to be no longer than 2 km. Cable will be delivered by Heavy Goods Vehicles (HGVs).

Once the onshore cable route is finalised the appropriate installation method will be decided. However, it is anticipated that open-cut trenching will be the primary installation method. HDD may be required, if obstacles are encountered:

> Open-cut trenching may comprise of ducted installation. In this case, a trench will be dug using backed-hoe excavators to a depth of 1 – 2 m depending on the multiple design factors. The turf, topsoil and spoil will be separated and placed beside the trench. Ducts would then be laid on top of fine aggregate/sand and then the excavated material would be backfilled and restored. Cable would then be drawn through the buried ducts at cable joint bays.

> HDD would generally be used at key crossings of sensitive features such as water courses. A much smaller drilling rig and working area (20 m x 20 m) would be required when compared to the landfall HDD operations but the technique is the same.

The working area includes the corridor in which the access road, the cable trenches, excavated material and any other equipment/machinery is placed. The dimensions of the access road will depend on the type of cable trench and whether access for transportation of cable drum to the cable pulling sites (at the cable jointing bays) is necessary. It is expected that one cable arrangement (single or trefoil) will be installed in a single trench up to 3 m wide with an associated working corridor width of up to 20 m. This working width would encompass the cable trench, an access track, oil and turf storage and fencing. Certain sections may be wider, if required, for temporary parking, storage and cable pulling equipment.

The onshore cable corridor can be reinstated and re-cultivated after installation is complete. However, construction above the cable is not permitted.

5.3.1.4 Cable Joint Bay

Cable Joint Bays (CJBs) are typically required every 500 - 1,000 m to string together the onshore cable sections depending on the manufacturing specification of the cable supplier. The joints will occur within CJBs; these are typically slightly smaller than the JTBs (5 m long and 1.5 m wide) but essentially the same design.

The CJBs will be excavated to approximately 1.5 m below ground level. This can take place prior to the trenching operation as long as the bay is temporarily covered until the jointing operation. During the jointing operation the bay will be covered by a tent or a container to ensure the correct environmental conditions for the jointing work. A working area of approximately 20 x 20 m is required adjacent the CJBs to provide space for the cable drums at one end, and the pulling equipment and auxiliary supply for the jointing work at the other end. This can be contained within the cable route working corridor. Following the cable jointing operation, the CJB will be backfilled and the ground restored.

A manhole cover will be the only surface level structure visible following full reinstatement of the cable corridor. This provides access for maintenance. The precise positioning will be agreed with landowners.

5.3.1.5 Switchgear or substation

The WTGs will export power up to a maximum of 110 kV. The Project will require an onshore substation to connect to the transmission network at 13 2kV (existing Dounreay Substation) or 275 kV (planned Dounreay West Substation) depending on which option is offered.

The onshore substation or switchgear will include the electrical equipment required to connect the Project to the grid. This may include switchgear, transformers, harmonic filter, reactive compensation devices, protection equipment, batteries and other auxiliary equipment. The entire footprint to the edge of the fence line is likely to be an area of approximately 100 m x 60 m (0.60 hectares).

The majority of electrical plant should be indoors owing to the coastal location. The exact configuration and access roads will be decided at a later stage. External lighting will be used to illuminate the building, but this will be intermittent and only used when people are on site.

5.3.2 Onshore Construction Activities

The following sections outline the key construction activities associated with the onshore element of the works, some of these activities may occur in parallel.

5.3.2.1 Cable landfall and onshore cable corridor

The construction of the cable landfall and cable corridor to the onshore Project switchgear can be summarized into the following activities:

- Erect site fencing;
- Excavation or Horizontal Directional Drilling (HDD);
- Possible laying of ducts for later installation of cables;
- Backfilling and compaction of soil; and
- Reinstatement, where necessary.

The specific details will be confirmed during the FEED and detailed design phase.

5.3.2.2 Onshore switchgear or substation

Construction of the onshore switch gear or substation would comprise the following stages:

- Construction of temporary access roads from the existing road network;

- Site preparation including site clearance, fencing off the construction area, provision of services to the site and creation of a construction compound with welfare facilities;
- Civil works to prepare the site for the heavy-duty equipment required for the installation of the foundations and buildings. This will comprise earthworks to create a firm and level platform across the site;
- Foundation works for the main electrical components and buildings which may comprise piled and/or shallow foundations;
- Provision of the main utilities to services the site including electrics, water and telecommunications;
- Construction of the main buildings housing the switchgear and controls;
- Installation and testing of electrical equipment;
- Landscaping works including earthworks and vegetation planting; and
- Commissioning activities.

The specific details will be confirmed during the FEED and detailed design phase.

5.3.3 Onshore Operations and Maintenance

Following commissioning, it is assumed that the onshore substation will operate continuously (24 hours a day, 7 days a week) except during planned shutdowns for maintenance. The onshore substation will be designed to remain in situ during the lifetime of the Project.

There will be a limited amount of traffic to and from the substation for general operation and maintenance purposes. This is estimated to be around four vehicles per month carrying up to three persons per vehicle. Beside this, there will be no day to day personnel on site in normal operation. Unexpected faults may lead to increasing traffic volumes depending on the type of fault.

Routine activities on the underground cable system during the operational phase will be regular and ad-hoc visits to the manholes as required for inspection/maintenance purposes. Non-routine activities could include repair of damage to cable or replacement of failed cable joint.

5.4 Construction Programme

A detailed construction programme will be developed as design and procurement activities progress. The fabrication activities are planned to commence upon financial close planned in2024 and will continue for a period of circa 18 months, the actual construction activities are planned to be completed in a 6-month period starting in 2026. Activities may not be continuous, and the sequence of activities may change. Engineering and procurement activities may overlap with certain development construction activities. The main fabrication and construction activities and their anticipated high-level durations are outlined in Figure 5-14 below.

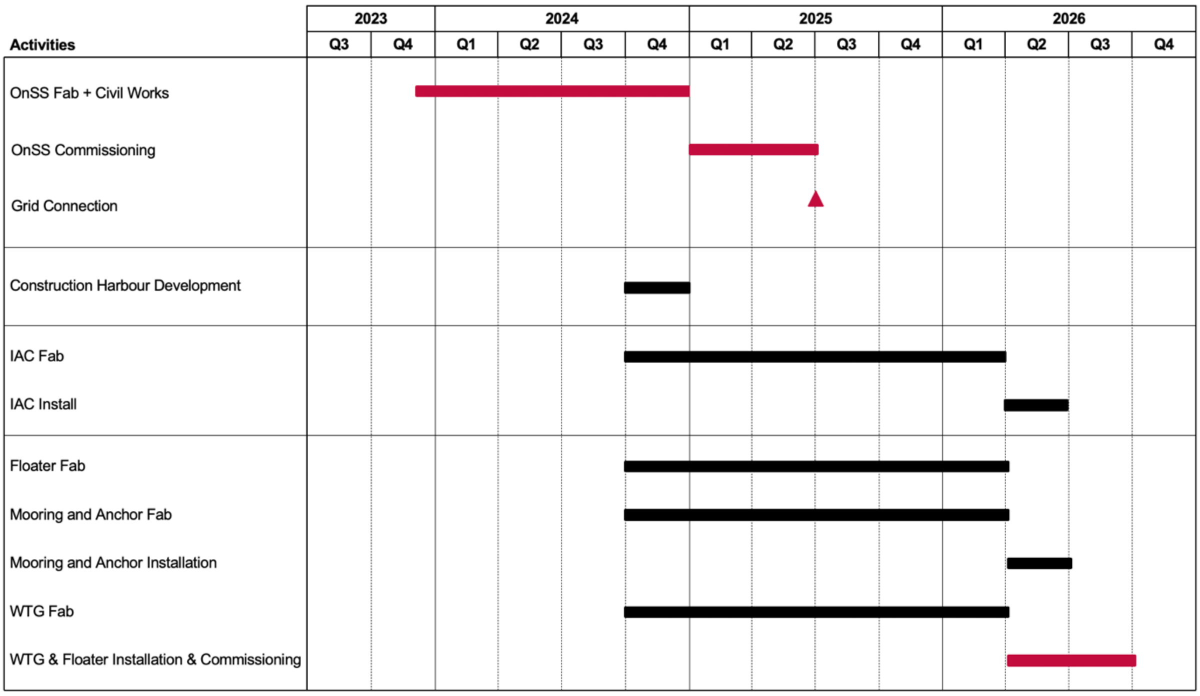


Figure 5-14 Indicative High-Level Programme for the Project

5.5 Decommissioning

The design life of the turbines and other major components of the Project have been designed to last for the lifetime of the Project.

The Energy Act 2004 and the Scotland Act 2016 contain statutory requirements in relation to the decommissioning of offshore renewable energy installations (OREI) and require the Project to provide a Decommissioning Programme, supported by appropriate financial security, prior to construction. The Decommissioning Programme will follow the guidance found in the Guidance Notes on Decommissioning of Offshore Renewable Energy Installations under the Energy Act 2004 from the UK Department of Energy and Climate Change (DECC) (Department for Business Energy and Industrial Strategy, 2019) and the Draft Guidance Note for the Decommissioning of Offshore Renewable Energy Installations in Scottish Waters or in the Scottish Part of the Renewable Energy Zone under the Energy Act 2004 published by Marine Scotland (Marine Scotland, 2019). Decommissioning activities will comply with all relevant legislation at that time.

5.5.1 Decommissioning Approach

The overarching principles that will be followed when developing an appropriate Decommissioning Programme are derived from the DECC Guidance Note and Marine Scotland's Draft Guidance Note and will consider:

> The Best Practicable Environmental Option (BPEO), which is the option that delivers the most benefit or least damage to the environment at an acceptable cost, both in the short and long terms. This involves balancing the reduction in environmental risk with practicability and cost of reducing the risk;

> Safety of surface and subsurface navigation;

- Other uses of the sea; and
- Health and safety considerations.

In addition, the Project will adhere to the principles of:

- Sustainable development, and will seek to ensure that, as far as reasonably practicable, future generations do not suffer from a diminished environment or from a compromised ability to make use of marine resources; and
- Polluter pays principle, which acknowledge the Project's responsibility to incur the costs associated with our impact on the environment.

In developing a Decommissioning Programme, the company will seek to maximise the re-use of materials and will pay full regard to the 'waste-hierarchy'. In order to ensure that commercial viability is maintained, the BATNECC (Best Available Technique Not Entailing Excessive Cost) decommissioning solutions will be sought. In achieving the above objectives, the Project will ensure practical integrity. When decommissioning the wind farm, the Project will seek to minimise influence on land transportation and where practicable, will plan transportation between the coast and respective waste management facilities in order to reduce safety issues and disturbance to traffic.

Following international standards such as those published by the International Maritime Organization (IMO) the starting presumption is that at the end of the operational lifetime of the Project, there will be a requirement for all offshore components above the seabed to be completely removed to shore for re-use, recycling, incineration with energy recovery or disposal at a licenced site. Decommissioning best practice and legislation will be applied at that time. For any components that are situated subsurface, a comparative assessment will be undertaken to provide a recommendation based on the performance against five main criteria, Safety, Environmental, Societal, Technical Feasibility and Economic.

Throughout the Project lifespan the Decommissioning Programme will be reviewed and updated every 5 years. Consultee bodies listed in the S105 Notices, and any additional consultees identified by MS-LOT or Highland Wind Limited, will be provided with the opportunity to comment on the final decommissioning strategy prior to it being finalised. It is anticipated that the final revision process will commence two years prior to the initiation of decommissioning activities.

5.5.2 Decommissioning the WTGs

The removal of turbine components including blades, nacelle, and tower will largely be a reversal of the installation process and will either be undertaken in situ or following reposition to shore. The general methodology for carrying out wind turbine decommissioning will likely be:

- To de-energise wind turbines and isolate them from the grid;
- Mobilise suitable heavy lift vessels to site;
- Remove turbine blades;
- Removal of all tower/nacelle internal cables that connect the generator and transformer as well as related control and communication cables;
- Remove nacelle including the gearbox and generator;
- Dismantle and remove turbine tower; and
- Transportation of all components to an onshore facility for processing.

Once onshore, the components are likely to be processed as follows:

- All hazardous substances and fluids will be removed from the wind turbines (such as oil reservoirs and any hazardous materials and components). All such materials will then be disposed of in accordance with relevant regulations at the time of disposal;
- All steel components will be sold for scrap to be recycled. This forms the bulk of the wind turbine structures;
- Electrical components will be disassembled and handled in accordance with the newest IEC 61400 at time of decommissioning; and
- The wind turbine blades (fibreglass) will be disposed of in accordance with the relevant regulations in force at the time of decommissioning.

5.5.3 Decommissioning the Floating Substructures

The removal and dismantling of the floating foundation will largely be a reversal of the installation process and subject to the same constraints. Decommissioning will be undertaken in the same controlled manner as the installation process and in accordance with a risk management plan to ensure the same level of safety and pollution control measures. Whichever anchoring system is deployed the post decommissioning state will be the same in terms of leaving the site with a clear seabed surface free from obstruction to other seabed traffic such as fishing gear. Components will be re-used or recycled, where possible.

5.5.4 Decommissioning the Export Cable and Inter-array Cables

Relevant stakeholders and regulators will be consulted to determine which sections of the offshore cables will need to be removed. However, it is anticipated that the dynamic sections of the inter-array cables will need to be recovered, potentially cut at the static transition.

If there are no issues with stakeholders/regulators and the risk of the cables becoming exposed is minimal, then the cables may be left in situ to avoid disturbing the seabed unnecessarily. The ends of the cables will be cut as close to the seabed. The ends will be weighted down and buried (probably using an ROV) to ensure they do not interfere with trawling and other rights and needs of legitimate users of the sea. A decision to decommission infrastructure in situ will be supported by a comparative assessment process (in line with BEIS guidance) and supported by a suitable body of evidence.

The sequence for removal of the cable is anticipated to be:

- Locate the cable using a grapnel and lift it from the water column or seabed. Alternatively, or in addition, it may be necessary to use an ROV to cut and/or attach a lifting attachment to the cable so that it can be recovered to the vessel;
- For dynamic cable removal the buoyancy modules will be removed as the cable is recovered to deck;
- Seabed material may need to be removed to locate the cable (excluding dynamic cables). This is likely to be carried out using a water jetting tool similar to that used during cable installation;
- The recovery vessel will either 'peel out' the cable as it moves backwards along the cable route whilst picking it up on the winch or cable engines, or, if the seabed is very stiff/hard it may first under-run the cable with a suspended sheave block to lift the cable from the seabed. The use of a suspended sheave block could be carried out before by a separate vessel such as a tug prior to the recovery vessel ‘peeling out’ the cable;
- The recovery vessel will either spool the recovered cable into a carousel or cut into lengths as it is brought aboard before transport to shore; and
- The cables will be recycled onshore.

5.5.5 Removal of Scour Protection

It may be preferable to leave the scour protection in-situ to preserve the marine habitat that may have developed over the life of the Project. Relevant stakeholders and regulators will be consulted to establish what the best approach is. If removal is deemed necessary, the removal sequence is anticipated to be:

> For rock armour, the individual boulders are likely to be recovered using a grab vessel, and transferred to a suitable barge for transport to an approved onshore site for appropriate re-use or disposal; or

> The filter layer is likely to be dredged and transported to be reused or disposed of at a licensed disposal area (this could be offshore or onshore).

5.5.6 Seabed Clearance and Restoration of the Site

Highland Wind Limited is committed to restoring the Project area, as far as is reasonably practicable, to the condition that it was in prior to construction of the wind farm. Consistent with the decommissioning provisions detailed above, the key restoration work will relate to:

> Ensuring that anchors (e.g. if suction anchors are deployed) are cut below seabed and are made safe and adequately covered; and

> Ensuring that cables and cable ends are adequately buried, or otherwise protected.

In line with the details provided above, Highland Wind Limited is committed to ensuring the Project is safely and effectively decommissioned. Where necessary, upon completion of the decommissioning works a survey will be undertaken to ensure that all debris has been removed. The survey will enable identification and recovery of any debris located on the seabed which may have arisen from activities related to the decommissioning process and which may pose a risk to navigation or other users of the sea (e.g. fishermen). The process of collecting and presenting evidence that the site is cleared is required to be independent of Highland Wind Limited. Highland Wind Limited proposes that an independent survey company complete the surveys and that the results of these surveys will be issued to MS-LOT for review and comment and circulated to stakeholders as agreed in advance with the Scottish Ministers. The required survey area would be determined during the decommissioning phase of the Project, taking into account good practice at the time and the views of stakeholders. It is anticipated that the survey area would focus around the renewable energy installations i.e. the anchor structure locations and any in situ infrastructure such as the export cables. Analysis of any survey data gathered will also ensure that items for removal and disposal relate only to the Project. Consultation with relevant stakeholders will be conducted in the event that other anomalies of archaeological interest are identified during seabed clearance.

5.5.7 Post-Decommissioning Monitoring, Maintenance and Management of the Site

Should any infrastructure be decommissioned in-situ, some post-decommissioning activities may be required, to identify and mitigate any unexpected risks to navigation or other users of the sea. This could be, for example, as a result of anchor piles or cables becoming exposed through natural sediment movement. The requirement for monitoring and the extent and approach taken will be determined based on the scale of the remaining infrastructure, the risk of exposure and the risk to marine users and will be agreed upon with Marine Scotland in subsequent revisions of the Decommissioning Programme as the Project matures.

Where considered necessary, post-decommissioning monitoring surveys of the seabed will be carried out following the completion of the decommissioning works. Surveys are expected to comprise geophysical survey (such as swathe bathymetry, sides can sonar and magnetometer). Surveys will be undertaken in line with the final Decommissioning Programme, and in line with survey scopes consulted on with MS-LOT and relevant stakeholders. Compliance will be verified by means of independent third-party survey upon completion of the works. The results of these surveys will be issued to MS-LOT for record keeping purposes. Any post-decommissioning hydrographic surveys will be undertaken in accordance with the requirements set out in the relevant guidance in place at the time.

If an obstruction appears above the seabed following decommissioning which is attributable to the Project, it will be marked so as not to present a hazard to other sea users and remediated if required. Any remediation method will be agreed with Marine Scotland. The navigational marking will remain in place until such time as the obstruction is removed or no longer considered a hazard due to suitable remediation. The monitoring of the obstruction will be built into any monitoring and maintenance programme.

Details of the post-decommissioning monitoring, maintenance and management will be discussed with stakeholders close to the point of decommissioning and will consider relevant guidelines and industry standard good practice at the time and where possible this will take the form of non-intrusive survey techniques.

5.6 Safety Zones, Marking and Lighting

5.6.1 Safety Zones

5.6.1.1 Construction (and decommissioning)

In accordance with the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007, it is expected that a 500 m safety zone around each renewable energy installation will be applied for under Section 95 of the Energy Act 2004 during the period of construction (and decommissioning) works (Figure 5-15). Section 62 of the Scotland Act 2016 amends Section 95 of the Energy Act 2004 making Scottish Ministers the appropriate Minister for safety zones. In order to minimise disruption to navigation by users of the sea, safety zones are expected to be established around such areas that have activities taking place at a given time. As such the safety zones are expected to follow throughout the different areas of the WTG Site and phased as construction work is undertaken. The exact locations will be subject to detailed engineering informing the construction plan and are to be determined at a later stage prior to execution.

It is standard safe working practice to establish minimum safe passing distances around areas of vessel activity that present a navigational safety risk to marine users. This includes providing information of planned works and a requested safe clearance distance. These safety zones are generally 500 m and move with the vessel during its operation.

Within port limits the relevant Harbour Authority may also choose to establish safety or exclusion zones around works, should a navigational safety risk be posed for example, due to the proximity to navigational channels or volume of traffic. This will be discussed with the relevant Harbour Authority during the works planning process. Safety zones, and/or any other exclusions required, will be implemented and communicated though standard protocol (i.e. Notice to Mariners).

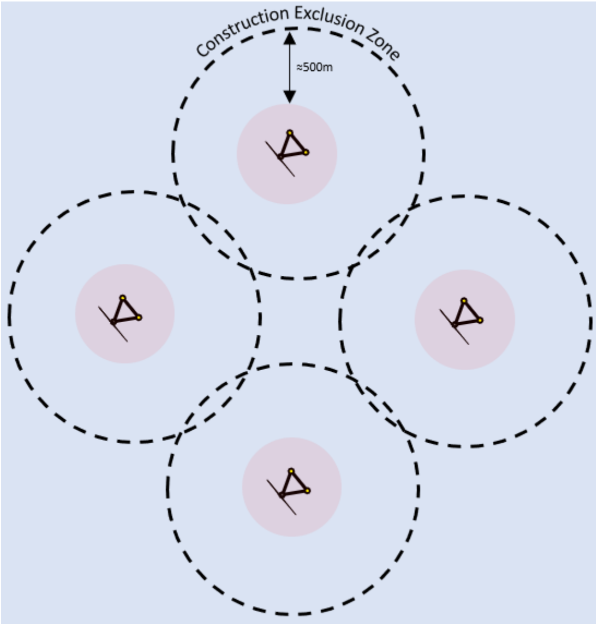


Figure 5-15 Nominal Safety Zone During Construction

5.6.1.2 Operations and maintenance

Under the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007, the standard dimensions for a safety zone during the operational phase is a radius of 50 m measured from the outer edge of the floater excursion zone (Figure 5-16). A request for larger safety zones may be made if a justification can be made in the application to Scottish Ministers. The requirement for operational safety zones will be considered as part of the Project safety case on review of the mutual risks posed, post construction, to the Wind Farm and third parties and will be dependent on the outcomes of the detailed engineering phase.

During periods of major maintenance works and where a risk is posed to marine users or wind farm technicians, further temporary 500 m zones may be applied for under the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007. This may be undertaken in conjunction with standard vessel safe operating procedures and use of guard vessels

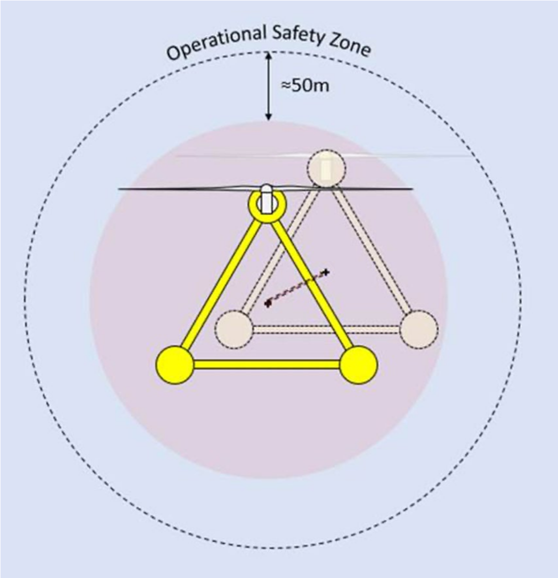


Figure 5-16 Nominal Safety Zone During Operation

5.6.1.3 Colour scheme, markings and lighting

The Project will be designed and constructed to satisfy the safety requirements of the Maritime and Coastguard Agency (MCA) as well as the marking, lighting and fog-horn specifications of the Civil Aviation Authority (CAA) and the Northern Lighthouse Board (NLB).

When in operation, the platform shall be marked with clearly visible unique identification characters, which will be visible from all sides and comply with applicable requirements in Maritime and Coastguard Agency Marine Guidance Notice MGN 543. Currently these recommend that they should be visible from at least 150 m from the structure and that lighting for this purpose be hooded or baffled so as to avoid unnecessary light pollution or confusion with navigation marks. Additionally, for aviation purposes, Wind Turbine Generators (WTG) shall have high contrast markings (dots or stripes) placed at 10 metre intervals on both sides of the blades to provide helicopter pilots with a hover-reference point.

The colour scheme of the turbine tower, nacelle and blades is likely to be light grey RAL 7035, white RAL 9010 or equivalent.

6 APPROACH TO SCOPING AND EIA

6.1 Introduction

Environmental Impact Assessment (EIA) is a process which identifies the potential environmental impacts of a development and then seeks to avoid, reduce or offset any adverse impacts through mitigation measures where possible. The EIA process is both iterative and cyclic and runs in tandem with project design. As potential impacts are identified, the design of the Project can be adjusted, and mitigation measures proposed. Consultation, a vital component of the EIA process, continues throughout each stage and contributes both to the identification of potential impacts and the development of mitigation measures.

6.2 Scoping Assessment Methodology

During the Scoping stage of the EIA (to which this report relates) a high level appraisal of the potential impacts is undertaken. This is undertaken using best judgement of the available data and professional expertise and will comprise of the following steps:

- Review of available existing information;
- Review the likely or potential impacts that might be expected to arise from the Project;
- Where an impact has been considered but is deemed to be insignificant it will be scoped out of the proposed EIA;
- Where an impact is considered to need assessment at the EIA stage a determination on whether available data is sufficient to undertake robust assessments for EIA and HRA with confidence; and
- Where data is lacking, identification of further data and surveys required in order to carry out EIA and HRA.

The Environmental Impact Assessment process is reported in the EIA Report. A full explanation of the assessment methodology for the EIA will be presented in the EIA Report.

The prediction of impacts will be made using the known parameters of the Project and through experience of similar projects. The prediction of impacts includes consideration of the construction, operations and maintenance and decommissioning phases of the Project.

6.3 Cumulative Impacts

Cumulative Impact Assessment (CIA) forms part of the EIA process. The scope of the CIA (in terms of relevant issues and projects) will be established with consultees as the EIA progresses. In addition, the CIA will look at the experience from other similar UK projects as well as incorporating continuing work from industry-wide initiatives with regard to cumulative impact.

The Scoping Report and subsequent EIA Report intend to consider projects which are "reasonably foreseeable" such as:

- Existing development either built or in construction;
- Approved development, awaiting implementation; and
- Proposals awaiting determination within the planning process with design information in the public domain.

This approach accords with Scottish Natural Heritage (now NatureScot) Guidance: Assessing the cumulative impact of onshore wind energy developments (SNH, 2012) and the Renewable UK Cumulative Impact Assessment Guidelines (RUK, 2013).

Once the relevant projects (sources) and receptors have been identified, possible pathways linking the two will be identified. Where no pathway exists between a source (other than the Project) and a receptor, cumulative impacts can be ruled out. This screening process will help to refine the relevant projects and receptors and inform the spatial extent of the Cumulative Impact Assessment (CIA).

At this stage some of the key issues to be considered as part of the CIA are predicted to be:

- Impacts on shipping and navigation, including constriction of shipping routes, increased navigational risk and disruption, increased travel and running costs from increased numbers of vessels serving various developments;
- Impacts on local residents, including employment opportunities, improvements to local infrastructure, increased industrial activity and increased demand on social services during construction, with benefits to the wider UK economy;
- Impacts on commercial fisheries, including impacts from displacement and the 'ripple effect' into other areas, increased steaming times, increased running costs and conflict between users of different gear because of construction activities, use of seabed and increased vessels, impacts on dependent shore-based industries;
- Cumulative loss of benthic habitat from particular developments with impacts on important species;
- Cumulative impacts on birds from disturbance during construction, loss of feeding grounds, noise;
- Cumulative impacts on marine mammals from disturbance during construction, loss of feeding grounds, noise; and
- Contributions to achieving the Scottish and UK renewable energy targets and promotion of marine renewable energy technology.

The identities of relevant projects to be taken into consideration as part of the cumulative impact assessment will vary from receptor to receptor and are therefore considered within each of the relevant chapters of this Scoping Report. The developments listed in Table 6-1 below are indicative of the type of plans or projects that will be included within the scope of the cumulative impact assessment:

Table 6-1 Indicative Developments considered for Cumulative Impact Assessment with the Project

Development Description	Status	Distance to nearest study area (km)	Start Date	Duration of Project	Additional Information
Highland Wind Limited - Pentland Floating Offshore Wind Demonstrator	Consented (although potentially subject to a section 36 variation)	0 km	2023 (construction)	2048	A demonstration project which will utilise the existing Dounreay Tri consent for the site. It should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider array as discussed in Section 1.2.3.
SHE-T Orkney-Caithness Interconnector Project	Consented	0 km	Unknown	Unknown	Overlap the Project Boundary
SHE-T Dounreay West Substation	Consented	0 km	Unknown	Unknown	Overlap the Project Boundary
Limekiln Wind Farm	Consented	3.2 km	2021 (construction)	Unknown	Limekiln Windfarm has also submitted scoping for a potential

Development Description	Status	Distance to nearest study area (km)	Start Date	Duration of Project	Additional Information
					extension to the consented site. The proposed 132 kV grid connection, currently at the application stage, will terminate at new switchgear equipment to be installed inside the existing Dounreay substation.
Drum Hollistan Wind Farm	Proposed	3.3 km	-	-	The Project was refused consent during 2015, however planning permissions have been resubmitted for the development
Decommissioning and remediation activities of the Dounreay Nuclear Site and Vulcan Test Reactor Site	Operational	0 km	Ongoing	Up to ~ 2032	Located immediately adjacent to eastern boundary of the Onshore Study Area
Potential developments within the ScotWind N1 DPO site	Undetermined	12 km	Unknown	Unknown	Potential cumulative impacts with DPO N1 will only be assessed where a Scoping Opinion has been submitted for a development.
Sutherland SpaceHub	Consented	45 km	2021	Unknown	Potential cumulative impacts with DPO N1 will only be assessed where a Scoping Opinion has been submitted for a development.
MeyGen Tidal Energy Project	Operational	38 km	2018	2043	Sutherland SpaceHub is aiming to achieve the first launch of satellites from Sutherland in the early 2020s. Over time, the number of launches is expected to grow to a maximum of 12 a year.

6.4 Transboundary Impacts

Transboundary effects arise when impacts from the Proposed Development within one European Economic Area (EEA) state affects the environment of another EEA state(s). The need to consider such transboundary effects has been embodied by the United Nations Economic Commission for Europe Convention on EIA in a Transboundary Context (commonly referred to as the 'Espoo Convention'). The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts. Due to the location of the Project there are no transboundary impacts foreseen and this is scoped out of the assessment.

6.5 Monitoring

The EIA Report will include recommendations for monitoring certain impacts attributed to the Project. Monitoring proposals will be linked to clearly defined criteria. Monitoring is liable to occur where there is either uncertainty in the original impact assessment or where an impact is deemed to be significant.

6.6 Structure of Assessments

In the subsequent technical scoping chapters, for both the onshore and offshore environment, the following structure has been adopted, where applicable:

- Introduction;
- Legislation; Policy and Guidance;
- Available Information;
- Study Area;
- Studies and Surveys Carried Out to Date;
- Description of the Current Environment;
- Overview of Potential Impacts;
- Cumulative Impacts;
- Assessment Methodology; and
- Conclusions and Next Steps.

7 OFFSHORE PHYSICAL ENVIRONMENT

7.1 Introduction

This Section describes the key sensitivities and potential changes to the marine physical environment arising from the offshore aspects of the Project from construction, operations and maintenance and decommissioning project activities. The marine physical environment receptors within this chapter are categorised in the following sections:

- Marine Physical Processes (including hydrodynamic, sediment, geology, bathymetry and geomorphology); and
- Water and Sediment Quality.

The Offshore Study Area is inclusive of both the WTG Site delineated in Figure 3-1 (marked in green) and referred to as the 'WTG Site' and the export cable corridor area (marked in blue) which is referred to as the 'Export Cable Corridor'.

Onshore water bodies are not considered in this section, instead these are addressed in Section 10.2: Geology, Physical Processes and Land Use.

7.2 Marine Physical Processes

7.2.1 Introduction

This section will provide an overview of the hydrodynamic, sediment, geological and coastal environment associated with the Offshore Study Area and how these fits within the regional physical processes within the Pentland Firth. Aspects relating to the water and sediment quality are addressed in Section 7.3.

An overview of the potential impacts on the marine physical environment as a result of the project activities during construction, operation and decommissioning phases are also discussed.

7.2.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on Marine Physical Processes:

Legislation

There is limited specific international, national or regional legislation or policy context with regard to marine physical processes.

Guidance

The following provide information on the best practice in considering marine physical processes for environmental impact assessment:

- OSPAR Assessment of the Environmental Impacts of Cables (OSPAR, 2009);
- Department of Business Enterprise and Regulatory Reform (BERR) - Review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Farm Industry (BERR, 2008);
- CIRCA C584 Coastal and marine environmental site guide (CIRCA, 2003);
- COWRIE Coastal Process Modelling for Offshore Wind Farm Environmental Impact Assessment: Best Practice Guidance (COWRIE, 2009);

- Land Use Planning System SEPA Guidance Note 17: Marine development and marine aquaculture planning guidance, Version 6 (SEPA, 2014);
- Pentland Firth and Orkney Waters Marine Spatial Plan (MSP) (Scottish Government, 2016);
- Cefas Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of Food and Environmental Protection Act (FEPA) and Coast Protection Act (CPA) Requirements: Version 2 (Cefas, 2004);
- Dynamics of scour pits and scour protection - Synthesis report and recommendations. (Sed02)' (HR Wallingford et al., 2007);
- Potential effects of offshore wind developments on coastal processes. (ABPmer and METOC, 2002); and
- Review of environmental data associated with post-consent monitoring of licence conditions of offshore wind farms. MMO Project No: 1031. (Fugro-Emu, 2014).

7.2.3 Available Information

Publicly available, regional and local information sources including scientific papers have been used to inform this section. The key information sources are listed below:

- Sediments, Geology and Geomorphology:
    - British Geological Survey Offshore GeoIndex Map (BGS, 2020a). Available at: http://mapapps2.bgs.ac.uk/geoindex_offshore/home.html
    - British Geological Survey. Geology of Britain viewer (BGS, 2015b). Available at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html?
    - British Geological Survey. Free downloads - Browsing (BGS, 2020c);
    - British Geological Survey. Nirex Geological Archive (BGS, 2002). Available at: http://www.bgs.ac.uk/downloads/browse.cfm?sec=1&cat=5.
    - Cefas Suspended Sediment Climatologies around the UK (Cefas, 2016). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584621/CEFAS_2016_Suspended_Sediment_Climatologies_around_the_UK.pdf
    - Department of Trade and Industry (DTI) Strategic Environmental Assessment Area 4 (SEA4): Continental shelf seabed geology and processes (Holmes, R; Cooper, R; & Jones S, 2003).
    - Scottish Government Dynamic Coast: Scotland's National Coastal Change Assessment Map (NatureScot, 2020). Available at: https://snh.maps.arcgis.com/apps/webappviewer/index.html
    - DTI Technical Report: Sandbanks, sand transport and offshore wind farms (Kenyon, H; Cooper, B, 2005)
- Bathymetry, Water Levels and Currents:
    - United Kingdom Hydrographic Office (UKHO) Admiralty Chart data & UKHO INSPIRE bathymetric data. Available at: https://datahub.admiralty.co.uk/portal/apps/webappviewer/index.html
    - National Tidal and Sea Level Facility- Observational Water Level Records (NTSLF, 2020). Available at: https://www.ntslf.org/

- Marine Scotland Science. Farr Point Bathymetry Survey (MSS, 2014). Available at: http://marine.gov.scot/information/farr-point-bathymetry-2014

> Hydrodynamics: Wind, Waves and Tides:

- Atlas of UK Marine Renewable Energy. Interactive Map (ABPmer, 2020a). Available at: https://www.renewables-atlas.info/explore-the-atlas/
- SEASTATES Metocean Data and Statistics Interactive Map (ABPmer, 2020b). Available at: https://www.seastates.net/explore-data/
- United Kingdom Hydrographic Office (UKHO) Admiralty Tide Tables (UKHO, 2017)

> Stratification and Frontal Systems:

- British Oceanographic Data Centre Observational Conductivity Temperature Depth (CTD) Records (BODC, 2019). Available at: https://www.bodc.ac.uk/data/bodc_database/ctd/search/
- UK Offshore Energy Strategic Environmental Assessment 3 (OESEA3). Appendix 1D - Water Environment (Regional Sea 8) (DECC, 2016). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/504541/OESEA3_A1d_Water_environment.pdf
- Climatology of Surface and Near-bed Temperature and Salinity on the North-West European Continental Shelf for 1971–2000 (Berx, B, Hughes, S, 2009). Available at: https://marinescotland.atkinsgeospatial.com/nmpi/

7.2.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore physical environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to marine physical processes have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

7.2.5 Offshore Study Area

The Offshore Study Area is shown in Figure 3-1. For the purpose of baseline data collection, the focus on Marine Physical Processes is located in the immediate vicinity of the Offshore Study Area at the Dounreay coast. However, where appropriate the wider Pentland Firth area has been evaluated to provide regional context.

7.2.6 Surveys and Studies Carried Out to Date

In 2016, Horizon Geosciences conducted a geophysical survey at the site from 1st – 17th October (Horizon Geosciences, 2016). Additionally, a multibeam survey of the north coast of Scotland between the Kyle of Tongue and 13 km west of Thurso was surveyed by the Marine Scotland Science vessel, the MRV Scotia in 2014:

- MSS (2014). Marine Scotland Science Farr Point Bathymetry Survey http://www.gov.scot/Topics/marine/science/MSInteractive/datatype/Bathymetry/data/farr-point;

Additionally, video-based monitoring of the benthic environment located in the same area was also conducted in 2014:

- Moore, C.G. 2015. Biological analyses of underwater video from research cruises in marine protected areas and renewable energy locations around Scotland in 2014. Scottish Natural Heritage Commissioned Report No. 819.

These data sources have been used to inform the scoping assessment.

7.2.7 Description of the Current Environment

The marine physical process characteristics that are relevant to understanding the Project's potential offshore environmental impacts during construction, operation and decommissioning are the following:

- Hydrodynamics (including waves, currents, water levels, tidal flows, fronts and stratification);
- Surface sediment, geology, bathymetry, geomorphology and sediment transport;
- Coastal characteristics; and
- Wind characteristics.

7.2.7.1 Geology

The Offshore Study Area is typically made up of Pre-Quaternary bedrock covered by varying depths of glacier-derived material deposited during the Pleistocene epoch and sediments laid down during sea transgression during the early Holocene. Specifically, the geological succession of the near shore and coastal areas in the vicinity of the Project comprises Devensian glacial deposits, overlying Middle Devonian lacustrine sediments (known as the Caithness Flagstone groups), which themselves lie unconformably on the older metamorphic and igneous basement rock. These Middle Devonian lacustrine sediments extend approximately 4 km off the Dounreay Coast and are present in a cyclic alternation of indurated siltstones and sandstones, with mudstones and limestones. The sequence dips to the NW at around 10° and is cut by a number of northerly trending faults usually downthrown to the SE. Extending beyond 4km offshore the bedrock in the vicinity of the proposed WTG Site is undifferentiated conglomerates, sandstone, siltstone, mudstone and areas of evaporites which are of Permian – Triassic age.

7.2.7.2 Bathymetry and Morphology

Bathymetry was assessed from regional nautical charts and multibeam echo sounder data collected in the area (MSS, 2014). Additionally, multibeam bathymetry, side scan sonar, magnetometer and multi-channel UHR seismic surveys were undertaken by Horizon Geosciences in 2016 (Horizon Geosciences, 2016). These surveys, together with the multibeam data (MSS, 2014) provided higher resolution bathymetric information and it has been possible to interpret this data for the purpose of the scoping baseline.

Regional nautical charts show water depths in the Offshore Study Area are in the range 60 m - 102 m. Water depth is greatest in the north-west corner of the Offshore Study Area and decreases gradually towards the south-east corner. Going south along the Export Cable Corridor the seabed shelves gently to the north-west at about 0.5°.

Although not clear on the charts at this location (unlike that observed around Orkney and the north-east coast of Caithness) submarine cliffs have been observed at about water depths of approximately 10 m and 45 m related to stillstands in sea-level rise at around 7,000 – 9,500 years before present (BP), respectively. The high resolution profile on the potential cable route shows that the ± 45 m cliff/steep slope does exist but probably requires much more analysis to verify whether or not this will be a significant risk to subsea cable placement.

7.2.7.3 Sediment Regime

Mapped national marine landscape types present within the Offshore Study Area are ‘shelf sand plain’ in the northern offshore section of the WTG site and ‘shallow sand plain’ in the south. ‘Shallow sand plain’ extends inshore to the coast along the potential cable route (Connor, D.W *et al*, 2006). Geological surveys of the area (BGS, 1987) indicate that the surface sediments are mainly composed of sand and slightly gravelly sand. Three main types of sediment classification were observed during the Horizon (2016) survey for the WTG site including, slightly gravelly fine sand, gravelly sand with occasional boulders, and coarse sand and gravel with numerous boulders (Horizon Geosciences, 2016). Seabed video survey collected in the vicinity of the offshore area (Moore, C.G. 2015) indicated the presence of a predominantly sandy seabed with areas of slightly gravelly sand. Similar sediments were recorded along the Export Cable Corridor however in shallow water areas (<40 m depth) areas of mixed coarser sediment types and rocky outcrops were also recorded. The coarse sediment is replaced by muddy sand with decreasing distance to the coastline, as indicated by the Marine Scotland sea bottom video. Four main types of sediment classification were observed during the Horizon (2016) survey for the Export Cable Corridor, including muddy very fine sand, gravelly fins sand/ muddy fine sand, coarse sand and gravel with numerous boulders and rugged, high relief seafloor dominated by outcrops with pinnacles (Horizon Geosciences, 2016).

The sediment grain size for the surface sediments within the Offshore Study Area ranges from 0.0625 mm (very fine sand) to 2 mm (very coarse sand), with a single core sample located 6 km off the Dounreay Coast recording surface sediments as “*SHELL-SAND, Fine-grained, well sorted and clean. Quartz grains, mainly subangular comprise 60% and 38% shell fragments and forarms with 2% mica also present*” (BGS, 2020a).

The thickness of sediment across the majority of the Offshore Study Area is greater than 2m (BGS, 1987). Sediment thickness decreases to approximately 1 m in the southernmost part of the Offshore Study Area, at its shallowest reaches approximately 0.1 m. Sediment thickness decreases to 0 m towards the coast. Expert interpretation of ripple marks and dunes apparent on the survey data (MSS, 2014) indicate that locally considerable variation in the sediment thickness exists.

Further review of data covering the project area demonstrates that the sediments below wave base are current rippled sands and silts which have been derived from dynamic weathering of the Boulder clay and in particular the shelly till member. A glacial moraine seabed feature runs diagonally across the Offshore Study Area from northwest to southeast (BGS,1987).

Existing regional-scale mapping suggests that bedload sediment transport within the Pentland Firth flows broadly from East to West (Kenyon and Cooper, 2005; Holmes, R., Cooper, R. & Jones S, 2003), in connection with general tidal flows. Whilst broad regional scale net transport patterns have been inferred by previous studies e.g. Strategic Environmental Assessment Area 4 (SEA4), local sediment transport pathways may be more variable in rate and direction.

The average non-algal Suspender Particle Matter (SPM) was recorded for the Scottish Continental Shelf region (Cefas, 2016). This region overlaps the Offshore Study Area and showed an average of 0 mg/l of SPM between the period 1998 – 2015. However, significant increasing trends for SPM were recorded during the months of October -December, potentially as a result of early winter storm surges in the area.

7.2.7.4 Coastal Characteristics

The offshore cable landing search area extends from the western edge of the Dounreay Nuclear Power Plant site to the eastern side of Sandside Bay. The coastal type is characterised as hard and mixed substrate (NatureScot, 2020). The height of the clifftop at Dounreay on the eastern boundary of the potential cable landing area in the vicinity of Dounreay Burn is approximately 6 m. The cliff height gradually increases to around 9 m at White Geos at the eastern entrance to the Bay then reducing to around 4 m in the sand dunes at the outfall of the Burn of Isauld at the western extent of the cable route.

Sandside Bay is located immediately to the west of the potential cable landing location. The bay is a north-facing pocket beach composed of sandy sediments originating from ancient glacial deposits. The sheltered nature of the beach limits sediment transport within the bay although there is some disturbance during storm events and some wind driven movement of sediments that have led to the formation the extensive dune systems present behind the beach. Additionally, deposits of fluvial material occur from the Sandside Burn, Reay Burn and Burn of Isauld which flow through the Bay (Ramsay and Brampton, 2000).

7.2.7.5 Wind Climate

Summary statistics describing the meteorological characteristics for the Offshore Study Area were obtained from the Atlas of UK Marine Renewable Energy (ABPmer, 2020a). Average annual wind speeds at both 80 m and 100 m elevation are greatest at distances furthest offshore and are highest in the western half of the WTG Site (7 m/s - 10 m/s and 8 m/s - 10 m/s at 80 m and 100 m respectively). Lowest wind speeds for both elevations are present in the south east sector of the Offshore Study Area (7 m/s -8 m/s). Similar wind speeds are present in the south west sector of the Offshore Study Area at 80 m but are greater at 100 m elevation (to 8 m/s - 9 m/s). Wind speeds show seasonal trends with highest speeds recorded in the winter months recording up to 11 m/s winds in the western portion of the Offshore Study Area and the lowest in summer recording <7 m/s. Additionally, Southwest – West was the most prevailing wind direction in the region of the Offshore Study Area (ABPmer, 2020b).

7.2.7.6 Hydrodynamic Regime

The Pentland Firth channel separates the Orkney Islands from the Scottish mainland. This channel connects the Atlantic Ocean with the North Sea. The Pentland Firth is characterised by strong tidal currents with widespread and highly energetic tidal races, eddies, overfalls and areas of general turbulence. Peak spring tidal currents in the Outer Sound between Swona and the Island of Stroma are about 4.5m/s on both the flood and ebb tides. These flows cause an almost continuous tidal race north of the Island of Stroma, referred to as The Swilkie (Scottish Government, 2016).

Summary statistics describing the hydrodynamic regime for the wider Pentland Firth region and the Offshore Study Area were obtained from the Atlas of UK Marine Renewable Energy (APBmer 2020a).

The mean maximum height of the tide above chart datum (ACD) for the Outer Sound of the Pentland Firth is 4.2 m ACD with the mean lowest at 1m above chart datum. The maximum range here, which occurs during the equinox, is 7.2 m.

The annual mean spring tidal range across the Offshore Study Area ranges between 3.01 m – 4 m, with a corresponding neap range of 1.01 m – 2 m. Tidal velocities for the Offshore Study Area are modest in comparison to the Outer Sound and range from approximately 0.1 – 0.5 m/s during spring tides and 0.1 – 0.25 m/s for neap tides.

7.2.7.7 Wave Regime

The wave climate in the area is dominated by the passage of low-pressure systems from west to east across the North Atlantic. In general terms the highest waves approach the area from westerly directions. Wave periods of 4 seconds are typical of the Pentland Firth. On the northern coast of Scotland, significant wave heights throughout the year are typically within the range of 1.75 - 2m and 1.25 - 1.5m within the Pentland Firth (Scottish Government, 2009).

Summary statistics describing the hydrodynamic regime for the Offshore Study Area were obtained from the Atlas of UK Marine Renewable Energy (APBmer 2020a). Annual mean significant wave height across the majority of the WTG Site ranges between 1.5 - 2.0 m. To the south of the WTG Site annual mean significant wave height values are in the range of 1.5 – 1.75 m decreasing further closer to shore. Additionally, winter wave height has recorded waves up to 2.5 m in the WTG Site area, whereas summer lows of 1.0 m have also been recorded. The dominant wave direction for the Offshore Study Area is from the North and Northwest (APB, 2020b).

7.2.7.8 Frontal Systems and Stratification

Fronts or frontal zones mark boundaries between water masses, including tidally mixed and stratified areas, and are numerous on the European continental shelf. Tidal mixing fronts normally form in summer months around the UK, when stratification occurs away from the coast due to more settled weather. Salinity fronts are observed all year round and occur where freshwater runoff occurs (e.g. mouths of estuaries and sea lochs), or where there is greater influence of saline ocean waters.

Within the north coast of Scotland seasonal water mass and water column structure are characterised as well mixed shelf waters through all seasons except summer, where weakly stratified shelf waters are recorded, with the dominant stratification category defined as intermittently stratified (DECC, 2016).

Only six burns enter the sea within the landward side of the Export Cable Corridor from west to east they are:

> Allt Achadh na Gaodha;
> Lady's Well Burn;
> Sandside Burn;
> Reay Burn;
> Burn of Isauld; and
> Dounreay Burn.

The volume of water coming down each of these watercourses is relatively small and has watersheds draining poor agricultural land, peat and bogs. Due to the low volume of water, the fluvial runoff is not expected to majorly contribute to mixing of the any stratified waters in the coastal reaches of the Offshore Study Area, instead mixing is more likely to be due to the dynamic wave and tidal characteristics of the Pentland Firth described above.

Annual mean near-bed temperature for the waters of the Offshore Study Area are recorded as 9.4°C. The lowest near-bed temperatures are recorded in April where temperatures drop to 7°C and are warmest in October at 12°C. Furthermore, annual mean surface temperature are similar with an annual average of 9.8°C, and seasonal highs of 12.4°C in September and October, and lows of 7°C in April Annual mean near-bed and near - surface salinity for the waters in the Offshore Study Area are recorded at approximately 35 ppt (parts per thousand) (Berx, B, Hughes, S, 2009). The similarity in the near – bed and near- surface temperatures and salinity data further demonstrate the well mixed characteristics of the marine environment within the Offshore Study Area.

The Offshore Study Area is therefore considered to be a well-mixed environment, with little potential for the occurrence of marine frontal system.

7.2.7.9 Designated Sites

Environmental designated sites in the vicinity of the Offshore Study Area which are designated for the protection and conservation of physical marine characteristics (e.g. geology, geomorphology, dunes etc.). include:

> Red Point Coast Special Site of Scientific Interest (SSSI) located to the west of Sandside Bay is immediately adjacent to the Export Cable Corridor. This site is listed for (among others) geological interests including Quaternary geology and geomorphology and non-marine Devonian stratigraphy (NatureScot, 2009); and

> Sandside Bay Site of Special Scientific Interest (SSSI) is located immediately adjacent to the western boundary of the Export Cable Corridor and covers the entire area of Sandside Bay. The site is designated for sand dunes (NatureScot, 2008).

7.2.8 Identification of Potential Impacts

In most cases, marine physical processes are not in themselves receptors but are instead pathways with the potential to indirectly impact other environmental receptors. This is the approach applied in this Scoping Assessment, where an assessment of the marine physical process factors are not on the basis of the significance of an effect. Instead, it is the information on the potential changes to the marine physical process factors and their associated pathways which will be used to inform other environmental, biological and human environment receptor topic assessments, including:

> Water and Sediment Quality (Section 7.3);

> Benthic Ecology (Section 8.2);

> Fish and Shellfish Ecology (Section 8.3);

> Marine Mammals and other Megafauna (Section 8.4);

> Ornithology (Section 8.5);

> Commercial Fisheries (Section 9.2); and

> Archaeology and Cultural Heritage (Section 9.6).

Despite the potential for marine physical processes to predominantly be considered as pathways, the identified sensitive marine physical process receptors which are applicable to the Offshore Study Area include:

> Seabed and morphology located within the designated SSSIs; and

> The coast.

Potential impact pathways are scoped in due to the potential for onward impacts to other receptor topics.

Due to the intervening distance between the Offshore Study Area and the two SSSI sites to the west of the Project, no impacts on these designated sites geological and coastal features are anticipated to occur throughout the construction, maintenance, operation or decommissioning of the Project.

Bedrock seafloor solid geology and bathymetry will not be impacted in the long-term by this development. However, local impacts relating to the wind turbine anchoring methods, moorings and cable installation with possible armouring for the offtake power cable during construction need to be assessed. All temporary and permanent changes in seabed characteristics, ranging from minor physical disturbances to the smothering of the existing seabed with deep deposits of gravel and/or rock, will be restricted to the immediate vicinity of the deployed infrastructure.

Changes to local sediment transportation processes and seabed features within the operation and maintenance phases due to altered hydrodynamics related to interactions between mooring cables, anchors and cables with action of water currents and waves may occur. Any effects are likely to be limited to localised areas of scouring and accretion (within a few metres) around seabed anchors, mooring lines and export cable protection from either physical abrasion or due to increased water turbulence. Furthermore, sediment changes related to open cut trenching and cable armouring may lead to sediment disturbance and water clouding. Sensitive location across medium sandy bottom could mitigate this since the sands over much of the eastern side of the Export Cable Corridor appear to be of sufficient size to settle rapidly after disturbance.

Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase. Following removal of structures opportunities for seabed recovery in the former location of seabed infrastructure may arise. If the export cable is left in situ any potential impacts will be reduced further.

Table 7-1 provides a summary of all potential impacts on marine physical processes from the Project during construction, operation, maintenance and decommissioning phases.

7.2.9 Cumulative Impacts

There is potential for cumulative impacts on the marine physical environment to arise from the development of projects in the nearby area including:

> The SHE-T Orkney - Caithness Interconnector Project (consented);

> Potential OWF Developments in the ScotWind N1 DPO; and

> Pentland Floating Offshore Wind Demonstrator (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on the physical environment have the potential to arise from cable installation activities in these areas.

Additionally, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on the physical environment if export cables cross the Project Offshore Study Area. Cumulative impacts arising from Project and NI DPO developments will only be assessed further if the N1 development is at the scoping stage whilst the Project EIA is underway.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the array. Ultimately the array will have the same number of turbines so there are no cumulative impacts predicted to physical processes as a result of operation of the Demonstrator and array. Because the Demonstrator will be subject to a separate installation campaign and will have a separate export cable to the Project, there is the potential for cumulative impacts on physical processes, however these are assessed to be minor.

Table 7-1 summarises all potential impacts including potential cumulative impacts.

Table 7-1 Potential impacts on geology, bathymetry and physical conditions during construction, operations and maintenance and decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Impact on geology	No impacts on geology are anticipated due to the use of floating wind structures, anchoring options will not penetrate into offshore seabed geology.	Scoped out
Impacts on SSSIs features	The construction activities within the Offshore Study Area do not overlap protected geological or coastal morphology features within the Red Point Coast or Sandside Bay SSSI. Therefore, loss, alteration or disturbance to these features due to construction activities are not anticipated.	Scoped out
Loss/ alteration of physical seabed characteristics (bathymetry and sediment type)	Localised alteration of the physical characteristics of the seabed and potential seabed scour due to installation of infrastructure (cables, moorings, anchors) and associated changes to localised currents.	Scoped in to inform the potential impacts to receptor topics including Water and Sediment Quality (7.3); Benthic Ecology (8.2); Fish and Shellfish Ecology (8.3); Marine Mammals and other

Impact	High Level Impact Summary and Justification	Scoped In/Out
		Megafauna (8.4); Ornithology (8.5); Commercial Fisheries (9.2); and Archaeology and Cultural Heritage (9.6).
Increase in suspended sediments	Sediment changes related to the turbine foundation mooring, open cut trenching and cable installation may include potential sediment disturbance and an increase in suspended sediments with pathways for impacts on other environmental, biological and human environment receptors.	Scoped in to inform the potential impacts to receptor topics including Water and Sediment Quality (7.3); Benthic Ecology (8.2); Fish and Shellfish Ecology (8.3); Marine Mammals and other Megafauna (8.4); Ornithology (8.5); Commercial Fisheries (9.2); and Archaeology and Cultural Heritage (9.6).
Change to coastal landfall morphology	Cable installation in coastal environments, may disrupt the coastal morphology to varying degrees depending on the method applied.	Scoped in
Potential Impacts During Operations and Maintenance		
Changes to tidal regime	Changes to currents due to placement of block anchors are not considered to be significant due to the small number, size of anchors, the water depth and wider tidal flows along the north coast of Scotland.	Scoped in to inform the potential impacts to receptor topics including Water and Sediment Quality (7.3); Benthic Ecology (7.2); Fish and Shellfish Ecology (8.3); Marine Mammals and other Megafauna (8.4); Ornithology (8.5); Commercial Fisheries (9.2); and Archaeology and Cultural Heritage (9.6).
Changes to wave regime	The floating base structure for the Project offshore wind farm may impact wave pattern and affect the local wave base near shore, with a net effect over time on the sediment transport regime. This impact is however, considered to be limited due to the relatively small size of the floating platforms, the distance to shore and water depths within the Offshore Study Area.	
Impacts on local sediment transport regime and seabed features	Changes to local sediment transport and seabed features due to altered hydrodynamics related to interactions between mooring cables, anchors and cables with the action of water currents and waves.	
Removal or creation of seabed features such as sand waves	Seabed sedimentary features disturbed during operations may move or be destroyed as sedimentary system reaches new equilibrium.	
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase. Following removal of structures opportunities for seabed recovery in the former location of seabed infrastructure may arise. If the export cable is left in situ any potential impacts will be reduced further		As construction

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Cumulative Impacts		
Cumulative impacts have the potential to arise from the proposed Pentland Floating Offshore Wind Demonstrator, SHE-T Orkney – Caithness interconnector project and any potential developments within the ScotWind N1 DPO site (if at scoping stage during the Project EIA), as these are at closest proximity to the Project and may potentially lead to cumulative impacts on the physical marine environment in the area due to cable installation activities crossing the Offshore Study Area footprint.		Scoped in

7.2.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 7-2. These methods will be used alongside input from the relevant guidance as identified in Section 7.2.2.

Table 7-2 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Loss/ alteration of physical seabed characteristics (bathymetry and sediment type)	Benthic and geophysical surveys undertaken in 2021.	The principal method to be employed will be careful examination of the findings of the project specific benthic and pre-construction geophysical surveys which will be conducted to inform the EIA. These surveys include, but are not limited to, geophysical, multibeam echosounder, grab sampling of seabed sediments, video and/or photography. This will provide site specific information on the seabed characteristics. The findings of the study will be used alongside a desk-based study utilising BGS mapping, borehole logs and regional reports and other relevant data.
Increase in suspended sediments	Benthic and geophysical surveys undertaken in 2021.	The principal method to be employed will be careful examination of the findings of the project specific benthic and pre-construction geophysical surveys which will be conducted to inform the EIA. These surveys include, but are not limited to, geophysical, multibeam echosounder, grab sampling of seabed sediments, video and/or photography. This will provide site specific information on seabed sediment characteristics. The findings of the study will be used alongside a desk-based study utilising BGS mapping, borehole logs and regional reports and other relevant data.
Change to coastal landfall morphology	Walkover surveys to be conducted in 2021.	The principal method to be employed will be careful examination of the findings of the project walkover studies. This will provide site specific information on coastal morphology. The findings of the study will be used alongside a desk-based study utilising BGS mapping, borehole logs and regional reports and other relevant data.
Changes to tidal regime	No surveys identified.	Desk based study utilising publicly available information on the tidal regime in the Pentland Firth

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
		(e.g. the Pilot Pentland Firth & Orkney Waters Marine Spatial Plan, 2016), and additional sources as listed in section 7.2.3.
Changes to wave regime	No surveys identified.	Desk based study utilising publicly available information on the wave regime in the Pentland Firth (e.g. the Pilot Pentland Firth & Orkney Waters Marine Spatial Plan, 2016), and additional sources as listed in section 7.2.3.
Impacts on local sediment transport regime and seabed features	Benthic and geophysical surveys undertaken in 2021.	The principal method to be employed will be careful examination of the findings of the project specific benthic and pre-construction geophysical surveys which will be conducted to inform the EIA. These surveys include, but are not limited to, geophysical, multibeam echosounder, grab sampling of seabed sediments, video and/or photography. This will provide site specific information on seabed sediment features which may be impacted by transport regimes. The findings of the study will be used alongside a desk-based study utilising BGS mapping, borehole logs and regional reports and other relevant data.
Cumulative impacts	No surveys identified.	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to understand timelines and potential cumulative impacts.

7.2.11 Conclusions and Next Steps

The 2016 Horizon Geosciences geophysical survey report findings will be used to inform the Project specific geophysical and benthic surveys to be undertaken in 2021. An all-inclusive assessment of potential project impacts and potential cumulative impacts will then be completed within the EIA Report

In conclusion, potential changes to the wave, tidal and sediment transport regime and localised seabed scour are scoped in and will be taken forward to the assessment phase due to the pathways to other receptors. In addition, the potential for changes to the landfall morphology and cumulative issues are also scoped in for assessment. Impacts on geology and designated sites are scoped out and will not be taken forward to the EIA.

7.3 Water and Sediment Quality

7.3.1 Introduction

This section provides a high-level description of the water and sediment quality within the Offshore Study Area. Due to the proximity of the Dounreay Nuclear Power station, the historic radioactive contamination along the Caithness coast is also considered. The topic section highlights the key sensitivities and potential impacts that may arise from the Project. It also presents a summary of the relevant UK guidance and details of the methodology which will be applied to the EIA.

The Offshore Study Area is delineated in Figure 3-1 and includes the WTG Site and Export Cable Corridor.

7.3.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on water and sediment quality:

EU Directives

- EU Water Framework Directive 2000/60/EC (2000)
- EU Marine Strategy Framework Directive (MSFD) (2008/56/EC) (2008)
- EU Bathing Waters Directive (2006/7/EC);
- EU Shellfish Waters Directive (2006/113/EC);

Legislation

- Water Environment and Water Services (Scotland) Act 2003;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended);
- The Pollution Prevention and Control (Scotland) Regulations 2012;
- Environmental Authorisations (Scotland) Regulations 2018;
- The Bathing Waters (Scotland) Regulations 2008;
- The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013;
- Food and Environment Protection Act 1985;

Policy

- Highland-wide Local Development Plan (2012) Planning Policies (Policy 63: Water Environment);

Guidance

- SEPAs Guidance for Pollution Prevention (GPPs);
- Supporting Guidance (WAT-SG-53) Environmental Quality Standards and Standards for Discharges to Surface Waters (SEPA, 2020);
- Pentland Firth and Orkney Waters Marine Spatial Plan (MSP) (Scottish Government, 2016);
- Land Use Planning System SEPA Guidance Note 17: Marine development and marine aquaculture planning guidance, Version 6 (SEPA, 2014);
- CIRCA C584 Coastal and marine environmental site guide (CIRCA, 2003);
- Cefas Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of Food and Environmental Protection Act (FEPA) and Coast Protection Act (CPA) Requirements: Version 2 (Cefas, 2004); and
- COWRIE Coastal Process Modelling for Offshore Wind Farm Environmental Impact Assessment: Best Practice Guidance (COWRIE, 2009).

7.3.3 Available Information

The following key sources of information shall be used for the assessment:

- Clean Seas Environmental Monitoring Programme (CSEMP). Available at: https://www.bodc.ac.uk/projects/data_management/uk/merman/assessments_and_data_access/csemp/ [Accessed 02/10/2020]
- Water Framework Directive (WFD) River Basin Management Plan (RBMP) Waterbody status. Available at https://www.sepa.org.uk/data-visualisation/water-environment-hub/ [Accessed 02/10/2020];
- Bathing water profiles from Environment Scotland. Available at: https://www.environment.gov.scot/data/data-analysis/bathing-waters/ [Accessed 02/10/2020];
- Shellfish Biotoxin Risk Water Profiles from Environment Scotland. Available at: https://www.environment.gov.scot/data/data-analysis/biotoxin-risk-management/ [Accessed 02/10/2020].

Additional resources:

- OSPAR Intermediate Assessment 2017 – Contaminant assessments (OSPAR, 2017). Available at: https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/contaminants/ [Accessed 02/10/2020];
- Scotland's water environment 2019: A summary and progress report (SEPA, 2019). Available at: https://www.sepa.org.uk/media/490771/191219_scotlands-water-environment-final.pdf [Accessed 02/10/2020]; and
- Regional Assessment of Hazardous Substances in Coastal and Offshore Marine Environments: 1999-2009 (Marine Scotland, 2014). Available at: https://www2.gov.scot/Resource/Doc/295194/0104805.pdf [Accessed 02/10/2020].

Information regarding the potential historic contamination is obtained from the following:

- Particles Retrieval Advisory Group (Dounreay) PRAG-D reports and Dounreay Particle Finds Datasheets. Available at: https://www.gov.uk/government/publications/radioactive-particles-in-the-environment-around-dounreay [Accessed 02/10/2020]; and
- Radioactivity in Food and the Environment (RIFE) 2018 Report (Environment Agency *et al,* 2019). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/843281/Radioactivity_in_food_and_the_environment_2018_RIFE_24.pdf [Accessed 02/10/2020].

7.3.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore physical environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to water and sediment quality receptors have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

7.3.5 Study Area

The Offshore Study Area is shown in Figure 3-1. For the purpose of baseline data collection, the focus on Water and Sediment Quality is located in the immediate vicinity of the Offshore Study Area at the Dounreay coast. However, where appropriate the wider Pentland Firth area has been evaluated to provide regional context.

7.3.6 Surveys and Studies Carried Out to Date

Horizon Geosciences conducted geophysical surveys which covered the footprint of the site from 1st – 17th October 2016 (Horizon Geosciences, 2016).

No project specific benthic survey was undertaken during the previous Dounreay Trì EIA. However, consenting conditions for the Dounreay Trì Project included the requirement for the development to "*complete a full sea floor coverage swath-bathymetry survey that meets the requirements of the International Hydrographic Organisation (IHO) Order 1a standard"* prior to commencement of the project works (Marine Scotland, 2017).

DSRL undertake frequent particle monitoring of the beaches around the Dounreay coast, particle finds are published on the Dounreay website.

Additionally, designated waters are monitored annually by SEPA and Marine Scotland, and this information will be used to inform the impact assessment process.

7.3.7 Description of the Current Environment

7.3.7.1 Water Quality

The chemical composition of the water present in the Project area would be expected to be similar to that recorded for typical unpolluted coastal/offshore Atlantic waters.

SEPA is responsible for producing and implementing RBMPs under the Water Environment and Water Services (Scotland) Act, 2003. River basins comprise all surface waters (including transitional (estuaries) and coastal waters) extending to three nautical miles seaward from the Scottish territorial baseline. Any proposed development within these waters must have regard to the requirements of the Water Framework Directive to ensure that all surface water bodies achieve 'Good Ecological Status (GES)' and that there is no deterioration in status.

Five classifications of water quality status are defined: High (near natural), Good, Moderate, Poor and Bad; and each classification is accorded a degree of confidence (high, medium or low) in the overall quality assessment.

Water quality for the Offshore Study Area baseline has been determined through evaluation of designated waters under SEPA's RBMP including designated waterbodies, designated bathing waters and designated shellfish waters as detailed in the following paragraphs.

Designated Waterbodies

The Offshore Study Area is located within the Strathy Point to Dunnet Head RBMP area. Strathy Point to Dunnet Head is a coastal water body (ID: 200224), in the Scotland river basin district. It is 275.1km^2 in area. In 2014 SEPA analysis identified no significant pressures on this water body and classified it as having an overall status of Good with High confidence. Specifically, Water Quality status is classified as Good, whereas Physical Condition and Freedom from Invasive Species are both classified as Excellent. Projected conditions for this water body are anticipated to retain their current status within the years 2021 and 2027.

Designated Bathing Waters

There are no designated bathing waters which intersect with the Offshore Study Area or the proposed cable landfall. The closest designated bathing waters are at Dunnet Bay and Thurso, which are about

15 km– 25 km east of Offshore Study Area. Both sites have consistently passed the mandatory standards set out in the EC Bathing Water Directive and as of 2019 are currently classified as Good (Thurso), and Excellent (Dunnet Bay). Due to the intervening distance between the Offshore Study Area and these designated bathing waters, it is unlikely that any localised impacts on water quality from the Project activities, would negatively impact upon the water quality of these designated bathing waters.

Designated Shellfish Waters

There are no designated shellfish waters which intersect with the Offshore Study Area. The nearest shellfish water is the Kyle of Tongue which is harvested for the Pacific oysters and is approximately 40 km west along the coast from the landfall area.

The statuses of fish and shellfisheries of commercial importance are discussed in Section 9.2: Commercial Fisheries.

7.3.7.2 Sediment Quality

With the exception the presence of historic radioactive seabed particles described below, there are no other known sediment quality issues associated with the Offshore Study Area.

The Marine Scotland 2019 assessment of Clean Seas Environmental Monitoring Programme (CSEMP) data describes the status and trends of contaminant concentrations in biota and sediment at monitoring stations around the UK between 2013 - 2018. There are no fixed CSEMP sites or strata recording sediment contaminants for the North Scotland Coast region.

The closest monitoring stations to the Offshore Study Area which provide robust sediment quality datasets are the North Minch Station (located approximately 110km west) and the Outer Moray Firth Station (located approximately 75km east). These sites are situated too far from the Offshore Study Area to supplement any assumptions related to sediment quality in the area.

In the absence of more localised up to date sediment quality data, a 2011 review of the status of the marine environment of the northern coastal area of Scotland identified no significant concerns relating to hazardous substances, eutrophication, oil/chemical spills, algal toxins and microbiology of bathing and shellfish waters (Baxter *et al*., 2011).

7.3.7.3 Historic Radioactive Contamination

Fragments of irradiated nuclear fuel were discharged to sea as a result of reprocessing nuclear fuels at the Dounreay Nuclear Facility during the 1960s and 70s (DSRL, 2014). Studies have shown that the most hazardous particles clustered on the seabed in a radioactive plume running parallel to the coast from southwest to northeast, within the immediate vicinity of the historic liquid effluent diffuser system (LEDS) located to the north of the facility approximately 1 km to the northeast of the Export Cable Corridor.

The Particle Retrievals Advisory Group (PRAG) estimated some several hundred thousand particles may have been discharged from the historic LEDS. The presence of the larger radioactive particles near the historic LEDS is believed to be the source of smaller, less hazardous particles detected in the wider area – most notably in the Sandside Bay area (PRAG, 2012).

An extensive programme of remediation activity has been undertaken by DSRL between 2008 – 2012 to detect and retrieve hazardous particles from areas of seabed near the outfall using remotely operated vehicles (ROVs), clean-up vehicles and divers. In the period up to summer 2012, when the last retrieval activities were conducted, a total of 2,184 particles were removed from the seabed. Of these 411 were deemed significant (particles with activities greater than 1 million becquerels (Bq) and likely to pose a risk to human health) and were removed from the seabed (DSRL, 2014).

To date, between November 1983 – April 2020, a total of 341 radioactive particles have been found in the Dounreay foreshore area, with the highest Caesium -137 activity recorded at 2.0E+08 Bq (26 November 1991) (DSRL, 2020a). Additionally, 287 radioactive particles have been found at Sandside

Bay between April 1984 – August 2020, with the highest Caesium -137 activity recorded at 5.0E+05 Bq (15 February 2007) (DSRL, 2020b).

Furthermore, routine marine monitoring includes sampling of seafood (including crabs, mussels and winkles, seawater, sediment and seaweed) around the Dounreay historic LEDS, and other materials further afield from the outfall, as well as the measurement of beta and gamma dose rates. Seafood samples are collected from within the offshore zone covered by a FEPA Order which prohibits the harvesting of seafood within a 2 km radius of the historic LEDS due to the radioactive particle plume. Sediment samples collected in 2018 recorded a maximum gamma dose rate of 0.14 µGy h-1 at 1 m over substrate at Oigin's Geo, immediately east of the Dounreay Nuclear Site. Seawater samples collected in 2018 from Brims Ness and Sandside bay did not result in detects for radioactive contaminants above laboratory Limits of Detection (LoD) (Environment Agency *et al*, 2019).

Based on the results of the reported survey results and extensive remediation it is unlikely that any significant particles would be encountered within either the Offshore Study Area during construction, operation, maintenance, or decommissioning Project phases.

7.3.8 Identification of Potential Impacts

Potentially significant effects on water and sediment quality that may occur as a result of the Project are discussed below and summarised in Table 7-3.

The installation of the Project will cause localised disturbance to sediments during cable burial and WTG infrastructure installation. This can cause sediments, contaminants and radioactive particles to mobilise from the seabed sediments into the water column which can lead to deterioration in water quality.

It is known that radioactive particles are present in the offshore and intertidal sediments. It is feasible that the construction and decommissioning phases of the Project may potentially disturb these particles and other contaminants in the sediment resulting in their release to the wider environment, which could cause further deterioration in water and sediment quality, and potentially impact on human health, should sufficient particles enter the food chain.

The release of radioactive particles may subsequently impact vulnerable receptors such as fish, shellfish, benthic ecology and marine mammals. The impact on these receptors due to the release of the radioactive particles will be assessed relative to the specific receptor and presented in the appropriate sections of this scoping report.

Sensitive receptors for the potential effects listed above include the coastal RBMP water body Strathy Point to Dunnet Head. Potential effects on shellfish water and bathing waters are considered unlikely as a result of the distance of the Project from any designated shellfish or bathing waters.

7.3.9 Cumulative Impacts

There is potential for cumulative impacts on the sediment and water quality to arise from the development of projects in the nearby area including:

- Installation of the SHE-T Orkney-Caithness interconnector cable (consented);
- Potential OWF Developments in the ScotWind N1 DPO (and associated export cables); and
- Pentland Floating Offshore Wind Demonstrator (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on sediment and water quality have the potential to arise from increased sediment mobilisation caused through cable installation activities in these areas.

Additionally, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on sediment and water quality if export cables cross the Project Offshore Study Area.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the array. Ultimately the array will have the same number of turbines so there are no cumulative impacts predicted to water and sediment quality as a result of operation of the Demonstrator and array. Because the Demonstrator will be subject to a separate installation campaign and will have a separate export cable to the Project, there is the potential for cumulative impacts on water and sediment quality, however these are anticipated to be minor.

Table 7-3 summarises all potential impacts including potential cumulative impacts.

Table 7-3 Potential impacts during construction, operations and maintenance and decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Impacts on status of designated bathing waters and shellfish due to increased suspended sediment and potential release of contaminants	Potential effects on bathing and shellfish waters are considered unlikely as a result of the intervening distance of the Project from any designated bathing or shellfish waters within the region.	Scoped out
Impacts on status of designated waterbodies due to increased suspended sediment and potential release of contaminants	The coastal RBMP water body Strathy Point to Dunnet Head overlaps the Offshore Study Area, as such any suspended sediment, or release of contamination into the water column due to construction activities will be temporary and transient and will not ultimately lead to a reduction in the waterbody status.	Scoped out
Changes in water quality due to increased suspended sediment concentrations	Construction activities may potentially result in mobilisation of seabed sediments into the water column, however these impacts are likely to be short lived and localised. Changes to water quality due to suspended sediment concentrations were also assessed within the 2016 EIA and were determined to have negligible impact.	Scoped out

Impact	High Level Impact Summary and Justification	Scoped In/Out
Changes in water and sediment quality due routine and accidental discharges from vessels during construction	Construction activities may potentially result in reduced water and sediment quality in the vicinity due to pollution from routine and accidental discharges from vessels. However, these impacts are likely to be short lived and localised and will be adequately managed through standard mitigations. Changes to water and sediment quality due to pollution was also assessed within the 2016 EIA and was determined to have negligible impact.	Scoped out
Changes in water and sediment quality due to accidental release of contaminants, radioactive particles	Construction activities may potentially result in mobilisation of contaminants and radioactive particles, therefore potentially resulting in reduced water and sediment quality in the vicinity. Additionally, changes in water and sediment quality due to pollution from routine and accidental discharges from vessels.	Scoped in
Disturbance and release of contaminated sediments or radioactive particles in sediment	Radioactive particles may be released into wider environment and impact upon biological environment receptors. Potential impacts will be assessed and described in the specific receptor sections. .	Scoped in and described in the specific receptor section as follows: Benthic Ecology (7.2); Fish and Shellfish Ecology (7.3); Marine Mammals and other Megafauna (7.4); Commercial Fisheries (8.2).
Potential Impacts During Operations and Maintenance		
Changes in water and sediment quality due to pollution from routine and accidental discharges from vessels during operation and maintenance	Routine maintenance activities may potentially result in reduced water and sediment quality in the vicinity due to pollution from routine and accidental discharges from vessels. However, these impacts are likely to be short lived and localised and will be adequately managed through standard mitigations. Changes to water and sediment quality due to pollution was also assessed within the 2016 EIA and was determined to have negligible impact.	Scoped out
Changes in water and sediment quality due to changes in wave, tide and sediment transport regime.	Minimal changes are anticipated to occur to sediment transport properties due to only small scale interaction with the anchoring structures. Therefore, there impacts on water and sediment quality are unlikely. Furthermore, changes to water and sediment quality due to changes in sediment transport was also assessed within the 2016 EIA and was determined to have negligible impact	Scoped out
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase.		As construction

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Cumulative Impacts		
Cumulative impacts have the potential to arise from the SHE-T Orkney – Caithness interconnector project and any potential developments within the ScotWind N1 DPO site, as these are at closest proximity to the Project and may potentially lead to cumulative impacts on water and sediment quality in the area due to cable installation and WTG foundation installation activities crossing the Offshore Study Area footprint.		Scoped In

7.3.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 7-4. These methods will be used alongside input from the relevant guidance as identified in Section 7.3.2.

Table 7-4 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Changes in water and sediment quality due to accidental release of contaminants, radioactive particles and spillages	Benthic and geophysical surveys undertaken in 2021.	The principal method to be employed will be conducting a sediment quality assessment based on the input from the findings of the project specific benthic and pre-construction geophysical surveys which will be conducted to inform the EIA. These surveys include, but are not limited to, geophysical, multibeam echosounder, grab sampling of seabed sediments, video and/or photography. This will provide site specific information on seabed sediment characteristics. Additionally, a desk study will be undertaken utilising publicly available information pertaining to sediment quality in the Pentland Firth (e.g. Dounreay Particle reports and the Pilot Pentland Firth & Orkney Waters Marine Spatial Plan, 2016), and additional sources as listed in section 7.2.3. Consultations with DSRL, NDA, Vulcan and SEPA will also be undertaken to collective information relevant to radioactive contamination in the marine environment.

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Disturbance and release of contaminated sediments or radioactive particles in sediment	Benthic and geophysical surveys undertaken in 2021.	The principal method to be employed will be an assessment based on the findings of the project specific benthic and pre-construction geophysical surveys which will be conducted to inform the EIA. These surveys include, but are not limited to, geophysical, multibeam echosounder, grab sampling of seabed sediments, video and/or photography. This will provide site specific information on seabed sediment characteristics. These findings will be presented in the relevant receptor chapters of the EIA report e.g. Benthic Ecology, Fish and Shellfish Ecology, Marine Mammals and other Megafauna, and Commercial Fisheries. Additionally, a desk study will be undertaken utilising publicly available information pertaining to radioactivity in the marine environment and sediment/ particle mobility (e.g. Dounreay Particle reports and the Pilot Pentland Firth & Orkney Waters Marine Spatial Plan, 2016), and additional sources as listed in section 7.2.3. Consultations with DSRL, NDA, Vulcan and SEPA will also be undertaken to collective information relevant to radioactive contamination in the marine environment.
Cumulative impacts	No surveys identified.	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to understand timelines and potential cumulative impacts.

7.3.11 Conclusions and Next Steps

The 2016 Horizon Geosciences geophysical survey report findings will be used to inform the Project specific geophysical and benthic surveys to be undertaken in 2021. An all-inclusive assessment of potential project impacts and potential cumulative impacts will then be completed within the EIA Report

The potential impacts taken forward to the EIA phase include the disturbance of contaminants and radioactive particles in sediment and potential changes in water and sediment quality due to release of contaminants and radioactive particles. Impacts on the water quality due to pollution through routine and accidental discharges and due to increased suspended sediment concentrations are scoped out. Furthermore, impacts on the status of designated sites with respect to water and sediment quality are scoped out and will not be taken forward to the assessment phase.

Additional proposed project specific studies include sediment quality assessment on samples within the Offshore Study Area to inform the EIA. Based on consent conditions for the previously consented development, the requirements and approach for a particle monitoring strategy is to be investigated further with SEPA.

8 OFFSHORE BIOLOGICAL ENVIRONMENT

8.1 Introduction

This section considers the impact of the Project on the following biological receptors present within Offshore Study Area:

> Benthic ecology;

> Fish and shellfish;

> Marine mammals; and

> Ornithology.

An overview of the relevant baseline environment is provided for each along with the anticipated impacts, a baseline characterisation strategy, impact assessment strategy and where applicable, possible mitigation and monitoring measures.

8.2 Benthic Ecology

8.2.1 Introduction

This section provides a high level description of the benthic community (flora and fauna living in and on the seabed) in the WTG site and Export Cable Corridor (Offshore Study Area), and highlights the key sensitivities and potential impacts that may arise from the Project. It also presents a summary of the relevant UK guidance and details of the methodology which will be applied during the EIA phase.

8.2.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on benthic ecology:

Legislation

> Nature Conservation (Scotland) Act 2004 (as amended);

> EIA Regulations;

> The Conservation of Habitats and Species Regulations 2017;

> The Conservation (Natural Habitats, &c.) Regulations 1994;

Strategy

> Scotland's Biodiversity Strategy: a route map to 2020 (2015); and

Guidance

> Pilot Pentland Firth & Orkney Waters Marine Spatial Plan, July 2016 (Scottish Government, 2016). Available online at https://www.gov.scot/publications/pilot-pentland-firth-orkney-waters-marine-spatial-plan/.

8.2.3 Available Information

The following key sources of information shall be used for the assessment:

> NMPi (2020). Spatial data relating to benthic ecology on National Marine Plan Interactive. Available online at https://marinescotland.atkinsgeospatial.com/nmpi/

- SNH (2018a) Ocean Quahog. Available online at (http://marine.gov.scot/node/12704); and
- Mapping European Seabed Habitat (MESH) project data. Available online at http://www.marine.gov.scot/data/mapping-european-seabed-habitats-mesh.

> MSS (2014). Marine Scotland Science Farr Point Bathymetry Survey. Available online at https://www2.gov.scot/Topics/marine/science/MSInteractive/datatype/Bathymetry/data/farr-point;

> EMODnet (2019). Seabed Habitat. Available online at https://www.emodnet-seabedhabitats.eu/access-data/launch-map-viewer/;

- EUSeaMap (2019) Broad-scale Predictive Habitat Map – EUNIS classification full detail.

> JNCC (2018). UKSeaMap 2018. Available online at https://jncc.gov.uk/our-work/marine-habitat-data-product-ukseamap/;

> Xodus Group (2019). LT17 Orkney – Mainland HVAC 220 kV Subsea Link Environmental Appraisal, Non-Technical Summary. Available online at http://marine.gov.scot/sites/default/files/06889_-_environmental_appraisal_non-technical_redacted.pdf);

> Moore, C.G. (2015). Biological analyses of underwater video from research cruises in marine protected areas and renewable energy locations around Scotland in 2014. Scottish Natural Heritage Commissioned Report No. 819. Available online at https://www.nature.scot/naturescot-commissioned-report-819-biological-analyses-underwater-video-research-cruises-marine);

> JNCC (2018) North-West Orkney MPA. Available online at https://jncc.gov.uk/our-work/north-west-orkney-mpa/;

> MarLIN (2020). The Marine Life Information Network. Available online at https://www.marlin.ac.uk/; and

> Marine Scotland (2013). Feature Activity Sensitivity Tool. Available online at http://www.marine.scotland.gov.uk/FEAST/.

8.2.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore biological environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the Project.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to benthic ecology have been considered within this report

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

8.2.5 Study Area

The impacts to the benthic ecology are expected to be localised within the Offshore Study Area, restricted to the seafloor immediately surrounding the infrastructure placed on the seabed. Therefore, the study area covers the area from the intertidal environment within the Export Cable Corridor, out to and including the WTG site.

8.2.6 Surveys and Studies Carried Out to Date

In 2016, Horizon Geosciences conducted a geophysical survey at the site from 1st – 17th October 2016, and then followed this up with a geotechnical survey in June 2017.

An intertidal survey was also undertaken on 12th October 2015 in an area covering the rocky habitat between the eastern flank of Sandside Bay to the western side of the Dounreay Site Restoration Limited (DSRL) site (Fox, 2015).

Additionally, a multi-beam survey of the north coast of Scotland between the Kyle of Tongue and 13 km west of Thurso was surveyed by the Marine Scotland Science vessel, the MRV Scotia, in 2014. Video-based monitoring of the benthic environment located in the same area was also conducted in 2014 (MSS, 2014; Moore, 2015).

8.2.7 Description of the Current Environment

There are no Marine Protected Areas (MPAs), SACs or Potential Annex I habitats within the Offshore Study Area or Export Cable Corridor. The nearest MPA is North-West Orkney MPA, located 33 km to the north of the WTG Site, recommended for its importance to biodiversity (sandeels) and geodiversity (marine geomorphology of the Scottish Shelf Seabed including sandbanks and sand and sediment wave fields) (JNCC, 2018).

At the closest point, the WTG site is located 6.3 km from the northern coastline of Scotland. The Export Cable Corridor will be connected to the distribution system at a suitable grid connection point in Caithness. The Offshore Study Area is within water depth ranging from 33 to 88 m. The predicted EUNIS classification for the Offshore Study Area is predominantly A5.25 Circalittoral fine sand or A5.26 Circalittoral muddy sand (Figure 8-1). Three main types of sediment classification were observed during the Horizon (2016) survey for the WTG site including, slightly gravelly fine sand, gravelly sand with occasional boulders, and coarse sand and gravel with numerous boulders (Horizon Geosciences, 2016) . The dominant habitat type observed within the MSS 2014 survey was slightly rippled fine sand, which is consistent with the predicted EUNIS classifications identified. Patches of scattered gravel, pebbles, cobbles and occasional boulders on sand were also observed, mainly in the south-western sector of the WTG site. The predicted EUNIS classification for the Export Cable Corridor is predominantly A5.25 Circalittoral fine sand or A5.26 Circalittoral muddy sand with areas of A3.2 Atlantic and Mediterranean moderate energy infralittoral rock and A5 Sublittoral sediment as the Export Cable Corridor approaches the coastline (EUSeaMap, 2019). Four main types of sediment classification were observed during the Horizon (2016) survey for the Export Cable Corridor, including muddy very fine sand, gravelly fins sand/ muddy fine sand, coarse sand and gravel with numerous boulders and rugged, high relief seafloor dominated by outcrops with pinnacles (Horizon Geosciences, 2016).

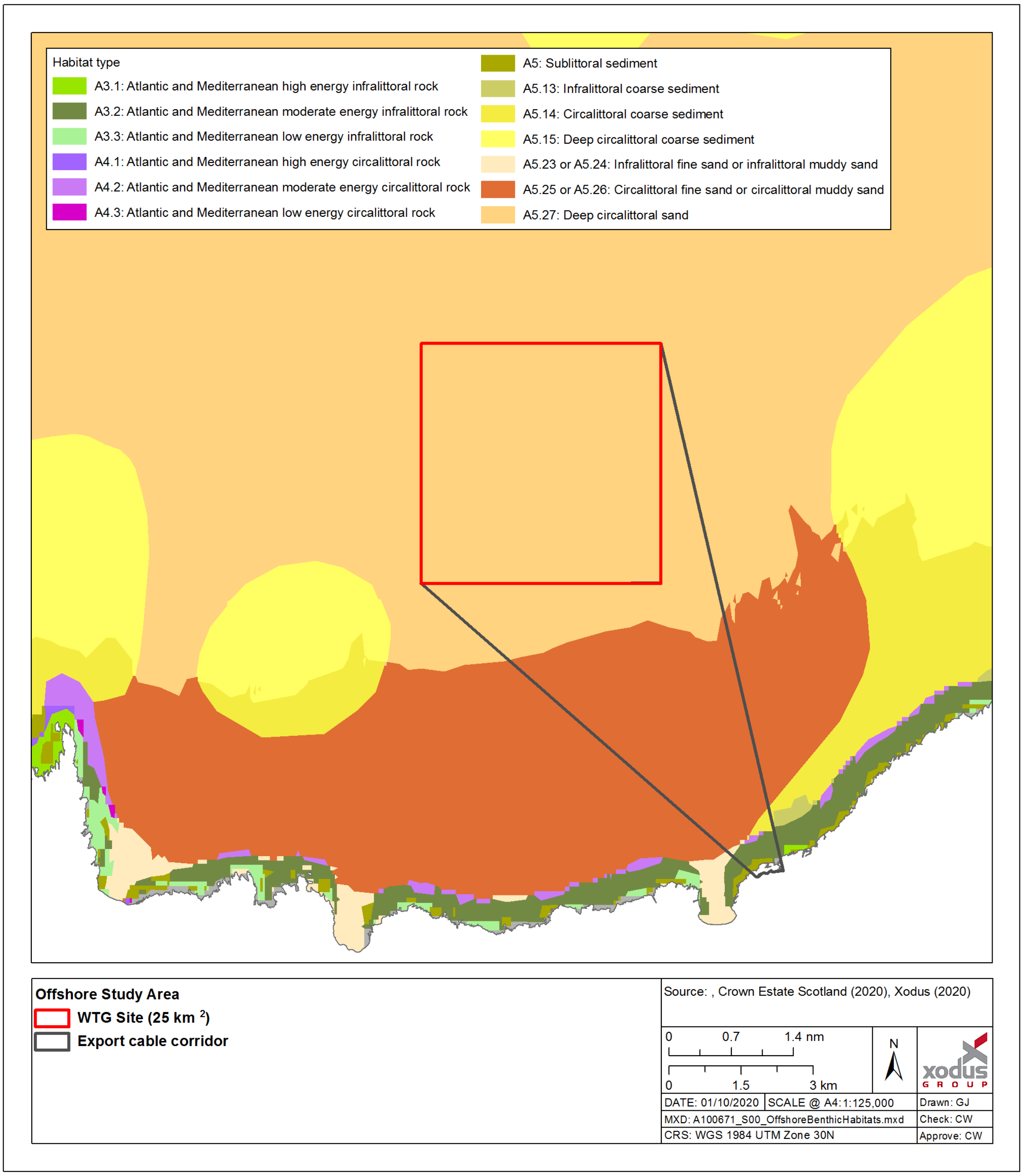


Figure 8-1 Sediment types in the vicinity of the Offshore Study Area

Video footage collected within the Export Cable Corridor indicate a gradual increase in the proportion of coarser sediment types as water depth decreases towards the coast and areas of rocky seabed are present. Emergent tubes, polychaete casts and bivalve siphons, most of which resembled those of *Arctica islandica,* were observed in the sandy sediments (Moore, 2015). In areas where hard substrates were present encrusting communities of soft corals, bryozoans and hydroids were observed (Moore, 2015). Furthermore, two *A. islandica* individuals have previously been recorded within the Offshore Study Area. Additionally, twelve *A. islandica* individuals have been found within a 10 km radius of the Offshore Study Area (SNH, 2018a).

The North Scotland coastline is composed of A3.1 Atlantic and Mediterranean high energy infralittoral rock interspersed with sandy beaches of A5.23 Infralittoral fine sand or A5.24 Infralittoral muddy sand (EUSeaMap, 2019). Areas of high-moderate energy infralittoral rock are likely to provide conditions suitable for the development of kelp forest/ park habitats.

As described by the British Geological Survey, the rock formation is "sandstone dominate cyclic sequence with siltstone and calcareous (fish bed) laminated limestone". The phase 1 intertidal survey results found nine biotypes were present in the area. this includes: *Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock, *Semibalanus balanoides* on exposed to moderately exposed or vertical sheltered eulittoral rock, *Fucus spiralis* on full salinity exposed to moderately exposed upper eulittoral rock, Fucoids and kelp in deep eulittoral rockpools, Green seaweeds (*Enteromorpha spp.* and Cladophora spp.) in shallow upper shore rockpools, *Corallina officinalis*, coralline crusts and brown seaweeds in shallow eulittoral rockpools, Lichens or small green algae on supralittoral rock, *Fucus serratus* and under-boulder fauna on lower eulittoral boulders, and *Laminaria digitata* on moderately exposed sublittoral fringe rock (Fox, 2015).

Intertidal boulder communities are a functional habitat and are in decline in the UK. They are also a habitat for which the UK has international obligations for conservation (Council Directive 92/43/EEC). Additionally, dog whelk *Nucella lapillus* was found on most of the intertidal rock and is an OSPAR species (OSPAR, 2008) (Fox, 2015).

8.2.8 Identification of Potential Impacts

Although impacts are predicted to be localised given the small scale of the Offshore Study Area, depending on the construction methods there is the potential that benthic habitats and species may be impacted by increased suspended sediments and a reduction in water quality during the construction phase. It is likely that there will be highly localised and small-scale habitat and species loss directly beneath any anchor blocks, seabed disturbance along the export cable routes, disturbance from mooring lines and scour effects. There is also the possibility of localised impacts form the disturbance of contaminated or radioactive sediments.

Longer term impacts will include the creation of new habitat via the introduction of marine infrastructure and associated colonisation and the potential introduction of non-native species during the construction phase.

Increased vessel activity in the area as a result on installation activities will result in an increased risk of pollution through increased number of vessels. There is also the potential for electro-magnetic field (EMF) impacts arising from the export cables and a highly localised change in the thermal load of the immediate area.

8.2.9 Cumulative Impacts

There is potential for cumulative impacts on the benthic ecology environment to arise from the development of projects in the nearby area including:

- The SHE-T Orkney-Caithness interconnector cable (consented);
- Potential OWF Developments in the ScotWind N1 DPO; and
- Pentland Floating Offshore Wind Demonstrator (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on the physical environment have the potential to arise from cable installation activities in these areas.

Additionally, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on the physical environment if export cables cross the Project Offshore Study Area.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of, and ahead of installation activities associated with the array. Because the Demonstrator will be subject to a separate installation campaign and will have a separate export cable to the Project, there will be cumulative impacts to the benthic ecology receptors. These are not expected to be significant, but the extent will be assessed thoroughly within the EIA.

Impacts to the benthic ecology receptors present in the Offshore Study Area are expected to be largely temporary and relatively localised, therefore there will be limited scope for cumulative impacts. However, it is considered the Project and other projects in the vicinity have the potential to impact the benthic ecology in the area in a cumulative manner. This will be assessed further at EIA stage.

Table 8-1 summarises all potential impacts including potential cumulative impacts.

Table 8-1 Potential Impacts on Benthic Ecology during Construction, Operations and Maintenance and Decommissioning of the Offshore Study Area

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Damage from placement of infrastructure (cables, moorings, anchors) on the seabed	Substrate, habitat and species loss. Significance of impact not known as will depend on species and habitats within the footprint and surrounding area of any infrastructure placed on the seabed. However, due to the size of the Project the impact is not expected to be large scale.	Scoped in
Installation of subsea infrastructure in inshore waters	Increased suspended sediment and turbidity. Seabed survey data will be utilised to allow for micro-siting to avoid particularly sensitive habitats or species, with any impacts generally being short-term and localised.	Scoped in
Disturbance of contaminated sediments	The Export Cable Corridor is located on the border of the Dounreay Nuclear Facility and it is known that there are small numbers of radioactive particles present in the offshore and intertidal sediments as a result of activities at Dounreay Nuclear Facility. These may be released into wider environment as a result of disturbance from installation activities.	Scoped in
Potential Impacts During Operations and Maintenance		
Hydrodynamic changes leading to scour around subsea infrastructure (including mooring cables as result of movement with wave and tides)	Localised movement of seabed sediments due to the placement of anchor blocks and associated changes to localised currents. Considered to be minor due to the small number and size of anchors but extent is unknown.	Scoped in

Impact	High Level Impact Summary and Justification	Scoped In/Out
Damage to habitat or species due to pollution from routine and accidental discharges	Accidental release of pollutants are limited to oils and fluids contained within the WTGs, the majority of which are characterised by water / glycol (21.8%) and nitrogen (65.4%), which are organic substances. The remaining 12.8% of the fluid constituents are oils and grease, which total to 7,050 L for a 10 MW turbine and 11,283 L for a 16 MW turbine. This is an exceptionally small volume which would take up less volume than the equivalent 7.1 or 11.3 m3 of water due to the reduced density of hydrocarbons and lubricants. As the potential for a full inventory release from any individual turbine is considered extremely remote, requiring a catastrophic unplanned event (e.g. vessel collision with WTG), it is considered that potentially a slow leak of fluids is the only mode of release during ongoing operations. However, the subsequent slow release volume would be so small as to be undetectable, becoming rapidly dispersed in the energetic waters comprising the PCOW. This rapid dispersal limits the potential for any important interactions between benthic ecology and pollutants, such as ingestion, consumption or exposure of the dermal or soft tissues. Any fault in the machinery which could compromise a WTG and cause such an accidental release would be remedied with expediency as a matter of utmost importance by mobilised personnel. For these reasons impacts to benthic ecology from any accidental release of pollutants are not considered further.	Scoped out
Introduction of marine non-natives	Potential use of infrastructure as steppingstones enabling the movement of non-natives species between habitats, and introduction of species through vessel movements. Operational control measures including ensuring that standard vessel audits are undertaken for all project vessels will be undertaken to mitigate this impact. This impact was assessed in the Dounreay Trì EIA (2016) as minor, therefore this impact has been scoped out.	Scoped out
Colonisation of subsea infrastructure, scour protection and support structures	Whilst this could have a beneficial effect, this is dependent on the colonising species which may include non-native species. Industry best practice will be followed for all operations. This impact was also assessed in the Dounreay Trì EIA (2016) as negligible, therefore impacts this impact has been scoped out.	Scoped out

Impact	High Level Impact Summary and Justification	Scoped In/Out
Impact to benthic communities from any thermal load or EMF arising from the cable during operation	The potential impacts on benthic species from thermal changes and EMF from export cables is not well understood at present and the level of EMF exposure will be dependent on cable burial and protection methods. The export cables design parameters and installation methods are expected to conform to industry standard specifications which includes shielding technology to reduce the direct emission of EMFs. In addition, the cables will be buried wherever possible. In areas where cable burial cannot be achieved, mechanical protection may be placed which also reduces the emission of EMFs. As a result of these mitigations, the impact is considered to be minor (as identified in the Dounreay Trì EIA (2016)) and has therefore been scoped out.	Scoped out
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase. Following removal of structures, opportunities for habitat recovery in the former location of foundations are expected.		As per construction
Potential Cumulative Impacts		
It is considered feasible that there may be cumulative impacts arising from the interaction of the Offshore Study Area with future wind farm developments associated with the ScotWind N1 DPO. Cumulative impacts are considered relevant if the export cable from the N1 DPO is in/in the vicinity of the Offshore Study Area.		Scoped in

8.2.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 8-1. These methods will be used alongside input from the relevant guidance as identified in Section 8.2.2.

Table 8-2 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Damage from placement of infrastructure (cables, moorings, anchors) on the seabed	Benthic and geophysical surveys undertaken in 2021.	A geophysical survey will be undertaken, the results of which will be used to inform the scope of a benthic survey campaign and the production of a habitat map which will include grab sampling, video and/or photography will take place in the Offshore Study Area to characterise the benthic environment and to identify any species or features of conservation importance. These findings will be presented in the relevant receptor chapters of the EIA report e.g. Water and Sediment Quality, Fish and Shellfish Ecology, Marine Mammals and other Megafauna, and Commercial Fisheries. Additionally, an overview of habitats and species (classified into biotopes where appropriate) in and around the Offshore Study Area and will be assessed in the context of the wider environment.

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
		Data exists on the MarLIN website and FEAST to allow an assessment of the sensitivities of individual biotopes and species to be included as part of any impact assessment (MarLIN, 2020; Marine Scotland, 2013).
Installation of subsea infrastructure in inshore waters	No confirmed surveys identified.	An overview of habitats and species (classified into biotopes where appropriate) in and around the Offshore Study Area and will be assessed in the context of the wider environment. Data exists on the MarLIN website and FEAST to allow an assessment of the sensitivities of individual biotopes and species to be included as part of any impact assessment (MarLIN, 2020; Marine Scotland, 2013). If pinning the cable as opposed to the use of HDD, an intertidal survey will be necessary to inform a baseline against which potential impacts can be assessed during the EIA. A renewed intertidal survey will be conducted to inform the EIA if required. This survey will only be required if HDD is not utilised in bringing the cable to onshore i.e. where the cable will interact with the intertidal area.
Disturbance of contaminated sediments	Benthic and geophysical surveys undertaken in 2021.	A geophysical survey will be undertaken, the results of which will be used to inform the scope of a benthic survey campaign and the production of a habitat map which will include grab sampling, video and/or photography will take place in the Offshore Study Area to characterise the benthic environment and to identify any species or features of conservation importance. These findings will be presented in the relevant receptor chapters of the EIA report e.g. Water and Sediment Quality, Fish and Shellfish Ecology, Marine Mammals and other Megafauna, and Commercial Fisheries. Additionally, an overview of habitats and species (classified into biotopes where appropriate) in and around the Offshore Study Area and will be assessed in the context of the wider environment. Data exists on the MarLIN website and FEAST to allow an assessment of the sensitivities of individual biotopes and species to be included as part of any impact assessment (MarLIN, 2020; Marine Scotland, 2013).
Hydrodynamic changes leading to scour around subsea infrastructure (including mooring cables as result of movement with wave and tides)	Benthic and geophysical surveys undertaken in 2021.	A geophysical survey will be undertaken, the results of which will be used to inform the scope of a benthic survey campaign and the production of a habitat map which will include grab sampling, video and/or photography will take place in the Offshore Study Area to characterise the benthic environment and to identify any species or features of conservation importance. These findings will be presented in the relevant receptor chapters of the EIA report e.g. Water and Sediment Quality, Fish and Shellfish Ecology, Marine Mammals and other Megafauna, and Commercial Fisheries.

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
		Additionally, an overview of habitats and species (classified into biotopes where appropriate) in and around the Offshore Study Area and will be assessed in the context of the wider environment. Data exists on the MarLIN website and FEAST to allow an assessment of the sensitivities of individual biotopes and species to be included as part of any impact assessment (MarLIN, 2020; Marine Scotland, 2013).
Cumulative impacts	No surveys identified.	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to understand timelines and potential cumulative impacts.

8.2.11 Conclusions and Next Steps

The 2016 Horizon Geosciences geophysical survey report findings will be used to inform the Project specific geophysical and benthic surveys to be undertaken in 2021. An assessment of potential impacts and potential cumulative impacts will then be completed within the EIA Report. Potential impacts relate to damage from placement of infrastructure, installation of subsea infrastructure in inshore waters and disturbance of contaminated sediments and potential cumulative impacts associated with nearby future developments have been scoped in for the assessment within the EIA Report.

8.3 Fish and Shellfish Ecology

8.3.1 Introduction

This section provides a description of the fish and shellfish community in the vicinity of the Offshore Study Area and identifies potential impacts from the Project to this receptor. The potential impacts which should be considered within the EIA are also presented. The fish and shellfish ecology baseline includes habitat usage such as spawning and nursery grounds, species of commercial or conservation importance, species susceptible to impacts from Electromagnetic Fields (EMFs), diadromous species and those which may be vulnerable to disturbance or injury caused by underwater noise. It should be noted that basking shark is excluded from this section and is considered within Section 8.4. SACs which are designated due to the presence of certain species of fish and shellfish are briefly described in Section 7.3.7 but will be detailed in the HRA along with whether the Project is likely to have a significant effect on these sites. It should be noted that an HRA will be undertaken alongside the EIA for the proposed Project.

8.3.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on to fish and shellfish Ecology:

Legislation

- Wildlife & Countryside Act 1981 (as amended);
- Nature Conservation (Scotland) Act 2004;
- Wildlife and Natural Environment (Scotland) Act 2011; and

- Priority Marine Features (PMFs).

8.3.3 Available Information

The following information is available and will inform the EIA phase:

- Coull *et al*. (1998) Fisheries sensitivity maps in British waters. Available online at https://www.cefas.co.uk/media/o0fgfobd/sensi_maps.pdf; and
- Ellis *et al.* (2012) Spawning and nursery grounds of selected fish species in UK waters. Available online at https://www.cefas.co.uk/publications/techrep/TechRep147.pdf.
- Marine Scotland Science (2016). Fish and Shellfish Stocks: 2016 Edition. Available online at https://data.marine.gov.scot/dataset/fish-and-shellfish-stocks-2016;
- MarLIN (2020). The Marine Life Information Network. Available online at https://www.marlin.ac.uk/;
- National Biodiversity Network (NBN) (2015). NBN Atlas. Available online at https://nbn.org.uk/content-block/nbn-gateway/;
- Confirmation of presence, absence and seasonality from fisheries statistics (MMO, 2019), local and national fishermen's associations, representatives, groups and federations as per Section 4;
- JNCC (2020). JNCC SAC information. Available online at https://sac.jncc.gov.uk/;
- NatureScot (2020). Scottish Biodiversity Strategy. Available online at https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy#:~:text=Aims,and%20to%20support%20healthy%20ecosystems&text=maximise%20the%20benefits%20for%20Scotland,contributing%20to%20sustainable%20economic%20growth;
- International Bottom Trawl Survey (North Sea).

8.3.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore biological environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the Project.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to fish and shellfish ecology have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

8.3.5 Study Area

The Offshore Study Area is situated within ICES sub-area rectangle[5] 46E6 which includes the north-east coast of Scotland from Strathy Point to Duncansby Head and the south-west region of the Orkney Islands (Figure 8-2). The study area for fish and shellfish ecology is identified as this ICES rectangle boundary which extends over 1 degree longitude by 30' latitude; which at the project latitude, is an area

[5] *The International Council for Exploration of the Sea (ICES) is a global organisation which coordinates oceanic and coastal monitoring and research, and advises international commissions and governments on marine policy and management issues. Fisheries effort and landings data (volume and value) are reported by defined statistical rectangles (geographical areas) to Marine Scotland and ICES.*

of approximately 3,240 km^2, plus the inclusion of the rivers which fall within 13 km of the Offshore Study Area, and adjacent ICES rectangles to correlate with the commercial fisheries study area and provide perspective on overall habitat usage and extent of species which are present in waters relevant to the Project.

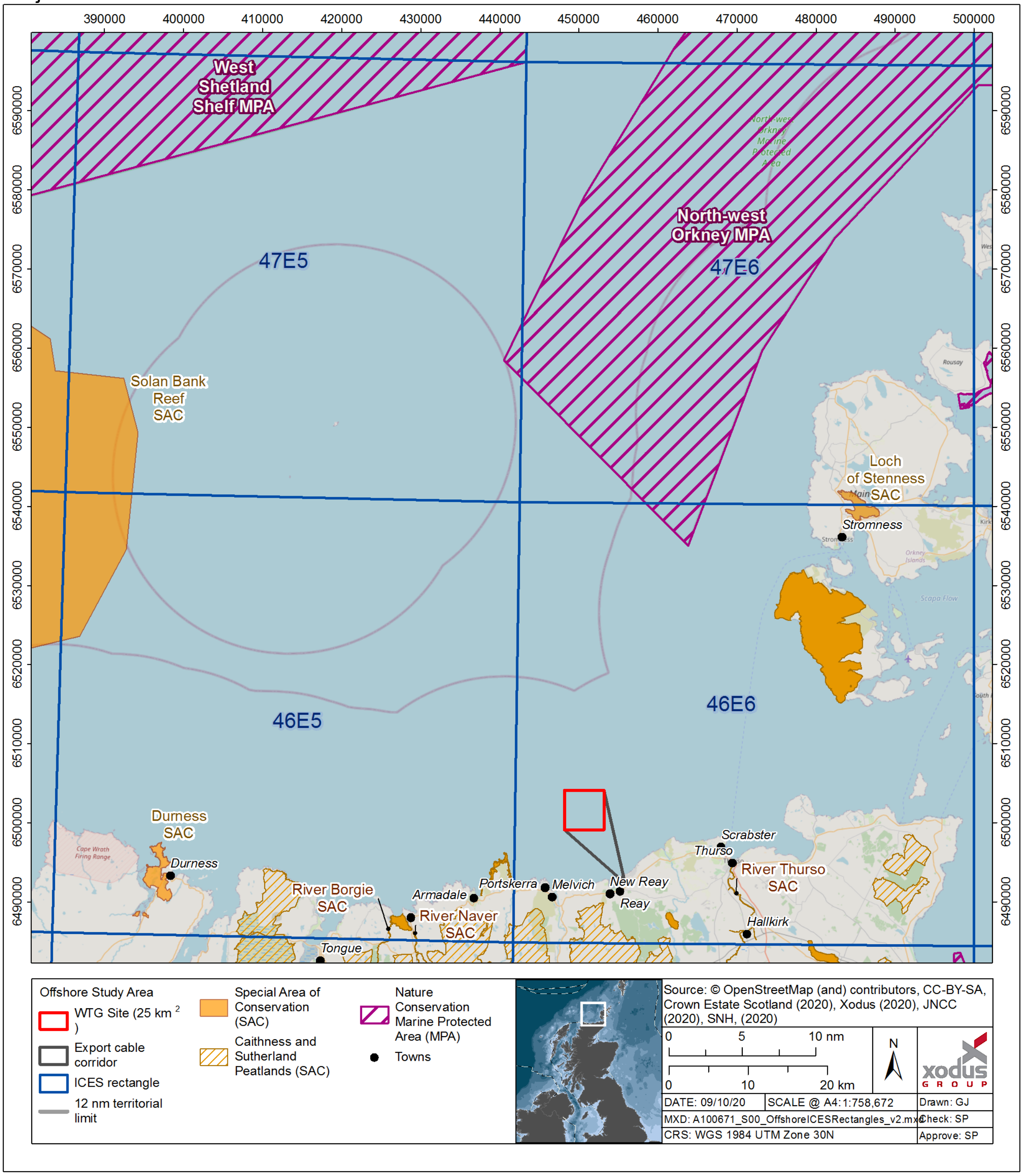


Figure 8-2 Offshore Study Area, Associated ICES Rectangles and Protected Sites

8.3.6 Surveys and Studies Carried Out to Date

No site-specific surveys or studies for fish and shellfish were carried out to inform the 2016 Dounreay Trì EIA.

8.3.7 Description of the Current Environment

The key features of fish and shellfish species which are likely to require consideration within the EIA are:

- Protected species;
- Species of commercial significance;
- Seabed dependence during any life stage, including spawning and/or nursery stages;
- Sensitivity to underwater noise;
- Diadromous fish species which have migratory routes which pass through or close to the Offshore Study Area; and
- Sensitivity to Electromagnetic Fields (EMFs).

The following sections provide information on these key features for the fish and shellfish assemblage which is understood to use the waters relevant to the Offshore Study Area.

8.3.7.1 Fish and Shellfish Assemblage: Conservation and Commercial Status

There are no Special Areas of Conservation (SACs) for fish located within the Offshore Study Area; however, the rivers Thurso, Naver and Borgie, located 13 km, 23 km and 24 km from the Offshore Study Area, respectively, are all SACs designated for their importance to Atlantic salmon *Salmo salar.* Atlantic salmon may use the Pentland Firth as a migratory route (Malcolm *et al*., 2010) between the rivers and ocean prior to maturation and spawning. Atlantic salmon are also host species for freshwater pearl mussel *Margaritifera margaritifera* which is a feature of several designated sites in Scotland including the River Naver SAC and River Borgie SAC (JNCC, 2020). European eel *Anguilla anguilla* and sea trout *Salmo trutta* are other species of conservation concern that are likely to be present in the Offshore Study Area at certain times of the year. European eel, a critically endangered species on the IUCN Red List, spend most of their lives in freshwater, migrating to the sea to spawn. Sea trout (IUCN Red list least concern) predominately are found in shallow coastal waters of the oceans and estuaries, except for when they have reached maturity when they migrate upstream to spawn (Malcolm *et al*, 2010). Both European eel and sea trout may use the Offshore Study Area as a migratory route, and in the nearshore areas as habitat.

The north-west Orkney MPA, a Nature Conservation Marine Protected Area (NCMPA), is located 33 km to the north of the Offshore Study Area. This MPA is an area of importance for sandeels that spend the majority of their life in the sandy substrate of seabed on which they depend, except when feeding and spawning, and are therefore vulnerable to disturbance and habitat loss. Sandeels are a key source of food for a range of marine wildlife, including many types of larger fish and seabirds along with being commercially important to the UK and EU nations (e.g. Denmark). Newly hatched sandeel larvae from the north-west Orkney MPA are transported by currents to sandeel grounds around Shetland and south of the Moray Firth. Predicted EUNIS habitat data (McBreen *et al*., 2010) suggests there may be seabed which comprises suitable habitat for sandeels within the Offshore Study Area, however, this would need to be confirmed by benthic grab samples and the geophysical and geotechnical site investigation surveys, plus information gathered during consultation with NatureScot and MSS.

Elasmobranchs are also recorded in the Pentland Firth waters. Some species of skate and ray are species of conservation concern, with the common skate being listed as Critically Endangered on the IUCN Red List. Both skates and rays are likely to be found on sandy substrates in and around the Offshore Study Area. The International Bottom Trawl Survey (IBTS) data will provide further information on the distribution of these and other fish and shellfish species in and around the Offshore Study Area, which will be referred to during development of the EIA.

8.3.7.2 Fish and Shellfish Spawning and Nursery Grounds

The waters off the north coast of Scotland, including the Offshore Study Area, are potential spawning and nursery areas for a number of species of commercial and conservation importance (see Figure 8-3 to Figure 8-5). The Offshore Study Area may overlap with suitable habitat for spawning grounds for sandeel and nursery grounds for sandeel, cod and herring – all of which are potentially sensitive to impacts caused by the installation, operation or decommissioning of OWFs due to seabed dependence (sandeel, herring) or noise sensitivity (herring, cod). Spawning grounds of other commercially important species which will be considered during the EIA production are provided in Table 8-3. It should be noted that the spawning and nursery grounds identified by Coull *et al* (1998) and Ellis *et al* (2012) are based on predictions, and therefore may be spatially and temporally variable.

Table 8-3 Spawning and nursery grounds of fish and shellfish species within ICES rectangle 46E6 according to Coull *et al.,* 1998 and Ellis *et al.*, 2012

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anglerfish	N	N	N	N	N	N	N	N	N	N	N	N
Blue whiting	N	N	N	N	N	N	N	N	N	N	N	N
Cod	N	N	N	N	N	N	N	N	N	N	N	N
Common Skate	N	N	N	N	N	N	N	N	N	N	N	N
European Hake	N	N	N	N	N	N	N	N	N	N	N	N
Haddock	N	N	N	N	N	N	N	N	N	N	N	N
Herring	N	N	N	N	N	N	N	N	N	N	N	N
Lemon Sole	N	N	N	SN	SN	SN	SN	SN	SN	N	N	N
Ling	N	N	N	N	N	N	N	N	N	N	N	N
Mackerel	N	N	N	N	N	N	N	N	N	N	N	N
Plaice	N	N	N	N	N	N	N	N	N	N	N	N
Saithe	N	N	N	N	N	N	N	N	N	N	N	N
Sandeel	SN	SN	N	N	N	N	N	N	N	N	SN	SN
Sprat	N	N	N	N	S*N	S*N	SN	SN	N	N	N	N
Spotted Ray	N	N	N	N	N	N	N	N	N	N	N	N
Spurdog	N	N	N	N	N	N	N	N	N	N	N	N
Thornback Ray	N	N	N	N	N	N	N	N	N	N	N	N
Tope Shark	N	N	N	N	N	N	N	N	N	N	N	N
Whiting	N	N	N	N	N	N	N	N	N	N	N	N
S = Spawning, N = Nursery, SN = Spawning and Nursery; * = peak spawning; Species = High nursery intensity as per Ellis *et al*., 2012.												

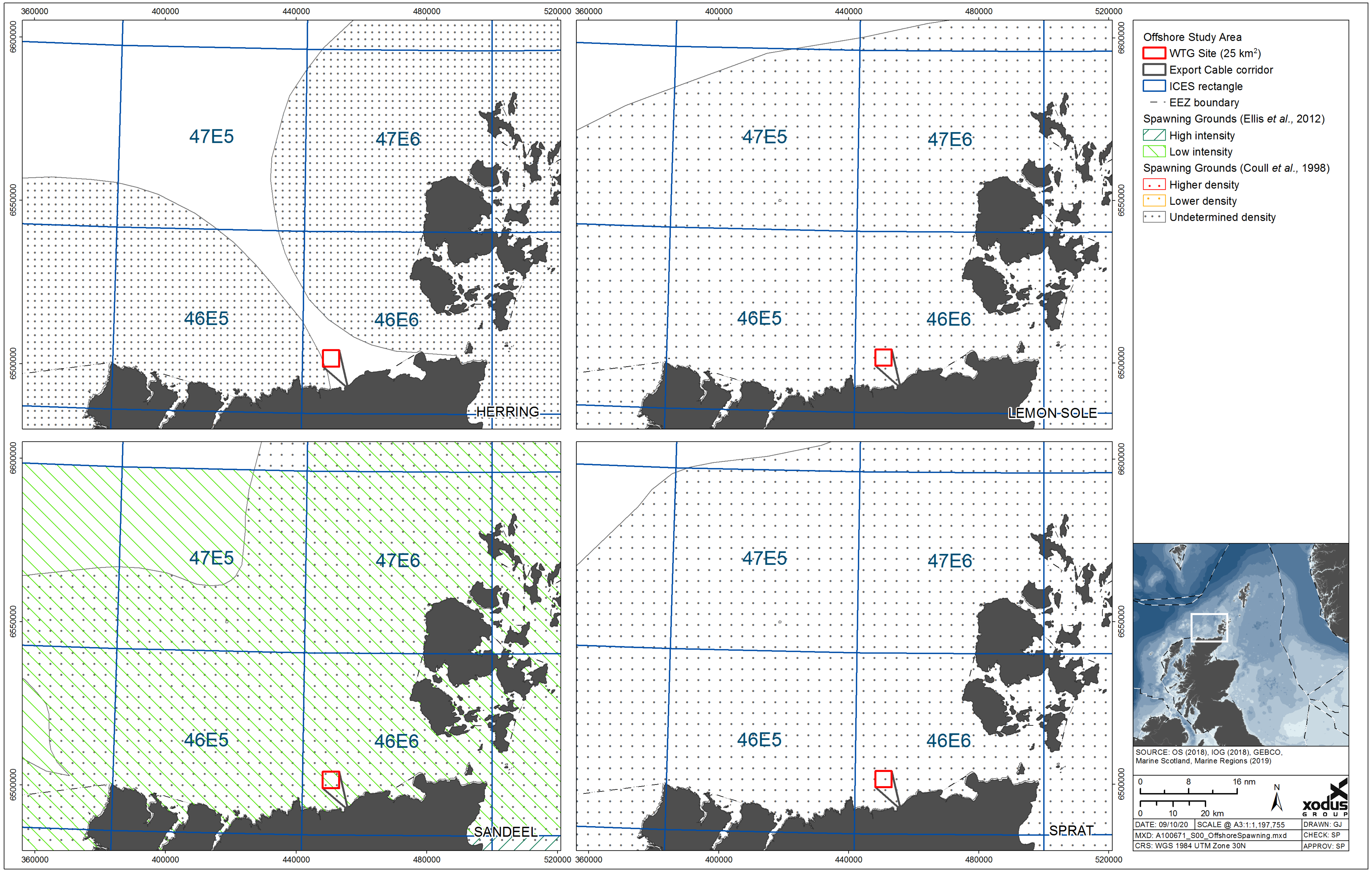


Figure 8-3 Spawning Grounds (Ellis *et al.*, 2012 and Coull *et al.*, 1998)

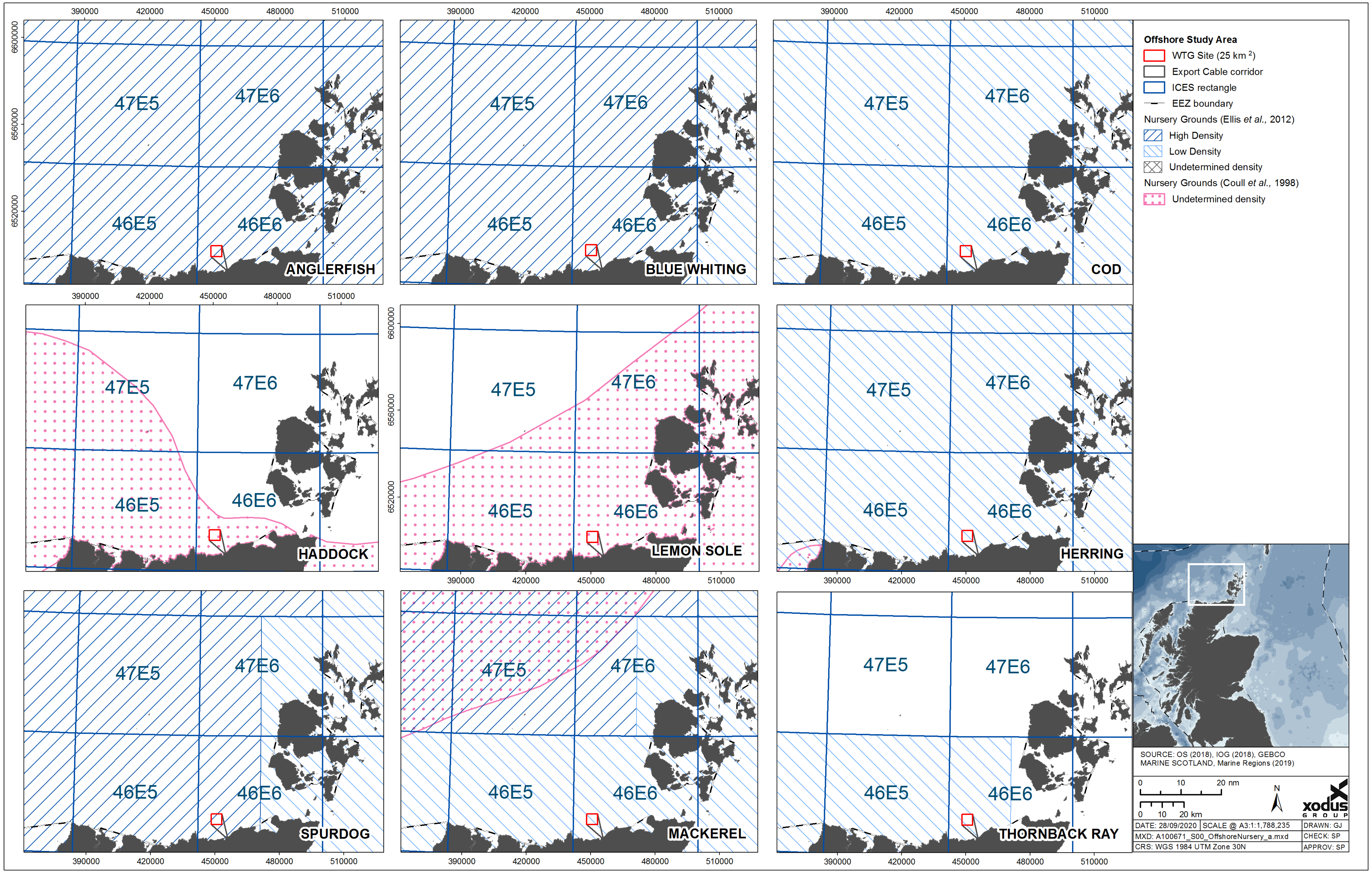


Figure 8-4 Nursery Grounds (part 1) (Ellis *et al.*, 2012 and Coull *et al.*, 1998)

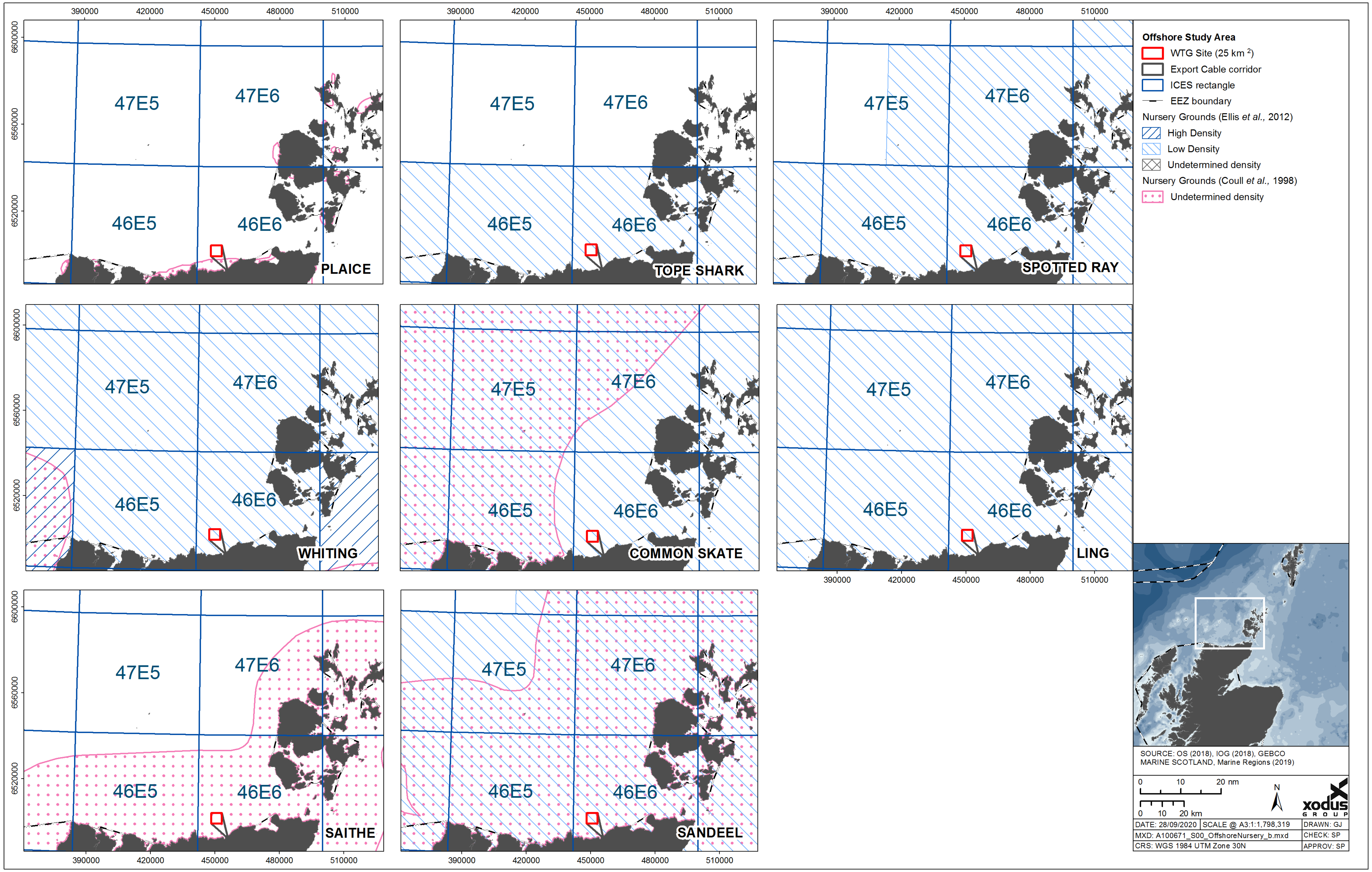


Figure 8-5 Nursery Grounds (part 2) (Ellis *et al.*, 2012 and Coull *et al.*, 1998)

8.3.8 Identification of Potential Impacts

Fish and shellfish species may be affected by the Project by a number of potential impacts which are associated with the construction, operation and maintenance and/or decommissioning of the Project. In particular, impacts to species which are known to be seabed dependent and/or with lower mobility and so less able to tolerate disturbance will be carefully considered within the EIA. The fish and shellfish species which will require detailed consideration in the EIA include sandeel, herring, cod and Atlantic salmon. A full list of the potential impacts, and whether it is proposed they are scoped in or out of full assessment within the EIA are provided in Table 8-4.

8.3.9 Cumulative Impacts

The significance of potential impacts identified during construction the Project to the fish and shellfish species may change when considered cumulatively with other proposed developments. The potential impacts which are identified for consideration in the EIA during construction phase are expected to be of a temporary nature and localised in their extent, therefore there are likely to be limited cumulative effects. However, it is considered the Project and other projects in the vicinity have the potential to impact the fish ecology in the area in a cumulative manner. This will be assessed further within the EIA and is likely to include the potential cumulative impacts of habitat loss and disturbance with a particular focus on seabed dependent species and spawning species and underwater noise.

Developments which are within a certain proximity to the Project will be considered within the cumulative impact assessment. The developments which have the potential to cause cumulative effects on impacts to fish and shellfish receptors include the following:

- The SHE-T Orkney-Caithness interconnector cable (consented);
- Potential OWF Developments in the ScotWind N1 DPO; and
- Pentland Floating Offshore Wind Demonstrator Project (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on the physical environment have the potential to arise from cable installation activities in these areas.

In addition, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on the physical environment if export cables cross the Project Offshore Study Area.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the array. Ultimately the array will have the same number of turbines so there are no cumulative impacts predicted to fish and shellfish as a result of operation of the Demonstrator and array. Because the Demonstrator will be subject to a separate installation campaign and will have a separate export cable to the Project, there is the potential for cumulative impacts on water and sediment quality, however these are assessed to be minor.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

Table 8-4 summarises the potential impacts including potential cumulative impacts.

Table 8-4 Potential Impacts Upon Fish and Shellfish Ecology Receptors during Construction, Operations and Maintenance and Decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scope In/Out
Potential Impacts During Construction		
Disturbance or damage to sensitive species due to underwater noise generated from construction activities	Disturbance to fish populations caused by underwater noise generated during construction (i.e. pin pile drilling) including effects on migratory fish and fish spawning behaviour. This may depend on the number of pin piles required, and the duration and timing of installation activities. Impacts likely to be highly localised.	Scoped in
Direct habitat loss due to disturbance of spawning and nursery grounds during the installation of export cables and placement of anchors on seabed	The Offshore Study Area occupies very small proportions of potential habitat for a number of PMF, commercial or sensitive species. The extent of habitat loss will depend on type of anchors and export cable installation methods. Disturbance may be temporary, and Impacts are likely to be highly localised.	Scoped in
Effects of increased sedimentation / smothering on fish and shellfish during construction activities	Increased sedimentation may lead to smothering of slow moving or sessile species. However, due to the small scale of the Project and the dynamic conditions in the area (including sediment disturbance from swell, tide and fishing activity), any disturbance from construction activity is likely to be highly localized. The findings of the Dounreay Try EIA (2016) indicate that the sediment type in the Offshore Study Area will not lead to high sediment suspension, and that any burial of sensitive species would be minimal. The slight increase in the number of WTGs is not expected to cause a significant increase in suspension of sediments, and therefore the impacts of increased sedimentation due to construction activities is expected to be no more than the assessed impacts in the Dounreay Trì EIA (2016). On this basis this impact has been scoped out of further assessment.	Scoped out
Potential Impacts During Operations and Maintenance		
Habitat loss of spawning and nursery grounds due to presence of anchors and export cable on the seabed	The total footprint of anchors may be relatively small and impacts here not significant, however the Export Cable Corridor could have a greater impact on seabed habitats depending on location (and presence of sensitive habitat), length, whether cable protection is used and the type of material.	Scoped in
Effects of EMFs from subsea and dynamic cables on sensitive species	EMF may impact sensitive species e.g. elasmobranchs and teleost fish (i.e. flat fish, salmonids and gadoids) by altering foraging or migratory behaviour. Magnitude of this impact will depend in part on the burial and cable protection measures which are utilised and are expected to be localized in extent. The export cables design parameters and installation methods are expected to conform to industry standard specifications which includes shielding technology to reduce the direct	Scoped out

Impact	High Level Impact Summary and Justification	Scope In/Out
	emission of EMFs. In addition, the cables will be buried wherever possible. In areas where cable burial cannot be achieved, mechanical protection may be placed which also reduces the emission of EMFs. As a result of these mitigations and based on the findings of the Dounreay Trì EIA (2016), which assessed the impacts of EMF to fish and shellfish species as minor, this impact has been scoped out of further assessment.	
Barrier effects on migratory fish from the presence of the floating platform and associated infrastructure	The small scale and offshore location of the development, enabling passage either side, is unlikely to present a significant barrier to movement for migratory fish. Furthermore, the Offshore Study Area is located at least 17 km from the nearest SAC for migratory salmonids.	Scoped out
Effects of operational noise on sensitive species	Disturbance to migratory fish populations, especially salmon and sea trout, caused by underwater noise generated by 6-10 turbines is not likely to be at significant levels above ambient noise levels in the area. The project is also sufficiently small that underwater noise which is generated during operation and maintenance is not expected to create a barrier effect to migration pathways of fish species through the Pentland Firth. In addition, this area is a heavily used shipping channel and therefore the noise generated during operation and maintenance is not expected to surpass the existing ambient levels. Based on this and the findings of the Dounreay Trì EIA (2016), this impact has been scoped out of further assessment.	Scoped out
Fish aggregation around the floating structure and associated infrastructure	The offshore infrastructure may act as a fish aggregation device (FAD), providing refuge for some species and also habitat for some shellfish and benthic species, whilst also potentially attracting larger predators which could indirectly increase entanglement or collision risk for both fish and marine mammal species. Note this impact has been considered in section 8.4 with reference to basking shark. Based on the findings of Dounreay Trì EIA (2016), although relatively little is known about how FADs work, it is unlikely that the array will cause a large aggregation of fish. The magnitude of this impact is considered to be low and the vulnerability of the receptor is low. Hence it is unlikely that this will have a significant effect on local fish populations. The significance of this impact is considered to be minor. Therefore, the impact has been scoped out.	Scoped out
Ghost fishing due to lost fishing gear becoming entangled in installed infrastructure	Potential for lost gear to become entangled with project infrastructure leading to ghost fishing, and therefore an impact to fish and shellfish species. The potential for this to occur and the significance of the impact to fish and shellfish species will be linked with the associated impact in the commercial fisheries chapter of the EIA (see section 9.2.8)	Scoped in

Impact	High Level Impact Summary and Justification	Scope In/Out
Potential impacts during decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase.		As construction
Potential cumulative impacts		
It is considered feasible that there may be cumulative impacts arising from the interaction of the Offshore Study Area with future wind farm developments associated with the ScotWind N1 Draft Plan Option area, Orkney-Caithness Interconnector and the proposed Pentland Floating Offshore Wind Demonstrator.		Scoped in

8.3.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 8-5 These methods will be used alongside input from the relevant guidance as identified in Section 8.3.2.

Table 8-5 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Disturbance or damage to sensitive species due to underwater noise generated from construction activities	Benthic and geophysical surveys undertaken in 2021.	Existing research and data are considered to be sufficient to inform the assessment, with the addition of the IBTS data on fish and shellfish species which are recorded along with Project specific surveys carried out during site investigations and benthic grab sampling. A desk based assessment will be based on the most recent available data on spawning and nursery grounds and migratory behaviour of sensitive species. Seabed images collected in the area will also be reviewed to determine the suitability of the sediments present as spawning and nursery grounds.
Direct habitat loss due to disturbance of spawning and nursery grounds during the installation of export cables and placement of anchors on seabed	Benthic and geophysical surveys undertaken in 2021.	Existing research and data are considered to be sufficient to inform the assessment, with the addition of the IBTS data on fish and shellfish species which are recorded along with Project specific surveys carried out during site investigations and benthic grab sampling. A desk based assessment will be based on the most recent available data on spawning and nursery grounds and migratory behaviour of sensitive species. Seabed images collected in the area will also be reviewed to determine the suitability of the sediments present as spawning and nursery grounds.

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Habitat loss of spawning and nursery grounds due to presence of anchors and export cable on the seabed	Benthic and geophysical surveys undertaken in 2021.	Existing research and data are considered to be sufficient to inform the assessment, with the addition of the IBTS data on fish and shellfish species which are recorded along with Project specific surveys carried out during site investigations and benthic grab sampling. A desk based assessment will be based on the most recent available data on spawning and nursery grounds and migratory behaviour of sensitive species. Seabed images collected in the area will also be reviewed to determine the suitability of the sediments present as spawning and nursery grounds.
Ghost fishing due to lost fishing gear becoming entangled in installed infrastructure	Benthic and geophysical surveys undertaken in 2021.	Existing research and data are considered to be sufficient to inform the assessment, with the addition of the IBTS data on fish and shellfish species which are recorded along with Project specific surveys carried out during site investigations and benthic grab sampling. A desk based assessment will be based on the most recent available data on spawning and nursery grounds and migratory behaviour of sensitive species. Seabed images collected in the area will also be reviewed to determine the suitability of the sediments present as spawning and nursery grounds.
Cumulative impacts	No surveys identified.	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to understand timelines and potential cumulative impacts.

8.3.11 Conclusions and Next Steps

An assessment of potential impacts and potential cumulative impacts will be completed within the EIA Report. Potential impacts relate to disturbance or damage to sensitive species due to underwater noise, habitat loss due to disturbance of spawning and nursery grounds, ghost fishing due to lost fishing gear becoming entangled in installed infrastructure and potential cumulative impacts associated with nearby future developments have been scoped in for the assessment within the EIA Report. These potential impacts to fish and shellfish species have therefore been scoped into the assessment and will be considered in the EIA phase.

8.4 Marine Mammals and Other Megafauna

8.4.1 Introduction

This section of the Scoping Report considers marine mammals (cetaceans and pinnipeds) and basking sharks, which may be affected by the Project through the same or similar impact pathways. The marine megafauna considered in this section are large, highly mobile, and sometimes migratory, species which occupy the coastal and neritic waters of Scotland.

This section concentrates only on those species which are known or are likely to occur in the WTG site and Export Cable Corridor —collectively 'the Offshore Study Area'—and within the Pentland Firth and

Orkney Waters (PFOW). Records of sea turtles are sparse in the UK, with leatherback turtles (*Dermochely coriacea*) as the most commonly sighted species (NBN Atlas, 2020). Sea turtle sightings in Scotland are mostly limited to the southwest coast, as individuals generally occupy the Irish Sea and Northeast Atlantic Ocean during their long-distance migrations (Baxter *et al.,* 2011). According to the National Biodiversity Network (NBN) Atlas, the largest repository of UK biodiversity data, there are no confirmed sea turtle sightings along the north coast of Scotland (NBN Atlas, 2020). Due to the remote likelihood of encountering sea turtles within the Option Area, this taxon has not been included as 'other megafauna' and is not considered further within this Scoping Report.

This section will provide an overview of the baseline environment for cetaceans, pinnipeds, and basking sharks within the Option Area to identify the key sensitivities and potential impacts which should be assessed within the EIA. It will also provide a summary of the relevant UK guidance, legislation and details of the methodology which will be applied during the EIA phase.

It should be noted that a shadow HRA will be undertaken alongside the EIA for the proposed Project. The HRA will consider relevant European designated sites.

8.4.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on marine mammals and other megafauna:

Legislation

> Wildlife & Countryside Act 1981 ('WCA');

> Nature Conservation (Scotland) Act 2004;

> Priority Marine Features (PMFs), as described in NatureScot Commissioned Report 388;

Strategy

> The UK Post-2010 Biodiversity Framework and the Scottish Biodiversity Strategy, including the 2020 Challenge for Scotland's Biodiversity; and

> Scottish Marine Wildlife Watching Code (NatureScot, 2017).

Guidance

> The protection of Marine European Protected Species from injury and disturbance: Guidance for Inshore Waters (July 2020 Version) (Marine Scotland, 2020);

> Joint Nature Conservation Committee (JNCC) guidelines for minimising the risk of injury to marine mammals from geophysical surveys (seismic survey guidelines) (JNCC, 2017);

> Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010);

> Guidance on the Offence of Harassment at Seal Haul-out Sites (Marine Scotland, 2014);

> Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010); and

> The Basking Shark Code of Conduct (Marine Conservation Society, n.d.).

8.4.3 Available information

During the EIA, a review of any relevant guidance documents, industry reports and publicly available data and literature will be undertaken to investigate the existing baseline for marine mammals and other megafauna.

Key resources to be drawn on in the EIA phase include:

- Site-specific surveys in 2015 for the Dounreay Trì Project
    - Site-specific surveys in 2015 and 2016 for the Highlands and Islands Dounreay Demonstration Centre Project, 0.5 km west of the Project;
- A Framework for Studying the Effects of Offshore Wind Development on Marine Mammals and Turtles (Kraus *et al.*, 2019);
- Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters (Hague *et al.*, 2020), focussing on the baseline information provided for the N1 offshore wind Draft Plan Option (DPO), which lies approximately 12 km north of the Project.
- The SCANS I, II and III projects, with a focus on the data presented in the most recent survey report (SCANS-III; Hammond *et al.*, 2017);
- Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters (Evans *et al.*, 2011);
- Scientific Advice on Matters Related to the Management of Seal Populations (SCOS, 2019);
- Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters (Evans *et al.*, 2011);
- Basking sharks in the northeast Atlantic: Spatio-temporal trends from sightings in UK waters (Witt *et al.*, 2012);
- Management Units for cetaceans in UK waters (IAMMWG, 2015);
- Estimated at-sea Distribution of Grey and Harbour Seals (Russell *et al.*, 2017);
- Harbour porpoise responses to pile-driving diminish over time (Graham *et al.*, 2019); and
- Avoidance of wind farms by harbour seals is limited to pile driving activities (Russell *et al.*, 2016).

8.4.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore biological environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the Project.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to marine mammal and other megafauna have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

8.4.5 Study Area

The study area comprises the Marine Licence area with a 2 km buffer in all directions. It sits within the Pentland Firth and Orkney Waters marine region (Evans *et al.,* 2011) which has been used to spatially define habitat use by marine mammals and basking sharks. The study area also comprises Block S of the SCANS-III survey data used to characterise density and abundance of cetaceans in UK and

Northern European waters (Hammond *et al.*, 2017). However, management units for the populations of cetaceans utilising this study area are on a broader, species-specific scale. The study area overlaps the North Coast and Orkney harbour and grey seal population area, based on the most recent annual population productivity reports for these species (SCOS, 2019). Management units have yet to be defined for basking sharks.

8.4.6 Surveys and Studies Carried Out to Date

Site-specific aerial surveys were undertaken in 2016 for the Dounreay Trì Project. Thirteen baseline aerial surveys were conducted at the Dounreay Trì Floating Wind Demonstration Project Site from January to December 2015 to collect data on marine mammals and birds.

8.4.6.1 Dounreay Trì Site-Specific Surveys

Thirty marine mammals were recorded, including 24 individuals identified to species level (four species) and 6 individuals recorded as unidentified species. White-beaked dolphins were the most commonly recorded species, particularly in the winter months, with the highest densities being observed in February. All other species were recorded in low densities within the survey area. Table 8-6 lists the species recorded during the site-specific surveys.

Table 8-6 Marine Mammal Species Recorded in the Study Area during Aerial Surveys

Species	No. Detected in Study Area*
Grey seal (*Halichoerus grypus*)	3
Harbour porpoise (*Phocoena phocoena*)	3
White-beaked dolphin (*Lagenorhynchus albirostris*)	15
Risso's dolphin (*Grampus griseus*)	3
Seal species (unidentified species)	2
Seal/small cetacean species (unidentified species)	4

** Source: Dounreay Trì Limited aerial survey results, January to December 2015.*

8.4.6.2 Cetaceans

Thirteen species of cetacean are expected to be present within the PFOW region (Hague *et al.,* 2020; Evans *et al.,* 2011). The following cetacean species are known to frequent or seasonally visit the waters of the north coast of Scotland: harbour porpoise; bottlenose dolphin; short-beaked common dolphin (*Delphinus delphis*); white-beaked dolphin; Atlantic white-sided dolphin (*Lagenorhynchus acutus*); Risso's dolphin; long-finned pilot whale (*Globicephala melas*); killer whale (*Orcinus orca*); minke whale (*Balaenoptera acutorostrata*) and beaked whale (*Ziphiidae* spp.) (Evans *et al.,* 2011; Hammond *et al.*, 2017; Hague *et al.*, 2020). Of these species, it is expected that harbour porpoise, white-beaked dolphin, bottlenose dolphin, Risso's dolphin, and minke whale occur with the most frequency in the Offshore Study Area and its surrounding waters based on survey data and available published abundance and distribution data (Evans *et al.*, 2011; Hague *et al.,* 2020). There are no protected sites with cetacean qualifying features within 100 km of the Offshore Study Area.

White-beaked dolphin

White-beaked dolphin are common in Northern European continental shelf seas from Iceland and Norway south to Ireland and Southwest England, including the northern and central North Sea. White-beaked dolphin have an estimated density within Block S of the SCANS III survey, within which the project resides, of 0.021 animals/ km^2, which is considered moderate compared to the rest of the UKCS (Hammond *et al.*, 2017). However, it is expected that densities within the Project area may be higher than this, given the high predicted densities for this species immediately North and west of the Project (Hague *et al.*, 2020; Waggit *et al.,* 2020).

It is expected that white-beaked dolphin will be present within the region year-round with peak densities occurring between June and October. The north of Scotland is used both for feeding and breeding by white-beaked dolphin, primarily between May and August, when this species may be most sensitive to disturbance (Evans *et al.,* 2011).

Harbour Porpoise

Harbour porpoise are the most abundant cetacean species in UK waters and are generally observed in small groups of one to three individuals (Reid *et al.,* 2003). The density of harbour porpoise within Block S of the SCANS III survey was approximately 0.152 animals/km^2, which is average in the context of the wider United Kingdom Continental Shelf (UKCS) region (Hammond *et al.*, 2017). According to density modelling data (combining SCANS-III density data with environmental predictive factors), it is predicted that harbour porpoise densities within the Project area will be low, with higher densities occurring in deeper offshore waters to the north and west of the Project (Hague *et al.*, 2020; Hammond *et al.,* 2017). Nevertheless, this species has also been sighted within bays along the North Caithness coast (Evans *et al.,* 2011).

This species is present in UK waters year-round with peak densities occurring in the summer months (Evans *et al.*, 2011). In addition, the peak calving period for harbour porpoises in Scottish waters is between April and June, indicating a possible increased sensitivity to any potential disturbance during this time.

Bottlenose dolphin

Bottlenose dolphins are less common in Scottish offshore waters than inshore waters. Small resident or semi-resident populations occupy a few scattered coastal localities throughout Scotland, with a large resident population in the inner Moray Firth and the Forth of Tay, and a smaller resident population in the Inner Hebrides, centred around Skye, Barra, the Small Isles and Mull (Cheney *et al.,* 2013; Hague *et al.*, 2020). Densities of bottlenose dolphin along the North coast of Scotland are expected to be lower than the West and East coast and densities within Block S of the SCANS-III survey were approximately 0.004 animals/ km^2, which is low to average for the region (Hammond *et al.*, 2017; Hague *et al.,* 2020). Bottlenose dolphins have been shown to prefer coastal habitats (20 – 50 m depths), with densities highest around bays, estuaries or sandbanks (Evans *et al.,* 2011). Concentrations of sightings of this species have occurred in Thurso bay, south of the Project area (Evans *et al.*, 2011).

This species is present in UK waters year-round, although peak densities are expected to occur between May and September, with a breeding season between May and October when individuals may be particularly sensitive (Evans *et al.*, 2011).

Minke whale

Minke whale are the smallest, most prevalent baleen whales to occur in Scottish waters. They feed mainly in shallower waters over the continental shelf and regularly appear around shelf banks and mounds, or near fronts where zooplankton and fish are concentrated at the surface (Reid *et al.,* 2003). They are also commonly seen in the strong currents around headlands and small islands, where they can come close to land, even entering estuaries, bays and inlets. Minke whale density within Block S of the SCANS -III survey is considered to be moderate in comparison to the rest of the UKCS, with an estimate 0.010 animals/km^2 (Hammond *et al.*, 2017). However, density modelling data suggests densities along the north coast of Scotland are higher than this, particularly along the North coastline of Caithness where the Project resides (Hammond *et al.,* 2017; Hague *et al.,* 2020).

This species shows a large seasonal variation with much lower densities in the winter months, likely driven by variations in sea surface temperature and chlorophyll concentrations (Hague *et al.*, 2020). Breeding locations of this species are currently unknown.

Risso's dolphin

Risso's dolphin are present in low numbers in UK waters (Reid *et al.,* 2003). However, the north west coast of Scotland is of particular importance for this species (Hague *et al*., 2020). Risso's dolphin were not observed in Block S during the SCANS-III surveys, however, moderate to high densities of this species was observed in Blocks K and J which lie west of the Project area (Hammond *et al.,* 2017). Moreover, recent density predictions for this species suggest moderate densities of Risso's dolphin across the North coast of Scotland (Waggit *et al.,* 2020). This species favours the deeper waters of the continental shelf (< 200 m deep), with lower densities occurring in coastal areas (Evans *et al.,* 2011; Hague *et al*., 2020).

This species is present along the north coast of Scotland year-round, with peak densities occurring during summer months (Waggit *et al*., 2020). The waters around the north coast of Scotland are used primarily for feeding, however, breeding may occur also (Evans *et al.,* 2011). The breeding and calving season is believed to span from spring to early summer (Baines & Evans, 2009).

Other cetacean species

Other cetacean species, such as short-beaked common dolphin, Atlantic white-sided dolphin, long-finned pilot whale, killer whale and beaked whale species (*Ziphiidae* spp.), are encountered intermittently throughout the year along the north coast of Scotland, with no obvious spatial or temporal patterns in abundance or distribution (Reid *et al*., 2003; Evans *et al.,* 2011; Hague *et al*., 2020).

8.4.6.3 Pinnipeds

Two species of pinniped regularly occur in the Scottish offshore and coastal environment: grey seals and harbour seals (*Phoca vitulina)*. Scotland supports the greatest numbers of seals within the UK, providing habitat to approximately 85% of the grey seals and 80% of the harbour seals therein (SCOS, 2019). Northern Scotland remains a stronghold for both species, despite declines in harbour seal numbers across the north-east and in the Northern Isles in recent decades (SCOS, 2019). The Faray and Holm of Faray SAC and Sanday SAC, located approximately 80 km NW of the Offshore Study Area in the northernmost Orkney Isles, have been designated for the protection of grey and harbour seals, respectively. Nearer to the Study Area lie several designated seal haul outs which are prevalent along the tortuous coastline of the PFOW region (Figure 8-6). Seal haul outs are terrestrial sites designated for the protection of seals during vulnerable haulout periods, such as breeding and pupping. The extent of these protections is limited to those seals on shore at the haul-out. Given the distance from the nearest designated seal haul out is over 25 km (Figure 8-6), there is considered to be no potential for interactions with any seals as protected features of designated sites or haul outs.

Grey and harbour seals forage in the coastal and shelf waters, with their movement patterns largely dependent upon the seasonal distribution of their prey species. Both species tend to remain concentrated close to shore, particularly during the pupping seasons which occur from May to July for harbour seals and September to December for grey seals (Marine Scotland, 2014). Grey seals have greater maximum foraging ranges than do harbour seals and may travel over a hundred kilometres to optimum foraging habitat whilst harbour seals generally remain within 50 km of their selected haul-out sites (SCOS, 2019).

At-sea usage by grey seals in the immediate area surrounding the Offshore Study Area is low (Figure 8-6) and increases with proximity to Orkney, which supports the greatest concentration of designated haul-outs for this species. Telemetry data illustrates the importance of the Orkney isles as the superlative hotspot for grey seals in northern Scotland, with this continuous region of elevated habitat use extending southward toward the outer Moray Firth (Russell et al., 2017).

At sea usage by harbour seals is also low in the immediate area surrounding the Project, with higher usage occurring near the coast to the west and east of the Offshore Study Area (Figure 8-6). These areas support several harbour seal haul-outs of varying extents. A similar spatial distribution is apparent from available harbour seal telemetry data, with reductions in habitat use within the Offshore Study Area, surrounded by regions of higher use (Russell *et al.,* 2017).

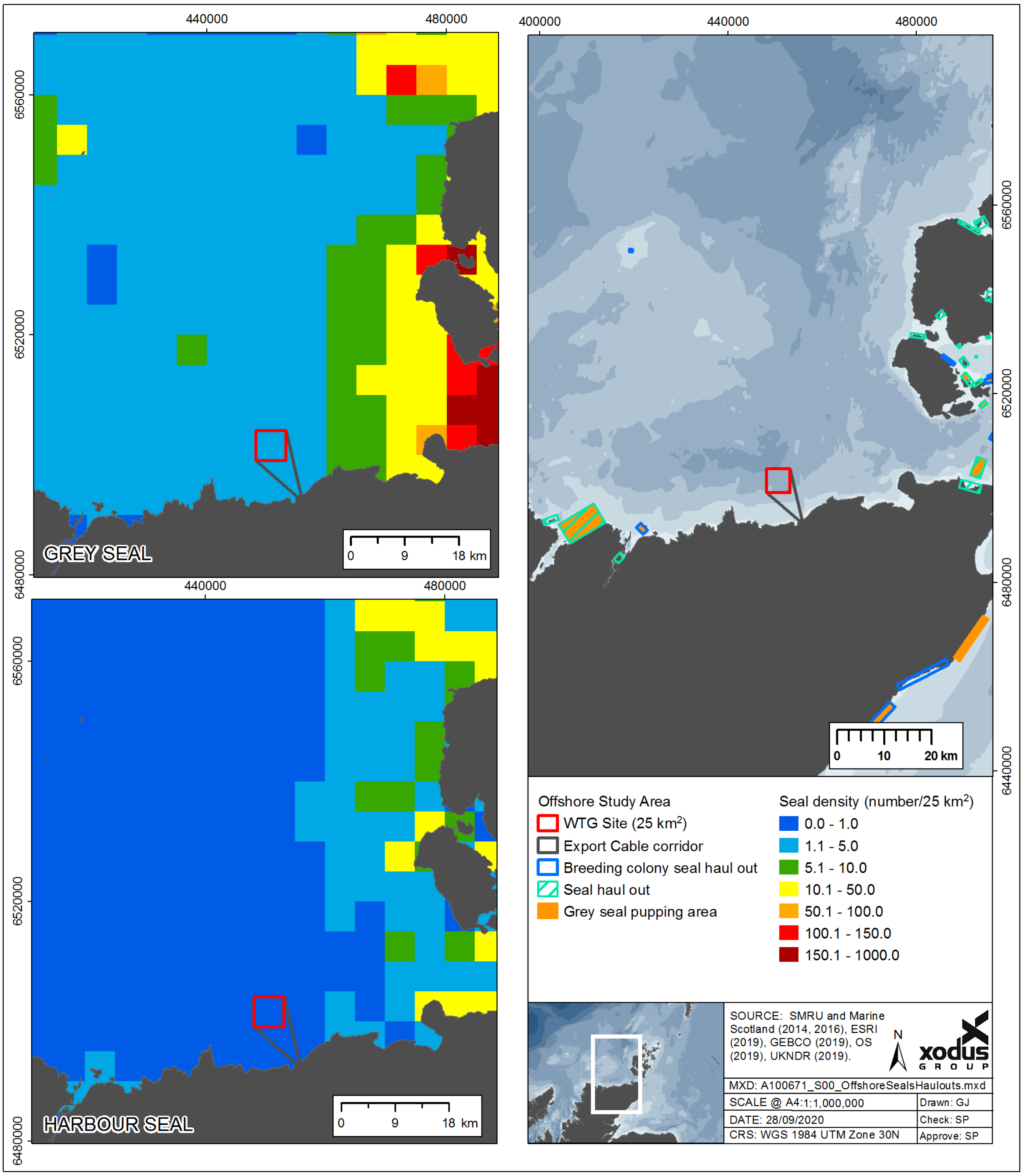


Figure 8-6 **Seal Densities for Harbour and Grey Seal and Seal Haul Outs in the vicinity of the Offshore Study Area**

8.4.6.4 Basking Sharks

Basking sharks were hunted in Scotland until 1995 but are now protected under Schedule 5 of the Wildlife and Countryside Act 1981 and the Nature Conservation (Scotland) Act 2004. They occupy cold and temperate waters and feed predominately on plankton and zooplankton (e.g. barnacle larvae, copepods, fish eggs and deep-water oceanic shrimps) by passively filtering large volumes of water through their open mouths. Individuals typically move very slowly (around 1.8 ms^{-1}) in a generally direct swimming pattern (HWDT, n.d.).

Basking sharks seasonally visit Scottish coastlines in the spring and leave come autumn. In the summer, basking sharks spend the majority of time near the surface, where they appear to be basking whilst feeding on plankton. Summer also functions as a potential breeding season for the species, with aggregations of individuals peaking in July and August. They are mainly found around the western isles of Scotland, but at certain times can be found in the Northern Isles or along the east coast as an occasional visitor (Evans *et al.*, 2011; Witt *et al.,* 2012).

8.4.7 Identification of Potential Impacts

Given the important conservation status granted to cetaceans, the impact assessment presented within the EIA will draw upon information presented both in the wider EIA (i.e. protected sites, physical and biological environment, etc.) as well as the HRA Screening Report. It should be noted that there is potential for mobile species to move between protected sites and the wider area and, as such, individuals associated with protected sites may be present within or in close proximity to the Offshore Study Area.

At present, the key species anticipated to be considered within the EIA for marine mammals are white-beaked dolphin, harbour porpoise, bottlenose dolphin, minke whale, harbour seals and grey seals, however this may be refined following the completion of the bird and marine mammal surveys in 2021. Other species of cetacean will be included within the EIA, at a level proportional to their occurrence in the Offshore Study Area and to their corresponding sensitivity to the identified impact pathways.

It has previously been stated that gravity anchors are the preferred method of mooring for the WTGs, but pin piling has not been ruled out as an option. Such pile foundations are installed by drilling, which generates lower amplitude underwater noise than impact or vibratory pile driving (Aquatera, 2011).

The JNCC have stated, "*the installation of driven piles in the marine environment without mitigation is likely to produce noise levels capable of causing injury and disturbance to marine mammals*" (JNCC, 2010). They continue by highlighting that "*pile driving is also likely to cause injury (e.g. hearing impairment) and there remains the possibility of causing death in marine mammals that are in very close proximity*" (JNCC, 2010). Whilst pin piling is not anticipated to generate noise levels analogous to those produced during the pile driving of fixed wind turbine foundations, there remains the potential for impacts to hearing sensitive marine species from the installation of piled foundations which must be considered.

8.4.8 Cumulative Impacts

As mentioned previously, the potential impact as a result of the accumulation of individual smaller impacts is present. Independently, the Project is likely to have a minor impact to underwater noise levels. But cumulatively, if works on neighbouring projects were to coincide in terms of deployment timelines then this increases the possibility of potential impact on local receptors. Given the wide ranging nature and sensitivity of marine mammals to noise, the area considered for cumulative impacts will tend to be larger than for other receptors. At this early stage, indicative projects to be included within the cumulative impact assessment are presented within Section 6.3, Table 6-1. A detailed list of the projects which are considered to have the potential for cumulative impacts on marine mammals and other megafauna receptors will be provided and assessed at the EIA stage.

Table 8-7 presents the key issues for marine mammal and basking sharks which may arise from the construction, operation or decommissioning of the Project. Offshore noise impacts to basking sharks will be covered along with other fish species in the EIA, as described in Section 7.3: Fish and Shellfish Ecology.

Table 8-7 Summary of the Potential Impacts on Marine Mammals and Basking Sharks during Construction, Operation and Decommissioning of the Proposed Project

Potential Impact	Scoping Justification	Scoped In/Out
Potential Impacts During Construction		
Noise-related impacts to marine mammals associated with construction noise, including the risk of physiological impacts, barrier effects and displacement	The Project may require pin-piled anchors as a part of the mooring systems of the WTGs. This activity would constitute the greatest noise source associated with construction. Piling noise can have important impacts on marine mammal habitat use and distribution, with the evidence base suggesting that mitigation ensures such impacts are generally limited to short term and temporary displacement or disturbance effects. Regardless, impacts related to disturbance of EPS and other protected species, as well as those associated with protected sites, requires further consideration.	Scoped in
Indirect impacts of construction noise on the prey species of marine mammals	As per Section 8.3: Fish and Shellfish.	Scoped in
Disturbance due to the physical presence of vessels	The potential for the physical presence of installation vessels to generate a disturbance response in EPS or other protected species is considered negligible, given the high levels of shipping activity which characterise the baseline environment in the PFOW. Given the importance of the PFOW region to passenger, cargo and other vessel activities, the addition of a small number of vessels during the construction phase of the project is considered negligible.	Scoped out
Risk of injury resulting from collision of marine mammals and basking sharks with installation vessels	Increased localised vessel traffic as a result of construction within the Offshore Study Area is not expected to increase collision risk to marine mammals or basking sharks. Vessel movements will be managed to preclude any negative impacts to navigation in other sea users, which have positive effects on minimising potential impacts to other large marine receptors. Vessel activities will fall within standard (e.g. transit) speeds and will follow prescribed routes (i.e. non-random movement), thereby reducing the possibility of collision. Furthermore, vessel sizes will remain small relative to the large cargo vessels which are known to have the greatest potential for collision related injury or mortality to large marine species. Highland Wind Limited will consider the implementation of additional mitigations to further reduce any potential collision events, including: maintaining manned bridges, training vessel crew in the Scottish Marine Wildlife Watching Code and following the relevant (i.e. activity-specific) JNCC guidance for minimising the risks of injury to marine mammals during construction, which may include use of a marine mammal observer.	Scoped out

Potential Impact	Scoping Justification	Scoped In/Out
Impacts associated with effects upon marine water quality, particularly due to any disturbed sediments affecting turbidity.	Cable laying activities, particularly those associated with the installation of the export cable, comprise the primary pathway which may influence water quality through disturbed sediments. Changes in turbidity due to cable laying are short-lived, with resettlement taking place within hours or days. Cetaceans, pinnipeds and basking sharks regularly occupy waters with varying levels of turbidity, including exceptionally murky tidal waters, for extended periods without any important impacts to their biology or behaviour. Marine mammals have adapted to utilise other sense organs as their primary sensory modality in their marine environment, with pinnipeds using tactile information via their vibrissae (whiskers) and cetaceans using sound (including echolocation) to successfully survive in the ocean. Similarly, basking sharks are known to occupy very deep, dark waters for months at a time, employing their electro-sensory organs in place of visual cues. For these reasons, highly localised and temporary changes in water quality from sediment disturbance will not generate important impacts to marine mammals or basking sharks.	Scoped out
Potential Impacts During Operation		
Risk of injury resulting from entanglement of marine mammals or basking sharks with mooring lines or cables, including secondary interactions with derelict fishing gears, or entrapment with mooring systems.	The potential environmental impacts associated with floating marine renewable energy device mooring systems remain poorly understood. It is thought that the introduction of mooring systems with static or dynamic lines or cables may present hazards to larger marine species which have the potential to become entangled within or between the lines. However, identifying the likelihood of such an interaction is made difficult by the lack of evidence in the offshore energy sector and entanglement data from the commercial fisheries sector is generally modelled as a surrogate to characterise risk levels. The highest entanglement risk is thought to be generated by mooring systems with catenary configurations. These are freely hanging mooring lines or cables which have one part lying on the seabed and a dynamic portion in the water column with a relatively large swept area. Whilst existing modelling predicts that mooring lines are a low risk for marine animals, baleen whales and basking sharks were found to be at greater risk of entanglement with lines, particularly synthetic lines, because of their size and feeding behaviours (Benjamins *et al.* 2014). As the WTGs will employ dynamic interarray cables in a catenary “lazy-s” configuration, further consideration of potential entanglement risk to marine megafauna is recommended and should consider the potential for secondary interactions with derelict gears from surrounding commercial fisheries operations.	Scoped in

Potential Impact	Scoping Justification	Scoped In/Out
Risk of injury resulting from collision of marine mammals or basking sharks with WTG foundations	As the floating substructure is yet to be defined, various configurations are considered for their potential to introduce potential collision risk to marine megafauna. Those designs with the greatest total submerged volumes, such as the semi-submersible and SPAR designs, are more likely to generate potential collision risk to marine mammals and basking sharks which may interact with dynamic infrastructure below the surface. It is less likely that animals will collide with the infrastructure at the surface, however collision risk with floating structures is poorly characterised and is likely to change as new technologies emerge. Further consideration of the potential risks to marine megafauna from collision with the foundations of floating WTGs is recommended.	Scoped in
Impacts of operational noise	The evidence base suggests that the level of operational noise is significantly less than construction noise and detectable only at short ranges from each WTG. Given an individual would need to approach the WTG to experience operational noise, this is not considered a pathway for disturbance impacts, including displacement or barrier effects, due to underwater noise.	Scoped out
Displacement or barrier effects resulting from the physical presence of devices and infrastructure	The addition of infrastructure in the marine environment can deter individuals from occupying those areas, potentially leading to exclusions from important habitats or barrier effects to movement. Whilst this impact pathway is poorly characterised for offshore floating renewable energy projects, some evidence from monitoring studies at existing wind farms may help to inform the issue. This impact pathway will require further consideration.	Scoped in
Disturbance due to the physical presence of vessels	Per construction phase.	Scoped out
Risk of injury resulting from collision of marine mammals and basking sharks with operations and maintenance vessels	Per construction phase.	Scoped out

Potential Impact	Scoping Justification	Scoped In/Out
Risk associated with electromagnetic fields (EMFs) associated with subsea cabling	Subsea cables emit EMFs along their lengths, with high-voltage AC or DC export cables emitting the greatest EMFs. Research on the potential effects of EMFs on sensitive marine species have focused on behavioural and physiological effects of exposure in field and laboratory settings. However, the mechanism for detection of electric or magnetic fields remains poorly understood in the majority of species. Results have shown that, even for some of the most sensitive species – a group which includes elasmobranchs (e.g. basking sharks) - none of the evidence indicates that crossing EMFs at levels typical of power cables used in marine renewable developments have the potential to cause significant impacts to individuals or populations (OES, 2020). Moreover, the location of the export and array cables precludes potential barrier effects to travel for basking sharks, which generally occur in the Offshore Study Area in low to very low numbers on occasion. For these reasons, it is considered that there is no potential pathway for significant impacts resulting from the operations of subsea cabling as a part of the Project and this disturbance will not generate important impacts to marine mammals or basking sharks.	Scoped out
Impacts associated with effects upon marine water quality due to any accidental release of pollutants.	Accidental release of pollutants are limited to oils and fluids contained within the WTGs, the majority of which are characterised by water / glycol (21.8%) and nitrogen (65.4%), which are organic substances. The remaining 12.8% of the fluid constituents are oils and grease, which total to 7,050 L for a 10 MW turbine and 11,283 L for a 16 MW turbine. This is an exceptionally small volume which would take up less volume than the equivalent 7.1 or 11.3 m3 of water due to the reduced density of hydrocarbons and lubricants. As the potential for a full inventory release from any individual turbine is considered extremely remote, requiring a catastrophic unplanned event (e.g. vessel collision with WTG), it is considered that potentially a slow leak of fluids is the only mode of release during ongoing operations. However, the subsequent slow release volume would be so small as to be undetectable, becoming rapidly dispersed in the energetic waters comprising the PCOW. This rapid dispersal limits the potential for any important interactions between marine megafauna and pollutants, such as ingestion, consumption or exposure of the dermal or soft tissues. Any fault in the machinery which could compromise a WTG and cause such an accidental release would be remedied with expediency as a matter of utmost importance by mobilised personnel. For these reasons impacts to marine megafauna from any accidental release of pollutants are not considered further.	Scoped out
Long term habitat change, including the potential for change in foraging opportunities	As per Section 8.2: Benthic Ecology, Section 8.3: Fish and Shellfish, and Section 9.2: Commercial Fisheries.	Scoped in

Potential Impact	Scoping Justification	Scoped In/Out
Potential Effects During Decommissioning		
Potential impacts arising from decommissioning phase are expected to be similar to those arising during the construction phase and would be temporary and of short duration.		As construction
Potential Cumulative Impacts		
Construction noise	The main sources of noise considered in project-specific cumulative impact assessments are pin-piling, with cumulative effects with construction and vessel noise associated with surrounding projects and commercial shipping activities.	Scoped in
Displacement or barrier effects resulting from the physical presence of devices and infrastructure	The addition of infrastructure in the marine environment has the potential to deter individuals, potentially leading to exclusion from an area. However, this largely depends on the aversive/evasive behavioural response characteristic of the individual or its species, and the extent of the change in movement on general habitat use. Evidence from floating marine energy projects indicates that, if there is clear passage between devices or around an array, such developments do not typically create barrier effects. However, the physical presence of the Project, in conjunction with neighbouring developments, have the potential to modify broader-scale habitat use for some marine mammal species, and this will require further investigation.	Scoped in
Long term habitat change, including the potential for change in foraging opportunities	As per Section 8.2: Benthic Ecology, Section 8.3: Fish and Shellfish, and Section 9.2: Commercial Fisheries.	Scoped in
Potential Inter-Related Impacts		
The inter-relationships between relevant receptors will be considered in the ES where potential pathways exist between topic areas. The key inter-relationships during the construction and operation of the Project that will be considered in the ES for marine mammals and basking sharks are benthic and fish ecology, commercial fisheries, and designated sites.		

8.4.9 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 8-8. These methods will be used alongside input from the relevant guidance as identified in Section 8.4.2.

Table 8-8 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Noise-related impacts to marine mammals associated with construction noise, including the risk of physiological impacts, barrier effects and displacement	12 months of aerial surveys which commenced in September 2020 and will end in August 2021	The assessment of impacts arising from the Project on marine mammals and basking sharks will utilise Project-specific and publicly available data and will be augmented by consultation during the EIA phase. Impacts will be assessed at individual and population levels, with consideration of potential impacts to biogeographical populations and/or management units, where available. The impact

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Indirect impacts of construction noise on the prey species of marine mammals		assessment will draw on species-specific sensitivities to offshore wind farms, as identified during a desk-based data gathering exercise. The assessment of potential impacts of underwater noise on marine mammals will involve simulating the source pressure level and frequency ranges of the Project activities, within the conditions of the surrounding environment, to identify how noise will propagate through the water column. Installation of piles associated with the foundation mooring systems are likely to form the greatest potential noise source for the Project. Depending on the sediment type, drilled piles may be employed in which a pile or ground anchor is drilled into the seabed using a subsea drill rig. In the absence of measured data on drilled pile installation, noise modelling will be employed to characterise the received levels for the sensitive marine receptors under consideration in which potentially significant impacts have been identified (i.e. potential for injury or significant disturbance). This modelled data will then be combined with the functional hearing ranges of sensitive marine receptors, as well as the potential auditory thresholds for disturbance and injury (as detailed in Southall et al., 2007; Southall et al., 2019 and NMFS, 2014) to identify the potential disturbance and injury ranges surrounding the Project activities
Risk of injury resulting from entanglement of marine mammals or basking sharks with mooring lines or cables, including secondary interactions with derelict fishing gears, or entrapment with mooring systems.	12 months of aerial surveys which commenced in September 2020 and will end in August 2021	The assessment of impacts arising from the Project on marine mammals and basking sharks will utilise Project-specific and publicly available data and will be augmented by consultation during the EIA phase. Impacts will be assessed at individual and population levels, with consideration of potential impacts to biogeographical populations and/or management units, where available. The impact assessment will draw on species-specific sensitivities to offshore wind farms, as identified during a desk-based data gathering exercise. Estimates of the occurrence and, in particular, the density, of marine mammals and basking sharks remains poorly characterised for the Offshore Study Area. Site-specific marine mammals and basking shark data will be required to conduct the impact assessment for the Project and Export Cable Corridor. This data gap will be initially addressed by conducting a desk-based review of the existing available information defined in Section 8.4.3 and will be complemented by an aerial survey, which is planned for April – August 2021. Potential impacts resulting from underwater noise, entanglement risk, collision risk, displacement or barrier effects, and long-term habitat change are unlikely to require additional modelling data. These will primarily be assessed using the baseline environment data to conduct a desk-based
Risk of injury resulting from collision of marine mammals or basking sharks with WTG foundations	12 months of aerial surveys which commenced in September 2020 and will end in August 2021	
Displacement or barrier effects resulting from the physical presence of devices and infrastructure	12 months of aerial surveys which commenced in September 2020 and will end in August 2021	
Long term habitat change, including the potential for change in foraging opportunities	12 months of aerial surveys which commenced in September 2020 and will end in August 2021	

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
		assessment of potential impacts, drawing on species specific knowledge on the sensitivities to offshore wind farm impacts. It is proposed that the evidence-base for the impact assessment will likely utilise industry guidance documents, post-consent monitoring data and scientific literature. It is standard industry practice to adopt a series of marine mammal mitigation measures during construction, which can include the use of marine mammal observers, passive acoustic monitoring (PAM), soft start to piling etc. Mitigation measures will be identified during the formal EIA process, and will be informed through the assessment process itself in consultation with stakeholders.
Cumulative Impacts	None identified	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

8.4.10 Conclusions and Next Steps

An assessment of potential impacts and potential cumulative impacts will be completed within the EIA Report. Potential impacts relate to disturbance or injury of marine mammals due to underwater noise, indirect impacts of underwater noise on prey species, entanglement with mooring lines and secondary entanglement with derelict fishing gears, collision risk with floating WTG foundations, barrier effects from the physical presence of devices and infrastructure, and potential cumulative impacts associated with nearby future developments have been scoped in for the assessment within the EIA Report. These potential impacts to marine mammals and basking sharks have therefore been scoped into the assessment and will be considered in the EIA phase.

8.5 Ornithology

8.5.1 Introduction

This section considers the potential impacts to species of birds from the construction, operation and decommissioning of the Project. The section concentrates on species that are known to or are likely to occur within the Offshore Study Area and off the North Coast of Scotland.

The assessment of potential impacts upon ornithology which will be presented in the EIA will be partly informed using the detail presented in the following relevant technical Sections: Project Description (Section 5), Marine Physical Processes (Section 7.2), Benthic Ecology (Section 8.2) and Fish and Shellfish Ecology (Section 8.3). It should be noted that an HRA will be undertaken alongside the EIA for the proposed Project.

The extent of the study area for birds will take into account the known distribution and maximum foraging range of each species (from Woodward *et al*. 2019). It is anticipated that the final study area will be agreed following the completion of the bird surveys and as part of the consultation process, with the designated sites to be considered agreed through the HRA screening process.

8.5.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on ornithology:

Guidance

- CIEEM (2018). Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal. Winchester, Institute of Ecology and Environmental Management. Available at: https://cieem.net/wp-content/uploads/2019/02/Combined-EclA-guidelines-2018-compressed.pdf.
- CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Chartered Institute of Ecology and Environmental Management, Winchester. Available online at https://cieem.net/wp-content/uploads/2019/02/Combined-EclA-guidelines-2018-compressed.pdf;
- King, S. Maclean, I.M.D. Norman, T. and Prior, A. (2009). Developing guidance on ornithological cumulative impact assessment for offshore wind farm developers. COWRIE;
- NatureScot (2018). Environmental Impact Assessment Handbook. V5. Available online at https://www.nature.scot/handbook-environmental-impact-assessment-guidance-competent-authorities-consultees-and-others;
- MacLean, I.M.D. Wright, L.J. Showler, D.A. and Rehfisch, M.M. (2009). A review of assessment methodologies for offshore wind farms. British Trust for Ornithology report commissioned by COWRIE;
- Walls, R., Pendlebury, C. Budgey, R. Brookes, K. and Thompson, P. (2009). Revised best practice guidance for the use of remote techniques for ornithological monitoring at offshore wind farms. COWRIE REMTECH-08-08.

Where necessary mitigation and/or monitoring measures will be identified as required during the formal EIA process, to be informed through the assessment process itself in consultation with stakeholders.

8.5.3 Available Information

The following list provides a high-level overview of the existing knowledge base and make reference to reports and/or studies that are relevant to the consideration of potential impacts on ornithology. This information will be combined with site-specific studies to inform the EIA. Examples of the reports that are available which can provide insight into outcomes of monitoring undertaken at other offshore wind farm sites are provided below:

- Site-specific surveys in 2015 for the Dounreay Trì Project.
- Band, B. (2012). Using a collision risk model to assess bird collision risks for offshore windfarms. Strategic Ornithological Support Services (SOSS), Project SOSS-02;
- BirdLife International (2017) BirdLife International Species Factsheets. [online] Available at: http://www.birdlife.org/datazone.
- Cook, A.S.C.P., Humphreys, E.M., Masden, E.A. & Burton, N.H.K. (2014). The avoidance rates of collision between birds and offshore turbines. Scottish Marine and Freshwater Science 5(16). Marine Scotland Science. Available online at https://data.marine.gov.scot/dataset/avoidance-rates-collision-between-birds-and-offshore-turbines;
- Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review, 2014.

> Kober, K. Webb, A. Win, I. Lewis, M. O'Brien, S. Wilson, L.J. and Reid, J.B. (2010). An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs. JNCC Report No. 431;

> Mavor, R.A. Heubeck, M. Schmitt, S. and Parsons, M. (2008). Seabird numbers and breeding success in Britain and Ireland, 2006. Peterborough, Joint Nature Conservation Committee. (UK Nature Conservation, No. 31.) (https://hub.jncc.gov.uk/assets/f8becf1f-e111-4186-a3cf-cbd814be9cc5);

> Mitchel, P.I. Newton, I.S.F. Ratcliffe, N. and Dunn, T.E. (Eds.) (2004). Seabird Populations of Britain and Ireland: results of the Seabird 2000 census (1998-2002). Published by T and A. D. Poyser, London;

> Robinson, R.A. (2017). BirdFacts: profiles of birds occurring in Britain and Ireland. [Online]. Available at: http://www.bto.org/birdfacts

> RSPB (2019). The use of bird data in marine planning and licensing. Available online at https://www.rspb.org.uk/globalassets/downloads/documents/positions/marine/rspb-guidance-on-the-use-of-bird-data-in-marine-planning.pdf.

> SNH (2020). Biodiversity Indicator. The numbers and breeding success of seabirds. Available online at https://www.nature.scot/sites/default/files/2020-02/Scottish%20Biodiversity%20Indicator%20-%20S005%20-%20Abundance%20of%20Breeding%20Seabirds%201986-2017.pdf.

> Wakefield *et al.* (2017). Breeding density, fine-scale tracking, and large-scale modelling reveal the regional distribution of four seabird species. Available online at https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/eap.1591.

> Woodward *et al.* (2019). Desk- based revision of seabird foraging ranges used for HRA screening.

8.5.4 Study Area

The study area comprises the Marine Licence area with a 2 km buffer in all directions.

8.5.5 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore biological environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the Project.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to ornithology have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

8.5.6 Surveys and Studies Carried Out to Date

The following surveys, relevant to the Project, have been carried out to date:

- Dounreay Trì Limited commenced aerial bird surveys in January 2015. The survey programme covered a 12-month period and was completed in December 2015 (HiDef, 2015). This followed Marine Scotland's "survey, deploy and monitor approach".
- A 12-month survey was completed for a site immediately west of the Offshore Study Area commissioned by Highlands and Islands Enterprise between May 2015- April 2016 (reported by Irwin (2016)) (HiDef, 2016).
- Pentland Firth aerial surveys wide data (digital still dats) was collected by APEM in 2010 and 2012 and historical, JNCC European Seabirds at Sea data.

8.5.7 Description of Current Environment

8.5.7.1 Designated sites

The Offshore Study Area is located near to a number of important bird sites which have been classified as Special Protection Areas ("SPA") under the European Council ("EC") Directive 2009/147/EC on the conservation of wild birds ("the Birds Directive"). The most significant of these are likely to be the North Caithness Cliffs SPA to the east, Hoy SPA and Sule Skerry and Sule Stack SPA (see Table 8-9 and Figure 8-7).

Table 8-9 Designated Sites and Description

Designated site	Distance (km)	Description
North Caithness Cliffs SPA	0 (cable corridor passes through the seaward extension of this SPA)	Holds internationally important concentrations of guillemot *Uria aalge*, and an internationally important breeding assemblage of seabirds including fulmar *Fulmarus glacialis*, kittiwake *Rissa tridactyla*, razorbill *Alca torda* and puffin *Fratercula arctica*. These seabird species are likely to use the waters in and around the Project for feeding.
Hoy SPA	28 km	Holds nationally important concentrations of nesting red-throated divers *Gavia stellata* and internationally important concentrations of breeding great skuas *Catharacta skua*, and an internationally important breeding assemblage of seabirds, including fulmar, kittiwake, great black-backed gull *Larus marinus*, Arctic skua *Stercorarius parasiticus*, guillemot and puffin.
Sule Skerry and Sule Stack SPA	26 km	Comprises of two offshore islands which hold nationally important concentrations of European storm-petrel *Hydrobates pelagicus* and Leach's storm-petrel *Oceanodroma leuchoroa*, and internationally important breeding numbers of gannet *Morus bassanus* and puffin, and an internationally important breeding assemblage comprising also shag *Phalacrocorax aristotelis* and guillemot.
North Rina & Sula Sgeir SPA	117 km	Holds nationally important concentrations of breading fulmar, gannet, kittiwake, Leach's petrel, puffin, razorbill, storm petrel and breading seabird assemblage.
Cape Wrath SPA	50 km	Holds nationally important concentrations of breading fulmar, guillemot, kittiwake, puffin, razorbill, and breeding seabird assemblages.
Rousay SPA	66 km	Holds nationally important concentrations of breeding arctic skua, arctic tern *Stercorarius parasiticus*, fulmar, guillemot, kittiwake and breeding seabird assemblage.

Designated site	Distance (km)	Description
Handa SPA	77 km	Holds nationally important concentrations of breeding fulmar, great skua *Stercorarius skua*, guillemot, kittiwake, razorbill and seabird assemblages.
Marwick Head SPA	54 km	Holds nationally important concentrations of breeding guillemot, kittiwake and breeding seabird assemblages.
West Westray SPA	80 km	Holds nationally important concentrations of breeding Artic skua, Artic tern, fulmar, guillemot, kittiwake, razorbill and breeding seabird assemblages.
Calf of Eday SPA	87 km	Holds nationally important concentrations of breeding cormorant, fulmar, great black-backed gull *Larus marinus*, guillemot, kittiwake and breeding seabird assemblages.

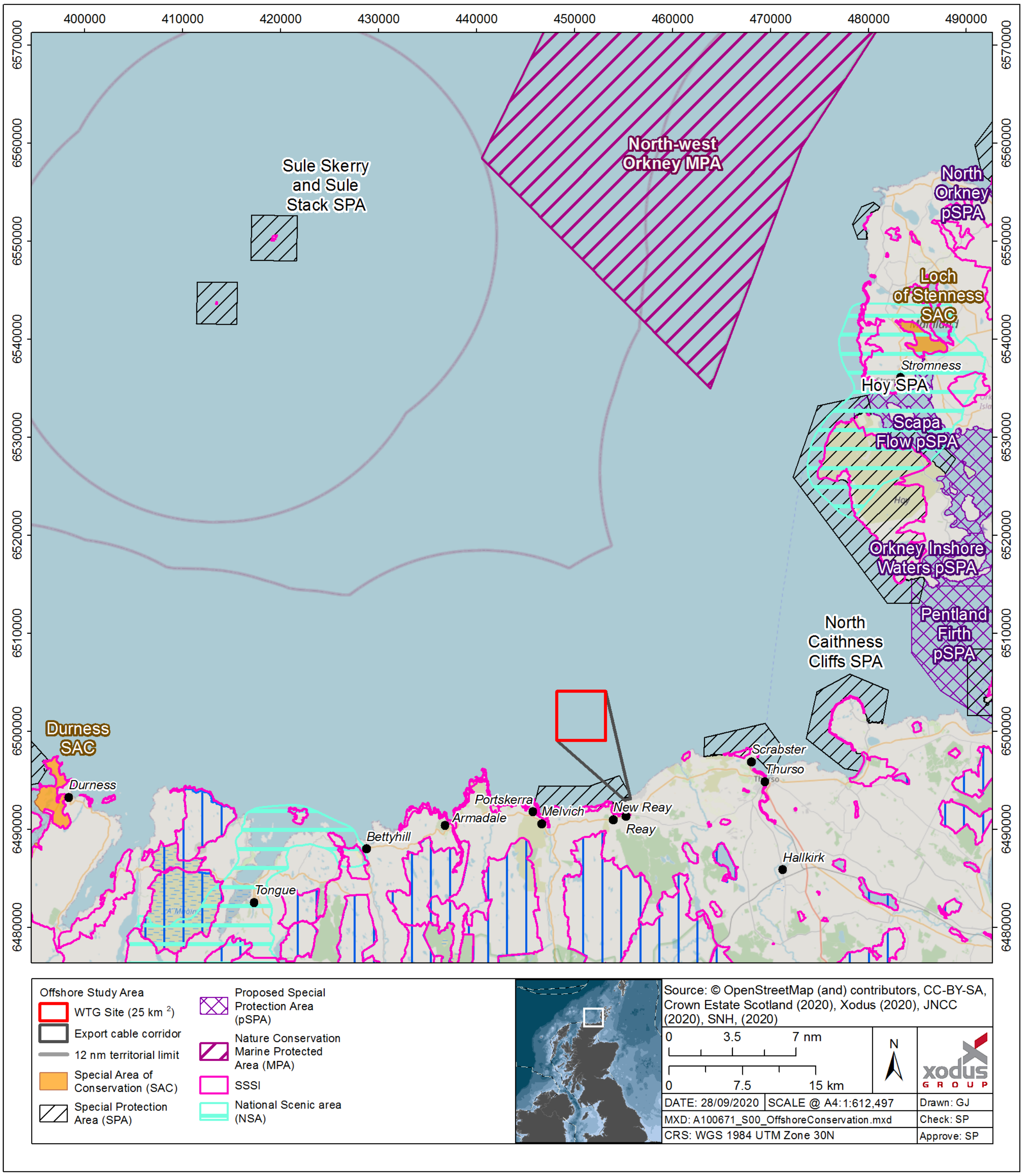


Figure 8-7 Designated Conservation Areas in the vicinity of the Offshore Study Area

8.5.7.2 PFOWF Offshore Study Area

In the 2015 aerial surveys (surveyed area can be seen in Figure 8-8), a total of 4960 birds of 14 species and 24 marine mammals of four species were recorded during January to December (Table 8-10 and Table 8-11). A further 172 animals were recorded, which were not assigned to a species, an identification rate to species level of 97% across the survey programme (HiDef, 2015). The primary observation from the 2015 surveys were that:

- Low to moderate density of fulmars were recorded, mainly during the winter months, but a peak in August was likely to have been of young birds leaving their nest sites;
- Low density of gannets were present, and these increased in numbers in late June and again in August, although most of these were in the buffer area around the project site;
- Kittiwakes were one of the commonest species recorded during these surveys and reached moderate density in June;
- A low density of great black-backed gulls was recorded with peak abundance in August. Few other large gulls present in these surveys. Only a very small sample size of flight heights was possible for this species;
- Arctic terns were found to be present at moderate density during the June and July surveys;
- Guillemots were the commonest species recorded and high density was found to occur in the two June surveys, then again at the end of the survey period in November and December;
- Razorbills were only present at low density in the study area and were also found to be most abundant in the summer months; and
- The density of puffins was generally found to be low to moderate, but one of the June surveys found very high density of this species which was not present in a follow-up survey less than three weeks later, suggesting that this concentration was ephemeral and highly likely to be an exploitation of a temporary food source.

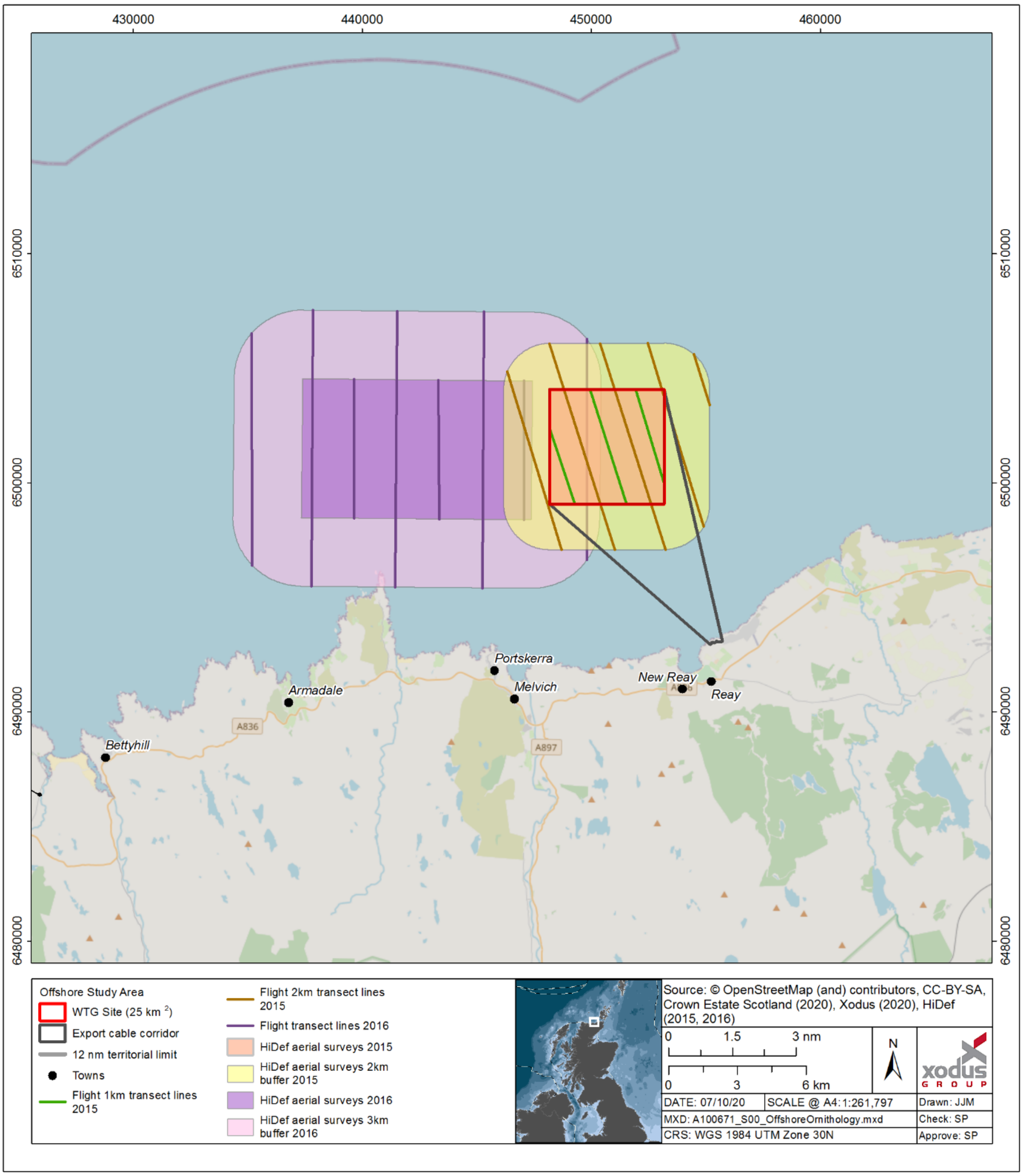


Figure 8-8 Digital Aerial Survey Areas in the vicinity of the Offshore Project Area (HiDef, 2015; HiDef, 2016)

Table 8-10 Number of Objects Detected During Each Survey Assigned to Species Level January to December 2015 (HiDef, 2015)

Species	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
Fulmar	42	47	26	61	4	9	10	543	13	2	65	1	**834**
Gannet	0	0	4	2	1	36	0	45	36	7	3	0	**139**
Red-throated diver	0	0	0	0	0	1	0	0	1	0	0	0	**2**
Great northern diver *Gavia immer*	0	0	0	0	0	1	0	0	0	0	0	0	**1**
Manx shearwater *Puffinus puffinus*	0	0	0	0	0	0	5	0	0	0	0	0	**5**
Great skua *Stercorarius skua*	0	0	0	0	2	3	0	2	0	0	0	0	**8**
Kittiwake	3	10	12	21	5	116	0	7	6	5	109	84	**509**
Common gull *Larus canus*	1	1	0	0	0	0	0	0	0	1	0	0	**3**
Herring gull *Larus argentatus*	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Great black-backed gull	6	4	13	0	0	0	0	39	0	10	4	6	**82**
Arctic tern *Sterna paradisaea*	0	0	0	0	0	39	38	0	0	3	0	0	**83**
Guillemot	102	86	139	77	132	259	191	11	62	123	181	195	**1,781**
Razorbill	7	0	0	2	4	34	4	0	9	3	2	9	**78**
Puffin	0	0	0	5	44	130	12	43	4	2	0	0	**1,414**

Species	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
Total	**161**	**148**	**194**	**168**	**192**	**628**	**260**	**690**	**131**	**156**	**364**	**295**	**4939**

Table 8-11 Number of objects with no species ID detected during each survey assigned to species groups (HiDef, 2015)

Species group (No ID)	Jan	Feb	Mar	Apr	May	Jun	Jun[6]	July	Aug	Sep	Oct	Nov	Dec	Total
Fulmar / gull species	0	0	1	1	0	0	0	1	6	0	1	5	0	**15**
Small gull species	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**
Large gull species	0	1	1	0	0	0	0	0	0	0	6	0	2	**10**
Gull species	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**
Tern species	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
Large auk	3	0	6	1	0	2	2	9	0	2	4	2	14	**45**
Auk species	0	0	0	13	0	37	7	6	3	7	1	2	8	**84**
Auk / small gull	0	0	0	0	0	1	0	0	0	0	0	0	1	**2**
Large auk / diver species	2	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Total	**5**	**1**	**8**	**15**	**0**	**40**	**10**	**16**	**9**	**9**	**14**	**9**	**25**	**161**

[6] *Two surveys were undertaken in June on the 8th and June the 30th.*

The behaviour of seabirds was categorised as follows: flying or sitting. The number of each observed is presented in Table 8-12 (HiDef, 2015). Loafing has been included for information only and has not been analysed in the results overall.

> All red-throated divers were recorded sitting on the sea;

> Fulmar fluctuated in the number of individuals flying with an overall percentage of 61% from May 2015 to April 2016. All fulmar in May, June, November and April were recorded flying. the lowest percentage recorded flying was 23% of observations in August. A total of 15 birds were observed taking off in all the surveys;

> Gannet behaviour varied across the surveys with all gannets recorded as flying in June, November, December and April. Only 25% were recorded flying in May. Overall, 86% of observations of gannets were flying;

> Shags were all recorded sitting on the sea;

> All great skuas were recorded flying;

> Overall, 58% of kittiwakes were recorded flying throughout the survey period with a total of three birds taking off. All kittiwake were flying in May and in the January to March surveys;

> The two observations of common gull were both flying;

> Some 33% of herring gulls were flying;

> Great black-backed gulls were only observed flying in August, November and February with an overall percentage of 36% flying across the survey period;

> All Arctic terns were recorded flying in July, the only month when this species was present;

> Only 11% of guillemots were observed flying throughout the survey period. None were recorded flying from August to October. The highest number of this species observed flying was in April with 58%;

> The majority of razorbills were recorded sitting on the sea at 91% of all observations. Flying razorbills were observed in March only; and

> Puffins were only observed flying in June and July, and during all surveys only 1% were recorded flying.

Table 8-12 Summary of Seabird Behaviours between January and December 2015 (HiDef, 2015)

Species	Number Recorded Flying	Number Recorded Sitting	% Flying	Total
Fulmar	318	516	38%	834
Manx seawater	0	4	0%	5
Gannet	62	77	45%	139
Red-throated diver	1	1	50%	2
Great northern diver	0	1	0%	1
Great skua	5	3	63%	8
Kittiwake	436	161	73%	597
Common gull	3	0	100%	3

Species	Number Recorded Flying	Number Recorded Sitting	% Flying	Total
Herring gull	1	2	33%	3
Great black-backed gull	16	66	20%	82
Arctic tern	79	1	99%	80
Guillemot	165	1,616	9%	1,781
Razorbill	0	75	0%	75
Puffin	6	1,408	0%	1,414
No ID				
Fulmar / gull species	4	11	27%	15
Small gull species	0	1	0%	1
Large gull species	3	7	30%	10
Gull species	0	1	0%	1
Tern species	1	0	100%	1
Large auk	13	32	29%	45
Auk species	7	77	8%	84
Auk / small gull	1	1	50%	2
Large auk / diver species	0	2	0%	2
Total	**1,121**	**4,063**	**22%**	**5,185**

During May 2015 to April 2016, aerial surveys conducted immediately to the west of the Offshore Study Area (see Figure 8-8) recorded a total of 3779 birds of 13 species which closely resembled the results of the Hexicon 2015 survey.

8.5.7.3 The Project Landfall Area

The export cable landfall area falls within the North Caithness Cliffs SPA. This SPA holds internationally important concentrations of guillemot *Uria aalge*, and an internationally important breeding assemblage of seabirds including fulmar *Fulmarus glacialis*, kittiwake *Rissa tridactyla*, razorbill *Alca torda* and puffin *Fratercula arctica*. These seabird species are likely to use the waters in and around the Project for feeding.

8.5.8 Identification of Potential Impacts

The assessment of potential impacts presented in the EIA will draw on information presented both in the wider EIA (i.e. shellfish ecology) as well as the HRA. There is potential for birds to move between the sites to migrate or commute to foraging areas. The impact assessment will take account of these factors, together with the known ecology, flight patterns, flight heights etc of individual species.

8.5.9 Cumulative Impacts

Impacts to ornithology present in the Offshore Study Area are expected to be largely temporary and relatively localised, therefore there will be limited scope for cumulative impacts. However, it is considered the Project and other projects in the vicinity (both offshore and onshore) have the potential to impact offshore ornithology in the area in a cumulative manner. This will be assessed further at EIA stage. The assessment will be undertaken, as appropriate, for those species (such as red-throated diver) for which it is deemed necessary. The focus of assessment will be on other wind farms, offshore and where appropriate onshore, and will include all projects that are present and/or reasonably foreseeable. The developments which have the potential to cause cumulative effects on impacts to offshore ornithology receptors include the following:

> The SHE-T Orkney-Caithness interconnector cable (consented);

> Potential OWF Developments in the ScotWind N1 DPO;

> The onshore Limekiln Wind Farm (consented);

> Limekiln Wind Farm Grid Connection Overhead Line (OHL) Project (proposed);

> The onshore Drum Hollistan Wind Farm (proposed); and

> Pentland Floating Offshore Wind Demonstrator (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on the physical environment have the potential to arise from cable installation activities in these areas.

In addition, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on the physical environment if export cables cross the Project Offshore Study Area.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the array. Ultimately the array will have the same number of turbines so there are no cumulative impacts predicted to offshore ornithology receptors as a result of operation of the Demonstrator and array. Because the Demonstrator will be subject to a separate installation campaign to the Project, there is the potential for cumulative impacts, however these are anticipated to be minor. Table 8-13 summaries all potential impacts including potential cumulative impacts.

Table 8-13 Summary of the potential impacts upon ornithological features to be considered within the EIA

Impact	High level impact summary and justification	Scope in/out
Potential Impacts During Construction		
Potential impact of disturbance/displacement/exclusion due to construction noise or physical presence	The potential for construction impacts to lead to disturbance/displacement / exclusion will be short term and temporary, with a number of monitoring studies providing an evidence base.	Scoped in
Potential for a barrier effect due to physical presence	The potential for construction impacts to lead to a barrier effect will be short term and temporary, with a number of monitoring studies providing an evidence base.	Scoped in
Potential change in habitat/prey availability	As per Benthic Ecology (Section 8.2) and Fish and Shellfish (Section 8.3)	Scoped in
Potential increase in suspended sediment affecting visibility	As per Benthic Ecology (Section 8.2) and Fish and Shellfish (Section 8.3)	Scoped in

Impact	High level impact summary and justification	Scope in/out
Potential accidental release of pollutants	Embedded mitigation implemented during construction (e.g. implementation of a pollution prevention plan agreed with agreed with the regulator) will avoid the risk of accidental releases of pollution and as a result seabird are extremely unlikely to be adversely affected by such an incident	Scoped out
Potential Impacts During Operation and Maintenance		
Potential impact of disturbance/displacement/exclusion due to physical presence, marine noise and maintenance works	The potential for the physical presence of the Project to lead to disturbance/displacement/exclusion will be for the duration of the Project, however noise levels will be less, and habituation is more likely to be a factor. A number of monitoring studies provide an evidence base.	Scoped in
Collision risk, in particular for migratory species/populations	The potential for collision risk is very well studied, with numerous guidance documents, recommended methods/approaches and increasing numbers of monitoring studies available.	Scoped in
Potential for a barrier effect due to physical presence	The potential for the physical presence of the Project to lead to a barrier effect will be for the duration of the Project, however noise levels will be less, and habituation is more likely to be a factor. A number of monitoring studies provide an evidence base.	Scoped in
Potential change in habitat/prey availability	As per Benthic Ecology (Section 8.2) and Fish and Shellfish (Section 8.3)	Scoped in
Potential increase in suspended sediment affecting visibility	As per Benthic Ecology (Section 8.2) and Fish and Shellfish (Section 8.3)	Scoped in
Creation of a roosting habitat or foraging opportunities	The addition of new structures presents the opportunity additional for roosting and foraging. Potential for foraging opportunities are as per Benthic Ecology (Section 8.2) and Fish and Shellfish (Section 8.3) with some evidence from monitoring reports to inform the potential for roosting.	Scoped in
Potential accidental release of pollutants	Embedded mitigation implemented during operation (e.g. implementation of a pollution prevention plan agreed with agreed with the regulator) will avoid the risk of accidental releases of pollution and as a result seabird are extremely unlikely to be adversely affected by such an incident	Scoped out
Potential Impacts During Decommissioning		
Potential impacts arising from decommissioning phase are expected to be similar to but not exceeding those arising during the construction phase and would be temporary and of short duration.		As construction section
Potential Cumulative Impacts		
Potential impact of disturbance/displacement to physical presence	Disturbance and displacement effects will be considered in the ES	Scoped in
Potential for a barrier effect due to physical presence	The potential for a barrier effect will be informed by a number of monitoring studies, which provide an evidence base.	Scoped in

Impact	High level impact summary and justification	Scope in/out
Potential change in habitat/prey availability	As per Benthic Ecology (Section 8.2) and Fish and Shellfish (Section 8.3).	Scoped in
Potential increase in suspended sediment affecting visibility	As per Benthic Ecology (Section 8.2) and Fish and Shellfish (Section 8.3)	Scoped in
Collision risk, in particular for migratory species/populations	The potential for collision risk is very well studied, with numerous guidance documents, recommended methods/approaches and increasing numbers of monitoring studies available from operational offshore wind farms.	Scoped in
Potential Inter-Related Impacts		
The inter-relationships between relevant receptors will be considered in the ES where potential pathways exist between topic areas. The key inter-relationships during the construction and operation of the Project that will be considered in the ES for ornithology are benthic and fish ecology and designated sites.		

8.5.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below Table 8-14. These methods will be used alongside input from the relevant guidance as identified in Section 8.5.2.

Table 8-14 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Disturbance/displacement/exclusion due to construction noise or physical presence, marine noise and maintenance works	Aerial surveys -September 2020-August 2021	During the EIA a review will be undertaken of any relevant post-consent monitoring data and industry reports in order to investigate the existing evidence base. This information will be used to provide further insight into the potential environmental impacts, based upon offshore wind industry experience. A high-level description of the proposed ornithological EIA methods are provided below. These methods will be the subject of further consultation. ***Breeding and non-breeding season*** Bird behaviour and abundances differs across a year depending upon the season. Separate seasons will be identified for each species based on SNH guidance (Tyler, 2017) to establish the level of importance any seabird species has within the array area during any particular time period. ***Apportioning***
Potential for a barrier effect due to physical presence	Aerial surveys -September 2020-August 2021	

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Potential change in habitat/prey availability	Aerial surveys -September 2020-August 2021	It is important to understand the potential impact the development may have on SPA populations and how this translates to breeding colony trends at SPA sites to ensure site integrity. Apportioning of effects will be based on SNH (2018b). Interim Guidance on Apportioning Impacts from Marine Renewable Development to Breeding Seabird Populations in Special Protection Areas. The use of any emerging guidance or statistical tools will be discussed further with consultees. ***Collision Risk*** It is considered that the most appropriate approach to model the collision risk to seabirds is through the use of the Band model (2012), alongside outputs using the stochastic collision risk model (sCRM) (McGregor *et al*., 2018). Where Band CRM Options 2 and 3 are applied, the proportion of birds at risk height will be derived from Johnston et al., 2014. Avoidance rates will be based on Smart Wind (2014), Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review 25th November 2014. ***Disturbance and displacement*** Displacement is the potential for an offshore wind farm and associated activities to reduce or prevent birds, including flying birds, from using an offshore wind farm. The displacement assessment will be based on the SNCB recommended matrix methods as outlined within the Joint SNCB Interim Displacement Advice Note (2017), based on estimated seabird densities derived from the digital aerial surveys. The use of SeaBORD (Searle *et al*., 2018) and any other new techniques emerging as tools for assessing displacement will also be investigated and considered and discussed with consultees during the development of the assessment. ***Barrier Effects*** Barrier effects will be considered in a qualitative way with reference to published literature. Emerging guidance and techniques may consider the integration of displacement and barrier effects together. ***EIA Methodology***
Potential increase in suspended sediment affecting visibility	Aerial surveys -September 2020-August 2021	
Collision risk, in particular for migratory species/populations	Aerial surveys -September 2020-August 2021	
Creation of a roosting habitat or foraging opportunities	Aerial surveys -September 2020-August 2021	

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
		The offshore and intertidal ornithology EIA will follow the methodology outlined within Section 6.2. Ornithology specific guidance will also be considered. The ornithology EIA section will detail all relevant guidance considered in the preparation of the assessment. Any emerging guidance will be reviewed and applied as appropriate to the assessment.
Cumulative Impacts	Aerial surveys -September 2020-August 2021	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

8.5.11 Conclusions and Next Steps

An assessment of potential impacts and potential cumulative impacts will be completed within the EIA Report. Potential impacts relate to disturbance/displacement/exclusion due to construction noise or physical presence, marine noise and maintenance works, barrier effect due to physical presence, change in habitat/prey availability, increase in suspended sediment affecting visibility, collision risk, in particular for migratory species/populations, creation of a roosting habitat or foraging opportunities and potential cumulative impacts associated with nearby future developments have been scoped in for the assessment within the EIA Report. These potential impacts to ornithology species have therefore been scoped into the assessment and will be considered in the EIA phase. The only potential impact associated with ornithological receptors to be scoped out is ‘potential accidental release of pollutants.

9 OFFSHORE HUMAN ENVIRONMENT

9.1 Introduction

This section considers the impact of the Project on the human environment within or using the WTG site and Export Cable Corridor- the 'Offshore Study Area' and considers the following receptors:

> Commercial fisheries;
> Shipping and navigation;
> Aviation and radar;
> Seascape, landscape and visual amenity;
> Archaeology and cultural heritage;
> Other users of the marine environment; and
> Socio-economics, recreation and tourism.

An overview of the relevant baseline environment is provided for each along with the anticipated impacts, a baseline characterisation strategy, impact assessment strategy and where applicable, possible mitigation and monitoring measures.

9.2 Commercial Fisheries

9.2.1 Introduction

This section characterises commercial fishing activity in and around the Offshore Study Area. For the purpose of this report, commercial fishing is defined as the legal capture of finfish and shellfish by licenced fishing vessels.

Impacts relating to the distribution and abundance of commercially important fish and shellfish species are addressed in Section 8.2: Benthic Ecology and Section 8.3: Fish and Shellfish Ecology. Other impacts associated with commercial fisheries including navigation and socio-economics are discussed in Section 9.3: Shipping and Navigation, and Section 9.8: Socio-economics, Recreation and Tourism.

9.2.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on to commercial fisheries:

Guidance

> Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison (FLOWW, 2014);
> Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015);
> Best practice guidance for fishing industry financial and economic impact assessments (UK Fisheries Economics Network (UKFEN), 2012);
> Blyth-Skyrme, R.E. (2010) Options and opportunities for marine fisheries mitigation associated with wind farms. Final report for Collaborative Offshore Wind Research into the Environment contract FISHMITIG09. COWRIE Ltd, London. Available online at https://tethys.pnnl.gov/sites/default/files/publications/Blyth-Skyrme-2010.pdf; and

- Fishing and Submarine Cables - Working Together (International Cable Protection Committee (ICPC), 2009).

9.2.3 Available Information

The following information sources will be used to inform the commercial fisheries baseline, where available, during development of the EIA:

- MMO (2019). Fisheries statistics per ICES Rectangle (average 2013-2017). Available online at https://www2.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/RectangleData;
- MMO (2019) Vessel Monitoring System (VMS) values by fishing method (average 2013-2017)
- NMPi (2020). Spatial data on commercial fisheries on National Marine Plan Interactive. Available online at https://marinescotland.atkinsgeospatial.com/nmpi/
- Marine Scotland (2015). VMS Amalgamated Fishing Intensity Layers (2009-2013). Available online at http://marine.gov.scot/node/12882.
- Average intensity (hours) of fishing with bottom trawls 2009-2016 (ICES SR.2017.17). http://marine.gov.scot/node/12832
- Average intensity (hours) of fishing with dredges 2009-2016 (ICES SR.2017.17). http://marine.gov.scot/node/12832
- Average intensity (hours) of fishing for nephrops and crustaceans with bottom trawls 2009-2017 (ICES SR.2018.14). http://marine.gov.scot/node/12832
- Automatic Information System (AIS) data of fishing vessel tracks; and
- Data on fishing grounds gathered during consultation meetings, where possible.

9.2.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore human environment. In response to the briefing letter SFF requested a meeting at which an overview of fishing activities in the area and an overview of the Project were discussed.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to commercial fisheries have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

9.2.5 Study Area

The Offshore Study Area and Export Cable Corridor are situated close to the western boundary of ICES sub-area rectangle 46E6 which includes the north-east coast of Scotland from Strathy Point to Duncansby Head and the south-west region of the Orkney Islands (Figure 9-1). The commercial fisheries study area is identified as ICES rectangles 46E6, 45E5, 47E5 and 47E6. Reference may also be made to waters outside of these four ICES rectangles in order to provide contextual information and relevance for fishing activity on a regional basis.

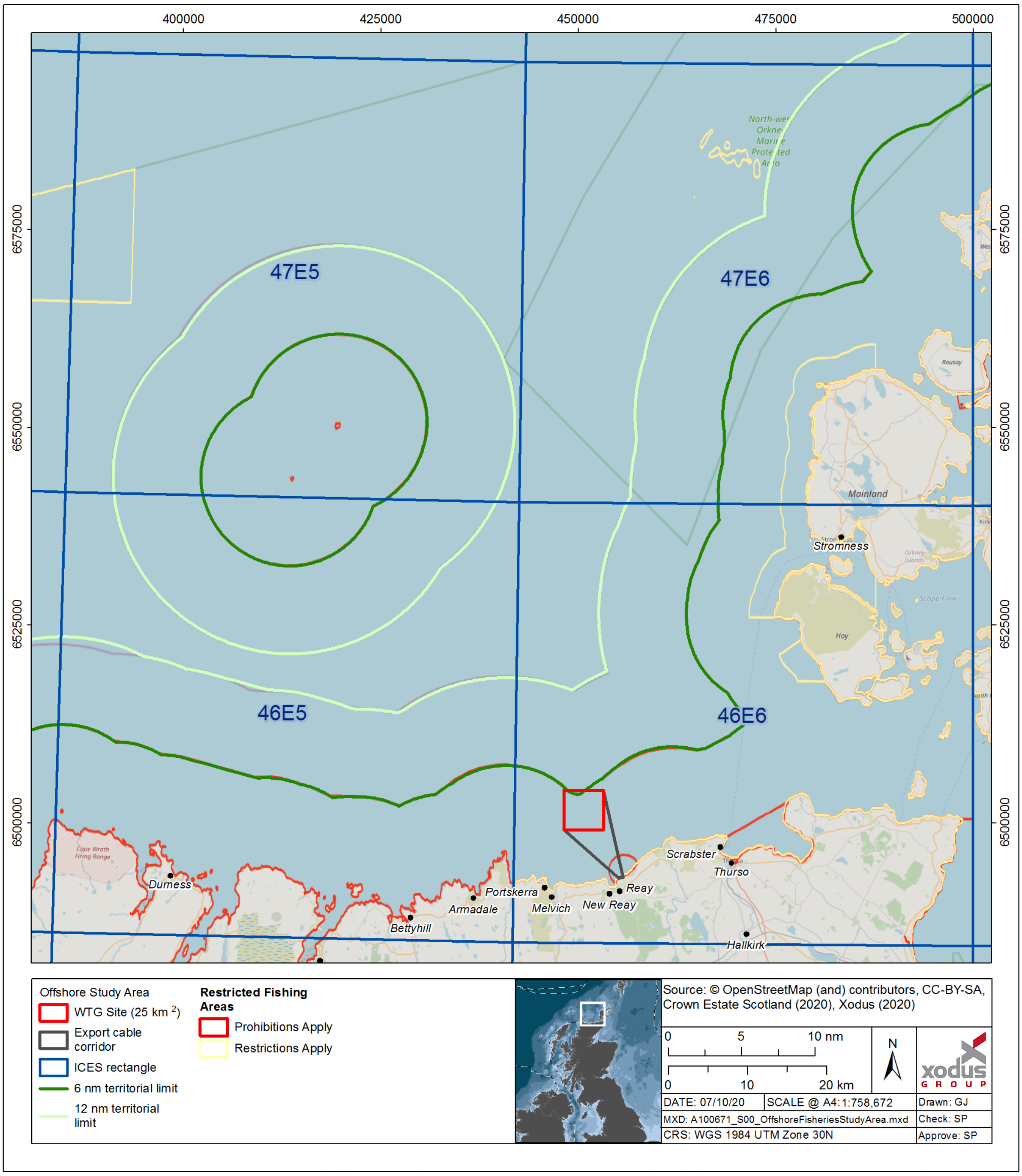


Figure 9-1 Offshore Study Area, associated ICES Square and Protected Sites

9.2.6 Surveys and Studies Carried Out to Date

No site-specific surveys or studies for commercial fisheries were carried out during the 2016 Dounreay Trì EIA.

Consultation has been carried out as detailed in Section 9.2.4 and will continue to be undertaken with various fishing representatives and local fishermen, where necessary, to fill any data gaps and finalise baseline characterisation which will inform the commercial fisheries section of the EIA report.

9.2.7 Description of the Current Environment

The Dounreay closed area shown on Figure 9-1 is closed to all fishing year-round due to potential hazards to human health from any fish or shellfish which are caught in that area (Marine Scotland, 2019). The presence of the closed area which directly overlaps with the proposed export cable corridor reduces the fishing activity in that area. This is of particular relevance to nearshore smaller vessels operating static and to a lesser extent demersal trawl and dredge gears which may be impacted temporarily due to reduced access to fishing grounds during construction activities. As detailed in the Dounreay Trì EIA, consultation with the SFF during the Offshore Study Area selection process in 2014 indicated that the Offshore Study Area is not intensively fished and that the export cable corridor avoids known fishing grounds, likely due to the Dounreay closed area. This has also been supported by consultation with the Scrabster harbour master, who mentioned the closed area reducing fishing activity in the Offshore Study Area and also that small under 10m vessels were likely to stay closer to shore than the WTG site (Dounreay Trì EIA, 2016. Initial consultation with SFF in regard to this Project indicates a number of different fisheries occur in the vicinity of the Project to varying degrees and it was noted that Scrabster is a major landing point and transit hub for the fisheries industry.

9.2.7.1 Fisheries Statistics

Fisheries statistics provide data on fishing activity from all registered fishing vessels per ICES rectangle. Average landings values (£) from 2014 to 2018 show that most vessels operating in the Offshore Study Area are over 10m in length, especially as the distance from shore increases (Figure 9-2). This mirrors the pattern shown in surrounding ICES rectangles. The average landings values in ICES 46E6 are typical to the wider area, with slightly lower overall landings values to the east and west, and higher values to the north and north east of the Offshore Study Area.

As shown in Figure 9-3, the predominate gear types which are utilised in ICES rectangle 46E6 according to average landings values, are demersal trawl/seine and pots/traps. Average landings values from ICES rectangles to the north and north east of ICES 46E6 are mostly due to fishing vessels operating demersal trawl/seine gears. Other gear types which are utilised in the ICES rectangles which are shown in Figure 9-3 include dredges, and other passive gears.

Figure 9-4 shows the average landings values by species from ICES rectangle 46E6 are mostly of crabs, followed by haddock, lobsters, monk/anglerfish, cod and scallop which reflects the pattern of landings values by gears shown in Figure 9-3. Species composition of the landing values from ICES rectangle 47E5, 47E6 and 47E7 shows a higher proportion of pelagic species such as herring and mackerel, which are likely to be targeted by larger fishing vessels than those operating in the nearshore ICES rectangles, operating pelagic trawl gears.

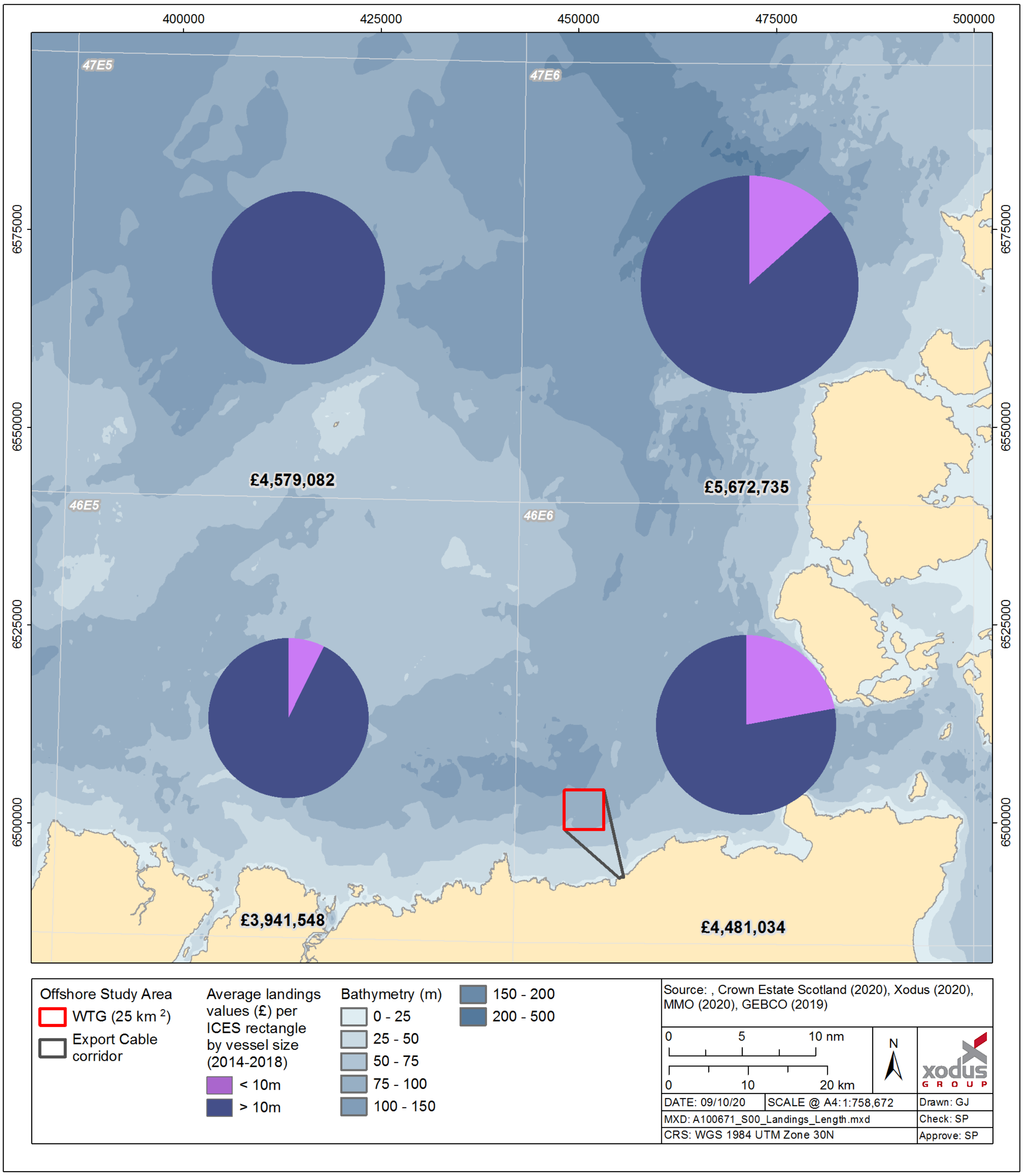


Figure 9-2 Average Landings Values by Vessels per ICES Rectangle, by Vessel Length (2014-2018; MMO, 2020)

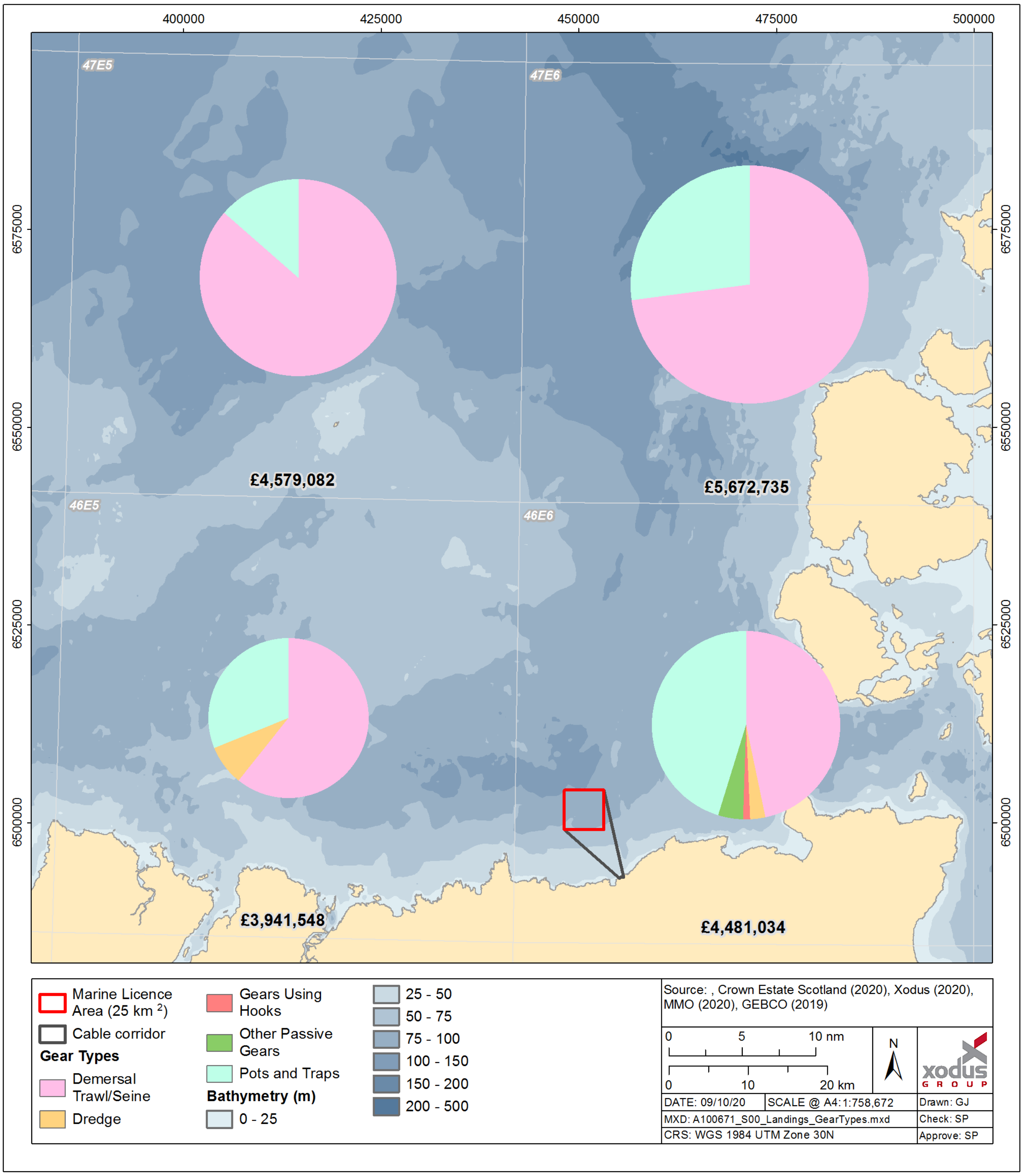


Figure 9-3 Average Landings Values by Vessels per ICES Rectangle, by Gear Type (2014-2018; MMO, 2020)

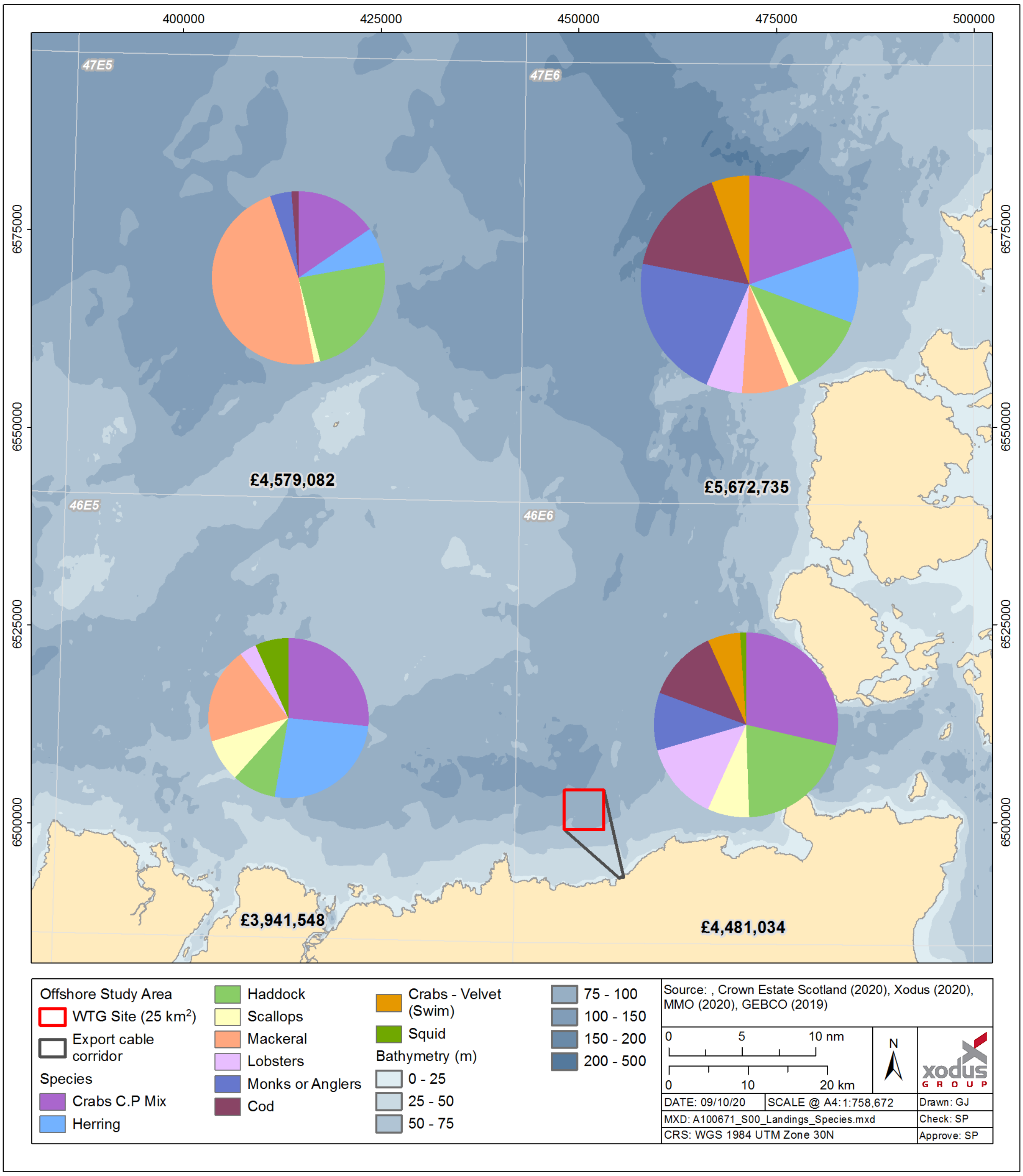


Figure 9-4 Average Landings Values by Vessels per ICES Rectangle, by Species (2014-2018; MMO, 2020)

9.2.7.2 Vessel Monitoring System (VMS) data

VMS data shows that within ICES rectangle 46E6, demersal trawling activity for species such as haddock, monk/anglerfish and cod is highest in the north west quadrant of the WTG site of moderate value, which forms the southern end of an area of low to moderate demersal trawling activity throughout the western half of ICES rectangle 46E6. The Export Cable Corridor experiences low to no demersal trawling intensity (Figure 9-5), in part due to the Dounreay closed area (Figure 9-1). When taking into account the wider study area, VMS values from ICES rectangle 47E6 to the north of ICES rectangle 46E6 are higher and the activity in ICES rectangle 47E5 and 47E6 cover a larger area than that of 46E6.

VMS data shown in Figure 9-6 indicates that ICES rectangle 46E6 supports low levels of dredging activity for scallops, with low to moderate levels of scallop dredging activity taking place to the east of the Offshore Study Area nearshore. The surrounding ICES rectangles to the north and west of ICES rectangle 46E6 support patchy small areas of low dredging activity. Dredging activity is higher according to VMS values in the Moray Firth to the south west of the Offshore Study Area (Figure 9-6).

As shown Figure 9-7, low levels of pelagic trawling activity for herring and mackerel are recorded in waters relevant to the Offshore Study Area, and those of surrounding ICES rectangles. Average VMS values of pelagic trawling increase to the north and west of ICES rectangle 46E6 in ICES rectangle 47E7 (Figure 9-7).

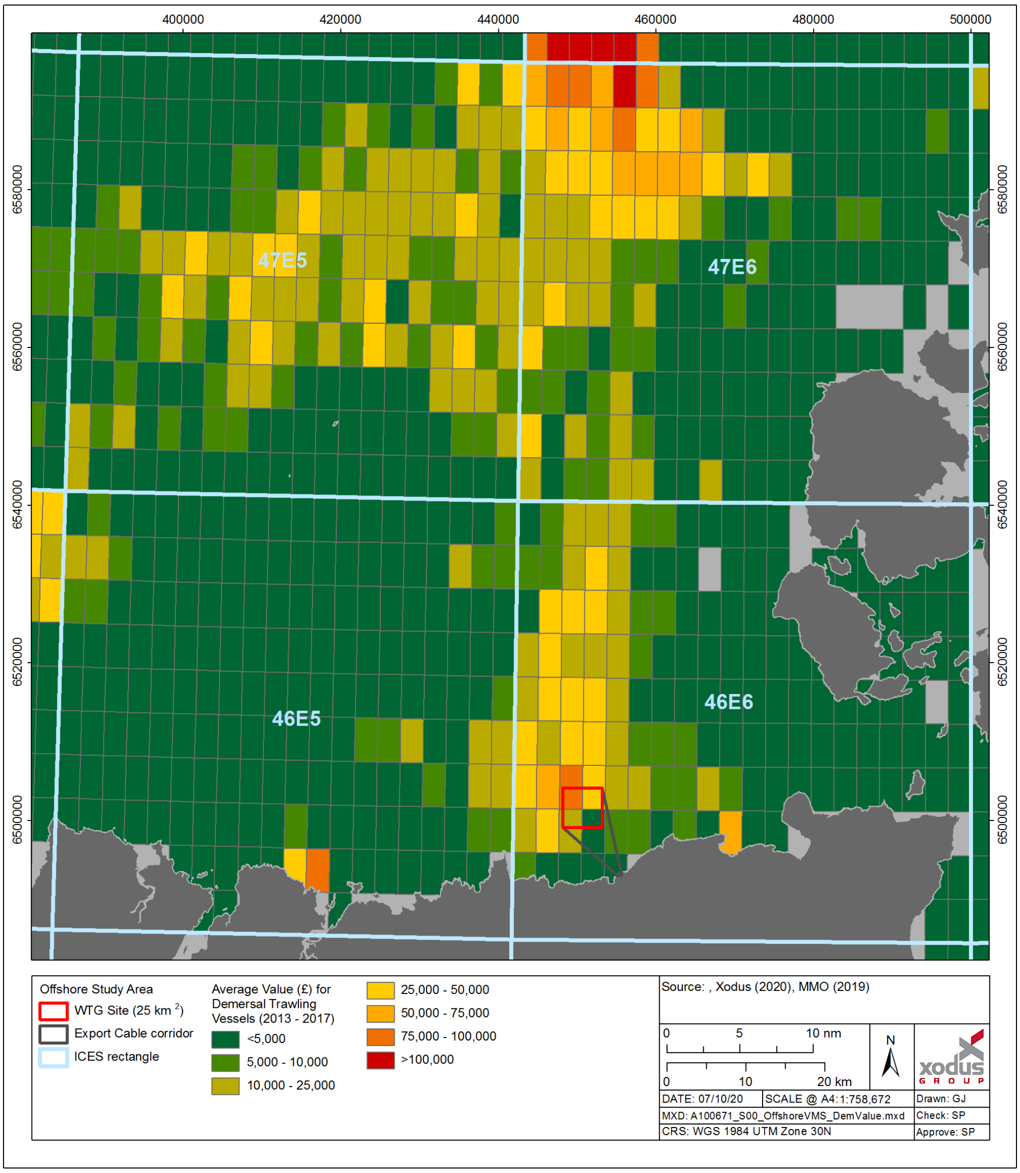


Figure 9-5 Average VMS Value for Demersal Trawling Vessels (2013-2017) (MMO, 2019)

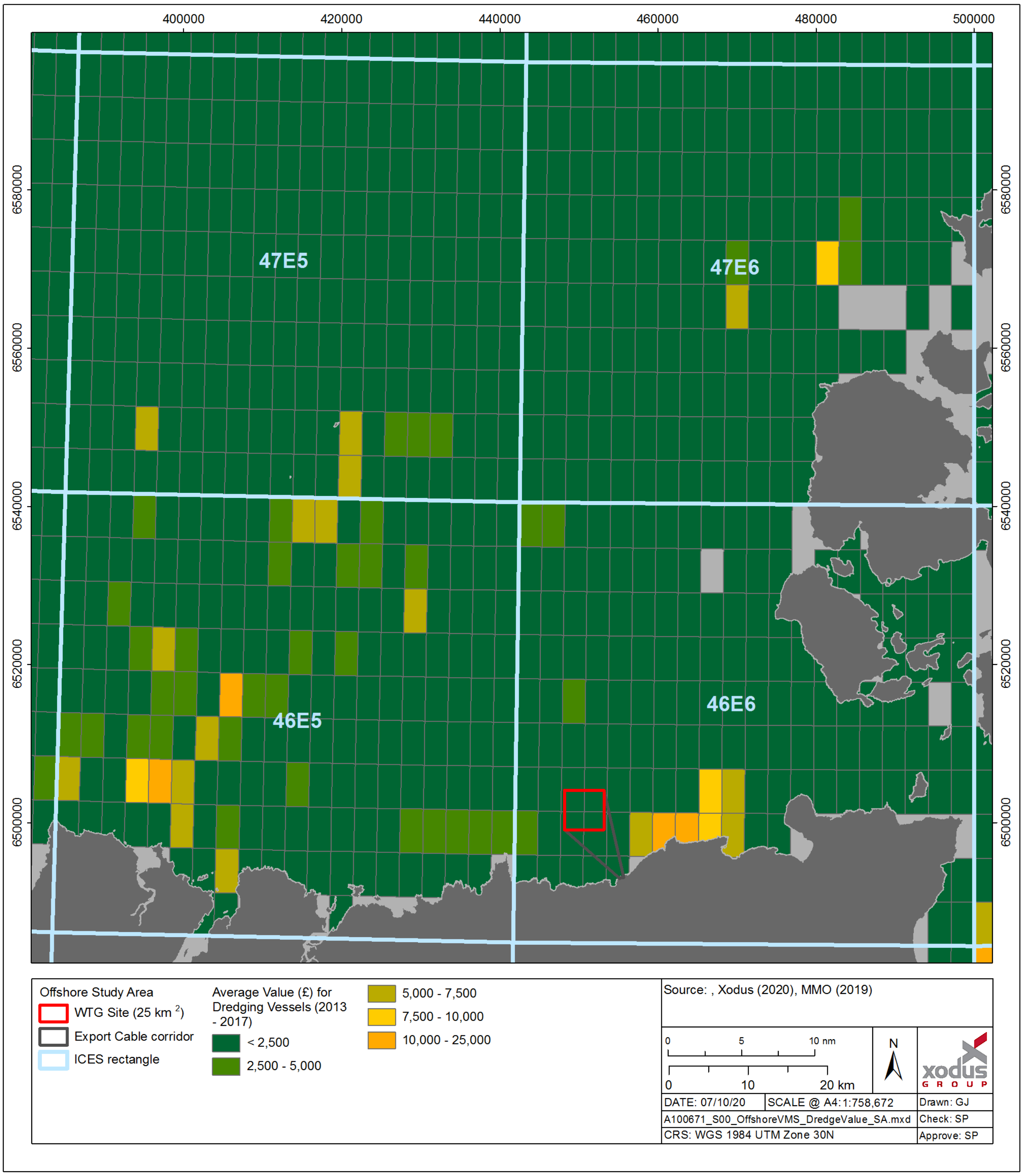


Figure 9-6 Average VMS Values for Dredging Vessels (2013-2017) (MMO, 2019)

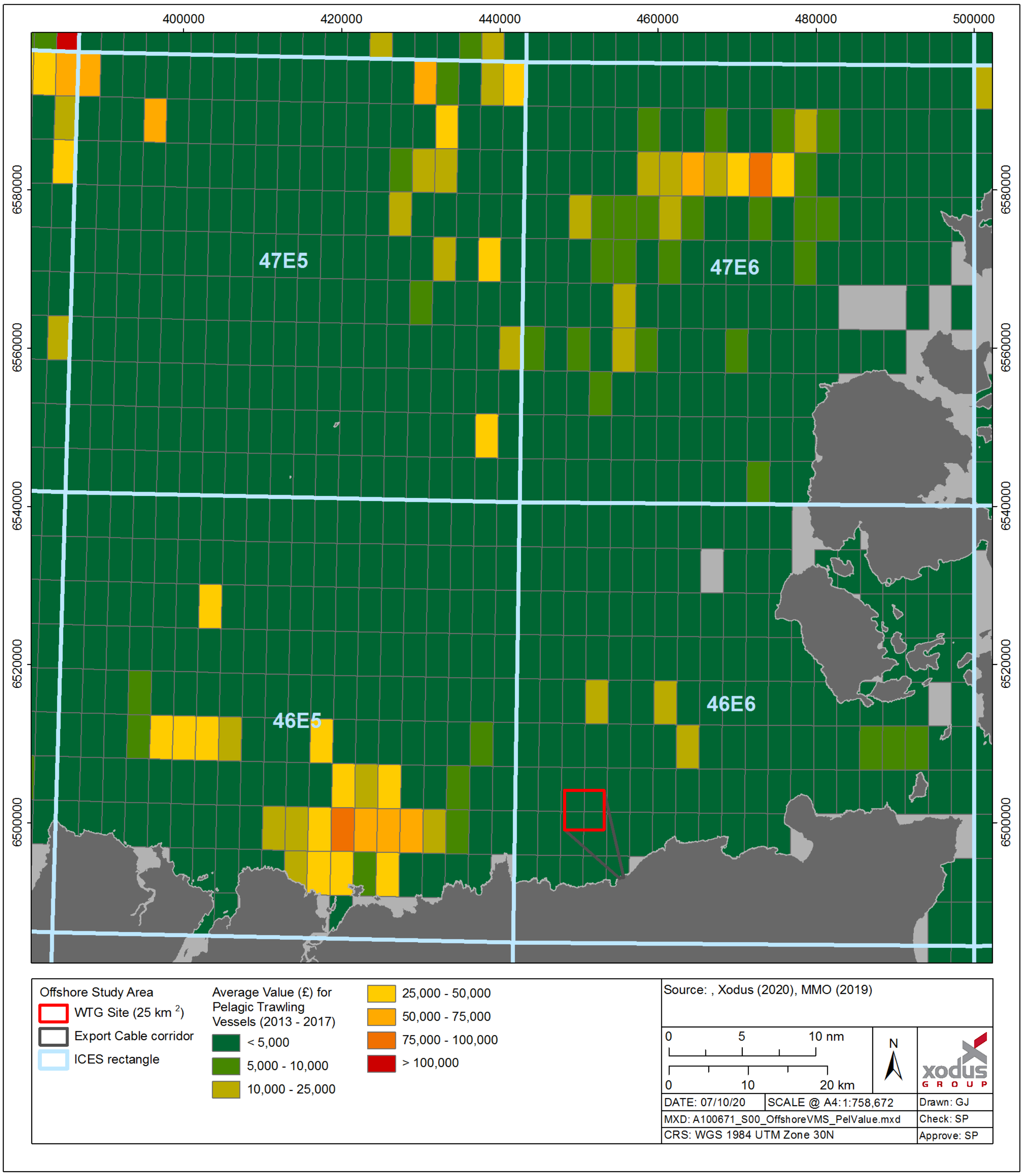


Figure 9-7 Average VMS Values for Pelagic Trawling Vessels (2013-2017) (MMO, 2019)

9.2.8 Identification of Potential Impacts

There are a number of potential impacts which could occur to commercial fisheries receptors during the construction operation and maintenance and decommissioning phase of the Project. The full list of the potential impacts which have been scoped in for assessment within the commercial fisheries section of the EIA is provided in Table 9-1. Impacts which will be considered within other chapters of the EIA include:

- Obstruction of regular fishing vessel transit routes due to the presence of vessels and safety zones during construction or due to the presence of floating platform and associated moorings during operation and maintenance (Section 9.3: Shipping and Navigation);
- Navigational safety issues for fishing vessels during construction and operation and maintenance phases (Section 9.3: Shipping and Navigation); and
- Change in the abundance or distribution of target species and resulting impact on fisheries resource due to construction activities (Section 8.3: Fish and Shellfish Ecology).

9.2.9 Cumulative Impacts

Impacts to commercial fisheries present in the Offshore Study Area are expected to be largely temporary and relatively localised, therefore there will be limited scope for cumulative impacts. However, it is considered the Project and other proposed projects in the vicinity have the potential to impact commercial fisheries in the area in a cumulative manner. This will be assessed further at EIA.

Developments which are within a certain proximity to the Project will be considered within the cumulative impact assessment. The developments which have the potential to cause cumulative effects on impacts to fish and shellfish receptors include the following:

- The SHE-T Orkney-Caithness interconnector cable (consented);
- Potential OWF Developments in the ScotWind N1 DPO; and
- Pentland Floating Offshore Wind Demonstrator (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on the physical environment have the potential to arise from cable installation activities in these areas.

In addition, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on the physical environment if export cables cross the Project Offshore Study Area.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the array. Ultimately the array will have the same number of turbines so there are no cumulative impacts predicted to commercial fisheries receptors as a result of operation of the Demonstrator and array. Because the Demonstrator will be subject to a separate installation campaign to the Project, there is the potential for cumulative impacts, however these are anticipated to be minor.

Table 9-1 summarises all potential impacts including potential cumulative impacts.

Table 9-1 Potential impacts on Commercial Fisheries during Construction, Operations and Maintenance and Decommissioning of the Offshore Study Area

Impact	High level Impact Summary and Justification	Scoped in/out
Potential Impacts During Construction		
Loss of access to fishing grounds due to the presence	The implementation of safety zones around construction activities may result in a temporary loss	Scoped in

Impact	High level Impact Summary and Justification	Scoped in/out
of vessels and safety zones during construction	or restricted access to fishing grounds within in and in the vicinity of the Offshore study Area.	
Displacement of fishing activity into other areas	Fishing activity may be temporarily displaced due to the temporary loss or restricted access to fishing grounds associated with safety zones around construction activities or vessels	Scoped in
Potential Impacts During Operations and Maintenance		
Loss of access to fishing grounds due to the presence of floating platform, associated moorings and safety zone	The presence of infrastructure within the Offshore Study Area may result in a loss or restricted access to fishing grounds during the operation and maintenance phase. Additionally, the implementation of safety zones around major maintenance activities may also result in temporary localised loss or restricted access to grounds.	Scoped in
Displacement to other fishing grounds resulting in increased pressure on resources or conflict with other sea users, due to the presence of floating platform, associated moorings and safety zone	Fishing activity may be displaced into other areas as a result of loss of grounds or restricted access to fishing grounds during the operation and maintenance phase. Any displacement of existing fishing activity from the area may result in increased pressure on other existing grounds; affecting those fishing locally and in other areas. This has the potential to impact existing local fishing management practices and relationships between existing sea users.	Scoped in
Potential for fishing gear to become entangled with floating and subsea structures, resulting in damage or loss of fishing gear	Navigational safety risks (e.g. collision/allision) may arise as a result of increased vessel traffic associated with maintenance works and the presence of project infrastructure. Potential navigational risk have also been considered in the PHA (Section 9.3) and will be considered further in the Navigational Risk Assessment (NRA). In addition to navigational safety risks, in the specific case of the vessels engaged in fishing, there may be additional risks such as the potential for snagging with project infrastructure and the presence of objects/obstacles on the seabed e.g. in areas where the export cable is suspended (the dynamic part of the export cable) or if there are areas where the export cable cannot be buried to the optimal burial depth there is an increases risk of snagging	Scoped in and considered further with reference to Section 9.2: Shipping and Navigation
Obstruction of regular fishing vessel transit routes due to the presence of floating platform and associated moorings	The development may result in changes to local navigation and transit routes for fishing vessels.	Scoped in

Impact	High level Impact Summary and Justification	Scoped in/out
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase. Following removal of structures opportunities for habitat recovery in the former location of foundations may arise.		As construction
Potential Cumulative Impacts		
There is the potential for cumulative impacts arising in association with the Orkney-Caithness interconnector developments and the proposed Pentland Floating Offshore Wind Demonstrator. The same impacts will be considered here as those identified for the construction phase		Scoped in

9.2.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 9-2. These methods will be used alongside input from the relevant guidance as identified in Section 9.2.2.

Table 9-2 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Loss or restricted access to fishing grounds	None identified	The data sources which are identified in Section 9.2.3 will provide the basis for the commercial fisheries Section of the EIA. In addition, data which is gathered during consultation with the stakeholders listed in Section 9.2.4 will be used to inform the commercial fisheries baseline. An assessment following the approach outlined in Section 6, utilising desk-based sources and consultation data will be undertaken. The assessment of some impacts (clarified in Table 9-1) will be carried out in line with other Sections of the EIA such as Fish and Shellfish Ecology and Shipping and Navigation. In addition, certain aspects of the Project design, implementation or construction methodology will lead to mitigation measures which are embedded within the EIA.
Displacement of fishing activity into other areas	None identified	The data sources which are identified in Section 9.2.3 will provide the basis for the commercial fisheries Section of the EIA. In addition, data which is gathered during consultation with the stakeholders listed in Section 9.2.4 will be used to inform the commercial fisheries baseline. An assessment following the approach outlined in Section 6, utilising desk-based sources and consultation data will be undertaken. The assessment of some impacts (clarified in Table 9-1) will be carried out in line with other Sections of the EIA such as Fish and Shellfish Ecology and Shipping and Navigation. In addition, certain aspects of the Project design, implementation or construction

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
		methodology will lead to mitigation measures which are embedded within the EIA.
Interference with fishing activity	None identified	The data sources which are identified in Section 9.2.3 will provide the basis for the commercial fisheries Section of the EIA. In addition, data which is gathered during consultation with the stakeholders listed in Section 9.2.4 will be used to inform the commercial fisheries baseline. An assessment following the approach outlined in Section 6, utilising desk-based sources and consultation data will be undertaken. The assessment of some impacts (clarified in Table 9-1) will be carried out in line with other Sections of the EIA such as Fish and Shellfish Ecology and Shipping and Navigation. In addition, certain aspects of the Project design, implementation or construction methodology will lead to mitigation measures which are embedded within the EIA.
Increased steaming times	None identified	The data sources which are identified in Section 9.2.3 will provide the basis for the commercial fisheries Section of the EIA. In addition, data which is gathered during consultation with the stakeholders listed in Section 9.2.4 will be used to inform the commercial fisheries baseline. An assessment following the approach outlined in Section 6, utilising desk-based sources and consultation data will be undertaken. The assessment of some impacts (clarified in Table 9-1) will be carried out in line with other Sections of the EIA such as Fish and Shellfish Ecology and Shipping and Navigation. In addition, certain aspects of the Project design, implementation or construction methodology will lead to mitigation measures which are embedded within the EIA.
Safety issues for fishing vessels	None identified	The data sources which are identified in Section 9.2.3 will provide the basis for the commercial fisheries Section of the EIA. In addition, data which is gathered during consultation with the stakeholders listed in Section 9.2.4 will be used to inform the commercial fisheries baseline. An assessment following the approach outlined in Section 6, utilising desk-based sources and consultation data will be undertaken. The assessment of some impacts (clarified in Table 9-1) will be carried out in line with other Sections of the EIA such as Fish and Shellfish Ecology and Shipping and Navigation. In addition, certain aspects of the Project design, implementation or construction methodology will lead to mitigation measures which are embedded within the EIA.

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Potential impacts to commercially exploited species	None identified	The data sources which are identified in Section 9.2.3 will provide the basis for the commercial fisheries Section of the EIA. In addition, data which is gathered during consultation with the stakeholders listed in Section 9.2.4 will be used to inform the commercial fisheries baseline. An assessment following the approach outlined in Section 6, utilising desk-based sources and consultation data will be undertaken. The assessment of some impacts (clarified in Table 9-1) will be carried out in line with other Sections of the EIA such as Fish and Shellfish Ecology and Shipping and Navigation. In addition, certain aspects of the Project design, implementation or construction methodology will lead to mitigation measures which are embedded within the EIA.
Increased steaming times	None identified	The data sources which are identified in Section 9.2.3 will provide the basis for the commercial fisheries Section of the EIA. In addition, data which is gathered during consultation with the stakeholders listed in Section 9.2.4 will be used to inform the commercial fisheries baseline. An assessment following the approach outlined in Section 6, utilising desk-based sources and consultation data will be undertaken. The assessment of some impacts (clarified in Table 9-1) will be carried out in line with other Sections of the EIA such as Fish and Shellfish Ecology and Shipping and Navigation. In addition, certain aspects of the Project design, implementation or construction methodology will lead to mitigation measures which are embedded within the EIA.
Cumulative Impacts	None identified	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

9.2.11 Conclusions and Next Steps

Potential impacts which may be caused to commercial fisheries receptors shall be scoped in for assessment in the EIA. Consultation will be continued to clearly define the nature, spatial extent and operating practices variability of fishing vessels which are active in waters relevant to the Offshore Study Area. Linkages will occur with the assessments carried out in other sections of the EIA including Fish and Shellfish Ecology and Shipping and Navigation

9.3 Shipping and Navigation

9.3.1 Introduction

This section characterises shipping activity in the vicinity of the Project by considering commercial shipping activity and shipping routes, fishing vessel activity, recreational vessel activity, maritime incidents, Search and Rescue (SAR) resources and other navigational features such as ports /

harbours. The section goes on to describe the key sensitivities and an initial appraisal of the potential impacts arising from the Project on shipping and navigation and presents a summary of the relevant UK guidance, methodologies and best practice which will be applied to the EIA.

Key information and data gaps associated with each receptor are identified and an outline of the approach to addressing each information/data gap is provided. Key stakeholders that would be consulted with regards to each receptor are also listed. This section also outlines the scope of the surveys and studies that will be completed in support of the EIA process and that will be subject to consultation with relevant consultees.

9.3.2 Study Area

A study area encompassing the area within 10 nautical miles (nm) around the WTG Site has been considered in this section in order to characterise maritime activity that might be potentially affected by the Project.

9.3.3 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on to shipping and navigation:

Guidance

- IALA (2013). O-139 the Marking of Man-Made Offshore Structures. Edition 2. Saint Germaine en Laye, France: IALA.
- IMO (1972/77). Convention on the International Regulation for Preventing Collision at Sea (COLREGs) – Annex 3. London: IMO.
- IMO (1974). International Convention for the Safety of Life at Sea (SOLAS). London: IMO.
- IMO (2018). Revised Guidelines for Formal Safety Assessment. London: IMO.
- MCA (2013). Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms, Southampton: MCA.
- MCA (2016). MGN 543 (Merchant and Fishing) Safety of Navigation OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response. Southampton: MCA.
- MCA & HSE (2017). Regulatory Expectations on Moorings for Floating Wind and Marine Devices.
- MCA (2018). Annex 5 to MGN 543. Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response. Southampton: MCA.
- RYA (2015). The RYA's Position on Offshore Energy Developments: Paper 1 – Wind Energy. Southampton: MCA.
- RYA (2019). UK Coastal Atlas of Recreational Boating 2.1. Southampton: RYA.

9.3.4 Available Information

9.3.4.1 Automatic Identification System

Automatic Identification System (AIS) is an automatic tracking system used on ships and by vessel traffic services (VTS) for identifying and locating vessels. AIS is required to be fitted aboard all ships of 300 gross tonnage and upwards engaged on international voyages, cargo ships of 500 gross tonnage and upwards not engaged on international voyages, and passenger ships irrespective of size built on or after 1 July 2002.

It should be noted that AIS carriage is not compulsory for fishing vessels less than 15 m length, or vessels of less than 300 Gross Tonnage (GT) (notably this includes most recreational vessels). It is therefore considered that such traffic may be under-represented within the assessment undertaken for this Scoping Report; however, it is noted that smaller vessels are increasingly observed to utilise AIS voluntarily given the associated safety benefits. Taking into account these limitations, AIS data, supported by the other data sets, are considered suitable for the high-level baseline assessment provided in this Scoping Report.

9.3.4.2 Maritime Incident Data

Marine Accident Investigation Branch (MAIB) Incident Data from 2008 to 2017 was reviewed for the Study Area.

Royal National Lifeboat Institution (RNLI) Incident Data from 2008 to 2017 was reviewed for the Study Area.

9.3.4.3 Admiralty Publications

Admiralty charts 2162 (Issued May 2020) and 1945 (January 2019) were used for the study, and reference was made to UKHO (2018). NP52 Admiralty Sailing Directions North Coast of Scotland Pilot Book 10th Edition.

9.3.4.4 Other

Other data sources will include the previous NRA, the Marine Scotland Shipping Study of the Pentland Firth & Orkney Waters, and ScotMap.

9.3.5 Surveys and Studies Carried Out to Date

The following sources data were used to prepare the 2016 NRA for the same site.

> Consultation with stakeholders (national and local).
> Review of the Marine Scotland Shipping Study of the Pentland Firth & Orkney Waters.
> Assessment of small fishing vessels not typically on AIS or Vessel Monitoring System (VMS) using ScotMap Pilot Study of Fishing in PFOW.
> Review of the Strategic Area Navigation Appraisal by The Crown Estate (2014).
> 28 Day Desktop AIS data analysis using 14 Days Summer (2015) and Winter (2016).
> 3 Years Desktop VMS data analysis between April 2011 and March 2014.
> Incident Data review for RNLI and MAIB incidents.

No site-specific surveys were undertaken to inform the NRA for shipping and navigation.

9.3.6 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore human environment. Consultation was carried out with the MCA in October 2020 and used to inform this Scoping chapter.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to shipping and navigation have been considered within this report

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

9.3.7 Baselines Characterisation

9.3.7.1 Navigational Features

Navigational features are presented in Figure 9-8. The Pentland Firth itself is subject to a voluntary ship reporting system whereby vessels are advised to contact the Aberdeen Coastguard one hour before entering the Firth and again on leaving. There are Admiralty Chart warnings about the very strong tidal streams within Pentland Firth. These warnings also specify an Area to be Avoided (ATBA), advising laden tankers not bound for or to Flotta or Scapa Flow to avoid the Pentland Firth in adverse weather or restricted visibility.

The Pentland Firth is used by the Ministry of Defence (MOD) for the Exercise Joint Warrior which takes place predominately in the north west of Scotland. The exercise is the largest in Europe and could involve around 50 vessels. The exercise is biannual with a duration of approximately 2 weeks.

No navigational channels are marked on Admiralty charts for the area surrounding the Site.

Six lighthouses are present along the north coast of the Scottish mainland and Pentland Firth and Orkney Waters (PFOW), namely Cape Wrath, Dunnet Head, Stroma, Swona, Duncansby Head and Pentland Skerries.

The nearest industrial/fishing ports are Scrabster, Stromness and Lyness. There are also small harbour facilities along the North coast comprising small jetties, semi natural harbours, harbour walls and slipways.

There are four existing subsea cables located to the east of the Offshore Study Area between Thurso Bay and Orkney.

The 6 nm fishery limit intersects the northern section of the Offshore Study Area.

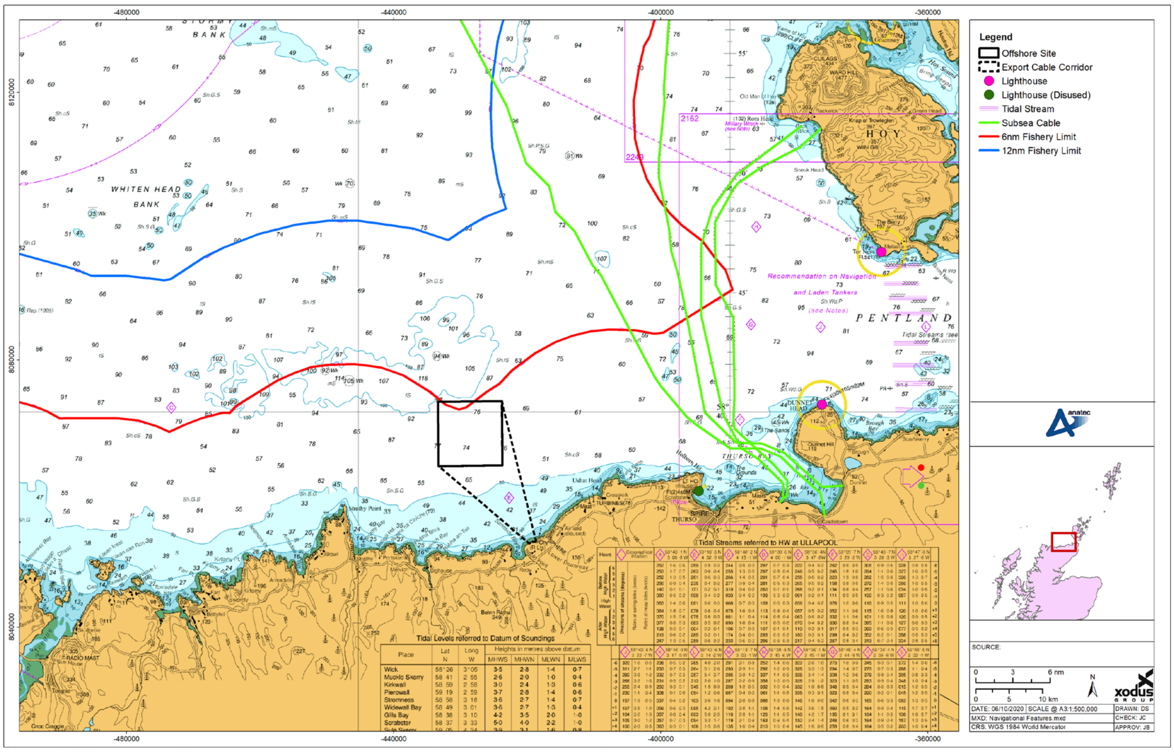


Figure 9-8 Navigational Features

9.3.7.2 Vessel Traffic

Baseline characterisations of the AIS vessel traffic data within the shipping and navigation study area, collected during the summer and winter periods (14 days per period) 2019, is shown in

Figure 9-9 and Figure 9-10, respectively. Vessels berthed in Scrabster Harbour were excluded from analysis.

An average of 20 unique vessels were recorded per day within the study area during summer 2019, with an average of approximately two unique vessels per day intersecting the site. The daily averages were similar in winter 2019, with 21 per day within the study area and two per day intersecting the site.

The main vessel types recorded in the study area during summer 2019 were cargo (39%), fishing vessels (23%); passenger vessels (10%) and recreational vessels (10%). The main vessel types recorded during the winter 2019 study period were cargo vessels (39%), fishing vessels (34%) and tankers (13%). No recreational vessels were recorded during the winter 2019 study period. It is again noted that smaller vessels are not required to carry AIS.

The majority of vessels passing through the site were fishing vessels during both summer and winter periods.

Anchored vessels were only observed within Thurso Bay during the surveys.

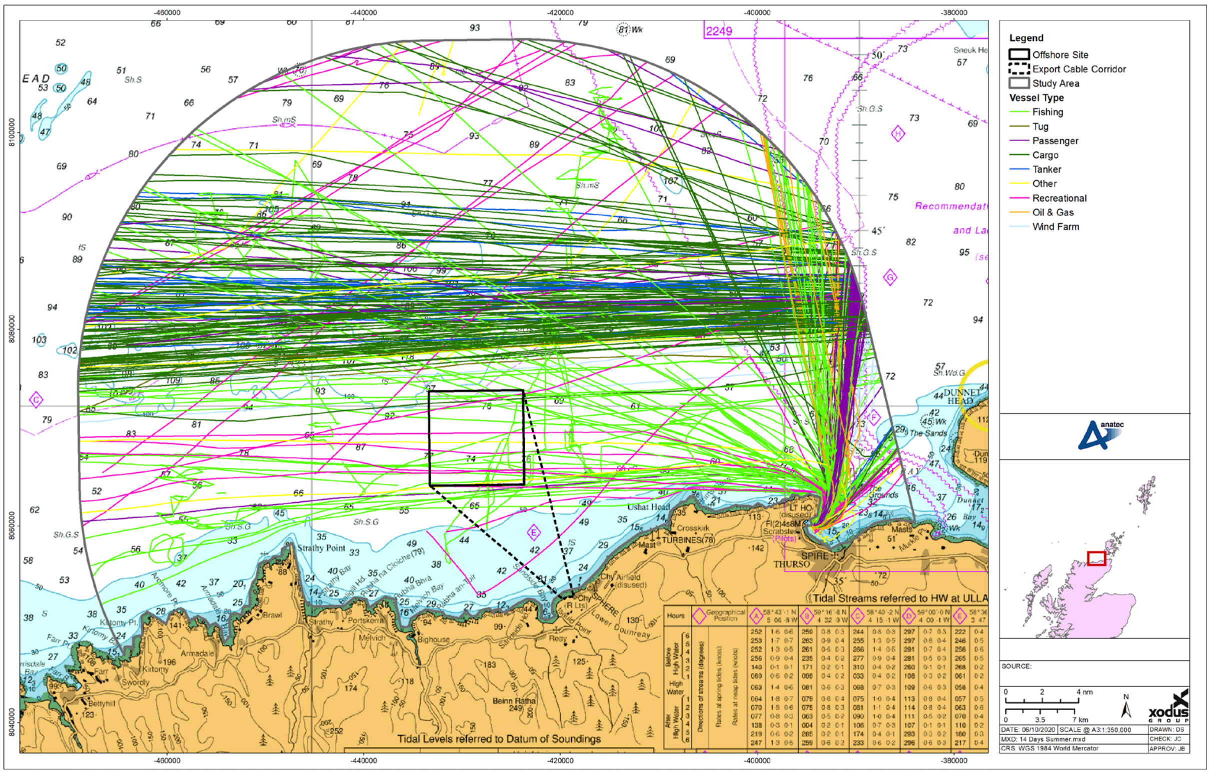


Figure 9-9 14 Days Summer 2019 AIS Marine Traffic Data

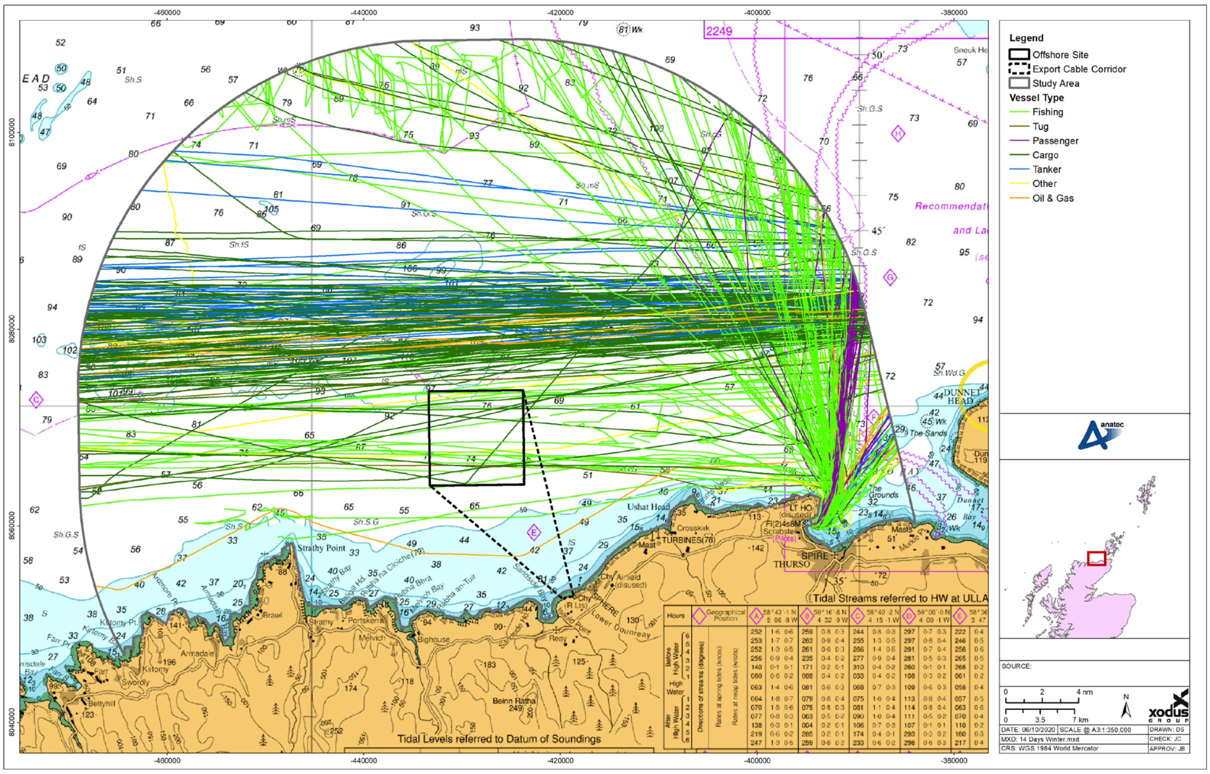


Figure 9-10 14 Days Winter 2019 AIS Marine Traffic Data

9.3.7.3 Maritime Incidents

9.3.7.3.1 MAIB

An analysis of the MAIB incident data from 2008 to 2017, indicated that a total of 11 incidents were reported within the study area, but all outside the WTG site and Export Cable Corridor.

Of the 11 incidents, seven involved machinery failure, two involved accident to person, one involved cargo handling failure and one involved contact which was within Thurso harbour area. The main vessel type involved was fishing (6 incidents), followed by cargo (3), passenger (1) and fishery research (1).

9.3.7.3.2 RNLI

An analysis of the RNLI incident data from 2008 to 2017, indicated that a total of 42 incidents were recorded within the study area, but all outside the site and Export Cable Corridor. Twenty were within Thurso Bay.

As with the MAIB data, the most common vessel type was fishing, and the most common cause was machinery failure.

9.3.8 Identification of Potential Impacts

Table 9-3 summarises the potential impacts / risks to shipping and navigation of the Project identified from the Scoping review. Given that the NRA will cover a set of criteria under MGN 543 (MCA, 2016) which must be considered, no impacts will be scoped out.

9.3.9 Cumulative Impacts

There is potential for cumulative effects to occur on shipping and navigation receptors as a result of other projects or activities. The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities identified within the EIA to have a potential cumulative impact. Impacts are likely to be temporary and minor and relate largely to increased vessel traffic relating to installation activities where they occur simultaneously with installation activities relating to the Project.

Developments which are within a certain proximity to the Project will be considered within the cumulative impact assessment. The developments which have the potential to cause cumulative effects on impacts to fish and shellfish receptors include the following:

> The SHE-T Orkney-Caithness interconnector cable (consented);
> Potential OWF Developments in the ScotWind N1 DPO; and
> Pentland Floating Offshore Wind Demonstrator (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on the physical environment have the potential to arise from cable installation activities in these areas.

In addition, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on the physical environment if export cables cross the Project Offshore Study Area.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the array. Ultimately the array will have the same number of turbines so there are no cumulative impacts predicted to shipping receptors as a result of operation of the Demonstrator and array. Because the Demonstrator will be subject to a separate installation campaign to the Project and will have a separate export cable, there is the potential for cumulative impacts, however these are assessed to be minor.

Table 9-3 summarises all potential impacts including potential cumulative impacts.

Table 9-3 Potential Impacts on Shipping and Navigation during Construction, Operations and Maintenance and Decommissioning of the Project

Impact	High level impact summary and justification	Scoped in/out
Potential Impacts During Construction		
Vessel displacement due to construction activities.	Vessels may be displaced from their existing routes due to construction activities associated with project.	Scoped in
Vessel to vessel collision risk between a third-party vessel and a project vessel due to the presence of project related vessels.	The presence of project vessels during construction may increase the likelihood of vessel to vessel encounters and subsequently increase the collision risk between third-party and project vessels.	Scoped in
Increased vessel to vessel collision risk between third party vessels due to vessel displacement.	Displaced vessels may lead to increased traffic densities in certain areas and a subsequent increase in collision risk between third party vessels.	Scoped in

Impact	High level impact summary and justification	Scoped in/out
Vessel to structure allision risk due to the presence of new structures associated with the project.	Partially complete and completed structures within the site could create an allision risk (powered or drifting) to passing traffic.	Scoped in
Reduced access to local ports due to construction activities associated with the site.	Access to local ports may be impacted due to construction activities associated with the project.	Scoped in
Potential Impacts During Operations and Maintenance		
Commercial traffic displacement due to the presence of the site.	Commercial vessels may be displaced from their existing routes due to the presence of the site.	Scoped in
Fishing vessel and recreational vessel displacement due to the presence of the site.	Fishing vessels and recreational vessels may be displaced from their existing routes due to the presence of the site.	Scoped in
Vessel to vessel collision risk between a third-party vessel and a project vessel due to the presence of project vessels.	The presence of project vessels during maintenance may increase the likelihood of vessel to vessel encounters and subsequently increase the collision risk between third-party and project vessels.	Scoped in
Increased vessel to vessel collision risk between third-party vessels (route-based) due to the displacement of vessels from their usual routes.	Displaced vessels may lead to increased traffic densities in certain areas and a subsequent increase in collision risk between third party commercial vessels.	Scoped in
Increased vessel to vessel collision risk involving fishing vessels and/or recreational vessels due to the displacement of fishing and/or recreational vessels.	Displaced vessels may lead to increased traffic densities in certain areas and a subsequent increase in encounters / collisions.	Scoped in
Vessel to structure allision risk for fishing vessels in transit due to the presence of new structures associated with the project.	Structures within the site could create an allision risk (powered or drifting) to passing fishing vessels.	Scoped in
Vessel to structure allision risk for recreational vessels due to the presence of new structures associated with the project.	Structures within the site could create an allision risk (powered or drifting) to passing recreational vessels. This includes the risk of yacht mast interaction with rotor blades.	Scoped in
Reduced access to local ports due to maintenance activities associated with the project.	Access to local ports may be impacted due to maintenance activities associated with the project.	Scoped in
Reduction of under keel clearance due to the presence of moorings/ inter array cables / export cables/ cable protection associated with the Offshore Study Area.	The implementation of cable protection to cables associated with the Offshore Study Area may reduce water depths in proximity and therefore reduce the under keel clearance for third-party traffic.	Scoped in

Impact	High level impact summary and justification	Scoped in/out
Vessel interaction with subsea cables and mooring lines associated with the project.	The presence of subsea cables and mooring lines associated with the project may increase the likelihood of anchor or fishing gear interaction for third-party vessels.	Scoped in
Loss of Station	A mooring system failure could cause a structure to lose station and create a hazard to navigation away from its given location.	Scoped in
Interference with marine navigation, communications and position fixing equipment due to the presence of new structures associated with the project.	Communication and position fixing equipment may be affected by the presence of structures within the site, or proposed offshore Export Cable Corridor	Scoped in
Reduction of emergency response capability due to increased incident rates and/or reduced access for SAR responders.	The presence of the project may result in an increased number of incidents requiring emergency response associated with work vessels or third-party vessels. Also the presence of the structures may reduce access for SAR responders.	Scoped in
Potential Impacts During Decommissioning		
The impacts for the decommissioning phase will be similar to the impacts for the construction phase noting that from a shipping and navigation perspective the activities during both of these phases will be similar.		As construction
Potential Cumulative Impacts		
There is potential for cumulative effects to occur on shipping and navigation receptors as a result of other projects or activities.		Scoped in

9.3.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 9-6. These methods will be used alongside input from the relevant guidance as identified in Section 9.3.3.

Table 9-4 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Vessel displacement Vessel to vessel collision risk between a third-party vessel and a project vessel due to the presence of project related vessels. Increased vessel to vessel collision risk between third party vessels due to vessel displacement.	In line with MGN 543 (MCA, 2016), it will be necessary to undertake a maritime traffic survey covering both AIS and non-AIS traffic within the Offshore Study Area and surrounding area. The requirement is for a minimum of 28 days of seasonally varied data which is usually collected during two, 14-day surveys, in summer and winter.	AIS data have been used to inform the baseline for this Scoping study but as noted this has limitation in terms of the tracking of small vessels, in particular, fishing and recreation. This will be overcome by carrying out site-specific surveys for the EIA (see below) as well as wider stakeholder consultation. Navigational safety is one of the key issues to be considered when developing an offshore wind farm and as such careful planning is required in consultation with the relevant statutory advisors.

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Vessel to structure allision risk due to the presence of new structures associated with the Project. Reduced access to local ports due to construction activities associated with the Offshore Study Area. Vessel to structure allision risk for vessels due to the presence of new structures associated with the Project. Reduction of under keel clearance due to the presence of moorings/ inter array cables / export cable / cable protection associated with the Export Cable Corridor. Vessel interaction with subsea cables and mooring lines associated with the project. Loss of Station Interference with marine navigation, communications and position fixing equipment due to the presence of new structures associated with the project. Reduction of emergency response capability due to increased incident rates and/or reduced access for SAR responders.		Navigational stakeholders will be circulated this Scoping Report and feedback will be considered within the EIA process. In general, the shipping and navigation offshore EIA Report will follow the methodology set out within the guidance and legislation presented in Section 9.3.3, in particular MGN 543 (MCA, 2016) and the accompanying Risk Assessment Methodology (MCA, 2013). As per the MCA Methodology, a Navigational Risk Assessment (NRA) will be undertaken, the output of which will form the primary input into the Offshore EIA Report. Given that the NRA includes a set of criteria under MGN 543 (MCA, 2016) which must be considered, no impacts will be scoped out of the NRA process. The IMO FSA methodology (IMO, 2018) is the internationally recognised approach for assessing the impacts to shipping and navigation receptors, and is the approach required under the MCA Methodology. This methodology is centred on risk control and assesses each impact in terms of its frequency and consequence so that its significance can be determined as: > "broadly acceptable"; > "tolerable"; or > "unacceptable". Any impacts assessed as "unacceptable" will require additional measures implemented beyond those considered embedded measures, so that the significance of the impact is reduced to within "tolerable" or "broadly acceptable" parameters. Impacts will be assessed using a risk ranking matrix based on the frequency and consequence of the impact. The frequency and consequence rankings of each impact will be determined using a number of inputs, including: > Quantitative modelling undertaken in the NRA; > Output of the baseline assessment; > Consideration of embedded measures; > Lessons learnt from other offshore windfarm projects; > Level of stakeholder concern; > Consultation output; > Hazard review workshop involving a cross-section of users; and > Expert opinion.
Cumulative Impacts	None identified	Desk based study on cumulative impacts utilising available consenting documents written for each

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
		of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

9.3.11 Conclusions and Next Steps

It has been concluded that the planned site is within an area of moderate shipping activity due to the regular commercial shipping traffic routeing via the Pentland Firth.

Approximately 20 vessels per day on average pass within the 10-mile study area based on four weeks of seasonally weighted AIS data. The main types of vessels recorded were commercial ships (cargo and tanker) and fishing vessels in both periods. During the summer there was notable recreational vessel activity. However, this is likely to be under-represented in the AIS data, along with smaller fishing vessels, which are not required to broadcast on AIS.

The bulk of the commercial shipping through the study area was identified as heading east-west off the north coast of Scotland, via the Pentland Firth, and therefore naturally passes north of the site. An average of two vessels per day were recorded within the site, mostly fishing vessels.

No historical maritime incidents were recorded within the site between 2008 and 2017, however a number were recorded within the study area. These most commonly involved fishing vessels, with machinery failure being the most common cause of past incidents.

Potential impacts during construction, operation and maintenance, and decommissioning were identified associated with the Project, including potential displacement of traffic, allision risk and collision risk. In line with MGN 543 (MCA, 2016) requirements, no impacts have been scoped out. As part of the EIA Report, a Navigational Risk Assessment will be carried out incorporating information on all types and sizes of vessels using the area identified through vessel traffic surveys and stakeholder consultation. Impacts / risks will be assessed in more detail and appropriate mitigation measures identified.

9.4 Aviation and Radar

9.4.1 Introduction

This section characterises civil and military aviation with respect to the Offshore Study Area by considering the proximity to and operations of civil airports, the types of radar operating around the north Scottish coast, helicopter operations and Ministry of Defence (MoD) operations. The potential impacts arising from the Offshore Study Area on these activities are considered with a summary presented of the relevant UK guidance, methodologies and best practice that will be applied in undertaking the EIA.

9.4.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts on aviation and radar:

Guidance

- Civil Aviation Authority (CAA) (2019a). Civil Aviation Publication (CAP) 670 Air Traffic Services Safety Requirements, Third Issue, Amendment 1/2019, 2019. Available online at http://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=9124;

- CAA (2019b) CAP 393 Air Navigation - The Order and the Regulations, Fifth Edition, 2019. Available online at https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=7523;
- CAA (2018). CAP 437 Standards for Offshore Helicopter Landing Areas, Edition 8, Amendment 1/2018, 2018. Available online at https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=523;
- CAA (2016). CAP 764 – CAA Policy and Guidelines on Wind Turbines, Sixth Edition, 2016. Available online at https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=5609;
- CAA (2017). CAP 774 – The UK Flight Information Services, Third Edition, 2017. Available online at https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=7890#:~:text=Description%3AThe%20UK%20Flight%20Information,provided%20to%20aircraft%20operating%20in.
- Military Aviation Authority (MAA) (2018). Regulatory Publication 3000 Series: Air Traffic Management Regulations. Available online at https://www.gov.uk/government/collections/3000-series-air-traffic-management-regulations-atm;
- MAA (2019). Manual of Military Air Traffic Management. Available online at https://www.gov.uk/government/publications/manual-of-military-air-traffic-management-mmatm;
- Marine Guidance Note (MGN) (2016) 543: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response Issues. Available online at https://www.gov.uk/government/publications/mgn-543-mf-safety-of-navigation-offshore-renewable-energy-installations-oreis-uk-navigational-practice-safety-and-emergency-response;
- MoD (2014). MoD Obstruction Lighting Guidance. Available online at https://cdn.ymaws.com/www.renewableuk.com/resource/collection/0B792CF1-8B8A-474B-95B6-17886BF724A7/MOD_lighting_guidance.pdf; and
- WED&CAIWG (2002). The Wind Energy, Defence and Civil Aviation Interests Working Group's 2002 Report on 'Wind Energy and Aviation Interests: Interim Guidelines. Available online at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48101/file17828.pdf.

9.4.3 Available Information

Data sources and guidance considered as part of the desktop review of the baseline situation include the following:

- CAA (2015). Visual Flight Rules Chart 2015. Available online at https://www.bfgc.co.uk/VFR_Guide.pdf;
- CAA (N.D). CAP 032, UK Integrated Aeronautical Information Package (UKIAIP). The UKIAIP is the main resource for information and flight procedures at all licensed UK airports as well as airspace, en-route procedures, charts and other air navigation information. Available online at https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=223;
- CAA (2019c), CAP 168, Licensing of Aerodromes, Eleventh edition, 2019 Available online at https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=6114#:~:text=De

scription%3ACAP%20168%20sets%20out,fighting%20services%20and%20medical%20services.&text=*This%20is%20a%20large%20file;

- Mil AIP (2020). Military Aeronautical Information Publication. Available online at https://www.aidu.mod.uk/aip/aipVolumes.html; and
- MoD (2018). MoD UK Low-Flying System (UKLFS) Priority Area Map 2018. Available online at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/714776/The_pattern_of_military_low_flying_across_the_uk_20162017.pdf.

9.4.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the Project. However, a pre-application proforma will be completed and sent to the MoD for further consultation.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to aviation and radar have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

9.4.5 Study Area

A study area encompassing the Offshore Study Area and the wider Pentland Firth has been considered in the section in order to sufficiently describe the existing civil and military aviation receptors (both onshore and offshore) that might be potentially affected by the offshore elements of the Offshore Study Area. For the purposes of this section, the zones are defined as:

- Local – specifically within the Offshore Study Area;
- Regional – that is the wider Pentland Firth area; or
- International – the airspace within 250 km of the Offshore Study Area boundary.

9.4.6 Surveys and Studies Carried Out to Date

No site-specific surveys or studies with regards to aviation in the marine environment have been carried out to date.

9.4.7 Description of the Current Environment

9.4.7.1 Civil En-Route/ Airport operations

Primary Surveillance Radar (PSR) systems at Allanshill approximately 151 km south-east of the Offshore Study Area and at Perwinnes approximately 191 km south-east of the WTG site. The WTG site is within the operational ranges of the two radar systems. The preliminary analysis undertaken for the previous EIA indicates that the wind turbines within the WTG site are unlikely to be detectable by these systems.

Inverness Airport PSR at approximately 125 km and Aberdeen Airport at approximately 185 km which utilises the Allanshill and Perwinnes PSR systems. Preliminary analysis indicates that the wind turbines within the Offshore Study Area are unlikely to be detectable by Inverness or Aberdeen PSR system.

Wick Airport is located at a distance of 47 km from the Offshore Study Area and Kirkwall Airport is located 63 km from the Offshore Study Area. The Dounreay Airstrip is disused and will therefore not taken forward for further assessment.

RAF Lossiemouth PSR is located 110 km to the south-east. Initial analysis indicates that the wind turbines within the Offshore Study Area are unlikely to be detectable by Lossiemouth PSR system.

Additionally, Islay Aerodrome and Tiree Aerodrome occur in the vicinity of the Project, however the airports lie approximately 356 km and 295 km from the Project. There is the potential for minor changes to Instrument Flight Procedures.

9.4.7.2 Precision Approach Radar Systems

RAF Lossiemouth Precision Approach Radar (PAR) system. The system is utilised to provide precision guidance to aircraft on approach to a runway and is safeguarded to a range of 20 nm from the end of operational runways and therefore will not be affected, as such will not be considered further in completing the EIA.

9.4.7.3 MoD Air Defence Operations

The MoD has AD radar stations in operation at Benbecula on the Isle of North Uist at a distance of 247 km from the WTG site and at Buchan in Aberdeenshire at a distance of 180 km. The WTG site is within the operational ranges of the two radar systems. Preliminary analysis indicates that the wind turbines within the WTG site are unlikely to be detectable by these systems.

9.4.7.4 Civil/ Military Secondary Surveillance Radar (SSR)

There are no SSR installations within 10 km of the WTG site boundary; consequently, SSR will not be affected and will not be considered in the EIA.

9.4.7.5 Other Aviation Communication and Navigation Systems

There are no Communication and Navigation System (CNS) installations within 34 km of the WTG site boundary; consequently, other CNS systems will not be affected and therefore will not be considered in the EIA.

9.4.7.6 Other MoD Aviation Activities

The Offshore Study Area is located in Low Flying Area (LFA) 14, which covers Scotland to the north of the Scottish central belt. Specifically, however, the WTG site is not considered to be in an area of particular low-flying sensitivity for the MoD with regard to the development of wind energy; the MoD is therefore not expected to raise concerns.

Temporary Reserved Area (TRA) 008B above the WTG site is active from Flight Level (FL) 195 up to FL245 (approximately 19,500ft up to 24,500ft). In addition, the Northern Managed Danger Area (MDA) complex (D712 Areas A-D) is located above the Offshore Study Area and when active, operate from FL245 up to FL660.

The Cape Wrath and Garvie Island complex (D801/2/3) are located approximately 35 km to the west of the WTG site and are active from the surface up to 55,000 ft. Live firing, bombing and Unmanned Aerial Vehicle activities take place within these areas.

The Offshore Study Area lies within military Practice and Exercise Area (PEXA) Area of Intense Aerial Activity (AIAA) D712C. An AIAA is defined as "*airspace within which military or civil aircraft, singly or in combination with others, regularly participate in unusual manoeuvres*" (CAA, 2008). Dander area D712C is an AIAA that is only used when notified (NATS, 2018).

9.4.7.7 Meteorological Office Radar

The closest Met Office radar systems are Druim a'Starraig located near Stornoway, Isle of Lewis and Hill of Dudwick near Ellon, Aberdeenshire and are both located a significant distance away from the

WTG site (146 km and 174 km respectively) and are highly unlikely to be affected and as such these will not be considered further in this assessment or the EIA.

9.4.7.8 Helicopter Activities

Helicopters operating between Aberdeen and the west of the Shetland Islands use a network of Main Helicopter Routes (MHR). The routes of MHRs X-Ray and Yankee are located approximately 10 nm and 4 nm, respectively to the north-east of the WTG site boundary.

The Sule Skerry Lighthouse located 54 km from the Offshore Study Area also requires helicopter access. Although, this Is limited as this lighthouse underwent automation in 1982 (NLB, 2020) and will therefore with only need to be accessed for maintenance purposes.

HMRs have no defined lateral dimensions, although 2 nm either side of the route centreline should ideally be kept obstacle free. However, it is not mandatory for helicopters to use established HMRs. When operating in good weather conditions, helicopters may route direct to their destination point. The offshore helicopter operators are not expected to raise concerns.

9.4.7.9 Search and Rescue Operations

When on an operational mission, Search and Rescue (SAR) aircraft are not constrained by the normal rules of the air and operate in accordance with their Aircraft Operator Certificate (AOC), which allows them total flexibility to manoeuvre using pilot's best judgement.

An Emergency Response Co-operation Plan (ERCoP) will be compiled in conjunction with the MCA and would be in place for the construction, operation and decommissioning phases of the Offshore Study Area. The ERCoP will detail specific marking and lighting of the wind turbine generators. The SAR helicopter bases will be supplied with an accurate Project GPS position. The MCA will also receive the hydrographic office information for the Offshore Study Area.

9.4.7.10 Minimum Sector Altitude

The Minimum Sector Altitude (MSA) is the lowest altitude which may be used which will provide a minimum clearance of 1,000 ft above all objects located in the area contained within a sector of a circle of 46 km (25 nm) radius centred on a radio aid to navigation. Wick Airport has a number of Instrument Flight Procedures (IFP) established which allow aircraft operating to use the airport in poor weather conditions without the provision of support from radar.

9.4.7.11 Aviation Lighting and Marking Requirements

There is expected to be a requirement for Aviation Obstruction Lighting on all or individual wind turbines within Zone, this will be determined via consultation.

There is a CAA requirement in the UK for all structures over 300 ft high to be charted on civil aviation maps and documentation (the MoD uses a lower threshold height). Consequently, the developer will be required to provide details of the development to the Defense Geographic Centre (DGC).

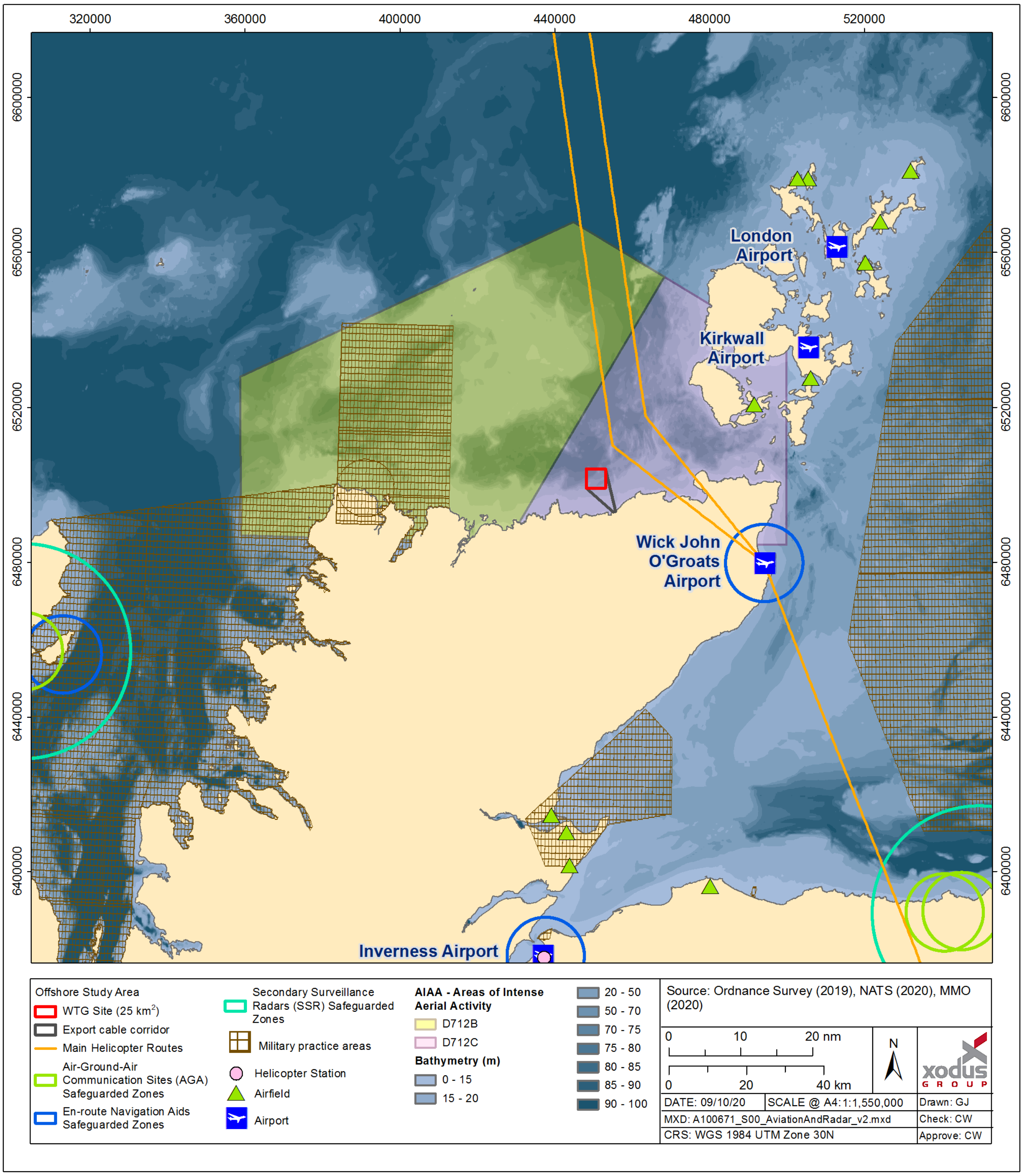


Figure 9-11 Key Airports and Radar Installations

Table 9-5 Aviation and Radar Interests of Relevance to the Offshore Study Area including Local ATC radars within 100 km of any Turbine and En-route Radars within 250 km of the Edge of the WTG site

Aviation stakeholder	Type	Approximate distance to the wind farm	Approximate bearing to the wind farm
Aberdeen Airport	Civil airport (utilising the Allanshill and Perwinnes radar systems)	185 km	149°
Allanshill (also utilised by Aberdeen airport)	En-route PSR/SSR	146 km	138°
Benbecula	ADR/SSR	237 km	244°
Buchan	ADR/SSR	174 km	137°
Druim a'Starraig	Met Office Radar	159 km	248°
Hill of Dudwick	Met Office Radar	165 km	136°
Inverness Airport	Civil Airport with PSR/SSR	122 km	189°
Kirkwall Airport	Civil Airport without Radar	61 km	143°
RAF Lossiemouth	Aerodrome with PSR/SSR/PAR	106 km	166°
MoD	UK Low Flying System – LFA 14	N/A	N/A
Oil and Gas Industry	Helicopter Support Operations	N/A	N/A
Perwinnes (also utilised by Aberdeen Airport)	En-route PSR/SSR	190 km	148°
Sandwick 1 and 2	SSR	156 km	252°
Search and Rescue Operations		N/A	N/A
Wick Airport	Civil Airport without Radar	46 km	115°

9.4.8 Identification of Potential Impacts

The key sensitivities for civil and military aviation within the study area are considered to be operational impacts on Civil Airports, En-route radar systems and on MoD radar systems and flying operations. The potential impacts on these systems will be fully considered in the EIA process.

The relative distances to operational aerodromes are, on preliminary analysis considered to be sufficient for the wind farm to avoid direct impacts upon airport operations in terms of Obstacle Limitation Surface infringements[7]. In addition, wind farm physical obstruction impacts on regional aviation operations will

[7] *The rules governing obstacles near aerodromes are outlined in the CAA document CAP 168 and MAA Regulatory Article 3016.*

be considered as part of the EIA process. Additionally, Kirkwall airport has future plans to introduce a radar by HIAL. Therefore, ongoing consultation will take place throughout the EIA process to understand what mitigation might be required.

A range of potential impacts on civil and military aviation related activities within the Offshore Study Area may occur during each phase (construction, operation and decommissioning) of the development and will therefore need to be considered as part of the EIA process, as detailed in Table 9-6.

9.4.9 Cumulative Impacts

There is potential for cumulative impacts on aviation and radar receptors to arise from the development of projects in the nearby area including:

- The SHE-T Orkney-Caithness interconnector cable (consented);
- Sutherland Spacehub (consented);
- Potential OWF Developments in the ScotWind N1 DPO; and
- Pentland Floating Offshore Wind Demonstrator (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on the physical environment have the potential to arise from cable installation activities in these areas.

In August 2020 permission was granted for the construction of a vertical launch space port with launch operations control centre, site integration facility, launch pad complex, antenna park, access road, fencing, services and associated infrastructure at Talmine, Tongue approximately 38 km from the Project. In the planning permission a condition is applied to limit the number of launches to 12 a year. The first satellite launches are planned for the early 2020s. Given the nature of this project it is not anticipated to interact with the Project. Therefore, cumulative impacts are not considered further.

Additionally, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on the physical environment if export cables cross the Offshore Study Area.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward) Thus, it would be independent of and ahead of installation activities associated with the array.

Impacts to aviation and radar as a result of the Project are expected to be relatively localised and small scale, therefore there will be limited scope for cumulative impacts. However, it is considered the Project and other projects in the vicinity have the potential to impact aviation and radar in the area in a cumulative manner. This will be assessed further at EIA stage.

Table 9-6 summarises the potential impacts including potential cumulative impacts.

Table 9-6 Potential impacts associated with aviation during construction, operations and maintenance and decommissioning of the Offshore Study Area based on preliminary analysis

Impacts	High level impact summary and justification	Scoped in/out
Potential Impacts During Construction		
Interference with civil, military and meteorological radar systems	No significant infrastructure is necessary during the construction phase e.g. high cranes. No overlap with radar systems.	Scoped out
Interference with MoD Air Defense Operations	Preliminary analysis indicates that the wind turbines within the Offshore Study Area are unlikely to be detectable by these systems.	Scoped out
Interference with helicopter operations	No significant infrastructure is necessary during the construction phase e.g. high cranes. No overlap with radar systems.	Scoped out
Interference with SAR operations	Physical presence of infrastructure during the construction phase and installation of wind turbines may present a physical obstruction and affect SAR operations.	Scoped in
Potential Impacts During Operations and Maintenance		
Interference with civil en-route operations	Analysis indicates no LOS to Civil En-route PSR systems; therefore, no effect on operations anticipated.	Scoped out
Interference with civil airport operations	The wind farm may present a physical obstruction and effect regional airport operations.	Scoped in
Interference with MoD aerodrome operations	Analysis indicates no LOS to MoD Aerodrome PSR systems; therefore, no effect on operations anticipated.	Scoped out
Interference with MoD air defence operations	Analysis indicates no LOS to MoD ADR systems; therefore, no effect on operations anticipated.	Scoped out
Interference with civil/military SSR	There are no SSR installations within 10 km of the Offshore Study Area boundary; consequently, SSR systems will not be affected.	Scoped out
Interference with low flying operations	The Offshore Study Area may present a physical obstruction and effect operations of Military Low Flying aircraft.	Scoped in
Interference with Met Office radar	The Offshore Study Area is not within the consultation zone whereby impacts to Met Office radar may be encountered; therefore, Met Office radar systems are highly unlikely to be affected.	Scoped out
Interference with helicopter operations	The wind farm may present a physical obstruction and affect operations of Low Flying aircraft supporting the Offshore O&G industry.	Scoped out

Impacts	High level impact summary and justification	Scoped in/out
Interference with SAR operations	The wind farm may present a physical obstruction and affect SAR operations.	Scoped in
Potential Impacts During Decommissioning		
Impacts are considered to be the same as those arising in the construction phase.		Scoped in
Potential Cumulative Impacts		
The potential for cumulative impacts will be assessed during the EIA process. The EIA will consider the impacts of the construction, operations and maintenance, and decommissioning of the Project cumulatively with other relevant projects that have been consented and are yet to be constructed as well as relevant projects for which an application has been submitted but which are not yet consented. Other projects in the area that are likely to cumulatively impact upon civilian and/or military aviation will be identified during the EIA process.		Scoped in

9.4.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 9-7. These methods will be used alongside input from the relevant guidance as identified in Section 9.4.2.

Table 9-7 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Interference with SAR operations	None identified	A desk-based study will be undertaken in the assessment phase to identify the potential impacts on those receptor groups scoped in. The study will incorporate a review and summary of the aviation consultation including an overview of the key concerns gathered from the industry regarding the potential development of the Offshore Study Area and present proposals for mitigation measures where likely significant impacts have been identified. Ongoing consultation as detailed above will continue to inform the EIA process. The EIA will build on the data collected as part of the scoping process, updated as necessary. No surveys are considered necessary.

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Interference with civil airport operations	None identified	A desk-based study will be undertaken in the assessment phase to identify the potential impacts on those receptor groups scoped in. The study will incorporate a review and summary of the aviation consultation including an overview of the key concerns gathered from the industry regarding the potential development of the Offshore Study Area and present proposals for mitigation measures where likely significant impacts have been identified. Ongoing consultation as detailed above will continue to inform the EIA process. The EIA will build on the data collected as part of the scoping process, updated as necessary. No surveys are considered necessary.
Interference with low flying operations	None identified	A desk-based study will be undertaken in the assessment phase to identify the potential impacts on those receptor groups scoped in. The study will incorporate a review and summary of the aviation consultation including an overview of the key concerns gathered from the industry regarding the potential development of the Offshore Study Area and present proposals for mitigation measures where likely significant impacts have been identified. Ongoing consultation as detailed above will continue to inform the EIA process. The EIA will build on the data collected as part of the scoping process, updated as necessary. No surveys are considered necessary.
Cumulative Impacts	None identified	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

9.4.11 Conclusions and Next Steps

In conclusion, interference with civil airport operations, low flying operations, helicopter operations and SAR operations are considered to be potential impacts arising from the operational phase of the Offshore Study Area and will be taken forward to the assessment phase. An assessment of potential impacts and potential cumulative impacts will then be completed within the EIA Report. Potential impacts relate to interference with SAR operations, civil airport operations, low flying operations and potential cumulative impacts associated with nearby future developments have been scoped in for the assessment within the EIA Report. There is not considered to be any potential impact during the construction phase due to the lack of tall structures or construction equipment necessary to install the Offshore Study Area infrastructure and impacts during this phase are scoped out.

9.5 Seascape, Landscape and Visual Impact Assessment

9.5.1 Introduction

This section of the Scoping Report sets out the proposed methodology and approach to be applied in the production of the Seascape, Landscape and Visual Impact Assessment (SLVIA) of the offshore components of the Project. It also presents the recommended scope of the SLVIA in terms of those coastal, landscape and visual receptors to be scoped in, and scoped out, of the detailed assessment. Justification of the recommended scope is presented through a preliminary appraisal of the relevant receptors, in respect of their potential to be significantly affected by the offshore components of the Project.

The purpose of the SLVIA is to identify and record the potential effects that the offshore components of the Project may have on coastal and landscape character, as well as effects on visual amenity. The assessment will take into account effects on coastal and landscape character, landscape designations, Wild Land Areas (WLAs), and views from various locations such as settlements, routes, hilltops and other sensitive locations. The potential cumulative effects that may arise from the addition of the Project to a context comprising wind farms and other large-scale energy developments, will also considered.

The SLVIA will consider the potential landscape and visual effects during the construction, operations and maintenance and decommissioning of the Project. Seascape, landscape and visual receptors may or may not be affected at all three development stages.

The offshore site is defined by the 'Indicative Development Area' illustrated in Figure 9-12 by a black rectangle, (hereafter referred to as the 'Site'). For the purposes of the Scoping Report, the offshore components of the Project comprise 6 to 10 turbines, each of a maximum blade tip height of 270 m above Highest Astronomical Tide (HAT) and the submerged offshore cable route. The proposed turbines will be supported by floating substructures. While the exact dimensions of these structures have not been determined, the base could potentially measure 124 m by 124 m, with a height of 54.25 m.

The Scoping Report for the LVIA of the onshore components of the Project (including landfall) is presented in Section 12.4: Landscape and Visual Amenity.

9.5.2 Legislation, Policy and Guidance

Legislation

The relevant regulations for carrying out EIA are set out in the Town and County Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (the 'EIA Regulations').

Policy

Relevant national and regional planning policy will also be considered in the SLVIA, including the Highland wide Development Plan (2012) and Scottish Planning Policy (2014). If revisions to any policy or best practice guidance documents are published during the preparation of the EIA, then the revised version will be used in place of the current version.

Guidance

As a matter of best practice, the SLVIA will be undertaken with regard to the following published guidance. This list is not definitive and the SLVIA will take note of all current and relevant guidance.

> Landscape Institute and the Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3).

> Countryside Agency and Scottish Natural Heritage (2002). Guidelines for Landscape Character Assessment.

- Scottish Natural Heritage (2012). Offshore Renewables: guidance on assessing the impact on coastal landscape and seascape.
- Scottish Natural Heritage (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments.
- Scottish Natural Heritage (2018). Methodology: Assessing the impacts on Special Landscape Qualities – Working Draft 11.
- Nature Scot (2020). Assessing Impacts on Wild Land Areas: Technical Guidance.
- Scottish Natural Heritage (February 2017). Visual Representation of Wind Farms Version 2.2.
- The Highland Council (July 2016). Visualisation Standards for Wind Energy Developments.
- Landscape Institute (September 2019). Visual Representation of Development Proposals Technical Guidance Note 06/19.

The term SLVIA refers to seascape, landscape and visual impact assessment, however the process of landscape and visual impact assessment remains the accepted methodology underpinning the assessment and, thus, this approach will be followed in the EIA.

9.5.3 SLVIA Study Area

The SLVIA study area for the offshore components of the Project will cover a radius of 50 km from the outer limits of the WTG Site, as shown in Figure 9-12 . This is considered to be the maximum radius within which a significant landscape or visual effect could occur, given the height of the turbines that are being considered and is the same study area radius that was agreed for the Moray East and Moray West SLVIAs off the Caithness and Sutherland coastline. The study area is not intended to identify the outer limit to which the offshore components of the Project will be visible, but instead to ensure that an area is defined which covers all potential significant effects.

In respect of the cumulative assessment, known cumulative wind farms within a 50 km study area are shown for scoping purposes in Figure 9-13. It is considered that all potential cumulative effects will arise as a result of interactions between the Project and other wind farms or large-scale energy developments within a 50 km study area, and not as a result of interactions with developments beyond this. It is proposed that following a detailed review of cumulative sites, a plan will be produced showing the location of wind farms and other large-scale energy developments, that are operational, under construction, consented or at application stage. These will be shown within a 50 km radius of the offshore Project and only include turbines greater than 50 m to blade tip.

This plan would form the basis for the cumulative assessment of the Project in the SLVIA. THC and NatureScot will be consulted over the final list of sites to be considered within the detailed cumulative assessment. Exceptionally, scoping stage sites may also be included where they are considered to be of specific relevance to the cumulative effect of the Project.

9.5.4 SLVIA Methodology and Approach

This Scoping Report has been informed by a preliminary appraisal. This has been initiated through a desk study of the 50 km radius study area, combined with a good working knowledge of this area. This study has identified aspects of the landscape and visual resource that will need to be considered in the landscape and visual assessment, including:

- Landscape Character Types (LCTs);
- Landscape-related planning designations;
- Wild Land Areas (WLAs);

> Representative viewpoints;
> Principal Visual Receptors; and
> Potential cumulative wind farms.

The desk study has also utilised Geographic Information System (GIS) software to explore the potential visibility of the Project. The resultant ZTV diagrams (Figure 9-14 - Figure 9-17) have provided an indication of which coastal, landscape and visual receptors may be affected by the Project.

The SLVIA is intended to determine the effects that the Project would have on the landscape and visual resource. For the purpose of assessment, the potential effects on the landscape and visual resource are grouped into four categories:

Effects on landscape character: landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and the way that this pattern is perceived. Effects on landscape character arise either through the introduction of new elements that physically alter this pattern of elements or through visibility of the Project that may alter the way in which the pattern of elements is perceived. This category of effects is made up of landscape character receptors, which fall into three groups; landscape character areas, coastal character areas and landscape-related designated areas. For the National Scenic Areas (NSAs) this would also include an assessment of the effects on the identified Special Qualities of the NSA.

Effects on wild land: the assessment of the effects on the wild land qualities of the Wild Land Areas through consideration of the impacts on the physical attributes and perceptual responses identified.

Effects on views: the assessment of the effects on views is an assessment of how the introduction of the Project would affect views throughout the study area. The assessment of effects on views is carried out in relation to representative viewpoints and principal visual receptors.

Cumulative effects: cumulative effects arise where the study areas for two or more wind farms overlap so that both of the wind farms are experienced at a proximity where they may have a greater incremental effect, or where wind farms may combine to have a sequential effect. The cumulative assessment will also consider other large-scale developments as part of the cumulative assessment, including SpaceHub Sutherland. In accordance with guidance, the SLVIA assesses the effect arising from the addition of the Project to the cumulative situation.

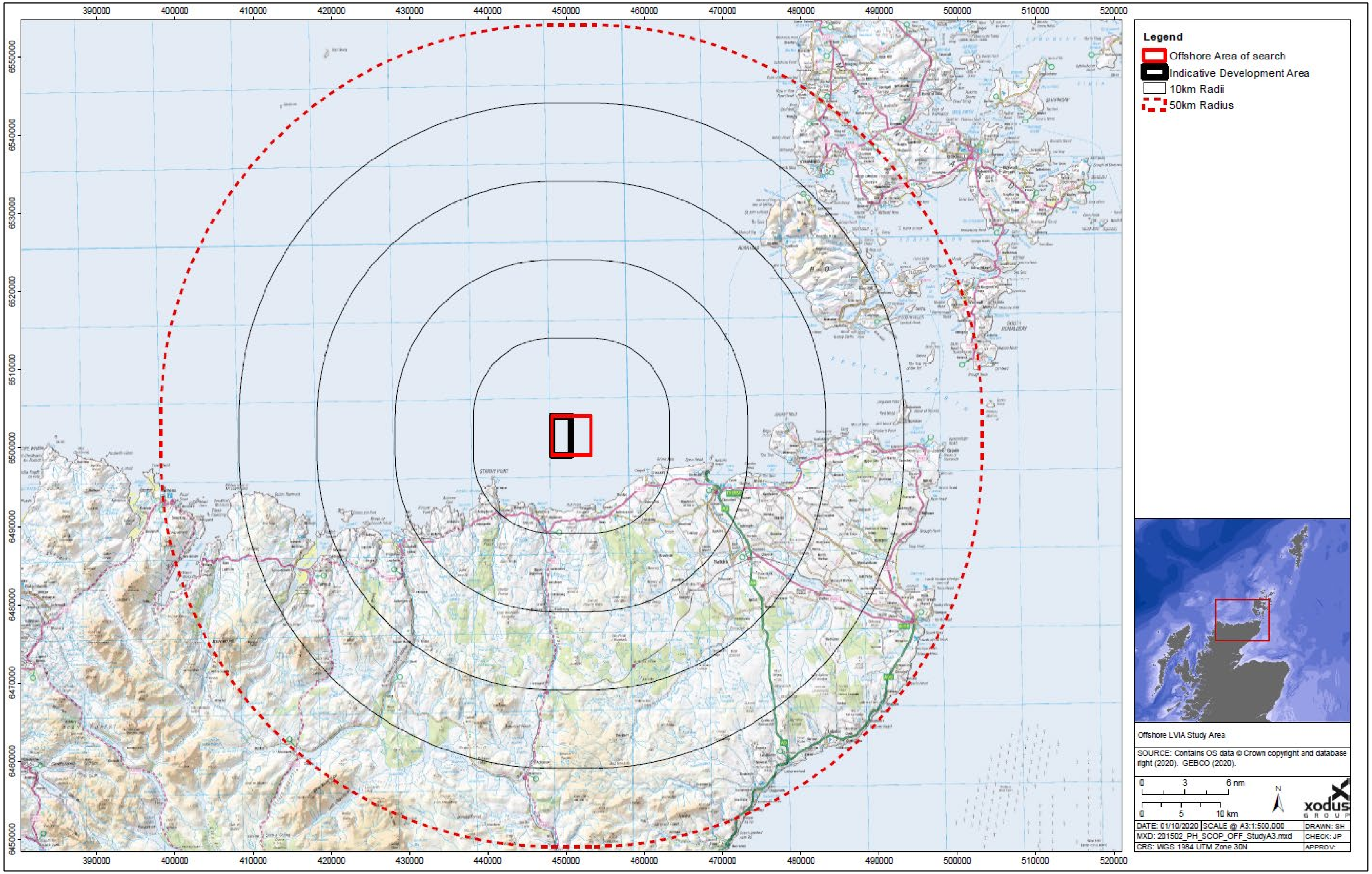


Figure 9-12 Offshore SLVIA Study Area

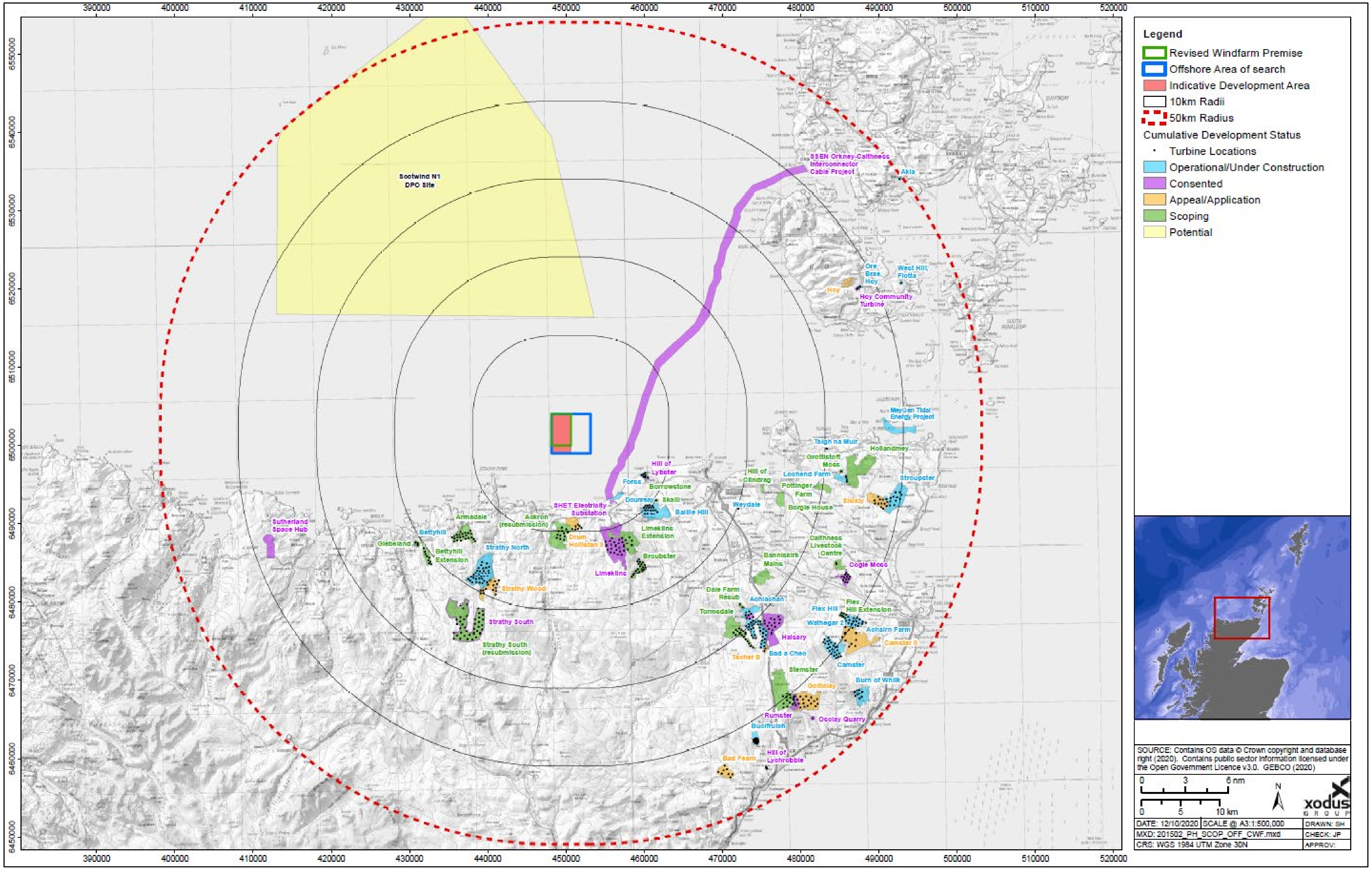


Figure 9-13 SLVIA Cumulative Impacts Potential

The objective of the SLVIA is to predict the likely significant effects on the seascape, landscape and visual resource. In line with the EIA Regulations, the SLVIA effects are assessed to be either significant or not significant.

The significance of effects is assessed through a combination of two considerations: the sensitivity of the seascape, landscape or visual receptor and the magnitude of change that would result from the addition of the Project. The level of sensitivity is derived from a combination of the value of the receptors and its susceptibility to the Project.

The geographic extent over which the landscape and visual effects would be experienced is also assessed, which is distinct from the size or scale of effect. This evaluation is not combined in the assessment of the level of magnitude but instead is used in determining the extent in which a particular magnitude of change is experienced and the extent of the significant and non-significant effects. The extent of the effects would vary depending on the specific nature of the Project and is principally assessed through analysis of the geographical extent of visibility of the Project across the landscape or principal visual receptor.

The duration and reversibility of effects on views are based on the period over which the Project is likely to exist, and the extent to which the Project will be removed, and its effects reversed at the end of that period. Duration and reversibility are not incorporated into the overall magnitude of change and may be stated separately in relation to the assessed effects.

The 'nature of effects' relates to whether the effects of the Project are adverse, neutral or beneficial. Guidance provided in GLVIA3 states that "thought must be given to whether the likely significant landscape and visual effects are judged to be positive (beneficial) or negative (adverse) in their consequences for landscape or for views and visual amenity" but does not provide an indication as to how that may be established in practice. The nature of effect is therefore one that requires interpretation and reasoned professional opinion.

OPEN generally adopts a precautionary approach which assumes that significant landscape and visual effects will be weighed on the negative side of the planning balance, although positive or neutral effects may arise in certain situations.

9.5.5 Baseline Studies and SLVIA Production

The detailed assessments presented in the SLVIA will be based on a combination of desk-based study and site work. The assessment of effects on landscape and coastal character will make reference to the following sources.

> Scottish Natural Heritage (2005). Commissioned Report No. 103: An assessment of the sensitivity and capacity of the Scottish seascape in relation to wind farms.

> Scottish Natural Heritage's Landscape Character Assessment of Scotland available at:

https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions

> Scottish Natural Heritage (2016). Landscape Character Assessment: Orkney and North Caithness.

> The Highland Council and Scottish Natural Heritage (2014). Assessment of Highland Special Landscape Areas.

> The Highland Council (December 2017). Landscape Sensitivity Appraisal: Black Isle, Surrounding Hills and Moray Firth Coast Caithness - For Inclusion in the Onshore Wind Energy Supplementary Guidance Addendum Supplementary Guidance: "Part 2B".

> Scottish Natural Heritage (2010). The special qualities of the National Scenic Areas.

> Scottish Natural Heritage (2017). Descriptions of Wild Land Areas.

An understanding of the potential effects of the offshore Project on landscape and visual receptors will be developed through detailed study of the ZTV for the Project. The assessment will be further developed on Site, where ZTVs and wirelines from the selected viewpoints will be used to establish whether the effects of the offshore Project will be significant or not. While field surveys will be carried out across the 50 km radius study area, the focus will be on those areas that are most sensitive to potential significant effects.

The written SLVIA will be accompanied by a volume of figures, which will be divided into two categories, maps and visualisations. The maps will be based on the 50 km study area around the Project and will present data of relevance to the assessment, such as LCTs, landscape designations, WLAs, viewpoints, cumulative developments and ZTVs. It is proposed that the visualisations will be based on the nine viewpoint locations, which are representative of the visual amenity of visual receptors in the study area. In line with approach agreed with NatureScot and THC for the preparation of visualisations for the Moray West Offshore Wind Farm SLVIA it is proposed that the visualisation figures would consist of viewpoint location plans in accordance with THC requirements, 90 degree field of view baseline photographs and cumulative wirelines (cylindrically projected) and 53.5 degree field of view wirelines and (planar projection) in accordance with SNH (NatureScot) visualisation standards. Single frame photomontages and photomontages presented for use in THC’s panoramic viewer would also be provided to THC in line with its visualisation standards.

9.5.6 Consultation

Consultation with stakeholders is an important part of the EIA process. Scottish Natural Heritage (SNH) and The Highland Council (THC) were consulted, in respect of the SLVIA included in the previous application. Comments on the previous application have helped inform the proposed approach and scope of the new application, albeit taking into account the fact that the updated project comprises a larger number of turbines that are larger in height. The North Planning Applications Committee Report (10th January 2016) presents a number of points that have been taken into account in the preparation of this Scoping Report.

In terms of the overall conclusion, the report makes the following statement; ‘*SNH consider however that the moderate significant landscape, visual and coastal effects predicated are likely to be contained between Strathy Point and Litter Ness. As such potential cumulative significant effects are likely to reflect this analysis and pattern of effects and are unlikely to trigger issues of national interest to SNH. The Planning Authority agrees that there will be moderate significant, visual and coastal effects within a localised area*.’

In respect of potential effects of the original offshore Project on NSAs, the following statement is made; ‘*SNH consider that the relatively small footprint of the development and distance from the NSA mitigates significant effects.’*

In respect of potential effects of the original offshore Project on WLAs, the following statement is made; ‘…*SNH agree with the ES that the visibility of the turbines is unlikely to be significant and not affect the integrity of the Wild Land Area. On balance, having considered SNH’s assessment and the ES, it is agreed that there would be no impact on the physical or perceptual qualities of the Wild Land Area.’*

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the Project. However, it is proposed that additional consultation is held in the assessment phase with THC and NatureScot.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders’ views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Pre-application Advice was issued by The Highland Council on 7th October 2020. Comments made by The Highland Council have helped inform this Scoping Report and will be considered in the SLVIA.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

9.5.7 Description of the Current Environment

The proposed 6 to 10 turbines will be located in the Atlantic Ocean, approximately 6.5 km north of the north coast of Scotland. They will occupy an area of the ocean where there are currently no other natural features or human artefacts. While there are no regular ferry routes passing through this part of the Atlantic Ocean, commercial and recreational vessels do pass through these waters.

The proposed turbines will be located north of the section of the Caithness coastline that lies between the villages of Melvich to the west and Reay to the east. This section of coastline is classified as part of the High Cliffs and Sheltered Bays LCT. There is no settlement along this elevated and exposed coastline and the hinterland is characterised by fields used for livestock grazing. This will be the closest section of coastline to the proposed offshore turbines.

The wider section of coastline forms a broad concave curve, spanning from Strathy Point in the west, to Brims Ness and Holborn Head in the east. Much of this coastline comprises high cliffs and rocky shores, with occasional, small and indented sandy bays, including Strathy Bay, Melvich Bay and Sandside Bay. The county boundary between Sutherland and Caithness falls in the centre of this broad bay, a couple of kilometres to the east of Melvich Bay. The regional scenic value of the coastline between Portskerra and Bettyhill is recognised through the Farr Bay, Strathy and Portskerra SLA. The open and exposed nature of this coastline is accentuated by the openness of the farmland that forms the immediate hinterland, and in which tree cover is sparse. Views to the north and north-west are predominantly drawn out across the featureless expanse of the Atlantic Ocean, while views to the north-east extend across the Pentland Firth to the Orkney Islands.

Beyond these two distinct promontories, the coastline folds away to the north-west and north-east, such that the strong association with the seascape of the Site, experienced across the concave curve coastline, is weakened as views are drawn in slightly different directions. The exception occurs at Dunnet Head, where its western coastline is orientated westwards towards the seascape of the Site. The regional scenic value of this section of coastline is recognised through the Dunnet Head SLA. Further west, a short section of the northern coastline is covered by the Kyle of Tongue NSA, although the focus of this landscape is introverted towards the Kyle, with seaward views focussing on Eilean nan Ron and the Rabbit Islands.

The other coastlines broadly orientated towards the Site, are the western coast of Hoy and Mainland Orkney. While the sensitivity of these coastlines is recognised through their designation as NSA and definition as WLA, the minimum separation distance of 30 km does weaken their association with the Site. Special landscape features on Hoy include the remote and elevated western cliffs, and the high hills of Hoy that sit behind these.

Back on Mainland Scotland, the hinterland to the north coast, comprises mostly sweeping moorland, whose remote and largely undeveloped nature, have led to the definition of parts as WLA. While there are no NSAs in this area of sweeping moorland, there are a number of SLAs, mostly centred on the more remote and higher hills. While the association with the Atlantic Ocean typically weakens with movement southwards into the hinterland, the higher hills from a connection with the wider context, including the ocean to the north, albeit with many other natural and human influences also at play.

In respect of human habitation, this area has been settled by humans for over 7,000 years and there are many archaeological remains. Modern settlement is typically sparse in extent and rural in character. There are some small nucleated or linear settlements, the most relevant being Reay, Melvich and Portskerra, approximately 7 to 8 km south of the Project. While many of the properties are inset from the coastal edge, the predominant orientation is out toward the Atlantic Ocean, with properties in elevated locations maximising these views.

The A836 is the main coastal road and also forms part of the North Coast 500 and National Cycle Route 1. While views from the road are largely open, with some sections affording broad views across the Atlantic Ocean and Pentland Firth, long sections are set further inland, where intervening landform often contains the extent of these seaward views. The direction of the A836 is generally west to east, and while this means that views towards the Site from most sections, are oblique, those coastal sections aligned broadly north-east or north-west increase the prominence of the ocean views.

There are a number of recreational attractions along the northern coast of Caithness and the western coast of Hoy and West Mainland Orkney. In addition to the beaches and coastal paths of the north Caithness coast, the lighthouses at Dunnet Head and Strathy Point, and designed landscapes at Castle of Mey and Tongue House form popular visitor attractions.

There are no ferry routes along the north coast of Scotland. The most relevant ferry route to the SLVIA is between Scrabster and Stromness. This ferry route is popular owing to the impressive views of the high western cliffs of Hoy and the Old Man of Hoy, visible from relatively close-range. The north coast of Scotland does form part of the route for a number of cruises and is also used by recreational vessels.

9.5.8 Identification of Potential Impacts

There is potential for the offshore Project to give rise to significant impacts on landscape and coastal character, as well as on the visual amenity of locals and visitors. Listed below are some of the key receptors that will be considered in the SLVIA;

- Coastal and hinterland landscapes with a strong association with the Site;
- Designated landscapes with a special sensitivity relating to ocean views;
- Coastal settlements with views of the Site;
- Roads with views of the Site;
- Adjacent beaches, coastal paths and other areas of high amenity value;
- Hill tops in the hinterland with views of the Site.

Key sensitivities when considering SLVIA are anticipated to comprise:

- Designated landscapes (NSAs, SLAs and G&DLs);
- Mapped Interests: (WLAs);
- Seascape and landscape character areas; and
- Onshore and offshore visual receptors.

Due to the requirement for the turbines to be lit at night in accordance with civil aviation and navigation requirements the night-time effects of the lighting will also be assessed.

Potential impacts are those which could result from the construction, operations and maintenance or decommissioning of the offshore Project, according to the characteristics of the Site, the Project, the landscape and visual receptors, and the interactions between these factors. Table 9-8 describes the potential landscape and visual effects that may arise as a result of the offshore Project. Their inclusion in the table does not imply that they will occur, or occur as significant effects, but instead, highlights their importance as key considerations for the SLVIA.

Table 9-8 Potential Impacts associated with SLVIA during Construction, Operations and Maintenance and Decommissioning of the Project

Source of Impacts	Potential Impacts	Potential Receptors affected	Scoped In / Out
Potential Impacts During Construction			
Presence and activity of marine construction plant and vessels	The presence and activity of the marine construction plant used to construct and erect the offshore components of the wind farm will form a notable addition into an area of the Atlantic Ocean where currently there is no development. Other potential impacts may result from increased vessel movements in the area as plant, materials and personnel are moved to and from the Site.	Indirect, temporary and short-term impacts on coastal and landscape character where the presence and activity of marine construction plant, emergence of offshore turbines and floating substructures and use of night-time lighting would alter their contextual character. Indirect, temporary and short-term impacts on landscape designations and WLAs, especially where special landscape qualities or wildness qualities relate to associations with the Atlantic Ocean. Indirect, temporary and short-term impacts on onshore visual receptors, especially where formal viewpoints, settlements, roads, footpaths, hill-tops and other amenity locations have a close association with the Atlantic Ocean. The movement of vessels, activity of construction and use of lighting will add to the potential visual impact. While the majority of visual receptors will be onshore, offshore receptors will also be affected and could experience closer range views.	Scoped In
Emergence of offshore turbines and floating substructures	Introduction of large-scale vertical structures and bright coloured floating substructures into an area of the Atlantic Ocean where currently there is no development. While operational onshore wind farms form part of the baseline character, the emergence of larger offshore turbines will create a new human influence.		
Use of lighting during construction	Construction vessels will be working continuously and will be lit at night. The lighting will be visible within an otherwise dark outlook over the Atlantic Ocean.		
Potential Impacts During Operations and Maintenance			
Presence of offshore turbines and floating substructures	The presence of the 6 to 10 floating turbines up to a maximum height of 270 m (above HAT) will introduce development into an area of the Atlantic Ocean where currently there is no development. The movement of the blades will add a dynamic feature and there may also be some movement of the turbine structures. The floating substructures will form substantial bases with possible	Indirect, temporary and long-term impacts on coastal and landscape character where the presence and movement of offshore turbines, brightly coloured floating substructures and use of night-time lighting would alter their contextual character. Indirect, temporary and long-term impacts on landscape designations and WLAs, especially where special landscape qualities or wildness	Scoped In

Source of Impacts	Potential Impacts	Potential Receptors affected	Scoped In / Out
	dimensions being 124 m x 124 m x 54.25 m. These will be coloured yellow for navigational safety.	qualities relate to associations with the Atlantic Ocean. Indirect, temporary and long-term impacts on onshore visual receptors, especially where formal viewpoints, settlements, roads, footpaths, hill-tops and other amenity locations have a close association with the Atlantic Ocean. The movement of the turbine blades and use of night-time lighting will add to the potential visual impact. While the majority of visual receptors will be onshore, offshore receptors will also be affected and could experience closer range views.	
Use of lighting during operations and maintenance	The turbines will require night-time lighting for aviation safety.		
Activity of vessels during maintenance	Maintenance checks and repairs will require the activity of vessels, although the occurrence is likely to be infrequent with maintenance activities smaller in scale than construction activities.		
Potential Impacts During Decommissioning			
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding those arising during the construction phase. These would be indirect, temporary and short-term.			Scoped In
Potential Cumulative Impacts			
The potential for cumulative impacts will be assessed during the EIA process. The EIA will consider the impacts of the construction, operations and maintenance, and decommissioning of the Project cumulatively with other operational and proposed onshore and offshore wind farms. The key cumulative projects include: > The consented SHE-T Orkney-Caithness Interconnector Project; > The consented onshore Limekiln Wind Farm; > The consented SHE-T Electricity Substation at Dounreay; > The proposed onshore Drum Hollistan Wind Farm; > Decommissioning and remediation activities of the Dounreay Nuclear Site and Vulcan Test Reactor Site; > Potential developments within the ScotWind N1 DPO site; > The consented Sutherland SpaceHub; and > The MeyGen Tidal Energy Project (under construction).			Scope In

9.5.9 Preliminary Seascape, Landscape and Visual Appraisal

A preliminary seascape, landscape and visual appraisal has been undertaken to inform this Scoping Report. This has been used to define the scope of the assessment in terms of identifying those landscape and visual receptors with potential to be significantly affected and which, therefore, require detailed assessment in the SLVIA. Should the proposed layout of the Project alter materially, this preliminary appraisal will be reviewed accordingly to ascertain if any receptors require to be added back into the scope of the SLVIA.

9.5.10 Potential Effects on Coastal Character

The SLVIA will consider the effects of the offshore Project on coastal character. The basis of this assessment will be SNH's 'Coastal Character Assessment: Orkney and North Caithness (2016), which presents classification descriptions for the Orkney and North Caithness coastlines. The distribution and extent of the Regional Coastal Character Areas (RCCAs) within the 50 km study area is shown in Figure 9-15 . Local Coastal Character Areas (LCCAs) further divide the RCCAs into more detailed coastal sections. These LCCAs will be referenced in the detailed assessment of the SLVIA.

Set out in Table 9-9 below, is the preliminary appraisal of the potential effects of the Project on coastal character. These are considered in respect of all RCCAs within the first 20 km radius of the offshore Project. This considers the separation distance between the RCCAs and the Project, the extents and levels of visibility across the RCCAs, and the association between the RCCAs and the Site. A 20 km radius has been set, as it is considered unlikely for significant effects on coastal character to occur beyond this range.

In the final column, it is assessed whether or not, in OPEN's opinion, these RCCAs should be scoped in or out of the assessment. The boxes that are shaded grey highlight those RCCAs which will be assessed in detail within the SLVIA. THC's and NatureScot's agreement to this is sought through this scoping exercise, in order to enable the SLVIA to be focussed on key considerations.

Table 9-9 Preliminary Appraisal of Coastal Character

RCCA	Approx. distance to offshore Project	Subject to theoretical visibility?	Needs detailed assessment within SLVIA?
Portskerra Remote High Cliffs RCCA	6 km	Yes – almost continuous visibility along this section of coastline.	Yes – the close proximity of this coastline to the offshore Project and its general orientation in the direction towards the Site means that there is potential for coastal character to be significantly affected.
Farr Point Remote High Cliffs RCCA	17 km	Yes – although intermittent with visibility occurring on more northerly and exposed NE facing sections.	Yes – despite the intermittent and limited extent of visibility combined with the separation distance and NW orientation, the sensitivity of this coastline means that there is potential for coastal character to be significantly affected.
Scarfskerry and Dunnet Head Remote High Cliffs RCCA	23 km	Yes – visibility along W and NW facing coastal edges.	Yes – despite the separation distance of 23 km, the close association between this coastline and the Site of the offshore Project means that there is the potential for coastal character to be significantly affected.
Thurso Bay Deposition Coastline Open Views RCCA	15 km	No – the intervening landform prevents visibility from occurring in this sheltered bay.	No – as there will be no visibility and no effect, significant effects will not arise.
Brims Ness Rocky Coastline Open Sea Views RCCA	7 km	Yes – almost continuous visibility along this coastal edge.	Yes – the close proximity of this coastline to the offshore Project and its general orientation in the direction towards the Site means that there is potential for coastal character to be significantly affected.

9.5.11 Potential Effects on Landscape Character

NatureScot has recently reviewed and updated the 30 original Landscape Character Assessments (LCA), originally produced to cover the whole of Scotland during the 1990s, by creating a single data set in a digital version. This is based on the original LCAs and updated to ensure greater consistency in the approach and structure, to reduce cross boundary discrepancies and to make the mapping more accessible and readily legible. This information is contained in the NatureScot Landscape Character Assessment GIS dataset, which divides the landscape into areas of distinctive character, referred to as Landscape Character Types (LCTs). The distribution and extent of the LCTs within the 50 km study area is shown in Figure 9-15.

Set out in Table 9-10 below, is the preliminary appraisal of the potential effects of the offshore Project on landscape character. These are considered in respect of all LCTs within the first 20 km radius of the offshore Project. This considers the separation distance between the LCTs and the Project, the extents and levels of visibility across the LCTs and the association between the LCTs and the Site. A 20 km radius has been set, as it is considered unlikely for significant effects on landscape character to occur beyond this range.

The boxes that are shaded grey highlight those LCTs / LCUs which will be assessed in detail within the SLVIA. THC's and NatureScot's agreement to this is sought through this scoping exercise, in order to enable the SLVIA to be focussed on key considerations.

Table 9-10 Preliminary Appraisal of Landscape Character Types / Units

Landscape Character Type / Unit	Approx. distance to offshore Project	Subject to theoretical visibility?	Needs detailed assessment within SLVIA?
Sweeping Moorland and Flows LCT	7 km	Yes – visibility is almost continuous across the N part and extends inland, albeit with patches across N facing slopes.	Yes - the relative proximity of the N part of this landscape, combined with its openness and close association with the seascape context, means that there is potential for its landscape character to be significantly affected.
High Cliffs and Sheltered Bays LCT	6 km	Yes – visibility is almost continuous along the coastline.	Yes - the relative proximity of the N part of this coastal landscape, combined with its openness and close association with the seascape context, means that there is potential for landscape character to be significantly affected.
Sandy Bays and Dunes LCT: Strathy Bay LCU	7 km	Yes – visibility across this small LCU is continuous.	Yes – the relative proximity of this coastal landscape, combined with its openness and close association with the seascape context, means that there is potential for its landscape character to be significantly affected.
Farmed Lowland Plain LCT	7 km	Yes – almost continuous visibility occurring along N coastline and in patches over NW facing slopes of hinterland.	Yes – the relative proximity of the N part of this landscape, combined with its openness and close association with the seascape context, means that there is potential for its landscape character to be significantly affected.

Landscape Character Type / Unit	Approx. distance to offshore Project	Subject to theoretical visibility?	Needs detailed assessment within SLVIA?
Coastal Crofts and Small Farms LCT: Melvich LCU	8 km	Yes – almost continuous visibility across this small LCU.	Yes – the relative proximity of the N part of this landscape, combined with its openness and close association with the seascape context, means that there is potential for its landscape character to be significantly affected.
Strath LCT: Halladale LCU	9 km	Yes – small patches of visibility occur along the western slopes of this LCU.	No – the enclosed nature of this LCU combined with the limited visibility of the Project means that the Project will not significantly affect the landscape character of this LCU.
Rocky Hills and Moorland LCT: Strathy LCU	11 km	Yes – visibility occurs across the NE facing hill slopes of this LCU.	No – the limited extent of visibility, the limited association between this LCU and the location of the Project, and the closer range influence from operational Strathy Wind Farm, means that the Project will not significantly affect the landscape character of this LCU.

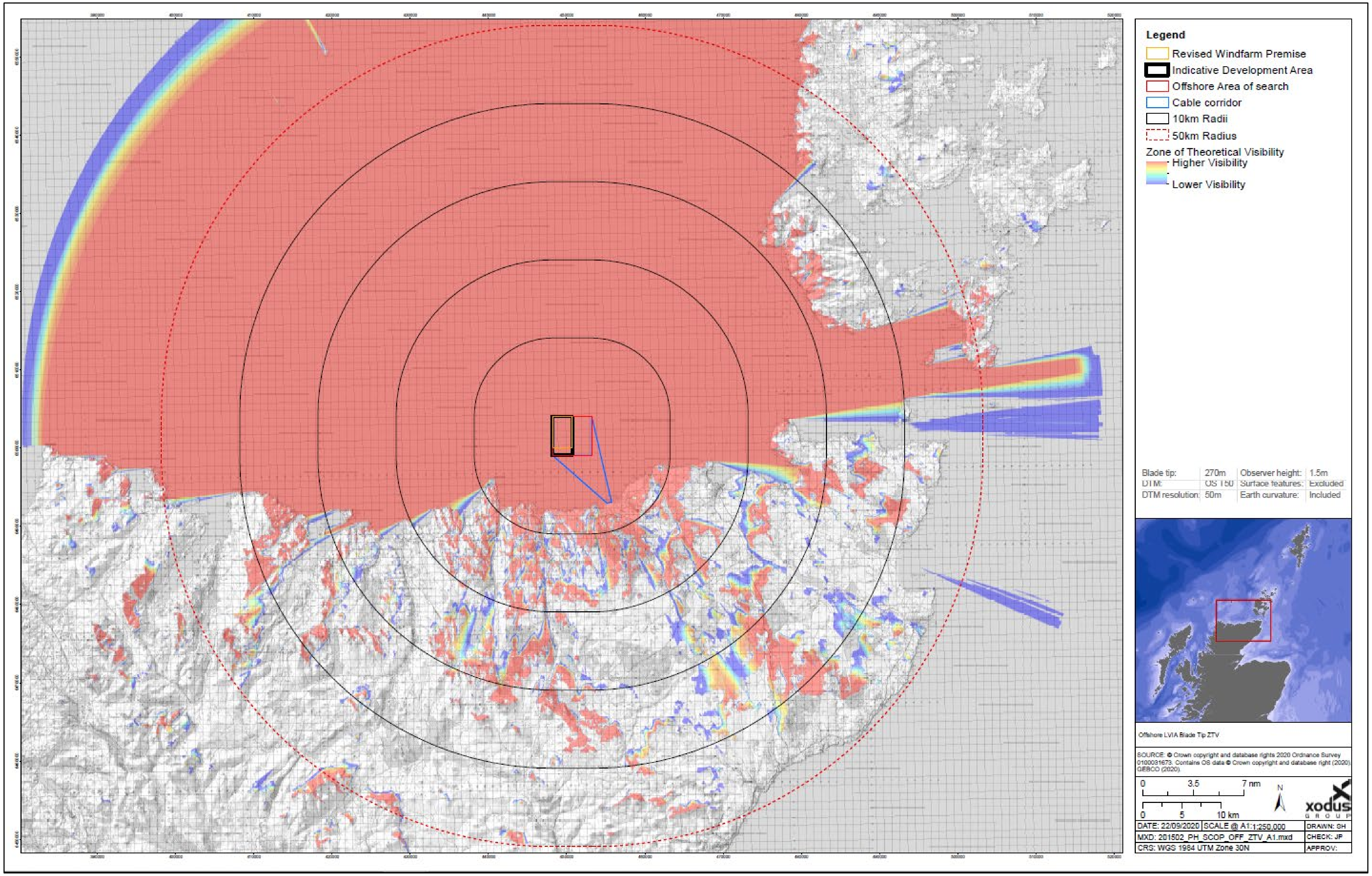


Figure 9-14 Offshore SLVIA Blade Tip ZTV

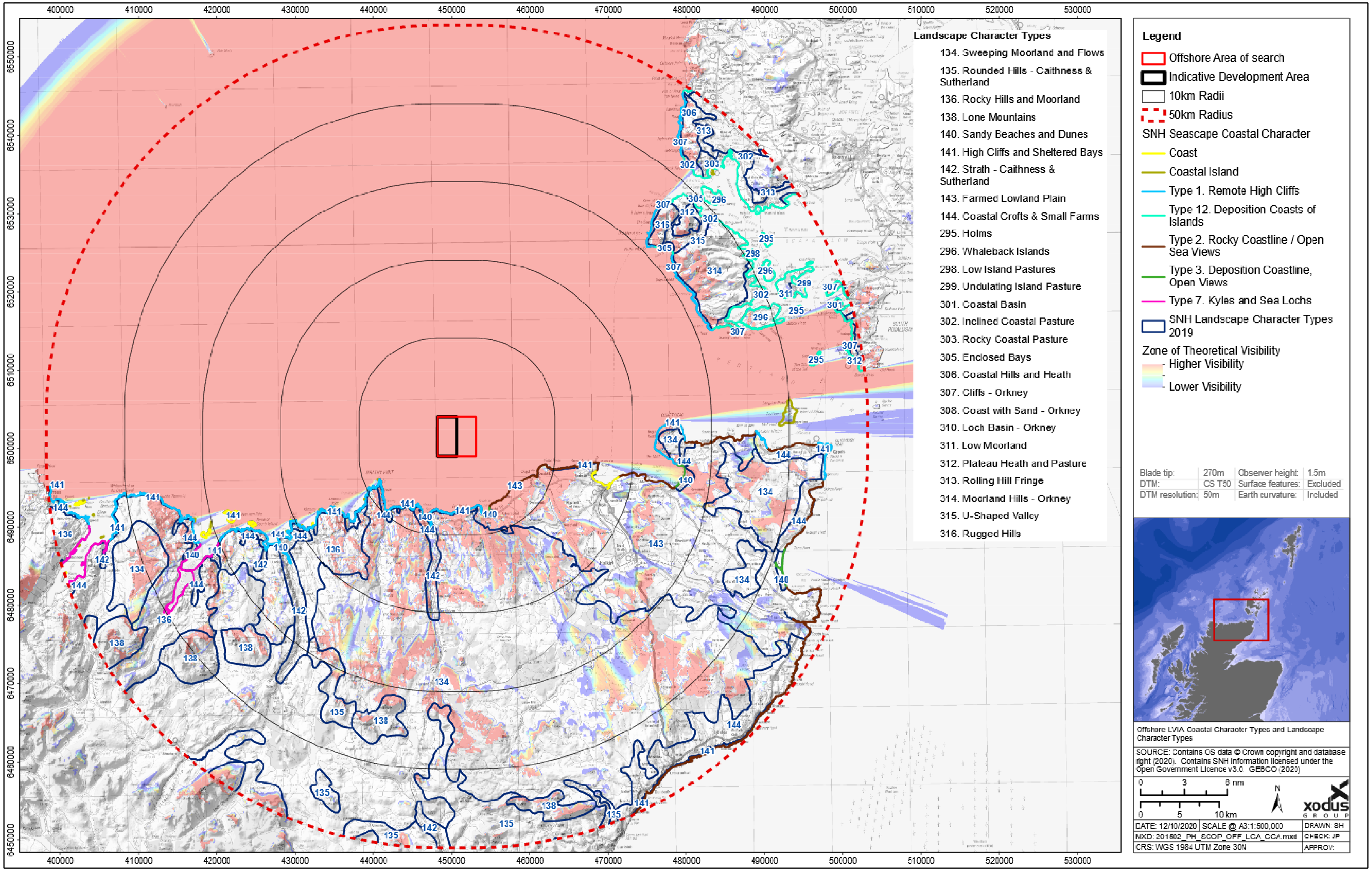


Figure 9-15 Offshore SLVIA Coastal Character Type and Landscape Character Type

9.5.12 Potential Effects on Landscape Designations

While there are no designations to protect seascape areas, there are areas within the 50 km study area that have been attributed a landscape planning designation, with some boundaries extending across inshore waters. Figure 9-16 shows the distribution and extent of landscape designations across the 50 km radius study area. These include nationally important National Scenic Areas (NSAs) and Gardens and Designed Landscapes (GDLs), designated by NatureScot and Historic Environment Scotland (HES) respectively. There are also regionally important Special Landscape Areas (SLAs) which have been designated through The Highland Council's 'Highland wide Local Development Plan' (2012).

In the preliminary appraisal, set out in Table 9-11 below, the potential effects of the Project are considered in respect of all landscape designations. This considers the separation distance between the landscape designation and the Project, the extents and levels of visibility across the landscape designation, the association between the landscape designated area and the location of the Project, and existing influences from other human influences. It is assessed in the final column, whether or not, in OPEN's opinion, these landscape designations can be scoped out of the assessment. The boxes that are shaded grey will be assessed further within the SLVIA. The Council's and NatureScot's agreement to this is sought through this scoping exercise, in order to enable the SLVIA to be focussed on key considerations.

The findings of this preliminary appraisal are that two SLAs have the potential to be significantly affected by the Project and, therefore, require a detailed assessment. The NSAs, GDLs and other SLAs, do not have the potential to be significantly affected owing mainly to the substantial separation distances between the designated areas and the Project, but also the limited extents of visibility, and limited association between the designated areas and the location of the Project.

The closest SLAs to the Project include Farr Bay, Strathy and Portskerra SLA at approximately 7 km to the south-west, and Dunnet Head at approximately 22 km to the east. It is recommended that these SLAs are scoped into the detailed assessment owing to their close association with the seascape context where the Project would be located. The SLVIA will assess the likely effects of the Project on these SLAs, based on the citations presented in THCs 'Assessment of Highland Special Landscape Areas'. It is recommended that the other SLAs be scoped out of the detailed assessment.

The boxes that are shaded grey highlight those landscape designations which will be assessed in detail within the SLVIA. THC's and NatureScot's agreement to this is sought through this scoping exercise, in order to enable the SLVIA to be focussed on key considerations.

Table 9-11 Preliminary Appraisal of Landscape Designations

Landscape Designation	Approx. distance to Project	Subject to theoretical visibility?	Needs detailed assessment within SLVIA?
Kyle of Tongue NSA	23 km	Yes – patches of visibility occur along the N coast edge and NE facing slopes of Ben Hope and Ben Loyal.	No –the separation distance of 23 km, combined with the focus of the NSA in towards the Kyle of Tongue and the oblique angle at which the Project would sit relative to the N coast of the NSA, means that the Project will not significantly affect the special qualities of this NSA.
Hoy and West Mainland NSA	30 km	Yes – patches of visibility occurring across the western side of Hoy and western edge of West Mainland.	No – the separation distance of 30 km, combined with the location of the Project closer to the Mainland of Scotland coast, where operational wind farms already have an influence, means that the Project will not

Landscape Designation	Approx. distance to Project	Subject to theoretical visibility?	Needs detailed assessment within SLVIA?
			significantly affect the special qualities of this NSA.
Farr Bay, Strathy and Portskerra SLA	7 km	Yes – almost continuous visibility across the E extent of this SLA with patchier visibility across other parts.	Yes – the relative proximity of this SLA to the Project, the extent of visibility and its close association with the seascape context means that there is potential for significant effects to arise.
Dunnet Head SLA	22 km	Yes – visibility extends around the NE and E facing coastline but does not extend fully into the interior of the SLA.	Yes - the extent of visibility along the coastline and the close association of this SLA with the seascape context means that there is potential for significant effects to arise.
The Flow Country and Berriedale Coast SLA	28 km	Yes – visibility occurs as a large patch in the NE corner and then as smaller patches across N facing slopes.	No – the separation distance of 28 km, combined with the influence of closer range operational wind farms and closer association with E coast, means that the Project will not significantly affect this SLA.
Ben Griam and Loch nan Clar SLA	31 km	Yes – visibility occurs in small patches on N facing slopes.	No - the separation distance of 31 km, combined with the influence of closer range operational wind farms, means that the Project will not significantly affect this SLA.
Eriboll East and Whiten Head SLA	33 km	Yes – visibility is limited to the northern coastline but with no visibility across remaining parts.	No - the separation distance of 33 km, combined with the limited association between this coastline and the location of the Project, means that the Project will not significantly affect this SLA.
Duncansby Head SLA	43 km	Yes – there is a small patch of visibility in the centre of the SLA.	No – the separation distance of 43 km, combined with the limited association between this coastline and the location of the Project, means that the Project will not significantly affect this SLA.
Oldshoremore, Cape Wrath and Durness SLA	44 km	Yes – small patches of visibility along the coastline.	No - the separation distance of 44 km, combined with the limited association between this coastline and the location of the Project, means that the Project will not significantly affect this SLA.
Ben Klibreck and Loch Choire SLA	46 km	Yes – visibility occurring in patches	No - the separation distance of 46 km, combined with the limited association between this

Landscape Designation	Approx. distance to Project	Subject to theoretical visibility?	Needs detailed assessment within SLVIA?
		across N facing slopes.	hinterland and the location of the Project, means that the Project will not significantly affect this SLA.
Tongue House GDL	33 km	No	No – no visibility means the Project will have no effect on this GDL.
Castle of Mey (Barrogill Castle) GDL	34 km	Yes – low levels of visibility occurring across the grounds.	No – the separation distance of 34 km, combined with the orientation of the back of the castle to the north and the location of the Project to the north-east, and the intervening landform of Dunnet Head, means that the Project will not significantly affect this GDL.
Melsetter House GDL	34 km	Yes – visibility occurring along the southern margins of the GDL.	No – the separation distance of 34 km, combined with the orientation of the house to the east, the enclosure of the gardens by high walls and the limited association between this GDL and the location of the Project, means that the Project will not significantly affect this GDL.
Dunbeath GDL	48 km	No	No – no visibility means the Project will have no effect on this GDL.
Skaill House GDL	49 km	No	No – no visibility means the Project will have no effect on this GDL.

9.5.13 Potential Effects on Wild Land

Wild Land is recognised in Scottish Planning Policy (SPP) and regional planning policy as a nationally important mapped interest, and not a designation. While WLAs are afforded protection for their wildness qualities, they are not statutorily protected in the way that National Parks and NSAs are for their scenic qualities. Figure 9-16 shows the distribution and extent of WLAs across the 50 km radius study area.

The assessment of effects on WLAs follows guidance set out in NatureScot's recently published 'Assessing Impacts on Wild Land: Technical Guidance' (2020) ('the 2020 Guidance'). NatureScot, on its website, states that the 2020 Guidance is the appropriate guidance to be applied in the assessment of effects on WLAs in place of the previous 2017 Draft Guidance.

Whether a WLA assessment is required, is discussed in paragraph 5 of the 2020 Guidance, with the need considered to be highly likely where the Project is located within a WLA, but less likely where the Project is located outwith the WLA. The Wildness Qualities of the WLAs are described in terms of either physical attributes or perceptual responses. As the Project lies outwith any of the WLAs it will have no effect on the physical attributes of any of the WLAs in the 50 km study area. While the Project may have an effect on the perceptual responses of the WLAs, in respect of the fact that there are no WLAs within a 10km radius of the Project, it is unlikely that the perceptual responses of any of the WLAs would be significantly affected. Furthermore, the presence of operational wind farms along the north coast of Scotland, as shown in Figure 9-13, illustrates the extent of existing human influences that form the baseline context to the WLAs.

In the preliminary appraisal, the potential effects of the Project are considered in respect of all WLAs. Table 9-12 below lists the WLAs in the study area and provides information on the separation distance between the WLA and the Project, the extents and levels of visibility across the WLA, and the association between the WLA and the location of the Project. It is assessed in the final column whether or not, in OPEN's opinion, these WLAs can be scoped out of the assessment. The boxes that are shaded grey will be assessed further within the SLVIA.

The findings of this preliminary appraisal are that one of the WLAs has the potential to be significantly affected by the Project, namely East Halladale Flows WLA, and, therefore, will require a detailed assessment. It is recommended that all other WLAs be scoped out of the SLVIA. THC's and NatureScot's agreement to this is sought through this scoping exercise in order to enable the SLVIA to be focussed on key considerations.

Table 9-12 Preliminary Appraisal of Wild Land Areas

Wild Land Area	Approx. distance to Project	Subject to theoretical visibility?	Needs detailed assessment within SLVIA?
East Halladale Flows (39)	10 km	Yes – visibility occurs as patches across the NW half of the WLA, with limited visibility across the SE half.	Yes – the extent of visibility across the NW part of the WLA, despite the separation distance of 10 km, combined with the closer range influence from consented Limekiln Wind Farm, as well as other operational wind farms between the WLA and the Project, means that the Project may have the potential to significantly affect the perceptual responses of the WLA.
Causeymire - Knockfin Flows (36)	28 km	Yes – visibility occurs in patches mainly over NW and NE parts.	No – the limited extent of visibility, combined with the separation distance of 28 km and the influence from closer range operational wind farms across Caithness, means that the Project will not significantly affect the perceptual responses of the WLA.
Hoy (41)	32 km	Yes – visibility extends across the western half of the WLA.	No – despite the extent of visibility, the separation distance of 32 km means that the Project will not significantly affect the perceptual responses of the WLA.
Ben Hope - Ben Loyal (38)	36 km	Yes – visibility occurs across NE slopes of Ben Hope and Ben Loyal and in more continuous patches in the N part of the WLA.	No – the separation distance of 36 km, combined with the influence from closer range operational wind farms, means that the Project will not significantly affect the perceptual responses of the WLA.
Ben Klibreck - Armine Forest (35)	41 km	Yes - visibility occurs as patches across upper N facing slopes.	No - the separation distance of 41 km means that the Project will not significantly affect the perceptual responses of the WLA.
Foinaven - Ben Hee (37)	46 km	Yes – visibility occurs in patches across upper NE facing slopes.	No – the separation distance of 46 km means that the Project will not significantly affect the perceptual responses of the WLA.

9.5.14 Potential Effects on Visual Receptors

A preliminary viewpoint list is presented in Table 9-13 below and the locations of the viewpoints are shown in Figure 9-17. The preliminary list has been informed by the selection made in the 2017 SLVIA for the original project, which included comments and contributions from THC Planning Service.

The viewpoints represent sensitive visual receptors in the study area which have potential to be significantly affected. The selection of the viewpoints also considers the representation of different landscape and coastal character receptors, within which they are located, as well as the representation of the surrounding cumulative context. This means that the visual assessment is able to inform the wider assessment. While the aim is to achieve a distribution of viewpoints from different directions and distances across the study area, the priority is to ensure that the closer range or most sensitive receptors with the greatest potential to be significantly affected are fully represented.

Comment on the proposed viewpoint locations is invited as part of this request for a Scoping Opinion. Visualisations and figures will be produced to NatureScot's standards as set out in 'Visual Representation of Wind farms: Version 2.2' (February 2017). In line with NatureScot guidance, photomontages will be prepared for viewpoints within a 20 km radius of the nearest turbine.

Table 9-13 Preliminary Viewpoint List

VP	Viewpoint Location	Approx OS ref	Approx. Elevation	Key Reasons for selection
Mainland Scotland				
1	Beinn Ratha	NC94972, 61078	251 m	Hill walkers Representative of East Halladale Flows WLA
2	Strathy Point Car Park	NC82774, 68503	62 m	Visitors / Tourists Representative of Farr Bay, Strathy Point and Portskerra SLA
3	Portskerra/Melvich	NC87745, 66118	25 m	Residents / Visitors Local and regional road users on A836 Cyclists on NCR1 / North Coast 500 Representative of Farr Bay, Strathy Point and Portskerra SLA
4	Drum Holliston Car Park	NC93261, 64623	90 m	Residents Local and regional road users on A836 Cyclists on NCR1 / North Coast 500
5	Sandside Harbour Car Park	NC95777, 65913	10 m	Locals / Visitors
6	St Mary's Chapel, Forss	ND02504, 70078	11 m	Locals / Visitors
7	Dunnet Head	ND20557, 76518	127 m	Formal viewpoint on OS map Locals / Visitors Representative of Dunnet Head SLA
8	Scrabster – Stromness Ferry	ND13206, 84983	15 m	Ferry passengers
Orkney				

VP	Viewpoint Location	Approx OS ref	Approx. Elevation	Key Reasons for selection
9	Path to the Old Man of Hoy	ND19147, 98988	140 m	Walkers Representative of Hoy and West Mainland NSA

In addition to representative viewpoints, the SLVIA will also consider the effects on principal visual receptors, such as people in settlements, roads or footpaths, from which sequential effects may occur. The key principal visual receptors to be included in this SLVIA are the users of the main coast road and recreational route, the A836, the settlements of Reay, Melvich, Portskerra and Strathy and all core paths along the coastal edge between Farr Point in the west, and Holborn Head in the east. The sensitivity of the receptors, combined with the close association with the coastline and Atlantic Ocean, and their relative proximity to the offshore Project, means that there is the potential that their visual amenity be significantly affected by the offshore Project. It is recommended that the other Principal Visual Receptors be scoped out of the SLVIA, as their greater separation distance from the offshore Project, combined with their weaker association with the coastline and Atlantic Ocean where the Site will be located, means that the offshore Project will not significantly affect their visual amenity.

9.5.15 Potential Cumulative Effects

The assessment of cumulative effects describes the effects arising from the addition of the Project to a cumulative baseline of operational, under construction, consented and application stage wind farms, along with other large-scale energy developments within a 50 km study area. This assessment will include supporting graphics such as cumulative ZTVs and cumulative wirelines.

There are currently no operational or proposed offshore wind farms in the study area. Based on the current position, the cumulative assessment will consider the interactions of the Project with the onshore wind farms and other large-scale energy developments, including the Sutherland SpaceHub, as well as the proposed Pentland Floating Offshore Wind Demonstrator Key consultees are asked to comment on the content of the final cumulative wind farm list and cut-off date for further updates prior to the completion of the SLVIA. This is not only to ensure the most up-to-date information is available, but also to allow sufficient time for the SLVIA to be produced. As with the assessment of significance of effects of the Project in isolation, the significance of cumulative effects is determined through a combination of the sensitivity of the landscape receptor or visual receptor and the magnitude of change upon it.

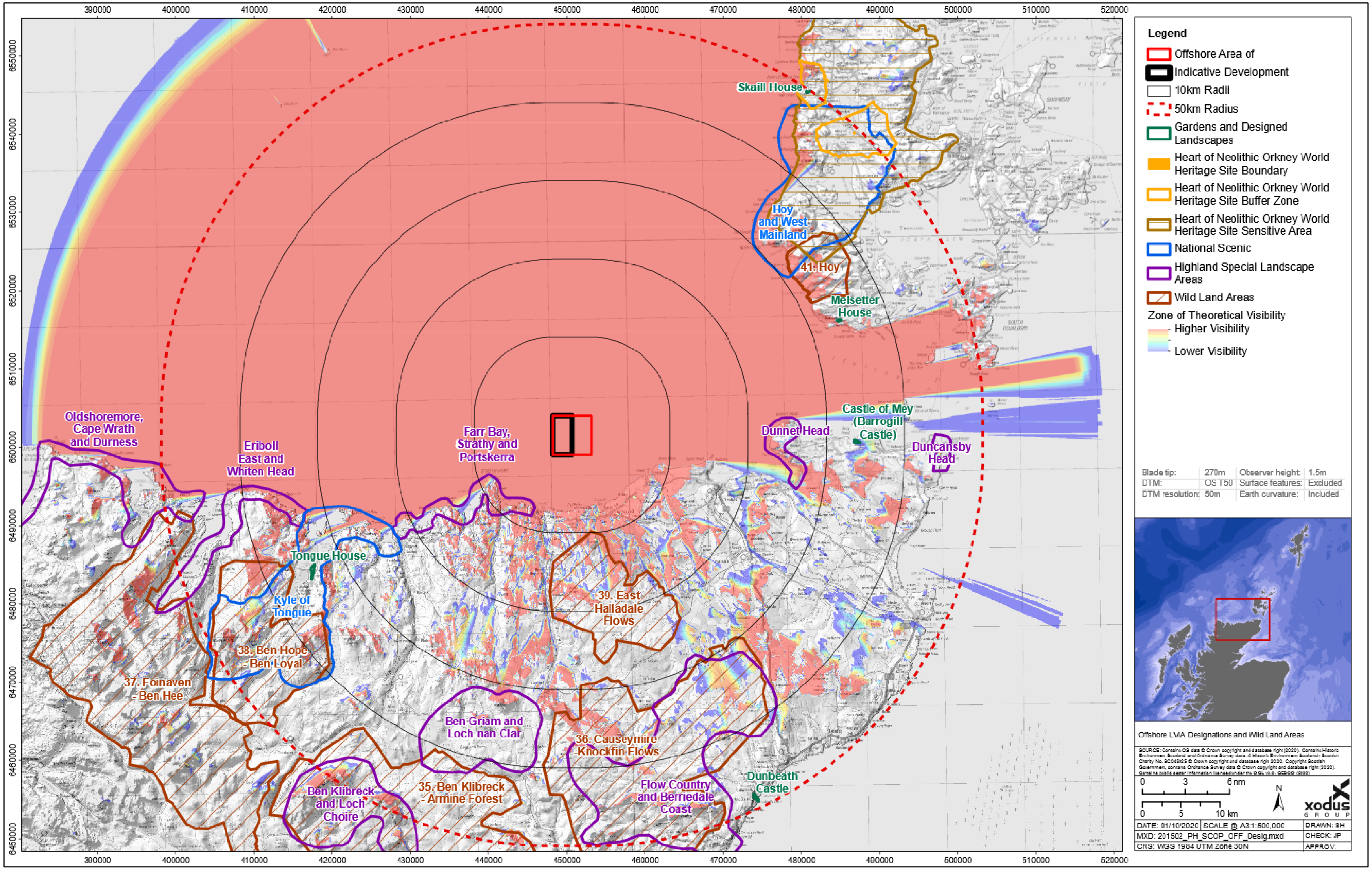


Figure 9-16 Offshore SLVIA Designations and Wild Land Areas

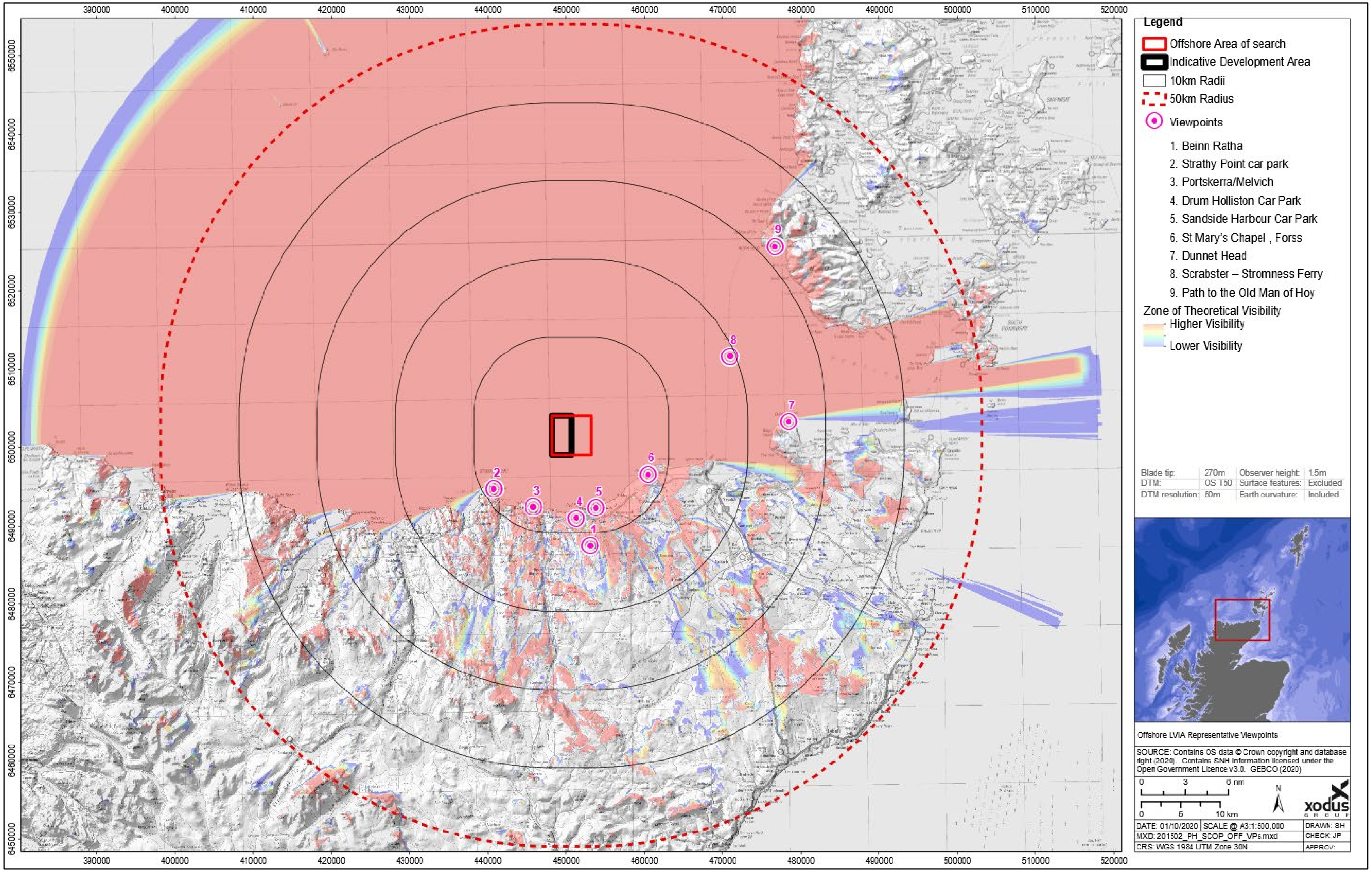


Figure 9-17 Offshore SLVIA Representative Viewpoints

9.5.16 Potential Effects of Lighting

The turbines will be lit in accordance with civil aviation and navigation requirements. The location of the offshore Project, approximately 6-9 km north of the Caithness Coast, means that it will be located in a remote seascape and close to a rural coastal edge. The visual effect of wind turbine lighting at night will be of considerable importance to the statutory and non-statutory consultees, as well as people living and moving around in the local area. It is, therefore, recommended that an assessment of turbine lighting be included as part of the SLVIA.

A night-time impact assessment and visualisations illustrating turbine lighting at night, will be prepared for inclusion in the SLVIA. The hub height ZTV will be used to identify where there would be direct line of sight of the lights from the surrounding area. In order to inform this assessment, OPEN will take photographs from three of the readily accessible viewpoints at dusk and will prepare visualisations to represent the effects of lighting on these views in accordance with NatureScot guidance.

In terms of how lighting is captured in visualisations, there is currently quite a lot of work being done on this by NatureScot, in respect of turbine lighting visualisations for onshore turbines over 150m. The main change in the latest version of the NatureScot's "Visual Representation of Wind Farms" (Version 2.2, February 2017) is in paragraphs 174-177 and relates to turbine lighting. For turbines exceeding 150m, the need to consult on new lighting visuals is now required. OPEN will produce night-time visualisations using photographs taken after the period of Civil Twilight, when in addition to the turbine aviation lights other artificial lighting (such as street lights and lights on buildings) are on, to show how the wind farm lighting will look compared to the existing baseline at night. It is important to ensure that the photographs represent the levels of darkness as seen by the naked eye at the time and the camera exposure does not make the image appear artificially brighter, than it is in reality. We have not anticipated the need for remote views in the hours of darkness.

The impacts are likely to be of a higher magnitude in this remote rural location where there is little baseline light. Consideration will also be given to the flashing effect that the movement of turbine blades may create depending on where the viewer is in relation to the wind farm. If the turbine blades pass in front of the light, a flashing effect as they cut across the light can occur. If the blades pass behind the light, there can be a striped effect as the light runs up the passing blades.

OPEN has undertaken night-time lighting assessments and visualisations for several other wind farm projects around the UK. This will inform the basis of our professional judgement about the level of effect arising from the proposed lighting.

9.5.17 Conclusions and Next Steps

This Scoping Report seeks agreement that the following landscape and visual receptors be scoped into the SLVIA for the offshore Project;

- Landscape Character Types: Sweeping Moorland and Flows LCT / High Cliffs and Sheltered Bays LCT / Sandy Bays and Dunes LCT: Strathy Bay LCU / Farmed Lowland Plain LCT / Coastal Crofts and Small Farms LCT: Melvich LCU.
- Regional Coastal Character Areas: Portskerra Remote High Cliffs RCCA / Farr Point Remote High Cliffs RCCA / Scarfskerry and Dunnet Head Remote High Cliffs RCCA / Brims Ness Rocky Coastline Open Sea Views RCCA.
- Landscape Designations: Farr Bay, Strathy and Portskerra SLA / Dunnet Head SLA.
- Wild Land Areas: East Halladale Flows.
- Viewpoints: Beinn Ratha / Strathy Point car park / Portskerra and Melvich / Drum Holliston Car Park / Sandside Harbour car park / St Mary's Chapel, Forss / Dunnet Head / Scrabster – Stromness Ferry / Path to the Old Man of Hoy.

- Principal Visual Receptors: A836 (NCR1 and North Coast 500) / Reay / Portskerra and Melvich / Strathy / all Coastal Core paths between Farr Point and Holborn Head.
- Cumulative Assessment: all operational, under construction, consented and application stage onshore and offshore wind farms over 50 m to blade tip and all other large-scale energy infrastructure, including the onshore Project.
- Lighting Assessment: effect of hub-height lighting on three representative onshore viewpoints (to be agreed through consultation with NatureScot and THC)

The Scoping Report seeks agreement that the following landscape and visual receptors be scoped out of the assessment of the offshore Project.

- All seascape, landscape and visual effects arising beyond the 50km radius study area.
- Landscape Character Types: Strath LCT: Halladale LCU / Rocky Hills and Moorland LCT: Strathy LCU and all other LCTs beyond 20 km radius of the offshore project.
- Regional Coastal Character Areas: Thurso Bay Deposition Coastline Open Views RCCA and all other RCCAs beyond 20 km radius of the offshore project.
- Landscape designations: including all NSAs, GDLs and SLAs (with the exception of Farr Bay, Strathy and Portskerra SLA / Dunnet Head SLA).
- WLAs: with the exception of East Halladale Flows.
- Principal Visual Receptors: including all other roads, settlements and core paths not referenced as being scoped in above.

In addition, it is proposed that the seascape, landscape and visual effects of the sub-sea cable installation are scoped out. Significant effects are considered to be unlikely to arise as a result of marine vessels located along the cable route within a context where vessels are part of the baseline environment.

Marine Scotland, THC and NatureScot's agreement to the recommended scope of the SLVIA is sought through this Scoping Report, in order to enable the SLVIA to be focussed on key considerations.

9.6 Archaeology and Cultural Heritage

9.6.1 Introduction

This section considers the potential impact on existing marine archaeology and cultural heritage in the Offshore Study area as a result of the Project, by considering the presence of marine and maritime sites and the potential for prehistoric landscapes, which may be affected by the Offshore Study Area.

This section also presents a summary of the relevant UK guidance, methodologies and best practice that will be applied in completing the EIA. The section outlines the proposed scope of surveys and studies that will be completed and that will be subject to consultation with relevant consultees.

9.6.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts on archaeology and cultural heritage receptors:

International/ EU Legislation and Policy

- The United Nations Convention of the Law of the Sea (UNCLOS);

- The Annex to the UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001; and
- The European Convention on the Protection of the Archaeological Heritage (revised), known as the Valletta Convention

Legislation

- The Merchant Shipping Act 1995;
- The Protection of Wrecks Act 1973 (Section 1 of the Protection of Wrecks Act was repealed in Scotland on the 1 November 2013 and the eight wrecks around the coast of Scotland designated under this section of the Act are now protected by Historic Marine Protected Areas (HMPAs) as defined in the Marine (Scotland) Act 2010);
- The Ancient Monuments and Archaeological Areas Act 1979;
- The Protection of Military Remains Act 1986;

Policy and Framework

- Historic Scotland (2011). Scottish Historic Environmental Plan 2011.
- The UK Marine Policy Statement (2011);
- HEPS (2019). Historic Scotland: Scottish Historic Environment Policy. Available online at https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=1bcfa7b1-28fb-4d4b-b1e6-aa2500f942e7;
- Historic Environment Scotland Designation Policy and Selection Guidance 2019 standards;
- Scotland's National Marine Plan - Policy GEN6 Historic environment: Development;
- Scotland's National Marine Plan: A Single Framework for Managing Our Seas (2015), Scottish Government and Marine Scotland;
- The Scottish Government: (2014) Scottish Planning Policy (SPP) 2014;
- The Scottish Government: Planning Advice Note (PAN 2/2011): Planning and Archaeology, July 2011; and

Guidance

- The Joint Nautical Archaeology Policy Committee and The Crown Estate's Maritime Cultural Heritage & Seabed development (2006): JNAPC Code of Practice. Available online at https://www.jnapc.org.uk/jnapc_brochure_may_2006.pdf;
- Wessex Archaeology (2007). Historic Environment Guidance for the Offshore Renewable Energy Sector, commissioned by COWRIE Ltd. Available online at https://www.wessexarch.co.uk/sites/default/files/field_file/COWRIE_2007_Wessex_%20-%20archaeo_%20guidance_Final_1-2-07.pdf;
- COWRIE (2008). Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy by Oxford Archaeology & George Lambrick Archaeology and Heritage. Available online at http://www.biofund.org.mz/wp-content/uploads/2018/11/F1349.Cowrie-Ciarch-Web.pdf;
- The Nautical Archaeology Society: Underwater Archaeology (2008). The NAS Guide to Principles and Practice (2nd edn,). Available online at https://www.nauticalarchaeologysociety.org/underwater-archaeology-the-nas-guide);

- Gribble, J. and Leather, S. for EMU Ltd. (2011). Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector. Commissioned by COWRIE Ltd (project reference GEOARCH- 09). Available online at https://www.historicenvironment.scot/media/2376/2011-01-offshore-geotechnical-investigations-and-historic-environment-analysis-guidance-for-the-renewable-energy-sector.pdf);
- Wessex Archaeology (2011) Assessing Boats and Ships (presented in three period reports: 1860 - 1913, 1914 - 1938 and 1939 - 1950). Available online at https://www.wessexarch.co.uk/our-work/assessing-boats-and-ships;
- The Crown Estate (2014a). Protocol for Archaeological Discoveries: Offshore Renewables Projects, Wessex Archaeology Ltd on behalf of The Crown Estate. Available online at https://www.thecrownestate.co.uk/media/1782/ei-protocol-for-archaeological-discoveries-offshore-renewables-projects.pdf;
- Firth, A. (2013). Historic Environment Guidance for Wave and Tidal Energy. Published by Fjordr Ltd on behalf of English Heritage, Historic Scotland and Cadw. Available online at https://historicengland.org.uk/images-books/publications/historic-environment-guidance-wave-tidal-energy/wavetidal/.; and
- The Crown Estate (2014b). Model clauses for Archaeological Written Schemes of Investigation: Offshore Renewables Projects, Wessex Archaeology Ltd (Ref 73340.05) for The Crown Estate.

9.6.3 Other Sources of Information

This section has been primarily informed by detail presented in the information sources listed below and also utilises SeaZone data.

- Historical Environment (2020). National Record of the Historic Environment (NRHE) of Scotland. Available online at https://www.historicenvironment.scot/archives-and-research/archives-and-collections/national-record-of-the-historic-environment/;
- UKHO (2020). Wreck register and relevant nautical charts. Available online at http://www.admiralty.co.uk;
- Wrecksite (2020). The wrecksite.eu database. Available online at https://www.wrecksite.eu/;
- Canmore (2012). Hms King Edward Vii [possibly]: Pentland Firth. Available online at https://canmore.org.uk/site/101982/hms-king-edward-vii-possibly-pentland-firth.
- Crash Site Orkney (2020). Aviation Research Group Orkney and Shetland. Available online at http://www.crashsiteorkney.com.
- Flemming (2003). Strategic Environmental Assessment (SEA) 4;
- The National Monuments Record of Scotland, using the Canmore (https://canmore.org.uk/) and Pastmap (https://pastmap.org.uk/map) database websites; and
- NMPi (2020). Spatial data on archaeology and cultural heritage on National Marine Plan Interactive. Available online at (https://marinescotland.atkinsgeospatial.com/nmpi/):
  - Historic Environment Scotland (2018a) Scheduled Ancient Monuments. Available online at http://marine.gov.scot/node/1275;
  - Historic Environment Scotland (2019). Designated Wrecks. Available online at http://marine.gov.scot/node/12750; and
  - Historic Environment Scotland (2018b). Historic Marine Protected Areas. Available online at http://marine.gov.scot/node/12783.

Although no specific reports are available which describe the impacts on archaeology and cultural heritage receptors, the guidance documents and experience in the industry highlight the importance of early consultation to fully understand the impacts of offshore wind farms on marine archaeology and cultural heritage.

9.6.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the Project.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to archaeology and cultural heritage have been considered within this report

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

9.6.5 Study Area

A study area encompassing the Offshore Study Area has been considered in this section in order to sufficiently describe the existing marine historic environment that might be potentially affected by the Offshore Study Area.

9.6.6 Surveys and Studies Carried Out to Date

Marine Scotland conducted a Multibeam EchoSounder (MBES) marine geophysical survey between the Kyle of Tongue and 13 km west of Thurso with the Marine Scotland Science vessel the MRV *Scotia* in 2014:

- Marine Scotland (2014a) MBES data as post processed XYZ data in txt file format which gives coordinate and depth information. Available online at (http://www.gov.scot/Topics/marine/science/MSInteractive/datatype/Bathymetry/data/farr-point);
- Marine Scotland (2014b) Dropcam footage in kmz format files for reviewing in Google Earth. Available online at (http://www.gov.scot/Topics/marine/ science/MSInteractive/datatype/TV).

This surveyed area includes the Offshore Study Area. These surveys were used during the baseline assessment for evidence of marine historic environment assets (ORCA, 2015). The desk-based assessment of potential submerged cultural heritage was completed in accordance with the Chartered Institute for Archaeologists (CIfA) Standard and Guidance for historic environment desk-based assessment (revised December 2014) and reviewed key data sources of known submerged sites within the WTG and previous Export Cable Corridor. Potential wrecks or archaeological artefacts located in the wider area as identified in are included in this assessment as their exact locations are uncertain, therefore they could possibly be within the WTG site or Export Cable Corridor and so there is the potential for adverse impact.

9.6.7 Description of the Current Environment

The marine historic environment encompasses not only shipwrecks, but also other evidence of human exploitation of maritime resources, such as shipyards, piers, fish traps, anchor sites and submerged landscapes where human beings and early hominids previously lived or hunted on terrain which was at that time dry land, or where they exploited fish and shellfish on the coast which is now submerged (Marine (Scotland) Act 2010, Section 73, paragraph 5). Obstructions and foul ground areas can also represent wrecks that have not been classified due to lack of investigation.

Marine cultural and archaeological remains are located on and below the seabed and can include wrecks and wreckage of historical, archaeological or artistic importance designated under the Protection of Wrecks Act (1973), wrecks, areas and deposits of national importance designated as an HMPA under the Marine (Scotland) Act (2010) and military (including human) remains designated under the Protection of Military Remains Act (1986). It is an offence to cause damage to protected historic remains and in some cases where a restricted zone exists around the remains, a licence is required before any works or salvage can be undertaken within this zone.

Her Majesty's Government *UK Marine Policy Statement* (2011) states heritage assets should be conserved through marine planning in a manner appropriate and proportionate to their significance. The absence of designation for such assets does not necessarily indicate lower significance and the marine planning authority should consider them subject to the same policy principles as designated heritage assets (include those outlined) based on information and advice from the relevant regulator and advisors. The Scottish Historic Environment Policy (SHEP) 2011 outlines the principles that underpin the designation of HMPAs, including that marine historic assets from all parts of the Scottish marine protection area are equally worthy of study and consideration for statutory protection. The Scottish Government's Planning Advice Note (PAN 2/2011): Planning and Archaeology state that for all developments, the principles (in Scottish Planning Policy 2014 and SHEP 2011) of preservation *in situ*, or mitigation where necessary equally apply to sites on land or underwater.

There are no HMPAs or designated wrecks and military remains in the Offshore Study Area (Figure 9-18). Consultation is underway seeking views from the public on the designation of an HMPA in Scapa Flow, Orkney to protect the areas wartime heritage however it is located over 41 km from the Project (Figure 8-5). There are four wrecks less than 5 km from the Offshore Study Area. Two are unknown wrecks that are presumed to be Atlantic, one is unknown and presumed to be Dounreay Pentland Firth, and chartered wreck is the pre-dreadnought Battleship HMS King Edward VII which is 3.5 km north of the Offshore Study Area which was identified in the Marine Historic Environment Technical Baseline as a chartered wreck (ORCA, 2015). Additionally, one wreck lies just outside the Export Cable Corridor on the shoreline. This is the Arnisdale Dounreay Pentland Firth wreck (Figure 9-18).

There may be one shipwreck of high importance (HMT Orsino) somewhere within the area. There could be unknown wrecks, aircraft and unexploded wartime ordnance in the area. However, none are known and none has been identified in the available survey data (ORCA, 2015).

Within the Marine Scotland MBES data there is an anomaly 4.6 km north east of the Offshore Study Area with dimensions that make it a possible target for HMT Orsino. However, without ground-truthing it is also possible that this could be another unnamed vessel, or a large glacial erratic. The lack of complete MBES survey coverage for the WTG Site and Export Cable Corridor means that HMT Orsino could lie within the un-surveyed part of the Offshore Study Area (ORCA, 2015).

There are no known aircraft losses in the Offshore Study Area, but a number of aircraft have gone 'missing'' off the north coast of Scotland so the possibility remains of finding one here. Any aircraft found is automatically protected under the Protection of Military Remains Act 1986 if lost on active service. These would be considered of high importance.

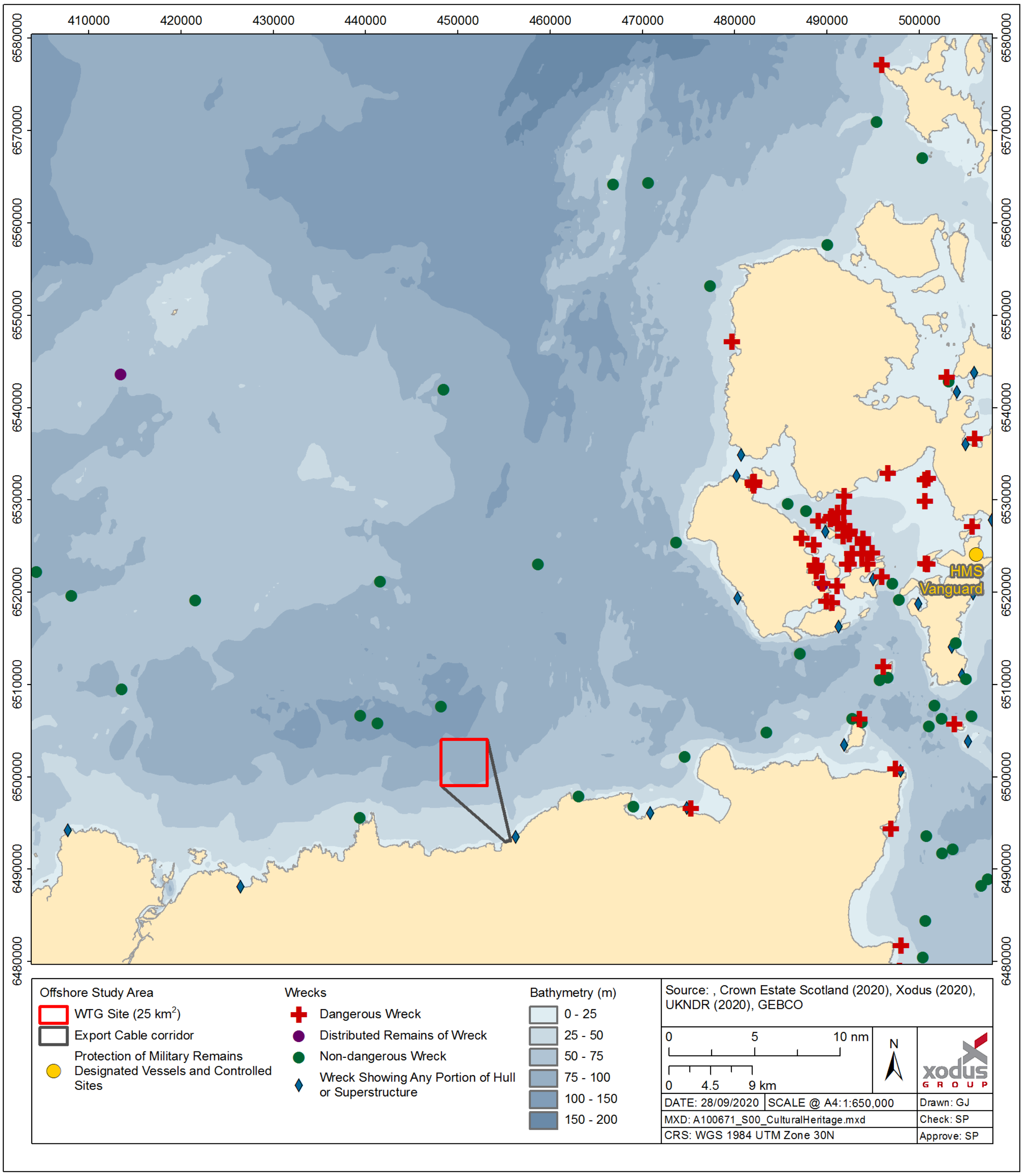


Figure 9-18 Archaeology and Cultural Heritage Receptors in the vicinity of the Offshore Study Area

There is the possibility that HMD *Orsino*, which was sunk by U-boat in 1916, could be in the study area. Its actual position remains unknown. It is variously listed as 'Between Loch Eriboll and Stromness'; Between Loch Eriboll and The Islands'; Pentland Firth'' (CANMORE ID 214438). If identified, this vessel is of high importance as none of the six men killed in the attack were recovered and the vessel would be considered a war grave.

9.6.8 Identification of Potential Impacts

The key potential impacts on archaeology and cultural heritage within the Offshore Study Area are considered to be direct and/or indirect physical disturbance to or loss of known and unknown assets of potential archaeological and cultural significance.

As described in the guidance documents *Historic Environment Guidance for the Renewable Energy Sector* (Wessex Archaeology, 2007) and *Historic Environment Guidance for Wave and Tidal Energy* (Fjordr Ltd, 2013, on behalf of English Heritage, Historic Scotland and Cadw), there may be direct and indirect impacts upon cultural heritage receptors preserved offshore from offshore renewable energy developments. These potential impacts are paraphrased below:

> Direct impacts on cultural heritage features, artefacts, wrecks and submerged landscapes due to, for example, intrusive site investigations, dredging and clearance, anchoring of construction and support vessels, embedment/gravity anchors, seabed-laid moorings, seabed-laid connecting cables, seabed laid cable hub, trenching or ploughing/jetting in of export cable; and

> Indirect or secondary impacts on cultural heritage features, artefacts, wrecks and submerged landscapes from, for example, scouring around anchors, moorings, cable hub, connecting and export cables, changes to sediment transport and deposition, changes to the wave energy regime, changes to the setting of coastal historic environment assets.

Direct impacts are generally restricted to the installation, maintenance and decommissioning of the anchors, moorings and cable infrastructure. Indirect impacts may develop via a number of varied processes. The associated impacts arising from the key sensitivities on the relevant receptors are detailed in Table 9-14.

9.6.9 Cumulative Impacts

Impacts to archaeology and cultural heritage present in the Offshore Study Area are not anticipated as the projects associated with potential cumulative impacts will not significantly overlap the boundary of the Offshore Study Area (the proposed Pentland Floating Offshore Wind Farm Demonstrator is within the study area). It is, therefore, envisaged that there is no potential for cumulative impacts to arise from the development of other projects in the nearby area to impact the archaeological or cultural heritage assets within the Offshore Study Area.

Table 9-14 summarises the potential impacts including potential cumulative impacts.

Table 9-14 Potential Impacts on Archaeology and Cultural Heritage During Construction, Operations and Maintenance and Decommissioning of the Offshore Study Area

Impacts	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Direct physical disturbance to or loss of marine archaeological features	Seabed preparation, the installation of the anchors, the use of scour protection and the construction of associated infrastructure and cables could directly disturb, or damage known or potential artifacts of cultural importance or affect sites of archaeological interest. Such impacts may also arise from activities associated with the construction activity such as vessel anchoring. Archaeological assessment carried out for the Dounreay Trì EIA in 2016 concluded that with correct management and mitigation such as avoidance of areas recorded as anomalies picked up in geophysical surveys, the residual impacts as a result of direct disturbance would be negligible. Review of geophysical and geotechnical data post consent will also occur.	Scoped out

Impacts	High Level Impact Summary and Justification	Scoped In/Out
Indirect physical disturbance to marine and coastal archaeological features	Changes to currents, sediment transport and erosion patterns during the construction period have the potential to impact on sites, deposits or artifacts even where direct physical contact from construction activities does not occur. As discussed in Section 7.2 changes to physical processes in the area as a result of the Project will be minor. This coupled with correct management and mitigation remove the need for further assessment of this impact.	Scoped out
Potential impacts on historic landscapes and monuments	This would only be of relevance to offshore archaeology of a floating nature or wrecks which are used for diving etc. This is not the case with the Project and will not be considered further.	Scoped out
Potential Impacts During Operations and Maintenance		
Direct physical disturbance to marine and coastal archaeological features	Although no new disturbance of the seabed is likely to take place during the operational phase, some activities associated with maintenance (for example, positioning of cable maintenance) may give rise to direct physical disturbance. Archaeological assessment carried out for the Dounreay Trì EIA in 2016 concluded that with correct management and mitigation such as avoidance of areas recorded as anomalies in geophysical surveys, the residual impacts as a result of direct disturbance would be negligible. Review of geophysical and geotechnical data post consent will also occur.	Scoped out
Indirect physical disturbance to marine and coastal archaeological features	Indirect changes to the hydrodynamic and sedimentary regimes could occur, resulting in disturbance to archaeological features through sediment transport, scouring or deposition. As discussed in Section 7.2 changes to physical processes in the area as a result of the Project will be minor. This coupled with correct management and mitigation remove the need for further assessment of this impact. This impact was also considered to be have a negligible residual impact in the Dounreay Trì EIA in 2016.	Scoped out
Potential impacts on historic landscapes and monuments	This would only be of relevance to offshore archaeology of a floating nature or wrecks which are used for diving etc. This is not the case with the Project and will not be considered further.	Scoped out
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to but not exceeding those arising during construction.		Scoped out
Potential Cumulative Impacts		
Projects associated with potential cumulative impacts do not significantly overlap the boundary of the Offshore Study Area. It is, therefore, envisaged that there is no potential for cumulative impacts to arise from the development of other projects in the nearby area to impact the archaeological or cultural heritage assets within the Offshore Study Area.		Scoped out

9.6.10 Conclusions and Next Steps

Potential environmental impacts associated with archaeology and cultural heritage for the Project have been scoped out of the EIA and will not be addressed further within the EIA Report. Although the further study of impacts is scoped out of the EIA, management measures will be in place to ensure Risk Assessments and Method Statements will be produced as appropriate (and required by consent). These will be disseminated prior to development activities taking place associated with the Project. This will include archaeological review of the data collected during the geophysical survey campaign, this review will occur post consent and any features of archaeological interest which are observed will be given due consideration and appropriate management measures put in place.

9.7 Other Users of the Marine Environment

9.7.1 Introduction

This section characterises other human activities that occur in the marine environment within the vicinity of the Project by considering diverse interests such as utilities, military activity, oil and gas activities, marine renewables, waste disposal, aquaculture and aggregate extractions.

Other human receptors in the marine environment such as Commercial Fisheries, Shipping and Navigation, and Socio-Economic, Recreational and Tourism are addressed in Sections 9.2, 9.3 and 9.8 respectively.

9.7.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on other sea users:

Legislation

The MoD can regulate and restrict the use of sea areas temporarily or in some cases permanently for the purposes of national defence using by-laws under the provisions of the following acts:

- Military Lands Act 1892 and 1900;
- Land Powers Defence Act 1958;

Guidance

- Scotland's National Marine Plan (Scottish Government, 2015). This document provides sector-specific guidance relevant for the other sea user receptor groups and some potential interactions between them. The relevant other sea users included in this report are:
    - Aquaculture;
    - Oil and Gas;
    - Offshore Wind and Marine Renewable Energy;
    - Recreation and Tourism;
    - Submarine Cables; and
    - Defence.
- National Policy Statement for Renewable Energy Infrastructure (EN-3) (DECC, 2011). This policy outlines various environmental considerations that applications for OWFs should acknowledge. This includes considerations of the impacts of OWFs on other marine users.

- Marine Scotland (2015). Regional Locational Guidance -Consultation Draft. Marine Renewable Energy in the Pentland Firth and Orkney Waters.
- SgurrEnergy Ltd (2014). RenewableUK Offshore wind and marine energy health and safety guidelines. 2014 (issue 2) [online]. Available at: https://cdn.ymaws.com/www.renewableuk.com/resource/collection/AE19ECA8-5B2B-4AB5-96C7-ECF3F0462F75/Offshore_Marine_HealthSafety_Guidelines.pdf; and
- The Highland Council (2016). Aquaculture Planning guidance. Available online at https://www.highland.gov.uk/downloads/file/16929/aquaculture_planning_guidance.

9.7.3 Available Information

The following available information was used in the preparation of this section:

- NMPi (2020). Spatial data on other users of the marine environment on National Marine Plan Interactive. Available online at https://marinescotland.atkinsgeospatial.com/nmpi/, including:
    - Oil and Gas UK (2019). Oil and gas infrastructure;
    - European Subsea Cables Association (2019).
    - Cables;
    - Crown Estate Scotland (2020). Energy and Infrastructure Spatial Data;
    - Scottish Government (2020). Area management – dredge spoil disposal sites (open, closed, and disused); and
    - Crown Estate Scotland (2019). Aquaculture lease agreements.
- Royal Navy (2015). Information on Joint Warrior exercised;
- Tethys (2020). Brims Tidal Array. Available online at https://tethys.pnnl.gov/project-sites/brims-tidal-array;
- Simecatlantis (2020a). Tidal Stream Projects MeyGen. Available online at https://simecatlantis.com/projects/meygen/;
- Simecatlantis (2020b). Tidal Stream Projects: Ness of Duncansby. Available online at https://simecatlantis.com/projects/duncansby/.
- SSE (2019). Orkney . Available online at https://www.ssen-transmission.co.uk/projects/orkney/;
- CAA (2008). Safety Sense Leaflet 18: Military low Flying. Available online at https://publicapps.caa.co.uk/docs/33/ga_srg_09webSSL18November.pdf; and
- NAT (2018). Chart of United Kingdom Airspace Restrictions and Hazardous Areas. Available online at https://www.aurora.nats.co.uk/htmlAIP/Publications/2018-11-08-AIRAC/graphics/43863.pdf.

9.7.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the Project.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to other sea user have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

9.7.5 Study Area

The study area covers the Offshore Study Area and the north coast of Scotland to identify any users that may directly interact with the Offshore Study area and its components or interact with project vessels transiting to the Offshore Study Area during construction, operations and maintenance and decommissioning activities.

9.7.6 Surveys and Studies Carried Out to Date

No site-specific surveys with regards to other users in the marine environment have been carried out to date as the information obtained during previous consultation along with desktop studies was deemed sufficient.

9.7.7 Description of the Current Environment

Figure 9-19 shows the location of other sea user operating in the vicinity of the Offshore Study Area.

9.7.7.1 Other Marine Renewable Energy Projects

There are several marine renewable energy (MRE) projects either in the development phase or undergoing the consenting process within the Pentland Firth and Orkney Waters strategic area (PFOW). The closest operational site is the MeyGen Phase 1A (86 MW) development located 36 km from the Offshore Study Area. Project Stroma (formally known as MeyGen Phase 1b) is currently under construction and includes the installation of a single power export cable for the turbines within MeyGen Phase 1A. Additionally, MeyGen Phase 1C has full consent and is in the development phase. This will include building an additional 49 turbines (73.5 MW). Phase 2 and 3 are also in the development phase and will follow Phase 1C to increase the MW to reach the full 398 MW capacity for the offshore lease (Simeatlantis, 2020a).

There are several proposed tidal arrays in the PFOW including the Brims Tidal Array and Ness of Duncansby both of which are at least 30 km from the Offshore Study Area. In July 2018, project partners (for the Brims Tidal Array) OpenHydro's parent company, Naval Energies, made the decision to liquidate OpenHydro. There has not been a final decision regarding Brims Tidal Array, which is almost fully consented from its initial application in 2016. There is the possibility that other developers may take on this project, however the current status of this remains unknown (Tethys, 2020). The Ness of Ducansby is a neighbouring project to MeyGen that will lie to the east. The project is currently in the development phase and it is anticipated to undergo consenting alongside MeyGen Phase 2 (Simeatlantis, 2020b).

Additionally, there are several proposed projects that have now been postpone indefinitely or cancelled within a 20 km radius of the Offshore Study Area. The proposed developments include the Farr Point Wave Farm, the Dounreay Demonstration Centre (DDC) and Katanes Floating Energy Park. The Farr Point Wave Farm was a proposal for up to ten Pelamis wave energy converters situated 18 km west of the Offshore Study Area. This project has undergone scoping, but the technology developer has since gone into administration and there are currently no new proposals to continue development of this site. This project is therefore not considered further. The proposed DDC, located directly adjacent to the Offshore Study Area (0.6 km), received a Screening Opinion in February 2015. This project has since been cancelled. Finally, the proposed Katanes Floating Energy Park located approximately 18 km west of the Offshore Study Area was for a pilot 8 MW offshore wind array, however, the project status is now dormant.

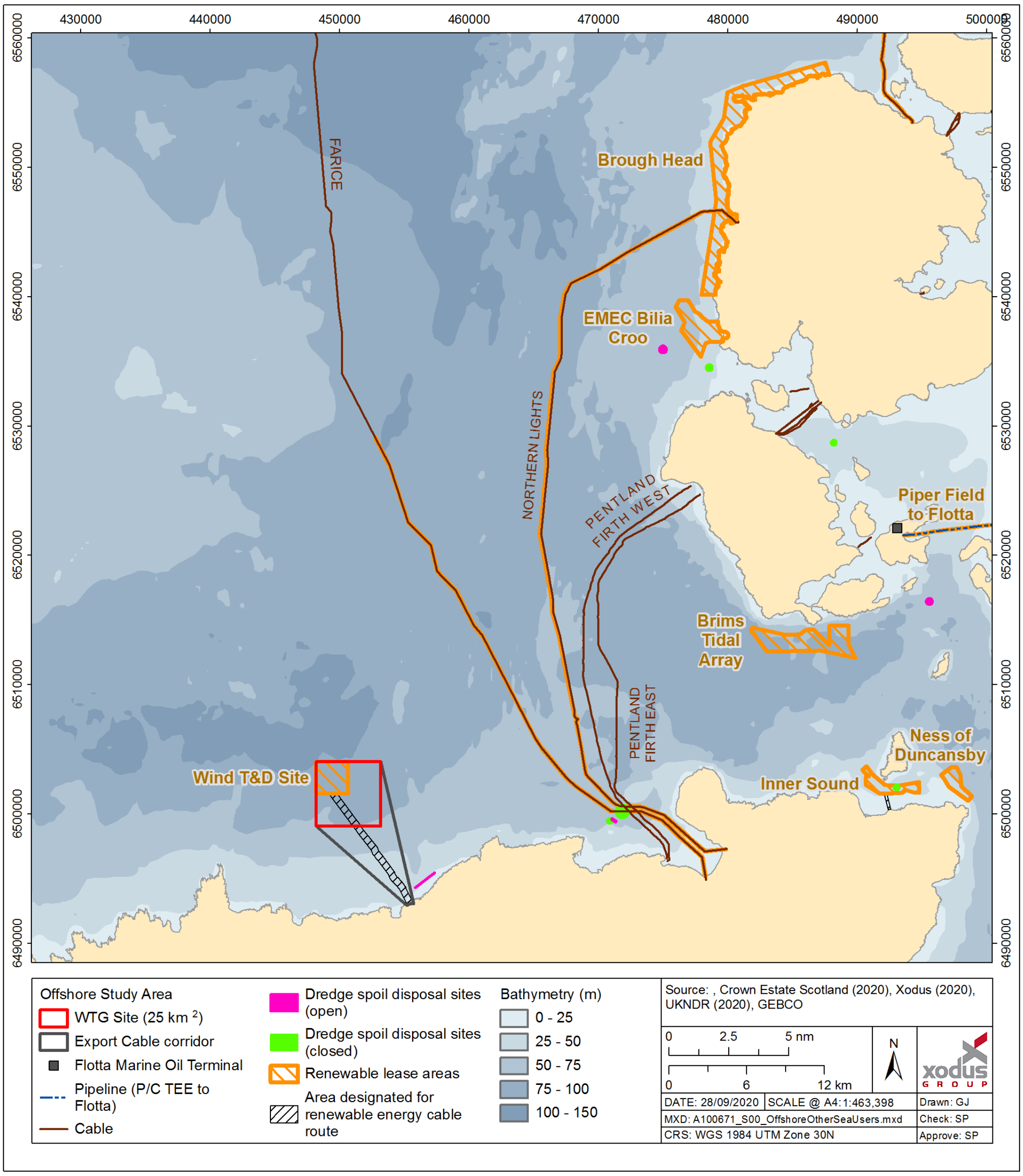


Figure 9-19 Location of Other Sea User in the vicinity of the Offshore Study Area

9.7.7.2 Military Activity and Unexploded Ordnance (UXO)

The Ministry of Defence (MoD) operates in Scotland's coastal areas and adjacent seas where they carry out maritime and aerial training activities and surveillance of potential threats to the country's offshore interests. Defence activities include the operation of naval vessel aircraft, navigational interests, underwater acoustic ranges, maritime exercise areas, amphibious exercises, coastal training ranges and coastal test and evaluation ranges.

The Offshore Study Area lies within a military Practice and Exercise Area (PEXA) D712C which is an Area of Intense Aerial Activity (AIAA). An AIAA is defined as "*airspace within which military or civil aircraft, singly or in combination with others, regularly participate in unusual manoeuvres*" (CAA, 2008). Dander area D712C is an AIAA that is only used when notified (NATS, 2018).

Additionally, the Offshore Study Area is approximately 35 km west of the Cape Wrath Firing Range military exercise area and its Firing Danger Area. There is also a PEXA within Loch Eriboll, Sutherland (within the Cape Wrath Firing Range area). The firing ranges are not always in use and access to these areas for appropriate activities is permitted where compatible with operational requirements. Temporal and spatial restrictions may be in place in these areas and where other military exercises are carried out.

Twice a year, Europe's largest military exercise, Joint Warrior is undertaken off the north, north-east and north-west coasts of Scotland. Joint Warrior involves the three-Armed Forces and aircraft, navy vessels, submarines and army personnel and occurs in March/April and October each year over a period of 10 - 15 days.

There are no current or historical military munitions disposal sites within the vicinity of the Offshore Study Area, and it is considered that the potential for unexploded ordnance (UXO) is low.

Aerial military activity is discussed in Section 9.4: Aviation and Radar.

9.7.7.3 Licensed Spoil Disposal Sites

There are no dredge disposal sites located within the vicinity of the Offshore Study Area. One marine aggregate disposal site is located approximately 11 km east off Dounreay. A Dounreay microsite is located adjacent to the Export Cable Corridor.

9.7.7.4 Aggregate Extraction

There are no marine aggregate extraction sites within the vicinity of the Offshore Study Area. A construction aggregate site for fine (coarse sands) is location at least 15 km east of the development area.

9.7.7.5 Subsea Cables and Utilities

There are no cables or pipelines that intersect with the Offshore Study Area. However, the currently proposed landfall search area for the Orkney-Caithness interconnector is within the Export Cable Corridor and there is therefore the potential for interaction during construction at the landfall or cable corridor installation offshore (Figure 9-19). New transmission infrastructure is required between Orkney and Caithness to enable the export of electricity from renewable energy generation in Orkney into the national grid. SHE-T is planning to develop a 70 km 220 kV subsea electricity transmission connection from the existing connection site at Dounreay to the Bay of Skaill on the west coast of Orkney (SSE, 2019). This project is consented but is currently on hold pending confirmation of how much renewable generation is likely to feed into Orkney.

9.7.7.6 Oil and Gas Activity and Carbon Capture and Storage

There are no UK Continental Shelf (UKCS) licensed blocks for oil and gas activities within the vicinity of the Offshore Study Area (Oil & Gas Authority, 2019). The majority of oil and gas activities are undertaken offshore beyond territorial waters and are particularly concentrated further north and along eastern offshore waters. Pipelines are therefore directed to SHE-T and, Orkney and the east coast of Scotland.

The nearest potential carbon capture and storage (CCS) sites are located in the Moray Firth and North Sea east of the Scottish mainland and therefore not likely to interact with the Offshore Study Area.

9.7.7.7 Aquaculture

There are no active finfish or shellfish marine aquaculture sites within the vicinity of the Offshore Study Area. The nearest marine aquaculture sites are located 30 km east of the Offshore Study Area in the Kyle of Tongue and 50 km north in Orkney waters.

The north of Scotland coastline has also been identified as an area where the development of new aquaculture sites is restricted. Only existing aquaculture sites can be extended. Given the proximity of the existing aquaculture sites, it is unlikely there will be any overlap with this activity (The Highland Council, 2016).

9.7.7.8 Dounreay Nuclear Facility

DSRL is the licence company responsible for the decommissioning of the Dounreay nuclear facility. As a result of operational standards in reprocessing during the 1960s and 1970s, some radioactive particles were released into the sea via an active discharge pipeline in a subsea tunnel that extends approximately 600 m offshore. A number of radioactive particles have been discovered on the seabed close to the old discharge point. An extensive programme of remediation activity has been undertaken by DSRL to detect and retrieve hazardous particles from a 60-hectare area of seabed near the outfall using remotely operated vehicles (ROVs), clean-up vehicles and divers. Sandside Bay is routinely monitored for particles and other contamination (DSRL, 2015). This remediation work is currently ongoing. Additionally, the Nuclear Decommissioning Authority are looking to decommission the facility between 2022 and 2033.

9.7.7.9 Telecommunications

Due to the production of low levels of electromagnetic radiation, wind turbines can have an effect on communication systems that utilise electromagnetic waves as their means of transmission. The rotating blades of wind turbines can also cause interference through reflection and shadowing of electromagnetically propagated radio signals such as terrestrial fixed microwave links, terrestrial radio telemetry links and television broadcasts. Therefore, it is necessary to ensure a suitable separation distance between telecommunications links and wind turbines.

Telecommunications considered will include:

- Microwave communications;
- Television reception;
- Radio reception; and
- Cellular telephone service.

The scope of the assessment presented in the EIA will be finalised, based on site-specific sensitivities, and in consultation with Ofcom, JRC, Atkins and Arquiva.

9.7.7.10 Space Hub Sutherland

In August 2020 permission was granted for the construction of a vertical launch space port with launch operations control centre, site integration facility, launch pad complex, antenna park, access road, fencing, services and associated infrastructure at Talmine, Tongue approximately 38 km from the Project. In the planning permission a condition is applied to limit the number of launches to 12 a year. The first satellite launches are planned for the early 2020s. Given the nature of this Project it is not anticipated to interact with the Project.

9.7.8 Identification of Potential Impacts

The potential for interaction with, and therefore impact on, other sea users arising from the Offshore Study Area is considered to focus on obstruction and exclusion from areas under construction. The presence of additional vessels in the area during the construction phase and during any planned and unplanned maintenance operations may impact on existing sea users. The physical presence of the floating platform during the operational phase may also impact on sea users.

9.7.9 Cumulative Impacts

There is potential for cumulative impacts on other sea user receptors to arise from the development of projects in the nearby area including:

- The SHE-T Orkney-Caithness interconnector cable (consented);
- Potential OWF Developments in the ScotWind N1 DPO; and
- Pentland Floating Offshore Wind Demonstrator (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on the physical environment have the potential to arise from cable installation activities in these areas.

Additionally, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on the physical environment if export cables cross the Project Offshore Study Area.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the array. Ultimately the array will have the same number of turbines so there are no cumulative impacts predicted to other sea users as a result of operation of the Demonstrator and array. Because the Demonstrator will be subject to a separate installation campaign to the Project, there is the potential for cumulative impacts, however these are anticipated to be minor. Impacts to other sea users present in the Offshore Study Area are expected to be relatively localised and small scale, therefore there will be limited scope for cumulative impacts. However, it is considered the Project and other projects in the vicinity have the potential to impact other sea users in the area in a cumulative manner. This will be assessed further at EIA stage.

Table 9-15 summarises the potential impacts including potential cumulative impacts.

Table 9-15 Potential Impacts Upon Other Users of the Marine Environment during Construction, Operations and Maintenance and Decommissioning of the Offshore Study Area

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Obstruction of MRE activities due to the presence of safety zones and construction vessels during installation activities	Most of the proposed MRE sites are a considerable distance from the Offshore Study Area, however it is possible that ports utilised for construction or operation and maintenance bases could be located within proximity to COP activities. Any impacts on capacity at ports will be addressed in Section 8.8: Socio-economics, Recreation and Tourism. Impacts to navigation of vessels associated with these developments will be addressed in the NRA. All MRE projects are therefore scoped out as potential receptors to impacts from the Offshore Study Area.	Scoped out
Obstruction of military activities due to the presence of safety zones and construction vessels during installation activities	There is potential for the Offshore Study Area to interact with military activities and further consultation may be required to ensure impacts are minimised.	Scoped in and addressed in Section 8.4: Aviation and Radar

Impact	High Level Impact Summary and Justification	Scoped In/Out
Obstruction of spoil disposal activities or aggregate extraction due to the presence of safety zones and construction vessels during installation activities	No potential impacts are anticipated due to the distance of these activities from the Offshore Study Area. Any impacts relating to the safe navigation of vessels carrying material to and from these sites are addressed in Section 9.3 Shipping and navigation.	Scoped out
Obstruction of electricity cable installation activities due to the presence of safety zones and construction vessels during installation activities	There are no anticipated impacts in relation to existing cables, however the proposed landfall location for the SSE Orkney-Caithness interconnector overlaps with the project cable landfall and there is potential for interaction.	Scoped in
Obstruction of oil, gas and CCS activities due to the presence of safety zones and construction vessels during installation activities	There are no current or planned activities within close proximity to the Offshore Study Area. Any impacts relating to the safe navigation of operational vessels associated with these activities are addressed in Section 9.3 Shipping and Navigation.	Scoped out
Disruption to DSRL remedial and monitoring activities due to the presence of safety zones and construction vessels during installation activities	DSRL remedial activities are undertaken within the Export Cable Corridor and there is therefore potential for disruption.	Scoped in
Telecommunications	No tall structures considered during the construction phase.	Scoped out
Potential Impacts During Operations and Maintenance		
Obstruction of MRE activities due the presence of the floating structure and associated moorings; and the presence of safety zones and vessels during maintenance activities	As construction impacts.	Scoped out
Obstruction of military activities due to the presence of the floating structure and associated moorings; and the presence of safety zones and vessels during maintenance activities	As construction impacts.	Scoped in and addressed in Section 8.4: Aviation and Radar
Obstruction of spoil disposal activities or aggregate extraction due the presence of the floating structure and associated moorings; and the	As construction impacts.	Scoped out

Impact	High Level Impact Summary and Justification	Scoped In/Out
presence of safety zones and vessels during maintenance activities		
Obstruction of cable installation activities due to the presence of the floating structure and associated moorings; and the presence of safety zones and vessels during maintenance activities	As construction impacts.	Scoped in
Obstruction of oil, gas and CCS activities due to the presence of the floating structure and associated moorings; and the presence of safety zones and vessels during maintenance activities	As construction impacts.	Scoped out
Obstruction of DSRL remedial and monitoring activities due to the presence of the floating structure, associated moorings and export cable; and the presence of safety zones and vessels during maintenance activities	As construction impacts.	Scoped in
Obstruction of adverse impact on telecommunication systems in operation in the region	Potential impact on services.	Scoped in
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase.		As construction
Potential Cumulative Impacts		
Due to construction and presence of the Offshore Study Area and the Orkney-Caithness interconnector export cable and landfall as well as the proposed Pentland Floating Offshore Wind Demonstrator, potential cumulative impacts include the following; obstruction of DSRL remedial and monitoring activities, obstruction of military activities and obstruction of other MRE activities.		Scoped in

9.7.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 9-16. These methods will be used alongside input from the relevant guidance as identified in Section 9.7.2.

Table 9-16 Principle Method of Assessment to be Conducted within the EIA Report

<table>
<tr><th>Impact Scoped In</th><th>Survey Work During EIA</th><th>EIA Assessment Methodology</th></tr>
<tr><td>Obstruction of military activities due to the presence of safety zones, the floating structure and associated moorings; and installation and maintenance vessels.</td><td>None identified</td><td rowspan="4">It is proposed that the baseline conditions can be further refined, and potential impacts assessed by obtaining the following information:
> MRE activities: Liaison with HIE and other developers to establish the nature, timing and duration of development activities and determine whether any significant impacts expected;
> Use of the Offshore Study Area by military vessels: Project AIS data will be gathered to inform the Navigational Risk Assessment (NRA) and will provide some information about military vessel activity. Further consultation with the MoD may be required as military vessels have some dispensations regarding switching off their AIS tracks and jamming GPS during some exercises therefore vessel tracking data will not always be available
> Liaison required with relevant SSE departments to establish the nature, timing and duration of electricity cable development activities and determine whether any significant impacts expected; and
> Baseline information regarding DSRL remedial and monitoring activities will be gathered to establish boundaries and timing of activities. Will require consultation with DSRL to determine requirements/approach.
A desk-based assessment will be undertaken augmented by the consultation described above. Where necessary specific impacts will be addressed in other sections, such as impacts on military activities (Section 8.6: Other Users of the Marine Environment).
It is anticipated that no surveys will be required to complete baseline characterisation and the impact assessment for other users of the marine environment. Consultation with various stakeholders will be sufficient to fill any data gaps.</td></tr>
<tr><td>Obstruction of electricity cable installation activities due to the presence of safety zones, the floating structure and associated moorings; and installation and maintenance vessels.</td><td>None identified</td></tr>
<tr><td>Disruption to DSRL remedial and monitoring activities due to the presence of safety zones, the floating structure and associated moorings; and installation and maintenance vessels.</td><td>None identified</td></tr>
<tr><td>Obstruction of adverse impact on telecommunication systems in operation in the region</td><td>None identified</td></tr>
<tr><td>Cumulative Impacts</td><td>None identified</td><td>Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.</td></tr>
</table>

9.7.11 Conclusions and Next Steps

It is recommended that disposal sites, aggregate extraction areas and oil, gas and carbon capture and storage (CCS) activities are scoped out if the EIA as it is considered unlikely for any significant impacts on their activities to arise a result of the Offshore Study Area.

The following other marine users are recommended to be scoped in for an environmental impact assessment and further consultation will be required to clearly define the nature, spatial extent and timing of activities within the study area: MRE projects; military activity; electricity cables and DSRL remedial activity.

9.8 Socio-Economics, Recreation and Tourism

9.8.1 Introduction

The offshore wind sector in the UK is a demonstrable success, representing as it does the largest installed capacity of offshore wind in the world, contributing to our Net Zero ambitions, and bringing skilled jobs and important income to regions and communities. The UK Government has recognised this with the 2020 Offshore Wind Sector Deal, which formalises the ambitions of the Industrial Strategy to make offshore wind "an integral part of a low-cost, low-carbon, flexible grid system" and to "boost the productivity and competitiveness of the UK supply chain".

Whilst bottom-fixed wind dominates the offshore wind deployments to date in the UK, floating wind offers significant opportunity to expand capacity and spread of installed capacity in the UK, and in particular around Scotland. To make the most of this opportunity in terms of local content, there is a need to build the supply chain quickly and robustly. A key facilitator of this will be mid-scale deployments, greater than the pilot sites consented to date (up to 50MW), but smaller than the in-development projects and those likely to come through the ScotWind Leasing Round. These mid-scale floating projects will give the supply chain the real projects to help develop new, and scale-up existing, capabilities to ensure they are ready for the larger projects that will come.

As discussed in Section 1.4, this project, and to an extent those which may be encouraged by the energy transition-focussed North Sea Sector Deal, represents an important milestone in building this capability.

This section characterises the socio-economic, recreation and tourism activity in the vicinity of the Offshore Study Area and outlines the proposed approach to assessment at EIA stage. Key to the assessment will be ensuring alignment with the relevant sector deals and balancing the typically short-term and localised impacts described in Section 9.8.8 – 9.8.10 with the potentially significant, longer-term benefits as described above.

9.8.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance will be taken into consideration as part of the assessment of potential impacts on socio-economic, recreation and tourism. Although there are no specific guidance documents for assessing the socio-economics, recreation and tourism of an offshore wind farm, there are existing data sources and literature including:

Guidance

- Scottish Government (2015). National Marine Plan. Available online at https://www.gov.scot/publications/scotlands-national-marine-plan/;
- Scottish Government (N.D). Scottish Shelf Model data (Part 2). Available online at http://marinedata.scotland.gov.uk/dataset/scottish-shelf-model-part-2-pentland-firth-and-orkney-waters-sub-domain;

- Scottish Government (2016). Pentland Firth & Orkney Waters marine spatial plan (PFOW MSP) and associated documents, including the Sustainability Appraisal and Socio-economic study. Available online at http://www.gov.scot/Publications/2016/03/3696;
- Outputs from the Orkney and Caithness Coastal Character Project, which provides regional and local landscape character assessments (R/LCCAs), should be available from the SNH website by the end of March;
- Visit Scotland (N.D). Available online at (https://www.visitscotland.com/);
- Highland Government (N.d). Economy and employment data from Highland Council Ward Statistics. Available online at https://www.highland.gov.uk/info/695/council_information_performance_and_statistics/575/highland_facts_and_figures;
- Scotland Census (2020). National Census data. Available online at https://www.scotlandscensus.gov.uk/;
- Scottish Renewables (2007). Scottish Renewables Economic Impact Report ;
- Scottish Renewables and British Wind Energy Association (2002); Tourist Attitudes Towards Wind Farms.
- ESC (Economic and Social Research Centre Data archive);
- ABPMer *et al*. (2012) produced for The Crown Estate (TCE) outlines a common approach to and associated methodologies for socio-economic assessment of marine projects in the Pentland Firth and Orkney Waters (PFOW) strategic area, which is reflected in this assessment;
- Scottish Marine Recreation and Tourism Survey 2015 (Land Use Consultants (LUC), 2016)
- The Scottish Enterprise 'Additionality & Economic Impact Assessment Guidance Note' (2008);
- Caithness and Sutherland Local Development Plan (CaSPlan, 2014) sets out the local issues that affect development and the council's plans for development and forms part of the overall Highland regional plan;
- Orkney Islands Council (OIC) Local Development Plan (adopted in April 2014) is a similar document to the Caithness and Sutherland plan that sets out the local issues that affect development and the council's plans for development; and
- Scottish Government (2011). National Renewable Infrastructure Plan.

9.8.3 Available Information

In addition to the above cited data sources, relevant information gathered from desk studies, feedback from consultation and appraisal of the most up to date research studies to establish the relevant baseline and likely potential impacts (negative and positive) will be utilised to provide sufficient information relating to the socio-economic assessment.

Publicly available, regional and local information sources have been used to inform this section. The key information sources are listed below:

- ONS data;
- Key employment sectors;
- Census details;

- Aquatera (2014). A review of the potential impacts of wave and tidal energy development on Scotland's marine environment;
- Population surveys;
- Walking routes, core paths;
- Economy and employment data from Highland Council Ward Statistics;
- National Census data (2011), scotlandcensus.gov.uk;
- RYA data;
- Scottish Renewables Economic Impact Report (Scottish Renewables, 2007);
- Foundation Scotland (2013). The Caithness Conversation Community Profile. Available online at https://www.foundationscotland.org.uk/media/637832/The_Caithness_Conversation_Community_Profile-1-.pdf).
- NMPi (2020). Spatial data on socio-economic, recreation and tourism marine environmental on National Marine Plan Interactive. Available online at https://marinescotland.atkinsgeospatial.com/nmpi/, including:
    - Marine Scotland (2016). Marine Recreation and Tourism Survey 2015 - Walking at the coast (restricted zoom). Available online at http://marine.gov.scot/maps/1020;
    - RYA (2019). Leisure and Recreation - Recreational AIS intensity - RYA UK Coastal Atlas of Recreational Boating - September 2019. Available online at http://marine.gov.scot/maps/1855; and
    - Magic Seaweed (2020). Leisure and Recreation - Surfing locations. Available online at http://marine.gov.scot/maps/405.
- Tourism Impact of Wind Farms, (2012). University of Edinburgh submitted to Renewables Inquiry Scottish Government;
- ESRC (Economic and Social Research Centre Data archive), which is an organisation which funds research on economic and social issues; and
- PFOW marine spatial plan (and accompanying socio-economic baseline review (ttps://consult.scotland.gov.uk/marine-scotland/pfowmarinespatialplan/supporting_documents/PFOW%20MSP%20%20SocioEconomic%20Baseline%20Review.pdf).

9.8.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the offshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the Project.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to socio-economic, recreation and tourism have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed Section 4.

9.8.5 Study Area

Socio-economic impacts have the potential to spread far beyond the fixed boundaries of the Offshore Study Area. It is proposed to assess the impact at a local (Highlands), regional (Scotland) and national (United Kingdom) level.

9.8.6 Surveys and Studies Carried Out to Date

Given the size of the proposed project no site-specific surveys have been carried out to date; however, the following desk-based studies and assessments were used, in addition to the specific guidance and strategic plans for the Pentland Firth, to inform this assessment:

- Pilot PFOW Marine Spatial Plan Consultation Draft: Socio-economic Baseline Review (Marine Scotland, 2015); and
- Shipping Study for Pentland Firth and Orkney Waters (Anatec and Halcrow, 2012).

9.8.7 Description of the Current Environment

Whilst Sutherland is largely rural in nature, Caithness benefits from a large centre of employment at the Dounreay nuclear facility. The main population centres are the ward of Thurso, and the ward of Wick. Traditional industries such as farming, quarrying and fishing account for approximately 13% of employment (Foundation Scotland, 2013). The largest employment sector, however, is public administration, education and health.

The Caithness region has a mostly seasonal tourist industry. Walking is popular along the coastline and there are numerous published routes in the study area (Marine Scotland, 2016). Water sports including SCUBA diving, surfing and sea angling are also popular.

The Offshore Study Area lies within a Royal Yachting Association (RYA) medium recreational cruising route which passes along the north coast of Scotland. There is also a RYA light recreational cruising route between Scrabster and Stromness. The closest marinas are at Scrabster, Stromness and Kirkwall (RYA, 2019). The tourism and recreation study by Marine Scotland (2015) identifies areas of recreational vessel activity and the main routes to and from all major marinas and ports in the area as well as commonly used bays and anchorages. The main period of activity is summer, with little activity outside of April to September.

There are surfing beaches located all along the north coast of Scotland (Magic Seaweed, 2020). The closest surfing beach to the Offshore Study Area is Sandside Bay located to just outside the Export Cable Corridor to the west.

A number of other recreational activities occur in the study area, such as water skiing, wakeboarding, small craft, motor cruising, power boating and personal watercraft. Beaches are used for walking, swimming camping and general recreation.

Walking is practised throughout the north of Scotland by both locals and tourists. There are no core paths in the cable route Study Area. The closest designated core path is Path CA11.07 which provides a walking route from Reay village to the beach area in the south of Sandside Bay and which lies well to the west of the Study Area (see Figure 18-8 and Chapter 22 Land Use, Agriculture and Soils).

Wildlife watching is promoted as a tourist and recreational activity throughout the Pentland Firth and Orkney Waters (PFOW). It is particularly known for seals, whales and birds including the Atlantic puffin and other seabirds which nest abundantly on the sea cliffs in the area.

The village of Reay is located at Sandside Bay approximately 2 km to the west of the proposed substation location. Reay golf course is located on the coastline. The golf course lies outside the Onshore Study Area and unlikely to be impacted in any way.

9.8.8 Identification of Potential Impacts

Impacts arising from the Offshore Study Area can be negative or positive. Socio-economic impacts are likely to involve job creation and localised investment and expenditure. The following impacts are anticipated.

There is significant cross-over with the following Sections and specific impacts will be addressed there as appropriate:

> Section 8.1: Commercial fisheries with regard any loss of fishing grounds or facilities;

> Section 8.2: Shipping and Navigation with regard any sea restrictions or port congestion;

> Section 8.4: Seascape, Landscape and Visual Impact if this has a positive or negative affect on tourist amenity; and

> Section 8.6: Other Users of the Marine Environment where specific recreation pursuits are discussed out with this section.

9.8.9 Cumulative Impacts

There is potential for cumulative impacts on socio-economic, recreation and tourism receptors to arise from the development of projects in the nearby area including:

> The SHE-T Orkney-Caithness interconnector cable (consented);

> Potential OWF Developments in the ScotWind N1 DPO; and

> Pentland Floating Offshore Wind Demonstrator (proposed).

The indicative cable route for the SHE-T Orkney-Caithness interconnector cable will cross the Project Export Cable Corridor area. Therefore, localised cumulative impacts on the physical environment have the potential to arise from cable installation activities in these areas.

Additionally, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts arising on the physical environment if export cables cross the Project Offshore Study Area.

However, timescales for the SHE-T Orkney-Caithness interconnector cable project and any potential developments within the N1 DPO are not currently known however both projects will be given due consideration in the EIA process.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward) Thus, it would be independent of and ahead of installation activities associated with the array.

Impacts to socio-economic, recreation and tourism present in the Offshore Study Area are expected to be largely temporary and relatively localised, therefore there will be limited scope for cumulative impacts. However, it is considered the Project and other projects in the vicinity have the potential to impact socio-economic, recreation and tourism in the area in a cumulative manner. This will be assessed further at EIA stage.

Table 9-17 summarises the potential impacts including potential cumulative impacts.

Table 9-17 Potential Impacts on Socio-Economics, Tourism and Recreation during Construction, Operations and Maintenance and Decommissioning of the Offshore Study Area

Impact	High level impact summary and justification	Scoped in/out
Potential Impacts During Construction		
Positive impact on local economy	Positive impact on employment through creation of local jobs and increased spend in local area.	Scoped in
Direct impact on tourism	Potential for impact on tourism where visitors are deterred from visiting due to disruption.	Scoped in
Direct impact on recreation	Direct impact on access to amenities in the vicinity of the cable landfall and offshore cable route	Scoped in
Direct impact on access to amenities	Direct impact on access to amenities in the vicinity of the cable landfall and offshore cable route.	Scoped in
Potential Impacts During Operations and Maintenance		
Direct impact on tourism	Direct impact on tourism whereby visitors are attracted or deterred from visiting due to the presence of the wind farm.	Scoped in
Direct impact on recreation	Direct impact on access to amenities in the vicinity of the cable landfall and offshore cable route.	Scoped in
Direct effect on local economy	Direct effect from increased local spend during planned maintenance.	Scoped in
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase. Following removal of structures opportunities for habitat recovery in the former location of foundations may arise.		As construction
Potential Cumulative Impacts		
There is the potential for cumulative impacts.		Scoped in

9.8.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 9-18. These methods will be used alongside input from the relevant guidance as identified in Section 9.8.2.

Table 9-18 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Positive impact on local economy	None identified	A desk-based assessment will be undertaken. Consultation will be key to determining and quantifying potential impact and will be a significant element of the data gathering phase in the EIA. Currently it is anticipated that there will not be any data gaps while using the listed data sources. No surveys are anticipated. Following early consultation, it is possible that targeted consultation events and meetings will be required to further ground truth the assessment conclusions.

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Direct impact on tourism	None identified	A desk-based assessment will be undertaken. Consultation will be key to determining and quantifying potential impact and will be a significant element of the data gathering phase in the EIA. Currently it is anticipated that there will not be any data gaps while using the listed data sources. No surveys are anticipated. Following early consultation, it is possible that targeted consultation events and meetings will be required to further ground truth the assessment conclusions.
Direct impact on recreation	None identified	A desk-based assessment will be undertaken. Consultation will be key to determining and quantifying potential impact and will be a significant element of the data gathering phase in the EIA. Currently it is anticipated that there will not be any data gaps while using the listed data sources. No surveys are anticipated. Following early consultation, it is possible that targeted consultation events and meetings will be required to further ground truth the assessment conclusions.
Direct impact on access to amenities	None identified	A desk-based assessment will be undertaken. Consultation will be key to determining and quantifying potential impact and will be a significant element of the data gathering phase in the EIA. Currently it is anticipated that there will not be any data gaps while using the listed data sources. No surveys are anticipated. Following early consultation, it is possible that targeted consultation events and meetings will be required to further ground truth the assessment conclusions.
Direct effect on local economy	None identified	A desk-based assessment will be undertaken. Consultation will be key to determining and quantifying potential impact and will be a significant element of the data gathering phase in the EIA. Currently it is anticipated that there will not be any data gaps while using the listed data sources. No surveys are anticipated. Following early consultation, it is possible that targeted consultation events and meetings will be required to further ground truth the assessment conclusions.
Cumulative Impacts	None identified	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

9.8.11 Conclusions and Next Steps

An assessment of potential impacts and potential cumulative impacts will then be completed within the EIA Report. Potential impacts relate to directive impacts to local economy, tourism, recreation, access to local amenities and potential cumulative impacts associated with nearby future developments have been scoped in for the assessment within the EIA Report. Socio-economic, recreation and tourism is therefore scoped into the assessment phase and will be covered in the EIA.

10 ONSHORE PHYSICAL ENVIRONMENT

10.1 Introduction

This Section considers the impact of the onshore elements of the proposed Project on the following physical environment receptors:

- Geology and Soils;
- Contaminated Land;
- Land Use;
- Hydrology and Hydrogeology; and
- Designated Sites.

The Onshore Study Area is considered to be the onshore cable search area (from Mean Low Water Springs (MLWS)), cable jointing infrastructure and associated substation site. Collectively these will be referred to as the 'Onshore Study Area' delineated in Figure 10-1 in red.

This Section provides an overview of the physical environment within the Onshore Study Area and how this fit within the regional geological and physical environment, along with the anticipated impacts, impact assessment strategy and where applicable mitigation and monitoring.

10.2 Geology, Physical Processes and Land Use

10.2.1 Introduction

This Section describes the key sensitivities and potential changes to the physical environment comprising the geology, soils, contaminated land, land use, hydrology and hydrogeology within the Onshore Study Area arising from the onshore aspects of the Project.

10.2.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on geology, physical processes and land use:

Legislation

- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended);

Policy and Framework

- SEPA: Policy No. 19, Groundwater protection policy for Scotland (2009);
- Highland-wide Local Development Plan (2012) Planning Policies (including Policy 55 – Peats and Soils, Policy 62: Geodiversity, Policy 63: Water Environment, Policy 64: Flood Risk and Policy 66 – Surface Water Drainage);
- National planning policy on agriculture - Scottish Government's Scottish Planning Policy (SPP) (2014);
- The Scottish Soils Framework (Scottish Government, 2009);

Guidance

- SEPA: Water Environment (Controlled Activities) (Scotland) Regulations 2011 - A Practical Guide (SEPA, 2018);

- The Scottish Environment Protection Agency (SEPA)'s Guidance for Pollution Prevention (GPPs) and Pollution Prevention Guidelines (PPGs);
- Scottish Government Planning Advice Notes (PANs) and Guidance (including PAN 51 Planning, Environmental Protection and Regulation; PAN 1/2013 Environmental Impact Assessment, as amended; PAN 69 Planning and Buildings Standards Advice on Flooding; and PAN 79 Water and Drainage);
- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland;
- Nitrate vulnerable zones guidance from the Scottish Government;
- SEPA Technical Flood Risk Guidance for Stakeholders (2019);
- SEPA: Policy No. 19, Groundwater protection policy for Scotland (2009);
- SEPA: Land Use Planning System, SEPA Guidance Note 31: Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (2017);
- Review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Farm Industry, Technical Report, January 2008 (BERR (now BEIS) (2008));
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA, 2009); and
- SEPA: Climate change allowances for flood risk assessment in land use planning, Land Use Planning System SEPA Guidance (2019).

10.2.3 Available Information

Publicly available, regional and local information sources have been used to inform this Section. The key information sources are listed below:

- British Geological Survey (BGS) Maps and Reports. Available at: http://www.bgs.ac.uk/. [Accessed 24 August 2020];
- British Geological Survey (BGS) - Nirex Geological Archive Report. [online] Available at: http://www.bgs.ac.uk/downloads/browse.cfm?sec=1&cat=5.;
- Soil Survey of Scotland, Staff. (1981). Soil maps of Scotland at a scale of 1:250 000. Macaulay Institute for Soil Research, Aberdeen. Scotland's Soils. 2015. Soil maps - Scotland's Soils. [online] Available at: https://soils.environment.gov.scot/maps/soil-maps/national-soil-map-of-scotland/;
- NatureScot (SNH, 2016) The Carbon and Peatland Map. Available at: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/soils/carbon-and-peatland-2016-map;
- Historic Environment Scotland: Scotland's Historic Land Use Assessment (HLA) Interactive Map. Available at: https://hlamap.org.uk/;
- SEPA Flood Map (2020). Available at: http://map.sepa.org.uk/floodmap/map.htm;
- SEPA River Basin Management Plan (RBMP) interactive map. Available at: https://www.sepa.org.uk/data-visualisation/water-environment-hub/;
- The Highland Council Private Water Supply Interactive Map (2019). Available at: https://map-highland.opendata.arcgis.com/datasets/; and

SNH Sitelink interactive map - Key Protected Sites Across Scotland (2020). Available at: https://sitelink.nature.scot/home.

In addition, it is known that information is available from The Highland Council on public and private water courses and soil quality information from publicly available soil maps, all of which will be consulted during the assessment phase.

10.2.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the onshore physical environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to onshore geology, physical processes, and land use receptors have been considered within this report. Moreover, the project team has engaged with immediate landowners as part of the pre-application activities.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

10.2.5 Onshore Study Area

The Onshore Study Area comprises a footprint of approximately 0.85 km^2, located directly adjacent to the western side of the Naval Reactor Test Establishment (NRTE) Vulcan site, and extending out to the eastern edge of Sandside Bay. The onshore project area will be refined once a final decision is made regarding the option of cable installation at the landfall site as described in Section 5.3. The Onshore Study Area is shown in Figure 10-1.

10.2.6 Surveys and Studies Carried Out to Date

No studies have been carried out to date for this topic. Instead, at this stage scoping is based on a thorough desk-top study utilising the publicly available sources of information listed above.

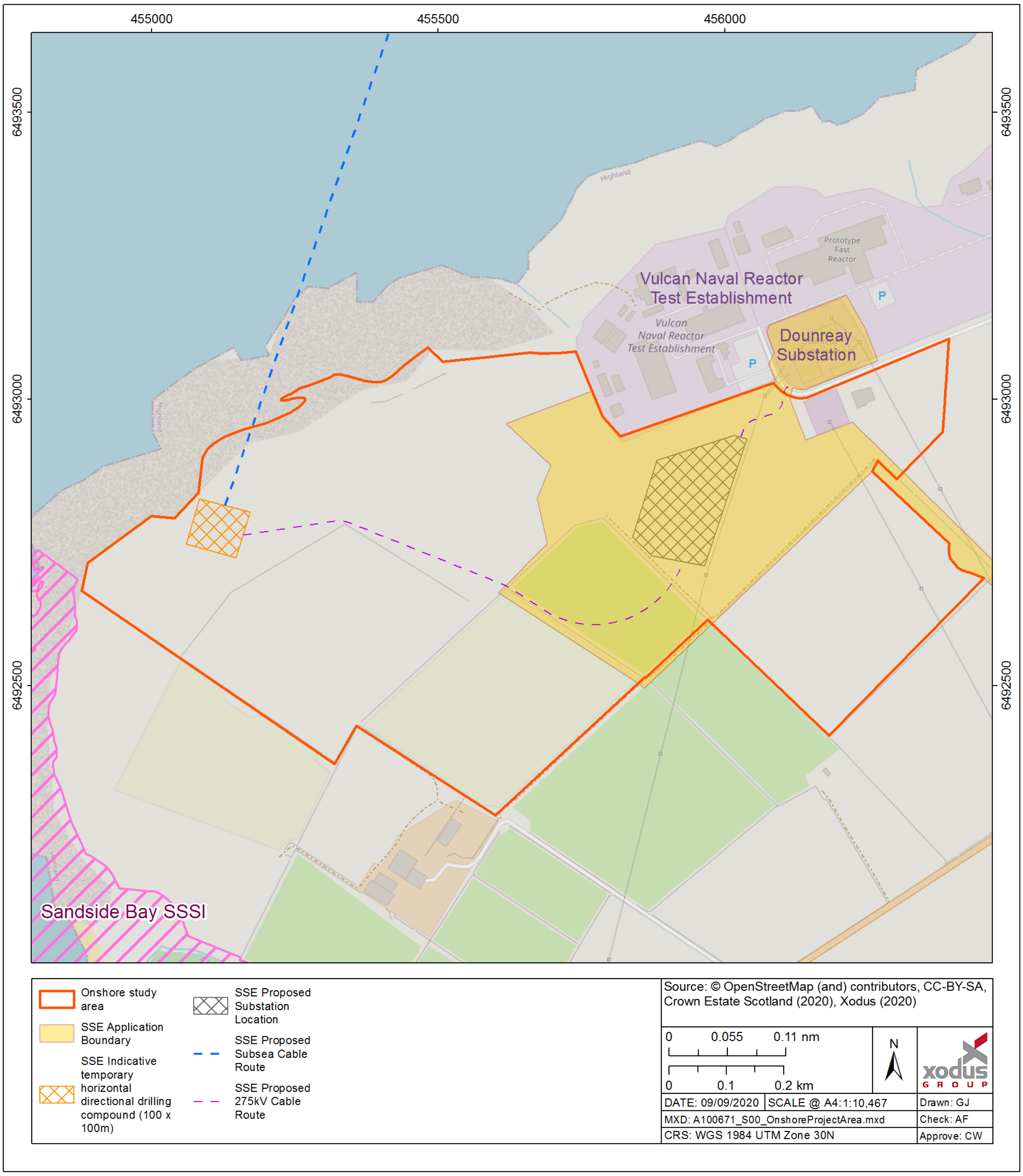


Figure 10-1 Onshore Study Area

10.2.7 Description of the Current Environment

The following physical process characteristics are considered relevant to describing potential impacts arising from the Project during construction, operations and maintenance, and decommissioning phases.

10.2.7.1 Geology

Bedrock Geology

The geology of the north of Scotland involves rocks of Lewisian age (2.5 billion years old), the Caledonian mountain chain which formed about 450 million years ago through to the Quaternary (2.2 million years ago). When the region experienced pull-apart tectonics in the early Devonian, 400 million years ago, rift valleys and half-graben basins formed. These filled with coarse immature sediments until a low relief, flat, broad and elongate basin resulted. This intramontane basin eventually stopped having major tectonic movements and slowly filled with fine-grained lacustrine sediment of the middle Devonian Orcadian Basin. This lake basin, Lake Orcadie, lasted for some 10 million years.

In Caithness and eastern Sutherland, the rocks tend to decrease in age from south-west to north-east. The Caledonian metamorphic basement intruded by large igneous intrusions (Strath Halladale granite, Raey diorite and Helmsdale granite) is overlain by Lower Devonian (lower old red sandstone) conglomerates and breccia. These pass up into the Middle Devonian (middle old red sandstone) lower and upper Caithness flagstone groups separated by the Achanarras Fish Bed. The uppermost rock sequence is the fluvial sandstones with occasional aeolian sand of the John O'Groats and Dunnet Head sandstone possibly of upper Devonian age (upper old red sandstone).

The shore sections are often complicated by many small faults and high cliffs. Several major faults have been traced, mainly from the coast into the interior and confirmed by seismic section. Smaller faults undoubtedly exist but are not exposed. These faults include normal faults, reverse faults and wrench faults. Because of the abundance of these faults simple geometry cannot be used to estimate stratigraphic thicknesses.

The Reay area lies on the western margin of the Orcadian Basin. The Devonian sedimentary rocks (flagstones) rest on the crystalline basement rocks. The Reay landfall also lies south of the margin of the offshore West Orkney Basin of Permo-Triassic and younger sedimentary rocks resting on the Devonian and basement rocks. This basin contains oil fields west of Shetland. At Dounreay, crystalline basement rocks lie below Devonian sedimentary rocks. The top of the basement rocks is at a depth of 300 - 600 m below surface. Additionally, five limestone beds are shown to be present to the west of the Onshore Study Area, one which overlaps the western boundary of the Onshore Study Area and the remaining passing beneath Sandside Bay (Figure 10-2).

The plain of Caithness east and south-east of the Onshore Study Area has been significantly modified by the passage of ice sheets to give a strongly lineated terrain. The main ridges run SE-NW, parallel to ice flow, and are separated by shallow valleys and depressions excavated in zones of weakness and elongate lochans within the Flow Country to the south-east of the Onshore Study Area. The depressions are rock gouges now smothered by till. The streamlining of the terrain is picked out by the south to north orientation of lakes filling rock basins on the plain of Caithness. It is only on the basement rocks and conglomerates that classic ice-roughened terrain is developed. The widely spaced vertical joints in these hard rocks allow plucking to generate cliffs on the lee sides of rock bumps, allowing the formation of roche moutonnées. Good examples occur south of Reay, where there is a marked change in the terrain moving off the Old Red Sandstone. An outstanding example of ice-roughened scenery is found just over the county border at the mouth of Strath Halladale, where the granite hills show a succession of cliffs facing north (Ballantyne and Hall, 2008; Hall and Quaternary Research, 1996; Phillips *et al.,* 2008).

The BGS Geology of Britain Map Viewer indicates that trial bit and borehole logs for the geological Onshore Study Area (NC96NE7617 series) generally confirm the published geology. Trial pits were recorded as encountering weathered sandstone and siltstone (upper Caithness flagstone group) at depths of generally 1 m to 2 m bgl. Rotary boreholes drilled at the eastern end of the site recorded layers of weathered sandstone, siltstone and mudstone.

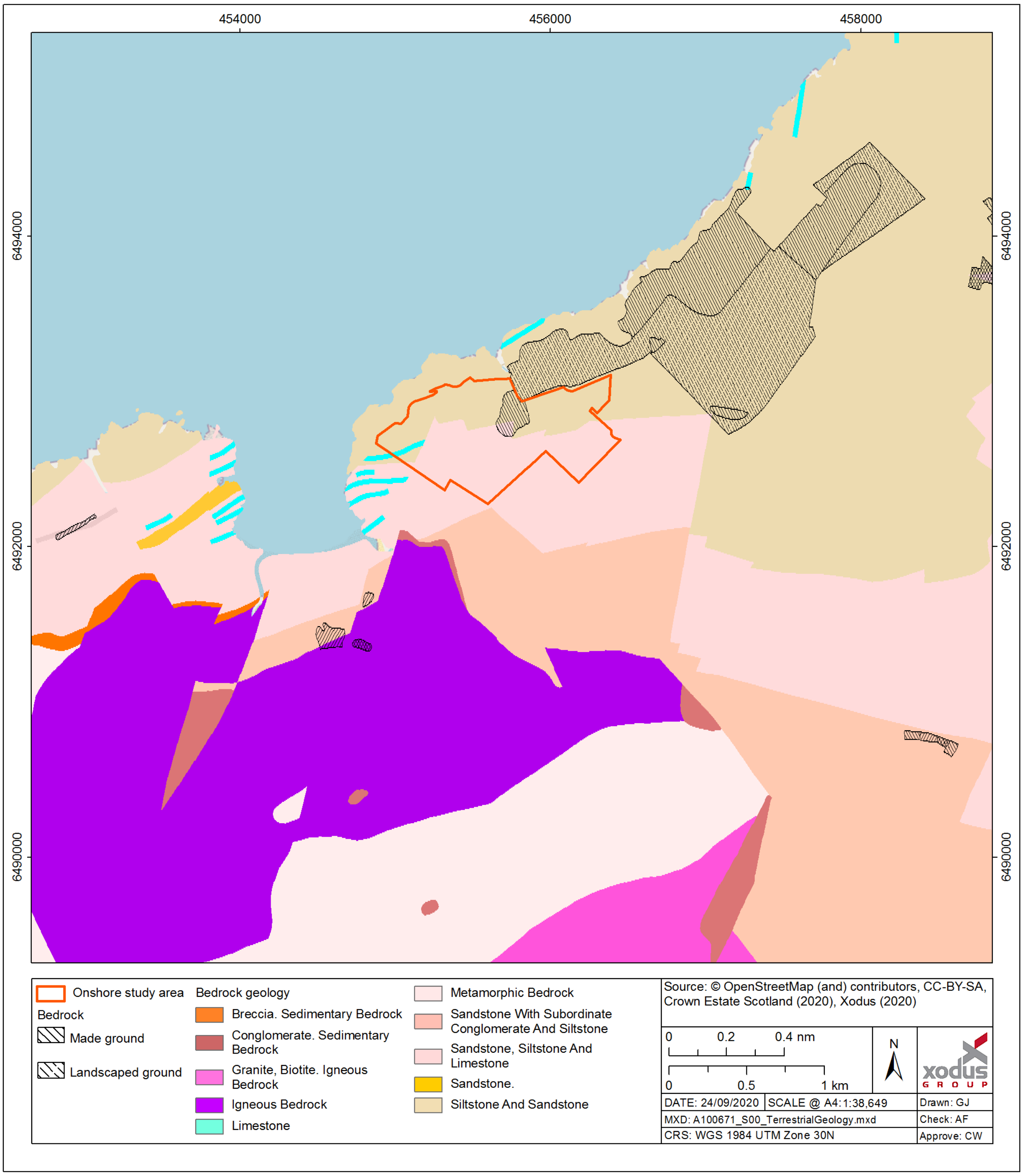


Figure 10-2 Terrestrial Bedrock Geology in the vicinity of the Onshore Study Area

Superficial deposits

Quaternary deposits occur over much of the Dounreay area and have a variable thickness, ranging up to 70 m offshore and 50 m onshore (Michie, 1994). They are usually absent from a narrow strip in the immediate coastal zone, but there are some drift filled valleys which reach the coast (Ballantyne and Hall, 2008; Brown, 2011; Hurst, 2009).

A review of the relevant BGS geological mapping indicates that the whole of the Onshore Study Area is underlain by glacial till comprising sandy clay. BGS trial pit and borehole logs available for the onshore Study Area generally confirm the published geology. Trial pits encountered topsoil to approximately 0.2 m to 0.3 m depth below ground level (bgl) in most pits, underlain by natural sands and/or sandy, silty clays (glacial till).

Additionally, one trial pit (NC96NE7617/TP9), at the far eastern edge of the site and immediately south west of the Dounreay Nuclear Facility, recorded made ground (broken stone with traces of trick, timber and concrete overlying sandy silt and gravel with roots and topsoil) to 1.3 m bgl.

The BGS superficial deposits "surface sediments" recognise a number of different subsoil sediment types related to different physical processes. These sediment types in part, control the type of overlying soils in this area. These deposits are alluvium, blown sand, glacial sand and gravel (reworked till), peat, raised marine deposits and till (diamictites). This latter surficial deposit is the dominant type in the Onshore Study Area. These superficial deposits within the vicinity of the Onshore Study Area are highlighted in Figure 10-3.

10.2.7.2 Soils

Utilising the 1:250 000 scale National Soil Map of Scotland a limited number of soil types are present in the area of interest namely peat, podzols, brown earth, gleys and calcareous soil which is found on top of the shell rich dunes system stretching from the beach at Sandside Bay into the middle of the village of Reay. The soil map was derived from a mixture of new soil survey work undertaken between 1978 and 1981 and a simplification of more detailed mapping undertaken between 1947 and 1978. The soil map units are mainly soil 'complexes' based on a limited number of repeated landforms found throughout Scotland and, as such, often comprise of more than one particular soil type.

A review of NatureScot's Carbon and Peatland mapping (2016) indicates that carbon-rich, deep peat and priority peatland habitat is not present at the site. Furthermore, a review of the BGS trial pit log data for the Onshore Study Area further indicates the absence of peat, as only one trial pit (NC96NE7617/TP9) at the very eastern boundary, recorded peat underlying the made ground to 1.9 m below ground level (bgl). Given the absence of peat, either mapped or encountered in any of the other trial pits within the Onshore Study Area, it is considered likely that the recorded peaty soils at this location represent either a highly localised residual deposit or emplaced made ground containing peaty materials.

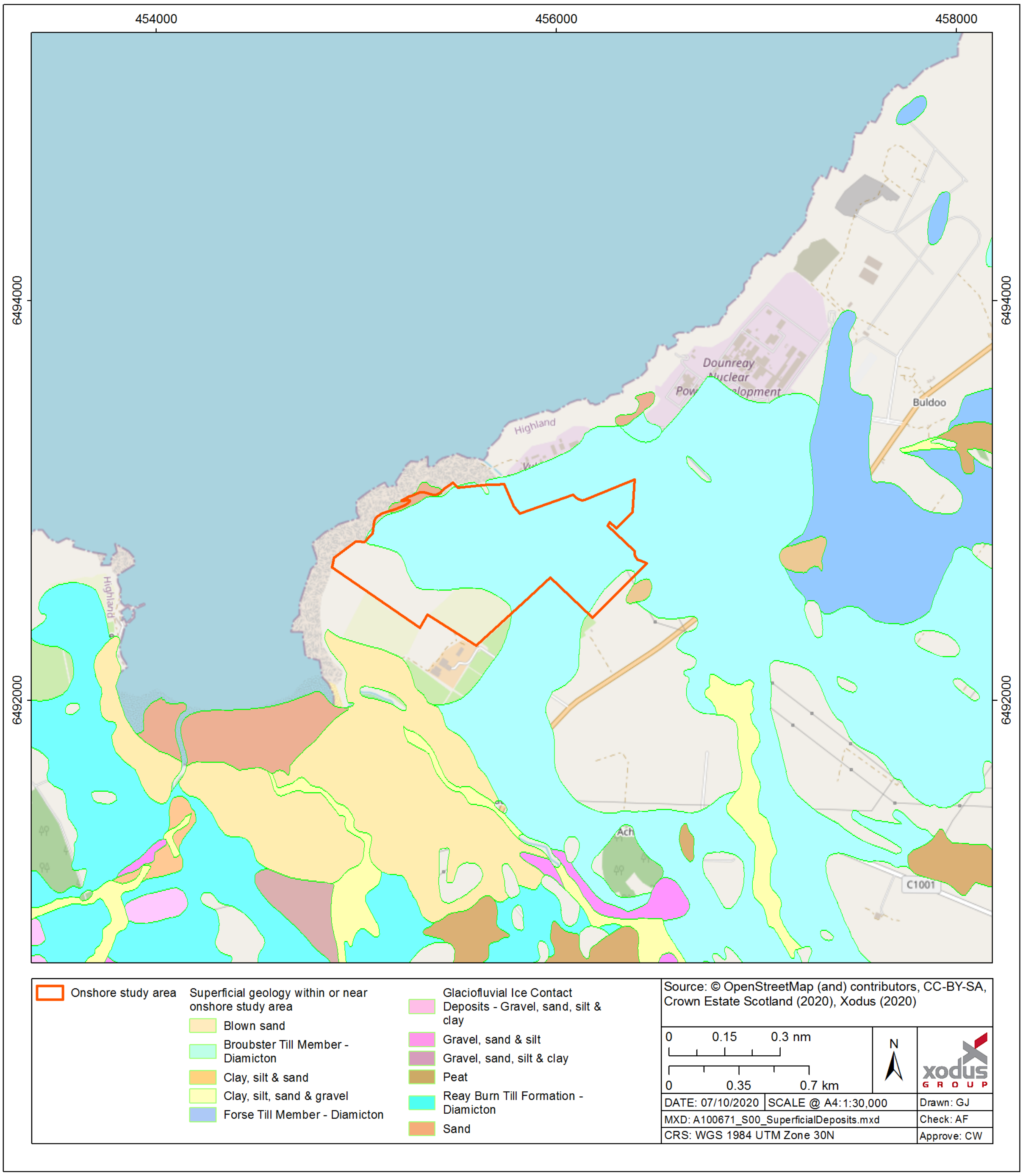


Figure 10-3 Terrestrial Superficial Geology in the vicinity of the Onshore Study Area

10.2.7.3 Contaminated land

The site is located adjacent to the former Dounreay Nuclear Power Facility. Contamination has previously been identified within the grounds of the Dounreay site, which is currently being remediated and there is some potential for contaminants to have leached into the site boundary (DSRL, 2009).

Made ground was recorded in one BGS trial pit (NC96NE7617/TP9), at the eastern edge of the Onshore Study Area, where aerial photography suggests there to be a highly localised area of disturbed ground. Made ground was described as broken rock with traces of brick, timber and concrete, overlying sandy silt, gravel, roots and topsoil. The description does not suggest evidence of contamination, although no chemical testing is understood to have been carried out.

10.2.7.4 Land Use

Land use in this area is predominantly open intensive farmland (improved arable, improved grazing and rough grazing) (Figure 10-5), particularly on the fields immediately inland from the coast. A large field in the eastern part of the Onshore Study Area in proximity to the Dounreay Nuclear Facility is used for arable production.

The land within the Onshore Study Area falls within agricultural land capability Class 3.2, which is defined as land capable of producing a moderate range of crops, with good yields from a narrow range of crops including cereals and grass and moderate yields from other crops such as potatoes and some vegetables. Limiting factors here may include wetness, unfavourable soil structure or texture or variable climate (MISR, 1981). Further information on the characteristics of the soil underlying the Onshore Study Area is provided above (under 'Soils').

The Onshore Study Area is predominantly in the ownership of one landowner who farms the land from the Isauld Farmhouse forming part of the wider Isauld House Farmstead.

The farmhouse is located immediately adjacent to the southern boundary of the Study Area. The fields within the Study Area are divided by a combination of post and wire fences with some drystone dykes and the area lacks any significant tree cover.

There are no residential or commercial properties within the Onshore Study Area. Properties identified within 500 m of the boundary of the Onshore Study Area are listed in Table 10-1.

Table 10-1 Residential and Commercial Properties within 500 m of Onshore Study Area

Property	Description
Residential Property	
Gunnerscroft	Located c50 m SE of the Study Area boundary
Isauld Farmhouse	Located c150 m SW of the Study Area boundary
Commercial Property	
Isauld House (Farmstead)	Farm steading located c150 m SW of the Study Area boundary
Dounreay Nuclear Facility	Former nuclear power station facility, located immediately adjacent to north east edge of Study Area boundary
NRTE Vulcan	NRTE Vulcan is a Ministry of Defence (MoD) establishment located immediately adjacent to the eastern edge of the onshore study area.

The settlement of Reay lies approximately 1.1 km south west of the Onshore Study Area.

The Project site is not located within a Nitrate Vulnerable Zone (NVZ)[8].

10.2.7.5 Hydrology and Hydrogeology

Rainfall

[8] *NVZs are designated by the Scottish Government to control agricultural activities in order to reduce the introduction of nitrates in areas of sensitive receiving watercourses.*

Rainfall data from Strathy Bridge climate station (~13 km to the west of the site boundary) indicates average annual rainfall of 962 mm from 2011 to 2019. April and June are shown to be the driest months (55 mm – 62 mm) with almost half the rainfall of winter months, November to January, receiving 96 mm – 119 mm on average (SEPA, 2020). The North Scotland District received an average annual rainfall of 1,681 mm, in 2019, with August receiving up to 221 mm and April the lowest level at 87 mm (Met Office, 2020).

Surface Water

A review of aerial mapping indicates there are no watercourses present within the Onshore Study Area, other than a single field drain, as identified through aerial OS maps. The layout of the field drain, and topography indicates that the site drains to the north west towards the Pentland Firth, with an outflow shown immediately west of the Dounreay plant. The aerial OS mapping indicates that there is also a small pond located immediately south of the Onshore Study Area, and the slightly larger Loch Achbuiligan just extends into the south east part of the surface water Onshore Study Area (as shown in Figure 10-4). None of the field drains, ponds, or Loch Achbuiligan are classified by SEPA under its RBMP system.

Outwith the Onshore Study Area, but located within close proximity, a further six burns enter the sea on the landward side of the cable corridor with the potential for connectivity to the Onshore Study Area. From west to east they are:

- Allt Achadh na Gaodha;
- Lady's Well Burn;
- Sandside Burn;
- Reay Burn;
- Burn of Isauld; and
- Dounreay Burn.

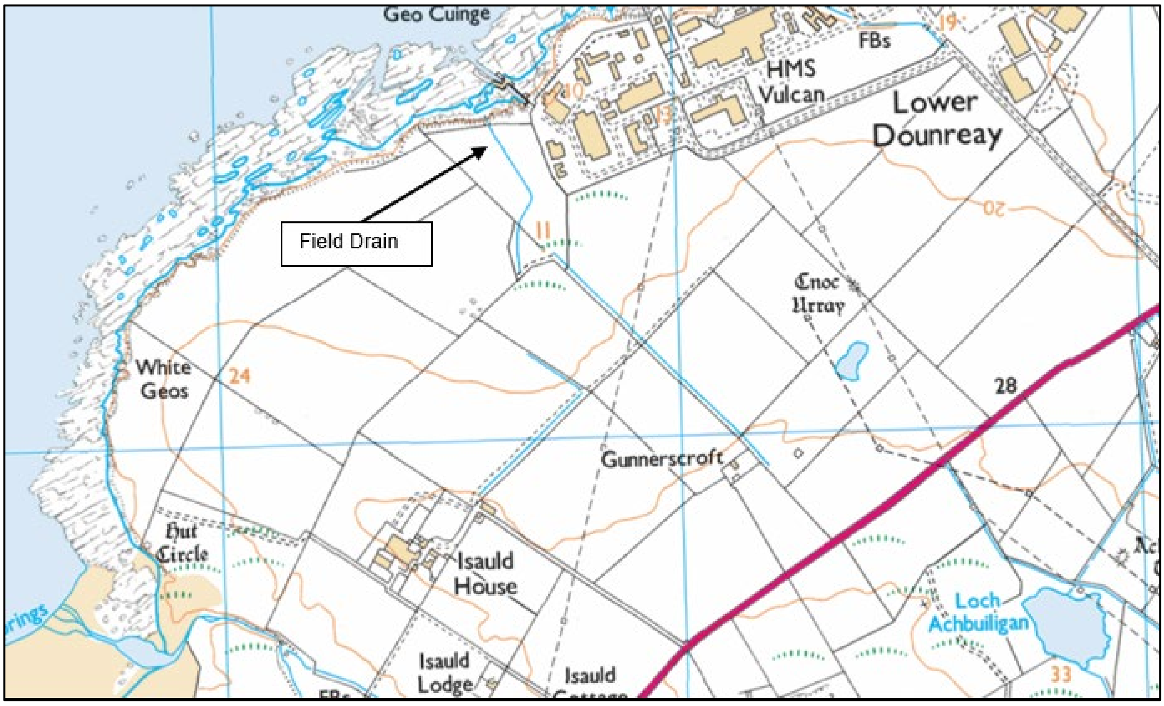


Figure 10-4 OS Map highlighting Surface Water Courses in the vicinity of the Onshore Study Area

The above watercourses are small and have correspondingly low volumes of water draining agricultural land comprising improved arable, improved grazing and rough grazing and as such are not expected to carry pollutants into the marine environment. Furthermore, two of these watercourses are classified as having a Good overall status with High confidence that they meet the requirements of the Water Framework Directive, namely, the Burn of Isauld and the Dounreay Burn, according to SEPAs RBMP interactive map. These waterbodies are mapped on Figure 10-5.

The different geological units in the region interact to control the movement of groundwater. Surface sediments, particularly base of the boulder clay (till) where it lies on frost shattered bedrock form the major water transport layers. Surface runoff relates to the slope gradient; however, the burns are the major water transport mechanism.

Groundwater

The geological units such as boulder clay, middle Devonian Caithness flagstones, lower Devonian conglomerates and basement rocks (along with fracturing associated with faults and structure of these rocks) form a framework for the study of the hydrogeology of the area. The hydrogeology defines the pattern of groundwater flow (aquifers) beneath the site. A review of the BGS 1:625,000 scale digital hydrogeological dataset indicates that the site sits above Middle Old Red Sandstone (sandstone, siltstone, mudstone and conglomerates), which is a moderately productive aquifer in which flow is virtually all through fractures and other discontinuities.

The different geological units in the region interact to control the movement of groundwater which is considered to be the dominant mechanism for transport of radionuclides associated with the Dounreay Nuclear Site from the ground to the surface (Savage, D *et al.*, 2009). It is therefore important to understand if the project will impact these flow patterns.

The SEPA RBMP interactive map refers to the underlying groundwater body as Thurso bedrock and localised sand and gravel aquifers. It provides a classification of Good overall status. The area of immediate hydrogeological significance extends from a watershed, some 10 km to the south of the Onshore Study Area.

Flood Risk

The SEPA flood maps show the likely extent of flooding for high, medium and low likelihood for fluvial, pluvial (surface water) and tidal flows and enables a more sustainable approach to managing flood risk by considering where natural flood management could be most effective. The flood maps are only indicative based on a regional approach to the analysis. Therefore, local understanding of the general risk will help consideration of local risk associated with any individual development at the detailed design stage.

Flood risk on coastal sites comes from the potential of sea-level rise and storm surges associated with climate change, and also changes in the rainfall pattern within the watershed, including storm surges associated with climate change. The Onshore Study Area lies between the two major river basins of the Forss Water and the Strath Halladale river system and is backed by a major wetland catchment which may slow the response of short-term heavy rainfall reaching the lower reaches of the burns and the ocean.

Review of flood map indicates that the banks and immediate local area around both the Burn of Isauld and Dounreay Burn are at risk of a 1 in 200-year flood event (flooding from rivers), however these potential flood events are unlikely to encroach into the Onshore Study Area.

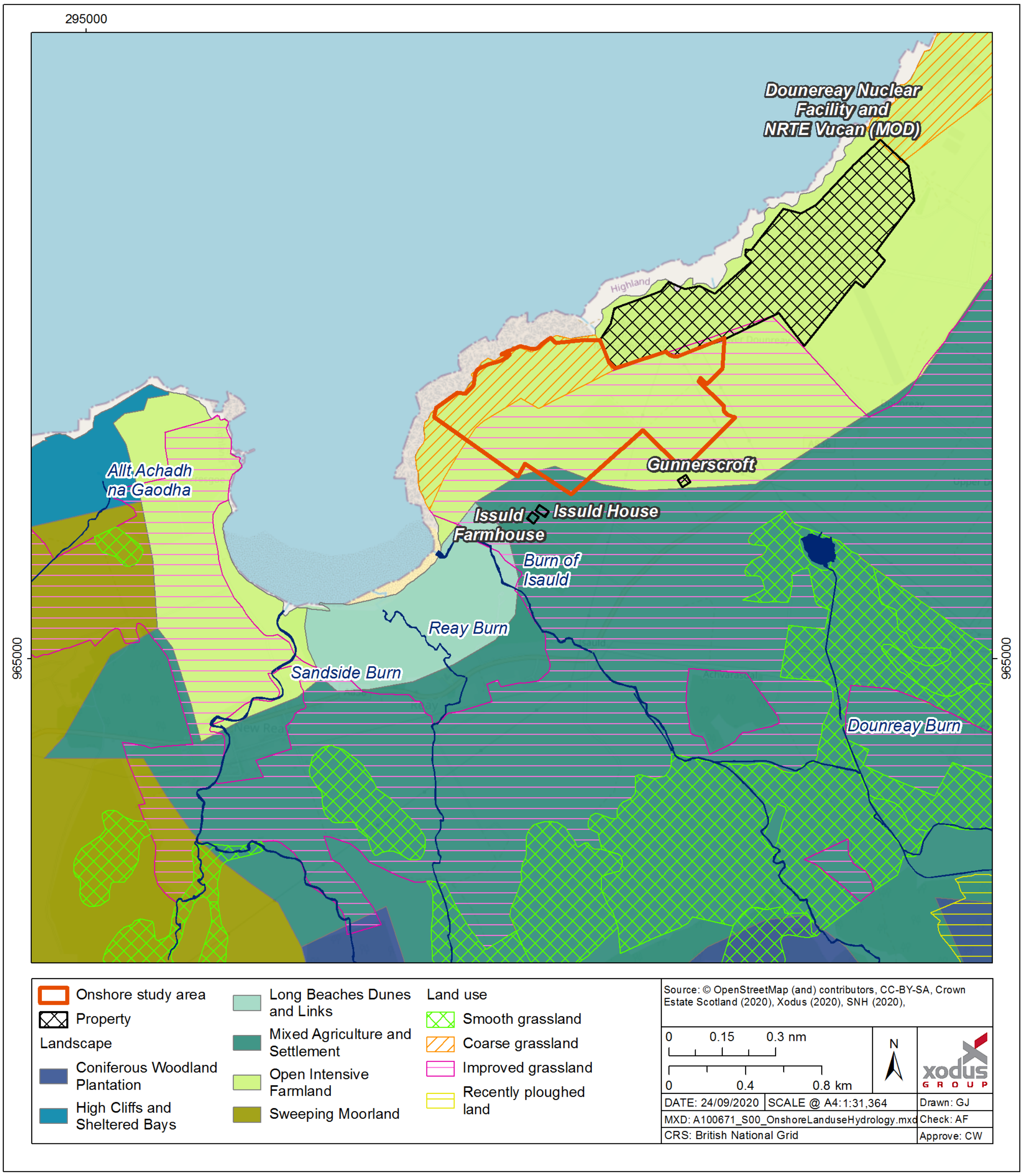


Figure 10-5 Land use and Surface Waterbodies in the vicinity of the Onshore Study Area

Private Water Supplies

In 2015 the Highland Council (THC) reviewed its records of known private water supplies in the wider area of the site for the Dounreay Trì Project and reported that there were no recorded private water supplies in the vicinity of the onshore cable corridor Onshore Study Area.

Furthermore, a review of Type A and Type B[9] private water supplies in 2019 identified by the Highland Council Private Water Supply Interactive Map did not highlight any private water supplies in the immediate vicinity of the Onshore Project Area. The nearest private water supply, is a domestic private water supply, located approximately 2.5 km to the southwest of the Onshore Study Area boundary at Achins, Brawlbin, Scotscalder, Halkirk.

10.2.7.6 Designated Sites

A search of available digital datasets indicates that there are no designated conservation sites with geological notified features within the site boundary for the Onshore Study Area.

The Sandside Bay Site of Special Scientific Interest (SSSI) is located immediately adjacent to the western boundary of the Onshore Study Area. Whilst this is not designated specifically for its geological interests, the sand dunes present are fundamental to the plant species found at this location for which the site has been notified.

The Onshore Study Area has been purposefully positioned in order to avoid contact with the Sandside Bay SSSI designated features (as highlighted in Figure 10-1). Therefore, there will not be any loss of sand dune habitat feature of Sandside Bay SSSI due to the development's activities. The potential impacts on the SSSI biological features are further considered in Section 11.3.

10.2.8 Identification of Potential Impacts

There is the potential that localised onshore geology and hydrogeology may be impacted as a result of onshore activities, in particular during the cable laying operations and the construction of all other onshore components e.g. cable joint transition bay and the sub-station. These impacts will relate to construction work involved in bringing the cable to landfall and siting the onshore cable to the onshore substation e.g. through potentially trenching of the cable from landfall to Dounreay substation or potentially utilising local areas of HDD.

Construction activities may potentially impact other sediments (soil, sand and till) in the area causing loose sediments to enter the water table. Addition of fine sediment to the hydrological environment could affect the transmissibility of local aquifers and lead to potential flooding.

Depending on the cable installation methods, there is the potential that existing drainage processes may be impacted. However, there will be no impacts on riverbanks or dunes as these receptors are not present within the Onshore Study Area.

During the operations and maintenance phase it is considered that the presence of the cable and onshore substation may permanently impact on localised water and drainage flows. There is also the potential that localised pollution or water quality issues may arise as a result of onshore works during scheduled or emergency maintenance.

Construction, operation and maintenance works may impact on localised land use through direct loss of agricultural land, indirect changes to soil quality, interference with agriculture activities and changes to land access.

10.2.9 Cumulative Impacts

Cumulative impacts on onshore physical process receptors including geology, hydrology and hydrogeology, may occur due to construction overlaps at the Onshore Study Area with:

- the SHE-T Dounreay West Substation (consented);
- the SHE-T Orkney – Caithness Interconnector (consented);

[9] *Type A private water supplies are those that provide in total more than 10m³ of water a day (on average) or which supply more than fifty people or are deemed to be used for any type of commercial activity. All other supplies are classed as Type B.*

- Potential developments within the ScotWind N1 DPO (particularly if the landfall site for the developments are proposed at the Dounreay Coast); and
- The Pentland Floating Offshore Wind Demonstrator (proposed).

The onshore elements of the SHE-T Dounreay West Substation and the SHE-T Orkney – Caithness Interconnector projects are located within the Project Onshore Study Area. Furthermore, there is the potential for any development within the N1 DPO to be connected to shore at the Dounreay coast. However, the timescales for the construction of the consented SHE-T projects and potential offshore wind developments within the N1 DPO are uncertain, and as such, relative timeframes required in order to ascertain cumulative impacts cannot be determined.

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site, making landfall at Dounreay. However, it should be noted that in the event the Demonstrator is taken forward this would ultimately form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the array. Nonetheless, until the design specifications of the onshore components for the demonstrator project are finalised and the associated impacts understood, cumulative impacts with this project will be taken forward to the EIA.

Therefore, at this early stage, cumulative impacts are anticipated. As a worst case, any proposal for simultaneous construction of the onshore works for this project with the proposed Project onshore construction is predicted to have significant residual cumulative impacts on physical processes within the Onshore Study Area.

No other cumulative impacts are anticipated for onshore physical process receptors.

Table 10-2 provides a summary of potential impacts and cumulative impacts on geology, physical processes and land use that have been identified at this stage.

Table 10-2 Potential Impacts on Geology, Physical Processes and Land Use

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Impact on geology	Landfall will cut across geology as will the onshore cable route. Geology considers the surface sediments, dunes, Quaternary glacial sediments and soils and as such is scoped in for further assessment.	Scoped in
Impact on hydrogeology	Interaction with the water table causing modifications to natural drainage patterns and potential increase in flood risk from inappropriate drainage and surface water treatment around the construction works.	Scoped in
Impact on surface sediments	Distribution of Quaternary deposits in the Onshore Study Area from trenching works resulting in modifications to natural drainage patterns and potential increase in flood risk.	Scoped in
Impact on contaminated land	Distribution of historic contamination in the Onshore Study Area from trenching works which have the potential to expose contaminants that may be bound in soils and superficial deposits resulting in contamination of non-contaminated areas.	Scoped in
Damage to riverbanks	Other than one field drain, there are no watercourses present within the site boundary.	Scoped out

Impact	High Level Impact Summary and Justification	Scoped In/Out
Impact on groundwater and aquifers	Pollution of surface water due to disturbance of sediments and/or accidental spills from construction machinery and trenching works and HDD have the potential to alter existing surface water and groundwater flows through excavation, storage and reinstatement of soils and superficial materials, and installation of solid linear infrastructure.	Scoped in
Impact on private water supplies	No private water supplies have been identified either within or in close proximity to the site boundary.	Scoped out
Impact on land use	Construction works may impact on localised land use via direct loss of agricultural land, indirect changes to soil quality, changes to agricultural drainage, potential interference with agricultural operations, and changes to access.	Scoped in
Potential Impacts During Operations and Maintenance		
Impact on ground conditions	Localised heating impacts arising from the buried cable.	Scoped in
Impact on hydrogeology	Interaction with streams and water table causing modifications to natural drainage patterns and potential increase in flood risk.	Scoped in
Impact on water quality	As there are no watercourses or private water supplies located within the site boundary, no impacts on interactions resulting in a reduction in water quality are anticipated.	Scoped out
Impact on soil/sediment quality	Pollution or contamination of soils from chemical spills, erosion and potential mobilisation of historic contamination due to maintenance activities.	Scoped in
Damage to riverbanks	Other than a field drain, there are no watercourses present within the site boundary.	Scoped out
Impact on land use	Operation and maintenance works may impact on localised land use via direct loss of agricultural land, indirect changes to soil quality, interference with agriculture activities and changes to access.	Scoped in
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase		As construction section
Potential Cumulative Impacts		
Cumulative impacts on physical process receptors (impacts on geology, hydrology and hydrogeology) associated with earth works during construction activities of the new SHE-T Dounreay West Substation, the SHE-T Orkney – Caithness interconnector, potential developments within the ScotWind N1 DPO and the Pentland Floating Offshore Wind Demonstrator which may make landfall at the Dounreay Coast.		Scoped in

10.2.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 10-3. These methods will be used alongside input from the relevant guidance as identified in Section 10.2.2.

Table 10-3 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Impact on geology	Walkover survey Q2 or Q3 2021	Desk based study utilising BGS mapping, borehole logs, trial pit data and regional reports and other relevant data.
Impact on hydrogeology, aquifers and groundwater	Walkover survey Q2 or Q3 2021	The walkover survey will identify wells, boreholes, springs marshes, bogs and surface water systems both natural and man-made within the area of interest and the surrounding countryside. A desk-based assessment of groundwater levels, flow direction, soil characteristics and land profiles will be employed. Interpretation method will be used to map the areas above and below the water table, this can then be integrated with regional habitat mapping. Flood risk from rising sea-level and from catchment area rainfall and flooding will be assessed
Impact on surface sediments	Walkover survey Q2 or Q3 2021	Desk based study utilising BGS mapping, borehole logs, trial pit data and regional reports and other relevant data.
Impact on contaminated land	None identified	Desk based study utilising available Dounreay monitoring reports and anecdotal input from other key stakeholders for expert advice such as DSRL, Vulcan, NDA and SEPA.
Impacts on land use	Walkover survey Q2 or Q3 2021	The walkover survey will identify current land use in the immediate vicinity of the Onshore Study Area. Additionally, consultation with landowners to ensure potential impacts are captured and appropriately mitigated against.
Cumulative Impacts	None identified	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

10.2.11 Conclusions and Next Steps

Due to the relatively small scale of the onshore elements of the Project, the potential impact to the onshore physical environment is not considered to be significant. Potential impacts associated with impacts to geology, hydrogeology, drainage, soil and sediment quality, contaminated land, and land use and cumulative impacts on geology, hydrology, and hydrogeology are scoped in and will be taken forward to the assessment phase.

11 ONSHORE BIOLOGICAL ENVIRONMENT

11.1 Introduction

This Section considers the impact of the onshore elements of the Project – on the following terrestrial biological receptors:

> Terrestrial ornithology; and

> Terrestrial ecology.

An overview of the relevant baseline environment is provided for each along with the anticipated impacts, a baseline characterisation strategy, impact assessment strategy and where applicable, possible mitigation and monitoring measures.

11.2 Terrestrial Ornithology

11.2.1 Introduction

This Section characterises the terrestrial avian ecology in the Onshore Study Area (Figure 10-1) and appropriate buffer zones through consideration of use for breeding, wintering and foraging. It also highlights the key sensitivities and potential impacts arising from the onshore aspects of the Project, presents a summary of the relevant UK guidance, and details of the methodology which will be applied to the EIA.

11.2.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts on terrestrial ecology:

Legislation

> Wildlife and Countryside Act 1981 (as amended in Scotland);

> Nature Conservation (Scotland) Act 2004;

> Wildlife and Natural Environment (Scotland) Act 2011;

Policy and Strategy

> Highland-wide Local Development Plan (2012) Planning Policies (including Policy 58 - Protected Species and Policy 59 - Other Important Species);

> 2020 Challenge for Scotland's Biodiversity. A strategy for the conservation and enhancement of biodiversity in Scotland (2013);

> Scotland's biodiversity: a route map to 2020 (2015);

> Highland Biodiversity Action Plan 2015-2020;

> Caithness Biodiversity Action Plan 2003 - 2013;

> Dounreay Biodiversity Action Plan, 2017;

Guidance

> The Highland Council Supplementary Guidance. Highland's Statutorily Protected Species (2013);

- Pollution Prevention Guidelines 6 (PPG6): Working at Construction and Demolition Sites (currently under review) (SEPA *et al.,* 2012);
- A Handbook on Environmental Impact Assessment, version 5 (SNH, 2018);
- Guidelines for Ecological Impact Assessment in the United Kingdom (Chartered Institute of Ecology and Environmental Management (CIEEM, 2018);
- Guidelines for Preliminary Ecological Appraisal, 2nd Edition (CIEEM, 2017);
- The state of UK's birds 2017 (RSPB, 2017);
- Birds of Conservation Concern, Volume 4 (*Eaton et al.*, 2015);
- Recommended bird survey methods to inform impact assessment of onshore wind farms, version 2 (SNH, 2017);
- Bird Monitoring Methods (Gilbert *et al.*, 1998);
- Raptors: A Field Guide to Survey and Monitoring, 3rd Edition (Hardey *et al.*, 2013);
- Barn Owl Survey Techniques (Barn Owl Trust, 2001);
- Barn Owl Conservation Handbook (Barn Owl Trust, 2012); and
- Handbook of Biodiversity Methods (Hill *et al.*, 2005).

11.2.3 Available Information

The following data sources will be used to inform the terrestrial ornithology baseline:

- Onshore ornithology surveys undertaken during the previous 2016 Dounreay Trì EIA (see below);
- British Trust for Ornithology (BTO) online profiles of birds occurring in Britain and Ireland, BirdFacts (Robinson *et al.*, 2016);
- Natural England: Non-breeding season population of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS) (Furness R.W*,* 2015);
- Greenland White-fronted Geese: Land use and conservation at small wintering sites in Scotland (Francis *et al.*, 2011);
- Greenland White-fronted Goose Study Data: North Highland Inventory (GWFGS, 2020). Available at: https://greenlandwhitefront.org/;
- Mapping the distribution of feeding Pink-footed and Icelandic Greylag Geese in Scotland (Mitchell, 2012);
- Survey of the feeding areas, roosts and flight activity of qualifying species of the Caithness Lochs Special Protection Area, 2011/12 and 2012/13. Scottish Natural Heritage Commissioned Report No. 523b (Patterson *et al.*, 2013);
- UK Biodiversity Action Plan (BAP) (JNCC, 2019); and
- SNH Sitelink interactive map - Key Protected Sites Across Scotland (2020). Available at: https://sitelink.nature.scot/home.

11.2.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the onshore biological environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

An initial meeting was also held with the RSPB, Marine Scotland and NatureScot on the 4th of June 2020 to discuss the future offshore and onshore ornithology surveys to be conducted as part of the EIA.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to onshore ornithology receptors have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

11.2.5 Onshore Study Area

The study area for potential impacts on terrestrial ornithology is defined as the Onshore Study Area and a surrounding 30 km buffer (Figure 11-1).

11.2.6 Surveys and Studies Carried Out to Date

A series of terrestrial ornithology surveys were completed by Caledonian Conservation Ltd on behalf of Hexicon in 2015. These surveys covered the current Project Onshore Study Area and buffer zones appropriate for each survey type (as detailed in Table 11-1). The findings from these surveys (although outdated) have been used to inform the scoping assessment. The surveyed areas are referred to as the 'survey search area' in the baseline description text below.

The surveys and methodologies are summarised in Table 11-1. These surveys were undertaken for the previous Dounreay Trì Project EIA and were designed with reference to relevant guidance at the time of writing.

These surveys although outdated, present a reasonable framework to enable the impact scoping within this report. However, the EIA Report will be written based on the findings of surveys due to be carried out on behalf of the Project during 2021.

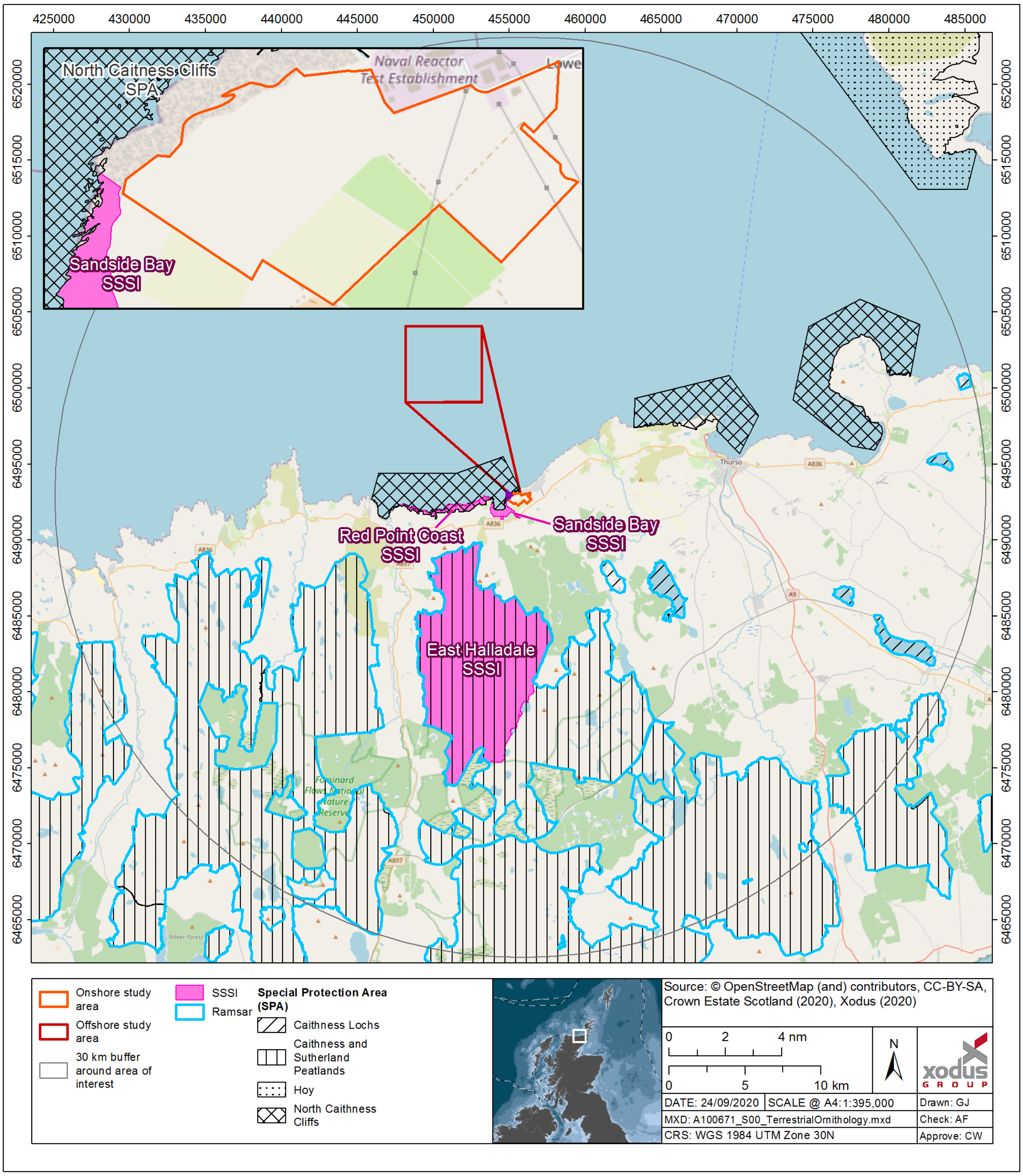


Figure 11-1: Designated Sites: SPAs, Ramsar and SSSIs within the vicinity of the Onshore Study Area

Table 11-1 Caledonian Conservation Ltd 2015 Terrestrial Ornithology Surveys Methodology Overview

Survey	Survey Period	Methodology
Foraging goose survey	April – May 2015 and Sept – Dec 2015	A survey of foraging geese was undertaken during spring and winter to establish the number of geese foraging in the surrounding areas. The survey methodology was designed with reference to SNH guidance and involves driving the wider area and selecting vantage points to observe fields within at least 3 km of the Onshore Study Area (SNH, 2014). The survey area exceeds the recommended 500 m (SNH, 2014) buffer area in order to provide a robust dataset to allow the assessment of impacts on geese associated with Caithness Lochs Special Protection Area (SPA). Foraging goose surveys would normally be undertaken every two weeks between September and mid-May. Due to the project timeframe it was only be possible to complete three visits from mid-April to mid-May 2015 and fortnightly visits between September and December 2015. However, given the low and temporary nature of the impact of the Project (underground cable), the shorter survey period combined with an assessment of habitat suitability and historic data should provide adequate data for an assessment, and is unlikely to present a significant data gap.
Breeding bird survey	April – July 2015	The breeding bird survey was completed within a 500 m buffer of the Onshore Study Area and followed the modified Brown and Shepherd methodology recommended by SNH guidance (SNH, 2014) and based upon the methods detailed in Gilbert *et al.,* (1998). This methodology is used to census upland breeding birds, which may use more open habitats surrounding the site. Four survey visits were made between April and July 2015, in line with SNH guidance (2014) and Calladine *et al.,* (2009). Each 500 m x 500 m quadrat of open land was surveyed for 20-25 minutes. Details of bird behaviour were noted using standard BTO CBC notation (see Gilbert *et al.*, 1998). All areas will be approached within 100 m. The survey focussed on breeding waders, in accordance with SNH guidance (SNH, 2014). However, all species seen or heard were recorded. The purpose of the breeding bird survey is to map the territories of breeding birds and breeding bird density in order to allow an assessment of potential displacement impacts, particularly for waders.
Breeding raptor, owl and seabird surveys	April – Aug 2015	Breeding raptor and seabird surveys were completed within a 2 km buffer around the Onshore Study Area. Walkovers and short VP watches of all suitable areas were carried out in order to establish whether any protected raptors and seabirds breed within or close to the Onshore Study Area, following methodologies detailed in Hardey *et al.,* (2009) and Gilbert *et al.,* (1998) in accordance with SNH guidance (SNH, 2014). Target species included Annex I (EU Birds Directive) and Schedule 1 (Wildlife and Countryside Act) listed species, as well as species associated with north Caithness Cliffs Special Protection Area (SPA), although observations of buzzards, kestrels and sparrowhawks

Survey	Survey Period	Methodology
		were also noted. When recording seabirds, the number of nests or individual birds (in the case of species which form dense colonies) was recorded for each distinct colony observed during survey visits, as appropriate (Gilbert *et al.*, 1998). All areas of suitable breeding habitat were visited monthly between April and August during the breeding season to determine occupancy of territories. In addition, potential barn owl nest sites were identified within 1 km of the Onshore Study Area. Potential nest sites were visited once in the breeding season to search for evidence of occupancy. This survey is based upon the methodology recommended in Hardey *et al.,* (2009) and by the Barn Owl Trust (2001 and 2012). The purpose of this survey is to map the territories of breeding raptors and owls and identify seabird colonies in order to allow an assessment of potential displacement impacts.
Wetland Bird Survey (WeBS)	Sept – Dec 2015	Surveys followed the standard Wetland Bird Survey (WeBS) Core Counts methods (Gilbert *et al.*, 1998). All waders and wildfowl species using the shore in the Onshore Study Area and within a 500 m buffer were recorded. Counts made using telescopes from VPs selected to avoid disturbance to birds. Routes between VPs were carefully selected so as to avoid disturbance to birds. Where birds moved during a count, this has been recorded to avoid double counting. All counts have been completed within a seven-hour period commencing 3.5 hours before the advertised time of low water and finishing 3.5 hours after low water. This survey would have normally been completed monthly between September and March inclusive. Due to the project timeframe it will only be possible to complete the September to December 2015 visits. However, given the low and temporary nature of the impact of the Project (underground cable), the shorter survey period should provide adequate data for an assessment, and is unlikely to present a significant data gap. Furthermore, data provided by BTO includes counts for January and February from previous years, which will provide an indication of use of Sandside Bay by waders in these months.
Winter bird walkover survey	Sept – Dec 2015	The Onshore Study Area and a 500 m buffer was surveyed following the same methods as the breeding bird survey described above, to assess the use of these areas by wintering birds (SNH, 2010). All areas were approached within 200 m.
**Note that no access was permitted to the Dounreay Nuclear Power Development Establishment or HMS Vulcan military base, which are located within the buffer zone of all terrestrial ornithology surveys (see Survey limitations section below for further details)*		

11.2.7 Description of the Current Environment

A search of available digital datasets indicates that there are statutory designations of European importance and national importance within the vicinity of the Onshore Study Area. Table 11-2 provides details of statutory designations of European importance for ornithological features within 30 km and biological SSSIs with ornithological features within 5 km of the Onshore Study Area. Special Protection

Areas (SPA) and Ramsar Sites and SSSIs within 30 km are shown in Figure 11-1. Potential impacts on these sites will be considered alongside the relevant species.

Table 11-2 Designated Sites Relevant to Terrestrial Ornithology

Designation(s)	Site name	Distance (km)	Qualifying feature
Special Protected Areas	North Caithness Cliffs	0.04 km N[10]	Supports peregrine falcon populations of European importance. Supports nationally important assemblage of breeding seabirds, including internationally important populations of northern fulmar, black-legged kittiwake, razorbill, common guillemot and Atlantic puffin. It is possible that these species may be disturbed by construction activities if completed during the breeding season. It is also possible that nesting habitat may be lost depending on the selected cable route.
Sites of Special Scientific Interest	Red Point Coast	1.09 km NW	Supports a nationally important aggregation of breeding common guillemot. It is possible that breeding guillemot may be disturbed by construction activities if completed during the breeding season. It is also possible that nesting habitat may be lost depending on the selected cable route.
Special Protected Areas	Caithness and Sutherland Peatlands	3.3 km SW	Supports an internationally important population of dunlin. Supports a wide range of nationally important populations including: > Red-throated diver; > Black-throated diver; > Hen harrier; > Golden eagle; > Merlin; > Golden plover; > Wood sandpiper; and > Short-eared owl. It is possible that raptors and owls associated with these breeding populations may forage over the site. This may result in temporary loss of foraging habitat during construction but is unlikely to result in a significant negative impact as there are ample alternatives in the local area.

[10] *The North Caithness Cliffs SPA is not directly overlapped by the Onshore Study Area boundary; however, the Offshore Study Area for the Project does overlap this SPA (as detailed in Section 8.5)*

Designation(s)	Site name	Distance (km)	Qualifying feature
Ramsar	Caithness and Sutherland Peatlands	3.3 km SW	Supports internationally important populations of breeding dunlin and greylag goose. Also supports an important breeding bird assemblage. At this distance from the Ramsar site the Project will have no direct or indirect impact on these species.
Sites of Special Scientific Interest	East Halladale	3.3 km SW	Supports nationally important populations of breeding dunlin and golden plover. Also supports a nationally important breeding bird assemblage including: > Waders and wildfowl; > Red-throated diver; > Black-throated diver; > Greylag goose; > Common scoter; > Golden eagle; > Peregrine falcon; and > Merlin. It is possible that raptors associated with these breeding populations may forage over the site. This may result in temporary loss of foraging habitat during construction but is unlikely to result in a significant negative impact as there are ample alternatives in the local area.
Special Protected Areas and Ramsar	Caithness Lochs	6.3 km SE	Supports internationally important populations of wintering Greenland white-fronted geese, greylag geese and whooper swans. It is possible that wildfowl associated with this site may forage within the search area. This may result in temporary loss of foraging habitat during construction but is unlikely to result in a significant negative impact as there are ample alternatives in the local area.

11.2.7.1 Wintering wildfowl

Wintering wildfowl represent a potential significant ornithological sensitivity for the Onshore Study Area. The nearby Caithness Lochs SPA supports an internationally important proportion of the population of wintering Greenland white-fronted geese, greylag geese and whooper swans (Table 11-2). While the survey search area does not offer suitable roosting habitat, it is possible that birds associated with this SPA may forage within the survey search area.

Greenland white-fronted geese have not been recorded feeding in the Onshore Study Area or survey search area (based on Greenland White-Fronted Goose Study (GWFGS) data and Francis *et al.*, 2011). The nearest record of foraging Greenland white-fronted geese is from Balmore in 1979, on the east side of Dounreay Nuclear Facility (based on GWFGS data). However, Greenland white-fronted geese tend to forage in fields around Forss Water, and do not normally feed at coastal sites except during particularly cold winters (Dounreay Trì Ltd, 2016). Greenland white-fronted geese are Red listed in the Birds of Conservation Concern 2015 (Eaton *et al.,* 2015), on account of the non-breeding population decline, most likely due to climate change impacts. Greenland white-fronted geese were not recorded within any of the onshore terrestrial ornithological surveys undertaken by Caledonian Conservation Ltd in 2015.

Greylag geese are known to forage in the fields around Gunnerscroft, to the east of Sandside Bay (based on RSPB data; BTO data; Mitchell, 2012; Patterson *et al.*, 2013). These species are Amber Listed in Birds of Conservation Concern 2015 (Eaton *et al.,* 2015) and are protected under Schedule 2 of the Wildlife and Countryside Act 1981 (as amended).

Whooper swans have been recorded to the south of the Onshore Study Area and have also been known to roost at Loch Achbuiligan (based on RSPB and BTO data). Whooper Swan was identified within the Wetland bird survey and the winter walkover surveys conducted by Caledonian Conservation Ltd in 2015. In addition, pink-footed geese and barnacle geese have been recorded foraging in the survey search area (based on RSPB and BTO data). These species are both Amber Listed in Birds of Conservation Concern 2015 (Eaton *et al.,* 2015).

However, the survey search area offers only limited foraging opportunities for geese and swans, and there is ample alternative foraging habitat of higher quality in the surrounding area. Furthermore, the survey search area of 3 km from the previous onshore study area was not found to be used for foraging by Greenland white-fronted geese, greylag geese, pink-footed geese or whooper swans during winter 2011/12 and 2012/13 (Patterson *et al.*, 2013).

11.2.7.2 Seabirds

Several species of breeding seabird were recorded within the vicinity of the Onshore Study Area during the 2015 terrestrial ornithological surveys which may be considered to be associated with North Caithness Cliffs SPA. These include fulmar (total peak count of 537 nests within 2 km), guillemot (total peak count 730 individual birds within 2 km), kittiwake (total peak count of 890 individual birds within 2 km) and razorbill (total peak count of 154 individual birds within 2 km). Puffins were also recorded during surveys, although no breeding behaviour was observed. The cliffs within the survey search area and wider area do, however, offer potentially suitable nesting habitat for this species. There are also historic records of small numbers of puffins nesting in the wider area (based on BTO data and NatureScot data).

A number of other species of breeding seabirds were also recorded within the Onshore Study Area and survey search area. These include black guillemot (Amber Listed – individual bird recorded alarming in suitable nesting habitat within 2 km), shag (Red Listed – total peak count of 10 nests within 2 km), herring gull (Red Listed – total peak count of 10 nests, beyond 2 km) and great black-backed gull (Amber Listed – total peak count of two nests, beyond 2 km).

The 2015 surveys found all breeding seabirds to be located outside the Onshore Study Area, to the west located within in Red Point Coast SSSI / North Caithness Cliffs SPA as highlighted in Figure 10-3 to 10-7 of the 2015 Dounreay Trì Project Scoping Report.

Several other species of seabirds were also recorded, although no evidence of breeding was observed. Red-throated diver and great northern diver were recorded during the seabird survey. Northern diver is Amber Listed. The Onshore Study Area and survey search area did not offer suitable breeding habitat for red-throated diver while great northern diver are only passage migrants around mainland Scotland during the breeding season (Forrester *et al.*, 2007). Arctic skua (Red Listed), arctic tern (Amber Listed), black-headed gull (Amber Listed), common tern (Amber Listed), cormorant, eider (Amber Listed), gannet (Amber Listed), great skua (Amber Listed), and shelduck (Amber Listed) were recorded during the 2015 breeding seabird survey. No breeding behaviour was observed for these species.

There are also historic records of breeding arctic tern, common tern, eider and great skua within the Onshore Study Area and survey search area (based on NatureScot and BTO data).

Small numbers of arctic terns are known to occasionally breed on the seaward edge of unvegetated sea cliffs similar to those found here, and occasionally in pastureland (Forrester *et al.*, 2007). The Onshore Study Area does offer potentially suitable breeding habitat for the other species in isolated areas. It is therefore possible that these species may breed within the Onshore Study Area in future.

11.2.7.3 Other bird species

Peregrine were recorded during the 2015 breeding raptor survey although no breeding behaviour was observed. Peregrine have been recorded within the survey search area during the winter non-breeding season based on historic data. The cliffs within the survey search area offer potentially suitable nesting habitat for this species, while the seabird colonies offer prey. Peregrine are listed on Schedule 1 of the Wildlife & Countryside Act 1981, and breeding birds may be associated with North Caithness Cliffs SPA.

A barn owl territory was recorded within 1 km of the previous onshore search area during surveys, as was a buzzard territory. Barn owls are listed under Schedule 1 of the Wildlife & Countryside Act 1981, while buzzards are not of particular conservation concern.

Several other raptor and owl species were recorded within the survey search area although no breeding territories were identified. These included hen harrier (Schedule 1 of the Wildlife & Countryside Act 1981), merlin (Schedule 1 of the Wildlife & Countryside Act 1981), kestrel (Amber Listed) and sparrowhawk. The Onshore Study Area does not offer suitable breeding habitat for hen harrier or merlin.

The breeding bird survey found four species of wader and four species of passerine to hold territories within the survey area (Onshore Study Area and 1 km buffer). These included curlew (Red Listed – four territories), lapwing (Red Listed – seven territories), oystercatcher (Amber Listed – five territories), redshank (Amber Listed – one territory), skylark (Red Listed – 22 territories), meadow pipit (Amber Listed – up to 139 territories), sedge warbler (one territory) and wren (four territories). The majority of wader, skylark and meadow pipit territories were located in the fields at the east adjacent to the Onshore Study Area.

Common sandpiper, ringed plover, sanderling, turnstone and whimbrel were also recorded during the 2015 surveys, although none of these species were found to breed.

All accounts of other bird species identified within the vicinity of the Onshore Study Area during the 2015 terrestrial ornithological surveys are presented in Appendix 23.1 of the 2016 Environmental Statement.

11.2.8 Identification of Potential Impacts

There is potential for the loss of habitat, individuals or breeding territories through construction work within the Onshore Study Area. This may affect species associated with North Caithness Cliffs SPA.

Disturbance to or displacement of birds in proximity to the site through construction activities. Construction activities during the non-breeding season may affect species associated with Caithness Lochs SPA and construction activities during the breeding season may affect species within the North Caithness Cliffs SPA.

Species associated with North Caithness Cliffs and/or Caithness Lochs SPA in proximity to operations and maintenance activities, may be displaced or disturbed depending upon the final cable route and timing of operations and maintenance activity within the Onshore Study Area.

Table 10-4 provides a summary of potential impacts on terrestrial ornithology that have been identified at this stage.

11.2.9 Cumulative Impacts

There are two aspects of cumulative effects to consider:

- The cumulative effect of two or more developments on an individual animal or home range / territory; and
- The cumulative effect of a number of developments within a region on the local / regional population of a species or the distribution of a habitat.

Nearby developments which have the potential to impact upon terrestrial ornithology include:

- SHE-T Dounreay West Substation (consented);
- SHE-T Orkney – Caithness Interconnector Project (consented);
- Pentland Floating Offshore Wind Demonstrator (proposed);
- Limekiln Wind Farm (consented);
- Limekiln Wind Farm Grid Connection Overhead Line (OHL) Project (proposed);
- The Dounreay Phase 3 Decommissioning (2018 - Interim End State) (consented);
- Potential OWF developments within the ScotWind N1 DPO; and
- Drum Hollistan Wind Farm (proposed).

The Dounreay West Substation Onshore Study Area overlaps entirely with the majority of the Onshore Study Area for the proposed Project. SHE-T undertook a Screening exercise for the Dounreay West Substation in 2018 (SHE-T, 2018). The Screening letter indicated there were unlikely to be any likely significant effects on ornithology receptors in line with ornithology surveys conducted on behalf of the project during 2018. The Highland Council issued a decision notice (19/01092/FUL) granting planning permission for the development based on the screening letter, however outlining the requirement for a Construction and Environmental Management Document (CEMD) to be submitted for the development (THC, 2019).

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site, making landfall at Dounreay. However, in the event the Demonstrator is taken forward this would form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward) Thus, it would be independent of and ahead of installation activities associated with the array. Nonetheless, due to the limited size of the Demonstrator cumulative impacts on ornithological receptors are anticipated to be minor, however the significance of these impacts will be determined within the EIA once the design specification for the onshore components is finalised.

The consented Limekiln Wind Farm EIA Onshore Study Area does not overlap with the Project Onshore Study Area directly, however, is located within the 30 km buffer zone for ornithological receptors. A full suite of ornithological surveys were carried out to inform the EIA including breeding raptor and owl surveys; breeding bird surveys; breeding diver survey; winter walkover surveys and flight activity (VP) surveys. Species found to be either breeding within or overflying the Onshore Study Area for the wind farm included some species that were also present within the Onshore Study Area for the Project: hen harrier, golden plover, greylag goose, pink-footed goose, whooper swan and curlew. The EIA concluded that there would be no likely significant impacts on ornithological interests.

The Limekiln Wind Farm Grid Connection OHL Project will overlap the Onshore Study Area in the north eastern corner. The Limekiln Wind Farm Grid Connection EIA Report (SHE-T, 2020) concluded that there would be no significant effects from the development on ornithological features.

The Dounreay Phase 3 Decommissioning (2018 - Interim End State) project lies immediately adjacent to the north eastern boundary of the Onshore Study Area. The 2017 Environmental Statement (DSRL, 2017) does not address potential impacts on ecology (including ornithology) receptors as these were scoped out due to there being unlikely any significant effects as a result of the Phase 3 developments.

The Drum Hollistan Wind Farm is proposed for development ~ 3 km southwest of the Project, this is outwith the direct reaches of the Onshore Study Area but lies within the buffer zone for ornithological receptors. The project was refused consent during 2015, however planning permissions have been resubmitted for the development. On the 21 August 2020, RSPB issued an objection comment (RSPB, 2020) for cumulative impact associated with common scoter (designated within the Caithness and Sutherland Peatlands SPA) stating:

"We do not agree with the certainty of the conclusion that "the predicted in-isolation effects of the proposed Development on common scoter are nil, or at worst negligible, and are considered to have no potential to contribute to cumulative effects with other wind farms in the area".

Common scoter was not identified in the 2015 Caledonian Conservation Ltd surveys. However, with these comments in mind, common scoter will be assessed within the terrestrial ornithological surveys undertaken for the Project in 2021 in order to inform the EIA Report.

In addition, any potential OWF developments within the ScotWind N1 DPO may also result in cumulative impacts on ornithology as headroom for certain ornithology species may be reduced. However, timescales for potential developments within the N1 DPO are not currently known but be given due consideration in the EIA process.

Cumulative effects are therefore considered to be limited to those resulting from the addition of the onshore aspects of the Project to other proposed or operational projects where there is the potential for similar effects to arise, particularly with regard to high sensitivity ornithology receptors. Nonetheless, until more recent surveys are conducted for the project in 2021, cumulative impacts on terrestrial ornithological receptors cannot be scoped out, and as such will be determined within the EIA report.

Table 11-3 provides a summary of potential impacts and cumulative impacts on terrestrial ornithology that have been identified at this stage.

Final cumulative methodologies are subject to further discussion and agreement with the regulatory bodies for both offshore and onshore ornithology and it is recognised that the cumulative assessments of offshore and onshore ornithology will be closely related.

Table 11-3 Potential Impacts on Terrestrial Ornithology during Construction, Operations and Maintenance, And Decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Loss of habitat, individuals or breeding territories through construction work at the Onshore Study Area	This may affect species associated with North Caithness Cliffs SPA. The level and type of impact will depend on the cable route selected, the methods used and timing of construction. It is likely that best practice during construction and appropriate mitigation will reduce the level of such impacts, particularly given the low impact and temporary nature of the construction activities.	Scoped in
Disturbance to or displacement of birds in proximity to the site through construction activities	This may affect species associated with Caithness Lochs SPA. The level and type of disturbance will depend on the cable route selected, the methods used and timing of construction. It is likely that best practice during construction and appropriate mitigation will reduce the level of such impacts, particularly given the low impact and temporary nature of the Project.	Scoped in
Potential Impacts During Operations and Maintenance		
Disturbance to or displacement of birds in proximity to the site through operations and maintenance activities	This may affect species associated with North Caithness Cliffs and/or Caithness Lochs SPA depending on the cable route selected and timing of maintenance works. However, the level of disturbance would be extremely temporary and only occur rarely. Furthermore, depending on the selected cable route, maintenance	Scoped in

Impact	High Level Impact Summary and Justification	Scoped In/Out
	may represent only a minor increase in human activity over the existing ornithology baseline.	
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas.		As construction
Potential Cumulative Impacts		
The need to consider cumulative impacts will be determined during the formal assessment of impacts as part of the EIA once terrestrial ornithology surveys are undertaken and the final location of onshore infrastructure has been selected. Cumulative impacts on high sensitivity ornithological receptors are therefore scoped into the EIA.		Scoped in

11.2.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 11-4. These methods will be used alongside input from the relevant guidance as identified in Section 11.2.2.

Table 11-4 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Loss of habitat, individuals or breeding territories through construction work at the Onshore Study Area	Terrestrial ornithology survey conducted in 2021	Desk based study utilising up to date guidance and literature with significant input from the findings of the 2021 terrestrial ornithology surveys, supplemented with the findings from the 2015 Caledonian Conservation Ltd ornithology surveys. The assessment of potential impacts within the EIA Reports will be completed following best practice guidance (CIEEM, 2018). Additionally, mitigation and/or compensation will be developed where appropriate.
Disturbance to or displacement of birds in proximity to the site through construction, operation and maintenance activities	Terrestrial ornithology survey conducted in 2021	Desk based study utilising up to date guidance and literature with significant input from the findings of the 2021 terrestrial ornithology surveys, supplemented with the findings from the 2015 Caledonian Conservation Ltd ornithology surveys. The assessment of potential impacts within the EIA Reports will be completed following best practice guidance (CIEEM, 2018). Additionally, mitigation and/or compensation will be developed where appropriate.
Cumulative Impacts	None identified	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

11.2.11 Conclusions and Next Steps

Ornithology surveys will be undertaken in 2021. An all-inclusive assessment of potential project impacts and potential cumulative impacts will then be completed within the EIA Report. Potential impacts related to direct loss of habitat, disturbance, displacement and potential cumulative impacts on high sensitivity ornithology receptors with nearby developments have been scoped in for assessment within the EIA Report.

11.3 Terrestrial Ecology

11.3.1 Introduction

This section characterises the non-avian terrestrial ecology (protected mammals, reptiles, amphibians, invertebrates, flora and habitats) in the Onshore Study Area and appropriate buffer zones through consideration of use for breeding, wintering and foraging, as defined in Figure 11-1 and Figure 11-2.

It also highlights the key sensitivities and potential impacts arising from the onshore aspects of the Project, presents a summary of the relevant UK guidance, and details of the methodology which will be applied to the EIA.

11.3.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts on terrestrial ecology:

Legislation

- Wildlife and Countryside Act 1981 (as amended in Scotland);
- Nature Conservation (Scotland) Act 2004;
- Wildlife and Natural Environment (Scotland) Act 2011;
- The Protection of Badgers Act 1992;

Policy and Strategy

- Highland-wide Local Development Plan (2012) Planning Policies (including Policy 58 - Protected Species, Policy 59 - Other Important Species, and Policy 60 – Other Important Habitats);
- Scotland's biodiversity: a route map to 2020 (2015);
- 2020 Challenge for Scotland’s Biodiversity. A strategy for the conservation and enhancement of biodiversity in Scotland (2013);
- Highland Biodiversity Action Plan 2015-2020;
- Caithness Biodiversity Action Plan 2003-2013;
- Dounreay Biodiversity Action Plan, 2017;

Guidance

- The Highland Council Supplementary Guidance. Highland’s Statutorily Protected Species (2013);
- A Handbook on Environmental Impact Assessment, version 5 (SNH, 2018);
- Pollution Prevention Guidelines 6 (PPG6): Working at Construction and Demolition Sites (currently under review) (SEPA *et al.,* 2012);

- Guidelines for Ecological Impact Assessment in the United Kingdom (Chartered Institute of Ecology and Environmental Management [CIEEM], 2018);
- Guidelines for Preliminary Ecological Appraisal, 2nd Edition (CIEEM, 2017);
- Scotland's Wildlife: Badgers and Development (SNH, 2001);
- Bat Mitigation Guidelines (Mitchell-Jones, 2004);
- Bat Conservation Trust Bat Surveys for Professional Ecologists, Good Practice Guidelines, 3rd Edition (Collins, J *et al.*, 2016);
- Land Use Planning System - SEPA Guidance Note 31 Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Issue 3 (SEPA, 2017);
- Handbook for Phase 1 Habitat Survey: a technique for environmental audit (JNCC, 2010);
- National Vegetation Classification: Users' Handbook (Rodwell, 2006); and
- Handbook of Biodiversity Methods (Hill *et al.*, 2005).

11.3.3 Available Information

Publicly available, regional and local information sources have been used to inform this Section. The key information sources are listed below:

- Onshore ecology surveys undertaken during the previous 2016 Dounreay Trì EIA (see below);
- SNH Sitelink interactive map - Key Protected Sites Across Scotland (2020). Available at: https://sitelink.nature.scot/home;
- National Biodiversity Network Atlas Scotland, Available at https://nbnatlas.org/;
- Joint Nature Conservation Committee (JNCC) website. Available at: http://www.jncc.gov.uk/;
- Highland Biological Recording Group (HBRG) website. Available at: https://www.hbrg.org.uk/MainPages/AboutHBRG.html;
- The Amphibian and Reptile Conservation (ARC) Rare Species Database. Available at: https://registry.nbnatlas.org/public/;
- *Primula scotica* survey in Caithness and Sutherland 2007-2008. Scottish Natural Heritage Commissioned Report No. 312 (Morris, 2009); and
- Sand dune vegetation survey of Scotland: North West. Scottish Natural Heritage Research, Survey and Monitoring Report No. 126. Vols. 1 -3 (Dargie, 1998).

11.3.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the onshore biological environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to onshore ecology receptors have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

11.3.5 Onshore Study Area

The study area for potential impacts on terrestrial ecology is defined as the Onshore Study Area and the surrounding 30 km buffer (Figure 11-2). Future ecology surveys will be completed within appropriate buffers as advised by relevant statutory bodies.

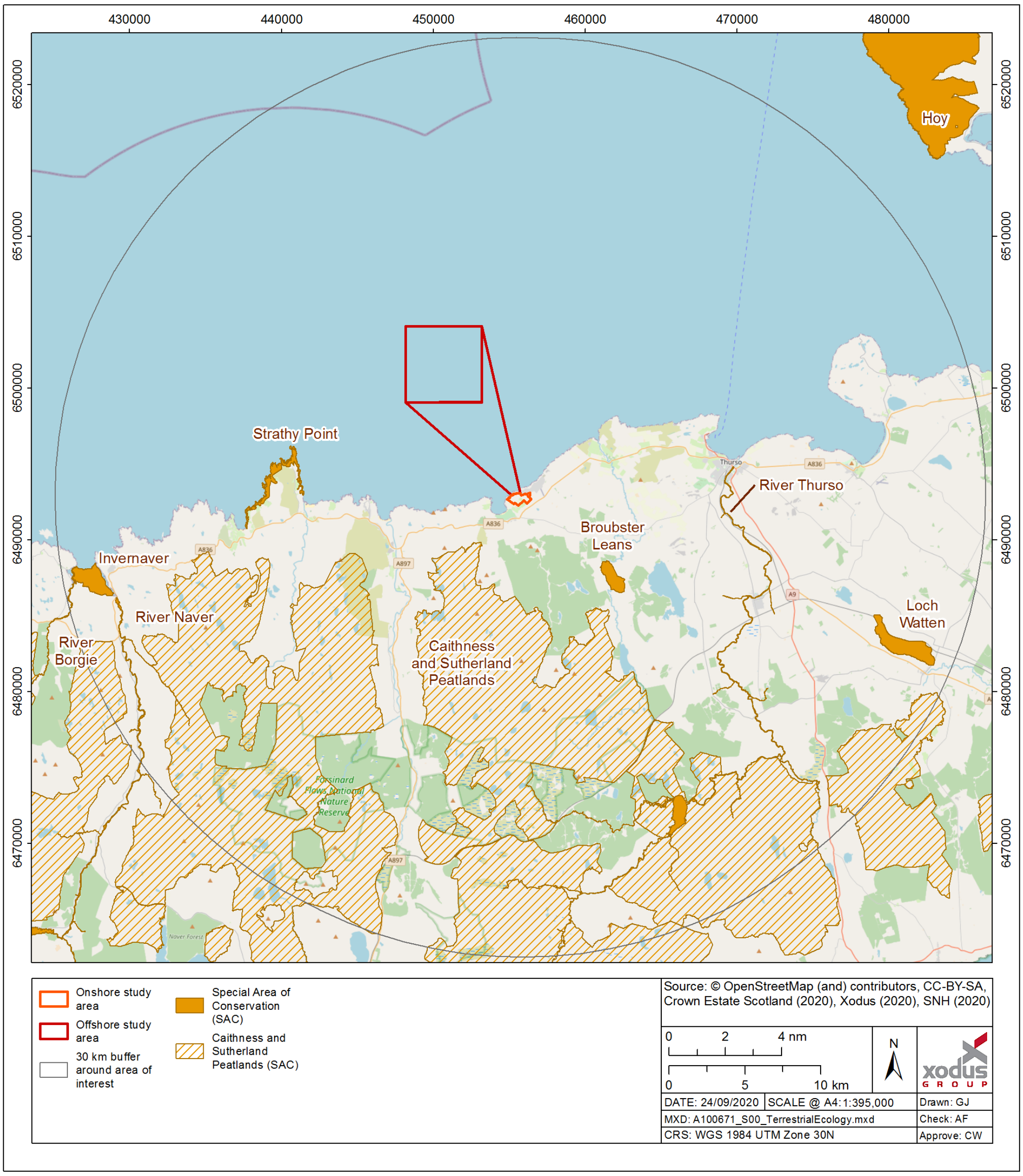


Figure 11-2 Designated Sites: SACs within the vicinity of the Onshore Study Area

11.3.6 Surveys and Studies Carried Out to Date

A series of terrestrial ecology surveys were completed by Caledonian Conservation Ltd between 29 June and 03 July 2015, on behalf of Hexicon. These surveys covered the current Project Onshore Study Area and buffer zones appropriate for each survey type, as detailed in Table 11-5. The surveyed areas are referred to as the 'survey search area' in the baseline description text below.

The surveys and methodologies are summarised in Table 11-5. The 2015 detailed survey findings are contained within Appendix 24.1 of the 2016 Environmental Statement undertaken for the previous Dounreay Trì Project. These surveys were designed with reference to relevant guidance at the time of writing.

Table 11-5 Terrestrial Ecology Surveys

Survey	Survey Period	Methodology
Phase 1 Habitat Survey	July 2015	Standard Phase 1 habitat mapping methodology was used to identify habitat areas of ecological importance within the vicinity of the Onshore Study Area (Onshore Study Area plus buffer area extending 1.5 km west and 1 km south), particularly those listed under Annex I of the Habitats Directive. Methodology followed that outlined in the Handbook for Phase 1 habitat survey published by the JNCC (2007).
National Vegetation Classification (NVC) survey	June – July 2015	A full NVC survey was completed within the vicinity of the Onshore Study (Onshore Study Area plus buffer area extending 1.5 km west and 1 km south) in order to identify any areas of habitat which may be included under Annex I of the Habitats Directive. This survey also ensured that any potential groundwater dependent terrestrial ecosystem (GWDTEs) were identified in accordance with guidance (SEPA, 2012; UKTAG, 2003; UKTAG 2009). The process of identifying wetlands was also informed by the methodology published in SNIFFER (2009). The NVC survey was completed following the methods described in Rodwell (2006). Communities were compared with the published descriptions given in Rodwell et seq. (1991). Aerial photos were reviewed to give an overview of the survey search area and to identify broad distributions of vegetation types and an initial site walkover was undertaken, noting the main NVC communities and mosaics present. Where appropriate 2 m x 2 m quadrats were used to collected data for comparison with published species accounts. Where the collection of quadrat data was found to be impractical, i.e. where the habitat was fragmented or occupied a very small area, the DAFOR dominance scale (Dominant, Abundant, Frequent, Occasional, Rare) was used to record habitats. This data can also be used for comparison with published species accounts. The NVC communities identified were then mapped and community accounts provided, making particular reference to communities of conservation concern.

Survey	Survey Period	Methodology
Scottish primrose survey	June – July 2015	All locations where Scottish primrose plants were recorded in 2007 (Morris, 2009) were revisited, and other potential habitat (coastal grassland and heathland, including areas between 5 m and 10 m of sea cliffs) was also surveyed within the vicinity of the onshore search area in order to detect any new or unrecorded populations. A count of flowering and non-flowering Scottish primrose plants was made at each location. Physical counts of individual plants were to be made up to 200. Where populations exceeded 200 individual Scottish primrose plants, the total was to be estimated based on density and extent.
Protected species survey	July 2015	A protected species survey was undertaken within the vicinity of the Onshore Study Area (Onshore Study Area plus buffer area extending 1.5 km west and 1 km south) and an additional 250 m buffer. This survey targeted pine marten (*Martes martes*), otter (*Lutra lutra*), and badger (*Meles meles*). Habitat was also assessed as to its suitability to support bats (*Chiroptera*). All signs and sightings were recorded on large scale maps, and locations marked using handheld GPS devices. Suitable habitat was also noted for reptiles.

11.3.7 Description of the Current Environment

Consultation and a search of available digital datasets indicates that there are statutory designations of national importance (e.g. Sites of Special Scientific Interest (SSSI) within the vicinity of the Onshore Study Area).

Table 11-6 provides details of statutory designations of European importance for non-avian features within 30 km (e.g. Special Areas of Conservation (SAC) and biological SSSIs and Ramsar sites with non-avian features within 5 km of the Onshore Study Area.

SACs within 30 km are shown in Figure 11-2. SSSIs and Ramsar Sites in the vicinity of the Onshore Study Area are shown in Figure 11-1. Potential impacts on these sites will be considered alongside the relevant species and habitats.

Additionally, there are no local designations (e.g. Special Landscape Areas (SLA), Local Nature Conservation Sites (LNCS) etc.) in the vicinity of the Onshore Study Area that could potentially be affected by the onshore components.

Table 11-6 Designated Sites Relevant to Terrestrial Ecology

Designation (s)	Site name	Distance (km)	Qualifying feature
Sites of Special Scientific Interest	Sandside Bay	Adjacent to NW	Supports a nationally important example of sand dunes. The Onshore Study Area has been purposefully positioned in order to avoid contact with the Sandside Bay SSSI designated features (as highlighted in Figure 10-1). Therefore, there is unlikely to be any loss of sand dune habitat feature of Sandside Bay SSSI from onshore cabling activities.

Designation (s)	Site name	Distance (km)	Qualifying feature
Sites of Special Scientific Interest	Red Point Coast	1.09 km NW	Supports a nationally important population of Scottish primrose. It is possible that Scottish primrose associated with the SSSI population may be more widespread onsite and may be lost depending on the cable route selected and mitigation employed.
Special Areas of Conservation and Ramsar	Caithness and Sutherland Peatlands	3.3 km SW	Supports a range of internationally important habitats listed under Annex I of the Habitats Directive including: > Depressions on peat substrates; > Blanket bog; > Wet heathland; > Wet mires; > Acid peat-stained lakes and ponds; and > Clear-water lakes with aquatic vegetation and poor to moderate nutrient levels. Also supports internationally rare species listed under Annex II of the Habitats Directive, including: > Otter; and > Marsh saxifrage. It is possible that otters associated with this SAC may forage within the Onshore Study Area, although any negative impacts should be avoided by employing appropriate mitigation. As the Project will have no direct or indirect impact on the site or adjacent habitat, there is no pathway for impact on other features as identified in this report.
Sites of Special Scientific Interest	East Halladale	3.3 km SW	Supports nationally important blanket bog habitat. As the Project will have no direct or indirect impact on the site or adjacent habitat, there is no pathway for impact as identified in this report.
Special Areas of Conservation	Broubster Leans	6.3 km SE	Supports internationally important mire habitat. As the Project will have no direct or indirect impact on the site or adjacent habitat, there is no pathway for impact as identified in this report.
Special Areas of Conservation	River Thurso	12.4 km E	Supports an internationally important population of Atlantic salmon (listed under Annex II of the Habitats Directive). As the Project will have no direct or indirect impact on this site, there is no pathway for impact on other features as identified in this report.
Special Areas of Conservation	Strathy Point	13.4 km W	Supports internationally important vegetated sea cliff habitat.

Designation (s)	Site name	Distance (km)	Qualifying feature
			As the Project will have no direct or indirect impact on the site or adjacent habitat, there is no pathway for impact as identified in this report.
Special Areas of Conservation	Loch Watten	23.9 km SE	Supports Freshwater habitats for nutrient-rich lakes or lochs which are often dominated by pondweed (listed under Annex I of the Habitats Directive). As the Project will have no direct or indirect impact on the site or adjacent habitat, there is no pathway for impact as identified in this report.
Special Areas of Conservation	River Naver	25.4 KM SW	Supports an internationally important population of Atlantic salmon and freshwater pearl mussel (both listed under Annex II of the Habitats Directive). As the Project will have no direct or indirect impact on the site or adjacent habitat, there is no pathway for impact as identified in this report.
Special Areas of Conservation	Invernaver	26.6 km SW	Supports Annex I habitats including upland habitats and coastal habitats. As the Project will have no direct or indirect impact on the site or adjacent habitat, there is no pathway for impact as identified in this report.
Special Areas of Conservation	River Borgie	28.7 km SW	Supports an internationally important population of Atlantic salmon, freshwater pearl mussel and Otters (all listed under Annex II of the Habitats Directive). As the Project will have no direct or indirect impact on the site or adjacent habitat, there is no pathway for impact as identified in this report.

11.3.7.1 Habitats

Overall, 16 habitats were identified and mapped during the 2015 Phase 1 Habitat Survey. The features J2.4 Fence and J5 Other (mainly buildings, tracks and roads) are not considered as habitats, but are included here for completeness.

11.3.7.2 NVC Survey Overview

The results of the novel 2015 NVC survey show that the composition of the habitats around and in Sandside Bay have remained broadly similar to that found during a previous survey SNH survey of the area (Dargie, 1998). The strandline and bare, shifting sand above MHWS level on Sandside Bay contains very small areas of the sand dune communities of the NVC types SD2 *Honkenya peploides* – *Cakile maritima* strandline community and SD4 *Elymus farctus* foredune community. The area of these communities is less than several square metres in total.

Behind the Sandside Bay beach lies the main area of sand dunes. The dunes area is fronted by the pioneering SD6 *Ammophila arenaria* mobile dune community. As the dunes become more fixed, this community is replaced by the SD7 *Ammophila arenaria* – *Festuca rubra* semi-fixed dune community. Areas of SD6 mobile dune community persist in the more fixed dunes where disturbance and the collapse of dune structures exposes more bare sand. SD7 semi-fixed dune communities form a mosaic with and are gradually replaced by the SD8 *Festuca rubra* – *Galium verum* fixed dune grassland where the dunes become more stable and erosion and the accretion of sand ceases; here the sward becomes grassier (Rodwell, 2000). Also forming the mosaic on the large fixed dunes is the mesotrophic grass community MG1 *Arrhenatherum elatius* grassland, dominated by large grasses and umbellifers. The golf course itself primarily consists of SD8 fixed dune grassland with less cultivated areas of taller dunes comprising of SD7, SD8 and MG1. A small area of flushed wet ground occurs in the centre of the golf course and consists of areas of M10 *Carex dioica – Pinguicula vulgaris* mire with SD8 colonising the drier patches within the wet ground.

This vegetation pattern occurs along the front of the bay from the minor road leading to the parking area at Fresgoe to the Burn of Isauld. North of the burn mouth the sand dune communities persist where the pattern is repeated. A tiny area of SD2 and SD4 occurs on the loose sand immediately north of the burn's mouth. Behind this the succession of SD6 into SD7 and SD8 is repeated. The SD8 fixed dune grassland is then succeeded by mesotrophic grasslands. A narrow strip of dunes no more than 5 m wide runs north from here toward White Geos above low cliffs and sea washed rocks.

The coastal strip north and east of the bay above low cliffs is colonised by a strip of the NVC type MC10 *Festuca rubra – Plantago* spp. maritime grassland. Small areas of H7 *Calluna vulgaris – Scilla verna* heath also occur up to 80 m from the cliff edge.

The eastern extent of the 2015 NVC survey area consists of agricultural fields of mesotrophic grasslands and arable fields. The fields are primarily of MG7 *Lolium perenne* improved grassland with MG6 *Lolium perenne* - *Cynosurus cristatus* grassland in less intensively grazed areas. A small number of trampled areas have rank assemblages of grasses dominated by *Urtica dioica* (stinging nettle) closely resembling the OV25 *Urtica dioica* - *Cirsium arvense* community. MG1 *Arrhenatherum elatius* grassland lines the banks of the field margins and burns of the search area. Small wooded areas of planted conifers (no NVC designation) with some *Alnus glutinosa – Fraxus excelsior* woodland occur around the periphery of the plantations.

NVC communities SD2, SD6, SD7, SD8, M10, M15 and H7 identified within the vicinity of the Onshore Study Area, but not within it, are listed under Annex I of the Habitats Directive. In addition, NVC community M10 is considered to be a highly groundwater dependent GWDTE, and MG10 moderately groundwater dependent.

11.3.7.3 Scottish Primrose Survey

The Scottish primrose (*Primula scotica*) is nationally scarce and is confined to Caithness, Orkney and North Sutherland. It is distinguishable from the more common Primrose by its blue, rather than the more common yellow, flowers. Scottish primrose is included in the 2017 Dounreay Biodiversity Action Plan.

An individual Scottish primrose plant was found on Reay Golf Course. This represents a fall in numbers from the previous survey which found three plants there in 2007 (Morris, 2009). Large populations of Scottish primrose have been found at Sandside Head (Morris, 2009). However, these populations fall outside the Onshore Study Area. The area of suitable habitat along the coast north east of Sandside Bay was searched and no Scottish primrose found. Therefore, development in the vicinity of this side of the survey search area is unlikely to impact the species.

11.3.7.4 Protected Species Survey

No evidence of any protected mammal species were found during the 2015 protected species survey. Three historic records exist of pine marten within 10 km of the Onshore Study Area, one of which relates to a confirmed breeding den (based on 2020 HBRG data). Additionally, 15 historic records of otters were also confirmed within 10km of the Onshore Study Area (based on 2020 HBRG data). Suitable habitat for foraging and/or commuting otters, pine martens and badgers is present within the previous 2015 terrestrial ecology search area, and it is possible that these species may use the area occasionally, including the coastline adjacent to the current Onshore Study Area. However, it is considered unlikely that otters will make use of the current Onshore Study Area itself for more than occasional commuting.

Otters are classed as European Protected Species (EPS) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and are qualifying species of Caithness and Sutherland Peatlands SAC. Pine martens and their dens are protected by Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and by the Nature Conservation (Scotland) Act 2004. Badgers and their setts are protected under the Protection of Badgers Act 1992.

Both brown long-eared and common pipistrelle bats have been recorded within 10km of the Onshore Study Area (based on 2020 HBRG data). One of these records, from 2006, relates to a confirmed pipistrelle roost. The Onshore Study Area and survey search area offers potential roost sites for bats. The farm and outbuildings at Isauld House, buildings at Gunnerscroft, Mary's Cottage, NTRE Vulcan, Dounreay and around Reay and New Reay may offer roosting opportunities. The woodland around New Reay also contains mature broadleaved trees which offer further opportunities. The previous 2015 survey search area also offers potentially suitable foraging habitat for bats. All bat species are classed as European Protected Species (EPS) under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

Reptiles were not recorded during surveys and there are no historic records of reptiles relevant to the search area. However, both adders and slow-worms are known from the wider area, based on HBRG and ARC data. The survey search area does offer suitable habitat for these species, and for common lizards. Adders, slow-worms and common lizards are protected from intentional and reckless harm under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).

The great yellow bumblebee (*Bombus distinguendus*) has been recorded in the survey search area but outwith the Onshore Study Area (two records from 2009 based on HBRG data). The great yellow bumblebee is a Scottish Biodiversity List species.

Other bumblebee species, all included on the Caithness Local Biodiversity Action Plan (LBAP), have also been recorded within the vicinity of the Onshore Study Area and wider survey search area (based on HBRG data), including small garden bumblebee (*Bombus hortorum*), broken-belted bee (*Bombus soroeensis*), common carder bee (*Bombus pascuorum*), northern white-tailed bumblebee (*Bombus magnus*) and early bumblebee (*Bombus pratorum*).

In addition, several butterfly species included on the Caithness Local Biodiversity Action Plan have been recorded within the vicinity of the Onshore Study Area and wider survey search area (based on HBRG data) including red admiral (*Vanessa atalanta*), common blue (*Polyommatus Icarus*), meadow brown (*Maniola jurtina*) and small tortoiseshell (*Aglais urticae*). Outwith the substation which will be sited adjacent to existing development, only a small area of habitat would be temporarily disturbed during cable installation before being fully restored following standard mitigation, there is unlikely to be any significant impact on these species.

11.3.8 Identification of Potential Impacts

The onshore construction works will involve construction of the onshore cable corridor and substation/switchgear, as well as hardstanding, and potentially an HDD compound and widening of the existing access track, all of which would result in direct habitat loss.

As stated in Section 5.3, confirmed onshore infrastructure has yet to be determined. However, the Onshore Study Area has been purposefully positioned in order to avoid contact with the Sandside Bay SSSI designated features (as highlighted in Figure 11-1). Therefore, there will not be any loss of sand dune habitat feature of Sandside Bay SSSI. However, where trenching of the export cable is conducted there may be potential for loss NVC Annex I habitats and Ground Water Dependent Terrestrial Ecosystems (GWDTEs) depending on the location of the final cable route, although HDD may be deployed in order to avoid sensitive onshore receptors.

Cable trenching during construction may result in the loss of Scottish primrose plants or populations. Red Point Coast SSSI supports a nationally important population of Scottish primrose. It is possible that Scottish primrose associated with the SSSI population may be more widespread than the footprint of the SSSI, and so may be lost depending on the cable route selected and mitigation employed, although this is considered unlikely.

Mortality, displacement or disturbance to otter a protected species associated with Caithness and Sutherland Peatlands SAC may occur as a result of onshore infrastructure construction and maintenance during operations, including potential disturbance due to increased noise and light levels. Pine marten, badger and reptiles are also likely to be in proximity to cable routes, and possibly within the Onshore Study Area during construction and maintenance. The impact of the Project's operations and maintenance activities upon otter from Caithness and Sutherland Peatlands SAC will also be considered.

There is only potentially a small area of invertebrate habitat (bumblebee and butterfly species) that would be temporarily disturbed during construction of the Project (based on HBRG and ARC data).

The Project does not affect any features with the potential to support bat roosts within the Onshore Study Area.

Indirect effects on habitats and species that may arise as a result of construction and operation activities include hydrological effects, pollution, sedimentation and effects of dust.

Table 11-7 provides a summary of potential impacts on terrestrial ecology that have been identified at this stage and justification for scoping in or out.

11.3.9 Cumulative Impacts

There are two aspects of cumulative effects to consider:

- The cumulative effect of two or more developments on an individual animal or home range / territory; and
- The cumulative effect of a number of developments within a region on the local / regional population of a species or the distribution of a habitat.

Nearby developments which have the potential to impact upon terrestrial ecology include:

- SHE-T Dounreay West Substation (consented);
- SHE-T Orkney - Caithness Interconnector Project (consented);
- Pentland Floating Offshore Wind Demonstrator (proposed);
- Limekiln Wind Farm Grid Connection OHL Project (proposed); and
- Dounreay Phase 3 Decommissioning (2018 - Interim End State) (consented).

The Dounreay West Substation Onshore Study Area overlaps entirely with the majority of the Onshore Study Area for the proposed Project. SHE-T undertook a Screening EIA for the Dounreay West Substation in 2018 (SHE-T, 2018). The Screening letter indicated there were unlikely to be any likely significant effects on ecology receptors in line with a Phase 1 Habitat survey conducted on behalf of the project during 2018. The Highland Council issued a decision notice (19/01092/FUL) granting planning permission for the development based on the screening letter, however outlining the requirement for a Construction and Environmental Management Document (CEMD) to be submitted for the development (THC, 2019).

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site, making landfall at Dounreay. However, in the event the Demonstrator is taken forward this would form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the Project array. Nonetheless, due to the limited size of the Demonstrator, cumulative impacts on ecology receptors are anticipated to be the significance of these impacts will be determined within the EIA once the design specification for the onshore components are finalised.

The Limekiln Wind Farm Grid Connection OHL Project will overlap the Onshore Study Area in the north eastern corner. The Limekiln Wind Farm Grid Connection EIA Report (SHE-T, 2020) concluded that there would be no significant residual impacts from the development on ecology features.

The Dounreay Phase 3 Decommissioning (2018 - Interim End State) project lies immediately adjacent to the north eastern boundary of the Onshore Study Area. The 2017 Environmental Statement (DSRL, 2017) states that no significant effects, residual effects or cumulative impacts on ecological receptors are predicted as a result of the Phase 3 decommissioning activities.

Cumulative effects are therefore considered to be limited to those resulting from the addition of the onshore aspects of the Project to other proposed or operational projects where there the potential for similar effects to arise, particularly with regard to high sensitivity ecology receptors. Nonetheless, until more recent ecology surveys are conducted for the project in 2021, cumulative impacts on terrestrial ecology receptors cannot be scoped out, and as such will be determined within the EIA report.

Table 11-7 Potential Impacts on Terrestrial Ecology during Construction, Operations and Maintenance, and Decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Loss of habitat	This may affect the NVC Annex I habitats and GWDTEs. The level of impact will depend on the cable route selected and the methods used in construction. It is likely that best practice during construction and appropriate mitigation will reduce the level of such impacts, particularly given the low impact and temporary nature of the Project. This will be considered further during the EIA.	Scoped in
Loss of Scottish primrose plants or populations	The level of impact will depend on the cable route selected, the methods used and timing of construction. Red point Coast SSSI supports a nationally important population of Scottish primrose. It is possible that Scottish primrose associated with the SSSI population may be more widespread onsite and may be lost depending on the cable route selected and mitigation employed. This will be considered further during the EIA.	Scoped in
Mortality of protected species (otter, pine marten, badger, reptiles) through construction activities	This may affect otters, which are associated with Caithness and Sutherland Peatlands SAC. The level of impact will depend on the cable route selected, the methods used and timing of construction. It is likely that best practice during construction and appropriate mitigation will reduce the level of such impacts, particularly given the low impact and temporary nature of the Project. This will be considered further during the EIA.	Scoped in
Disturbance to or displacement of protected species (otter,	This may affect otters, which are associated with Caithness and Sutherland Peatlands SAC.	Scoped in

Impact	High Level Impact Summary and Justification	Scoped In/Out
pine marten, badger, reptiles) in proximity to the site through construction activities	The level and type of disturbance will depend on the cable route selected, the methods used and timing of construction. It is likely that best practice during construction and appropriate mitigation will reduce the level of such impacts, particularly given the low impact and temporary nature of the Project. This will be considered further during the EIA.	
Indirect effects on habitats and species	Indirect effects on habitats and species that may arise as a result of construction activities include hydrological effects, pollution, sedimentation and effects of dust. For example, heavy rainfall can result in silt runoff and peat slides, which may cause siltation of watercourses, while pollution of watercourses may occur as a result of chemical or fuel spillage.	Scoped in
Loss of bat roosts	The proposed onshore infrastructure will not affect any features with the potential to support bat roosts.	Scoped out
Loss of habitat important for invertebrate populations of conservation concern	As only a small area of habitat would be temporarily disturbed before being fully restored following standard mitigation, there is unlikely to be any significant impact on these species.	Scoped out
Potential Impacts During Operations and Maintenance		
Disturbance to or displacement of protected species (otter, pine marten, badger, reptiles) in proximity to the site through operation and maintenance activities	This may affect otters, which are associated with Caithness and Sutherland Peatlands SAC. However, the level of disturbance would be extremely temporary and only occur rarely. Furthermore, depending on the selected onshore infrastructure siting location, maintenance may represent only a minor increase in human activity over the existing land use baseline. This will be considered further during the EIA.	Scoped in
Indirect effects on habitats and species	Maintenance may also result in indirect effects on habitats, e.g. pollution of watercourses as a result of spillage. However, the potential for indirect effects to occur during operation is generally lower than that during construction.	Scoped in
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas.		As construction
Potential Cumulative Impacts		
The need to consider cumulative impacts will be determined during the formal assessment of impacts as part of the EIA once terrestrial ecology surveys are		Scoped in

Impact	High Level Impact Summary and Justification	Scoped In/Out
undertaken and the final onshore cable route has been selected. Cumulative impacts on high sensitivity ecology receptors are therefore scoped into the EIA.		

11.3.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 8-14. These methods will be used alongside input from the relevant guidance as identified in Section 11.2.2.

Table 11-8 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Loss of habitat	Phase 1 Habitat surveys conducted in 2021	Desk based study utilising up to date guidance and literature (including HBRG data) with significant input from the findings of the 2021 Phase 1 habitat surveys, supplemented with the findings from the 2015 Caledonian Conservation Ltd ecology surveys. The assessment of potential impacts within the EIA Reports will be completed following best practice guidance (CIEEM, 2018). Additionally, mitigation and/or compensation will be developed where appropriate.
Loss of Scottish primrose plants or populations	Scottish Primrose survey conducted in 2021	Desk based study utilising up to date guidance and literature (including HBRG data) with significant input from the findings of the 2021 Scottish Primrose survey if required, supplemented with the findings from the 2015 Caledonian Conservation Ltd ecology surveys. The assessment of potential impacts within the EIA Reports will be completed following best practice guidance (CIEEM, 2018). Additionally, mitigation and/or compensation will be developed where appropriate.
Mortality of protected species (otter, pine marten, badger, reptiles) through construction activities	Protected Species survey conducted in 2021	Desk based study utilising up to date guidance and literature (including HBRG data) with significant input from the findings of the 2021 Protected Species survey, supplemented with the findings from the 2015 Caledonian Conservation Ltd ecology surveys. The assessment of potential impacts within the EIA Reports will be completed following best practice guidance (CIEEM, 2018). Additionally, mitigation and/or compensation will be developed where appropriate.
Disturbance to or displacement of protected species (otter, pine marten, badger, reptiles) in proximity to the site through construction, operation and maintenance activities	Protected Species survey conducted in 2021	Desk based study utilising up to date guidance and literature (including HBRG data) with significant input from the findings of the 2021 Protected Species survey, supplemented with the findings from the 2015 Caledonian Conservation Ltd ecology surveys. The assessment of potential impacts within the EIA Reports will be completed following best practice guidance (CIEEM, 2018). Additionally, mitigation

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
		and/or compensation will be developed where appropriate.
Indirect effects on habitats and species	Phase 1 Habitat surveys conducted in 2021	Desk based study utilising up to date guidance and literature (including HBRG data) with significant input from the findings of the 2021 Phase 1 habitat surveys, supplemented with the findings from the 2015 Caledonian Conservation Ltd ecology surveys. The assessment of potential impacts within the EIA Reports will be completed following best practice guidance (CIEEM, 2018). Additionally, mitigation and/or compensation will be developed where appropriate.
Cumulative Impacts	None identified	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

11.3.11 Conclusions and Next Steps

Ecology surveys will be undertaken in 2021 these will include a Phase 1 Habitats Survey and National Vegetation Classification (NVC) Survey, as advised within responses from the Pre-Application Advise Pack. An all-inclusive assessment of potential project impacts and potential cumulative impacts will then be completed within the EIA Report. Potential impacts related to direct loss of habitat, mortality/ loss of species, disturbance, displacement, indirect impacts and potential cumulative impacts with nearby developments have been scoped in for assessment within the EIA Report.

12 ONSHORE HUMAN ENVIRONMENT

12.1 Introduction

This Section considers the impact of the onshore elements of the Project – on the following human environment receptors:

- Archaeology and cultural heritage;
- Air quality;
- Landscape and visual amenity;
- Traffic and transport; and
- Other Issues (Electro-magnetic fields (EMF) and Major Accidents and Disasters).

It is not considered possible to separate socio-economics for the onshore and offshore environment. A combined socio-economics scoping Section is presented in Section 9.8: Socio-economics, Recreation and Tourism.

An overview of the relevant baseline environment is provided for each along with the anticipated impacts, a baseline characterisation strategy, impact assessment strategy and where applicable, possible mitigation and monitoring measures.

12.2 Onshore Archaeology and Cultural Heritage

12.2.1 Introduction

This section considers existing known archaeology and cultural heritage baseline receptors within the Onshore Study Area by considering the potential direct and indirect effects resulting during construction, operation, and decommissioning phases of the Project and cumulative impacts on known archaeology and cultural heritage assets and their setting. The potential for as yet unknown archaeological finds and cultural heritage assets will also be identified, such resources include:

- Scheduled Monuments;
- Listed Buildings;
- Conservation Areas;
- Other archaeological sites and monuments; and
- Other non-designated historic environment assets.

12.2.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts on onshore cultural heritage and archaeology receptors:

EU Conventions

- The European Convention on the Protection of the Archaeological Heritage (revised) (Valletta, 1992);
- The European Landscape Convention (ratified by the UK Government in 2006);

Legislation

- The Ancient Monuments and Archaeological Areas Act (as amended) (1979);
- The Planning (Listed Buildings and Conservation Areas) (Scotland) Act (as amended) (1997);
- Environmental Assessment (Scotland) Act (2005);
- The Historic Environment Scotland Act (2014);
- The Town and Country Planning (Scotland) Act (1997);
- The Planning (Scotland) Act (2019);
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations (2017);
- The Town and Country Planning (Development Management Procedure) (Scotland) Regulations (2013);
- The Town and Country Planning (Historic Environment Scotland) Amendment Regulations (2015);

Policy

- Highland-wide Local Development Plan (2012) and Planning Policies (Policy 57 - Natural, Built & Cultural Heritage);
- The Scottish Planning Policy (2014);
- Historic Environment Policy for Scotland (HEPS) (2019);
- Caithness and Sutherland Local Development Plan (2018);

Guidance

- Planning and Archaeology (Planning Advice Note (PAN) 2/2011);
- Conservation area management: Planning Advice Note (PAN 71/2004);
- The Highland Council Standards for Archaeological Work (2012);
- The Chartered Institute for Archaeologists. Standard and guidance for historic environment desk-based assessment (2014); and
- Historic Scotland. Managing Change in the Historic Environment Guidance Note: Setting (2016).

12.2.3 Available Information

The existing knowledge base will be combined with site specific data to inform the EIA. Guidance documents and professional expertise will highlight the importance of early consultation to fully understand the impacts of the Project’s terrestrial aspects.

The primary sources of information used to inform the Scoping Report were:

- Onshore walkover survey undertaken during the previous 2016 Dounreay Trì EIA (see below);
- The Highland Council’s Historic Environment Record (HER) interactive map. Available at: https://her.highland.gov.uk/map;
- Historic Environment Scotland Portal Interactive Map. Available at: https://hesportal.maps.arcgis.com/apps/Viewer/index.html;

- Historic Environment Scotland: Scotland's Historic Land Use Assessment (HLA) Interactive Map. Available at: https://hlamap.org.uk/; and
- The National Monuments Record of Scotland via the Canmore and Pastmap database websites. Available at: https://canmore.org.uk/.

These sources contain findspot locations, undesignated heritage assets, Scheduled Monuments, Listed Buildings, Inventories of Gardens and Designed Landscapes, Historic Battlefield sites and local authority Conservation Areas.

12.2.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the onshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to cultural heritage and archaeology receptors have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

12.2.5 Onshore Study Area

The study area for archaeology and cultural heritage extends from Dounreay to Fresgoe, encompassing the Onshore Study Area, Sandside Bay and Reay is considered in order to establish a historic environment baseline, identifying known sites within this and to determine the potential for unidentified sites and landscapes that could potentially be affected by the Project.

12.2.6 Surveys and Studies Carried Out to Date

In 2015 the Orkney Research Centre for Archaeology (ORCA) undertook a desk-based assessment and walkover survey for the previously consented Dounreay Trì Project Onshore Study Area. While the surveys were conducted for the previous Dounreay Tri study area, there is considerable overlap between this and the Project's Onshore Study Area, which covers a slightly larger area. Findings from this study has been used to inform the historic environment baseline conditions for the Project, along with data collected utilising the sources noted within Section 12.2.3.

12.2.7 Description of the Current Environment

Archaeological sites and monuments are an important and finite resource that should be protected and preserved in-situ whenever possible (SPP, 2014). The relative importance of the historic environment is recognised on an International, National, Regional and Local level. The historic environment needs to be considered throughout the development process in order to prevent, reduce and offset any adverse impacts resulting from a proposed development (The European Convention on the Protection of the Archaeological Heritage (1992), The European Landscape Convention (2006). The setting of Scheduled Monuments, Listed Buildings, Inventoried Gardens or Designated Landscapes and Inventoried Historic Battlefield sites are of material consideration as well (The Town and Country Planning (Scotland) Act 1997). The historic environment includes undesignated archaeological and cultural heritage assets, that can be as important as designated assets and should therefore be protected and enhanced in an appropriate setting (SPP, 2014).

There are no cultural heritage designations, including: Scheduled Monuments, Listed Buildings, Conservation Areas, Garden and Designed Landscape or battlegrounds, found to directly overlap with the Project Onshore Study Area.

However, there are a number of designations within the wider study area which will be considered within the Scoping Report. The area around and to the east of Sandside Bay contains numerous recorded cultural heritage assets of national, regional and local importance that date from the prehistoric to more modern times. These are described in the following sections and highlighted in Figure 12-1.

12.2.7.1 Scheduled Monuments

The Historic Environment Scotland (HES) Interactive Map search highlighted a number of Scheduled Monument designations within the vicinity of the Onshore Study Area, which have the potential to be impacted by the Project these are identified as:

- Knock Stanger Cairn 730 m east of Sandside House (SM 458);
- Knock Urray, Broch, 400 m north/north-east of Gunnscroft (SM 564);
- Dounreay Castle (SM 6401);
- Achunabust Broch (SM 513);
- Achvarasdal House, two stones (SM 421);
- Reay, burial ground, old church and cross slab (SM 615); and
- two carved stones at Sandside House (SM 616).

12.2.7.2 Listed Buildings

The Historic Environment Scotland (HES) Interactive Map search highlighted a number of Listed Building designations within the vicinity of the Onshore Study Area, which have the potential to be impacted by the Project these are identified below.

Category A Listed Buildings include:

- Reay Parish Church and Enclosure Wall (LB14992);
- Sandside House Kiln Barn and Single Storey Range of Former Byres, Cottage and Dairy, and Implement Shed (LB14986); and
- Sandside Harbour 1 and 2, Sandside and Fishing Store (LB14988).

Category B Listed Buildings include:

- Reay Village, Reayburn House (LB17592);
- Reay Village Market Cross Adjacent to the Terrace New Reay (LB18831);
- Sandside House (LB14984);
- Sandside House Gate Lodge and Gate Piers (LB14987);
- Sandside House, Garden Walls, 2 Walled Gardens, Dovecote and Privy (LB14985); and
- Upper Dounreay Farm Steading (LB14989).

Category C Listed Buildings include:

- Reay Village, Brackside Bridge Over Brackside-Sandside Burn (LB14981); and

- Reay Village, Smithy Cottage and Steading Range (Former Dwellings at Right Angles) (LB14982).

12.2.7.3 Undesignated cultural heritage

The Highland Council's Historic Environment Record (HER) additionally identified 2 undesignated cultural heritage assets which do overlap the Onshore Study Area, these are:

- Sheepfold, Ling Geo (MHG2483); and
- Earthwork Bank, Isauld House (MHG765);

Furthermore, the Highland Council's Historic Environment Record (HER) shows there are approximately 99 other non-designated cultural heritage assets within the wider area.

12.2.7.4 2015 Onshore Historic Environment Baseline Assessment

The 2015 ORCA desk-based assessment and walkover survey identified a total of 61 archaeology features within the vicinity of the Onshore Study Area. Of these, only 5 are found to overlap the Project Onshore Study Area. These are:

- Earthwork Bank, Isauld House (MHG765);
- Sheepfold, Ling Geo (MHG2483);
- Deposit - Layer of burnt ash or silt (no ID);
- Stone Spread noted on coastal edge (no ID); and
- Circular depression in ground noted with change of vegetation (no ID).

All archaeological features identified within the 2015 ORCA surveys are detailed in Appendix 25.1 of the 2016 Environmental Statement undertaken for the previous Dounreay Trì Project.

Due to the prevalence of known archaeological features within the area, it is likely that unrecorded archaeological features are present within the Onshore Study Area.

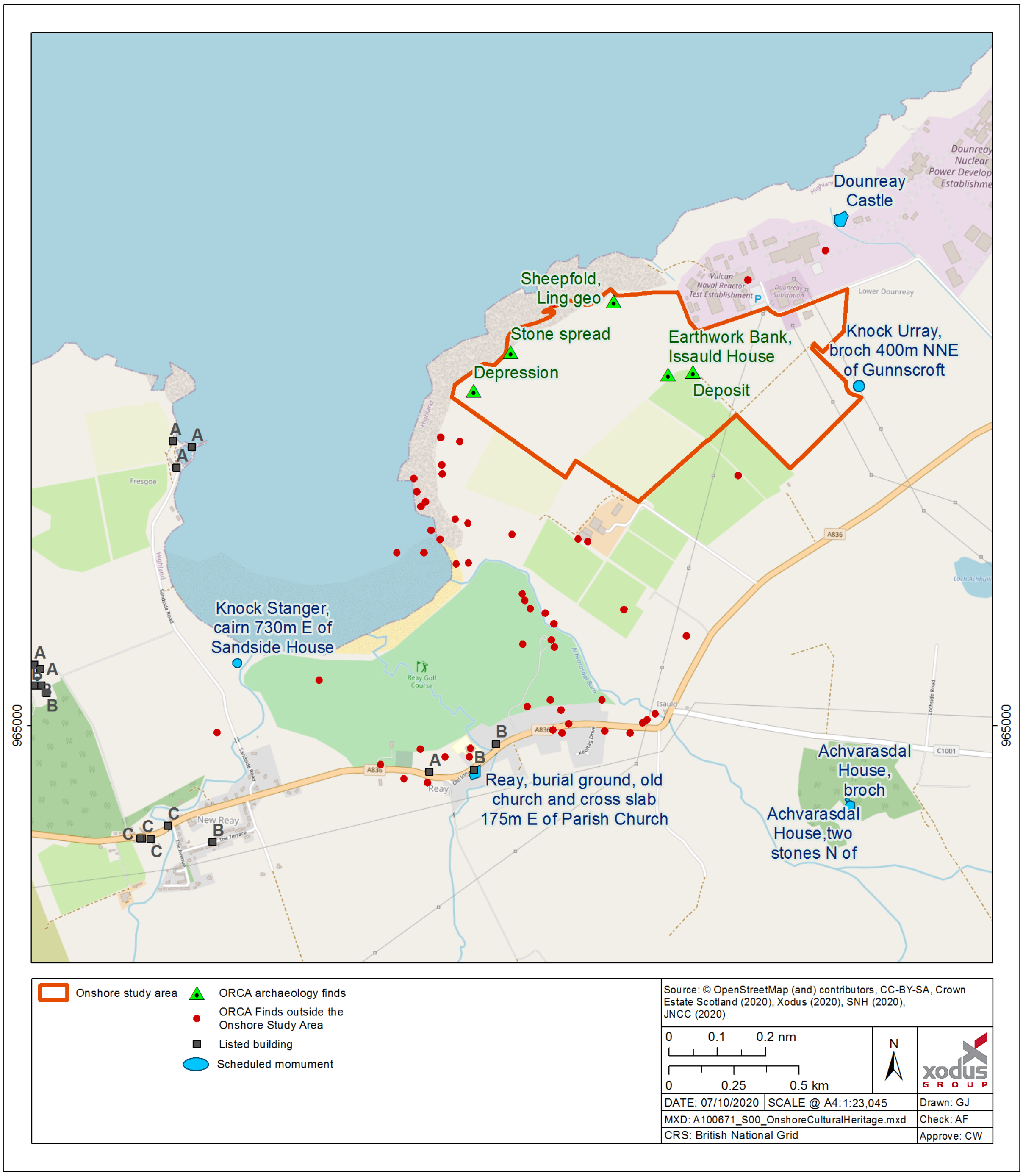


Figure 12-1 Designated Cultural Heritage Sites and ORCA Survey Archaeology Finds in the vicinity of the Onshore Study Area

12.2.8 Identification of Potential Impacts

The key potential impacts on the onshore archaeology and cultural heritage within the Onshore Study Area are considered to be indirect impacts (those that would produce an impact on the historical landscape and setting of identified cultural heritage sites and resources). Indirect impacts may relate to the Project affecting views to, or from, cultural heritage features with important landscape settings. Such impacts are likely to persist throughout the operational phase of the Project.

Direct physical impacts are those that would produce a physical impact on heritage assets and archaeological features. However, due to the limited number of archaeological finds during previous surveys, and no designated sites of cultural heritage present in the Onshore Study Area, direct disturbance to known archaeological finds, features and/or landscapes of cultural significance are unlikely to occur. Additionally, with standard mitigations in place direct impacts to any further archaeological finds will be removed.

Table 12-1 provides a summary of potential impacts on onshore cultural heritage and archaeology that have been identified at this stage and justification for scoping in or out.

12.2.9 Cumulative Impacts

There are two aspects of cumulative effects to consider:

- The cumulative effect of two or more developments on an individual animal or home range / territory; and
- The cumulative effect of a number of developments within a region on the local / regional population of a species or the distribution of a habitat.

Nearby developments which have the potential to impact upon Onshore Archaeology and Cultural Heritage include:

- SHE-T Dounreay West Substation (consented);
- SHE-T Orkney - Caithness Interconnector Project (consented);
- Pentland Floating Offshore Wind Demonstrator (proposed);
- Limekiln Wind Farm Grid Connection OHL Project (proposed);
- Limekiln Wind Farm (consented);
- Drum Hollistan Wind Farm (proposed); and
- Dounreay Phase 3 Decommissioning (2018 - Interim End State) (consented).

The Dounreay West Substation Onshore Study Area overlaps entirely with the majority of the Onshore Study Area for the proposed Project. SHE-T undertook a Screening EIA for the Dounreay West Substation in 2018 (SHE-T, 2018). The Screening letter indicated there were unlikely to be any likely significant effects on cultural heritage receptors. The Highland Council issued a decision notice (19/01092/FUL) granting planning permission for the development based on the screening letter, however outlining the requirement for an archaeological watching brief to be submitted for the development (THC, 2019).

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site, making landfall at Dounreay. However, in the event the Demonstrator is taken forward this would form part of the wider PFOWF array considered within this Report. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward) Thus, it would be independent of and ahead of installation activities associated with the Project array. Nonetheless, due to the limited size of the Demonstrator cumulative impacts on archaeology and cultural heritage receptors are anticipated to be minor, however the significance of these impacts will be determined within the EIA once the design specification for the onshore components are finalised.

The Limekiln Wind Farm Grid Connection OHL Project will overlap the Onshore Study Area in the north eastern corner. The Limekiln Wind Farm Grid Connection EIA Report (SHE-T, 2020) concluded that impacts on cultural heritage from the development were assessed as negligible to minor and no significant effects were anticipated on these receptors from direct, indirect, residual or cumulative impacts.

The consented Limekiln Wind Farm site boundary is located approximately 1 km south of the Project Onshore Study Area, at the nearest point. The Limekiln Wind Farm Environmental Statement did not identify any significant effects on cultural heritage receptors (Infinergy, 2012).

The Drum Hollistan Wind Farm is proposed for development 4 km southwest of the Project. The project was refused consent during 2015, however planning permissions have been resubmitted for the development. The Drum Hollistan EIA Report does not identify and significant impacts on cultural heritage receptors (Muirden Energy LLP, 2020).

The Dounreay Phase 3 Decommissioning (2018 - Interim End State) project lies immediately adjacent to the north eastern boundary of the Onshore Study Area. The 2017 Environmental Statement (DSRL, 2017) does not address potential impacts on Cultural Heritage receptors as these were scoped out due to there being unlikely any significant effects as a result of the Phase 3 developments.

Cumulative effects are therefore considered to be limited to those resulting from the addition of the onshore aspects of the Project to other proposed or operational projects where there the potential for similar effects to arise. Cumulative impacts will be of particular importance to indirect impacts on setting of cultural heritage receptors. Therefore, cumulative impacts are scoped in to the EIA Report where they will be better established on finalisation of the Project's onshore infrastructure design.

Table 12-1 summarises these impacts.

Table 12-1 Potential Impacts on Onshore Archaeology and Cultural Heritage During Construction, Operations and Maintenance, and Decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Direct physical disturbance to or loss of known onshore cultural heritage assets and disturbance to or potential loss of any unknown sub-surface archaeological features	Based on previous surveys and the limited number of archaeological finds in the Onshore Study Area, construction of landfall areas, substation, equipment laydown, working areas, and temporary construction compounds are unlikely to directly disturb, or damage known or potential archaeological sites or features of significance, particularly with the implementation of standard mitigations.	Scoped out
Indirect impacts that affect the setting of Scheduled Monuments, Listed Buildings and other designated archaeological and cultural heritage assets	The impacts on setting of archaeological and cultural heritage assets during the construction phase should be fully reversible; therefore, this will not be considered further in the EIA process.	Scoped out
Potential Impacts During Operations and Maintenance		
Direct physical disturbance to or loss of known onshore cultural heritage assets and disturbance to or	No new disturbance that would affect cultural heritage assets would be anticipated during the operational phase.	Scoped out

Impact	High Level Impact Summary and Justification	Scoped In/Out
potential loss of any unknown sub-surface archaeological features		
Indirect impacts that affect the setting of Scheduled Monuments, Listed Buildings and other designated archaeological and cultural heritage assets	The impacts of the Project on the setting of onshore cultural heritage assets will be considered within the EIA. The potential impacts on the setting of Scheduled Monuments, Listed Buildings, gardens and designed landscapes, Inventoried Battlefields, and Word Heritage Sites will be identified and assessed including potential obstruction to views to or from cultural heritage features.	Scoped in
Potential Impacts During Decommissioning		
No potential impacts are anticipated to arise during the decommissioning phase.		Scoped out
Potential Cumulative Impacts		
The potential for cumulative impacts will be assessed during the EIA process. The EIA will consider the impacts of the construction, operations and maintenance, and decommissioning of the Project cumulatively with other relevant projects that have been consented and are yet to be constructed as well as relevant projects for which an application has been submitted but which are not yet consented. Other projects for consideration for impacts to archaeology and cultural heritage are likely to be any activities that could incrementally reduce the quality or number of archaeological features and sites such as onshore wind energy projects.		Scoped in

12.2.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 12-2. These methods will be used alongside input from the relevant guidance as identified in Section 12.2.2.

Table 12-2 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Indirect impacts that affect the setting of Scheduled Monuments, Listed Buildings and other designated archaeological and cultural heritage assets during operation and maintenance phases	None identified	Desk based study utilising up to date guidance and literature supplemented with findings of the 2015 ORCA archaeology desk-based assessment and walkover survey. The assessment of potential impacts within the EIA Reports will be completed following best practice guidance including: The Highland Council Standards for Archaeological Work (2012) and The Chartered Institute for Archaeologists Standard and guidance for historic environment desk-based assessment (2014). Additionally, once mitigation measures have been agreed, a Written Scheme of Investigation (WSI) will be developed, that will set out the design and implementation of mitigation with regard to both known and potential

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
		archaeological and cultural heritage assets during the course of the Project.
Cumulative Impacts	None identified	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers to be understand timelines and potential cumulative impacts.

12.2.11 Conclusions and Next Steps

In conclusion, indirect impacts during the operation and maintenance phase of the Project and cumulative impacts on archaeology and cultural heritage are scoped in and will be taken forward to the assessment phase.

12.3 Air Quality

12.3.1 Introduction

This section considers onshore construction activities that could impact localised air quality and the carbon baseline within the Onshore Study Area. The Onshore Study Area for the Project is delineated in Figure 10-1.

One of the main attractions of wind energy technology is the fact that it is a sustainable source of power and does not create greenhouse gas emissions, or emit pollution when generating electricity. There is the potential for a positive environmental impact with regard to carbon saving and avoidance of gaseous discharges associated with global climate change. However, there will be a carbon cost on account of the Project development activities. Therefore, contributing factors to the Project carbon costs will be considered within the EIA Report, once a firmer grasp of the design envelope and associated carbon emissions generating infrastructure (e.g. vessel activity, onshore transport mechanisms etc.) are understood. Therefore, the primary focus of the scoping assessment will be on the generation of dust, especially in dry and windy conditions and the potential impacts of these on human health and ecological receptors.

12.3.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts on air quality receptors:

EU Directive

- EU Directive 2008/50/EC Ambient Air Quality and Cleaner Air for Europe;

Legislation

- The Air Quality (Scotland) Regulations 2000;

Policy and Strategy

- The Scottish National Marine Plan (NMP) 2015;
- Highland-wide Local Development Plan (2012) Planning Policies (Policy 73 – Air Quality);
- GEN 14 Air quality: Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits;

Guidance

- Guidance on the Assessment of dust from demolition and construction (IAQM, 2014);
- Guidance on land-use planning and development control: Planning for air quality (IAQM, 2017);
- Air Quality Monitoring in the vicinity of Demolition and Construction Sites (IAQM, 2018);
- A guide to the assessment of air quality impacts on designated nature conservation sites (IAQM, 2020); and
- Pollution Prevention Guidelines 6 (PPG6): Working at Construction and Demolition Sites (currently under review) (SEPA *et al.,* 2012).

12.3.3 Available Information

The primary sources of information used to inform the Scoping Report are listed below:

- 2019 Air Quality Annual Progress Report (APR) for The Highland Council (THC, 2019);
- Air Quality in Scotland. Available at: http://www.scottishairquality.scot/laqm/aqma;
- UK-AIR Air Quality Information Resource (DEFRA, 2019);
- Air Quality Monitoring Stations for the Highland Council including:
    - Inverness City Centre (approximately 120 miles south of the Onshore Study Area);
    - Strath Viach (approximately 130 miles southwest of the Onshore Study Area); and
    - Fort William (approximately 180 miles southwest of the Onshore Study Area).
    - an additional 29 non-automatic monitoring sites for Nitrogen Dioxide utilising passive diffusion tubes in Inverness, Fort William and Dingwall (The Highland Council, 2019).
- Air Quality Impact Assessment Section of the Dounreay Phase 3 Decommissioning Environmental Statement (DSRL, 2017);
- Dounreay Site Restoration Ltd (DSRL) have a series of dust monitors installed around the site to measure dust levels. The results of which will be requested to inform the EIA baseline; and
- 1:25,000 Ordnance Survey map of the Project area to identify potential receptors.

12.3.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the onshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to air quality receptors have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

12.3.5 Onshore Study Area

Air quality impacts associated with dust will be localised around the Onshore Study Area as shown in Figure 12-2. A 100 m and 500 m buffer around the Onshore Study Area has been assumed for the purpose of the assessment. This buffer is inclusive of the preferred 350 m buffer for the identification of human receptors, and 50 m for ecological receptors as specified by the IAQM, 2014 Guidance on the Assessment of dust from demolition and construction.

Climate change issues associated with carbon dioxide are on a global scale, hence no specific Onshore Study Area has been defined for the assessment. Nonetheless, carbon emissions associated with the Development will be accounted for within the EIA Report once final decisions on the Project design envelope are made.

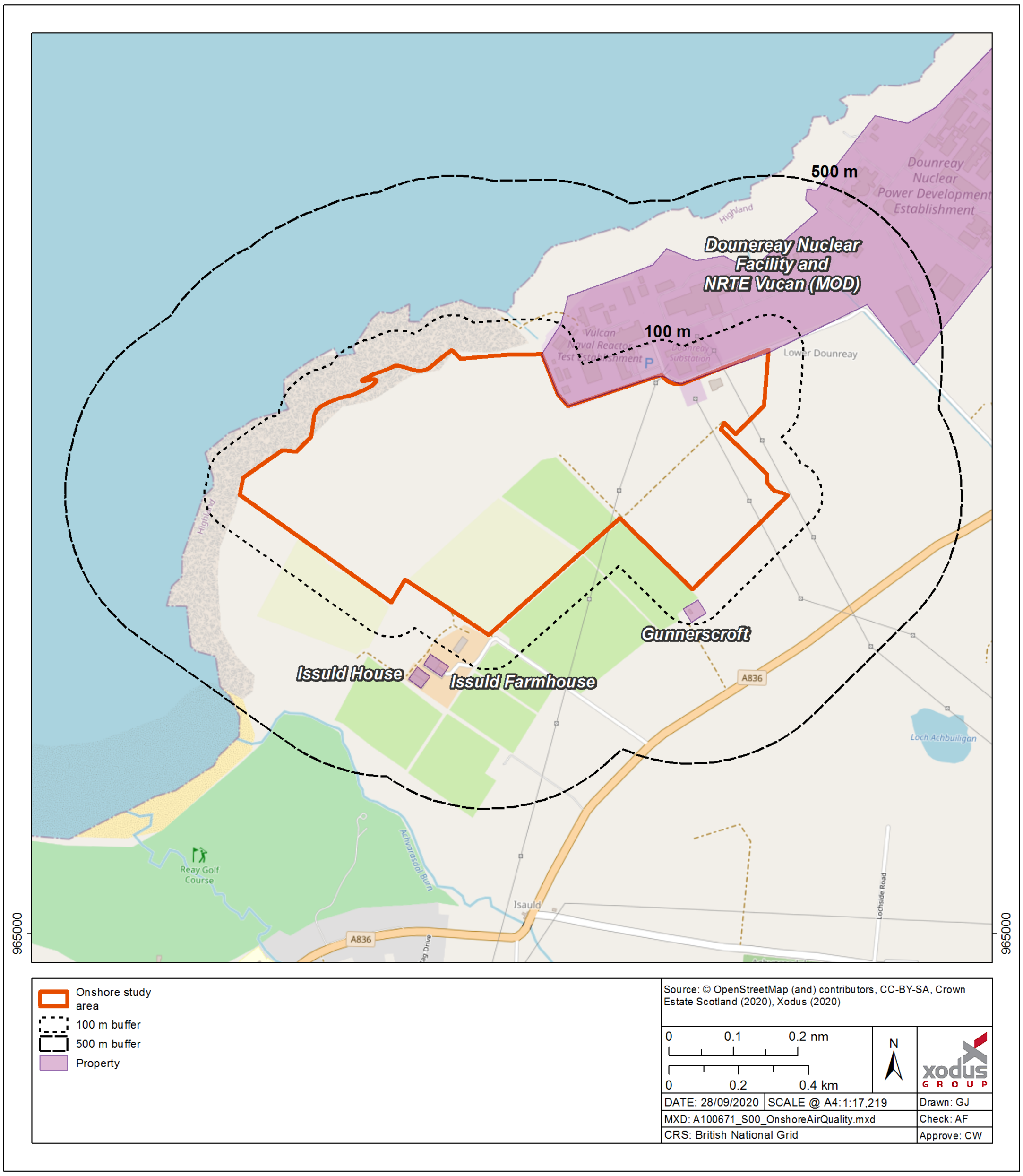


Figure 12-2 Onshore Air Quality Assessment Zones

12.3.6 Surveys and Studies Carried Out to Date

No air quality specific surveys or studies were carried out during the previous 2016 Dounreay Trì Project EIA.

12.3.7 Description of the Current Environment

The only Air Quality Management Area in The Highland Council Area is in Inverness City Centre approximately 120 miles south of the Onshore Study Area. The Highland Council only have three automatic air quality monitoring sites; these are in Inverness, Fort William and Strath Viach. Through 2018 there was an additional 29 non-automatic monitoring sites for Nitrogen Dioxide utilising passive diffusion tubes in Inverness, Dingwall and Fort William (The Highland Council, 2019).

All of The Highland Council monitoring locations are too far from the Onshore Study Area to be representative. However, the lack of monitoring would suggest that there are no air quality issues in the area. Additionally, The Onshore Study Area is currently farmland and as such is assumed to have a relatively high air quality level.

Existing local sources of particulate matter and dust likely includes windblown dust from agricultural land, exhaust emissions from road vehicles, and the adjacent nuclear plant activities and plant vehicles.

The Dounreay and Vulcan nuclear sites are located within 500 m east of the development. Dounreay Site Restoration Limited (DSRL) is undergoing a programme of decommissioning including building demolition, which could give rise to dust. The Vulcan submarine test reactor shut down in July 2015 for the final time and as such it can be presumed that this site will also be moving into a decommissioning phase and could give rise to dust associated with demolition activities.

Wind speed and wind direction may influence the dispersion of dust and particulate matter from the onshore project works. Data for Dounreay in 2015 indicates that wind direction is predominantly south-westerly, and wind speeds are generally in the range of 10 – 16 knots (DSRL, 2017).

Additionally, the grain size of superficial deposits may also influence dust dispersal radius. As described in Section 10.2.7.1, the superficial sediments encountered within the vicinity of the Onshore Study Area are found to be namely alluvium, blown sand, glacial sand and gravel (reworked till), raised marine deposits and till (diamictites). Glacial Till is the dominant type of superficial deposit within the Onshore Study Area. The actual materials encountered during excavations will depend on the final onshore cable routing and substation placement, however it is noted that the larger particle size materials (sand and gravel) are less likely to give rise to dust. Clay based material e.g. Glacial Till, is more likely to give rise to dust due to its small particle size.

A review of the 1:25,000 Ordnance Survey map of the Project area was used to identify human and ecological receptors in line with IAQM 2014 and IAQM 2020 guidance, which have the potential to be impacted by dust and particulate matter within the search area and close to the area. The findings are as summarised in Table 12-3.

Table 12-3 Receptors Screened for Potential Impacts from Air Quality Issues in the vicinity of the Onshore Project Area

Receptor Type	Within 100 m of the Onshore Study Area	Within 500 m of the Onshore Study Area	Specific Receptor
Hospitals, Care Homes and Schools	Not Present	Not present	None Identified
Residential Properties	Present	Present	Gunnerscroft
	Not Present	Present	Isauld Farmhouse
Non – Residential Properties	Present	Present	Isauld House (Farmstead) Dounreay Nuclear Facility

Receptor Type	Within 100 m of the Onshore Study Area	Within 500 m of the Onshore Study Area	Specific Receptor
			NRTE Vulcan Site
Amenity Areas	Not Present	Present	Reay Golf Course North Coast 500 Route
Designated Sites*	Present	n/a*	North Caithness SPA Sandside Bay SSSI
Red Data List Species*	Present	n/a*	Lapwing Skylark
Carparks	Present	Not Present	NRTE Vulcan Car Park

** Ecology receptors present within designated sites and Red Listed Species are only considered if present within the 100 m buffer, as per the 2014 IAQM guidance.*

12.3.8 Identification of Potential Impacts

Construction of the substation/switch gear building and access road will include groundworks, aggregates and cements all of which can be sources of dust.

Excavation works associated with the cable installation have the potential to give rise to dust impacts.

There is a carbon cost of construction associated with materials utilised and their transport. During operations the wind turbines will produce low carbon power, reducing the need for fossil fuel burning and hence provide a carbon saving and impacting positively towards climate change.

The substation/switch gear building has not as yet been designed hence the scale is unclear, however there is a potential for dust impacts on human health and ecology receptors, if mitigation is not implemented.

Due to the onshore cable run potentially traversing an area of up to 2 km, the excavation volumes may be significant and hence have the potential to give rise to an environmental impact on human health and ecology receptors if mitigation is not implemented. Similarly, the area of ground potentially uncovered during the construction of the new access road is such that dust impacts are potentially significant if mitigation is not implemented.

The overall carbon saving associated with the project have the potential to have a significant positive environmental impact on climate change, this will be scoped in to the EIA.

Table 12-4 provides a summary of potential impacts on onshore cultural heritage and archaeology that have been identified at this stage and justification for scoping in or out.

12.3.9 Cumulative Impact

The neighbouring nuclear sites of Vulcan and Dounreay may start demolition works while the Project is being constructed, demolition works can give rise to dust hence if they are being undertaken at the same time there is a potential for cumulative impacts.

Additionally, construction of the SHE-T Dounreay West Substation and the SHE- T Orkney – Caithness Interconnector onshore infrastructure may also cause cumulative impacts to arise if this work is conducted in tangent with construction of the onshore Project elements.

Furthermore, there may be potential cumulative impacts associated with the onshore infrastructure at Dounreay of the Pentland Floating Offshore Wind Demonstrator project, which may give rise to dust. However, the onshore infrastructure is expected to be minor in relation to the small-scale nature of the

Demonstrator project the exact timings for the construction of this project (if taken forward) are unknown although it will be independent of and ahead of installation activities associated with the Project array. Nonetheless, the significance of these impacts will be determined within the EIA once the design specification and relative timings for the onshore components are finalised.

Cumulative impacts associated with dust depending on the timing of activities on neighbour sites and developments have the potential to be significant and hence are scoped into the EIA.

Table 12-4 summarises the potential cumulative impacts and provides a justification for scoping these impacts in or out of the EIA.

Table 12-4 Potential impacts on Air Quality during Construction, Operations and Maintenance, and Decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
Dust (onshore construction)	Ground works and the use of aggregates and cements on the sub-station/switch gear construction site has the potential to give rise to local dust issues.	Scoped in
Dust (onshore cable laying)	Onshore cable laying will involve excavations, if stored spoil becomes dry then it can give rise to dust.	Scoped in
Dust (access road)	Ground works and the use of aggregates associated with the construction of a temporary access road has the potential to give rise to local dust issues.	Scoped in
Carbon cost (construction)	Carbon dioxide is the primary greenhouse gas emitted through human activities. The use of materials such as cement and steel, and their transport to the development site, has an associated carbon cost.	Scoped in
Potential Impacts During Operations and Maintenance		
Carbon saving (operation and maintenance)	The wind turbines will produce electricity with a minimal carbon cost and reduce the consumption of fossil fuels.	Scoped in
Potential Impacts During Decommissioning		
Dust (decommissioning)	As per construction there is a potential for dust to be created during the decommissioning of the sub-station/switch gear, especially if the floor is to be removed as it will need to be broken up. Similarly, if the onshore cable is to be removed then the excavation of soil could give rise to dust.	Scoped in
Carbon cost (decommissioning)	The carbon cost of decommissioning will primarily be associated with fuel for vehicle and vessel movements. The recycling of materials could help to minimise the lifecycle carbon cost of the project.	Scoped in
Potential Cumulative Impacts		
Potential demolition works being carried out at the adjacent nuclear sites, the construction of the SHE-T Dounreay West Substation, and the SHE-T Orkney - Caithness Interconnector onshore elements and the construction of the Pentland Floating Offshore Wind Demonstrator could give rise to cumulative impacts depending on the timings associated with these activities in connection with the Project onshore activities.		Scoped in

12.3.10 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 12-5. These methods will be used alongside input from the relevant guidance as identified in Section 12.3.2.

Table 12-5 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Dust (onshore construction, onshore cable laying and access road)	No surveys are proposed.	Dust can be managed using standard construction management techniques, such as those discussed in Pollution Prevention Guidelines 6 (PPG6): Working at Construction and Demolition Sites (SEPA et al., 2012). As such with mitigation no significant impact is predicted. It is proposed that an assessment of dust impacts is carried out utilising the Institute of Air Quality Management (IAQM) Assessment of Dust from Demolition and Construction Sites (IAQM, 2014) methodology and the IAQM Guide to the assessment of air quality impacts on designated nature conservation sites (IAQM, 2020). The methodology will assist in ensuring that appropriate mitigation methods are identified and if appropriate, monitoring is to be employed to check its effectiveness.
Carbon cost and carbon saving	No surveys are proposed.	An estimate of the carbon cost of the construction and decommissioning of the project will be made based on the proposed construction materials, quantities and published carbon equivalences where available. The carbon cost of transport will be estimated, taking account of where the components are to be transported from and how they will be moved. The carbon saving associated with the electricity production will also be estimated. The costs and savings carbon information will then be combined to identify the overall carbon benefit of the Project.
Cumulative Impacts	No surveys are proposed.	Desk based study on cumulative impacts utilising available consenting documents written for each of the developments, as well as consultation with the Highland Council and other developers e.g. DSRL, NDA, Vulcan, SHE-T and SHE-T to understand timelines and potential cumulative impacts.

12.3.11 Conclusions and Next Steps

The Project has the potential to give rise to dust during construction and decommissioning activities, due to the area of groundworks and potential for cumulative impacts, there is a potential for this to have a significant impact in EIA terms. Dust can however be mitigated to reduce impacts, as such, appropriate mitigation will be identified as part of the EIA process.

As a renewable energy project, this Project could give rise to a carbon saving which will have a beneficial environmental impact, this will be assessed within the EIA.

12.4 Landscape and Visual Amenity

12.4.1 Introduction

This section of the Scoping Report sets out the proposed methodology and approach to be applied in the production of the Landscape and Visual Impact Assessment (LVIA) of the onshore components of the Project. It also presents the suggested scope of the LVIA in terms of those landscape and visual receptors to be scoped in and scoped out of the EIA. Justification of the suggested scope is presented through a preliminary appraisal of all relevant receptors in respect of their potential to be significantly affected by the onshore Project.

The purpose of the LVIA is to identify and record the potential effects that the onshore Project may have on the landscape and visual resource, taking into account effects on the landscape elements of the identified Project Site; the landscape character of the Site and surrounding area; areas that have been designated for their scenic or landscape-related qualities; and views from various locations such as settlements, routes, hilltops and other sensitive locations. The potential cumulative effects that may arise from the addition of the Project to other onshore and offshore energy infrastructure developments, will also be considered.

The LVIA will consider the potential effects of the Project during the construction, operations and maintenance and decommissioning of the Project. Landscape and visual receptors may or may not be affected at all three development stages. The onshore Project area is considered to be the onshore cable search area (from Mean Low Water Springs (MLWS)), cable jointing infrastructure and onshore substation which may include switchgear, transformers, harmonic filter, reactive compensation devices, protection equipment and other auxiliary equipment. At this stage it has not been determined where these elements of the Project will be located and therefore this Scoping Report is based on an 'onshore study area', as illustrated in Figure 12-3.

If any uncertainty regarding the final layout or dimensions of the onshore Project remain at the time of writing the LVIA, a worst case assumption will be applied. This will include the maximum Design Envelope parameters for the component parts of the Project which would result in the greatest potential impacts upon the landscape and visual receptors.

The Scoping Report for the SLVIA of the offshore components of the Project is presented in Section 9.5: Seascape, Landscape and Visual Impact.

12.4.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts on air quality receptors:

Legislation

> the Town and County Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (the 'EIA Regulations').

Policy

> Highland wide Development Plan (2012); and

> Scottish Planning Policy (2014)

Guidance

As a matter of best practice, the LVIA will be undertaken with regard to the following published guidance. This list is not definitive and the LVIA will take note of all current and relevant guidance.

> Landscape Institute and the Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3).

- Countryside Agency and Scottish Natural Heritage (2002). Guidelines for Landscape Character Assessment.
- Scottish Natural Heritage (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments.
- Scottish Natural Heritage (2020). Assessing the Impacts on Wild Land: Technical Guidance.
- Landscape Institute September 2019). Visual Representation of Development Proposals Technical Guidance Note 06/19.

12.4.3 LVIA Study Area

For the purposes of the LVIA, a study area of 5 km will be applied to determine the extent of potentially significant effects. The radius of this study area is set 5 km from the boundary of the onshore Project area, as shown in Figure 12-3. The extent of the study area is based on descriptions of the onshore components of the Project, good working knowledge of the area, and information drawn from the Zone of Theoretical Visibility (ZTV) map. These sources have shown that visibility of the onshore Project will be largely contained within the 5 km study area. This relates to the enclosure of landform which gradually rises up from the coastal edge, as well as large-scale forestry which covers the sweeping moorlands to the south.

The ZTV illustrates theoretical visibility of the entire Onshore Search Area (rather than an identified substation location within it) and is shown in Figure 12-4. This is based on screening by landform and does not take into account the additional screening from above ground features such as forestry or buildings. The study area is not intended to identify the outer limit to which the onshore components of the Project will be visible, but instead to ensure that an area is defined which covers all potential significant effects.

12.4.4 LVIA Methodology and Approach

This Scoping Report has been informed by a preliminary appraisal. This has been initiated through a desk study of the Site and 5 km radius study area, combined with a good working knowledge of this area. This study has identified aspects of the landscape and visual resource that will need to be considered in the LVIA, including:

- Landscape elements;
- Landscape Character Types (LCTs);
- East Halladale Flows Wild Land Area (WLA);
- Roads, paths and hilltops;
- Settlements; and
- Potential cumulative energy developments.

Figure 12-3 Onshore LVIA Study Area

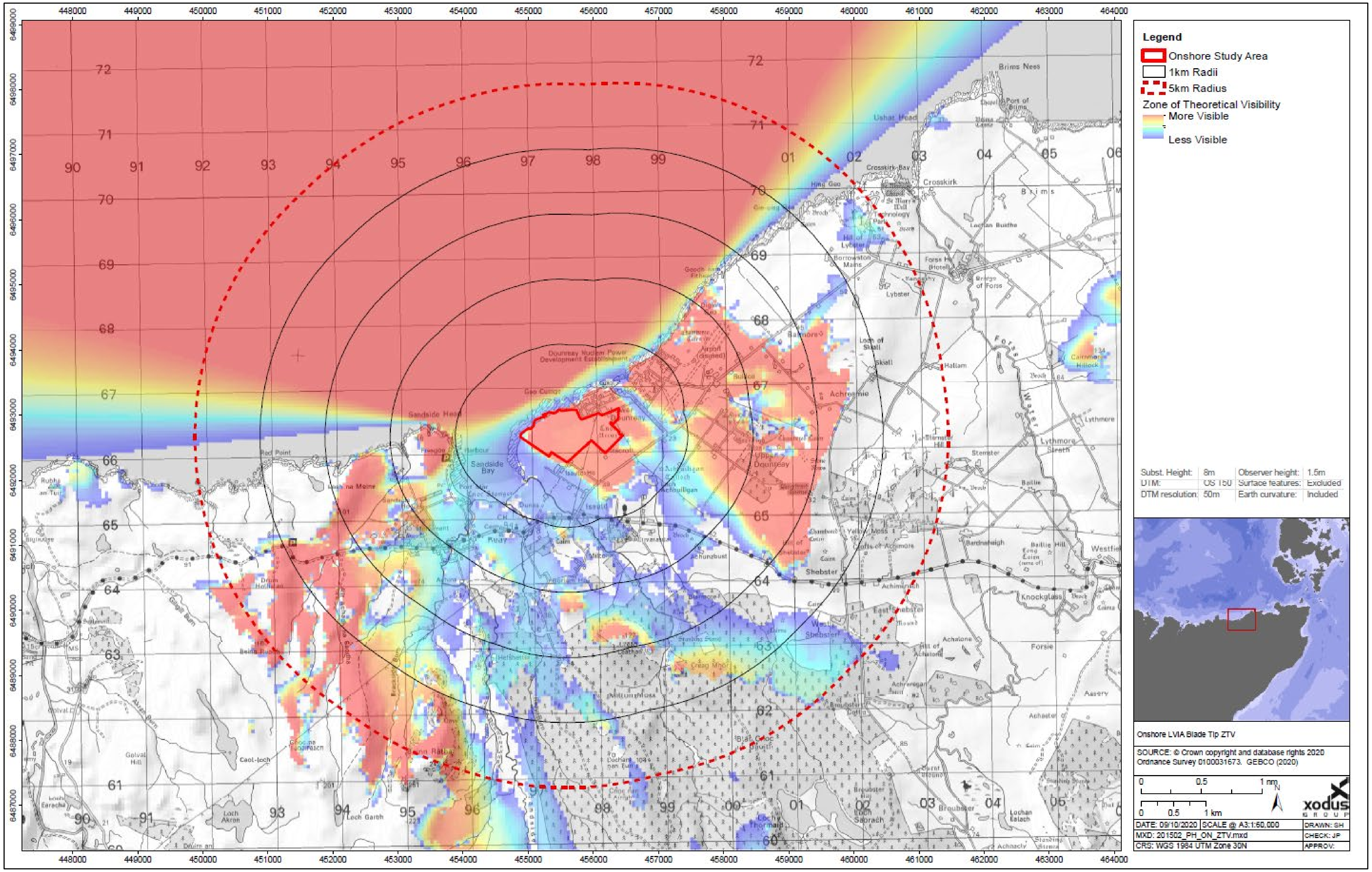


Figure 12-4 Onshore LVIA Blade Tip ZTV

The desk study has also utilised Geographic Information System (GIS) software to explore the potential visibility of the Project. The resultant ZTV diagram (Figure 12-4) have provided an indication of which landscape and visual receptors may be affected by the onshore Project.

The LVIA is intended to determine the effects that the Project would have on the landscape and visual resource. For the purpose of assessment, the potential effects on the landscape and visual resource are grouped into five categories.

Physical effects: physical effects are restricted to the area within the Site and are the direct effects on the existing fabric of the Site. This category of effects is made up of landscape elements, which are the components of the landscape such as rough grassland and moorland that may be directly and physically affected by the Project.

Effects on landscape character: landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and the way that this pattern is perceived. Effects on landscape character arise either through the introduction of new elements that physically alter this pattern of elements or through visibility of the Project that may alter the way in which the pattern of elements is perceived. This category of effects is made up of landscape character receptors, which fall into three groups; landscape character areas, coastal character areas and landscape-related designated areas.

Effects on wild land: the assessment of the effects on the wild land qualities of the Wild Land Areas through consideration of the impacts on the physical attributes and perceptual responses identified.

Effects on views: the assessment of the effects on views is an assessment of how the introduction of the Project would affect views throughout the study area. The assessment of effects on views is carried out in relation to representative viewpoints and principal visual receptors.

Cumulative effects: cumulative effects arise where the study areas for two or more large-scale developments overlap so that both of the large-scale developments are experienced at a proximity where they may have a greater incremental effect, or where large-scale developments may combine to have a sequential effect. In accordance with guidance, the LVIA assesses the effect arising from the addition of the Project to the cumulative situation.

The objective of the LVIA is to predict the likely significant effects on the landscape and visual resource. In line with the EIA regulations, the LVIA effects are assessed to be either significant or not significant.

The significance of effects is assessed through a combination of two considerations: the sensitivity of the landscape or visual receptor and the magnitude of change that would result from the addition of the Project.

The geographic extent over which the landscape and visual effects would be experienced is also assessed, which is distinct from the size or scale of effect. This evaluation is not combined in the assessment of the level of magnitude but instead is used in determining the extent in which a particular magnitude of change is experienced and the extent of the significant and non-significant effects. The extent of the effects would vary depending on the specific nature of the Project and is principally assessed through analysis of the geographical extent of visibility of the Project across the landscape or principal visual receptor.

The duration and reversibility of effects on views are based on the period over which the Project is likely to exist, and the extent to which the Project will be removed and its effects reversed at the end of that period. Duration and reversibility are not incorporated into the overall magnitude of change and may be stated separately in relation to the assessed effects.

The 'nature of effects' relates to whether the effects of the Project are adverse, neutral or beneficial. Guidance provided in GLVIA3 states that "thought must be given to whether the likely significant landscape and visual effects are judged to be positive (beneficial) or negative (adverse) in their consequences for landscape or for views and visual amenity" but does not provide an indication as to how that may be established in practice. The nature of effect is therefore one that requires interpretation and reasoned professional opinion.

OPEN generally adopts a precautionary approach which assumes that significant landscape and visual effects will be weighed on the negative side of the planning balance, although positive or neutral effects may arise in certain situations.

12.4.5 Baseline Studies and LVIA Production

The detailed assessments presented in the LVIA will be based on a combination of desk-based study and site work. The assessment of effects on landscape and coastal character will make reference to the following sources:

> Scottish Natural Heritage's Landscape Character Assessment of Scotland available at:

https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions

> Scottish Natural Heritage (2016). Landscape Character Assessment: Orkney and North Caithness.

An understanding of the potential effects of the onshore Project on landscape and visual receptors will be developed through detailed study of the ZTV for the Project. The assessment will be further developed on Site, where ZTVs and wirelines from the selected viewpoints will be used to establish whether the effects of the Project will be significant or not. Field surveys will be carried out throughout the 5 km radius study area, although the focus will be on those areas most sensitive to potential significant effects.

The written LVIA will be accompanied by a volume of figures, which will be divided into two categories; maps and visualisations. The maps will be based on the 5 km study area around the Project and will present data of relevance to the assessment, such as the location of the LCTs, viewpoints, and cumulative developments. It is proposed that the visualisations will be based on five viewpoint locations, selected to represent sensitive views and visual receptors in the study area. For each viewpoint there will be a baseline photograph and an accompanying photomontage, which will use the baseline photography and add onto this a computer-generated model of the onshore substation.

12.4.6 Consultation

Consultation with stakeholders is an important part of the EIA process. NatureScot and The Highland Council (THC) were consulted, in respect of the LVIA included in the previous application. Comments on the previous application have helped inform the proposed approach and scope of the new application. The similarities between these applications, in particular the scale of the onshore infrastructure, means that the original consultation comments are relevant to the updated project design. The conclusion presented in North Planning Applications Committee Report (10th January 2016) stated '*It is not considered that the onshore elements will result in significant adverse landscape impacts given the siting and scale of these within the site are identified.'* Despite this finding, a full and comprehensive LVIA will be carried out to ensure all potential significant effects are assessed. It is proposed that additional consultation is carried out during the assessment phase with THC and NatureScot.

Following a Pre-application Advice Meeting, held between The Highland Council, NatureScot and the Applicant Xodus, on 9th September 2020, Pre-application Advice was issued by The Highland Council on 7th October 2020. Comments made by The Highland Council have helped inform this Scoping Report and will be considered in the SLVIA.

It is proposed that additional consultation is held in the assessment phase with THC and NatureScot.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

12.4.7 Description of the Current Environment

The onshore Site is located in Caithness, on the northern coast of Scotland. It lies to the immediate south-east of the Dounreay Nuclear Facility, on an adjoining area of land. The A836 passes to the south of the Site and the village of Reay lies less than 1 km to the south and south-west. The local landscape is characterised by a coastal edge of rocky headlands and high cliffs, with intermittent and enclosed sandy bays, backed by dunes and low-lying pasture. To the south and west, the landform rises gradually, transitioning from a farmed landscape into an expanse of sweeping moorland, with commercial forestry covering extensive tracts of land.

The northern coastline is settled and cultivated. The A836 is the main coastal road, extending from Tongue in the west, to John 'O Groats in the east. This forms part of National Cycle Route 1 and North Coast 500, making this route popular with cyclists and motorists. This road passes close to the southern boundary of the onshore Project Area. While views from the A836 are mostly open, enclosure occurs through Reay and the woodland block to the west of this settlement. The farmland comprises a mix of arable and livestock, with fields small to medium in size, and enclosed either by post and wire fencing or traditional slate walls. The landscape is relatively open and exposed, with trees typically concentrated in larger blocks of commercial forestry on the less fertile land.

The landform along the coast is generally low-lying and gently undulating, albeit with sections of high cliffs occurring along some coastal edges. While the low hills to the south are covered in forestry, those to the south-west are open. These include the high point of Beinn Ratha, which although only at 242 m AOD, presents a broad panorama across the surrounding low-lying landscape and seascape and is located with the East Halladale Flows WLA.

To the immediate east of the Project, lies the large-scale buildings and structures at the Dounreay Nuclear Facility which are prominent in views across the Caithness landscape. Management at Dounreay is now focussed on the decommissioning of the reactors, ancillary nuclear facilities and the restoration of the environment. The detail and extent of decommissioning at Dounreay aims to complete site closure by 2030. The impacts of the onshore Project, in respect of the future scenario in which Dounreay Nuclear Facility will be decommissioned, will be considered in the LVIA.

12.4.8 Identification of Potential Impacts

There is potential for the onshore Project to give rise to significant impacts on landscape and coastal character, as well as on the visual amenity of locals and visitors. Listed below are some of the key receptors that will be considered in the LVIA;

- Coastal and hinterland landscapes with a strong association with the Site;
- Coastal settlements with views of the Site;
- Roads with views of the Site;
- Adjacent beaches, coastal paths and other areas of high amenity value;
- Hill tops in the hinterland representative of walkers and of the East Halladale Flows WLA.

Key sensitivities when considering LVIA are anticipated to comprise:

- Seascape and landscape character areas; and
- Onshore and offshore visual receptors.

Potential impacts are those which could result from the construction, operations and maintenance or decommissioning of the onshore Project, according to the characteristics of the Site, the Project, the landscape and visual receptors, and the interactions between these factors. Table 12-6 describes the potential landscape and visual effects that may arise as a result of the onshore Project. Their inclusion in the table does not imply that they will occur, or occur as significant effects, but instead, highlights their importance as key considerations to be scoped in to the LVIA.

Table 12-6 Potential Impacts Associated with LVIA during Construction, Operations and Maintenance, and Decommissioning of the Project

<table>
<tr><th>Source of Impacts</th><th>Potential Impacts</th><th>Potential Receptors affected</th><th>Scoped In / Out</th></tr>
<tr><td colspan="4">Potential Impacts During Construction</td></tr>
<tr><td>Presence and activity of construction plant and vehicles</td><td>The presence and activity of construction plant used to construct and erect the onshore components of the wind farm will form a notable addition, albeit in an area where large-scale energy developments already have an influence. Other potential impacts may result from presence of drilling equipment and increased vehicle movements in the area as plant, materials and personnel are moved to and from the Site.</td><td rowspan="3">Direct, temporary and long-term impacts on the landscape element of the agricultural land which will be removed for construction works associated with the construction of the access road and onshore substation. Direct, temporary and short-term impacts on agricultural land which will be removed for construction works associated with landfall, onshore cable route, temporary tracks and temporary construction compound.

Indirect, temporary and short-term impacts on coastal and landscape character where the presence and activity of construction plant, emergence of the onshore substation and use of night-time lighting would alter their contextual character.

Indirect, temporary and short-term impacts on onshore visual receptors, especially where formal viewpoints, settlements, roads, footpaths, hill-tops and other amenity locations have a close association with this section of coastline. The movement of plant and vehicles, activity of construction and use of lighting will add to the potential visual impact.</td><td rowspan="3">Scoped in</td></tr>
<tr><td>Construction of onshore substation, landfall and onshore cable route</td><td>Construction of fenced substation compound 100 m x 50 m containing electrical infrastructure with a maximum height of 8 m. Construction of permanent and temporary tracks, landfall, onshore cable route and temporary construction compounds. With the exception of the substation, the majority of these works will be relatively small scale and their effect will be moderated by the existing influence of Dounreay Nuclear Facility.</td></tr>
<tr><td>Use of lighting during construction</td><td>Construction is likely to take place in the hours of darkness, especially during the winter months and, therefore, will require night-time lighting. The effects of lighting will be moderated by existing site lighting at Dounreay Nuclear Facility.</td></tr>
<tr><td colspan="4">Potential Impacts During Operations and Maintenance</td></tr>
<tr><td>Presence of onshore substation</td><td>The presence of the onshore substation, with a footprint of 100 m x 50 m, up to a maximum height of 8 m, will add to the extent of large-scale energy developments located at Dounreay Nuclear Facility.</td><td>Indirect, temporary and long-term impacts on coastal and landscape character where the presence of the substation has the potential to alter their contextual character.</td><td>Scoped in</td></tr>
</table>

Source of Impacts	Potential Impacts	Potential Receptors affected	Scoped In / Out
Use of lighting during operations and maintenance	The substation may require low-level night-time lighting for security.	Indirect, temporary and long-term impacts on visual receptors, especially where, settlements, roads, footpaths, hill-tops and other amenity locations have a close association with this section of coastline.	Scoped in
Potential Impacts During Decommissioning			
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding those arising during the construction phase. These would be indirect, temporary and short-term.			Scoped in
Potential Cumulative Impacts			
The potential for cumulative impacts will be assessed during the EIA process. The EIA will consider the impacts of the construction, operations and maintenance, and decommissioning of the Project cumulatively with other operational and proposed onshore and offshore wind farms and other large-scale energy developments. The key cumulative projects include: > Onshore and offshore visual receptors. > The consented SHE-T Orkney-Caithness Interconnector Cable Project; > The proposed Pentland Floating Offshore Wind Demonstrator > The consented onshore Limekiln Wind Farm; > The consented SHE-T Dounreay West Substation; > The proposed onshore Drum Hollistan Wind Farm; > Decommissioning and remediation activities of the Dounreay Nuclear Site and Vulcan Site; > Potential developments within the ScotWind N1 DPO site; > The consented Sutherland SpaceHub; and > The MeyGen Tidal Energy Project (under construction).			Scoped in

12.4.9 Preliminary Landscape and Visual Appraisal

A preliminary landscape and visual appraisal has been undertaken to inform this Scoping Report. This has been used to define the scope of the assessment in terms of identifying those landscape and visual receptors with potential to be significantly affected and which, therefore, require detailed assessment in the LVIA. This preliminary appraisal has been informed by desk based study, including the production of ZTVs, along with good working knowledge of the area. Should the current assumptions about the Project (located within the search area currently being considered) alter materially this preliminary appraisal will be reviewed accordingly to ascertain if any receptors require to be added back into the scope of the LVIA.

12.4.10 Potential Effects on Landscape Elements

Effects on landscape elements are the direct physical effects on the fabric of the Site. In respect of the Site, this will mostly comprise the loss of agricultural land within the Site boundary of the onshore Project area. The construction of the landfall, onshore cable routes and substation will result in the loss of areas of the existing agricultural land. In addition, permanent and temporary access tracks and construction compounds will also be required in this area. The LVIA will consider the direct effects of the onshore components of the Project on the landscape element of the agricultural land.

12.4.11 Potential Effects on Landscape Character / Coastal Character

The classification of landscape character is contained in NatureScot's Landscape Character Assessment GIS dataset, which divides the landscape into areas of distinctive character, referred to as Landscape Character Types (LCTs). The distribution and extent of the LCTs within the 5 km study area is shown in Figure 12-5. LCTs will be used as the basis of the landscape character assessment, with reference made to the LCT descriptions on NatureScot's website.

In addition to the assessment of effects on landscape character, the LVIA will also consider the effects on coastal character. The basis of this assessment is SNH's 2016 publication entitled 'Coastal Character Assessment: Orkney and North Caithness', which presents classification descriptions for regional and local coastal character areas around all the Orkney and North Caithness coastlines. The distribution and extent of the Regional Coastal Character Areas (RCCAs) within the 5 km study area is shown in Figure 12-5.

The ZTV in Figure 12-4 shows that theoretical visibility of the onshore Project will be relatively continuous within the extent of the 5 km study area. In respect of the RCCAs, their close proximity and exposed nature mean that there is the potential for a significant effect to arise and that all should be included in the detailed assessment of the LVIA. In respect of the LCTs, it is recommended that the Farmed Lowland Plain LCT be included as the onshore Project is located in this LCT, and that the neighbouring Sandy Beaches and Dune LCT, and Cliffs and Sheltered Cliffs and Bay LCT be included, owing to their close proximity and exposed nature. It is recommended, however, that the Sweeping Moorland and Flows be scoped out of the detailed assessment owing to its separation distance from the onshore Project and the existing influence on landscape character that already occurs from this sector, owing to the presence of Dounreay Nuclear Facility.

12.4.12 Potential Effects on Landscape Designations

The Site and 5 km study area are not subject to any national, regional or local landscape designations which would otherwise denote a special landscape value (as highlighted in Figure 12-6). The Project will not have the potential to give rise to significant effects on landscape designations and, therefore, it is recommended that landscape designations be scoped out of the assessment.

12.4.13 Potential Effects on Wild Land

While the Site is not subject to definition as a Wild Land Area (WLA), the East Halladale Flows WLA is located to the south-east of the study area, at a minimum distance of 3.7 km from the Project (as highlighted in Figure 12-6). The ZTV in Figure 12-4 shows theoretical visibility to occur across this northern tip of the WLA, albeit in an area where visibility of the existing Dounreay Nuclear Facility and other human influences already occur. The scale of the Project, in relation to the scale of the existing developments, will ensure that the Project will not form a notable addition. Despite the limited potential for East Halladale Flows WLA to be significantly affected by the onshore Project in respect of the baseline situation, it is included in the LVIA to cover the future scenario, in which Dounreay Nuclear Facility is fully decommissioned by 2030. It is therefore, recommended that East Halladale Flows be scoped into the LVIA.

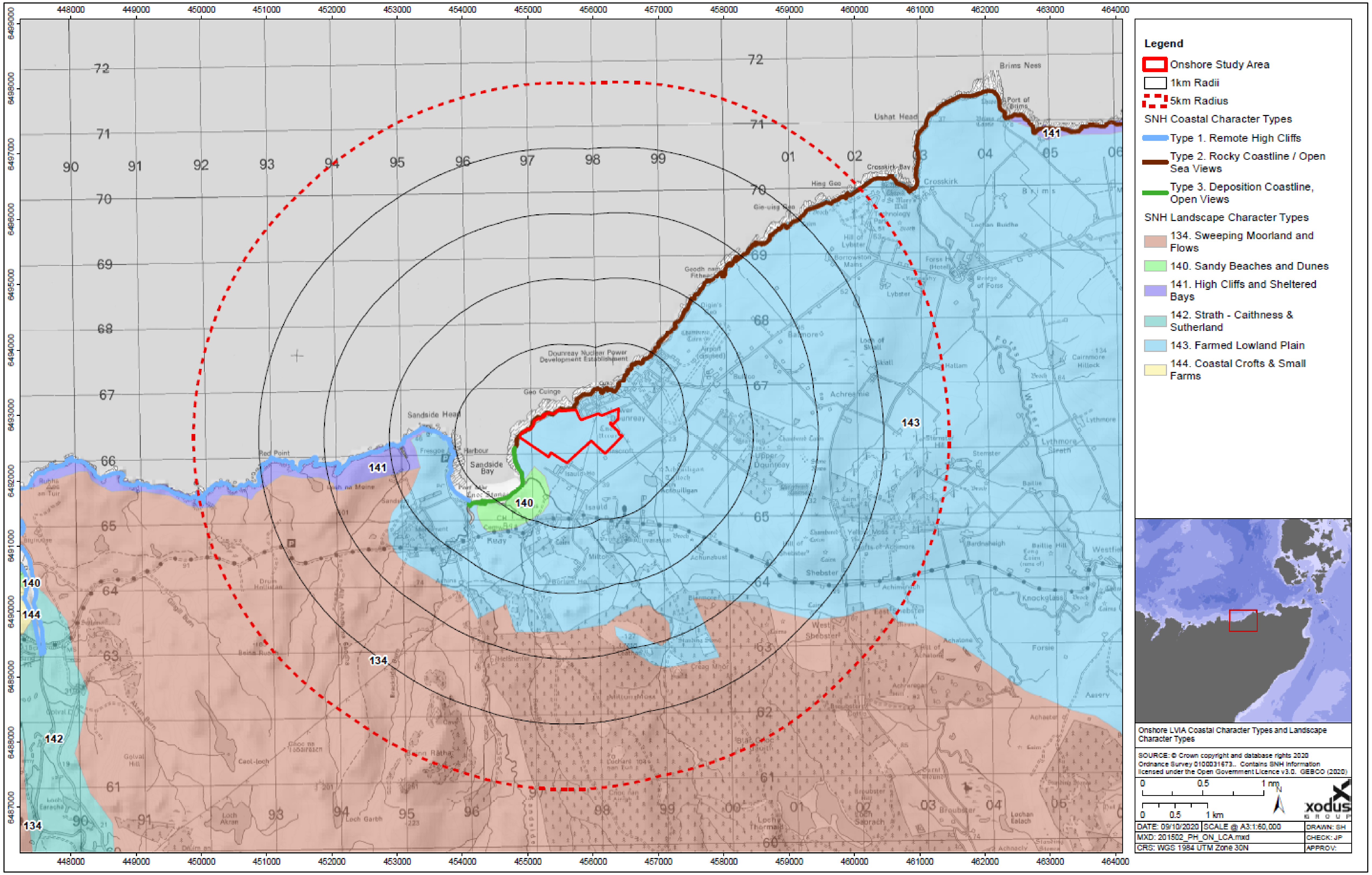


Figure 12-5 LVIA Coastal Character Types and Landscape Character Types

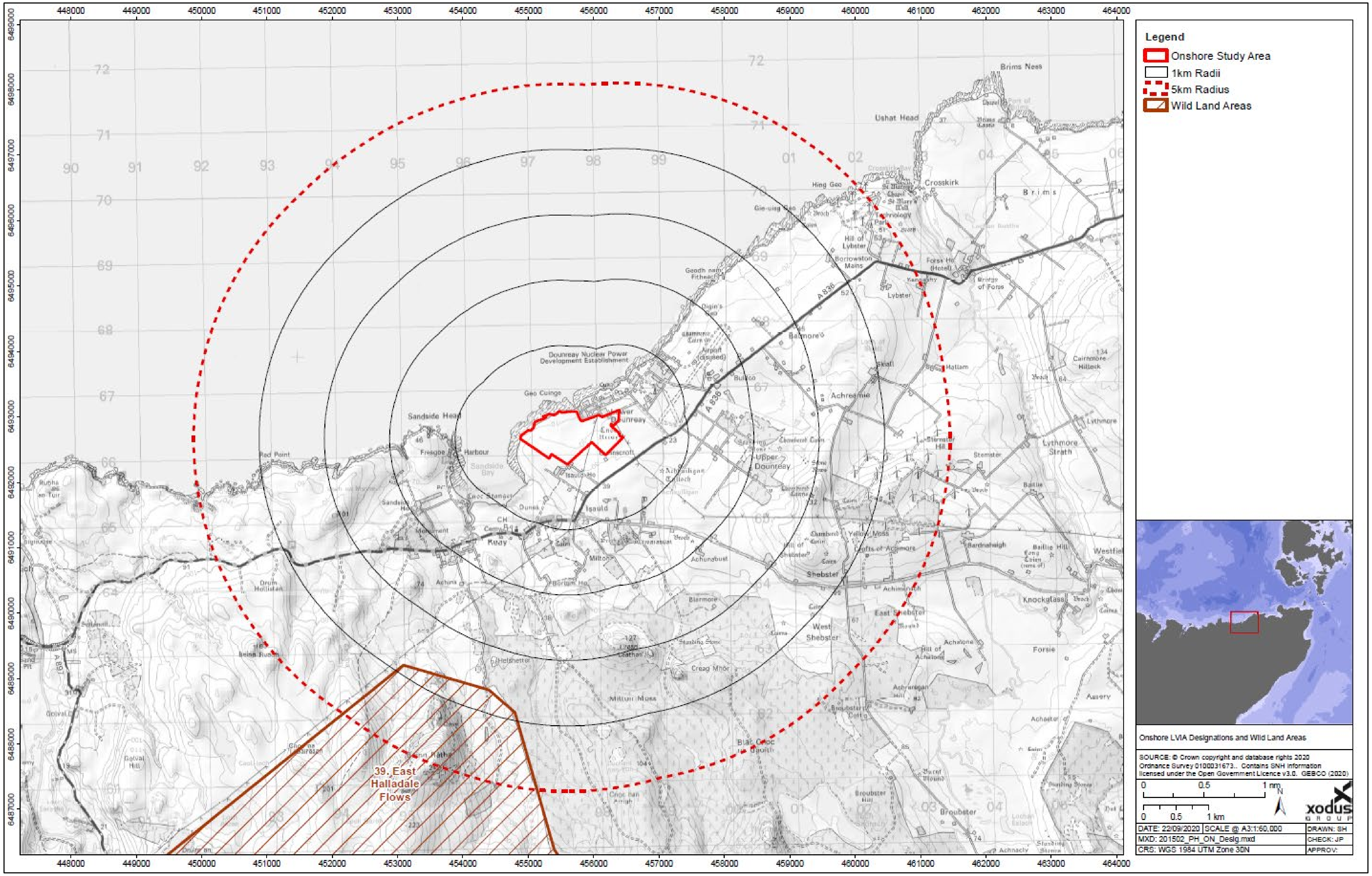


Figure 12-6 LVIA Designations and Wild Land Areas

12.4.14 Potential Effects on Visual Receptors

A preliminary viewpoint list is presented in Table 12-7 below. The locations of the viewpoints are shown in Figure 12-7 with the principal visual receptors shown in Figure 12-8. The preliminary list has been informed by the selection made in the previous LVIA. The list has been updated to ensure all potential close range significant effects are being fully covered.

The viewpoints represent sensitive visual receptors in the study area, which have potential to be significantly affected. The selection of the viewpoints also considers the representation of the landscape receptors within which they are located, and the representation of the surrounding cumulative context, with both these considerations helping to inform the wider assessment. While it is important to achieve a distribution of viewpoints from different directions and distances across the study area, the overall aim is to ensure that the closer range receptors with the greatest potential to be significantly affected are fully represented.

The key receptors to be considered in the LVIA will be road-users on the nearby A836 (North Coast 500 / National Cycle Route 1) who will come into close proximity to the onshore Project. A viewpoint at the entrance to Dounreay Nuclear Facility has been included to represent these close range views as well as Drum Hollistan layby, which presents a more elevated perspective within the context of the wider coastline. Residents of, and visitors to, the nearby settlement of Reay are also important to represent, and, therefore, viewpoints have been included from the car park at Sandside Bay and Reay Golf Course, both of which present open views towards the onshore Project. Views of walkers in the upland landscape to the south-west are represented by the viewpoint on Beinn Ratha, which is also representative of the East Halladale Flow WLA.

Comment on the proposed viewpoint locations is invited as part of this request for a Scoping Opinion. The visualisations will accord with Type 4 in the Landscape Institute's guidance (2019). They will indicate the maximum substation parameters/Design Envelope (AVR Level 1, Landscape Institute (2019)) with baseline views and visualisations presented as 53.5-degree field of view (planar projection). If mitigation planting or landform is proposed, then the Project would be illustrated without this mitigation shown and with it shown at year 15 of its establishment.

Table 12-7 Preliminary Viewpoint List

VP	Name	Approx OS Ref	Approx. Elevation	Key Reasons for selection
1	Sandside Harbour car park	NC95777/65913	10 m AOD	Walkers / Visitors
2	A836, Doun Reay entrance	NC99092/66286	20 m AOD	Road-users / Residents
3	Reay Golf Course	NC96562/64972	10 m AOD	Golfers / Walkers / Residents
4	A836, Drum Holliston layby	NC93261/64623	90 m AOD	Road-users
5	Beinn Ratha	NC94972, 61078	251 m AOD	Hill walkers Representative of East Halladale Flows WLA

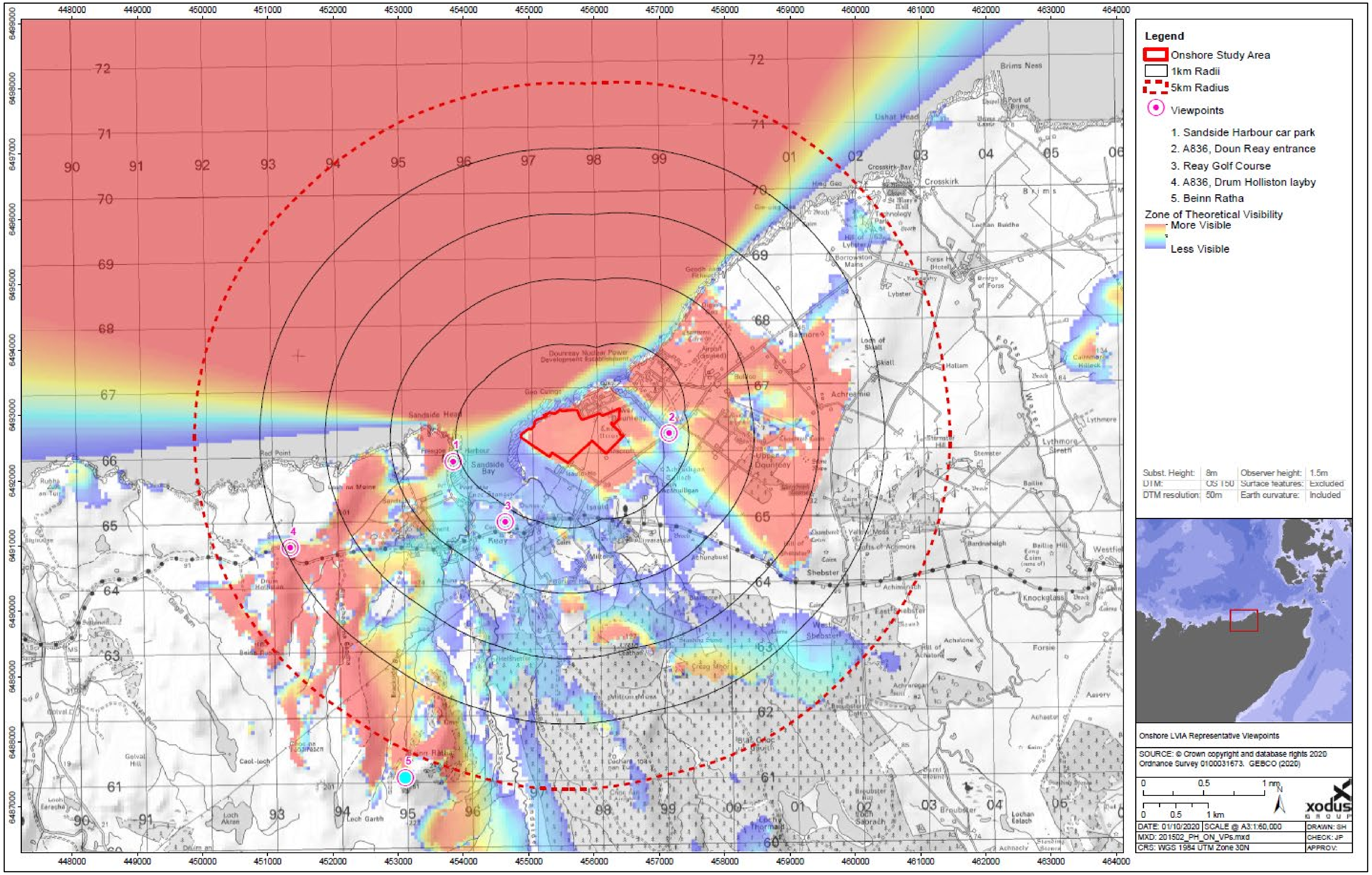


Figure 12-7 LVIA Representative Views

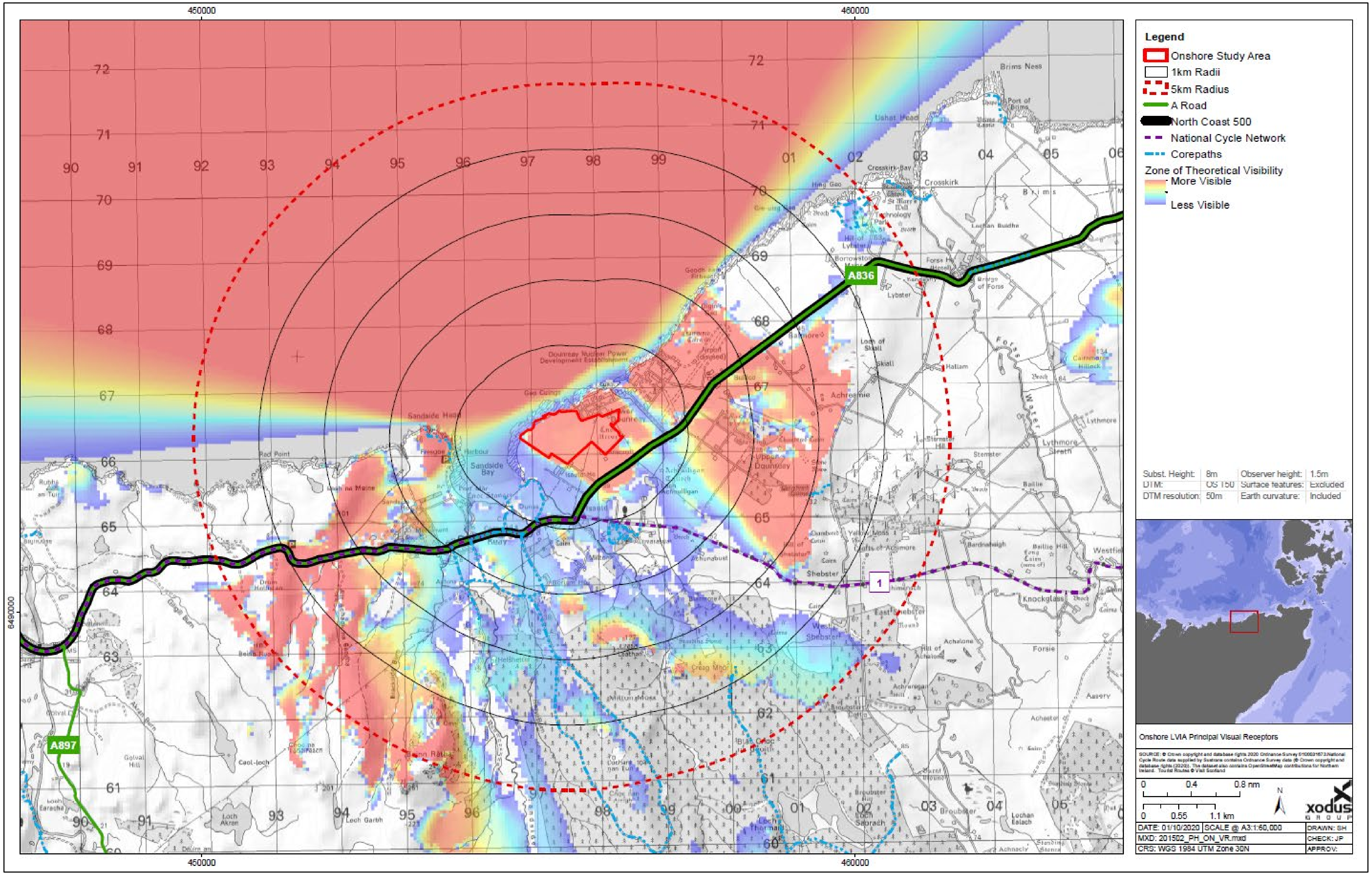


Figure 12-8 LVIA Principal Visual Receptors

12.4.15 Potential Cumulative Effects

The assessment of cumulative effects describes the effects arising from the addition of the onshore Project to a cumulative baseline of operational, under construction, consented and application stage wind farms or other large-scale energy developments within a 5 km study area. This assessment will include supporting graphics such as cumulative ZTVs and cumulative wirelines.

Currently the only proposed wind farm within 5 km of the study is the Pentland Floating Offshore Wind Demonstrator which will utilise the existing Dounreay Tri consent for the site, making landfall at Dounreay (however, in the event the Demonstrator is taken forward this would form part of the wider PFOWF array considered within this Report).

The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, it would be independent of and ahead of installation activities associated with the Project array. Nonetheless, due to the limited size of the Demonstrator, cumulative impacts on LVIA receptors are anticipated to be minor, however the significance of these impacts will be determined within the EIA once the design specification for the onshore components are finalised

There are no other large-scale energy developments located in the 5 km study area, other than Dounreay Nuclear Facility, which will be considered as part of the baseline in the main assessment of the LVIA as well as the proposed 132kV overhead line to connect Limekiln Wind Farm with the existing Dounreay substation. This situation will be monitored and any developments that arise will be included in the cumulative assessment.

12.4.16 Conclusions and Next Steps

This Scoping Report seeks agreement that the following landscape and visual receptors be scoped into the LVIA for the onshore Project;

- Landscape element: Agricultural land;
- Landscape Character Types: Farmed Lowland Plain LCT / Sandy Beaches and Dunes LCT / High Cliffs and Sheltered Bays LCT;
- Regional Coastal Character Areas: Remote High Cliffs RCCA / Rocky Coastline RCCA / Deposition Coastline RCCA;
- East Halladale Flows WLA;
- Viewpoints: Sandside Harbour car park / A836, Dounreay entrance / Reay Golf Course / A836, Drum Holliston layby / Beinn Ratha; and
- Cumulative Assessment: all operational, under construction, consented and application stage onshore and offshore wind farms over 50 m to blade tip and all other large-scale energy infrastructure, including the offshore Project (and associated Demonstrator).

The Scoping Report seeks agreement that the following landscape and visual receptors be scoped out of the assessment of the onshore Project.

- Landscape Character Types: Sweeping Moorlands and Flows LCT.
- Landscape designations: including all NSAs, SLAs and GDLs.
- WLAs: with the exception of East Halladale Flows WLA.

THC’s and NatureScot’s agreement to the recommended scope of the LVIA is sought through this Scoping Report, in order to enable the LVIA to be focussed on key considerations.

12.5 Traffic and Transport

12.5.1 Introduction

This Section considers the potential traffic and transport impact caused by the construction of the onshore components of the Project and assesses the potential impacts upon the local and trunk road network.

During the construction, operations and maintenance, and decommissioning of the Project both materials and personnel will need to travel to the site, hence it is important to understand whether or not this will have a significant impact on traffic and transport in the area.

12.5.2 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts from traffic and transport:

Legislation

> Roads (Scotland) Act 1984;

> The Roads (Scotland) Act 1984 (Environmental Impact Assessment) Regulations 2017;

Policy

> Highland-wide Local Development Plan (2012) Planning Policies (Policy 56 – Travel and Policy 77- Public Access);

Guidance

The main EIA guidance for traffic assessment are:

> Institution of Highways and Transportation (IHT), Guidelines for Traffic Impact Assessment (IHT,1994);

> Institute of Environmental Assessment (now the Institute of Environmental Management and Assessment (IEMA) (1993), Guidelines for the Environmental Assessment of Road Traffic, Guidance Notes No. 1 (referred to as 'the IEMA Guidelines') (IEMA, 1993);

> Transport Scotland Transport Assessment Guidance (Transport Scotland, 2012);

> The Highland Council Roads and Transport Guidelines for New Developments (2013);

> Scottish Government, NESA Manual, DMRB, Volume 15, Economic Assessment of Road Schemes in Scotland (Scottish Government, 2005); and

> The Royal Society for the Prevention of Accidents (ROSPA) Road Safety Engineering Manual (ROSPA, 2007).

Additionally, Scotland's National Transport Strategy (Transport Scotland, 2016) outlines a framework for transport in Scotland up to around 2026. Two of the high-level objectives within the strategy are applicable to the development, these are:

> *protect our environment and improve health by building and investing in public transport and other types of efficient and sustainable transport which minimise emissions and consumption of resources and energy; and*

> *improve safety of journeys by reducing accidents and enhancing the personal safety of pedestrians, drivers, passengers and staff.*

12.5.3 Available Information

A permanent access road to the new substation is likely to be required during operations along with temporary access during construction works; the routing for this is not as yet known, however it is assumed that it will have a junction with the A836, potentially utilising the existing access road to the existing Dounreay substation.

With regard to traffic and vehicle types required for the construction the full details are yet to be developed however some initial worst-case assumptions can be made, these are provided in Table 12-8.

During operations there will be minimal traffic associated with operations and maintenance activities. Decommissioning traffic levels are assumed to be no higher than those associated with construction.

The Department of Transport Road Traffic Statistics interactive map collates traffic movement data, relevant information from which has been considered from https://roadtraffic.dft.gov.uk/#14/58.5806/-3.7395/basemap-countpoints.

The main source of traffic on the A836 is associated with people travelling to and from the Dounreay and Vulcan Nuclear sites for work. Hence the start and finish times for the shift patterns will provide a good understanding of when peak traffic flows occur. Buses are timed to coincide with shifts, this information has been sourced from https://bustimes.org/localities/dounreay.

In addition, the www.CrashMaps.co.uk provides information on road traffic accidents, this has also been reviewed.

Table 12-8 Initial Traffic and Vehicle Types Required for the Construction

Activity	Timescale	Workforce numbers**	Vehicle movement needs	Assumptions	Source	Maximum daily movements			
						Car/LGV From West	HGV From West	Car/LGV From East/ South	HGV From East/South***
Cable landfall Installation	1 - 2 months	10-20	Staff commuting to work each day	Assume worse case 20 staff all drive to and from work in own vehicles.	The majority of the workforce will travel from the east (Thurso/Wick) a small number from the west.	8	-	32	-
	5 days*	-	Delivery of duct and other materials.	Materials will be delivered in a short space of time and stored for use. Maximum of 5 vehicles per day	Material will be delivered by sea/rail or road from the south.	-	-	-	10
	4 days*	-	Delivery and Removal of heavy machinery/drilling rig.	Heavy equipment will be delivered at start of works on low loaders for example and remain on site until works are completed. Up to 4 deliveries and subsequent removals required (16 movements).	Heavy Equipment will be delivered by road from the south.	-	-	-	4

Activity	Timescale	Workforce numbers**	Vehicle movement needs	Assumptions	Source	Maximum daily movements			
						Car/LGV From West	HGV From West	Car/LGV From East/ South	HGV From East/South***
Underground cable system	1 -2 months	8-10	Staff commuting to work each day	Single excavation team. Assume worse case all staff drive to work in own vehicles.	The majority of the workforce will travel from the east (Thurso/Wick) a small number from the west.	4	-	16	-
	15 days*	-	Delivery of the Cable, junction boxes and other materials.	Smaller components may be delivered by LGV. Materials will be delivered as required.	Material will be delivered by sea/rail or road from the south.	-	-	2	4
	4 days*	-	Delivery and Removal of heavy machinery/drilling rig.	Heavy equipment will be delivered at start of works on low loaders for example and remain on site until works are completed. Up to 4 deliveries/removals required.	Heavy Equipment will be delivered by road from the east or south.	-	-	-	4

Activity	Timescale	Workforce numbers**	Vehicle movement needs	Assumptions	Source	Maximum daily movements			
						Car/LGV From West	HGV From West	Car/LGV From East/ South	HGV From East/South***
Onshore substation	12 -18 months	20-50	Staff commuting to work each day	Workforce numbers will vary through the construction works. Assume worse case 50 staff all drive to work in own vehicles.	The majority of the workforce will travel from the east (Thurso/Wick) a small number from the west.	10	-	90	-
	4 days*	-	Delivery and Removal of heavy machinery/drilling rig.	Heavy equipment will be delivered at start of works on low loaders for example and remain on site until works are completed. Up to 4 deliveries/removals required.	Heavy Equipment will be delivered by road from east or the south.	-	-	-	4
	5 days*	-	Aggregate deliveries	Assumed deliveries are just in time, not stockpiled, hence less likely to have lots of deliveries at one time.	Assumed from west, could be east, as that is the closest source.	-	40	-	-
	5 days*	-	Cement deliveries	Assumes cement is brought in as ready mix. If batching onsite then delivery or dry products	Assumed from west, could be east as that is the closest source.	-	60	-	-

Activity	Timescale	Workforce numbers**	Vehicle movement needs	Assumptions	Source	Maximum daily movements			
						Car/LGV From West	HGV From West	Car/LGV From East/ South	HGV From East/South***
				will require less vehicles in total and fewer on any given day. Aggregate will have to be in place prior to cement being poured hence not possible to have them at the same time.					
	100 days*	-	Equipment deliveries.	Smaller components may be delivered by LGV. Equipment will be delivered as required.	Equipment may come by sea, rail or road. Road deliveries will primarily be from the east.	4	-	8	10
Maximum on any one day taking account of parallel working.						26	60	148	14

** Days may not be consecutive.*
*** Assumed 20% of workforce from west. 5% from Scrabster, 50% from Thurso and 20% from further east and 5% from further south.*
**** Assumed that there are a maximum of 10 movements in any one day by road from south of the Train Station at Georgemas Junction.*

12.5.4 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the onshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to traffic and transport receptors have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

12.5.5 Onshore Study Area

The proposed Project is located immediately west of the Dounreay and Vulcan nuclear sites, approximately 2 km east of Reay village. There is currently no direct access track to the Onshore Study Area.

The nearest road to the development is the A836. All construction vehicles will require to access the site via the A836 which serves as the main route to the proposed site access. It is a single lane carriageway that is approximately 6 m wide. This road links Thurso with Reay, Melvich and other settlements to the west, traversing the extent of the mainland north coast.

It is considered that a large majority of HGV and light goods traffic will travel to the site via the A9 which is located approximately 14 km east, which serves many of the main settlements in the region and is the main trunk road connecting the A836 to the south.

Materials can also be sourced locally or brought to Caithness by sea, rail or road. Scrabster is the closest harbour to the Onshore Study Area as such it has been assumed that materials brought by sea would be offloaded here and travel south on the A9 prior to joining the A836.

If rail were to be utilised to transport any components, then it would be brought by train to Georgemas Junction, where there is the facility to offload materials. It would then travel by road north on the A9 to join the A836.

12.5.6 Surveys and Studies Carried Out to Date

No traffic specific surveys were carried out during the previous 2016 Dounreay Trì EIA.

12.5.7 Description of the Current Environment

The A836 and the A9 through Thurso makes up part of the North Coast 500 between John O' Groats and Tongue, the route is also part of the National Cycle Network. The route is most popular in the summer months particularly for motor vehicles doing the North Coast 500 and also is one of the two suggested routes through Caithness for cyclists on the John O'Groats to Land's End cycle route (the other route is directly down the A9 which avoids passing the proposed Project site). The route is also used year-round by commuters to the Dounreay Nuclear Facility and the NRTE Vulcan Site. The commuters utilise the route in the mornings predominantly between 7am – 9am and evenings between 3pm – 6pm, to tie in with shift patterns, which also coincides with key bus timetables for the route. Whereas the leisure cyclists tend to pass Dounreay between mid-morning to early afternoon, having left John O'Groats 50 km away in the morning, or starting their last day of the trip in Tongue, Bettyhill or Melvich on their way north.

12.5.7.1 Baseline Traffic Flow

Traffic flow data for the road sections that may be affected by the proposed Project has been obtained from count point data available from the Department of Transport. The Annual Average Daily Flow (AADF) data collected from manual Count Points for 2019 within the vicinity of the Onshore Project Area is summarised in Table 12-9 and has been used as a traffic flow baseline for the Project. The percentage of HGV vehicles recorded at each count point are highlighted.

The data illustrates a general trend of traffic decline from Thurso to the development site and with relatively low HGV proportions of an average of 2.8 % on the A836.

For completeness, average traffic flow data between 2014 – 2019 has been collated for the traffic count points detailing the breakdown of all vehicle types encountered at each point within Table 12-10.

Table 12-9 Traffic Flow Data from Manual Count Points in the vicinity of the Project

Location	Count point ID	Relevance to Project	Distance from Project	Year	AADF (total no. of vehicles)	HGV %
Strathy (A836)	40935	Vehicles coming from Melvich and the west	12 km W	2019	733	2.9 %
Bridge of Forss (A836)	10934	Vehicles coming from the east	6.5 km E	2019	2460	2.7 %
Scrabster Harbour (A9)	20801	Deliveries coming by sea	13 km E	2019	3256	2.9 %
Thurso – Pennyland (A9)	40800	Deliveries coming by train, and vehicles from Thurso, the south or east	14 km E	2019	3277	4.5 %
Thurso – Bridgend (A9)	40956	Deliveries coming by train, and vehicles from Thurso, the south or east	14.5 km E	2019	14230	1.9 %
Sordale, Halkirk (A9)	10800	Deliveries coming by train, and vehicles from the south or east (Wick)	19 km E	2019	3469	8.7 %
Achavanich, Latheron (A9)	10959	Deliveries coming from the south	31 km S	2019	1026	14.7 %
Ousdale, Berriedale (A9)	50719	Deliveries coming from the south	47 km S	2019	2146	11.9 %

Table 12-10 Average Daily Traffic Flow (ADTF) Data for Relevant Traffic Count Points Between 2014 - 2019

Count point ID	5 year average/ year	Pedal cycles	Motorcycles	Cars & taxis	Buses & coaches	Light goods vehicles	All HGVs	All motor vehicles
40935	2014 - 2019	11	131	515	9	43	20	718
10934	2014 - 2019	6	330	1,895	93	40	63	2,420
20801	2014 - 2019	13	390	2,618	24	20	102	3,154
40800	2014 - 2019	9	486	2,455	70	6	144	3,161
40956	2014 - 2019	34	1,794	10,149	129	74	266	12,412
10800	2014 - 2019	2	478	2,571	25	20	269	3,364
10959	2014 - 2019	0	312	516	4	4	146	982
50719	2014 - 2019	4	511	1,409	25	19	216	2,179

12.5.7.2 Accidents and Safety

The history of traffic incidents which occurred along the main routes to site was examined using the website CrashMaps.co.uk, between 2015 – 2019. This website provides details of the location and severity of traffic incidents occurring on UK roads, with severity divided into 3 categories of; slight, serious, and fatal.

When the A836 between Strathy in the west and the A836-A9 junction in Thurso to the east was analysed, 15 traffic incidents occurred over the 5 year period, 3 of which were fatal, 1 was serious and the remaining 11 were slight. One incident hotspot was identified, with 2 slight incidents and 2 fatal incidents occurring at Forss on the A838. This stretch of road is characterised as a long straight single carriage way road enclosed at either end by two sharp bends, all the accidents recorded at Forss occurred on these bends. Two other sections of the A836 were identified as having multiples incidents at the same site, one where two slight incidents occurred at the same site was the junction between the A897 and the A836 at Melvich, the other where 3 slight incidents occurred were on the A836 on a 2 km stretch of the road on the approach to Thurso.

The A9 from Thurso to the Dornoch Bridge was also considered, to account for deliveries originating in the south. This stretch of road is single carriage way, and includes steep gradients, and numerous bends. As such there is a relatively high traffic incident rate, with over 100 incidents over the past 5 years.

12.5.8 Identification of Potential Impacts

The Institute of Environmental and Assessment (IEA) publication Guidance Notes No. 1: Guidelines for the Environmental Assessment of Road Traffic 1993 sets out a methodology for assessing traffic and transport related environmental impacts. The IEA guidelines identify the following rules by which to undertake an assessment of potentially significant traffic and transport related environmental impacts:

> Rule 1: Include roads where traffic flows are predicted to increase by more than 30% (or where the number of HGVs are predicted to increase by more than 30%); and

> Rule 2: Include any specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

The following definition of a Specifically Sensitive Area has been applied: Medium to large rural settlements, containing some community and public services and facilities (particularly schools, churches, hospitals, areas of high pedestrian activity), areas with traffic control signals, waiting and loading restrictions, traffic calming measures and minor rural roads not constructed to accommodate frequent use by HGV.

Based on the traffic movements identified in Table 12-8 and associated assumptions, the percent change to traffic flow for the various road sections has been calculated based on the average traffic flow as indicated in Table 12-10; the results of which are shown in Table 12-11.

During up to 10 days of the Project construction period, there is a potential for an increase of more than 30% of HGV movements to the west of the development site. Taking into account that this is a comparison of worst-case daily movements with ADFT's, the short period involved and that the total number of movements is well below 30%, this is not deemed to have the potential to be a significant impact.

As shown in Table 12-11 even with the worst-case assumption that there will be no car sharing or use of public transport and assuming maximum levels; the predicted increased traffic movements for all vehicles are below the 30% and 10% (for sensitive areas) trigger level for all movements to the east and south of the site as such there is no potential for significant impact.

Table 12-12 provides a summary of potential impacts from traffic and transport that have been identified at this stage and justification for scoping in or out.

Table 12-11 Construction Percentage Change in Traffic Flow

Count point ID	Specifically sensitive area	5 year average/ year	Maximum No. of HGV's per day	Maximum No. of vehicles per day	% Increase in HGV's per day	% Increase in all vehicles per day
40935 (west of Project)	No	2014 - 2019	60	86	300.0	12.0
10934 (east of Project)	No	2014 - 2019	14	162	22.2	6.7
20801	No	2014 - 2019	14	22	13.7	0.7
40800	Yes (Thurso)	2014 - 2019	14	144	9.7	4.6
40956	Yes (Thurso)	2014 - 2019	14	64	5.3	0.5
10800	No	2014 - 2019	14	64	5.2	1.9
10959	No	2014 - 2019	10	18	6.8	1.8
50719	No	2014 - 2019	10	18	4.6	0.8

12.5.9 Cumulative Impact

Construction, operation and decommissioning of the new SHE-T Dounreay West Substation, the SHE-T Orkney – Caithness Interconnector project and the Pentland Floating Offshore Wind Demonstrator could potentially result in an increase in traffic flow in the immediate area of the Onshore Study Area. These projects and the Project may give rise to cumulative impacts if the phases of these two projects are carried out in parallel with the construction, operational and decommissioning phases of the onshore Project elements.

Additionally, the consented Limekiln Windfarm Project and the proposed Drum Hollistan Wind Farm Project may also result in increased traffic flow within the wider Project Area, if the construction, operation and decommissioning phases of these projects overlapped with those proposed for the Project, then cumulative impacts on traffic and transport have the potential to arise.

This notwithstanding, the timescale in which the SHE-T Orkney – Caithness Interconnector Project will be constructed is uncertain, and as such, relative timeframes required in order to ascertain cumulative impacts cannot be determined.

The timing of the Demonstrator installation is currently planned for 2023 (if taken forward). Thus, the Demonstrator will be independent of and ahead of installation activities associated with the Project array. Nonetheless, due to the limited size of the Demonstrator, cumulative impacts on traffic and transport receptors are anticipated to be minor. There is also a lack of knowledge of timescales for the onshore wind farms and the intended start date for construction, and as such, it is not possible to accurately determine any tangible impacts at this time.

Therefore, at this early stage, until a better understanding of other project schedules in the vicinity of the project can be acquired, cumulative impacts are anticipated and will be scoped in for further assessment within the EIA Report.

Table 12-12 summarises the potential impacts and provides a justification for scoping these impacts in or out of the EIA.

Table 12-12 Potential Impacts on Traffic and Transport During Construction, Operations and Maintenance, and Decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
HGV movements (west)	Movements as described in Table 12-8. Large movement number on up to 10 days, are not enough to increase the annual daily average levels, hence no potential to be significant.	Scoped out
All vehicle movements (west)	Movements as described Table 12-8. Maximum number of daily movements is well below the 30% increase in average daily movement levels hence no potential to have a significant impact.	Scoped out
HGV movements (east and south)	Movements as described Table 12-8. Maximum number of daily movements is well below the 30% increase in average daily movement levels and below 10% in specifically sensitive areas, hence no potential to have a significant impact.	Scoped out
All vehicle movements (east)	Movements as described in Table 12-8. The maximum number of daily movements is well below a 10% increase in average daily movements hence no potential to have a significant impact.	Scoped out
Potential Impacts During Operations and Maintenance		
HGV movements	HGV movements will only be required in event of equipment failure where a large component needs replaced. As such there is no potential of a significant impact to occur.	Scoped out
All vehicle movements	Vehicle movements associated with operations will mainly be associated with personnel carrying out operations and maintenance activities. Number of people involved will be limited and as such will not give rise to significant vehicle movements, no potential significant impacts are predicted.	Scoped out
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase. As such no significant impacts are predicted.		Scoped out
Potential Cumulative Impacts		
Cumulative impacts potentially arising due to the SHE-T Dounreay West Substation, the SHE-T Orkney - Caithness Interconnector project, and the Pentland Floating Offshore Wind Demonstrator, which are within the immediate vicinity of the project are scoped in due to the potential for increase traffic from an overlap between their construction, operation and decommissioning phases with that of the Project. Similarly, cumulative		Scoped in

Impact	High Level Impact Summary and Justification	Scoped In/Out
impacts arising from proposed and consented wind farms in the wider area are also scoped in.		

12.5.10 Method of Assessment

Traffic and transport impacts arising as a direct result of traffic associated with the Project have been scoped out for further assessment.

Cumulative impacts arising through the interaction of traffic associated with the Project and other, as yet unknown, traffic associated with other adjacent / nearby projects has been scoped in and will be taken forward to the assessment phase. The assessment will be desk based and utilise publicly available data and consultation.

It is anticipated that consultation with proposed and consented development owners in the wider project area may be required in order to quantify potential cumulative impacts on transport and traffic receptors.

Additionally, consultation with Dounreay Site Restoration Limited (DSRL) with regard to shift patterns and the associated buses may assist in the assessment and potentially identification of mitigation for traffic and transport impacts.

12.5.11 Conclusions and Next Steps

It has been concluded that there is not the potential for a significant environmental or human health impact associated with the Project traffic and transport in EIA terms. This does not however mean that steps will not be implemented to minimise impacts. There is scope for car sharing and public transport use to reduce the vehicle movements associated with the Project and this should be encouraged. The accident blackspot on the A836 can be highlighted to all drivers along with precautions to be taken when driving the A9 especially in adverse weather conditions. Nonetheless, cumulative impacts associated with traffic and transport have been scoped in for assessment in the EIA Report due to a number of consented and proposed developments in the area which will utilise the same road network.

The Highland Council has requested that a Transport Statement is submitted with the planning application. This will ensure that issues such as abnormal loads and the need for a temporary junction with the A836 are adequately addressed through the planning process. It will also assist in the identification of good practice measures to be adopted by the project especially during the construction process to minimise impacts.

12.6 Other Issues

12.6.1 Introduction

This Section sets out the proposed approach to the assessment of Other Issues, including Electric Magnetic Fields (EMF) and Major Accidents and Disasters associated with the construction and operation associated with the onshore components– the Project.

12.6.2 Electric and Magnetic Fields

The electric and magnetic fields associated with the export of electricity from the wind turbine generators to the substation needs to be understood in relation to potential impacts on human health. Potential impacts from EMF on benthic ecology (Section 8.2), fish and shellfish ecology (Section 8.3) and marine mammal receptors (Section 8.4), are discussed within the detailed offshore sections.

The Project Onshore Study Area is detailed in Figure 10-1.

12.6.2.1 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts from EMFs:

EU Directives

> EU Directive (2013/35/EU) Occupational Exposure to Electric Magnetic Fields (EMF) (2013);

Legislation

> The Control of Electromagnetic Fields at Work Regulations 2016;

Policy

> Highland-wide Local Development Plan (2012) Planning Policies (Policy 69 – Electricity Transmission Infrastructure);

Guidance:

> ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHZ) (ICNIRP, 1998);

> Non-binding guide to good practice for implementing Directive 2013/35/EU Electromagnetic Fields Volume 1: Practical Guide (2014);

> Department of Energy and Climate Change: Power Lines, Demonstrating compliance with EMF public exposure guidelines, A voluntary Code of Practice (DECC, 2012);

> HSE Electromagnetic fields at work A guide to the Control of Electromagnetic Fields at Work Regulations 2016, HSG281 (HSE, 2016); and

> Energy Networks Association (ENA) Guidelines for best practice in relation to electric and magnetic fields (EMFs) in the design and management of low voltage distribution networks (ENA, 2018).

12.6.2.2 Available Information

The primary sources of information used to inform the Scoping Report were:

> The World Health Organisation website provides information on EMF and their health impacts (WHO, 2020). Available at: https://www.who.int/peh-emf/about/WhatisEMF/en/index1.html; and

> Health and Safety Executive information on EMF and their impacts (HSE, 2016). Available at: https://www.hse.gov.uk/radiation/nonionising/index.html.

12.6.2.3 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the onshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to EMF receptors have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

12.6.2.4 Onshore Study Area

The area in the immediate vicinity of the Onshore Study Area as shown in Figure 10-1.

12.6.2.5 Surveys and Studies Carried Out to Date

To date, no specific surveys or studies relating to EMF in or around the Project area have been undertaken.

12.6.2.6 Description of the Current Environment

Electric Fields

Electric field strength is an expression of the intensity of an electric field at a particular location. The standard unit is the volt per meter. Field strength of 1 v/m represents a potential difference of one volt between points separated by one meter. Electric fields are produced by voltage. The cables are anticipated to be Alternating Current (AC) voltages only. AC voltages produce alternating electric fields.

Electric fields rapidly decrease with distance and are easily screened by earth, trees and buildings. Building structures can act as a Faraday cage i.e. an earthed metal box and provide an effective screen for electric fields generated within substations. When cables are buried the electric fields at the surface are hardly detectable (World Health Organisation, 2020).

Magnetic Fields

Magnetic fields are produced by electric current flow. Like electric fields, magnetic fields are strongest close to their origin and rapidly decrease at greater distances from the source magnetic fields are not easily screened and can pass through building and cable screens.

AC currents produce alternating magnetic fields and direct currents (DC) produce static magnetic fields. Magnetic fields cancel within relatively short distances. For example, if the AC cable includes three phase AC cores the magnetic fields will cancel out.

Magnetic fields are measured in Tesla (symbolized T) which is the standard unit of magnetic flux density.

Existing potential sources of electric and magnetic fields in the area include; the existing Dounreay substation and associated overhead electricity cables, both of which are AC. The electric fields produced by the substation are likely to be screened by the building structure.

Existing overhead AC cables will give rise to localised magnetic fields, these dissipate quickly with distance from the lines (within 50 - 100 m) (World Health Organisation, 2020).

12.6.2.7 Identification of Potential Impacts

During operations the cables and substation/switch gear will create electric and magnetic fields.

The design of the Projects' electrical infrastructure will ensure that no significant impacts to human health or environmental receptors will occur. Relevant design elements are as follows:

> Electrical cables will be buried and hence earthed, such that there will be no issues at the surface of the ground;

> The electrical cables are 3 phase and as such the magnetic field will cancel out;

> The substation/switch gear is anticipated to be housed within a building which will act as a Faraday cage and hence screen the electrical field; and

> Magnetic fields within the substation and switch gear will cancel out to some degree. Any remaining field will dissipate rapidly.

12.6.2.8 Cumulative Impacts

No change to the existing sources of electric and magnetic fields in the area are predicted from the Project.

The EMFs from the Project can combine with the EMFs already present from other sources, such as appliances, domestic and industrial wiring, etc. However, the largest source of EMFs is typically from electricity transmission and distribution infrastructure such as OHLs, and not sufficiently buried electrical cables.

The way in which fields from different sources combine with each other is complex; the relative power flows, voltage and the relative phasing of each electrical cable would affect the direction of the fields from each cable and whether they add or subtract with one another. The cumulative field could increase or decrease depending on the specific conditions, but it would only be a slight effect either way.

Due to the complex physical arrangement of electrical equipment, EMFs produced by electrical substations and sealing-end compounds are not readily calculable. However, the highest field levels at and outside the perimeter of a substation are usually those produced by the OHLs entering the substation. The fields produced by equipment within the substation are generally smaller and decrease with distance more quickly than fields generated by OHLs and particularly underground cables. Therefore, the cumulative impact of all of the components of the Project and any interactions with other developments which produce EMFs, including the SHE-T Dounreay West Substation, the SHE-T Orkney – Caithness Interconnector Project and the proposed Pentland Floating Offshore Wind Demonstrator, would not be considered significant.

Table 12-13 summarises the potential impacts and provides a justification for scoping these impacts in or out of the EIA.

Table 12-13 Potential impacts on EMF during Construction, Operations and Maintenance, And Decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		
There will be no significant sources of electric or magnetic fields onsite during construction works.		Scoped out
Potential Impacts During Operations and Maintenance		
Electric field associated with the cable(s)	The cable(s) is/are buried, and as such earthed; it/they will therefore not give rise to an electric field at the surface.	Scoped out
Magnetic field associated with the cable(s)	Presuming a cable containing 3 phase cores are utilised then the magnetic fields will cancel out.	Scoped out
Electric field associated with the substation/ switch gear	Electric field generated by electrical installation. The substation/switch gear will be in a building which will act as a Faradays cage and hence screen the environment from electrical impacts.	Scoped out
Magnetic field associated with the substation/ switch gear	Magnetic field generated by electrical installation. All 3 phases will be present in the substation and as such will cancel out to some degree. Any remaining fields will dissipate rapidly over a short distance.	Scoped out
Potential Impacts During Decommissioning		

Impact	High Level Impact Summary and Justification	Scoped In/Out
There should be no significant sources of electric or magnetic fields onsite during either construction or decommissioning works.		Scoped out
Potential Cumulative Impacts		
Calculating cumulative impacts from EMF is not straightforward. Generally, the main impacts from EMF are associated with OHL developments. The Project will not introducing any new OHLs, and the cables from the Project, the Pentland Floating Offshore Wind Demonstrator and the SHE-T Orkney – Caithness interconnector project will be sufficiently buried. Additionally, the SSE substation will be in a building which will act as a Faradays cage. Therefore, no cumulative impacts on the environment and human receptors from EMF are anticipated.		Scoped out

12.6.2.9 Conclusions and Next Steps

Potential environmental and human health impacts as a result of EMF associated with the Project have been scoped out of the EIA and will not be addressed further within the EIA Report as there will be no significant impacts. Although the further study of impacts is scoped out of the EIA, management measures will be in place to ensure Risk Assessments (e.g. a cable burial risk assessment) and Method Statements will be produced as appropriate (and required by consent). These will be disseminated prior to development activities taking place associated with the Project.

12.6.3 Major Accidents and Disasters

This section of the Scoping Report presents a high-level assessment of the likely significant adverse effects on the environment arising from the vulnerability of the proposed Project to risks of major accidents and/or natural disasters.

The Project Onshore Study Area is detailed in Figure 10-1.

12.6.3.1 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken in to consideration as part of the assessment of potential impacts from major accidents and disasters:

Legislation

- The Town and Country Planning (Environmental Impact Assessment) Regulations 2017;
- Infrastructure Planning (EIA) Regulations 2017;
- Construction (Design and Management) Regulations 2015;
- The Health and Safety at Work Act 1974;

Policy

- Highland-wide Local Development Plan (2012) Planning Policies (including Policy 64: Flood Risk and Policy 66 – Surface Water Drainage);

Guidance

- IEMA Major Accidents and Disasters in EIA: A Primer (IEMA, 2020);
- Scottish Government Planning Advice Notes (PANs) and Guidance (PAN 69 Planning and Buildings Standards Advice on Flooding);
- SEPA Technical Flood Risk Guidance for Stakeholders (2019); and

- Department of the Environment, Heritage & Local Government- A Framework for Major Emergency Management Guidance Document 1 - A Guide to Risk Assessment in Major Emergency Management (DEHLG, 2010).

12.6.3.2 Available Information

The primary sources of information used to inform the Scoping Report were:

- SEPA Flood Risk Interactive Maps. Available at: http://map.sepa.org.uk/floodmap/map.htm; and
- National Risk Register of Civil Emergencies 2017 edition (Cabinet Office, 2017). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/644968/UK_National_Risk_Register_2017.pdf;

Additionally, input from the Scoping Sections below have also informed the assessment:

- Section 10.2: Geology, Physical Processes and Land Use; and
- Section 12.5:Traffic and Transport.

12.6.3.3 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the onshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to major accidents and disasters have been considered within this report.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

12.6.3.4 Onshore Study Area

The area in the immediate vicinity of the Onshore Study Area as shown in Figure 10-1.

12.6.3.5 Surveys and Studies Carried Out to Date

To date, no specific surveys or studies relating to natural disasters in or around the Project area have been undertaken.

12.6.3.6 Description of the Current Environment

The proposed Project is not located in an area with a history of natural disasters such as extreme weather events.

Avoidance of flood risk areas, as defined within the SEPA Flood Map, in the routeing process and crossing of floodplains has been minimised where possible as the Onshore Study Area does not overlap any surface waterbodies and the nearest waterbodies portray a low risk of a 1 in 200-year flood event. Additionally, the Onshore Study Area is not located in the near vicinity of any Potentially Vulnerable Areas (PVA) for flooding, the nearest PVA is located ~15 km east and overlaps Thurso.

The Onshore Study Area is located at the coast in an area identified from the SEPA Flood Maps as having a high likelihood for coastal flooding. However, the vast majority of Scotland's coast is also categorised as having a high likelihood of coastal flooding due to sea levels change as a result of climate change. Therefore, the risk of coastal flooding at this location is not unique to the area.

Nevertheless, modifications to natural drainage patterns, changes to runoff rates and volumes and a consequent increase in flood risk during construction and operation are assessed in Section 10.2: Geology, Physical Processes and Land Use.

Peat is not present across the Onshore Study Area, except in one very localised area at the eastern boundary, as identified through trial pit drilling (and described in Section 10.2.7.2). Therefore, there is no risk of peat slides at the Onshore Study Area.

As discussed in Section 12.5: Traffic and Transport, it has been concluded that there is not the potential for significant environmental or human impacts associated specifically with the Project traffic and transport requirements. This does not however mean that steps will not be implemented to minimise impacts. These mitigations (as described in Section 12.5.11) will further aid to reduce any likely accidents and disasters occurring and impacting on human health and environmental receptors.

Furthermore, the construction and operation of the proposed Project will be managed within the requirements of a number of health and safety related regulations. As such, the risk of major accidents or disasters occurring, and then resulting in significant environmental or human health effects, is not considered likely and as such has not been assessed in detail.

12.6.3.7 Identification of Potential Impacts

As stated above, the proposed Project is not located in an area with a history of natural disasters, such as extreme weather events. Furthermore, the scope of the development activities and environmental conditions of the Onshore Study Area do not demonstrate conditions which would likely result give rise to major accidents and disasters. As such there is no source-pathway-receptor linkage of a potential hazard that could trigger a major accident and/ or disaster or potential for the scheme to lead to a significant environmental effect.

12.6.3.8 Cumulative Impacts

No cumulative impacts are anticipated to occur as a result of major accidents and disasters associated with other proposed and consented projects in the vicinity of the Project. This is due to the extremely low likelihood of these events occurring in unison and the uncertainty with regard to the timeframes for other projects potentially overlapping those of the Project.

Table 12-14 summarises the potential impacts and provides a justification for scoping these impacts in or out of the EIA.

Table 12-14 Potential impacts from Major Accidents and Disasters during Construction, Operations and Maintenance, and Decommissioning of the Project

High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction	
Major accidents and disasters are very unlikely to occur due to the scope of the construction activities and environmental conditions of the Onshore Study Area. As such there is no source-pathway-receptor linkage of a potential hazard that could trigger a major accident and/ or disaster or potential for the scheme to lead to a significant environmental effect.	Scoped out
Potential Impacts During Operations and Maintenance	
Major accidents and disasters are very unlikely to occur due to the scope of the operation and maintenance activities and environmental conditions of the Onshore Study Area. As such there is no source-pathway-receptor linkage of a potential hazard that could trigger a major accident and/ or disaster or potential for the scheme to lead to a significant environmental effect.	Scoped out
Potential Impacts During Decommissioning	

High Level Impact Summary and Justification	Scoped In/Out
Major accidents and disasters are very unlikely to occur due to the scope of decommissioning activities and environmental conditions of the Onshore Study Area. As such there is no source-pathway-receptor linkage of a potential hazard that could trigger a major accident and/ or disaster or potential for the scheme to lead to a significant environmental effect.	Scoped out
Potential Cumulative Impacts	
No cumulative impacts are anticipated to occur. This is due to the extremely low likelihood of these events associated with other developments occurring in unison and the uncertainty with regard to the timeframes for other projects potentially overlapping those of the Project.	Scoped out

12.6.3.9 Conclusions and Next Steps

Potential environmental and human health impacts as a result of major accidents and disasters associated with the Project have been scoped out of the EIA and will not be addressed further within the EIA Report. Although the further study of impacts is scoped out of the EIA, management measures will be in place to ensure Risk Assessments and Method Statements will be produced as appropriate (and required by consent). These will be disseminated prior to development activities taking place associated with the Project.

12.6.4 Onshore Noise

This section of the Scoping Report considers the potential effects from the Project in relation to both construction and operational noise and presents a high-level assessment of the potential effects on human health arising from both the airborne sources from onshore and offshore noise.

Additionally, underwater noise impacts for environmental receptors as a result of the Project construction, operation, maintenance and decommissioning phases have been assessed within the relevant receptor sections of this scoping report.

12.6.4.1 Legislation, Policy and Guidance

In addition to those described in Section 2: Legislative Context and Regulatory Requirements, the following guidance and legislation will be taken into consideration as part of the assessment of potential impacts from onshore noise:

Legislation

- Environmental Protection Act 1990; and
- Control of Pollution Act 1974

Policy

- Highland-wide Local Development Plan (2012) Planning Policies (Policy 72 – Pollution); and
- Scottish Government (2014), Scottish Planning Policy (SPP).

Guidance

- Scottish Government (2014), Scottish Planning Policy (SPP);
- Scottish Government (2011). Planning Advice Note (PAN) 1/2011: Planning & Noise;
- PAN50 (1996) Controlling the Environmental Effects of Surface Mineral Workings';
- British Standards Institution (2014) Code of practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration (BS 5228-2);

- British Standards Institution (2014, amended 2019) - Methods for rating and assessing industrial and commercial sound (BS 4142);
- British Standards Institution (2003) Description and measurement of environmental noise — Part 1: Guide to quantities and procedures (BS 7445-1); and
- British Standards Institution (2014) Guidance on sound insulation and noise reduction for buildings (BS 8233).

12.6.4.2 Available Information

The primary sources of information used to inform the Scoping Report was reference to BS 5228-1 which provides guidance on a range of considerations relating to construction noise including the legislative framework, general control measures, example methods for estimating construction noise levels, and example criteria which may be considered when assessing effect significance. While consideration of BS 4142 was considered in relation the potential effects on noise during operation.

Ordnance Survey and online satellite imagery has been reviewed to determine the location of noise-sensitive receptors in the Study Area.

12.6.4.3 Consultation

The project briefing letter distributed during the preparation of the Scoping Report went to a number of consultees with interest in the onshore human environment, no meetings (over and above the Pre application advice meeting with THC) have been requested at this stage of the project in relation to this topic.

A Highland Council Major Pre-Application Advice meeting was held on the 9th of September 2020 with representatives from the Highland Council, SEPA, Transport Scotland, NatureScot and Marine Scotland. The objective of the meeting was to receive early indications of key stakeholders' views of the proposed development, to clarify information needed for subsequent applications, and to help improve the overall quality of the proposal. This information was provided to the Applicant formally through receipt of a Pre-Application Advice Pack from the consultees. Formal response from the Pre-Application Advice Pack relevant to onshore noise have been considered within this report. Moreover, the project team has engaged with immediate landowners as part of the pre-application activities.

Further information on planned consultations and future stakeholder engagement is detailed in Section 4.

12.6.4.4 Onshore Study Area

The study area for onshore noise includes the Onshore Study Area, which covers an approximate area of 0.85 km^2, and the Offshore Study Area, both as shown in Figure 3-1, these study areas extends to residential and commercial properties in the immediate onshore vicinity.

12.6.4.5 Surveys and Studies Carried Out to Date

To date, no specific surveys or studies relating to onshore construction noise in or around the Project area have been undertaken.

However, RES undertook an assessment of operational turbine noise relating to the planning application for the previous Dounreay Tri Project in 2016, which will be used to help inform the scoping for the Project.

12.6.4.6 Description of the Current Environment

As described in Section 10.2.7.4 the land use in this area is predominantly open intensive farmland (Figure 10-5), particularly on the fields immediately inland from the coast.

The Onshore Study Area is largely in the ownership of one landowner who farms the land from Isauld Farmhouse forming part of the wider Isauld House Farmstead.

Isauld Farmhouse and associated agricultural outbuildings are located approximately 150m southwest of the southern boundary of the Onshore Study Area. Additionally, the Gunnerscroft building, which is approximately 50 m south of the Onshore Study Area, appears uninhabited, but this is unconfirmed.

There are no residential or commercial properties which directly overlap the Onshore Study Area. However, the Onshore Study Area lies immediately adjacent to the Dounreay Nuclear Facility and Vulcan Site.

Additionally, there are no amenity areas which overlap the onshore study area, however both the Reay Golf Course and the A896, which comprises part of the North Coast 500 route, are situated approximately 500 m from the Onshore Study Area.

Potential human receptors to onshore noise impacts identified within 500 m of the boundary of the Onshore Study Area are listed in Table 12-15.

Table 12-15 Noise Receptors within 500 m of Onshore Study Area

Receptor Type	Description	Distance from Onshore Study Area Boundary
Residential Properties	Gunnerscroft Isauld Farmhouse	~50 m ~150 m
Non – Residential Properties	Isauld House (Farmstead)	~150 m
	Dounreay Nuclear Facility & NRTE Vulcan Site	~0 m
Amenity Areas	Reay Golf Course North Coast 500 Route	~500 m ~500 m

Baseline Noise – Onshore

As stated above, the Onshore Study Area is located immediately adjacent to the industrial Dounreay Nuclear Power Plant and the Vulcan Site. The Dounreay Nuclear Facility has entered into a phase of decommissioning and remediation. Furthermore, it is anticipated that the Vulcan Site will also enter into a phase of decommissioning in the near future, these two sources of anthropogenic noise will be the major contributor to the baseline noise for the Onshore Study Area. Additional sources of anthropogenic onshore noise are attributed to agricultural work (e.g. from farming machinery such as tractors), and traffic from the A896 road located approximately 500m south of the Onshore Study Area. Therefore, due to the decommissioning activities (which also involves demolition activities), farming activities and the close proximity of the Onshore Study Area to the A896, the baseline noise for the onshore area would be primarily characterised as resulting from anthropogenic sources.

Additionally, 'natural' sources of noise such as wind, wave, disturbed vegetation and livestock noise from the adjacent fields, will also contribute to the baseline noise within the vicinity of the Onshore Study Area.

Baseline Noise – Offshore

There are a variety of noise sources which occur within UK territorial waters, both natural and anthropogenic. Natural noise sources include wind and wave action, fish and marine mammal species vocalisations and geological events such as earthquakes. Anthropogenic sources range from offshore energy infrastructure, vessel noise, at sea seismic surveys, or the use of fishing and navy sonar. The nature of the seabed topography and sediment will affect how quickly and easily any noise generated in the area will travel.

The Pentland Firth is a busy area for shipping, and it is likely that the background noise levels are noticeable.

12.6.4.7 Identification of Potential Impacts

Onshore Noise Impacts

In assessing the effects of noise associated with the construction and routing of the onshore cable and substation components, it is anticipated that the associated works are of a transient and short duration.

The noise associated with the construction activities of the onshore cable routing and substation will be transient and quickly diminish as the construction progresses. Due to the short term and localised nature of the construction of the onshore components, any temporary noise created is likely to be minimal and concentrated to the Onshore Study Area.

There are only two residential properties within close proximity to the Onshore Study Area. Gunnerscroft which appears uninhabited, although this is unconfirmed, and Isauld Farmhouse forming part of the wider Isauld House Farmstead. Due to the fact these are already subject to anthropogenic noise from both the adjacent nuclear facilities and farming activities and considering their distance from the likely location of the onshore infrastructure, it is unlikely that the addition of the onshore construction noise will result in significant effects on the residents of these properties. It is therefore considered that ambient noise levels are sufficiently high to provide a degree of masking of both construction and operational noise.

Furthermore, noise impacts related to operation and maintenance activities will be limited to noise from the onshore substation only, as cables will be buried. Noise impacts from the operation of the substation are likely to be minor in relation to noise emitted from the neighbouring nuclear facilities and is unlikely to emit noise above pre-existing levels. Furthermore, the closest residential receptor is partially screened by surrounding agricultural buildings.

Finally, impacts from onshore noise on human health factor were not previously considered as part of the previous Dounreay Trì Project EIA. As the Project is not proposing to substantially increase the onshore infrastructure arrangements or scale, it is considered previous justifications remain valid.

Offshore Noise Impacts

Noise generated from construction of the offshore infrastructure components will largely be propagated subsurface. The residual airborne noise generated will be minimised due to the fabrication of components onshore. It is considered that there is not the potential for significant impacts upon human receptors as a result of airborne noise during construction off the offshore infrastructure due to the intervening distance between the site and onshore human receptors. Additionally, there will only be limited exposure to human receptors on passing vessels such as fishing boats, recreational vessels and merchant vessels and therefore potential impacts will not be significant. This, notwithstanding, underwater construction noise from installation of the offshore infrastructure components may impact on marine species, such as benthic species, marine mammals and fish and shellfish, and as such these impacts will be assessed within the specific receptor topics within the EIA Report.

The operational turbine noise relating to the previous Dounreay Tri Project was assessed in 2016 by RES. Operational noise levels of the turbines were predicted using a noise propagation model, the proposed wind farm layout and assumed turbine emission data. The predicted noise levels for the previous project design were found to be within the permitted noise limits and therefore complied with the relevant guidance on wind farm noise and the impact on the amenity of the nearest residential properties would be regarded as acceptable.

Nonetheless, due to the increase in the number of turbines proposed for the Project, from 2 turbines previously to between 6 – 10 turbines currently proposed, potential impacts from the Project will need to be reassessed. However, it is not expected that airborne noise generated due to operation of the wind turbines will be a significant impact as a result of the distance that the Wind Turbine Generator (WTG) Site is located from shore. Additionally, modern wind turbines are actively engineered to minimise mechanical noise within the nacelle as well as the aerodynamic noise produced from the turbine blades.

12.6.4.8 Cumulative Impacts

Nearby developments which have the potential to contribute to both offshore and onshore noise impacts include:

> SHE-T Dounreay West Substation (consented);

> SHE-T Orkney - Caithness Interconnector Project (consented);

> Pentland Floating Offshore Wind Demonstrator (proposed);

> Potential developments within the ScotWind N1 DPO site; and

> The MeyGen Tidal Energy Project (under construction).

There is the potential for construction of the consented SHE-T Dounreay West Substation and the SHE-T Orkney – Caithness Interconnector projects to occur in tandem with the construction of the onshore Project components. However, the timelines for these projects are at present uncertain. SHE-T undertook a Screening EIA for the Dounreay West Substation in 2018 (SHE-T, 2018). The Screening letter stated that there is not the potential for adverse noise effects on the closest noise sensitive receptors, based on an initial Noise Impact Assessment (NIA), due to the substation emitting noise below typical pre-existing sound levels (SHE-T, 2018).

The proposed Pentland Floating Offshore Wind Demonstrator will utilise the existing Dounreay Tri consent for the site, making landfall at Dounreay. The timing of the Demonstrator installation is currently planned for 2023 (if taken forward) Thus, it would be independent of and ahead of installation activities associated with the Project array. Nonetheless, due to the limited scale of the Demonstrator, cumulative impacts from operational and construction noise of the Demonstrator with other projects are anticipated to be negligible.

As a result of the high energy potential of the Pentland Firth and Orkney Waters (PFOW) there are other commercial scale neighbouring developments in vicinity of this Project. These include the MeyGen Tidal Project (located approximately 38 km east) and potential developments within the ScotWind N1 Draft Plan Option (DPO) site (12km north). In terms of cumulative impacts, due to the limited proximity to other commercial scale offshore developments, and because the future ScotWind N1 DPO projects are not yet determined, cumulative impacts with these two offshore renewables developments are not anticipated.

Therefore, cumulative impacts are not anticipated throughout the construction, operation, maintenance or decommissioning phases of the onshore Project components. This is because all other known developments that could potentially be constructed at the same time are considered to be at a distance unlikely to produce a material increase in the predicted noise levels at sensitive receptors. Furthermore, the Onshore Study Area, where construction activities will take place, is immediately adjacent to two nuclear facilities which have entered into active decommissioning phases. It is not anticipated that noise emitted during either the construction operation or decommissioning phase will be above pre-existing or predicated noise levels associated to other proposed or consented developments in the area. As such, cumulative impacts associated with noise from surrounding developments have not been scoped into the EIA assessment.

Table 12-16 summarises the potential impacts and provides a justification for scoping these impacts in or out of the EIA.

Table 12-16 Potential impacts from Onshore Noise during Construction, Operations and Maintenance, and Decommissioning of the Project

Impact	High Level Impact Summary and Justification	Scoped In/Out
Potential Impacts During Construction		

Impact	High Level Impact Summary and Justification	Scoped In/Out
Onshore noise associated with construction of onshore components	Due to the short term and localised nature of the onshore construction process, any temporary noise generated is likely to be minimal and concentrated to the Onshore Study Area and is unlikely to cause an increase in the baseline noise of the area due to the close proximity of the neighbouring nuclear sites.	Scoped out
Airborne noise produced during construction of the offshore infrastructure.	Potentially human receptors on passing vessels such as fishing boats, recreational vessels and merchant vessels may be exposed to noise during the construction phase. It is considered however that this exposure will be minimal and sporadic and potential impacts will not be significant.	Scoped out
Underwater noise produced during construction of the offshore infrastructure.	Underwater noise may impact on marine species through behaviour modification, displacement, or injury. These impacts are explored in the scoping chapters: Benthic Ecology (Section 8.2), Fish and Shellfish Ecology (Section 8.3) and Marine Mammals and other Megafauna (Section 8.4) and will be assessed within the EIA under the relevant marine receptor chapter.	Scoped in (to be included under relevant marine receptor chapter of the EIA)
Potential Impacts During Operations and Maintenance		
Onshore noise associated with operation and maintenance of onshore components	Noise impacts related to the onshore operation and maintenance activities will be limited to noise from the onshore substation. Noise impacts from the operation of the substation are likely to be minor in relation to noise emitted from the neighbouring nuclear facilities and will not increase the current noise baseline for the area.	Scoped out
Operational noise associated with the WTG site	it is not expected that airborne noise generated due to operation of the wind turbines will be a significant impact as a result of the distance that the Wind Turbine Generator (WTG) Site is located from shore. However, due to the increase in the number of turbines proposed for the Project, from 2 turbines previously to between 6 – 10 turbines currently proposed, potential operational noise impacts from the WTG Site for the Project will need to be reassessed.	Scoped In
Potential Impacts During Decommissioning		
Potential impacts arising during the decommissioning phase are expected to be similar to, but not exceeding, those arising during the construction phase, with the exception that habitat is likely to be restored and displaced species able to return to abandoned areas.		As construction
Potential Cumulative Impacts		
No cumulative impacts due to interaction with offshore and onshore developments in proximity to the Project are anticipated to occur. This is due to all other known developments at close proximity to the Project, such as the SHE-T Dounreay West Substation, Orkney – Caithness Interconnector Project, Pentland Floating Offshore Wind Demonstrator, potential developments within the ScotWind N1 DPO, and MeyGen Tidal Project, are considered to be unlikely to produce a material increase in the predicted noise levels at sensitive receptors.		Scoped out

12.6.4.9 Method of Assessment

The principle methods of assessment to be employed within the EIA Report relating to each of the identified at risk receptors are summarised below in Table 12-17. These methods will be used alongside input from the relevant guidance as identified in Section 12.6.4.1.

Table 12-17 Principle Method of Assessment to be Conducted within the EIA Report

Impact Scoped In	Survey Work During EIA	EIA Assessment Methodology
Underwater noise produced during construction of the offshore infrastructure.	As discussed in scoping chapters: Benthic Ecology (Section 8.2.10), Fish and Shellfish Ecology (Section 8.3.10) and Marine Mammals and other Megafauna (Section 8.4.9).	As discussed in scoping chapters: Benthic Ecology (Section 8.2.10), Fish and Shellfish Ecology (Section 8.3.10) and Marine Mammals and other Megafauna (Section 8.4.9).
Operational noise associated with the WTG site	No surveys are proposed.	The EIA will undertake a high-level assessment of the turbine noise and potential impacts to receptors, in accordance with ETSU-R-97 "The Assessment and Rating of Noise from Wind Farms"

12.6.4.10 Conclusions and Next Steps

Potential impacts from operational noise associated with the Project WTGs have been scoped in, and therefore, the EIA Report will include an assessment of the potential noise impacts associated with the operation of the WTG, in accordance with ETSU-R-97 "The Assessment and Rating of Noise from Wind Farms".

Furthermore, the scoping assessment has concluded that there is not the potential for a significant human health impact associated with the Project onshore noise in EIA terms and therefore will not be addressed further within the EIA Report. This does not however mean that steps will not be implemented to minimise noise impacts. Highland Wind Limited is committed to implementing accepted good practice measures for controlling construction noise which may include, but not limited to:

- Restricted hours of construction work to avoid sensitive periods;
- The use of equipment with appropriate noise control measures;
- The positioning of temporary site compounds as far as practicable from neighbouring residential properties;
- Additional good practice set out in BD5228:2009; and
- Finally, management measures will be in place to ensure Risk Assessments and Method Statements will be produced as appropriate (and required by consent). These will be disseminated prior to development activities taking place associated with the Project.

13 SUMMARY OF POTENTIAL IMPACTS

Table 13-1 and Table 13-2 summarise the potential impacts offshore and onshore, respectively. Subject to the scoping opinion, these impacts shall be taken forward into the Environmental Impact Assessment.

Table 13-1 Summary of Offshore Potential Impacts

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Potential Impacts on Marine Physical Processes							
Impact of geology		X				X	Scoped in
Impacts on SSSI		X				X	
Loss/ alteration of physical seabed characteristics (bathymetry and sediment type)	X				X		
Increase in suspended sediments	X				X		
Change to coastal landfall morphology	X				X		
Changes to tidal regime			X				
Changes to wave regime			X				
Impacts on local sediment transport regime and seabed features			X				
Removal or creation of seabed features such as sand waves			X				

<table>
<tr><th rowspan="2">Description of Impact</th><th colspan="2">Construction Phase</th><th colspan="2">O&M Phase</th><th colspan="2">Decommissioning Phase</th><th rowspan="2">Cumulative Impacts</th></tr>
<tr><th>Scoped In</th><th>Scoped out</th><th>Scoped In</th><th>Scoped out</th><th>Scoped In</th><th>Scoped out</th></tr>
<tr><td colspan="8">Potential Impacts on Water and Sediment Quality</td></tr>
<tr><td>Impacts on status of designated bathing waters and shellfish due to increased suspended sediment and potential release of contaminants</td><td></td><td>X</td><td></td><td></td><td></td><td>X</td><td rowspan="8">Scoped in</td></tr>
<tr><td>Impacts on status of designated waterbodies due to increased suspended sediment and potential release of contaminants</td><td></td><td>X</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td>Changes in water quality due to increased suspended sediment concentrations</td><td></td><td>X</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td>Changes in water and sediment quality due routine and accidental discharges from vessels during construction/ decommissioning</td><td></td><td>X</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td>Changes in water quality due to accidental release of contaminants, radioactive particles and spillages</td><td>X</td><td></td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>Disturbance and release of contaminated sediments or radioactive particles in sediment</td><td>X</td><td></td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>Changes in water and sediment quality due to pollution from routine and accidental discharges from vessels</td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>Changes in water and sediment quality due to changes in wave, tide and sediment transport regime</td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr>
<tr><td colspan="8">Potential Impacts on Benthic Ecology</td></tr>
<tr><td>Damage from placement/ decommissioning of infrastructure (cables, moorings, anchors) on the seabed</td><td>X</td><td></td><td></td><td></td><td>X</td><td></td><td>Scoped in</td></tr>
</table>

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Installation/ decommissioning of subsea infrastructure in inshore waters	X				X		
Disturbance of contaminated sediments	X				X		Scoped in
Hydrodynamic changes leading to scour around subsea infrastructure (including mooring cables as result of movement with wave and tides)			X				
Damage to habitat or species due to pollution from routine and accidental discharges				X			
Introduction of marine non- natives				X			
Colonisation of subsea infrastructure, scour protection and support structures				X			
Impact to benthic communities from any thermal load or EMF arising from the cables during operation				X			
Potential Impacts on Fish and Shellfish Ecology							
Disturbance or damage to sensitive species due to underwater noise generated from construction/decommissioning activities	X				X		Scoped in
Direct habitat loss due to disturbance of spawning and nursery grounds during the installation/ decommissioning of export cables and placement of anchors on seabed	X				X		

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Effects of increased sedimentation / smothering on fish and shellfish during placement/decommissioning of anchors and export cable		X				X	
Habitat loss of spawning and nursery grounds due to presence of anchors and export cable on the seabed			X				Scoped in
Effects of electromagnetic fields from subsea and dynamic cables on sensitive species				X			
Barrier effects on migratory fish from the presence of the floating platform and associated infrastructure				X			
Effects of operational noise on sensitive species				X			
Fish aggregation around the floating structure and associated infrastructure				X			
Ghost fishing due to lost fishing gear becoming entangled in moorings and cables			X				
Potential Impacts on Marine Mammals and other Megafauna							
Noise-related impacts to marine mammals associated with construction/ decommissioning noise, including the risk of physiological impacts, barrier effects and displacement	X				X		Scoped out

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Indirect impacts of construction/decommissioning noise on the prey species of marine mammals	X				X		
Disturbance due to the physical presence of vessels		X				X	
Risk of injury resulting from collision of marine mammals and basking sharks with installation/decommissioning vessels		X				X	
Impacts associated with effects upon marine water quality, particularly due to any disturbed sediments affecting turbidity.		X				X	
Risk of injury resulting from entanglement of marine mammals or basking sharks with mooring lines or cables, including secondary interactions with derelict fishing gears, or entrapment with mooring systems.			X				
Risk of injury resulting from collision of marine mammals or basking sharks with WTGs			X				
Impacts of operational noise				X			
Displacement or barrier effects resulting from the physical presence of devices and infrastructure			X				Scoped in
Disturbance due to the physical presence of vessels				X			Scoped out
Risk of injury resulting from collision of marine mammals and basking sharks with operations and maintenance vessels				X			

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Risk associated with electromagnetic fields (EMFs) associated with subsea cabling				X			
Impacts associated with effects upon marine water quality due to any accidental release of pollutants.				X			Scoped out
Long term habitat change, including the potential for change in foraging opportunities			X				Scoped in
Construction noise							Scoped in
Potential Impacts on Ornithology							
Potential impact of disturbance/displacement/exclusion due to construction/ decommissioning noise or physical presence	X				X		Scoped in
Potential for a barrier effect due to physical presence	X				X		
Potential change in habitat/prey availability	X				X		
Potential increase in suspended sediment affecting visibility	X				X		
Potential accidental release of pollutants		X				X	Scoped out
Potential impact of disturbance/displacement/exclusion due to physical presence, marine noise and maintenance works			X				Scoped in

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Collision risk, in particular for migratory species/populations			X				Scoped in
Potential for a barrier effect due to physical presence			X				
Potential change in habitat/prey availability			X				
Potential increase in suspended sediment affecting visibility			X				
Creation of a roosting habitat or foraging opportunities			X				Scoped out
Potential accidental release of pollutants.				X			
Potential Impacts on Commercial Fisheries							
Loss of access to fishing grounds due to the presence of vessels and safety zones during construction/ decommissioning	X				X		Scoped in
Displacement of fishing activity into other areas	X				X		
Loss of access to fishing grounds due to the presence of floating platform, associated moorings and safety zone			X				Scoped out
Displacement to other fishing grounds resulting in increase pressure on resources or conflict with other sea users, due to the presence of floating platform, associated moorings and safety zone			X				

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Potential for fishing gear to become entangled with floating and subsea structures, resulting in damage or loss of fishing gear			X				
Obstruction of regular fishing vessel transit routes due to the presence of floating platform and associated moorings			X				
Potential Impacts on Shipping and Navigation							
Vessel displacement due to construction/ decommissioning activities.	X				X		
Vessel to vessel collision risk between a third-party vessel and a project vessel due to the presence of project related vessels.	X				X		
Increased vessel to vessel collision risk between third party vessels due to vessel displacement.	X				X		
Vessel to structure allision risk due to the presence of new structures associated with the project.	X				X		Scoped in
Reduced access to local ports due to construction/decommissioning activities associated with the site.	X				X		
Commercial traffic displacement due to the presence of the site.			X				
Fishing vessel and recreational vessel displacement due to the presence of the site.			X				

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Vessel to vessel collision risk between a third-party vessel and a project vessel due to the presence of project vessels.			X				
Increased vessel to vessel collision risk between third-party vessels (route-based) due to the displacement of vessels from their usual routes.			X				
Increased vessel to vessel collision risk involving fishing vessels and/or recreational vessels due to the displacement of fishing and/or recreational vessels.			X				
Vessel to structure allision risk for fishing vessels in transit due to the presence of new structures associated with the project.			X				
Vessel to structure allision risk for recreational vessels due to the presence of new structures associated with the project.			X				
Reduced access to local ports due to maintenance activities associated with the project.			X				Scoped in
Reduction of under keel clearance due to the presence of moorings/ inter array cables /export cables / cable protection associated with the Offshore Study Area.			X				
Vessel interaction with subsea cables and mooring lines associated with the project.			X				
Loss of Station			X				

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Interference with marine navigation, communications and position fixing equipment due to the presence of new structures associated with the project.			X				
Reduction of emergency response capability due to increased incident rates and/or reduced access for SAR responders.			X				
Potential Impacts on Aviation and Radar							
Interference with civil, military and meteorological radar systems		X				X	
Interference with MoD Air Defence Operations		X				X	
Interference with helicopter support to oil and gas operations		X				X	
Interference with SAR operations	X		X		X		Scoped in
Interference with civil en-route operations				X			
Interference with civil airport operations			X				
Interference with MoD aerodrome operations				X			
Interference with MoD air defence operations				X			
Interference with civil/military SSR				X			

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Interference with low flying operations			X				
Interference with Met Office radar				X			
Interference with helicopter support to oil and gas operations				X			
Potential Impacts on Seascape, Landscape and Visual Amenity							
Presence and activity of marine construction/decommissioning plant and vessels.	X				X		Scoped in
Emergence of offshore turbines and floating substructures.	X				X		
Use of lighting during construction/ decommissioning.	X				X		
Presence of offshore turbines and floating substructures.			X				
Use of lighting during operation.			X				
Activity of vessels during maintenance.			X				
Potential Impacts on Archaeology and Cultural Heritage							
Direct physical disturbance to or loss of marine archaeological features		X		X		X	Scoped out
Indirect physical disturbance to marine and coastal archaeological features		X		X		X	

<table>
<tr><th rowspan="2">Description of Impact</th><th colspan="2">Construction Phase</th><th colspan="2">O&M Phase</th><th colspan="2">Decommissioning Phase</th><th rowspan="2">Cumulative Impacts</th></tr>
<tr><th>Scoped In</th><th>Scoped out</th><th>Scoped In</th><th>Scoped out</th><th>Scoped In</th><th>Scoped out</th></tr>
<tr><td>Potential impacts on historic landscapes and monuments</td><td></td><td>X</td><td></td><td>X</td><td></td><td>X</td><td></td></tr>
<tr><td colspan="8">Potential Impacts on Other Users of the Marine Environment</td></tr>
<tr><td>Obstruction of MRE activities due to the presence of safety zones and construction/ decommissioning vessels during installation activities</td><td></td><td>X</td><td></td><td></td><td></td><td>X</td><td>Scoped out</td></tr>
<tr><td>Obstruction of military activities due to the presence of safety zones and construction/decommissioning vessels during installation activities</td><td>X</td><td></td><td></td><td></td><td>X</td><td></td><td rowspan="4">Scoped in</td></tr>
<tr><td>Obstruction of spoil disposal activities or aggregate extraction due to the presence of safety zones and construction vessels during installation/ decommissioning activities</td><td></td><td>X</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td>Obstruction of electricity cable installation activities due to the presence of safety zones and construction/ decommissioning vessels during installation/ decommissioning activities</td><td>X</td><td></td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>Obstruction of oil, gas and CCS activities due to the presence of safety zones and construction/decommissioning vessels during installation/ decommissioning activities</td><td></td><td>X</td><td></td><td></td><td></td><td>X</td></tr>
</table>

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Disruption to DSRL remedial and monitoring activities due to the presence of safety zones and construction/ decommissioning vessels during installation/ decommissioning activities	X				X		
Telecommunications		X				X	
Obstruction of MRE activities due the presence of the floating structure and associated moorings; and the presence of safety zones and vessels during maintenance activities				X			
Obstruction of military activities due to the presence of the floating structure and associated moorings; and the presence of safety zones and vessels during maintenance activities			X				Scoped in
Obstruction of spoil disposal activities or aggregate extraction due the presence of the floating structure and associated moorings; and the presence of safety zones and vessels during maintenance activities				X			
Obstruction of cable installation activities due to the presence of the floating structure and associated moorings; and the presence of safety zones and vessels during maintenance activities			X				

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Obstruction of oil, gas and CCS activities due to the presence of the floating structure and associated moorings; and the presence of safety zones and vessels during maintenance activities				X			
Obstruction of DSRL remedial and monitoring activities due to the presence of the floating structure, associated moorings and export cable; and the presence of safety zones and vessels during maintenance activities			X				
Obstruction of adverse impact on telecommunication systems in operation in the region			X				
Potential Impacts on Socio-Economics, Tourism and Recreation							
Positive impact on local economy	X				X		Scoped in
Direct impact on tourism	X		X		X		
Direct impact on recreation	X		X		X		
Direct impact on access to amenities	X				X		
Direct effect on local economy			X				

Table 13-2 Summary of Onshore Potential Impacts

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Potential Impacts on Geology, Hydrogeology and Physical Conditions							
Impact on geology	X				X		
Impact on hydrogeology	X		X		X		
Impact on surface sediments	X				X		
Impacts on contaminated land	X				X		
Damage to river banks		X		X		X	
Impact on groundwater and aquifers	X				X		Scoped in
Impacts on private water supplies		X				X	
Impact on land use	X		X		X		
Impact on ground conditions.			X				
Impact on water quality.				X			
Impact on soil/sediment quality.			X				
Potential Impacts on Terrestrial Ornithology							
Loss of habitat, individuals or breeding territories through construction work at the Onshore Study Area	X				X		Scoped in

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Disturbance to or displacement of birds in proximity to the site through construction activities	X				X		Scoped in
Disturbance to or displacement of birds in proximity to the site through operation and maintenance activities			X				
Potential Impacts on Terrestrial Ecology							
Loss of habitat	X				X		Scoped in
Loss of Scottish primrose plants or populations	X				X		
Mortality of protected species (otter, pine marten, badger, reptiles) through construction and decommissioning activities	X				X		
Disturbance to or displacement of protected species (otter, pine marten, badger, reptiles) in proximity to the site through construction and decommissioning activities	X				X		
Indirect effects on habitats and species	X		X		X		
Loss of bat roosts		X				X	
Loss of habitat important for invertebrate populations of conservation concern		X				X	

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Disturbance to or displacement of protected species (otter, pine marten, badger, reptiles) in proximity to the site through operation and maintenance activities			X				Scoped in
Potential Impacts on Onshore Archaeology and Cultural Heritage							
Direct physical disturbance to or loss of known onshore cultural heritage assets and disturbance to or potential loss of any unknown sub-surface archaeological features		X				X	Scoped in
Indirect impacts that affect the setting of Scheduled Monuments, Listed Buildings and other designated archaeological and cultural heritage assets		X				X	
Direct physical disturbance to or loss of known onshore cultural heritage assets and disturbance to or potential loss of any unknown sub-surface archaeological features.				X			
Indirect impacts that affect the setting of Scheduled Monuments, Listed Buildings and other designated archaeological and cultural heritage assets.			X				
Potential Impacts on Air Quality							
Dust (onshore construction)	X				X		Scoped in

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Dust (onshore cable laying)	X						Scoped in
Dust (access road)	X						
Carbon cost (construction)	X						
Carbon saving (operation and maintenance)			X				
Dust (decommissioning)					X		
Carbon Cost (decommissioning)					X		
Potential Impacts Associated with Onshore Landscape and Visual Amenity							
Potential impacts on landscape elements during construction and decommissioning	X				X		Scoped in
Potential impacts on landscape character/ coastal character receptors during construction and decommissioning	X				X		
Potential impacts on wild land during construction and decommissioning	X				X		
Potential impacts on visual receptors during construction and decommissioning	X				X		
Potential impacts on landscape elements during operation			X				
Potential impact on landscape character/ coastal character receptors during operation			X				
Potential impacts on wild land during operation			X				

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Potential impacts on visual receptors during the operation			X				
Potential Impacts Associated with Traffic and Transport							
HGV movements (west)		X		X		X	Scoped in
All vehicle movements (west)		X		X		X	
HGV movements (east and south)		X		X		X	
All vehicle movements (east)		X		X		X	
Potential Impacts Associated with Onshore Electromagnetic Fields (EMF)							
Sources of EMF during construction and decommissioning		X				X	Scoped out
Electric field associated with the cable(s)				X			
Magnetic field associated with the cable(s)				X			
Electric field associated with the substation/ switch gear				X			
Magnetic field associated with the substation/ switch gear				X			
Potential Impacts Associated with Major Accidents and Disasters							

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Major accidents and disasters during construction		X					Scoped out
Major accidents and disasters during maintenance and operation				X			
Major accidents and disasters during decommissioning						X	
Potential Impacts Associated with Onshore Noise							
Onshore noise associated with construction of onshore components		X					Scoped out
Airborne noise produced during construction of the offshore infrastructure.		X		X			
Underwater noise produced during construction of the offshore infrastructure.	X						
Onshore noise associated with operation and maintenance of onshore components				X			Scoped out
Operational noise associated with the WTG site			X				
Onshore noise associated with decommissioning of onshore components						X	
Airborne noise produced during decommissioning of the offshore infrastructure.						X	

Description of Impact	Construction Phase		O&M Phase		Decommissioning Phase		Cumulative Impacts
	Scoped In	Scoped out	Scoped In	Scoped out	Scoped In	Scoped out	
Underwater noise associated with decommissioning of the offshore components.					X		

14 SUGGESTED STRUCTURE OF THE EIA REPORT

This chapter proposes a structure for the Environmental Impact Assessment (EIA) Report which would be prepared by Highland Wind Limited in support of a request for consent to construct and operate the Project.

Highland Wind Limited propose to adopt a single EIA Report comprising of 3 distinct parts, comprising:

> Part 1: Introduction and background (offshore and onshore);

> Part 2: Offshore environmental statement; and

> Part 3: Onshore environmental statement and appendices.

Each technical chapter will begin with a description of relevant baseline conditions and assess the potential impacts of the Project on that baseline, including any potential cumulative impacts.

The suggested structure for the ES is set out below in Table 14-1.

Table 14-1 Suggested structure of the EIA Report

Chapter	Title
Non-Technical Summary	
Part 1: Introduction and Background	
1	Introduction
2	Legislative Context and Regulatory Requirements
3	Site selection and the consideration of alternatives
4	Project Description
5	Environmental Impact Assessment Methodology
Part 2: Offshore Environment	
6	Offshore Physical Environment
6.1	*Geology, Bathymetry and Physical Processes*
6.2	*Offshore Noise*
6.3	*Radioactivity*
7	Offshore Biological Environment
7.1	*Intertidal Ecology*
7.2	*Benthic Ecology*
7.3	*Fish and Shellfish Ecology*
7.4	*Marine Mammals, Turtles and Basking Sharks*
7.5	*Ornithology*
7.6	*Nature Conservation Designations*
8	Offshore Human Environment
8.1	*Commercial Fisheries*
8.2	*Shipping and Navigation*
8.3	*Aviation*

Chapter	Title
Non-Technical Summary	
8.4	*Seascape, Landscape and Visual Amenity*
8.5	*Archaeology and Cultural Heritage*
8.6	*Other Users of the Marine Environment*
8.8	*Socio-economics, Recreation and Tourism*
10	Summary and Next Steps
11	References
Part 3: Onshore Environment	
12	Onshore Physical Environment
12.1	*Geology, Physical Processes, Hydrology and Land Use*
13	Onshore Biological Environment
13.1	*Terrestrial Ornithology*
13.2	*Terrestrial Ecology*
13.3	*Nature Conservation Designations*
14	Onshore Human Environment
14.1	*Onshore Archaeology and Cultural Heritage*
14.2	*Air Quality*
14.3	*Landscape and Visual Amenity*
15	Summary and next steps
16	Summary of Mitigation
15	References
	Appendices

15 REFERENCES

15.1 Upfront Section References

Department for Business Energy and Industrial Strategy (2019). Decommissioning of Offshore Renewable Energy Installations Under The Energy Act 2004 Guidance notes for industry (England and Wales). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/916912/decommisioning-offshore-renewable-energy-installations-energy-act-2004-guidance-industry__1_.pdf [Accessed 12/10/2020];

Dounreay Trì Limited (2015). Scoping Report Dounreay Trì Floating Wind Demonstration Project. Available at: http://marine.gov.scot/sites/default/files/scoping_report.pdf [Accessed 12/10/2020];

Dounreay Trì Limited (2016). Environmental Statement Dounreay Trì Floating Wind Demonstration Project. Available at: http://marine.gov.scot/sites/default/files/environmental_statement_0.pdf [Accessed 12/10/2020];

Marine Scotland (2011). Blue Seas – Green Energy A Sectoral Marine Plan for Offshore Wind Energy in Scottish Territorial Waters, Part A the Plan. Available at: https://www2.gov.scot/Resource/Doc/346375/0115264.pdf [Accessed 12/10/2020];

Marine Scotland (2019). Decommissioning of Offshore Renewable Energy Installations in Scottish Waters or in the Scottish Part of the Renewable Energy Zone under the Energy Act 2004 Guidance notes for industry (in Scotland) (Draft), Scottish Government, 22 November 2019. Available at: https://www.gov.scot/publications/decommissioning-offshore-renewable-energy-installations-scottish-waters-scottish-part-renewable-energy-zone-under-energy-act-2004-guidance-notes-industry-scotland/pages/13/ [Accessed 27/10/2020];

NatureScot (2019). The Southern Trench MPA. Available at. https://sitelink.nature.scot/site/10477 [Accessed 12/10/2020];

RUK (2013). Cumulative Impact Assessment Guidelines Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms. Available at: https://tethys.pnnl.gov/sites/default/files/publications/Cumulative-Impact-Assessment-Guidelines.pdf [Accessed 12/10/2020];

Scottish Government (2015). Scotland's National Marine Plan A Single Framework for Managing Our Seas. Marine Scotland. Available at: https://tethys.pnnl.gov/sites/default/files/publications/Marine-Scotland-2015.pdf [Accessed 12/10/2020];

Scottish Government (2016). Pilot Pentland Firth and Orkney Waters Marine Spatial Plan. Available at:https://www.gov.scot/binaries/content/documents/govscot/publications/factsheet/2016/03/pilot-pentland-firth-orkney-waters-marine-spatial-plan/documents/00497299-pdf/00497299-pdf/govscot%3Adocument/00497299.pdf [Accessed 12/10/2020];

Scottish Government (2017). Scottish Energy Strategy: The future of energy in Scotland, Department of Energy and Climate Change (DECC). Available at: https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/pages/0/[Accessed 12/10/2020];

Scottish Government (2019). Draft Sectoral Marine Plan for Offshore Wind Energy (2019). Available at: http://www.gov.scot/publications/draft-sectoral-marine-plan-offshore-wind-energy/ [Accessed 12/10/2020];

Scottish Government (2020a). Draft Sectoral Marine Plan for Offshore Wind Energy (2019) Consultation Analysis Report (December 2019 to March 2020). Available at: https://www.gov.scot/publications/draft-sectoral-marine-plan-offshore-wind-energy-2019-consultation-analysis-report/ [Accessed 12/10/2020];

Scottish Government (2020b). NPF4 call for ideas: analysis of responses. Available at: https://www.gov.scot/publications/npf4-analysis-reponses-call-ideas/ [Accessed 12/10/2020]; and

SNH (2012). Guidance Assessing the Cumulative Impact of Onshore Wind Energy Developments. Available at: https://www.nature.scot/sites/default/files/2019-11/Guidance%20-

%20Assessing%20the%20cumulative%20impact%20of%20onshore%20wind%20energy%20developments.pdf [Accessed 12/10/2020].

15.2 Offshore Physical Environment

Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors) (2011) Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. 191pp.

British Geological Survey (BGS) (1987). 1:250,000 Series Sea Bed Sediments and Quaternary Geology. Available at: http://www.largeimages.bgs.ac.uk/iip/mapsportal.html?id=1003745 [Accessed 30/09/20 20]

Connor, D.W., Gilliland, RM., Golding, N, Robinson, R,Todd, D., & Verling, E. 2006. UKSeaMap: The Mapping of Seabed and Water Column Features of UK Seas. Joint Nature Conservation Committee, Peterborough.

DSRL (2014). Particles Briefing DSG(2014)C002, Dounreay Stakeholder Group. Available at: https://www.dounreaystakeholdergroup.org/wp-content/uploads/2019/06/download2458.pdf [Accessed 30/09/2020]

DSRL (2020a). Dounreay Foreshore Particle Finds Report. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/919698/Dounreay_foreshort_particle_finds.pdf [Accessed 30/09/2020]

DSRL (2020b). Sandside Beach Near Dounreay Particle Finds Report. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/909597/Sandside_beach_near_Dounreay_particle_finds.pdf [Accessed 30/09/2020]

Horizon Geosciences (2016). Survey Report Geophysical Site, Route Investigation and Unexploded Ordnance Survey Services Dounreay Tri Offshore Windfarm, North Coast, Offshore Scotland, UU-HEX-020, Revision 1, Volumes 1 – 4, October 2016.

Marine Scotland (MS) (2019). Clean Seas Environment Monitoring Programme (CSEMP). Available at: http://marine.gov.scot/information/clean-seas-environment-monitoring-programme-csemp [Accessed 30/09/20]

NatureScot (2008). Citation- Sandside Bay Site of Special Scientific Interest Highland (Caithness). Available at: https://sitelink.nature.scot/site/1405 [Accessed 30/09/20]

NatureScot (2009). Citation- Red Point Coast Site of Special Scientific Interest Highland (Caithness/ Sutherland). Available at: https://sitelink.nature.scot/site/1338 [Accessed 30/09/20]

PRAG (2012). Particle Retrievals Advisory Group (Dounreay) 2012 Report. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/696375/PRAGD_Dounreay-2012-report.pdf [Accessed 30/09/2020].

Ramsay, DL. B Brampton, A.H. (2000). Coastal Cells in Scotland: Cell 4 - Duncansby Head to Cape Wrath. Scottish Natural Heritage Research. Survey and Monitoring Report No 146. Available at: http://www.dynamiccoast.com/files/Ramsay_Brampton_Cell_04.pdf [Accessed 30/09/2020].

Scottish Government (2009). Pentland Firth and Orkney Waters Marine Spatial Plan Framework & Regional Locational Guidance for Marine Energy Final Report. Available at: https://tethys.pnnl.gov/sites/default/files/publications/Marine-Scotland-2011_0115355.pdf [Accessed 30/09/2020].

15.3 Offshore Biological Environment

Aquatera. (2011). Environmental Monitoring Report - 2011 Installation of monopile at Voith Hydro test berth, Fall of Warness, Orkney. Aquatera Ltd., Orkney, Scotland. [online] Available at: https://tethys.pnnl.gov/publications/environmental -monitoring-report-2011-installation-monopile-voith -hydro-test-berth-fall

Armstrong, J.D., Hunter, D-C., Fryer, R.J., Rycroft, P. and Orpwood, J.E. (2015). Behavioural Responses of Atlantic Salmon to Mains Frequency Magnetic Fields. Scottish Marine and Freshwater Science, 9(6) Available online at https://www.gov.scot/publications/scottish-marine-freshwater-science-vol-6-9-behavioural-responses-atlantic/;

Bailey, H., Brookes, K.L. and Thompson, P.M., (2014). Assessing environmental impacts of offshore wind farms: lessons learned and recommendations for the future. Aquatic biosystems. 10: 1-13.

Bailey, H., Senior, B., Simmons, D., Rusin, J., Picken, G. and Thompson, P.M., (2010). Assessing underwater noise levels during pile-driving at an offshore windfarm and its potential effects on marine mammals. Marine pollution bulletin, 60: 888-897.

Baines, M.E. and Evans, P.G.H. (2009). Atlas of the Marine Mammals of Wales. CCW Monitoring Report No.68. 82pp.

Band, B. (2012). Using a collision risk model to assess bird collision risks for offshore windfarms. Strategic Ornithological Support Services (SOSS), Project SOSS-02;

Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., Moffat, C.F., (Editors) (2011) Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. 191pp.

Benjamins, S., Harnois, V., Smith, H.C.M., Johanning, L., Greenhill, L., Carter, C. and Wilson, B. (2014). Understanding the potential for marine megafauna entanglement risk from renewable marine energy developments. Scottish Natural Heritage Commissioned Report No. 791.

Bergstom, L., Kautsky, L., Malm, T., Rosenberg, R., Wahlberg, M., Capetillo, N. A. and Wilhelmsson D. (2014). Effects of offshore wind farms on marine wildlife—a generalized impact assessment. Environmental Research letters, 3 (9). Available online at https://iopscience.iop.org/article/10.1088/1748-9326/9/3/034012/meta;

BSI. (2002). The Control of Noise (Codes of Practice for Construction and Open Sites) (Scotland) Order 2002. [online] Available at: http://www.legislation.gov.uk/ssi/2002/104/pdfs/ssi_20020104_en.pdf.

BSI. (2019). Wind energy generation systems. Measurement and assessment of electrical characteristics. Wind turbine harmonic model and its application. PD IEC TR 61400-21-3:2019.

Centre for Marine and Coastal Studies (CMACS) (2003). A Baseline Assessment of Electromagnetic Fields Generated by Offshore Windfarm Cables (COWRIE Technical Report EMF 01-2002 66), Birkenhead, England, UK;

Cheney, B., Thompson, P.M., Ingram, S.N., Hammond, P.S., Stevick, P.T., Durban, J.W., Culloch, R.M., Elwen, S.H., Mandleberg, L., Janik, V.M. and Quick, N.J., (2013). Integrating multiple data sources to assess the distribution and abundance of bottlenose dolphins Tursiops truncatus in Scottish waters. Mammal Review, 43: 71-88.

Copping, A.E. and Hemery, L.G., editors. (2020). OES-Environmental 2020 State of the Science Report: Environmental Effects of Marine Renewable Energy Development Around the World. Report for Ocean Energy Systems (OES).

Coull, K.A., Johnstone, R., and S.I. Rogers. (1998) Fisheries sensitivity maps in British waters, 1. Available online at https://www.cefas.co.uk/media/o0fgfobd/sensi_maps.pdf; and

DTI. (1996). The Assessment & Rating of Noise form Wind Farms (ETSU-R- 97). [online] Available at: http://webarchive.nationalarchives.gov.uk/+/http:/www.berr.gov.uk/files/file20433.pdf

Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J.(2012) Spawning and nursery grounds of selected fish species in UK waters. Available online at https://www.cefas.co.uk/publications/techrep/TechRep147.pdf.

EU. (2008). EU Marine Strategy Framework Directive (Directive 2008/56/EC). [online] Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN.

EUSeaMap (2019). Broad-scale Predictive Habitat Map – EUNIS classification full detail. Available online at https://www.emodnet-seabedhabitats.eu/access-data/launch-map-viewer/;

Evans, P.G.H., Baines, M.E. & Coppock, J. (2011). Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters. Report by Hebog Environmental Ltd & Sea Watch Foundation. Scottish Natural Heritage Commissioned Report No.419

Farcas, A., Powell, C.F., Brookes, K.L., and Merchant, N.D. (2020). Validated shipping noise maps of the Northeast Atlantic. Science of the Total Environment, 735: 139509.

Fox, J. (2015). Intertidal Survey Report: Dounreay Trì Floating Wind Demonstration Project 0.4.

Graham, I.M., Merchant, N.D., Farcas, A., Barton, T.R., Cheney, B., Bono, S. and Thompson, P.M., (2019). Harbour porpoise responses to pile-driving diminish over time. Royal Society open science, 6: 190335.

Hague, E.L., Sinclair, R.R and Sparling, C.E. (2020). Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters. Scottish Marine and Freshwater Science Vol 11 No 12

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J., and Øien, N. (2017). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. May 2017.

Hastie, G., Merchant, N.D., Götz, T., Russell, D.J., Thompson, P. and Janik, V.M., (2019). Effects of impulsive noise on marine mammals: investigating range-dependent risk. Ecological Applications, 29: e01906.

Hastie, G.D., Russell, D.J., McConnell, B., Moss, S., Thompson, D. and Janik, V.M., (2015). Sound exposure in harbour seals during the installation of an offshore wind farm: predictions of auditory damage. Journal of Applied Ecology, 52: 631-640. http://www.smru.st-andrews.ac.uk/files/2020/08/SCOS-2019.pdf [Accessed 03/09/2019].

Hawkins, A.D., and Myrberg, A.A. Jr. (1983). Hearing and sound communication underwater. In: Lewis B (ed), Bioacoustics, a comparative approach. Academic Press, London, p 347–405;

HiDef (2015). Digital video aerial survey s of seabirds and marine mammals at the Hexicon Dounreay Trì project: final report. Document Number: HP00054-703.

HiDef (2016). Digital video aerial survey s of seabirds and marine mammals at the Highlands and Islands Dounreay Demonstration Centre project: final report. Document Number: HP00059-701

HiDef (2020). HiDef Digital Video Aerial Survey for Seabirds and Marine Mammals. Doc. No. HP00298-001, Draft 3. 04 August 2020.

Horizon Geosciences (2016). Survey Report Geophysical Site, Route Investigation and Unexploded Ordnance Survey Services Dounreay Tri Offshore Windfarm, North Coast, Offshore Scotland, UU-HEX-020, Revision 1, Volumes 1 – 4, October 2016.

HWDT (n.d.) Basking shark. Available from: https://hwdt.org/basking-shark#:~:text=Basking%20sharks%20normally%20swim%20at,occasionally%20see%20in%20the%20Hebrides [Accessed 03/09/2020].

IAMMWG. (2015). Management Units for cetaceans in UK waters (January 2015). JNCC Report No. 547, JNCC Peterborough.

IoA. (2013). A good practice guide to the application of ETSU-R- 97 for the assessment and rating of wind turbine noise. [online] Available at: http://www.ioa.org.uk/sites/default/files/IOA%20Good%20Practice%20Guide%20on%20Wind%20Turbine%20Noise%20 -%20 may%202013.pdf.

IOS. (1996). ISO 9613 - 2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation. [online] Available at: http://www.iso.org/iso/catalogue_detail.htm?csnumber=20649.

JNCC (2018). North-West Orkney MPA. Available online at https://jncc.gov.uk/our-work/north-west-orkney-mpa/;

JNCC (2020). JNCC SAC information. Available online at https://sac.jncc.gov.uk/;

JNCC. (2010). Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise. August 2010. [online]. Available at: http://data.jncc.gov.uk/data/31662b6a-19ed-4918-9fab-8fbcff752046/JNCC-CNCB-Piling-protocol-August2010-Web.pdf

JNCC. (2017). JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys. August 2017. [online]. Available at: http://data.jncc.gov.uk/data/e2a46de5-43d4-43f0-b296-c62134397ce4/jncc-guidelines-seismicsurvey-aug2017-web.pdf

JNCC. (2020). Marine Noise Registry. [online] Available at: https://mnr.jncc.gov.uk/

Johnston, A., Cook, A., Wright, L., Humphreys, E. and Burton, N. (2014). Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. Journal of Applied Ecology, 51(1), pp.31-41.

Joint Nature Conservation Committee. (2010). Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals form piling noise. [online] Available at: http://jncc.defra.gov.uk/pdf/JNCC_Piling%20protocol_August_2010.pdf.

Kraus, S.D., R.D. Kenney, and L. Thomas. (2019). A Framework for Studying the Effects of Offshore Wind Development on Marine Mammals and Turtles. Report prepared for the Massachusetts Clean Energy Center, Boston, MA 02110, and the Bureau of Ocean Energy Management. Available from: https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/A-Framework-for-Studying-the-Effects.pdf [Accessed 03/09/2020].

Malcom, A., Godfrey, J. and Youngson, A.F. (2010). Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables. Scottish Marine and Freshwater Science Vol 1 No 14. Available online at https://www2.gov.scot/Resource/Doc/295194/0111162.pdf;

Marine Conservation Society (n.d.). Basking Shark Code of Conduct. Available from: https://www.mcsuk.org/downloads/wildlife/basking_sharks/Basking_Shark_Code_of_Conduct_Poster.pdf [Accessed 03/09/2020].

Marine Scotland (2011) Pentland Firth and Orkney Waters Marine Spatial Plan Framework. Available from: https://tethys.pnnl.gov/sites/default/files/publications/Marine-Scotland-2011_0115355.pdf [Accessed 04/09/2020].

Marine Scotland (2013). Feature Activity Sensitivity Tool. Available online at http://www.marine.scotland.gov.uk/FEAST/.

Marine Scotland (2014) Guidance on the Offence of Harassment at Seal Haul-out Sites. Available from: https://consult.gov.scot/marine-environment/possible-designation-of-a-seal-haul-out-site/user_uploads/guidance-on-the-offence-of-harassment-at-seal-haul-out-sites.pdf-1 [Accessed 03/09/2020].

Marine Scotland (2020). The protection of Marine European Protected Species from injury and disturbance – Guidance for Scottish Inshore Waters (July 2020 Version). Available from: https://www.gov.scot/publications/marine-european-protected-species-protection-from-injury-and-disturbance/#:~:text=Marine%20European%20protected%20species%3A%20protection%20from%20injury%20and%20disturbance,-Published%3A%2029%20Jul&text=This%20guidance%20provides%20advice%20for,European%20protected%20species%20(EPS) [Accessed 03/09/2020].

Marine Scotland Science (2015). Fish and Shellfish Stocks: 2015 Edition. Available online at https://www.gov.scot/publications/fish-shellfish-stocks-2015-edition/#.

Marine Scotland (2019). Areas where ALL FISHING is restricted. Available online at http://marine.gov.scot/node/12774.

MarLIN (2020). The Marine Life Information Network. Available online at https://www.marlin.ac.uk/;

McBreen, F., Askew, N., Cameron, A., Connor, D., Ellwood, H. & Carter, A. (2011). UKSeaMap 2010: Predictive mapping of seabed habitats in UK waters. JNCC Report No. 446, JNCC, Peterborough. Available online at https://hub.jncc.gov.uk/assets/07a4513b-f04a-41c2-9be2-4135a14d0d15.

McGegor, R.M., King, S., Donovan, C.R., Caneco, B. and Webb, A. (2018). A Stochastic Collision Risk Model Seabirds in Flight. Available online at https://tethys.pnnl.gov/sites/default/files/publications/McGregor-2018-Stochastic.pdf.

MMO (2014). Review of post-consent offshore wind farm monitoring data associated with licence conditions. A report produced for the Marine Management Organisation, pp 194. MMO Project No: 1031. ISBN: 978-1-909452-24-4.

Moore, A., Freake, S. M., & Thomas, I. M. (1990). Magnetic particles in the lateral line of the Atlantic salmon (Salmo salar L.). Philosophical Transactions of the Royal Society B: Biological Sciences, 329, 11-15;

Moore, C.G. (2015). Biological analyses of underwater video from research cruises in marine protected areas and renewable energy locations around Scotland in 2014. Scottish Natural Heritage Commissioned Report No. 819. Available online at https://www.nature.scot/naturescot-commissioned-report-819-biological-analyses-underwater-video-research-cruises-marine);

MSS (2014). Marine Scotland Science Farr Point Bathymetry Survey. Available online at https://www2.gov.scot/Topics/marine/science/MSInteractive/datatype/Bathymetry/data/farr-point;

NBN Atlas (2020). Dermochelys coriacea – Leathery Turtle Records. Available from: https://species.nbnatlas.org/species/NBNSYS0000188646#tab_mapView [Accessed 03/09/2020].

NMFS (National Marine Fisheries Service). (2014). Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals—Acoustic thresholds for Onset of Permanent and Temporary Threshold Shifts. Federal Register 79:4672-4673.

NOAA (National Oceanic and Atmospheric Administration) (2018). Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing, Technical Memorandum NMFS-OPR-55, 2018.

OSPAR (2008). Co-ordinated Environmental Monitoring Programme - Assessment manual for contaminants in sediment and biota. OSPAR Commission, 2008, publication no. 379/2008. ISBN 978-1-906840-20-4. 39 pp. Available online at https://www.eea.europa.eu/data-and-maps/indicators/hazardous-substances-in-marine-organisms-3/ospar-2008.

Popper, A.N., Hawkins, A.D., Fay, R.R., Mann, D.A., Bartol, S. and Carlson, T.J., 2014. Sound exposure guidelines for fishes and sea turtles (No. ASA S3/SC1. 4 TR-2014).

Reid, J., Evans, P. & Northridge, S., (2003). An atlas of cetacean distribution on the northwest European Continental Shelf, Joint Nature Conservation Committee: Peterborough.

Russell, D.J., Hastie, G.D., Thompson, D., Janik, V.M., Hammond, P.S., Scott-Hayward, L.A., Matthiopoulos, J., Jones, E.L. and McConnell, B.J., (2016). Avoidance of wind farms by harbour seals is limited to pile driving activities. Journal of Applied Ecology, 53: 1642-1652.

Russell, D.J.F., Jones, E.L., and Morris, C.D. (2017). Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals. Scottish Marine and Freshwater Science Report Volume 8, No. 25.

Searle, K.R., Butler, A., Mobbs, D.C., Trinder, M., Waggitt, J., Evans. P. and Daunt, F. (2018). Scottish Waters East Region Regional Sectoral Marine Plan Strategic Ornithology Study: Final report. Available online at https://webcache.googleusercontent.com/search?q=cache:THD5eUfJcYAJ:https://northseaportal.eu/publish/pages/144481/scotland_case_report.pdf+&cd=4&hl=en&ct=clnk&gl=uk

Smart Wind (2014). Joint response from SNCBs to Marine Scotland Science Avoidance Rate Paper –25 November 2014 Appendix Y to the Response submitted for Deadline I Application Reference: EN010053. Available online at https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010053/EN010053-001024-Appendix%20Y_Joint%20response%20from%20SNCBs%20to%20MSS%20Avoidance%20Rate%20Paper%2025%20November%202014.pdf

SNH (2018a). Ocean Quahog. Available online at (http://marine.gov.scot/node/12704);

SNH (2018b). Interim Guidance on Apportioning Impacts from Marine Renewable Development to Breeding Seabird Populations in Special Protection Areas. Available online at https://www.nature.scot/interim-guidance-apportioning-impacts-marine-renewable-developments-breeding-seabird-populations.

Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene, C. R., Kastak, D. (2007). Marine mammal noise exposure criteria: initial scientific recommendations. Aquatic Mammals, 33(4); Special Issue.

Southall, B.L, Finneran, J.L., Reichmuth, C., Nachtigall, P.E., Ketten D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P., and Tyack, P. (2019). 'Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects'. Aquatic Mammals, 45(2) 125-232.

Special Committee on Seals (SCOS) (2019) Scientific Advice on Matters Related to the Management of Seal Populations: 2018.

Subacoustech. (2015a). SPEAR. [online] Available at: www.subacoustech.com/modelling/spear/

Subacoustech. (2015b). INSPIRE. [online] Available at: http://www.subacoustech.com/modelling/inspire/

The Crown Estate. (2020). Offshore Wind Operational Report 2019. April 2020. [online] Available at: https://www.thecrownestate.co.uk/media/3515/offshore-wind-operational-report-2019.pdf

Thompson, D., Hall, A.J., Lonergan, M., McConnell, B. & Northridge, S. (2013) Current status of knowledge of effects of offshore renewable energy generation devices on marine mammals and research requirements. Edinburgh: Scottish Government.

Thompson, P.M., Hastie, G.D., Nedwell, J., Barham, R., Brookes, K.L., Cordes, L.S., Bailey, H. and McLean, N., (2013). Framework for assessing impacts of pile-driving noise from offshore wind farm construction on a harbour seal population. Environmental Impact Assessment Review, 43, pp.73-85.

Verfuss, U.K., Sparling, C.E., Arnot, C., Judd, A. and Coyle, M., (2016). Review of offshore wind farm impact monitoring and mitigation with regard to marine mammals. In The Effects of Noise on Aquatic Life II (pp. 1175-1182). Springer, New York, NY.

Waggitt, J.J., Evans, P.G., Andrade, J., Banks, A.N., Boisseau, O., Bolton, M., Bradbury, G., Brereton, T., Camphuysen, C.J., Durinck, J. and Felce, T., (2020). Distribution maps of cetacean and seabird populations in the North-East Atlantic.Journal of Applied Ecology, 57. 253-269.

WHO. (2009). Night Noise Guidelines for Europe. [online] Available at: http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf

WHO. (2018). Environmental Noise Guidelines for the European Region. [online] Available at: https://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

Witt, M.J., Hardy, T., Johnson, L., McClellan, C.M., Pikesley, S.K., Ranger, S., Richardson, P.B., Solandt, J.L., Speedie, C., Williams, R. and Godley, B.J. (2012). Basking sharks in the northeast Atlantic: spatio-temporal trends from sightings in UK waters. Marine Ecology Progress Series, 459: 121-134.

Woodward, I., Thaxter, C.B., Owen, E., and Cook, A.S.C.P. (2019). Desk-based revision of seabird foraging ranges used for HRA screening. BTO research report number 724.

15.4 Offshore Human Environment

ABPMer. (2008). Atlas of UK Marine Renewable Energy Resources. [online] Available at: http://www.abpmer.co.uk/experience/renewable-energy-experience/atlas-of-uk-marine-renewable-energy-resources/.

ABPMer. (2013). Pentland Firth and Orkney Waters Strategic Area: Marine Energy Resources.

Canmore (2012). Hms King Edward Vii [possibly]: Pentland Firth. Available online at https://canmore.org.uk/site/101982/hms-king-edward-vii-possibly-pentland-firth.

Dounreay Site Restoration Ltd. (DSLR) (2015). Patricle Cleanup. Beach Monitoring – Sandside. [online] Available at: http://www.dounreay.com/particle-cleanup/beach-monitoring/sandside.CAA (2008). Safety Sense Leaflet 18: Military low Flying. Available online at https://publicapps.caa.co.uk/docs/33/ga_srg_09webSSL18November.pdf; and

Foundation Scotland (2013). The Caithness Conversation Community Profile. Available online at https://www.foundationscotland.org.uk/media/637832/The_Caithness_Conversation_Community_Profile-1-.pdf).

IMO (2018). Revised Guidelines for Formal Safety Assessment. London: IMO.

Magic Seaweed (2020). Leisure and Recreation - Surfing locations. Available online at http://marine.gov.scot/maps/405.

Marine Scotland (2016). Marine Recreation and Tourism Survey 2015 - Walking at the coast (restricted zoom). Available online at http://marine.gov.scot/maps/1020;

MCA (2013). Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms, Southampton: MCA.

MCA (2016). MGN 543 (Merchant and Fishing) Safety of Navigation OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response. Southampton: MCA.

MMO (2019) Vessel Monitoring System (VMS) values by fishing method (average 2013-2017)

MMO (2020). Landing values by species (average 2014-2018).

NAT (2018). Chart of United Kingdom Airspace Restrictions and Hazardous Areas. Available online at https://www.aurora.nats.co.uk/htmlAIP/Publications/2018-11-08-AIRAC/graphics/43863.pdf.

NLB (2020). Sule Skerry. Available online at https://www.nlb.org.uk/lighthouses/sule-skerry/.

Oil and Gas UK (2019). Oil and gas infrastructure data set. Available online at http://marine.gov.scot/node/15124.

ORCA (2015). Dounreay Trì Offshore Wind Farm Caithness: Marine Historic Environment Technical Baseline Report.

RYA (2019). Leisure and Recreation - Recreational AIS intensity - RYA UK Coastal Atlas of Recreational Boating - September 2019. Available online at http://marine.gov.scot/maps/1855; and

Simecatlantis (2020a). Tidal Stream Projects MeyGen. Available online at https://simecatlantis.com/projects/meygen/;

Simecatlantis (2020b). Tidal Stream Projects: Ness of Duncansby. Available online at https://simecatlantis.com/projects/duncansby/.

SSEPD (2014). Orkney Caithness. Available online at https://www.ssen.co.uk/OrkneyCaithness/;

Tethys (2020). Brims Tidal Array. Available online at https://tethys.pnnl.gov/project-sites/brims-tidal-array;

The Scottish Government: Planning Advice Note (PAN 2/2011): Planning and Archaeology, July 2011;

Wessex Archaeology (2007). Historic Environment Guidance for the Offshore Renewable Energy Sector, commissioned by COWRIE Ltd. Available online at https://www.wessexarch.co.uk/sites/default/files/field_file/COWRIE_2007_Wessex_%20-%20archaeo_%20guidance_Final_1-2-07.pdf;

15.5 Onshore Physical Environment

Ballantyne, C. and Hall, A., 2008. The altitude of the last ice sheet in Caithness and east Sutherland, northern Scotland. *Scottish Journal of Geology*, 44(2), pp.169-181.

Phillips, W. M., Hall, A. M., Ballantyne, C. K., Binnie, S., Kubik, P. W. and Freeman, S. 2008. Extent of the last ice sheet in northern Scotland tested with cosmogenic 10Be exposure ages. J. Quaternary Sci., Vol. 23 pp. 101–107. ISSN 0267-8179

DSRL (2009). Strategy for Contaminated Land Management and Restoration 2008, DEC (08)P166, Issue 2.1. Available at: https://webarchive.nationalarchives.gov.uk/20151002133145/http:/dounreay.com/UserFiles/File/Contaminated%20Land/DEC_08_P166v2_1.pdf [Accessed 01/10/2020]

SEPA (2020). SEPA Rainfall Data – Data download for Strathy Bridge. Available at: https://www2.sepa.org.uk/rainfall/data/index/234319 [Accessed 01/10/2020]

Met Office (2020). UK and Regional Series – Scotland N, Rainfall Data Extract 1990 – 2020. Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/climate/datasets/Rainfall/ranked/Scotland_N.txt [Accessed 01/10/2020]

Savage, D., Watson, C., Wilson, J., Bond, A., Jones, W., Metcalf, R., Milodowski, T., Munro, C., Penfold, J., Watson, S. 2009. Understanding Radionuclide Migration from the D1225 Shaft, Dounreay, Caithness, UK. Materials Research Society. Symp. Proc. Vol. 1193 pp. 367 -374.

Brown, J. F., (2011). Quaternary with Underlying Geology For The Cable Route Converter Station And Landing: Aquatera.

Hall, A. M., and Quaternary Research, A., (1996). The Quaternary of Orkney field guide, Cambridge, Quaternary Research Association, Field guide (Quaternary Research Association (Great Britain)), v. 160 p.

Hurst, N. T. A., (2009). Excursion Guide to the Geology of East Sutherland and Caithness Edinburgh, Dunedin Academic Press Ltd.

Michie, U., (1994). The geology and hydrogeology of Dounreay, Executive Summary: United Kingdom Nirex Limited.

15.6 Onshore Biological Environment

Calladine, J., Garner, G., Wernham, C. and Thiel, A. (2009). The influence of survey frequency on population estimates of moorland breeding birds. Bird Study 56, 381 -288.

DSRL (2017). Environmental Statement Phase 3 (2018 – Interim End State). Vol 2: Environmental Statement. Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=OY46OSIHIFP00 [Accessed 01/10/2020]

Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R., Aebischer, N.J., Gibbons, D.W., Evans, A. and Gregory, R.D. (2009). Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. British Birds 102, 296-341.

Forrester, R. W., Andrews, I., J., McInerny. C., J., Murray, R., D., McGowan, R., Y., Zonfrillo, B., Betts, M., W., Jardine, D., C. and Grundy, D., S. (eds). (2007). The Birds of Scotland. The Scottish Ornithologists' Club, Aberlady.

Gilbert, G., Gibbons, D.W. and Evans, J. (1998). Bird Monitoring Methods. RSPB, Sandy.

Hardey, J., Crick, H., Werham, C., Riley, H., Etheridge, B. And Thompson, D. (2009). Raptors: a field guide to survey and monitoring. Second Edition. SNH, Inverness.

JNCC. (2007). Handbook for Phase 1 habitat survey: a technique for environmental audit. JNCC, Peterborough.

Mitchell, C. (2012). Mapping the distribution of feeding Pink-footed and Icelandic Greylag Geese in Scotland. Wildfowl & Wetlands Trust / Scottish Natural Heritage, Slimbridge.

Morris, J. (2009). Primula scotica survey in Caithness and Sutherland 2007-2008. Scottish Natural Heritage Commissioned Report No. 312. SNH, Golspie.

Patterson, I.J., Lambie, D., Smith, J. and Smith, R. (2013). Survey of the feeding areas, roosts and flight activity of qualifying species of the Caithness Lochs Special Protection Area, 2011/12 and 2012/13. Scottish Natural Heritage Commissioned Report No. 523b. Scottish Natural Heritage, Golspie.

Rodwell, J S (ed.). (1991a). British Plant Communities, Vol. 1: woodlands and scrub. Cambridge University Press, Cambridge.

Rodwell, J S (ed.). (1991b). British Plant Communities, Vol. 2: mires and heaths. Cambridge University Press, Cambridge.

Rodwell, J S (ed.). (2000). British Plant Communities, Vol. 5: maritime communities and vegetation of open habitats. Cambridge University Press, Cambridge.

Rodwell, J.S. (2006). National Vegetation Classification: Users' Handbook. JNCC, Peterborough.

RSPB (2020). Objection Comment - 20/00645/FUL Drum Hollistan 2 Wind Farm – Supplementary Information. 21st August 2020. Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=Q5J9ADIHL4U00 [Accessed 01/10/2020]

SEPA. (2012). Land Use Planning System SEPA Guidance Note 4: Planning Guidance on Windfarm Developments. SEPA.

SHET (2018). Environmental Impact Assessment, Town and Country Planning Screening Letter (LT000017/DRW/SCRE/01). Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=P8V7LXIH0C200 [Accessed 01/10/2020]

SHET (2018). Environmental Impact Assessment, Town and Country Planning Screening Letter (LT000017/DRW/SCRE/01). Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=P8V7LXIH0C200 [Accessed 01/10/2020]

SNH. (2010). Survey Methods for Use in assessing the Impacts of Onshore Wind farms on Bird Communities. November 2005 (revised December 2010). SNH, Battleby.

SNH. (2014). Recommended bird survey methods to inform impact assessment of onshore wind farms. May 2014. SNH.

SNIFFER. (2009). WFD95: A Functional Wetland Typology for Scotland - Project Report. ISBN: 978-1-906934-21-7.

SSEN (2020). Limekiln Wind Farm 132 kV Grid Connection Application. EIA Vol 2 – Main Text. Chapter 8: Ornithology. Available at: https://www.ssen-transmission.co.uk/limekiln-wind-farm-connection-environmental-impact-assessment/ [Accessed 01/10/2020].

SSEN (2020). Limekiln Wind Farm 132 kV Grid Connection Application. EIA Vol 2 – Main Text. Chapter 7: Ecology. Available at: https://www.ssen-transmission.co.uk/limekiln-wind-farm-connection-environmental-impact-assessment/ [Accessed 01/10/2020].

The Highland Council (THC) (2019). Planning Permission Decision Notice Ref No. 19/01092/FUL. Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=PO7709IHI5P00 [Accessed 01/10/2020].

The Highland Council (THC) (2019). Planning Permission Decision Notice Ref No. 19/01092/FUL. Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=PO7709IHI5P00 [Accessed 01/10/2020].

UKTAG. (2003). Guidance on the identification of groundwater dependent terrestrial ecosystems. UKTAG.

UKTAG. (2009). Guidance on the identification of groundwater dependent terrestrial ecosystems: Annex I – NVC plant communities and dependency on groundwater. UKTAG.

15.1 Onshore Human Environment

DSRL (2017). Environmental Statement Phase 3 (2018 – Interim End State). Vol 2: Environmental Statement. Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=OY46OSIHIFP00 [Accessed 01/10/2020]

INFINERGY (2020). Limekiln Wind Farm Extension EIA Report. Chapter 10 – Cultural Heritage Vol 1: Written Statement. Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=QAQ68JIH0FM00 [[Accessed 01/10/2020].

Muirden Energy LLP (2020). Drum Hollistan 2 Wind Farm EIA Report. Volume 2: Written Statement. Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=Q5J9ADIHL4U00 [Accessed 01/10/2020]

SHET (2018). Environmental Impact Assessment, Town and Country Planning Screening Letter (LT000017/DRW/SCRE/01). Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=P8V7LXIH0C200 [Accessed 01/10/2020]

SSEN (2020). Limekiln Wind Farm 132 kV Grid Connection Application. EIA Vol 2 – Main Text. Chapter 7: Ecology. Available at: https://www.ssen-transmission.co.uk/limekiln-wind-farm-connection-environmental-impact-assessment/ [Accessed 01/10/2020].

The Highland Council (THC) (2019). Planning Permission Decision Notice Ref No. 19/01092/FUL. Available at: https://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=documents&keyVal=PO7709IHI5P00 [Accessed 01/10/2020].