Environmental Impact Assessment

Scoping Report

Date: March 2020

Revision: A

Copyright ©2020 innogy Renewables UK

REVISION	DATE	STATUS/ REASON FOR ISSUE	AUTHOR:	CHECKED BY:	APPROVED BY:
A	16/03/2020	External Draft	GoBe	innogy	innogy

Crynodeb Weithredol

Mae innogy yn cydnabod y ffaith bod statws swyddogol i'r Iaith Gwynt y Môrraeg o dan Fesur y Gymraeg (Cymru) 2011 ac na ddylid trin yr iaith yn llai ffafriol na'r Saesneg. Mae innogy yn credu bod ymgysylltu ag iaith ein rhanddeiliaid yn arfer busnes da. Disgwylia Innogy ddilyn y cynsail a sefydlwyd gan Brosiectau Seilwaith o Arwyddocâd Cenedlaethol yng Ngogledd Cymru, a darparu deunyddiau sydd o fudd cyffredinol yn ddwyieithog, a dogfennau technegol yn Saesneg yn unig. O'r herwydd, darperir y Crynodeb Gweithredol hwn o'r Adroddiad Cwmpasu yn y Gymraeg a'r Saesneg, gyda'r penodau technegol dilynol yn Saesneg yn unig.

Mae'r ddogfen hon yn cefnogi cais am Farn Gwmpasu ar yr Asesiad o'r Effaith Amgylcheddol (AEA) gan yr Arolygiaeth Gynllunio ac Adnoddau Naturiol Cymru (ANC) ar gyfer Fferm Wynt Alltraeth (FfWA) Awel y Môr. Mae FfWA Awel y Môr yn Brosiect Seilwaith o Arwyddocâd Cenedlaethol. Bydd AEA yn cael ei ddarparu fel rhan o gais Gorchymyn Caniatâd Datblygu o dan Ddeddf Cynllunio 2008 ac fel rhan o'r cais am Drwydded Forol o dan Ddeddf y Môr a Mynediad i'r Arfordir 2009.

Mae Adroddiad Cwmpasu'r AEA hwn wedi ei baratoi ar ran innogy Renewables UK Ltd (innogy) yn unol â Rheoliad 10 o Reoliadau Cynllunio Seilwaith (Asesu Effeithiau Amgylcheddol) 2017 a Rheoliad 6 o Reoliadau Gwaith Morol (Asesu Effeithiau Amgylcheddol) 2007.

Estyniad i Fferm Wynt Alltraeth weithredol Gwynt y Môr yw FfWA Awel y Môr. Mae FfWA Gwynt y Môr yn cynnwys 160 generadur tyrbin gwynt ac yn cyflenwi trydan i tua 400,000 o gartrefi bob blwyddyn. Byddai'r estyniad arfaethedig yn cyfrannu'n sylweddol at dargedau ynni Llywodraeth Cymru (sef bod angen i 70% o'r trydan gael ei gynhyrchu gan ffynonellau adnewyddadwy erbyn 2030 a bod yn "sero-net" erbyn 2050). Y prif ysgogiad ar gyfer ynni adnewyddadwy yn y DU, ac ym mhrosiect FfWA Awel y Môr, yw lleihau allyriadau nwyon tŷ gwydr, gan roi mwy o sicrwydd ynni, a chynyddu cyfleoedd economaidd y DU ac economïau lleol i'r eithaf. Ystyrir fod estyniadau fel hyn yn brosiectau sy'n rhoi cyfle sylweddol i ostwng costau gwynt alltraeth drwy fanteisio ar y seilwaith presennol, arbenigedd technegol a'r profiad sydd ar y safle; yn ogystal â setiau data ac astudiaethau amgylcheddol presennol. Mae hwn yn un o'r ffactorau sy'n dod yn gynyddol bwysig er mwyn ysgogi marchnad drydan gystadleuol iawn y DU, a cheisio sicrhau'r gwerth gorau bosibl i'r prynwr.

Mae astudiaethau dichonoldeb cynnar ar gyfer FfWA Awel y Môr wedi eu cychwyn ar adeg ysgrifennu'r adroddiad hwn ac felly mae rhai o fanylion y prosiect heb eu cadarnhau. Gallai'r prosiect gynnwys hyd at 107 generadur tyrbin gwynt a fyddai'n cael eu lleoli i'r gorllewin o'r FfWA weithredol Gwynt y Môr.

Byddai ceblau'n cysylltu'r tyrbinau i blatfformau'r isbwerdy alltraeth ac yn allforio'r pŵer a gynhyrchir i'r tir. Disgwylir y byddai nifer o geblau rhyng-aráe, hyd at ddau gebl allforio a hyd at ddau blatfform isbwerdy alltraeth. Mae pwynt agosaf aráe'r generaduron tyrbin gwynt wedi ei leoli 10.6 km o'r lan.

Rhagwelir mai ym Modelwyddan yn Sir Ddinbych y bydd y cysylltiad i'r Grid Cenedlaethol. Byddai'r ceblau allforio yn cael eu gosod (o dan y ddaear) rhwng y pwynt lle maent yn dod i'r tir a phwynt cyswllt y grid. Mae nifer o leoliadau'n cael eu hystyried fel pwyntiau i'r cebl ddod i'r tir, yn ogystal â llwybr y cebl tua'r tir, felly nid yw'r pwynt lle daw'r cebl i'r tir wedi ei bennu hyd yn hyn. Byddai angen isbwerdy newydd ar y tir i Awel y Môr ac mae'n debygol y bydd yn cael ei adeiladu yn agos at isbwerdy presennol y Grid Cenedlaethol ym Modelwyddan.

Mas Astudiaeth Dewis Safle'n cael ei gynnal er mwyn penderfynu ar y llwybr gorau i'r cebl a lleoliad isbwerdy Awel y Môr. Darperir mwy o wybodaeth am yr astudiaeth hon yn yr Adroddiad Cwmpasu hwn. Mae'r ymgynghoriad wedi ei gychwyn yn barod gyda rhanddeiliaid allweddol a bydd yn parhau drwy gydol y prosesau o ymgeisio am Orchymyn Caniatâd Datblygu a Thrwydded Forol. Bydd ymgynghoriad cyhoeddus hefyd yn cael ei gynnal a fydd yn gymorth i fwydo i ddatblygiad y prosiect, yn ogystal â'r Asesiad o'r Effaith Amgylcheddol.

Bwriad yr Adroddiad Cwmpasu hwn yw cefnogi'r ymgysylltiad â'r Arolygiaeth Gynllunio, Cyfoeth Naturiol Cymru ac ymgynghorwyr perthnasol eraill yn y broses o Asesu'r Effaith Amgylcheddol. Fe'u gwahoddir i ddarparu gwybodaeth berthnasol a chyflwyno sylwadau ar y dull arfaethedig o weithredu ar yr Asesiad o'r Effaith Amgylcheddol, er mwyn sicrhau bod Datganiad Amgylcheddol cadarn yn cael ei baratoi ac yn bwydo i ddatblygiad FfWA Awel y Môr. Yn hynny o beth, mae'r prif elfennau'r amgylchedd alltraeth ac atraeth, dynol, biolegol a materol y rhagwelir yr effeithir arnynt yn sylweddol gan y gwaith o adeiladu, rhedeg a datgomisiynu Fferm Wynt Alltraeth arfaethedig Awel y Môr wedi eu canfod. Mae'r ddogfen hon hefyd yn rhoi amlinelliad o'r astudiaethau amgylcheddol arfaethedig y mae'n rhaid eu cynnal fel rhan o'r Asesiad o'r Effaith ar yr Amgylchedd.

Ystyrir nifer o effeithiau amgylcheddol posibl yn yr Adroddiad Cwmpasu hwn. Mae'r adnabyddiaeth o'r effeithiau yn yr Adroddiad Cwmpasu hwn yn seiliedig ar ddealltwriaeth o'r amodau amgylcheddol sy'n debygol o fod ar waith yn FfWA Awel y Môr, gan ddefnyddio gwybodaeth sy'n deillio o'r gwaith o adeiladu a rhedeg FfWA Gwynt y Môr a ffynonellau data eraill sydd ar gael yn gyhoeddus. Cynigir y dylid casglu ac asesu mwy o ddata er mwyn cynnal yr asesiad o'r effaith ar yr amgylchedd cysylltiedig â nifer o'r effeithiau potensial a ganfuwyd. Er mwyn canfod rhai o'r effeithiau potensial eraill, cynigir, ar sail dealltwriaeth o natur y datblygiad (gan gynnwys mesurau a fabwysiadwyd fel rhan o'r prosiect), eu bod yn cael eu cwmpasu o wybodaeth yr AEA (h.y. ni chynigir casglu nac asesu mwy o ddata).

Gwahoddir yr ymgynghorwyr i ystyried yr holl wybodaeth a ddarperir yn yr Adroddiad Cwmpasu hwn a chyflwyno sylwadau ar y dull arfaethedig ac, yn arbennig, i nodi a ydynt yn cytuno â'r casgliadau. Ar ddiwedd bob adran dechnegol, darperir cwestiynau i'r ymgynghorwyr ynglŷn â phynciau penodol, sydd wedi eu cynllunio i annog ystyriaeth o elfennau allweddol bob un o bynciau technegol yr Adroddiad Cwmpasu hwn.

Executive Summary

This document supports a request for an Environmental Impact Assessment (EIA) Scoping Opinion from the Planning Inspectorate (PINS) and Natural Resources Wales (NRW) for the Awel y Môr Offshore Wind Farm (OWF). Awel y Môr OWF is a Nationally Significant Infrastructure Project (NSIP). An EIA will be provided as part of a Development Consent Order (DCO) application under the Planning Act 2008 and also as part of a Marine Licence (ML) application under the Marine and Coastal Access Act 2009.

This EIA Scoping Report has been prepared on behalf of innogy Renewables UK Ltd (innogy) in accordance with Regulation 10 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and Regulation 6 of the Marine Works (Environmental Impact Assessment) Regulations 2007.

The Awel y Môr OWF is a proposed extension to the operational Gwynt y Môr OWF. The Gwynt y Môr OWF consists of 160 wind turbine generators (WTGs) and supplies electricity to approximately 400,000 households annually. The proposed extension project would provide a further significant contribution to Welsh Government's energy targets (which are for 70% of electricity to be generated from renewables by 2030 and to be "net-zero" by 2050). The key drivers for renewable energy in the UK, and therefore the Awel y Môr OWF project, are reducing greenhouse gas emissions, providing increased energy security, and maximising economic opportunities for the UK and local economies. Extension projects, such as this, are considered to represent a significant opportunity for cost reduction in offshore wind through the benefits of existing infrastructure, technical expertise and experience on site; and existing datasets and environmental studies. This is an increasingly important driver under the highly competitive UK electricity market which aims to deliver the best possible value to the consumer.

Early feasibility for Awel y Môr OWF is underway at the time of writing and therefore some project details are yet to be confirmed. The project could consist of up to 107 WTGs. The WTGs would be situated to the west of the operational Gwynt y Môr OWF.

Cables would connect the turbines to the offshore substation platforms and then export the power generated to shore. It is expected that there would be a number of inter-array cables, up to two export cables and up to two offshore substation platforms. The WTG array is at its closest point 10.6 km from shore.

It is anticipated that the connection to the National Grid would be at Bodelwyddan in Denbighshire. The export cables would be installed (underground) between the landfall and the grid connection point. There are currently several options being explored for the landfall and onshore cable route, the landfall point is therefore yet to be determined. A new Awel y Môr onshore substation would be needed and is likely to be constructed near to the National Grid's existing substation at Bodelwyddan.

A Site Selection Study is currently being undertaken to identify the preferred cable route and Awel y Môr substation location. Further details of this study are provided within this Scoping Report. Consultation is already underway with key stakeholders and will continue through the DCO and ML application processes. Public consultation will also be undertaken which will help inform the development of the project, as well as the EIA.

This Scoping Report is intended to support engagement with PINS, NRW and relevant consultees in the EIA process, inviting them to provide relevant information and to comment on the proposed approach to the EIA, to ensure that a robust Environmental Statement is prepared and informs the development of Awel y Môr OWF. In that regard, the main elements of the offshore and onshore, human, biological and physical environment likely to be significantly affected by the construction, operation and decommissioning of the proposed Awel y Môr OWF have been identified. This document also outlines the extent of proposed environmental studies to be undertaken as part of the EIA.

A number of potential environmental impacts are considered within this Scoping Report. The identification of impacts within this Scoping Report has been based upon an understanding of the environmental conditions likely to be encountered within Awel y Môr OWF, utilising information that has been gained from the construction and operation of the Gwynt y Môr OWF and other publicly available data sources. For a number of identified potential impacts, further data collection and assessment is proposed in order to undertake the environmental impact assessment. For other potential impacts, it is proposed, based on an understanding of the nature of the development (including measures adopted as part of the project), that they are scoped out of the EIA (i.e. no further data collection or assessment is proposed).

Consultees are invited to consider all of the information provided in this Scoping Report and to provide comments on the proposed approach and in particular whether they agree with the conclusions. Topic specific questions for consultees are provided at the end of each technical section which have been designed to encourage reflection on the key elements of each technical topic in this Scoping Report.

Contents

1 Introduction 36

1.1 Background 36

1.2 Purpose of this Scoping Report 40

1.2.1 Notification of accompanying Environmental Statement 42

1.3 The Applicant 43

1.3.1 The EIA scoping team 44

1.4 Policy and Legislative Context 44

1.4.1 The Planning Act 2008 44

1.4.2 The Development Consent Order 45

1.4.3 Marine and Coastal Access Act 2009 46

1.4.4 Marine Licencing 46

1.4.5 The Environmental Impact Assessment Process 47

1.4.6 Habitats Regulation Assessment 48

1.4.7 UK Energy Policy and the Role of Renewable Energy 49

1.4.8 Overview of Welsh Planning Policy 51

1.5 Report structure 52

2 Project need 55

2.1 The need to reduce greenhouse gas emissions 55

2.2 The need for national energy security 56

2.3 The need to maximise economic opportunities from energy infrastructure investment for the UK 57

2.4 The need to produce affordable energy 58

3 Project Description 59

3.1 General 59

3.2 Need for flexibility 59

3.3 Key project components 61

3.4 Key project parameters – offshore 68

3.4.1 Array 68

3.4.2 Wind turbine generators 68

3.4.3 Offshore substation platforms 79

3.4.4 Inter-array cables 81
3.4.5 Offshore export cables 82
3.4.6 Scour and cable protection 84
3.4.7 Other design considerations 85
3.5 Key project parameters – Landfall 85
3.6 Key project parameters – Onshore 85
3.6.1 Onshore export cables 85
3.6.2 Onshore substation 87
3.6.3 Other onshore design considerations 88
3.7 Operations and maintenance 89
3.7.1 Offshore 89
3.7.2 Onshore 90
3.8 Decommissioning 90
3.9 Programme 90
4 Environmental Impact Assessment Approach and Methodology 91
4.1 EIA best practice 95
4.2 Data gathering 95
4.3 EIA approach 96
4.3.1 Evidence based approach 98
4.3.2 Key parameters 99
4.3.3 Assessment of effects 100
4.3.4 Acknowledging levels of certainty 103
4.4 Mitigation and monitoring 103
4.5 Cumulative impacts 105
4.5.1 Offshore components 107
4.5.2 Onshore components 107
4.6 Inter-related effects 108
4.7 Transboundary effects 108
5 Site selection and alternatives 110
5.1 Introduction 110
5.2 Policy and legislation on alternatives 112

5.2.1 EIA Regulations 2017 113
5.2.2 Habitats Regulations 2017 113
5.2.3 National Policy Statements 113
5.2.4 Crown Estate's Cable Route Protocol 114
5.2.5 Horlock Rules 115
5.3 Project alternatives and early design commitments 115
5.4 Site selection process 116
5.5 Array 118
5.6 Onshore substation 120
5.7 Landfall options 123
5.8 Offshore export cable 123
5.9 Onshore export cable 126
5.10 Consultation on site selection and alternatives 129
5.11 Next steps 129
6 Consultation process 131
6.1 Introduction 131
6.2 Requirements and process 131
6.3 Approach to stakeholder engagement 132
6.4 Consultation to date 133
6.4.1 EIA Evidence Plan 133
6.4.2 Other consultation to date 135
6.5 Proposed consultation 136
7 Offshore Environment – Physical Environment 138
7.1 Physical Processes 138
7.1.1 Introduction 138
7.1.2 Study Area 138
7.1.3 Baseline data 141
7.1.4 Baseline environment 143
7.1.5 Proposed approach to the Environmental Impact Assessment 151
7.1.6 Summary of next steps 161
7.1.7 Further considerations for Consultees 161

7.2 Marine water and sediment quality....162
7.2.1 Introduction....162
7.2.2 Study Area....162
7.2.3 Baseline data....164
7.2.4 Baseline environment....165
7.2.5 Proposed approach to the Environmental Impact Assessment....176
7.2.6 Summary of next steps....186
7.2.7 Further considerations for consultees....187
8 Offshore Environment – Biological Environment....188
8.1 Benthic Subtidal & Intertidal Ecology....188
8.1.1 Introduction....188
8.1.2 Study Area....188
8.1.3 Baseline data....191
8.1.4 Baseline environment....194
8.1.5 Proposed approach to the Environmental Impact Assessment....206
8.1.6 Summary of next steps....214
8.1.7 Further consideration for Consultees....215
8.2 Fish and Shellfish Ecology....216
8.2.1 Introduction....216
8.2.2 Study Area....216
8.2.3 Baseline data....218
8.2.4 Baseline environment....219
8.2.5 Proposed approach to the Environmental Impact Assessment....231
8.2.6 Summary of next steps....246
8.2.7 Further considerations for Consultees....247
8.3 Marine Mammals....248
8.3.1 Introduction....248
8.3.2 Study Area....248
8.3.3 Baseline data....249
8.3.4 Baseline environment....252
8.3.5 Proposed approach to the Environmental Impact Assessment....265

8.3.6 Summary of next steps....279
8.3.7 Further considerations for Consultees....280
8.4 Offshore Ornithology....281
8.4.1 Introduction....281
8.4.2 Study Area....281
8.4.3 Baseline data....283
8.4.4 Baseline environment....284
8.4.5 Proposed approach to the Environmental Impact Assessment....291
8.4.6 Summary of next steps....302
8.4.7 Further considerations for Consultees....303
9 Offshore Environment – Human Environment....304
9.1 Commercial Fisheries....304
9.1.1 Introduction....304
9.1.2 Study Area....304
9.1.3 Baseline data....307
9.1.4 Proposed approach to the Environmental Impact Assessment....314
9.1.5 Summary of next steps....326
9.1.6 Further Considerations for Consultees....327
9.2 Shipping and Navigation....328
9.2.1 Introduction....328
9.2.2 Study Area....328
9.2.3 Baseline Data....330
9.2.4 Proposed approach to the Environmental Impact Assessment....340
9.2.5 Summary of next steps....351
9.2.6 Further Consideration for Consultees....351
9.3 Military and Civil Aviation....352
9.3.1 Introduction....352
9.3.2 Study Area....352
9.3.3 Baseline data....355
9.3.4 Baseline environment....356
9.3.5 Proposed approach to the Environmental Impact Assessment....363

9.3.6 Summary of next steps....376
9.3.7 Further considerations for Consultees....377
9.4 Seascape, Landscape and Visual Impact Assessment....378
9.4.1 Introduction....378
9.4.2 Study Area....378
9.4.3 Baseline data....385
9.4.4 Baseline environment....393
9.4.5 Proposed approach to the Environmental Impact Assessment....400
9.4.6 Summary of next steps....411
9.4.7 Further considerations for Consultees....412
9.5 Marine Archaeology....413
9.5.1 Introduction....413
9.5.2 Study Area....413
9.5.3 Baseline data....413
9.5.4 Baseline environment....415
9.5.5 Proposed approach to the Environmental Impact Assessment....431
9.5.6 Potential transboundary Impacts....442
9.5.7 Summary of next steps....442
9.5.8 Further considerations for Consultees....443
9.6 Other Marine Users and Activities....444
9.6.1 Introduction....444
9.6.2 Study Area....445
9.6.3 Baseline data....445
9.6.4 Baseline environment....447
9.6.5 Proposed approach to the Environmental Impact Assessment....461
9.6.6 Summary of next steps....474
9.6.7 Further considerations for consultees....475
10 Onshore Environment....476
10.1 Terrestrial Ecology and Nature Conservation....476
10.1.1 Introduction....476
10.1.2 Study Area....476

10.1.3 Baseline data 479
10.1.4 Baseline environment....483
10.1.5 Proposed approach to the Environmental Impact Assessment....486
10.1.6 Summary of next steps....500
10.1.7 Further considerations for Consultees....502
10.2 Archaeology and Cultural Heritage 503
10.2.1 Introduction....503
10.2.2 Study Area 503
10.2.3 Data assessed for scoping 506
10.2.4 Baseline data 506
10.2.5 Legislation, Planning Policy and Guidance....510
10.2.6 Proposed approach to the Environmental Impact Assessment....511
10.2.7 Summary of next steps....521
10.2.8 Further considerations for Consultees....522
10.3 Airbourne Noise and Vibration 523
10.3.1 Introduction....523
10.3.2 Study Area 523
10.3.3 Baseline data 525
10.3.4 Baseline environment....525
10.3.5 Proposed approach to the Environmental Impact Assessment....526
10.3.6 Summary of next steps....543
10.3.7 Further considerations for Consultees....544
10.4 Traffic and transport 545
10.4.1 Introduction....545
10.4.2 Study Area 545
10.4.3 Baseline data 548
10.4.4 Baseline environment....549
10.4.5 Proposed approach to the Environmental Impact Assessment....552
10.4.6 Summary of next steps....563
10.4.7 Further considerations for Consultees....564
10.5 Air Quality....565

10.5.1 Introduction 565
10.5.2 Study Area 565
10.5.3 Baseline data 565
10.5.4 Baseline environment 566
10.5.5 Proposed approach to the Environmental Impact Assessment 567
10.5.6 Summary of next steps 573
10.5.7 Further considerations for Consultees 574
10.6 Hydrology, Hydrogeology and Flood Risk 575
10.6.1 Introduction 575
10.6.2 Study Area 575
10.6.3 Baseline data 578
10.6.4 Baseline environment 580
10.6.5 Proposed approach to the Environmental Impact Assessment 583
10.6.6 Summary of next steps 598
10.6.7 Further considerations for Consultees 598
10.7 Geology and Ground Conditions 599
10.7.1 Introduction 599
10.7.2 Study Area 599
10.7.3 Baseline data 599
10.7.4 Baseline environment 600
10.7.5 Policy and Regulatory context 604
10.7.6 Proposed approach to the Environmental Impact Assessment 607
10.7.7 Summary of next steps 619
10.7.8 Further considerations for Consultees 621
10.8 Onshore Landscape and Visual Impact Assessment 622
10.8.1 Introduction 622
10.8.2 Study Area 622
10.8.3 Baseline data 623
10.8.4 Baseline environment 624
10.8.5 Proposed approach to the Environmental Impact Assessment 639
10.8.6 Summary of next steps 649

10.8.7 Further considerations for Consultees....650
10.9 Socio-economic and Tourism....651
10.9.1 Introduction....651
10.9.2 Study Area....651
10.9.3 Baseline data....654
10.9.4 Baseline environment....655
10.9.5 Proposed approach to the Environmental Impact Assessment....658
10.9.6 Summary of next steps....670
10.9.7 Further considerations for Consultees....671
10.10 Public Health....672
10.10.1 Introduction....672
10.10.2 Study Area....672
10.10.3 Baseline data....673
10.10.4 Baseline environment....675
10.10.5 Proposed approach to the Environmental Impact Assessment....676
10.10.6 Summary of next steps....689
10.10.7 Further considerations for Consultees....690
11 Summary of EIA Scoping....691
12 Proposed content of the Environmental Statement....707
13 References....710

Appendices

Appendix A - SLVIA Wirelines

Appendix B - Gazetteer of the UKHO wrecks, obstructions and foul ground

Appendix C - Gazetteer of NMRW wrecks, intertidal sites and palaeolandscapes

Appendix D - Gazetteer of CPAT wrecks and intertidal sites

Appendix E - Nature Conservation Designations with relevance to Awel y Môr OWF

Appendix F - Extract of BGS Mineral Resource Map for the North East Wales region

Figures

Figure 1 – Overview of scoping boundary – offshore 38
Figure 2 – Overview of scoping boundary – onshore 39
Figure 3 – DCO application process 45
Figure 4 - Geographical overview of the array and offshore ECR search area 66
Figure 5 - Geographical overview of the onshore ECR search area and substation search area 67
Figure 6 - Typical Wind Turbine Generator 69
Figure 7 - Examples of monopile foundation types 72
Figure 8 - Examples of suction bucket monopile foundation types 73
Figure 9 - Examples of gravity base monopile foundation types 73
Figure 10 - Examples of pin piled jacket foundation types 74
Figure 11 - Examples of suction bucket jacket foundation types 74
Figure 12 - Examples of gravity base jacket foundation types 75
Figure 13 – Source-pathway-receptor model and example 97
Figure 14 – Geographical overview of project scoping area 111
Figure 15 - Simplified diagram of the site selection process 116
Figure 16 – Awel y Môr proposed Array Area 119
Figure 17 – Awel y Môr substation SEARCH AREA 122
Figure 18 – Awel y Môr offshore ecr SEARch area 125
Figure 19 – Awel y Môr onshore ecr SEARCH AREA 128
Figure 20 – Physical processes Study Area 140
Figure 21 - Geographic overview of the Marine Water and Sediment Quality Study Area in the context of the wider area 163
Figure 22 - Analysed satellite SPM data – Annual Average (Cefas, 2016) 168
Figure 23 - Analysed satellite SPM data – December Average (Cefas, 2016) 169
Figure 24 - Sediment type distribution (source: Cefas, 2018) 172

Figure 25 - Geographical overview of WFD protected sites 175
Figure 26 - The Awel y Môr benthic ecology Study Area.....190
Figure 27 - The location of existing subtidal benthic grab, DDV and trawl data across the Awel y Môr OWF benthic ecology Study Area (NIRAS, 2017; CMACS, 2011; CMACS, 2005A; CMACS, 2005B) 193
Figure 28 - BGS Sediment description from sample locations obtained across the Awel y Môr OWF benthic ecology Study Area and wider surrounding region (NIRAS, 2017; CMACS, 2011; CMACS, 2005[1]; CMACS, 2005[2]). Also presented are the predicted broadscale seabed habitat map, using the EUNIS habitat classification (UKSeaMap, 2019) 196
Figure 29 - Biotope descriptions (JNCC Marine Habitat Classification) from existing data sources across the Awel y Môr OWF benthic ecology Study Area and wider surrounding region (NIRAS, 2017; CMACS, 2011; CMACS, 2005[1]; CMACS, 2005[2]).....200
Figure 30 - Designated sites surrounding Awel y Môr, with relevance to benthic subtidal and intertidal ecology 205
Figure 31 - Awel y Môr OWF Study Area for fish and shellfish ecology 217
Figure 32 - Baseline Environment Data Sources 221
Figure 33 - High Intensity Spawning Grounds within the Fish and Shellfish Study Area (Coull *et al*, 1998).....223
Figure 34 - High Intensity Spawning Grounds within the Fish and Shellfish Study Area (Ellis *et al*, 2010) 224
Figure 35 - High Intensity Nursery Grounds (Coull *et al*, 1998) 225
Figure 36 - High Intensity Nursery Grounds (Ellis et al, 2010).....226
Figure 37 - Designated Sites relative to the Awel y Môr Study Area 230
Figure 38 - Grey seal telemetry tracks. Data provided by SMRU.....255
Figure 39 - Grey seal estimated at-sea usage. Data obtained from Russell *et al.* (2017). 256
Figure 40 - Bottlenose dolphin sightings recorded during photo-ID surveys around Anglesey. Data obtained from Feingold & Evans (2014) 258
Figure 41 - Special Areas of Conservation for marine mammals proximal to the Awel y Môr OWF. 264
Figure 42 – Offshore ornithology Study Area 282
Figure 43 - Awel y Môr OWF and ICES statistical rectangles 306
Figure 44 – Top twelve species by weight (tonnes) from 2014 to 2018 landed from the study area (MMO, 2019).....310
Figure 45 – Top twelve species by value (GBP) from 2014 to 2018 landed from the study area (MMO, 2019). 310
Figure 46 – Dredge landed value (Euro) for UK and EU ≥ 12 m vessels in 2017. Source: ICES, 2019.....312
Figure 47 - Overview of Awel y Môr OWF study area 329
Figure 48 - Navigational Features in Proximity to Awel y Môr OWF 334

Figure 49 - Marine Aggregate Dredging Features and BMAPA Transit Routes.....335
Figure 50 - 14 days summer 2019 marine traffic by vessel type within the study area 338
Figure 51 - 14 days winter 2018 marine traffic by vessel type within the study area .339
Figure 52 - Aviation Study Area 354
Figure 53 - Airspace above the Array Area 357
Figure 54 - Seascape, landscape and visual assessment Study Area 379
Figure 55 - Landscape planning designations and defined areas 380
Figure 56 - Zone of theoretical visibility and viewpoint locations 383
Figure 57 - ZTV and viewpoint locations (enlarged plan) 384
Figure 58 - Awel y Môr OWF Study Area Submerged palaeolandscapes 416
Figure 59 - Holocene coastal sediments, submerged forests and intertidal peats in western Britain (Bell, 2007) 419
Figure 60 - Coastal change in western Britain c. 9500-4000 cal. BC (Bell, 2007).....420
Figure 61 - Archaeological potential of the submerged landscapes in the Awel y Môr OWF Study Area, as classified by Fitch *et al.* 2011.....421
Figure 62 - Landscape Character Area defined by the WCPS (2011) in relation to the Awel y Môr OWF Study Area.....422
Figure 63 - Landscape Features identified by the WCPS (2011) in relation Awel y Môr OWF Study Area.....423
Figure 64 - UKHO wrecks, obstructions and foul ground 428
Figure 65 - NMRW intertidal sites and submerged palaeolandscapes.....429
Figure 66 - CPAT wrecks, intertidal and coastal sites.....430
Figure 67 - Energy infrastructure within the Awel y Môr Study Area 453
Figure 68 - Aggregate extraction and disposal sites within the Awel y Môr Study Area 456
Figure 69 - Recreational activity around the Awel y Môr Study Area.....460
Figure 70 - Terrestrial ecology and nature conservation topic study area 478
Figure 71 – Archaeology and cultural heritage Study Area.....505
Figure 72 – Noise and vibration Study Area 524
Figure 73 – Traffic and transport Study Area.....547
Figure 74 – Hydrology, Hydrogeology and Flood Risk Study Area.....577
Figure 75 - Landscape Designations.....625
Figure 76- LANDMAP Aspect Area – Cultural Landscape 627
Figure 77 - LANDMAP Aspect Area – Geological Landscape 628
Figure 78 - LANDMAP Aspect Area – Historic Landscape.....629
Figure 79 - LANDMAP Aspect Area – Landscape Habitats 630
Figure 80 - LANDMAP Aspect Area – Visual and Sensory 631
Figure 81 - Visual Receptors 633
Figure 82 – socio-economics and tourism STUDY AREA 653

Tables

Table 1 – Scoping report structure and sign-posting for the DCO and ML applications 52
Table 2 - Key project infrastructure components....62
Table 3 - Key array site characteristics 68
Table 4 - WTG maximum design scenario....69
Table 5 - Foundation types for WTGs 71
Table 6 - Key parameters for WTG monopile foundations....75
Table 7 - Key parameters for WTG suction bucket monopile foundations 76
Table 8 - Key parameters for WTG gravity base foundations 76
Table 9 - Key parameters for WTG pin-piled jacket foundations....77
Table 10 - Key parameters for WTG suction bucket jacket foundations....77
Table 11 - Key parameters for WTG gravity base jacket foundations 78
Table 12 - Key OSP parameters 79
Table 13 - Key parameters for OSP monopile foundations....80
Table 14 - Key parameters for OSP suction bucket monopile foundations 80
Table 15 - Key parameters for OSP gravity base foundations....80
Table 16 - Key parameters for OSP pin-piled jacket foundations....81
Table 17 - Key parameters for OSP suction bucket jacket foundations 81
Table 18 – Key parameters for inter-array cables 82
Table 19 - Key parameters for offshore export cables 83
Table 20 - Key parameters for onshore export cables maximum design scenario....86
Table 21 - Key parameters for onshore substation maximum design scenario 88
Table 22 – Indicative average two-way numbers of construction vehicle movements required during the onshore works 88
Table 23 - Overview of proposed EIA process....94
Table 24 - Proposed matrix for determining the significance of effects....103
Table 25 - Mitigation strategy 105
Table 26 – Key data sources 141
Table 27 - Marine nature conservation designations with relevance to physical processes and Awel y Môr OWF....148
Table 28 - Impacts proposed to be scoped in to the assessment for physical processes 154
Table 29 - Key sources of information for marine water and sediment quality....164
Table 30 - Protected sites under the Water Framework Directive within 2km of the offshore ECR search area....174
Table 31 - Impacts proposed to be scoped in to the assessment for marine water and sediment quality 177

Table 32 - Impacts proposed to be scoped out of assessment for marine water and sediment quality 182
Table 33 - Data sources consulted for the Awel y Môr OWF....191
Table 34 - Marine nature conservation designations with relevance to benthic subtidal and intertidal ecology and Awel y Môr OWF....204
Table 35 - Impacts proposed to be scoped into the assessment for benthic subtidal and intertidal ecology 207
Table 36 – Impacts proposed to be scoped out of assessment for benthic subtidal and intertidal ecology 211
Table 37 - Data sources consulted for the Awel y Môr OWF....218
Table 38 - Marine nature conservation designations with relevance to fish and shellfish and Awel y Môr OWF 229
Table 39 - Impacts proposed to be scoped into the assessment for fish and shellfish ecology....233
Table 40 – Impacts proposed to be scoped out of assessment for fish and shellfish ecology....240
Table 41 - Marine nature conservation designations with relevance to marine mammals and Awel y Môr OWF....262
Table 42 - Impacts proposed to be scoped in to the assessment for marine mammals 266
Table 43 – Impacts proposed to be scoped out of assessment for marine mammals 273
Table 44 - Summary of nature conservation value of species considered at risk of impacts 287
Table 45 - Species specific definitions of biological seasons (from Furness 2015) 289
Table 46 - Impacts proposed to be scoped in to the assessment for offshore ornithology....293
Table 47 – Impacts proposed to be scoped out of assessment for offshore ornithology 298
Table 48 – Key sources of commercial fisheries data....308
Table 49 - Impacts proposed to be scoped in to the assessment for commercial fisheries....316
Table 50 – Impacts proposed to be scoped out of assessment for commercial fisheries 322
Table 51 - Operational OWFs in proximity to Awel y Môr OWF 331
Table 52 - Ports in vicinity of Awel y Môr OWF 333
Table 53 - Risk ranking matrix 342
Table 54 - Impacts proposed to be scoped into the assessment for shipping and navigation 345
Table 55 - Cumulative OWFs in vicinity of Awel y Môr OWF 350

Table 56 - Impacts proposed to be scoped in to the assessment for civil and military aviation 367
Table 57 - Impacts proposed to be scoped out of assessment for civil and military operations 371
Table 58 – Proposed preliminary viewpoint list for the Awel y Môr OWF EIA 391
Table 59 – Landscape planning designations and defined areas with relevance to SLVIA. 397
Table 60 - Impacts proposed to be scoped in to the SLVIA 402
Table 61 – Impacts proposed to be scoped out of the SLVIA 408
Table 62 - Data sources consulted for the Awel y Môr OWF 414
Table 63 - UKHO wrecks, fouls and obstructions 424
Table 64 - NMRW wrecks, obstructions and documented losses 425
Table 65 NMRW submerged landscapes and intertidal sites 425
Table 66 - CPAT wreck sites 426
Table 67 - CPAT intertidal and coastal sites 426
Table 68 - Archaeological and cultural heritage designations with relevance to Awel y Môr OWF 427
Table 69 - Impacts proposed to be scoped in to the assessment for marine archaeology 433
Table 70 - Impacts proposed to be scoped out of assessment for marine archaeology 436
Table 71 - Data sources for infrastructure and other users 446
Table 72 - Operational Wind Farms in the Irish Sea Region 448
Table 73 - Impacts proposed to be scoped into the assessment for infrastructure or other users 462
Table 74 – Impacts proposed to be scoped out of assessment for infrastructure and other users 469
Table 75 – Baseline Data Sources 479
Table 76 - Impacts proposed to be scoped in to the assessment for terrestrial ecology and nature conservation 487
Table 77 – Impacts proposed to be scoped out of assessment for terrestrial ecology 496
Table 78 - Designations with relevance to the onshore historic environment and Awel y Môr OWF 507
Table 79 - Impacts proposed to be scoped in to the assessment for onshore historic environment 513
Table 80 – Impacts proposed to be scoped out of assessment for construction, operation and decommissioning phases 517
Table 81 - Levels of Heritage Significance 519
Table 82 - Impacts proposed to be scoped in to the assessment for onshore noise and vibration 530

Table 83 – Impacts proposed to be scoped out of assessment for onshore noise and vibration 540
Table 84 – Existing traffic count data (2-way AADT).....550
Table 85 - Impacts proposed to be scoped in to the assessment for traffic and transport 555
Table 86 – Impacts proposed to be scoped out of assessment for traffic and transport 561
Table 87 - Impacts proposed to be scoped in to the air quality assessment 569
Table 88 - Impacts proposed to be scoped out of the air quality assessment 571
Table 89 - Environmental designations with relevance to the onshore search area for Awel y Môr OWF 582
Table 90 - Impacts proposed to be scoped into the assessment for onshore hydrology and hydrogeology 590
Table 91 – Impacts proposed to be scoped out of assessment for hydrology and hydrogeology 595
Table 92 - Environmental designations with relevance to the onshore area of search for Awel y Môr OWF.....601
Table 93 - Historical landfill sites identified within the onshore area of search for Awel y Môr OWF 603
Table 94 - Impacts proposed to be scoped into the assessment for onshore geology and ground conditions.....611
Table 95 - Impacts proposed to be scoped out of assessment for onshore geology and ground conditions 616
Table 96 – Landscape related designations with relevance to the scope of the landscape and visual impact assessment for the onshore elements of Awel y Môr OWF 636
Table 97 - Impacts proposed to be scoped in to the assessment for the LVIA 643
Table 98 – Impacts proposed to be scoped out of assessment for LVIA 646
Table 99 - Impacts proposed to be scoped in to the socio-economic and tourism assessment.....662
Table 100 - Impacts proposed to be scoped out of socio-economic and tourism assessment.....668
Table 101 - Impacts proposed to be scoped in to the assessment for public health678
Table 102 - Impacts proposed to be scoped out of assessment for public health ...683
Table 103 - Summary of potential offshore environment – physical environment impacts 691
Table 104 - Summary of potential offshore environment – biological environment impacts 692
Table 105 - Summary of potential offshore environment – human environment impacts 695
Table 106 - Summary of potential onshore environment.....700

Table 107 – Proposed structure of ES for Awel y Môr OWF 709

Definition of acronyms

TERM	DEFINITION
✓	Scoped in
×	Scoped out
AADT	Annual Average Daily Traffic
ACC	Area Control Centre
AEP	Annual Exceedance Probability
AEPM	Annual Egg Production Method
AEZ	Archaeological Exclusion Zone
AfL	Agreement for Lease
agl	above ground level
AIL	Abnormal Indivisible Load
AIP	Aeronautical Information Publication
AIS	Automatic Identification System
ALAR	Abnormal Load Assessment Report
AMSL	Above Mean Sea Level
ANS	Air Navigation Service
aOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AoS	Area of Search
AQMA	Air Quality Management Area
ATC[1]	Air Traffic Control
ATC[2]	Automatic Traffic Count
ATS	Air Traffic Service

[1] Cited within the Military and Aviation chapter
[2] Cited within the Traffic and Transportation chapter

TERM	DEFINITION
BCM	Billion Cubic Metres
BGS	British Geological Survey
BMAPA	British Marine Aggregate Producers Association
BODC	British Oceanographic Data Centre
BP	Before Present
BPM	Best Practicable Means
BRAG	Black, Red, Amber and Green appraisal
BTO	British Trust for Ornithology
CAA	Civil Aviation Authority
Cadw	National agency for conservation of the historic environment
CAP	Civil Aviation Publication
CAS	Controlled Air Space
CCBC	Conwy County Borough Council
CCS[3]	Carbon Capture and Storage
CCS[4]	Construction Consolidation Sites
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CIA	Cumulative Impact Assessment
CIAL	Corridor Identification and Approval for Linear activities
CIEEM	Chartered Institute for Ecology and Environmental Management
CIfA	Chartered Institute for Archaeologists
CIRIA	Construction Industry Research and Information Association
CLR	Contaminated Land Report
CO_2	Carbon dioxide
CoCP	Code of Construction Practice

[3] Cited within the Other Marine Users and Activities chapter
[4] Cited within the Traffic and Transportation chapter

TERM	DEFINITION
CoS	Chamber of Shipping
CPA	Coast Protection Act
CPAT	Clwyd-Powys Archaeological Trust
CRM	Collision Risk Modelling
CSM	Conceptual Site Model
CTA	Control Area
CTMP	Construction Traffic Management Plan
DCC	Denbighshire County Council
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
DDV	Drop Down Video
DECC	Department of Energy and Climate Change
Defra	Department for Environment Food and Rural Affairs
DfT	Department for Transport
DGC	Defence Geographic Centre
DHA	Designated Historic Assets
DMRB	Design Manual for Roads and Bridges
DTI	Department of Trade and Industry
EA	Environment Agency
EcIA	Ecological Impact Assessment
ECR	Export Cable Route
EEZ	Exclusive Economic Zone
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMODnet	European Marine Observation and Data Network

TERM	DEFINITION
EMP	Ecological Management Plan
EPA	Environmental Protection Act
ERCoP	Emergency response Co-operation Plan
ERM	Existing Route Map
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
EU DCF	European Union Data Collection Framework
FCA	Flood Consequence Assessment
FEPA	Food and Environment Protection Act
FIR	Flight Information Region
FL	Flight Level
FLO	Fisheries Liaison Officer
FLOWW	Fisheries Liaison with Offshore Wind and Wet Renewables group
FSA	Formal Safety Assessment
ft	feet
GAAC	General Aviation Awareness Council
GBP	British pound sterling
GCN	Great Crested Newt
GEART	Guidance for Environmental Assessment of Road Traffic
GIS	Geographical Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GPP	Guidance for Pollution Prevention
GVA	Gross Value Added
GWD	Groundwater Directive
GyM	Gwynt y Môr

TERM	DEFINITION
HAT	Highest Astronomical Tide
HDD	Horizontal Directional Drilling
HER	Historic Environment Record
HGV	Heavy Goods Vehicles
HLW	Landscapes of Historic Interest in Wales
HRA	Habitats Regulation Assessment
IAIP	Integrated Aeronautical Information Package
IALA	International Associate of Marine Aids to Navigation and Lighthouse Authorities
IAQM	Institute for Air Quality Management
ICES	International Council for the Exploration of the Sea
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEMA	Institute of Environmental Management and Assessment
IFCA	Inshore Fisheries Conservation Authority
IFP	Instrument Flight Procedure
IMC	Instrument Flight Conditions
IMO	International Maritime Organisation
INNS	Invasive Non-native Species
IOF	Important Ornithological Feature
JCP	Joint Cetacean Protocol
JNCC	Joint Nature Conservation Committee
KIS-ORCA	Kingfisher Information Service – Cable Awareness
km	Kilometre
LAI	Local Area of influence
LAQM	Local Air Quality Management
LARS	Lower Airspace Radar Service

TERM	DEFINITION
LAT	Lowest Astronomical Tide
LB	Listed Buildings
LCA	Landscape Character Area
LGV	Light Goods Vehicle
LiDAR	Light Detection and Ranging
LNR	Local Nature Reserves
LOS	Line of Sight
LRN	Local Road Network
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Sites
m	Metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MCEU	Marine Consents and Environment Unit
MCZ	Marine Conservation Zones
MDS	Maximum Design Scenario
MGN	Maritime Guidance Notice
MHWS	Mean High Water Springs
MIEU	Major Infrastructure Environment Unit
Mil	Military
MINNS	Marine Invasive Non-Native Species
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MOD	Ministry of Defence
MPA	Marine Protected Area

TERM	DEFINITION
MPCP	Marine Pollution Contingency Plan
MRCC	Maritime Rescue Coordination Centre
MSA	Minimum Safe Altitude
MU	Management Unit
NATS	National Air Traffic Services
NBN	National Biodiversity Network
NCA	National Character Area
NCR	National Cycle Route
NDHA	Non-Designated Historic Assets
NERL	NATS En Route Limited
NFFO	National Federation of Fishermen's Organisations
NGET	National Grid Electricity Transmission
NIGFS	Northern Ireland Groundfish Surveys
NLCA	National Landscape Character Areas
nm	Nautical mile
NMRW	National Monuments Record of Wales
NMWTRA	North and Mid Wales Trunk Road Agency
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
NPPF	National Planning Policy Framework
NPRN	National Primary Record Number
NPS	National Policy Statement
NRA	Navigation Risk Assessment
NRW	Natural Resources Wales
NSIP	Nationally Significant Infrastructure Project
NSR	Noise Sensitive Receptor

TERM	DEFINITION
NtM	Notice to Mariners
NWWT	North Wales Wildlife Trust
O&G	Oil & Gas
O&M	Operations and Maintenance
OPERA	Operational Programme for the Exchange of weather Radar Information
OREIs	Offshore Renewable Energy Installations
OS	Ordnance Survey
OSP	Offshore Substation Platform
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic
OTP	Outline Travel Plan
OWF	Offshore Wind Farm
PAD	Protocol for Archaeological Discoveries
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PCL	Potential Contaminant Linkages
PEA	Preliminary Ecological Appraisal
PEI	Preliminary Environmental Information
PEIR	Preliminary Environmental Information Report
PEMP	Project Environmental Management and Monitoring Plan
PEXA	Practice and Exercise Area
PFS	Petrol Filling Station
PINS	Planning Inspectorate
PLQRA	Phase I Preliminary Land Quality Risk Assessment
Pollutant Linkage	An established conceptual relationship between a source, pathway and receptor of contamination

TERM	DEFINITION
PPE	Personal Protective Equipment
PPW	Planning Policy Wales
PRoW	Public Right of Way
PSA	Particle Size Analysis
pSPA	Potential Special Protection Area
PSR	Primary Surveillance Radar
PTS	Permanent Threshold Shift
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales
RCS	Radar Cross Section
RDP	Radar Data Processor
RNLI	Royal National Lifeboat Institution
RPG	Registered Parks and Gardens
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yachting Association
SAB	SuDS Approval Bodies
SAC	Special Area of Conservation
SAR	Search and Rescue
SCA	Seascape Character Area
SCANS	Small Cetaceans in European Atlantic waters and the North Sea
SCOS	Special Committee on Seals
SCT	Seascape Character Type
SEA	Strategic Environmental Assessment
SEL	Sound Exposure Level
SLVIA	Seascape, landscape and visual impact assessment
SM	Scheduled Monument
SMA	Seal Management Area

TERM	DEFINITION
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Bodies
SNH	Scottish Natural Heritage
SoCC	Statement of Community Consultation
SOLAS	International Convention for the Safety of Life at Sea
SoS	Secretary of State
SPA	Special Protection Area
SPL	Sound Pressure Level
SPM	Suspended Particulate Matter
SPZ	Source Protection Zone
SRN	Strategic Road Network
SSC	Suspended Sediment Concentrations
SSR	Secondary Surveillance Radar
SSSI	Site of Special Scientific Interest
STEAM	Scarborough Tourism Economic Activity Monitor
SuDS	Sustainable Drainage System
TANs	Technical Advice Notes
TBT	Tributyltin
TCE	The Crown Estate
TH	Trinity House
TJB	Transitional Joint Bay
TOC	Total Organic Carbon
TP	Transitional Piece
TSS	Traffic Separation Scheme
TTS	Temporary Threshold Shift
UK	United Kingdom

TERM	DEFINITION
UKCP	United Kingdom climate predictions
UKFEN	United Kingdom Fisheries Economics Network
UKHO	United Kingdom Hydrographic Office
UKLFS	United Kingdom Low Flying System
UKSAP	United Kingdom's Storage Appraisal Project
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UXO	Unexploded Ordnance
VFR	Visual Flight Rules
VMS	Vessel Monitoring System
WCPS	West Coast Palaeolandscapes Survey
WeBS	Wetland Bird Survey
WFA	Welsh Fishermen's Association
WFD	Water Framework Directive
WHS	World Heritage Sites
WSA	Wider Study Area
WSI	Written Schemes of Investigation
WTG	Wind Turbine Generator
WWI	World War One
WWII	World War Two
ZTV	Zone of Theoretical Visibility

1 Introduction

1.1 Background

1 This Environmental Impact Assessment (EIA) Scoping Report has been prepared on behalf of innogy Renewables UK Ltd (innogy) in accordance with Regulation 10 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 2017 EIA Regulations) and Regulation 13 of Marine Works (EIA Regulations) 2007 (as amended).

2 The Awel y Môr Offshore Wind Farm (Awel y Môr OWF) is a proposed extension to the operational Gwynt y Môr OWF off the north east coast of Wales (see Figure 1). The Gwynt y Môr OWF consists of 160 wind turbine generators (WTGs) and supplies approximately 400,000 households annually. The Gwynt y Môr OWF has been operational since 2015. It is anticipated that a grid connection would be made at Bodelwyddan in Denbighshire and as such export cables would be installed (underground) between the landfall and the grid connection. There are currently several options being explored for the landfall and onshore cable route, the landfall point is therefore yet to be determined. A new onshore substation would be constructed near to the National Grid's existing substation at Bodelwyddan. More information on the project design is provided in Chapter 3. Offshore and onshore scoping boundaries for the proposed development are presented in Figure 1 and Figure 2 respectively. These scoping boundaries include the search areas for the onshore and offshore infrastructure. It should be noted that the extent of the Study Areas for the specific topics considered within this Scoping Report are presented within the technical sections of this Scoping Report.

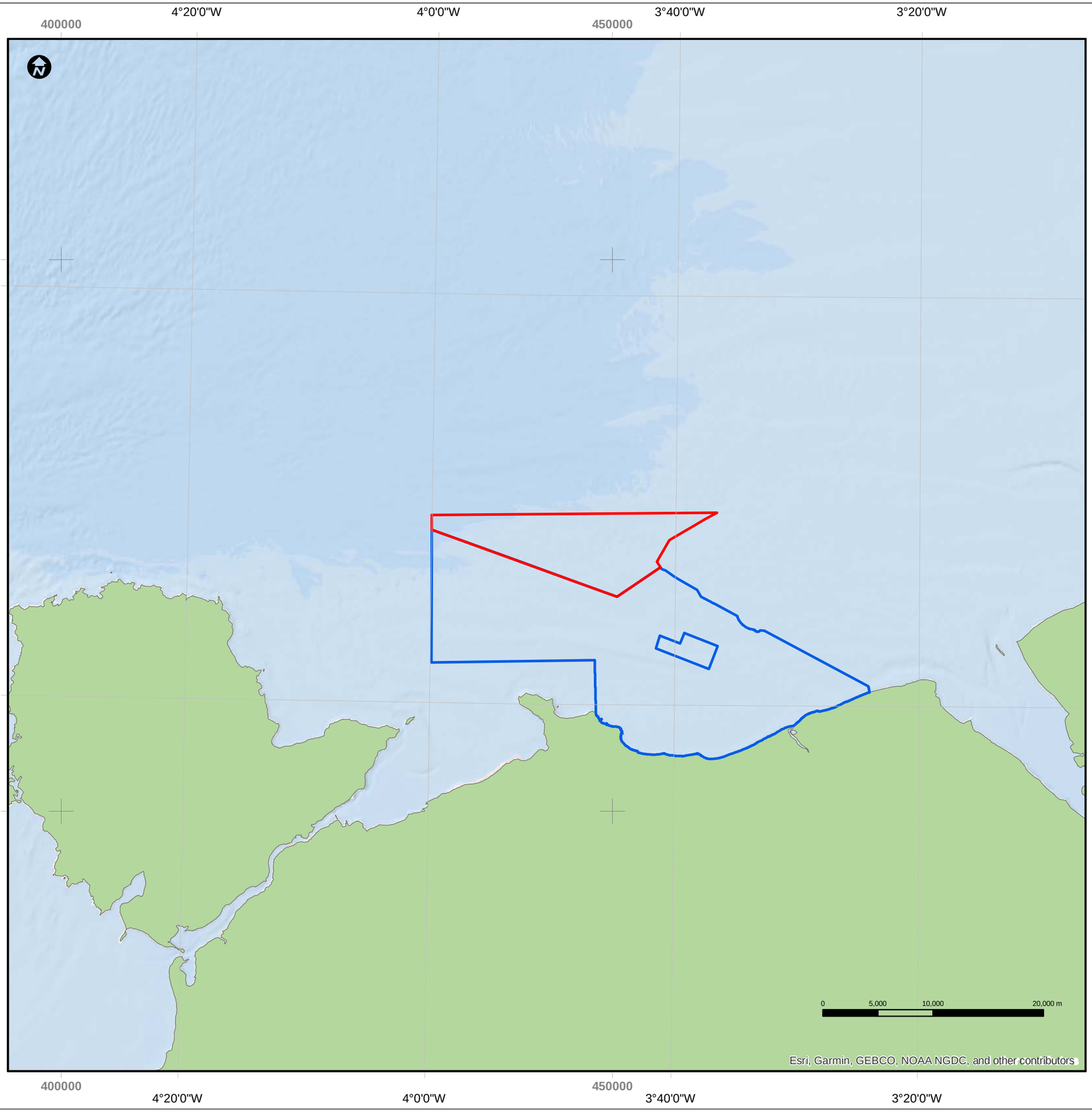
3 The proposed Awel y Môr OWF comprises an offshore generating station with a capacity of greater than 100 MW and therefore is a Nationally Significant Infrastructure Project (NSIP), as defined by Section 15(3) of the Planning Act 2008. As such, there is a requirement to submit an Application for a Development Consent Order (DCO) to the Secretary of State (SoS). The DCO and Marine Licence Applications will be accompanied by an Environmental Statement (ES) prepared in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the '2017 EIA Regulations'), the development falling under Schedule 2 of the 2017 EIA Regulations. This Scoping Report supports a request for a formal Environmental Impact Assessment (EIA) Scoping Opinion from the Planning Inspectorate (PINS) and Natural Resources Wales (NRW) in relation to the proposed Awel y Môr OWF.

4 A Marine Licence is required under the Marine and Coastal Access Act 2009 before carrying out any licensable marine activity, which includes the works required to construct the Awel y Môr OWF. In England, it is possible to include the marine licence within the DCO, but not for applications in Welsh waters. The responsibility for marine licensing in Wales lies with the Welsh Government, but with day-to-day authority delegated to NRW It is intended, therefore, that this Scoping Report also covers the EIA for the application for a Marine Licence from NRW.

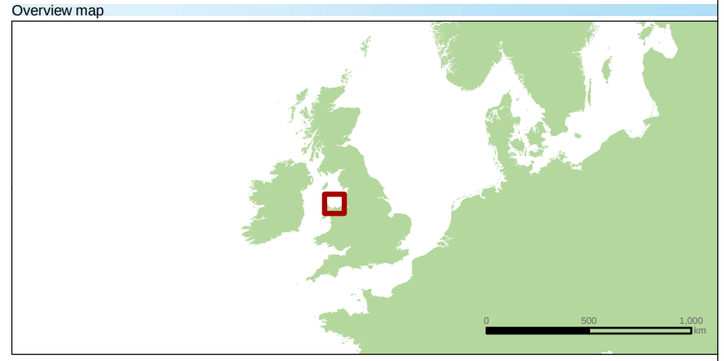
5 This Scoping Report presents an initial overview and description of the project and a review of the potential impacts associated with the construction, operation and maintenance, and decommissioning phases of the proposed Awel y Môr OWF.

6 All project details presented in this report are accurate at the time of writing. This Scoping Report aims to identify the potential likely significant effects arising from the proposed Awel y Môr OWF on the physical, human and biological environments, offshore and onshore. This Report also outlines the proposed approach to understanding and characterising the baseline conditions and assessing environmental impacts through the EIA process.

7 This Scoping Report also builds on and makes reference to agreements already made through discussion with stakeholders regarding selected topics which have been discussed prior to the publication of this Report (see Chapter 6).



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

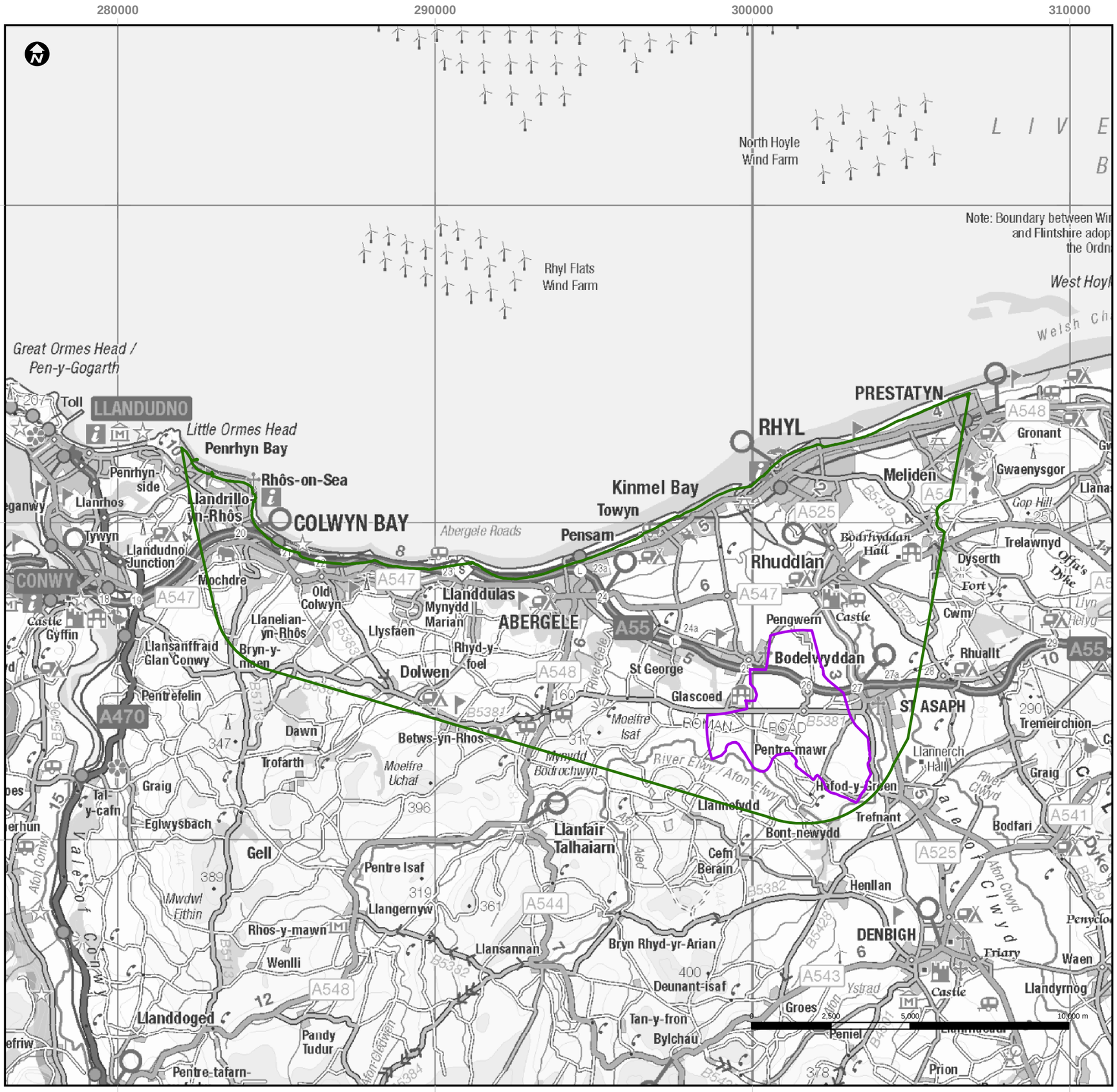
PROJECT
Offshore Windpark
Awel y Môr

TITLE
Array and Offshore Export Cable Search Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	27/01/2020	1:350,000	@DIN A3

DRAWING No.	REV
None Issued	01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\General\AyM_0119_Array_and_ECR_Search_Area.mxd



Overview map



Legend

- Onshore Export Cable Route Search Area
- Substation Search Area

Cartographic information

Coordinate System: British National Grid
Map Datum: ODN (Ordnance Datum Newlyn)

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Onshore Export Cable Route Search Area and Onshore Substation Search Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	27/01/2020	1:125,000	@DIN A3

DRAWING No. None Issued

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\General\AyM_0119_Onshore_ECR_Search_Area_and_Substation_Search_Area.mxd

1.2 Purpose of this Scoping Report

8 To start the DCO and Marine Licence processes, innogy has prepared this EIA Scoping Report, which presents an initial review of the potential issues associated with the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The purpose of the Scoping Report is to request a formal Scoping Opinion from the Secretary of State (SoS) and NRW in accordance with Regulation 10 of the 2017 EIA Regulations and Regulation 13 the Marine Works (EIA) Regulations and to ensure a proportionate EIA.

9 To comply with Regulation 10 of the 2017 EIA Regulations and Regulation of the 13 Marine Works (EIA Regulations) 2007 (as amended), this Scoping Report provides:

- Plans sufficient to identify the area required for the construction, operation and decommissioning of Awel y Môr OWF;
- A brief description of the nature and purpose of the proposed development and of its possible effects on the environment; and

10 Awel y Môr OWF is located within an area of relatively high OWF development (including Gwynt y Môr, Rhyl Flats and Burbo Bank OWFs), for which large volumes of existing data and knowledge regarding the baseline environment are available from the previous OWF projects, as well as from other sources. The Awel y Môr OWF EIA, including this scoping stage, will maximise the use of these data and related assessments, in order to:

- Characterise the baseline environment to inform the EIA where data are suitable to do so;
- Scope out certain matters from further assessment where there is a clear evidence basis in order to avoid duplication of assessment; and
- Where certain matters are scoped in, draw upon the evidence base and previous impact assessment work where appropriate.

11 As part of the pre-application consultation process for certain key topics, the nature of the existing baseline data, its sufficiency for the Awel y Môr OWF EIA and any requirements for further data collection are currently being discussed with the relevant consultees as part of the EIA Evidence Plan Process (see Chapter 6).

12 Other information on the characteristics of the proposed development and the environmental features likely to be affected by the proposed development, sufficient to define those potential characteristics, impacts and features to be considered further in the EIA and those which need not be considered further.

13 This report provides an overview of all potential issues and provides robust and sufficient justification for focusing the EIA on those issues which have the potential to be significant (in EIA terms) and to reduce the emphasis on issues which are demonstrably not significant (in EIA terms). This approach enables the EIA to be focused on the potential key issues and proportionate.

14 The benefits of delivering proportionate EIA, as defined by the Institute of Environmental Management and Assessment (IEMA) (2017), are to:

- Drive collaborative action and understanding across the EIA community;
- Focus assessments so their findings are accessible to all stakeholders;
- Reduce uncertainty and risk within project consenting;
- Save time and costs for developers, consenting authorities and consultees; and
- Allow more time to be spent exploring the delivery of environmental improvements.

15 One of the key actions for delivering proportionate EIA is to improve scoping so that it becomes a core process running through the EIA, which presents ongoing opportunities to define and redefine what information is of value and how it is made available to stakeholders. Therefore, an integral element of this Scoping Report is to focus on aspects which innogy believes can be scoped out in the interest of proportionality.

16 This Scoping Report sets out to provide a detailed justification that is anticipated will facilitate the scoping out of certain topics or impacts from further assessment. This is in line with recent PINS Advice Note 7[5].

17 The overall objective of the EIA will be to satisfy the requirements of the Planning Act 2008 (and the associated EIA Regulations (2017)), the Marine and Coastal Access Act (MCAA) (2009) and the Marine Works (EIA Regulations) 2007 (as amended)).

[5] Paragraph 4.10 of Advice Note 7 (https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/12/Advice-note-7.pdf)

18 The Environmental Statement, which reports the EIA, will be based on the Scoping Opinion, informed by the recommendations of the consultees and the information contained within this Scoping Report.

1.2.1 Notification of accompanying Environmental Statement

19 Innogy hereby gives notice, pursuant to Regulation 8(1)(b) of the 2017 EIA Regulations, that the applications for a DCO and a Marine Licence will be accompanied by an ES. The ES will include at least the information set out in Regulation 14(a) – (e) and any additional information specified in Schedule 4 relevant to the specific characteristics of Awel y Môr OWF and to the environmental features likely to be significantly affected. It will include the information reasonably required for reaching a reasoned conclusion on the likely significant effects of Awel y Môr OWF.

20 It is anticipated that the ES will be submitted to both PINS and NRW as part of each application (i.e. one copy for the DCO and another for the Marine Licence). A letter (or document) will accompany each application to sign-post which parts of the ES fall under NRW's jurisdiction (and require a Marine Licence) and which are relevant to the DCO application only.

1.3 The Applicant

21 Innogy Renewables UK Ltd. is a leading European energy company with the goal of enabling people to improve their quality of life by using energy more innovatively through sustainable products and services.

22 innogy employs over 100 permanent employees across its four offices in Wales located at Mostyn, Dolgarrog, Llanidloes and Baglan. The teams have extensive experience in developing, building and operating renewable energy projects that make a significant contribution towards Welsh Government's ambitious target to generate 70% of its electricity needs from Welsh renewable sources by 2030 and to reach "net-zero" by 2050.

23 innogy is the largest renewable energy operator in Wales, generating one third of all of Wales' renewable electricity. Put together, the onshore, offshore and hydro projects innogy operates produce enough electricity to meet the equivalent needs of more than 550,000 homes (which is approximately half the households in Wales or enough energy to power the households in both Cardiff and Swansea twice over).

24 innogy's portfolio includes involvement in an installed capacity of 957 MW. innogy operate three offshore wind farms off the coast of North Wales: Gwynt y Môr Offshore Wind Farm (576 MW), Rhyl Flats Offshore Wind Farm (90 MW) and the UK's first large scale Offshore Wind Farm which we also built - North Hoyle Offshore Wind Farm (60 MW). innogy also operates Brechfa Forest West Onshore Wind Farm in Carmarthenshire (57.4MW), Mynydd y Gwair Onshore Wind Farm north of Swansea (32.8MW) and construction of our Clocaenog Forest Wind Farm (96MW) in North Wales is underway. Also, innogy operates six hydro sites in and around North Wales: Cwm Croesor Hydro (0.505 MW); Cwm Dyli Hydro (9.87 MW); Dolgarrog Low Head Hydro (15 MW); Dolgarrog High Head Hydro (17 MW); Dulyn Hydro (0.5 MW); Garnedd Hydro (0.5 MW). These projects have brought significant investment to their neighbouring communities both during the construction and ongoing operation phases.

25 As a responsible developer, innogy has also looked to upskill the future generation. innogy's Wind Turbine Apprenticeship Programme was created with Grwp Llandrillo Menai. The course has trained nearly 30 new apprentices producing high quality technicians who are primarily deployed on offshore and onshore wind farms, both locally and across the UK.

1.3.1 The EIA scoping team

26 The preparation of the EIA Scoping Report is being led by GoBe Consultants Ltd working closely with SLR Consulting. In addition, a number of specialist consultancies have provided expert input into the scoping topic chapters (see Table 1).

27 GoBe Consultants' EIA activities and ESs are accredited by the Institute of Environmental Management and Assessment (IEMA) under the EIA Quality Mark Scheme. This demonstrates GoBe Consultants' commitment to ensuring EIA is undertaken at high quality and in accordance with best practice.

28 Pursuant to Regulation 14(4) of the 2017 EIA Regulations, the ES will be prepared by competent experts and the ES will outline the relevant expertise or qualifications of the experts.

1.4 Policy and Legislative Context

1.4.1 The Planning Act 2008

29 The Planning Act 2008 (the 2008 Act) received Royal Assent on 26 November 2008. It has since been amended by the Marine and Coastal Access Act 2009 (see Section 1.4.3), the Localism Act 2011, the Growth and Infrastructure Act 2013, the Infrastructure Act 2015 and the Housing and Planning Act 2016.

30 The 2008 Act is the primary legislation that established the legal framework for applying for, examining, and determining applications for NSIPs.

National Policy Statements

31 NPSs are produced by the UK Government and set out national policy against which proposals for major infrastructure projects will be assessed and decided on by the relevant Secretary of State. NPSs include the UK Government's objectives for the development of nationally significant infrastructure. The three NPSs of relevance to the proposed Awel y Môr OWF are:

- EN-1 Overarching Energy (DECC 2011a);
- EN-3 Renewable Energy Infrastructure (DECC 2011b), which covers nationally significant renewable energy infrastructure (including offshore generating stations in excess of 100 MW); and
- EN-5 Electricity Networks Infrastructure (DECC 2011c), which covers the electrical infrastructure associated with an NSIP.

32 In addition, the Marine Policy Statement (MPS) adopted by all UK administrations in March 2011 provides the policy framework for the preparation of marine plans and establishes how decisions affecting the marine area should be made in order to enable sustainable development.

1.4.2 The Development Consent Order

33 The key stages in the DCO application process, from pre-application through to post decision, along with the timescales associated with each key stage, are illustrated in Figure 3.



FIGURE 3 – DCO APPLICATION PROCESS

1.4.3 Marine and Coastal Access Act 2009

34 The MCAA received Royal Assent on 12 November 2009. It introduced new planning and management systems for overseeing the marine environment, most notably through the requirement to obtain marine licences for works at sea (including the deposition or removal of any substance or object from the sea below Mean High Water). It created a strategic marine planning system that seeks to promote the efficient, sustainable use and protection of the marine environment, guided by the Marine Policy Statement and a series of Marine Plans.

35 The MCAA provides the framework for a marine licencing system, which is administered by NRW in Wales, a statutory consultee within the DCO application process. The Act also amended certain provisions of the Planning Act 2008.

36 The MCAA also enabled the designation of Marine Conservation Zones (MCZs). MCZs are a type of Marine Protected Area (MPA) which seek to protect a range of nationally important marine wildlife, habitats, geology and geomorphology. A MCZ assessment will be undertaken as part of the DCO and ML applications.

1.4.4 Marine Licencing

37 The assessment of the marine environment will have due regard to the principles within the UK Marine Policy Statement, the MCAA and any relevant marine plans and policies. A marine licence is required under the MCAA before carrying out any licensable marine activity. In England it is possible to include licensing marine licence within the DCO, but the devolution agreement means that this must be applied for separately in Welsh waters. The responsibility for marine licencing in Wales lies with the Welsh Government, but day-to-day authority has been delegated to NRW.

38 Licensable marine activities of relevance to the Awel y Môr OWF include constructing works in the sea or on the seabed and the deposition of any substance or object in the sea or on or under the seabed (for example disposal of dredgings or arisings).

39 The marine licence application will require EIA to be carried out under the Marine Works (EIA Regulations) 2007 (as amended). The competent authority (NRW) will be also be required to undertake a Habitats Regulations Assessment (HRA), under the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations).

40 The chapters of this Scoping Report which are of relevance to the ML application are presented in Section 1.5.

1.4.5 The Environmental Impact Assessment Process

41 EIA is a tool for systematically examining and assessing the impacts of a development on the physical, biological and human environment. This process allows management and mitigation measures to be identified to ensure the development is sustainable.

42 EIA was introduced under the European Union (EU) EIA Directive 85/337/EEC (as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC). The EIA Directive was transposed into English law for NSIPs by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009. In 2011, the original EIA Directive and amendments were codified by EIA Directive 2011/92/EU (as amended by Directive 2014/52/EU).

43 Amendments were made by EIA Directive 2014/52/EU and have been transposed into English law for NSIPs by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) 2017. These came into force on 16 May 2017 and are the relevant EIA regulations for the Awel y Môr OWF. Key changes which are of note in the 2017 EIA Regulations relate to:

- A requirement to provide a description of the likely significant effects of the development on the environment resulting from impacts on climate change, risks to human health and use of natural resources;
- Ensuring EIA quality by requiring that those who undertake the work are competent experts;
- More detailed demonstration of the consideration of reasonable alternatives to the proposed project; and
- Further consideration of how to avoid, prevent, reduce and / or offset significant adverse effects where possible and develop monitoring strategies.

44 The Marine Works (Environmental Impact Assessment) Regulations (2007) (as amended) transposes the EIA Directive (85/337/EEC) into English and Welsh law in relation to:

- Harbour works which require approval or consent pursuant to a local Act or an order made under Section 14 or 16 of the Harbours Act 1964; and

- Activities which are regulated under the MCAA (i.e. those activities which require a Marine Licence).

45 The regulations apply to Marine Licences issued by NRW and implement a legal requirement on NRW that an EIA be undertaken for certain types of development before consent is granted. The new regulations came into force in May 2017 and as such the EIA will be undertaken under the 2017 amendments.

1.4.6 Habitats Regulation Assessment

46 In England and Wales, the Habitats Directive is implemented under the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) and the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2017. The Marine Habitats Regulations transpose the Habitats Directive and the Birds Directive into national law.

47 The provisions of the Birds Directive are implemented through the Wildlife and Countryside Act 1981, the Habitats Regulations and the Offshore Marine Conservation (Natural Habitats & c.) Regulations 2017, as well as other legislation related to the uses of land and sea.

48 Under this legislation, a network of protected areas (the Natura 2000 network) has been established. These are Special Areas of Conservation (SACs) for habitats and species, and Special Protection Areas (SPAs) for birds. The Habitats Regulations require that, where the possibility of a likely significant effect on a Natura 2000 site cannot be excluded (either alone or in combination with another plan or project), a competent authority must undertake an Appropriate Assessment as part of the HRA process. The Habitats Regulations state that it is the developer's responsibility to provide sufficient information to the competent authority to enable them to assess whether there are likely to be any significant effects and to enable them to carry out the appropriate assessment, where necessary.

49 A HRA Screening Report (innogy, 2020) has been prepared in addition to this Scoping Report for consultation with the relevant stakeholders. Further assessment will be undertaken (as required) in the form of a Report to Inform Appropriate Assessment (RIAA), and will be included with the DCO and ML applications. The RIAA will provide sufficient information to enable the competent authority to carry out an Appropriate Assessment should it determine that one is required.

1.4.7 UK Energy Policy and the Role of Renewable Energy

50 At a European Union (EU) level the Renewables Directive (Directive 2009/28/EC) requires that by 2020, some 20% of the EU's energy consumption must come from renewable sources. As part of this process the 'UK Renewable Energy Strategy' (The SoS for Energy and Climate Change, 2009) set the UK's commitment to source 15% of its energy from renewable sources by 2020.

51 The Renewable Energy Roadmap (DECC, 2011a; 2012; 2013) updated some of the aims within the Renewable Energy Strategy (TSO, 2009b) and identified eight technologies capable of providing 90% of the renewable energy required to meet the UK's 2020 target of 15% of energy consumption derived from renewable sources. It suggests that offshore wind is an ideal technology for the UK, where shallow seas and strong winds make it an important national asset which will play a key role in enabling the UK to meet its legally binding 2020 renewable energy targets (DECC, 2013).

52 The first National Infrastructure Assessment by the National Infrastructure Commission (NIC, 2018) recommends that half of the UK's power is provided by renewables by 2030. This represents a substantially more ambitious target compared to the EU Renewables Directive and UK Renewable Energy Strategy and is partly driven by the cost competitiveness of offshore wind energy generation.

53 In 2017, the Welsh Government its target of meeting 70% of Wales' electricity demand from renewable electricity sources by 2030 (Welsh Government, 2018a). In addition, The Welsh Government has also declared an ambition to reach net zero by 2050.

The Climate Change Act 2008

54 The Climate Change Act 2008 commits the UK to a net reduction in greenhouse gas emissions against the 1990 baseline by 2050.The Climate Change Act 2008 implements the UK's commitments under the Kyoto protocol (to which the UK is a signatory). This is implemented through a system of carbon budgets, which are set by the Government for a period of five years each. The UK Government has legislated for the first four carbon budgets to cut emissions by 23% below 1990 levels by 2012, 29% by 2017, 35% by 2022, 50% by 2027, and 57% by 2032 (TSO, 2009b, 2011, 2016 (respectively)). The first target, 23% below 1990 levels by 2012, was met by the UK. Currently, the UK is on track to outperform the targets of the second and third carbon budgets (Committee on Climate Change, 2017).

55 The Climate Change Act 2008 also established the Committee on Climate Change. The Committee on Climate Change advises the UK and devolved administration governments on setting and meeting the carbon budgets, and on preparing for climate change. In May 2011, the Committee published the Renewable Energy Review, which sets out a detailed vision of the role of renewable energy in meeting longer term emissions targets. The Renewable Energy Review concludes that the development of renewable energy is a potentially significant contributor to delivering decarbonisation of the power sector by 2030 at reasonable cost. It also underlined that firm commitments of support for offshore wind and marine generation through to the 2020s should be made (Committee on Climate Change, 2011).

The Energy Act 2013

56 The Energy Act 2013 received Royal Assent on 18 December 2013. The Energy Act makes provisions to incentivise investment in low carbon electricity generation, ensure security of supply, and help the UK meet its emissions reduction and renewables targets. In particular, the Energy Act contains provisions from the then Department of Energy and Climate Change (DECC) (now the Department for BEIS) for Electricity Market Reform (EMR).

57 The EMR sets out the framework for replacing Renewables Obligation Certificates (ROCs) with Contracts for Difference (CfD) to provide stable financial incentives to encourage investment in low carbon electricity generation. CfD are private contracts between a low carbon electricity generator and the UK Government owned Low Carbon Contracts Company (LCCC). Under a CfD, the electricity generating party is paid the difference between the strike price (the price for electricity reflecting the cost of investment in low carbon technology) and the reference price (a measure of the average market price for electricity in the Great Britain market).

58 The aim of CfD is to give greater certainty and stability of revenues to electricity generators by reducing exposure to volatile wholesale prices, whilst at the same time protecting the consumer from paying for higher generation support costs when electricity prices are high (BEIS, 2016).

Clean Growth Strategy

59 The Clean Growth Strategy (2017) promotes 'clean growth' as growing national income while cutting greenhouse gas emissions. Clean growth forms one of the four 'grand challenges' within the UK's Industry Strategy (2017). The UK has been one of the most successful countries in the developed world in growing its economy while reducing emissions. This success has been aided by the falling costs of many low carbon technologies including solar and offshore wind. The Strategy aims to promote further growth of offshore wind by holding a second auction of CfD, working with the industry to develop a Sector Deal for offshore wind, and to provide further funding for innovation in offshore wind.

1.4.8 Overview of Welsh Planning Policy

Planning Policy Wales

60 Planning Policy Wales sets out the land use planning policies of the Welsh Government, forming a strategic framework to guide development. Planning Policy Wales provides specific guidance on topics such as the natural, built and historic environment; economic development, transport, housing, tourism, recreation and managing environmental risks. Key policy expectations, where relevant, will be drawn out in topic chapters of the ES and further detail will be provided in the Planning Statement (to accompany the DCO and ML applications).

61 Planning Policy Wales is supplemented by topic-based Technical Advice Notes. The EIA assessments within the ES will identify the relevant Technical Advice Notes for each of the technical disciplines. The Technical Advice Notes provide detailed planning advice for Local Planning Authorities to be considered in the drafting of local development plans. The key Technical Advice Note for the DCO and ML applications will be Technical Advice Note 8 (Planning for Renewable Energy).

62 The key local development plans to be considered in the development of the ES will be:

- Conwy County Borough Council local development plan; and
- Denbighshire County Council local development plan.

63 Government consultation responses were submitted in August 2019.

Welsh National Marine Plan

64 The Welsh National Marine Plan (WNMP) was published on 12 November 2019 and contains policy across a range of considerations (including nature conservation, sustainable use, seascape, and coastal communities and economic growth). The WNMP includes sector objectives for renewable energy to support decarbonisation of the Welsh economy and the use of marine renewable energy generation (including OWF).

1.5 Report structure

65 The structure of this report is presented in Table 1. Table 1 also provides sign-posting for the relevant chapters of this Scoping Report pertinent to the DCO and ML applications.

TABLE 1 – SCOPING REPORT STRUCTURE AND SIGN-POSTING FOR THE DCO AND ML APPLICATIONS

CHAPTER NUMBER	CHAPTER TITLE	PREPARED BY	RELEVANT FOR THE DCO	RELEVANT FOR THE ML
N/A	Executive Summary	GoBe Consultants Ltd	✓	✓
N/A	Glossary	GoBe Consultants Ltd	✓	✓
1	Introduction	GoBe Consultants Ltd	✓	✓
2	Project Need	GoBe Consultants Ltd	✓	✓
3	Project Description	GoBe Consultants Ltd	✓	✓
4	Environmental Impact Assessment Approach and Methodology	GoBe Consultants Ltd	✓	✓
5	Site selection and alternatives	GoBe Consultants Ltd	✓	✓
6	Consultation Process	GoBe Consultants Ltd	✓	✓

CHAPTER NUMBER	CHAPTER TITLE	PREPARED BY	RELEVANT FOR THE DCO	RELEVANT FOR THE ML
7	Offshore Environment – Physical Environment	GoBe Consultants Ltd	✓	✓
7.1	Physical Processes	ABPmer	✓	✓
7.2	Water and Sediment Quality	GoBe Consultants Ltd	✓	✓
8	Offshore Environment – Biological Environment	GoBe Consultants Ltd	✓	✓
8.1	Benthic and Intertidal Ecology	GoBe Consultants Ltd	✓	✓
8.2	Fish and Shellfish Ecology	GoBe Consultants Ltd	✓	✓
8.3	Marine Mammals	SMRU Consulting	✓	✓
8.4	Ornithology	McArthur Green	✓	✓
9	Offshore Environment – Human Environment	GoBe Consultants Ltd	✓	✓
9.1	Commercial Fisheries	Poseidon	✓	✓
9.2	Shipping and Navigation	Anatec	✓	✓
9.3	Military and Civil Aviation	Osprey	✓	✓
9.4	Seascape, Landscape and Visual Impact Assessment	Optimised Environments	✓	✓
9.5	Archaeology and Cultural Heritage	Maritime Archaeology	✓	✓
9.6	Other Marine Users and Activities	GoBe Consultants Ltd	✓	✓
10	Onshore Environment	SLR Consulting	✓	×
10.1	Terrestrial Ecology and Nature Conservation	SLR Consulting	✓	×
10.2	Archaeology	SLR Consulting	✓	×

CHAPTER NUMBER	CHAPTER TITLE	PREPARED BY	RELEVANT FOR THE DCO	RELEVANT FOR THE ML
10.3	Airbourne Noise and Vibration	SLR Consulting	✓	×
10.4	Traffic and Transport	SLR Consulting	✓	×
10.5	Air Quality	SLR Consulting	✓	×
10.6	Hydrology and Flood Risk	SLR Consulting	✓	×
10.7	Geology and Ground Conditions	SLR Consulting	✓	×
10.8	Landscape and Visual	SLR Consulting	✓	×
10.9	Socioeconomics and Tourism	SLR Consulting	✓	×
10.10	Health	GoBe Consultants Ltd	✓	×
11	Summary of EIA Scoping	GoBe Consultants Ltd	✓	✓
12	Proposed Content of EIA Report	GoBe Consultants Ltd	✓	✓
13	References	GoBe Consultants Ltd	✓	✓

2 Project need

66 Offshore wind, as a source of renewable energy, offers the UK a wide range of benefits from an economic growth, energy security and decarbonisation perspective. Awel y Môr would make a significant contribution to renewable energy supply and consequently help provide these benefits to Wales and globally. The strategic development of Awel y Môr OWF will increase this contribution to UK energy supply and help fulfil future increasing demand for renewable energy.

67 The primary drivers for the development of offshore wind energy are:

- The need to reduce greenhouse gas emissions;
- The need for national energy security;
- The need to maximise economic opportunities from energy infrastructure investment for the UK; and
- The need to produce affordable energy.

2.1 The need to reduce greenhouse gas emissions

68 In the Overarching National Policy Statement for Energy (Department of Energy and Climate Change (DECC), 2011d), predictions are made that a continuation of global emission trends, including emissions of greenhouse gases such as carbon dioxide, could lead average global temperatures to rise by up to 6°C by the end of this century. The potential impacts associated with such a global temperature rise include (DECC, 2014):

- Increased frequency of extreme weather events such as floods and drought;
- Reduced food supplies;
- Impacts on human health;
- Increased poverty; and
- Ecosystem impacts, including species extinction.

69 A commitment by the UK was made during the 21st Conference of the Parties (COP) in Paris in 2015 to pursue efforts to limit the global temperature increase to within 2°C of the pre-industrial average temperature, with an aspiration for an improved limit of 1.5°C.

2.2 The need for national energy security

70 The UK has been a net importer of electricity since 2010 and imported around 5.5 Terawatt-hour (TWh)[6] of its electricity in Q3 2019 (BEIS, 2020). There were reduced imports on all interconnectors which were operational in 2018, with a particularly large decrease for the Ireland-Wales interconnector of approximately 41%. Renewable electricity generation was 29 TWh in Q3 2019, representing 38.9% of total electricity generation.

71 Key issues associated with energy security in the UK are:

- The decline in fossil fuel reserves (in particular North Sea oil and gas);
- The required ongoing closure and decommissioning of existing elderly fossil fuel and nuclear electricity generating infrastructure; and
- The need for replacement sources.

72 Reliance on global markets for imported energy leaves the UK vulnerable to spikes in world energy market prices, political pressure and potentially, to physical supply disruptions.

73 It is widely considered that a transition to low carbon energy will provide greater energy security but may require more complex electricity systems. These systems may necessitate new approaches to balancing supply and demand or increasing risks of cyber-attacks due to the widespread use of digital technologies (UK Energy Research Centre, 2018). Therefore, the relationship between energy security and low carbon energy generation should not be considered linear.

[6] One terawatt-hour is equivalent to 10^{12} watt-hours

2.3 The need to maximise economic opportunities from energy infrastructure investment for the UK

74 A key commitment within the UK's Industrial Strategy (developed by the Department for Business, Energy & Industrial Strategy) is to "lead the world in delivering clean energy technology" and to support innovation in this area. The aim is for "the UK to be a global leader in innovation, science and research and our Industrial Strategy will help us to deliver our ambitious CO_2 reduction targets while, creating jobs and opportunities for people across the country" (HM Government, 2017). The energy sector in the UK plays a central role in the economy and renewable energy can play a major part in boosting the economy and providing new jobs and skills.

75 The Centre for Economics and Business Research (CEBR, 2012) estimates that by 2030, offshore wind could increase the Gross Domestic Product (GDP) value by 0.6% and support 173,000 jobs. In contrast, The Stern Report (Stern, 2006) concludes that if no action is taken to prevent climate change, the economic impacts could be equivalent to losing at least 5% of global GDP each year.

76 According to the 2017 Report on Offshore Wind UK Content (RenewableUK, 2017), 48% of the total expenditure associated with UK offshore wind farms was spent in the UK in 2015.

77 The Sector Deal (HMG, 2019) seeks to maximise the advantages for UK industry from the global shift to clean growth, consistent with the Clean Growth Grand Challenge. The deal sets out to achieve this with five commitments including the Contracts for Difference third allocation round (results publish in October 2019) and energy export targets by 20230. The report states that up to 30 GW of offshore wind is anticipated to be constructed in the UK by 2030. These developments could account for over £40bn of infrastructure spending in the next decade.

78 The offshore wind industry presents an opportunity to utilise and further develop the UK's maritime engineering skills as other industries decline (such as shipbuilding and North Sea oil) in order to secure supply chain and other employment opportunities in the UK. The importance of maximising opportunities for the involvement of local businesses and communities in offshore wind has been highlighted as a key success factor for the sector in the UK (The Crown Estate, 2014).

2.4 The need to produce affordable energy

79 Energy from offshore wind has often been described as being an expensive alternative to more conventional forms of energy generation such as coal, gas and nuclear. However, ORE Catapult (2016) shows that UK projects reaching Final Investment Decision (FID) in 2015/16 achieved an average Levelised Cost of Energy (LCOE) of £97/MWh; a 32% reduction since 2010/11. This means that the industry has beaten its target of £100/MWh by 2020 four years early. There is also high industry confidence of continued rapid cost reduction in LCOE for offshore wind (ORE Catapult, 2016), as is being demonstrated in Europe.

80 A strike price of £105/MWh for offshore wind in 2021-22 was announced by the UK Government in 2016 which represents the maximum price that will be paid, however with competitive bidding between developers, the final winning Contract for Difference (CfD) price is expected to be less than that of nuclear power at £92.5/MWh over a longer contract of 35 years versus 15 years for the CfD. As widely expected, the results of Allocation Round 2 CfD (September 2017) showed a dramatic fall in the cost of offshore wind. The cost of offshore wind, as measured by the CFD auction prices, has therefore reduced by almost 50% (from £105 to £57.50/MWh) in 2 years. This trend continued in the CfD Allocation Round 3 (September 2019) further reducing the strike price by approximately 30% (from £57.50 to £35.07/MWh). This trend has made offshore wind one of the most attractive and cost-effective methods of generating large quantities of low carbon energy.

3 Project Description

3.1 General

81 This chapter provides an overview of the proposed development. It sets out the design and main components of the offshore wind farm for both offshore and onshore. It also describes the key activities and methodologies that will be undertaken during construction, operations and maintenance (O&M) and decommissioning, including key parameters along with indicative timescales.

82 Detailed project design will be developed throughout the application process and the pre-construction phase. Therefore, the description of the project provided in this Scoping Report is indicative and designed to provide context for the wider document. The project design envelope will be developed in parallel with the EIA process and will be influenced by the results of environmental and technical studies and in some cases stakeholder consultation (such as the Evidence Plan process).

83 It should be noted that at the time of writing, the cable routes and precise locations for infrastructure have not yet been defined, however search areas have been defined in this Scoping Report. Details of the Site Selection Study and the development of the search areas (for the purposes of scoping) are presented in Chapter 5 of this Scoping Report. Following the refinement of the project design and the search areas, a Red Line Boundary (innogy's proposed Order Limits) will be defined for assessment in the ES. All project infrastructure will be installed within the Order Limits (as defined in the DCO - if consent is granted).

84 It should be noted that all parameters provided in this chapter are subject to change throughout the design process and may vary from those presented in the ES. However, the parameters provided are sufficient for the purposes of scoping.

3.2 Need for flexibility

85 Where necessary (or appropriate), a range of parameters for each aspect of the project will be defined in the ES and the worst-case scenario for a particular receptor and/or impact will be identified and applied for each receptor/impact. This is known as the project design envelope approach or the 'Rochdale Envelope' approach (PINS, 2012a).

86 As noted in PINS Advice Note Nine (PINS, 2012a), the "Rochdale Envelope" approach may be employed where the developer may not know the full or exact specifications of infrastructure that will comprise the proposed project. The note states that:

"The 'Rochdale Envelope' is an acknowledged way of dealing with an application comprising EIA development where details of a project have not been resolved at the time when the application is submitted".

87 The Rochdale Envelope also provides flexibility to address uncertainties inherent to the proposed development, this need for flexibility is identified in a number of National Policy Statements (NPS) (PINS, 2012b). The use of the Design Envelope approach has been recognised in the Overarching NPS for Energy (NPS EN-1) (DECC, 2011a) and the NPS for Renewable Energy Infrastructure (NPS EN-3) (DECC, 2011b). This approach has been used in the majority of offshore wind farm applications.

88 In the case of offshore wind farms, NPS EN-3 (paragraph 2.6.42) recognises that:

"Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application, possibly including:

Precise location and configuration of turbines and associated development;

Foundation type;

Exact turbine tip height;

Cable type and cable route; and

Exact locations of offshore and/or onshore substations."

89 NPS EN-3 (paragraph 2.6.43) (DECC, 2011b) continues:

"The Secretary of State should accept that wind farm operators are unlikely to know precisely which turbines will be procured for the site until sometime after any consent has been granted. Where some details have not been included in the application to the Secretary of State, the applicant should explain which elements of the scheme have yet to be finalised, and the reasons. Therefore, some flexibility may be required in the consent. Where this is sought and the precise details are not known, then the applicant should assess the effects the project could have to ensure that the project as it may be constructed has been properly assessed (the Rochdale [Design] Envelope)".

90 NPS EN-3 also states that:

"The 'Rochdale [Design] Envelope' is a series of maximum extents of a project for which the significant effects are established. The detailed design of the project can then vary within this 'envelope' without rendering the ES [Environmental Statement] inadequate".

91 At this early phase, the project description is indicative, and the 'envelope' has been designed to include sufficient flexibility to accommodate further refinement during detailed design. This chapter therefore sets out a series of options and/or parameters for which maximum values are used to constitute a realistic Maximum Design Scenario (MDS) for Awel y Môr OWF.

92 A more detailed project design envelope will be presented in the ES (which will accompany the developer's application for a DCO to the Secretary of State (SoS) and a Marine Licence to Natural Resources Wales (NRW)) which will therefore provide the maximum envelope of the consent sought, allowing appropriate flexibility to enable the refinement of the project design after consent (if granted).

3.3 Key project components

93 A geographical overview of the search areas for offshore and onshore project infrastructure are presented in Figure 4 and Figure 5 respectively. All of the key components and works will be undertaken within these areas.

94 The key components of Awel y Môr OWF are presented in Table 2.

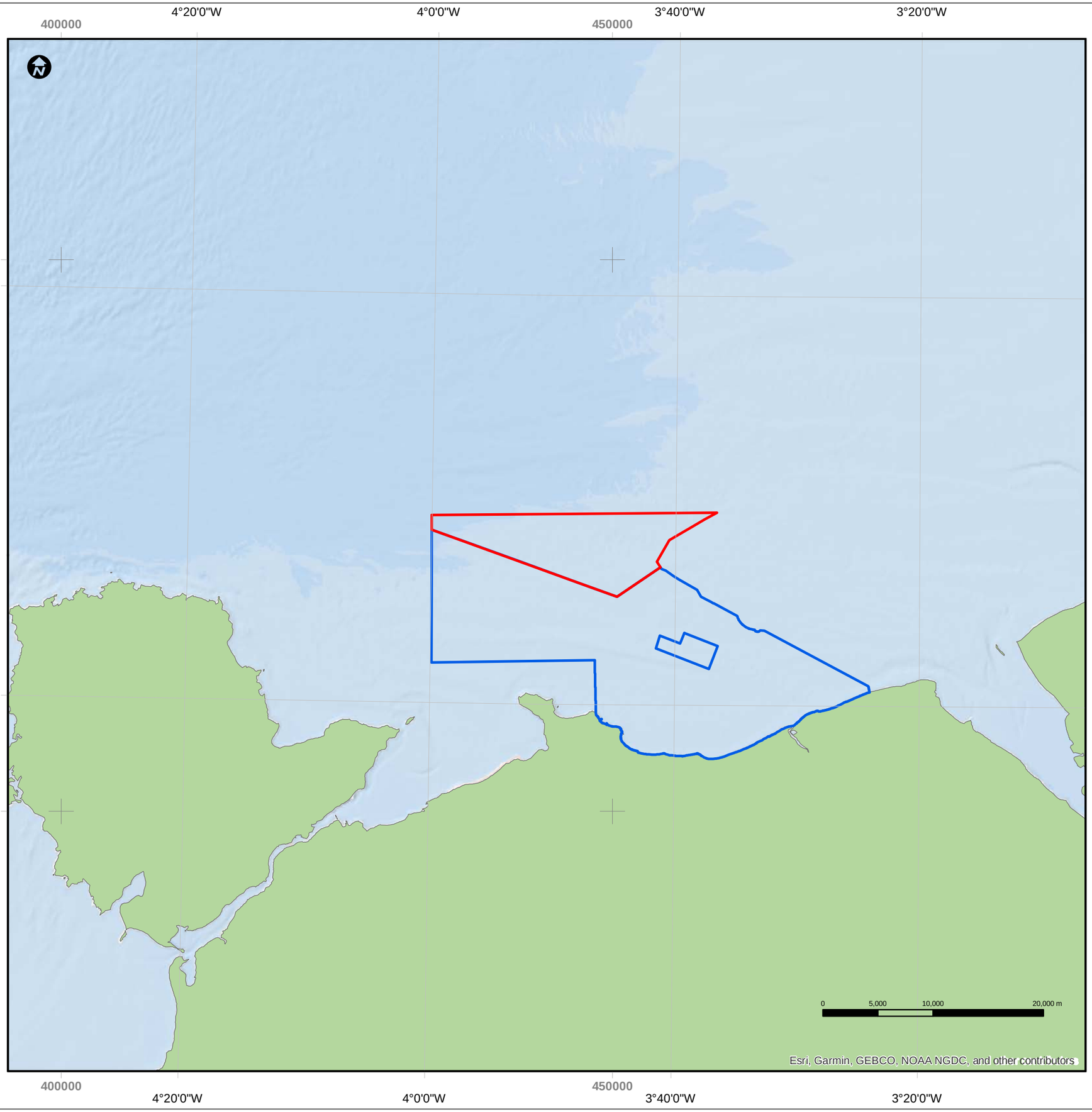
TABLE 2 - KEY PROJECT INFRASTRUCTURE COMPONENTS

INFRASTRUCTURE	COMPONENT	DETAIL	DETAILS INCLUDED IN:
Array	Wind Turbine Generators (WTGs)	The Wind Turbines convert wind energy to electricity. Key components include rotor blades, gearboxes (in some cases), transformers, power electronics and control equipment. Offshore turbine models are continuously evolving and improving; therefore, the exact wind turbine model will be selected post-consent from the range of models available at the point of procurement.	Table 4
Array	Offshore Substation Platform (OSP)	Offshore substations are the systems that collect and export the power generated by WTGs through the inter-array cables.	Table 12 to Table 17
Array	Met mast	Offshore Met masts are used to collect data on meteorological variables such as wind speed and air temperature. This data is then used to refine design parameters post consent and optimise performance during operation.	Section 3.4.7
Array	foundations	The wind turbines, OPSs and met mast will be permanently attached to the seabed with foundation structures. These are typically fabricated from steel or concrete. A limited number of foundation designs are under consideration.	Table 6 to Table 10
Array	Inter-array cables	Cables will connect the WTGs to one of the offshore substations, typically in branched strings. Cables will be buried and may require a hard-protective layer (such as rock or concrete mattresses) to ensure that the cables	Table 18

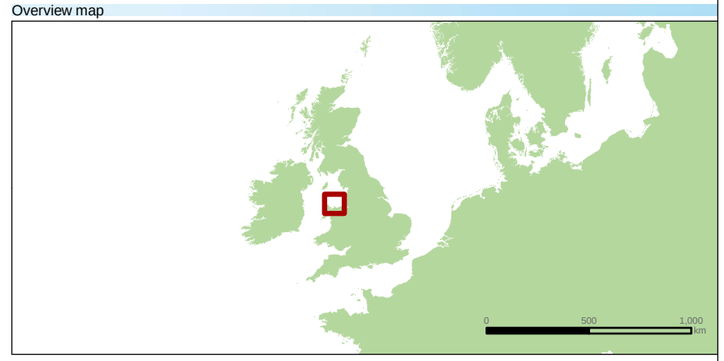
INFRASTRUCTURE	COMPONENT	DETAIL	DETAILS INCLUDED IN:
		remain secure and do not become a hazard to other sea users and are not damaged by waves and currents.	
Array	Scour and cable protection	In order to protect the seabed around foundation structures and cables from scour, some rocks and other materials may be placed on the seabed to protect from current and wave action.	Section 3.4.6.
Offshore export cable route	Export cables	Cables connecting the offshore substations to the landfall. Cables will be routed to avoid major seabed obstacles and minimise electrical losses.	Table 19
Offshore export cable route	Scour and cable protection	In order to protect the seabed around cables from scour, some rocks and other materials may be placed on the seabed to protect from current and wave action.	Section 3.4.6
Landfall	Landfall and Transition Joint Bays	The landfall is the area where the export cables are brought ashore. Techniques at landfall may include either trenchless (for example Horizontal Directional Drilling) or open-cut trenching techniques resulting in buried cables. A Transition Joint Bay (TJB) will be installed and is an underground concrete structure holding the joint between the offshore and onshore export cables.	Section 3.5.
Onshore export cable route	Onshore export cables	Cables connecting the landfall first to the onshore substation and then on to the National Grid substation at Bodelwyddan.	Figure 5 and Table 20

INFRASTRUCTURE	COMPONENT	DETAIL	DETAILS INCLUDED IN:
		Cables will be delivered in sections and buried in trenches, which will subsequently be reinstated to pre-existing condition as far as reasonably practical. Sections will be connected together within jointing bays. The cables shall follow the prescribed route onshore and will be either directly buried or installed within a cable duct. This Scoping Report presents a search area for the cable routing options currently being considered (see Figure 5). It should be noted that at the time of writing, the onshore cable route has not been defined. The key parameters for the onshore export cables are presented in Table 20.	
Onshore substation	Onshore substation	A new onshore substation will be constructed which will be located within the substation search area (see Figure 5 and Chapter 5) and will include all necessary electrical plant to meet the requirements of the National Grid.	Table 21
Onshore export cable route	Grid connection	In the vicinity of the National Grid Electricity Transmission (NGET) substation at Bodelwyddan.	Table 21

95 It is anticipated that National Grid will be required to undertake an extension to the existing NGET GIS building and substation boundary at the existing Bodelwyddan 400kV substation in order to accommodate Awel y Môr OWF and reconfigure the existing 400kV overhead line circuits. If these alterations or extensions require planning consent, then this will be obtained by either National Grid or the wind farm. The Applicant is currently consulting with National Grid to help inform and develop the project description for the next stages of the project.



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

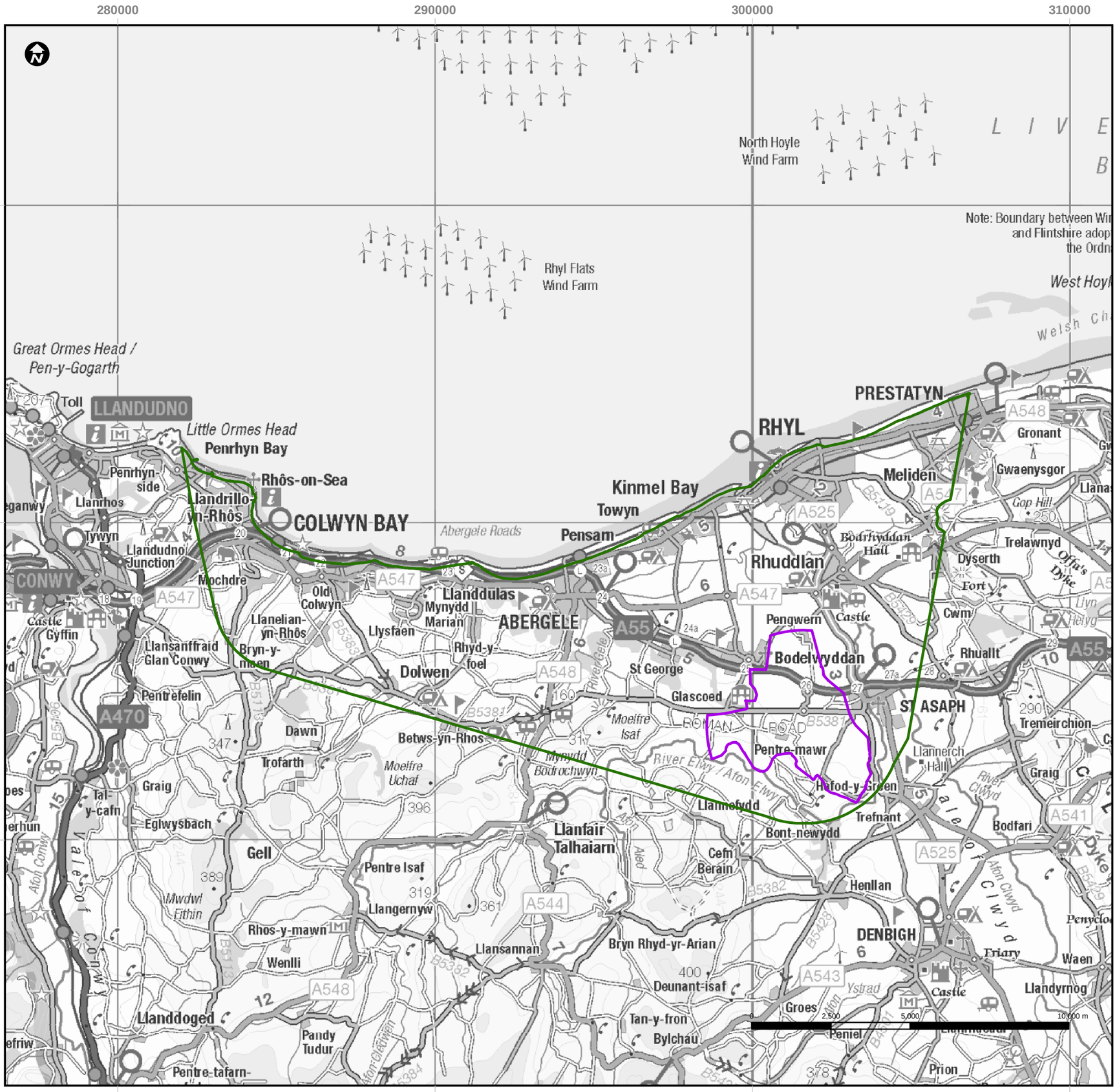
PROJECT
Offshore Windpark
Awel y Môr

TITLE
Array and Offshore Export Cable Search Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	27/01/2020	1:350,000	@DIN A3

DRAWING No.	REV
None Issued	01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\General\AyM_0119_Array_and_ECR_Search_Area.mxd



Overview map



Legend

- Onshore Export Cable Route Search Area
- Substation Search Area

Cartographic information

Coordinate System: British National Grid
Map Datum: ODN (Ordnance Datum Newlyn)

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Onshore Export Cable Route Search Area and Onshore Substation Search Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	27/01/2020	1:125,000	@DIN A3

DRAWING No. None Issued

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\General\AyM_0119_Onshore_ECR_Search_Area_and_Substation_Search_Area.mxd

3.4 Key project parameters – offshore

3.4.1 Array

96 The key characteristics of the array are presented in Table 3.

TABLE 3 - KEY ARRAY SITE CHARACTERISTICS

PARAMETERS	DESIGN ENVELOPE
Array area (km²)	106.4
Closest distance to shore (km)	10.6

3.4.2 Wind turbine generators

97 The maximum design scenario for the WTGs for this Scoping Report is presented in Table 4. The proposed Awel y Môr project will consist of up to 107[7] wind turbine generators (WTGs). The physical parameters of the WTGs, for example the tip height or hub height which are important for the assessments (see Table 4). The WTGs will incorporate tapered tubular towers and three blades attached to a nacelle housing mechanical and electrical generating equipment (see Figure 6). All WTGs will be located within the offshore array as defined within the DCO. Note: the layout of the WTGs will not be defined in the DCO application.

[7] The exact number will vary based on WTG size, i.e. either a greater number (107) of smaller WTGs or a smaller number of larger WTGs.

TABLE 4 - WTG MAXIMUM DESIGN SCENARIO

PARAMETERS	DESIGN ENVELOPE
Maximum number of WTGs	107
Indicative number of WTGs assuming maximum rotor diameter	51
Minimum lower blade tip above MHWS (m)	22
Maximum blade tip height above MHWS/ (LAT) (m)	332 (341[8])
Maximum rotor diameter (m)	300

* Exact MW will be confirmed depending on the technology available at the time of procurement.

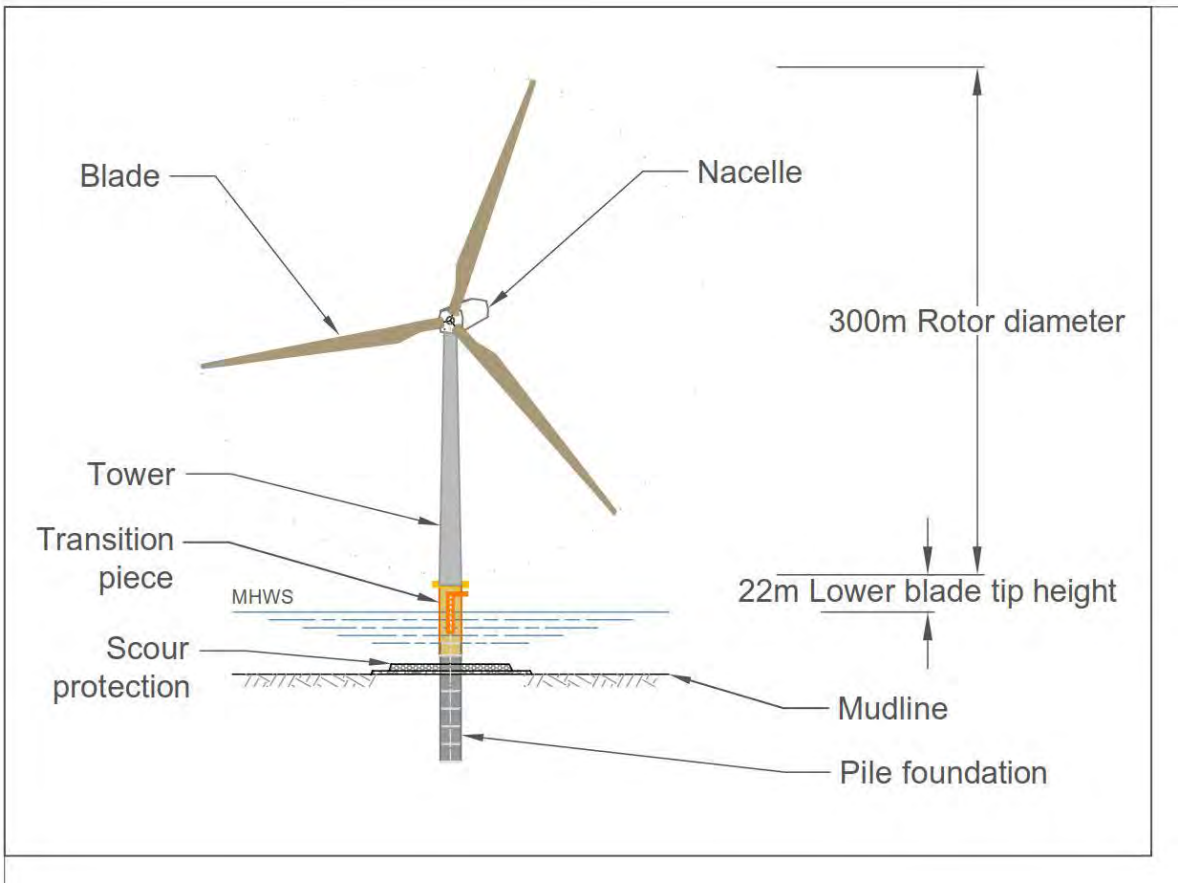


FIGURE 6 - TYPICAL WIND TURBINE GENERATOR

[8] This height to the LAT datum has been derived from applying a static datum conversion across the whole site and has been provided for context only.

Foundations

98 The factors influencing the choice of foundation for a specific project are; the type of wind turbine to be used, the nature of the ground conditions on the site, the water depth and sea conditions (i.e. prevailing wave and current climate), as well as supply chain constraints and overall cost. The foundation type selected in the final design for the WTGs (and offshore substation – see below) will be dependent on the final site investigations (undertaken post consent (if granted)) and procurement.

99 Therefore, given the uncertainty over this aspect of the design, a range of foundation types have been considered in this Scoping Report (and EIA). The types of foundations being considered (and assessed) are presented in Table 5.

TABLE 5 - FOUNDATION TYPES FOR WTGS

TYPE	DESCRIPTION	EXAMPLE FIGURE	DETAILS PROVIDED IN:
Monopile foundation	Monopile foundations typically consist of a single tubular section, consisting of a number of sections of rolled steel plate welded together. In many cases a Transition Piece (TP) is fitted over the monopile and secured via bolts or grout, in other cases the monopile will connect directly to the wind turbine tower (a TP-less solution).	Figure 7	Table 6
Suction bucket monopile foundation	Suction bucket monopile foundations consist of a single tubular structure fixed to the seabed by a suction caisson. The suction buckets are typically hollow steel cylinders, capped at the upper end.	Figure 8	Table 7
Gravity base monopile foundation	Gravity base foundations are typically concrete structures which are floated to site and then ballasted when in the correct location. The stability of the foundation is achieved by its weight.	Figure 9	Table 8
Pin piled jacket foundation	Piled jacket foundations are formed of a steel lattice construction (comprising tubular steel members and welded joints). The foundation is secured to the seabed by hollow steel pin-piles which sit within a sleeve or leg which is part of the jacket. Piling may take place once the jacket is in position, or alternatively it may be pre-piled. The piles rely on frictional and end bearing properties of the seabed for support. Unlike monopiles, there is no separate TP; the TP and ancillary structure is fabricated as an integral part of the jacket. Pin-piles will typically be of a smaller diameter than monopiles.	Figure 10	Table 9
Suction bucket jacket foundation	Suction bucket jacket foundations are formed of a steel lattice construction (comprising tubular steel members and welded joints) fixed to the seabed by suction caissons. The suction buckets are typically hollow steel cylinders, capped at the upper end, which are fitted	Figure 11	Table 10

TYPE	DESCRIPTION	EXAMPLE FIGURE	DETAILS PROVIDED IN:
	underneath the legs of the jacket structure. Unlike monopiles, but similar to piled jacket foundations, there is no separate TP; the TP and ancillary structure is fabricated as an integrated part of the jacket structure and is not installed separately offshore.		
Gravity base jacket foundation	Gravity base jacket foundations are formed of a steel lattice construction (comprising tubular steel members and welded joints) with heavy masses at the base. The foundation is secured to the seabed by the weight of the foundation.	Figure 12	Table 11

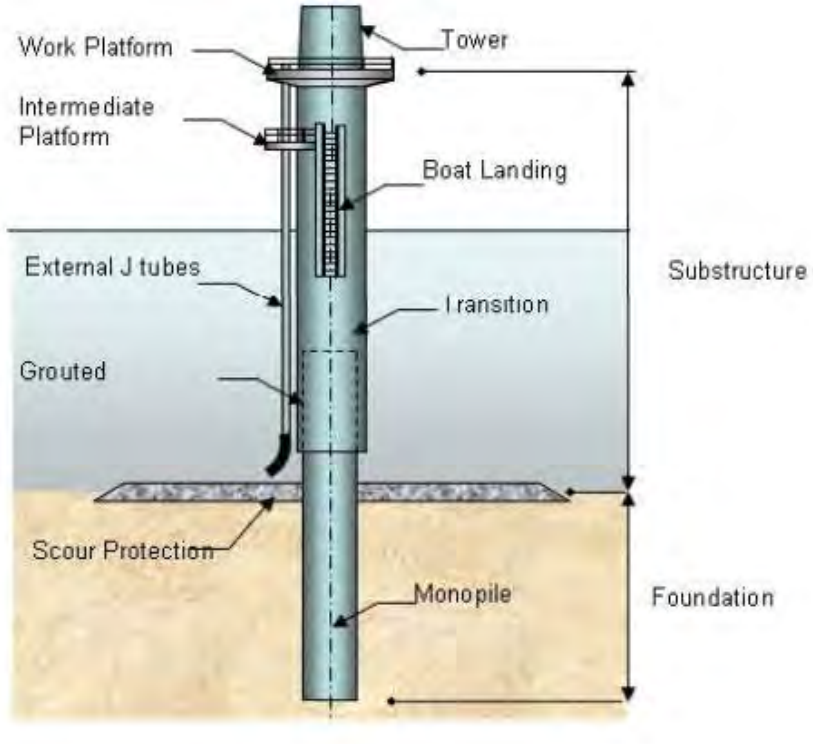


FIGURE 7 - EXAMPLES OF MONOPILE FOUNDATION TYPES

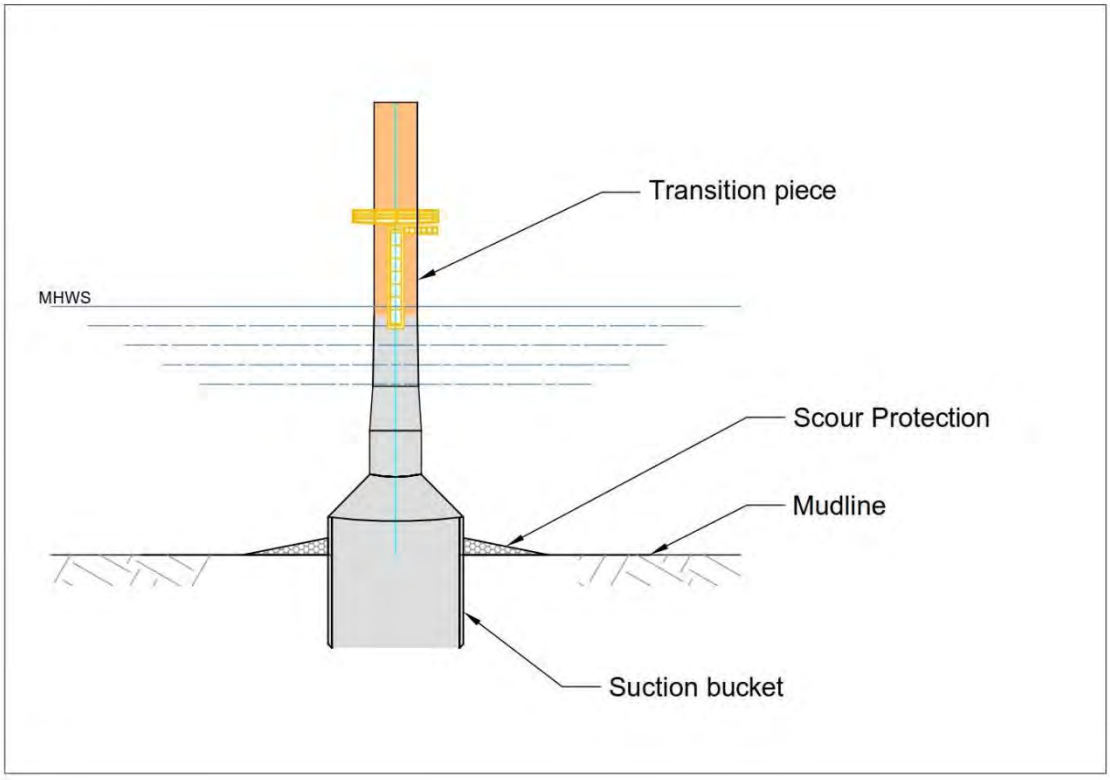


FIGURE 8 - EXAMPLES OF SUCTION BUCKET MONOPILE FOUNDATION TYPES

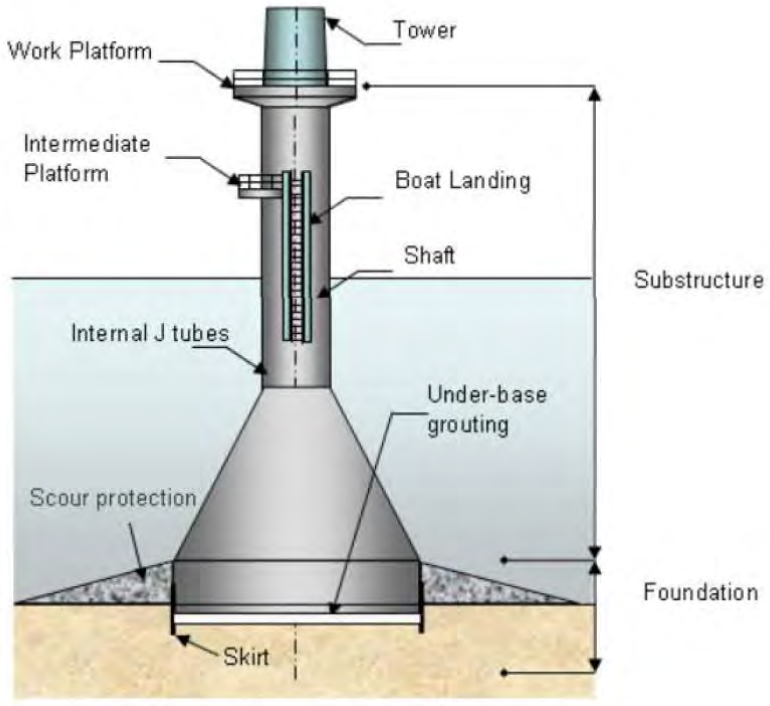


FIGURE 9 - EXAMPLES OF GRAVITY BASE MONOPILE FOUNDATION TYPES

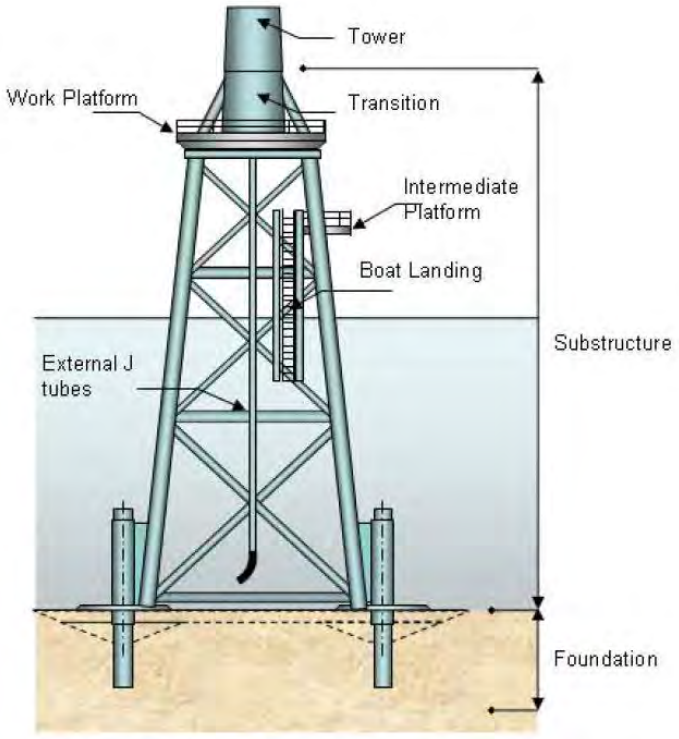


FIGURE 10 - EXAMPLES OF PIN PILED JACKET FOUNDATION TYPES

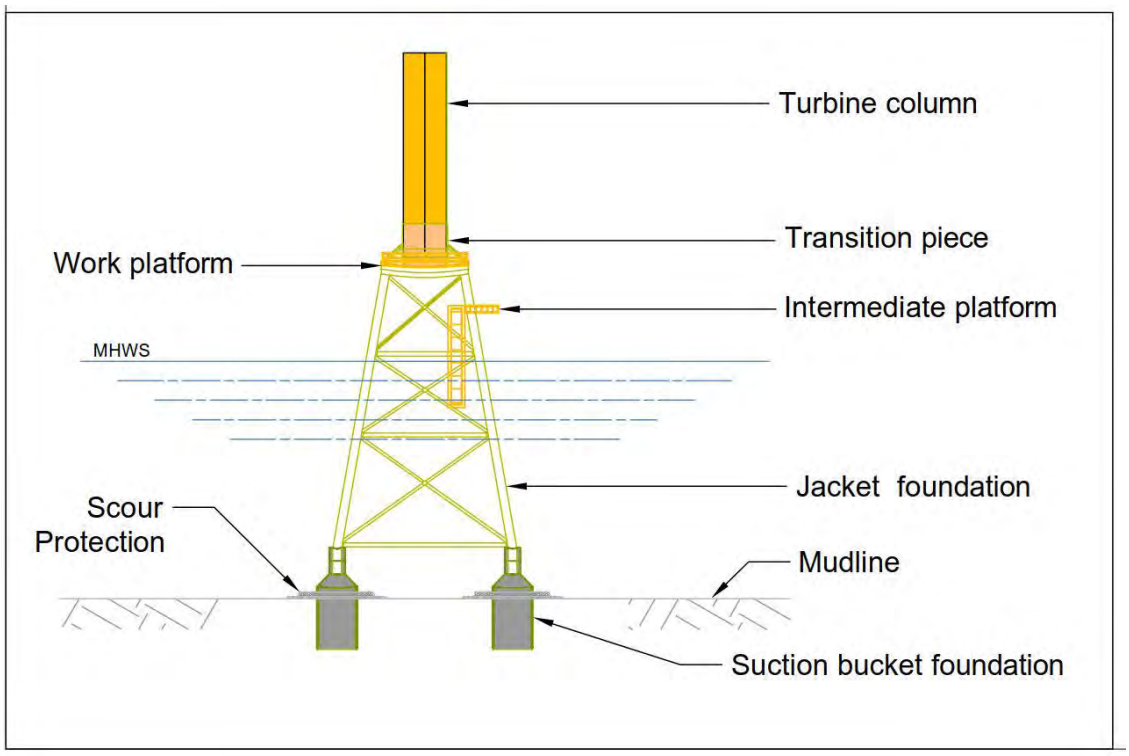


FIGURE 11 - EXAMPLES OF SUCTION BUCKET JACKET FOUNDATION TYPES

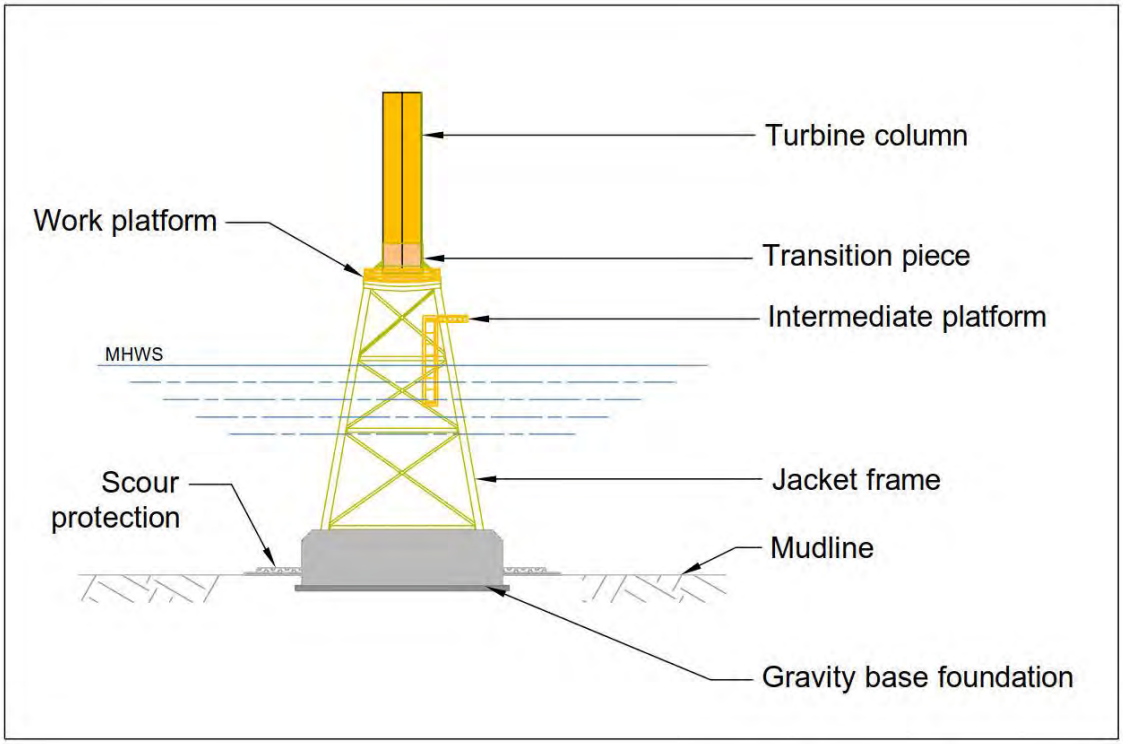


FIGURE 12 - EXAMPLES OF GRAVITY BASE JACKET FOUNDATION TYPES

TABLE 6 - KEY PARAMETERS FOR WTG MONOPILE FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of WTG foundations	107 (1 per WTG)
Maximum pile diameter (m)	15
Maximum footprint per foundation[9] (m^2)	177
Maximum hammer energy (kJ)	5,000[10]

[9] excluding scour protection

[10] [10] Note: that drill-driving could also be used to install the WTG monopile foundations.

TABLE 7 - KEY PARAMETERS FOR WTG SUCTION BUCKET MONOPILE FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of WTG foundations	107 (1 per WTG)
Maximum bucket diameter (m)	28
Maximum footprint per bucket (m^2)	616
Suction bucket height above seabed (m) excluding structural supports	3

TABLE 8 - KEY PARAMETERS FOR WTG GRAVITY BASE FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of WTG foundations	107 (1 per WTG)
Maximum number of bases per WTG	1
Maximum base diameter (m)	55
Maximum diameter of base and seabed preparation (m)	60
Maximum footprint per base (including seabed preparation) (m^2)	2,827

TABLE 9 - KEY PARAMETERS FOR WTG PIN-PILED JACKET FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of WTG foundations	107 (1 per WTG)
Maximum number of legs per WTG	4
Minimum number of legs per WTG	3
Maximum total number of legs	428 (107 foundations x 4 legs)
Maximum separation of adjacent legs at seabed level (m)	60
Maximum separation of adjacent legs at LAT level (m)	50
Maximum pin pile diameter (m)	3.5
Maximum footprint per pin pile (m^2)	10
Number of pin piles	428 (one per leg)
Maximum hammer energy (kJ)	3,000

TABLE 10 - KEY PARAMETERS FOR WTG SUCTION BUCKET JACKET FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of WTG foundations	107 (1 per WTG)
Maximum number of legs per WTG	4
Maximum number of buckets per WTG	4 (1 per leg)
Maximum total number of buckets	428 (107 foundations x 4 legs)
Maximum bucket diameter (m)	20
Maximum footprint per bucket (m^2)	314
Maximum separation of adjacent legs at seabed level (m)	60
Separation of adjacent legs at LAT (m)	50

TABLE 11 - KEY PARAMETERS FOR WTG GRAVITY BASE JACKET FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of WTG foundations	107 (1 per WTG)
Maximum number of legs per WTG	4
Maximum number of bases per WTG	4 (1 per leg)
Maximum total number of bases	428 (107 foundations x 4 legs)
Maximum base diameter (m)	20
Maximum base diameter (including seabed preparation) (m)	25
Maximum footprint per base (including seabed preparation) (m^2)	491

100 The foundations, wind turbines and OSPs are likely to be installed using specialist installation vessels using either jack-up, anchors or dynamic positioning (DP) technology.

101 Different methods will be required for installation of foundations dependent upon the type(s) chosen as listed in Table 5. Some of these methods may first require seabed preparation to level the area (such as dredging) before placement of foundations.

102 Seabed preparation will also be required prior to the installation of cables, including the working construction area. Depending on the seabed conditions at any given location, a variety of seabed preparation methods may be required, including levelling and clearance of boulders and debris.

103 Following foundation installation, WTGs will be installed. Commonly, towers and nacelles are pre-erected or erected individually at the site using a suitable installation vessel. Blades are subsequently fitted to the tower nacelle structure as individual components or in a part assembled state.

3.4.3 Offshore substation platforms

104 Offshore substations collect the power generated by WTGs (via the inter-array cables) and export it (through the export cable) to shore. They step-up and stabilise the voltage of power generated offshore and reduce the potential electrical losses, all in a manner that supplies the greatest return on investment. Table 12 presents the maximum design parameters for the offshore substation platforms (OSPs).

TABLE 12 - KEY OSP PARAMETERS

PARAMETERS	DESIGN ENVELOPE
Maximum number of OSPs	2
Foundation Options	Monopile (see Table 13); Suction bucket monopile (see Table 14); Gravity base (see Table 15) Pin-piled jacket foundations (see Table 16); or Suction bucket jacket foundation (see Table 17).
Maximum topside height (m) (including crane)	+ 115m above LAT
Maximum topside width (m)	50
Maximum topside length (m)	80

105 A range of foundation types will be considered in this Scoping Report (and EIA) for the OSPs (see Section 3.2). The types of foundations being considered (and assessed) are presented in Table 12. The maximum design parameters for each foundation type, for the OSPs, are presented in Table 9 to Table 17.

TABLE 13 - KEY PARAMETERS FOR OSP MONOPILE FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of OSP foundations	2 (1 per OSP)
Maximum pile diameter (m)	15
Maximum footprint per foundation excluding scour protection (m^2)	177
Maximum hammer energy (kJ)	5,000[11]

TABLE 14 - KEY PARAMETERS FOR OSP SUCTION BUCKET MONOPILE FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of OSP foundations	2 (1 per OSP)
Maximum number of legs per OSP	11
Maximum number of buckets per OSP	1
Maximum total number of buckets	2 (1 per OSP)
Maximum bucket diameter (m)	28
Maximum footprint per foundation (m^2)	616

TABLE 15 - KEY PARAMETERS FOR OSP GRAVITY BASE FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of OSP foundations	2 (1 per OSP)
Maximum base diameter (m)	55
Maximum seabed preparation diameter	60
Maximum footprint per foundation (including seabed preparation) (m^2)	2,827

[11] Note a drill-drive solution may be employed to install monopiles for the OSPs.

TABLE 16 - KEY PARAMETERS FOR OSP PIN-PILED JACKET FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of OSP foundations	2 (1 per OSP)
Maximum number of legs per OSP	6
Maximum total number of legs	12 (2 foundations x 6 legs)
Maximum leg diameter (m)	3.5
Pin pile diameter (m)	3.5
Maximum footprint per pin pile (m^2)	10
Number of pin piles	12 (one per leg)
Maximum hammer energy (kJ)	3,000

TABLE 17 - KEY PARAMETERS FOR OSP SUCTION BUCKET JACKET FOUNDATIONS

PARAMETERS	DESIGN ENVELOPE
Maximum number of OSP foundations	2 (1 per OSP)
Maximum number of legs per OSP	6
Maximum number of buckets per OSP	6 (1 per leg)
Maximum total number of buckets	12 (2 foundations x 6 legs)
Maximum bucket diameter (m)	20
Maximum footprint per bucket (m^2)	314

3.4.4 Inter-array cables

106 The inter-array cables will connect the WTGs to each other and to the OSPs. A number of platform link cables will also be required between OSPs.

107 Table 18 outlines the general parameters for inter-array cables.

TABLE 18 – KEY PARAMETERS FOR INTER-ARRAY CABLES

PARAMETERS	DESIGN ENVELOPE
Maximum external cable diameter (mm)	220
Maximum length of inter-array cables (km)	228
Maximum width of seabed disturbed during installation (m)	12
Total footprint of disturbance during installation (km^2)	33 (228 km x 12 m)

108 Consent will be sought for the following installation (burial[12]) methodologies for inter-array cables:

- Jet-trenching;
- Pre-cut and post-lay ploughing or simultaneous lay and plough
- Mechanical trenching; (such as chain cutting)
- Dredging (typically THSD and backhoe dredging or water injection dredging);
- Mass flow excavation;
- Rock cutting; and
- Burial sledge.

109 The cables will either be directly buried using the above techniques or pulled into a duct/pipe that will be installed using the above techniques.

110 Full details of proposed methodology (and associated design parameters) for seabed preparation (for the potential removal of debris, boulders and sandwaves) for inter-array cable installation will be provided in the ES for the purposes of assessing in the EIA.

3.4.5 Offshore export cables

111 The transmission technology proposed for Awel y Môr OWF is High Voltage Alternating Current (HVAC). Table 19 presents the design envelope for the offshore export cables.

[12] Cables will be surface laid where burial is not possible.

TABLE 19 - KEY PARAMETERS FOR OFFSHORE EXPORT CABLES

PARAMETERS	DESIGN ENVELOPE
Offshore export cable corridor search area at scoping stage (km^2)	388
Maximum number of export circuits	2
Maximum number of cables per circuit	1
Indicative cable technology	Not oil-filled cables
Maximum cable voltage (kV)	400
Indicative external cable diameter (mm)	310
Maximum offshore cable length per cable (km)	40
Indicative cable corridor width (km)	1
Total offshore cabling length (km)	80 (40 km x 2 cables)
Maximum width of seabed disturbed during installation excluding anchors and crossings[13] (m)	12
Total offshore footprint of disturbance during installation (km^2)	1 (40 km x 12 m x 2 cables)

112 Consent will be sought for the following installation methodologies for export cables:

- Jet-trenching;
- Pre-cut and post-lay ploughing or simultaneous lay and plough
- Mechanical trenching; (such as chain cutting)
- Dredging (typically THSD and backhoe dredging or water injection dredging);
- Mass flow excavation;
- Rock cutting; and
- Burial sledge.

[13] Cables will be surface laid where burial is not possible. Note burial depths may vary based on conditions such as sandwaves.

113 Full details of proposed methodology (and associated design parameters) for seabed preparation for offshore export cable installation will be included in the Project Description within the ES.

3.4.6 Scour and cable protection

Scour protection

114 Scour could occur around the base of foundations; this is when seabed sediment is winnowed away as a result of the flow of water around the structure. The following methods of scour protection may be used around the bases of the WTG and substation foundations:

- Rock or gravel placement;
- Concrete mattresses;
- Flow energy dissipation devices;
- Protective aprons or coverings (solid structures of varying shapes, typically prefabricated in concrete or high-density plastics; and
- Bagged solutions.

115 Scour protection installation may involve some seabed preparation prior to installation. Based on innogy's experience of other developments, it is likely that the maximum area of scour protection per foundation (including structure footprint area) (m^2) will be around 41,000m^2.

Cable protection

116 As far as practicable, all cables will be buried. Where it is not reasonably practicable to bury cables (inter-array and export) it may be necessary to install cable protection to prevent scour and minimise the risk of damage to the cable. Full details of each the areas, volumes and assumptions for the requirement for cable protection (for both export and inter-array cables) will be included in the Project Description within the ES. The ES assessment will consider the use of cable protection to be laid anywhere within the offshore Red Line Boundary (to be defined in the ES), i.e. within the array and export cable route.

117 An analysis of the requirement for the cables to cross existing infrastructure (such as cables and pipelines) will be provided within the ES along with realistic worst case design parameters to enable a detailed assessment to be undertaken.

3.4.7 Other design considerations

118 Consent for UXO removal will be sought in a future Marine Licence application, when geophysical survey data of suitable spatial resolution is available to identify and quantify UXO. The effects of removal of UXO will nevertheless be considered in the ES and therefore have been included within this Scoping Report.

119 Details for the requirements of vessel types and numbers will be provided in the ES to inform the relevant assessments (such as marine mammals, ornithology and shipping and navigation).

120 A met mast may be installed within the array on a monopile foundation (with a maximum diameter of 5 m). Alternative data recording devices, such as a floating LiDAR, may also be considered.

3.5 Key project parameters – Landfall

121 An initial area of potential landfall locations and onshore cable routings are presented within this Scoping Report (see Figure 5). This area will be refined further, and details of the process will be presented in the ES. Techniques at landfall may include either trenchless techniques (for example Horizontal Directional Drilling) or open-cut trenching techniques. The maximum length of the HDD is anticipated to be approximately 1.1 km with an estimated depth of 20 m; and up to 3 HDD bores may be undertaken. The offshore cables will be jointed to the onshore cables at a transition joint bay (TJB) on the landward side of the landfall site. A TJB is an underground concrete structure holding the joint between the offshore and onshore export cables.

122 Landfall installation may also require some form of beach access for construction vehicles, depending on the preferred method of installation identified and the preferred landfall location.

123 Full details of each of the landfall location(s) and method(s) will be included in the Project Description within the ES.

3.6 Key project parameters – Onshore

3.6.1 Onshore export cables

124 The cables will be either directly buried or installed within a cable duct. The key parameters for the onshore export cables are presented in Table 20.

TABLE 20 - KEY PARAMETERS FOR ONSHORE EXPORT CABLES MAXIMUM DESIGN SCENARIO

PARAMETERS	DESIGN ENVELOPE
Onshore export cable corridor search area (km^2)	11.6
Maximum number of export circuits	2
Maximum number of cables per circuit	3 (power cables) and up to 4 (communications and earthing cables)
Indicative Power Cable technology	Not oil-filled cables
Maximum cable voltage (kV)	400
Maximum onshore cable length per cable (km)	15
Total onshore cabling length (km)	30 (15 km x 2 cables)
Indicative external cable diameter (mm)	145
Maximum number of TJBs	2 (one per circuit)
Number of joint bays	Up to 46 (one per circuit every 500m)
Total construction area for TJBs (m)	150 x 100
Minimum cable trench depth (m)	0.9
Maximum cable trench depth (m)	2
Width of topsoil affected per cable (m)	40 m for a two circuit route

125 Cable installation is a well-established technique and incorporates environmental management and mitigation measures as standard practice. Precise installation methods will differ according to the nature of the environment through which the cable is being installed. Most of the cable route will be constructed using an open cut method of cable construction. Where an open trench approach is not possible due to significant obstructions (e.g. a major road or watercourse) non-trenching techniques may be employed, such as HDD.

126 During construction of the cable trenches the topsoil and subsoil will be stripped and stored on site within the temporary working corridor of the project onshore cable corridor. The procedures followed will be in line with best practice and agreed through the Code of Construction Practice or an appropriate management plan.

127 Jointing bays (an underground concrete structure holding the joint between sections of the onshore export cables) will be required. The detailed design of these components will be defined post-consent (if granted).

128 Full details of the proposed cable corridor, jointing bays and installation methods (and parameters) will be included within the ES.

3.6.2 Onshore substation

129 The Awel y Môr OWF will require a project specific onshore substation to be built. The onshore substation contains the electrical components for transforming the power supplied from the wind farm to 400 kV and to adjust the power quality and power factor, as required to meet the UK System-Operator Transmission-Owner Code (STC) for supply to the National Grid.

130 Grading, earthworks and drainage will be undertaken initially within the onshore substation footprint. Foundations will then be installed which will either be ground-bearing or piled, based on the prevailing ground conditions.

131 The proposed building substructures will be predominantly composed of steel and cladding materials although brick/block-built structures are sometimes employed. The structural steelwork is likely to be fabricated and prepared off site and delivered to site for erection activities. The steelwork may be erected with the use of cranes. Cladding panels (typically composite) may also be delivered to site ready to erect and be fixed to the steelwork. In addition, there could be unhoused equipment, such as compensation transformers, water tanks and a distribution network operators substation. Noise enclosers and lightning masts may also be constructed with a maximum height of 18 m.

132 A key aspect of the onshore substation installation will be the delivery of the transformers. Due to their size and weight, these items will be delivered via specialist means and offloaded with the use of cranes, Self-Propelled Modular Transporters (SPMTs) or skids. The majority of the remaining equipment is anticipated to be erected with the use of small mobile plant and lifting apparatus.

133 The onshore substation will be required throughout the lifetime of the project. The key parameters for the onshore substation are presented in Table 21.

TABLE 21 - KEY PARAMETERS FOR ONSHORE SUBSTATION MAXIMUM DESIGN SCENARIO

PARAMETERS	DESIGN ENVELOPE
Maximum site area (up to the permanent fencing) (m^2)	50,000
Number of buildings	5
Type of substation being considered	Air Insulated (AIS) or Gas Insulated Substations (GIS)
Maximum building height (m)	15
Maximum external equipment height (m)	18
Proposed substation location	The proposed substation location will be presented in the ES.

3.6.3 Other onshore design considerations

134 Following consultation with the Local Authorities, innogy has sought to provide some high-level assumptions of average vehicle movements which will be required during the construction phase of the onshore works. These assumptions are based on the construction of the Gwynt y Môr OWF and should be considered as indicative at this stage. The assumptions for the cars and light goods vehicles are based on the anticipated number of construction workers on site.

TABLE 22 – INDICATIVE AVERAGE TWO-WAY NUMBERS OF CONSTRUCTION VEHICLE MOVEMENTS REQUIRED DURING THE ONSHORE WORKS

ACTIVITY	CARS/ LIGHT GOODS VEHICLES	HEAVY GOODS VEHICLES
Cable installation	30 per day	20-30 per day
Substation construction	20-30 per day	20-50 per day

3.7 Operations and maintenance

135 During the operational period, scheduled and unscheduled monitoring and maintenance activities will be required. The maintenance activities will be categorised as either preventative or corrective maintenance. Preventive maintenance will be undertaken according to scheduled services whereas corrective maintenance will be needed to cover unexpected repairs, component replacements, retrofit campaigns and breakdowns.

3.7.1 Offshore

136 A number of different vessel types will be required for O&M activities.

137 During the operational phase of the project there will be no planned maintenance or replacement of the subsea cables, however repairs could be required should the cable fail or be damaged. Periodic surveys will be required to ensure the cables remain buried and, if they do become exposed, then corrective maintenance will be undertaken (such as deployment of cable protection or reburial).

138 The windfarm could be maintained from shore using a fleet of O&M vessels (e.g. crew transfer vessels, supply vessels) and/or helicopters or could be maintained using an offshore base (such as an accommodation vessel, Service Offshore Vessel, or mother ship). The O&M base (onshore, offshore or both) will be determined by the O&M strategy; following final decision (i.e. post consent) when the technical specifications of the development are known, such as the location of the O&M base(s) and the WTG type.

139 A detailed breakdown of O&M activities (both onshore and offshore) which innogy is seeking consent for will be provided in the ES. The EIA will seek to assess expected maintenance activities based on innogy's experience and best practice, however if during the life of the proposed project, further consents or licences are required then these will be applied for.

3.7.2 Onshore

140 Onshore, the O&M requirements will be largely corrective, accompanied by infrequent on-site inspections of the onshore transmission infrastructure. However, the onshore infrastructure will be consistently monitored remotely, and there may be O&M staff visiting the onshore substation to undertake works on a regular basis (expected to be once per week). The onshore substation will not be manned; and security at the substation will be provided through the use of perimeter fencing and CCTV. Periodic access to transition joint bays may also be required for inspection.

3.8 Decommissioning

141 At the end of the operational lifetime of the offshore wind farm, it is anticipated that all structures above the seabed level will be completely removed. The decommissioning sequence will generally be the reverse of the construction sequence (reverse lay) and involve similar types and numbers of vessels and equipment. Closer to the time of decommissioning, it may be decided that removal of infrastructure would lead to greater environmental impacts than leaving components in situ, in which case certain components may be cut at or below the seabed (e.g. piles) or left buried (e.g. cable ducts). Any final decommissioning methodology will adhere to industry best practice, rules and regulations at the time of decommissioning.

3.9 Programme

142 The proposed operational phase for the development is in the order of 25 years. It is anticipated, that if granted consent, then construction will commence in 2026 and the OWF will be operational in 2028. A more detailed programme will be provided in the ES to inform the detailed assessments (including in-combination and cumulative assessments).

4 Environmental Impact Assessment Approach and Methodology

143 This chapter considers the manner in which the EIA will be undertaken. A brief description is also provided of the approach used to prepare the technical chapters of this Scoping Report (Chapters 7 to 10).

144 This chapter sets out common matters that are relevant to all technical chapters of this Scoping Report and should therefore be read in conjunction with those chapters. Where known at this stage, any proposed divergence from the standard EIA methodology set out below is explored within the technical chapters themselves.

145 The information provided in the following sections of this chapter explains the purpose of, and proposed approach to the EIA; in this case including the manner in which impacts and effects are proposed to be addressed. Transboundary considerations, cumulative and in-combination effects as well as mitigation and monitoring are also explored in this chapter.

146 At this early phase, the project description is indicative and the 'design envelope' has been developed to include sufficient flexibility to accommodate further refinement during detailed design. Chapter 3 (of this Scoping Report) sets out a series of options and/or parameters for which maximum values are used to constitute a realistic Maximum Design Scenario (MDS) for Awel y Môr OWF.

147 The purpose of EIA is to provide a systematic analysis of the impacts of a proposed development in relation to the existing (baseline) environment. This is summarised in an ES, which provides information to those from whom the consents and authorisations are sought, to enable them to assess the environmental impact of the project. Information in the ES is also used by stakeholders to evaluate the acceptability of the development and its potential impact.

148 The EIA will address the three stages of the proposed development:

- Construction – the works, activities and processes that will be required to build the proposed development, including preparatory works;
- Operation and Maintenance – the works after the developed scheme construction works are completed and in operation; and

- Decommissioning – the works and processes required to undertake the closure, dismantling and removal of the development.

149 The EIA process typically comprises a series of phases, which are shown in Table 23. The EIA for Awel y Môr OWF will comprise desk studies and baseline surveys, assessment of impacts, development of mitigation measures, and identification of residual impacts. The EIA will satisfy the requirements of Schedule 4 of the Infrastructure Planning (Environmental Impact Assessment) Regulations (see Section 1.4.5) and Schedule 3 of the Marine Works (EIA Regulations) 2007 (as amended), and will include a description of the development comprising information on the site, design and size of the development, a description of the aspects of the environment likely to be significantly affected by the development, the likely significant effects of the development on the environment, and mitigation measures required to minimise potentially significant effects.

150 The technical topic areas identified for assessment as part of the EIA for the proposed offshore and onshore elements are:

- Offshore:
  - Physical Processes;
  - Water and Sediment Quality;
  - Benthic Subtidal and Intertidal Ecology;
  - Fish and Shellfish Ecology;
  - Marine Mammals;
  - Offshore Ornithology;
  - Commercial Fisheries;
  - Shipping and Navigation;
  - Military and Civil Aviation;
  - Seascape, Landscape and Visual Impact Assessment;
  - Marine Archaeology; and
  - Other Marine Users and Activities (including tourism).
- Onshore:
  - Terrestrial Ecology and Nature Conservation (including intertidal birds);
  - Archaeology and Cultural Heritage;
  - Airbourne Noise and Vibration;
  - Traffic and Transport;

- Air Quality;
- Hydrology, Hydrogeology and Flood Risk;
- Geology and Ground Conditions;
- Onshore Landscape and Visual Impact Assessment;
- Socioeconomics and Tourism; and
- Health.

151 Table 23 presents an overview of the proposed approach for undertaking the EIA for Awel y Môr OWF.

TABLE 23 - OVERVIEW OF PROPOSED EIA PROCESS

DATA GATHERING	Project Data Gathering -Collection of information regarding site characteristics and engineering requirements to identify methods of construction and operation of the proposed wind farm development, including identification of the project components, proposed activities and expected programme. ↓ Environmental Data Gathering - Collection of information within the AfL area, offshore and onshore cable corridor, and substation site.	STAKEHOLDER ENGAGEMENT IS TO BE CARRIED OUT AT EACH STAGE
SCOPING	Identification of Environmental Sensitivities -Identification of receptors and the key environmental sensitivities, which could potentially be affected by the proposed wind farm development; consultation with regulatory authorities to discuss aspects associated with the proposed project activities.	
ASSESSMENT	Site Survey Work - Surveys of the baseline environmental conditions to fill gaps in data, identify and confirm potential constraints identified as part of the desk-based assessment, and assist in the determination of likely significant impacts. ↓ EIA - A detailed assessment of the identified potential effects associated with project activities, including consideration of built-in/designed-in mitigation where appropriate. ↓ Evaluation of Significance - Evaluation of significance, including qualitative estimation of magnitude and severity of impacts.	
MANAGEMENT	Mitigation Measures Identification and definition of mitigation measures to be applied to eliminate, minimise or manage the identified potential significant environmental effects.	
COMPILATION OF ENVIRONMENTAL STATEMENT	Presentation of the findings of the baseline studies and mitigation measures in a systematic way to determine the significance of the residual effect on the environment; schedule of environmental commitments and monitoring requirements.	

152 This Scoping Report has been prepared to set out the proposed approach to EIA for the proposed Awel y Môr OWF. The Scoping Report includes the identification of assessment methodologies for each of the environmental aspects to be assessed. All representations received during the scoping process will be considered and used to inform the EIA process.

4.1 EIA best practice

153 The approach to the EIA and the production of the ES will closely follow numerous relevant guidance and industry best practice documents, including but not limited to:

- PINS advice notes (3,7, 9, 10,11,12,17 and 18);
- National Policy Statements (EN-1. EN-3 and EN-5);
- Industry EIA guidance documents:
  - Assessment of the environmental impact of offshore wind-farms (OSPAR Commission, 2008a);
  - Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of Food and Environment Protection Act 1985 and Coastal Protection Act 1949 requirements (Cefas, 2004);
  - Cumulative Impact Assessment Guidelines - Guiding Principles For Cumulative Impact Assessment in Offshore Wind Farms (RenewableUK, 2013); and
  - Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Cefas, 2012).
- Professional EIA guidance documents:
  - Guidelines for Environmental Impact Assessment (IEMA, 2004);
  - Guide to Shaping Quality Development (IEMA, 2016); and
  - Delivering Proportionate EIA, A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice (IEMA, 2017).

4.2 Data gathering

154 A basic description of the construction and operation of the proposed development is provided in Chapter 3 of this report.

155 Data gathering for the proposed Awel y Môr OWF has already commenced. Environmental information has been collected from publicly available data sources and will be supplemented with information as agreed with relevant consultees during the EIA through the Evidence Plan process and informal consultation (see Chapter 6). Baseline surveys will be undertaken to fill gaps in the available data, for example data already gathered from desk-based and field surveys already completed.

156 Innogy has collated a significant amount of existing data from a number of sources including the surveys undertaken to support the EIA for the Gwynt y Môr OWF project as well as subsequent studies undertaken for pre-construction and construction monitoring and operational monitoring. In addition, innogy will also undertake new surveys both offshore and onshore to ensure that the baseline is up to date.

157 Where further survey will be undertaken, this is covered in more detail in the receptor topic sections of this report. The specific approach to establishing a robust baseline (upon which impacts can be assessed) is set out under each parameter within this Scoping Report. It is envisaged that this approach will be subject to review following the receipt of the Scoping Opinion from PINS and subsequent consultation with statutory bodies. It is also recognised that this approach may evolve over time with the collection of new data from the study area and as the design of the project advances.

158 The relevant data currently available and a gap analysis are provided in each technical chapter of this Scoping Report.

4.3 EIA approach

159 The EIA will be undertaken within a consistent framework that will facilitate transparency in the assessment and its conclusions. The definition of terms and assessment processes that will be adopted by each of the specialist assessors is described below.

160 In general, the EIA will identify, describe and analyse the potential impacts of the proposed development using a source-pathway-receptor model. For instance, a project activity may entail a predicted change in environmental conditions affecting either directly or indirectly (the pathway) that could result in either a positive or negative effect on that sensitive receptor (the impact). Figure 13 presents this model (turquoise) with a specific example (light green) to illustrate how this would be applied in the EIA.

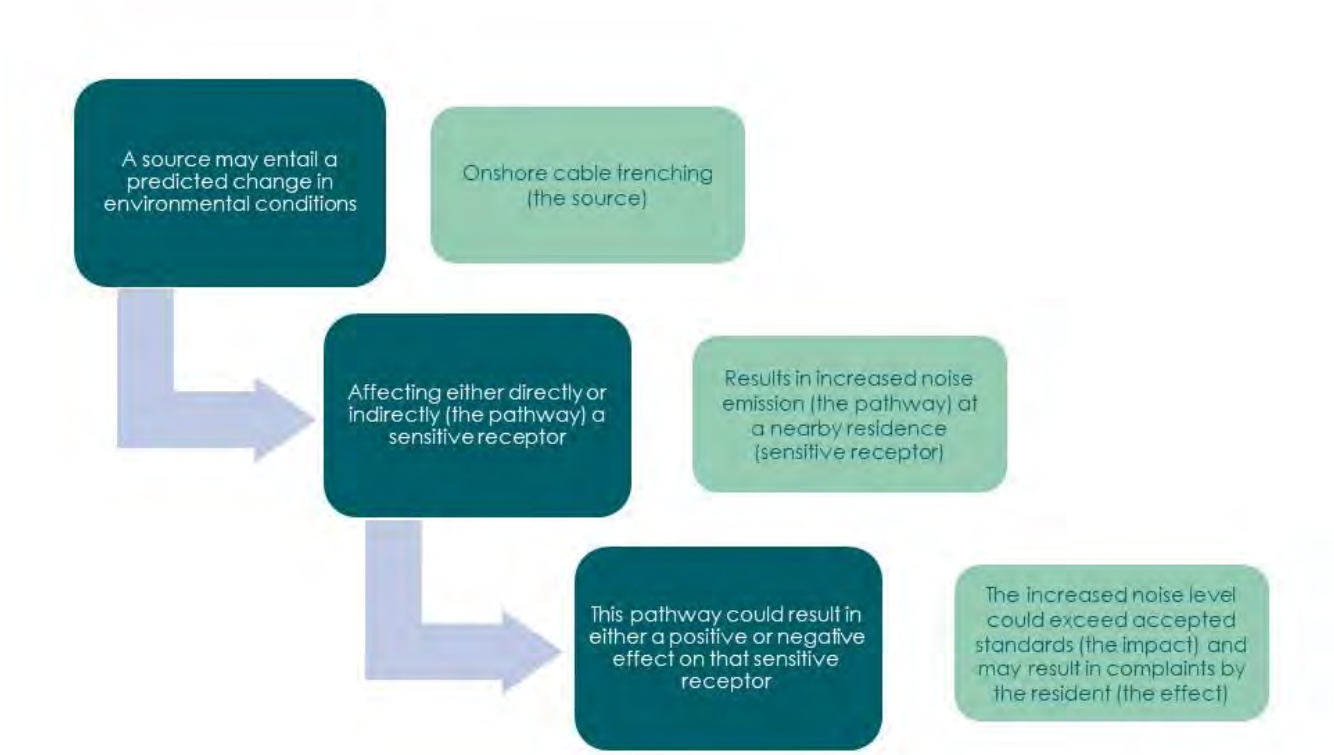


FIGURE 13 – SOURCE-PATHWAY-RECEPTOR MODEL AND EXAMPLE

161 The impact assessment process will be structured and will consider the following:

- The magnitude of the impact;
- The sensitivity of the receptor to a given impact;
- The probability that the impact on the receptor will result in a given effect;
- The determination of the resulting likely environmental effects and their significance, given spatial and temporal extent of potential impact, the potential for reversibility or recovery; and
- The level of certainty in the predictions.

4.3.1 Evidence based approach

162 The evidence-based approach to EIA involves not only utilising data collected specifically for the purposes of the development but also data and information from sufficiently similar investigations to inform the understanding of the baseline and/ or impact assessments for the development that is the subject of the EIA.

163 Awel y Môr OWF neighbours the existing Gwynt y Môr OWF. Therefore, extensive data from the EIA process and baseline and post-construction monitoring for Gwynt y Môr are available which provide both raw data and also modelling that will inform the assessments for Awel y Môr OWF. Where possible, appropriate, and agreed with the relevant stakeholders, Awel y Môr intends to use this existing data to: aid in the characterisation of the baseline environment, where data is sufficient and appropriate to do so; scope out impacts where there is a clear evidence base; and provide evidence for assessments where impacts are scoped in.

164 The use of this existing data is encouraged as part of the offshore wind industry's response to Government drivers to reduce the cost of offshore wind energy, such as those outlined in the Offshore wind industrial strategy: business and government action (BEIS, 2013). Collaborative Offshore Wind Research into the Environment has provided best practice principles for documentation and dissemination of data (COWRIE, 2008a).

165 Each topic chapter will identify where the data used for the baseline and the assessments is sourced from to inform the EIA. A gap analysis has been undertaken to identify the requirement for additional data to be collected. Each topic chapter provides the methodology for any new data collections (if required) including surveys. Adequate data collection will be undertaken for the purposes of the EIA, to enable the receiving environment to be robustly characterised. The Evidence Plan process will provide details of datasets for agreement with stakeholders for the purposes of characterisation and assessment for each of the technical expert panels.

166 This Scoping Report sets out to provide a detailed justification that is anticipated will facilitate the scoping out of certain topics or impacts from further assessment. This is in line with recent PINS Advice Note 7[14].

167 Mitigation that is embedded (designed-in) within the project will be described in the ES. Any modification of the standard approach and definitions will be fully described and justified within each section where necessary.

4.3.2 Key parameters

168 The Awel y Môr EIA, in line with the PINS Advice Note 9: Rochdale Envelope,[15] will be based on identifying the 'worst-case' scenario (see Chapter 3 for further details on the Rochdale Envelope). This 'worst case' scenario will be referred to throughout the EIA as the 'maximum design scenario' (MDS). A MDS will be presented in the impact assessment for each topic area. This approach ensures that the scenario that would have the greatest impact (i.e. largest footprint, longest exposure, or tallest dimensions, depending on the topic) is assessed; it can then be assumed that any other (lesser) scenarios will have an impact that is no greater than that assessed.

169 The design information (as presented in Chapter 3) is based on the best available information and the parameters outlined in the project description chapter are realistic yet conservative estimations of the Project parameters. Therefore, each chapter will assess the 'realistic worst-case' scenario for each of the identified potential impacts.

[14] Paragraph 4.10 to 4.11 of PINS Advice Note 7 (https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/12/Advice-note-7.pdf)

[15] https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf

170 This approach is particularly advantageous for developments, including offshore wind, where it is not possible to identify the exact components to be used within the final development as it provides for flexibility in design and construction within maximum extents and ranges assessed within the EIA. Therefore, the consent permits the use of any components so long as they are within the maximums assessed, rather than limiting the development to existing technology at the time of assessment, which may not be economically viable at the point of construction. This is of particular relevance to offshore wind development, where the technology is constantly improving, with larger and more powerful turbines being developed.

171 More detailed design information will be provided in the ES.

4.3.3 Assessment of effects

172 Confusion can arise whilst reading an ES due to a lack of clarification around the words 'impact' and 'effect'. Throughout the Awel y Môr EIA process, the term 'impact' will be used to define a change that is caused by a source. For example, pile driving of foundations during construction (the source) results in increased levels of subsea noise (the impact) (see Figure 13). Impacts can be direct, indirect, secondary, cumulative, inter-related or transboundary. They can also be beneficial, adverse or negligible. The term 'effect' is used throughout this assessment (and in the ES) to express the outcome of an impact, i.e. the increased levels of noise (impact) from the piling of foundations (source) has the potential to disturb marine mammals or fish (the effect).

173 Effects will be presented within the ES as 'significance of effect', which will take into account the magnitude of an impact in combination with the importance and/ or the sensitivity of the receptor or resource, in line with defined significance criteria.

174 The impact assessment process will consider the following:

- The magnitude of the impact;
- The sensitivity of the receptor to the impact;
- The probability that the impact will result in a given effect;
- The significance of the resulting likely environmental effect; and
- The level of certainty inherent within the assessment.

175 For each topic, the most relevant and latest guidance or best practice will be used and therefore definitions of magnitude and sensitivity of impact will be tailored to each receptor.

The magnitude of the impact

176 The magnitude of an impact provides a useful initial measure of the likelihood of an environmental effect arising. Magnitude is defined for the purposes of assessment via four factors:

- Extent - The area over which an impact occurs;
- Duration - The time for which the impact occurs;
- Frequency - How often the impact occurs; and
- Severity - The degree of change relative to the baseline level.

177 Each ES chapter will present a 'Magnitude of impact' table within the assessment chapter. This table will present how the magnitude of the identified impacts are defined based on the criteria above.

The sensitivity of a receptor

178 The sensitivity of the receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected. The sensitivity of the receptor is therefore quantified via the following factors:

- Adaptability - The degree to which a receptor can avoid or adapt to an impact;
- Tolerance -The ability of a receptor to accommodate temporary or permanent change without a significant adverse impact;
- Recoverability - The temporal scale over and extent to which a receptor will recover following an impact; and
- Value - A measure of the receptor's importance, rarity and worth.

179 Each ES chapter will present a 'Sensitivity/ importance of the environment' table within the assessment chapter. This table will present how sensitivity is defined for the topic's receptors based on the criteria above.

180 For some assessments, such as Shipping and Navigation, the probability of an impact occurring will be taken into consideration when determining the significance of the effect (see below).

The determination of effect significance

181 The significance of an effect, either adverse or beneficial, will be determined using a combination of the magnitude of the impact and the sensitivity of the receptor. A matrix approach is proposed to be used throughout all topic areas to ensure a consistent approach within the Awel y Môr ES.

182 The terms assigned to categorise the significance of effects, where they are predicted to occur, can be described as follows:

- Negligible: beneficial or adverse - where the development would cause no discernible improvement in or deterioration of the existing environment;
- Minor: beneficial or adverse - where the development would cause a barely perceptible improvement in or deterioration of the existing environment;
- Moderate: beneficial or adverse - where the development would cause a noticeable improvement or deterioration of the existing environment; or
- Major: beneficial or adverse - where the development would cause a considerable improvement or deterioration of the existing environment.

183 In general, the categories of Moderate and Major would be considered significant in EIA terms, however the exact definition of these terms will be defined further within each topic chapter.

184 For example, if the magnitude of the impact is assessed as High (negative) and the sensitivity of the receptor is assessed as Negligible, then the significance would be Minor adverse (see Table 24), and therefore would not be considered significant in EIA terms.

185 Predictions of impact will be based on the best available data using a combination of professional judgement, expert knowledge and modelling where appropriate. The precautionary principle will be applied to ensure that potential effects are not ascribed unduly low probability of occurrence or low levels of significance.

TABLE 24 - PROPOSED MATRIX FOR DETERMINING THE SIGNIFICANCE OF EFFECTS

		SENSITIVITY			
		HIGH	MEDIUM	LOW	NEGLIGIBLE
NEGATIVE MAGNITUDE	HIGH	Major	Major	Moderate	Minor
	MEDIUM	Major	Moderate	Minor	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	NEGLIGIBLE	Minor	Minor	Negligible	Negligible
BENEFICIAL MAGNITUDE	NEGLIGIBLE	Minor	Minor	Negligible	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	MEDIUM	Major	Moderate	Minor	Negligible
	HIGH	Major	Major	Moderate	Minor

4.3.4 Acknowledging levels of certainty

186 The assessment needs to be robust and so will seek to describe and take into account the degree of uncertainty inherent in, for instance, the data used in the assessment, the identification of activities and impacts, the confidence in determining impact magnitude and receptor sensitivity, and in assigning significance levels to predicted resulting effects.

4.4 Mitigation and monitoring

187 Appropriate mitigation measures will be explored to eliminate, minimise or manage identified potentially significant effects on the environment. Best practice strategies for mitigation are widely practiced and accepted within EIA and will be followed when considering the methods of dealing with the environmental impacts of the proposed development. The strategy comprises the components listed in Table 25.

188 Where changes are required to be made to the design of the project during the iterative EIA process, these measures will be clearly identified within the ES. The clear inclusion of these measures within the ES will demonstrate the commitment of Awel y Môr to these measures. Where required these measures will be secured by the Development Consent Order (DCO) and/ or the Marine Licence. By employing this method, the significance of effect presented for each identified impact may be presumed to be representative of the maximum residual effect that the development will have, should it be approved and constructed absent any specific mitigation.

189 The assessment is then repeated for the revised 'maximum adverse scenario' until:

- The effect has been reduced to a level that is not significant in EIA terms; or
- No further changes may reasonably be made to the development parameters in order to reduce the magnitude of the impact, thereby permitting the presentation of an effect that is still significant in EIA terms.

190 In some instances, additional mitigation measures will be outlined in the topic ES chapters. The extra mitigation measures may be deemed necessary where:

- An effect is significant in EIA terms, even with embedded mitigation, but additional mitigation measures are available to reduce the level of effect; or
- Mitigation has been proposed but has not yet been agreed with regulators, stakeholders, etc. or it is unproven.

191 Where relevant, these additional mitigation measures will be outlined in the topic chapters, after the assessment of significance section.

192 Table 25 outlines the proposed mitigation strategy to be undertaken in the Awel y Môr EIA.

TABLE 25 - MITIGATION STRATEGY

AVOIDANCE	Where viable, the project will be redesigned to avoid impacts. Avoidance will also be considered during the assessment of alternative sites/routes.
REDUCTION	Reduction (through the use of mitigation or different techniques) will be considered when all options for the avoidance of impacts have been exhausted or deemed to be impractical. For example, alternative technologies could be considered to reduce impact.
COMPENSATION	Where the potential for avoiding and reducing impacts has been exhausted, consideration will be given to providing compensation for residual impacts to make the proposal more environmentally acceptable.
REMEDIATION	Where adverse effects are unavoidable, consideration will be given to limiting the level of impact by undertaking remedial works.

4.5 Cumulative impacts

193 A Cumulative Effects Assessment (CEA) is required under the EIA Regulations 2017 (Schedule 4, Paragraph 5(e)) and Marine Works (EIA Regulations) 2007 (as amended), (Schedule 3, Paragraph 3(2)(e)). Cumulative effects are defined as those effects on a receptor that may arise when the development is considered together with other existing and/ or approved projects.

194 The need to consider cumulative effects is also outlined in NPS EN-1 (DECC, 2011a), which states:

'When considering cumulative effects, the ES should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence)'.

195 The approach to the CEA will be based on PINS Advice Note 17 (PINS, 2015).

196 Cumulative impacts of the proposed development will be assessed to identify where there could be an accumulation of impacts on a sensitive receptor, which could result in the need for further mitigation (for instance a large number of minor effects may coincide to result in an adverse effect of greater severity/ harm overall). The EIA will consider the following:

197 Cumulative impacts consider other proposed development within the context of the site and any other reasonably foreseeable proposals in the vicinity including:

- Under construction;
- Permitted application(s), but not yet implemented;
- Submitted application(s) not yet determined;
- Projects on the Planning Inspectorate's Programme of Projects;
- Identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited; and
- Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

198 It is proposed that projects that are built and operational at the time that survey data were collected have been classified as part of the baseline conditions. For those projects that were/ are only partially constructed or have only recently been completed, the full extent of the impacts arising from the development(s) may not be known and therefore will be included within the CEA.

199 In assessing the potential cumulative impact(s) for Awel y Môr, it is important to bear in mind that some projects, predominantly those 'proposed' or identified in development plans or at early project stages may or may not actually be taken forward. There is thus a need to build in some consideration of certainty (or uncertainty) with respect to the potential impacts which might arise from such proposals. For this reason, all relevant projects/ plans considered cumulatively alongside Awel y Môr will be allocated into 'Tiers', reflecting their stage within the planning and development process. This allows the cumulative impact assessment to present several future development scenarios, each with a differing potential for being ultimately built out.

4.5.1 Offshore components

200 A detailed search will be undertaken as part of the EIA to identify projects for which cumulative impact considerations will be applicable. These projects will be included in the cumulative impact assessments of the relevant ES chapters. The cumulative assessment will be undertaken using current IEMA EIA guidance and the 'Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions', prepared for the European Commission (DG X1) and the Environment Protection Agency (EPA) Advice Notes on Current Practice. The assessment will comply with the advice on cumulative impacts in PINS Advice Note 9 (PINS, 2018a).

201 The search will include (but not be limited to):

- Relevant renewable energy developments;
- Relevant offshore oil and gas developments;
- Relevant pipelines and cable developments;
- Relevant port and harbour activities (including capital and maintenance dredging);
- Relevant marine disposal sites; and
- Relevant marine dredging sites.

4.5.2 Onshore components

202 A check for other planning applications (in conjunction with the relevant local authorities) will be made as part of the consultation process, in order that any planned developments that are the subject of lodged planning applications are included within the assessment of cumulative impacts for the onshore components of the proposed development.

203 Onshore plans or projects that may be considered include (but are not limited to):

- Other energy generation infrastructure;
- Building/housing developments;
- Installation or upgrade of roads;
- Installation or upgrade of cables and pipelines;
- Coastal protection works; and
- National Grid enabling works.

4.6 Inter-related effects

204 Inter-relationships consider impacts of the proposals on the same receptor. These occur where a number of separate impacts, e.g. noise and air quality, affect a single receptor such as fauna.

205 Inter-related effects are proposed to be assessed through consideration of all effects on a receptor by the Project. The assessment will consider the potential for all effects on that receptor to interact, whether that be spatially or temporally, results in the identification of inter-related effects on a receptor (for example all effects on human amenity - noise and air quality, access, and traffic - these might be short-term, temporary or transient effects or incorporate longer term effects).

4.7 Transboundary effects

206 The Espoo Convention[16] sets out the obligations of Parties to assess the environmental impact of certain activities that have the potential to have transboundary effects at an early stage of planning and to notify and consult other States in cases where there is likely to be significant adverse environmental impact on those States. This duty is encapsulated in Regulation 32 of the 2017 EIA Regulations, with procedural advice provided in PINS Advice Note 12.

207 Consideration of transboundary effects includes:

- Impacts that may occur in/ on the environment of another State (i.e. their territory or territorial waters but not including the UK EEZ); and
- Impacts that may occur to interests of another State (for instance commercial fishing taking place with the UK EEZ).

208 No potential transboundary construction, operation or decommissioning effects or cumulative effects are predicted to arise from any part of the proposed onshore development. Thus, the technical chapters of this Scoping Report relating to the onshore elements of the proposed development do not seek to repeat this fact.

[16] The Convention on EIA in a Transboundary Context. United Nations Economic Commission for Europe (UNECE), signed at Espoo, Finland, 1991

209 With regard to the offshore elements of the proposed development, it is acknowledged that certain works comprising installation of submarine cables will take place within the UK EEZ. PINS Advice Note 12 recommends that:

"As part of their request to the Secretary of State for a scoping opinion, developers are strongly encouraged to identify both the possible significant transboundary impacts or, where applicable, why they consider that there would not be any significant impacts on the environment of another EEA State."

210 Each of the technical assessments presented in this Scoping Report (see Chapters 7 to 10) provide consideration for the potential of significant transboundary impacts and present innogy's position of whether these impacts should be scoped in (or out) from further consideration in the EIA. A screening matrix for transboundary impacts will be provided in the ES.

211 It is considered that there are not likely to be any significant effects on other States, either directly or indirectly on their interests. The issues be taken up and assessed fully in the relevant parts of the ES, where relevant to the consideration of (non-transboundary) project impacts.

5 Site selection and alternatives

5.1 Introduction

212 This chapter provides an overview of the main site selection activities undertaken to determine the Scoping Area for the Awel y Môr OWF, within which the proposed development will be located, (see Figure 14) and an assessment of alternatives (locations and methodologies) considered. The following items are described in this chapter:

- The legislative and policy requirements for consideration of alternatives;
- The process for site selection that is being adopted by Awel y Môr OWF;
- Project alternatives and early design commitments;
- Site selection work completed to date and its findings so far; and
- Plans for further site selection work (including consultation).

4°0'0"W 3°40'0"W 3°20'0"W

425000 450000 475000

53°40'0"N

5925000

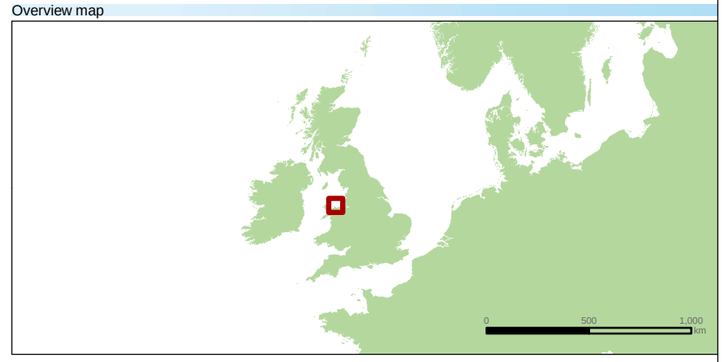
53°20'0"N

5900000

425000 450000 475000

4°0'0"W 3°40'0"W 3°20'0"W

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Array, Offshore and Onshore Export Cable Route Search Areas and Onshore Substation Search Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	27/01/2020	1:250,000	@DIN A3

DRAWING No. None Issued

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\General\AyM_0119_Array_and_ECR_Search_Areas_and_Substation_Search_Area.mxd

5.2 Policy and legislation on alternatives

213 Full details of the key policy and legislative drivers which underpin and support the development of the Awel y Môr OWF are provided in Chapter 1.

214 The following legislation and guidance provides the framework of the site selection and consideration of alternatives process:

- Environmental Impact Assessment Regulations 2017 (see Chapter 1 of this Scoping Report);
- Marine Works EIA Regulations (2007) (as amended) (see Chapter 1 of this Scoping Report);
- Habitats Regulation 2017 (see Chapter 1 of this Scoping Report);
- National Policy Planning Framework 2019;
- Offshore Habitats Regulation 2017;
- The Planning Act 2008;
- Planning Policy Wales 10 (2018);
- Overarching National Policy Statement for Energy (EN-1);
- National Policy Statement for Renewable Energy Infrastructure (EN-3);
- National Policy Statement for Electricity Networks Infrastructure (EN-5);
- Planning Inspectorate Advice Note Nine: Rochdale Envelope;
- Planning Inspectorate Advice Note Seven: EIA;
- Marine Policy Statement (2011);
- The Crown Estate's Cable Route Protocol (2019) (see below);
- Denbighshire County Council Local Development Plan 2006-2021;
- Conwy Local Development Plan 2007-2021;
- Institute of Environmental Management and Assessment's (IEMA) EIA Guide to Shaping Quality Development (IEMA, 2015);
- The Holford Rules (see Section 5.2.5); and
- Seascape and visual sensitivity to offshore wind farms in Wales: Strategic assessment and guidance' (NRW, 2019).

215 Further detail on the key policy and legislation drivers for the site selection and consideration of alternatives process is provided below.

5.2.1 EIA Regulations 2017

216 Schedule 4 of the EIA Regulations 2017, at paragraph 2, requires that Environmental Statements include "A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects". The EIA will set out the options considered for Awel y Môr OWF and the rationale for selecting particular options, taking into consideration environmental effects, technical feasibility and the overall objectives of the project.

217 Further information is provided in Section 1.4 of this Scoping Report.

5.2.2 Habitats Regulations 2017

218 Furthermore, under the Habitats Regulations (2017) and Offshore Habitats Regulations (2017), a consideration of alternatives to the proposed project may be required where the development is likely to have a significant effect on a European Site that may adversely affect the integrity of the site. The requirements under the Habitats Regulations and the Offshore Habitats Regulations will be addressed in the Habitat Regulation Assessment Report(s) which will be submitted alongside the DCO and Marine Licence applications.

219 Further information is provided in Section 1.4 of this Scoping Report.

5.2.3 National Policy Statements

220 From a policy perspective, the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) does not contain a general requirement to consider alternatives or to establish whether the proposed project represents the best option. Paragraph 4.4.1 of NPS EN-1 states:

- "As in any planning case the relevance or otherwise to the decision making process of the existence (or alleged existence) of alternatives to the proposed development is in the first instance a matter of law, detailed guidance on which falls outside the scope of this NPS. From a policy perspective this NPS does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option (emphasis added)".

221 The National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) states at paragraph 2.6.81 that the applicant should include an assessment of the effects of installing cables across the intertidal zone which should include information, where relevant, about:

- "any alternative landfall sites that have been considered by the applicant during the design phase and an explanation for the final choice"; and
- "any alternative cable installation methods that have been considered by the applicant during the design phase and an explanation for the final choice."

222 The information and considerations under NPS EN-3 will be presented in the ES.

5.2.4 Crown Estate's Cable Route Protocol

223 The Crown Estate's Cable Route Protocol (CRP) (2019) comprises a set of principles and requirements for offshore wind developers in the planning of offshore export cable routes. Compliance with these principles and requirements is secured within the offshore array Agreement for Lease (AfL). Compliance with these requirements must be demonstrated within the Corridor Identification and Approval for Linear Activities (CIAL) document which will accompany an application to The Crown Estate for a transmission assets AfL. All the principles and requirements within the CRP are relevant to the site selection process, but of particular relevance are the following:

- Principle 3: This principle makes it clear that the "*Cable Route Protocol applies specifically to Habitats Regulations Sites*", however it should be taken to include all other protected sites and sensitive habitats.
- Requirement 9: This requirement sets out what constraints must be mapped during the site selection process, namely: Habitats Regulations sites and features of these sites, areas of Annex I habitats and irreplaceable habitats. Requirement 9 also makes it clear that consultation with the relevant SNCB should be undertaken at this stage.
- Requirement 10: This requirement makes it clear that design parameters of possible cabling infrastructure, including number and capacities of the export cables with their indicative spacing requirements and the additional structures, should be included within the site selection process.

5.2.5 Horlock Rules

224 The relevance of planning and environmental considerations in the siting of onshore substations is set out by National Grid in the 'Horlock Rules'. The Horlock Rules are a set of guidelines produced by National Grid to assist those responsible for siting and designing substations to mitigate the environmental effects of such developments (National Grid, 2003). They are still referred to and used by National Grid when undertaking planning studies for new infrastructure although they now have to be considered alongside other guidance in National Policy Statements, the National Planning Policy Framework, Development Plan documents and other sources.

225 In the Horlock Rules, National Grid states that it will encourage generators to adopt the guidelines when working with National Grid on proposals for substations, sealing end compounds or line entries. These guidelines also confirm that consideration must be given to environmental issues at the earliest stage in order to keep adverse effects to a reasonably practical minimum in the planning of new substations.

5.3 Project alternatives and early design commitments

226 A number of alternatives have been considered as part of the decision-making process. The early strategic project objectives which have fed directly into the site selection process are detailed below.

- Firstly, to minimise the need for new infrastructure required for the Awel y Môr OWF from the outset, innogy has considered the use of the existing Gwynt y Môr OWF export cables and substation. However, as the infrastructure for Gwynt y Môr OWF was installed and rated to the capacity specifically for that project, the existing cables and substation do not have capacity to transmit the required electricity from the Awel y Môr OWF to the National Grid.
- Innogy has committed to burying all onshore cables as opposed to using overhead lines to connect to the landfall to the project substation and between the project substation and the National Grid substation. This commitment has been made to reduce permanent landscape effects associated with overhead lines.
- Innogy has committed to considering trenchless technologies, such as HDD at the landfall, in order to bring cables from the marine environment onshore. This is intended to protect sensitive features and minimise the extent of direct interaction with the intertidal area and coastal features.

5.4 Site selection process

227 An overview of the site selection process for development of the project (up to DCO application) is presented in Figure 15 and described in this Section. The grey shaded box indicates the current activity being undertaken by Innogy.

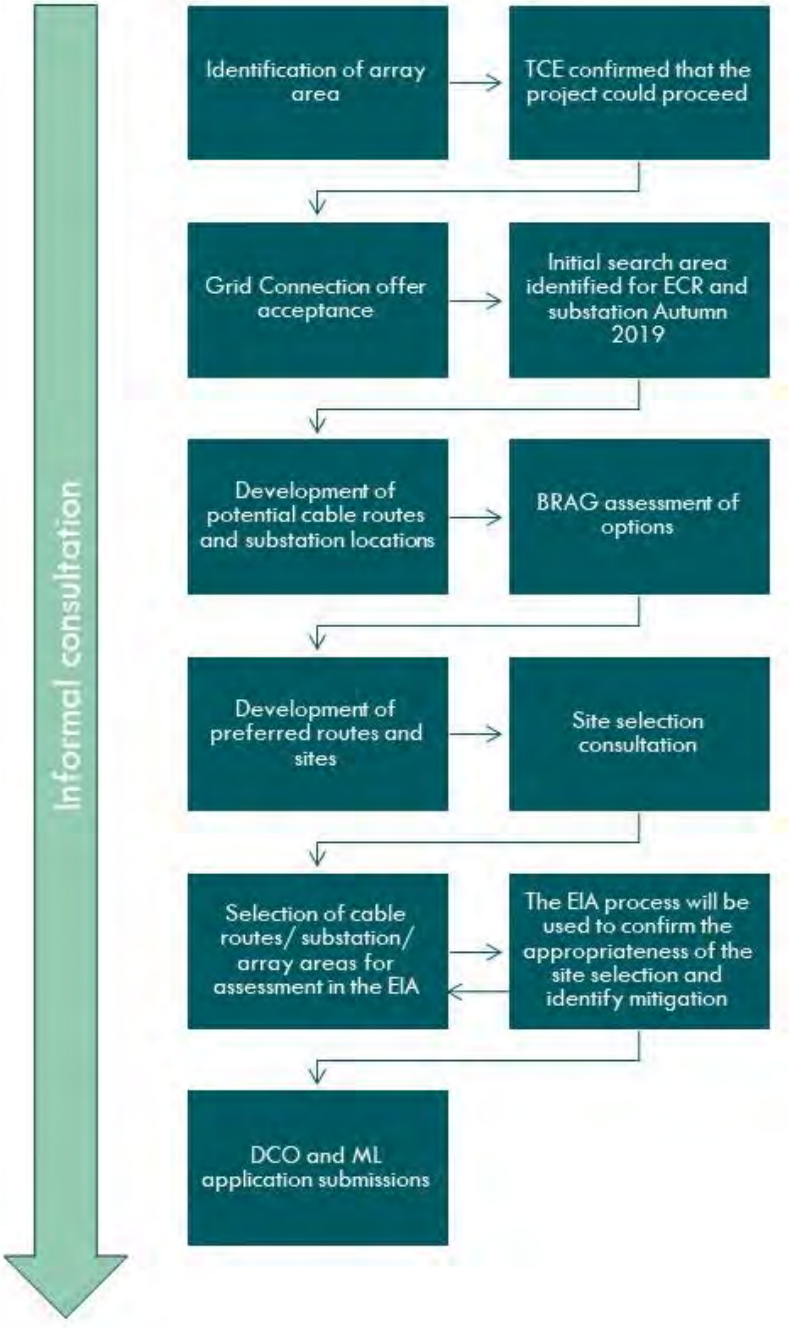


FIGURE 15 - SIMPLIFIED DIAGRAM OF THE SITE SELECTION PROCESS

228 The overall aim of the process is to understand the relevant constraints (environmental, engineering and economic) to ensure that the final design is robust and deliverable. Furthermore, the final design will aim to minimise impacts on the environment whilst ensuring that the lowest cost of energy be passed to consumers.

229 The location for the proposed array was selected by innogy on the basis of a number of environmental and engineering constraints (described in Section 5.5) pursuant to The Crown Estate issuing an opportunity for operating offshore wind farms to apply for extensions in 2017.

230 Following identification of the array area, innogy submitted a grid connection application to National Grid. Innogy has accepted a grid connection offer to connect at National Grid's existing substation at Bodelwyddan. A Connection and Infrastructure Options Note (CION) process is being undertaken by National Grid to identify the overall efficient, coordinated and economical connection point.

231 A Site Selection Study was subsequently commissioned by innogy (which is being undertaken by Royal HaskoningDHV) to identify locations for the export cable routes (ECR), landfall and a project specific substation location, in order to connect the array to the existing National Grid substation at Bodelwyddan. The Site Selection Study follows best practice guidance as set out in Section 1.2. The process followed within the Site Selection Study will be detailed in full within the PEIR (see Section 5.10 below) and the ES submitted with the DCO application.

232 At the time of writing, the Site Selection Study is underway. The first stage of the study has been to define the search area within which the ECR, landfall and substation could be located. The search area has been identified, following The Crown Estate's Cable Route Protocol (TCE, 2017) and the Horlock Rules (National Grid, 2003), through applying high level engineering and environmental constraints to the areas located between the array and the proposed National Grid point of connection, to help delineate a broad area within which the electrical transmission infrastructure could potentially be located. Figure 14 provides a geographical overview of the search area. This EIA Scoping Study has been undertaken on this search area.

5.5 Array

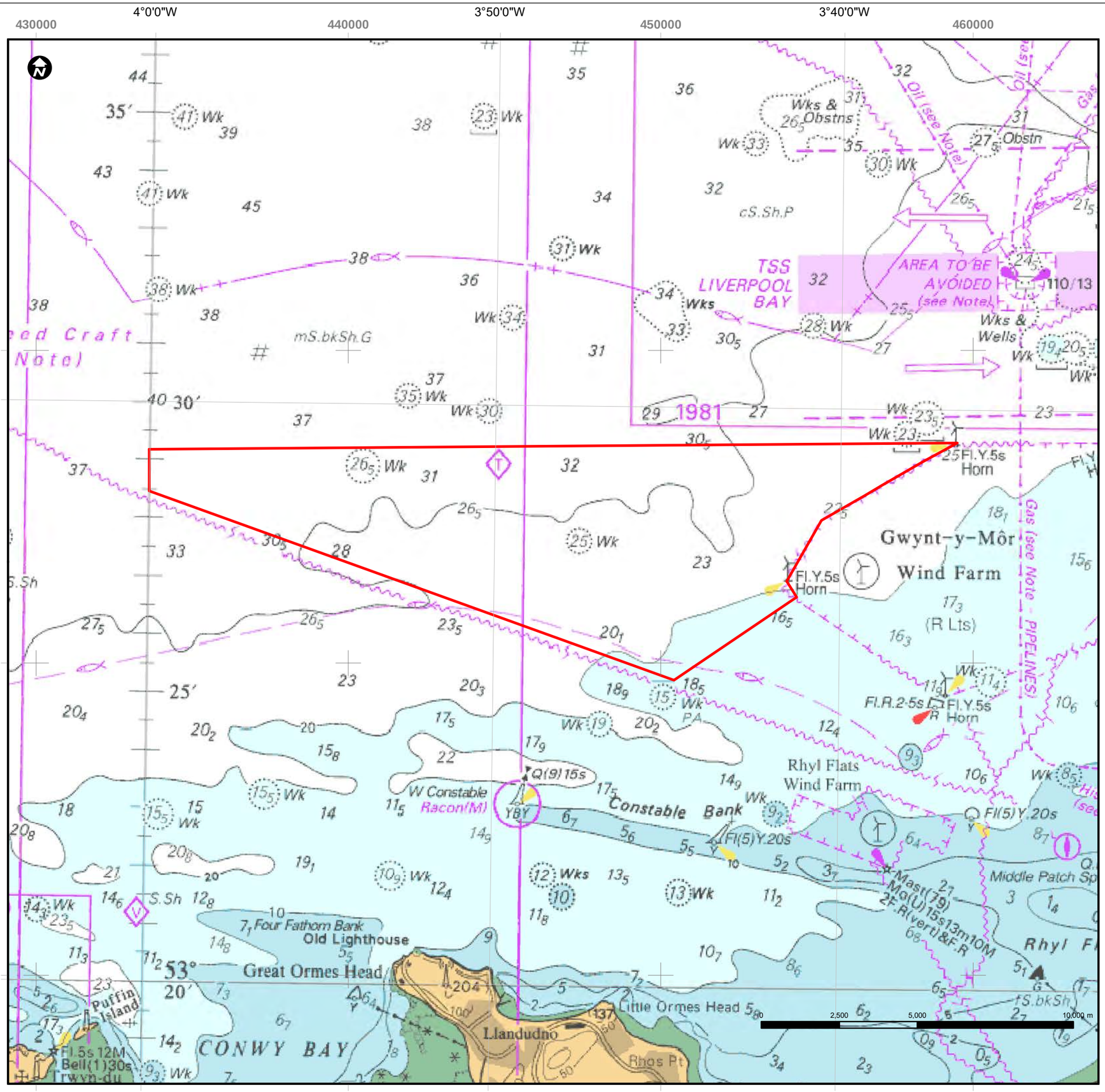
233 In February 2017, The Crown Estate (TCE) announced the opportunity for developers to apply for project extensions to operational OWFs. Eight applications were received, including Awel y Môr OWF (as an extension to Gwynt y Môr OWF), which met the specified application criteria.

234 The boundaries for the proposed array were initially chosen by delineation of the Gwynt y Môr OWF site boundary combined with analysis of existing constraints. The extension projects are required to share at least one boundary with the existing OWF. Key considerations which were taken into account when choosing the array location were the presence of shipping constraints (particularly to the north of Gwynt y Môr), the presence of existing OWFs nearby and the presence of statutory designated sites (such as Liverpool Bay SPA to the south). The array boundary is considered the maximum buildable area for placement of turbines, pending further survey and consultation.

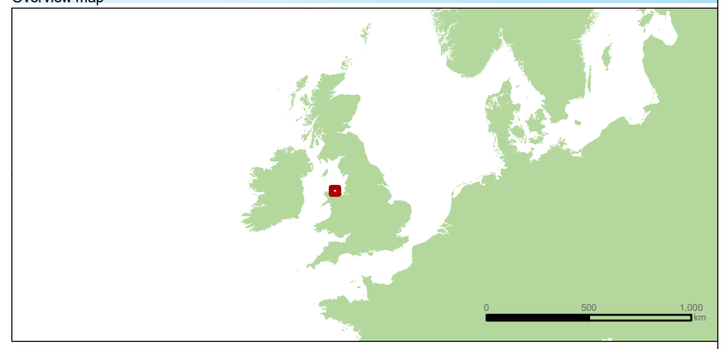
235 In August 2019, TCE published the Plan-level HRA which assessed the potential impacts of the proposed extension projects on relevant nature conservation sites of European importance (Natura 2000 sites). The production of the Plan-level HRA was supported by expert independent advisors, and consulted with the statutory marine planning authorities, the statutory nature conservation bodies and a number of nongovernmental stakeholders.

236 Seven of the eight extension projects, including Awel y Môr OWF, are able to seek planning consent (through the DCO process) and proceed to the award of the leasing rights as part of the 2017 extensions round.

237 This area in which the WTGs will be installed (see Chapter 3) comprises the array area being considered within this Scoping Report - see Figure 16. This is hereafter referred to as the array.



Overview map



Legend

Array Area

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

Reproduced with the permission of the Controller of Her Majesty's Stationery Office and UK Hydrographic Office (www.ukho.gov.uk).

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT: Offshore Windpark Awel y Môr

TITLE: Awel y Môr AFL

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:125,000	@DIN A3

REV: 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Site Selection\AyM_0119_SS_Fig3_Area_for_Lease.mxd

5.6 Onshore substation

238 Innogy has accepted a grid offer from National Grid to connect into its existing substation at Bodelwyddan. A high level overview of the infrastructure required is provided in Chapter 3.

239 A new project specific onshore substation will be constructed and will include all necessary electrical plant to meet the requirements of the National Grid. Further information on the project design, for the project specific substation, will be provided in the PEIR (see Section 5.10) and subsequently in the ES.

240 In order to identify the most appropriate location to site the substation, National Grid's Guidelines on Substation Siting and Design (The Horlock Rules) have been taken into consideration. These guidelines document National Grid's best practice for the consideration of relevant constraints associated with the siting of electricity network infrastructure.

241 The Horlock Rules state "Consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum" (Section III, paragraph 1).

242 On this basis, a 3 km radius (avoiding key sensitive environmental designations has been identified around the existing Bodelwyddan National Grid substation site, see Figure 17. This is hereafter referred to as the substation search area.

243 The final siting and location of the infrastructure required as part of the onshore substation will take into account the following elements:

- Amenity, cultural or scientific value of local sites;
- Community considerations (e.g. proximity to residential properties, public rights of way (PRoW) and sensitive land use);
- Archaeology, heritage and ecology (presence/proximity to scheduled monuments and listed buildings, proximity to designated sites and presence of protected species);
- Landscape (landscapes sensitive to development and potential visual impacts);
- Hydrogeology, land quality and flood risk (proximity to source protection zones, flood risk and contaminated land);

- Engineering requirements (complexity of design required, access requirements);
- Potentially affected landowners;
- The local context, planning policy and guidance; and
- Feedback from the community and other stakeholder consultation.

244 The project is at a very early stage and the final siting of substation infrastructure will only be determined through a detailed site selection process taking into account environmental, physical, technical, commercial and social considerations and opportunities as well as engineering feasibility and extensive consultation.

297500 300000 302500 305000

377500 375000 372500 370000

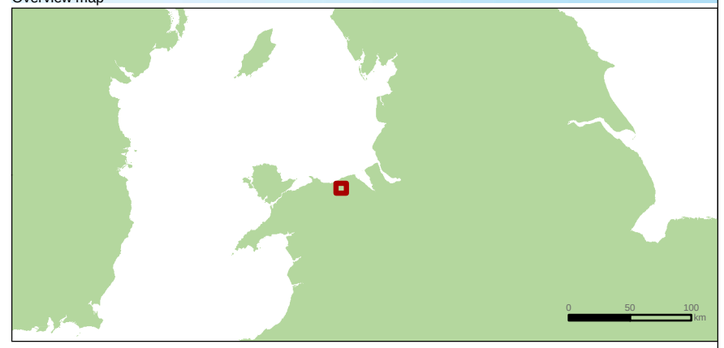
RHUDDLAN
LLANELWY / ST ASAPH
Terfyn
Llansan Sior / St George
Pentre Isaf
Bont-newydd
Glascoed
Groesffordd Marli
Llannefydd
Pen-rhewl
Nant-y-Patrick

A547 Ffordd Abergele / Abergele Road
Rhuddlan Road
A525
A55
A548 St Asaph Road
B5381 Glascoed Road
B5429
Afon Elwy / River Elwy
The Roe
High Street
Chester Street

0 500 1,000 2,000 m

Contains OS data © Crown Copyright and database right 2019

Overview map



Legend

- Substation Search Area
- Existing Bodelwyddan Substation

Cartographic information

Coordinate System: British National Grid
Map Datum: ODN (Ordnance Datum Newlyn)

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Awel y Môr Substation Search Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	06/03/2020	1:30,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Site Selection\AyM_0119_SS_Fig4_Substation_Search_Area.mxd

5.7 Landfall options

245 The landfall is the area where the offshore export cables are brought ashore. The stretch of coast between Colwyn Bay and Prestatyn has been selected for potential landfall by the Site Selection Study (see Figure 18). The primary considerations for the selection of the landfall search area, were:

- The location of the array;
- The location of the grid connection at Bodelwyddan;
- The key ecological designations along the coast;
- The presence of other infrastructure assets;
- The presence of coastal settlements and other coastal development; and
- Space requirements for the transition joint bays (TJBs).

246 During the refinement of the landfall search area, the following constraints have specifically been avoided:

- Dee Estuary SAC, SPA and Ramsar to the east; and
- Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC.

247 Following identification of the landfall search area, a long list of potential landfall locations are being considered which meet the design and environmental criteria identified above.

248 Engineering feasibility, area refinement and further consideration of the presence of additional constraints (including but not limited to the proximity of the railway and the A55; and risk of coastal erosion) will be explored further as part of the subsequent stages of the site selection work and project design refinement. These will be reported in the Site Selection Study.

5.8 Offshore export cable

249 The offshore ECR search area is the area in which the export cables would be placed which connect the array to the landfall (see Sections 5.5 and 5.6). This is presented in Figure 18.

250 The offshore ECR search area has been delineated alongside the array boundary, and this incorporates options for cable routing and landfall at various locations along the north Wales coast between Penrhyn Bay and Prestatyn.

251 First design principles for the identification of the offshore ECR search area were to keep the general cable corridor as short as possible and also to avoid the operating offshore wind farms (Gwynt y Môr, North Hoyle and Rhyl Flats), an aggregate production area, the pipeline from the Liverpool Bay fields, and a closed disposal site. This therefore created a search area from the southern extent of the Awel y Môr array, to the Welsh coastline, specifically avoiding European Sites. Direct interaction with the Bae Lerpwl SPA/ Liverpool Bay SPA, which covers a large extent to the south east of the ECR search area, however, cannot be avoided.

252 Due to the proximity of other operational windfarms and interconnector cables in the area, the potential for interaction with these assets will also form a consideration in the refinement of ECRs as the design progresses. These considerations will include the requirement to cross existing assets and a consequential reduction in navigable depth. Consideration will also be afforded to the necessary separation distances between the export cables and other operators' assets.

253 The following additional constraints are also present within the offshore ECR search area which will considered further during identification of potential cable routes:

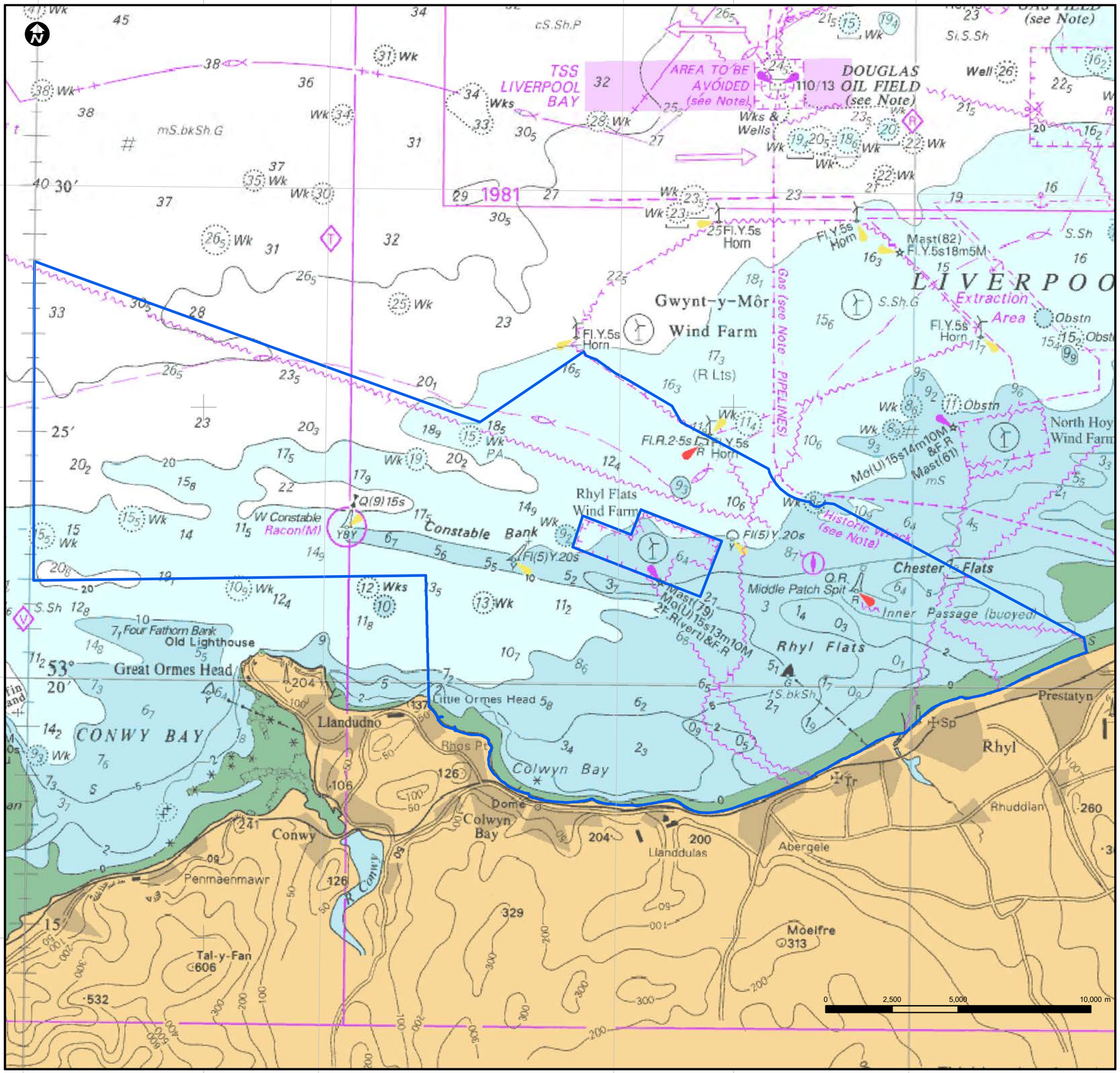
- Known historical wrecks;
- An identified marine farm area (the operational status of which is currently unknown); and
- Minimising direct impacts to ecologically important habitats, including Annex 1 sandbanks and potential Annex 1 reefs as far as possible.

4°0'0"W 3°50'0"W 3°40'0"W 3°30'0"W

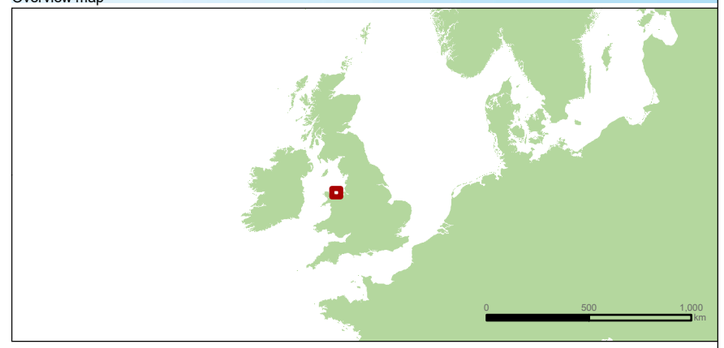
440000 460000

53°30'0"N 53°20'0"N

5920000 5900000



Overview map



Legend

Offshore Export Cable Route Search Area

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

Reproduced with the permission of the Controller of Her Majesty's Stationery Office and UK Hydrographic Office (www.ukho.gov.uk).

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT	
	Offshore Windpark **Awel y Môr**

TITLE

Awel y Môr Offshore ECR Search Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:150,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Site Selection\AyM_0119_SS_Fig5_Offshore_ECR_Search_Area.mxd

5.9 Onshore export cable

254 The onshore ECR search area is the area in which the onshore export cables (and associated infrastructure) would be installed which link the landfall to the onshore substation (see Sections 5.6 and 5.7).

255 In order to minimise permanent visual impact during the operational life of the wind farm, the onshore cables between the landfall and the grid connection point will be underground (buried) rather than any new overhead lines.

256 The onshore ECR search area has been identified through an iterative process. Initially publicly available data was collated to provide spatial mapping of potential constraints including environmental designations, heritage designations, tourist attractions and engineering constraints. In addition, engineering constraints were considered to ensure that there is sufficient room and flexibility within the area to ensure onshore routing options can be accommodated.

257 The onshore ECR search area was refined to avoid overlap with Bryniau Clwyd A Dyffryn Dyfrdwy / Clwydian Range and Dee Valley AONB.

258 The onshore ECR search area is presented in Figure 19.

259 Where practical the following key principles will be incorporated in the final site selection of the onshore cable route and associated onshore infrastructure:

- Avoid proximity to residential dwellings;
- Avoid proximity to historic buildings;
- Avoid designated sites;
- Minimise impacts to local residents in relation to access to services and road usage, including footpath closures;
- Wherever possible the cable route would seek to utilise open agricultural land;
- Minimise requirement for complex crossing arrangements, (e.g. road, river and rail crossings);
- Avoid areas of important habitat, trees, ponds and agricultural ditches;
- Install cables in flat terrain maintaining a straight route where possible;
- Avoid other services (e.g. gas pipelines) but aim to cross at right angles where crossings are required;

- Minimise the number of hedgerow crossings, utilising existing gaps in field boundaries if possible; and
- Minimise impacts on agricultural practices and access, avoid rendering parcels of agricultural land inaccessible during construction and installing cables along field boundaries where possible.

280000 290000 300000 310000

390000 380000 370000

North Hoyle Wind Farm

Rhyl Flats Wind Farm

Note: Boundary between Wirral and Flintshire adopted the Ordnanc

West Hoyle B

Welsh Chan

L I V E

B

Great Ormes Head / Pen-y-Gogarth

Little Ormes Head

LLANDUDNO

Toll

Penrhyn Bay

Penrhyn-side

Rhôs-on-Sea

Rhos Bay

Llandrillo-yn-Rhôs

COLWYN BAY

Llanrhos

Tywyn

Llandudno Junction

CONWY

Mochdre

Old Colwyn

Abergele Roads

Kinmel Bay

Towyn

Pensam

RHYL

PRESTATYN

A548

Gronant

Meliden

Gwaenysgor

Llanasa

Gop Hill

A525

A547

Bodrhyddan Hall

Rhuddlan

Trelawnyd

Dyserth

Offa's Dyke

Fort

A515

Llanddulas

Mynydd Marian

ABERGELE

A55

Pengwern

Castle

Cwm

Llyn Helyg

Castle Gyffin

Llanelian-yn-Rhôs

Llysfaen

Bryn-y-maen

Llansanffraid Glan Conwy

Dolwen

Rhyd-y-foel

St George

Bodelwyddan

Rhuallt

Glascoed

ST ASAPH

Tremeirchion

Pentrefelin

A470

B5381

ROMAN ROAD

Pentre-mawr

Llannerch Hall

River Elwy / Afon Elwy

Betws-yn-Rhos

Dawn

Trofarth

Moelfre Isaf

Moelfre Uchaf

Graig

Tal-y-cafn

Eglwysbach

Hafod-y-Green

Llanefydd

Trefnant

Bont-newydd

Bodfari

A541

River Clwyd

Llanfair Talhaiarn

Gell

Pentre Isaf

Cefn Berain

Afon Aled

Afon Conwy

Vale of Conwy

Mwdwl Eithin

Llangernyw

Henllan

A525

Afon Clwyd

Dyke Path

Rhos-y-mawn

Wenlli

Llansannan

Bryn Rhyd-yr-Arian

DENBIGH

Friary

Waen

Penycloddi

A544

A543

Deunant-isaf

Groes

Llandyrnog

Llanrhaeadr

Peniel

Afon Ystrad

Llanddoged

Pandy Tudur

Tan-y-fron

Bylchau

Pentre-tafarn-y-fedw

LLANRWST

Gwydir Castle

Afon Elwy

Gwytherin

Nantglyn

Pentre-Llanrhaeadr

Llanynys

Gorsedd

0 2,500 5,000 10,000 m

Contains OS data © Crown Copyright and database right 2019

Overview map



Legend

Onshore Export Cable Route Search Area

Cartographic information

Coordinate System: British National Grid
Map Datum: ODN (Ordnance Datum Newlyn)

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT	Offshore Windpark **Awel y Môr**
TITLE	**Awel y Môr Onshore ECR Search Area**
DRAWN	BenBlakeman
DATE	05/03/2020
SCALE	1:125,000
SIZE	@DIN A3
REV	01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Site Selection\AyM_0119_SS_Fig6_Onshore_ECR_Search_Area.mxd

5.10 Consultation on site selection and alternatives

260 Consultation has commenced with stakeholders through the EIA Evidence Plan process and bilateral meetings to introduce the proposed search areas. In addition, the proposed site selection criteria/ principles have been presented to consultees for the development of:

- The search areas;
- Refinement of these areas to the long list of options; and
- The methods for identification of a short list/ preferred options.

261 Innogy will continue to discuss the site selection process and ensure that stakeholders are consulted at key milestones in order to receive early feedback. Further details of the consultation held to date and the EIA Evidence Plan process are provided in Chapter 6.

262 The Preliminary Environmental Information Report will be used to consult the local authorities and other persons/ bodies prescribed in Section 42 of the 2008 Act and Schedule 1 of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the 'APFP Regulations'). The PEIR will contain detailed information on the site selection process undertaken and will enable stakeholders and public to provide comment on this process and its findings.

5.11 Next steps

263 Following the identification of search areas there is a process of ongoing design refinement to reach a design which can be taken forward to the next stage of the EIA process. This process includes the following steps to create and refine the design:

- More detailed constraints mapping;
- Application of design and engineering requirements;
- Identification of a long list of options;
- Black, Red, Amber and Green (BRAG) assessment of the options, to compare the environmental, engineering, land management and cost constraints and opportunities of each option;
- Ongoing consultation with key stakeholders and the public to identify risks and opportunities with site selection options;

- Additional studies to address specific queries raised during the site selection process (for example, more detailed landfall feasibility assessment); and
- Selection of a preferred option (or options) to take forward to the next stage of EIA for the offshore cable route, landfall, onshore cable route and onshore substation.

264 Ultimately, a preferred option (or options) will be selected and consulted upon and refined further for the PEIR and ES.

265 Innogy has sought to consult, at the earliest stages possible of the process, with all relevant consultees to gain early feedback and input into the site selection process. This consultation will continue during development of the project (see Chapter 6 for further details).

6 Consultation process

6.1 Introduction

266 Formal and informal consultation with stakeholders and the general public (prior to the submission of the DCO application) is an inherent part of the DCO and ML application processes. This chapter seeks to provide an overview of the consultation requirements, the consultation that has been carried out to date, and innogy's proposed approach for further consultation.

6.2 Requirements and process

267 As outlined in PINS Advice Note 3 (Planning Inspectorate, 2017) it is the Applicant's responsibility to "ensure that their pre-application consultation fully accords with the requirements of the Planning Act 2008, including associated regulations, and that they have regard to relevant guidance."

268 A particular emphasis of the Planning Act 2008 is prior consultation with all potentially affected stakeholders. As part of the DCO process, the Applicant is required to:

- Consult with the local authorities (as prescribed in Section 43 of the 2008 Act) on what information should be included in the Statement of Community Consultation (SoCC), which will set out how the Applicant proposes to consult with the local community, as prescribed in Section 47 of the 2008 Act;
- Make the SoCC available for public inspection, advertise where the SoCC may be inspected and carry out consultation in accordance with it;
- Consult the local authorities and other persons/ bodies prescribed in Section 42 of the 2008 Act and Schedule 1 of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the 'APFP Regulations');
- Notify the Secretary of State, prior to consulting under Section 42, of a proposed DCO application in accordance with Section 46 of the 2008 Act; publicise the application in accordance with Section 48 of the 2008 Act and paragraph 4 of the APFP Regulations;
- Have regard to the relevant responses to publicity and consultation as required by Section 49 of the 2008 Act; and

- Prepare a consultation report to accompany the DCO application as required by Section 37(3) (c) of the 2008 Act.

269 As part of the process an Evidence Plan Report will be prepared to accompany the DCO and ML applications which will document the consultation activities undertaken as part of the Plan.

270 Under Regulation 10 (6) of the EIA Regulations 2017, the Planning Inspectorate must consult with consultation bodies prior to providing the Applicant with a Scoping Opinion.

271 The Crown Estate's Cable Route Protocol (TCE,2019) has recently been issued. This sets out the process offshore wind developers to consult with Statutory Nature Conservation Bodies (SNCBs) which is secured through the TCE agreement for lease.

272 Public consultation is also required for a ML application, including but not limited to, a placement of a public notice in a local newspaper (using text provided by NRW) and advising of a public consultation event (to be held in a public building). Copies of the application and supporting documents must be made available to the public in a public building. Contact details must also be provided so that the public can make any representations concerning the application.

6.3 Approach to stakeholder engagement

273 Innogy recognises that effective and meaningful consultation is an integral part of its development activities and is committed to ensuring that it maintains a transparent approach to consultation and stakeholder engagement. Innogy's engagement objectives are to:

- Identify and actively engage with those statutory bodies, nongovernmental organisations, other national and international organisations, the local community and landowners who may be affected by its activities;
- Develop a transparent consultation and engagement strategy that meets the requirements for pre-application consultation under the Planning Act 2008 and Marine and Coastal Access Act 2009;
- Prioritise consultation with those likely to be directly affected;
- Maintain open and honest communications with all stakeholders; and

- Recognise the interests and viewpoints of stakeholders and where appropriate use the feedback to inform the site selection, design and development activities.

274 All consultation and notifications will be undertaken in accordance with the relevant legal requirements.

6.4 Consultation to date

275 Innogy has notified PINS and NRW that it intends to submit DCO and ML applications (and provide an EIA).

276 Innogy has undertaken early consultation with both statutory and non-statutory bodies to seek to include early feedback on the proposed content of this Scoping Report. Innogy has consulted various statutory bodies including NRW and the MCA, as well as the relevant local planning authorities, Conwy County Borough Council, Denbighshire County Council, Isle of Anglesey County Council, Flintshire County Council and Gwynedd Council. Discussions have also been held with several nongovernmental organisations including the Wildlife Trust and the Royal Society for the Protection of Birds (RSPB). The consultation, which has been held in the context of an EIA Evidence Plan (see Section 6.4.1), has primarily been in connection with the following:

- Site selection principles for the transmission assets;
- Proposed scope of the EIA including matters which innogy is seeking to scope out;
- Proposed data and information utilised to inform this Scoping Report; and
- Proposed assessment methods, surveys and data collection requirements for the EIA.

6.4.1 EIA Evidence Plan

277 The Evidence Plan process was initially developed by the Major Infrastructure Environment Unit (MIEU) of Defra to provide a formal mechanism to agree between Applicants and statutory bodies what information and evidence an Applicant for a NSIP should submit in support of an application, with a specific focus on HRA matters. However, in practice the MIEU advises that the topic areas that may be covered by an Evidence Plan can be expanded, at the request of the Developer, to include broader EIA issues as well as HRA issues.

278 Guidance on the preparation of Evidence Plans is provided within the Department for Environment Food and Rural Affairs (Defra) Guidance Note "Habitats Regulations: Evidence Plans for Nationally Significant Infrastructure Projects", dated September 2012 (Defra, 2012).

279 Under the Defra guidance note, Applicants are expected to:

- Engage with SNCBs, PINS and other consenting bodies throughout the project process;
- Collect evidence and analyse it using agreed methodologies; and
- Be accepting that evidence requirements may change throughout the project process.

280 Under the Defra guidance note SNCBs are expected to:

- Seek pragmatic solutions;
- Take a proportionate approach;
- Only change evidence requirements under specified conditions; and
- Engage proactively; and
- Provide clear guidance and advice.

281 For the purposes of the Awel y Môr Evidence Plan, the remit of the Evidence Plan has been widened, and will include EIA topics in addition to HRA aspects. As a consequence, the Evidence Plan itself is to be titled an EIA Evidence Plan to distinguish it from a solely HRA-related Plan.

282 The process followed in the preparation of the EIA Evidence Plan is aimed at producing a non-legally binding agreement between the developer and the relevant statutory authority(ies) and advisers and other relevant stakeholders on those matters to be addressed by the EIA and HRA process (the scope), the data that will be used to support the assessments and the methods to be applied in analysing the data and assessing the potential impacts of a scheme. Agreement on a Terms of Reference document has been sought (by innogy) from parties invited to be engaged in the Evidence Plan. The document outlines general rules of working, roles and responsibilities; and engagement during the process.

283 Innogy will be seeking to discuss the site selection and alternatives process, ensuring that stakeholders are consulted, and their views taken into account at key milestones. Early discussions were held in Q4 2019 to Q1 2020 as part of the Evidence Plan to discuss the principles being applied to site selection to ensure early feedback from stakeholders. To date, the following Evidence Plan meetings have been held:

- Physical processes, water quality, benthic ecology and fish ecology on 21st November 2019;
- Offshore ornithology and marine mammals on 25th November 2019;
- Onshore Ecology, hydrology and land quality on 10th December 2019;
- Traffic and transport, air quality, onshore noise, public health and socio economics (including tourism) on 9th December 2019;
- Seascape and landscape on 10th December 2019;
- Maritime archaeology, onshore archaeology and cultural heritage on 10th December 2019;
- Onshore site selection principles and consideration on 9th March 2020; and
- Offshore site selection principles and consideration on 10th March 2020.

284 The minutes and agreement logs from these meetings will be included within the Evidence Plan Report to support the DCO and ML applications for the Awel y Môr OWF.

6.4.2 Other consultation to date

285 The following project introduction meetings/phone calls have also been held outwith the Evidence Plan:

- National Air Traffic Services (NATS) on 20th November 2019;
- Maritime and Coastguard Agency (MCA) and Trinity House on 19th November 2019[17] and 26th February 2020;
- Chamber of Shipping and the Royal Yachting Association on 20th February 2020;
- Conwy Borough Council on 14th January 2020 to discuss traffic and transport;
- PINS on 23rd January 2019; and

[17] Note: it is proposed that shipping and navigation assessment matters should be included under the EIA Evidence Plan. However, commercial shipping and navigation matters will be considered outwith the Evidence Plan.

- NRW on 7th January 2020, 11th February 2020 and 3rd March 2020.

6.5 Proposed consultation

286 Further consultation will take place prior to finalisation of the designs and submission of the DCO and ML applications with relevant parties. This further consultation will include (but not be limited to) preliminary environmental information and the site selection process to ensure stakeholder feedback is received and is taken into account, in line with the best practice industry guidance.

287 Consultation will be held with stakeholders and the public in fulfilment of the requirements of the DCO applications process described in Section 6.2. Key dates currently proposed (but subject to change) include:

- Onshore and offshore site selection for alternative options of transmission infrastructure in Q2 2020;
- Draft Statement of Community Consultation (with LPAs) in Q2/3/4 2020; and
- PEIR consultation in Q3/4 of 2021.

288 Consultation will continue with key stakeholders under the Evidence Plan (as described in Section 6.4.1). It is proposed that a series of Expert Topic Group meetings will be held at key stages of the project as part of the EIA process and consultation will also be undertaken as necessary outside of these meetings.

289 Innogy will formally consult with the SNCBs at each of the steps (including the detailed planning and identification of the offshore cable corridor and submission of the Corridor Identification and Approval for Linear activities (CIAL)) required as outlined under The Crown Estate's Cable Route Protocol (TCE, 2019).

290 A series of public information events will be held in Q2 2020 to seek views on the site selection process for the transmission infrastructure. These events will be held locally to where the infrastructure may be located in order to best engage those who have the potential to be impacted by the development.

291 With regards to the ML application, Innogy will provide public consultation including but not limited to, a public notice in a local newspaper (including the text provided by NRW) advising of a public consultation event (in a public building). Innogy will arrange for the ML application documents (and supporting information) to be made available to the public. Contact details will be made available to enable public representations concerning the ML Application to be made to NRW. Any pre-application consultation undertaken by Innogy in relation to the Marine Licence application will be co-ordinated as far as possible with that programmed for the DCO application.

7 Offshore Environment – Physical Environment

7.1 Physical Processes

7.1.1 Introduction

292 This Section of the Scoping Report identifies the characteristics of the offshore physical environment of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential changes to physical processes, and impacts on physical processes receptors, from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on physical processes and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

293 'Physical processes' is a collective term for the following:

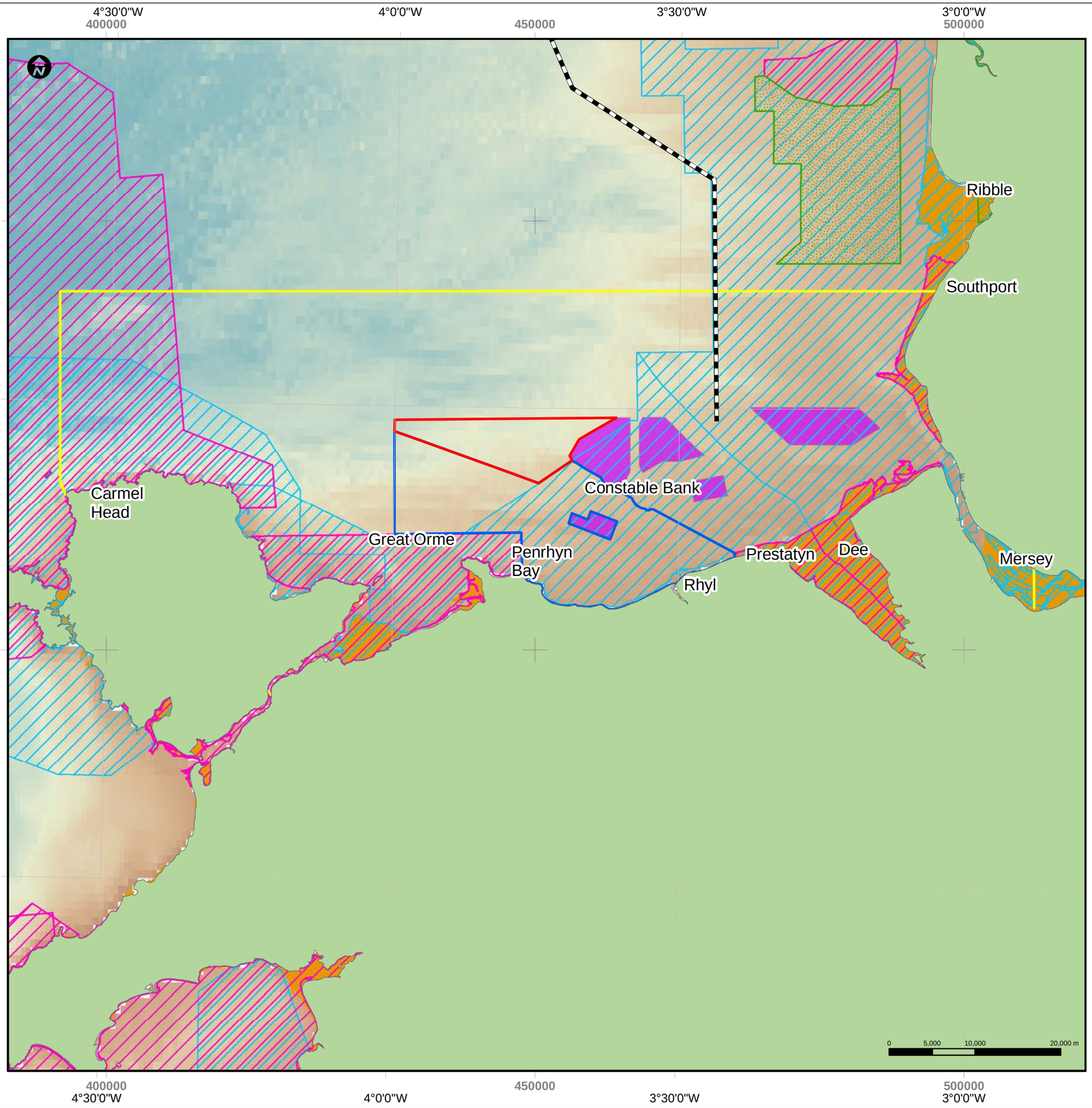
- Water levels;
- Currents;
- Waves (and winds);
- Sediments and geology (including seabed sediment distribution and sediment transport);
- Seabed geomorphology; and
- Coastal geomorphology.

294 Potential impacts of changes to physical processes on other receptors, such as water quality and marine ecology are covered in other topic chapters in this Scoping Report.

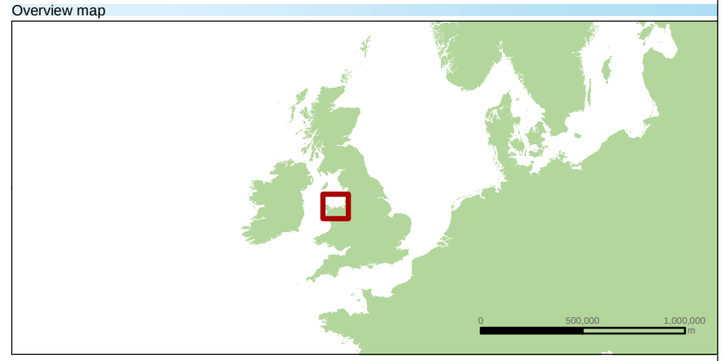
7.1.2 Study Area

295 The Study Area encompasses Liverpool Bay, as well as adjacent seabed areas, and includes the Awel y Môr OWF array area and offshore ECR search area (Figure 20). The Study Area overlaps with a number of nationally and internationally designated nature conservation sites, which contain qualifying geological and geomorphological features. These sites are also illustrated in Figure 20.

296 The landfall for the export cable has yet to be determined but is expected to be located somewhere between Prestatyn and Penrhyn Bay on the North Wales coast. The Study Area will be reviewed following the scoping responses, outcomes of the Expert Technical Group meetings, project design information and identification of any additional constraints (environmental and/ or engineering).



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Study Area
- Marine Conservation Zone
- Special Area of Conservation
- Special Protection Area
- Site of Special Scientific Interest
- Wind Farm (Active/In Operation)
- Liverpool Bay Front

EMODnet Bathymetry (m LAT)

70.56 50.4 30.3 10.2 -9.9 -30.0 -50.1 -70.2 -90.3 -110.4

Cartographic information

Coordinate System: UTM Zone 30 Grid North
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Data sources: EMODnet, 2018; © The Crown Estate, 2018; © NE
Contains public sector information licensed under the Open Government Licence v3.0.
© ABPmer, All rights reserved, 2020.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT	
	Offshore Windpark **Awel y Môr**

TITLE

Physical processes study area

DRAWN	DATE	SCALE	SIZE
AJBrooks	05/03/2020	1:450,000	@DIN A3

	REV
	01

Path: P:\4788_Five_Estuaries_Awel-y-Mor_Scoping\GIS\MXD\AwelYMor\GLext_Innogy_WF_UK_DIN_A3_Physical_Processes_Study_Area_106.mxd

7.1.3 Baseline data

297 The main physical processes data sources, which will be used to inform the assessment, are summarised in Table 26.

TABLE 26 – KEY DATA SOURCES

SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR OWF ARRAY AREA AND OFFSHORE ECR SEARCH AREA
Npower Renewables (2004)	Gwynt y Môr Offshore Wind Farm, Final Environmental Assessment Scoping Report	OWF array area & offshore ECR search area
Npower Renewables (2005)	Gwynt y Môr Offshore Wind Farm, Environmental Statement. Chapter 5 The physical environment	OWF array area & offshore ECR search area
https://www.channelcoast.org/northwest/	Northwest Regional Coastal Monitoring Programme coastal survey data	Offshore ECR search area
http://lle.gov.wales/home http://www.welshcoastalmonitoringcentre.cymru/eng/	Welsh coastal survey data available through the Lle geoportal and Welsh Coastal Monitoring Centre	OWF array area & offshore ECR search area
http://www.seacams.ac.uk/	Hydrodynamic and bathymetric data collected as part of the SEACAMS project	OWF array area & offshore ECR search area
https://www.ntslf.org/	Tidal water levels from the National Tide and Sea Level Facility	Offshore ECR search area (landfall)

SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR OWF ARRAY AREA AND OFFSHORE ECR SEARCH AREA
https://www.bodc.ac.uk/	Hydrodynamic data from the British Oceanographic Data Centre (BODC)	OWF array area & offshore ECR search area
https://www.cefas.co.uk/cefas-data-hub/wavenet/	Cefas WaveNet data	OWF array area & offshore ECR search area
https://www.seastates.net/	Wave and hydrodynamic data from ABPmer SEASTATES model	OWF array area & offshore ECR search area
ABPmer *et al.* (2008a)	Hydrodynamic and wave data from the Marine Renewables Atlas	OWF array area & offshore ECR search area
Palmer *et al.* (2018)	UKCP18 climate change projections	Offshore ECR search area (landfall)
https://www.bgs.ac.uk/Geolndex/offshore.htm	British Geological Survey (BGS) offshore geoindex [including seabed sediments and geology]	OWF array area & offshore ECR search area
UKHO (2019)	United Kingdom Hydrographic Office (UKHO) bathymetry data	OWF array area & offshore ECR search area
Cefas (2016)	Suspended Sediment Climatologies around the UK	OWF array area & offshore ECR search area
http://www.mycoastline.org.uk/ www.westofwalessmp.org/content.asp	▪ North West England and North Wales Shoreline Management Plan (SMP)2 ▪ West of Wales SMP2	Offshore ECR search area (landfall)

SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR OWF ARRAY AREA AND OFFSHORE ECR SEARCH AREA
Environment Agency (2019)	Coastal flood boundary conditions for the UK: update 2018	Offshore ECR search area (landfall)
Ken Pye coastal processes study (Pye, K. & Blott, S.J. (2017)	Barkby Beach to Point of Ayr: Geomorphology Review)	Offshore ECR search area (landfall)

298 Information drawn from the sources given above will also be augmented by geophysical/ geotechnical data and survey reports from the operational Gwynt y Môr OWF, including information from scour and cable monitoring surveys. It is also understood that Dŵr Cymru Welsh Water has collected potentially useful hydrodynamic data (to calibrate/ validate water quality models). The project will attempt to make use of this data, if possible.

299 Site specific geophysical and benthic surveys of the Awel y Môr OWF array area and possible offshore export cable route(s) are planned for 2020. Data derived from these surveys will provide a more detailed site characterisation, detailing the seabed character and associated sediment properties.

7.1.4 Baseline environment

300 This Section provides a high-level summary of the existing physical environment across the Study Area, with consideration given to bathymetry, water levels, currents, waves, seabed sediments and geomorphology.

Bathymetry

301 Water depths generally decrease in a west to east direction across the wider Study Area, with the greatest depths (*c.* 50 to 60 m LAT) found to the northwest of the Awel y Môr array area, to the north of Anglesey (Figure 20). Water depths within, and close to, the Awel y Môr array area range between approximately 20 and 40 m LAT, with a mean depth of around 30 m LAT. The deepest areas are found at the western end of the array, with the shallowest areas encountered along the southern margin.

302 Within the offshore ECR search area, water depths of approximately 25 m LAT are found at the offshore extent and gradually shallow towards the coast. Historic bathymetric analysis undertaken for the (operational) Gwynt y Môr OWF indicate that the seabed in this region has been generally stable, with no significant change in bathymetry between 1873 and 2004 (Npower Renewables, 2005).

Hydrodynamic regime

303 Across the Study Area there is a west to east gradient in tidal range, with spring tidal range increasing from approximately 4.5 m in the west of the Study Area to around 7.5 m in the east. Within the Awel y Môr OWF array area, the mean spring tidal range is around 6.5 m and is between approximately 6.5 and 7 m at the coast, within the offshore ECR search area.

304 Peak tidal current speeds are highly variable across the Study Area: off Anglesey they can reach *c.* 2.5m/s on spring tides while mean spring peak tidal currents are more typically between 0.25 and 0.5 m/s close to the shore within the offshore ECR search area. In general, currents decrease in strength in a west to east direction and also with proximity to the coast.

305 Within the Awel y Môr OWF array area, mean spring peak tidal currents are between approximately 0.75 and 0.9 m/s, and around half this speed on neap tides. Currents flow in an approximate east to west direction, with easterly flow during most of the flood tide and westerly flow during most of the ebb tide.

Fronts

306 A 'front' is an area separating two distinct water masses, with different densities as a result of varying salinity or temperature properties. Within the Irish Sea, a number of seasonal and permanent fronts exist due to the freshwater influence from the surrounding land, compared with the water properties of the sea area. To the northeast of the Awel y Môr array area is the permanent Liverpool Bay front (Figure 20), which extends northwards from the River Dee. Stratification associated with this front is predominantly associated with salinity gradients, although temperatures associated with outflows from the Dee, Mersey and Ribble estuaries can also have a seasonal effect (Norman, *et al.*, 2014).

Wave regime

307 The wave regime within the Study Area is characterised by locally generated wind waves and longer period swell waves that have propagated into the Irish Sea from the Atlantic Ocean via the St Georges Channel and Cardigan Bay (to the south) or the North Channel between Scotland and Northern Ireland (to the north). Winds in the region most frequently come from the west but may also come from any other direction (with an approximately uniform probability of occurrence). The strongest winds also tend to come from these westerly directions.

308 Locally generated wind waves related to the prevailing winds come from westerly, north-westerly and northern sectors and typically have a period of less than 4 seconds, while the less frequent swell waves have a wave period of about 8 seconds. Generally, approximately 50% of the waves are generated from directions 250°N to 330°N (west-southwest to north-northwest), and with over 30% from the directions of largest fetch (Npower Renewables, 2004).

309 Due to the restricted fetches, wave heights and periods are correspondingly restricted with only 1-2% of waves being greater than 3.0 m in height (Npower Renewables, 2004). Wave heights across the Study Area will tend to reduce in an easterly direction due to decreasing water depth.

310 For the ES, baseline understanding of the wave regime within the Study Area will be developed using available wave data (including that collected from the Gwynt y Môr OWF), alongside hindcast metocean data.

Geology and seabed sediments

311 The Awel y Môr OWF array area and offshore ECR search area are located within the Irish Sea Basin. The solid geology within the basin is characterised by Permo-Triassic units, which unconformably overlies older Carboniferous and Palaeozoic units (Npower Renewables, 2005).

312 Overlying the Permo-Triassic geology is a disconformity of Quaternary and Holocene geological units comprising predominantly of sand, with varying proportions of mud, gravel and pebbles and cobbles (BGS, 1995). These units are representative of environmental change brought about through a combination of climate change, vertical movements of relative sea level and consequent spatial shifts in shoreline position (Npower Renewables, 2005). They are also indicative of the intermittent erosional phases in relation to wave and tidal processes.

313 Seabed sediments across the Study Area are dominated by sands and gravels. Fine grained (muddy) sediments are less common, although they are present in the north-east of the Study Area (corresponding to the southern end of the Irish Sea Mud Belt), notably in localised areas to the north of the Awel y Môr array area and within the Dee/ Clywd estuaries. Sands and gravels are also the dominant substrate across the Awel y Môr OWF array area and offshore ECR search area.

Geomorphology and sediment transport

314 Across the Awel y Môr OWF array area and the offshore ECR search area, bedload sediment transport is the primary pathway in which material is transported. This is driven by tidal currents although in very shallow inshore areas, sediment mobilisation and transport can also be driven/ enhanced by wave action. Across the Study Area, the movement of sediment is primarily in a net west to east direction with some finer sediment being transported in suspension (Kenyon and Cooper, 2005).

315 Tidal bedform features comprising unconsolidated coarse-grained material are prevalent within the Study Area, especially across nearshore areas. These bedforms typically range from sand ribbons and patches of mega-ripples (with heights of less than *c.* 0.5 m) to sandbanks with elevations in excess of 12 m. A notable feature within the Study Area is Constable Bank, a *circa* 10 m high sandbank, which runs east to west, south of the Awel y Môr OWF array area and within the offshore ECR search area.

Coastal characteristics

316 The coastline within the Study Area extends from Carmel Head (in the west) to Southport (in the east). The coastal characteristics are highly varied, ranging from rocky cliffs (e.g. Great Orme's Head) to low lying settings characterised by accumulations of soft unconsolidated sediments (such as the Dee estuary). The extension of Great Orme beyond the general alignment of the coastline provides a major drift divide, with easterly longshore sediment transport to the east (within the offshore ECR search area), and westerly transport to the west of Great Orme.

317 The shoreline management policy for much of the coastline is 'hold the line'. Indeed, several areas along the North Wales coast have a long history of sea defences, with seawalls, revetments, groynes and flood embankments preventing shoreline erosion and managing flood risk to coastal towns (e.g. Rhyl and Prestatyn).

Designated sites

318 The Study Area contains several nationally and internationally designated sites (Figure 20) The sites are primarily designated for the habitats they contain rather than for the presence of geological and geomorphological features. However, changes to the physical characteristics of these sites have the potential to impact the habitats they support and, therefore, consideration will be given in the physical processes assessment.

319 Designated sites that are coincident with (or very close to) the Awel y Môr OWF array area and offshore ECR search area are listed in Table 27. It is noted that, once a preferred export cable corridor is identified, the list of marine nature conservation designations with relevance to physical processes will be refined. Similarly, as further project design details become available, consideration will be given to any other designated sites outside of the Awel y Môr OWF array area and offshore ECR search area, that should also be considered for assessment within the EIA.

TABLE 27 - MARINE NATURE CONSERVATION DESIGNATIONS WITH RELEVANCE TO PHYSICAL PROCESSES AND AWEL Y MÔR OWF

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF/ ECR SEARCH AREA	FEATURES OR DESCRIPTION
INTERNATIONAL		
Liverpool Bay SPA	[Coincident with the ECR search area]	Large areas of muddy sand and gravelly sand and a number of prominent sandbanks
Dee Estuary SAC	[Immediately adjacent to the ECR search area]	Saltmarshes, intertidal mudflats, sandflats, sand dunes and sea cliffs
Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC	[Immediately adjacent to the ECR search area]	Large areas of sand and mud flats as well as subtidal sand banks belonging to the Four Fathom Banks complex
Dee Estuary SPA	[Immediately adjacent to the ECR search area]	Saltmarshes, intertidal mudflats, sandflats, sand dunes and sea cliffs
Anglesey Terns / Morwenoliaid Ynys Mdn SPA	3 km	Extends around most of the east, north and west coasts of Anglesey, generally from the mean high water mark out to between 10 and 20 km from the shore
Traeth Lafan / Lavan Sands, Conway Bay SPA	10 km	Large intertidal area of sand and mudflats lying at the eastern edge of the Menai Straits
North Anglesey Marine SAC	14 km	Encompasses a range of habitats including coarse and sandy sediments, rock and mud

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF/ ECR SEARCH AREA	FEATURES OR DESCRIPTION
NATIONAL		
Traeth Pensarn SSSI	[Coincident with the ECR search area]	Large area of intertidal sand and mud flat
Gronant Dunes and Talacre Warren SSSI	[Immediately adjacent to the ECR search area]	Large area of sand dunes and foreshore located between Prestatyn and Gronant
Creigiau rhiwledyn/ Little Ormes Head SSSI	[Immediately adjacent to the ECR search area]	Limestone headland on the eastern side of Llandudno Bay
Pen Y Gogarth / Great Ormes Head SSSI	3 km	Site is significant for (among other things) its Carboniferous Limestone and associated sedimentary deposits
Arfordir Gogleddol Penmon SSSI	7 km	Steep Carboniferous limestone cliffs of geological interest
Traeth Lafan SSSI	10 km	Large intertidal area of sand and mud flats lying at the eastern edge of the Menai Straits
Puffin Island - Ynys Seiriol SSSI	5 km	Carboniferous limestone island approximately 1 km off the eastern tip of Anglesey
Glannau Penmon – Biwmares SSSI	7 km	Muddy and boulder strewn shore containing tide-swept sediments flanked by soft cliffs

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF/ ECR SEARCH AREA	FEATURES OR DESCRIPTION
Aber Afon Conwy SSSI	3 km	Intertidal estuarine complex flanked by natural rock and boulder clay cliff, sand dunes and salt marsh.

7.1.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

Relevant guidance and best practice

320 It is expected that EIA studies should apply any relevant guidance and best practice. The following guidance documents will inform the choice of methodologies to be used in the EIA:

- 'Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects.' For Natural Resources Wales. (Brooks *et al.* 2018);
- 'Environmental impact assessment for offshore renewable energy projects.' (BSI, 2015).
- 'Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects'. (Cefas, 2011);
- 'General advice on assessing potential impacts of and mitigation for human activities on Marine Conservation Zone (MCZ) features, using existing regulation and legislation' (JNCC and Natural England, 2011);
- 'Coastal Process Modelling for Offshore Wind farm Environmental Impact Assessment: Best Practice Guide'. ABPmer & HR Wallingford for COWRIE, 2009, [http://www.offshorewindfarms.co.uk];
- 'Guidelines in the use of metocean data through the lifecycle of a marine renewables development'. (ABPmer *et al.*, 2008b); and
- 'Offshore Windfarms: Guidance note for Environmental Impact Assessment in Respect of FEPA and CPA requirements'. (Cefas, 2004).

321 The following studies are also of relevance:

- 'Review of environmental data associated with post-consent monitoring of licence conditions of offshore wind farms'. MMO Project No: 1031. (Fugro-Emu, 2014);
- 'Further review of sediment monitoring data'. (COWRIE ScourSed-09).' (ABPmer *et al.*, 2010);
- 'Review of Cabling Techniques and Environmental Effects applicable to the Offshore Wind farm Industry'. Department for Business Enterprise and Regulatory Reform in association with Defra. (BERR, 2008);

- 'Review of Round 1 Sediment process monitoring data - lessons learnt. (Sed01)' (ABPmer *et al.*, 2007);
- 'Dynamics of scour pits and scour protection - Synthesis report and recommendations. (Sed02)' (HR Wallingford *et al.*, 2007); and
- 'Potential effects of offshore wind developments on coastal processes'. (ABPmer and METOC, 2002).

Proposed approach

322 The project will utilise standard approaches for the assessment of changes to physical processes as a result of the construction, operation and decommissioning of the Awel y Môr OWF. The methods to use will be refined at a later stage if necessary, based on the project design information and the receptor assessment requirements of all relevant topics. The proposed methods to be used for the physical processes assessment will be discussed and confirmed with the relevant stakeholders as part of the development of the PEIR and so in advance of the final ES.

323 The assessment approach options include a range of desktop analyses and quantitative evidence-based assessments. New numerical modelling is presently considered unlikely to be required for assessment of the Awel y Môr OWF (with reference to the relevant best practice guidance; ABPmer & HR Wallingford, 2009).

324 The adjacent Gwynt y Môr project was consented based on several project-specific studies, which included the use of numerical modelling to quantify the environmental baseline, and the scheme impacts on the physical processes and environment for the realistic worst-case development options at the time. The modelling results remain valid, with the scheme scenarios providing a conservative representation of the 'as constructed' development. As a broadly similar OWF development, in a similar environmental setting, the Gwynt y Môr OWF EIA will likely provide a range of existing evidence to inform similar assessments for the Awel y Môr OWF. Other supporting evidence may also be drawn from existing assessments and monitoring of other sufficiently similar OWF developments.

Potential project impacts

325 In most cases, marine physical processes are not in themselves receptors but are, instead, 'pathways' which have the potential to indirectly impact other environmental receptors. Accordingly, although outputs from the Awel y Môr OWF physical processes assessments will be reported in a stand-alone ES chapter, for the most part they will not be accompanied by statements of 'effect significance'. Instead, the information on changes to marine physical processes pathways will be used to inform other EIA topic assessments, namely:

- Water and Sediment Quality;
- Benthic and Intertidal Ecology;
- Fish and Shellfish Resource;
- Marine Mammals;
- Ornithology (Offshore);
- Commercial Fisheries; and
- Archaeology and Cultural Heritage (Offshore).

326 While marine physical processes can largely be considered as pathways, a small number of features have been identified as potentially sensitive physical processes receptors. These are:

- The coast;
- Nearby offshore sandbanks (including Constable Bank); and
- Seabed areas contained within nationally or internationally designated sites.

327 A range of potential impacts on these physical process receptors have been identified, which may occur during the construction, O&M, and decommissioning phases of the Awel y Môr OWF. The impacts that have been scoped into the Awel y Môr OWF EIA are outlined in Table 28, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

328 No impacts have been identified to be scoped out of the assessment of the project for physical processes at this stage. This is mainly due to the potential for pathway changes to physical processes to impact on other topic receptors.

TABLE 28 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR PHYSICAL PROCESSES

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
7.1.1	Potential changes to suspended sediment concentrations, bed levels and sediment type	Activities such as foundation construction or cable laying can cause increases in suspended sediment concentration (SSC) as a result of seabed disturbance. The transport of the disturbed material and the eventual deposition could, in turn, result in variations in the underlying bed levels and changes to the sediment type.	Spreadsheet assessments will be developed to quantitatively inform the assessment of potential changes to suspended sediment concentrations and bed levels caused by construction activities. Results will be provided for a range of hydrodynamic conditions and sediment types, capturing the realistic worst case (in terms of plume extent, concentration and sediment deposition). The available baseline information and the planned site-specific surveys will provide the data inputs for this assessment.
7.1.2	Potential changes to landfall morphology	Where the export cable makes landfall, it must transition through the intertidal and coastal zone. The methods available for installing cables in such environments may physically disturb or disrupt the coastal morphology to differing degrees. At the	The short-term physical impact of cable installation at the landfall will be assessed as a desktop analysis, considering available relevant coastal processes data (e.g. LiDAR, inter-tidal topographic data, coastal monitoring reports

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		time of construction, any disturbance will be localised to the landfall site.	etc.). The assessment will also draw upon observational evidence from other suitably analogous projects. The available baseline information and the planned site-specific surveys will provide the data inputs for this assessment.
OPERATION			
7.1.3	Potential changes to the tidal regime	Interaction between the naturally present metocean regime (waves and currents) and the foundations of the wind farm infrastructure will result in patterns of change in current speed, wave energy, and turbulence. The effect of increased turbulence on sediment transport immediately adjacent to individual foundations is to cause scour (considered as a separate impact below). At greater distances but still within the extent of the array area, the effect on tidal currents is evident as a series of discrete	Persistent changes to wave and currents may have a net effect over time on net patterns of sediment transport (rates and directions). The sensitivity of these patterns to change will depend upon the relative importance of currents and/or waves, the magnitude and extent of any effect, the nature of the seabed substrate and the degree to which the system is presently in balance (e.g. could a small change reverse the direction of net transport, or, is the present rate and direction of transport essential to the maintenance of a dynamic morphological feature). The importance of small changes to
7.1.4	Potential changes to the wave regime		
7.1.5	Potential changes to the sediment transport regime		

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		wake features extending downstream along the tidal axis from each foundation. The effect of a foundation on individual waves is typically not measurable in practice but the cumulative effect of many foundations is generally accepted to be a slight reduction in wave height that is not significant in EIA terms (e.g. East Anglia Offshore Wind, 2012; Moray Offshore Renewables Ltd, 2012, Navitus Bay Development Ltd, 2014).	instantaneous wave and current parameters will be evaluated in the context of the wide range of natural temporal variability (and longer-term trends, e.g. annual to decadal cycles) in these regimes on hourly to decadal timescales. Potential changes to the tidal (water levels and currents) and wave regimes caused by the presence of the wind farm foundations will be assessed initially by reference to the results of more detailed previous numerical modelling studies undertaken for sufficiently analogous wind farm developments and metocean conditions, with consideration of the environmental setting and the foundation type, number and layout. A comparison will then be made of the blockage density presented by the additional foundations in the Awel y Môr OWF array area, through consideration of the cross-sectional area of each foundation, turbine spacing, number and the dimensions of the Awel y Môr OWF array area. The blockage density will be considered both in absolute terms and in comparison to the Gwynt y

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			Môr OWF and other operational wind farms where no associated direct or indirect adverse impacts have yet been observed. Potential changes to the sediment transport regime will be primarily assessed on the nature and magnitude of any impacts on the tidal and wave regimes (which control the rates and patterns of sediment transport). Consideration will then be given to whether the nature or rate of sediment supply across the wider area might be otherwise affected by the wind farm.
7.1.6	Scour	Interaction between the naturally present waves and currents and the wind farm infrastructure has the potential to cause localised scouring of seabed sediment, leaving a depression that will persist in some form until the structure is removed. The extent and depth of scour may vary over time and may be limited under certain physical conditions.	A conservative approach using standard relationships from the relevant literature will be applied to calculating the maximum expected dimensions of scour independent of other factors. Scour protection measures are typically used to mitigate the engineering risk posed by scour and, where used, will largely prevent scour developing. However, the area occupied by the scour protection might also be similarly considered as a modification to habitat.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
DECOMMISSIONING			
7.1.7	Potential changes to suspended sediment concentrations, bed levels and sediment type	Activities such as removal of foundations or cables can cause increases in suspended sediment concentration as a result of seabed disturbance. The transport of the disturbed material and the eventual deposition could in turn result in variations in the underlying bed levels and changes to the sediment type.	It is expected that decommissioning activities will result in a lesser rate of sediment disturbance than that already considered in relation to the construction phase. No further quantitative assessment of the actual (similar or lower) resulting levels of suspended sediment concentration or the fate of locally re-suspended sediments will be undertaken.
7.1.8	Potential changes to landfall morphology	Where the export cable makes landfall, it must transition through the intertidal zone. The methods identified for removing or decommissioning the cable and/or cable protection measures may physically disturb or disrupt the intertidal morphology.	If infrastructure previously affecting marine processes is removed, there will be a subsequent readjustment of marine processes back towards the (future) baseline conditions. This may include changes to the regional coastal morphology by local enhancement or interruption of a long-shore sediment transport pathways. The potential for impacts relating to the decommissioning of cables and/or cable protection measures at the landfall will be

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			assessed as part of the cable landfall desktop analysis described in relation to the construction and operation phases. This will include the consideration of observational evidence from analogous cable decommissioning activities and with reference to the metocean baseline understanding and the wider evidence base.

Mitigation measures adopted as part of the project

329 As part of the design process for Awel y Môr OWF, several embedded measures are proposed to reduce the potential for physical processes impacts, which are presented below. These will evolve in response to the project design envelope and in response to consultation.

330 innogy is committed to implementing these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts are scoped in for assessment, presented in Table 28.

331 Measures adopted as part of the project will include:

- Development of, and adherence to, a Cable Specification and Installation Plan post consent (if granted), which sets out measures to minimise adverse impacts to potentially sensitive receptors. It will also set out appropriate cable burial depth in accordance with industry good practice, minimising the risk of cable exposure; and
- Development of a scour protection plan which will consider the need for scour protection where there is the potential for scour to develop around wind farm infrastructure, including turbine and substation/platform foundations and cables.

332 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

333 The EIA methodology chapter sets out how potential cumulative effects will be assessed. For physical processes, cumulative interactions may occur with other offshore wind farms as well as other activities in the Study Area (such as aggregate dredging). Potential impacts are summarised below.

334 Offshore wind: the potential impacts of the Awel y Môr OWF on physical processes are likely to be small in both absolute and relative terms. Previous studies have consistently shown that similar arrays of WTG foundations are relatively unlikely to have significant effects in EIA terms on waves, currents or sediment transport, either within or outside of the Awel y Môr OWF array area. The potential for cumulative effects is therefore likely to be similarly limited. However, consideration will be given for potential cumulative interaction with nearby wind farms including Gwynt y Môr OWF, Rhyl Flats and North Hoyle.

335 Modelling was completed as part of the Gwynt y Môr OWF Environment Statement with conservative design options used. Given the similar environmental setting of the Awel y Môr OWF in relation to the existing project, and likely similarity in design options, the potential for cumulative effects is likely to be similarly limited.

336 Other activities: There is (limited) potential for other nearby activities to result in cumulative sediment plume impacts, including aggregate dredging and subsea cabling. However, the short duration, temporary and localised nature of sediment plumes means that cumulative effects are relatively unlikely to occur at all, and if so, only for short durations in very localised areas.

Potential transboundary Impacts

337 Due to the localised nature of any potential impacts, transboundary impacts are unlikely to occur and therefore it is suggested that this impact will be scoped out from further consideration within the EIA.

7.1.6 Summary of next steps

338 Aside from the site specific geophysical and benthic survey being completed in 2020, no further surveys are proposed to inform the physical processes assessment. No requirement for new numerical modelling is anticipated.

339 The proposed assessment approach for the PEIR chapter is as outlined in the methodology Section (7.1.5).

7.1.7 Further considerations for Consultees

340 We seek responses to the following questions:

i. Do you agree that the data sources identified are sufficient to inform the physical process baseline for the Awel y Môr OWF PEIR and Environmental Statement?

ii. Have all potential impacts resulting from Awel y Môr OWF been identified for the physical processes receptor?

iii. For those impacts scoped in (Table 28), do you agree that the methods described are sufficient to inform a robust impact assessment? and

iv. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on the physical process receptors and pathways?

7.2 Marine water and sediment quality

7.2.1 Introduction

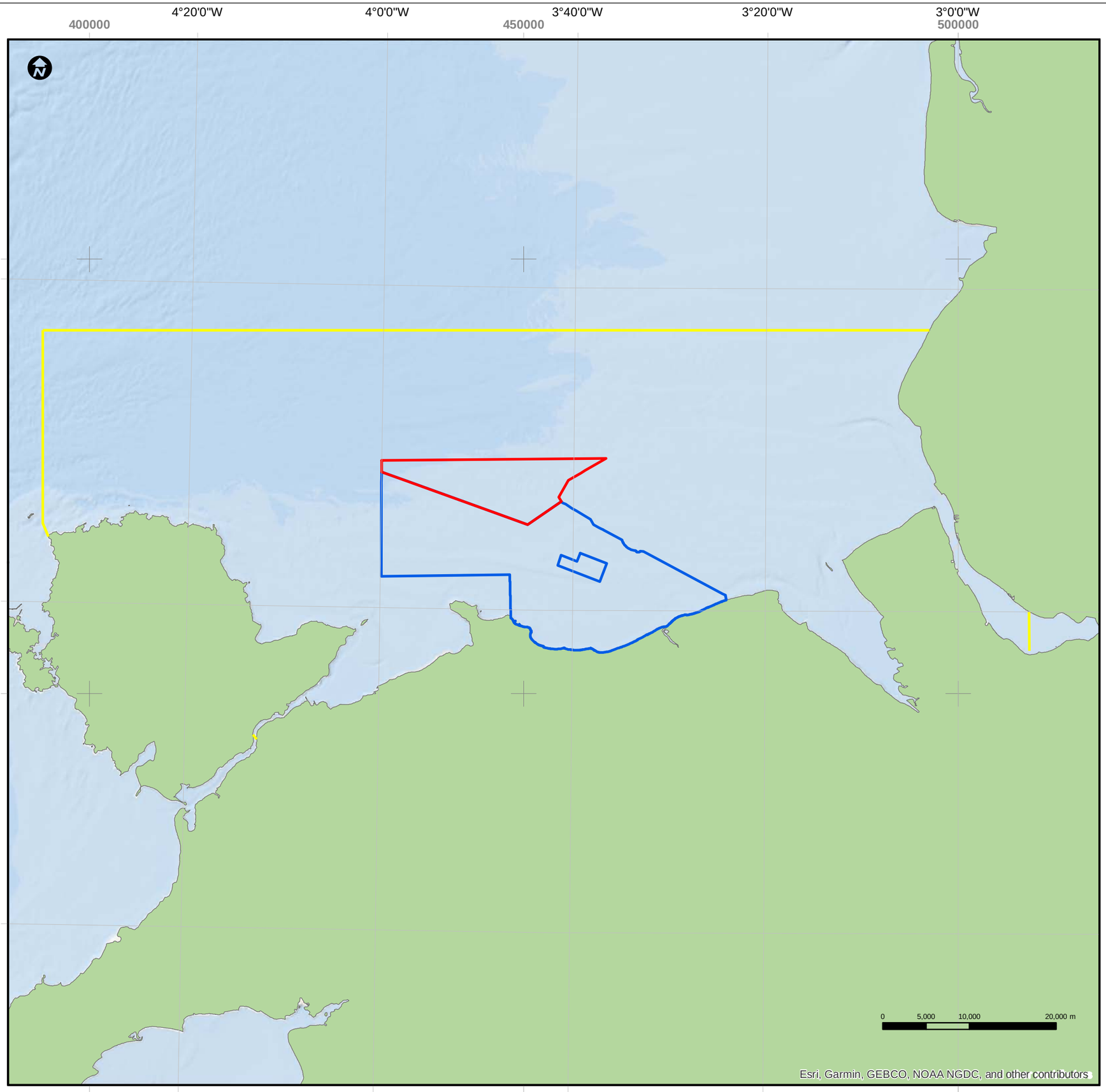
341 This Section of the Scoping Report identifies the marine water and sediment quality receptors of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on marine water and sediment quality and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

342 The European Union (EU) Water Framework Directive (WFD) (2000/60/EC) was established in 2000 in order to provide a single framework for the protection of surface waterbodies (including rivers, lakes, coasts (up to 1 nautical mile (nm) from the shore and estuaries) and groundwater. Each waterbody has an assigned ecological and chemical status. This Section also considers the requirements under the WFD and the proposed assessment for coastal and transitional waters. An assessment will be undertaken as part of the EIA to assess the potential for the proposed development to have a significant (non-temporary) effect on WFD parameters within all relevant waterbodies and designated sites.

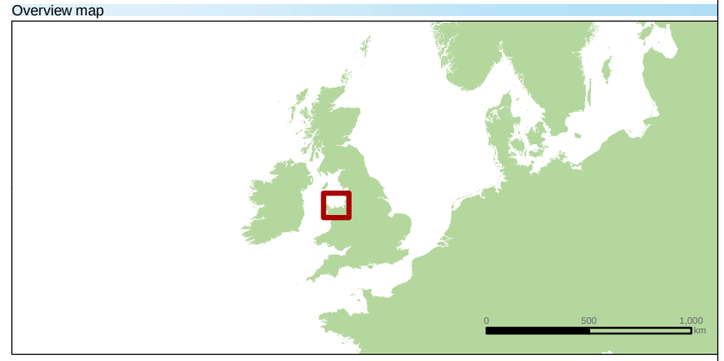
7.2.2 Study Area

343 The Study Area for the marine water and sediment quality assessment is located on the North Welsh coast and includes the Awel y Môr OWF array area and offshore ECR search area, see Figure 21. The Study Area is consistent with the Physical Processes Study Area (see Section 7.1 - Physical Processes) which considered the work previously undertaken for the Gwynt y Môr OWF. Furthermore, the Study Area encompasses the limit of tidal excursion in the area (approximately 11 km) (RWE, 2005).

344 The Study Area for the assessment in the PEIR (and ES) will be reviewed and potentially refined based on the predicted zone of influence which will be determined by the Physical Processes assessment and the project description presented at that time.



Overview map



Legend

- Array Area
- Study Area
- Offshore Export Cable Route Search Area

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT
Offshore Windpark
Awel y Môr

TITLE
Geographic overview of the Marine Water and Sediment Quality Study Area in the context of the wider area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:450,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\MW&SQ\AyM_0119_MWSQ_Fig1_Geographic_Overview.mxd

7.2.3 Baseline data

345 A desk-based review of literature and data sources has been undertaken to inform this Scoping Report. Table 29 presents data sources which have been identified and which would be expected to inform the assessment in the PEIR and ES.

TABLE 29 - KEY SOURCES OF INFORMATION FOR MARINE WATER AND SEDIMENT QUALITY

SOURCE	SUMMARY	COVERAGE OF AWEL Y MOR OWF
Western Wales River Basin Management Plan (and associated data)	The River Basin Management Plan provides information on the current status, pressures, objectives and programme of measures of the water environment.	Partial coverage[xviii] of the ECR search area
NRW WFD water body sampling data	Data collected by the Environment Agency to quantify the chemical performance of the water environment.	Partial coverage[xviii] of the ECR search area
NRW Bathing Water classifications	Data collected by the Environment Agency to quantify the performance of the local bathing waters.	Partial coverage[xviii] of the ECR search area
NRW Shellfish Water classifications	Data collected by the Environment Agency to quantify the performance of the local shellfish waters.	Partial coverage[xviii] of the ECR search area
Gwynt y Môr OWF post-construction data/information. Sourced from the Applicant.	Benthic environmental monitoring was carried out for Gwynt y Môr OWF to establish if the wind farm is having an effect upon the local benthic ecology and seabed sedimentology.	Partial coverage of the array and of the ECR search area

[xviii] These sources provide coverage of the designated water bodies which are to be assessed in the WFD assessment.

SOURCE	SUMMARY	COVERAGE OF AWEL Y MOR OWF
Gwynt y Môr OWF Environmental Statement.	Characterisation and monitoring data for the existing operational Gwynt y Môr OWF site (including particle size analysis, contaminant analysis, and drop down video surveys).	Partial coverage of the Study Area
Sediment model detailing multiple different sediment classifications, including Folk and EUNIS substrate (Cefas, 2018)	Spatial predictions of the fractions of mud, sand and gravel as continuous response variables for the north-west European continental shelf.	Full coverage of the Study Area
Cefas Suspended Particulate Matter (SPM) data (Cefas, 2016).	Annual average of non-algal SPM data available from Cefas. These data are based on the satellite derived Ifremer OC5 algorithm (Gohin *et al*, 2011).	Full coverage of the Study Area

346 In addition to these existing data sources, further information will be collected for the Awel y Môr OWF EIA as part of a site-specific benthic ecology survey which will be undertaken across both the array and the ECR search area (including the intertidal area). As part of this survey, sediment samples will be taken and a selection of these will be analysed for contaminants and particle size analysis (PSA).

7.2.4 Baseline environment

Water quality

347 The Irish Sea is characterised by a high degree of spatial and temporal (both annual and inter-annual) variability in suspended sediment concentrations. In general, there exists an inshore to offshore gradient in SSC, with the highest concentrations observed close to, and especially at the mouths of, large estuaries such as the Dee and Mersey.

348 Water quality in the offshore part of Liverpool Bay, away from the coastal bathing waters, is affected predominantly by contaminants from rivers, sewage effluent or industrial discharges. A variety of contaminants can be present in seawater, including:

- Trace metals;
- Organic micro-pollutants (such as pesticides or PCBs);
- Hydrocarbons; and
- Radioactive isotopes.

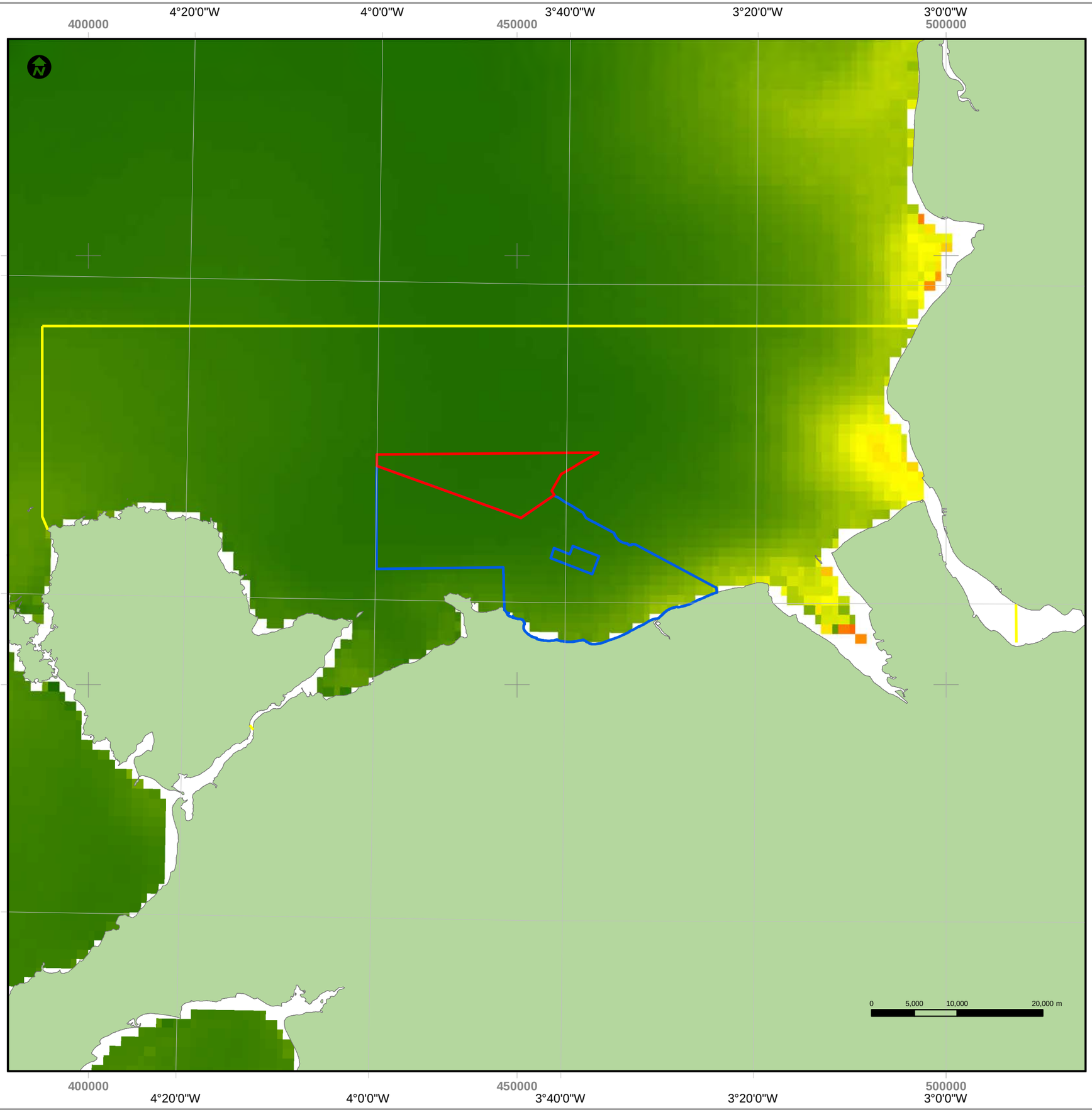
349 Radioactive isotopes are relatively soluble in seawater and are dispersed throughout the eastern Irish Sea from the Sellafield reprocessing plant on the Cumbrian coastline, it being the largest single input of radioactive material in the Irish Sea (DEFRA, 2000). However, the resulting exposure levels to marine species in the eastern Irish Sea and Liverpool Bay remain well below those known to cause adverse effects (Npower, 2005).

350 Within Liverpool Bay, the levels of trace metals from trade and sewage outfalls and levels of lead, cadmium and mercury are known to be higher than Background Reference Concentration values, set by OSPAR in 1997. Studies regarding metal concentration in the waters of the Irish Sea have been carried out by Abdullah *et al.* (1973) and Preston (1972), and recorded a gradient of metal concentrations from high levels near the Mersey and Dee Estuaries to lower concentrations further offshore, tending to confirm the importance of rivers and estuaries as sources for these pollutants.

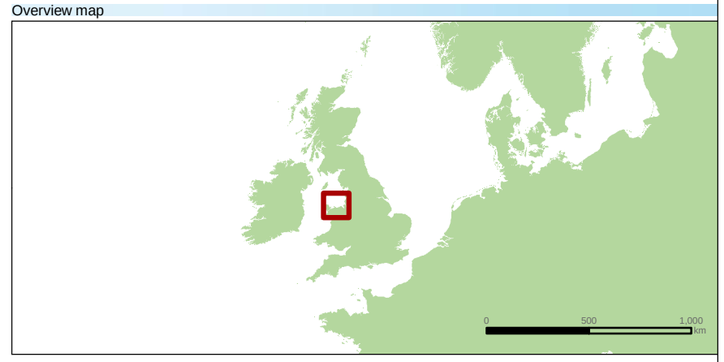
351 Historically, much of Liverpool Bay has been contaminated with mercury (MAFF, 1991), which has been attributed to inputs from the Mersey Estuary, primarily as the result of industrial effluents specifically from the chlor-alkali industry. The Irish Sea also receives the largest single input of lead nationally from the river Mersey (DEFRA, 2005) and elevated copper levels in the region (when compared with the rest of the Irish Sea) are also attributed to inputs from the Rivers Dee and Mersey (MPMMG, 1998). River discharge is also a major source of cadmium and zinc in the region (Norton *et al.*, 1984).

352 Annual averaged satellite imagery of SPM as presented in Figure 22, suggests that within the Awel y Môr array area, average (surface) SPM is approximately 2 to 3 mg/l, increasing during winter months to values of approximately 4 mg/l (Cefas, 2016), occasionally reaching up to 6 mg/l. Higher values are anticipated during spring tides and storm conditions, with the greatest concentrations encountered close to the seabed.

353 Annual and monthly averaged satellite imagery of SPM, as presented in Figure 22 and Figure 23, suggests that the Awel y Môr offshore ECR search area shows variation, with highest values in the southern extents near the coast. The offshore ECR search area shows a greater seasonality than the array area, increasing in the winter months to mean values between 5 to 25 mg/l. Similarly, within the array area higher values are anticipated during spring tides and storm conditions, with the greatest concentrations encountered close to the seabed.



Overview map



Legend

- Array Area
- Study Area
- Offshore Export Cable Route Search Area

Analysed SPIM (1998-2015) Annual Average

- High : 50
- Low : 0

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Monthly averages of non-algal SPM based on Ifremer OC5 algorithm (Gohin et al 2011). Data obtained from CEFAS.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

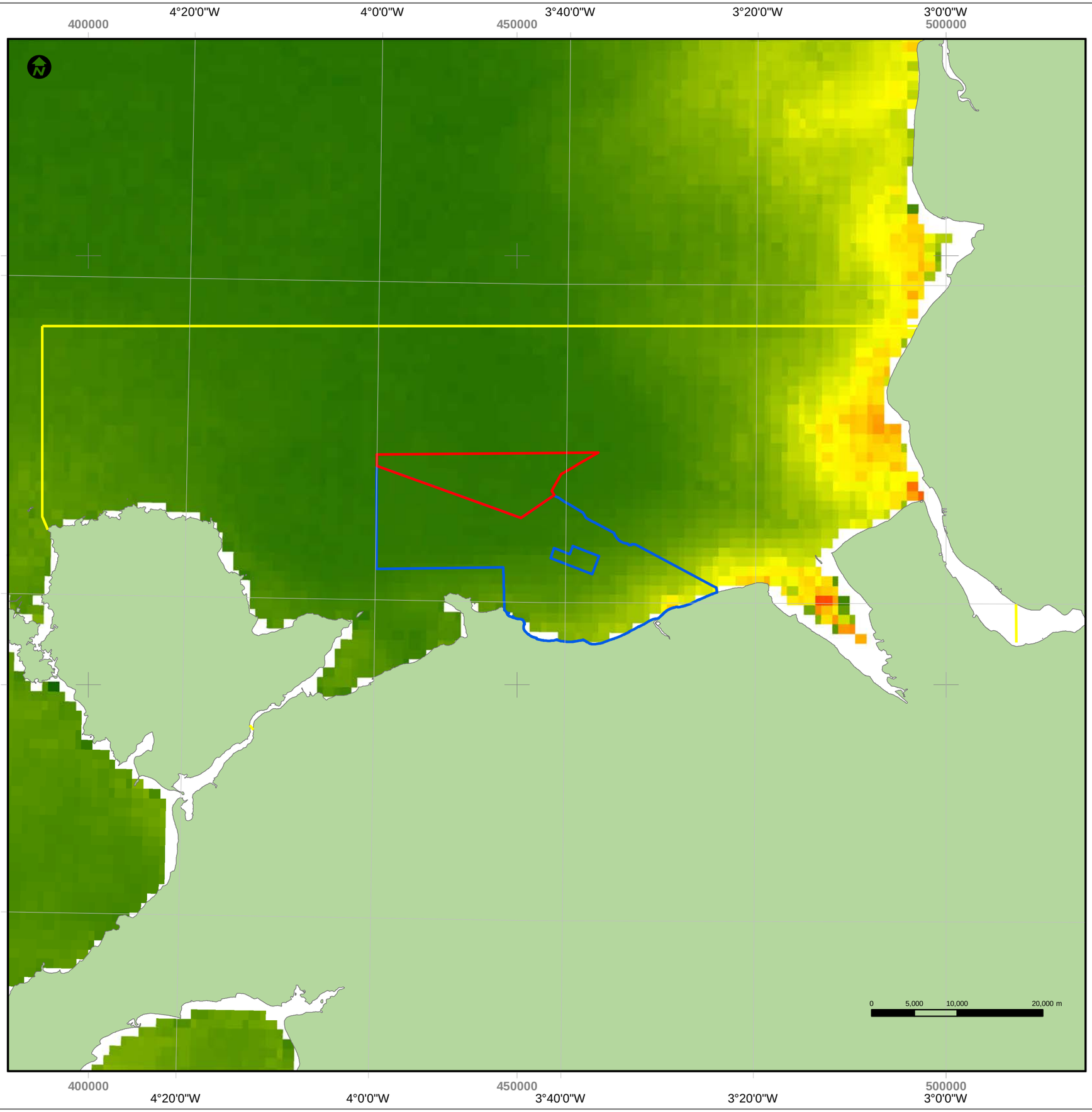
PROJECT
Offshore Windpark
Awel y Môr

TITLE
Analysed satellite SPM data - Annual Average

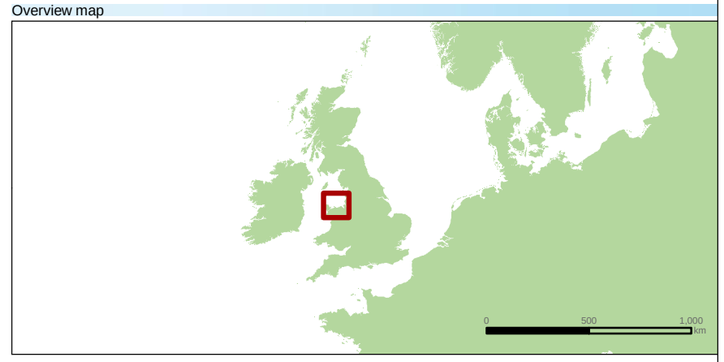
DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:450,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\MW&SQ\AyM_0119_MWSQ_Fig2_Annual_Average_SPM.mxd



Overview map



Legend

- Array Area
- Study Area
- Offshore Export Cable Route Search Area

Analysed SPIM (1998-2015) December Average

High : 120

Low : 0

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Monthly averages of non-algal SPM based on Ifremer OC5 algorithm (Gohin et al 2011). Data obtained from CEFAS.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT	
	Offshore Windpark **Awel y Môr**

TITLE

Analysed satellite SPM data - December Average

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:450,000	@DIN A3

	REV
	01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\MW&SQ\AyM_0119_MWSQ_Fig3_December_Average_SPM.mxd

354 The ECR search area passes through the North Wales Water Framework Directive (WFD) water body (GB641011650000) (see Figure 4). The North Wales coastal water body is described as heavily modified. The waterbody has a Fail chemical status and Moderate ecological status (NRW, 2020). The overall status is Moderate, see Table 2 (NRW, 2020).

Sediment quality

355 Liverpool Bay is characterised by three main seabed formations:

- Sand ribbons and patches with mega-ripple relief of less than 0.3 m;
- Sand wave fields, the sand waves having amplitudes of around 2 m and wavelengths of between 10 and 20 m; and
- Individual sand waves with amplitudes of up to 12 m and often carrying minor transverse waves.

356 A number of bank features are present within the general Liverpool Bay region. Apart from small banner banks tied to the headlands of Anglesey, there are many banks in the wide embayment of the approaches to the Mersey Estuary and others filling a large proportion of the many wide-mouthed estuaries.

357 The distribution of contaminants in sediments is generally similar to that of surface water. The sediment type is an important factor when considering the potential presence of contaminants within sediments. Sediments with a finer particle size, such as clays and muds, can act as adsorption surfaces for contaminants that may be released into the water column if the sediment is disturbed (Cefas, 2001). Sediments with larger particle sizes (e.g. sands) are not typically associated with elevated concentrations of anthropogenic contaminants. Hydrocarbons in particular are closely linked to the spatial distribution of sediment types. The concentrations of metals in sediments are generally higher in the coastal zone and around estuaries, decreasing offshore, indicating that river input and run-off from land are significant sources.

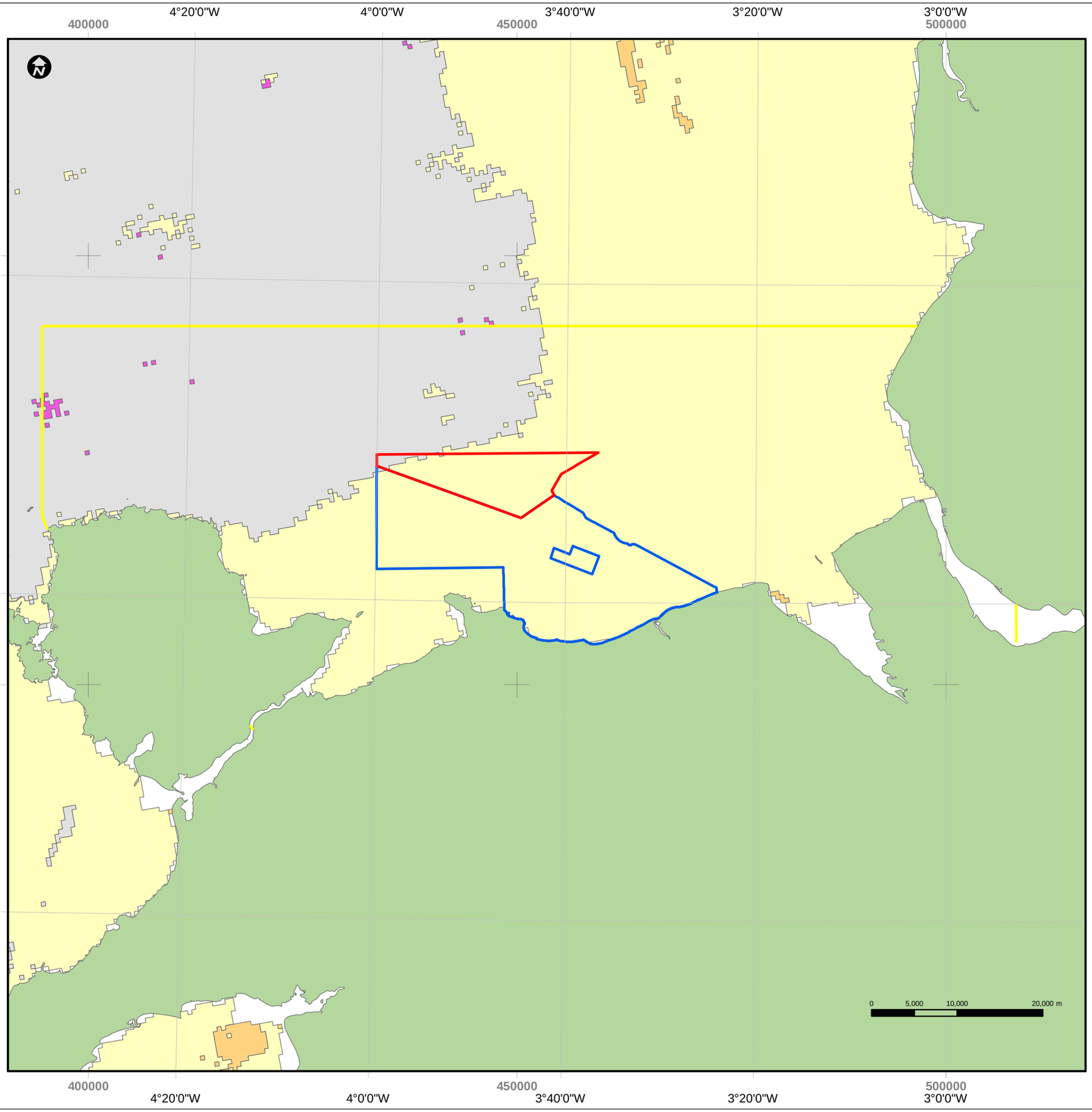
358 As presented in Figure 24, the majority of the Study Area is defined as sand and muddy sand, with coarse sediments in the northwest (Cefas, 2018). This is further supported by the sediment distribution analysis undertaken for the Gwynt y Môr OWF which indicated that the within the Gwynt y Môr array, the seabed is characterised by sand with gravels and some areas of boulders. Given the presence of sand, in the Awel y Môr array it is considered to be low risk for anthropogenic contaminants.

359 As part of baseline characterisation at Gwynt y Môr OWF, surface sediments were tested for a range of contaminants at 24 sites both within and around the Gwynt y Môr array and at inshore locations along the export cable route corridor. The results for the trace metals analysis showed low concentrations within the sediments sampled, with all being below the threshold effects levels[xix], with the exception of arsenic, which was recorded at concentrations slightly above the TEL (but well below probable effects levels) at nine sites. This result for arsenic is taken to reflect the lithogenic inputs from the north Wales region as a result of the geological weathering.

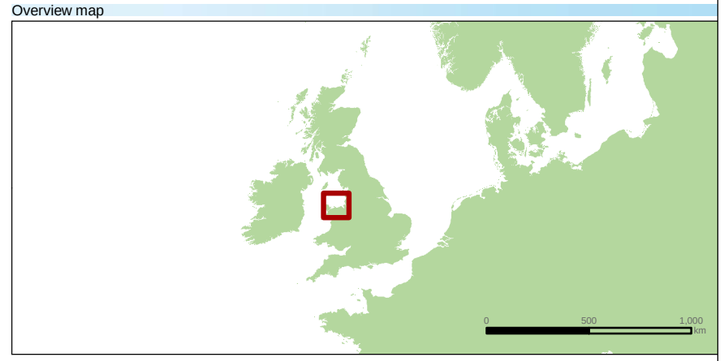
360 Both organochlorine and PCB residues were below the minimum limit of detection at all of the sampling sites for the Gwynt y Môr OWF. The concentrations of PAHs within the Gwynt y Môr sediments were also below the limits of detection or below the equivalent TEL or PEL values in most cases. However, two locations had elevated concentrations which exceeded PEL limits. It was concluded that these elevated samples were attributable to the riverine discharges of Liverpool Bay and the adjacent oil and gas extraction activities.

361 Overall, the sediments within the Gwynt y Môr OWF area did not contain any persistent contaminants at levels which are considered to pose a risk of adverse impact on the marine environment (Npower, 2005).

[xix] The Canadian guidelines define threshold effects levels (TEL), which represent the lower end of the range of concentrations at which biological effects are occasionally observed and probable effects levels (PEL) where the level of contaminant within sediments could have an effect on a wider range of organisms.



Overview map



Legend

- Array Area
- Study Area
- Offshore Export Cable Route Search Area

Cefas Sediment Model (2015)

- Coarse Sediments
- Mixed Sediments
- Mud and Sandy Mud
- Sand and Muddy Sand

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Sediment model (2015) obtained from CEFAS.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT
Offshore Windpark
Awel y Môr

TITLE
Sediment type distribution

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:450,000	@DIN A3

REV
01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\MW&SQ\AyM_0119_MWSQ_Fig4_Sediment_type_distribution.mxd

Designated sites

362 Table 30 and Figure 25 present the water bodies, as designated under the Water Framework Directive within 2 km of the proposed development. The sites outlined in Table 30 will be considered further in the screening and scoping assessments of the WFD assessment, to be provided within the PEIR. A 2 km screening distance has been selected to align with the 'Clearing the Waters for All' Guidance (Environment Agency, 2017) and deterioration of the chemical or ecological status of sites protected under the WFD are not anticipated to occur beyond this distance.

363 The WFD assessment will also be undertaken in line with 'Updated Local Authority services and the water environment - Advice note on the Water Framework Directive (NRW and Welsh Local Government Association, 2017)' as agreed as part of the Evidence Plan.

364 Eight designated bathing waters have been identified within 2 km of the ECR search area, it should be noted that following refinement of the project boundary for the EIA, this number is likely to reduce. Further details are provided in Table 30.

365 It is noted that Special Protected Areas and Special Areas of Conservation are required to be assessed under the 'Clearing the Waters for All' Guidance (Environment Agency, 2017). These will be identified in the WFD assessment and the detailed assessment of these sites will be undertaken under the HRA. Further information on Natura 2000 sites to be considered in the HRA assessment is available within the HRA Screening Report which has been made available with this Scoping Report.

TABLE 30 - PROTECTED SITES UNDER THE WATER FRAMEWORK DIRECTIVE WITHIN 2KM OF THE OFFSHORE ECR SEARCH AREA

SITE NAME	TYPE	CURRENT STATUS[xx]
Anglesey North	Coastal water body	O = Moderate, E = Good, C = Fail
North Wales	Coastal water body	O = Moderate, E = Moderate, C = Fail
Clwyd	Transitional water body	O = Moderate, E = Moderate, C = Good
Colwyn Bay	Bathing Water	Excellent
Colwyn Bay Porth Eirias	Bathing Water	Excellent
Abergele (Pensarn)	Bathing Water	Sufficient
Kinmel Bay (Sandy Cove)	Bathing Water	Good
Marine Lake, Rhyl	Bathing Water	Sufficient
Rhyl	Bathing Water	Sufficient
Rhyl East	Bathing Water	Good
Prestatyn	Bathing Water	Excellent
Rhos-on-sea	Shellfish water	B-LT (long-term)
Llanddulas	Shellfish water	Unknown[xxi]

[xx] O = Overall Status; E = Ecological Status; C = Chemical Status.
[xxi] Following a review of the latest publication of shellfish water classifications (Defra, 2020) and a further search the classification of this bed remains unknown.

4°0'0"W 3°50'0"W 3°40'0"W 3°30'0"W 3°20'0"W

440000 460000 480000

5940000 5920000 5900000

53°30'0"N 53°20'0"N 53°10'0"N

Anglesey North

North Wales

RHOS-ONSEA

LLANDDULAS

Colwyn Bay

Colwyn Bay Porth Eirias

Abergele (Pensarn)

Kinmel Bay (Sandy Cove)

Prestatyn

Rhyl

Rhyl East

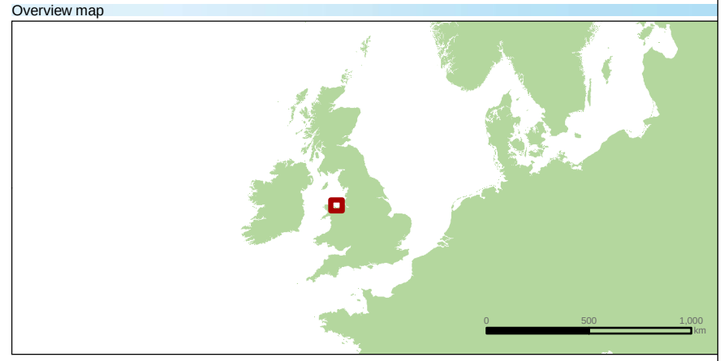
Marine Lake, Rhyl

CLWYD

0 2,500 5,000 10,000 m

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Bathing Waters
- Shellfish Waters
- WFD Transitional Water Bodies
- WFD Coastal Water Bodies

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains data obtained from Natural Resources Wales

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Geographic overview of WFD protected sites

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:200,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\MW&SQ\AyM_0119_MWSQ_Fig5_WFD_Sites.mxd

7.2.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

366 The marine water and sediment quality assessment of the EIA will follow the methodology set out in Chapter 4. Specific to the marine water and sediment quality assessment, the following guidance documents will be considered:

- Updated Local Authority services and the water environment - Advice note on the Water Framework Directive (NRW and Welsh Local Government Association, 2017);
- Water Framework Directive assessment: estuarine and coastal waters (Environment Agency, 2017);
- 'Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects'. (Cefas, 2011);
- Environmental impact assessment for offshore renewable energy projects.' (BSI, 2015); and
- 'Further review of sediment monitoring data'. (COWRIE ScourSed-09).' (ABPmer, HR Wallingford and Cefas, 2010).

Potential project impacts

367 A range of potential impacts on marine water and sediment quality have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The impacts that are proposed to be scoped into the Awel y Môr OWF EIA are outlined in Table 31, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses to enable an assessment of the impact.

368 Based on the baseline information currently available and the project description (see Chapter 3), several impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 32, together with a justification for scoping them out.

TABLE 31 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR MARINE WATER AND SEDIMENT QUALITY

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
7.2.1	Deterioration in water quality due to re-suspension of sediments	Sediment disturbance arising from construction activities, such as cable laying and foundation installation, may result in adverse effects on marine water quality. This can be a result of temporary increase in SSC and associated effects (reduction in clarity and increases in nutrient concentrations).	A characterisation of the water quality baseline will be provided, including details of the presence and extent of sediment types using existing and new site-specific survey data for both the array and the ECR. The sensitivity of the environment to the impact will be determined through available literature, designations and expert judgement. The magnitude of the impact will be informed by the physical processes assessment, which will include a quantification of the predicted sediment plume concentrations and longevity. The sensitivity and magnitude will be utilised to inform the significance of the effect – see Chapter 4.
7.2.2	Release of contaminants from disturbed sediments	Sediment disturbance arising from construction activities, such as cable laying and foundation installation, may result in adverse effects on marine water quality. This can be a	The presence and extent of sediment bound contaminants will be described in the EIA using existing and new site-specific survey data for both the array and the ECR.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		result of temporary re-suspension of contaminants within the seabed sediments.	The sensitivity of the environment to the impact will be determined through available literature, designations and expert judgement. The magnitude of the impact will be informed by the physical processes assessment, which will include a quantification of the predicted sediment plume concentrations and longevity. The sensitivity and magnitude will be utilised to inform the significance of the effect – see Chapter 4.
7.2.3	Accidental releases or spills of construction materials or chemicals	During construction activities accidental spills or releases could occur without appropriate mitigation in place.	The sensitivity of the environment to the impact will be determined through available literature, designations and expert judgement. A consideration of the potential liquids which could be spilt during the activities will be considered to determine the potential magnitude. The likelihood of an incident occurring will be considered which will be substantially reduced by the implementation of a Project Environmental Management Plan (PEMP). The sensitivity and magnitude will be utilised to inform the significance of the effect – see Chapter 4.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			A recent ruling by the ECJ, referred to as Sweetman II[xxii],relates to how screening for Likely Significant Effect (LSE) is carried out within Habitats Regulation Assessments. Specifically, the ruling is in relation to the way in which mitigation is considered in the LSE screening process. Following the Sweetman II ruling, mitigation included within the project specifically in relation to a relevant site (i.e. a site being considered within the Report to Inform Appropriate Assessment) cannot be considered during screening for Likely Significant Effect but remains relevant for consideration of adverse effect. Where project mitigation forms part of the project (or would be legally required by the project regardless of the content of the RIAA, for example standard pollution control measures), such mitigation remains in consideration during the determination of Likely Significant Effect. While it is noted that the majority of technical topics within this Scoping Report have proposed to scope out the impacts from accidental releases and spills, this effect has been retained in this

[xxii] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62017CJ0323

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			chapter. This is primarily to provide information to inform consideration of adverse effects in the report to Inform Appropriate Assessment.
OPERATIONS AND MAINTENANCE			
7.2.4	Accidental releases or spills of construction materials or chemicals-designated sites	During O&M activities accidental spills or releases could occur without appropriate mitigation in place.	The same approach will be adopted as effect 7.2.3.
DECOMMISSIONING[xxiii]			
7.2.5	Deterioration in water quality due to re-suspension of sediments	Similar to during construction activities, decommissioning could result in temporary increases in suspended sediment concentrations (SSC) and the associated effects	The same approach will be adopted as effect 7.2.1.

[xxiii] The scope of the decommissioning works will be determined by the relevant legislation, policy and guidance at the time of decommissioning. Decommissioning will accord to changing best practice and new technologies at that time.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		(reduction in clarity and increases in nutrient concentrations).	
7.2.6	Release of contaminants from disturbed sediments	Similar to during construction activities, decommissioning could result in temporary re-suspension of contaminants within the seabed sediments.	The same approach will be adopted as effect 7.2.2.
7.2.7	Accidental releases or spills of construction materials or chemicals	During decommissioning activities accidental spills or releases could occur without appropriate mitigation in place.	The same approach will be adopted as effect 7.2.3.

TABLE 32 - IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR MARINE WATER AND SEDIMENT QUALITY

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
7.2.8	Release of drilling mud from HDD at the landfall	Bentonite (specifically sodium bentonite as the chemical species under discussion) is a non-toxic, inert, natural clay mineral (<63 µm particle diameter) that can be diluted with water and used as a drilling mud, lubricating the drill annulus and forming an impermeable filter cake that acts to control fluid loss. It has been used both for HDD works for the renewable sector and in the oil and gas industry for the drilling of wells. Bentonite is on the List of Notified Chemicals approved for use in the marine environment and is classed as Offshore Chemical Notification Scheme Group E, which is the group least likely to cause environmental harm. It is anticipated that bentonite will be mixed with water to create the drilling fluid. Bentonite (specifically sodium bentonite as the chemical species under discussion) is a non-toxic, inert, natural clay mineral (<63 µm particle diameter) that can be diluted with water and used as a drilling mud, lubricating the drill annulus and forming an impermeable filter cake that acts to control fluid loss. It has been used both for HDD works for the renewable sector and in the oil and gas industry for the drilling of wells. Bentonite is on the List of Notified Chemicals approved for use in the marine environment and is classed as Offshore Chemical Notification Scheme Group E, which is the group least likely to cause environmental harm. It is anticipated that bentonite will be mixed with water to create the drilling fluid. The use of drilling mud, such as bentonite (or another inert mud), for the HDD option for making landfall, could result in the release of drilling mud within the intertidal area at the punch out point. The bentonite may then be dispersed and transported by tidal currents. The principal issues relating to bentonite release to the water column comprise the potential for an increase in SSC within an area and/or deposition causing a risk of smothering benthic organisms should the material settle on the seabed, for example during low tidal flow states. The significance

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		of such potential impacts relates to the degree to which SSC are elevated in an area and the depth and temporal extent of any deposition on the seabed. An assessment of the increases of SSC will be undertaken as part of the assessment for marine water and sediment quality (and the other relevant receptors) for all realistic worst case of all proposed activities. Although no specific modelling of bentonite within the intertidal has been undertaken for the purposes of this Scoping Report, numerous studies have been carried out regarding the fate of drilling muds and bentonite in the water column after release from oil and gas platforms. These oil and gas studies provide a good indication of the behaviour of bentonite after re-suspension by wave action, in particular the dispersal of bentonite within the marine environment. The initial plume from the drill mud can produce a high SSC locally, however the dispersal and dilution of the drilling muds within the water column is very rapid and occurs over very small distances. Coats (1994) demonstrated that within 0.5 km of an actively drilling oil and gas platform, only 2% of the SSC could be attributed to the drilling muds. It is also noteworthy that the bentonite release from the oil and gas platform was situated in deep waters offshore, the current speeds were lower than those found in the Study Area; as such, dispersal should be even more rapid within the higher energy environment. Therefore, it can be expected that within one tidal cycle the contribution of the bentonite to the local background levels of SSC would be negligible. Any elevation in SSC as a consequence of inert drilling mud, such as bentonite, would be localised, within the range of natural variability and temporary and as such it is not anticipated to result in significant effects in EIA terms. Bentonite itself is inert and the increase in SSC from the project activities more generally will be included within the EIA. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
OPERATION		
7.2.9	Deterioration in water quality due to re-suspension of sediments and contaminants as a result of scour	There is the potential that sediment could be re-suspended as a result of scour around project infrastructure (including WTGs and cable protection). Given that the volume of suspended sediment released during operation via scour would be much lower than during construction, it is proposed that this impact will be scoped out from further consideration within the EIA. Furthermore, the effect will be highly localised and associated volumes of mobilised sediment (and associated contaminants) are considered to be within the range of natural variability. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.

Mitigation measures adopted as part of the project

369 As part of the design process for Awel y Môr OWF, a number of designed-in measures are proposed to reduce the potential for impacts on marine water and sediment quality receptors. These are presented below. These will evolve over the development process, as the EIA progresses, and in response to consultation.

370 innogy is committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 31 and Table 32.

371 Measures adopted as part of the project will include:

i. A Project Environment Management Plan (PEMP) will be produced post-consent and implemented to cover the construction and O&M phases of Awel y Môr OWF. The PEMP will include a Marine Pollution Contingency Plan to cover accidental spills, potential contaminant release and include key emergency contact details (e.g. Marine Management Organisation, Maritime Coastguard Agency and the project site co-ordinator). Development of, and adherence to, an appropriate PEMP;

- A Decommissioning Programme will be developed to cover the decommissioning phase; and
- Typical measures to be included within the plans above include storage of all chemicals in secure designated areas with impermeable bunding (generally to 110% of the volume); and double skinning of pipes and tanks containing hazardous materials. The purpose of these measures is to ensure that potential for contaminant release is strictly controlled and provides protection to marine life across all phases of the life of the wind farm.

372 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

373 Full details of the proposed approach to assessing cumulative effects for Awel y Môr are provided in Chapter 3.

374 The potential effects of the proposed Awel y Môr OWF on marine water and sediment quality are highly localised and small scale, and so cumulative impacts are unlikely to occur. This is supported by the relatively low levels of potential contaminants, particularly further offshore, within the sediments. Due to the localised nature of any potential impacts, such as suspended sediment plumes, cumulative impacts are unlikely to be significant (in EIA terms) and therefore it is proposed that this impact will be scoped out from further consideration within the EIA for marine water and sediment quality.

Potential transboundary Impacts

375 The potential effects of the proposed Awel y Môr OWF on marine water quality will be highly localised and small scale with limited potential for transboundary impacts. No transboundary impacts are anticipated with other wind farms or other activities in the region. It is proposed that in line with the approach agreed for previous projects (e.g. East Anglia THREE and Norfolk Vanguard (Planning Inspectorate, 2012 and 2016)) transboundary impacts are scoped out from further consideration within the EIA. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.

7.2.6 Summary of next steps

376 The proposed approach to the assessment for marine water and sediment quality PEIR chapter will be to define the worst-case scenarios on which the assessments will be based. The assessment will be informed by the Physical Processes assessment, and in particular the assessment of changes in SSC and bed disposition.

377 An additional site-specific survey (including sediment analysis) is proposed to help fill data gaps that currently exist across the Awel y Môr OWF Study Area. The survey will identify the potential areas of sediment contamination and quantify the levels of contamination within the PEIR Study Area. The survey methodology will be provided to the Evidence Plan to seek agreement on the methodology and principles of the proposed survey.

7.2.7 Further considerations for consultees

i. Do you agree that the data sources identified are sufficient to inform the marine water and sediment quality baseline for the Awel y Môr OWF PEIR and ES?

ii. Are you aware of any point sources of contaminants within the Study Area which may be of concern? If so, are any data available for these?

iii. Have all potential impacts resulting from Awel y Môr OWF been identified for marine water quality receptors?

iv. Have all potential impacts resulting from Awel y Môr OWF been identified for marine sediment quality receptors?

v. Do you agree that the most appropriate guidance is Clearing the Waters for all, NRW's Updated Local Authority services and the water environment - Advice note on the Water Framework Directive, and PINS Advice Note 18?

vi. Do you agree that the impacts described in Table 32 can be scoped out?

vii. For those impacts scoped in (see Table 31), do you agree that the methods described are sufficient to inform a robust impact assessment?

viii. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on marine water and sediment quality receptors?

8 Offshore Environment – Biological Environment

8.1 Benthic Subtidal & Intertidal Ecology

8.1.1 Introduction

378 This Section of the Scoping Report identifies benthic subtidal and intertidal ecology resources of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on benthic species and habitats (up to the MHWS mark) and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

379 This chapter should be read alongside the following chapters of this Scoping Report:

- Section 7.2: Marine water and sediment quality;
- Section 8.2: Fish and Shellfish Ecology; and
- Section 10.1: Terrestrial Ecology and Nature Conservation – which covers effects on habitats to landward of MHWS.

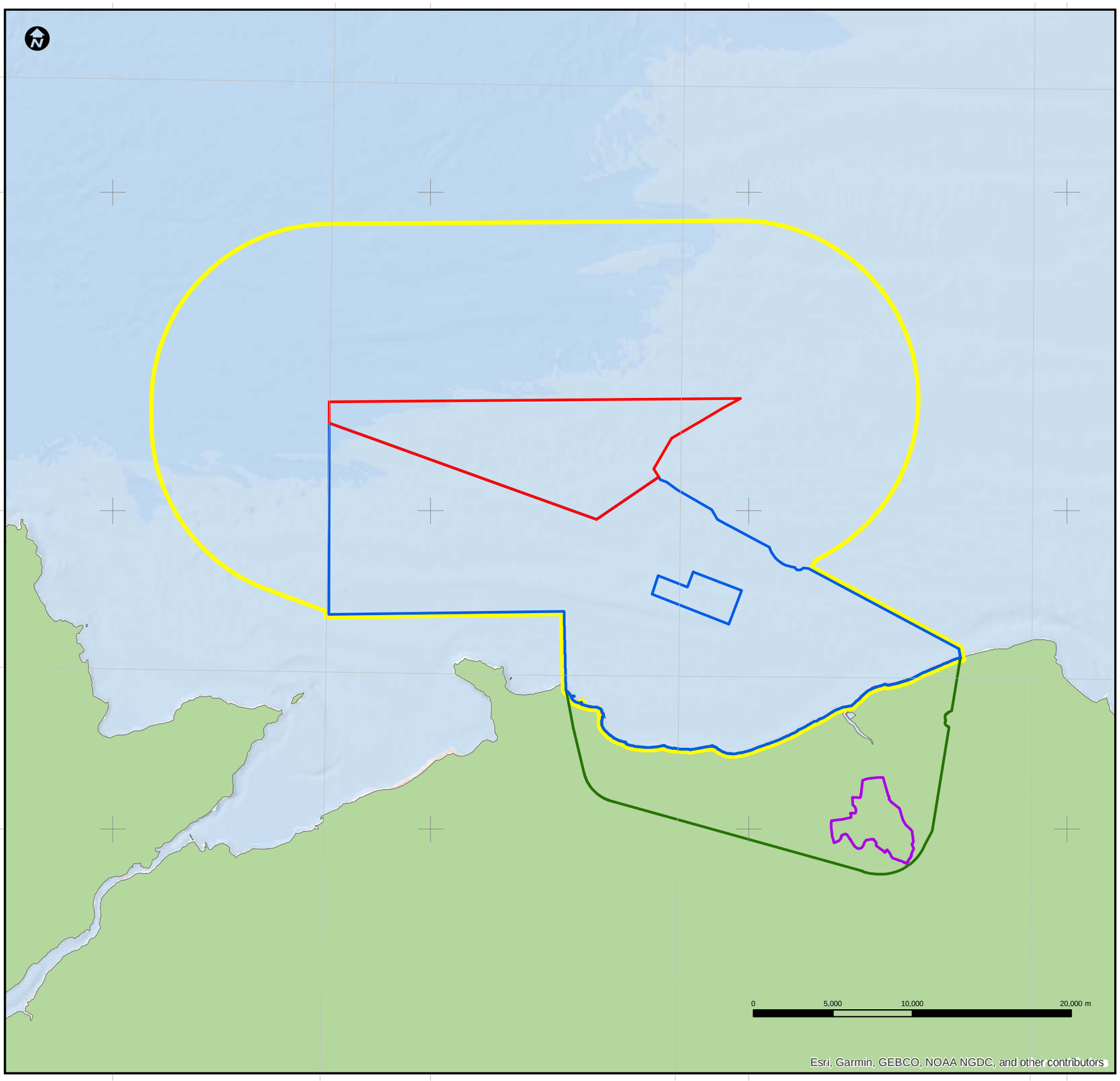
8.1.2 Study Area

380 For the purposes of this benthic subtidal and intertidal ecology scoping assessment, the benthic ecology Study Area has been defined at two spatial scales:

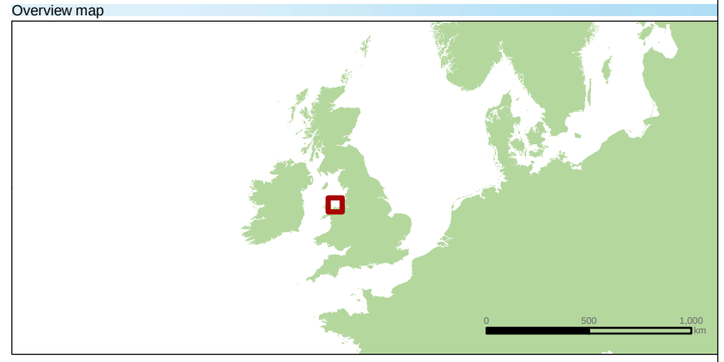
- The Awel y Môr Study Area defined as the area encompassing the array area and the offshore ECR search area, as shown in Figure 26. The Awel y Môr benthic ecology Study Area includes the intertidal zone at potential landfall options up to MHWS.
- A wider Study Area including an 11 km buffer surrounding the array area, which represents the tidal ellipse distance as modelled for the Gwynt y Môr Offshore Wind Farm project (RWE, 2005), in order to incorporate the potential maximum distance suspended sediments may be disturbed and therefore travel as a result of the construction (or decommissioning) activities. The ECR search area is considered a large Study Area for impacts associated with export cable installation, however this will be reviewed as the project evolves.

381 The Study Area will be reviewed during subsequent stages of the EIA process and refined as necessary to reflect the development of the scheme. Additionally, information from the physical processes technical report will inform the final Study Area, in order to incorporate the maximum distance suspended sediments disturbed by the development of the OWF might impact benthic habitats.

4°0'0"W
3°40'0"W
3°20'0"W
420000
440000
460000
480000
53°40'0"N
5940000
5920000
5900000
53°20'0"N



Overview map



Legend

- Array Area
- Study Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT
Offshore Windpark
Awel y Môr

TITLE
The Awel y Môr benthic ecology Study Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:250,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Benthic EcologyAyM_0119_BE_Fig1_Benthic_Ecology_Study_Area.mxd

8.1.3 Baseline data

382 A desk-based review of literature and data sources to support this Scoping Report highlighted the following data sources, which provide coverage across large parts of the Awel y Môr OWF benthic ecology Study Area, and wider region (see Table 33 and Figure 27).

TABLE 33 - DATA SOURCES CONSULTED FOR THE AWEL Y MÔR OWF

SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR OWF ARRAY AREA AND OFFSHORE ECR SEARCH AREA
Gwynt y Môr OWF baseline characterisation (CMACS, 2005[1])	Drop-down video (DDV) and grab sampling gear were deployed across the Gwynt y Môr OWF site and surrounding area as part of the baseline characterisation.	Good data coverage across the Awel y Môr OWF benthic ecology Study Area (Figure 27).
Gwynt y Môr OWF pre-construction study (CMACS, 2011)	Drop-down video (DDV) and grab sampling gear were deployed across the Gwynt y Môr OWF site and surrounding area as part of pre-construction monitoring.	Good data coverage across the Awel y Môr OWF benthic ecology Study Area (Figure 27).
Gwynt y Môr OWF post-construction surveys (NIRAS, 2017 and 2018/2019 survey)	Drop-down video (DDV) and grab sampling gear were deployed across the Gwynt y Môr OWF site and surrounding area as part of post-construction monitoring.	Good data coverage across the Awel y Môr OWF benthic ecology Study Area (Figure 27).
UKSeaMap (2018)	EUNIS Level 4 model, detailing biological zone and substrate.	Complete coverage up to MHWS.

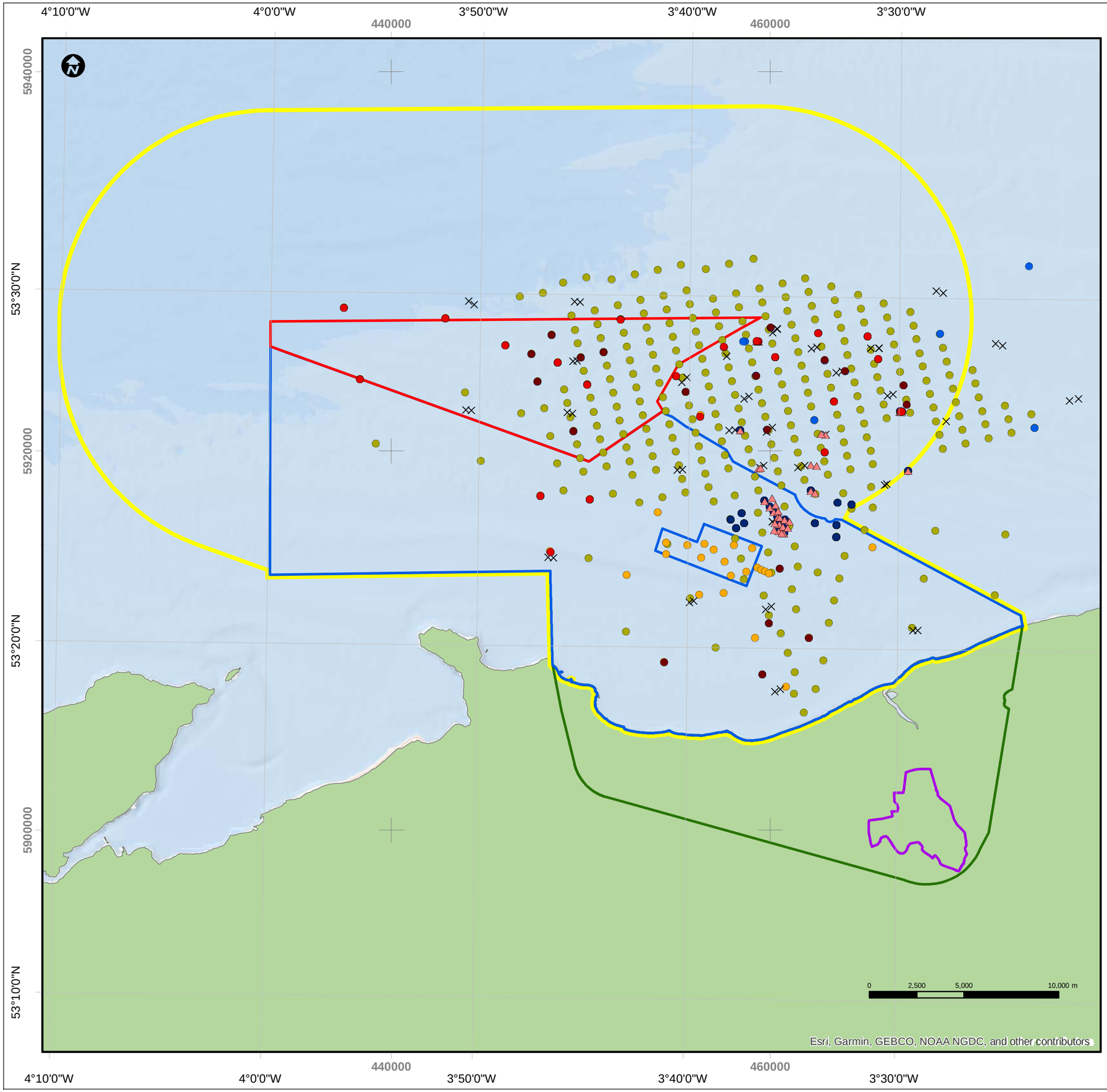
SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR OWF ARRAY AREA AND OFFSHORE ECR SEARCH AREA
North Hoyle OWF baseline characterisation (CMACS, 2002)	Benthic grab and trawl sampling were undertaken across the North Hoyle OWF site and surrounding area as part of the characterisation study	No overlap with Awel y Môr OWF array area or offshore ECR search area. However, dataset provides a regional context for site-specific information.
Burbo Bank OWF baseline characterisation (SeaScape Energy, 2002)	Benthic grab and trawl sampling were undertaken across the Burbo Bank OWF site and surrounding area as part of the characterisation study.	No overlap with Awel y Môr OWF array area or offshore ECR search area. However, dataset provides a regional context for site-specific information.
Rhyl Flats pre-construction study (CMACS, 2005[2])	Benthic grab and trawl sampling were undertaken across the Rhyl Flats OWF site and surrounding area as part of pre-construction monitoring.	Rhyl Flats monitoring data overlaps with the Awel y Môr OWF offshore export cable route search area (Figure 27).

383 It should be noted that as there is a good data coverage across the Awel y Môr OWF benthic ecology Study Area, the data informing this scoping characterisation is of high quality and confidence.

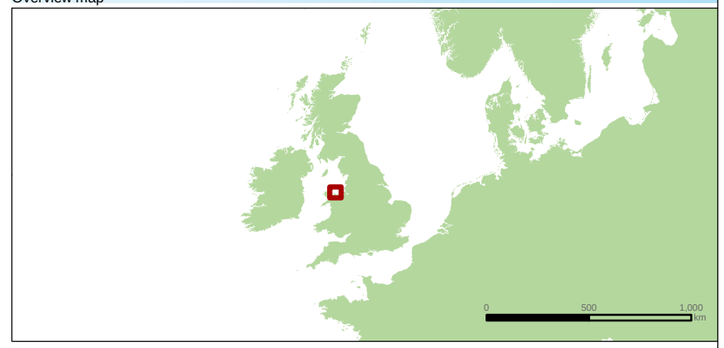
384 To supplement and complement the existing data sources, further information will be available for the Awel y Môr benthic ecology Study Area through site-specific benthic ecology surveys which will be undertaken across both the array and the ECR in 2020.

385 Subtidal benthic habitats will be sampled via a combination of targeted benthic infaunal grab sampling and drop-down video (DDV) surveys. Sediment samples will also be collected for contaminants and particle size analysis.

386 Intertidal benthic habitats will be characterised via a Phase I habitat survey.



Overview map



Legend

- Array Area
- Study Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area

GyM post-con Yr1 (2016)

- Fauna & PSA
- PSA only
- DDV

GyM pre-con (2011)

- Fauna & PSA
- DDV
- Trawl

Rhyl Flats (2006)

- Fauna & PSA

GyM EIA (2005)

- Fauna & PSA

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT
Offshore Windpark
Awel y Môr

TITLE
The location of existing subtidal benthic grab, DDV and trawl data across the Awel y Môr OWF benthic ecology Study Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:200,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Benthic Ecology\AyM_0119_BE_Fig2_Benthic_Grab_DDV_Trawl.mxd

8.1.4 Baseline environment

387 The following Section provides a high-level overview of the benthic subtidal and intertidal ecology baseline environment for the Awel y Môr OWF benthic ecology Study Area and wider Study Area, including a review of the relevant marine nature conservation designations.

Subtidal sediments

388 Broadscale regional habitat mapping to EUNIS Level 4, detailing biological zone and substrate (UKSeaMap, 2019), indicates that the dominant habitats across the Awel y Môr benthic ecology Study Area are predominantly characterised by circalittoral fine sands or circalittoral muddy sands and infralittoral fine sands or infralittoral muddy sands with circalittoral coarse sediments across some of the site and nearer the edges of the Study Area boundary. Deep circalittoral sand is also indicated in a swath across the northern part of the proposed array (Figure 28).

389 Figure 28 represents point sediment data that have been collected across the Awel y Môr Study Area, as part of monitoring programmes at Gywnt y Môr OWF (NIRAS, 2017; CMACS, 2011; CMACS, 2005[1]) and Rhyl Flats (CMACS, 2005[2]). The data show that the sediments within the Study Area and wider region comprise of a mixture sands and gravels, ranging across the BGS categories sand, slightly gravelly sand, gravelly sand and sandy gravel. The distribution of these habitats is influenced by a number of physical factors, such as substrate type, depth and tidal conditions at the seabed.

390 During the post-construction survey at Gywnt y Môr OWF (NIRAS, 2017), the organic content in the 43 grab samples revealed that total organic content of the sediments sampled was very low (0.37% to 1.38%), which is to be expected of coarser sediments. This was in-line with the results found during the baseline characterisation and pre-construction surveys (CMACS, 2011; CMACS, 2005a).

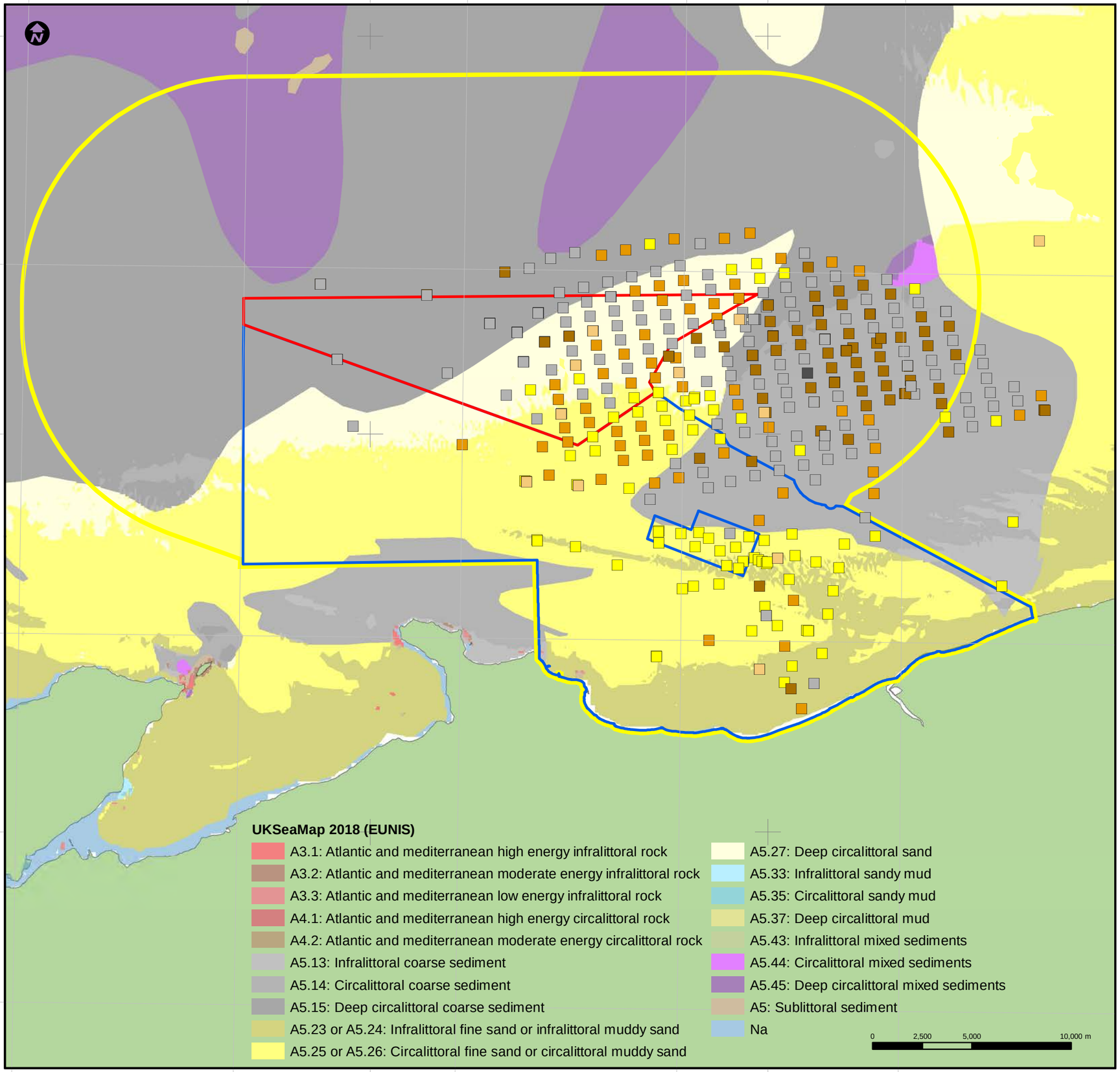
391 As part of baseline characterisation at Gwynt y Môr OWF, surface sediments were tested for a range of contaminants. The results revealed that the levels of contaminants within the sediments were generally low. However, levels of arsenic were raised in certain areas of the project area, but these concentrations were all found to be below the probable effects levels suggested by sediment quality guidelines. Elevated levels of arsenic found were also found in other surveys in Liverpool Bay, such as the North Hoyle OWF baseline survey (CMACS, 2002). The concentrations of PAHs within the Gwynt y Môr sediments were also below the limits of detection or below the PEL values in most cases. However, two locations had elevated concentrations which exceeded PEL limits. Overall, the sediments within the Gwynt y Môr OWF area did not contain any persistent contaminants at levels which are considered to pose a risk of adverse impact on the marine environment (Npower, 2005). More details are provided in Section 7.2.

4°10'0"W 4°0'0"W 3°50'0"W 3°40'0"W 3°30'0"W

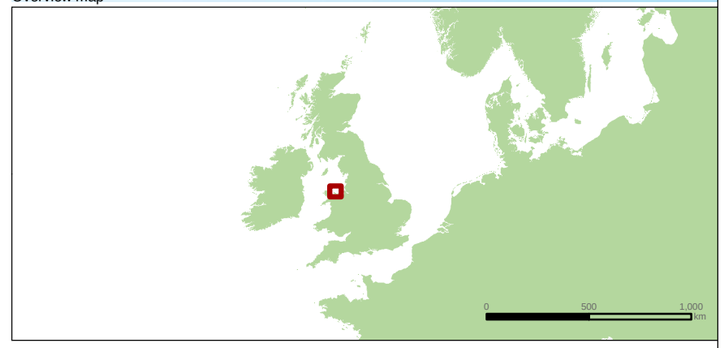
440000 460000

5940000 5920000 5900000

53°30'0"N 53°20'0"N 53°10'0"N



Overview map



Legend

- Array Area
- Study Area
- Offshore Export Cable Route Search Area

Sediment Description

- Gravel
- Gravelly Sand
- Sand
- Sandy Gravel
- Slightly Gravelly Sand
- Slightly Sandy Gravel

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

UKSeaMap 2018 has been generated by JNCC and is a by-product of the 2013-2016 activities of the EMODnet Seabed Habitats 2013-2016 consortium.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE BGS Sediment description from sample locations obtained across the Awel y Môr OWF benthic ecology Study Area and wider surrounding region

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:200,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Benthic Ecology\AyM_0119_BE_Fig3_BGS_Sediment_EUNIS.mxd

Subtidal benthic ecology

392 Much of the subtidal benthos in the eastern Irish Sea is composed of sedimentary communities. These communities tend to be dominated by burrowing animals known as infauna although epifauna (species living on the surface of sediments) are also important, especially in areas of coarser substratum (NIRAS, 2017; CMACS, 2005[1]; SeaScape Energy, 2002; COWL, 2002). Mackie (1990) described most of the eastern Irish Sea as being dominated by Venus communities, the deep Venus community occurring on coarser sands and gravels and the shallow Venus community on finer sands, usually in shallower waters. However, it is considered that it is the shallow Venus community which dominates areas around the Irish Sea coastline, including much of Liverpool Bay.

393 Surveys across the adjacent site Gywnt y Môr OWF during the post-construction monitoring programme identified that the infaunal communities across the site were relatively rich, although the total number of taxa at each station ranged from 16 to 144 with generally high numbers of taxa recorded at stations located within the wind farm. There were also generally high numbers of individuals from samples taken within the wind farm.

394 The most abundant faunal group in the grab survey were annelid worms. The most abundant taxa included the horseshoe worm *Phoronis* spp., the amphipod *Urothoe marina,* the keel worm *Spirobranchus triqueter* and the ribbon worm *Nemertea* spp.

395 Sessile epifauna recorded were typical of sand-scoured mixed sediments, mostly cnidarians such as *Hydrallmania falcata*, *Sertularia* sp. (both hydrozoans), the octocoral *Alcyonium digitatum* and the anemones *Metridium senile, Urticina felina*, *Sagartia* sp. and *Sagartiogeton undatus*. The erect bryozoan *Flustra foliacea* was also recorded across much of the site. Mobile epifauna included echinoderms such as the starfish *Asterias rubens*, sea urchin *Psammechinus miliaris* and brittlestars *Ophiura* spp. as well as the goby *Pomatoschistus* sp.

396 The results of the surveys across the Gywnt y Môr OWF site, which included grab, DDV and trawl data from pre- and post-construction surveys, were used to describe the following biotopes (JNCC Marine Habitat Classification) that have been identified within the Awel y Môr benthic ecology Study Area. A description of each biotope identified is presented below and the distribution of biotopes is presented in Figure 29.

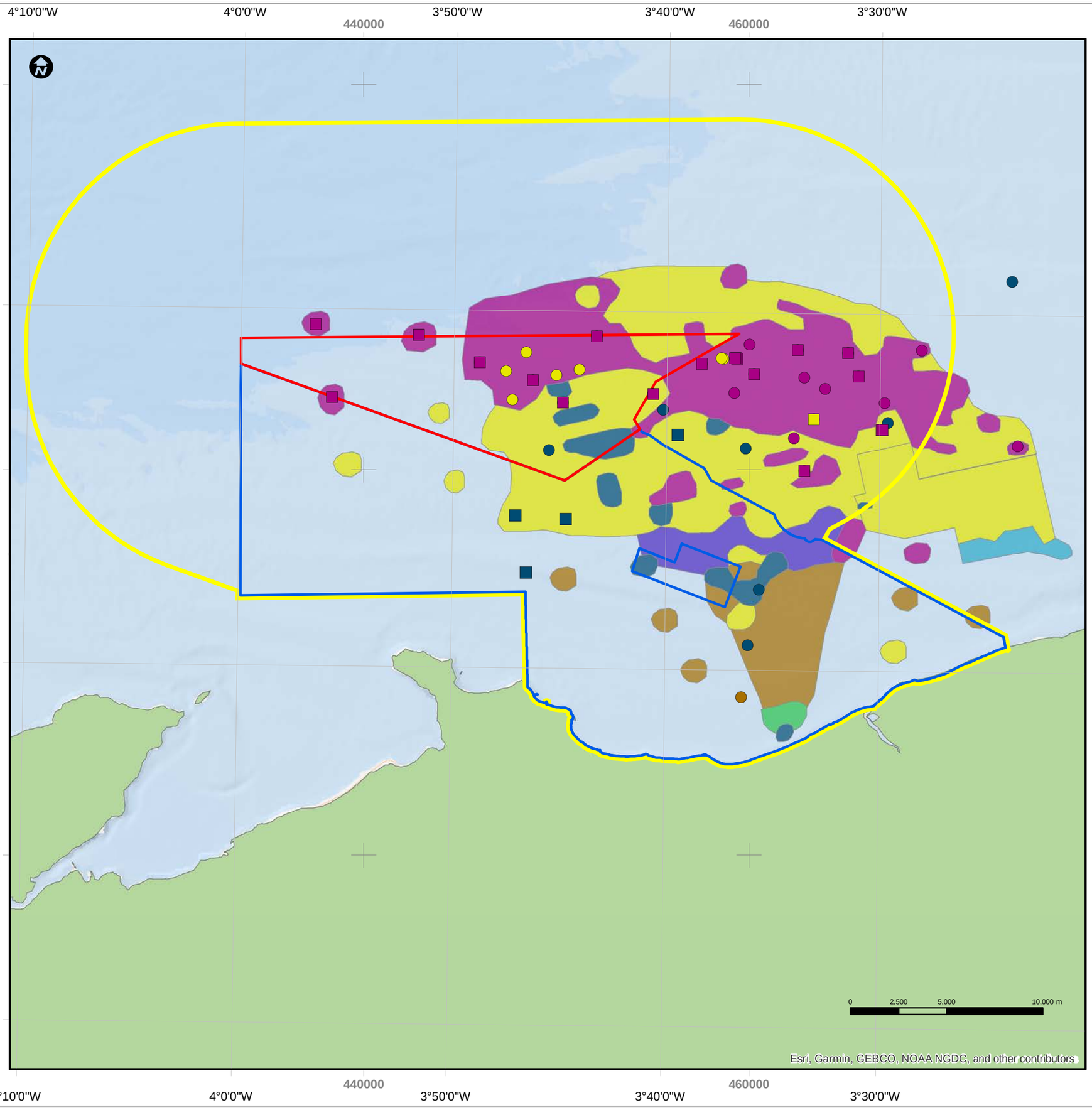
- SS.SCS.ICS.MoeVen (*Moerella* spp. with venerid bivalves in infralittoral gravelly sand): Infralittoral medium to coarse sand and gravelly sand which is subject to moderately strong water movement from tidal streams may be characterised by *Moerella* spp. with the polychaete *Glycera lapidum* (agg.) and venerid bivalves. Typical species include *Moerella pygmaea* or *M. donacina* with other robust bivalves such as *Dosinia lupinus*, *Timoclea ovata*, *Goodallia triangularis* and *Chamelea gallina*.
- SS.SSA.IfiSa.NcirBat (*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand): Well-sorted medium and fine sands characterised by *Nephtys cirrosa* and *Bathyporeia* spp. (and sometimes *Pontocrates* spp.) which occur in the shallow sublittoral to at least 30 m depth. This biotope occurs in sediments subject to physical disturbance, as a result of wave action (and occasionally strong tidal streams).
- SS.SCS.CCS.MedLumVen (*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel): Circalittoral gravels, coarse to medium sands, and shell gravels, sometimes with a small amount of silt and generally in relatively deep water (generally over 15-20m), may be characterised by polychaetes such as *Mediomastus fragilis*, *Lumbrineris* spp., *Glycera lapidum* with the sea urchin *Echinocyamus pusillus*. Other taxa may include Nemertea spp., *Protodorvillea kefersteini*, *Owenia fusiformis*, *Spiophanes bombyx* and *Amphipholis squamata* along with amphipods such as *Ampelisca spinipes*.
- SS.SSA.IMuSa.FfabMag (*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves): In stable, fine, compacted sands and slightly muddy sands in the infralittoral and littoral fringe, communities occur that are dominated by venerid bivalves such as *Chamelea gallina*. This biotope may be characterised by a prevalence of *Fabulina fabula* and *Magelona mirabilis* or other species of Magelona (e.g. *M. filiformis*). Other taxa, including the amphipod *Bathyporeia* spp. and polychaetes such as *Chaetozone setosa*, *Spiophanes bombyx* and *Nephtys* spp. are also commonly recorded.
- SS.SCS.ICS.SLan (dense *Lanice conchilega* and other polychaetes in tide-swept infralittoral sand and mixed gravelly sand): Dense beds of *Lanice conchilega* occur in coarse to medium fine gravelly sand in the shallow sublittoral, where there are strong tidal streams or wave action. Several other species of polychaete also occur as infauna e.g. *Spiophanes bombyx*, *Scoloplos armiger, Chaetozone setosa* and *Magelona mirabilis*.

397 The biotope communities identified above are typical of the faunal assemblages previously described for the eastern Irish Sea. This is supported by benthic surveys undertaken at the Burbo Bank OWF site located at the mouth of the Mersey Estuary, which described the benthic communities from across much of the surveyed area to be dominated largely by the biotope SS.SSA.IMuSa.FfabMag in deeper areas and by SS.SSA.IfiSa.NcirBat in shallower areas, including most of the subtidal part of the cable route (SeaScape Energy, 2002).

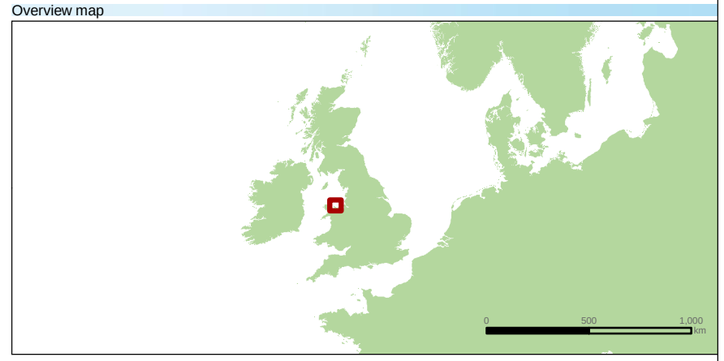
398 Results from the site-specific surveys undertaken at the Rhyl Flats OWF identified that the benthic community was also similar to that described above, with the main biotopes also being SS.SSA.IfiSa.NcirBat and SS.SSA.IMuSa.FfabMag (COWL, 2002).

399 The North Hoyle baseline survey of 2001 revealed that the benthic community at North Hoyle fitted reasonably well to that of Mackie's shallow Venus community, with the biotope SS.SCS.ICS.MoeVen dominating most of the site (RWE, 2003).

400 As depicted in Figure 29, the EUNIS 4 predictive habitat map demonstrates that the EUNIS Level 4 habitats are similar across the wider region and therefore we can expect the biotopes within the Awel y Môr benthic ecology Study Area to be representative of those that have been recorded in the wider Study Area previously.



Overview map



Legend

- Array Area
- Study Area
- Offshore Export Cable Route Search Area

GyM post-con Yr1 (2016)

- SS.SCS.CCS.MedLumVen
- SS.SCS.ICS.MoeVen
- SS.SSa.IFiSa.NcirBat

Biotopes GyM pre-con (2011

- SS.SCS.CCS.MedLumVen
- SS.SCS.ICS.MoeVen
- SS.SSA.IMuSa.FfabMag
- SS.SSA.IfiSa.NcirBat

Biotopes GyM EIA (2005)

- SS.SSA.IMuSa.EcorEns
- SS.SSA.ImuSa.FfabMag
- SS.SCS.CCS.MedLumVen
- SS.SCS.ICS.MoeVen
- SS.SSA.IfiSa.NcirBat
- SS.SCS.ICS.SLan
- Unclassified stoney ground

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT
Offshore Windpark
Awel y Môr

TITLE
Biotope descriptions (JNCC Marine Habitat Classification) from existing data sources across the Awel y Môr OWF benthic ecology Study Area and wider surrounding region

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:200,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Benthic Ecology\AyM_0119_BE_Fig4_Biotope_Descriptions.mxd

Intertidal benthic ecology

401 The intertidal zone across the Awel y Môr benthic ecology Study Area is mostly characterised by shingle and sandy shores, with areas of sand dunes and saltmarsh, associated with the region's estuaries, also present. Studies such as Bamber (1988) and Garwood & Foster-Smith (1991) have investigated the sandy intertidal zone between Rhos-on-Sea (Conwy) and New Brighton (Wirral) and CCW have also undertaken Phase I habitat mapping of the North Wales coastline (CCW, 2004). Results from these studies describe mostly areas of medium sands supporting populations of polychaetes such as *Scolelepis squamata*, burrowing crustaceans including the amphipod *Bathyporeia pelagica* and the isopod *Eurydice pulchra*, found above the mid-tide level on the open shore. Below the mid-tide level, communities were dominated by the polychaetes; *Spio martinensis, Magelona mirabilis, Nephtys cirrosa, Lanice conchilega* and *Arenicola marina*. Areas of hard substratum were noted as being usually artificial (sea defences) and these tended to be encrusted by species such as *Mytilus edulis*, *Elminium modestus* and *Semibalanus balanoides*, in addition to lichens and algae.

402 Extensive areas of shingle are present throughout the coastline of the eastern Irish Sea, but its extent is thought to represent only a relatively small proportion of the United Kingdom's shingle habitat (Randall, 1996). Much of this shingle is described as barren, supporting an impoverished community structure with very few invertebrate species.

403 Within the region there are also several major estuaries, notably the Conwy, Dee, Mersey and Ribble. These comprise mudflats and sandflats and almost all of the saltmarsh within Liverpool Bay. The mudflats are known to support faunal communities characterised by the estuary ragworm (*Hediste diversicolor*) and oligochaetes, in addition to molluscs such as cockles. Mobile banks of intertidal sediments are common at the mouths of these estuaries, which are known to support species such as the burrowing amphipod, *Bathyporeia pelagica* and the polychaete worm, *Nephtys cirrosa*. Most of the saltmarsh habitat is concentrated within the Dee and Ribble Estuaries with smaller pockets found in the Clwyd, Mersey and Conwy. Saltmarsh plant species commonly associated with these estuaries are: *Potomageton, Ceratophylum, Zannichella, Myophyllum, Pucinellia maritima* and *Salicornia* spp. (BHP Billiton Petroleum Ltd., 2001).

404 Sand dune habitats are present along the North Wales coastline at Kinmel Bay, Talacre and Gronant with the latter two areas representing the last surviving complex of north facing dunes in Wales east of Anglesey (BHP Billiton Petroleum Ltd., 2001). Small areas of dune habitats are also found along the Wirral coastline (Doody, 1989). These sand dunes are characterised by plants such as marram grass *Ammophilia arenaria* and lyme grass *Elymus arenarius* (BHP Billiton Petroleum Ltd., 2001).

Annex 1 habitats

405 Annex I habitats are defined under the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora; more commonly referred to as the EC Habitats Directive (1992) as amended. Under these regulations, species and habitats that fall into specific categories are eligible for legal protection from activities which have the potential to damage them.

406 The nearest designated subtidal Annex I habitat to the Awel y Môr Study Area lies within the Menai Strait and Conwy Bay / Y Fenai a Bae Conwy SAC. As identified in Table 34, this designated site lies adjacent to the west of the Awel y Môr Study Area (Figure 30). The Annex I habitat includes 'sandbanks which are slightly covered by sea water all the time', 'mudflats and sandflats not covered by seawater at low tide' and 'rocky reefs'.

407 Constable Bank is a sandbank feature which crosses the Awel y Môr Study Area within the offshore ECR search area, although this feature does not form part of the Menai Strait and Conwy Bay SAC. Large areas of the inshore eastern Irish Sea are composed of sandy substrate in less than 20m water depth, which are identified as being potential Annex I habitat. These shallow sandy sediments are typically colonised by burrowing infauna of worms, crustaceans, molluscs and echinoderms and have associated epifauna such as crabs and gastropods. Where surface material is coarse e.g. shell, species of algae, bryozoans, hydroids and ascidians may form distinct communities. These sandbank habitats are widely distributed on the Atlantic coastlines of north-west Europe and within the UK they are considered as being widespread in inshore waters (JNCC, 2019).

408 There is also the occurrence of potential reef habitat within an area on the north side of Ynys Mon (Isle of Anglesey). Records reveal that there is an extensive area of gravel containing patches of gravelly sand with scattered rock outcrops. Within this area are patches of *Modiolus modiolus* reef (although the exact location of these areas is not clearly defined) (CMACS, 2005[1]).

409 Across the intertidal, the reef forming worm *Sabellaria alveolata* has previously been recorded within the Awel y Môr benthic ecology Study Area, at Colwyn Bay (Frost *et al.* 2004).

410 There are occurrences of other potential Annex I habitat across the Awel y Môr Study Area including 'sandbanks which are slightly covered by sea water all the time' and 'reef' habitats. Site specific surveys will be undertaken to review and understand the extent of such features.

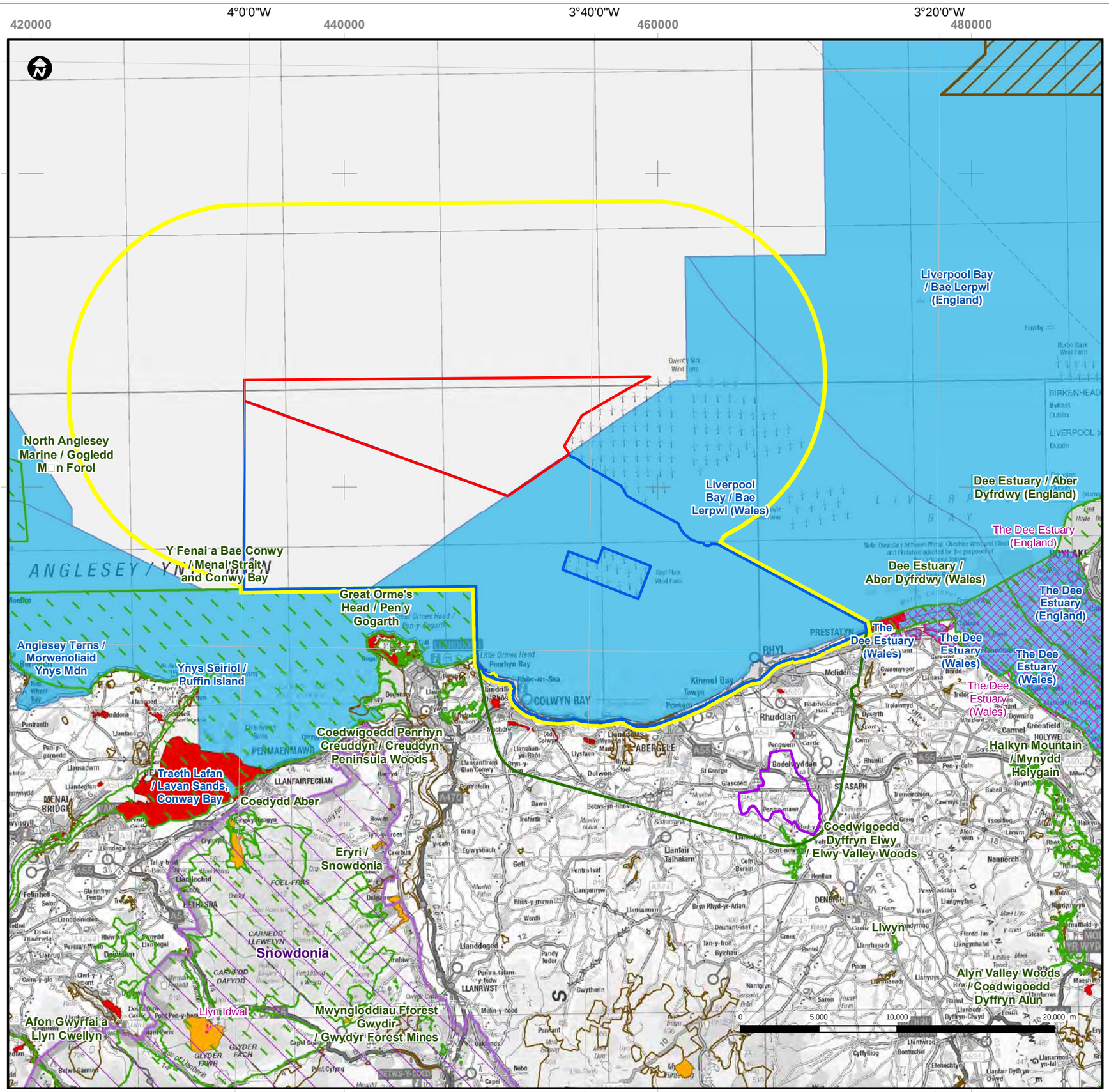
Designated sites

411 For this Scoping Report, a review has been undertaken to identify designated sites in the Awel y Môr benthic Study Area which are either designated for benthic and intertidal ecology interest or habitats/species which are dependent on or associated with benthic and intertidal ecology.

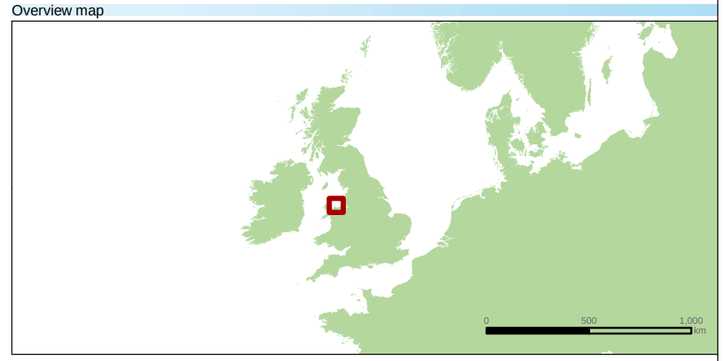
412 The nature designations which have been screened in for consideration in the benthic subtidal and intertidal ecology EIA comprise of European conservation sites (i.e. SACs, SCIs and Ramsar sites) and national designations (i.e. SSSIs, NNRs and designated (and recommended MCZs), which are listed in Table 34 and presented in Figure 30. Further details on the SACs, SCIs and Ramsar sites are provided in the HRA Screening Report (innogy, 2020).

TABLE 34 - MARINE NATURE CONSERVATION DESIGNATIONS WITH RELEVANCE TO BENTHIC SUBTIDAL AND INTERTIDAL ECOLOGY AND AWEL Y MÔR OWF

SITE	#	FEATURES OR DESCRIPTION
INTERNATIONAL		
Menai Strait and Conwy Bay / Y Fenai a Bae Conwy SAC	No overlap but the site lies adjacent offshore ECR search area	Annex I habitats that are a primary reason for the selection of this site, which include: ▪ Sandbanks which are slightly covered by sea water all the time; ▪ Mudflats and sandflats not covered by seawater at low tide; and ▪ Reefs
Dee Estuary/ Aber Dyfrdwy SAC	No overlap but the site lies adjacent offshore ECR search area	Annex I habitats that are a primary reason for the selection of this site, which include: ▪ Mudflats and sandflats not covered by seawater at low tide; ▪ Salicornia and other annuals colonizing mud and sand; and ▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
North Anglesey Marine / Gogledd Môn Forol SAC	13.8 km from Awel y Môr OWF array boundary	Annex II species harbour porpoise (*Phocoena phocoena*) are the primary reason for the selection of this site
NATIONAL		
Fylde Marine Conservation Zone	25.8 km from Awel y Môr OWF array boundary	This site was chosen for the extensive areas of subtidal sediment habitats "subtidal sand" and "subtidal mud"



Overview map



Legend

- Array Area
- Study Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area
- Marine Conservation Zone
- Special Area of Conservation
- Special Protection Areas
- Ramsar Site
- National Parks
- National Nature Reserve
- Local Nature Reserve
- Site of Special Scientific Interest

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Designated sites surrounding Awel y Môr, with relevance to benthic subtidal and intertidal ecology

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:250,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Benthic Ecology\AyM_0119_BE_Fig5_Designated_Sites.mxd

8.1.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

413 The benthic subtidal and intertidal ecology assessment will follow the methodology set out in Chapter 4: Environmental Impact Assessment Approach and Methodology. Specific to the benthic subtidal and intertidal ecology assessment, the following guidance documents will be considered:

- Guidelines for EIA in Britain and Ireland. Marine and Coastal, Final Document (IEEM, 2010);
- Guidance note for EIA in respect of FEPA and CPA requirements (Cefas *et al*., 2004);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012);
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008); and
- Benthic habitat assessment guidance for marine developments and activities: Guidance for undertaking benthic marine habitat survey and monitoring (NRW, 2019).

Potential project impacts

414 A range of potential impacts on benthic subtidal and intertidal ecology have been identified, which may arise during construction, operation (and maintenance) and decommissioning phases of Awel y Môr OWF. The potential impacts that are proposed to be scoped into the Awel y Môr OWF EIA are detailed in Table 35, along with a description of any proposed additional data collection (e.g. site-specific surveys) and / or supporting analyses (e.g. modelling) required to facilitate an impact assessment.

415 Based on the benthic subtidal and intertidal ecology information currently available and the project description, outlined in Chapter 3: Project Description, a number of impacts are proposed to be scoped out of the EIA for benthic subtidal and intertidal ecology. These impacts are outlined in Table 36, together with a justification for scoping them out.

TABLE 35 - IMPACTS PROPOSED TO BE SCOPED INTO THE ASSESSMENT FOR BENTHIC SUBTIDAL AND INTERTIDAL ECOLOGY

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION PHASE			
8.1.1	Habitat disturbance	There is the potential of direct habitat disturbance during construction activities in the array area and along the ECR corridor, due to cable laying and foundation installation.	The presence and extent of benthic and intertidal habitats and features will be informed though the use of existing and new site-specific survey data. The area of habitat disturbance will be defined using a worst-case scenario based approach. The sensitivity of habitat types to the impact will be determined through available literature and expert knowledge, based on the habitats resilience and resistance to impacts.
8.1.2	Temporary increase in suspended sediment and sediment deposition	Sediment disturbance arising from construction activities, such as cable laying and foundation installation, may result in adverse effects on benthic communities. This can be a result of temporary increase in suspended sediment concentrations (SSC) and associated sediment deposition.	The effects on benthic and intertidal ecology from increased suspended sediment and sediment deposition will be informed by the findings and assessment of the Physical Processes Chapter. The sensitivity of habitat types to the impact will be determined through available literature and expert knowledge, based on the habitats resilience and resistance to impacts.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
8.1.3	Direct and indirect seabed disturbances leading to the release of sediment contaminants	Seabed disturbances during construction which could lead to the mobilisation of sediment contaminants that could be harmful to the benthos.	The effects on benthic and intertidal ecology from changes to water quality will be informed by the findings and assessment of the Water Quality Assessment. The sensitivity of habitat types to the impact will be determined through available literature and expert knowledge, based on the habitats resilience and resistance to impacts.
8.1.4	Increased risk of introduction or spread of Marine Invasive Non-Native Species (MINNS)	Increased risk of introduction or spread of MINNS due to increased vessel movements during construction (e.g. ballast water) may facilitate the spread of non-native species and may subsequently impact biodiversity and benthic ecology of the area.	The potential introduction or spread of MINNS and subsequent impact to local benthic ecology receptors will be assessed based on current industry understanding, available literature and expert knowledge. The assessment will take into consideration the mitigation and control of invasive species measures that will be incorporated into a Project Environmental Monitoring Programme (PEMP).
OPERATION AND MAINTENANCE PHASE			
8.1.5	Long-term habitat loss / alteration	There is the potential for long-term habitat loss or changes directly associated with the presence of foundations, scour protection and cable laying,	The presence and extent of benthic and intertidal habitats and features will be informed though the use of existing and new site-specific survey data. The area of habitat loss will be defined using a worst-case scenario to determine the maximum loss of seabed. The presence and extent of benthic

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		where secondary cable protection is required.	habitats and features will be informed though the use of existing and new site-specific survey data.
8.1.6	Habitat disturbance	There is the potential for direct habitat disturbance of the seabed during planned maintenance or, in the case of a cable failure, excavation of cables.	The presence and extent of benthic and intertidal habitats and features will be informed though the use of existing and new site-specific survey data. The area of habitat disturbance will be defined using a worst-case scenario based approach. The sensitivity of habitat types to the impact will be determined through available literature and expert knowledge, based on the habitats resilience and resistance to impacts.
8.1.7	Colonisation of hard substrates	Man-made substructures (WTG foundations and associated scour / cable protection) on the seabed are expected to be colonised by a variety of marine organisms. This can result in an increase in local biodiversity and alterations to the benthic ecology.	The potential impacts on benthic ecology receptors will be considered in terms of effects on biodiversity and productivity. The area of introduction of hard substrate will be defined using a worst-case scenario to determine the maximum area of impact. The sensitivity of habitat types to the impact will be determined through available literature and expert knowledge, based on the habitats resilience and resistance to impacts.
8.1.8	Increased risk of introduction or spread of Marine	Increased risk of introduction or spread of MINNS due to the presence of the subsea	The potential introduction or spread of MINNS and subsequent impact to local benthic ecology receptors will be assessed based on current industry understanding, available literature

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	Invasive Non-Native Species (MINNS)	infrastructures and increased vessel movements may facilitate the spread of non-native species and may subsequently impact biodiversity and benthic ecology of the area.	and expert knowledge. The assessment will take into consideration the mitigation and control of invasive species measures that will be incorporated into a Project Environmental Monitoring Programme (PEMP).
8.1.9	Changes in physical processes	The presence of the OWF subsea infrastructure can result in potential effects on benthic communities arising from scour effects, changes in sediment transport and wave regimes.	The effects on benthic and intertidal ecology from changes in physical processes will be informed by the findings and assessment of the Physical Processes Chapter. The sensitivity of habitat types to the impact will be determined through available literature and expert knowledge, based on the habitats resilience and resistance to impacts.
DECOMMISSIONING PHASE			
The potential impacts arising during the decommissioning phase are envisaged to be similar to those described for the construction phase and will therefore be assessed in the same way as set out above, however there will also be assessment of the loss of additional habitat arising from the removal of foundation structures that have been colonised during the operational phase of the project.			

TABLE 36 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR BENTHIC SUBTIDAL AND INTERTIDAL ECOLOGY

IMPACT NUMBER	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
8.1.9	Noise pollution on benthic ecology during foundation installation	It is generally accepted that the particle motion component of noise is most relevant to benthic species. While there are few studies looking at reactions of benthic invertebrates and in particular polychaetes and infaunal bivalves, it is likely that particle motion will dissipate in close proximity to the noise source. In addition, the noise will be temporary in nature and conditions will return to baseline following cessation of piling. It is proposed that this impact is therefore scoped out of the assessment.
8.1.10	Accidental pollution	The magnitude of an accidental spill will be limited by the size of chemical or oil inventory on construction vessels. In addition, released hydrocarbons would be subject to rapid dilution, weathering and dispersion and would be unlikely to persist in the marine environment. The likelihood of an incident will be reduced by implementation of a Project Environmental Management Plan (PEMP) and Marine Pollution Contingency Plan (MPCP). It is proposed that this impact is therefore scoped out of the assessment.
OPERATION		
8.1.11	Indirect disturbance of benthic species from EMF generated by inter-array and export cables	EMFs are likely to increase above background levels in close proximity to the cables only. As the cable will be buried or protected across the majority of the array area and ECR any behavioural responses would be further mitigated. Furthermore, monitoring at OWF's to date has not recorded any changes in invertebrate behaviour resulting from EMF exposure. It is proposed that this impact is therefore scoped out of the assessment.

Mitigation measures adopted as part of the project

416 As part of the design process for the Awel y Môr OWF, a number of designed-in measures are proposed to reduce the potential for impacts on benthic subtidal and intertidal ecology receptors. These will evolve over the development process as the EIA progresses and in response to consultation.

417 Innogy is committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 35 and Table 36.

418 Measures adopted as part of the project will include:

- Avoid direct significant impacts to ecologically important sandbanks and potential reefs as far as practicable through route selection and micro-siting;
- Cable burial risk assessment to inform frontend engineering works. Cable burial will be the preferred option for cable protection;
- Development of, and adherence to, a Code of Construction Practice (CoCP);
- Development of, and adherence to, an appropriate Project Environmental Monitoring Programme (PEMP), which will include a Marine Pollution Contingency Plan (MPCP); and
- Development of, and adherence to, a Decommissioning Plan (DP).

419 The requirement and feasibility of any mitigation measures will be dependent on the significance of the effects on benthic subtidal and intertidal ecology and will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

420 Chapter 4 provides a full description of how potential cumulative effects will be assessed for the project as a whole. The specific approach with regards to the assessment of cumulative impacts on benthic subtidal and intertidal receptors that is to be undertaken as part of the PEIR/ES chapter is given below.

421 Offshore wind: Potential cumulative impacts with the Awel y Môr OWF could occur and this will be fully assessed within the ES. Given the predicted localised nature of potential impacts and the distance to other planned offshore wind farms, there is unlikely to be significant overlap in impact zones during construction of other offshore windfarms and Awel y Môr OWF.

422 Although there would be an aggregated direct and permanent loss of habitat during the operational phase of the wind farm it is anticipated that, given the recoverability of the species found in the Awel y Môr benthic ecology Study Area as well as across the wider region, cumulative impacts would not be considered significant. If the situation were to arise where several export cables were to be under construction concurrently, there may be potential for cumulative impacts to arise however these are not expected to be significant.

423 Impacts proposed to be scoped into the cumulative impact assessment include:

- Temporary increase in SSC and sediment deposition, during the construction phase;
- Long-term habitat loss/ change from the presence of foundations, scour protection and cable protection;
- Colonisation of the WTGs and scour/ cable protection may affect benthic ecology and biodiversity; and
- Changes to seabed habitats arising from effects on physical processes, including scour effects and changes in the sediment transport and wave regimes resulting in potential effects on benthic communities.

424 The following impacts are proposed to be scoped out of the cumulative impact assessment on the basis of the localised and temporary nature of the impacts:

- Temporary habitat disturbance;
- Direct and indirect seabed disturbances leading to the release of sediment contaminants;
- Direct disturbance to seabed from jack-up vessels and cable maintenance activities; and
- Increased risk of introduction or spread of Marine Invasive Non-Native Species (MINNS)

425 Other activities: There is the potential for cumulative impacts from other activities occurring in the region, these include aggregate dredging, shipping and oil and gas exploration and development and subsea cabling. Whilst it is not considered likely that there would be significant cumulative impacts, all potential impacts (i.e. those listed for Awel y Môr OWF in isolation) will be assessed as part of the EIA

Potential transboundary Impacts

426 As with Physical Processes (Section 7.1), due to the localised nature of any potential impacts, transboundary impacts are unlikely to occur and therefore it is suggested that this impact will be scoped out from further consideration within the EIA.

8.1.6 Summary of next steps

427 The proposed approach to the assessment for benthic subtidal and intertidal ecology PEIR chapter will first include the definition of the worst-case scenarios on which the assessments will be based. The geographic footprint of the project and the impacts resulting from any changes to physical processes, including scour effects and changes in the sediment transport will be key considerations in defining the worst-case scenarios for benthic subtidal and intertidal ecology receptors.

428 Additional site- specific surveys are proposed for benthic subtidal and intertidal ecology to help fill data gaps that currently exist across the Awel y Môr benthic ecology Study Area. Surveys will identify the extent and distribution of key habitat types and features, with a focus on any species or habitats of conservation importance, that might exist across the area of interest. The methodology for the survey will be consulted on with key stakeholders in due course.

8.1.7 Further consideration for Consultees

429 Scoping questions in relation to benthic subtidal and intertidal ecology include:

i. Are you satisfied that the baseline data referenced above is valid for the purposes of the scoping assessment?

ii. Have all potential impacts resulting from Awel y Môr OWF been identified for benthic subtidal and intertidal receptors?

iii. For those impacts scoped in (Table 35), do you agree that the methods described are sufficient to inform a robust impact assessment?

iv. Do you agree that, considering the embedded mitigation in place, the assessment of benthic subtidal and intertidal ecology impacts as detailed above (Table 36) can be scoped out of the Awel y Môr OWF EIA?

8.2 Fish and Shellfish Ecology

8.2.1 Introduction

430 This Section of the Scoping Report identifies the fish and shellfish ecology receptors of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on fish and shellfish receptors and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

8.2.2 Study Area

431 For the purposes of this fish and shellfish ecology scoping assessment, the Awel y Môr Study Area is defined as the area encompassing the array area, the offshore ECR corridor search area and the ICES rectangles 35E5, 35E6, 36E5 and 36E6. The extent of the Study Area will provide a regional context on fish and shellfish ecology, and also cover potential effects outside of the array and ECR search area. The Study Area is shown in Figure 31 below.

432 The Study Area will be reviewed during subsequent stages of the EIA process and refined as necessary to reflect the development of the scheme.

5°0'0"W
4°30'0"W
4°0'0"W
3°30'0"W
3°0'0"W
400000
450000
500000
54°0'0"N
5950000
53°30'0"N
5900000
53°0'0"N

ICES 36E5

ICES 36E6

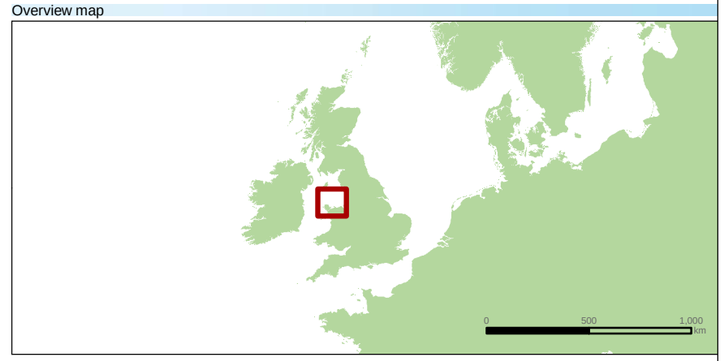
ICES 35E5

ICES 35E6

0 5,000 10,000 20,000 m

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Study Area
- ICES Rectangle

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Awel y Môr OWF Study Area for fish and shellfish ecology

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:500,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Fish and Shellfish\AyM_0119_FSF_Fig1_FS_Study_Area.mxd

8.2.3 Baseline data

433 A review of available data on fish and shellfish in the area has been undertaken as part of this Scoping Study. The datasets considered to be relevant to Awel y Môr OWF are listed in Table 37 below.

TABLE 37 - DATA SOURCES CONSULTED FOR THE AWEL Y MÔR OWF

SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR ARRAY AREA AND OFFSHORE ECR SEARCH AREA
Gwynt y Môr OWF baseline characterisation (CMACS, 2005[1])	Gwynt y Môr site specific 2 m beam trawl fish surveys conducted across the Gwynt y Môr OWF site and surrounding area as part of the baseline characterisation.	Good data coverage across the Awel y Môr OWF array and offshore ECR search area.
Burbo Bank Extension Adult and Juvenile Fish Characterisation surveys (BMM, 2011)	Otter and beam trawl sampling undertaken to assess juvenile and adult fish populations within and in the immediate vicinity of Burbo Bank Extension.	Data coverage to the east of the Awel y Môr OWF array and offshore ECR search area. No direct coverage of the proposed Awel y Môr OWF site.
Annual FEPA Monitoring Report for North Hoyle OWF (Cefas, 2005)	Post construction beam trawl surveys conducted across the eastern Irish Sea region, and North Hoyle OWF.	Partial data coverage of the Awel y Môr offshore ECR Search area.
Rhyl Flats Offshore Wind Farm Beam Trawl Survey Report (CMACS, 2005)	2005 beam trawl survey at the Rhyl Flats Offshore Wind Farm.	Good data coverage across the Awel y Môr offshore ECR Search area.
Northern Ireland Ground Fish Survey (NIGFS) (ICES, 2005-2018)	Otter trawls conducted across the Irish Sea.	Data coverage across the northern Irish Sea region, with partial coverage of the Awel y Môr OWF array area.
North West Groundfish Survey (Cefas, 2013)	Beam trawls conducted across the Irish Sea and Bristol Channel.	Data coverage of the Irish Sea, with partial coverage of the offshore ECR search area.

SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR ARRAY AREA AND OFFSHORE ECR SEARCH AREA
UK sea fisheries annual statistics report (MMO, 2018)	MMO fisheries landings data on commercially important fish species	Complete coverage of British waters and the Awel y Môr OWF array and the offshore ECR search area.
Spawning and nursery grounds of selected fish species in UK waters (Cefas, 2010)	Spawning and nursery maps for mobile species considered to be of conservation importance.	Complete coverage of British waters and the Awel y Môr OWF array and the offshore ECR search area.
Fisheries Sensitivity Maps in British Waters. (Coull *et al*., 1998)	Fisheries sensitivity maps, showing information on spawning and nursery grounds in British waters.	Complete coverage of British waters and the Awel y Môr OWF array and the offshore ECR search area.

8.2.4 Baseline environment

434 The following Sections describe the fish and shellfish ecology in the Study Area. A detailed literature review was undertaken to describe the use of the area by fish and shellfish species in relation to key life stages, spawning and juvenile behaviour and migratory pathways. The literature review was informed by data derived from the site-specific sampling surveys conducted for Gwynt y Môr OWF, and broader surveys across Liverpool Bay and the eastern Irish Sea. The locations of the sampling surveys are shown in Figure 32.

435 Sampling using a 2 m beam trawl was undertaken across the Gwynt y Môr OWF (located adjacent to the proposed Awel y Môr site) in December 2003, March and August 2004. The 2003 trawls were dominated by scaldfish (*Arnoglossus laterna*), solenette (*Buglossidium luteum*), dragonet (*Callionymus lyra*), dab (*Limanda limanda*) and sand goby (*Pomatoschistus minutus*). In the March 2004 trawl scaldfish, dragonet, dab, poor cod (*Trisopterus minutus*) and pogge (*Agonus cataphractus*) were abundant. The August 2004 trawls were dominated by dragonet, dab, solenette, sand goby and poor cod. Elasmobranch species were recorded in low abundances, and infrequently across all Gwynt y Môr site trawls, with the most common species being the thornback ray, (*Raja clavata)* of which a total of 11 individuals were recorded. It should be noted however, that these numbers are likely to be under-representative due to the semi-quantitative nature of beam trawls.

436 Site specific otter and beam trawl surveys conducted to inform the Burbo Bank Extension fish and shellfish baseline (Burbo Bank Extension Adult and Juvenile Fish Characterisation surveys, 2011), were dominated by the teleost species dab, plaice, flounder and whiting, and pelagic species sprat and herring. Thornback ray and lesser spotted dogfish were the most dominant elasmobranchs recorded in the area.

437 Post-construction monitoring beam trawl surveys (Cefas, 2005) undertaken at the North Hoyle OWF were dominated by plaice (*Pleuronectes platessa*), dab, sole and dragonet.

438 Beam trawl surveys undertaken at the Rhyl Flats OWF were dominated by sand goby and solenette, with dab and plaice being the most common commercial species surveyed at the site.

439 Since 1988, a series of trawls (4 m beam trawl) have been undertaken in the Irish Sea by Cefas to inform the North West Groundfish Survey (2013). The trawls were dominated in European plaice, lesser spotted dogfish, thornback ray, dragonet, grey gurnard, whiting, dab and sole, all of which were abundant across the proposed Awel y Môr ECR and array, and across the Liverpool Bay and eastern Irish Sea.

440 Otter trawls conducted across the Irish Sea, from 2005 to 2018, as part of the Northern Ireland Groundfish Surveys (NIGFS) were dominated by whiting, haddock, small spotted catshark, plaice and herring. *Nephrops* were recorded in high abundances to the north of the site but were absent from the Study Area.

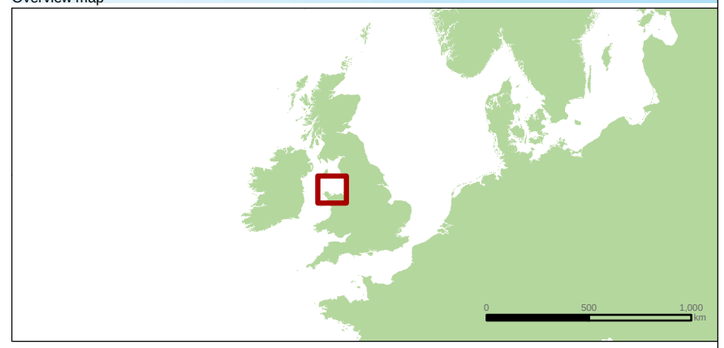
441 Data derived from Lockwood (2005) shows two distinct shellfish resources within the Irish Sea; a large scallop ground is located across the whole eastern Irish Sea, and a *Nephrops* resource is located to the north of Liverpool Bay, between the Isle of Man and the Cumbria coast (this finding is supported by similar findings by the NIGFS). Shellfish abundances inshore appear to be dominated by cockles, crabs, lobsters, mussels, shrimp and whelk.

5°0'0"W
4°30'0"W
4°0'0"W
3°30'0"W
3°0'0"W
400000
450000
500000
54°0'0"N
5950000
53°30'0"N
5900000
53°0'0"N

0 5,000 10,000 20,000 m

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Study Area
- Northern Ireland Groundfish Survey (2005-2018)
- North West Groundfish Survey (1988)

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Wind Farm Boundaries from The Crown Estate

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Baseline Environment Data Sources

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:500,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Fish and Shellfish\AyM_0119_FSF_Fig2_Baseline_Environment_Data_Sources.mxd

Spawning and Nursery grounds

442 This Section presents information on spawning and nursery areas for fish species. This is based on the data from Coull *et al.* (1998) and supported by data sources from Ellis *et al*. (2010).

443 Within the Study Area, sandeel, cod, plaice and sole all have 'high intensity' spawning grounds (Coull *et al*, 1998; Ellis *et al,* 2010) (Figure 33 and Figure 34). Of these species, sandeel are the only demersal spawners, and are therefore considered to be more sensitive to increased suspended sediment concentrations (SSC) and subsequent sediment deposition. Due to the high intensity of the spawning activity, across the Study Area, these species are considered to have the potential to be disturbed by noise impacts during the construction and decommissioning phases of the development. Cod are considered to be of increased sensitivity to noise impacts (Popper et al, 2014), although spawning grounds appear widespread across the Irish Sea.

444 Species with low intensity spawning grounds that cross the Study Area (as well as widely around the UK) include cod, sandeel, whiting, plaice, ling, mackerel, horse mackerel, hake and nephrops.

445 For fish nursery grounds, the only species with 'high intensity' nursery grounds in the Study Area are spurdog, herring, cod, whiting and sole (Coull *et al*, 1998; Ellis *et al,* 2010) (Figure 35 and Figure 36). The cod nursery grounds extend across the whole eastern Irish Sea and along most of the North Sea coast. High intensity herring nursery grounds extend around the entire northern UK, and the North Sea coast. Therefore, in a broader context, the Study Area only interacts with a very small portion of the high intensity nursery grounds for these species. Species with low intensity nursery areas that cross the Study Area (as well as widely around the UK) comprise of tope, thornback ray, spotted ray, sandeel, mackerel, anglerfish and plaice.

5°0'0"W 4°30'0"W 4°0'0"W 3°30'0"W 3°0'0"W

400000 450000 500000

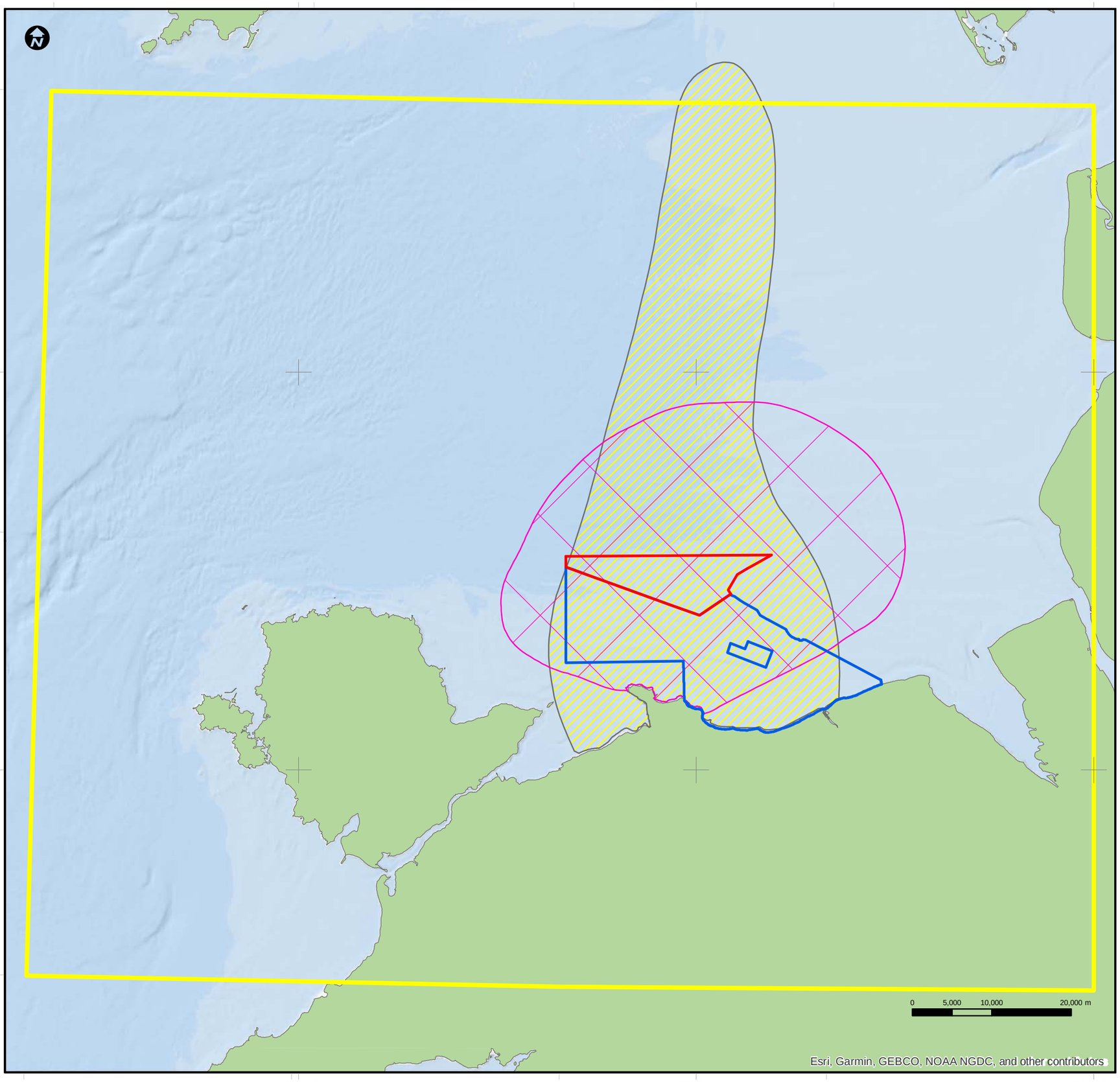
54°0'0"N

5950000

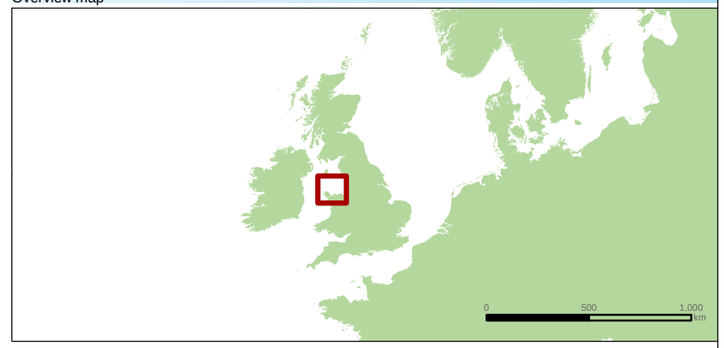
53°30'0"N

5900000

53°0'0"N



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Study Area

Spawning Grounds (Coull et al, 1998)

Species, Intensity

- Plaice, Higher
- Sole, Higher

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Species Data from CEFAS

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

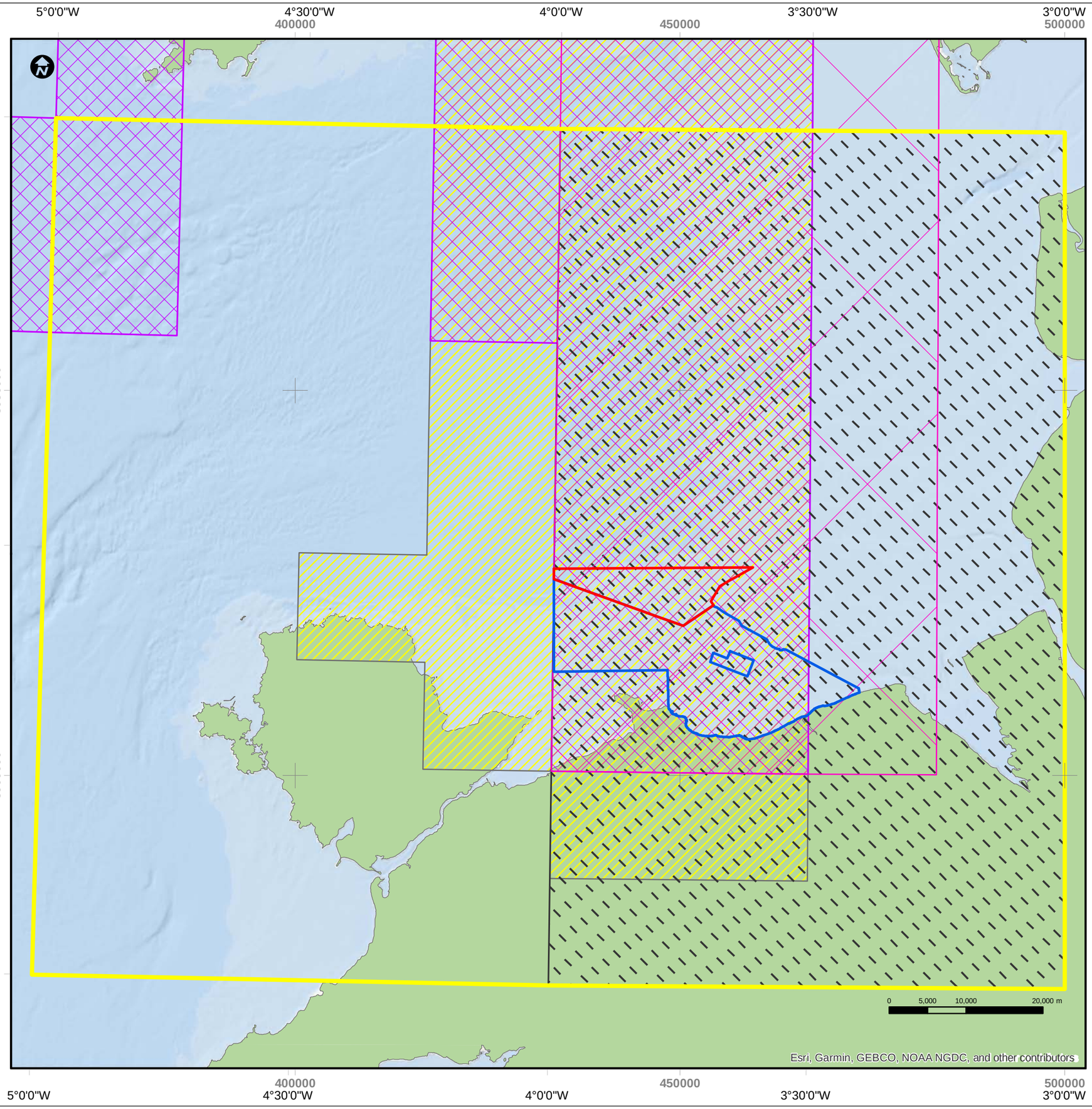
TITLE High Intensity Spawning Grounds within the Fish and Shellfish Study Area (Coull et al, 1998)

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:500,000	@DIN A3

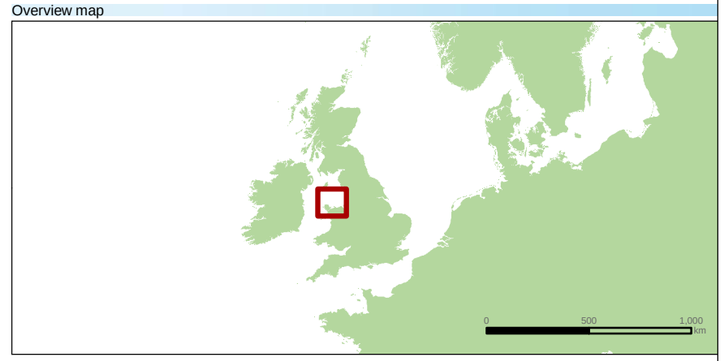
DRAWING No. None Issued

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Fish and Shellfish\AyM_0119_FSF_Fig3_Spawning_Grounds_1998.mxd



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Study Area

Spawning Grounds (Ellis et al, 2010)

- Cod, High Intensity
- Plaice, High Intensity
- Sandeel, High Intensity
- Sole, High Intensity

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Species Data from CEFAS

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

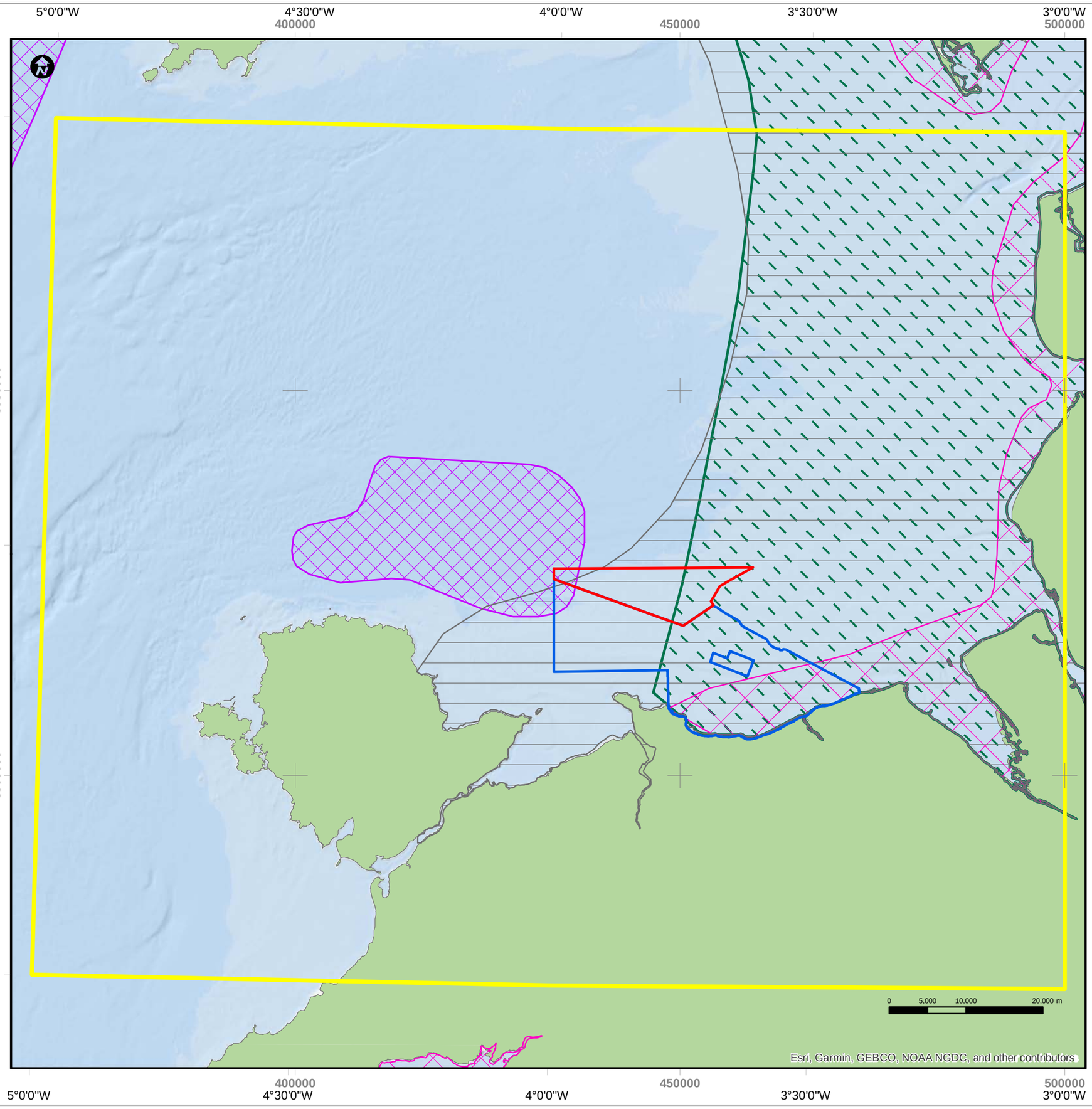
PROJECT Offshore Windpark **Awel y Môr**

TITLE High Intensity Spawning Grounds within the Fish and Shellfish Study Area (Ellis et al, 2010)

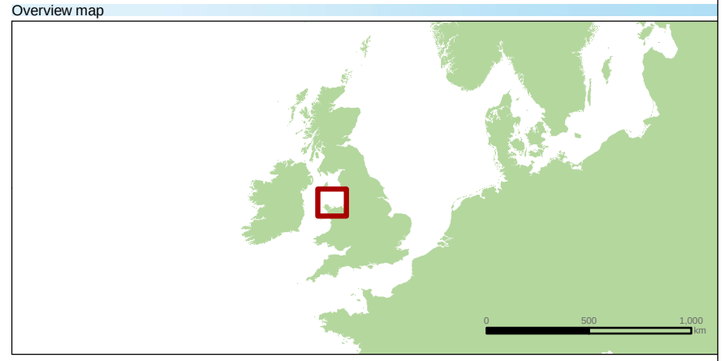
DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:500,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Fish and Shellfish\AyM_0119_FSF_Fig4_Spawning_Grounds_2010.mxd



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Study Area

Nursery Grounds (Coull et al, 1998)

- Cod
- Herring
- Sole
- Whiting

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Species Data from CEFAS

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE High Intensity Nursery Grounds (Coull et al, 1998)

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:500,000	@DIN A3

DRAWING No. None Issued

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Fish and Shellfish\AyM_0119_FSF_Fig5_Nursery_Grounds_1998.mxd

5°0'0"W 4°30'0"W 4°0'0"W 3°30'0"W 3°0'0"W

400000 450000 500000

54°0'0"N

5950000

53°30'0"N

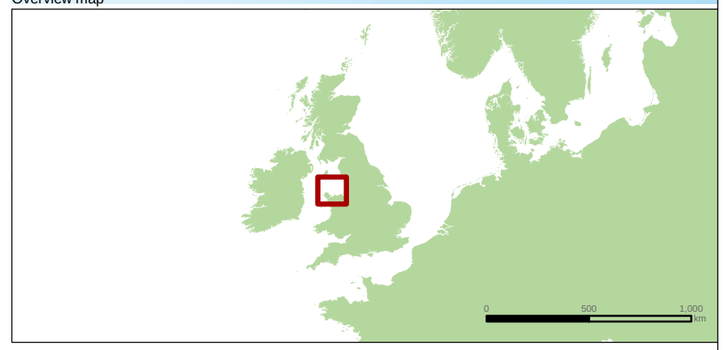
5900000

53°0'0"N

0 5,000 10,000 20,000 m

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Study Area

Nursery Grounds (Ellis et al, 2010)

- Cod
- Herring
- Sole
- Spurdog
- Whiting

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Species Data from CEFAS

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT
Offshore Windpark
Awel y Môr

TITLE
High Intensity Nursery Grounds (Ellis et al, 2010)

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:500,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Fish and Shellfish\AyM_0119_FSF_Fig6_Nursery_Grounds_2010.mxd

Species of commercial importance

446 Detailed information on species of commercial importance is provided in the Commercial Fisheries chapter of the Scoping Report (Section 9.1). Information sourced from the latest annual MMO fisheries statistics (MMO, 2018) and the Gwynt y Môr OWF Environmental Statement (2005) has been used to inform this Section. The Study Area encompasses the ICES rectangles 35E5, 35E6, 36E5 and 36E6; those species targeted within the ICES rectangles are considered to be of commercial importance to the region.

447 The Study Area is characterised primarily by UK vessels targeting demersal and shellfish species, with landings from the project area dominated by shellfish in terms of both weight and value.

448 A large king and queen scallop resource is located within the eastern Irish Sea, overlapping with the Study Area (CORDAH, 2003), whereby dredging for scallops accounts for one of the primary fishing activities across the proposed project site. Potting for whelk, crab and lobster is also commonplace across the Study Area, undertaken predominantly by Welsh vessels. Commercial aquaculture in Wales is dominated by the managed cultivation of blue mussels, although no potential development locations have been identified within the commercial fisheries Study Area.

Species of Conservation Importance

449 Within the region, species considered to be of conservation importance include the twaite shad (*Alosa fallax*) and allis shad (*A. alosa*), sea lamprey (*Petromyzon marinus*) and river lamprey (*Lampetra fluviatilis*) and basking shark (*Cetorhinus maximus*). Both the twaite shad and the allis shad are protected under Schedule 5 of the Wildlife and Countryside Act (1981), Schedule III of the Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979) and Annex IIa and Va of the EU Directive on the conservation of natural habitats and of wild flora and fauna (92/43/EEC). They are also on the UK Biodiversity Action Plan List of Priority Species. Both the sea lamprey and the river lamprey are covered by the Bern Convention and Habitats Directive. Basking shark are protected under Appendix III of the Bern convention Wildlife and Countryside Act (1981) and Appendix II of the Convention on International Trade in Endangered Species (CITES).

Migratory species

450 Migratory fish are fish that spend part of their life cycle in freshwater and part in seawater, such species are termed diadromous. The UK Salmon and Freshwater Fishery Act (1975) (amended) recognises three migratory species: Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*) and European eel (*Anguilla anguilla*). Sea lamprey and river lamprey are also migratory species, as well as being identified as qualifying features of the Dee Estuary SAC, and therefore are also considered in this Section of the report. Atlantic salmon, sea trout and European eel are all found in, or pass through, the eastern Irish Sea and Liverpool Bay at some stage during their life. The most important of the rivers in the vicinity of the proposed Awel y Môr OWF, in terms of numbers of salmon and sea trout, is the River Dee, with the River Clwyd also supporting small salmon and sea trout populations. The status of eel populations within these rivers is unknown but it is assumed that, in common with wider European eel stocks, there is a current downward trend in abundance.

Designated sites

451 For this Scoping Report, a review has been undertaken to identify designated sites in the area which are either designated for fish and shellfish interest or habitats/species which are dependent on or associated with fish or shellfish. The sites are presented in Table 38, and shown in Figure 37 below. It should be noted that a separate HRA Screening report is being produced which will cover in more detail matters associated with European designations.

TABLE 38 - MARINE NATURE CONSERVATION DESIGNATIONS WITH RELEVANCE TO FISH AND SHELLFISH AND AWEL Y MÔR OWF

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
INTERNATIONAL		
The Morecambe Bay Special Area of Conservation (SAC)	60 km	Designated for sandbanks, which may represent spawning habitats for sandeel.
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC	0 km	Designated for sandbanks, which may represent spawning habitats for sandeel.
Shell Flat and Lune Deep SAC	42 km	Designated for sandbanks, which may represent spawning habitats for sandeel.
The North Anglesey Marine SAC	14 km	Primary reason for site selection is harbour porpoise (*Phocoena phocoena*), of which herring and sandeel are key prey species.
Dee Estuary SAC and Site of Special Scientific Interest (SSSI)	9.3 km	Designated for Sea lamprey, *Petromyzon marinus* and River lamprey, *Lampetra fluviatilis*.
River Dee and Bala Lake SAC	36 km	Primary reason for site selection is for Atlantic salmon. Also designated for sea lamprey and river lamprey.
NATIONAL		
Fylde Marine Conservation Zone (MCZ)	26.5 km	Designated for subtidal sand and subtidal mud, which represent highly productive areas for crustacea, molluscs and flatfish species.
West of Walney MCZ	52.5 km	Designated for subtidal sand and subtidal mud, which represent highly productive areas for crustacea, molluscs and flatfish species.
Wyre Lune MCZ	61.3 km	Designated for Smelt.

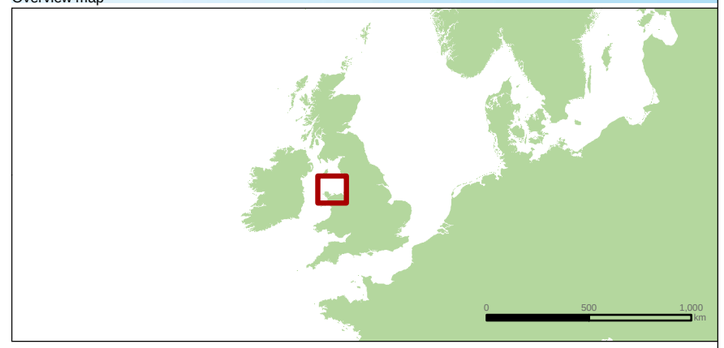
5°0'0"W
4°30'0"W
4°0'0"W
3°30'0"W
3°0'0"W
400000
450000
500000
54°0'0"N
5950000
53°30'0"N
5900000
53°0'0"N

Morecambe Bay
West of Walney
Wyre-Lune
Shell Flat and Lune Deep
Fylde
North Anglesey Marine / Gogledd Môn Forol
Bae Cemlyn/ Cemlyn Bay
Dee Estuary/ Aber Dyfrdwy
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh
West Wales Marine / Gorllewin Cymru Forol
Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau

0 5,000 10,000 20,000 m

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Study Area
- Special Area of Conservation
- Marine Conservation Zone

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Designated Sites relative to the Awel y Môr Study Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:500,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Fish and Shellfish\AyM_0119_FSF_Fig7_Designated_Sites.mxd

8.2.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

452 Existing site specific data from the Gwynt y Môr OWF Environmental Statement and from wider studies within the Irish Sea (as detailed Section in 8.2.3) are considered sufficient to characterise and describe the fish and shellfish resource within the Study Area (see Section 8.2.2) and on this basis no new site-specific surveys are proposed. These data will be reviewed, along with information from other data sources, including the Irish Sea Annual Egg Production Method (AEPM) Plankton Survey (2000), the International Bottom Trawl Survey (1965-2019) data and the Northern Ireland Ground Fish Survey (NIGFS) data (2005-2018), and relevant species specific research. This information will be further supplemented by findings of industry wide studies and relevant information obtained through consultation with local sea fisheries committees and commercial fishermen.

453 The assessment of fish and shellfish receptors will comply with the following guidance documents where they are specific to this topic:

- Guidelines for EIA in Britain and Ireland. Marine and Coastal, Final Document (IEEM, 2010);
- Guidance note for EIA in respect of FEPA and CPA requirements (Cefas *et al*., 2004);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (CEFAS, 2012); and
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).

454 In accordance with the Cefas *et al.,* (2004) guidance the assessment phase of the EIA the following aspects will be considered for fish and shellfish resource in the area:

- Spawning grounds;
- Nursery grounds;
- Feeding grounds;
- Overwintering areas for crustaceans; and
- Migration routes.

Potential project impacts

455 A range of potential impacts on fish and shellfish ecology have been identified which may occur during the construction, operation and maintenance and decommissioning phases of Awel y Môr OWF. These are presented in Table 39 below, together with a proposed approach for assessing the impact within the EIA. On the basis of the baseline fish and shellfish ecology information currently available, a number of impacts are proposed to be scoped out of the assessment for fish and shellfish ecology. These impacts are outlined, together with a justification, in Table 40 below.

TABLE 39 - IMPACTS PROPOSED TO BE SCOPED INTO THE ASSESSMENT FOR FISH AND SHELLFISH ECOLOGY

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT IN THE EIA INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION PHASE			
8.2.1	Mortality, injury, behavioural impacts and auditory masking arising from noise and vibration	Potential effects from construction activities may arise from noise and vibrations from pile-driving (monopiles and pin piles) for the installation of foundations for offshore structures (i.e. WTGs and offshore substations). Cable laying, dredging and vessel movements also have the potential to result in underwater noise. Noise from piling has the potential to cause significant impacts to fish and shellfish species ranging from lethal trauma to behavioural changes in susceptible fish species.	The effects on spawning of noise sensitive fish and shellfish receptors from noise and vibration impacts during the construction phase will be considered. Site-specific predictive noise modelling will be undertaken to assess the potential for noise disturbance on spawning fish and shellfish receptors. It is considered that there is sufficient existing information on the fish and shellfish interests of the Study Area to inform this assessment and no new surveys are required.
8.2.2	Temporary increase in SSC and sediment deposition	Sediment disturbance may arise from a range of construction activities within the array area, such as foundation installation and cable installation. Sediment disturbance from foundation installation may comprise the disposal of drill arisings following WTG installation or seabed	The effects on demersal spawning fish (e.g. sandeel) from increased SSC and deposition will be considered and will be informed by the findings and assessment of the Physical Processes Chapter.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT IN THE EIA INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		preparation. Sediment disturbance may also result from cable installation. Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on fish and shellfish receptors.	
8.2.3	Direct and indirect seabed disturbances leading to the release of sediment contaminants	Potential effects from construction may arise from sediment resuspension; while in suspension, there is the potential for sediment bound contaminants, such as metals, hydrocarbons and organic pollutants, to be released into the water column and lead to an effect on fish and shellfish receptors.	The effects on fish and shellfish receptors will be considered separately for the array and for the offshore ECR, and potential interactions considered. There will be a particular focus on King and Queen Scallop receptors, and sandeel. Existing data (sourced from the British Geological Society (BGS)) and site-specific sediment sampling and contaminants analysis undertaken for the Gwynt y Môr OWF EIA will be used to inform this assessment along with some new sampling sediment data that will be collected as part of a geophysical and benthic survey planned for the Awel y Môr OWF project.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT IN THE EIA INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
8.2.4	Impacts on fishing pressure due to displacement	Fishing activity may be reduced within the Awel y Môr array area as a result of the physical presence of the energy generating infrastructure. Landings from the site are dominated by landings of whelk, scallop and lobster.	Major commercial fish and shellfish species in the area will be identified, describing the fisheries, species and their seasonality. This will be done through obtaining MMO UK landings and fishing effort data as well as foreign fishing information where possible. Site-specific studies and information from other offshore wind farm sites will also be used to support the desk-based assessment, along with information collected through consultation with relevant authorities, including sea fisheries committees, Fishery Producers Organisations (FPOs) and relevant fisheries management organisations. The findings from the Commercial Fisheries chapter of the EIA will also be taken into consideration in this assessment. It is considered that there is sufficient existing data to inform this assessment, and therefore no further surveys are proposed.
OPERATION AND MAINTENANCE PHASE			
8.2.5	Long-term loss of habitat due to the presence of turbine	Potential effects during the operational phase will mostly result from the physical presence of infrastructure (i.e. foundations and any cable	Impacts on sensitive species will be considered in terms of long-term loss of spawning habitats and impacts on species of conservation importance. The area of habitat

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT IN THE EIA INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	foundations, scour protection and cable protection.	protection above the seabed) which will result in long-term habitat loss. This has the potential for impacts on substrate dependent fish and shellfish, in particular those that have substrate specific spawning behaviours (e.g. sandeel), or those with designated conservation status.	loss will be defined using a worst-case scenario to determine the maximum loss of seabed, and the potential loss of sandeel spawning grounds. It is considered that there are sufficient existing data to inform this assessment and therefore no further surveys are proposed.
8.2.6	Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection	Potential effects during operation may result from the introduction of infrastructure such as foundations and scour protection, which would result in the introduction of hard substrate to areas within the Study Area. The increased structural complexity from the introduced infrastructure may also provide habitat or foraging opportunities for mobile species and provide a refuge for fish and shellfish species (Hoffman *et al*, 2000).	The potential for impacts on fish and shellfish receptors will be considered in terms of effects on biodiversity and productivity. The area of introduction of hard substrate will be defined using a worst-case scenario to determine the maximum area of impact. It is considered that there are sufficient existing data to inform this assessment and, on this basis, no further surveys are proposed.
8.2.7	Impacts on fishing pressure due to displacement	Fishing activity may be reduced within the Awel y Môr array area as a result of the physical presence of the energy generating infrastructure. Landings from the site are	Major commercial fish and shellfish species in the area will be identified, describing the fisheries, species and their seasonality. This will be done through obtaining MMO UK landings and fishing effort data as well as foreign fishing

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT IN THE EIA INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		dominated by landings of whelk, scallop and lobster.	information where possible. Site specific studies and information from other offshore wind farm sites will also be used to support the desk-based assessment, along with information collected through consultation with relevant authorities, including sea fisheries committees, Fishery Producers Organisations (FPOs) and relevant fisheries management organisations. The findings from the Commercial Fisheries chapter of the EIA will also be taken into consideration in this assessment. It is considered that there are sufficient existing data to inform this assessment and therefore no further surveys are proposed.
DECOMMISSIONING PHASE			
8.2.8	Mortality, injury, behavioural changes and auditory masking arising from noise and vibration	Potential effects from decommissioning activities may arise from noise and vibrations from increased vessel movements and removal of the turbine foundations. Noise from decommissioning activities has the potential to cause significant impacts to fish and shellfish species ranging from lethal trauma to behavioural changes in susceptible fish species.	The effects on spawning of noise sensitive fish and shellfish receptors from noise and vibration impacts during the decommissioning phase will be considered. It is considered that there is sufficient existing information on the fish and shellfish interests of the Study Area to inform this assessment and no new surveys are required.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT IN THE EIA INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
8.2.9	Temporary increase in SSC and sediment deposition	Sediment disturbance may arise from removal of turbine foundations and cables. Elevations in SSC and subsequent deposition of disturbed sediments have the potential to result in adverse and indirect impacts on fish and shellfish receptors.	The effects on demersal spawning fish (e.g. sandeel) from increased SSC and deposition will be considered and will be informed by the findings and assessment of the Physical Processes Chapter.
8.2.10	Direct and indirect seabed disturbances leading to the release of sediment contaminants	Potential effects from the decommissioning phase may arise from sediment resuspension; while in suspension, there is the potential for sediment bound contaminants, such as metals, hydrocarbons and organic pollutants, to be released into the water column and lead to an effect on fish and shellfish receptors.	The effects on fish and shellfish receptors will be considered separately for the array and for the offshore ECR, and potential interactions considered. There will be a particular focus on King and Queen Scallop receptors, and sandeel. Existing data (sourced from the British Geological Society (BGS)) and site-specific sediment sampling and contaminants analysis undertaken for the Gwynt y Môr OWF EIA will be used to inform this assessment along with some new sampling sediment data that will be collected as part of a geophysical and benthic survey planned for the Awel y Môr OWF project.
8.2.11	Impacts on fishing pressure due to displacement	Fishing activity may be reduced within Awel y Môr OWF as a result of the removal of infrastructure within the array area and ECR.	Major commercial fish and shellfish species in the area will be identified, describing the fisheries, species and their seasonality.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT IN THE EIA INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		Landings from the site are dominated by landings of whelk, scallop and lobster.	This will be done through obtaining MMO UK landings and fishing effort data as well as foreign fishing information where possible. Specific studies and information associated with other offshore wind farm sites will also be used to support the desk-based assessment, along with information collected through consultation with relevant authorities, including sea fisheries committees, Fish Producers Organisations (FPOs) and relevant fisheries management organisations. The findings from the Commercial Fisheries section of the EIA will also be taken into consideration in this assessment. It is considered that there are sufficient existing data to inform this assessment and therefore no further surveys are proposed.

TABLE 40 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR FISH AND SHELLFISH ECOLOGY

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION PHASE		
8.2.12	Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species arising from construction activities	Affected species are likely to be mobile and can move away from disturbance. The habitats that will be disturbed represent a very small area of the total distribution of that habitat type in the Irish Sea. Most fish and shellfish receptors in the eastern Irish Sea fish and shellfish Study Area are deemed to be of low vulnerability, high recoverability and of local to international importance within the eastern Irish Sea fish and shellfish Study Area.
8.2.13	Accidental pollution events during the construction phase resulting in potential effects on fish and shellfish receptors	The magnitude of an accidental spill will be limited by the size of chemical or oil inventory on construction vessels. In addition, released hydrocarbons would be subject to rapid dilution, weathering and dispersion and would be unlikely to persist in the marine environment. The likelihood of an incident will be reduced by implementation of a Project Environmental Management Plan (PEMP). It is proposed that this impact is therefore scoped out of the EIA.
OPERATION AND MAINTENANCE PHASE		
8.2.14	EMF effects arising from cables during operational phase	Some species of fish utilise EMF for activities such as hunting prey and navigation. These species include elasmobranchs and some bony fish species such as cod. Several studies have been undertaken to understand the potential impacts of EMF on fish, however to date, research has been inconclusive as to whether EMF

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		causes attraction or repulsion or has a significant effect (Gill *et al.*, 2009) (Gill and Bartlett, 2010). CMACS (2012) reviewed available literature and assessed potential EMF impacts and concluded that any impacts would be limited to within a few metres of the cables and would not be significant. It is proposed therefore that the impact of EMF on fish and shellfish is scoped out of the EIA due to the lack of evidence to suggest there is any potential for an impact.
8.2.15	Direct disturbance resulting from maintenance during operational phase	Affected species are likely to be mobile and can move away from disturbance. The habitats that will be disturbed represent a small area of the total distribution of that habitat type in the eastern Irish Sea. Most fish and shellfish receptors in the eastern Irish Sea fish and shellfish Study Area are deemed to be of low vulnerability, high recoverability and of local to international importance within the eastern Irish Sea fish and shellfish Study Area.
DECOMMISSIONING PHASE		
8.2.16	Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species arising from decommissioning activities	Affected species are likely to be mobile and can move away from disturbance. The habitats that will be disturbed represent a very small area of the total distribution of that habitat type in the Irish Sea. Most fish and shellfish receptors in the eastern Irish Sea fish and shellfish are deemed to be of low vulnerability, high recoverability and of local to international importance within the eastern Irish Sea fish and shellfish Study Area.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
8.2.17	Accidental pollution events during the decommissioning phase resulting in potential effects on fish and shellfish receptors	The magnitude of an accidental spill will be limited by the size of chemical or oil inventory on construction vessels. In addition, released hydrocarbons would be subject to rapid dilution, weathering and dispersion and would be unlikely to persist in the marine environment. The likelihood of an incident will be reduced by implementation of a Project Environmental Management Plan (PEMP). It is proposed that this impact is therefore scoped out of the EIA.

Mitigation Measures adopted as part of the project

456 As part of the design process for the Awel y Môr OWF, a number of designed-in measures are proposed to reduce the potential for impacts on fish and shellfish receptors. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

457 Innogy is committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgement as to which impacts can be scoped in or out as presented in Table 39 and Table 40.

458 Measures adopted as part of the project will include:

- Undertake a cable burial risk assessment to inform front-end engineering works. Cable burial will be the preferred option for cable protection;
- A piling Marine Mammal Mitigation Protocol will be developed (see Section 8.3 Marine Mammals) which will include proposals for soft start and ramp-up of piling to help reduce disturbance impacts; and
- A PEMP (construction and operation phases) and Decommissioning Plan (decommissioning phase) will be produced and followed. The PEMP and Decommissioning Plan will cover the construction, operation and maintenance, and decommissioning phases of the Awel y Môr OWF respectively and will include a MPCP. This MPCP will outline procedures to protect personnel working and to safeguard the marine environment in the event of an accidental pollution event arising from offshore operations relating to the Awel y Môr OWF. The MPCP will also outline mitigation measures should an accidental spill occur, address potential contaminant releases and include key emergency contact details (e.g. Environment Agency, Natural England and the MCA).

459 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

460 Chapter 3 provides a full description of how potential cumulative effects will be assessed for the project as a whole. The specific approach with regards to the assessment of cumulative impacts on fish and shellfish receptors that is to be undertaken as part of the PEIR/ES chapter is given below.

461 Offshore wind: The key cumulative impacts identified are likely to come from underwater noise from pile driving, and from increased SSC and deposition.

462 As previously discussed, there is the potential for underwater noise to have a large spatial footprint (with regard to disturbance effects and displacement of prey species). This could have cumulative impacts spatially (i.e. if two or more piling operations are undertaken simultaneously) or temporally (i.e. if piling operations are happening consecutively). It is therefore necessary to consider that even if a piling programme is scheduled for many months, the actual duration of pile driving would be limited to a few hours per pile given the experience of other offshore wind projects in the Irish Sea.

463 The impacts resulting from increased SSC and deposition, are likely to be minor due to their localised nature, however there is potential for spatial cumulative impacts with regard to other offshore wind developments, particularly when considering cumulative impacts on spawning grounds for demersal spawning species, such as sandeel.

464 A range of realistic scenarios for cumulative noise impacts and increased SSC and deposition impacts will be developed for the cumulative assessment, based on publicly available information, liaison with other developers where possible, as well as consultation with the Regulators and stakeholders.

465 Impacts proposed to be scoped into the cumulative impact assessment include:

- Mortality, injury, behavioural changes and auditory masking arising from noise and vibration during construction; and
- Temporary increase in SSC and sediment deposition during construction.

466 The following impacts are proposed to be scoped out of the Cumulative Impacts Assessment on the basis of the localised and temporary nature of the impacts:

- Direct and indirect seabed disturbances leading to the release of sediment contaminants during construction;
- Long-term loss of habitat due to the presence of turbine foundations, scour protection and cable protection;
- Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection;

- Impacts on fishing pressure due to displacement during construction and operation;
- Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species;
- Accidental pollution events resulting in potential effects on fish and shellfish receptors;
- EMF effects arising from cables; and
- Direct disturbance resulting from maintenance during operation.

467 Other activities: There is the potential for other activities occurring in the region surrounding the proposed Wind Farm Area to create cumulative impacts, these include aggregate dredging, shipping, subsea cabling and O&G exploration and development. Potential cumulative impacts are unlikely to be significant, for instance behavioural disturbance from noise associated with dredging area operations would not have a spatial footprint on the scale of pile driving and there would therefore be of limited cumulative impact (Robinson *et al*., 2011). However, the scoped in cumulative impacts (as listed in above in paragraph 423) from these other activities, where relevant, will be assessed as part of the EIA.

Potential Transboundary Impacts

468 It is considered that there is potential for transboundary impacts upon fish and shellfish ecology due to the potential construction, operational and decommissioning impacts of the Awel y Môr OWF. These include direct effects as a result of underwater noise from piling operations during the installation of subsea infrastructure. Indirect effects may occur in relation to fish and shellfish habitat or disturbance to habitat due to increased suspended sediment concentrations (SSC) and deposition from the placement/removal of foundations and cables in or on the seabed.

469 These activities have the potential to directly affect Annex II migratory fish species that are listed as features of European Sites in other EEA States, or species that are of commercial importance for fishing fleets of other EEA States. The fish and shellfish species likely to be present in the Awel y Môr OWF Study Area are outlined in full in 8.2.4 of the Scoping Report, and include commercially important species such as scallop, whelk, crab, lobster, sole, plaice and ray species. Sandeel are of particular relevance when considering impacts to spawning areas as they are demersal spawners.

470 Indirect effects will include loss of, or disturbance to, fish spawning and nursery habitats in the Irish Sea that are for fish species of commercial importance to other EEA states as well as the behaviour of migratory fish species designated as Annex II species.

471 During construction the probability of impacts arising from underwater noise is high; modelling of the subsea noise generated by construction activities (piling) is not yet available but will be completed to support the EIA of effects on fish and shellfish ecology.

472 The potential effects associated with long-term habitat loss are, by nature, longer term but are spatially limited and considered unlikely to significantly effect species such that transboundary impacts will arise.

473 In conclusion, it is proposed that impacts on fish and shellfish ecology and their nature conservation interests, in so far as they are scoped into the main EIA process, will also be included within the transboundary assessment and are not screened out at this time. Any potential likely significant effects upon designated European Sites with fish as a qualifying feature will be assessed within the HRA.

8.2.6 Summary of next steps

474 The proposed approach to the assessment for the fish and shellfish ecology PEIR chapter will first include the definition of the worst-case scenarios, on which the assessments will be based. The geographic footprint of the project, the foundations proposed, and the piling hammer energies will be key considerations in defining the worst-case scenarios for fish and shellfish receptors.

475 The impacts of noise on sensitive fish and shellfish receptors is scoped into the EIA and noise modelling of the worst-case piling scenario is proposed to be undertaken for piling in the array. The worst-case scenario will be based on WTG foundation type and size, and water depths in which they will be deployed.

476 As noted above, no surveys are proposed for fish and shellfish, as the area has been extensively studied previously and is therefore characterised adequately for the purpose of EIA. Furthermore, the EIA will be limited to those receptors that are considered as having a realistic potential to be significantly impacted by the proposed development.

8.2.7 Further considerations for Consultees

477 Scoping questions for consultees in relation to fish and shellfish ecology include:

i. Are you satisfied that the baseline data referenced above is valid for the purposes of the scoping assessment?

ii. Have all potential impacts resulting from the Awel y Môr OWF been identified for fish and shellfish receptors?

iii. For those impacts scoped in (Table 39), do you agree that the methods described are sufficient to inform a robust impact assessment?

iv. Do you agree that the impacts described in Table 40 can be scoped out?

v. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Awel y Môr OWF on fish and shellfish receptors?

vi. Do you agree that the cumulative effects on Fish and Shellfish receptors (other than those related to subsea noise effects during construction) should be scoped out of the EIA for the Awel y Môr OWF based on the assumptions detailed in this Scoping Report?

8.3 Marine Mammals

8.3.1 Introduction

478 This Section of the Scoping Report identifies the marine mammal receptors of relevance to the Awel y Môr Offshore Wind Farm (OWF) array area and offshore ECR search area. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the offshore components of Awel y Môr OWF on marine mammals and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

8.3.2 Study Area

479 The Awel y Môr OWF marine mammal Study Area varies depending on the species, considering individual species ecology and behaviour. The marine mammal Study Area has been defined at two spatial scales:

- Regional scale study area: Provides a wider geographic context in terms of the species present and their estimated densities and abundance, at the appropriate scale for each marine mammal population. The marine mammal species likely to be present in the Awel y Môr OWF marine mammal Study Area include harbour porpoise (*Phocoena phocoena*), grey seal (*Halichoerus grypus*), bottlenose dolphin (*Tursiops truncatus*), Risso's dolphin (*Grampus griseus*), short-beaked common dolphin (*Delphinus delphis*) and minke whale (*Balaenoptera acutorostrata*).
- The regional Study Area for harbour porpoise is the Celtic and Irish Sea Management Unit (MU), for grey seals it is the South and West England and Wales MU, for bottlenose dolphins it is the Irish Sea MU, and for Risso's dolphins, short-beaked common dolphins, and minke whales, it is the Celtic and Greater North Seas MU. This scale defines the appropriate reference population for each species for the assessment.
- Awel y Môr Study Area: includes the area covered by site-specific marine mammal surveys which are currently underway for Awel y Môr. These will provide an indication of the marine mammals present across impact footprints.

8.3.3 Baseline data

480 Ongoing aerial surveys are taking place of Awel y Môr OWF led by APEM (March 2019-2021) with a 4 km buffer on the seaward side (north) and an 8 km buffer on the coastal side (south). However, a review of photographs taken from these aerial surveys have indicated a limited ability to identify small cetacean sightings to species level and, in addition, surveys to date have recorded a low number of sightings. Due to these identification difficulties and low encounter rates, it is unlikely that these surveys will be sufficient to provide species specific density estimates or density surfaces. Therefore, alternative density estimates will also be collated and presented using the data from the sources presented below. The species specific density estimates to be used in a quantitative impact assessment at EIA will be discussed and agreed with the SNCBs.

481 A review of available data on marine mammals in the Study Area has been undertaken as part of this Scoping Study. The datasets considered to be relevant are listed below:

- Previous offshore renewables surveys:
  - Prior to construction: Gwynt y Môr Environmental Impact Assessment (2005), Gwynt y Môr Marine Mammal Monitoring Baseline report (informed by aerial surveys) (2010-2011), Gwynt y Môr baseline visual and acoustic marine mammal surveys (Goold *et al.* 2005);
  - During construction: Gwynt y Môr Marine Mammal Mitigation First Year Construction Report (vessel based visual surveys - harbour porpoise, bottlenose dolphins and grey and harbour seals observed) (2013);
  - Post construction: Gwynt y Môr aerial surveys led by APEM (2016-2017; 2017-2018; 2018-2019);
  - Burbo Bank Extension Offshore Windfarm Environmental Statement: Annex 14 – Marine Mammals (2013) - Overlap of the same geographic area as the Awel y Môr OWF;
  - Morlais tidal stream energy project boat surveys conducted off the west coast of Anglesey (~56 km swimming distance from Awel y Môr OWF): 24 visual surveys from November 2016 to October 2018 and SEACAMS boat survey data including 18 visual and acoustic surveys from January 2015 to December 2016 (Royal Haskoning DHV 2019);

- Minesto Deep Green Holyhead Deep Project Environmental Statement and Habitats Regulations Assessment Report (Minesto 2016), a tidal project west of Anglesey (~57 km swimming distance from the Awel y Môr OWF).

- Horizon Wylfa Newydd Power Station baseline information, Environmental Statement and information for Habitats Regulations Assessment, including boat, land and acoustic marine mammal surveys between 2010 and 2017 (Jacobs 2018b, a). This was for a power station development on north Anglesey (~25 km swimming distance from the Awel y Môr OWF).
- Small Cetaceans in the European Atlantic and North Sea (SCANS III) data (Hammond *et al.* 2017): combination of vessel and aerial surveys of the North Sea and European Atlantic continental shelf waters conducted in July 2016.
- Revised Phase III data analysis of the Joint Cetacean Protocol (JCP Phase III) data (Paxton *et al.* 2016): 38 data sources from ship and aircraft surveys between 1994-2010. The JCP Phase III Data Analysis Product will be used to extract abundance estimates averaged for summer 2007-2010 and scaled to the SCANS III estimates for user specified areas.
- JNCC Report 544 (Heinänen and Skov 2015): In-depth analyses of the Joint Cetacean Protocol (JCP) survey data. JNCC identified north-west Wales (Anglesey, Lleyn Peninsula) as an area of persistent high density of harbour porpoises, particularly in summer.
- Northeast Atlantic cetacean distribution maps (Waggitt *et al.* 2019): density maps for harbour porpoise, minke whale, Risso's dolphins and common dolphins.
- ObSERVE aerial surveys (Rogan *et al.* 2018).
- Data and Management Units (MUs) for cetaceans in UK waters (IAMMWG 2015).
- National Biodiversity Network: Records of grey seal and harbour porpoise in the Awel y Môr OWF area.
- MARINElife Liverpool-Belfast 'Stena Mersey' ferry Marine Mammal Observer survey recordings: Includes sightings of harbour porpoise, harbour seal, grey seal, dolphin species, bottlenose dolphin and minke whale.
- Atlas of the Marine Mammals of Wales (Baines and Evans 2012): Collated data of land, vessel and aerial based marine mammal sightings from 16 groups/surveys covering the Welsh coastline.

- Seal haul-out data: Ground and aerial based grey seal pup abundance estimates (Stringell *et al.* 2014).
- Seal photo-identification data (Langley *et al.* 2018): The EIRPHOT database holds a minimum of 9000 individuals with photographs taken between the Dee Estuary and the Smalls & Grassholm Islands between 1992-2016.
- SMRU telemetry data: No harbour seals have been tagged by SMRU in Wales. There are also no telemetry track data from harbour seals tagged at other SMAs that enter into the vicinity of the Awel y Môr OWF. A total of 57 grey seals have been tagged in the West England and Wales SMA (17 pups, 1 juvenile and 39 adults). These were tagged between 2009 and 2017 at Anglesey, Bardsey, Ramsey, and the River Dee. Data will be used to assess the degree of overlap between tagged grey seals and the Awel y Môr OWF, and connectivity with seal SACs.
- SMRU density estimates and at-sea usage maps (Russell *et al.* 2017): Telemetry data from 270 grey seals tagged in the UK were combined with haul-out count data between 1996 and 2015 to provide estimates of at-sea usage for each species (the mean number of grey seals estimated in be in the water in each grid cell at any given time).
- Natural Resources Wales (NRW) reports, such as grey seal photo ID and SAC connectivity (Langley *et al.* 2018) and grey seal pup production (Clarke *et al.* 2018).
- Special Committee on Seals (SCOS) annual reporting of scientific advice on matters related to the management of UK seal populations. There are no systematic surveys for seals in Wales, partly because a large but unknown proportion of seals breed and pup in caves or small cliff beaches, which would not be identifiable to be included in usual survey methods (aerial or on foot surveys) (SCOS 2019).
- UK Offshore Energy Strategic Environmental Assessment (OWESEA3): Appendix 1a.7 – Marine and Other Mammals (DECC 2016).
- Countryside Council for Wales (CCW) reports. Grey seal abundance and distribution estimates: Visual counts of grey seal haul out sites in North Wales between 2002 and 2003 (Westcott and Stringell 2004), where for example 330 grey seals were observed on West Hoyle Sandbank on the Dee Estuary, which is ~20 km swimming distance from the Awel y Môr array area and ~6 km swimming distance from the offshore ECR search area.

- Sea Watch Foundation Sightings: Sightings from the North West England and Wales regions include harbour porpoise, bottlenose dolphin, Risso's dolphins, common dolphins and minke whales[24].
- Sea Watch Foundation Reports: Collation of 1975-2000 data on cetaceans observed in Liverpool Bay and the Northern Irish Sea (Evans and Shepherd 2001); bottlenose dolphin photo ID data off Anglesey (Feingold and Evans 2014).

8.3.4 Baseline environment

482 The marine mammal species likely to be present in the Awel y Môr OWF marine mammal Study Area include the harbour porpoise, grey seal, minke whale and bottlenose, Risso's and short-beaked common dolphin.

483 Other marine mammal species that have been sighted in the Celtic and Irish Sea but are considered to be only occasionally or rarely present around the Awel y Môr OWF Study Area include: harbour seal, fin whale, killer whale, long-finned pilot whale, humpback whale, sei whale, pygmy sperm whale, northern bottlenose whale, Cuvier's, Sowerby's and Blainville's beaked whales, striped dolphin, Atlantic white-sided dolphin and white-beaked dolphin.

484 Marine mammals are highly mobile, and therefore it is necessary to consider their occurrence within the Awel y Môr OWF, as well as their presence in the wider region.

Harbour porpoise

485 Harbour porpoise have been assessed in Annex IV of the Habitats Directive as having an 'Unknown' conservation status (JNCC 2019c). The MU for harbour porpoise in the area of the Awel y Môr OWF is the 'Celtic & Irish Sea (CIS)' (IAMMWG 2015) with an estimated a population size of 104,695 (95% CI: 56,774 – 193,065) which was based on data from SCANS I and II surveys (Macleod *et al.* 2009, Hammond *et al.* 2013). The most recent population estimate for the 'Celtic & Irish Sea' ICES assessment unit is 26,700 harbour porpoise (CV: 0.25; 95% CI: 16,055 – 42,128) with a density estimate of 0.11 porpoise/km^2 (Hammond *et al.* 2017); however SCANS III covered only part of this MU and a full MU wide estimate (combining SCANS III with ObSERVE data) is yet to be provided.

[24] http://seawatchfoundation.org.uk/legacy_tools/region.php?output_region=10

486 The population estimate for the SCANS III Block F, which is in the eastern Irish Sea and includes the Awel y Môr OWF, is 1,056 harbour porpoise (CV: 0.38; 95% CI: 342-2,010) (Hammond *et al.* 2017). The SCANS III estimated density in survey Block F is 0.086 porpoise/km^2, with mean group size of 1.00 (Hammond *et al.* 2017). The population estimate by SCANS III for the adjacent area, survey Block E, which is in the central and western Irish Sea, was 8,320 individuals with an estimated density of 0.239 porpoise/km^2, with mean group size of 1.31 (CV: 0.28; 95% CI: 4,643 – 14,354) (Hammond *et al.* 2017).

487 The JCP Phase III Data Analysis Product provided an estimate of 0.13 porpoise/km^2 in the vicinity of the array area, averaged for the summer 2007-2010. This estimate is for the summer months only and is not representative of densities at other times of the year.

488 Heinänen and Skov (2015) identified areas of persistent high usage by harbour porpoise, with harbour porpoise in the Celtic and Irish Sea regions showing a preference for shallower areas, and a negative relationship between number of ships and porpoise distribution. This identification of persistent high usage areas led to designation of porpoise SACs within UK waters.

489 Waggitt *et al.* (2019) present predicted spatial density maps of marine mammals in the North East Atlantic, with these maps indicating that harbour porpoise use the OWF area and are present year round.

490 All previous surveys listed in 'Data Sources' have identified harbour porpoise as being both common in the area and present year-round.

Grey seals

491 The conservation status of grey seals in UK waters has been assessed as 'Favourable' (JNCC 2019d) and population modelling for regularly monitored grey seal breeding colonies show an increasing trend of 2% p.a. (SCOS 2019).

492 The relevant Seal Management Area (SMA) for grey seals in this area is the Wales SMA. A total of 850 grey seals were counted during August haul-out counts in the Wales SMA for the count period 2008-2017 (SCOS 2019) which is an increase from the 750 in the count period 2007-2009. Estimates of August haul-out counts for the Wales SMA were compiled from various sources as there are no dedicated seal surveys in Wales, therefore caution is advised when interpreting these numbers and it should be noted that apparent increases may partly be due to increased reporting.

493 Around the rest of the UK grey seal pup production is monitored by aerial surveys, however in Wales more than half of pups are born in cryptic habitats such as sea caves, making monitoring and assessment of abundance or density unreliable when using traditional aerial survey methods (Stringell *et al.* 2014). Ground-based counts of grey seal adults and pups at haul out sites in caves and cryptic habitats around Anglesey and the Lleyn Peninsula were conducted and from this an estimate of 242-307 grey seals in the whole of north Wales was calculated (Stringell *et al.* 2014). However, this total count is lower than counts of seals from single haul out sites in North Wales taken during the non-breeding season (Westcott and Stringell 2004), perhaps due to immigration of seals from other areas. Therefore, the Stringell *et al.* (2014) extrapolated count should not be seen as a total North Wales population estimate.

494 The most recent pup production estimates suggest the grey seal pup production in Wales was 1,650 in 2016, the same estimate as 2014 (SCOS 2019). More recent efforts are not available as storms at the peak of pupping season hampered 2017 counts, which may have caused up to 75% pup mortality for that year.

495 Westcott and Stringell (2004) identify grey seal haul out sites in the Anglesey area. Of these, the nearest grey seal haul out sites to the Awel y Môr OWF are the West Hoyle Sandbank on the Dee Estuary (~20 km swimming distance from the Awel y Môr OWF array area and ~6 km swimming distance from the offshore ECR search area), Puffin Island (~17 km swimming distance from the Awel y Môr OWF array area and ~7 km swimming distance from the offshore ECR search area), East Mouse (~14 km swimming distance from the Awel y Môr OWF array and the offshore ECR search area), and The Skerries (~40 km swimming distance from the Awel y Môr OWF array and the offshore ECR search area).

496 Telemetry data indicate high use of the Awel y Môr OWF array area and the ECR search area (Figure 38). Telemetry data also demonstrate transboundary connectivity, with seals travelling from the Awel y Môr OWF across the Irish Sea to coastal Ireland.

497 Grey seal at-sea density estimates within the Awel y Môr OWF array area reach 0.3 seals/km^2 and in the ECR search area reach 1.7 seals/km^2. Densities are higher to the east of the development within Liverpool Bay at the mouth of the River Dee where densities reach 4.4 seals/km^2 (Figure 39).

7°30'0"W 6°40'0"W 5°50'0"W 5°0'0"W 4°10'0"W 3°20'0"W 2°30'0"W 1°40'0"W

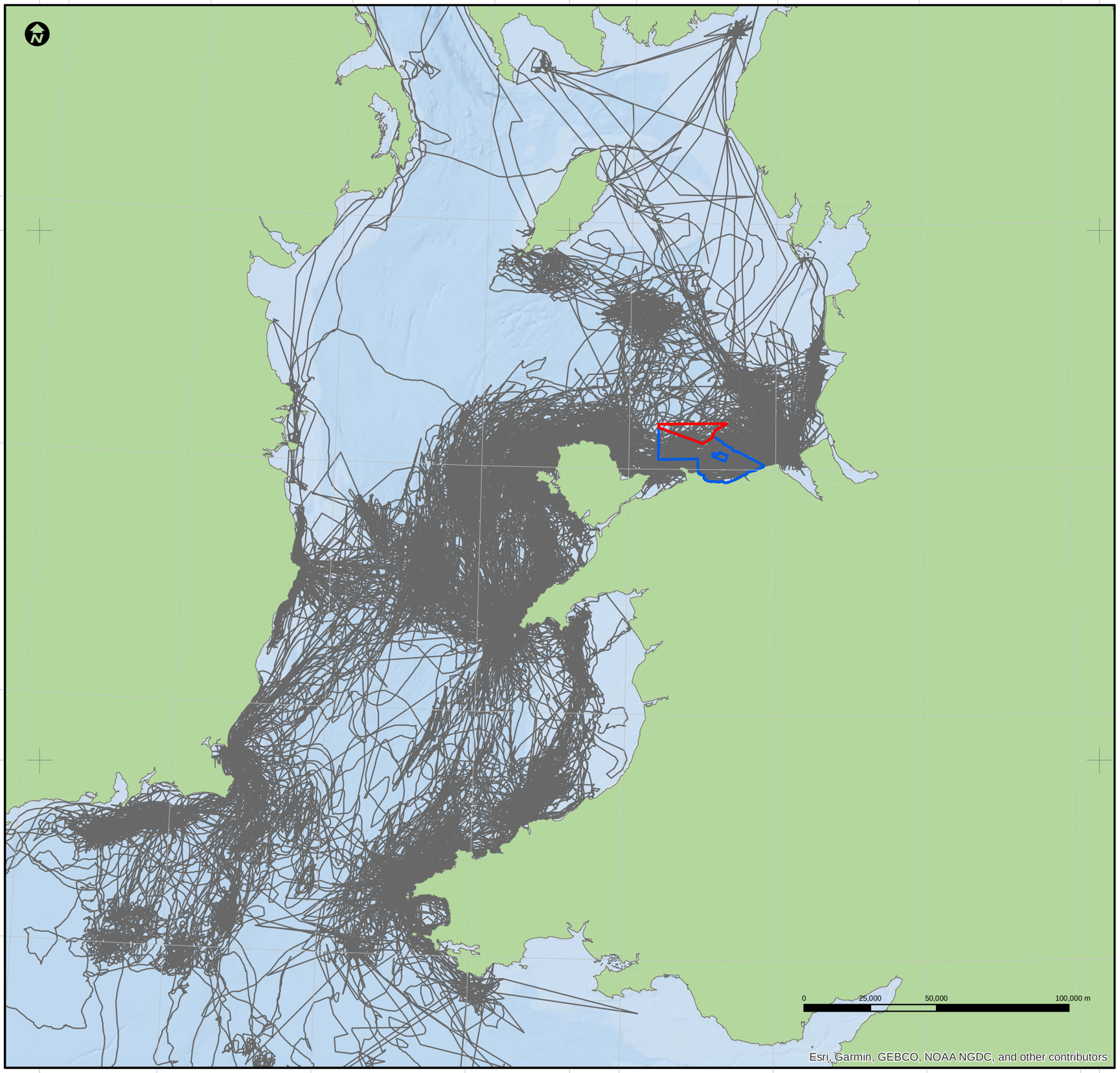
200000 400000 600000

54°10'0"N 6000000

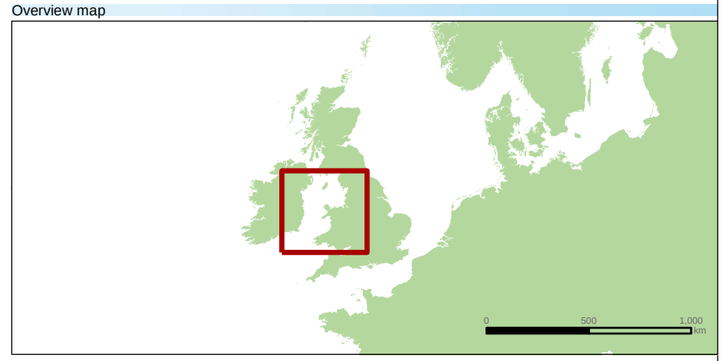
53°20'0"N

52°30'0"N 5800000

51°40'0"N



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Grey Seal Telemetry Tracks

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Grey Seal Telemetry Tracks

DRAWN	DATE	SCALE	SIZE
RRS	03/03/2020	1:1,500,000	@DIN A3

REV 01

Path: C:\Users\rp28.ST-ANDREWS\Documents\GIS\A-y-M\Final Scoping Maps\AyM_Chapter8.3_Figure1.mxd

5°50'0"W 5°0'0"W 4°10'0"W 3°20'0"W 2°30'0"W

300000 400000 500000

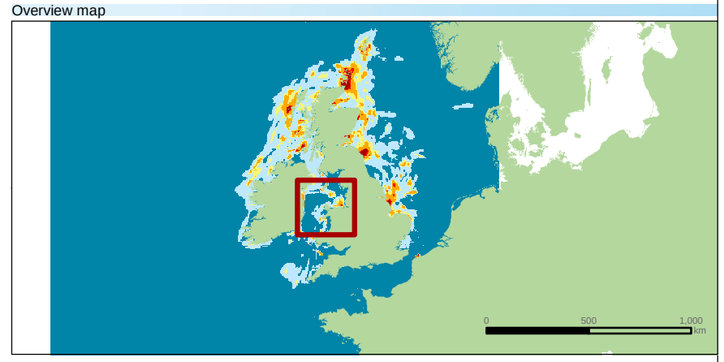
54°10'0"N 6000000

53°20'0"N 5900000

52°30'0"N 5800000

0 20,000 40,000 80,000 m

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area

Grey Seal At-Sea Usage (#/25km² cell)

- 0<1
- 1<5
- 5<10
- 10<50
- 50<100
- >100

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Grey Seal At-Sea Usage

DRAWN	DATE	SCALE	SIZE
RRS	03/03/2020	1:1,000,000	@DIN A3

REV 01

Path: C:\Users\rp28.ST-ANDREWS\Documents\GIS\A-y-M\Final Scoping Maps\AyM_Chapter8.3_Figure2.mxd

Bottlenose dolphin

498 Bottlenose dolphins have been assessed in Annex IV of the Habitats Directive as having an 'Unknown' conservation status (JNCC 2019a). The relevant MU for bottlenose dolphins which covers the Awel y Môr OWF and surrounding waters is the 'Irish Sea (IS)', which has an estimated abundance of 397 dolphins (CV: 0.23; 95% CI: 362-414) (IAMMWG 2015).

499 No bottlenose dolphins were recorded in survey Block F during the SCANS III survey (Hammond *et al.* 2017). In the adjacent Block E, the western Irish Sea, the abundance estimate was 288 individuals with an estimated density of 0.008 dolphins/km^2 and a mean group size of 1.50 (CV: 0.57; 95% CI: 0 - 664) (Hammond *et al.* 2017).

500 There are two SACs designated for bottlenose dolphins in UK waters, both with semi-resident groups: Cardigan Bay in Wales and the Moray Firth in Scotland. The Cardigan Bay SAC is ~170 km swimming distance from the Awel y Môr OWF boundary (Figure 41).

501 Photo identification of bottlenose dolphins off Anglesey (Figure 40) has identified at least 75 individuals that have also previously been seen within the Cardigan Bay SAC (Feingold and Evans 2014), highlighting how the bottlenose dolphin's range and distribution extends to north Wales, Liverpool Bay and north at least to the Isle of Man (Pesante *et al.* 2008). More recent studies also confirm sightings and a shift in usage of dolphins in the region to regularly used areas around the Isle of Anglesey and Liverpool Bay during the summer months (Feingold and Evans 2014, Duckett 2018). The Cardigan Bay SAC and the Lleyn Peninsula and the Sarnau SAC are both thought to be important calving areas for bottlenose dolphins (Feingold and Evans 2014).

5°0'0"W 4°40'0"W 4°20'0"W 4°0'0"W 3°40'0"W 3°20'0"W

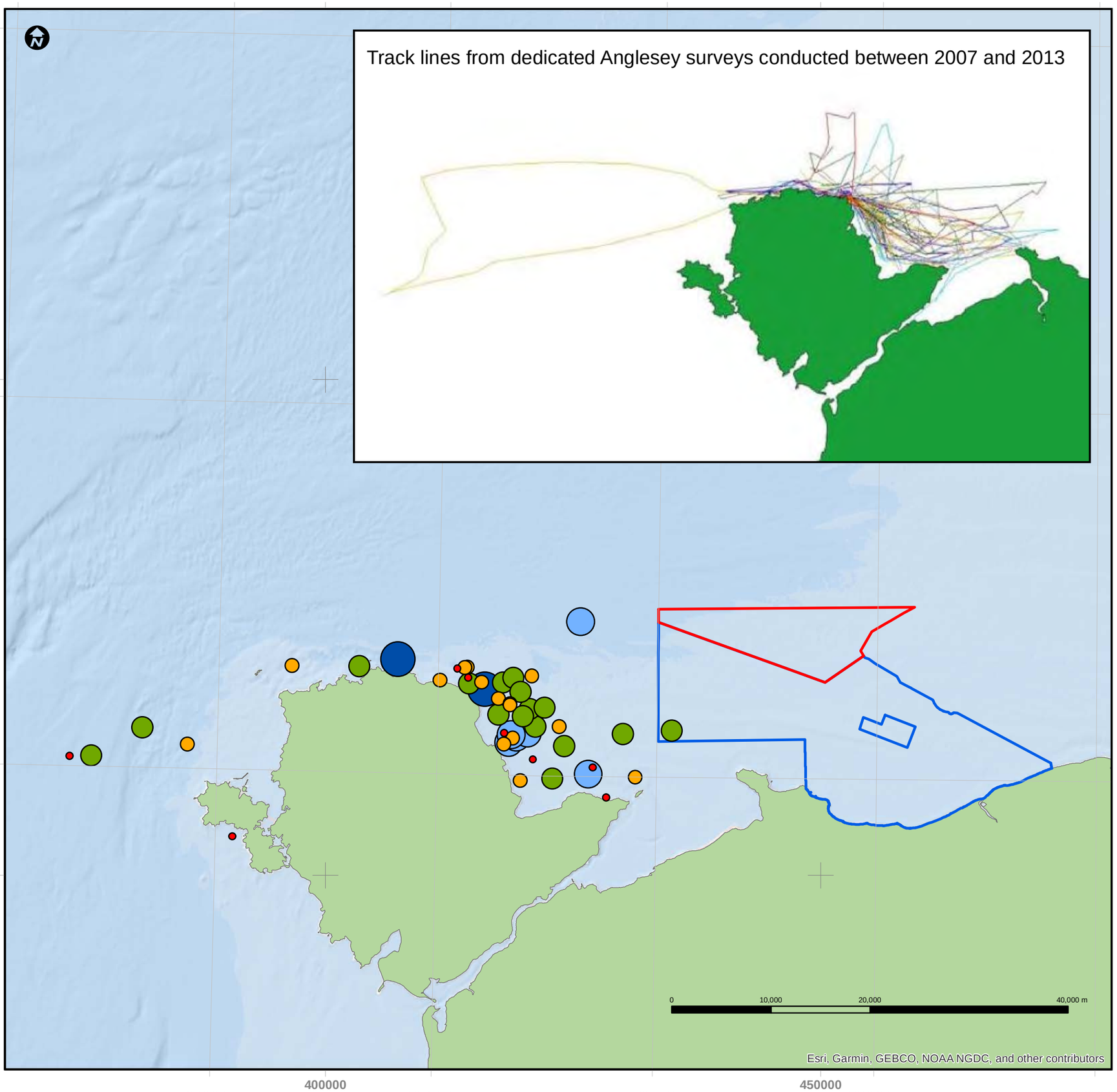
400000 450000

54°0'0"N

53°40'0"N 5950000

53°20'0"N 5900000

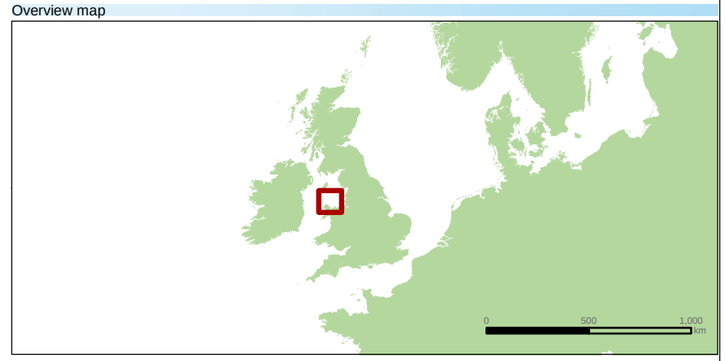
Track lines from dedicated Anglesey surveys conducted between 2007 and 2013



4°40'0"W 4°20'0"W 4°0'0"W 3°40'0"W 3°20'0"W

400000 450000

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area

Bottlenose dolphin photo ID encounters (Group size)

- 0 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 100

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Seawatch Foundation Bottlenose dolphin photo ID encounters (2007 - 2013)

DRAWN	DATE	SCALE	SIZE
RRS	03/03/2020	1:400,000	@DIN A3

REV 01

Path: C:\Users\rp28.ST-ANDREWS\Documents\GIS\A-y-M\Final Scoping Maps\AyM_Chapter8.3_Figure3.mxd

Risso's dolphin

502 Risso's dolphins have been assessed in Annex IV of the Habitats Directive as having an 'Unknown' conservation status (JNCC 2019e). Risso's dolphins in the Study Area fall within the 'Celtic and Greater North Seas (CGNS)' MU, however no abundance estimate was available for this species in IAMMWG (2015). JNCC recommends an abundance estimate for the CGNS MU of 8,974[25] based on SCANS III data. The 2010 abundance estimate in the Irish Sea Development Area was highest in spring, when abundance was estimated at 70 individuals (95% CI 0-280), with a summer abundance of 30 individuals (95% CI: 0-160) and winter/autumn abundance estimates of 0 (95% CI: 0-10) (Paxton *et al.* 2016).

503 No Risso's dolphins were recorded in survey Block F during the SCANS III survey (Hammond *et al.* 2017). In the adjacent Block E, the western Irish Sea, the abundance estimate was 1,090 individuals with an estimated density of 0.031 dolphins/km^2 and a mean group size of 7.50 (CV: 0.69; 95% CI: 0-2,843) (Hammond *et al.* 2017).

Short-beaked common dolphin

504 Short-beaked common dolphins have been assessed in Annex IV of the Habitats Directive as having an 'Unknown' conservation status (JNCC 2019b). Short-beaked common dolphins in the Study Area fall within the 'Celtic and Greater North Seas (CGNS)' MU which has an abundance estimate of 56,556 dolphins (CV: 0.28; 95% CI: 33,014 – 96,920) (IAMMWG 2015).

505 No short-beaked common dolphins were recorded in survey Block F or the adjacent Block E during the SCANS III survey (Hammond *et al.* 2017).

Minke whale

506 Minke whales have been assessed in Annex IV of the Habitats Directive as having an 'Unknown' conservation status (JNCC 2019f). Minke whales in the Study Area fall within the 'Celtic and Greater North Seas (CGNS)' MU which has an abundance estimate of 23,528 whales (CV: 0.27; 95% CI: 13,989-39,572) (IAMMWG 2015).

[25] JNCC (2017) JCP Data Resource Analysis Phase III Files. Management Units (MU) abundance values

507 No minke whales were recorded in survey Block F during the SCANS III survey (Hammond *et al.* 2017). In the adjacent Block E, the western Irish Sea, the abundance estimate was 603 individuals with an estimated density of 0.017 minke whales/km^2 (CV: 0.62, 95% CI: 134 – 1,573) (Hammond *et al.* 2017).

Designated sites

508 A separate HRA screening report has been completed (innogy, 2020), which includes details of the designated sites screened into the assessment for each marine mammal species. However, this Section outlines the SACs within the assessment management units for each marine mammal species.

509 The closest harbour porpoise SAC to the Awel y Môr OWF is the North Anglesey Marine (Gogledd Môn Forol) SAC which is ~15 km swimming distance from the Awel y Môr OWF array area. Other nearby SACs are the West Wales Marine (Gorllewin Cymru Forol) SAC, the North Channel SAC and the Bristol Channel Approaches (Dynesfeydd Môr Hafren) SAC, which are ~105 km, ~110 km and ~290 km swimming distance from the Awel y Môr OWF, respectively. Harbour porpoise are listed as Annex II species that are primary reason for the SAC site selection for all aforementioned SACs.

510 The closest grey seal SACs to the Awel y Môr OWF are: Lleyn Peninsula and the Sarnau (Pen Llŷn a'r Sarnau) SAC, Cardigan Bay (Bae Ceredigion) SAC and Pembrokeshire Marine (Sir Benfro Forol) SAC which are ~115 km, ~170 km and ~230 km swimming distance from the Awel y Môr OWF, respectively. Grey seals are listed as Annex II species for the Pembrokeshire Marine SAC, species that are a primary reason for selection of the site. Grey seals are also listed as Annex II species for the Cardigan Bay and Lleyn Peninsula and the Sarnau SAC, species that are a qualifying site feature, but not a primary reason for site selection.

511 The closest bottlenose dolphin SACs to the Awel y Môr OWF are: Lleyn Peninsula and the Sarnau (Pen Llŷn a'r Sarnau) SAC and the Cardigan Bay (Bae Ceredigion) SAC which are ~115 km and ~170 km swimming distance from the Awel y Môr OWF boundary, respectively. There is known connectivity between the North Wales coast and these dolphin SACs. Bottlenose dolphins are listed as Annex II species for the Cardigan Bay (Bae Ceredigion) SAC, species that are a primary reason for selection of the site. Bottlenose dolphins are listed as Annex II species for the Lleyn Peninsula and the Sarnau SAC (Pen Llŷn a'r Sarnau), species that are a qualifying site feature, but not a primary reason for site selection. Bottlenose dolphins within the Awel y Môr OWF boundary are likely to be from Cardigan Bay and/or the Lleyn Peninsula and the Sarnau SAC within the Irish Sea Management Unit.

512 There is a proposed Marine Protected Area (pMPA) under consultation at site 'North-east Lewis' which list the Risso's dolphin as a proposed protected feature, which is ~610 km swimming distance from the Awel y Môr OWF.

513 There are two proposed Marine Protected Areas under consultation at sites 'Sea of Hebrides' and 'Southern Trench' which list the minke whale as a proposed protected feature, which are ~240 km and ~950 km swimming distance from the Awel y Môr OWF, respectively.

TABLE 41 - MARINE NATURE CONSERVATION DESIGNATIONS WITH RELEVANCE TO MARINE MAMMALS AND AWEL Y MÔR OWF

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
INTERNATIONAL AND NATIONAL		
North Anglesey Marine (Gogledd Môn Forol) SAC	~15 km swimming distance from the Awel y Môr OWF boundary	Primary reason for site selection - harbour porpoise.
West Wales Marine (Gorllewin Cymru Forol) SAC	~105 km swimming distance from the Awel y Môr OWF boundary	Primary reason for site selection - harbour porpoise.
North Channel (Northern Ireland) SAC	~110 km swimming distance from the Awel y Môr OWF boundary	Primary reason for site selection - harbour porpoise.
Bristol Channel Approaches (Dynesfeydd Môr Hafren) SAC	~290 km swimming distance from the Awel y Môr OWF boundary	Primary reason for site selection - harbour porpoise.
Pembrokeshire Marine (Sir Benfro Forol) SAC	~230 km swimming distance from the Awel y Môr OWF boundary	Primary reason for site selection – grey seal.
Cardigan Bay (Bae Ceredigion) SAC	~170 km swimming distance from the Awel y Môr OWF boundary	Primary reason for site selection – bottlenose dolphin. Qualifying site feature, but not primary reason for site selection – grey seal.
Lleyn Peninsula and the Sarnau (Pen Llŷn a'r Sarnau) SAC	~115 km swimming distance from the Awel y Môr OWF boundary	Qualifying site feature – grey seal, bottlenose dolphin.
Menai Strait and Conwy Bay (Y Fenai a Bae Conwy) SAC	~5 km swimming distance from the Awel y Môr OWF boundary	No marine mammals listed as primary reason or qualifying features for site selection.

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
Lambay Island SAC	~125 km swimming distance from the Awel y Môr OWF boundary	Primary reason for site selection – grey seal and harbour seal.
North-east Lewis pMPA	~610 km swimming distance from the Awel y Môr OWF boundary	Proposed protected feature – Risso's dolphin
Sea of Hebrides pMPA	~240 km swimming distance from the Awel y Môr OWF boundary	Proposed protected feature – minke whale
Southern Trench pMPA	~950 km swimming distance from the Awel y Môr OWF boundary	Proposed protected feature – minke whale

8°0'0"W 6°40'0"W 5°20'0"W 4°0'0"W 2°40'0"W

300000 450000

54°10'0"N 6000000

53°20'0"N

52°30'0"N 5850000

51°40'0"N 5700000

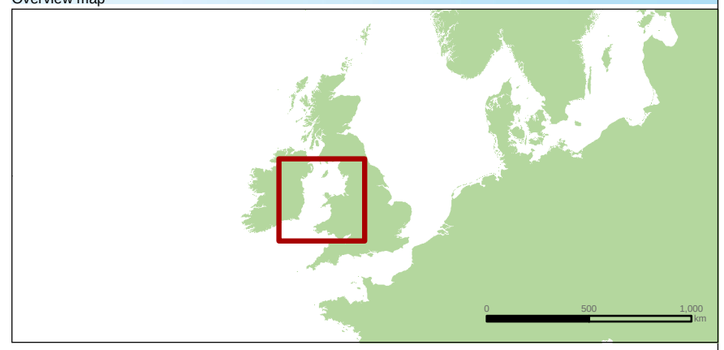
0 25,000 50,000 100,000 m

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

6°40'0"W 5°20'0"W 4°0'0"W 2°40'0"W

300000 450000

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area

Porpoise SACs

- Bristol Channel Approaches / Dynesfeydd Môr Hafren
- North Anglesey Marine / Gogledd Môn Forol
- North Channel
- West Wales Marine / Gorllewin Cymru Forol

Grey Seal and Bottlenose Dolphin SACs

- Cardigan Bay/ Bae Ceredigion
- Pembrokeshire Marine/ Sir Benfro Forol
- Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Marine Mammal Special Areas of Conservation

DRAWN	DATE	SCALE	SIZE
RRS	11/03/2020	1:1,500,000	@DIN A3

REV 01

Path: C:\Users\rp28.ST-ANDREWS\Documents\GIS\A-y-M\Final Scoping Maps\AyM_Chapter8.3_Figure4.mxd

8.3.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

514 Key guidance/best practice that will be referred to in undertaking the assessment of impacts for marine mammals are as follows:

- Institute of Ecology and Environmental Management (IEEM) guidelines for marine and coastal ecological impact assessment in Britain and Ireland (IEEM, 2010; CIEEM, 2019);
- European Union Guidance on wind energy developments and Natura 2000 legislation (EC 2011);
- Oslo Paris Convention (OSPAR) Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR 2008);
- The marine mammal PTS-onset noise exposure criteria recommended in Southall et al. (2019);
- Position statement from the Joint Statutory Nature Conservation Bodies in relation to the use of ADDs for marine mammal mitigation during offshore wind farm construction (JNCC et al. 2016); and
- Guidance on mitigation protocols to minimise the risk of injury to marine mammals from piling noise (JNCC 2010).

Potential project impacts

515 A range of potential impacts on marine mammals have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The impacts that have been scoped in to the Awel y Môr OWF EIA are outlined in Table 2, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

516 Based on the marine mammal information currently available and the project description, a number of impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 3, together with a justification for scoping them out.

TABLE 42 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR MARINE MAMMALS

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
8.3.1	PTS (piling)	The impact of impact piling during construction may result in hearing damage/auditory injury (PTS) in marine mammals.	Noise modelling will be required to quantitatively assess the risk of PTS. Unless any new guidance is published prior to the impact assessment, the Southall *et al.* (2019) thresholds will be used to assess the risk of PTS. The risk of injury will be based on both of the dual criteria: cumulative sound exposure level (SEL_{cum}) and peak sound pressure level (SPL_{peak}). To assess the SEL_{cum} criterion, the predictions of received sound level over 24 hours are frequency weighted, to reflect the hearing sensitivity of each functional hearing group. The SPL_{peak} criterion is for unweighted received sound level. If required, population level modelling will be conducted using the iPCoD model.
8.3.2	Disturbance (piling)	The impact of impact piling during construction may result in behavioural disturbance/ displacement of marine mammals.	Noise modelling will be required to quantitatively assess the risk of disturbance. The assessment of disturbance will be based on the best practice methodology at the time of assessment, making use

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			of the best available scientific evidence. It is likely based on current practice that the methodology will incorporate the application of a species-specific dose-response approach rather than a fixed behavioural threshold approach. Noise contours at appropriate intervals will likely be generated by noise modelling and overlain on species density surfaces to predict the number of animals potentially disturbed. This will allow the quantification of the number of animals that potentially will respond. If required, population level modelling will be conducted using the iPCoD model. Density estimates will be used in the impact assessment to estimate the number of animals predicted to experience behavioural disturbance/ displacement.
8.3.3	Disturbance (other construction activities)	The impact of other construction related activities (e.g. dredging, trenching, rock dumping) may result in behavioural disturbance/ displacement of marine mammals.	Evidence on disturbance ranges from noise modelling and from the literature will be presented in order to assess the likely magnitude of impact.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
8.3.4	PTS (UXO)	The clearance of UXOs by detonation may result in hearing damage/auditory injury (PTS) in marine mammals.	Noise modelling may be required to quantitatively assess the risk of PTS. Unless any new guidance is published prior to the impact assessment, the Southall *et al.* (2019) thresholds will be used to assess the risk of PTS. Density estimates from digital video aerial surveys will be used in the impact assessment to estimate the number of animals predicted to experience PTS-onset.
8.3.5	Disturbance (UXO)	The clearance of UXOs by detonation may result in behavioural disturbance/ displacement of marine mammals.	Noise modelling may be required to quantitatively assess the risk of disturbance. The assessment of disturbance will be based on the best practice methodology at the time of assessment, making use of the best available scientific evidence. It is likely based on current practice that the methodology will incorporate the application of a species-specific dose-response approach rather than a fixed behavioural threshold approach. Noise contours at appropriate intervals will likely be generated by noise modelling and overlain on species density surfaces to predict the number of animals potentially disturbed.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
8.3.6	Collision risk (vessel)	Increased vessel traffic during construction activities may result in collisions with marine mammals.	Expected vessel numbers during construction will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals.
8.3.7	Disturbance (vessel)	Increased vessel traffic during construction activities may result in behavioural disturbance/ displacement of marine mammals.	Expected vessel numbers during construction will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals.
8.3.8	Change in water quality	Increases in SSC resulting from construction activities may impact on the ability of marine mammals to forage.	This assessment will be dependent on the results of the Physical Processes impact assessment. Based on conclusions on the nature and extent of SSC, an assessment of the impact on marine mammals will be made based on the potential for disruption to foraging.
8.3.9	Change in fish abundance/ distribution	Changes in prey abundance and distribution resulting from construction activities may impact on the ability of marine mammals to forage in the area.	The key prey species for marine mammals will be identified. This assessment will be dependent on the results of the benthic and fish ecology impact assessment. Based on conclusions on the nature, extent and significant of effects on any fish species that form an important part of marine mammal diet, an

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			assessment of the impact on marine mammals will be made based on the potential for reductions in prey availability.
OPERATION			
8.3.10	Collision risk (vessel)	Increased vessel traffic during operation and maintenance activities may result in collisions with marine mammals.	Expected vessel numbers during operation and maintenance will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals.
8.3.11	Disturbance (vessel)	Increased vessel traffic during operation and maintenance activities may result in behavioural disturbance/ displacement of marine mammals.	Expected vessel numbers operation and maintenance will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals.
8.3.13	Change in fish abundance/ distribution	Changes in prey abundance and distribution resulting from operation activities may impact on the ability of marine mammals to forage in the area.	The key prey species for marine mammals will be identified. This assessment will be dependent on the results of the benthic and fish ecology impact assessment. Based on conclusions on the nature, extent and significant of effects on any fish species that form an important part of marine mammal diet, an assessment of the impact on marine mammals will be made based on the potential for reductions in prey availability.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
DECOMMISSIONING			
8.3.14	PTS from decommissioning activities	Underwater noise generated during decommissioning activities may result in hearing damage/auditory injury (PTS) in marine mammals.	Presentation of expected underwater noise levels produced by various cutting techniques (where available), the expected duration of activities and an assessment as to whether or not this is likely to result in PTS to marine mammals.
8.3.15	Disturbance from decommissioning activities	Underwater noise generated during decommissioning activities may result in behavioural disturbance/ displacement of marine mammals.	Presentation of expected underwater noise levels produced by various cutting techniques (where available), the expected duration of activities and an assessment as to whether or not this is likely to result in disturbance to marine mammals.
8.3.16	Collision risk (vessel)	Increased vessel traffic during decommissioning activities may result in collisions with marine mammals.	Expected vessel numbers during decommissioning will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals.
8.3.17	Disturbance (vessel)	Increased vessel traffic during decommissioning activities may result in behavioural disturbance/ displacement of marine mammals.	Expected vessel numbers during decommissioning will be compared to baseline levels of vessel activity to quantify the potential increase. Assessment of impact will be based on the most up to date scientific evidence on the effect of vessels on marine mammals.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
8.3.18	Change in water quality	Increases in Suspended Sediment Concentration (SSC) resulting from decommissioning activities may impact on the ability of marine mammals to forage.	This assessment will be dependent on the results of the Physical Processes impact assessment. Based on conclusions on the nature and extent of SSC, an assessment of the impact on marine mammals will be made based on the potential for disruption to foraging.
8.3.19	Change in fish abundance/ distribution	Changes in prey abundance and distribution resulting from decommissioning activities may impact on the ability of marine mammals to forage in the area.	The key prey species for marine mammals will be identified. This assessment will be dependent on the results of the benthic and fish ecology impact assessment. Based on conclusions on the nature, extent and significant of effects on any fish species that form an important part of marine mammal diet, an assessment of the impact on marine mammals will be made based on the potential for reductions in prey availability.

TABLE 43 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR MARINE MAMMALS

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
8.3.20	Accidental pollution	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality of marine mammals or a reduction in prey availability either of which may affect species' survival rates. With implementation of an appropriate CoCP it has been agreed with SNCBs on consent applications for other OWFs, that complete mortality within the equivalent extent of a windfarm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is considered very unlikely. It was predicted that any impact would be of local spatial extent, short term duration, intermittent and medium reversibility within the context of the regional populations and be not significant in EIA terms. This is considered to be equally applicable to Awel y Môr OWF for which construction will be comparable in scale and operation within the same environment, whilst implementing an appropriate CoCP. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, Awel y Môr OWF intends to scope this impact out of further consideration within the EIA.
8.3.21	Temporary threshold shift	Exposure to loud sounds can result in a reduction in hearing sensitivity. This reduction in sensitivity (threshold shift) can be permanent (PTS) or temporary (TTS). Reductions in hearing sensitivity may affect an animal's ability to forage, avoid predation and communicate but the TTS onset ranges alone do not allow assessment of the magnitude or significance of the likely consequences for individuals and ultimately populations of the predicted extent over which any TTS might occur. The magnitude of the consequence is

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		likely to be related to the duration and magnitude of the TTS. However, the current TTS onset thresholds are inappropriate to determine a biologically significant level of TTS. It is asserted that any effects of TTS, as currently defined, are captured in the period that marine mammals exposed to pile driving noise are predicted to be 'disturbed'. Therefore, a reduction in individual foraging capability as a result of exposure to pile driving noise will be included in the assessment and potential reductions in fitness as a result of noise exposure will be sufficiently captured by the assessment of disturbance. TTS is by definition, temporary, and the duration of effect at the threshold for TTS onset is likely to be short and therefore unlikely to cause any major consequences for an animal. An impact range which encompasses such a large variation in the predicted effect on individuals is extremely difficult to interpret in terms of the potential consequences for individuals. It is important to bear in mind that the quantification of the spatial extent over which any impact is predicted to occur in the environmental assessment process, is done so in order to inform an assessment of the potential magnitude and significance of an impact. Because the TTS thresholds are not intended to indicate a level of impact of concern per se but are used to enable the prediction of where PTS might occur, they should not be used for the basis of any assessment of impact significance. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, innogy intend to scope this impact out of quantitative consideration within the EIA. As per stakeholder advice on other recent offshore windfarm projects, the impact assessment will present TTS ranges and areas but no assessment of TTS magnitude, marine mammal sensitivity or overall significance of impact (please see the SMRU Consulting Position Statement on TTS for further details).

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
OPERATIONAL		
8.3.22	Operational noise	The MMO (2014) review of post-consent monitoring at OWFs found that available data on the operational WTG noise, from the UK and abroad, in general showed that noise levels from operational WTGs are low and the spatial extent of the potential impact of the operational WTG noise on marine receptors is generally estimated to be small, with behavioural response only likely at ranges close to the WTG. This is supported by several published studies which provide evidence that marine mammals are not displaced from operational wind farms. At the Horns Rev and Nysted offshore wind farms in Denmark, long-term monitoring showed that both harbour porpoise and harbour seals were sighted regularly within the operational OWFs, and within two years of operation, the populations had returned to levels that were comparable with the wider area (Diederichs *et al.* 2008). Similarly, a monitoring programme at the Egmond aan Zee OWF in the Netherlands reported that significantly more porpoise activity was recorded within the OWF compared to the reference area during the operational phase (Scheidat *et al.* 2011). Other studies at Dutch and Danish OWFs (Lindeboom *et al.* 2011) also suggest that harbour porpoise may be attracted to increased foraging opportunities within operating offshore wind farms. In addition, recent tagging work by Russell *et al.* (2014) found that some tagged harbour and grey seals demonstrated grid-like movement patterns as these animals moved between individual WTGs, strongly suggestive of these structures being used for foraging. Other reviews have also concluded that operational wind farm noise will have negligible effects (Madsen *et al.* 2006, Teilmann *et al.* 2006a, Teilmann *et al.* 2006b, CEFAS 2010, Brasseur *et al.* 2012).

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		In addition, previous modelling by Subacoustech (e.g. Hornsea Project Three EIA) concluded that underwater noise during the operational phase is expected to have a negligible range of influence on any marine receptors. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
8.3.23	Electro-magnetic Fields	Based on the data available to date, there is no evidence of electromagnetic fields (EMF) related to marine renewable devices having any impact (either positive or negative) on marine mammals (Copping 2018). There is no evidence that seals can detect or respond to EMF, however, some species of cetaceans may be able to detect variations in magnetic fields (Normandeau *et al.* 2011). To date, the only marine mammal known to show any response to EMF is the Guiana dolphin (*Sotalia guianensis*) which has been shown to possess an electroreceptive system, which uses the vibrissal crypts on their rostrum to detect electrical stimuli similar to those generated by small to medium sized fish (Czech-Damal *et al.* 2013). However, this has not been shown in any other species of marine mammal. Therefore, subject to consultation with the SNCBs and feedback received on this Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
DECOMMISSIONING		
8.3.24	Temporary threshold shift	See 8.3.21 above.

Mitigation measures adopted as part of the project

517 As part of the design process for Awel y Môr OWF, a number of designed-in measures are proposed to reduce the potential for impacts on marine mammals. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

518 Innogy is committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Tables 2 and 3.

519 Measures adopted as part of the project will include:

- Development of, and adherence to, a CoCP;
- Development of, and adherence to, a Vessel Management Plan;
- Implementation of a piling Marine Mammal Mitigation Protocol;
- Implementation of a UXO Marine Mammal Mitigation Protocol;
- Implementation of a decommissioning Marine Mammal Mitigation Protocol;
- Development of, and adherence to, an appropriate PEMMP; and
- Development of, and adherence to, a Decommissioning Plan.

520 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

521 The EIA methodology chapter (Chapter 4) outlines how potential cumulative effects will be assessed for each receptor group. For marine mammal receptors the approach to cumulative impact assessment will be holistic and combine all potential sources of underwater noise including pile driving of OWFs together with disturbance from vessels at OWFs, UXO detonations, seismic surveys and any other offshore construction developments that are planned within the relevant MUs for each species.

522 The key cumulative impact is likely to come from underwater noise from pile driving. There is the potential for this impact to have a large spatial footprint (with regard to disturbance effects). This could have cumulative impacts spatially (i.e. if two or more piling operations are undertaken simultaneously) or temporally (i.e. if piling operations are happening consecutively). It is necessary to consider that even if a piling programme is scheduled for many months, the actual duration of pile driving would be limited to a few hours per pile given the experience of other projects. A range of realistic scenarios for cumulative underwater noise impacts will be developed for the CIA, based on publicly available information, liaison with other developers where possible, as well as consultation with the regulators and stakeholders.

523 The impacts of fishing and shipping will not be considered in the CIA since these activities occur throughout the baseline and are therefore already accounted for in the existing marine mammal baseline characterisation abundance and density estimates.

Potential transboundary Impacts

524 There is the potential for transboundary impacts upon marine mammals due to the mobile nature of marine mammal species and the proximity of Awel y Môr OWF to the borders of surrounding EEA States, such as Ireland, which are within the ranges of certain species.

525 Direct impacts may occur due to underwater noise generated during construction and decommissioning, particularly piling during the installation of foundations. Indirect impacts may cause disturbance to prey (fish) species from loss of fish spawning and nursery habitat and suspended sediments and deposition. The operation and maintenance phase is considered less likely to result in significant transboundary impacts although the impacts associated with the operational noise of turbines and EMF are, by nature, longer term (although spatially limited) which will be reversible depending on the decommissioning strategy.

526 The probability of transboundary impacts to marine mammals occurring during construction, particularly as a result of underwater noise from piling, is potentially high although the extent cannot be determined at this stage and will be subject to assessment in the EIA. Behavioural disturbance resulting from underwater noise during construction could occur over large ranges (tens of kilometres) and therefore there is the potential for transboundary effects to occur where subsea noise arising could extend into waters of other EEA states. These impacts are predicted to be short term and intermittent, with recovery of marine mammal populations to affected areas following completion of all piling activities.

527 HRA screening will be conducted to identify all possible transboundary effects relating to marine mammals. The transboundary SACs likely to be included for consideration include:

- Lambay Island SAC – grey seal, harbour seal (designated species)
- Strangford Lough SAC – harbour seal (qualifying feature)
- Murlough (Northern Ireland) SAC – harbour seal (qualifying feature)
- Rockabill to Dalkey Island (Ireland) SAC – harbour porpoise (designated species)
- Slaney River Valley (Ireland) SAC - harbour seal (designated species)
- The Maidens (Ireland) SAC – grey seal (designated species)
- Saltee Islands (Ireland) SAC – grey seal (designated species)

528 It is proposed that impacts upon marine mammals and their nature conservation interests, in so far as they are scoped into the main EIA process will also be subject to transboundary assessment and are not screened out at this time. Likely significant effects upon European Sites with marine mammals as qualifying features, will be assessed within the HRA.

8.3.6 Summary of next steps

- Continue to review developing methods for marine mammal underwater noise impact assessment. For example, the development of a new harbour seal dose-response curve based on the individual response data (being analysed by SMRU) and any further refinements to the harbour porpoise dose-response curve based on recent OWF monitoring data.

- Continue to develop an approach to incorporating the range dependent characteristics of impulsive sound into the assessment of underwater noise on marine mammals (building upon work conducted by Hastie *et al.* 2019).
- Continuation of aerial surveys and associated data processing to provide marine mammal relative density estimates. Due to a limited ability to ID all marine mammal sightings obtained during aerial surveys to species level, alternative density estimates will also be collated and presented. These will include data from sources presented in Section 8.3.3.
- Identification of noise modelling locations and development of approach to underwater noise modelling to inform PTS and disturbance impact assessments.
- Investigate plans to update grey seal at-sea usage maps.

8.3.7 Further considerations for Consultees

i. Do you agree that the data sources identified are sufficient to inform the marine mammal baseline chapter for the Awel y Môr OWF PEIR and ES?

ii. Do you agree that all the protected areas within the zone of influence have been identified?

iii. Have all potential impacts resulting from Awel y Môr OWF been identified for marine mammal receptors?

iv. Do you agree that the impacts described in Table 3 can be scoped out?

v. For those impacts scoped in (Table 2), do you agree that the methods described are sufficient to inform a robust impact assessment?

vi. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on marine mammal receptors?

vii. Do you have any specific requirements for the underwater noise modelling and assessment methodology?

8.4 Offshore Ornithology

8.4.1 Introduction

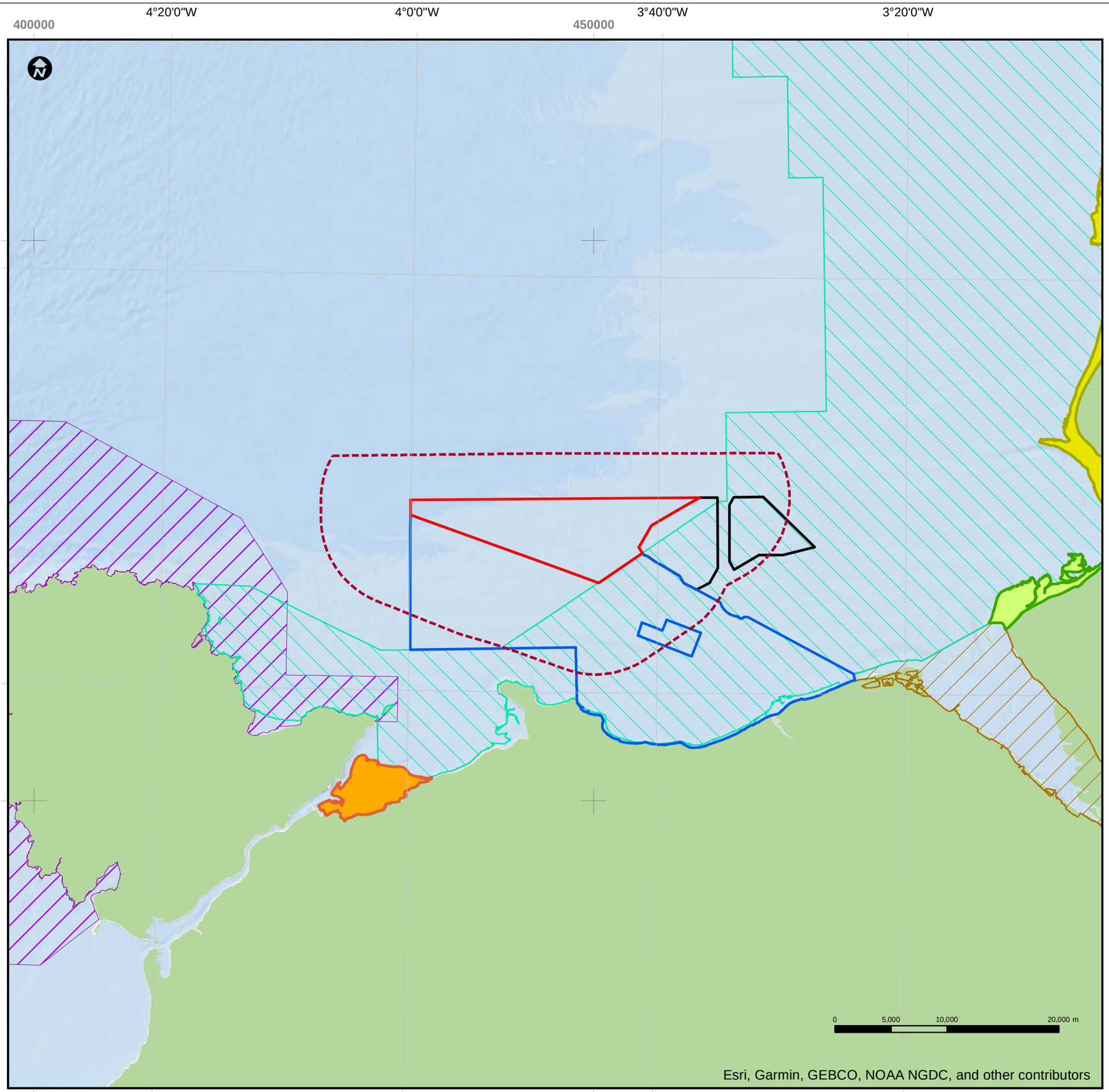
529 This Section of the Scoping Report identifies the likely bird species within the Awel y Môr OWF array area and offshore ECR search area. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the offshore components of Awel y Môr OWF on birds in the offshore environment and sets out the proposed scope of the EIA. The proposed method of assessment used to determine the significance of effects on important ornithological features (IOFs) (CIEEM, 2018) that would be sensitive to the Awel y Môr OWF development is also presented.

530 For consideration of impacts on birds in the intertidal and onshore areas, refer to Section 10.1 (Terrestrial Ecology and Nature Conservation).

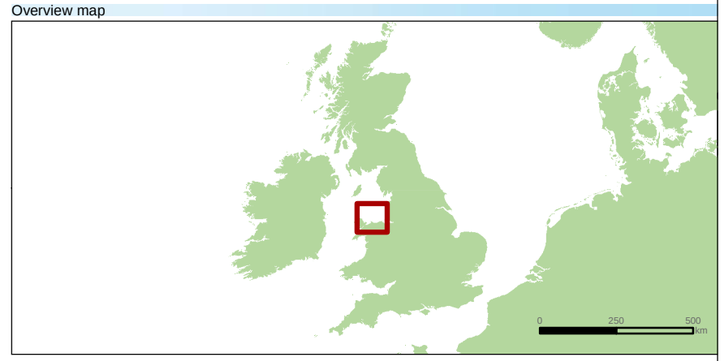
8.4.2 Study Area

531 The offshore ornithology Study Area is based on an area that is considered to represent a realistic maximum spatial extent of potential impacts on IOFs. This Study Area includes the Awel y Môr OWF array area and a 4km buffer, plus the offshore ECR search area (Figure 42).

532 It should be noted that the Study Area may be subject to review and amendments as a result of such matters as refinement of the offshore ECR and the identification of additional environmental or engineering constraints.



Overview map



Legend

- Array Area
- Aerial Survey Area
- Offshore Export Cable Route Search Area
- Gwynt y Môr Wind Farm Boundary

Special Protection Area (SPA)

- Liverpool Bay / Bae Lerpwl
- Anglesey Terns / Morwenoliaid Ynys Môn
- The Dee Estuary
- Mersey Narrows and North Wirral Foreshore
- Ribble and Alt Estuaries
- Traeth Lafan/ Lavan Sands, Conway Bay

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84
Background data: Contains public sector information licensed under the Open Government Licence v3.0, Contains data provided by The Crown Estate © Crown copyright and database right 2020
NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT
Offshore Windpark
Awel y Môr

TITLE
Offshore Ornithology Aerial Survey Area

DRAWN	DATE	SCALE	SIZE
lindsay.fergusson	02/03/2020	1:350,000	@DIN A3

REV 03

Path: S:\Projects\GoBe\AwelyMor_AYM\03_GIS\AwelyMor_Innogy_WF_UK_Fig8.4.1_Survey_Area_AYM.mxd

8.4.3 Baseline data

533 Two years of project-specific aerial surveys are being undertaken, as agreed with Natural Resources Wales, which commenced in April 2019, and will provide distribution and density/abundance data for all observed species. One survey will be undertaken per month until February 2021, separated by at least one week (unless weather conditions prohibit this). The survey area encompasses the Awel y Môr OWF array and a 4km buffer extending on the seaward side (north) and 8km on the coastal side (south) from the site boundary.

534 Data obtained for the adjacent Gwynt y Môr OWF have been used to identify species present and likely IOFs (see Section 8.4.4) and will also be fully considered as part of the Awel y Môr OWF impact assessment. This comprises the following surveys which overlapped with the Study Area:

- Baseline characterisation boat-based surveys undertaken between February 2003 and March 2005; and
- Pre-construction (2010), construction (2012-13) and post-construction (2016-19) aerial surveys.

535 A variety of sources of information will also be considered as part of a desk-based survey to describe the baseline environment, including both peer reviewed scientific literature and the 'grey literature' such as other OWF project submissions and reports. Published literature on seabird ecology and distribution, and on the potential impacts of wind farms will also be considered. Sources include:

- Aerial surveys undertaken from 2000/2001 to 2003/2004 by the Wildfowl and Wetlands Trust (WWT) as part of the All Wales Common Scoter Survey commissioned by the Countryside Council for Wales (CCW);
- Aerial surveys by National Environmental Research Institute (NERI) in July and August 2004 and by WWT over the winter of 2004/2005 and in May 2005 for the Department of Trade and Industry (DTI) as part of the survey programme for the Round 2 offshore wind farm strategic areas;
- Survey data from other nearby OWFs, including Rhyl Flats, North Hoyle, Burbo Bank and Burbo Bank Extension;
- Information on Special Protection Areas (SPAs) with potential connectivity such as Natural England / Natural Resources Wales site condition assessments;
- Information on breeding records, ringing recoveries etc. available from the North Wales Wildlife Trust and any other relevant nature organisations;

- Large scale datasets such as SeaMaST (Bradbury *et al.*, 2014);
- Potential impacts of OWFs on birds (Garthe and Hüppop, 2004; Drewitt and Langston, 2006; Stienen *et al.*, 2007; Speakman *et al.*, 2009; Langston, 2010; Band, 2012; Cook *et al.*, 2012; Furness and Wade, 2012; Wright *et al.*, 2012; Furness *et al.*, 2013; Johnston *et al.*, 2014a,b; Cook *et al.*, 2014; Dierschke *et al.*, 2017; SNCB, 2017; Jarrett *et al.*, 2018; Leopold & Verdaat, 2018; Mendel *et al.*, 2019);
- Bird population estimates and demographic rates (Mitchell *et al.*, 2004; BirdLife International, 2004; Holling *et al.*, 2011; Frost *et al.*, 2019; Musgrove *et al.*, 2013; Furness, 2015; Horswill *et al.*, 2017);
- Bird breeding ecology (Cramp and Simmons, 1977-94; Del Hoyo *et al.*, 1992-2011; Robinson, 2005);
- Bird distribution (Stone *et al.*, 1995; Brown and Grice, 2005; Kober *et al.*, 2010; Balmer *et al.* 2013); and
- Bird migration and foraging movements (Wernham *et al.*, 2002; Thaxter *et al.*, 2012; Woodward *et al.,* 2019).

536 Owing to the short-term nature and small spatial scale of potential impacts on IOFs from installation of the export cable, no specific surveys along the offshore cable corridor will be conducted (outside of the aerial survey area defined above), and therefore the above data sources will be used to inform the baseline characterisation and impact assessment for cable installation.

537 Information on statutory sites and their interest features has been drawn from the web-based resource Multi-Agency Geographic Information for the Countryside [MAGIC http://www.magic.defra.gov.uk], the Natural Resources Wales [http://www.naturalresources.wales], Natural England [http://www.naturalengland.org.uk] and JNCC [http://www.jncc.defra.gov.uk] websites.

8.4.4 Baseline environment

538 This Section provides information on the baseline ornithological environment, gathered from a desk-based assessment of information available to date.

Designated sites

539 The impact assessment will consider potential connectivity of Awel y Môr OWF with sites with statutory designation for nature conservation, which have birds listed as qualifying features. Four classes of statutory designated sites will be considered: SPAs, pSPAs, Ramsar sites and SSSIs.

540 Sites which may have connectivity to Awel y Môr OWF include those designated for breeding seabirds and those for terrestrial, coastal or marine bird interests (typically overwintering aggregations).

541 The Awel y Môr OWF array area does not directly overlap with any ornithological designations (Figure 42). However, as breeding seabirds can travel considerable distances it is necessary to give consideration to designated sites beyond the array boundary. The extent of connectivity between seabird SPAs and offshore windfarms during the breeding season is largely a function of distance and species-specific foraging ranges. Outside the breeding season patterns of migration are used to infer the origins of species recorded. Terrestrial / coastal sites designated for migrant species outside the breeding season may therefore be connected on the grounds of passage movements through the Awel y Môr OWF.

542 Full consideration of connectivity of European Sites (SPAs and Ramsar sites) will be provided in a separate HRA Screening report which will cover in more detail matters associated with European designations and will also be discussed with SNCBs as part of the Application process. For the EIA, a review of SSSIs (often overlapping in extent with SPAs and Ramsar sites) will be undertaken to consider potential connectivity with the Awel y Môr OWF.

543 The Awel y Môr OWF site abuts the Liverpool Bay SPA to the south, and the offshore ECR search area overlaps with the SPA (see Figure 42), and therefore potential impacts on qualifying features require consideration. The SPA qualifies under Article 4.1 of the Birds Directive (2009/147/EC) as it is used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I:

- Red-throated diver (non-breeding): 1,171 individuals (2004/05 – 2010/11), 6.89% of GB population;
- Little gull (non-breeding): 319 individuals (2004/05 – 2010/11), selected under stage 1.4 guidelines;
- Little tern (breeding): 260 individuals (2010 - 2014), 6.84% of GB population;
- Common tern (breeding): 360 individuals (2011 – 2015), 1.80% of GB population.

544 The site also qualifies under Article 4.2 of the Directive (79/409/EEC) as it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I):

- Common scoter (non-breeding): 56,679 individuals (2004/05 – 2010/11), 10.31% of biogeographic population.

545 The site additionally qualifies under SPA selection stage 1.3 as it is used regularly by over 20,000 waterbirds in any season:

- In the non-breeding season, the site regularly supports at least 69,687 (2004/05 – 2010/11) individual waterbirds. The main components of the assemblage include all of the non-breeding qualifying features listed above, as well as an additional two species present in numbers exceeding 1% of the GB total: red-breasted merganser and cormorant.

Baseline assemblage and assessment of nature conservation value for each bird species

546 Species likely to be taken forward to impact assessment as IOFs will be those which are recorded during surveys within the Study Area and which are considered to be at potential risk either due to their abundance, potential sensitivity to wind farm impacts or due to biological characteristics (e.g. commonly fly at rotor heights) which make them potentially susceptible. Prior to the completion of ongoing site-based aerial surveys, a list of species most likely to be considered IOFs is presented in Table 44, as determined from available information outlined in Section 8.4.3, in particular the Gwynt y Môr OWF survey results and EIA. This species list may be subject to change based on the results of ongoing aerial surveys and stakeholder consultation.

TABLE 44 - SUMMARY OF NATURE CONSERVATION VALUE OF SPECIES CONSIDERED AT RISK OF IMPACTS

SPECIES	NATURE CONSERVATION VALUE
Red-throated diver *Gavia stellata*	Liverpool Bay SPA species, Birds of Conservation Concern (BoCC) (Eaton et.al, 2015) Green listed, Birds Directive Migratory Species, Birds Directive Annex I, International Union for Conservation of Nature (IUCN) Red List 'Least Concern' status.
Manx shearwater Puffinus puffinus	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Fulmar Fulmarus glacialis	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Gannet Morus bassanus	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Cormorant Phalacrocorax carbo	Liverpool Bay SPA assemblage species, BoCC Green listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Common scoter Melanitta nigra	Liverpool Bay SPA species, BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Red-breasted merganser *Mergus serrator*	Liverpool Bay SPA assemblage species, BoCC Green listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Kittiwake Rissa tridactyla	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Vulnerable' status
Common gull *Larus canus*	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Herring gull Larus argentatus	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Near Threatened' status
Lesser black-backed gull *Larus fuscus*	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Great black-backed gull *Larus marinus*	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status

SPECIES	NATURE CONSERVATION VALUE
Little gull Hydrocoloeus minutus	Liverpool Bay SPA species, BoCC Green listed, Birds Directive Migratory Species, IUCN Red List 'Near Threatened' status
Sandwich tern Sterna sandvicensis	BoCC Amber listed, Birds Directive Annex I, Migratory Species, IUCN Red List 'Least Concern' status
Little tern Sternula albifrons	Liverpool Bay SPA species, BoCC Amber listed, Birds Directive Annex I, Migratory Species, IUCN Red List 'Least Concern' status
Common tern Sterna hirundo	Liverpool Bay SPA species, BoCC Amber listed, Birds Directive Annex I, Migratory Species, IUCN Red List 'Least Concern' status
Arctic tern Sterna paradisaea	BoCC Amber listed, Birds Directive Annex I, Migratory Species, IUCN Red List 'Least Concern' status
Guillemot Uria aalge	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Razorbill Alca torda	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Near Threatened' status

547 Data analysis for the EIA will consider seasonal variations in site usage by IOFs as well as the importance of the site for each species' different life stages. Table 45 provides an overview of relevant seasons for each species based on information from Furness (2015), where available.

548 Reference populations for each species and population sizes will be based on the best available information at the time of undertaking the assessment and will be agreed with key stakeholders. The conservation status (Table 44) of each species will also be taken into consideration.

TABLE 45 - SPECIES SPECIFIC DEFINITIONS OF BIOLOGICAL SEASONS (FROM FURNESS 2015)

SPECIES	BREEDING	MIGRATION-FREE BREEDING	MIGRATION – AUTUMN	MIGRATION – FREE WINTER	MIGRATION – SPRING (RETURN MIGRATION THROUGH UK WATERS)	NON-BREEDING
Red-throated diver	Mar-Aug	May-Aug	Sep-Nov	Dec-Jan	Feb-Apr	-
Manx shearwater	Apr-Aug	Jun-Jul	Aug-Oct	Nov-Feb	Mar-May	Sep-Mar
Fulmar	Jan-Aug	Apr-Aug	Sep-Oct	Nov	Dec-Mar	-
Gannet	Mar-Sep	Apr-Aug	Sep-Nov	-	Dec-Mar	-
Cormorant	Apr-Aug	May-Jul	Aug-Oct	Nov-Jan	Feb-Apr	Sep-Mar
Common scoter	Not included in Furness 2015					
Red-breasted merganser	Not included in Furness 2015					
Kittiwake	Mar-Aug	May-Jul	Aug-Dec	-	Jan-Apr	-
Common gull	Not included in Furness 2015					
Herring gull	Mar-Aug	May-Jul	Aug-Nov	Dec	Jan-Apr	Sep-Feb

SPECIES	BREEDING	MIGRATION-FREE BREEDING	MIGRATION – AUTUMN	MIGRATION – FREE WINTER	MIGRATION – SPRING (RETURN MIGRATION THROUGH UK WATERS)	NON-BREEDING
Lesser black-backed gull	Apr-Aug	May-Jul	Aug-Oct	Nov-Feb	Mar-Apr	-
Great black-backed gull	Mar-Aug	May-Jul	Aug-Nov	Dec	Jan-Apr	Sep-Mar
Little gull	Not included in Furness 2015					
Sandwich tern	Apr-Aug	Jun	Jul-Sep	Oct-Feb	Mar-May	Sep-Mar
Little tern	May-Aug	Jun	Jul-Sep	Oct-Mar	Apr-May	Aug-Apr
Common tern	May-Aug	Jun-mid July	Jul-Sep	Oct-March	Apr-May	Sep– Apr
Arctic tern	May-Aug	Jun	Jul-Sep	Oct-Mar	Apr-May	Mid Aug-Apr
Guillemot	Mar-Jul	Mar-Jun	Jul-Oct	Nov	Dec-Feb	Aug-Feb
Razorbill	Apr-Jul	Apr-Jul	Aug-Oct	Nov-Dec	Jan-Mar	-

8.4.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

549 The impact assessment methodology will be based on that described in Chapter 4: Environmental Impact Assessment Approach and Methodology, adapted to make it applicable to ornithology IOFs, and aligned with the key guidance document produced on impact assessment of ecological/ornithological receptors (CIEEM, 2018; updated 2019).

550 The assessment approach will use a 'source-pathway-receptor' model, which identifies likely impacts on IOFs resulting from the proposed construction, operation and decommissioning of the offshore infrastructure. The parameters of this model are defined as follows:

- Source – the origin of a potential impact (noting that one source may have several pathways and receptors) e.g. an activity such as cable installation and a resultant effect such as re-suspension of sediments.
- Pathway – the means by which the effect of the activity could impact an IOF e.g. for the example above, re-suspended sediment could settle and smother the seabed.
- Receptor – the element of the receiving environment that is impacted e.g. for the above example, bird prey species living on or in the seabed are unavailable to foraging birds.

551 The aerial surveys will provide information on species (or species-groups if species identification is not possible), abundance, distribution, behaviour, location, numbers, sex and age (where possible), flight height and direction. The EIA will identify the nature of the use of the site by birds recorded - i.e. seasonal differences and activities (i.e. foraging, overwintering, migrating or other) in order to determine the importance of the site relative to the wider area for seabirds throughout the year.

552 Detailed analysis will include abundance and density estimates (with associated confidence intervals and levels of precision). Flight height data will be reported, however owing to the technical difficulties in estimating flight height from aerial imagery it is anticipated that generic flight data (Johnston et al., 2014a, 2014b) will be used in the collision risk model (subject to discussion with stakeholders).

553 Reference populations for each species and population sizes will be based on the best available information at the time of undertaking the assessment and will be agreed with key stakeholders.

554 The sensitivity of each species will be determined based on the size of its population, its conservation status and its known sensitivity to offshore windfarms. Species identified as IOFs will be subject to full impact assessment against the impacts listed below. The impact assessment will be undertaken in line with guidance by CIEEM (2018; updated 2019) and expert opinion.

Potential project impacts

555 A range of potential impacts on IOFs have been identified, which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The impacts that are proposed to be scoped into the Awel y Môr OWF EIA are outlined in Table 46, together with a description of any proposed data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. collision modelling) to enable an assessment of the impact. Based on the offshore ornithology information currently available and the project description, a number of impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 47, together with a justification for scoping them out.

TABLE 46 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR OFFSHORE ORNITHOLOGY

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
8.4.1	Direct temporary habitat loss/ disturbance due to construction	Construction activities such as increased vessel activity and underwater noise may result in direct disturbance or displacement of birds from important feeding and roosting areas, including due to direct habitat loss.	Awel y Môr OWF array area: innogy has commissioned monthly aerial surveys across Awel y Môr OWF and a minimum 4 km buffer. These surveys commenced in April 2019 and will continue to February 2021. An analysis of existing survey data for the Gwynt y Môr OWF will be conducted and this will supplement the site-specific bird surveys, for use in determining numbers of individuals of each IOF potentially affected. Awel y Môr OWF offshore ECR corridor: It is considered that there is sufficient existing data (available from the sources outlined above in Section 8.4.3) to describe the ornithological baseline of the offshore components of the ECR corridor and no further specific surveys are proposed. In order to focus the assessment of disturbance and displacement, a screening exercise will be undertaken to identify those species most likely to be at risk. Any species recorded only in very small numbers within the Study Area

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			or with a low determined sensitivity to displacement (as per e.g. Furness and Wade, 2012; Furness *et al.* 2013) will be screened out of further assessment. The assessment of remaining IOFs will be based on relevant disturbance-displacement scientific studies which will aid determination of magnitude of displacement and resultant effects.
8.4.2	Indirect impacts on IOFs due to impacts on prey species due to construction	Impacts include those resulting from underwater noise (e.g. during piling) or the generation of suspended sediments (e.g. during preparation of the seabed for foundations) that may alter the distribution, physiology or behaviour of bird prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to active construction works to foraging seabirds.	A review of the data and impact assessments for Benthic and Intertidal Ecology (Section 8.1) and Fish and Shellfish Resource (Section 8.2) will be conducted within the context of the potential impacts on offshore ornithology. This will relate to the Awel y Môr OWF array area and offshore ECR corridor.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
OPERATION			
8.4.3	Operational disturbance and displacement	The presence of Wind Turbine Generators (WTGs) has the potential to disturb and displace birds from within and around the Awel y Môr OWF array area. This would have the potential to reduce the area available to birds for feeding or loafing. Vessel activity and the lighting of WTGs and associated ancillary structures could also attract (or repel) certain species of birds and affect migrating birds.	Awel y Môr OWF array area: Information on the assessment of disturbance-displacement is included in the *Proposed assessment methodology* Section above. A matrix approach (see JNCC/SNCBs, 2017) will be used to calculate a range of predicted impact magnitudes. These relate varying levels of displacement (within particular species-specific buffer distances from WTGs) to varying levels of additional mortality, with consideration then given to the population-level impacts of the potential additional mortality. Values and ranges of outputs would be discussed and agreed with SNCBs as appropriate.
8.4.4	Indirect impacts on IOFs through direct effects on prey species and habitats	Indirect impacts include those resulting from the production of underwater noise and the generation of suspended sediments that may alter the distribution or behaviour of bird prey species. There is also evidence that fish and mobile invertebrates may be attracted to the operational area (Kerckhof *et al*, 2010;	Awel y Môr OWF array area: an analysis of the data and impact assessments for Benthic and Intertidal Ecology (Section 8.1) and Fish and Shellfish Resource (Section 8.2) will be conducted within the context of the potential impacts on offshore ornithology, e.g. changes to prey resource.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		Emu 2008; Krone *et al*, 2013; Linley *et al*, 2008 and Wilhelmsson, 2006) and so beneficial impacts may occur.	
8.4.5	Collision Risk	There is a risk of birds in flight colliding with rotating WTG blades. The susceptibility of species to collision risk depends upon physiological and behavioural characteristics of the species, in addition to the project design specifications.	Awel y Môr OWF array area: collision risk modelling (CRM) will be undertaken using industry-standard approaches (Band, 2012, Masden 2015, Donovan 2018) to predict potential collision rates from this impact. The population-level impacts of the resulting potential additional mortality will be considered. The exact option and version of the collision risk model to be used, avoidance rates, flight height data, nocturnal activity rates and parameters for modelling will be based upon the best available evidence and will be agreed with stakeholders and clearly defined within the EIA and HRA.
DECOMMISSIONING			
8.4.6	Decommissioning Impacts	During decommissioning, the potential impacts are anticipated to be similar to those described above for the construction phase but on a smaller scale. There may also be an incremental	See descriptions of approach to assessment under impacts 8.4.1 and 8.4.2 (above).

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		reduction of impact as the permanent structures are removed from the site.	

TABLE 47 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR OFFSHORE ORNITHOLOGY

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
8.4.7	Indirect impacts through effects on prey species and habitats: Accidental pollution during construction	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality of birds or a reduction in prey availability either of which may affect species' survival rates. With implementation of an appropriate CoCP it has been agreed with stakeholders on consent applications for other OWFs, that complete mortality within the equivalent extent of a windfarm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is considered very unlikely. It has been predicted on other OWFs that any impact would be of local spatial extent, short term duration, and not significant in EIA terms. This is considered to be equally applicable to Awel y Môr OWF for which construction will be comparable in scale and operation and within the same environment, whilst implementing an appropriate CoCP. Therefore, subject to consultation with the stakeholders and feedback received on this Scoping Report, Awel y Môr OWF intends to scope this impact out of further consideration within the EIA.
OPERATION		
8.4.8	Operational disturbance and displacement (offshore ECR corridor)	Given that potential impacts along the offshore export cable route would be highly localised and episodic (i.e. limited to any maintenance or repair of the export cables) it is proposed that this impact should be scoped out from further consideration within the EIA in relation to the offshore ECR, with the focus of operation disturbance-displacement on the Awel y Môr OWF array only.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
8.4.9	Barrier Effects during operation	For the purposes of assessment of displacement for resident birds, it is usually not possible to distinguish between displacement and barrier effects - for example to define where individual birds may have intended to travel to, or beyond an offshore wind farm, even when tracking data are available. Therefore, in the impact assessment the effects of displacement and barrier effects on resident IOFs are considered together. The small risk of impact to migrating birds resulting from flying around rather than through the WTG array of an offshore wind farm is considered a potential barrier effect but has been scoped out of the assessment. Masden *et al*. (2010, 2012) and Speakman *et al*. (2009) calculated that the costs of one-off avoidances during migration were small, accounting for less than 2% of available fat reserves. Therefore, the impacts on birds that only migrate through the site (including seabirds, waders and waterbirds on passage) are considered negligible and these would be scoped out of detailed assessment.

Mitigation measures adopted as part of the project

556 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for impacts on offshore IOFs. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

557 Innogy is committed to implementing these measures, as well as various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 46 and Table 47.

558 Mitigation measures adopted for the Awel y Môr OWF that are relevant to offshore ornithology would include:

- Selection of the WTG specifications which allow a minimum lower blade tip height above Mean High Water Springs (MHWS) / Lowest Astronomical Tide (LAT), which reduces collision risks, based on evidence which shows that typical seabird flight height distribution is skewed towards low altitudes;
- Development of, and adherence to, a Code of Construction Practice (CoCP) to reduce direct and indirect disturbance-displacement effects;
- A piling Marine Mammal Mitigation Protocol will be developed (see Section 8.3 Marine Mammals) which will include proposals for soft start and ramp-up of piling to help reduce disturbance impacts on IOFs; and
- The need for any further mitigation (and the feasibility of this) would be dependent on the results of site specific survey and the impact assessment. Consultation with key ornithological stakeholders would be ongoing throughout the EIA process and would include the need for mitigation and the feasibility of potential options.

Potential cumulative impacts

559 The cumulative impact assessment methodology will be based on that described in Chapter 4: Environmental Impact Assessment Approach and Methodology, adapted to make it applicable to offshore ornithology.

560 The methodology will also be aligned with the approach to the assessment of cumulative impacts that has been applied by Ministers when consenting offshore windfarms and confirmed in recent consent decisions. It also follows the approach set out in guidance from the Planning Inspectorate (Planning Inspectorate 2015) and from the renewables industry (RenewableUK 2013 and The Crown Estate, 2019).

561 The potential impacts that would be scoped in to the cumulative impact assessment are operational disturbance and displacement, and collision risk. Cumulative construction and decommissioning impacts would be scoped out as the likelihood that there would be a cumulative impact is low. The contribution from the proposed project is likely to be small and is dependent on a temporal and spatial co-incidence of disturbance / displacement from other plans or projects (significant additive effects associated with simultaneous construction phases are considered unlikely based on project information presented in the Crown Estate's (2019) OWF Extensions Plan-level Habitats Regulations Assessment).

562 Offshore wind: there is a potential for cumulative impacts on birds due to operational, consented and planned offshore wind farms. As many bird species are highly mobile, there is the potential for the same bird populations to be affected by several wind farms. Of particular relevance to the cumulative assessment will be operational wind farms in the eastern Irish Sea and any further projects which may enter the consenting process during the period of the Awel y Môr OWF EIA.

563 Overall, the potential for cumulative impacts will be species-specific as the impacts will be dependent upon the individual sensitivities of each species, where the birds have originated from, and their potential to interact with other wind farms (i.e. on migratory or foraging travel).

564 Wherever possible the cumulative assessment will be quantitative (i.e. where data in an appropriate format have been obtained). However, the level of data available and the ease with which impacts can be combined across the windfarms is quite variable, reflecting the availability of relevant data for older projects and the approach to assessment taken. Where this has not been possible (e.g. for older projects) a qualitative assessment will be undertaken.

565 Other activities: other activities that could potentially have a cumulative impact on offshore IOFs include:

- Marine aggregate extraction;
- Oil and gas exploration and extraction;
- Sub-sea cables and pipelines; and
- Commercial shipping.

566 The cumulative assessment will take into account the fact that birds may already be habituated to on-going activities and therefore these may be considered to be part of the baseline conditions to avoid double-counting or exaggeration of potential impacts.

Potential transboundary Impacts

567 There is a potential for collisions and displacement of IOFs at wind farms outside UK territorial waters, and for international seabird populations being affected by Awel y Môr OWF. This includes, in particular, Irish OWF projects located within the Irish Sea, such as Arklow Bank, Dublin Array and Codling Bank, and Irish seabird populations. Potential impacts relating to OWFs and seabird populations from other countries are considered less likely due to larger distances involved.

568 A quantitative/qualitative assessment will be undertaken depending on the level of data availability. As the spatial scale of assessment would be increased, the inclusion of non-UK seabird populations for a transboundary assessment would also increase the reference population sizes.

8.4.6 Summary of next steps

569 As the project develops, a more detailed methodology for the EIA will be agreed with SNCBs. This will include the production of a method statement and Expert Topic Group (ETG) meetings where the methodology will be discussed and adopted accordingly based on relevant advice and perceived risk, progressed as part of the Evidence Plan Process. The process and record of agreements and any unresolved issues will be presented within the Environmental Statement (ES) chapter. It is anticipated that a Preliminary Environmental Impact Report (PEIR) will be produced in advance of the final assessment. This will be submitted to relevant stakeholders for review and with the final assessment informed by the comments received.

570 The ongoing programme of monthly aerial bird surveys for the Awel y Môr OWF site (and associated buffer) will continue until 2021 and will provide the key data source for the ornithology site characterisation and quantification of parameters for the impact assessment (e.g. CRM). Additionally, information from previous surveys in the wider area will be collated and provide further contextual information, alongside the literature and information sources outlined in Section 8.4.3.

8.4.7 Further considerations for Consultees

i. Do you agree that the data sources identified are sufficient to inform the offshore ornithological baseline for the Awel y Môr OWF PEIR and ES?

ii. Have all potential impacts resulting from Awel y Môr OWF been identified for offshore IOFs?

iii. Do you agree that the impacts described in Table 47 can be scoped out?

iv. For those impacts scoped in (Table 46), do you agree that the analysis and assessment methods described are appropriate and sufficient to inform a robust impact assessment?

v. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on offshore ornithology IOFs?

vi. Do you have any specific requirements for the CRM methodology?

9 Offshore Environment – Human Environment

9.1 Commercial Fisheries

9.1.1 Introduction

571 This Section of the Scoping Report identifies the commercial fisheries receptors of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential effects from construction, operation (including maintenance) and decommissioning of the offshore components (i.e. seaward of MHWS) of Awel y Môr OWF on commercial fisheries and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

572 Several other chapters of this Scoping Reports cover impacts which are closely related to commercial fisheries. These are:

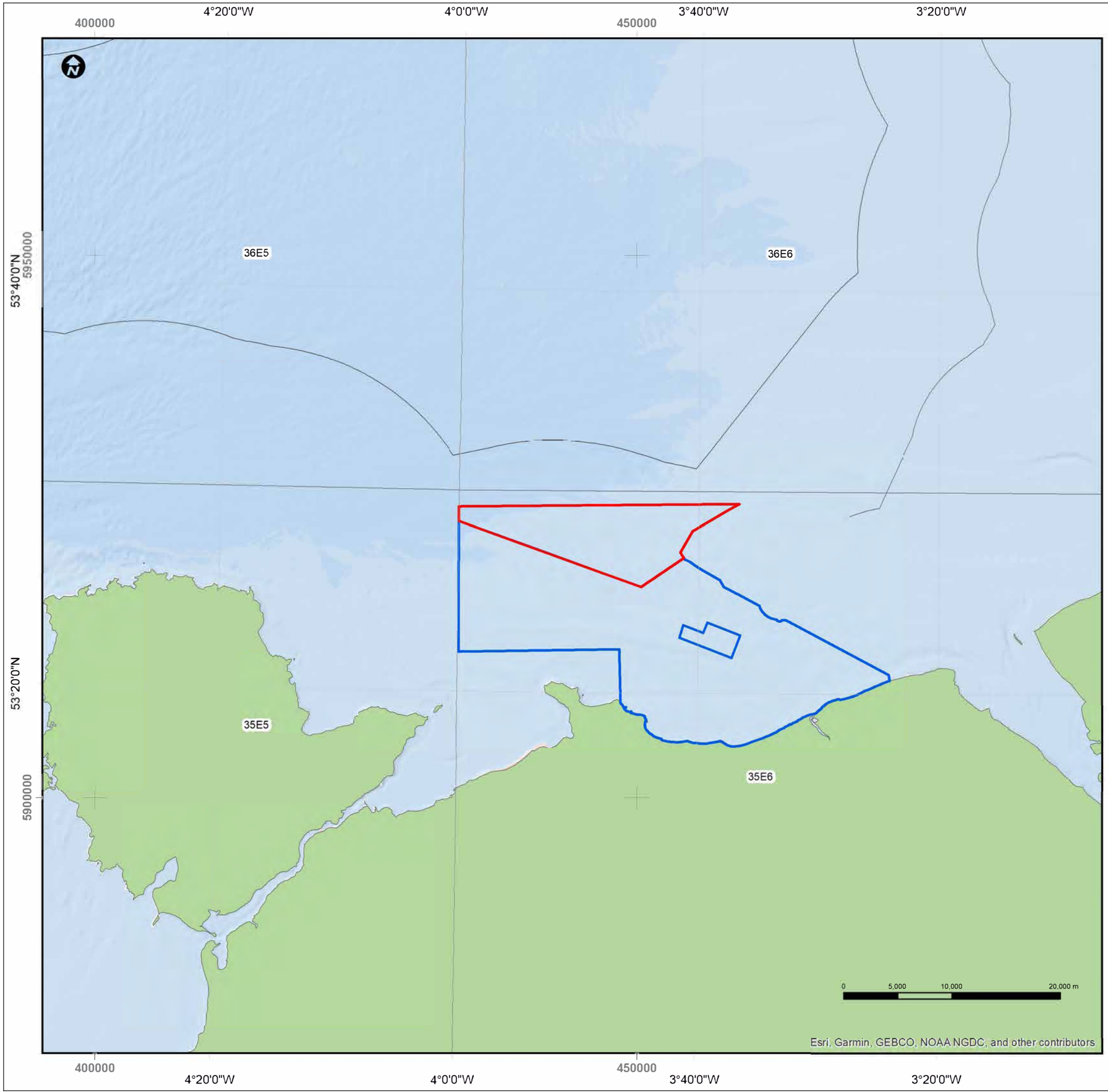
- Section 8.2: Fish and Shellfish Ecology.
- Section 9.7: Other Marine Users and Activities – this chapter covers effects on commercial and recreational angling.

9.1.2 Study Area

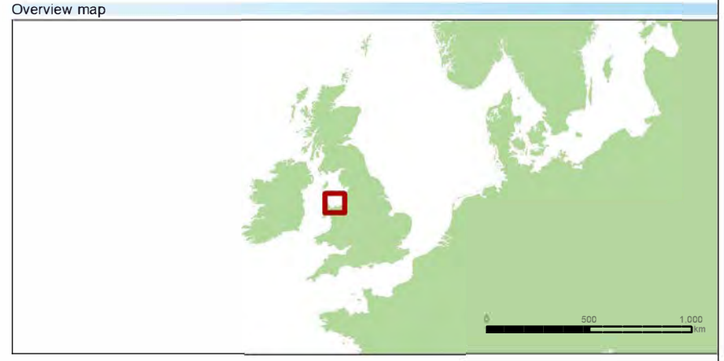
573 Awel y Môr OWF is located within the southern portion of the International Council for the Exploration of the Sea (ICES) Division 7a (Irish Sea) statistical area26; within United Kingdom (UK) Exclusive Economic Zone (EEZ) waters. For the purpose of recording fisheries landings, ICES Division 7a is divided into statistical rectangles which are consistent across all Member States operating in the Irish Sea.

[26] ICES standardise the division of sea areas to enable statistical analysis of data. Each ICES statistical rectangle is '30 min latitude by 1-degree longitude' in size (approximately 30 x 30 nautical miles). A number of rectangles are amalgamated to create ICES statistical areas.

574 The Awel y Môr OWF array area and offshore ECR search area are entirely located within ICES rectangle 35E6, which represents the study area for this scoping exercise. The study area is shown in Figure 43; note that Awel y Môr OWF occupies only a portion of the ICES rectangle. In order to understand fishing activity in waters adjacent to the Awel y Môr OWF, baseline data has also been gathered and analysed for surrounding ICES rectangles 36E6, 36E5 and 35E5, which are also shown in Figure 43.



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- 6nM
- 12nM
- 200nM
- ICES Statistical Rectangles

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT: Offshore Windpark **Awel y Môr**

TITLE: **Commercial Fisheries**

DRAWN	DATE	SCALE	SIZE
fiona	29/01/2020	1:350,000	@DIN A3

REV: 01

Path: C:\1.Work 2019\Galloper & GyM\GyM\ArcGIS files\CORRECTGyMext_Innogy_WF_UK_DIN_A3_Landscape_1to425001.mxd

9.1.3 Baseline data

575 An initial desk-based review of literature and data sources was undertaken to support this scoping exercise, as presented in Table 48 below. Table 48 also identifies additional sources of information that would be expected to inform assessment in the Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES).

576 It should be noted that the quantitative datasets identified in Table 48 may not capture all fishing activity in the commercial fisheries study area. For instance, the VMS datasets only covers vessels ≥12 m (ICES data) or ≥15 m (MMO data) in length. However, other published data does provide a useful insight into fishing activity undertaken in inshore areas (e.g. aerial surveillance data and Welsh Government publications) and consultation with fisheries stakeholders and industry is expected to further inform assessment in the PEIR/ES. Consultation will be undertaken to seek to corroborate the findings of desk-based baseline data analysis and to provide insight into specific fishing grounds and activity of any vessels active in the area. Consultation will also be important to inform gear specifications for vessels active in the area, which will allow a full understanding of how they may be affected.

TABLE 48 – KEY SOURCES OF COMMERCIAL FISHERIES DATA

SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR OWF
Landings statistics for the period 2012-2018. Sourced from the Marine Management Organisation (MMO) and the European Union Data Collection Framework (EU DCF). Note EU DCF data is only available up to 2016.	Fisheries landings data for nationally registered fishing vessels landing to their home nation ports.	Full coverage.
Vessel Monitoring System (VMS) data, for the period 2013 – 2017. Sourced from ICES and the MMO. Note that data from 2017 has been presented in this Scoping Report, but that longer term datasets will be used to inform the PEIR and ES.	VMS data for fishing vessels greater than 12 m in length.	Full coverage.
Key species stock assessments. Sources includes ICES, the Welsh Government and Bangor University. Data yet to be sourced.	Reports on the status of commercially fished species, which consider to what extent they are being exploited sustainably.	Full coverage (to be confirmed).
Aerial surveillance data for the period 2012-2017. Sourced from the MMO. Data yet to be sourced.	Sightings of fishing vessels recorded in UK waters on weekly surveillance fly-overs during daylight hours.	Full coverage (to be confirmed).
Gwynt y Môr Wind Farm post-construction data/information. Sourced from innogy.	Expected to include information on fishing activity held by the Company Fisheries Liaison Officer and the results of any relevant post-construction surveys.	Varying coverage.
Gwynt y Môr Wind Farm Environmental Statement.	Commercial fisheries impact assessment. Now dated but provides useful context.	Full coverage.

Baseline environment

577 ICES rectangle 35E6, within which the Awel y Môr OWF is located, had an annual average landings value of approximately £426,000 for all UK vessels across the years 2014 to 2018 (MMO, 2019), with landings values markedly peaking in 2018 at just under £820,000. The value of landings by foreign vessels is not accounted for in this total, though landings data indicates very limited foreign vessel activity (minimal landings by Irish vessels).

578 Figure 44 shows the top twelve species landed from the study area by weight, from 2014 to 2018 (MMO, 2019). The key species in terms of weight are whelks and scallops.

579 Figure 45 shows the top twelve species landed from the study area by value, from 2014 to 2018 (MMO, 2019). The key species in terms of value are scallops, whelks and lobsters. Scallop landings and associated values fluctuate markedly across the five-year period, peaking notably in 2018 and being the primary driver for the 2018 peak in average annual landings values described above.

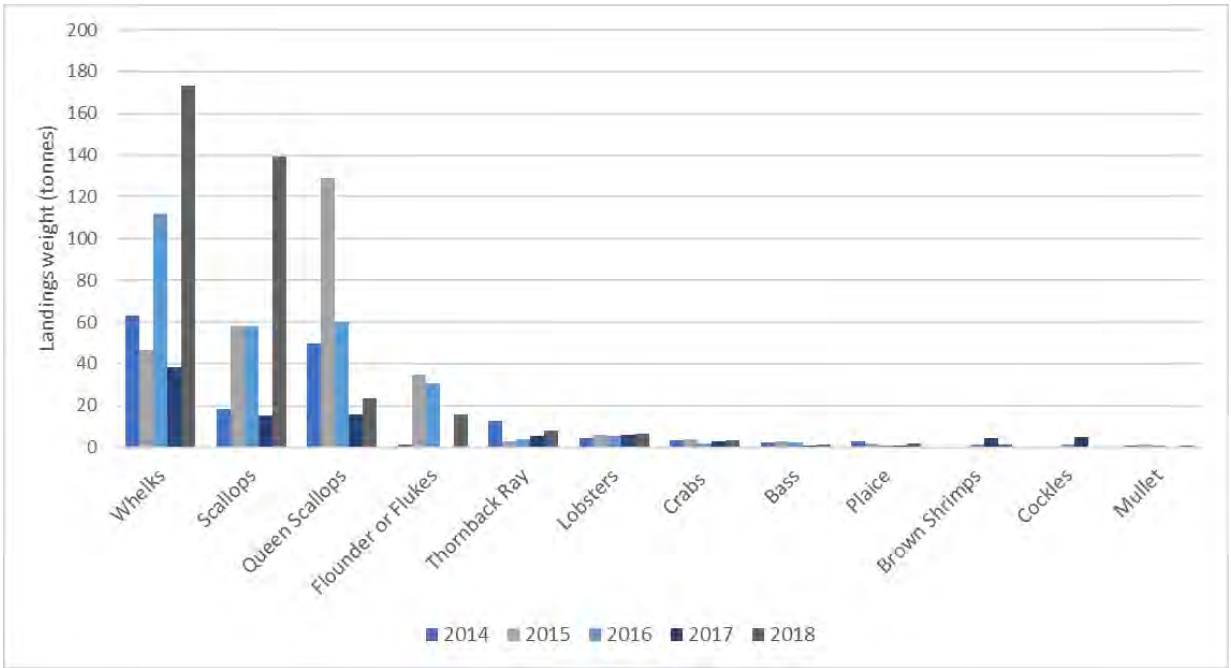


FIGURE 44 – TOP TWELVE SPECIES BY WEIGHT (TONNES) FROM 2014 TO 2018 LANDED FROM THE STUDY AREA (MMO, 2019).

580

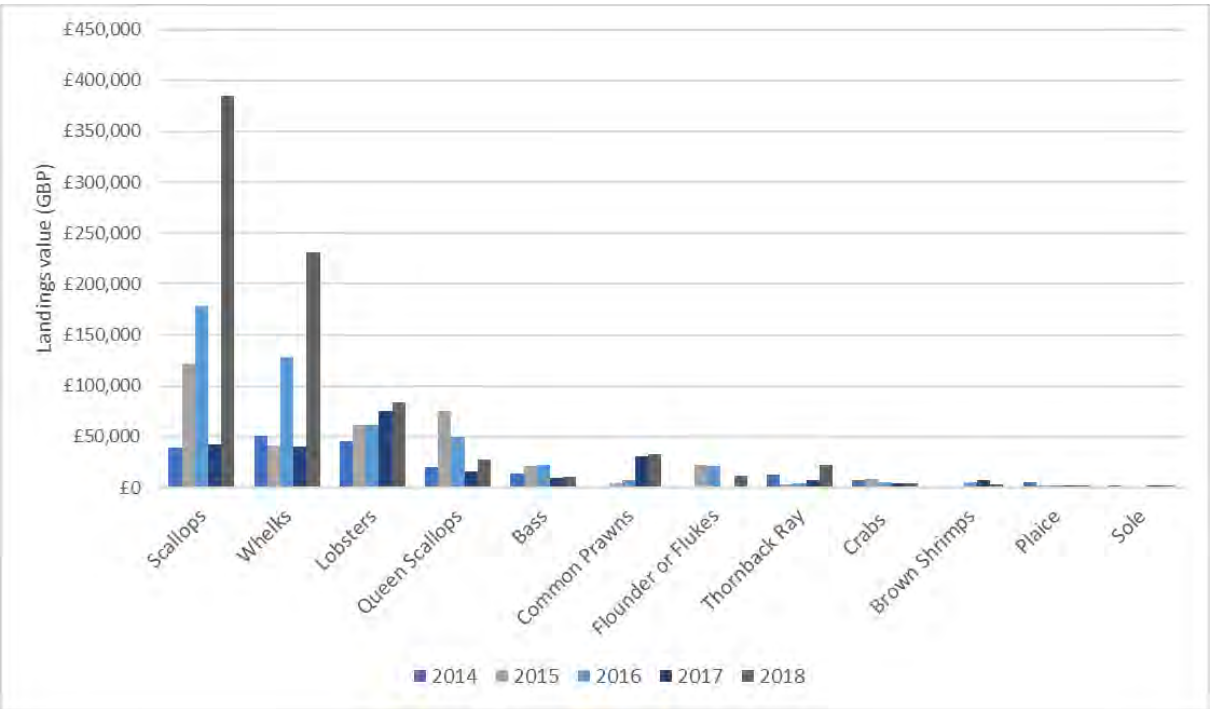
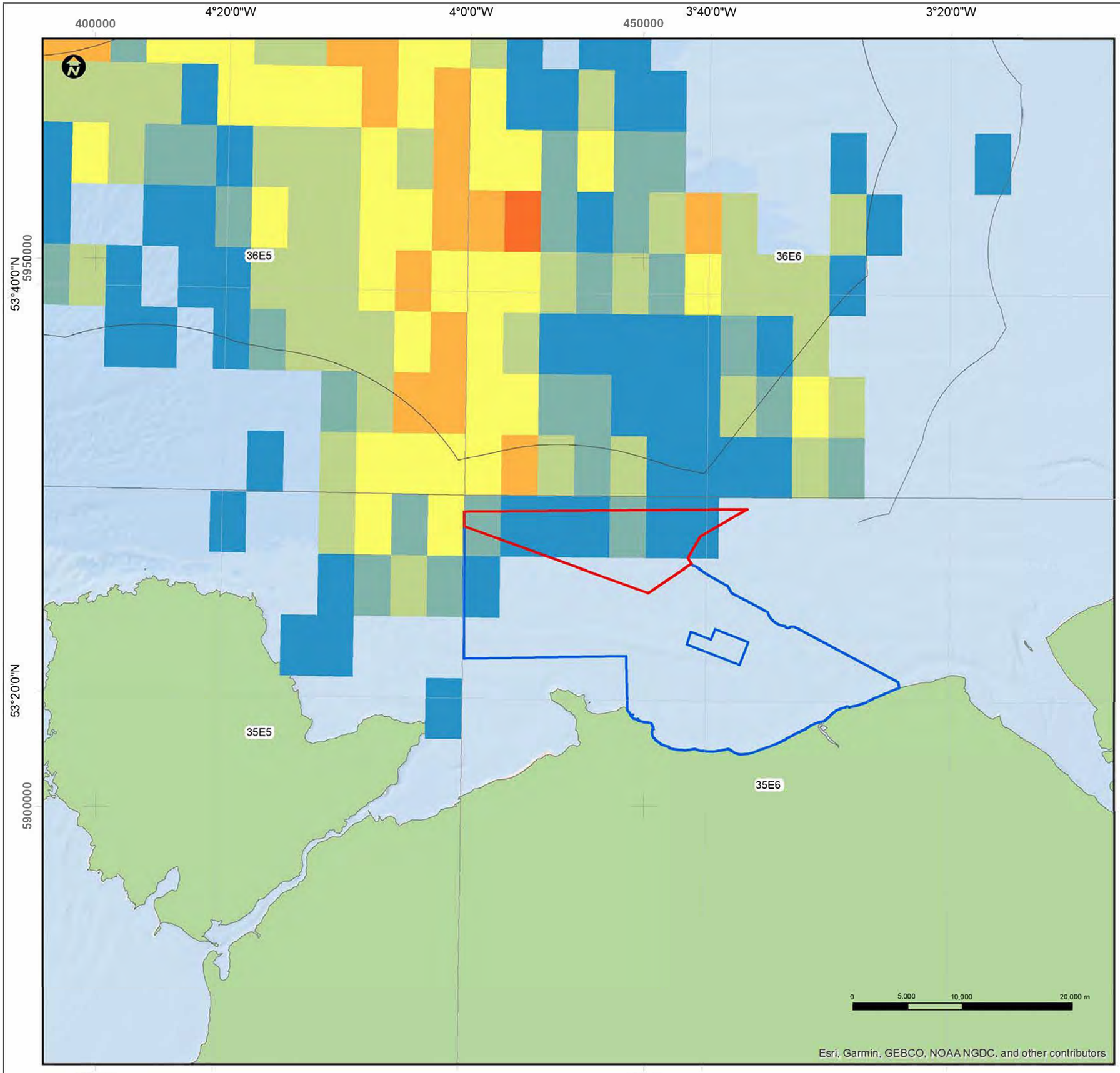


FIGURE 45 – TOP TWELVE SPECIES BY VALUE (GBP) FROM 2014 TO 2018 LANDED FROM THE STUDY AREA (MMO, 2019).

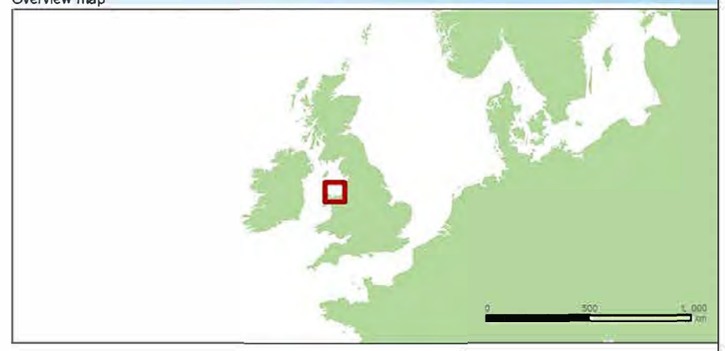
581 Landings data indicate that scallops caught by dredge (by English and Scottish vessels), and whelks and lobsters caught with pots (by Welsh vessels) are predominantly targeted by larger vessels over 10 m in length. Smaller Welsh vessels of 10 m length and under target mixed demersal species, including bass, flounders and rays using gillnets. Scallops are targeted in winter and spring months, while landings of other key species peak through later spring and summer. Crabs and lobsters are targeted primarily by local Welsh vessels, with landings peaking in summer months.

582 In addition to landings data, VMS data from 2016 and 2017 have also been obtained for the study area and surrounding ICES rectangles. The VMS data indicates that few large vessels over 12 m in length are active in the study area. Figure 46 indicates that while some scallop dredging may take place within the northernmost portion of the Awel y Môr OWF array area, dredging activity is more significant to the north and west of the study area further offshore. VMS data similarly suggests that larger vessels using passive gears (in this case pots to target whelks and lobster) may be present in the north easterly portion of the Awel y Môr OWF array area, but that greater activity is focused to the northeast of the study area.

583 In the Conwy Estuary, within the offshore ECR search area, mussels are gathered using traditional hand-raking methods between September and April each year.



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- 6nM
- 12nM
- 200nM
- ICES Statistical Rectangles

EU Dredge value (Euro), 2017

- 0 - 5000
- 5001 - 10000
- 10001 - 20000
- 20001 - 50000
- 50001 - 100000
- 100001 - 150000
- 150001 - 860000

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT: Offshore Windpark **Awel y Môr**

TITLE: **Commercial Fisheries**

DRAWN	DATE	SCALE	SIZE
fiona	29/01/2020	1:350,000	@DIN A3

REV: 01

Path: C:\ Work 2019\Galloper & Gyll\GyM\ArcGIS files\CORRECTGyllMxd_Innogy_WF_UK_DIN_A3_Landscape_104 29.01.20.mxd

584 In summary, the key fleets operating across the study area include (in no particular order):

- Welsh netting vessels (typically 10 m and under in length) targeting mixed demersal species;
- UK scallop dredgers operating across the northernmost extent of the study area;
- UK, predominantly Welsh potting vessels targeting whelks; and
- UK, predominantly Welsh potting vessels targeting lobsters and crabs.

585 The findings of initial baseline data analysis are broadly consistent with those reported in the Gwynt y Môr Offshore Wind Farm Environmental Statement (2005).

586 The Awel y Môr OWF avoids areas of greatest fishing activity, with, for example, dredging and potting activity being more significant outwith the study area. However, there is potential for impacts on local commercial fisheries during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF, as presented in Section 9.1.4 below.

587 Commercial aquaculture in Wales has traditionally focused on the managed cultivation of shellfish, principally blue mussels. While the Welsh National Marine Plan (Welsh Government, 2019) identifies potential for the future development of additional aquaculture production, no potential development locations have been identified within the study area.

Designated sites

588 In order to protect particular features of designated sites, fisheries management mechanisms may be put in place. These mechanisms can include spatial closures, permit schemes, effort controls, vessel size and fishing gear restrictions and seasonal fishing restrictions. There are currently no such mechanisms in place relevant to fishing activity in the study area.

589 Along the coastline within the study area there are a number of Shellfish Water Protected Areas; these are designated for the protection of economically significant shellfish species, to promote growth and production. These areas, designated under the Water Framework Directive, require pollution reduction programmes (related to run-off from agricultural land or discharges from sewage treatment works etc) to establish and maintain good water quality which is important for the production of high quality shellfish.

9.1.4 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

590 Detailed analysis of baseline datasets (see Section 9.1.3) will be undertaken to characterise long-term (i.e. over several years) patterns in commercial fisheries activity across the study area and predict potential impacts upon future commercial fishing activities. Consultation with the commercial fishing industry will be undertaken to ground-truth available baseline data and gain further understanding of fishing activity by smaller vessels across the inshore portion of the study area. Analysis of data and the results of consultation will provide an extended baseline characterisation of the study area, which will underpin impact assessment.

591 The commercial fisheries impact assessment will follow the EIA methodology set out in Chapter 4: Environmental Impact Assessment Approach and Methodology. Specific to commercial fisheries, the following guidance documents will also be considered:

- Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments (United Kingdom Fisheries Economic Network [UKFEN] and Seafish, 2012);
- Fisheries Liaison with Offshore Wind and Wet Renewables group (FLOWW) Recommendations for Fisheries Liaison: Best Practice guidance for offshore renewable developers (FLOWW, 2014);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015);
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010a);
- Developing guidance on fisheries Cumulative Impact Assessment for wind farm developers (Blyth-Skyrme, 2010b); and
- Offshore Wind Farms – Guidance note for Environmental Impact Assessment in respect of Food and Environment Protection Act (FEPA) and Coast Protection Act (CPA) requirements (Centre for Environment, Fisheries and Aquaculture Science [CEFAS], Marine Consents and Environment Unit [MCEU], Department for Environment, Food and Rural Affairs [DEFRA] and Department of Trade and Industry [DTI], 2004).

592 Impacts will be assessed for each relevant fleet/fishery active in the study area, and where relevant, impacts associated with the array area and the offshore ECR will be separately assessed.

Potential project impacts

593 A range of potential impacts on commercial fisheries have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. These impacts include those issues identified as requiring consideration in the National Policy Statement for Renewable Energy Infrastructure (EN3) (DECC, July 2011) and in the guidance documents listed above.

594 The impacts that have been scoped into the Awel y Môr OWF EIA are outlined in Table 2, together with a description of any proposed additional data collection and/or supporting analyses to enable an assessment of the impact.

595 Based on the commercial fisheries information currently available and the project description, some impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 50, together with a justification for scoping them out.

TABLE 49 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR COMMERCIAL FISHERIES

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
9.1.1	Reduction in access to, or exclusion from established fishing grounds	Installation activities and physical presence of constructed Awel y Môr OWF infrastructure leading to reduction in access to, or exclusion from established fishing grounds. Potential for some loss of fishing opportunities over the construction period, though effect is expected to be short-term and localised, and the operational range of relevant fleets will not typically be limited to the array area / offshore ECR.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECR, and access to alternative grounds. The effects of exclusion/reduced access will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 48) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.
9.1.2	Displacement leading to gear	Displacement from the Awel y Môr OWF array area and	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	conflict and increased fishing pressure on adjacent grounds	offshore ECR leading to gear conflict and increased fishing pressure on adjacent grounds. Potential for displacement of fishing activity, though effect is expected to be short-term and localised, and the operational range of relevant fleets will not typically be limited to the array area / offshore ECR.	consider the dependence of fleets on grounds in the array area and offshore ECR, and access to alternative grounds. The nature and extent of displacement and implications for/of gear conflict will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 48) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.
9.1.3	Displacement or disruption of commercially important fish and shellfish resources	Array area and offshore ECR construction activities leading to displacement or disruption of commercially important fish and shellfish resources.	Assessment will be informed by the outcomes of the Fish and Shellfish Ecology impact assessment and it will be assumed that commercial fisheries will be affected as a result of any loss of resources. The conclusions presented in the Fish and Shellfish Ecology impact assessment regarding impact significance will be taken into account in determining the magnitude of impact on commercial fisheries.
OPERATION			
9.1.4	Reduction in access to, or exclusion from	Physical presence of constructed Awel y Môr OWF infrastructure leading to reduction in access to, or	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	established fishing grounds	exclusion from established fishing grounds. It is assumed fishing can resume to a degree within the OWF area. The effect will be long-term but localised, and the operational range of relevant fleets will not typically be limited to the array area / offshore ECR.	offshore ECR, and access to alternative grounds. The effects of exclusion/reduced access will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 48) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.
9.1.5	Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	Displacement from the Awel y Môr OWF area leading to gear conflict and increased fishing pressure on adjacent grounds. It is assumed fishing can resume to a degree within the OWF area. The effect will be long-term but localised, and the operational range of relevant fleets will not typically be limited to the array area / offshore ECR.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECR, and access to alternative grounds. The nature and extent of displacement and implications for/of gear conflict will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 48) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.1.6	Displacement or disruption of commercially important fish and shellfish resources	Array area and offshore ECR operation and maintenance activities leading to displacement or disruption of commercially important fish and shellfish resources.	Assessment will be informed by the outcomes of the Fish and Shellfish Ecology impact assessment and it will be assumed that commercial fisheries will be affected as a result of any loss of resources. The conclusions presented in the Fish and Shellfish Ecology impact assessment regarding impact significance will be taken into account in determining the magnitude of impact on commercial fisheries.
9.1.7	Physical presence infrastructure leading to gear snagging	Standard industry practice and protocol (e.g. seabed infrastructure will be buried and/or marked on nautical charts) will minimise the risk of gear snagging, but it remains likely to be an area of industry concern.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECR, and access to alternative grounds. The potential nature of gear snagging and associated implications will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 48) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.
DECOMMISSIONING			
9.1.8	Reduction in access to, or exclusion from	Decommissioning activities and physical presence of any Awel y Môr OWF infrastructure leading	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	established fishing grounds	to reduction in access to, or exclusion from established fishing grounds. Potential for some loss of fishing opportunities over the decommissioning period, though effect is expected to be short-term and localised, and the operational range of relevant fleets will not typically be limited to the array area / offshore ECR.	offshore ECR, and access to alternative grounds. The effects of exclusion/reduced access will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 48) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.
9.1.9	Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	Displacement from the Awel y Môr OWF array area and offshore ECR leading to gear conflict and increased fishing pressure on adjacent grounds. Potential for displacement of fishing activity, though effect is expected to be short-term and localised, and the operational range of relevant fleets will not	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECR, and access to alternative grounds. The nature and extent of displacement and implications for/of gear conflict will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 48) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		typically be limited to the array area / offshore ECR.	
9.1.10	Displacement or disruption of commercially important fish and shellfish resources	Array area and offshore ECR decommissioning activities leading to displacement or disruption of commercially important fish and shellfish resources.	Assessment will be informed by the outcomes of the Fish and Shellfish Ecology impact assessment and it will be assumed that commercial fisheries will be affected as a result of any loss of resources. The conclusions presented in the Fish and Shellfish Ecology impact assessment regarding impact significance will be taken into account in determining the magnitude of impact on commercial fisheries.
9.1.11	Physical presence infrastructure leading to gear snagging	Relevant during decommissioning should any infrastructure be left in-situ. Standard industry practice and protocol (e.g. seabed infrastructure will be buried and/or marked on nautical charts) will minimise the risk of gear snagging, but it remains likely to be an area of industry concern.	Baseline data analysis and consultation will be undertaken in order to characterise commercial fisheries activity in the study area and consider the dependence of fleets on grounds in the array area and offshore ECR, and access to alternative grounds. The potential nature of gear snagging and associated implications will be assessed. Understanding of the baseline will be informed by the most up-to-date versions of publicly available data (see Table 48) and consultation with fleets active in the study area to understand the specifics of fleet operation and grounds targeted.

TABLE 50 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR COMMERCIAL FISHERIES

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
9.1.12	Additional steaming to alternative fishing grounds for vessels that would otherwise fish within the Awel y Môr OWF area during construction	This impact will be localised and limited deviations to steaming routes are expected. Given adequate notification (see 'Mitigation Measures adopted as part of the project'), it is expected that vessels, which typically have an operational range beyond that of the Awel y Môr OWF, will be in a position to avoid temporary construction/decommissioning areas and installed infrastructure with no or minimal impact on their steaming times. The impact is not expected to be significant in EIA terms. Subject to feedback received on this scoping report, it is intended that this impact is scoped out of further consideration in the PEIR and ES.
9.1.13	Increased vessel traffic associated with Awel y Môr OWF within fishing grounds leading to interference with fishing activity during construction	Vessel movements associated with Awel y Môr construction, operation and maintenance, and decommissioning, will add to the existing volume of marine traffic in the area. However, the impact will be localised and given adequate notification (see 'Mitigation Measures adopted as part of the project'), fleets will be able to avoid Awel y Môr OWF vessel traffic.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		The impact is not expected to be significant in EIA terms. Subject to feedback received on this scoping report, it is intended that this impact is scoped out of further consideration in the PEIR and ES.
OPERATION		
9.1.14	Additional steaming to alternative fishing grounds for vessels that would otherwise fish within the Awel y Môr OWF area during operation and maintenance	As detailed for the 'Construction' phase.
9.1.15	Increased vessel traffic associated with Awel y Môr OWF within fishing grounds leading to interference with fishing activity during operation and maintenance	As detailed for the 'Construction' phase.
DECOMMISSIONING		
9.1.16	Additional steaming to alternative fishing grounds for vessels that would otherwise fish within the Awel y Môr OWF area during decommissioning	As detailed for the 'Construction' phase.
9.1.17	Increased vessel traffic associated with Awel y Môr OWF within fishing grounds leading to interference with fishing activity during decommissioning.	As detailed for the 'Construction' phase.

Mitigation Measures adopted as part of the project

596 As part of the design process for Awel y Môr OWF, a number of designed-in measures are proposed to reduce the potential for impacts on commercial fisheries; these are summarised below.

597 innogy is committed to implementing these measures (noting they may evolve over the development process as the EIA progresses and in response to consultation), and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 49 and Table 50.

598 Measures adopted as part of the project will include:

- innogy is committed to ongoing liaison with fishermen throughout all stages of the project, based upon FLOWW (2014, 2015) guidance and the following:
  - Appointment of a company Fisheries Liaison Officer (FLO) to maintain effective communications between the project and fishermen;
  - Appropriate liaison with relevant fishing interests to ensure that they are fully informed of development planning and any offshore activities and works;
  - Timely issue of notifications including Notice to Mariners (NtMs), Kingfisher Bulletin notifications and other navigational warnings to the fishing community to provide advance warning of project activities and associated Safety Zones and advisory safety distances; and
  - Development, prior to construction, of a fisheries liaison and co-existence plan, setting out in detail the planned approach to fisheries liaison and means of delivering any other relevant mitigation measures. It is intended that a draft of this plan be submitted at the point of consent application.
- innogy is committed to marking and lighting the project in accordance with relevant industry guidance and as advised by relevant stakeholders including the Maritime and Coastguard Agency (MCA), Civil Aviation Authority (CAA) and Trinity House. innogy will also ensure the project is adequately marked on nautical charts.

- A dropped objects plan will be developed for reporting and recovery of dropped objects where they pose a potential hazard to other marine users.
- Where practicable, cable burial will be the preferred means of cable protection.

Potential cumulative impacts

599 There may be potential for cumulative impacts to occur on commercial fisheries as a result of the development of other offshore wind farms and other activities in the marine environment. The approach to assessment of potential cumulative impacts is set out in Chapter 4 of this Scoping Report.

600 Offshore wind projects and other activities relevant to the assessment of cumulative impacts on commercial fisheries will be identified through a screening exercise. The potential impacts considered in the cumulative assessment as part of EIA will be in line with those described in Section 9.1.4 for the project-alone assessment, though it is possible that some will be screened out on the basis that the impacts are highly localised (i.e. they occur only within the Awel y Môr OWF boundary) or where management measures in place for Awel y Môr OWF and other projects will reduce the risk of impacts occurring.

601 For the purposes of cumulative impact assessment, it will be assumed that already-operational offshore wind farms and active licensed activities constitute part of the existing baseline environment, as commercial fisheries would already be adapted to them and any effect they might have had will be reflected in the baseline characterisation undertaken to inform impact assessment.

602 The likely scope of other offshore wind projects and other activities to be included in cumulative impact assessment is set out immediately below, though this will be confirmed by the aforementioned screening exercise.

603 Offshore wind: Given the presence of wider offshore wind development within Liverpool Bay, there is the potential for small impacts associated with the Awel y Môr OWF to be part of a more significant cumulative impact. The cumulative impact assessment will consider other offshore wind farm projects across the Liverpool Bay area and the key cumulative impacts are expected to result from loss or restricted access to established fishing grounds and displacement of fishing activity.

604 Other activities: There is the potential for other activities occurring in the region surrounding Awel y Môr OWF to create cumulative impacts; these include aggregate dredging activity, oil and gas activity and infrastructure, and subsea cabling. As for offshore wind projects, the key cumulative impacts are expected to result from loss or restricted access to established fishing grounds and displacement of fishing activity.

Potential Transboundary Impacts

605 Due to the localised nature of any potential impacts and the absence of foreign fishing fleet activity, transboundary impacts are unlikely to occur and therefore it is suggested that their consideration be scoped out from further consideration within the EIA.

9.1.5 Summary of next steps

606 It is intended that during the EIA, full acquisition and analysis of the baseline data sources listed in Table 48 is completed. Data analysis will then be corroborated and expanded upon by consultation with the fishing industry and other relevant stakeholders, including the following:

- MMO;
- Welsh Government;
- National Federation of Fishermen's Organisations (NFFO);
- Welsh Fishermen's Association (WFA);
- North West Fish Co-operative;
- Other Local Fishermen's Associations and Producer Organisations as identified by the Company FLO/other means;
- Individual fishermen as identified by the Company FLO/other means.

607 Consultation will not only seek to validate the baseline, but to identify key stakeholder concerns to inform the impact assessment.

9.1.6 Further Considerations for Consultees

608 The following questions are posed to consultees to help them frame and focus their response to the commercial fisheries scoping exercise, which will in turn inform the Scoping Opinion:

i. Do you agree that the data sources identified are sufficient to inform the commercial fisheries baseline for the Awel y Môr OWF PEIR and ES?

ii. Have all potential impacts on commercial fisheries resulting from Awel y Môr OWF been identified within this Scoping Report?

iii. Do you agree that the impacts described in Table 50 can be scoped out?

iv. For those impacts scoped in (Table 49), do you agree that the methods described are sufficient to inform a robust impact assessment?

v. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on commercial fisheries receptors?

vi. Do you agree that all relevant stakeholders with which consultation should be undertaken have been identified?

9.2 Shipping and Navigation

9.2.1 Introduction

609 This Section of the Scoping Report identifies the shipping and navigation receptors of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on shipping and navigation and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

610 There are a several topics related to shipping and navigation which are covered in other chapters of this Scoping Report. These chapters are:

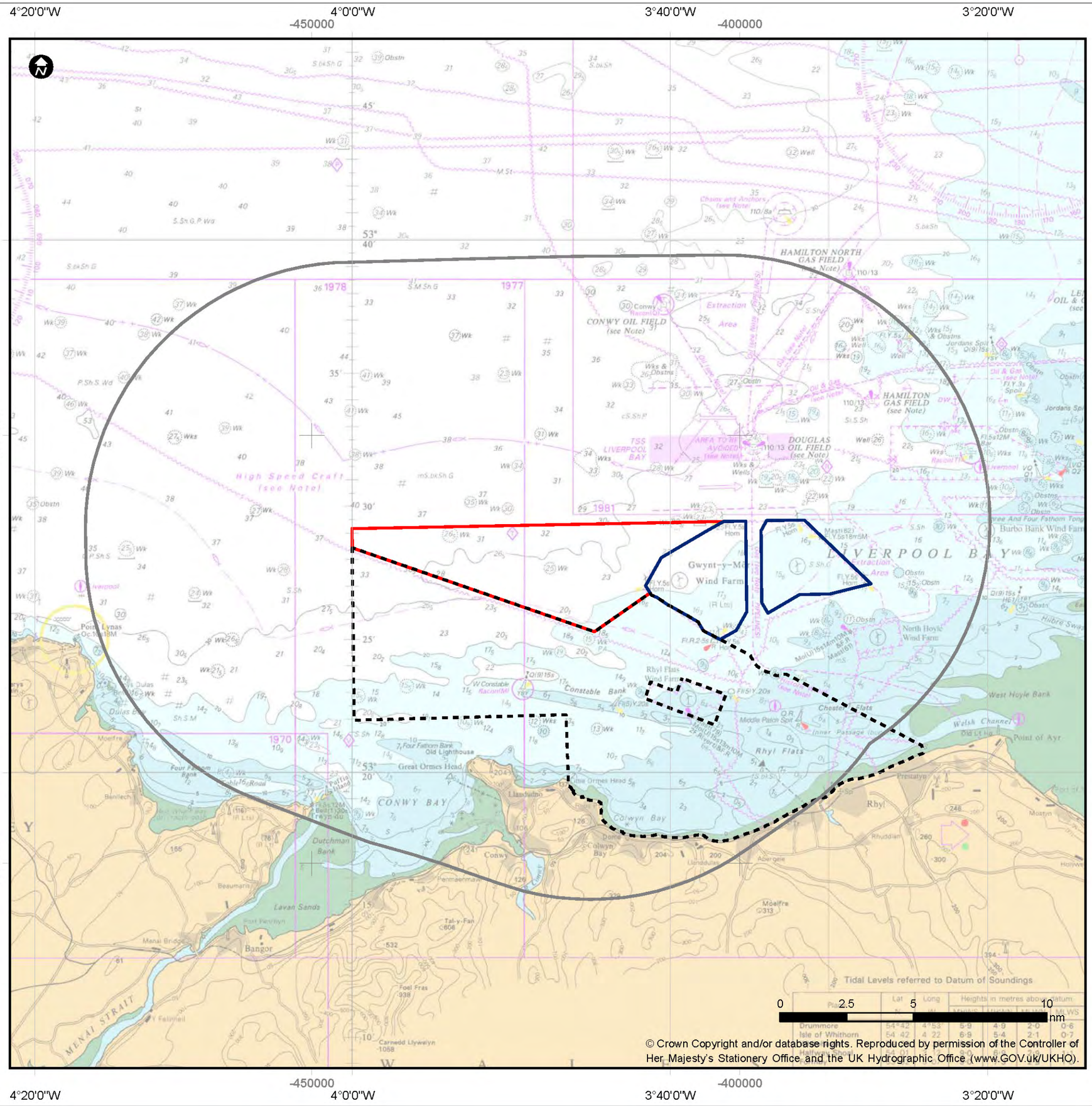
- Section 9.1 - Commercial Fisheries; and
- Section 9.6 - Other Marine Users and Activities.

9.2.2 Study Area

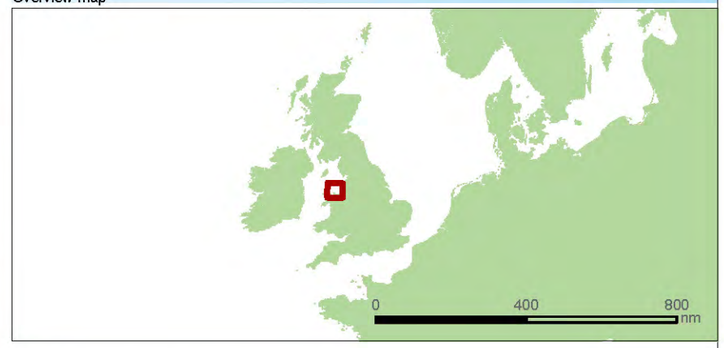
611 In the majority, data has been considered within a 10 nautical mile (nm) buffer of the Awel y Môr OWF array area (the "study area"), as shown in Figure 47. The 10 nm buffer is standard for shipping and navigation assessments as it is large enough to encompass vessel routeing which may be impacted, while still remaining site specific to the project being studied.

612 Where necessary, this 10 nm buffer has been extended to consider features that may impact vessel routeing outwith the 10 nm threshold.

613 The export cable route is yet to be determined, however an ECR search area within which options will be explored has been identified. The ECR search area has also been included in Figure 47, which also includes the current indicative landfall options.



Overview map



Legend

- Array Area
- GyM OWF Array Area
- Study Area
- Offshore Export Cable Route Search Area

Cartographic information

Coordinate System: World Mercator
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT: Offshore Windpark **Awel y Môr**

TITLE: Overview of Awel y Mor and GyM

DRAWN	DATE	SCALE	SIZE
DS	11/03/2020	1:450,000	@DIN A3

REV: 03

Path: P:\Project\A4371 Galloper and Gwynt Y Mor\GyM\GIS\ESRI\Figure 1 - Overview of Awel y Mor\Figure 1 - Overview of Awel y Mor and GyM.mxd

9.2.3 Baseline Data

614 The following data sources have been used to inform the preliminary baseline assessment undertaken for this scoping exercise:

- 14 days of Automatic Identification System (AIS) data collected from coastal receivers during July 2019 within the 10 nm study area;
- 14 days of AIS data collected from coastal receivers during December 2018 within the 10 nm study area;
- Admiralty Charts 1978, 1977 and 1826;
- United Kingdom Hydrographic Office (UKHO) Admiralty Sailing Directions – West Coasts of England and Wales Pilot NP37 (UKHO, 2011);
- Marine Accident Investigation Branch (MAIB) incident data (2005 to 2014);
- Royal National Lifeboat Institution (RNLI) incident data (2008 to 2017); and
- British Marine Aggregate Producers Association (BMAPA) transit routes (BMAPA, 2018).
- Royal Yachting Association (RYA) Coastal Atlas (RYA, 2011)
- Section 9.1 Commercial Fisheries

615 AIS carriage and broadcast is not compulsory for fishing vessels of less than 15 metres (m), or vessels of less than 300 Gross Tonnage (notably this includes most recreational vessels). It should therefore be considered that such traffic is likely to be underrepresented within the assessment undertaken for this scoping exercise; however, it is noted that smaller vessels are increasingly observed to utilise AIS voluntarily given the associated safety benefits. On this basis and noting that AIS is accepted as being comprehensive for other larger vessel types, the available data is considered as fit for the purpose of providing the high level baseline assessment presented in this scoping exercise.

616 Additional data that is proposed to be collected (including that which will account for non-AIS traffic) post scoping during the subsequent stages of the EIA is detailed in Section 9.2.4.

Baseline Environment

Navigational Features

617 This Section presents the baseline environment for navigational features, which have been identified via a review of Admiralty Charts and the local UKHO Admiralty Sailing Directions (UKHO, 2011) as per Section 9.2.3. An overview of the navigational features that were deemed relevant to the scoping exercise is shown in Figure 48 , with key features discussed further below.

618 For clarity, marine aggregate dredging areas, spoil grounds, and associated BMAPA transit routes are shown separately in Figure 49.

619 The Liverpool Bay Traffic Separation Scheme (TSS), shown in Figure 48, is north of Awel y Môr OWF array area and is utilised by vessels entering and leaving Liverpool Harbour to the east of the study area. While not within or in the proximity of the study area (and hence not shown in Figure 48), the Off Skerries TSS to the west of the study area used by vessels transiting around Holyhead is considered relevant as vessels will stay on a similar transit between the two TSSs.

620 There are five operational OWFs located nearby to Awel y Môr OWF, all of which are shown in Figure 48, and listed in Table 51 below.

TABLE 51 - OPERATIONAL OWFS IN PROXIMITY TO AWEL Y MÔR OWF

OWF	DISTANCE AND BEARING FROM AWEL Y MÔR OWF ARRAY AREA	COMMISSIONED
Gwynt y Môr	Adjacent	2015
Rhyl Flats	3 nm South East	2009
North Hoyle	8 nm South East	2004
Burbo Bank Extension	9 nm East	2017
Burbo Bank	14 nm East	2007

621 There are two marine aggregate dredging areas within the study area, both of which are currently production areas. A total of seven BMAPA transit routes intersect the study area, one of which also intersects the Awel y Môr OWF array area.

622 A United Kingdom Ministry of Defence (MoD) practice area is located outwith the study area (19 nm to the East of the Awel y Môr OWF), as shown in Figure 48 , which is used for an onshore rifle firing practice, but is only used when the area is clear of vessels.

623 Large anchorage areas associated with Liverpool harbour are located east of the existing Gwynt y Môr site. It is noted that anchoring is prohibited in the area located at the mouth of the Queens Channel, which provides access to Liverpool Harbour.

624 There are three Oil and Gas platforms located within the study area which are listed below with their respective distances and bearings from Awel y Môr OWF:

- Douglas Oil Field (3 nm North East) and contained within the separation zone of Liverpool Bay TSS;
- Hamilton Gas Field (7.5 nm North East); and
- Conwy Oil Field (8.5 nm North).

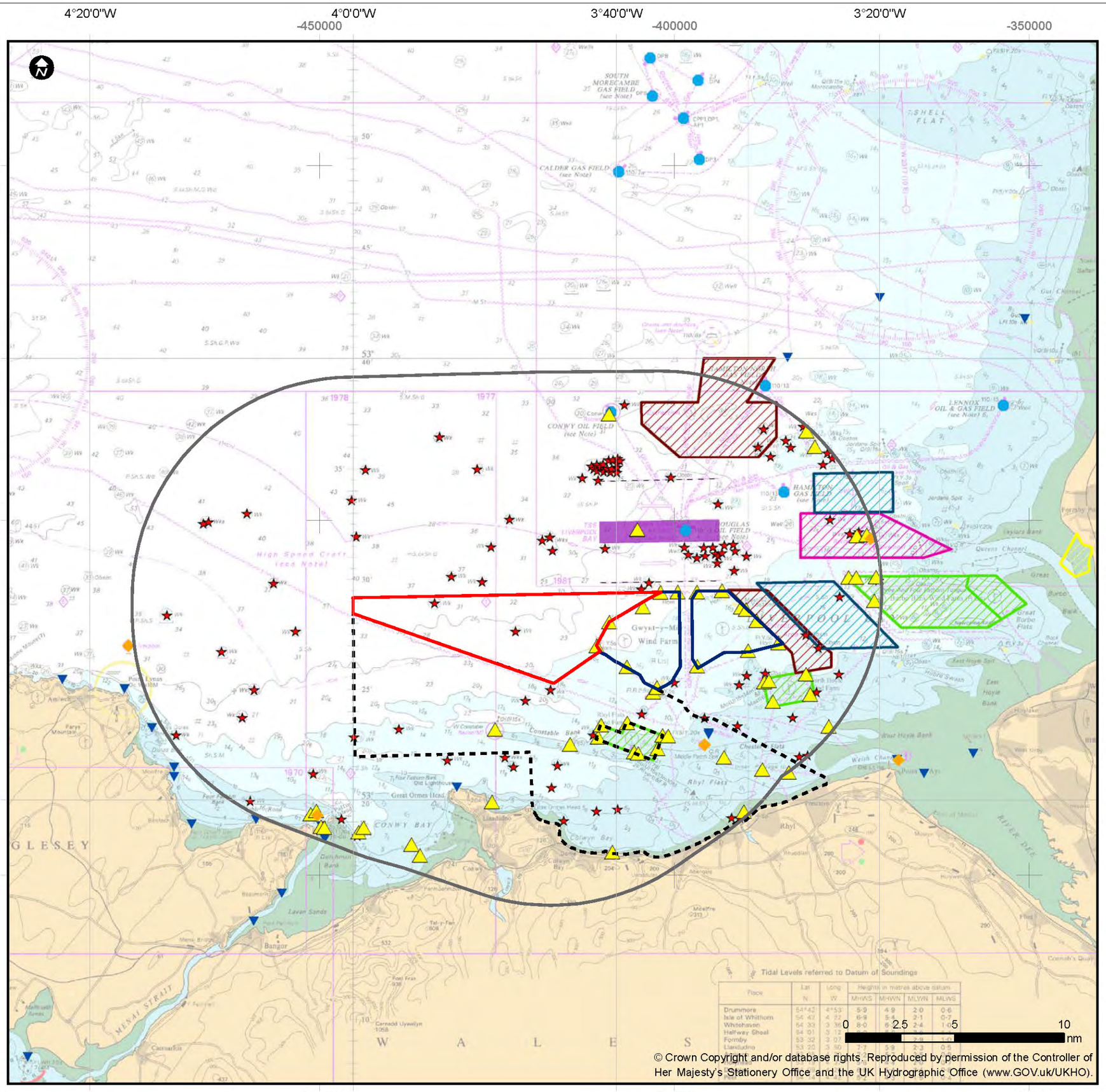
625 Note the Douglas platform is within the central separation zone of the Liverpool Bay TSS.

626 Key ports local to the Awel y Môr OWF include those listed in Table 52. There are pilot boarding stations located within the study area associated with local ports, although none in close proximity to Awel y Môr OWF. The Port of Liverpool has Vessel Traffic Service coverage that extends across Liverpool Bay to Anglesey.

TABLE 52 - PORTS IN VICINITY OF AWEL Y MÔR OWF

PORT	DISTANCE FROM AWEL Y MÔR ARRAY AREA (NM)	PRINCIPAL TRAFFIC
Llanddulas	9	Dry bulk
Conwy	10	Fishing
Amlwch	13	Fishing, recreation
Port Penrhyn	15	Commercial, fishing, recreation
Mostyn	17	Commercial
Menai Bridge	18	Commercial
Liverpool*	21	Commercial

* Distance from the mouth of the estuary of the Mersey River


4°20'0"W
4°0'0"W
3°40'0"W
3°20'0"W
-450000
-400000
-350000
7100000
7050000
7000000
53°40'0"N
53°20'0"N
SOUTH MORECAMBE GAS FIELD (see Note)
CALDER GAS FIELD (see Note)
CONWY OIL FIELD (see Note)
LENNOX OIL & GAS FIELD (see Note) 6
HAMILTON GAS FIELD (see Note)
DOUGLAS OIL FIELD (see Note)
LIVERPOOL BAY TSS
SHELL FLAT
Gwynt-y-Môr Wind Farm
Rhyl Flats
Great Ormes Head
CONWY BAY
Llandudno
Colwyn Bay
Rhyl
Prestatyn
Abergele
Bangor
Menai Strait
Lavan Sands
Puffin Island
Penmon Point
Point Lynas
Amlwch
Parys Mountain
Carmel Head
Carnedd Llywelyn
1058
Tal-y-Fan
609
Foel Fras
938
Moelfre
Puffin Island
Great Orme
Middle Patch Spit
Constable Bank
Hilbre Swash
West Hoyle Bank
East Hoyle Bank
Queens Channel
Great Burbo Flats
Rock Channel
Formby Point
Crosby
Coronation Dock
Liverpool
Eastham
Ellesmere Port
Queensferry
Connah's Quay
Flint
Mostyn
Point of Ayr
Talacre
Gronant
Prestatyn
Rhuddlan
Meliden
Dyserth
Abergele
Llanddulas
Llysfaen
Old Colwyn
Colwyn Bay
Penrhyn Bay
Llandudno
Great Ormes Head
Conwy
Deganwy
Llandudno Junction
Penmaenmawr
Aber
Llanfairfechan
Penmaenmawr
Dwygyfylchi
Penmaen-bach
Sychnant Pass
Conwy Mountain
Tal-y-Cafn
Dolgarrog
Trefriw
Llanrwst
Betws-y-Coed
Capel Curig
Llyn Cowlyd
Llyn Crafnant
Llyn Geirionydd
Llyn Eigiau
Llyn Dulyn
Llyn Cwm Dulyn
Llyn Cwm Llan
Llyn Cwm Bychan
Llyn Cwm Llwch
Llyn Cwm Ffynnon
Llyn Cwm Dyli
Llyn Cwm Idwal
Llyn Ogwen
Llyn Bochlwyd
Llyn Cwm Cneifion
Llyn Cwm Clyd

4°20'0"W 4°0'0"W 3°40'0"W 3°20'0"W

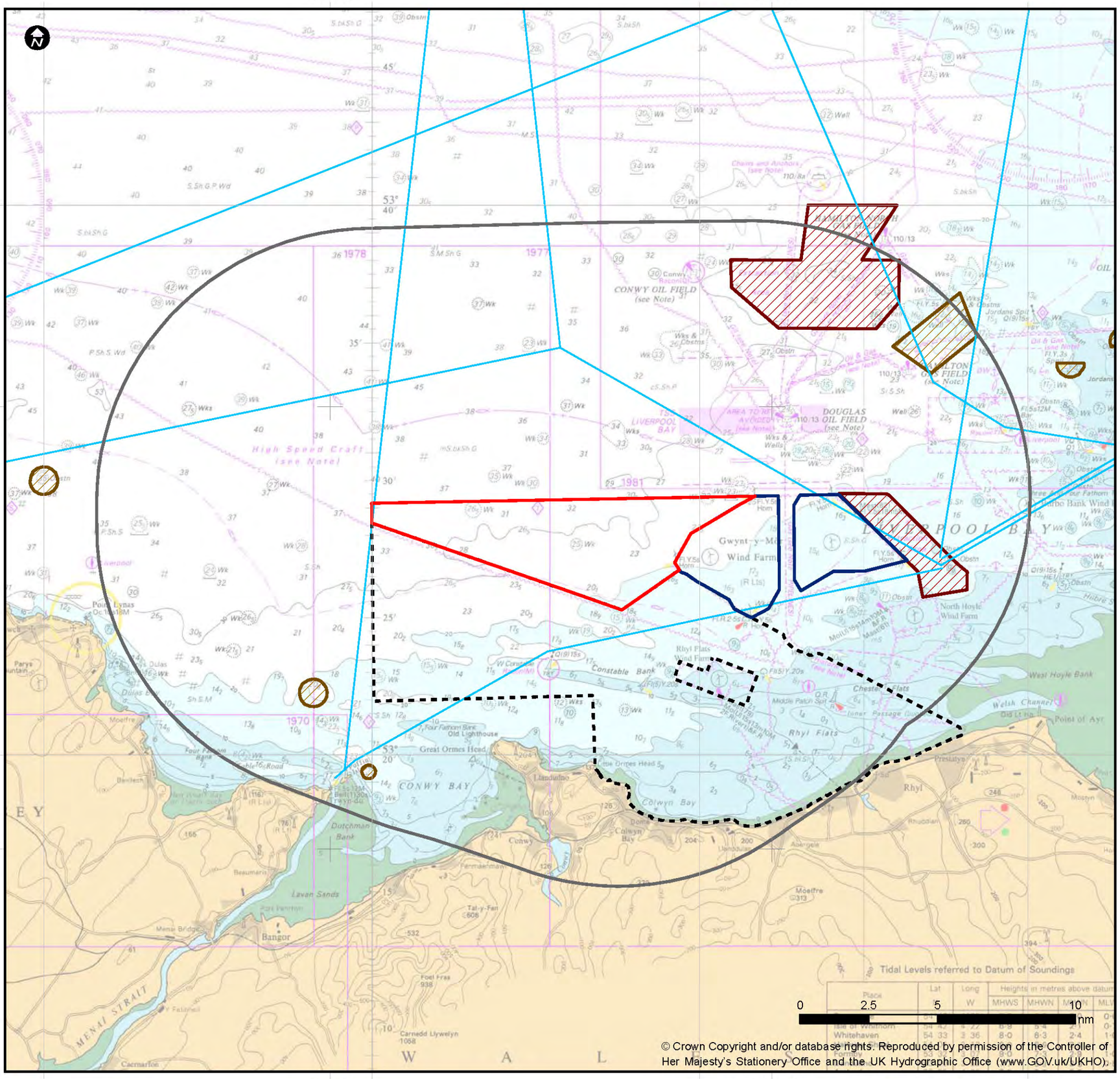
-450000 -400000

53°40'0"N

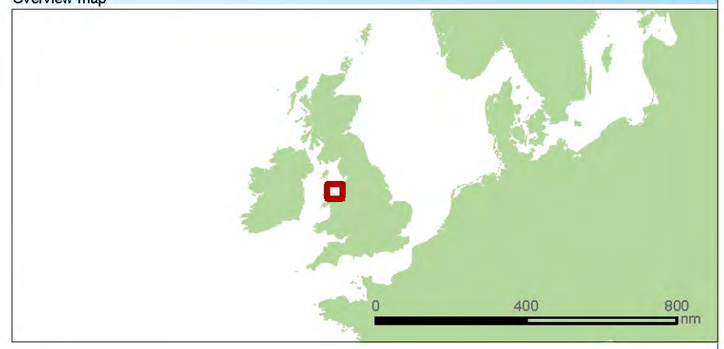
53°20'0"N

7050000

7000000



Overview map



Legend

- Array Area
- GyM OWF Array Area
- Offshore Export Cable Route Search Area
- Study Area

Dredging Features

- Extraction Area
- Spoil Ground
- Transit Routes

Cartographic information

Coordinate System: World Mercator
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT: Offshore Windpark **Awel y Môr**

TITLE: Marine Aggregate Dredging Features and BMAPA Passage Plans in Proximity to Awel y Môr

DRAWN	DATE	SCALE	SIZE
DS	11/03/2020	1:450,000	@DIN A3

REV: 02

Path: P:\Project\A4371 Galloper and Gwynt Y Mor\GyM\GIS\ESRI\Figure 3 - Dredging Features\Figure 3 - Dredging Features.mxd

Marine traffic

627 The marine traffic data collected during the winter and summer survey periods are shown in Figure 50 and Figure 51 respectively. It is noted that vessels deemed as representing temporary traffic (e.g. vessels engaged in surveys) have been removed. It has been assumed that vessels visiting operational OWFs in the area represent operational traffic and thus have been retained.

628 An average of 62 vessels were recorded per day within the 10 nm study area during summer, five of which intersected the site (noting these were in the majority associated with Gwynt y Môr). This represents an increase over the winter period, when an average of 43 vessels per day were recorded within 10 nm, three of which intersected the site. The majority of traffic in the area was observed to be cargo vessels, which comprised 47% and 37% of the total in winter and summer respectively.

629 The majority of commercial (cargo and tanker) traffic within the study was observed to be associated with Liverpool Harbour, and utilise the Liverpool Bay TSS. It is noted that vessels accessing the inbound (eastbound) lane of the TSS were observed to intersect the extension site when approaching from the south west.

630 The following commercial passenger ferry routes were recorded within the data studied:

- Liverpool / Belfast (Stena operated);
- Liverpool / Dublin (P&O Ferries operated);
- Liverpool / Douglas (Isle of Man Steam Packet operated); and
- Belfast / Birkenhead (Stena operated).

631 Recreational traffic was observed to be most prominent within the south west of the study area within Conwy Bay and in the vicinity of the mouth of the Menai Strait. Vessels associated with Liverpool were also recorded. The majority (95%) of the recreational traffic was recorded during the summer study period. As noted in Section 9.2.3, recreational vessels are not obliged to broadcast via AIS and as such may be underrepresented.

632 Fishing activity was observed to be minimal over the periods studied, with no clear distinction between summer and winter behaviours observed. However, as per Section 0 fishing vessels less than 15 m in length are not obliged to broadcast via AIS and as such may be underrepresented.

633 Oil and gas support traffic was recorded at the platforms associated with the Douglas, Conwy, and Hamilton fields.

634 A preliminary assessment of anchoring showed that vessels utilise the berths available in the anchorages associated with Liverpool Harbour. Notable levels of commercial vessel anchoring were also recorded at the anchorages near to Point Lynas. Anchorage can also be found in Conwy Bay, the River Dee, North of Hamilton North gas field, and North of Lennox oil and gas field.

4°20'0"W 4°0'0"W 3°40'0"W 3°20'0"W

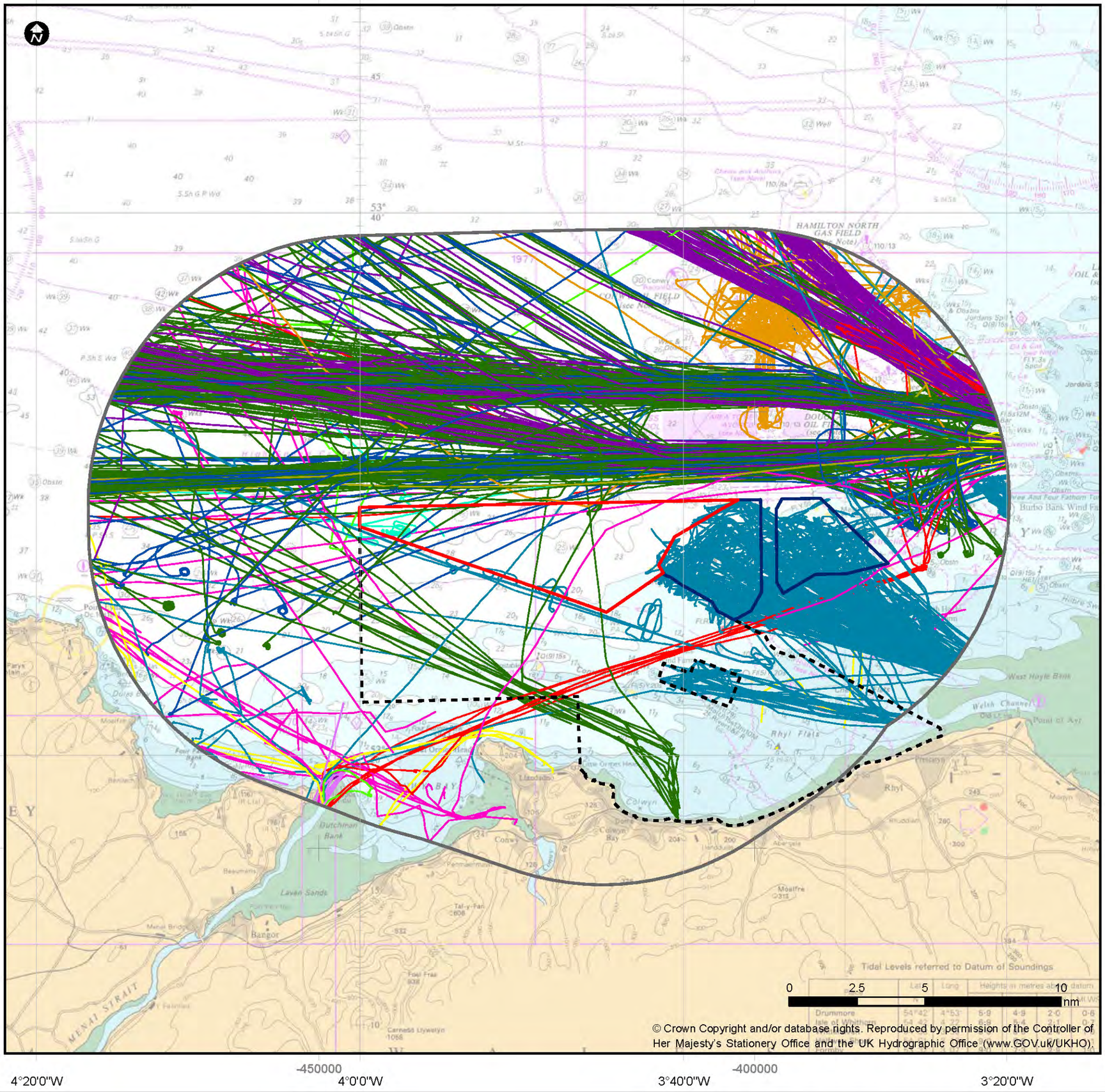
-450000 -400000

53°40'0"N

7050000

53°20'0"N

7000000

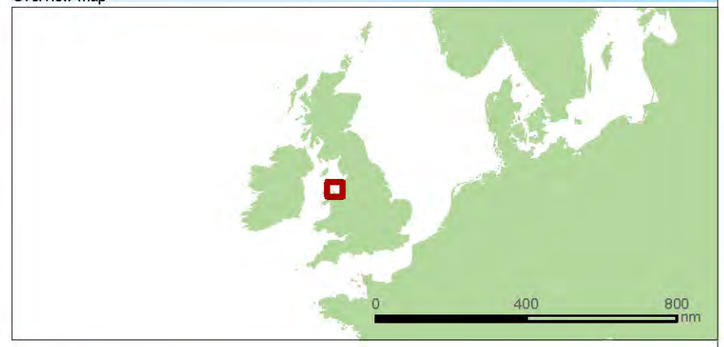


© Crown Copyright and/or database rights. Reproduced by permission of the Controller of Her Majesty's Stationery Office and the UK Hydrographic Office (www.GOV.uk/UKHO).

-450000 -400000

4°20'0"W 4°0'0"W 3°40'0"W 3°20'0"W

Overview map



Legend

- Array Area
- GyM OWF Array Area
- Offshore Export Cable Route Search Area
- Study Area

Vessel Type

- Fishing
- Military
- Dredger/Subsea
- HSC
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Recreational
- Oil and Gas
- Wind Farm

Cartographic information

Coordinate System: World Mercator
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT: Offshore Windpark **Awel y Môr**

TITLE: 14 days Summer 2019 Marine Traffic by Vessel Type within the Study Area

DRAWN	DATE	SCALE	SIZE
DS	11/03/2020	1:450,000	@DIN A3

REV: 02

Path: P:\Project\A4371 Galloper and Gwynt Y Mor\GyM\GIS\ESRI\Figure 4 - 14 Days Summer 2018\Figure 4 - 14 Days of Marine Traffic.mxd

4°20'0"W 4°0'0"W 3°40'0"W 3°20'0"W

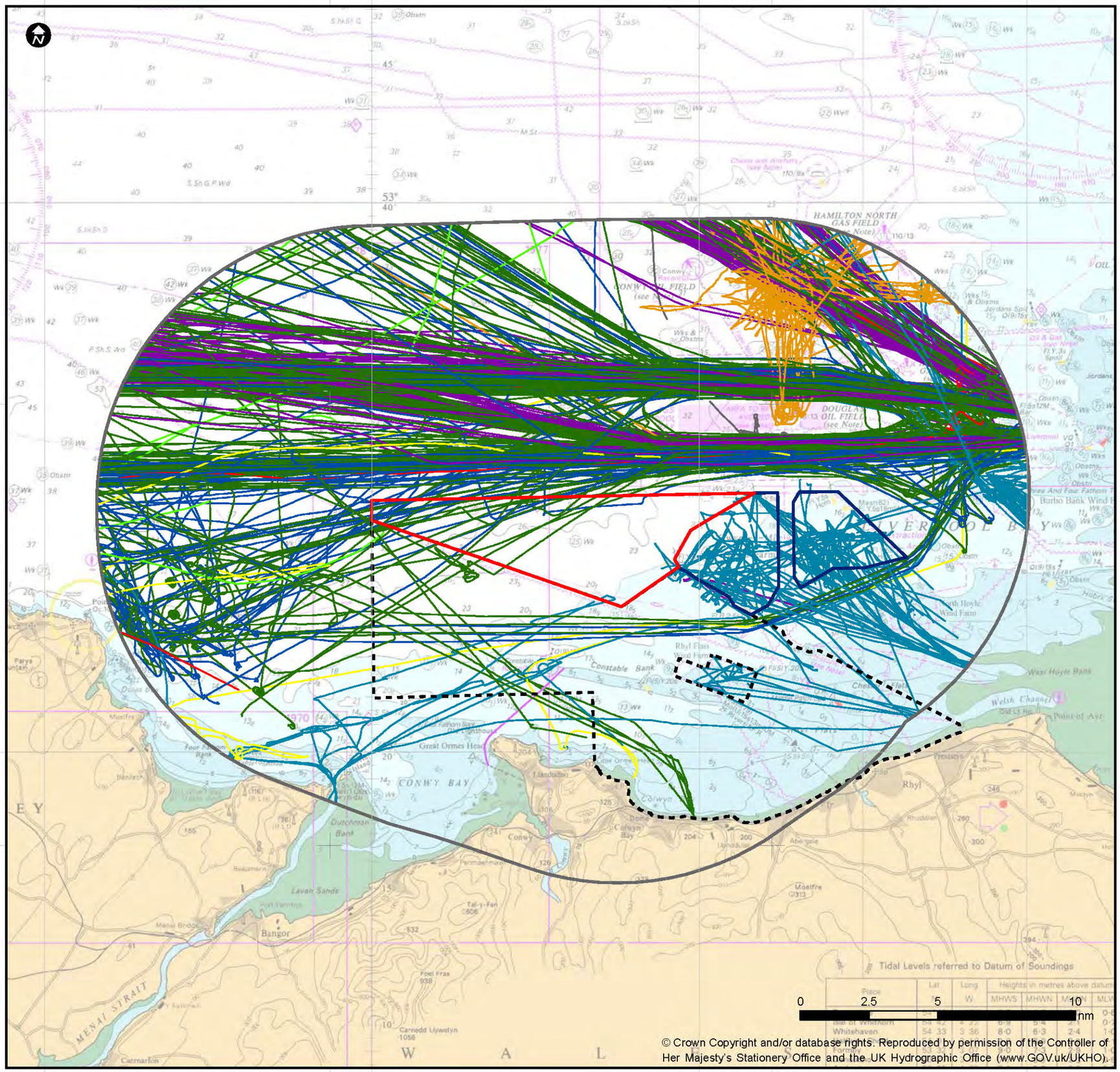
-450000 -400000

53°40'0"N

7050000

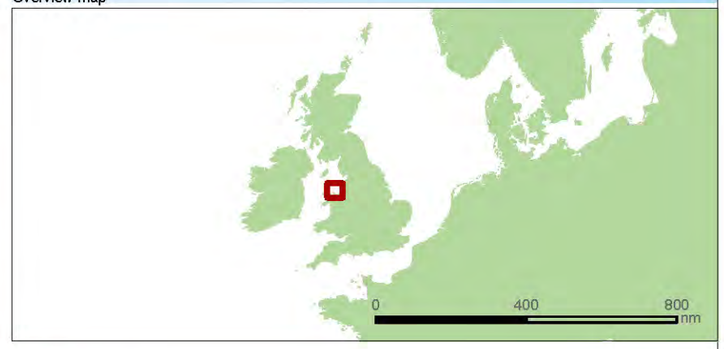
53°20'0"N

7000000



© Crown Copyright and/or database rights. Reproduced by permission of the Controller of Her Majesty's Stationery Office and the UK Hydrographic Office (www.GOV.uk/UKHO).

Overview map



Legend

- Array Area
- GyM OWF Array Area
- Offshore Export Cable Route Search Area
- Study Area

Vessel Type

- Unspecified
- Fishing
- Dredger/Subsea
- HSC
- Passenger
- Cargo
- Tanker
- Other
- Oil and Gas
- Wind Farm

Cartographic information

Coordinate System: World Mercator
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT: Offshore Windpark **Awel y Môr**

TITLE: 14 days Winter 2018 Marine Traffic by Vessel Type within the Study Area

DRAWN	DATE	SCALE	SIZE
DS	11/03/2020	1:450,000	@DIN A3

REV: 02

Path: P:\Project\A4371 Galloper and Gwynt Y Mor\GyM\GIS\ESRI\Figure 5 - 14 Days Winter 2018\Figure 5 - 14 Days 2018 marine traffic by vessel type within the study area.mxd

Marine incidents

635 An analysis of MAIB incident data from 2005-2014 indicated that a total of 61 incidents were recorded within the study area, and a total of eight within the ECR search area. One incident, detailed below, was recorded in the Awel y Môr OWF array area:

- December 2012, machinery failure of an offshore industry vessel.

636 An analysis of RNLI incident data from 2008-2017 indicated that a total of 1018 incidents were recorded within the study area, and a total of 323 within the ECR search area. Three incidents, detailed below, were recorded within the Awel y Môr OWF array area:

- March 2011, powered recreational vessel requiring assistance;
- August 2015, machinery failure of a fishing vessel; and
- June 2017 capsize of recreational sailing vessel capsized and subsequently towed to safety.

9.2.4 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

637 It is noted that the proposed approach to assessment for shipping and navigation has been agreed at a high level with the Marine Coastguard Agency (MCA) and Trinity House (TH).

638 The key guidance document that will be considered within the Shipping and Navigation chapter of the EIA is the MCA's Marine Guidance Note (MGN) 543[27] and its annexes (MCA, 2016). Other key guidance is as follows:

- International Maritime Organization (IMO) guidelines for Formal Safety Assessment (IMO, 2018);
- International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) – O-139 the Marking of Man-Made Offshore Structures (IALA, 2013).

[27] Or any subsequent updates to MGN 543 available sufficiently far in advance of the application.

- MCA MGN 372[28] (M+F) (MGN 372 M+F) Offshore Renewable Energy Installations (OREIs) Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA 2008);
- MCA Methodology for Assessing the Marine Navigational Safety Risks of Offshore Renewable Energy Installations (MCA, 2015); and
- RYA – The RYA's Position on Offshore Energy Developments: Paper 1 – Wind Energy (RYA, 2015).

639 As per the MCA methodology (MCA, 2015)[29], a Navigational Risk Assessment (NRA) will be undertaken, where impacts will be assessed on a preliminary basis to determine which should be included within the EIA. The outputs of this scoping process will therefore inform the NRA.

640 The IMO Formal Safety Assessment (FSA) Methodology (IMO, 2018) is the internationally recognised approach for assessing impacts to shipping and navigation receptors, and is the approach required under the MCA methodology (MCA, 2015). This methodology is centred on risk control and assesses each impact in terms of its frequency and consequence in order that its significance can be determined as "broadly acceptable", "tolerable", or "unacceptable". Any impact assessed as "unacceptable" will require additional measures implemented beyond those considered embedded in order that the impact is reduced to within "tolerable" or "broadly acceptable" parameters.

641 Impact significance for the application will be determined via a risk ranking matrix dependent on its assessed frequency and consequence. The frequency and consequence, as part of the NRA process, will be related to the parameters required IMO FSA significance and agreed at the Hazard Workshop. The risk ranking matrix is illustrated in Table 53 below. The frequency and consequence rankings per impact will be determined using a number of inputs, notably:

- Quantitative modelling undertaken in the NRA (Anatec CollRisk);
- Output of the baseline assessment;
- Consideration of embedded mitigation in place;
- Lessons learnt from other OWF projects;

[28] Or any subsequent updates to MGN 372 at the time of application.
[29] Including any subsequent updates to the methodology.

- Level of stakeholder concern; and
- Consultation output.

TABLE 53 - RISK RANKING MATRIX

CONSEQUENCE						
	MAJOR	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable
	SERIOUS	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
	MODERATE	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
	MINOR	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
	NEGLIGIBLE	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
		NEGLIGIBLE	EXTREMELY UNLIKELY	REMOTE	REASONABLY PROBABLE	FREQUENT
		FREQUENCY				

Additional data

642 In line with MGN 543 (MCA, 2016), it will be necessary to undertake a marine traffic survey covering both AIS and non-AIS traffic within the site and surrounding area. The nature of this survey will be agreed with the MCA and TH, and it will be compliant with the requirements set out in MGN 543. This data will form a key input to the NRA. MGN 543 requires 28 days of seasonal data which will be collected during two 14 day surveys in summer (June, July, August) or winter (November to March).

643 Given the extent of the ECR search area, detailed marine traffic analysis has not been undertaken at this stage. It is anticipated that by the time of the NRA, the ECR search area will have been refined. Marine traffic within the ECR to be assessed will constitute an AIS only survey. Consultation outputs from fishing and recreational stakeholders will also be considered to ensure the analysis is reflective of non-AIS traffic.

644 The most recent iteration of the RYA Coastal Atlas (RYA, 2011) will also be considered in line with RYA preference for both the array area and ECR search area.

Consultees

645 The following statutory and non-statutory organisations deemed relevant to shipping and navigation will be included in further consultation:

- MCA;
- TH;
- Chamber of Shipping (CoS);
- RYA;
- Cruising Association;
- BMAPA;
- National Federation of Fishermen's Organisations;
- Commercial ferry operators;
- Port of Mostyn;
- Peel Ports;
- Local District Marine Safety Committee;
- Conwy Borough Council;
- Isle of Anglesey Council;
- Caenarfon port; and
- Bangor University (who operate the local Madog research vessel).

Potential project impacts

646 Following the results of the preliminary baseline assessment, which is presented in Section 9.2.4, and based on experience of other OWF shipping and navigation assessments, impacts that will be assessed within the NRA and EIA are presented in Table 54. The assessment will be split by phase (i.e. each impact will be assessed separately for the construction, operational, and decommissioning phases). The cumulative assessment will consider the same impacts as the projects in isolation (base case); noting it is likely that the impacts will be refined post scoping.

647 Given that MGN 543 (MCA, 2016) and its associated checklist require a specific set of criteria to be applied to assessment of shipping and navigation impacts, none of the identified impacts listed in Table 54 will be scoped out of the NRA and EIA process. This has been agreed with the MCA and TH.

TABLE 54 - IMPACTS PROPOSED TO BE SCOPED INTO THE ASSESSMENT FOR SHIPPING AND NAVIGATION

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
9.2.1	Traffic displacement	Vessels being displaced from their usual / established routes due to construction areas onto new routes.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area. Worst case deviations will then be assessed to ascertain impact significance.
9.2.2	Increased vessel to vessel collision risk between third party vessels resulting from displacement and proximity to routeing measures	Displaced vessels and the proximity of the array to routeing measure may lead to an increased risk of collision between third party vessels.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area, with worst case deviations then assessed. Collision modelling will be run to assess the change in risk from the pre OWF case to the post OWF case.
9.2.3	Increased vessel to vessel collision risk between a third party vessel and a project vessel	Increase in the volume of traffic in the area due to construction related project vessels resulting in an increased collision risk to third party vessels.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area. Collision risk with project vessels will be based on qualitative assessment of likely transit routes to / from site relative to third party traffic.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.2.4	Reduced access to local ports	Project infrastructure or associated construction related traffic impacting access to local ports.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area. Access patterns to local ports will be identified and assessed against the array area, cable routes, and likely project vessel transits to ascertain impact significance.
OPERATION			
9.2.5	Traffic displacement	Vessels being displaced from their usual / established routes onto new routes.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area. Worst case deviations will then be assessed to ascertain impact significance.
9.2.6	Increased vessel to vessel collision risk between a third party vessel and a project vessel	Increase in the volume of traffic in the area due to project vessels resulting in an increased collision risk to third party vessels.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area. Collision risk with project vessels will be based on qualitative assessment of likely transit routes to / from site relative to third party traffic.
9.2.7	Vessel to structure allision risk	Structures within the Awel y Môr OWF array area creating allision risk to passing traffic.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area, with worst case deviations then

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			assessed. This post case routeing will be modelled for both powered and drifting allision scenarios.
9.2.8	Reduced access to local ports	Project infrastructure or associated traffic impacting access to local ports.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area. Access patterns to local ports will be identified and assessed against the array area, cable routes, and likely project vessel transits to ascertain impact significance.
9.2.9	Reduction of under keel clearance resultant of cable protection	Reductions in water depth resultant of cable protection creating an underkeel risk to third party traffic.	An assessment of the traffic in the vicinity of the cable route (AIS only) will be undertaken and assessed against water depths within the ECR to identify any areas where underkeel clearance may be of concern.
9.2.10	Anchor interaction with subsea cables	Vessel anchors making contact with subsea cables	Marine traffic assessment (AIS only) will be undertaken to determine areas of anchoring near the cables (to determine anchor dragging risk). Any areas of busy traffic over the cables will also be considered (to determine emergency or inadvertent anchoring risk).

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.2.11	Interference with communications and position fixing equipment	Communication and position fixing equipment may be affected by the presence of the structures / within the Awel y Môr OWF array area, or the cables.	A dedicated marine traffic survey will be undertaken to determine traffic levels and routeing in the area. Post OWF routeing will be assessed to determine likely level of impact (which will be based on proximity to the structures). Potential effects of the cable will also be considered.
9.2.12	Reduction of Search and Rescue (SAR) capability due to increased incident rates and reduced access for surface / air responders	The presence of the OWF will increase the number of vessels in the area which could increase the number of incidents. The layout of the Wind Turbine Generators (WTGs) within the array could reduce access for SAR responders.	Pre OWF incident rates will be determined via assessment of MAIB and RNLI incident data. Any potential increase would then be assessed based on anticipated project vessel and personnel numbers. Existing SAR resources (national and local) will be identified as part of the NRA process; project self-help capabilities will be considered where available. MGN 543 will be considered throughout the assessment process.
DECOMMISSIONING			
9.2.13	The impacts for decommissioning will be similar to the impacts for construction noting that from a shipping and navigation prospective the activities during both of these events will be similar.		

Mitigation Measures Adopted as part of the project

648 Embedded mitigation measures relevant to marine navigation under consideration for the Awel y Môr OWF at this stage are listed below. The need for any additional mitigation required beyond those considered embedded will be identified and defined as part of the EIA process.

- Compliance with MGN 543 (MCA, 2016) and its annexes (in particular SAR annex 5 (MCA, 2018));
- Appropriate marking on Admiralty charts;
- Promulgation of information as required (e.g., Notice to Mariners, Kingfisher bulletin);
- Buoyed construction area in agreement with TH;
- Application for safety zones during construction and periods of major maintenance;
- Marine coordination and communication to manage project vessel movements;
- Marking and lighting the site in agreement with TH and in line with IALA O-139 (IALA, 2013)
- Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974);
- Blade clearance of at least 22 metre (m) above Mean High Water Springs (in line with RYA Requirements (RYA, 2015)); and
- Guard vessel(s) if identified as necessary via risk assessment.

Potential cumulative impacts

649 Other projects which may lead to a greater significance of impact when considered with the Awel y Môr OWF on a cumulative basis have been identified, and subsequently scoped in or out of the cumulative assessment based on their proximity to the Awel y Môr OWF array area relative to vessel routeing as identified on a preliminary basis within the baseline assessment (see Section 9.2.4).

650 The OWFs that will be considered cumulatively, given they may impact upon vessel routeing due to their proximity, array area and local traffic density when considered with the Awel y Môr OWF are listed in Table 3. Operational or constructing OWF have already been captured within the baseline assessment; however, these are included for completeness.

TABLE 55 - CUMULATIVE OWFS IN VICINITY OF AWEL Y MÔR OWF

OWF	STATUS[1]	DISTANCE FROM AWEL Y MÔR (NM)
Gwynt y Môr	Operational	0
Rhyl Flats	Operational	3
Burbo Bank Extension	Operational	9
Burbo Bank	Operational	14
West Of Duddon Sands	Operational	28
Barrow	Operational	32
Walney Extension	Operational	32
Walney Phase 1	Operational	32
Walney Phase 2	Operational	33
Ormonde	Operational	35
Isle Of Man OWF	Concept / Early Planning	42

651 Cumulative impacts will be scoped in or out of the EIA via appropriate assessment within the NRA based on the required MGN 543 (MCA, 2016) and checklist criteria. This approach has been agreed with MCA and TH.

Potential transboundary Impacts

652 Similarly, to the cumulative assessment, the NRA and EIA would consider transboundary offshore wind developments with regards to vessel routeing and international ports. It should be noted that fishing, recreation and marine aggregate dredging impacts, although have the potential to be internationally owned or located, would be considered as part of the baseline assessment.

653 Given the location of the Awel y Môr OWF array area, any transboundary effects are likely to be limited.

9.2.5 Summary of next steps

654 The output of this scoping exercise will feed into the NRA, which will be drafted in support of the PEIR and subsequent ES as required under the MCA methodology (MCA, 2015). The primary purpose of the NRA is to identify scoped in impacts that require further assessment within the ES.

9.2.6 Further Consideration for Consultees

655 Based on the findings of the scoping report, the following questions are requested to be considered by stakeholders seeking to respond:

i. Are there any impacts to shipping and navigation receptors (including port operations) that should be considered over those listed in Section 9.2.4?

ii. Are there any mitigation measures not listed in Section 9.2.4 that should be considered?

iii. Are there any cumulative projects not listed in Table 55 that are considered relevant to the Awel y Môr OWF?

iv. Are there any organisations not listed in Section 9.2.4 that should be consulted with?

v. Are the study areas suggested appropriate to capture the impacts Awel y Môr OWF may have?

vi. Are there any additional guidance documents and/or data sources not listed in Section 9.2.3 that should also be considered?

vii. Are the methods of assessment that have been suggested appropriate for assessing the impacts listed in Section 9.2.4?

viii. Are there any additional events in the area (e.g. specific fishing seasons, or yacht races) that will not be incorporated by the 28 day data set suggested in Section 9.2.4?

9.3 Military and Civil Aviation

9.3.1 Introduction

656 This Section of the Scoping Report identifies the military and civil aviation receptors of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential effects from the construction, operation and maintenance and decommissioning of the Awel y Môr OWF on military and civil aviation and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

657 This Section considers the operations of civil airports, the types and operational coverage of aviation radar over the array area, impact on civil aviation agencies, offshore helicopter operations and the Ministry of Defence (MOD) aviation operations.

9.3.2 Study Area

658 While not definitive, Civil Aviation Authority (CAA), Civil Aviation Publication (CAP) 764 Policy and Guidelines on Wind Turbines (CAA, 2016), provides criteria for assessing whether any wind turbine development might have an impact on civil aerodrome and radar related operations. Consideration of the proposed Awel y Môr OWF's potential to impact on aviation stakeholders and receptors has been undertaken in accordance with the standard consultation distances stated in CAP 764. A number of consultees and receptors were scoped out from the consultation process as they were out-with the stated CAP 764 consultation zones or criteria which include:

- Within 30 kilometres (km) of an aerodrome with Primary Surveillance Radar (PSR) – although it is acknowledged that the distance quoted in CAP 764 can be greater than 30 km dependent on a number of factors at individual aerodromes, including type and coverage of radar utilised.
- Airspace coincident with published airfield Instrument Flight Procedures (IFP) to take into account the requirement for an aerodrome's responsibility to safeguard its IFPs.
- Within 17 km of a non-radar equipped licensed aerodrome with a runway of 1,100 metres (m) or more.

659 The operational range of a radar system is dependent on the type of radar used and its operational requirement. CAP 764 provides a guide of 30 km for assessment of radar impact; however, any impact is dependent on radar detectability of operational wind turbines, the radar's operational range and the use of airspace in which the development sits. The operational impact assessment has considered the orientation of approach and departure flight paths, physical safeguarding of flight, airspace characteristics and flight procedures as published in the UK Integrated Aeronautical Information Package (IAIP) (NATS, 2019) and the Military Aeronautical Information Publication (Mil AIP) (MOD, 2019). This assessment has been informed by the results of baseline studies and consultation, with reference to the existing evidence base regarding the effects of offshore wind farm development. The aviation and radar Study Area is shown in Figure 52 below and encapsulates the Awel y Môr OWF offshore project area and the airspace between Awel y Môr OWF array area, the UK mainland from the location of the NATS operated Great Dun Fell PSR to the north (East Cumbria) and the NATS operated Clee Hill PSR to the south (Shropshire).

200000 300000 400000

500000 400000 300000

Great Dun Fell (NATS) PSR

St Annes (NATS) PSR

Warton (BAE) PSR

Liverpool PSR

Valley (RAF) PSR

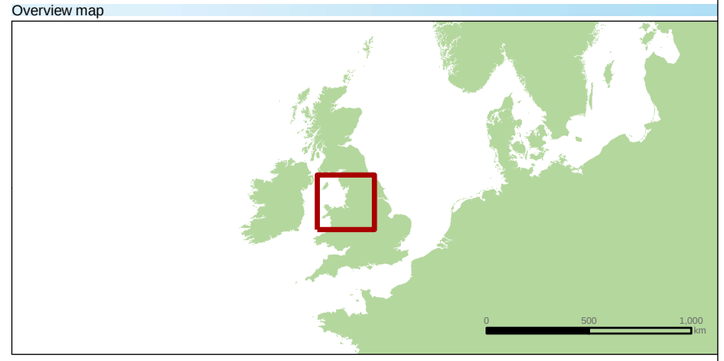
Hawarden PSR

Clee Hill (NATS) PSR

Numbered unitary areas:
6 LIVERPOOL
7 BOLTON
8 SALFORD
9 TRAFFORD
10 ROCHDALE
11 MANCHESTER
12 TAMESIDE
14 WARRINGTON
15 CITY OF WOLVERHAMPTON
16 WALSALL
17 SANDWELL
18 DUDLEY
19 BIRMINGHAM
20 SOLIHULL

0 12,000 24,000 48,000 m

Overview map



Legend

Array Area

Primary Surveillance Radar Location

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT: Offshore Windpark **Awel y Môr**

TITLE: **Aviation Study Area**

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:1,000,000	@DIN A3

REV: 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Aviation\AyM_0119_MCA_Fig1_Aviation_Study_Area.mxd

660 The Awel y Môr OWF aviation and radar Study Area for undertaking the assessment of cumulative effects includes other offshore wind farms in the Irish Sea that could have potential cumulative effects on identified radar receptors. Specifically, the Awel y Môr OWF civil and military aviation Study Area covers:

- Aviation radar systems that potentially detect 332 m (1089ft) high (blade tip) wind turbines within the array area;
- Offshore helicopter operations that are completed to oil and gas platform helideck destinations that are located within a CAA suggested nine nautical mile (NM) 'consultation buffer' (CAP 764, 2016), which surrounds each helideck equipped offshore platform;
- Airborne Search and Rescue (SAR) flight operations;
- Military low flying and Practice and Exercise Area (PEXA) that intersect or are adjacent to the Awel y Môr OWF array area; and
- Aviation activities and aviation safeguarded areas that are adjacent to the onshore electricity cable route.

661 As all of the offshore ECR will be below sea-level, therefore there is no potential source/receptor pathway for an impact to arise on aviation interests and therefore it is not assessed in this chapter and is scoped out.

662 The Study Area may be reviewed and amended following consultation responses, as a result of any amendments to the array area and potentially any identification of additional constraints (environmental, technical and/ or engineering).

9.3.3 Baseline data

663 A desk study was undertaken to obtain information on civil and military stakeholders and radar systems. A variety of aviation publications contain information and guidance relating to the potential effects of an offshore wind development on aviation stakeholders. Data sources and guidance documents considered as part of the desktop review in the establishment of the baseline aviation situation include the following documents and charts:

- CAA (March 2019), 'Visual Flight Rules Charts' [Available by private subscription] [Accessed December 2019].
- CAA (December 2019], 'UK Integrated Aeronautical Information Package' (UK IAIP). https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=223.

- CAA (February 2016), 'Civil Aviation Publication (CAP) 764 Policy and Guidelines on Wind Turbines'. https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=5609 [Accessed December 2019].
- CAA (March 2019), 'CAP 168 Licensing of Aerodromes' https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=6114 [Accessed December 2019].
- Ministry of Defence (MOD) (December 2019), 'The UK Military Aeronautical Information Publication (UK Mil AIP)' Available by private subscription [Accessed December 2019].
- Osprey Consulting Services Ltd (December 2019), 'Radar Line of Sight Analysis'.

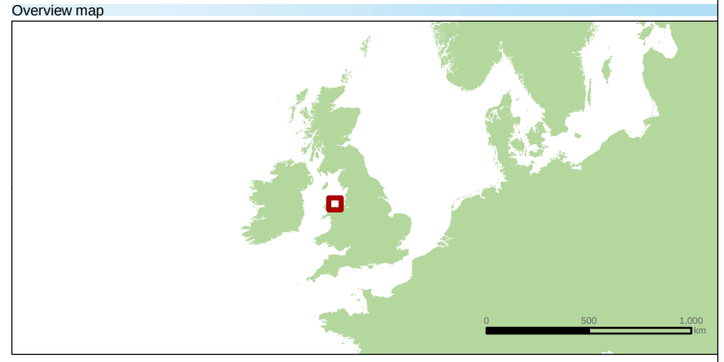
9.3.4 Baseline environment

664 The Awel y Môr OWF will be located in an area of Class G uncontrolled airspace, which is established above the array area from the surface up to varying Flight Levels (FL)[30], the lowest being FL 45 (approximately 4,500 feet (ft). Above this Class G airspace, Class C Controlled Airspace (CAS) forms the Holyhead Control Area (CTA) which is established from various levels up to FL 195 (19,500 ft), further CAS is established above FL 195. Figure 53 below provides an illustration of the airspace structure above the array area.

[30] A Fight Level (FL) is a surface of constant atmospheric pressure related to a specific pressure datum, 1013.2hPa, and is separated from other such surfaces by specific pressure intervals. Altitude above the sea-level is measured in 100 feet units according to the standard atmosphere. In lay terms the FL corresponds approximately to the nearest 100 ft of altitude at which the airspace begins.



Overview map



Legend

Array Area

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Reproduced from CAA digital map data © Crown copyright 2019

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Airspace Above the Array Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:220,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Aviation\AyM_0119_MCA_Fig2_Airspace_above_Array.mxd

Airspace designations

665 The airspace within, above and surrounding the array area is used by both military and civil registered aircraft which observe the airspace rules dependent on the classification of airspace they are operating in as follows:

- Glass G uncontrolled airspace; any aircraft can operate in an area of uncontrolled airspace without any mandatory requirement to be in communication with Air Traffic Control (ATC). Pilots of aircraft operating under Visual Flight Rules[31] (VFR) in Class G airspace are ultimately responsible for seeing and avoiding other aircraft, terrain and obstructions; and
- Class C CAS; all aircraft operating in this airspace must be in receipt of an Air Traffic Service (ATS).

666 Above and surrounding the Awel y Môr OWF array area within Class G uncontrolled airspace, a radar based ATS may be provided on request (subject to suitable radar and radio coverage) by the following agencies:

- RAF Valley, a flying station on Anglesey, provides a Lower Airspace Radar Service[32] (LARS) to participating aircraft up to FL 100 to a radius of 40 NM from the radar position (Valley), as well as a radar based ATS to aircraft inbound and outbound from the airfield.
- BAE Warton also provides a LARS to aircraft on request operating within 40 NM radius of the radar position (Warton). Furthermore, Warton also provides a radar based ATS to aircraft participating in test and experimental flying and to aircraft operating to and from the airfield.
- Liverpool Airport may provide a limited ATS to aircraft overflying the eastern edge of the array area when other ATC service providers are not operating.
- Military En-Route Area Control, military air traffic controllers located at the Swanwick Area Control Centre (ACC) utilise NATS radar for the provision of ATS to aircraft flying outside of and crossing CAS above FL 100 within radar and radio coverage.

[31] Visual Flight Rules - A set of regulations under which a pilot operates an aircraft in weather conditions clear enough to allow the pilot to see where the aircraft is going; the pilot must be able to operate the aircraft with visual reference to the ground, and by visually avoiding obstructions and other flying machines.

[32] LARS – is available to all aircraft flying outside of controlled airspace up to FL 100 within the limits of radio and radar cover. The provision of LARS is at the discretion of the controllers concerned because they may be fully engaged in their primary tasks. Therefore, occasionally, the service may not be available.

667 In aviation and airspace terms, the world is divided into Flight Information Regions (FIRs) for the responsibility of the provision of ATS to aircraft. Within CAS, NATS En-route Limited (NERL) (which is a subsidiary of NATS) are the main ATS provider utilising several long-range PSR and Secondary Surveillance Radar (SSR)[33] systems positioned to provide maximum coverage of UK airspace. Additionally, NATS has a licence obligation to provide radar data to other remote aviation stakeholders to a high quality and performance standard for the benefit of UK aviation as a whole. Any effect that Awel y Môr OWF might have on NERL radar systems must be considered both in terms of effect on the civilian en-route services and in the context of its remote users such as the MOD and airports. There are no SSR systems located within the CAA suggested radius where impact is expected; therefore, SSR is scoped out from further analysis. NATS operates three PSR systems which provide coverage over the array area:

- Great Dun Fell PSR;
- St Anne's PSR; and
- Clee Hill PSR.

668 NATS has completed radar Line Of Sight (LOS) analysis to the three NATS radar systems listed above. The NATS Great Dun Fell and the St Anne's PSR systems are predicted to theoretically detect the development wind turbines however; Clee Hill will not theoretically detect wind turbines at a maximum blade tip height of 332 m above mean sea level (amsl). The results of the NATS radar system analysis are accepted and therefore those two PSR systems that are predicted to be affected by the Awel y Môr OWF wind turbines (at a blade tip height of 332 m amsl) will be considered in the assessment of impact in the EIA. The Clee Hill PSR is scoped out from further analysis as it will not detect the array area.

[33] SSR differs from PSR systems in that it transmits an interrogation requesting a dedicated response. CAA guidance (CAP 764, 2016) states that SSR systems are typically affected when wind turbines are located less than 10 km from the radar position.

669 Radar detectable wind turbines are a significant cause of radar false plots, or clutter, as the rotating blades can trigger the Doppler threshold (e.g. minimum shift in signal frequency) of the Radar Data Processor (RDP) and therefore may be interpreted as aircraft targets. Significant effects have been observed on radar sensitivity caused by the substantial Radar Cross Section (RCS) of the wind turbine structural components (blades, tower and nacelle) which can exceed that of a large aircraft; the effect 'blinds' the radar (or the operator) to wanted targets in the immediate vicinity of the windfarm. False plots and reduced radar sensitivity may reduce the effectiveness of radar to an unacceptable level and compromise the provision of a safe radar service to participating aircraft and detection of aircraft targets.

670 In order to inform the baseline an additional radar LOS analysis has been completed to non NATS radar systems at a 'worst case' scenario blade tip height of 332 m amsl. The aim of the LOS analysis is to determine which radar systems have the potential to detect wind turbines at the maximum blade tip height placed within the offshore array development area. No wind turbine site layout is available at the time of writing therefore, to enable the analysis points of reference in the form of a grid pattern were established across the offshore array area.

671 Radar LOS analysis was also completed to the Chester (Hawarden) Airport PSR which is located on a bearing of 122°/30 NM from the south eastern edge of the array area. Theoretically the Chester (Hawarden) PSR will detect wind turbines at the assessed blade tip height in the far eastern point of the array area. It is considered unlikely that Chester Airport ATC will be controlling aircraft in the airspace above the array area and therefore impact to operations conducted at the airport is scoped out.

672 QINETIQ Aberporth operates a Watchman PSR which ATC generally operate within a 40 NM radius of the radar location. The Awel y Môr OWF array area is located over 80 NM from the location of the radar system and therefore Aberporth radar is scoped out.

673 The Statement of the European Union Meteorological Network Operational Programme for the Exchange of weather Radar information (OPERA) Group, on the cohabitation between meteorological weather radars and wind turbines indicates that the deployment of wind turbines within 5 km of weather radar is prohibited. In addition, an impact study should be completed on wind turbines planned between 5 km and 20 km from UK Met Office radar.

674 The closest Met Office radar system is located at Hameldon Hill located approximately 2.5 NM southwest of Burnley, Lancashire. It is located a significant distance (more than 20 km) away from the array area and is highly unlikely to be affected and as such weather radar is scoped out.

675 Radar LOS analysis indicates that the BAE Warton PSR will theoretically detect all wind turbines placed in the array area at a blade tip height of 332 m amsl; to a lesser extent the Liverpool Airport and RAF Valley PSRs will detect an area of the array closest to the respective radar systems.

676 Radar detectability of wind turbines does not automatically provide justification for an objection from radar stakeholders. Other factors will determine the nature and severity of the operational impact on the receptor e.g.

- The consideration of airspace structure and classification in the wind turbine vicinity;
- The operational significance of the airspace;
- The range of the development from the radar source;
- Aircraft traffic patterns; and
- The type of radar service provided to air traffic using the airspace.

Military low flying operations

677 The UK Low Flying System (UKLFS) used for Military Low Flying activity covers the open airspace over the entire UK land mass and surrounding sea areas generally out to 2 NM from the coastline, from the surface to 2,000 ft. agl (above ground level) or amsl, however military low flying activities can take place further from the coastline out to sea. The development has the potential to impact low flying operations due to the creation of an obstruction therefore impact to low flying operations is scoped in.

Military training areas

678 The offshore project does not lie within, or underneath, any military training areas and therefore no assessment of military PEXA is required within the EIA and this impact is scoped out.

Offshore oil and gas installations

679 In order to help achieve a safe operating environment, a consultation zone of 9 NM radius exists around offshore helicopter platforms. This consultation zone is not considered a prohibition on windfarm development within a 9 NM radius of offshore operations but a trigger for consultation between the platform operators, the offshore helicopter operators, the operators of existing installations and wind developers to determine a solution that would maintain safe offshore helicopter operations in the presence of the windfarm. The basic requirement of the 9 NM consultation zone is to provide airspace for the safe operation of helicopter instrument approaches in poor weather conditions where a low visibility approach profile is needed. There are three platforms in which the 9 NM 'consultation zones' potentially overlap the array area, Hamilton, Douglas and Conwy and consultation will be completed with appropriate authorities.

Airborne search and rescue operations

680 The SAR helicopter force provides 24-hour aeronautical SAR cover in the UK which is provided from ten strategically located bases across the UK. The bases are positioned close to SAR hotspots so that aircraft can provide support as quickly and efficiently as possible. Bristow Helicopters were awarded the contract to provide SAR helicopter services for the UK in 2013; the closest SAR helicopter base is located at Caernarfon Airport. The development has the potential to impact airborne SAR operations due to the creation of an obstruction, therefore impact to airborne SAR operations is scoped in.

9.3.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

681 The EIA will be supported by further desk based studies that will identify and examine in greater detail civil and military aviation receptors. Studies will be undertaken in parallel with consultation and meetings with specific stakeholders in order to provide a detailed understanding of potential impacts.

682 The aviation industry and the provision of Air Navigation Services (ANS) (including radar services) are regulated through extensive legislation; however, the main mechanism for regulating the relationship between aviation and offshore wind is through the consenting system and the guidance outlined below. The following documents, as a minimum, have been and will be reconsidered during the EIA process.

- CAA (August 2019), 'CAP 670 Air Traffic Services Safety Requirements'. http://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=9124 [Accessed November 2019].
- CAA (March 2019), 'CAP 393 The Air Navigation Order 2016 and Regulations'. https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=7523 [Accessed December 2019].
- CAA (September 2018), 'Standards for Offshore Helicopter Landing Areas'. http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=523 [Accessed December 2019].
- Royal Air Force (November 2014) 'Obstruction Lighting Guidance'. https://cdn.ymaws.com/www.renewableuk.com/resource/collection/0B792CF1-8B8A-474B-95B6-17886BF724A7/MOD_lighting_guidance.pdf
- Department for Trade and Industry (2002) 'Wind Energy and Aviation Interests – Interim Guidelines'. http://www.offshorewindenergy.org/COD/reports/report-files/report_037.pdf

Potential project impacts

683 Aviation receptors were identified in accordance with CAP 764 (CAA, 2016). This assessment considers all radar systems within operational range of the Awel y Môr OWF, as well as military areas of operation. For each identified receptor, the physical obstruction and/ or radar effect, and subsequently the operational impacts were considered with any other potential impacts during the construction, operation and maintenance and decommissioning phases of the Awel y Môr OWF.

684 The impacts that have been scoped into the Awel y Môr EIA are outlined in Table 56, together with a description of additional data collection through radar LOS modelling.

Potential impacts during construction

685 Effects on Aviation Radar Systems: There would be no specific impact on aviation radar as a result of construction activities over and above that identified at operation, therefore potential impacts arising from the presence of wind turbines are considered in more detail under operational impacts.

686 Creation of an Obstruction: In the construction phase, the presence and movement of certain construction vessels (e.g. tall cranes) may present an increased tall obstruction risk to low flying military aircraft and helicopter flight operations to Oil and Gas helicopter platforms and SAR operations.

Potential impacts during operation

687 Effects on Aviation Radar Systems: Radar LOS analysis conclusions indicate that the following PSRs would detect turbines within the array area (assuming a tip height of 332 m amsl) and create wind turbine induced clutter, presented onto ATC radar data displays:

- NATS Great Dun Fell PSR;
- NATS St Annes PSR;
- BAE Warton PSR;
- Liverpool Airport PSR; and
- RAF Valley PSR.

688 Creation of an Obstruction: As per the construction phase, aviation stakeholders may have concerns with the potential physical presence of the array area wind turbines.

Potential impacts during decommissioning

689 Effects on Aviation Radar Systems: Any wind turbine within line of sight to current aviation radar infrastructure could have an impact on the system. If a technical mitigation solution is required, mitigation will be required to remain in place until the wind turbine is incapable of rotation.

690 Creation of an obstruction: The infrastructure required in the process of wind turbine decommissioning, in particular large crane structures, may present a physical obstruction and affect operations of low flying aircraft, helicopter flights in support of oil and gas operations and SAR operations.

691 Any impacts from the operation of the proposed project would be incrementally reduced to zero with the decommissioning of the Awel y Môr OWF.

TABLE 56 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR CIVIL AND MILITARY AVIATION

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
9.3.1	Creation of an obstruction.	Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the Awel y Môr array area.	Under aviation flight rules, a Minimum Safe Altitude (MSA) is established to provide the altitude below which it is unsafe to fly in Instrument Flight Conditions (IMC) owing to presence of terrain or obstacles within a specified area. On design freeze, analysis will be undertaken to ensure the MSA established in the array area provides the required separation in the presence of the wind turbines. An IFP is a published procedure used by aircraft flying in accordance with the instrument flight rules which is designed to achieve and maintain an acceptable level of safety in operations. An analysis of IFPs may be required in due course. Consultation with the MOD will be completed to establish any impact to military low flying operations completed in the vicinity of the offshore array. Helicopter operators and applicable offshore Oil and Gas Platform operators will be consulted with regard to the potential of the Awel y Môr OWF to create an obstruction to aviation activities conducted in the vicinity of the wind turbines. Dependent on response and before operation, the completion of an aviation

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			safety analysis may be required to ensure the continuation of safe operations to applicable offshore platforms in the presence of the wind turbines. Once the onshore ECR corridor is finalised a review of aviation safeguarded areas will be completed.
OPERATION			
9.3.2	Impact on aviation radar systems.	Wind turbine derived radar clutter appearing on radar displays can confuse the air traffic controller in being unable to differentiate between aircraft and those radar returns provided by the detection of wind turbines. Furthermore, the appearance of multiple false targets in close proximity can generate false aircraft tracks and seduce those returns from real aircraft away from the true aircraft position.	Further radar LOS analysis will be completed at design freeze to ensure the mitigation solution agreed ahead of operation is fit for purpose. Consultation with radar stakeholders will continue to reach agreement of a technical primary radar mitigation scheme which will remove all impact.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.3.3	Creation of an obstruction.	Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the Awel y Môr array area.	A range of specific and embedded mitigation measures (notification, lighting and marking) to minimise environmental effects would apply to the development of the proposed project. These will comply with current guidelines and be agreed with the appropriate stakeholders and are outlines in paragraph 694.
DECOMMISSIONING			
9.3.4	Impact on aviation radar systems.	Wind turbine derived radar clutter appearing on radar displays can confuse the air traffic controller in being unable to differentiate between aircraft and those radar returns provided by the detection of wind turbines. Furthermore, the appearance of multiple false targets in close proximity can generate false aircraft tracks and seduce those returns from	During the gradual decommissioning of above sea level infrastructure, the impact on radar would be incrementally reduced. Firstly, as wind turbines are decommissioned and the blades cease rotation, before being removed from the site. Any agreed mitigation will be maintained until the last wind turbine is non-operational and unable to rotate in the decommissioning phase.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		real aircraft away from the true aircraft position.	
9.3.5	Creation of an obstruction.	Maximum physical obstruction to aviation operations due to size and number of above sea level infrastructure within the Awel y Môr array area.	A range of specific and embedded mitigation measures (notification, lighting and marking) to minimise environmental effects would apply to the development of the proposed project. These will comply with current guidelines and be agreed with the appropriate stakeholders and are outlines in Section 694.

TABLE 57 - IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR CIVIL AND MILITARY OPERATIONS

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
9.3.1	Impact to PEXA	There are no PEXA within or surrounding the airspace of the Awel y Môr OWF.
9.3.2	Impacts from the offshore ECR	As the offshore ECR is subsea there is no impact to aviation activities.
9.3.3	Impact to radar systems	The stationary nature of the wind turbines during construction will not be processed by radar systems and therefore there is no impact to radar within the construction phase.
OPERATION		
9.3.4	Impact to PEXA	There are no PEXA within or surrounding the airspace of the Awel y Môr OWF.
9.3.5	Impacts from the offshore ECR	As the offshore ECR is subsea there is no impact to aviation activities.
9.3.6	Impact to SSR systems	The CAA state that impact to SSR systems may be prevalent if wind turbines are located within 10 km of the radar source; there are no such systems within the stated distance of the array.
9.3.7	Impact to Chester Airport PSR	Radar LOS results that the PSR will detect the north east corner of the array at a blade tip height of 332 m amsl; it is considered that that the airspace in the vicinity of the array is not of operational significance to Chester Airport and therefore the operational impact would be limited.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
9.3.8	Impact to Clee Hill PSR	NATS has stated that the Clee Hill PSR will not be impacted.
9.3.9	Impact to Aberporth PSR	The array area location is outside of the operational range of the radar.
9.3.10	Impact to meteorological radar	No meteorological radar systems are located within the recommended consultation zone.
DECOMMISSIONING		
9.3.11	Impact to PEXA	There are no PEXA within or surrounding the airspace of the Awel y Môr OWF.
9.3.12	Impacts from the offshore ECR	As the offshore ECR is subsea there is no impact to aviation activities.

Mitigation measures adopted as part of the project

692 As part of the design process for Awel y Môr OWF, a number of designed-in measures are proposed to reduce the potential for impacts on civil and military aviation receptors. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

693 A range of embedded mitigation measures exist to minimise physical obstruction effects which will be created by the placement of the wind turbines. These mitigation measures will comply with current guidelines and be agreed with the appropriate stakeholders, as follows:

- CAP 393 Article 223 (CAA, 2019) sets out the mandatory requirements for lighting of offshore wind turbines.
  - Legislation requires the fitting of obstacle lighting on offshore wind turbines with a height of 60 m or more above the level of the sea at Highest Astronomical Tide (HAT);
  - Where four or more wind turbines are located together in the same group, with the permission of the CAA, only those on the periphery of the group need to be fitted with at least one medium intensity steady red light positioned as close as reasonably practicable to the top of the fixed structure; and
  - The obstruction light or lights must be fitted to show when displayed in all directions without interruption. The requirements of the angle of the plane of the beam and peak intensity levels are defined within CAP 393 (CAA, 2019).
- CAP 437 (CAA, 2018) sets out a procedure to indicate to a helicopter operator that the wind turbine blades and nacelle are safely secured in position prior to helicopter hoist operations commencing;
  - CAP 437 states that this is best achieved through the provision of a helihoist status light located on the nacelle of the wind turbine within the pilot's field of view, which is capable of being operated remotely and from the platform itself or from within the nacelle.
  - A steady green light is displayed to indicate to the pilot that the wind turbine blades, and nacelle are secure and it is safe to operate. A flashing green light is displayed to indicate that the wind turbine is in a state of preparation to accept hoist operations or, when displayed during hoist operations, that parameters are moving out of limits. When the light is extinguished this indicates to the operator that it is not safe to conduct helicopter hoist operations.

- Obstruction lighting in the vicinity of the winching area that has a potential to cause glare or dazzle to the pilot or to a helicopter hoist operations crew member should be switched off prior to, and during, helicopter hoist operations.

- An Emergency Response Co-operation Plan (ERCoP) will be in place for the construction, operation and decommissioning phases of the Awel y Môr OWF. The ERCoP is completed initially in discussion between the developer and the Maritime and Coastguard Agency (MCA), SAR and Navigation Safety Branches. Detailed completion of the plan will then be in cooperation with the Maritime Rescue Coordination Centre (MRCC), responsible for maritime emergency response. The ERCoP must then be submitted to and approved by the MCA. The ERCoP would detail specific marking and lighting of the wind turbines. The SAR helicopter bases would be supplied with an accurate chart of Awel y Môr wind turbine locations and would provide any required SAR access lanes, helicopter access positions and spacing between wind turbines. Furthermore, the arrangements of liaison between the wind farm developer and HM Coastguard in the event of an emergency response would be detailed together with an explanation of procedures and processes carried out.

694 It is good practice to notify aviation stakeholders of the location and dimension of any wind energy development and the associated construction activities. Information regarding construction will be passed to the Defence Geographic Centre (DGC) and the General Aviation Awareness Council (GAAC) at least six weeks in advance of the erection of the first wind turbine and to follow up on the day with a confirmation that the activity has taken place. The data will include:

- Location height (of all structures over 150 ft, date of erection, date of removal and lighting type (none, infra-red or lighting brightness); and
- Local aerodromes identified during consultation should be notified, particularly any police helicopter or air ambulance unit.

695 Information will be circulated to relevant aviation stakeholders including NATS and the MOD. Information on potential aviation obstructions would be promulgated within the UK IAIP (NATS, 2020) and notified to DGC for marking on aeronautical related charts and documentation.

696 The Awel y Môr OWF would be theoretically detectable by a number of ATC radar systems. Wind turbines detectable by a PSR system are highly likely to degrade the system by creating false targets, reducing system sensitivity, creating radar shadowing behind the wind turbines and saturating the radar receiver leading to clutter potentially concealing real aircraft targets. Mitigation of effected aviation radar systems will be considered as part of the EIA and in consultation with the radar asset owner e.g. MOD and NATS. Any applicable mitigation for the radar effects will be identified and agreed prior to construction of the Awel y Môr OWF and secured through commercial agreement.

Potential cumulative impacts

697 The EIA Methodology Chapter 4 provides a description of how potential cumulative effects will be assessed. In assessing the potential cumulative impact(s) for the Awel y Môr OWF, it is important to bear in mind that for some projects, predominantly those 'proposed' or identified in development plans etc. may or may not actually be taken forward. Therefore, there is a need to build in some consideration of certainty (or uncertainty) with respect to the potential impacts which might arise from such proposals. For example, relevant projects/ plans that are already under construction are likely to contribute to cumulative impacts with the Awel y Môr OWF whereas projects/ plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason, all relevant projects/ plans considered cumulatively alongside Awel y Môr will be allocated into 'Tiers', reflecting their stage within the planning and development process. This allows the cumulative impact assessment to present several future development scenarios, each with a differing potential for being ultimately built out.

698 By virtue of its distance from centres of aviation activities, the proposed project produces fewer direct adverse effects on aviation operations than an equivalent onshore development. In the case of the Awel y Môr OWF, aviation impacts are confined to the introduction of a remote obstacle environment and the effect of wind turbine detection by aviation PSR systems. The potential for cumulative impact created by the radar detection of the Awel y Môr OWF exists to those radar systems that will also detect other wind farm developments in the Study Area.

699 It may be necessary to determine, through consultation, whether mitigation exists for other wind farms within the Study Area to support the cumulative assessment and to determine the availability of the mitigation for Awel y Môr. It will be necessary to determine the area affected by radar clutter and the distances between areas of clutter (associated with Awel y Môr, and the other wind farms in the Study Area) that will be presented on the radar display screen in order to understand any limitations on the mitigation associated with cumulative effect.

Potential transboundary impacts

700 The EIA Methodology Chapter 4 provides a description of how potential effects will be assessed. As the array area is completely within UK airspace and due to the localised nature of any potential impacts, transboundary impacts are unlikely to occur and therefore it is proposed that this impact will be scoped out from further consideration within the EIA.

9.3.6 Summary of next steps

701 To inform the EIA process, consultation will be required with aviation stakeholders. Consultation has commenced and it is proposed that consultation will be an iterative process, allowing for any concerns that are raised to be considered in the wind turbine layout and optimisation process of windfarm design.

702 Standard offshore wind farm enquiries to relevant aviation stakeholders (including but not limited to helicopter and oil and gas platform operators, civil and military airports and the MOD) will allow for a standardised approach to provision of data and assessment by the regulators and statutory consultees.

703 A pre-planning assessment has been completed by NATS in which an unacceptable impact is predicted on the Great Dun Fell and St Annes PSRs. Discussion with NATS to establish appropriate technical mitigation for the effect of the proposed project on the PSR systems is in progress. The Applicant has consulted with the MOD in order to understand the significance of any potential aviation issues associated with the area of development. The MOD responded to a request for pre-planning advice on the 29 January 2020. The MOD stated that it 'may have concerns about the proposal' due to potential impact to ATC PSR at Warton, RAF Valley and Great Dun Fell (which also provides NATS radar data to Warton). Furthermore, the MOD stated that the proposed development may create an impact to military low flying operations. The Great Dun Fell PSR is a NATS asset; consultation with NATS will continue and will consider impact to other users of radar data. A meeting with the MOD has been requested to discuss the MOD concerns in greater detail.

9.3.7 Further considerations for Consultees

i. Do you agree that the data sources identified are sufficient to inform the offshore civil and military aviation baseline for the Awel y Môr OWF PEIR and EIA?

ii. Do you agree that all the areas within the Study Area have been identified?

iii. Have all potential impacts resulting from Awel y Môr OWF been identified for civil and aviation receptors?

iv. Are you content that the lighting (and charting) requirements pertaining for the fitment of aviation lighting of a wind turbine of up 332 m amsl are sufficient to provide situational awareness to aircrews?

v. For those impacts scoped out in Table 57, do you agree?

vi. For those impacts scoped in Table 56, do you agree that the methods described are sufficient to inform a robust impact assessment?

9.4 Seascape, Landscape and Visual Impact Assessment

9.4.1 Introduction

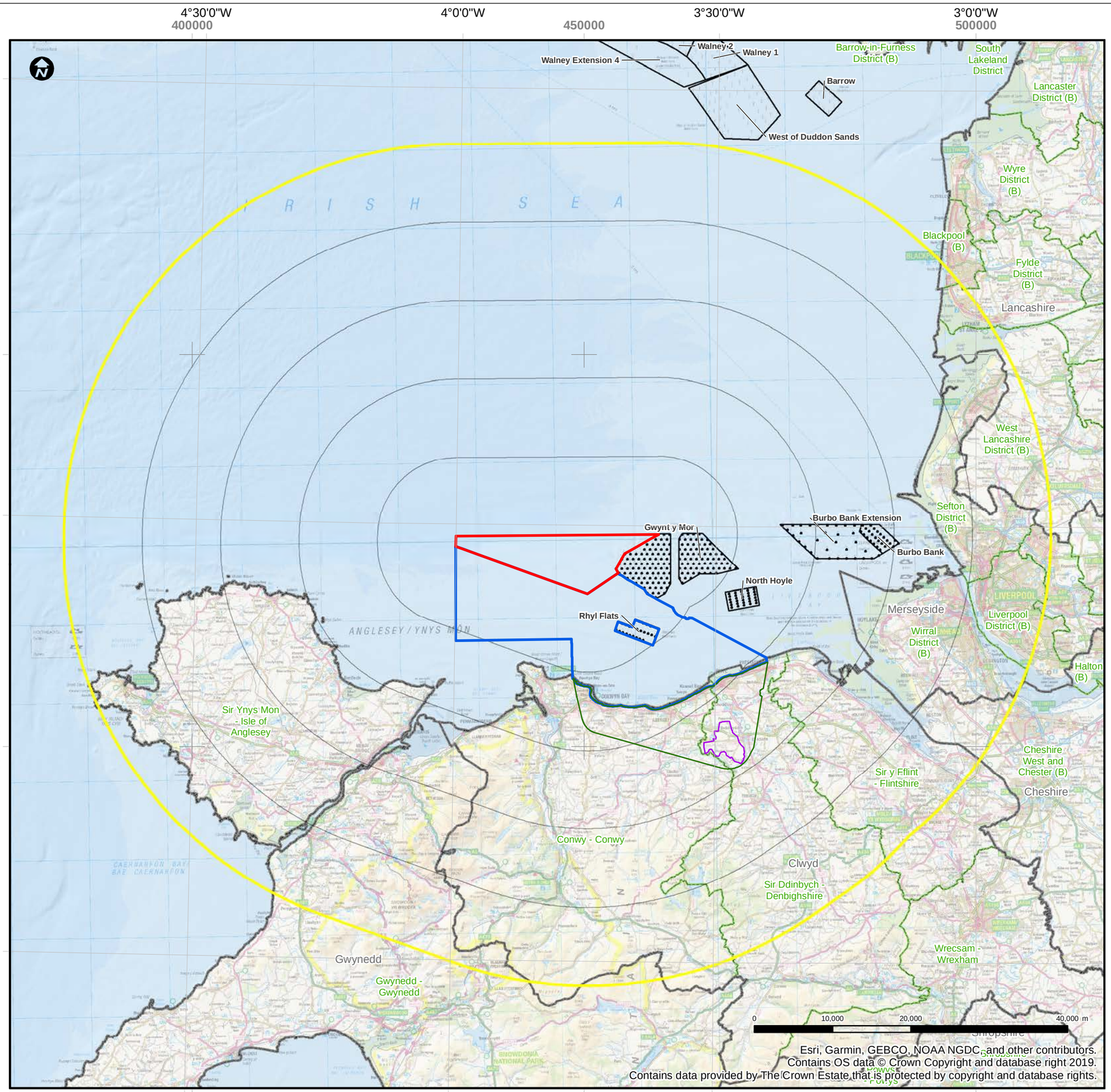
704 This Section of the Scoping Report identifies the seascape, landscape and visual receptors of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the offshore components of Awel y Môr OWF on seascape, landscape and visual receptors and sets out the proposed scope of the EIA. The proposed methodology for the EIA is also presented.

705 The landscape and visual aspects of the onshore proposals are covered separately in Section 10.8. Section 9.5 covers the potential effects of the offshore components on Cultural Heritage.

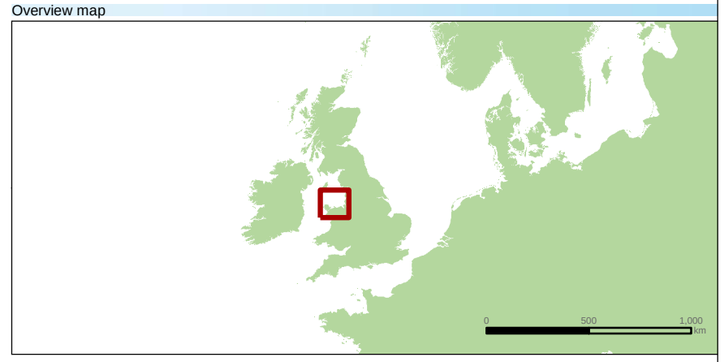
9.4.2 Study Area

706 The seascape, landscape and visual impact assessment (SLVIA) Study Area for the Awel y Môr OWF covers a radius of 50 km from the proposed Awel y Môr OWF array area, as illustrated in Figure 54. Beyond the boundary of the array area, the SLVIA will generally focus on locations from where it may be possible to see the offshore wind turbines and other offshore components.

707 A 50 km radius Study Area has been selected for the SLVIA for a number of reasons. Although wind turbines of the height proposed could theoretically be visible at distances beyond 50 km, the EIA regulations require assessment of the 'likely significant effects' of the Awel y Môr OWF, therefore the SLVIA Study Area should extend far enough to include all areas within which significant effects are likely to occur (not all effects). In considering this, the sensitivity of the receiving landscape and visual receptors has been reviewed taking particular account of the Landscape Planning Designations and Defined Areas, as shown on Figure 55, and Visual Receptors within the Study Area.



Overview map



Legend

- Array Area
- 10km Radii
- 50km Study Area
- Offshore Export Cable Route Search Area
- Substation Search Area
- Onshore Export Cable Route Search Area
- County Boundary
- District Boundary

Wind Development Status:

- Active / In Operation

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

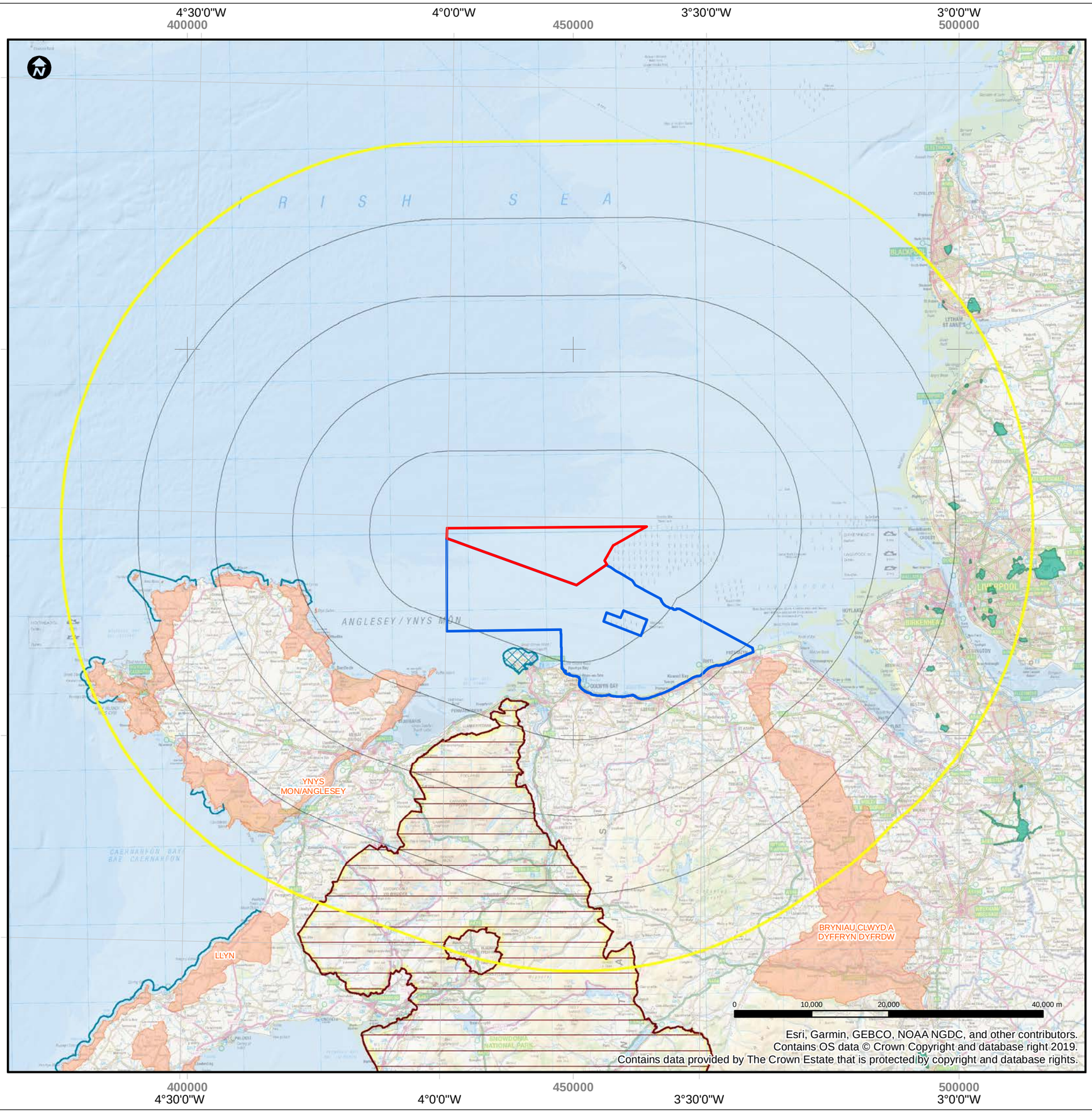
PROJECT Offshore Windpark **Awel y Môr**

TITLE Seascape, Landscape and Visual Assessment Study Area

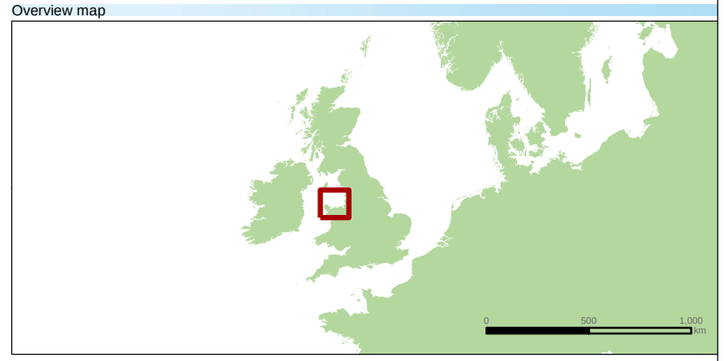
DRAWN	DATE	SCALE	SIZE
MachJ	04/03/2020	1:500,000	@DIN A3

REV 03

Path: P:\2019\191332_GwntYMor\GIS\191332_GWYM\SCOPING\AyM_Chapter9.4_Figure1_SLVA_Study_Area.mxd



Overview map



Legend

- Array Area
- 10km Radii
- 50km Study Area
- Offshore Export Cable Route Search Area
- Heritage Coast
- Registered Park and Garden (England)
- Area of Outstanding Natural Beauty
- National Park

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Landscape Planning Designations and Defined Areas

DRAWN	DATE	SCALE	SIZE
MachJ	04/03/2020	1:500,000	@DIN A3

REV 03

Path: P:\2019\191332_GwntYMor\GIS\191332_GWYM\SCOPING\AyM_Chapter9.4_Figure2_Designantions.mxd

708 Blade tip Zone of Theoretical Visibility (ZTV) analysis has been generated by Geographical Information System (GIS) software. This demonstrates the relative number of turbines that may theoretically be seen from any point in the Study Area. It is based on a preliminary layout developed for the purposes of informing stakeholders of the approximate area within which it may be theoretically possible to have visibility of the offshore wind farm. For this reason, the proposed maximum turbine height has been used in the analysis (332m height to tip - above MHWS). The ZTV illustrates where there would be no visibility at all or where there would be low to high numbers of turbines theoretically visible, but it does not indicate the extent to which each turbine may be visible. The ZTV illustrates the 'bare ground' situation and does not take into account the screening effects of vegetation, buildings, or other local features that may prevent or reduce visibility.

709 In order to inform stakeholders of the relative scale of the maximum turbine height proposed compared to landform features and the operational offshore wind turbines, it was considered helpful to include cumulative wireline views from a number of locations within the Study Area. The wireline views are contained in Appendix A. At this early stage in the EIA process, the layout used in the preparation of the ZTVs, as shown on Figure 56 and Figure 57, has also been used to generate the wireline views as these indicate the greatest possible difference in scale.

710 However, the wirelines also illustrate a lower number of turbines (51) than the maximum being considered at this stage. This is because if a larger number of turbines were installed (than has been illustrated in the wirelines), these would be of a lower height. The process of developing the maximum design scenario for the purposes of the EIA will continue through the iterative process and agreement on this aspect will be sought from consultees at a later stage.

711 It is considered that the Awel y Môr OWF is unlikely to result in significant effects at distances over 50 km. Relevant guidance, professional experience, ZTV analysis (Figure 56), published visibility studies (e.g. Bureau of Ocean Energy Management, 2013) and Met Office visibility frequency data all indicate that the threshold at which significant visual effects would diminish is likely to be within this proposed 50 km radius area. In reality, significant seascape, landscape and visual effects are more likely to occur from locations at closer proximity; and less likely to occur towards the outer edges of the SLVIA Study Area at long distances.

712 Consideration of the blade tip ZTV (Figure 56 and Figure 57) and field survey verification of visibility from the ground, indicates that the visibility of the Awel y Môr OWF will become very restricted and dispersed at distances beyond 50 km, with visibility from inland areas becoming fragmented by either landform, vegetation or built features/settlements that screen visibility of the sea. At distances over 50 km, the lateral spread of the Awel y Môr OWF will occupy a very small portion of available views, which would generally also contain the operational wind farm located in the immediate vicinity of the Awel y Môr OWF. The vertical height of the wind turbines would appear relatively small, therefore significant visual effects are unlikely to arise at greater than this distance (even if the wind turbines are visible - in only the most excellent visibility conditions).

713 Potential cumulative effect interactions with other offshore wind farms have also influenced the Study Area for the SLVIA. Other offshore windfarms within the SLVIA Study Area are shown in Figure 54. Within the SLVIA Study Area, the assessment will focus primarily on the assessment of seascape, landscape and visual effects of the Awel y Môr OWF within Wales in the Isle of Anglesey, Gwynedd, and Conwy unitary authority areas and their adjacent seascapes as well as the Snowdonia National Park. To the east of these locations the intervening or closer range influence of the operational offshore wind farms, as well as the configuration of the proposed Awel y Môr OWF Array Area and the more developed coastlines ensure that significant effects are less likely to occur.

714 Seascape, landscape and visual effects as a result of the Awel y Môr OWF are proposed to be scoped out beyond 50 km.

715 The Study Area may be reviewed and revised following further consultation responses, as a result of any amendments to the array area or ECR or the identification of additional constraints (environmental and/ or engineering).

4°30'0"W 400000 | 4°0'0"W | 450000 | 3°30'0"W | 3°0'0"W 500000

54°0'0"N | 5950000 | 53°30'0"N | 5900000 | 53°0'0"N

Walney Extension 4
Walney 2
Walney 1
Barrow
West of Duddon Sands
Barrow-in-Furness District (B)
South Lakeland District
Lancaster District (B)
Wyre District (B)
Blackpool (B)
Fylde District (B)
Lancashire
West Lancashire District (B)
Sefton District (B)
Merseyside
Liverpool District (B)
Wirral District (B)
Cheshire
Cheshire West and Chester (B)
Sir y Fflint - Flintshire
Wrecsam - Wrexham
Shropshire
Clwyd
Sir Ddinbych - Denbighshire
Conwy - Conwy
Sir Ynys Mon - Isle of Anglesey
Gwynedd
Gwynedd - Gwynedd
Gwynt y Mor
Burbo Bank Extension
Burbo Bank
North Hoyle
Rhyl Flats
IRISH SEA
ANGLESEY / YNYS MÔN

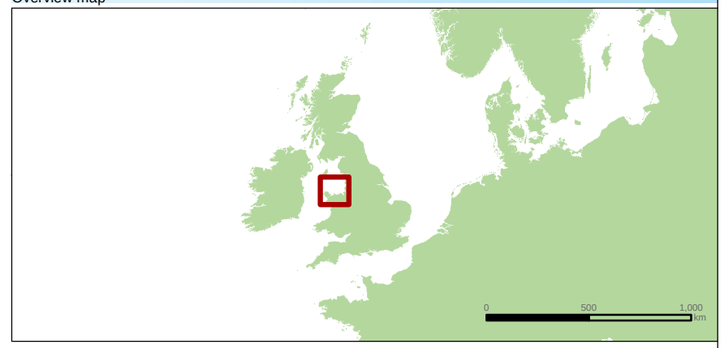
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

Blade Tip:	332m	Observer height:	2m
DTM:	OS T50	Surface features:	Excluded
DTM resolution:	50m	Earth curvature:	Included

0 10,000 20,000 40,000 m

Esri, Garmin, GEBCO, NOAA NGDC, and other contributors.
Contains OS data © Crown Copyright and database right 2019.
Contains data provided by The Crown Estate that is protected by copyright and database rights.

Overview map



Legend

- Array Area
- 10km Radii
- 50km Study Area
- Turbine Location
- Offshore Export Cable Route Search Area
- County Boundary
- District Boundary

Wind Development Status:

- Active / In Operation

Blade Tip Zone of Theoretical Visibility

- Higher Theoretical Visibility
- Lower Theoretical Visibility

Viewpoint Location

1 - Amlwch
2 - Point Lynas
3 - Mynydd Eilian
4 - Moelfre Headland
5 - Red Whalf Bay
6 - Bwrdd Arthur
7 - Penmon Point
8 - Beaumaris
9 - Bangor
10 - Carnedd Llewelyn
11 - Lanfairfechan
12 - Conwy Mountain
13 - Great Orme; Summit
14 - Isle of Anglesey Coastal Path near Penrhyn
15 - Great Orme; Café
16 - Benlech Bay View Road
17 - Penrhyn Castle
18 - Llandudno; Paddling Pool
19 - Rhos-on-Sea
20 - Bryn Euryn
21 - Mynydd Marian
22 - Abergele Station
23 - Rhyl Aquarium
24 - Craig Fawr
25 - Prestatyn Nova Centre
26 - Bryn-Ilwyn Viewpoint (Prestatyn Hillside viewpoint, Gwaenysgor)
27 - Point of Ayr
28 - Twyn y Penrhyn parking
29 - Colwyn Bay Promenade
30 - Hilbre Point
31 - Crosby
32 - Formby Lifeboat Station (Formby Point)
33 - Southport (pier)
34 - Snowdon Summit
35 - Blackpool Tower

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Zone of Theoretical Visibility and Viewpoint Locations

DRAWN	DATE	SCALE	SIZE
MachJ	04/03/2020	1:500,000	@DIN A3

REV 03

Path: P:\2019\191332_GwntYMor\GIS\191332_GWYM\SCOPING\AyM_Chapter9.4_Figure3_ZTV_BT_VPs.mxd

4°30'0"W
400000
4°0'0"W
450000
53°30'0"N
5900000

Viewpoints
1 - Amlwch
2 - Point Lynas
3 - Mynydd Eilian
4 - Moelfre Headland
5 - Red Whalf Bay
6 - Bwrdd Arthur
7 - Penmon Point
8 - Beaumaris
9 - Bangor
10 - Carnedd Llewelyn
11 - Lanfairfechan
12 - Conwy Mountain
13 - Great Orme; Summit
14 - Isle of Anglesey Coastal Path near Penrhyn
15 - Great Orme; Café
16 - Benlech Bay View Road
17 - Penrhyn Castle
18 - Llandudno; Paddling Pool
19 - Rhos-on-Sea
20 - Bryn Euryn
21 - Mynydd Marian
22 - Abergele Station
28 - Trwyn y Penrhyn parking
29 - Colwyn Bay Promenade



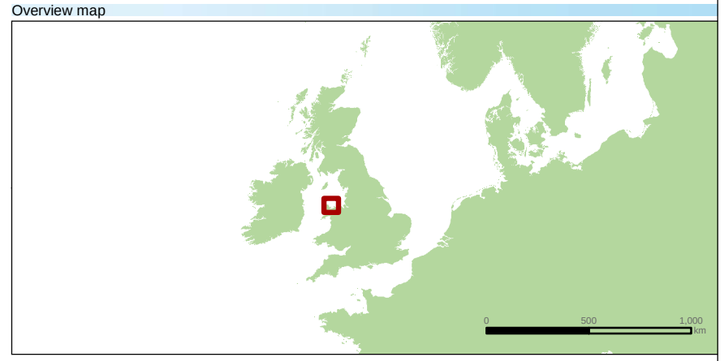
Gwynt y Mor
Rhyl Flats
Gwynedd
Sir Ynys Mon - Isle of Anglesey
YNYS MON/ANGLESEY
Gwynedd - Gwynedd
Conwy - Conwy
Clwyd

Blade Tip:	332m	Observer height:	2m
DTM:	OS T50	Surface features:	Excluded
DTM resolution:	50m	Earth curvature:	Included

0 5,000 10,000 20,000 m

Contains OS data © Crown Copyright and database right 2019.
Contains data provided by The Crown Estate that is protected by copyright and database rights.

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Turbine Location
- 10km Radii
- 50km Study Area
- Viewpoint Location
- County Boundary
- District Boundary
- National Cycle Network
- Regional Cycle Network
- Wales Coastal Path
- Heritage Coast
- Area of Outstanding Natural Beauty
- National Park

Wind Development Status:
- Active / In Operation

Blade Tip Zone of Theoretical Visibility
- Higher Theoretical Visibility
- Lower Theoretical Visibility

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE ZTV and Viewpoint Locations Enlarged Plan

DRAWN	DATE	SCALE	SIZE
MachJ	04/03/2020	1:250,000	@DIN A3

REV 03

Path: P:\2019\191332_GwntYMor\GIS\191332_GWYM\SCOPING\AyM_Chapter9.4_Figure4_ZTV_BT_VPs_50K.mxd

9.4.3 Baseline data

716 Baseline data will be used to define and describe the seascape, landscape and visual receptors that will be considered in the SLVIA. Data will be gathered from official, reliable and up-to-date sources. These will include Ordnance Survey map-based data, as well as data on landscape characterisation, landscape designations and other Governmental and local authority data of relevance.

717 In addition, the PEIR/EIAs for other wind farms, notably including the adjacent Gwynt y Môr OWF may also be referred to.

Seascape character

718 The majority of the Study Area is covered by the sea. Following the approach set out by Natural England (Natural England, 2012, p7, Box 1) the National Seascape Assessment for Wales includes the Welsh Inshore Waters which are defined as extending 12 nautical miles from the high water mark. The Welsh National Marine Character Areas are complemented by the existing National Landscape Character Areas, which extend to the low water mark to provide seamless character assessment coverage between land and sea.

719 In order to ensure consistency with this approach and baseline characterisation and to include the intertidal area between the mean low and high water mark, the SLVIA will assess seascape effects on seascape character areas (SCAs) that are seaward of the high water mark, which include beaches and intertidal areas. Landscape effects will be assessed on landscape character areas (LCAs) lying to the landward side of the low water mark and coastlines within LCAs covering the coast and those LCAs covering inland terrestrial areas with views of the Awel y Môr OWF that may materially alter its character.

720 At a national scale, the Welsh part of the Study Area is covered by the National Seascape Assessment for Wales Natural Resources Wales (NRW) Evidence Report No: 80, 2015. In addition, NRW has recently published the Seascape and visual sensitivity to offshore wind farms in Wales: Strategic assessment and guidance (White, S. Michaels, S. King, H, 2019).

721 At a more local scale, the Anglesey Seascape Character Assessment covers Seascape Character Types (Terrestrial (tSCTs); Intertidal (iSCTs) and Marine (mSCTs) and Seascape Character Areas. Snowdonia National Park has also prepared a Seascape Character Assessment entitled Snowdonia National Park Supplementary Planning Guidance 7: Landscapes and Seascapes of Snowdonia, 2014.

722 It is proposed that to the west of Colwyn Bay and including the Great Orme, the Seascape Character Areas defined in the Anglesey Seascape Character Assessment will be used as the primary source for the mapping of the seascape character. To the east of this, the assessment will map seascape character areas based on the National Marine Character Areas for Wales and the subdivisions of coastal character used in the Gwynt y Môr ES. The baseline information will be supplemented with information drawn from the Seascape Character Types descriptions included in the Anglesey Seascape Character Assessment and the information included in the Snowdonia National Park Supplementary Planning Guidance 7.

723 A national level seascape character assessment for the English sector of the Study Area has been prepared for the Marine Management Organisation (MMO) namely MMO 1134: Seascape Character Assessment for the North West Inshore and Offshore marine plan areas, 2018.

Landscape character

724 There is a hierarchy of published Landscape Character Assessments that describe the baseline landscape character of the landscape in the SLVIA Study Area, at the National and local level.

725 The Welsh and English Landscape is classified at the national level by National Landscape Character Areas (NLCA) and National Character Areas (NCAs) respectively. The descriptive profiles for the 48 individual NLCAs identified and described in Wales by NRW highlight what distinguishes one landscape from another, with reference to their regionally distinct natural, cultural and perceptual characteristics. Similarly, the 159 NCAs, which cover England, have been revised and developed by Natural England into NCA profiles, which provide a recognised, national, spatial framework.

726 The landscape of the onshore parts of the Study Area will be described and assessed in relation to the following documented landscape character assessments and other reference material:

- Anglesey Landscape Character Assessment: Anglesey Landscape Strategy, Update (2011);
- Gwynedd Council Supplementary Planning Guidance: Landscape Character (2009);
- Conwy Borough Council Landscape Unit and Strategy Area Maps 2014;
- Snowdonia National Park Supplementary Planning Guidance 7: Landscapes and Seascapes of Snowdonia, 2014; and
- Snowdonia National Park Supplementary Planning Guidance 13: Landscape Sensitivity and Capacity Assessment, 2016.

727 In addition, LANDMAP maps and surveys will also be referenced in describing and evaluating the landscape.

Landscape planning designations and defined areas

728 The Awel y Môr OWF array area is not within the boundary of any area subject to international, national or regional landscape designation intended to protect landscape quality.

729 Certain landscapes found within the onshore Study Area have been designated or defined due to their scenic or historic landscape qualities as shown on Figure 55 and some of their defined special qualities relate to their setting, which may include seascape.

730 Of particular importance to this SLVIA are the Anglesey Area of Outstanding Natural Beauty (AONB), Clwydian Range and Dee Valley AONB and the Snowdonia National Park, which are located at distances of 16.5km, 23.4 km and 16.5 km from the Awel y Môr array area respectively. The following documents will inform the understanding of the baseline characteristics and qualities of this area.

- The Isle of Anglesey Area of Outstanding Natural Beauty (AONB) Management Plan Review 2015-2020;
- Clwydian Range and Dee Valley AONB Management Plan 2014-2019;
- Snowdonia National Park Management Plan 2010-2015; and
- National Resources Wales (2019). Seascape and visual sensitivity to offshore wind farms in Wales: Strategic Assessment and Guidance.

731 The Snowdonia National Park Partnership Plan 2020 is currently at a consultation stage. It will supersede the 2010-2015 Plan, once adopted, and its materiality will be taken into account during the EIA process. There are several areas within the Study Area that have been defined as Heritage Coast. On the Isle of Anglesey, these coincide with parts of the Isle of Anglesey AONB coastline. The SLVIA will assess the effects of the Awel y Môr OWF on the special characteristics and qualities of the Anglesey Heritage Coast as part of the assessment of the Anglesey AONB.

732 There is a further area of Heritage Coast covering the Great Orme, which is not part of an AONB. There are no statutory requirements or powers associated with the Heritage Coast definition. However, reference will be made in the assessment of the effects of the Awel y Môr OWF in relation to the Conwy Local Development Plan 2007-2022 and the Great Orme Country Park and Local Nature Reserve Management Plan 2011-2016.

733 There are several Registered Parks and Gardens (RPG) in the English parts of the Study Area, the closest of which to the Awel y Môr OWF array area is Flaybrick Memorial Gardens located in Birkenhead at a distance of approximately 38 km from the array area. The key reference material for consideration of these receptors is the Historic England 'Register of Parks and Gardens of Special Historic Interest in England'. This is an on-line resource that can be accessed through the National Heritage List for England (NHLE) at https://historicengland.org.uk/listing/the-list/.

734 It is understood that Cadw is preparing a Register of Historic Parks and Gardens (HPG) in Wales and that this will be available in early 2020. If available, it will be used to inform the PEIR and ES.

735 The SLVIA will undertake an assessment of the visual effects on the registered HPG and RPG only where access to the public is provided. The Cultural Heritage assessment in the EIA will consider the effects on the historic and cultural aspects of the properties where relevant HPG and Registered Landscapes of Historic Interest in Wales will be considered as part of the Cultural Heritage assessment.

736 Special Landscape Areas have been designated locally by Conwy Borough Council, Isle of Anglesey County Council and Gwynedd Council through their Local Development Plans (LDP). These will be mapped in the SLVIA and the associated value of the landscape within these areas will be taken into account in the assessment of sensitivity. The LANDMAP visual and sensory landscape evaluation categories will also be considered.

Zone of Theoretical Visibility

737 The visual baseline is largely defined by the ZTV shown in Figure 56 and in more detail for the area to the west of the Study Area in Figure 57. The ZTV shows the main area in which the Awel y Môr OWF would theoretically be visible, highlighting the different groups of people who may experience views of wind turbines located within the array area and assisting in the identification of viewpoints where they may be affected.

738 Other visual receptors may also be identified in close proximity to the offshore cable route construction.

739 The SLVIA will assess the project envelope which has the maximum effect on seascape, landscape and visual receptors and this will be agreed with relevant consultees.

740 For key viewpoints, to be agreed with the stakeholders, figures and visualisations showing a number of alternative layouts will also be provided in the EIA.

741 The ZTV overlaid on OS mapping shows that the main areas of theoretical visibility of the Awel y Môr OWF will be across the open sea and along the Conwy and Isle of Anglesey coastlines and the immediate hinterland. The closest areas of theoretical visibility of the Awel y Môr OWF will be from the Great Orme at approximately 10.5 km from the array area.

742 There is also shown to be theoretical visibility at a slightly greater distance from the coastline and sands of Gwynedd.

743 Further east within Wales there is theoretical visibility from along the coasts of Denbighshire and Flintshire and along the high ground formed by the Clwydian Range and the estuary of the River Dee.

744 In the eastern part of the Study Area, the ZTV is shown to extend across much of the English coast and the settlements and urban areas located along it. The closest point is around Hoylake at a distance of approximately 30 km from the array area.

Visual receptors

745 As well as OS mapping, the following datasets, information and stakeholder consultation will be used to inform the identification and analysis of visual receptors during the EIA:

- Ordnance Survey (OS) open map local data;
- OS 1:25,000 and 1:50,000 raster mapping;
- NRW;
- Cadw;
- Natural England;
- Historic England;
- Sustrans UK;
- ROWmaps; and
- Local Development Plans prepared by the Planning Authorities.

Viewpoints

746 Viewpoint photography will be taken at a number of viewpoints to be agreed with relevant consultees through the scoping process, further consultation and the Evidence Plan process. In compiling the preliminary list presented in Table 58, reference has been made to the agreed viewpoints used in the SLVIA for the Gwynt y Môr OWF, where these are located within the Awel y Môr OWF Study Area.

TABLE 58 – PROPOSED PRELIMINARY VIEWPOINT LIST FOR THE AWEL Y MÔR OWF EIA

NO.	VIEWPOINT NAME	EASTING	NORTHING	DISTANCE TO ARRAY AREA (KM)
1*	Amlwch	242862	393937	25.02
2*	Point Lynas	247916	393456	20.24
3*	Mynydd Eilian	247285	391660	21.40
4*	Moelfre Headland	251451	386378	20.36
5*	Red Whalf Bay	253015	381050	23.05
6*	Bwrdd Arthur	258661	381282	19.82
7	Penmon Point Car Parking	264048	381246	17.76
8*	Beaumaris	260881	376132	23.69
9*	Bangor	258329	373338	27.25
10*	Carnedd Llewelyn	268328	364437	32.07
11*	Lanfairfechan	267933	375394	21.78
12*	Conwy Mountain	276011	377800	16.86
13*	Great Orme; Summit	276660	383405	11.38
14	Isle of Anglesey Coastal Path near Penrhyn	249165	388349	21.12
15*	Great Orme; Cafe	275674	384378	10.82
16	Benlech Bay View Road	252322	382437	22.44
17	Penrhyn Castle	260294	371891	27.84
18*	Llandudno; Paddling Pool	280020	382180	11.36
19*	Rhos-on-Sea	284310	380810	12.10
20*	Bryn Euryn	283252	379798	13.11
21*	Mynydd Marian	288590	377780	15.85
22*	Abergele Station	294545	378740	17.73
23*	Rhyl Aquarium	300678	381565	18.95

NO.	VIEWPOINT NAME	EASTING	NORTHING	DISTANCE TO ARRAY AREA (KM)
24*	Craig Fawr	306029	380327	23.66
25*	Prestatyn Nova Centre	306235	383835	21.16
26*	Bryn-llwyn Viewpoint (Prestatyn Hillside viewpoint, Gwaenysgor)	307450	381850	23.48
27*	Point of Ayr	312458	384955	24.74
28	Trwyn y Penrhyn parking	262971	379807	19.50
29	Colwyn Bay Promenade	285080	379215	13.74
30*	Hilbre Point	320295	388465	29.62
31*	Crosby	330665	398815	37.46
32*	Formby Lifeboat Station (Formby Point)	327026	406287	34.26
33*	Southport (pier)	332531	418135	43.04
34*	Snowdon Summit	261026	354341	43.93
35*	Blackpool Tower	330474	435380	50.98

*Viewpoint used in the Gwynt y Môr ES.

Visibility

747 The Met Office visibility data collected from the Rhyl weather station will be used to inform the assessment of the likelihood of effects.

748 The likelihood of the seascape, landscape and visual effects arising will be described in relation to the Met Office definitions for the different ranges of visibility. These are found on its website at https://www.metoffice.gov.uk/guide/weather/symbols#visibility and range from 'very poor' to 'excellent' as follows:

- Very poor visibility - range is less than 1km;
- Poor visibility - range is 1 to 4km;
- Moderate visibility - range is 4 to 10km;
- Good visibility - range is 10 to 20km;
- Very good visibility - range is 20 - 40km; and
- Excellent visibility - range is over 40km.

749 This suggests that the Awel y Môr OWF would require 'good visibility' conditions for it to be visible from the Welsh coast and 'very good visibility' to be visible from the English coast.

Cumulative wind farms

750 Crown Estate Offshore Wind Farm locational mapping data, data obtained from planning portals, and data provided by Innogy and other developers will be used to inform the cumulative wind farm mapping and assessment. The Gwynt y Môr, Rhyl Flats, North Hoyle, Burbo Bank and Burbo Bank Extension operational offshore wind farms form part of the baseline environment.

9.4.4 Baseline environment

Seascape character

751 The NRW (2015) National Seascape Assessment for Wales defines that the area within which the array area and the most northerly part of the offshore ECR are located as being 04: North Wales Open Waters. This Marine Character Area (MCA) covers the outer inshore waters of North Wales, coinciding broadly with the coastline stretching from the outer fringes of the Dee Estuary in the east to north-west Anglesey in the west.

752 The key characteristics of this part of the coast are set out in the NRW (2015) report as follows:

- 'An offshore MCA where depth increases gradually from approximately 15m below chart datum near Conwy Bay to over 60m in the north west.
- A thin layer of mostly coarse quaternary sediments overlying Carboniferous and Triassic sedimentary bedrock. Finer sand is found in the south east of the MCA.
- Includes a significant proportion within the Liverpool Bay SPA and Menai Strait and Conwy Bay SAC.
- A rich variety of life on the seabed and high levels of phytoplankton in the water provides important feeding grounds for sea birds, particularly in the south east. Marine mammals including bottlenose dolphin and grey seal can be sighted.
- Moderately strong east-west tidal currents. The strongest currents are found in the south west.
- A number of wrecks can be found in the MCA, including collisions owing to busy approaches to the Mersey, wartime losses, and losses from mine-laying activity.
- Dominant maritime character is one of transit: recreational vessels entering or leaving the Menai Strait/Conwy Bay, or commercial vessels passing east and west to and from the Mersey and Dee.
- Includes the former Mersey Docks and Harbour Board's spoil dumping ground in the northeast corner.
- Large fishing boats target demersal fish and scallops offshore with smaller potting boats seen closer to the coast.
- Gwynt y Môr offshore wind farm dominates the east of the MCA, and to the north – access is restricted around the Douglas Oil Field (marked by a series of lit buoys and shipping lanes depicted on marine charts).
- Commercial shipping seen offshore, including large vessels waiting for Liverpool Pilots to guide them safely into port. Recreational boats are a feature particularly in the south east of the MCA during the warmer months.
- Several wrecks are visited by recreational divers and diving clubs, including the HMS Derbent, Cartagena, Kincorth, Delfina, Cork and Vigsnes. The wreck of the Resurgam is a designated wreck.

- The landward view changes considerably throughout the MCA, with rocky headlands, islets and large bays found to the west and the large shallow opening of Conwy Bay to the east, with a backdrop of the mountains of Snowdonia.'

753 Along the coastline there lies a varied coast of bays, flats and estuaries.

754 The offshore ECR search area also extends across areas that are defined as the Red Wharf and Conwy Bays and the Colwyn Bay and Rhyl Flats National Marine Character areas which lie further inshore to the west and east of the Great Orme headland respectively. The seascape and coastal areas to the east are influenced by the presence and visibility of the Rhyl Flats, North Hoyle, Burbo Bank and Burbo Bank Extension offshore wind farms in addition to the more distant Gwynt y Môr.

Landscape character

755 The landscape character of the Study Area is highly varied. In the west lies the Isle of Anglesey which is characterised by a diverse scenic coastal strip in the east with relatively limited development, cliffs and bays. The interior forms the agricultural core of the island. Although described as a gentle lowland landscape, the south-west to north-east geological trend of fault lines influence changes in topography, with a few hills and rock outcrops.

756 Separating the Isle of Anglesey and the Menai Strait from the Snowdonia foothills lies the Arfon lowland area that runs from the north-east to the south-west. The upland area of Snowdonia reaches almost to the coast. This is an extensive, rural upland area, broadly coinciding with the Snowdonia National Park. It is dominated by mountain ranges of which the Snowdon massif rises to be the highest peak in England and Wales. The ranges extend into the Study Area and include the Carneddau and Glyderau.

757 To the east of the Snowdonia upland area lies the landscape of the Conwy Valley, which is the valley of Wales' longest tidal river. The valley effectively forms the border between the north-east and the north-west of Wales. This landscape area extends to the coast and forms the northern edge of Snowdonia around Conwy Bay.

758 To the north, the North Wales Coast extends from the prominent headland of the Great Orme in the west to the Point of Ayr in the east. This stretch of coastline is indented by a number of bays many of which are characterised by towns and villages that are popular with tourists. Further inland, the land rises providing containment to the coast and less developed uplands. This is with the exception of the lower lying Vale of Clwyd which runs away from the coast set below the Clwydian Range which runs in a similar north south direction further to the east. The Clwydian Range separates the lower lying valley landscapes of Deeside and Wrexham which form the most easterly extent of Wales in the North. On the other side of the estuary of the River Dee lies the more highly developed English coastline which includes the extensive settlements of Birkenhead and Liverpool on either side of the Mersey. The Study Area includes the English coast as far north as Blackpool.

Visual receptors

759 The principal visual receptors in the Study Area are likely to be found along the closest sections of the Welsh coastline. These include people within settlements, driving on roads, visitors to tourist facilities or historic environment assets and people engaged in recreational activity such as those using walking and cycle routes. A detailed assessment will be undertaken in the SLVIA for those visual receptors that are most susceptible to changes, which may experience significant visual effects as a result of the Awel y Môr OWF and will focus on visual receptors where the sea is a strong influence in the baseline view, along the Welsh coastline and immediate hinterland.

Designated sites

760 The following table sets out the designated and defined locations that are found within the Study Area which relate to the SLVIA.

TABLE 59 – LANDSCAPE PLANNING DESIGNATIONS AND DEFINED AREAS WITH RELEVANCE TO SLVIA.

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF ARRAY AREA (KM)	FEATURES OR DESCRIPTION
NATIONAL		
Snowdonia National Park	16.5	Covers 139 square km and stretches from Cardigan Bay's shoreline in the west to Dinas Mawddwy and the Aran mountains in the east, and from the River Dyfi and its estuary in the south to the North Wales coast as far as Conwy. Important not only for its natural beauty, wildlife and cultural heritage value but also in relation to the understanding and enjoyment of this by the public as well as its contribution to the economy of Wales. Snowdonia National Park takes its name from Snowdon which, at 1085m is the highest peak in Wales. The name Snowdonia is synonymous with a dramatic and varied landscape with spectacular mountain scenery which includes many peaks over 915m (3000ft). In addition, Snowdonia offers fine coastal vistas such as those on the Ardudwy coast, includes extensive moorlands typified by the Migneint, and is punctuated with classical glacial valleys.
Anglesey AONB	17	The areas designated in Anglesey are approximately 83 square miles (21,500 hectares) in extent and lie along the coast of the island with breaks around the urban areas and in the vicinity of Wylfa. The coastline of Anglesey, many stretches of which are isolated, contributes much to the island's appeal. Rugged cliffs, sandy bays, marshes, dunes, the sheltered shores of Menai Strait and the windswept slopes of Holyhead and Bodafon mountains give great variety of scene.

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF ARRAY AREA (KM)	FEATURES OR DESCRIPTION
Clwydian Range and Dee Valley AONB	23	This is described in the AONB management plan as 'the dramatic upland frontier to North Wales embracing some of the country's most wonderful countryside. The Clwydian Range is an unmistakeable chain of heather clad summits topped by Britain's most strikingly situated hillforts. Beyond the windswept Horseshoe Pass, over Llantysilio Mountain, lies the glorious Dee Valley with historic Llangollen a famous market town rich in cultural and industrial heritage.'
Registered Parks and Gardens in England (where open to the public)	>38	Various
Register of Historic Parks and Gardens in Wales (where open to the public)	To be determined once available	Various

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF ARRAY AREA (KM)	FEATURES OR DESCRIPTION
LOCAL		
Isle of Anglesey Heritage Coast	19.3	The sections of Heritage Coast amounting to approximately 50km of the coastline are: ▪ North Anglesey ▪ Holyhead Mountain ▪ Aberffraw Bay.
Great Orme Heritage Coast	10.3	A prominent headland lying at the north-western tip of the Creuddyn Peninsula near Llandudno. Conwy County Borough Council manages most of the site as a Country Park and Local Nature Reserve, this comprises a headland of Carboniferous limestone of some 291 hectares which rises from sea level to 207m at the summit. In addition to its importance for nature conservation and archaeology, the Great Orme has been important for tourism and recreation since early Victorian times and receives an extremely high level of recreational use.
Special Landscape Areas	>10.5	Conwy County Borough Council, Isle of Anglesey County Council and Gwynedd Council have designated these local areas. The closest to the array area is the Great Orme and Creuddyn Peninsula.

9.4.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

761 The assessment will be undertaken in accordance with the methods outlined in the following best practice guidance documents:

- The Landscape Institute with the Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment. Third Edition;
- Planning Inspectorate (2018) Advice Note Nine: Rochdale Envelope https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf;
- Landscape Institute (2019). Visual Representation of Development Proposals Technical Guidance Note 06/19;
- Scottish Natural Heritage (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments; and
- Scottish Natural Heritage (2017). Visual Representation of Windfarms: Version 2.2.

762 The objective of the assessment of the Awel y Môr OWF will be to predict the likely significant effects on the seascape, landscape and visual resource. In accordance with the EIA Regulations 2017, the SLVIA effects will be assessed to be either significant or not significant. The methodology to undertake the SLVIA will reflect the 'Guidelines for Landscape and Visual Impact Assessment: Third Edition' (Landscape Institute, 2013).

763 The significance of effects will be assessed through a combination of two considerations – the sensitivity of the landscape or visual receptor/view and the magnitude of change that will result from the Awel y Môr OWF. In accordance with the Landscape Institute's GLVIA3, the SLVIA methodology requires the application of professional judgement, but generally, the higher the sensitivity and the higher the magnitude of change the more likely that a significant effect will arise.

764 The objective of the cumulative SLVIA is to describe, visually represent and assess the ways in which the Awel y Môr OWF will have additional effects when considered together with other existing, consented or application stage developments and to identify related significant cumulative effects arising. The guiding principle in preparing the cumulative SLVIA will be to focus on the likely significant effects and in particular those which are likely to influence the outcome of the consenting process.

Potential project impacts

765 There is the potential for effects to arise on the landscape character of the nationally designated Isle of Anglesey AONB (approximately 16.5 km) and the associated Heritage Coast as well as the Great Orme Heritage Coast. In addition, there may be significant effects on the Snowdonia National Park. Although Awel y Môr OWF array area is located at a distance of more than 10 km offshore, it is likely that visual effects on people along the closest sections of the coastline will be an important matter for consideration in the EIA, due to the likely visibility of larger WTGs and their cumulative effect on the sea skyline in views from the coast west of Rhyl and east of the north coast of the Isle of Anglesey. This includes users of the Wales Coastal Path, which runs along much of the coast as well as numerous settlements and visitor attractions. The closest point of the coast to the array area is at Little Orme's Head, which lies to the south at a distance of 10.5 km.

766 The impacts that have been scoped into the Awel y Môr OWF EIA are outlined in Table 60 below, together with a description of any proposed additional data collection and/or supporting visualisations and ZTVs to enable an assessment of the impact.

767 Based on the seascape, landscape and visual information currently available and the project description, a number of impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 61, together with a justification for scoping them out.

TABLE 60 - IMPACTS PROPOSED TO BE SCOPED IN TO THE SLVIA

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
9.4.1	Impact (daytime) of the array area on seascape character within Welsh Marine Plan areas during construction.	The activities and structures located within the array area will alter the seascape character of the array area itself through alterations to it and within the wider area through visibility of the changes within the array area.	The SCTs will be mapped and the documented baseline seascape characterisation will be used to inform the baseline descriptions and assessment of sensitivity of the seascape receptors. The influence of the operational wind farms (Figure 54) and any subsequent changes to the baseline environment will be taken into account.
9.4.2	Impact (daytime) of the array area on landscape character receptors during construction.	The activities and structures located within the array area will be visible from the coast during good to excellent visibility conditions and may therefore affect the character of the landscape as part of its context.	Landscape character receptors will be mapped with the ZTV and described following desk based and field work.
9.4.3	Impact (daytime) of the array area on onshore	The activities and structures located within the array area will be visible from	Visual receptors and representative viewpoints (locations to be agreed with stakeholders) will be

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	visual receptors during construction.	the coast during good to excellent visibility conditions. They may be seen behind the operational wind farms however from locations to the west of Rhyl and north of Formby they would extend the horizontal field of the sea skyline affected by WTGs. The taller height and the horizontal spread of the WTGs will influence views through an increased density of turbines, their varied apparent height and creating a larger mass of WTGs in this area.	mapped with the ZTV and described following desk based and field work. Visualisations will be prepared for each viewpoint to illustrate the baseline views and the completed wind farm in the context of the cumulative wind farms. This will be used to inform the assessment of the effects during construction.
OPERATION			
9.4.4	Impact (daytime) of the array area on seascape character within Welsh Marine Plan areas during operation.	The activities and structures located within the array area will alter the seascape character of the array area itself through alterations to it and within the wider area through visibility of the changes within the array area.	The SCTs will be mapped and the documented baseline seascape characterisation will be used to inform the baseline descriptions and assessment of sensitivity of the seascape receptors. The influence of the operational wind farms (Figure 54) and subsequent changes will be taken into account.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.4.5	Impact (daytime) of the array area on landscape character receptors during operation.	The activities and structures located within the array area will be visible from the coast during good to excellent visibility conditions and may therefore affect the character of the landscape as part of its context.	Landscape character receptors will be mapped with the ZTV and described following desk based and field work.
9.4.6	Impact (daytime) of the array area on onshore visual receptors during operation.	The activities and structures located within the array area will be visible from the coast during good to excellent visibility conditions. They may be seen behind the operational wind farms however from locations to the west of Rhyl and north of Formby they would extend the horizontal field of the sea skyline affected by WTGs. The taller height and the horizontal spread of the WTGs will influence views through an increased density of turbines, their varied apparent height and creating a larger mass of WTGs in this area.	Visual receptors and representative viewpoints (to be agreed with stakeholders) will be mapped with the ZTV and described following desk based and field work. Visualisations will be prepared for each viewpoint to illustrate the baseline views and the completed wind farm in the context of the cumulative wind farms.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.4.7	Cumulative impact (daytime) of the array area on seascape character during operation.	The activities and structures located within the array area will alter the seascape character of the array area itself through alterations to it and within the wider area through visibility of the changes within the array area and cumulatively with other offshore development.	The SCTs will be mapped and the documented baseline seascape characterisation will be used to inform the baseline descriptions and assessment of sensitivity of the seascape receptors. The influence of the operational and application stage wind farms (Figure 54) and subsequent changes will be taken into account. The ZTV (Figure 56) will inform the likely visibility of the Awel y Môr OWF array area from areas of the seascape. Site visits and cumulative wireline visualisations prepared from agreed viewpoint locations will be used to inform the assessment of the effects.
9.4.8	Cumulative impact (daytime) of the array area on landscape character during operation.	The activities and structures located within the array area will be visible from the coast during good to excellent visibility conditions and along with other offshore development may therefore affect the character of the landscape as part of its context.	Landscape receptors and cumulative wind farms will be mapped with the ZTV and described following desk based and field work.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.4.9	Cumulative impact (daytime) of the array area on onshore visual receptors during operation.	The activities and structures located within the array area will be visible from the coast during very good to excellent visibility conditions in the context of other offshore development.	Visual receptors, cumulative wind farms and representative viewpoints will be mapped with the ZTV and described following desk based and field work.
9.4.10	Impact (night time) of the array area lighting on onshore visual receptors during operation.	The aviation and navigational lighting will be visible and may affect the views from the coast and further inland.	The hub height ZTV will be used to inform the lighting assessment for the aviation lighting. Night time photographs and visualisations would be prepared to illustrate the effects of the lighting from key viewpoints, to be agreed with stakeholders.
DECOMMISSIONING			
9.4.11	Impact (daytime) of the array area on seascape character within Welsh Marine Plan areas during decommissioning.	The activities and structures located within the array area will alter the seascape character of the array area itself through alterations to it and within the wider area through visibility of the changes within the array area.	The SCTs will be mapped and the documented baseline seascape characterisation will be used to inform the baseline descriptions and assessment of sensitivity of the seascape receptors. The influence of the operational wind farms (Figure 54) and subsequent changes will be taken into account.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.4.12	Impact (daytime) of the array area on landscape character receptors during decommissioning.	The activities and structures located within the array area will be visible from the coast during good to excellent visibility conditions and may therefore affect the character of the landscape as part of its context.	Landscape character receptors will be mapped with the ZTV and described following desk based and field work.
9.4.13	Impact (daytime) of the array area on onshore visual receptors during decommissioning	The activities and structures located within the array area will be visible from the coast during good to excellent visibility conditions. They may be seen behind the operational wind farms however from locations to the west of Rhyl and north of Formby they would extend the horizontal field of the sea skyline affected by WTGs. The taller height and the horizontal spread of the WTGs will influence views through an increased density of turbines, their varied apparent height and creating a larger mass of WTGs in this area.	Visual receptors and representative viewpoints will be mapped with the ZTV and described following desk based and field work. Visualisations will be prepared for each viewpoint to illustrate the baseline views and the completed wind farm in the context of the cumulative wind farms. These will be used to inform the assessment of the effects during decommissioning.

TABLE 61 – IMPACTS PROPOSED TO BE SCOPED OUT OF THE SLVIA

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
ALL PHASES		
9.4.14	Impacts relating to the offshore cable route construction, operation and decommissioning.	The offshore cable route will be constructed along the sea bed and would therefore not be visible during operation. During the construction and decommissioning of the cable route the only effect on the seascape, landscape and visual resource would be the visibility of a small number of vessels out at sea, which are a common occurrence as part of the baseline character and views and therefore not likely to give rise to a significant effect.
OPERATION		
9.4.15	Impacts on seascape character within the English Marine Plan Areas.	The distance to the English coast, the closer proximity of the operational offshore wind farms and the fact that the array area extends away from the English coast ensure that the effects on seascape character within these locations further to the east would not be significant.
9.4.16	Impacts on landscape character receptors (including landscape planning designations) in Denbighshire, Flintshire and the English parts of the Study Area.	The distance to the coast, the closer proximity of the operational offshore wind farms to the coast, the developed/settled character of much of this part of the Study Area and that the array area extends away from the English coast ensure that effects on landscape character receptors will not be significant.
9.4.17	Impacts on landscape character beyond coastal character types/areas except where they are also covered	Where landscape character receptors are separated from the coast by another landscape character type/area they tend to have limited association with the

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
	by the AONB or National Park designations.	sea as part of their context and therefore changes occurring out at sea are unlikely to have a significant effect as part of their context.
9.4.18	Impact on receptors at night due to lighting of infrastructure within the array area where they are located east of Conwy or in England.	The distance to the coast, the closer proximity of the lit operational offshore wind farms and the fact that the array area extends away from the English coast ensure that the effects of lighting within these locations further to the east would not be significant. The difference in turbine height is also unlikely to be as noticeable at night.
9.4.19	Cumulative impact with other forms of development (except for onshore wind farms with WTGs of greater than 50m to tip and offshore renewables development).	The cumulative effects with other forms of development and small turbines on shore are unlikely to give rise to a significant cumulative effect through the addition of the Awel y Môr OWF to that context.

Mitigation measures adopted as part of the project

768 At present, no mitigation measures have been adopted to reduce the potential for impacts on the seascape, landscape and visual resource. The requirement for mitigation measures will be kept under review during the SLVIA and EIA process, being informed by the outcomes of the assessment as part of an iterative process.

Potential cumulative impacts

769 Chapter 4: Environmental Impact Assessment Approach and Methodology sets out the general approach to the assessment of cumulative effects.

770 Cumulative effects may arise where two or more developments are experienced at a proximity where they may have a greater incremental effect, or where they may combine to have a sequential effect.

771 Offshore Wind: In accordance with guidance (SNH, 2012), the SLVIA will assess the effect arising from the addition of the Awel y Môr OWF to the cumulative situation, and not the overall effect of multiple wind farms. The focus of the cumulative seascape, landscape and visual assessment will be on the additional effect of the Awel y Môr OWF in conjunction with other developments of the same or similar type i.e. other onshore or offshore wind farms. In addition, consideration will be given to the potential for cumulative effects to arise in the context of other marine renewables development and the Wales Energy Priority Areas where wind farms may be developed in the future.

772 The cumulative SLVIA will include operational, consented and application stage offshore and onshore wind farms within the SLVIA Study Area where the WTGs are over 50m to tip. Operational and under-construction offshore wind farms, together with those consented, and any undetermined applications and proposals subject to scoping requests have been considered in the cumulative wind farms shown on Figure 56.

773 The SLVIA Study Area includes the following operational cumulative OWFs: Gwynt y Mor, Rhyl Flats, North Hoyle, Burbo Bank and Burbo Bank Extension. There are no under-construction, consented, application stage or scoping stage OWFs within the Study Area.

774 Other activities: There is the potential for other activities occurring in the areas affected by the Awel y Môr OWF. It is unlikely that the majority of these development types would contribute to a context where a significant cumulative effect may occur as a result of the addition of the Awel y Môr OWF.

Potential transboundary Impacts

775 There are no potential transboundary impacts on seascape, landscape or visual receptors anticipated as the Study Area does not include the land or waters of another European state.

9.4.6 Summary of next steps

776 Upon commencement of the SLVIA work, cumulative wireline views would be generated from all preliminary viewpoints in order to aid the authors and innogy in their understanding of the potential effects of the Awel y Môr OWF on views from the coast. Refined ZTVs would also be run to inform the assessors of likely visibility of the Awel y Môr OWF WTGs as indicative layouts are developed by the applicant for assessment purposes. These would be overlaid with the sensitive receptors in order to aid fieldwork which would largely occur within areas where there may be theoretical visibility.

777 Fieldwork will be undertaken to verify visibility, microsite viewpoint locations and to take viewpoint photographs once the viewpoints are agreed with stakeholders, which is anticipated to be following the scoping process and further stakeholder consultation.

778 Further field work will also involve visiting settlements and visitor attractions, travelling along transportation routes and walking along stretches of the long-distance footpaths.

779 The MDS for the assessment and how these and other potential layouts should be portrayed within the visualisations will be discussed. In addition, any requirements in relation to the proposed lighting of the WTGs and offshore substations will aim to be agreed.

9.4.7 Further considerations for Consultees

i. Do you agree with the proposed 50km radius Study Area?

ii. Do you agree with the preliminary viewpoint list or have any proposed additions or alternatives?

iii. Do you agree that the data sources identified are sufficient to inform the baseline for the Awel y Môr OWF PEIR and ES?

iv. Do you agree with the proposed methodologies for the assessment, cumulative assessment and presentation of visualisations for those impacts that are scoped in to the SLVIA (Table 60)?

v. Do you agree that the impacts described in Table 61 can be scoped out?

9.5 Marine Archaeology

9.5.1 Introduction

780 This Section of the Scoping Report identifies the cultural heritage receptors of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (up to the MHWS mark) of Awel y Môr OWF on cultural heritage asset sand sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

781 Effects of the onshore components of the OWF on cultural heritage assets are described separately in Section 10.2.

782 This Section should also be read in conjunction with:

- Appendix B - Gazetteer of the UKHO wrecks, obstructions and foul ground;
- Appendix C - Gazetteer of NMRW wrecks, intertidal sites and palaeolandscapes; and
- Appendix D - Gazetteer of CPAT wrecks and intertidal sites.

9.5.2 Study Area

783 A marine archaeology Study Area has been established for the purposes of collating baseline data as part of this desk-based review. The Study Area encompasses the Awel y Môr OWF array area and offshore ECR search area up to mean high water springs (MHWS), the boundaries of which define the zone where any potential effects on marine archaeology receptors may occur (Figure 58). It is important to note that the Study Area will be subject to review and may be amended for the PEIR in response to issues such as the refinement of the onshore and offshore ECR and the identification of additional constraints, including environmental and / or engineering.

9.5.3 Baseline data

784 The data sources detailed in Table 62 were consulted to undertake an initial desk-based review of known cultural heritage assets and likely significant impacts.

TABLE 62 - DATA SOURCES CONSULTED FOR THE AWEL Y MÔR OWF

SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR ARRAY AREA AND OFFSHORE ECR SEARCH AREA
UKHO wrecks and obstructions	Records of known wrecks and obstructions held by the United Kingdom Hydrographic Office (UKHO) and available via emapsite.com.	Full coverage of the Awel y Môr array area and offshore ECR search area.
UKHO Admiralty Charts	Admiralty charts and historic mapping relevant to the defined Study Area.	Full coverage of Awel y Môr array area and offshore ECR.
Clwyd-Powys Archaeological Trust (CPAT) Historic Environment Record (HER)	Point data derived from the HER held by CPAT.	Full coverage of Awel y Môr array area and offshore ECR.
National Monuments Record of Wales (NMRW), held by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW)	Point data derived from the NMRW database.	Full coverage of Awel y Môr array area and offshore ECR.
West Coast Palaeolandscape Survey (WCPS) (Fitch *et al.*, 2011)	Palaeolithic and Mesolithic landscape mapping of Liverpool Bay.	Full coverage of Awel y Môr array area and offshore ECR.
Technical Report for Strategic Environmental Assessment of Irish Sea Area SEA6 (Flemming, 2005)	Description of palaeolandscape potential of the Liverpool Bay area.	Broadscale data with regional coverage.
Gwynt y Môr Offshore Wind Farm – Cultural Heritage Technical Report (Gifford, 2005)	Review of archaeological potential of the subzone.	No coverage of Awel y Môr, though the detailed study provides useful characterisation of the directly adjacent subzone.
Gwynt y Môr – Archaeological Assessment of Geophysical	Review of geophysical data of the subzone.	No coverage of Awel y Môr, though the detailed study provides useful

SOURCE	SUMMARY	COVERAGE OF AWEL Y MÔR ARRAY AREA AND OFFSHORE ECR SEARCH AREA
Data (Wessex Archaeology, 2012)		characterisation of the directly adjacent subzone.
England's Historic Seascapes: Liverpool Bay Pilot Area (Wessex Archaeology, 2006)	Description of palaeolandscape potential of the Liverpool Bay area.	No coverage of Awel y Môr, though the detailed study provides useful characterisation of the wider context.

9.5.4 Baseline environment

785 The offshore marine archaeological resource can be attributed to three main categories of sites or features:

- Submerged prehistoric landscapes caused by changes to sea-level and eventual stabilisation of sea-level at or near to the present position. Such landscapes may contain highly significant evidence of prehistoric human occupation and/or environmental change;
- Archaeological remains of watercraft deposited when such vessels sank while at sea or became abandoned in an inter-tidal context which subsequently became inundated; and
- Remains of aircraft crash sites, either coherent assemblages or scattered material usually the result of Second World War (WWII) military conflict, but also numerous passenger casualties, particularly during the peak of seaplane activity during the interwar period. Also, includes aircraft, airships and other dirigibles dating to the First World War (WWI) though these rarely survive in the archaeological record.

786 In addition, structural remains other than watercraft, including such elements as fish traps, piers, tidal gates or sea defences, may be found within the intertidal zone (between MHWS and MLWS). Marine archaeology receptors located seaward of MHWS have been considered in this Section.

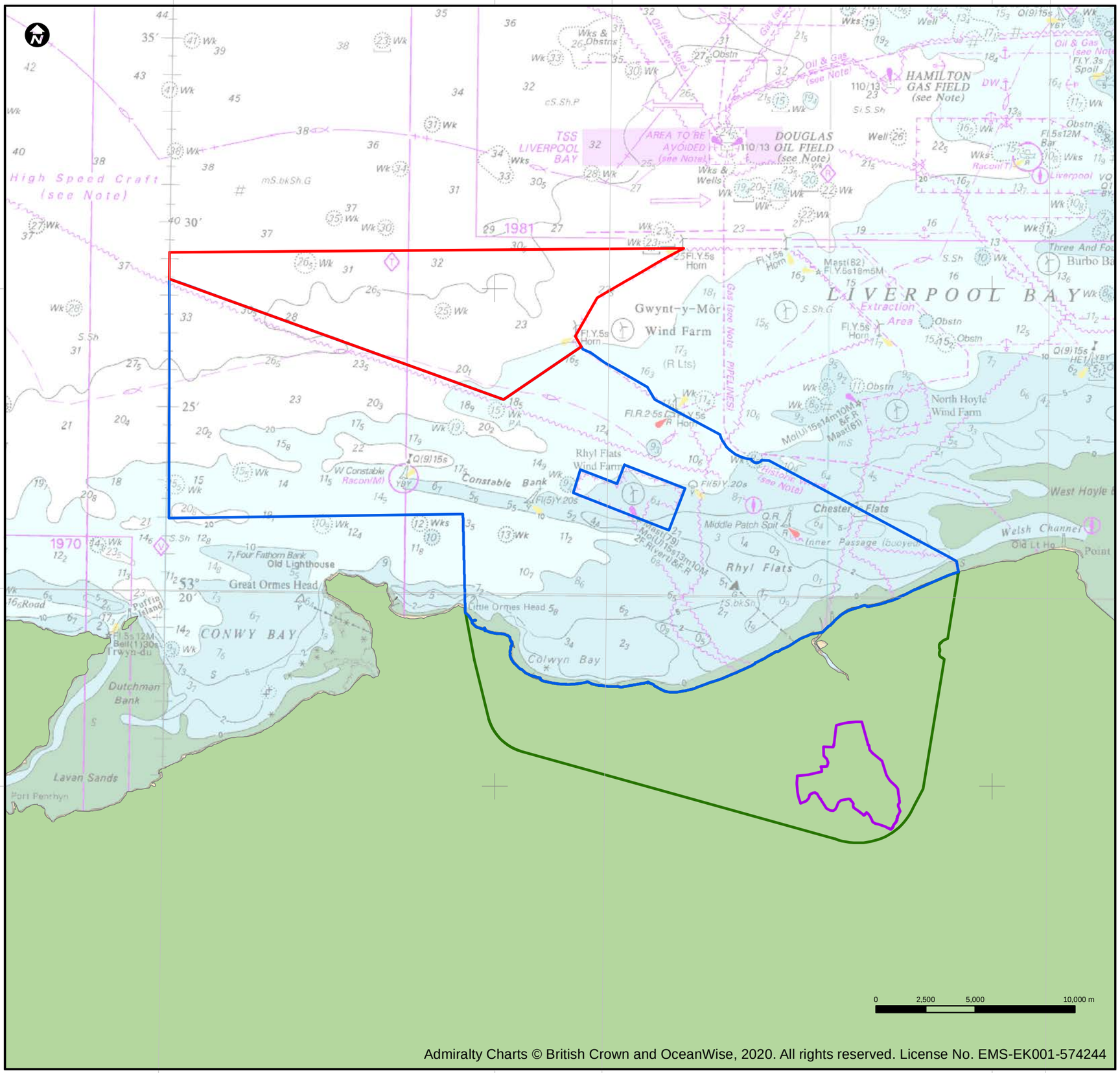
4°0'0"W 3°40'0"W 3°20'0"W

450000 475000

5925000

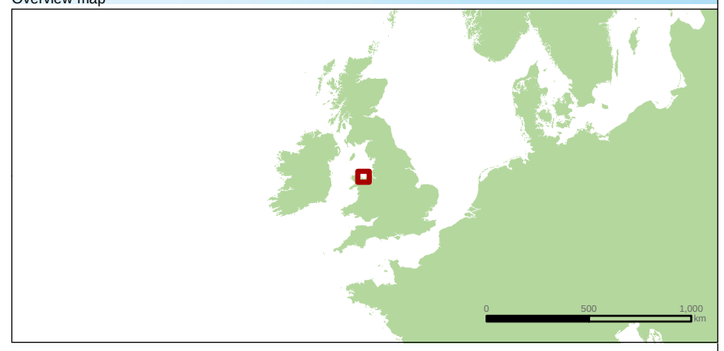
5900000

53°20'0"N



Admiralty Charts © British Crown and OceanWise, 2020. All rights reserved. License No. EMS-EK001-574244

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area

Cartographic information

Coordinate System: UTM Zone 30N Grid North
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Awel y Môr OWF Study Area

DRAWN	DATE	SCALE	SIZE
rebecca.ferreira	04/03/2020	1:200,000	@DIN A3

REV 01

Path: O:\Active Tenders\1888 - GoBe - Innogy Awel-y-Mor OWF\GIS\Draft Figures\AyM_MarineArchaeology_Figure_MXDs\AyM_MarineArchaeology_Fig1.mxd

787 Within the Study Area, there is high potential for preserved prehistoric sediment sequences, comprising palaeolandscapes, peats, submerged forests and estuarine silts laid down in the final stages of rapid sea-level rise in the first half of the Holocene (Bell, 2007). The Liverpool Bay area was identified by Coles (1998) as part of the palaeolandscape that connected the Isle of Man to the British mainland, with the landscape fully submerged by 5,500 BC (Fitch et al., 2011).

788 Earlier fluctuations in sea-level and temperature also presented opportunities for hominin exploitation of the landscape and from which sites, features and finds may remain preserved. These periods are associated with the retreat of ice-sheets following the last three glacial maximums:

- Devensian: Upper Palaeolithic c. 100 – 22,000 BP (glacial maximum);
- Wolstonian: Lower Palaeolithic c. 250 – 150,000 BP (glacial maximum); and
- Anglian: Lower Palaeolithic c. 350 – 280,000 BP (glacial maximum).

789 The earliest evidence of human occupation along the northern coastline of Wales is at the Pontnewydd Cave site near Llandudno, dating to c. 225 ka (thousand years) Before Present (BP), some 8 km inland from the present coastline (Flemming, 2005). Later Palaeolithic sites along this coastline include Kendrick's Cave on the Great Orme Peninsula near Llandudno, from which Late Upper Palaeolithic materials (c. 10 ka BP) were found (Flemming, 2005).

790 Along this north Wales coastline, at Rhuddlan, a significant early Mesolithic site has been identified adjacent to the River Clwyd (Bell, 2007). During this period the site would have been 10 km inland of the former Mesolithic coastline (Fitch et al., 2011). With sea-level rise an estuary at the mouth of the Clwyd was created, with a funnel-shaped mouth some 9 km wide between Abergele and Rhyl, extending 7 km inland. These former Holocene estuarine sediments were identified through borehole surveys (Figure 59), with sediment deposits as thick as 17.8 m in places (Manley, 1989; Bell, 2007).

791 There are 14 locations of submerged forests and intertidal peat beds along the north Wales coastline (Figure 60), three of which are located within the Awel y Môr OWF Study Area (National Primary Record Number (NPRN) 524772; 524722; and 524773). These are discussed further in Paragraph 0. In situ finds have also been recovered from these sites, including a Mesolithic antler mattock at Splash Point, Rhyl (CPAT Primary Reference Number 33099).

792 The West Coast Palaeolandscape Survey (WCPS) clearly highlights the high potential for submerged landscapes features and / or prehistoric artefacts or sites to be found on the seabed (Figure 61). Various landscape features have already been detected in the study area, including: glacial valleys, former coastlines, former estuaries, basin structures, palaeochannels, small deltaic systems and floodplains (Figure 62 and Figure 63; Fitch et al., 2011).

793 The highest area of archaeological and palaeoenvironmental potential within the Study Area is in the array area and the north-eastern part of the ECR search area (Figure 61). There are numerous palaeolandscape features and organic and other types of deposits within this zone and the WCPS identified these as 'Very High' archaeological and palaeoenvironmental potential (Figure 62 and Figure 63). It was recommended in the management strategy for the WCPS that every attempt is made to preserve deposits in this area in situ (Fitch et al., 2011).

794 There are no protected areas or statutory designations in relation to submerged landscapes within the Study Area.

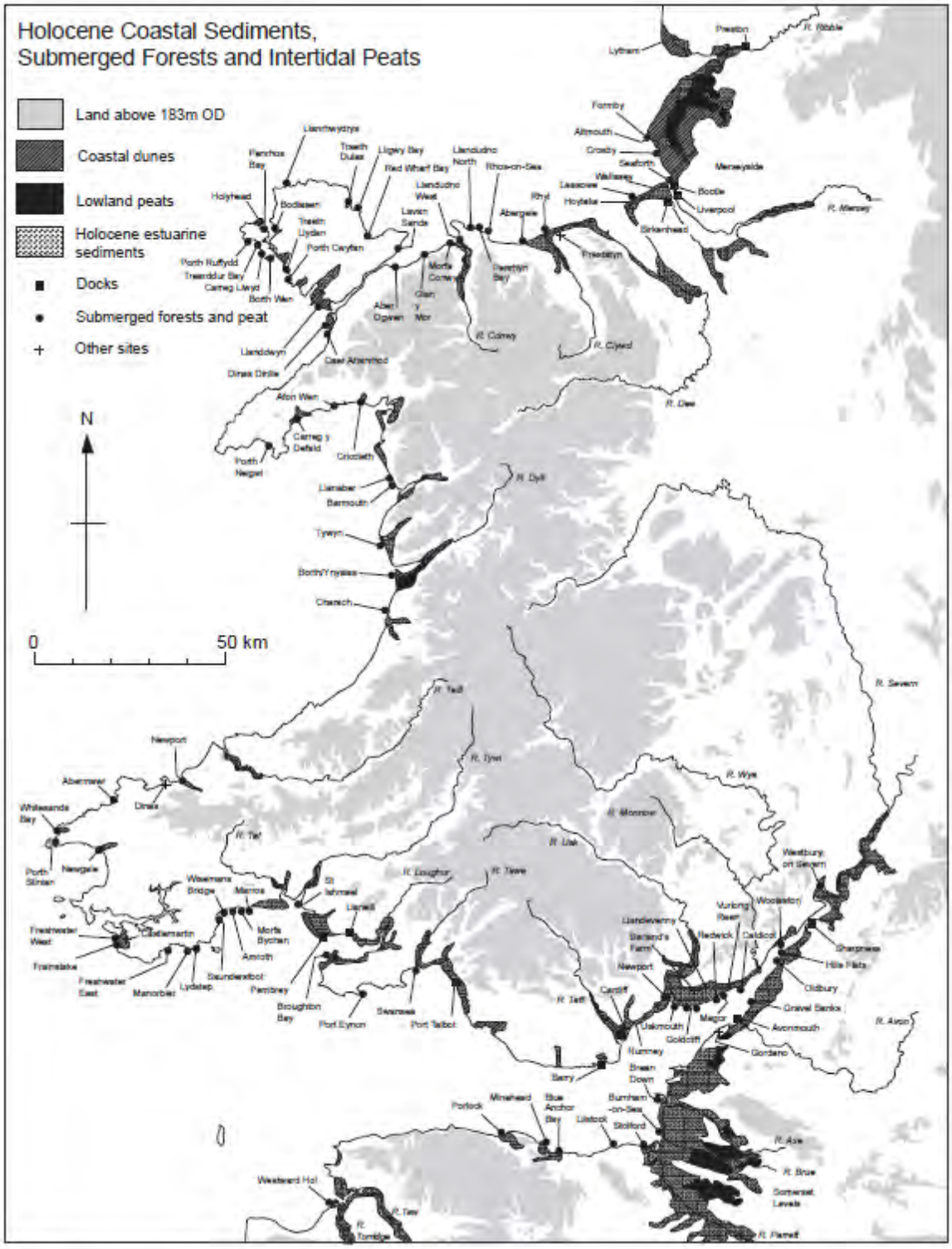


FIGURE 59 - HOLOCENE COASTAL SEDIMENTS, SUBMERGED FORESTS AND INTERTIDAL PEATS IN WESTERN BRITAIN (BELL, 2007)

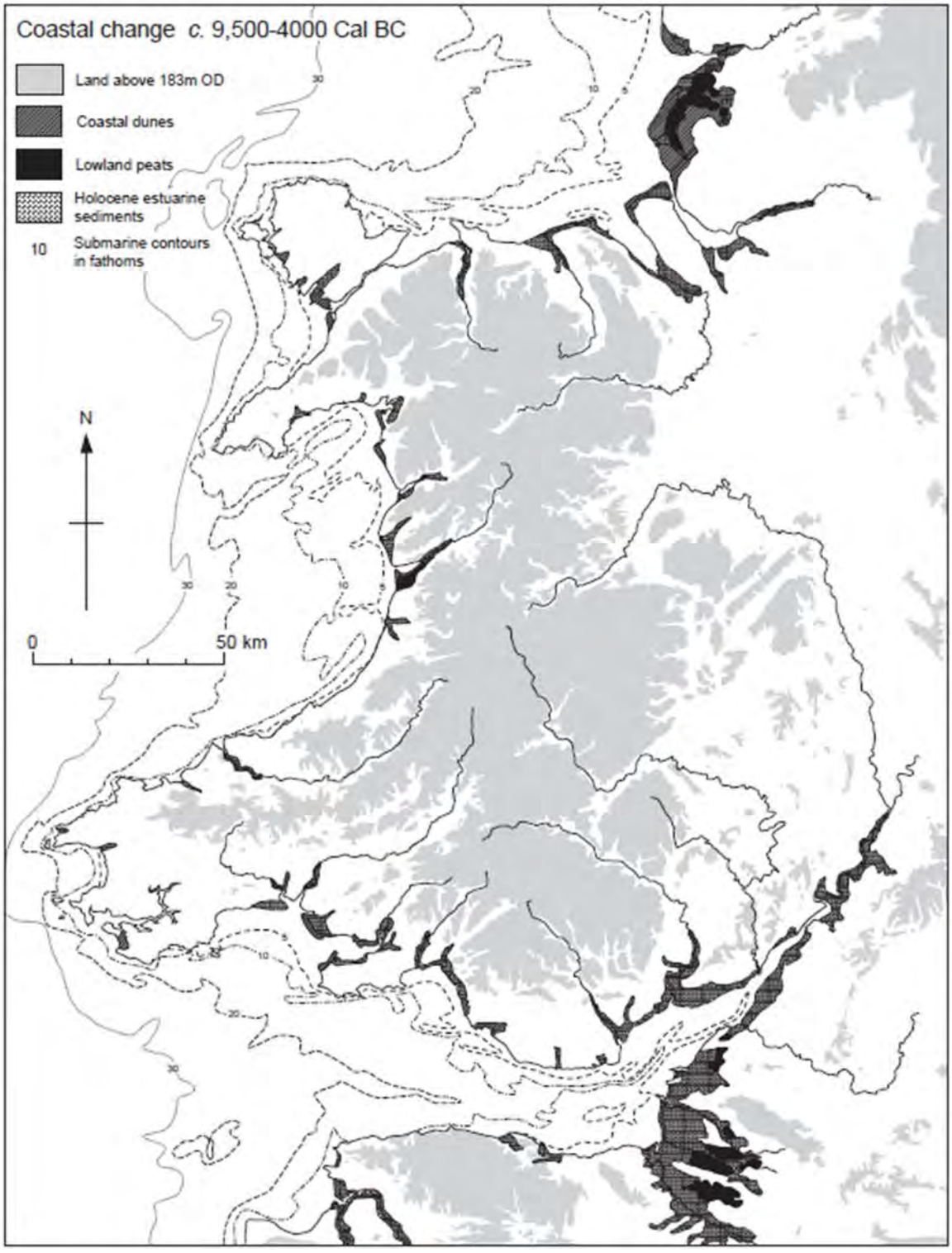


FIGURE 60 - COASTAL CHANGE IN WESTERN BRITAIN C. 9500-4000 CAL. BC (BELL, 2007)

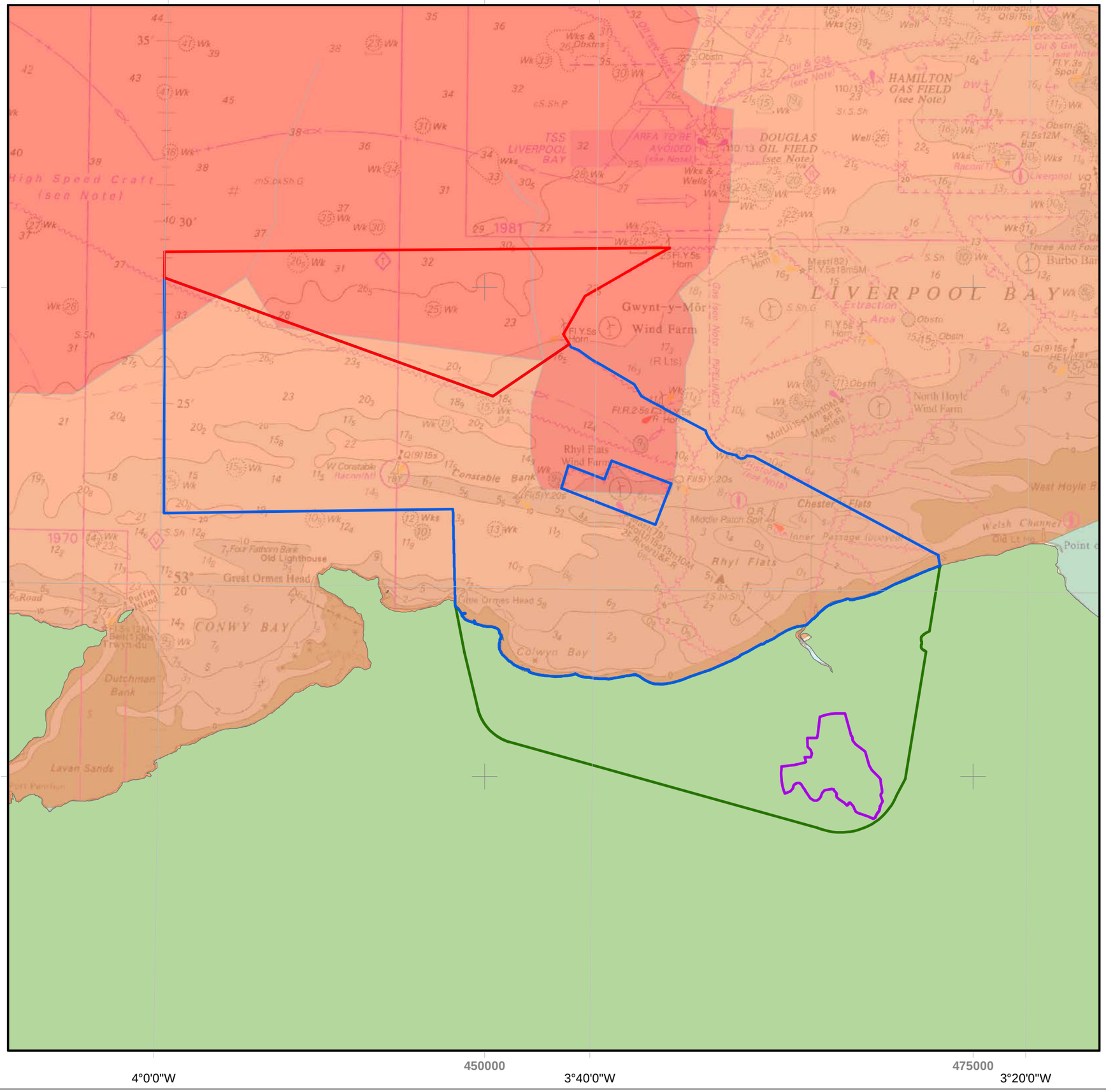
4°0'0"W 3°40'0"W 3°20'0"W

450000 475000

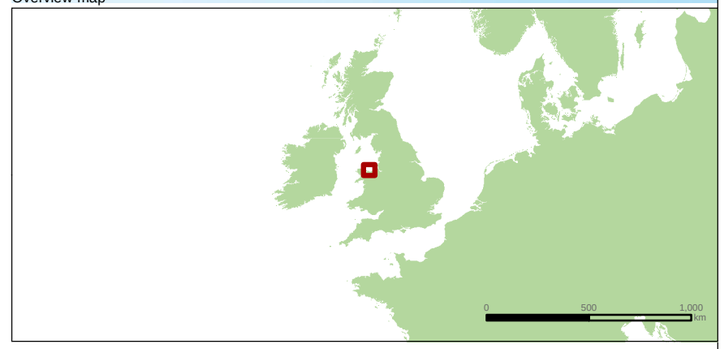
5925000

5900000

53°20'0"N



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area

Archaeological Potential

- High
- Very High

Cartographic information

Coordinate System: UTM Zone 30N Grid North
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains data from the West Coast Palaeolandscapes Survey (Fitch et al. 2013)

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

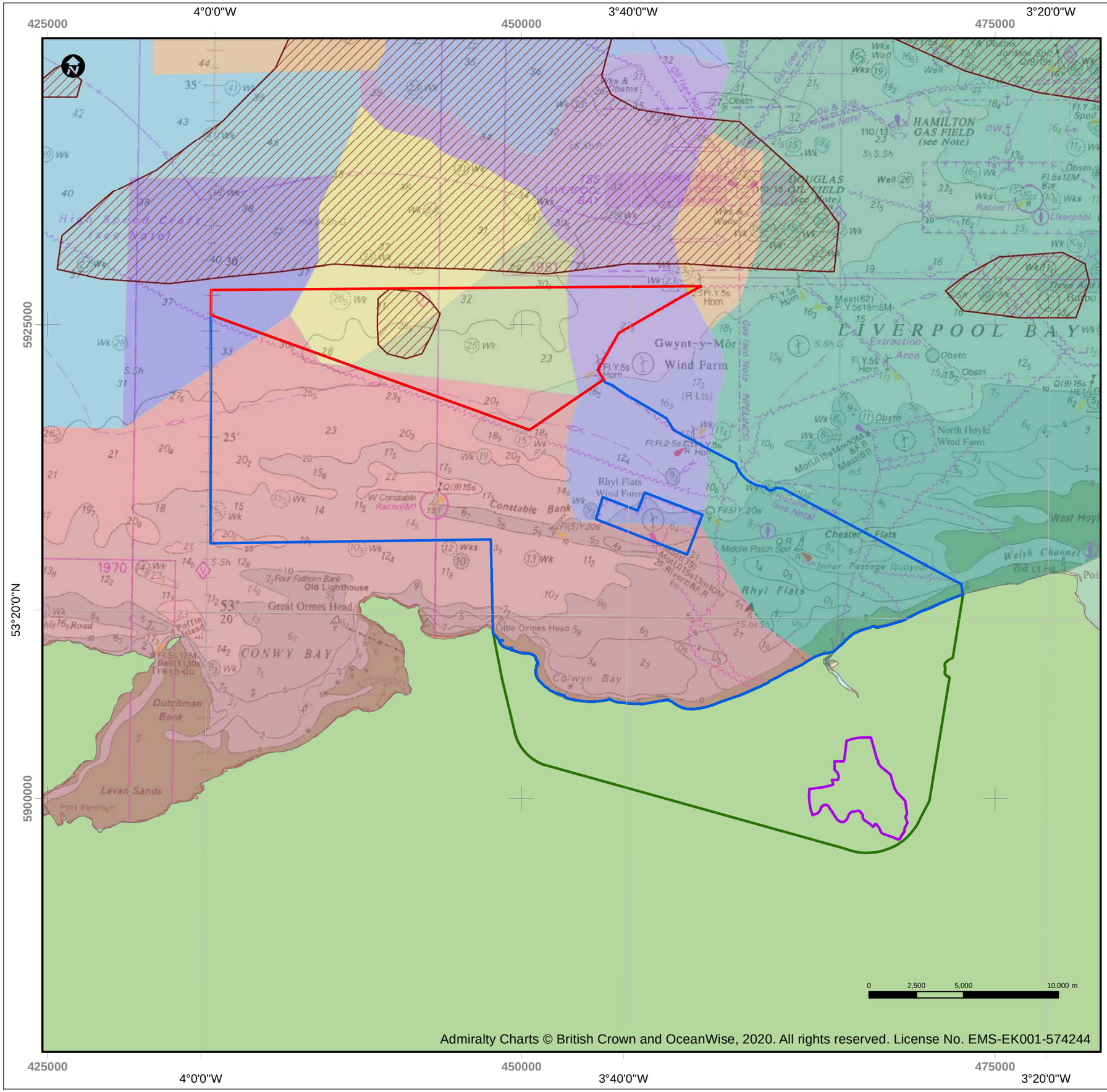
PROJECT Offshore Windpark **Awel y Môr**

TITLE **Archaeological potential of the submerged landscapes in the Awel y Môr OWF Study Area, as classified by Fitch et al. 2011**

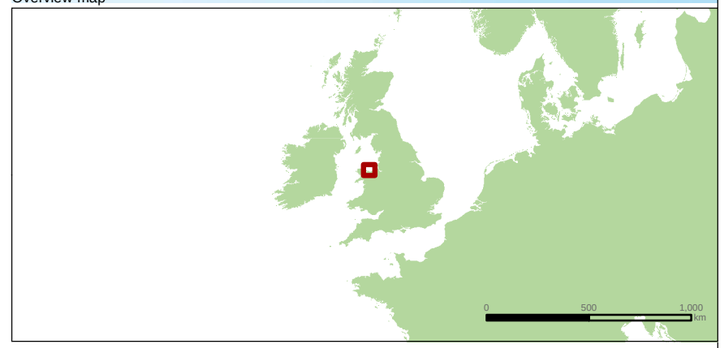
DRAWN	DATE	SCALE	SIZE
rebecca.ferreira	04/03/2020	1:200,000	@DIN A3

REV 01

Path: O:\Active Tenders\1888 - GoBe - Innogy Awel-y-Mor OWF\GIS\Draft Figures\AyM_MarineArchaeology_Figure_MXDs\AyM_MarineArchaeology_Fig4.mxd



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search
- Onshore Export Cable Route Search
- Substation Search Area

Landscape Character

- A plain with early Holocene channels.
- A probable plain containing organic sediments.
- A relatively small area dominated by a tunnel valley.
- A very extensive end glacial, fluvio-glacial plain containing organic deposits. This area is better characterised in its S half.
- An area consisting of early Holocene coastlines and estuaries.
- An area of end glacial valleys, reused in early Holocene.
- An area of relative high ground with some small channels.
- Area of relatively high ground. This is an area of erosion with just a few large channels detectable.
- End glacial, fluvio-glacial plain.
- Possible organic layer or floodplain

Cartographic information

Coordinate System: UTM Zone 30N Grid North
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains data from the West Coast Palaeolandscapes Survey (Fitch et al. 2013)

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

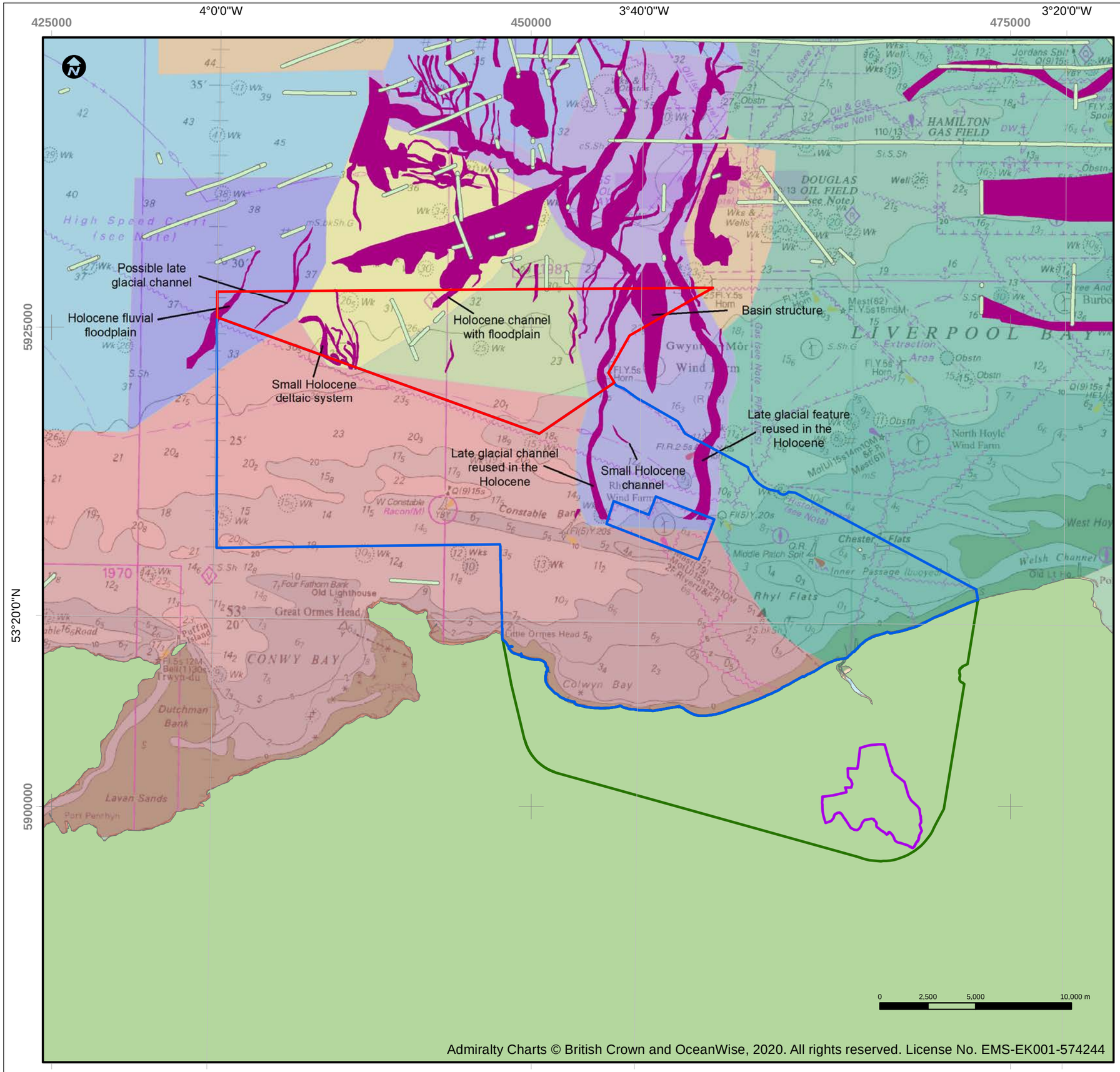
PROJECT Offshore Windpark **Awel y Môr**

TITLE
Landscape Character Area defined by the WCPS (2011) in relation to the Awel y Môr OWF Study Area

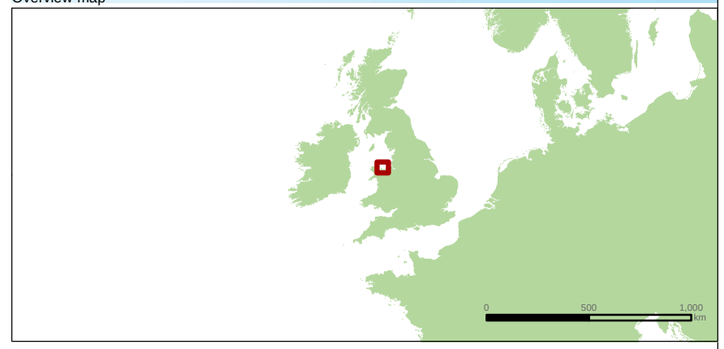
DRAWN	DATE	SCALE	SIZE
rebecca.ferreira	04/03/2020	1:200,000	@DIN A3

REV 01

Path: O:\Active Tenders\1888 - GoBe - Innogy Awel-y-Mor OWF\GIS\Draft Figures\AyM_MarineArchaeology_Figure_MXDs\AyM_MarineArchaeology_Fig5.mxd



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area
- 2D Features
- Landscape Features

Landscape Character Areas

- A plain with early Holocene channels.
- A probable plain containing organic sediments.
- A relatively small area dominated by a tunnel valley.
- A very extensive end glacial, fluvio-glacial plain containing organic deposits. This area is better characterised in its S half.
- An area consisting of early Holocene coastlines and estuaries.
- An area of end glacial valleys, reused in early Holocene.
- An area of relative high ground with some small channels.
- Area of relatively high ground. This is an area of erosion with just a few large channels detectable.
- End glacial, fluvio-glacial plain.

Cartographic information

Coordinate System: UTM Zone 30N Grid North
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains data from the West Coast Palaeolandscapes Survey (Fitch et al. 2013)

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT	Offshore Windpark **Awel y Môr**
TITLE	**Landscape Features identified by the WCPS (2011) in relation Awel y Môr OWF Study Area**
DRAWN	rebecca.ferreira
DATE	04/03/2020
SCALE	1:200,000
SIZE	@DIN A3
REV	01

Path: O:\Active Tenders\1888 - GoBe - Innogy Awel-y-Mor OWF\GIS\Draft Figures\AyM_MarineArchaeology_Figure_MXDs\AyM_MarineArchaeology_Fig6.mxd

UKHO wrecks, obstructions and foul ground

795 There are 22 wrecks and ten obstructions and fouls recorded by the UKHO within the Study Area (Table 63). Twelve of the wrecks have been identified, while the remaining ten wrecks are all unknown (Figure 64).

TABLE 63 - UKHO WRECKS, FOULS AND OBSTRUCTIONS

PERIOD	NUMBER RECORDED	TYPE
Post-medieval	4	Sailing vessels, steam ship
20th century (1900-1913/ 1919-1938)	2	Steam ship, sailing ship
WWII	3	Steam ships
Post WWII (1946 – present)	3	Fishing vessels
Unknown wrecks	10	Yacht, unknown
Obstructions and Foul Ground	10	Scientific equipment, aircraft, unknown

NMRW wrecks, obstructions, documented losses and sites

796 In addition to the UKHO wrecks, there are 63 unique known wrecks or documented losses, seven unknown losses, four vessel parts, and 19 aircraft known to be shot down between 1940-1945 within the Awel y Môr OWF Study Area (Table 64 and Error! Reference source not found.).

797 Where there was a discrepancy between the UKHO and NMRW charted positions, duplicate data was removed, and the UKHO position was favoured. NMRW and CPAT datasets were provided in the British National Grid co-ordinate system and were transformed to World Geodetic System 1984 (WGS84) using the OSTN02 v2 transformation, the most appropriate transformation for working with marine data (Dellino-Musgrave and Heamagi, 2010).

798 Regarding the unknown wrecks, obstructions and foul ground entries from the UKHO and NRMW data, duplicates cannot be removed from these categories at this stage as further investigation may be required in the subsequent phases of analysis to confirm correct location and correlation with identified archaeological receptors.

TABLE 64 - NMRW WRECKS, OBSTRUCTIONS AND DOCUMENTED LOSSES

PERIOD	NUMBER RECORDED	TYPES
Post-medieval	58	Sloops, schooners, wooden smacks, wooden ketch, fishing vessels, sailing vessels, brigs, brigantines, ketches, Mersey flats (barges), steam ship, wooden yawl, 'wooden wreck', barque, pleasure boat, rudder finds, iron propeller find, anchors
20th century	9	Wooden smack, schooner, steam ships, Mersey flat (barge)
WWII	19	Aircraft
Unknown wrecks	7	Schooner, wooden wreck, unknown

799 Three Mesolithic to Neolithic submerged forests are recorded at Rhos-on-Sea (NPRN 524772) Abergele (NPRN 524722) and Rhyl (NPRN 524773) (Table 65 and Figure 65). Four palaeolandscape features have been recorded within the array area, dating from the Palaeolithic to Mesolithic (NPRNs 518441, 516113, 516106, and 516114) (Table 65 and Figure 65). These records are associated with landscapes detected during the WCPS project.

800 Four fish traps are recorded within the intertidal zone of the Study Area, three of which date from the post-medieval period (NPRNs 518193, 303159, 525003) and one dates from the medieval period (NPRN 301217) (Table 65 and Figure 65). Further to this, two extant post-medieval pleasure piers and one sluice gate (Table 65 and Figure 65).

TABLE 65 NMRW SUBMERGED LANDSCAPES AND INTERTIDAL SITES

PERIOD	NUMBER RECORDED	TYPES
Palaeolithic	3	Palaeolandscapes
Mesolithic	4	Submerged forests, palaeolandscape
Medieval	1	Fish trap
Post-medieval	6	Fish traps, pleasure piers, sluice gate

CPAT wrecks, obstructions, documented losses and sites

801 There are five unique wreck records recorded in the CPAT HER, all of which date to the post-medieval period (Table 66 and Figure 66). One of these wrecks is a designated site under the Protection of Wrecks Act 1973 and is discussed further in paragraph 803 below.

TABLE 66 - CPAT WRECK SITES

PERIOD	NUMBER RECORDED	TYPES
Post-medieval	5	Submarine, wooden wreck, unknown

802 An additional 26 finds and sites are recorded by CPAT in the intertidal zone of the Study Area. See Table 67 for a summary of find types by period (Figure 66).

TABLE 67 - CPAT INTERTIDAL AND COASTAL SITES

PERIOD	NUMBER RECORDED	TYPES
Prehistoric	1	Stone anvil
Mesolithic	1	Antler mattock
Neolithic	2	Stone axe, stone tranchet
Bronze Age	1	Flat axe
Roman	6	Coins, brooches
Medieval	3	Pottery sherds, dagger guard
Post-medieval	5	Coin hoard, musket ball, ring, jetty, trackway
Modern	5	Jetties, pier, wood and metal object
Unknown date	2	Ring, fish trap or redundant sea defences

Designated sites

803 As mentioned above, there is one protected wreck site, designated under the Protection of Wrecks Act 1973, within the Study Area. The Resurgam wreck site represents the remains of the first mechanically propelled submarine launched in 1879. On her voyage from Birkenhead to Portsmouth for a demonstration for the Royal Navy, the vessel faced technical problems and docked at Rhyl for repairs. Once repaired, Resurgam was towed by a steam yacht, Elfin, but after the yacht experienced engine troubles the crew left the Resurgam to repair the Elfin's engine. With no crew on board the Resurgam to close the hatch, which could only be closed internally, the vessel took on water and the pressure caused the tow rope to break and the submarine foundered off Rhyl in 1880 (Statutory Instrument number 1996/1741; Table 68 and Figure 66). The designated area is based on a 300 m radius on the centre point 53 23.78N 03 33.18W (NPRN 405760).

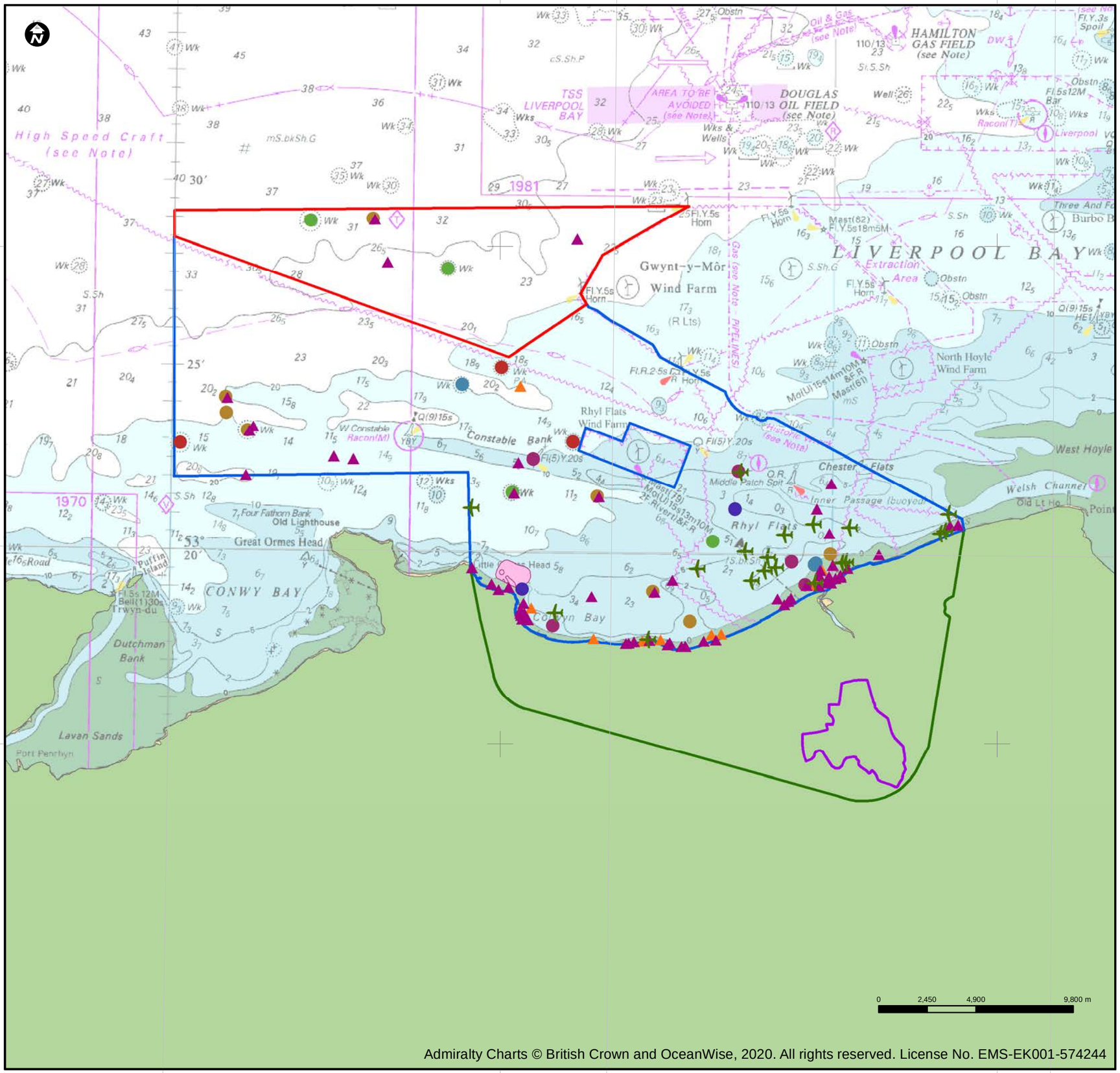
TABLE 68 - ARCHAEOLOGICAL AND CULTURAL HERITAGE DESIGNATIONS WITH RELEVANCE TO AWEL Y MÔR OWF

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
Resurgam	Within the Awel y Môr OWF offshore ECR search area search area, located to the east.	First mechanically propelled submarine, lost off Rhyl in 1880.

4°0'0"W 3°40'0"W 3°20'0"W

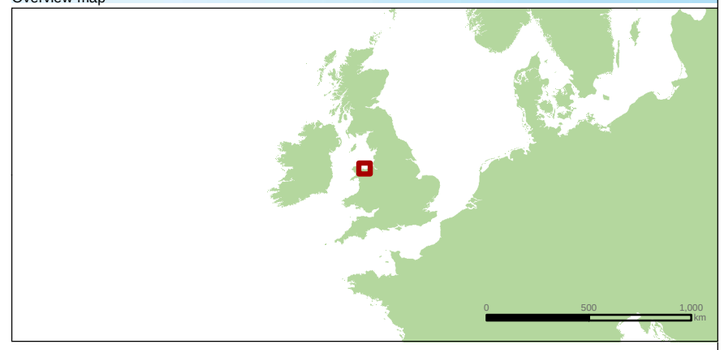
450000 475000

5925000 5900000 53°20'0"N



Admiralty Charts © British Crown and OceanWise, 2020. All rights reserved. License No. EMS-EK001-574244

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area

NMRW sites

- 20th century wrecks
- Post-medieval wrecks
- Aircraft

UKHO sites

- Post-medieval
- 20th century
- WWII
- Post WWII
- Unknown
- Obstructions/ Foul ground

Obstructions/ Foul ground

Cartographic information

Coordinate System: UTM Zone 30N Grid North
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains data from the NMRW

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT	
Offshore Windpark	**Awel y Môr**

TITLE

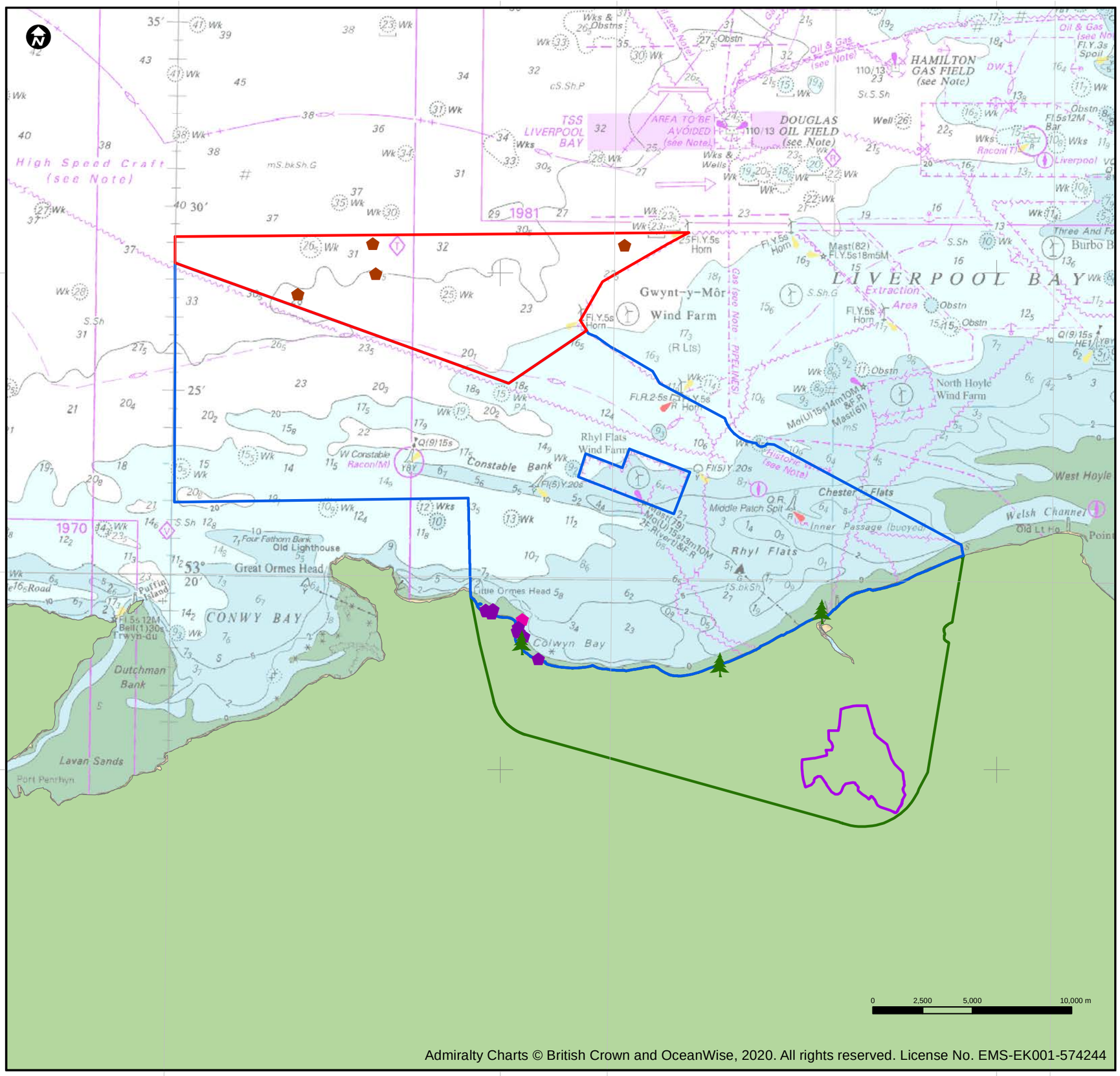
NMRW and UKHO wrecks, obstructions and foul ground

DRAWN	DATE	SCALE	SIZE
rebecca.ferreira	04/03/2020	1:200,000	@DIN A3

REV 01

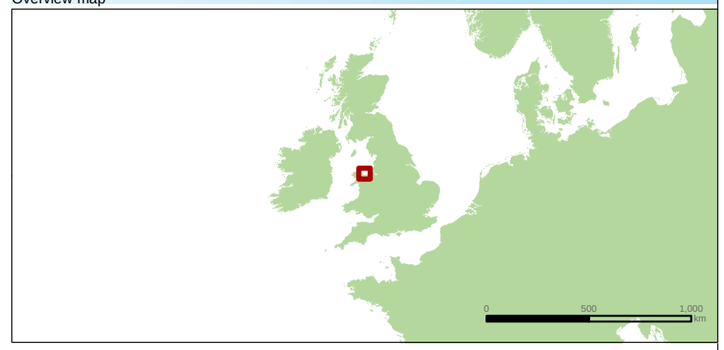
Path: O:\Active Tenders\1888 - GoBe - Innogy Awel-y-Mor OWF\GIS\Draft Figures\AyM_MarineArchaeology_Figure_MXDs\AyM_MarineArchaeology_Fig7.mxd

4°0'0"W
3°40'0"W
3°20'0"W
450000
475000
5925000
5900000
53°20'0"N



Admiralty Charts © British Crown and OceanWise, 2020. All rights reserved. License No. EMS-EK001-574244

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area
- Mesolithic Submerged Forests
- Medieval
- Post-medieval
- Submerged Palaeolandscapes

Cartographic information

Coordinate System: UTM Zone 30N Grid North
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains data from the NMRW

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE NMRW intertidal sites and submerged palaeolandscapes

DRAWN	DATE	SCALE	SIZE
rebecca.ferreira	04/03/2020	1:200,000	@DIN A3

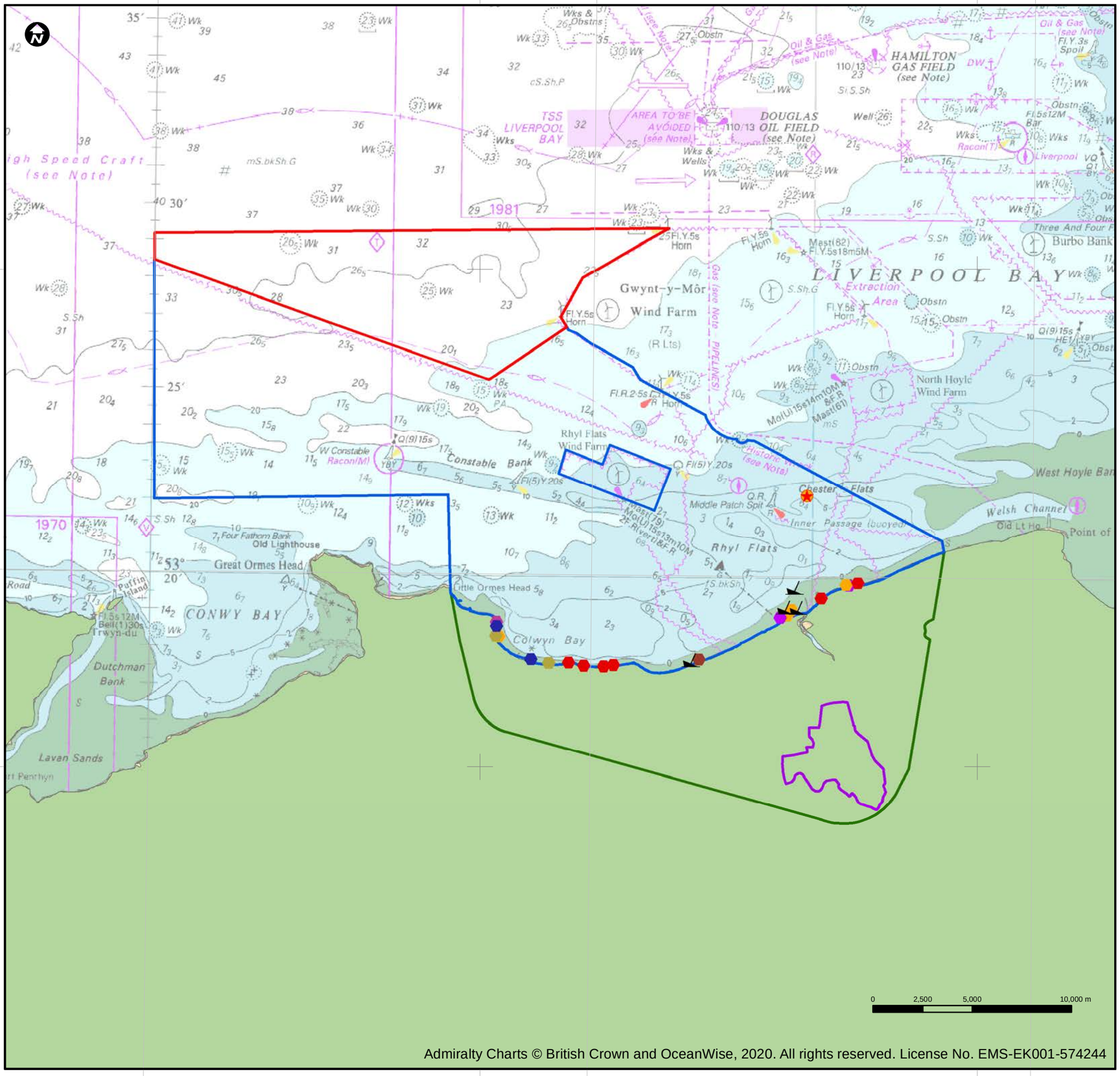
REV 01

Path: O:\Active Tenders\1888 - GoBe - Innogy Awel-y-Mor OWF\GIS\Draft Figures\AyM_MarineArchaeology_Figure_MXDs\AyM_MarineArchaeology_Fig8.mxd

4°0'0"W 3°40'0"W 3°20'0"W

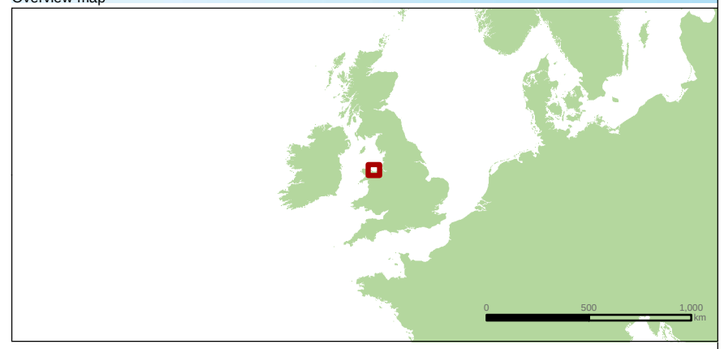
450000 475000

5925000 5900000 53°20'0"N



Admiralty Charts © British Crown and OceanWise, 2020. All rights reserved. License No. EMS-EK001-574244

Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area
- Substation Search Area
- Post-medieval wrecks
- Resurgam (Protected Wreck)
- Resurgam (Designated Area)
- Prehistoric
- Mesolithic
- Neolithic
- Bronze Age
- Roman
- Medieval
- Post-medieval
- Modern
- Unknown

Cartographic information

Coordinate System: UTM Zone 30N Grid North
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Contains data from CPAT

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE CPAT wrecks, intertidal and coastal sites

DRAWN	DATE	SCALE	SIZE
rebecca.ferreira	04/03/2020	1:200,000	@DIN A3

REV 01

Path: O:\Active Tenders\1888 - GoBe - Innogy Awel-y-Mor OWF\GIS\Draft Figures\AyM_MarineArchaeology_Figure_MXDs\AyM_MarineArchaeology_Fig9.mxd

9.5.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

804 The proposed assessment methodology for marine archaeology has incorporated the following guidance documents for marine archaeological and coastal developments:

- *Welsh National Marine Plan*, Welsh Government (2019);
- *Caring for Coastal Heritage*, Cadw: Welsh Historic Monuments (1999);
- Standard and Guidance for Historic Environment Desk-Based Assessment, Chartered Institute for Archaeologists (CIfA) (2014);
- *Historic Environment Guidance for Offshore Renewable Energy Sector*, Collaborative Offshore Wind Research into the Environment (COWRIE) (2007);
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy, COWRIE (2008);
- JNAPC Code of Practice for Seabed Development, Joint Nautical Archaeology Policy Committee (2006);
- Model Clauses for Archaeological Written Schemes of Investigation, Offshore Renewables Projects, The Crown Estate (2010); and
- Protocol for Archaeological Discoveries: Offshore Renewables Projects, The Crown Estate (2014).

805 Further, the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department for Energy and Climate Change, 2011a) and the NPS for Renewable Energy Infrastructure (EN-3) (Department for Energy and Climate Change, 2011b) contain planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to marine archaeology. NPS EN-1 and NPS EN-3 include guidance on which matters are to be considered in the assessment and highlight several factors relating to the determination of an application and in relation to mitigation. The assessment of the marine archaeological resource together with the mitigation measures adopted for the project consider all the relevant NPS EN-1 and EN-3 provisions.

806 The Scoping Report also considers the requirements for Scoping and EIA as outlined in the Welsh Marine Licence guidance in line with the Marine and Coastal Access Act 2009.

807 A site specific geophysical survey is planned for 2020 of the array area and preferred cable route (after it has been selected). The geophysical survey will be subject to an archaeological review. A project-specific Outline Written Scheme of Investigation (WSI) will be produced, which will present the final scope and specific methodologies for any upcoming geophysical and geotechnical surveys and investigations, which will be subject to archaeological review.

Potential project impacts

808 A range of potential impacts on marine archaeology receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF, based on the long term impact the development may have. The impacts that have been scoped in to the Awel y Môr OWF EIA are outlined in Table 69, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

809 Further, based on the baseline data currently available and the project description, a number of location specific impacts which may occur during the construction phase are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 70, together with a justification for scoping them out. Note that all known archaeological receptors, as well as anomalies of archaeological potential identified during subsequent survey work, will be assessed for archaeological significance and archaeological potential in the PEIR.

810 Where impacts on marine archaeological receptors identified within the scoping phase will be scoped out of the subsequent EIA, it will be demonstrated in the PEIR that the magnitude of effect is being reduced to the level of 'negligible' or 'none', based on the principles of proportionality in EIA. In such instances, the significance of the impact on archaeological receptors will be reduced to 'Not Significant' through the application of designed-in mitigation as further detailed below.

811 The methodology is to be agreed with the statutory advisors and a full scheme of archaeological mitigation would be implemented through the development and implementation of an Outline Written Scheme of Investigation (WSI) in order for the statutory advisors to be confident that due consideration and protection has been given throughout the EIA process.

TABLE 69 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR MARINE ARCHAEOLOGY

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
OPERATION			
9.5.1.	Total or partial loss of archaeological receptors during the operation and maintenance phase due to scour effects	Scour effects caused by (a) the presence of WTG and substation foundations, and (b) the exposure and replacement of inter-array and export cables or the use of cable protection measures (such as remedial cable burial), impacting archaeological receptors and exposing such material to natural, chemical or biological processes and causing or accelerating loss of the same.	Currently only general locations of known wrecks and obstructions are available, with the position and extent of the marine archaeological resources not yet established. Mitigation will include a review of the geophysical survey and monitoring data throughout the life of the project to gain a greater understanding of the archaeological resource and the long-term effect of the development. Identified features of value will be avoided through Archaeological Exclusion Zones (AEZ) and any unexpected finds will be reported through a project specific Protocol for Archaeological Discoveries (PAD).
9.5.2.	Total or partial loss of archaeological receptors during the operation and	Penetration and compression effects on seabed caused by corrective and preventative operation and maintenance activities (via jack-up vessels) leading to total or partial loss of	Currently only general locations of known wrecks and obstructions are available, with the position and extent of the marine archaeological resources not yet established. Mitigation will include a review of the geophysical survey and monitoring data throughout the life of the project to gain a greater understanding of the archaeological resource and the long-term

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	maintenance phase due to penetration and compression effects	archaeological receptors (material or contexts).	effect of the development. Identified features of value will be avoided through AEZ and any unexpected finds will be reported through a project specific PAD
DECOMMISSIONING			
9.5.3	Total or partial loss of archaeological receptors during the decommissioning phase due to the draw-down of sediments	Draw-down of sediment into voids left by removed turbine foundations leading to loss of sediment, destabilising archaeological sites and contexts, and exposing such material to natural, chemical or biological processes, and causing or accelerating loss of the same.	Currently only general locations of known wrecks and obstructions are available, with the position and extent of the marine archaeological resources not yet established. Mitigation will include a review of the geophysical survey and monitoring data throughout the life of the project to gain a greater understanding of the archaeological resource and the long-term effect of the development. Identified features of value will be avoided through AEZ and any unexpected finds will be reported through a project specific PAD.
9.5.4	Total or partial loss of archaeological receptors during the decommissioning	Penetration and compression effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial	Currently only general locations of known wrecks and obstructions are available, with the position and extent of the marine archaeological resources not yet established.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	phase due to penetration and compression effects	loss of archaeological receptors (material or contexts).	

TABLE 70 - IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR MARINE ARCHAEOLOGY

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
9.5.5.	Removal of sediment containing undisturbed archaeological contexts leading to total loss of the receptor during preparation of the seabed for WTGs and offshore substation foundations.	The designed-in mitigation measures as outlined 14117320.14117416.0 below will reduce the potential for impacts on marine archaeology receptors by demonstrating that the magnitude of effect on the receptors is being reduced to the level of 'negligible' or 'none' by primarily using avoidance supported by geophysical and geotechnical data assessments. The mitigation measures include: ▪ production of an Outline WSI which will include the planned archaeological works, archaeological methods and commitments; ▪ a review of relevant geophysical and geotechnical data within the whole development to ensure that receptors of archaeological potential are located; ▪ the establishment of Archaeological Exclusion Zones to avoid identified features of archaeological potential and assist micro-siting; and ▪ development of a project specific Protocol for PAD to support reporting unexpected finds during the life of the project.
9.5.6.	Intrusion of piling foundations disturbing archaeological contexts leading to a partial or total loss of the receptor.	The designed-in mitigation measures as outlined 0.0.0 below will reduce the potential for impacts on marine archaeology receptors by demonstrating that the magnitude of effect on the receptors is being reduced to the level of 'negligible' or 'none' by primarily using avoidance supported by geophysical and geotechnical data assessments.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		The mitigation measures include: ▪ production of an Outline WSI which will include the planned archaeological works, archaeological methods and commitments; ▪ a review of relevant geophysical and geotechnical data within the whole development to ensure that receptors of archaeological potential are located; ▪ the establishment of Archaeological Exclusion Zones to avoid identified features of archaeological potential and assist micro-siting; and ▪ development of a project specific Protocol for PAD to support reporting unexpected finds during the life of the project.
9.5.7.	Compression of stratigraphic contexts containing archaeological material from combined weight of foundation, transition piece, tower, and wind turbine.	The designed-in mitigation measures as outlined 0.0.0 below will reduce the potential for impacts on marine archaeology receptors by demonstrating that the magnitude of effect on the receptors is being reduced to the level of 'negligible' or 'none' by primarily using avoidance supported by geophysical and geotechnical data assessments. The mitigation measures include: ▪ production of an Outline WSI which will include the planned archaeological works, archaeological methods and commitments; ▪ a review of relevant geophysical and geotechnical data within the whole development to ensure that receptors of archaeological potential are located; ▪ the establishment of Archaeological Exclusion Zones to avoid identified features of archaeological potential and assist micro-siting; and

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		▪ development of a project specific Protocol for PAD to support reporting unexpected finds during the life of the project.
9.5.8.	Disturbance of sediment containing potential archaeological receptors (material and contexts) during inter-array and export cable laying operations.	The designed-in mitigation measures as outlined 0.0.0 below will reduce the potential for impacts on marine archaeology receptors by demonstrating that the magnitude of effect on the receptors is being reduced to the level of 'negligible' or 'none' by primarily using avoidance supported by geophysical and geotechnical data assessments. The mitigation measures include: ▪ production of an Outline WSI which will include the planned archaeological works, archaeological methods and commitments; ▪ a review of relevant geophysical and geotechnical data within the whole development to ensure that receptors of archaeological potential are located; ▪ the establishment of Archaeological Exclusion Zones to avoid identified features of archaeological potential and assist micro-siting; and ▪ development of a project specific Protocol for PAD to support reporting unexpected finds during the life of the project.
9.5.9.	Penetration and compression effects of jack-up legs and anchoring of construction vessels during turbine, sub-station or cable installation leading to total or partial loss of archaeological receptors.	The designed-in mitigation measures as outlined 14117320.14117416.0 below will reduce the potential for impacts on marine archaeology receptors by demonstrating that the magnitude of effect on the receptors is being reduced to the level of 'negligible' or 'none' by primarily using avoidance supported by geophysical and geotechnical data assessments. The mitigation measures include:

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		▪ production of an Outline WSI which will include the planned archaeological works, archaeological methods and commitments; ▪ a review of relevant geophysical and geotechnical data within the whole development to ensure that receptors of archaeological potential are located; ▪ the establishment of Archaeological Exclusion Zones to avoid identified features of archaeological potential and assist micro-siting; and ▪ development of a project specific Protocol for PAD to support reporting unexpected finds during the life of the project.

Mitigation measures adopted as part of the project

812 As part of the design process for Awel y Môr OWF, a number of designed-in measures are proposed to reduce the potential for impacts on marine archaeology receptors. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

813 Innogy is committed to implement these measures, together with various standard sectoral practices and procedures. It is therefore deemed that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped out as presented in Table 70.

814 Measures adopted as part of the project and in line with the Welsh National Marine Plan (2019) SOC General Policy 05 Historic assets, will include:

- An Outline Marine WSI will be developed at PEIR. The Marine WSI will include the implementation of a PAD;
- AEZs as outlined in the Outline WSI to protect any known and identified marine archaeological receptors;
- The possible re-routing of cables and amended foundation positions through micro-siting, where practicable, to avoid any identified archaeological receptors pre-construction, as detailed in an Outline WSI;
- Commitment to undertake a full archaeological review and assessment of all relevant geophysical and geotechnical data collected.

815 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

816 The project methodology for cumulative impact assessment is detailed in Chapter 4 Environmental Impact Assessment Approach and Methodology. In general, the impacts on known and identified archaeological receptors is deemed to be localised. However, cumulative scour and changes to seabed sediment transport over the long term and the effects, both negative and positive, on archaeological receptors will be assessed. The cumulative impact study will consider the effects upon a single receptor assessed alongside other proposed and foreseeable projects.

817 Offshore wind: The potential cumulative effects on marine archaeology will be assessed by taking any future planned offshore wind developments which may act cumulatively into account. For the purpose of this scoping report, it is proposed that any future planned offshore wind developments within a range of 50 km will be included. The following existing offshore wind farms (which are within50km of the project) form part of the baseline environment:

- Rhyl Flats Wind Farm and Export Cable Route;
- Gwynt y Mor Wind Farm and Export Cable Routes;
- North Hoyle Wind Farm and Export Cable Route;
- Burbo Bank Wind Farm and Export Cable Route;
- Burbo Bank Extension Wind Farm and Export Cable Route; and
- Walney Extension Export Cable Route.

818 The listed projects above have followed standard industry practice in consultation with the relevant curators which sought to avoid impacts on all marine archaeological receptors (sites and deposits) during the construction, operations and maintenance and decommissioning phases.

819 Cumulative effects will be considered for marine archaeology receptors, including paleoenvironmental features and deposits, maritime and aviation sites and materials. In-combination and cumulative impacts will include sediment disturbance alongside other offshore wind farms' export cables and seabed foundations, as well as the effects of jack-up vessel legs and anchoring of construction, operation and maintenance vessels. Cumulative impacts may expose marine archaeology receptors to natural, chemical or biological processes, causing or accelerating partial or total loss of the receptor.

820 Other activities: There is the potential for other activities to occur within the region surrounding the proposed Wind Farm Area to create potential cumulative impacts on archaeological receptors. As discussed above, the cumulative impacts of the proposed Wind Farm Area, Inter Array and ECR and other activities will utilise the relevant Environmental Statement documents to ensure that significant impacts on archaeological receptors will be mitigated effectively.

821 Other activities within 50 km to be considered include:

- Liverpool Bay Dredging Area; and
- Hilbre Swash Dredging Area.

9.5.6 Potential transboundary Impacts

822 With the border of the Irish Exclusive Economic Zone (EEZ) located just over 80 km away, and due to the localised nature of any potential impacts on marine archaeological receptors, transboundary impacts are unlikely to occur and therefore it is suggested that this impact will be scoped out from further consideration within the EIA as further detailed in the Chapter 4 Environmental Impact Assessment Approach and Methodology

9.5.7 Summary of next steps

823 The next steps to be undertaken ahead of the ES chapter submission for the marine archaeology topic are summarised below:

- Consultation with statutory advisors: Regular engagement will be established in order to ensure that the assessment proceeds according to the regulators' requirements;
- Full Baseline Assessment: A full marine archaeological desk-based study will aim to determine the marine archaeological potential of the development area and the importance of marine archaeology receptors, both known and as yet unknown;
- Full assessment of available marine geophysical and geotechnical survey data: An archaeological assessment will aim to identify marine archaeological receptors (deposits and material) and will assign a rating of archaeological potential. This will be based on a limited coverage survey during the application phase, with detailed coverage of the final design plan reviewed prior to construction;
- Full impact assessment: The EIA will include an assessment of significance of effects which will consider all aspects of the maximum design scenario in order to determine the impact on all marine archaeological receptors, both known and potential. It will also detail the built-in mitigation strategies and commitments;
- Production of an Outline WSI document: An outline WSI will be developed in order to detail all marine archaeology mitigation commitments and which will outline specific packages of work required in order to meet those commitments. The WSI will describe the roles and responsibilities of the applicant, statutory advisers and archaeological contractors, and set out the requirements for further surveys and monitoring to deliver all mitigation requirements.;

- Protocol for Archaeological Discoveries: The PAD will ensure the awareness of all managers and contractors undertaking offshore work, prior to or during construction, and throughout operational and decommissioning phases.

9.5.8 Further considerations for Consultees

i. Do you agree that all of the known marine archaeological receptors within the zone of influence have been identified and considered?

ii. Do you agree that all relevant sources of secondary data have been accessed for scoping and identified for use in the EIA?

iii. Do you agree that the designed-in mitigation commitments to undertake all necessary archaeological assessments reduces the impact on archaeological receptors which can therefore be scoped out ahead of the EIA?

iv. Is there any other baseline information that you feel should be considered?

9.6 Other Marine Users and Activities

9.6.1 Introduction

824 This Section of the Scoping Report identifies the existing offshore infrastructure and other users which are of relevance to the Awel y Môr OWF array area and offshore ECR search area. It describes the potential impacts from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on offshore infrastructure and other users and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

825 There are a number of topics related to offshore infrastructure and other users which are covered in other chapters of this Scoping Report. These chapters are:

- Section 9.1 - Commercial Fisheries;
- Section 9.2 - Shipping and Navigation;
- Section 9.3 - Military and Civil Aviation; and
- Section 10.9 - Socio-Economics and Tourism.

826 Other users considered in this chapter include:

- Offshore renewables;
- Oil and gas (gas storage);
- Carbon capture and storage;
- Power stations (Nuclear);
- Subsea cables and pipelines;
- Aggregate dredging;
- Licensed disposal sites;
- MOD activities (note that military aviation is also covered in Section 9.3 Military and Civil Aviation);
- Recreational activities (note that recreational boating is also covered in Section 9.2 Shipping and Navigation); and
- Angling – including chartered anglers (note that commercial fishing is also covered in Section 9.1 Commercial Fisheries).

9.6.2 Study Area

827 For the purposes of this infrastructure and other users scoping assessment, the Study Area has been defined as the area encompassing the Awel y Môr array area and the ECR search area, together with a regional context. The regional approach has been used to establish the wide-ranging nature of recreational activities and angling and helps to evaluate the effects and the consequences of such uses being excluded and or displaced by the construction and operation of the wind farm.

828 The export cable route is yet to be determined; however, an offshore ECR search area within which options will be explored has been identified. The ECR search area has also been included in Figure 1.

829 The Study Area has been designed to include sufficient flexibility to accommodate and reflect further refinement during detailed design and will be reviewed and amended in response to feedback received through the scoping opinion, relevant discussions during the Evidence Plan process, as well as other relevant consultation processes, including the PEIR or design refinement to the array or ECR options following identification of, for example, additional constraints (environmental and/ or engineering).

9.6.3 Baseline data

830 An initial desk-based review of available data sources was undertaken to identify other users and existing infrastructure within the Study Area. A large amount of contextual information with regards the other marine users and fixed infrastructure within the Study Area is already available, having been compiled for the scoping and EIA for Gwynt y Môr OWF (Npower Renewables, 2005). This has been supplemented by more contemporary licence data. Additional data sources are provided in Table 71.

TABLE 71 - DATA SOURCES FOR INFRASTRUCTURE AND OTHER USERS

TOPIC	DATA SOURCE AND SUMMARY	COVERAGE OF AWEL Y MÔR AREA AND OFFSHORE ECR SEARCH AREA
Offshore renewables	The Crown Estate offshore wind leasing sites - Rounds 1-4	Full coverage of all licensed activity
Oil and gas	Oil and Gas Authority interactive map of all offshore oil and gas activity (surface and sub-surface).	Full coverage of all licensed activity
CCS and natural gas storage	The Crown Estate The UKs Storage Appraisal Project strategic study of the potential for UK carbon dioxide (CO_2) storage	Full coverage of all licensed activity
Offshore cables and pipelines	Kingfisher Information Service – Cable Awareness (KIS-ORCA) displays used and abandoned cables and pipeline routes.	Full coverage of all licensed activity
Disposal sites	Cefas – GIS Shapefile of Disposal Sites	Full coverage of all licensed activity
Marine aggregate extraction	The Crown Estate Aggregate Licence Area Charts BMAPA dredger reports	Full coverage of all licensed activity
MOD	Ocean Wise marine themes – PEXA Charts	Full coverage
Recreational activities	UK Atlas of Recreational Boating SeaSearch	Full coverage

831 As part of the EIA, the Applicant will undertake consultation with relevant developers, operators and marine users within the vicinity of the Awel y Môr OWF Study Area to ascertain any planned developments and concerns relating to the project. In addition, it is envisaged that consultation with The Crown Estate, as well as other licensing authorities will identify any future developments planned within the Study Area.

9.6.4 Baseline environment

Offshore renewable developments

Offshore wind farms

832 There are a number of operational wind farms within the Irish Sea region with a combined total capacity of 2,731MW. The closest sites are Gwynt y Môr OWF, North Hoyle OWF, Rhyl Flats OWF and Burbo Bank and extension OWF, shown on Figure 67 and Table 72. In addition, there are six additional OWFs in the Irish Sea Region situated more than 30km away (Table 72). There is no spatial overlap of other OWFs with the Awel y Môr array area, but Rhyl Flats OWF lies within the outer boundary of the ECR search area although it is specifically excluded from the search area as a "cut-out" area. The export cables for all four closest existing OWFs transect the ECR search area as they connect to the coast.

833 Four bidding areas for leasing under the Crown Estate Round 4 were released in September 2019. The North Wales and Irish Sea Bidding Area comprises the North Wales and Irish Sea region, and the northern part of the Anglesey region and covers an area of approximately 8500km^2. Consideration will need to be given to any projects taken forward within the timescales of the EIA for Awel y Môr OWF.

834 The vessel traffic associated with operation and maintenance of these OWFs is described in Section 9.2 Shipping and Navigation.

TABLE 72 - OPERATIONAL WIND FARMS IN THE IRISH SEA REGION

OFFSHORE WIND FARM	CAPACITY MW	OPERATOR	DISTANCE FROM AWEL Y MÔR
Gwynt y Môr	576	Innogy	Adjacent to the boundary of the array
Rhyl Flats	90	Innogy	5 km
North Hoyle	60	RWE npower renewables	11 km
Burbo Bank	90	Ørsted	26 km
Burbo Bank extension	259	Ørsted	16 km
Barrow	90	Ørsted	58 km
West of Duddon Sands	389	Ørsted	51 km
Walney 1	184	Ørsted	58 km
Walney 2	184	Ørsted	61 km
Walney Extension (3 & 4)	659	Ørsted	57 km
Ormonde	150	Vattenfall	65 km

Wave and tidal

835 In addition to OWFs, there are a number of wave and tidal renewable projects and demonstration zones operational along the North Wales coastline.

836 There are three main schemes in North Wales at various stages of design and development. The West Anglesey Tidal Demonstration Zone, known as Morlais and leased to Menter Môn, is located around Holy Island to the west with associated cables and substation inshore near South Stack. This is outside of the Awel y Môr array and ECR search area.

837 The Minesto Deep Green tidal project is a commercial scale demonstration site, commissioned in 2018 with a 10 MW array that operates at 20 m below the surface. It is located within the Holyhead Deep site, approximately 8 km off Anglesey, well outside of the Awel y Môr array and ECR search area.

838 North Wales Tidal Energy through their proposed North Wales Tidal Lagoon, have identified an area of interest that stretches 30 km from Llandudno to Prestatyn with the exact location of the proposed sea wall under research. The project overlaps with the ECR search area for Awel y Môr but is still under development with funding required to validate the viability of the project. A second project that falls within the ECR search area was considered by Tidal Lagoon Power, who identified opportunities for a project in Colwyn Bay. Feasibility and engagement work was commenced but has since stalled.

Oil and gas infrastructure

839 There are a number of offshore oil and gas fields present in the region. The Liverpool Bay Development, currently operated by ENI UK Limited comprises four oil and gas fields located in the Irish Sea blocks 110/13 and 110/15, supported by numerous offshore and onshore facilities for extracting, transporting and processing reserves.

840 The Liverpool Bay fields and infrastructure (surface and subsurface) lie to the north east of the Study Area, the closest assets within the current licence block is a wellhead located approximately 1.5 km from Awel y Môr within the boundary of Gwynt y Môr OWF. New blocks awarded under the most recent licensing rounds, 31st round, are to the north of the array within the central Irish Sea. There is no overlap of the Awel y Môr array and ECR search area with existing or provisional licences blocks, or wells (live or abandoned).

841 Offshore operations are centred on the Douglas complex – a three-platform facility that monitors and controls the development's three unmanned satellite platforms at Lennox, Hamilton and Hamilton North. Oil and gas from all four fields are received at Douglas (approximately 5.5 km to the north east of the Study Area), gas extracted from Hamilton and Hamilton North is transported by a pipeline to a gas processing terminal at Point of Ayr on the North Wales coast. The pipeline runs south intersecting the Gwynt y Môr array before running east towards the coast, shown in Figure 67. The ECR search area has been designed to avoid any spatial overlap with the pipeline with further information provided in Chapter 5: Site Selection.

842 The Douglas platform, together with the satellite platforms of Lennox, Hamilton and Hamilton North are protected by a 500m shipping exclusion zone, monitored by radar and patrolled 24 hours a day, by one of the development's three support vessels.

843 The shipping and aviation traffic associated with the oil and gas industry is discussed in Sections 9.2 and 9.3 respectively.

844 A number of developers for oil and gas may have a requirement to undertake seismic surveys, to identify sub surface geological structures that might hold reserves of oil and gas and to further site investigation.

845 Subsea noise generated by piling activities during the construction phase of Awel y Môr OWF has the potential to interfere with the seismic acoustic signal while the presence of the project during construction, operation and decommissioning phases may interfere with the conduct of planned seismic surveys.

846 The HRA undertaken for the offshore oil and gas licensing 31st seaward round (BEIS, 2019) noted that none of the indicative work programmes for the Irish Sea region included the option to conduct 3D seismic survey, with activity restricted to drilling and well evaluation (e.g. site survey, vertical seismic profiling, rig and vessel movement, possible conductor piling).

Gas storage project

847 An Agreement for Lease with the Crown Estate has been awarded for the Gateway Gas Storage Facility, that covers offshore rights in the east Irish Sea for the development of a 1.5 billion cubic metres (bcm) salt cavern gas storage facility. It is proposed that natural gas is stored in artificially created salt caverns, connected to the shore at Barrow-in-Furness via pipeline.

848 No development activities have taken place to date and the project is located within the east Irish Sea with no spatial overlap with Awel y Môr OWF array or ECR search area.

Carbon capture and storage

849 As part of the UKs Storage Appraisal Project (UKSAP), a strategic study (Pale Blue Dot Energy, 2016) of the potential for UK carbon dioxide (CO_2) storage was undertaken which examined the potential for storage in UK waters. A number of sites were identified as having potential, with five taken forward across the UK, including the Hamilton depleted gas field in the Irish Sea, which lies approximately 7.5 nm to the north east of the Study Area. This site was identified as having potential over a 25 year period, to accommodate the injection of 125MT of CO_2.The Hamilton reservoir is configured in a faulted structure around 2.5 km across, 10 km long and a crest 700m below sea level. The existing plans propose no re-use of the Hamilton gas field infrastructure to allow decommissioning of the site. Modelling undertaken to date suggests two active injection wells would be required, which would be in the western section. It would be connected to Connah's Quay Beach Head with a new 26km pipeline.

850 The next steps for the CO_2 storage project within the Hamilton gas field were identified as the acquisition of new 3D seismic data, potentially undertaken during 2020 in the early part of the FEED programme to support the development of well placement and also serve as a baseline survey for site monitoring (Pale Blue Dot Energy, 2016). A final investment decision could follow in late 2022 with construction starting in late 2023 leading to first injection in mid-2026.

851 There is no overlap with the Awel y Môr OWF array or ECR search area, however further consultation with developers will, if required, be undertaken to identify the scope and timings of any seismic surveys being undertaken and the location of any new infrastructure.

852 The North and South Morecambe fields were also identified in the UKSAP study but were not recommended as part of the initial five sites portfolio to be progressed. Both fields are located in the East Irish Sea, approximately 40 km north of the Hamilton site with no overlap with the Awel y Môr Study Area.

Nuclear power station

853 Three nuclear power stations border the Irish Sea; Heysham in Morecambe, Sellafield and Calder Hey on the Cumbrian coast. There is no overlap with any infrastructure, offshore or onshore within the Study Area, Heysham being the closest at over 77 km away. There will be no interaction with any infrastructure that could result in impacts on or from these facilities.

854 The Wylfa nuclear facility located on Anglesey ceased generation in 2015 and is currently being decommissioned. A Development Consent Order (DCO) was submitted in June 2018 for the new Wylfa Newydd site, located adjacent to the former power station by Horizon Nuclear Power. The project components include a power station including two nuclear reactors, a marine offloading facility, cooling water intake and outfall structure and associated onsite infrastructure. In January 2019 work was suspended following difficulties reaching an agreement on the financing and associated commercial agreement. Planning permission was deferred in October 2019.

Subsea cables and pipelines

855 There are numerous active cables intersecting the southern and eastern parts of the Irish Sea region. Existing cable infrastructure lies outside of the array boundary but overlap occurs within the ECR search area. Consultation will be undertaken with the operators of all infrastructure to identify any safety zones and potential for interaction.

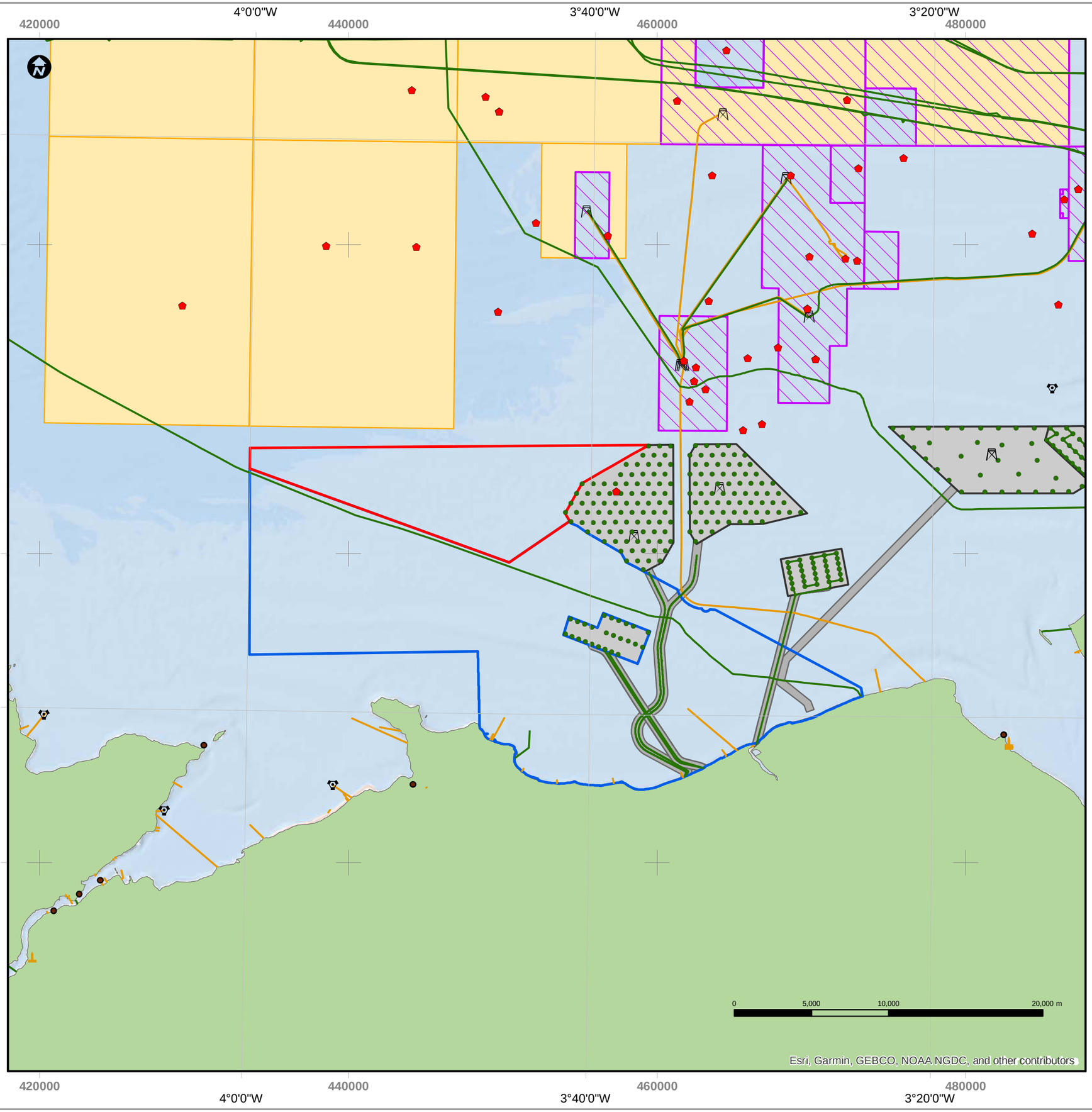
856 There is overlap with the ECR search area and the main export cables from the following OWFs: Gwynt y Môr, Rhyl Flats, North Hoyle and Burbo Bank and extension which run south, landing at various points along the North Wales coast.

857 The Eirgrid East-West Interconnector shown in Figure 67 connects Arklow, County Dublin in Ireland to Prestatyn, Wales. It runs parallel to the south-western boundary of the Awel y Môr array but is outside of the array and intersects the ECR search area.

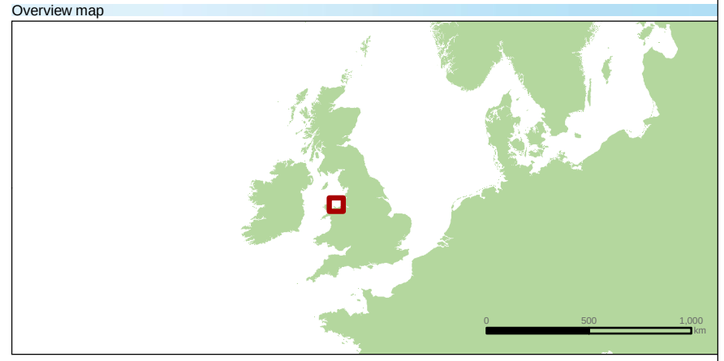
858 Gas pipelines run from the offshore fields in Liverpool Bay to the Point of Ayr (Flintshire) and from the Morecambe Bay gas fields to Walney, both of which lie immediately adjacent to the ECR search area.

859 A number of sewage outfall pipelines extend out from the coast into the ECR search area, including a 4 km outfall pipe from Kinmel Bay Sewage Treatment Works, shown in Figure 67. An outfall pipe is also located at the Pensarn Sewage Pumping Station near Abergele.

860 Further north, outside of the array and ECR search area, there are live telecommunications cables that run across Morecambe Bay from Blackpool and Haverigg Point to the Isle of Man.



Overview map



Legend

- Array Area
- OWF Export Cable DCO
- Offshore Wind Farm
- Current Oil and Gas Licence Block
- Oil and Gas 31st Round Provisional Awards
- Diffuser
- Harbour facility
- Offshore platform
- Pile
- Offshore turbine
- Wellhead
- Cable
- Pipeline

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Marine Themes data from Oceanwise,
Wind Farm data from The Crown Estate

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT
Offshore Windpark
Awel y Môr

TITLE
Energy infrastructure within the Awel y Môr Study Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:250,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Other Users\AyM_0119_Other_Users_Fig1_Energy_Infrastructure.mxd

Aggregate dredging

861 Extensive sand and gravel extraction operations have taken place in Liverpool Bay since 1959. Currently, there are three licenced production areas, shown in Figure 68, none of which overlap with the array or ECR search area:

- Area 457: operated by Westminster Gravels Ltd;
- Area 392: operated by Tarmac Marine Ltd; and
- Area 393: operated by Northwest Sands and Ballast Company.

862 Consultation will be undertaken with the operators to determine impacts on vessel routeing to the landing ports at the Liverpool wharves and Penrhyn, which will be captured within the Shipping and Navigation assessment (see Section 9.2). There are currently no application areas for mineral extraction within the North West region.

Dumping / disposal sites

863 Historically, significant quantities of material have been disposed in Liverpool Bay. Material from the Mersey Docks has been deposited in the Mersey Estuary since 1825 and in Liverpool Bay since 1874. Dredged material is at present the major material disposed of in the Irish Sea. The amount disposed each year can vary significantly depending on the requirements associated with harbour and marine dredging from the Liverpool and Birkenhead docks and the approach channel to the river Mersey.

864 The main open sites are Site Y (IS150) and Site Z (IS140) as shown on Figure 68, with no direct overlap with the array or ECR search area. The very eastern boundary of the array overlaps with the closed Liverpool Bay (sludge) B which received sewage sludge and industrial waste. Licensed disposal sites for Burbo Bank extension and Gwynt y Môr are now closed, no overlap occurs with the array or ECR search area.

Military areas

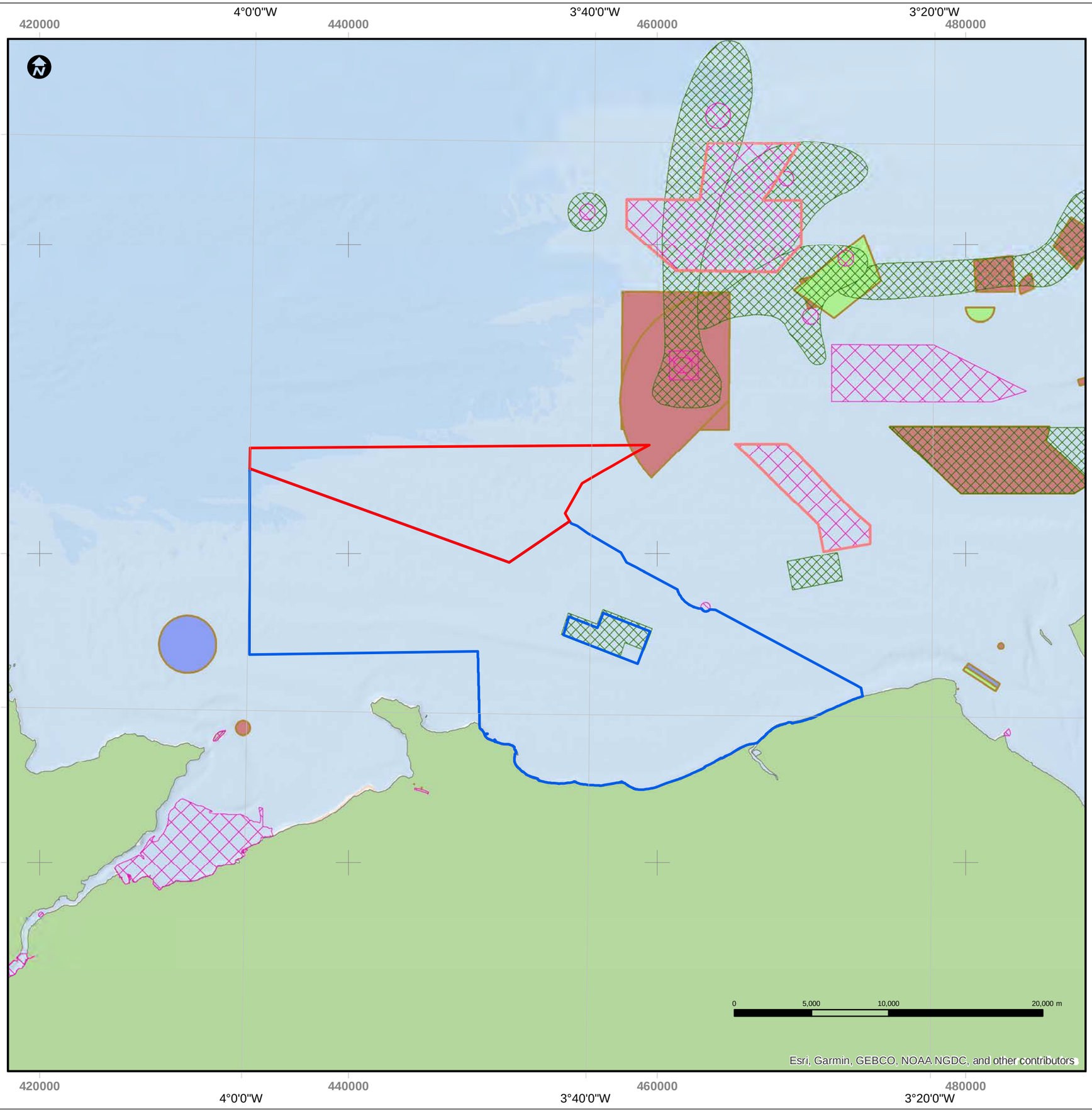
Ministry of Defence Activities

865 A summary of MOD activities is presented in this section. Further information is provided in Section 9.3 Military and Civil Aviation. The nearest military aviation installation is located at BAE Warton, with radar installations in the region located at Walton and St Annes, both of which are over 50km from the Study Area.

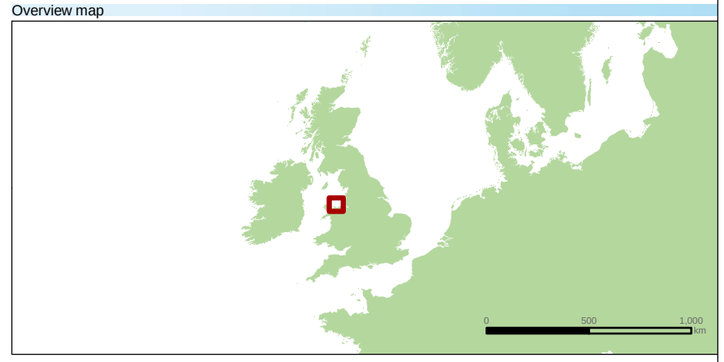
866 There is no overlap with known practice and exercise areas (PEXA) and the Study Area. There are no navy or air force exercise areas in the Liverpool Bay area. There is a single army exercise area, X5306 at Altcar, used for grenade and rifle firing, this lies to the east of the Study Area, approximately 33 km from the array. Military low flying aircraft are covered in Section 9.3: Military and Civil Aviation.

Unexploded Ordnance

867 The possibility of unexploded ordnance (UXO) and munitions in the marine environment generally arises from a number of sources including German WWII air raids, wrecks of armed vessels sunk during conflict, WWII defensive sea minefields, military ranges and munitions dumping areas. Confirmed munitions have been encountered as part of construction of the Gwynt y Môr OWF, hence it is considered that there is potential for UXO to be encountered on the seabed in the Awel y Môr Study Area.



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Aggregate Area
- Open Disposal Site
- Closed Disposal Site
- Disused Disposal Site
- Offshore production area
- Restricted area

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Marine Themes data from Oceanwise, Disposal Sites data from CEFAS, Aggregates data from The Crown Estate

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT
Offshore Windpark
Awel y Môr

TITLE
Aggregate extraction and disposal sites within the Awel y Môr Study Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:250,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Other Users\AyM_0119_Other_Users_Fig2_Aggregate_Extraction_and_Disposal.mxd

Recreational activities

Watersports

868 Recreational watersports in the area include canoeing, kayaking, sail-boarding and personal watercraft, all of which are limited to a few places close inshore and within the estuaries given the strong tides that prevail. The studies undertaken in support of Section 9.2 Shipping and Navigation, observed that recreational traffic was most prominent within the south west within Conwy Bay and in the vicinity of the mouth of the Menai Straits and off Liverpool.

869 The Irish Sea is a popular recreational boating area with routes from between points on the English, Welsh, Scottish and Irish coats as well as to and from the Isle of Man. The RYA atlas (RYA, 2019) identifies low intensity routes across the Irish Sea, transecting the Study Area and medium intensity routes closer inshore off Rhyl and extending from the mouths of the Dee and Mersey Estuaries.

870 General sailing takes place to varying distances off all yachting ports and marinas in the area, constrained only by the necessity to return on the same tide or to wait for the next tide. Such sailing is particularly common on the Solway, off the coasts of Lancashire, Wirral and North Wales and is not confined to the Study Area. Consideration will be given in the EIA to the latest iterations of the RYA UK Coastal Atlas of Recreational Boating (RYA, 2019) and recreational vessels will be captured through consultation with recreational stakeholders as per guidance in the MCA's Marine Guidance Note (MGN) 543 to identify any recreational vessels not required to broadcast via AIS.

871 Cruiser day-sailing occurs around the whole coast out to 24 km or more offshore. Cruising routes identified by the RYA (RYA, 2019) show traffic between the Scottish coast and North Wales coast and there is an increasing amount of traffic between the Mersey / Ribble estuaries and the Isle of Man. However, the majority of interarea routes tend to follow the coastline.

872 Yacht racing, principally by dinghies and smaller craft, takes place in estuaries including the Dee and Mersey in suitable weather and tide conditions. There are offshore yacht races organised from most of the larger yacht clubs on the main-land coast (Conwy, Liverpool, Preston, Heysham, Whitehaven and Maryport) to Ireland, the Isle of Man and Anglesey. There are Tall Ship races out of the Mersey to anywhere in the world.

873 There are a number of small quays from which pleasure craft sail and also numerous sailing clubs along the Flintshire-Denbighshire-Conwy coastline, among other smaller centres, Conwy Harbour supports over 400 leisure craft moorings and pontoons indicating that yachting and pleasure boating are well established pastimes within the North Wales area. Liverpool hosts the Liverpool Yacht Club and mostly covered by the Liverpool Bay Sailing Association.

Diving

874 There are a number of dive wreck sites within the Study Area but dive activity in the area is of relatively low intensity in comparison with the wider area. Sea diving in the area tends to be around Anglesey as shown in Figure 69 or further offshore centred around wreck sites. Liverpool Bay itself has strong currents that make diving offshore problematic and poor visibility on all but the deepest sites.

Waterfront Leisure Activities

875 The North Wales coastline offers an almost continuous accessible beach stretching from Rhos Point to the Point of Ayr near Mostyn, including well developed sand dunes with local nature reserve designation between the Point of Ayr and Prestatyn. There are also a number of leisure developments along the beach front, such as the Prestatyn Nova Centre, the Rhyl Sun Centre and the Rhyl SeaQuarium.

Recreational fishing (including commercial charter boat operators)

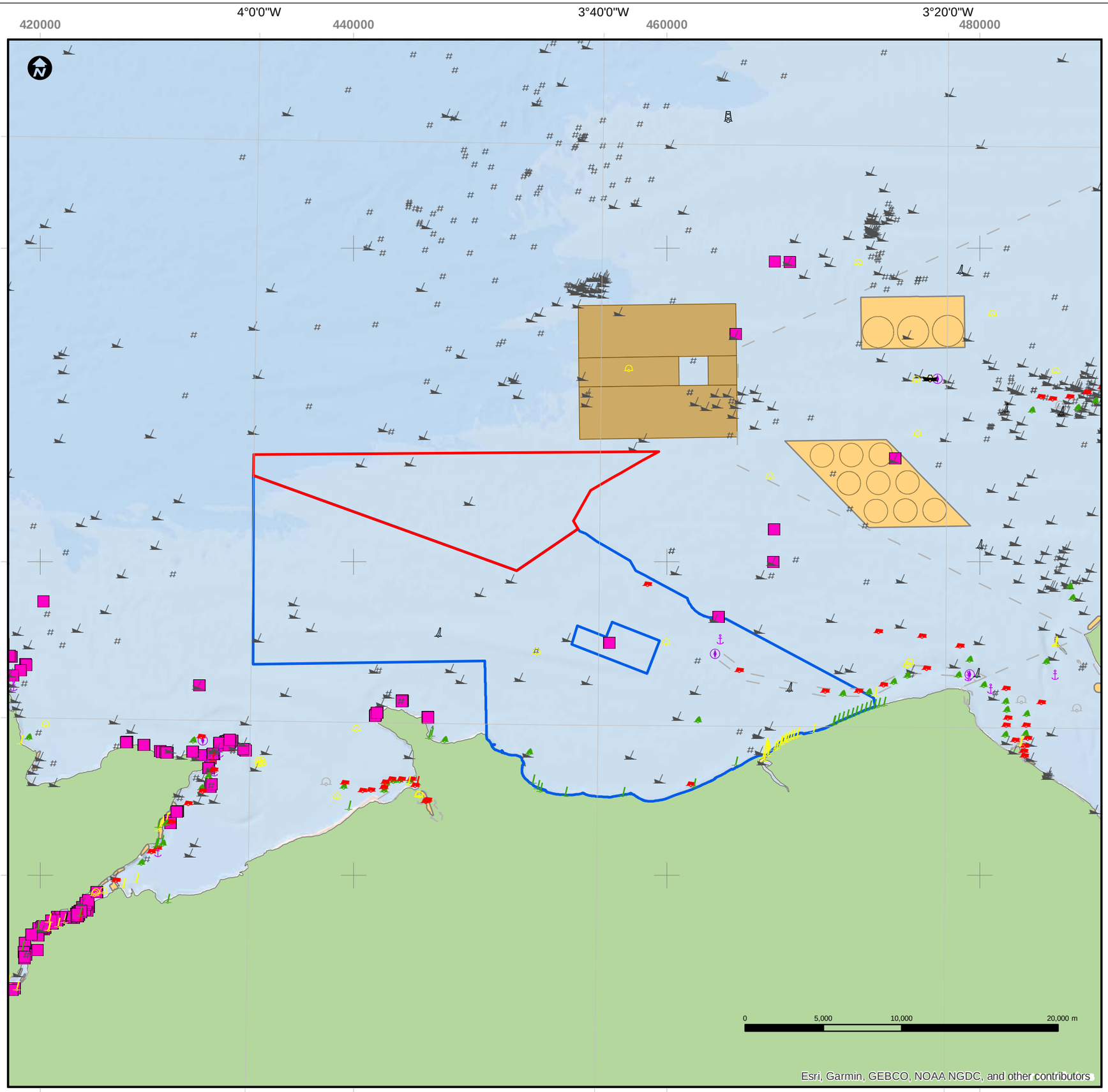
876 Recreational fishing in the area includes shore anglers, private boat anglers and commercial charter boat operators. Private boat angling is widespread across Liverpool Bay but centres on or around launch sites, moorings and marinas. Private boat angling tends to be trailer launched with boat owners using moorings, marinas and harbour facilities that enable quick launching and safe storage during the months of more frequent fishing activity. The smaller boats used by private owners generally operate up to 3-5 km offshore, with little overlap with the Study Area.

877 Commercial charter boats are vessels that can be hired by recreational anglers for fishing trips. These vessels are larger than privately owned angling boats, and operate at a greater distance offshore, typically up to 16-20 km from their operational bases and sometimes further afield. There are a number of registered charter companies in North Wales, including those that operate out of the Anglesey ports of Holyhead, Beaumaris and Amlwch the Gwynedd ports of Conwy, Porthmadog, Colwyn Bay and Rhyl. There are also a number of charter companies operating out of the Dee and Mersey.

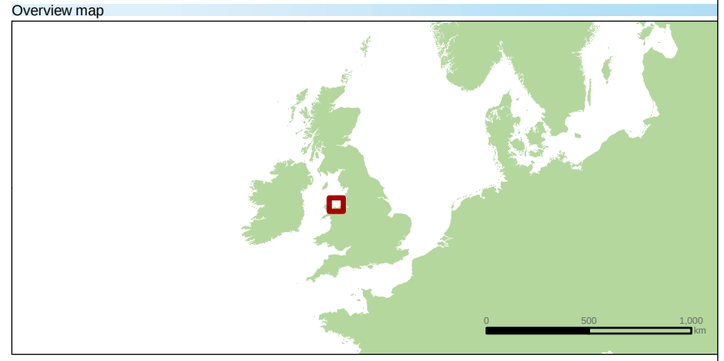
878 Consultation undertaken for the Gwynt y Môr OWF identified fishing "marks" (wrecks and rocky outcrops) between Puffin Island, Anglesey, and the more central part of Gwynt y Môr OWF site. The marks that different vessels fish is governed by the distance from their home port, tidal and weather conditions, and the type of fish that the anglers wish to catch.

879 The main fishing season for both private and commercial angling vessels in Liverpool Bay typically runs from Easter to September and October. Monkman *et al.,* (2015) mapped fishing activity of sea anglers in Welsh waters and identified that charter boats operating from the North Wales coastal resorts primarily target mackerel, smooth hound, tope and rays during the summer, although they will switch to smaller species, such as the flatfishes, whiting and gurnard according to client experience, competence and preference. Some vessels will also target cod, pollack and conger eel on deep water wrecks, with those targeted by specialist charters tending to be outside the 12 km limit to increase fish quantity and quality landed.

880 During winter, fishing will be primarily for dabs and whiting, and some codling. Overall winter effort will be much reduced due to weather although some skippers relocate to the Mersey estuary, both for the better cod fishing and the increased boat days afforded by the shelter of the estuary itself from the prevailing south westerly winds.



Overview map



Legend

- Array Area
- Offshore Export Cable Route Search Area
- Obstruction
- Wreck
- Dive Site
- Anchor berth
- Anchorage area
- Harbour area (admin)
- Traffic separation
- Beacon, Cardinal
- Beacon, Lateral, Port
- Beacon, Lateral, Starboard
- Beacon, Special purpose/general
- Buoy, Cardinal
- Buoy, Installation
- Buoy, Lateral, Port
- Buoy, Lateral, Starboard
- Buoy, Safe water
- Buoy, Special purpose/general
- Light float

Cartographic information

Coordinate System: UTM Zone 30
Map Datum: WGS84

NOT TO BE USED FOR NAVIGATION

Map information

Marine Themes data from Oceanwise, Disposal Sites data from CEFAS, Aggregates data from The Crown Estate

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel y Môr**

TITLE Recreational activity around the Awel y Môr Study Area

DRAWN	DATE	SCALE	SIZE
BenBlakeman	05/03/2020	1:250,000	@DIN A3

REV 01

Path: G:\GIS\GIS_Projects\0119 GyM Scoping\GIS\Figures\Scoping\Other Users\AyM_0119_Other_Users_Fig3_Recreational_Activity.mxd

9.6.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

881 The assessment of potential impacts has been undertaken using the same principles as are used in a full impact assessment and indicates that a number of impacts to other marine users do not require assessment within the full EIA. Further details are provided within Chapter 4: Approach to EIA.

882 As part of the assessment of other users and infrastructure within the EIA, a comprehensive desk study and consultation with operators and licensing bodies will establish the current status of known and planned infrastructure and other users within the Study Area. Existing and planned licences will be identified and a timeline for future activities associated with existing or planned infrastructure will be established.

Potential project impacts

883 The potential impacts for infrastructure and other marine users across the Awel y Môr OWF Study Area are described in Table 73.

884 Construction works such as the installation of cables or wind turbine foundations have the potential to impact on other marine infrastructure and users within the construction footprint. The presence of increased vessel numbers during construction may also impact on other marine users.

885 Based on the datasets on existing and planned infrastructure currently available and the project description, a number of impacts are proposed to be scoped out of the EIA for this topic (see Table 74). As there is no spatial overlap of infrastructure at the present time the following aspects are proposed to be scoped out of any further consideration: carbon capture and storage, nuclear sites, aggregate dredging and disposal sites. These impacts are described in Table 74, together with a justification for scoping them out.

TABLE 73 - IMPACTS PROPOSED TO BE SCOPED INTO THE ASSESSMENT FOR INFRASTRUCTURE OR OTHER USERS

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
9.7.1	Impacts on other offshore windfarms	The impact of construction activities such as potential for physical disruption or damage within the construction footprint of the export cable.	Awel y Môr offshore ECR search area: The potential for impact arises from the spatial overlap within the ECR search area with the export cables from the Rhyl Flats OWF, Gwynt y Môr OWF, Rhyl Flats OWF, North Hoyle OWF and Burbo Bank and extension OWFs. Owners and operators of all infrastructure will be consulted and where appropriate legal agreements will be put in place to mitigate any impact on existing cable infrastructure.
9.7.2	Potential impacts on non-OWF cables and pipelines	The impact of construction activities of the export cable has the potential to damage the existing non-OWF cable and pipeline infrastructure.	Awel y Môr offshore ECR search area: There is potential for the proposed cable corridor to cross the East West interconnector that runs along the southwestern boundary of the array and crosses the existing export cables for Gwynt y Môr, North Hoyle and Burbo Bank. Other pipelines (such as the Pensarn Sewage Pumping Station outfall) also have the potential for interaction depending upon the landfall location and ECR selected. All owners and operators will be consulted and where appropriate legal agreements will be put in place to mitigate any impacts from construction or maintenance activities arising.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.7.3	Direct effects on carbon capture projects/ features /infrastructure assets	The impact of construction activities of the export cable has the potential to interact with any proposed new cable infrastructure.	The potential for carbon capture and storage at the Hamilton field to the north of the array is currently pending a final investment decision with the potential for construction starting in late 2023 leading to first injection in mid-2026. The existing plans propose two injection wells with a connection to Connah's Quay Beach Head via a new 26 km pipeline, the route of which is currently unknown. Consultation with the developers will be undertaken as part of the EIA process to establish the potential for impact on the infrastructure required to support this project during construction of the array and cable installation.
9.7.4	Potential impact on recreational watersports users	The impact of construction activities and the physical presence of the turbines has the potential to displace or exclude recreational users for the area.	The activity of recreational vessels (together with all other vessels) within the project area during the construction and decommissioning phases will be restricted by the imposition of safety zones, this could result for example in recreational vessels taking alternative routes when transiting between North Wales and Liverpool or areas further north. Therefore, the potential for displacement and exclusion of recreational craft will be considered within in the EIA. Given the presence of cruising routes through the array and ECR search area, the potential impact on navigational safety will be fully assessed within a Navigational Risk Assessment (See Section 9.2).

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			The distance from the shore means that recreational activities such as jet-skiing, windsurfing and dinghy sailing do not routinely occur within the array and so would not be affected by the construction activity on site, however during export cable installation, there is potential for disturbance to watersports as the cable vessel approaches the shore. Consultation with the RYA and other appropriate recreational stakeholders will be undertaken to ensure the analysis is reflective of all recreational activity within the boundaries of the array and ECR search area but also within the regional context to consider any impacts from displacement of activity. In addition to consultation with stakeholders, the most recent iteration of the RYA Coastal Atlas (RYA, 2019) will also be considered for both the array area and ECR search area. There is potential for construction activity of the turbines and cable installation to impact upon known dive marks through the presence of safety zones and exclusion of vessels. Dive sites within the area tend to target wrecks sites. A full assessment of wrecks of archaeological interest will be undertaken as detailed within Section 9.5: Archaeology and Cultural Heritage with exclusion zones established for all wreck sites to mitigate against any significant impact.
9.7.5	Potential impact on commercial and recreational angling	The impact of construction activities has the potential to	There is potential for impacts on the recreational and commercial angling community as a result of the noise disturbance and implementation of

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		disturb, displace or exclude angling from the area	safety zones during construction activities resulting in temporary exclusion or displacement from the area. Consultation will be undertaken to compile a comprehensive baseline of fishing activity in the vicinity of the proposed development, including the identification of popular marks and routes as a basis for the assessment to establish the presence of alternative sites within the wider Study Area. As for recreational boating, during the EIA process, the Applicant will engage with the angling community on all issues pertaining to the construction and operation of the OWF. Issues pertaining to the fish and shellfish ecology are covered in Section 8.2: Fish and Shellfish Resources.
OPERATION			
9.7.6	Potential impacts on cables	Potential for impact from maintenance vessels	The Applicant will liaise with the operators of other cables to agree legal agreements where cable crossings are required to ensure no impact on the security of cable infrastructure arise as a result of operational maintenance activities.
9.7.7	Impacts on recreational watersports users	The physical presence of turbines has the potential to displace	The presence of turbines within the array has the potential to displace or exclude recreational craft. During the EIA process, the Applicant will engage in consultation with the RYA on all issues regarding recreational boating and navigational safety and the movement of vessels within the turbine array during the operational phase of the development. Due regard

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		or exclude recreational craft	will be given to minimum rotor blade clearance heights to allow unrestricted movement of yachts and other craft through the area. The EIA will consider all mitigation measures relevant to recreational boating through establishing numerous safety parameters including a minimum turbine blade height and appropriate charting, marking and lighting requirements. Experience from the operation of OWFs shows that passage within and through the wind farm would still be feasible for recreational vessels and angling providing that all safety zones are in place and adhered to. Navigational safety concerns will be fully addressed with the shipping and navigation assessment (see Section 9.2). During the operational phase, divers will be permitted to target wreck sites (with due regard to any operational safety zones) and as such, the EIA will consider the potential for exclusion from the area during construction and decommissioning phase only but the presence of charter and private vessels will be considered within the Shipping and navigation assessment (see Section 9.2). Impacts of tourism are proposed to be dealt with in the EIA in a stand-alone tourism study (see Section 9.6.6 for further details).

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
9.7.8	Potential impact on commercial and recreational angling	Displacement or exclusion of angling from within the array	The presence of turbines within the array has the potential to displace or exclude anglers (commercial and recreational) from existing fishing marks. Wrecks (including those targeted by anglers) will be subject to archaeological exclusion areas and therefore will not be impacted by the presence of turbines. As such during the operational phase, anglers will be able to target wreck sites (with due regard to any operational safety zones). The EIA will consider the potential for exclusion from the area during construction and decommissioning phase only and the presence of charter and private vessels will also be considered within the Shipping and navigation assessment (see Section 9.2). Experience from the operation of OWFs shows that passage within and through the wind farm would still be feasible providing all safety zones are in place and adhered to.
DECOMMISSIONING			
	All receptors	Decommissioning activities will result in exclusion of the area by other users	Impacts upon infrastructure and other users during decommissioning are anticipated to be similar to those discussed during construction of the wind farm if the cable is removed from the seabed at the end of the development's life, with an incremental reduction of impact as individual wind turbines are removed from the site.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			If the cables are left in the seabed at the end of the proposed development, impacts will be the same as those described above for the operation phase. Impacts with other activities throughout all phases of the life of the project would be mitigated by planning and design.

TABLE 74 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR INFRASTRUCTURE AND OTHER USERS

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
9.7.9	Direct effects on other offshore wind farms from construction of the turbines and associated infrastructure within the array	Awel y Môr OWF array area: No impacts are anticipated, given the lack of spatial overlap with the array boundary, there is no pathway for impacts with other OWF developments. Increases in construction and maintenance vessel traffic will be assessed as part of the Navigation Risk Assessment within the EIA.
9.7.10	Direct impacts on oil and gas infrastructure (surface or subsurface) from construction activities such as increased vessel traffic and the potential for physical disruption or damage within the construction footprint.	Awel y Môr OWF array area: No impacts are anticipated within the array on current or future oil and gas activity as there is no spatial overlap with surface or subsurface infrastructure within existing blocks or the new 31st round of licences. Awel y Môr offshore ECR search area: though the process of site selection, the area of search has been designed to avoid any overlap with the existing oil and gas infrastructure, particularly the pipeline that connects the Hamilton fields to the north east of the array with the North Wales coastline at Point of Ayr. Increases in construction vessel traffic will be assessed as part of the Navigation Risk Assessment within Section 9.2. Any conflicts with aviation activities, including helicopter operations associated with the oil and gas industry will be addressed as part of the aviation and radar assessment.
9.7.11	Direct impacts on non OWF cables from construction activities such as increased vessel traffic and the potential for physical disruption or	Awel y Môr OWF array area: There is no spatial overlap with any existing cable infrastructure and the array, existing cables within Awel y Môr array area would be avoided when siting the turbines and associated infrastructure avoiding any spatial overlap.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
	damage within the construction footprint.	
9.7.12	Direct effects on nuclear cooling and intake systems	No existing or planned sites overlap with the Study Area.
9.7.13	Direct effects on aggregate sites	It is not anticipated that the construction of the proposed Awel-y-Môr Wind OWF would impact existing production or application areas for aggregate extraction given the lack of any spatial overlap. It is therefore proposed that this aspect is scoped out of the EIA. Impacts associated with the navigational safety of vessels transiting between offshore production areas and onshore facilities at Liverpool and Penrhyn during construction, activities will be assessed in the Shipping and Navigation Section 9.2.
9.7.14	Direct impacts on offshore disposal areas	There are no active licensed disposal sites located within or immediately adjacent to the Awel y Môr array or ECR search area.
9.7.15	Direct effects on military infrastructure or areas	No existing or planned sites overlap with the Study Area. Any conflicts with aviation activities will be addressed as part of the aviation and radar assessment: Section 9.3.
OPERATION		
9.7.16	Direct impacts on other OWF	Given the lack of spatial overlap with any infrastructure, the operation of Awel y Môr OWF will not impact on other OWFs.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		Impacts associated with the navigational safety of vessels transiting between offshore production areas and onshore facilities at Liverpool and Penrhyn during operation and maintenance activities will be assessed in the Shipping and Navigation Section 9.2.
9.7.17	Direct impacts on oil and gas infrastructure	Awel y Môr OWF array area: No impacts are anticipated within the array on current or future oil and gas activity as there is no spatial overlap with surface or subsurface infrastructure within existing blocks or the new 31st round of licences. Increases in operational maintenance vessel traffic will be assessed as part of the Navigation Risk Assessment within Section 9.2. Any conflicts with aviation activities, including helicopter operations associated with the oil and gas industry will be addressed as part of the aviation and radar assessment.
9.7.18	Direct impacts on cables	There is no spatial overlap with any existing cable infrastructure and the array, existing cables within Awel y Môr array area would be avoided when siting the turbines and associated infrastructure avoiding any spatial overlap.
9.7.19	Direct effects on nuclear cooling and intake systems	No existing or planned sites overlap with the Study Area.
9.7.20	Direct effects on aggregate sites	It is not anticipated that the operation of the proposed Awel-y-Môr Wind OWF would impact existing production or application areas for aggregate extraction given the lack of any spatial overlap.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		Impacts associated with the navigational safety of vessels transiting between offshore production areas and onshore facilities at Liverpool and Penrhyn during operation, activities will be assessed in the Shipping and Navigation Section 9.2.
9.7.21	Direct impacts on offshore disposal areas	There are no active licensed disposal sites located within or immediately adjacent to the Awel y Môr array or ECR search area.
9.7.22	Direct effects on military infrastructure or areas	No existing or planned sites overlap with the Study Area. Any conflicts with aviation activities will be addressed as part of the aviation and radar assessment: Section 9.3.

Mitigation measures adopted as part of the project

887 As part of the design process for Awel y Môr OWF, a number of designed-in measures are proposed to reduce the potential for impacts on infrastructure and other marine user receptors. These will evolve over the development process as the EIA progresses in response to consultation.

888 Where conflicts between Awel y Môr OWF and other infrastructure are identified, owners and operators will be consulted, and legal agreements for example crossing agreements will be put in place to mitigate against any effects.

889 Innogy is committed to implement these measures, in addition to a range of standard sectoral practices and procedures including the design and implementation of cable plans and navigational safety and vessel management plans. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 74.

890 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process

Potential cumulative impacts

891 Reference is made to the Chapter 4 EIA Methodology Chapter where a full description is provided detailing how potential cumulative effects will be assessed.

892 Offshore wind: The key cumulative impacts identified are likely to arise from exclusion during construction and through the physical presence of turbines within the area used by recreational users and commercial anglers, which will be considered further in the EIA. Any potential cumulative impacts on the navigational safety and displacement of recreational users will be assessed within the Navigation Risk Assessment

893 Other Users: Given that the impacts of the Awel y Môr OWF and ECR on infrastructure and other users would be largely dependent upon physical overlap, non-significant or mitigated to no impact after consultation with the relevant parties (i.e. through the development of crossing agreements or similar); it is unlikely that there would be pathways for cumulative or in-combination impacts. It is therefore proposed that these impacts are scoped out.

894 There is potential for cumulative effects on seismic surveys for other developments. Subsea noise generated by piling activities during the construction phase of Awel y Môr OWF has the potential to interfere with the seismic acoustic signal while the presence of the project during construction, operation and decommissioning phases may interfere with the conduct of planned seismic surveys and this will need assessing within the EIA.

Potential transboundary Impacts

895 Due to the localised nature of any potential impacts and mitigation options available, transboundary impacts are unlikely to occur on infrastructure or other users and therefore it is proposed that this impact will be scoped out from further consideration within the EIA.

9.6.6 Summary of next steps

896 The proposed approach to the assessment for other users and infrastructure chapter is to undertake a desk study during the EIA as part of which consultation will be undertaken with relevant stakeholders. Innogy will undertake consultation with all relevant offshore developers, operators and marine users to ascertain any concerns relating to the project.

897 Consultation with developers and regulating authorities will also identify the status and timing of any proposed or foreseeable new infrastructure or activities, which will be taken forward for assessment where there is overlap with the OWF.

898 It is proposed that a standalone chapter will be provided within the PEIR/ ES for all tourism aspects (i.e. both offshore and onshore) to ensure that a comprehensive assessment is undertaken. It is anticipated that this chapter will be prepared based on literature review, desk-based research, and consultation with relevant stakeholders within the study area. The study will include assessment of the potential tourism impacts identified in Table 2 of Section 10.9 Socio-economics and Tourism. The four main study areas which will be considered in the chapter will be:

- Direct onshore recreational effects;
- Direct offshore recreational;
- Indirect onshore and offshore recreational effects will be based on the Zone of Theoretical Visibility (ZTV) (see Section 9.4); and
- Effects on the tourism economy will focus on the primary land area within the ZTV.

9.6.7 Further considerations for consultees

i. Do you agree that the data sources identified are sufficient to inform the offshore infrastructure and other marine users baseline for the Awel y Môr OWF PEIR and ES?

ii. Do you agree that all planned infrastructure have been identified?

iii. Have all potential impacts resulting from Awel y Môr OWF been identified for infrastructure and other marine users receptors?

iv. Do you agree that the impacts described in Table 74 can be scoped out?

v. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on fixed infrastructure and other users receptors?

10 Onshore Environment

10.1 Terrestrial Ecology and Nature Conservation

10.1.1 Introduction

899 This Section of the Scoping Report identifies the important ecological features of relevance to the Awel y Môr OWF onshore ECR search area, including substation. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on terrestrial ecology (including intertidal birds) and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

900 Other ecological receptors which are covered in separate chapters are as follows:

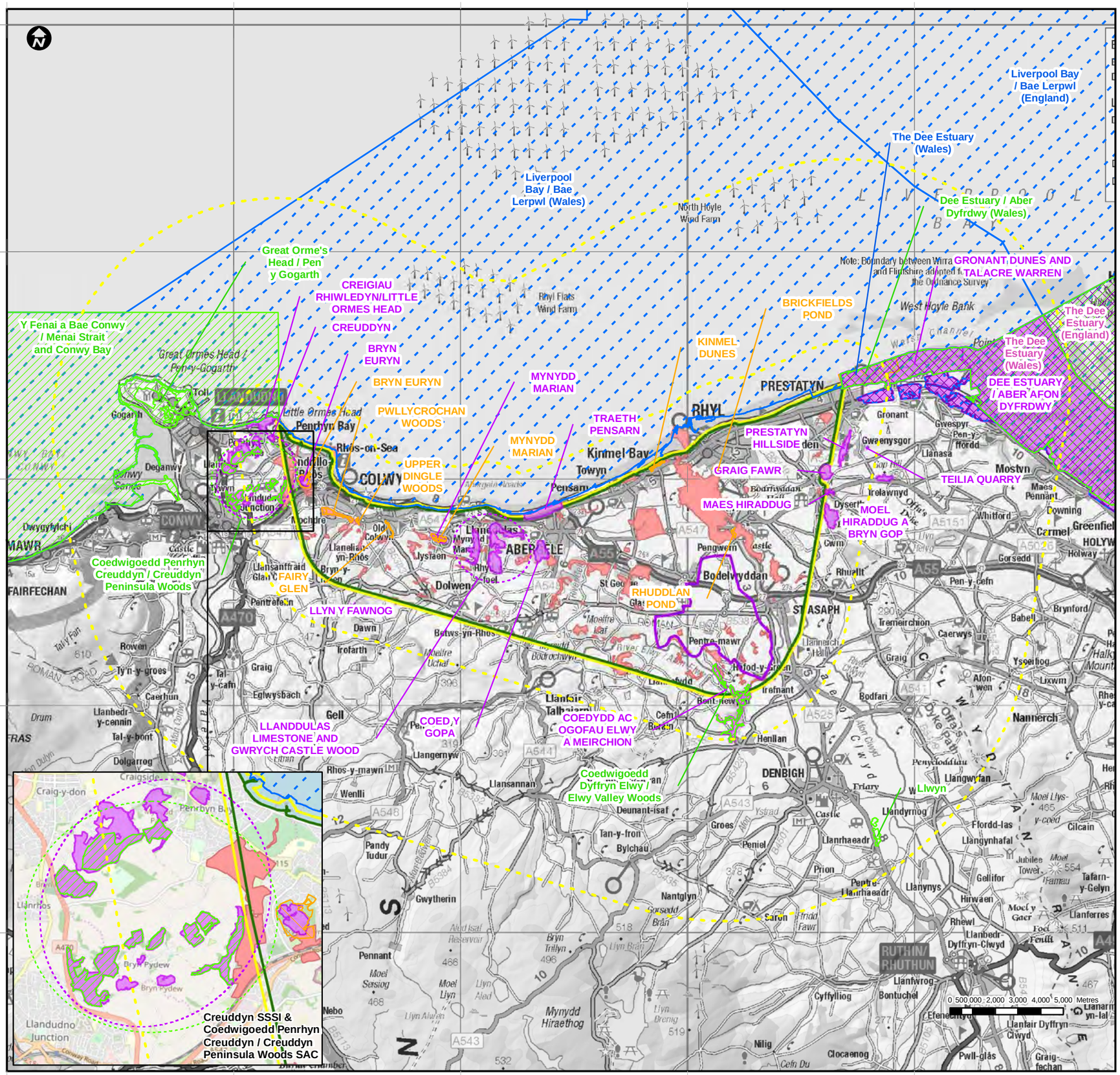
- Section 8.1 Benthic and Intertidal Ecology;
- Section 8.2 Fish and Shellfish Ecology;
- Section 8.3 Marine Mammals; and
- Section 8.4 Offshore Ornithology.

901 Effects upon geological SSSIs are covered in Section 10.7 Geology and Ground Conditions.

10.1.2 Study Area

902 The scoping Study Area for the Awel y Môr OWF terrestrial ecology and nature conservation topic area is defined as land within the onshore ECR search area, landward of Mean High Water Springs (MHWS). It also includes intertidal areas in respect of birds, plus intertidal and onshore elements of nationally designated sites (Sites of Species Scientific Interest (SSSI) and Local Nature Reserves (LNR) within 2km of the onshore ECR search area) and internationally designated sites (Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar Sites) within 10km (refer to Figure 70).

903 The Study Area will be reviewed and amended in responses, for the Preliminary Environmental Information Report (PEIR), to such matters as refinement of the onshore (and offshore) ECR and the identification of additional constraints (environmental and/ or engineering). This is expected to result in a significant reduction in the size of the Study Area as it is refined to more closely follow the route of the preferred onshore ECR, and preferred locations for the landfall and substation when these are selected during 2020.



Overview map



Legend

- Substation Search Area
- Onshore Export Cable Route Search Area
- Study Area
- 2km & 10km Study Area Buffer
- RAMSAR (Within 10km of Search Area)
- Special Area of Conservation (Within 10km of Search Area)
- Special Protection Area (Within 10km of Search Area)
- Site of Special Scientific Interest (Within 2km of Search Area)
- Local Nature Reserve (Within 2km of Search Area)
- Local Wildlife Site (Within Search Area)

Cartographic information

Coordinate System: British National Grid

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel Y Môr**

TITLE Statutory Designated Nature Conservation Sites

DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:175,000	@DIN A3

REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.1 - Ecology\A\Mext_Innogy_WF_UK_DIN_Statutory_Designations.mxd

10.1.3 Baseline data

904 An initial desk-based study has been undertaken to identify sources of pre-existing ecological data of relevance, that could inform the EIA. Table 75 lists the data sources that have been identified and indicates whether data were obtained for scoping (giving the date obtained where applicable). Where data have not yet been obtained, it is proposed that they will be sought at a later stage in the EIA process, dependent upon the final onshore ECR and substation selection.

TABLE 75 – BASELINE DATA SOURCES

SOURCE	SUMMARY	DATE OBTAINED
Joint Nature Conservation Committee (JNCC) jncc.gov.uk website	Special Area of Conservation (SAC) and Special Protection Area (SPA) details.	11 December 2019

SOURCE	SUMMARY	DATE OBTAINED
Natural Resources Wales (NRW) lle.gov.uk website	Datasets for: Ancient Woodland Inventory 2011; Candidate Special Areas of Conservation; Felling Licence Applications; Habitat Networks; Local Nature Reserves (LNR); National Forest Inventory 2016; National Nature Reserves (NNR); NRW Species Data on the NBN Gateway; Ramsar Sites; Saltmarsh Extents; Sites of Special Scientific Interest (SSSI); SACs; SAC and SPA Monitoring Programme Results; SPAs; Terrestrial Phase 1 Habitat Survey; and Traditional Orchards.	11 December 2019
NRW Designated Site Search https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/designated-sites/?lang=en	Statutory designated site details: SAC; SPA; SSSI; National Nature Reserves; and Local Nature Reserves.	12 December 2019

SOURCE	SUMMARY	DATE OBTAINED
Cofnod (North Wales Biological Records Centre)	Local Wildlife Sites (LWS); Protected Species Records; Bird Records; Phase 1 Habitat Information; and Ancient Woodland.	13 December 2019
British Trust for Ornithology (BTO)	Wetland Bird Survey (WeBS) Data; National ringed plover *Charadrius hiaticula* breeding survey data; and Non-estuarine shorebird survey data.	Not yet obtained.
Royal Society for the Protection of Birds (RSPB)	Ornithological data not otherwise held by Cofnod.	Not yet obtained.
Coed Cadw	Data in respect of Coed y Gopa & Coed Bryngwenallt Reserve	Not yet obtained.
North Wales Wildlife Trust (NWWT)	Data in respect of NWWT Reserves; and Locally occurring wildlife.	Not yet obtained.
National Biodiversity Network (NBN) Gateway	Protected and notable species records.	13 December 2019
Clwyd Bat Group	Monitoring data for important bat roosts in the region, including Coed y Gopa.	Not yet obtained.

SOURCE	SUMMARY	DATE OBTAINED
Denbighshire County Council (DCC)	Details for Roadside Nature Reserves; Annual Reports for little tern *Sterna albifrons* Colony at Gronant; Records for selected other bird species (e.g. Cetti's *Cettia cetti* warbler, peregrine falcon *Falco peregrinus*, common kingfisher *Alcedo atthis*, curlew *Numenius arquata* and lapwing *Vanellus vanellus*); Records for selected other species (dormouse *Muscardinus avellanarius*, great crested newt *Triturus cristatus* (GCN)); and Details for grant-aided woodland planting and habitat improvement projects.	Not yet obtained.
Conwy County Borough Council (CCBC)	Local wildlife information.	Not yet obtained.
Gwynt y Mor OWF Environmental Statement (ES) Onshore Ecology Chapter & Appendices	Surveys undertaken in 2005 including: Extended Phase 1 habitat survey; Wintering bird survey; and Breeding bird survey.	02 December 2019
Burbo Bank Extension OWF ES Ecology Chapter & Appendices	Surveys undertaken in 2011 and 2012 for habitats, plants, hedgerows, barn owl *Tyto alba*, breeding birds, wintering birds, bats, badger *Meles meles*, dormice, otter *Lutra lutra*, water vole *Arvicola amphibius*, reptiles, GCN and natterjack toad *Bufo calamita*.	02 December 2019
North Wales Windfarms Connection Project ES Ecology Chapter & Appendices.	Surveys undertaken in 2014 for GCN, dormouse, bats, birds, otters, water vole, dormouse, reptiles, badgers, habitats and hedgerows.	02 December 2019
Other planning applications within the search area	Ecological data may be available.	Not yet obtained.

10.1.4 Baseline environment

Designated sites

905 There are two SPAs, one Ramsar site and six SACs within 10km of the study area and a further 17 SSSIs and nine LNRs within 2km. 0 provides an overview of statutory designated sites within the Study Area – these are also illustrated on Figure 1. Please note that a separate HRA Screening report (innogy, 2020) is being produced which will cover in more detail matters associated with European designations.

906 A further 117 non-statutory LWS occur within the study area. These are also illustrated on Figure 70, and a list of names provided at Appendix E. Further detail in respect of the reason for importance of these LWS has not been sought at this stage.

Terrestrial habitats

907 The Awel y Môr OWF onshore search area supports a number of habitats listed on Annex 1 of the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the Habitats Directive). These tend to be concentrated within designated sites but may be found across the area.

908 Based upon available data obtained to date, the following habitats of Principal Importance (i.e. those included under Section 7 of the Environment Act (Wales) 2016), many of which are also included on Annex 1 of the Habitats Directive, are present within the Awel y Môr OWF onshore search area:

- Traditional orchard;
- Wood pasture and parkland;
- Wet woodland;
- Lowland mixed deciduous woodland;
- Hedgerows;
- Arable field margins;
- Coastal and floodplain grazing marsh;
- Lowland meadows;
- Lowland calcareous grassland;
- Lowland heathland;

- Lowland fen;
- Reedbeds;
- Rivers;
- Ponds;
- Inland rock outcrops and scree habitats;
- Calaminarian grasslands;
- Open mosaic habitats on previously developed land;
- Reedbed;
- Coastal sand dunes;
- Coastal vegetated shingle;
- Coastal saltmarsh; and
- Intertidal mudflat.

909 The legislation underpinning Welsh Habitats of Principal Importance is discussed in Section 1.3 Policy and Legislative Context.

910 Welsh habitat network areas are also identified within the onshore Study Area. In its report which explains the method for identifying the areas (Latham, Sherry & Rothwell, 2013) NRW states "*The habitat network layers offer a general guide to how habitats are functionally related in the landscape, and therefore can be interpreted to help locate conservation action such as habitat restoration and expansion. In general terms, such action is likely to have most benefit if located within habitat networks, as it strengthens connectivity that is already likely to be present*."

911 These areas are not specifically mentioned in legislation or policy, but it is anticipated they will inform the forthcoming Resilient Network Area Statements for Wales, due to be published by NRW in 2020.

Protected, notable and invasive species

912 A review of biological records obtained to date indicates that there are records for the following legally protected or notable species (e.g. Section 7 species) within the proposed Awel y Môr OWF onshore search area:

- A wide range of bird species, including Annex 1 (of the EC Birds Directive), Schedule 1 (of the Wildlife & Countryside Act 1981 (as amended)) and Section 7 (of the Environment (Wales) Act 2016) species. These include (but are not necessarily limited to);
  - Lapwing;

- Ringed plover;
- Curlew;
- Little tern;
- Barn owl;
- Kingfisher;
- Peregrine falcon; and
- Cetti's warbler.

- At least ten species of bat, including;
  - Lesser horseshoe bat Rhinolophus hipposideros;
  - Greater horseshoe bat Rhinolophus ferrumequinum;
  - Brown long-eared bat *Plecotus auritus*;
  - Common pipistrelle Pipistrellus pipistrellus;
  - Soprano pipistrelle *P. pygmaeus;*
  - Natterer's bat *Myotis natterri*;
  - Daubenton's bat *M. daubentonii;*
  - Noctule bat Nyctalus noctule;
  - Serotine Eptesicus serotinus; and
  - Whiskered/Brandt's Bat Myotis mystacinus/brandtii;
- Badger Meles meles;
- Brown hare Lepus europaeus;
- Water vole Arvicola terrestris;
- Otter Lutra lutra;
- Dormouse Muscardinus avellanarius;
- Hedgehog Erinaceaus europaeus;
- Great crested newt *Triturus cristatus;*
- Common toad *Bufo bufo;*
- Adder Vipera berus;
- Slow worm Anguis fragilis;
- Grass snake Natrix natrix;
- Common lizard Zootoca vivipara;
- Numerous notable invertebrate species; and
- Numerous notable, rare or invasive plant species.

10.1.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

913 The Ecological Impact Assessment (EcIA) will be undertaken following Chartered Institute for Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland.

914 The approach to assessment and data gathering will be discussed and agreed with relevant bodies prior to commencement. Further consultation will then be undertaken at key stages throughout the EIA process.

Potential project impacts

915 A range of potential impacts on terrestrial ecological receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The impacts that are proposed to be scoped into the Awel y Môr OWF EIA are outlined in Table 762, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of impacts. It should be noted that potential impacts and the scope of additional data collection will depend on the final ECR selection and substation location and as such it is not possible to provide a definitive list of impacts and additional data collection requirements at this stage.

916 Based on the information currently available and the project description, a number of potential impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 3, together with a justification for scoping them out.

TABLE 76 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR TERRESTRIAL ECOLOGY AND NATURE CONSERVATION

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
10.1.1	Permanent and temporary loss of habitat	At the substation there will be permanent loss of habitat due to the construction footprint of this element of the project and requirement for new grid connection. Trenching and the associated construction corridor (refer to Chapter 3) may also result in temporary (and depending on habitat type perhaps permanent) habitat loss along the onshore ECR. Key considerations are likely to be habitats which support protected and notable species such as bat, water vole, otter, badger, certain bird species, reptiles, dormice and great crested newt, notable plants and/or invertebrates.	A Preliminary Ecological Appraisal (PEA) (CIEEM, 2017) and protected/notable species surveys (where required) will be undertaken within the Awel y Môr OWF onshore ECR corridor, onshore substation site and the surrounding 100m (survey areas may be varied for certain species – see Impact 10.1.2). Methods will include mapping of habitats and the use of UKHab (UK Habitat Classification Working Group, 2018) for habitat classification to capture the presence of Section 7 and Annex 1 habitat types. The PEA will also note the potential presence of veteran trees, areas where evidence of protected species is found, or where habitat is suitable, such that specific follow up surveys can be scoped and undertaken thereafter (see subsequent rows). In addition, hedgerow assessment will be undertaken at areas which may be breached, in order to ascertain if they meet the definition of "Important Hedgerow" under the Hedgerow Regulation 1992.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
10.1.2	Impacts upon protected species or upon their resting or breeding sites	The potential exists for protected species to be impacted by construction activities either physically or from disturbance via light, noise and human presence. Of key concern would be bats, dormice, otter, water vole, great crested newt, certain bird species, reptiles, badger and certain invertebrates, however prior to the completion of detailed ecological field surveys all UK legally protected and notable species known to occur within the search area must be assumed to be potentially affected by the project.	Once the location for the onshore ECR and substation are known, and where the potential for significant impacts to local populations cannot be scoped out, detailed species-specific surveys will be undertaken. The nature and extent of these surveys will be determined through the findings of the PEA (refer to Impact 10.1.1 above) and consulted on with relevant stakeholders through the Evidence Plan process. All surveys will be guided by current good practice guidelines and undertaken by appropriately experienced/licensed ecologists. At this initial stage surveys are considered likely to include: ▪ Bats – Activity survey at hedgerows, woodlands and/or riparian areas which may be removed, illuminated or breached, preliminary roost inspections and presence/absence survey at trees and structures which may be removed or disturbed. Surveys will follow standard methods e.g. Collins, 2016). One full season (up to 12 months) of data gathered. ▪ Dormouse survey following standard methods e.g. Bright, Morris & Mitchell-Jones (2006) – hazelnut searches at

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			woodland within the ECR boundary. Nest tube survey at all hedgerows that may be breached, and which are potentially suitable for use by dormice. ▪ GCN – presence/absence data for all ponds within 250m of the ECR boundary (where there are no recent existing data). Population size class assessment at those ponds where GCN are confirmed present. Surveys will follow standard methods described within Biggs *et al* (2014) & Langton, Beckett & Foster (2001). An assessment of terrestrial habitat suitability for great crested newt of areas within the ECR and substation boundary will also be undertaken, including modelling if required. ▪ Water vole – habitat-based assessment at all watercourses within the ECR and substation footprint plus surrounding 100m. Water vole survey at watercourses crossing the ECR or within the substation footprint, plus 200m up and downstream, undertaken in accordance with standard methods e.g. Dean *et al.* (2016). ▪ Otter – habitat-based assessment at all watercourses within the ECR and substation footprint plus surrounding 100m. Otter survey at watercourses crossing the ECR or within the substation footprint, plus 250m up and

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			downstream. Survey methods informed by current references, such as Chanin (2003a and 2003b). ▪ Birds – breeding bird surveys will be targeted at areas in which desk-based study and the PEA indicates that significant effects on protected or notable bird species are possible. Surveys will follow standard methods, e.g. Marchant (1983) and/or species-specific methods including Gilbert *et al*. (1998). Wintering bird surveys will be similarly targeted. At this stage wintering bird surveys are only considered likely to be required where intertidal and wetland habitats could be affected and potentially in coastal grasslands, where these could be used by significant numbers of wintering waterfowl. Bird surveys will take place over a one-year period, with wintering bird surveys expected to take place during winter 2020-21 and breeding bird surveys expected to take place during spring and summer 2021. ▪ Badger – survey will follow standard methods (e.g. Scottish Natural Heritage (2003) and include a search for the presence of active badger setts and signs for the ECR corridor and substation footprint, plus surrounding 30m.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			▪ Reptiles – habitat suitability assessment, then presence/absence survey following standard methods (see Froglife (1999)) at areas of moderate or highly suitable habitat that would be permanently affected. ▪ Notable invertebrates – targeted survey during appropriate season/weather in areas of habitat that may be affected, particularly those where permanent habitat loss is likely and that are known or suspected to support potentially important populations of rare/notable species in order to determine presence and population size (where feasible). ▪ Notable plant species - targeted survey to identify location and extent of populations, during appropriate season, in areas of habitat known to support or suspected to support rare/notable species that may be affected.
10.1.3	Habitat fragmentation and species isolation	There is potential for permanent habitat fragmentation and species isolation as a result of substation construction. Temporary habitat fragmentation and species isolation	Surveys as described above.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		may also result from construction of the cable route.	
10.1.4	Spread of invasive non-native species (INNS)	There is potential for the presence of INNS which could be spread by construction activities.	The PEA will record the location and extent of species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and/or included on the Union List pertaining to EU Regulation 1143/2014 on Invasive Alien Species. However, it must be noted that negative results should not be used as confirmation of absence. Controls to avoid the spread of invasive species and biosecurity measures will be incorporated in a project specific Ecological Management Plan/Code of Construction Practice or equivalent.
10.1.5	Accidental pollution	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure may lead to direct or indirect disturbance or damage to species/habitats.	Surveys as already described above to determine location and extent of ecologically important features which may be sensitive to and at risk from accidental pollution events.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
OPERATION			
10.1.6	Planned maintenance at the substation	Planned maintenance at the substation is likely to be highly localised with a minimal likelihood of disturbance expected to the adjacent habitats and species.	As above: surveys at and adjacent to the proposed substation footprint will be necessary to determine if protected and notable species that are sensitive to any maintenance activities and how the area is utilised by them.
10.1.7	Disturbance via noise and light during operation of the substation	During operation of the substation there may be continual operational noise and lighting which have the potential to cause disturbance and illumination on adjacent habitats and species.	As above: surveys at and adjacent to the proposed substation footprint will be necessary to determine if protected and notable species that are sensitive to noise and light are present, and how the area is utilised by them.
10.1.8	Planned cable checks and maintenance along the ECR	Impacts arising from planned cable checks and maintenance along the ECR are proposed to be scoped out (see	Surveys along the ECR will be necessary to determine if protected and notable species that are sensitive to disturbance are present, and how the area is utilised by them.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		Table 77 – Impacts proposed to be scoped out of assessment for terrestrial ecology except where there is a potential for important habitats or species to be affected (such as within designated sites).	
DECOMMISSIONING			
10.1.9	Decommissioning impacts: similar in nature to those during construction but would be more limited in geographical extent and timescale.	It is proposed that the substation electrical infrastructure and building foundations would be removed as part of the decommissioning phase. Closer to the time of decommissioning, it may be decided that removal of certain infrastructure would lead to greater environmental impacts than leaving components in situ, in which case certain components may be left buried (e.g. onshore cables, jointing pits and transition pits). The decommissioning methodology cannot be finalised until	At this stage the future baseline conditions cannot be predicted accurately and both the proposals for decommissioning and the future regulatory context are unknown. A detailed assessment of decommissioning impacts is therefore not proposed to be undertaken. Instead it is proposed to assume that impacts from decommissioning would be similar to those for construction (albeit over a reduced timescale and affecting a smaller area since the assets will already be in situ) and that a similar range of embedded mitigation measures would be implemented.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		immediately prior to decommissioning; but would be in line with relevant policy at that time.	

TABLE 77 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR TERRESTRIAL ECOLOGY

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
ALL PHASES (I.E. CONSTRUCTION, OPERATION AND DECOMMISSIONING)		
10.1.10	Impacts to fish at watercourse crossings	Impacts on fish could potential occur where the onshore cable route crosses watercourses. However, Horizontal Directional Drilling (HDD) is likely to be used to cross any major watercourses, such that potentially significant impacts to fish populations are not anticipated. It is therefore proposed to scope out impacts on fish, however this will be reviewed during the course of the EIA and if HDD is not proposed this impact would be scoped back in. Impacts on fish could also potentially occur through accidental pollution – this is covered in impact 10.1.5 above (Accidental Pollution) and therefore remains scoped in.
10.1.11	Impacts to certain designated sites	In respect of terrestrial ecology and nature conservation it is proposed to scope out impacts to geological sites, and those statutory designated sites which are >200m from the ECR and substation footprints and have no mobile notified features (e.g. bats and birds) and/or no hydrological connection. On that basis it is proposed to scope out the following sites: ▪ Llwyn SAC/SSSI = woodland and swamp. ▪ Great Orme's Head / Pen y Gogarth SAC = heathland, grassland, sea cliffs. ▪ Coedwigoedd Penrhyn Creuddyn / Creuddyn Peninsula Woods SAC/SSSI = woodland, rare plants and invertebrates. ▪ Graig Fawr SSSI = limestone grassland, rare plants and butterflies.

		▪ Llyn Y Fawnog SSSI = swamp habitats. ▪ Maes Hiraddug SSSI = grassland habitats. ▪ Moel Hiraddug A Bryn Gop SSSI = limestone grassland and rare plants and ▪ Prestatyn Hillside SSSI = woodland, limestone grassland and rare plants. Significant impacts to LNRs beyond the Awel y Môr OWF onshore ECR search area are not anticipated and are also proposed to be scoped out.
10.1.12	All phases: impacts to certain local wildlife sites - those >200m from the ECR and substation footprints and with no mobile notified features (e.g. bats and birds) and/or no hydrological connection.	Potential impacts to LWS >200m from the proposed work footprint are not anticipated.
OPERATION		
10.1.13	Cable checks and cable maintenance	Planned cable checks and maintenance are considered to be temporary small-scale impacts unlikely to significantly affect any important ecological features, and for this reason are scoped out of the assessment, except where required within designated sites or where other features of particular importance are present.

Mitigation measures adopted as part of the project

917 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for impacts on terrestrial ecological receptors. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

918 Innogy are committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 77 and Table 3.

919 Embedded mitigation is likely to include the following:

- Avoidance of impact through cable route selection (e.g. avoiding designated sites or areas of important habitat, woodland areas, water bodies and streams as far as possible) where practicable;
- Avoidance of impact through methodology selection (e.g. HDD at sensitive locations, in particular river crossings and at coastal designated sites);
- Ensure seasonal constraints in relation to specific species are adhered to where possible (e.g. undertaking vegetation clearance outside the bird nesting season);
- Development of species-specific mitigation based on the findings of ecological surveys;
- Ensure no unnecessary land-take to reduce habitat loss;
- Habitats removed during cable route construction to be reinstated upon completion of works;
- Development of, and adherence to, a chemical/fuel storage and handling procedures;
- Development of a Code of Construction Practice (CoCP);
- Development of an Ecological Management Plan (EMP); and
- Development of, and adherence to, a Decommissioning Plan.

920 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

921 The cumulative impact assessment methodology will be based on that described in Chapter 4: Environmental Impact Assessment Approach and Methodology, adapted to make it applicable to onshore ecology. More specifically, it would be conducted in accordance with the CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland, with specific reference to the section related to cumulative impacts and effects. The detailed scope will depend on the ECR and substation locations and would be agreed as part of the Evidence Plan process.

922 For designated sites, cumulative impacts would be assessed within a set distance of each site (to be agreed with stakeholders). The distance from each designated site over which cumulative impacts would be assessed will be determined based upon the features of interest/reasons for designation for each site.

923 For habitats and species outside of designated sites, the approach would depend on if the feature is mobile or not. Cumulative impacts on mobile features (such as birds or bats) are possible in respect of developments occurring within the relevant core foraging range/core sustenance zone for the species involved. Where impacts on aquatic receptors are possible then other developments within the same catchment would be considered in the cumulative assessment. For other ecological receptors cumulative effects are unlikely beyond 2km, therefore all development within 2km will be included.

924 Wherever possible the cumulative assessment will be quantitative (i.e. where data in an appropriate format have been obtained). However, the level of data available and the ease with which impacts can be combined is quite variable, reflecting the availability of relevant data for older projects and the approach to assessment taken. Where this is not possible (e.g. for older projects) a qualitative assessment will be undertaken.

925 It is understood that little terns breeding at colonies in North Wales can regularly move between North Wales and colonies in Ireland, on the other side of the Irish Sea (Joel Whalley, DCC Ecologist, pers. comm.). Transboundary effects are therefore possible in respect of little tern and will therefore be assessed within the EIA, if potentially significant effects on little tern are identified, using existing data relating to little tern movements. Transboundary effects relating to little tern, which forms one of the notified features of the Liverpool Bay SPA and the Dee Estuary SPA, will also be addressed with the HRA Screening Study.

926 For all other terrestrial ecological features, effects are likely to be limited to habitats or species populations within the onshore Study Area. Transboundary effects are therefore unlikely and will be scoped out from further consideration within the EIA.

10.1.6 Summary of next steps

927 This scoping assessment has been undertaken based on an initial review of desk-based information only. Once a preferred ECR and substation location have been identified, more detailed survey information will be obtained to identify the potential impacts of Awel y Môr OWF upon onshore ecology, the methodologies for which will be consulted upon through the Evidence Plan process.

928 The following additional data sources are anticipated to be required to establish the baseline ecological environment, once the onshore ECR corridor and onshore substation site have been identified:

- An updated ecological desk-based assessment, including:
  - Further details in respect of non-statutory LWS from Cofnod; and
  - Data requests to BTO, RSPB, Coed Cadw, NWWT, Clwyd Bat Group, Denbighshire CC and Conwy CCBC.
- PEA of the onshore ECR corridor, onshore substation site and the surrounding 100m, to include habitat mapping and classification using UKHab and hedgerow assessment;
- Bats: Activity survey at hedgerows, woodlands and/or riparian areas which may be removed, illuminated or breached, preliminary roost inspections and presence/absence survey at trees and structures which may be removed or disturbed. One full season (12 months) of data gathered;

- Dormouse – hazelnut searches at woodland within the ECR boundary. Nest tube survey at all hedgerows that may be breached, and which are potentially suitable for use by dormice;
- GCN – presence/absence data for all ponds within 250m of the ECR boundary. Population size class assessment at those ponds where GCN are confirmed present. An assessment of terrestrial habitat suitability for great crested newt of areas within the ECR and substation boundary will also be undertaken, including modelling if required;
- Water vole – habitat-based assessment at all watercourses within the ECR and substation footprint plus surrounding 100m. Water vole survey at water courses crossing the ECR or within the substation footprint, plus 200m up and downstream;
- Otter – habitat-based assessment at all watercourses within the ECR and substation footprint plus surrounding 100m. Otter survey at water courses crossing the ECR or within the substation footprint, plus 250m up and downstream;
- Birds - breeding and wintering bird surveys will take place over a one-year period, with wintering surveys expected to take place during winter 2020-21 and breeding surveys expected to take place during spring and summer 2021. Surveys will be targeted at areas in which desk-based study and the PEA indicates that significant effects on protected or notable bird species are possible;
- Badger – survey for the presence of active badger setts for the ECR corridor and substation footprint, plus surrounding 30m;
- Reptiles – habitat suitability assessment, then presence/absence survey at areas of moderate or highly suitable habitat that will be permanently affected;
- Notable invertebrates – targeted survey during appropriate season/weather in areas of habitat that may be permanently affected (including via increased illumination) and that are known to support rare/notable species in order to determine presence and population size (where feasible); and
- Notable plant species - targeted survey to identify location and extent of populations during appropriate season in areas of habitat known to support rare/notable species that may be affected.

929 This baseline data will be used to undertake an Ecological Impact Assessment (EcIA) following the CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland.

10.1.7 Further considerations for Consultees

i. Do you agree that the list of existing data sources identified in Table 75 is comprehensive or are there other data sources which should be considered?

ii. Do you agree that all the statutory and non-statutory designated sites that could potentially be affected by the onshore aspects of Awel y Môr OWF have been correctly identified?

iii. Have all potential impacts resulting from Awel y Môr OWF been identified for important onshore ecological features in Table 76?

iv. Do you agree that the impacts escribed in Table 77 can be scoped out?

v. For those impacts scoped in Table 76, do you agree that the methods described are sufficient to inform a robust impact assessment (insofar as it is possible to identify detailed survey requirements at this early stage)?

vi. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on important onshore ecological features (insofar as it is possible to identify relevant mitigation requirements at this early stage)?

10.2 Archaeology and Cultural Heritage

10.2.1 Introduction

930 This Section of the Scoping Report identifies the types of onshore Archaeology and Cultural Heritage assets which could be receptors of significance for EIA regulations, to the Awel y Môr OWF onshore ECR search area and substation. It suggests the potential effects from the construction, operation and decommissioning of the Awel y Môr OWF on onshore historic environment and sets out the proposed scope of the EIA, including the need for assessment of specific onshore assets which might be visually impacted by the offshore turbines. The proposed methods for the EIA are also presented.

931 Potential effects on marine archaeology have been covered in a separate chapter (see Section 9.5 Marine Archaeology and Cultural Heritage). The intertidal zone has been included in both chapters to ensure gaps are avoided. This integrated approach between the two studies will be adopted during the EIA.

10.2.2 Study Area

932 The Archaeology and Cultural Heritage Study Area comprises two spatial levels. Firstly, an inner Study Area, comprising a broad coastal zone which forms the search area for the onshore construction elements of the project i.e. the onshore ECR and substation search. The inner Study Area covers c.20km west – east and c.12km north – south (240km^2) as shown on Figure 71. Such a large area has been included to accommodate the multiple route options from the cable landfall to the substation.

933 Secondly, a wider Study Area has been defined comprising a zone in which indirect visual impacts from the offshore turbines might affect onshore designated historic assets. For the purposes of scoping of the EIA, an initial wider Study Area has been defined which has been determined through analysis of the zone of theoretical visibility (ZTV) of the offshore wind turbines which is introduced and explained in detail in Section 9.4 (Seascape, Landscape and Visual Impact) of the Scoping Report. The ZTV has been reviewed against those assets of the highest sensitivity outside of the onshore search area, such as the Beaumaris World Heritage Site (WHS), and assets in Llandudno and the Great Orme. The wider Study Area for this assessment is presented in Figure 71. It is proposed that this Study Area will be discussed and agreed with Cadw and relevant stakeholders as part of Evidence Plan process.

934 Both Study Areas will be reviewed and amended in responses, for the Preliminary Environmental Information Report (PEIR), to such matters as refinement of the onshore (and offshore) Export Cable Routes (ECR) and the identification of additional constraints (environmental and/ or engineering). This is expected to result in a significant reduction in the size of the inner Study Area as it is refined to more closely follow the route of the preferred onshore cable corridor, and preferred locations for the landfall and substation when these are selected during 2020. The size of the wider Study Area will be finalised in consultation with Cadw and relevant stakeholders as more is known about the layout and size of the proposed wind turbines.

260000 270000 280000 290000 300000

400000 390000 380000 370000 360000

The Castles and Town Walls of Edward I in Gwynedd - Conwy Castle and Town Walls

The Castles and Town Walls of Edward I in Gwynedd - Beaumaris Castle

Gwynt y Mor Wind Farm

North Hoyle Wind Farm

Rhyl Flats Wind Farm

NGLESEY / YNYS MÔN

LLANDUDNO

COLWYN BAY

RHYL

PRESTATYN

ABERGELE

BEAUMARIS

BETWS-Y-COED

LLANRWST

LLANFAIRFECHAN

PENMAENMAWR

DENBIGH

ST ASAPH

BODELWYDDAN

RHUDDLAN

Great Ormes Head / Pen-y-Gogarth

Little Ormes Head

Penrhyn Bay

Rhôs-on-Sea

Kinmel Bay

Towyn

Pensarn

Abergele Roads

Conwy Sands

Menai Strait / Afon Menai

Lavan Sands / Traeth Lafan

Puffin Island

Red Wharf Bay

Llanddona

Llangoed

Llansadwrn

Llandegfan

Menai Bridge

Bangor

Penmaenmawr

Llanfairfechan

Aber

Llanfairfechan

Capelulo

Henryd

Bwlch-y-groes

Tal-y-bont

Llanbedr-y-cennin

Llanbedrog

Pwllheli

Abergwyngregyn

Llanllechid

Glasinfryn

Penrhosgarnedd

Tregarth

Llandygai

Llandegai

Llandinorwig

Dinorwig

Rhiwlas

Penisarwaun

Llanberis

Nant Peris

Pont Peny-benglog

Betws Garmon

Rhyd-Ddu

Snowdon / Yr Wyddfa

Ffridd Uchaf

Yr Aran

Llyn Cwellyn

Llyn Dinas

Llyn Gwynant

Llyn Llydaw

Llyn Glaslyn

Llyn Lagi

Llyn Cwm Dyli

Llyn Ogwen

Llyn Idwal

Llyn Cowlyd Reservoir

Llyn Crafnant Reservoir

Llyn Eigiau Reservoir

Llyn Geirionydd

Llyn Brenig

Llyn Alwen Reservoir

Llyn Elsi Reservoir

Llyn Crafnant

Llyn Craflwyn

Llyn Cwellyn

Llyn Dinas

Llyn Gwynant

Llyn Llydaw

Llyn Glaslyn

Llyn Lagi

Llyn Cwm Dyli

Llyn Ogwen

Llyn Idwal

Llyn Cowlyd Reservoir

Llyn Eigiau Reservoir

Llyn Geirionydd

Llyn Brenig

Llyn Alwen Reservoir

Llyn Elsi Reservoir

Llyn Crafnant

Llyn Craflwyn

Afon Dulyn

Afon Ddu

Afon Llugwy

Afon Conwy

Afon Lledr

Afon Glaslyn

Afon Gwyrfai

Afon Seiont

Afon Ogwen

10.2.3 Data assessed for scoping

935 Data has been downloaded from the lle.gov.wales portal but the original source for these data is Cadw. Assets of the highest sensitivity have been mapped, i.e. World Heritage Sites, Scheduled Monuments, Listed Buildings Grade I and II*, and Registered Parks and Gardens Grade I and II*.

10.2.4 Baseline data

936 In addition to the Castles and Town Walls of Edward I World Heritage Site designation, data will be downloaded for designated historic assets from the Cadw registers (scheduled monuments, listed buildings, registered parks and gardens, historic landscapes of Wales), and will be supplemented from local planning authorities for conservation areas. For non-designated heritage assets, data will be purchased from Gwynedd Archaeological Trust and Clwyd-Powys Archaeological Trust. These data will be layered into a GIS so that they can be shown spatially against appropriately detailed Ordnance Survey (OS) base mapping, historical mapping, and topography.

937 Additional studies such as the surveys undertaken by the Welsh Archaeological Trusts as part of the characterisation of the Historic Landscapes of Wales, will be studied to assist with achieving a sound understanding of the baseline. LiDAR data if available will be used for specific areas such as the cable landfall location, the preferred cable corridor, and selected substation site. Satellite imagery, drones and air photographs as well as historic maps will also form part of the baseline resource to be consulted as appropriate.

938 The assessment will also review and summarise the results of the original Gwynt y Mor application ES. This is contained within RWE Group and N Power Renewables November 2005 *Gwynt y Môr Offshore Wind Farm- Environmental Statement,* Gifford November 2005 *Gwynt Y Mor- Offshore Wind Farm- Cultural Heritage Technical Report.*

Baseline environment

939 The table below provides a high-level overview of the designated historic assets (DHA) within the inner Study Area.

TABLE 78 - DESIGNATIONS WITH RELEVANCE TO THE ONSHORE HISTORIC ENVIRONMENT AND AWEL Y MÔR OWF

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
INTERNATIONAL		
The Castles and Town Walls of Edward 1 (WHS)	c.15km	Beaumaris Castle, Anglesey Conwy Castle and Town Walls, Conwy
NATIONAL		
Scheduled monuments 23	c.11km	DE186 St George's Well, Abergele FL094 Prestatyn Roman Site FL004 Rhuddlan Castle DE082 Mynydd y Gaer Camp FL027 Pont Dafydd (old) FL026 St Asaph Bridge DE008 Pen-y-Corddyn Camp DE007 Tyddyn Bleiddyn Burial Chamber FL018 Rhuddlan Bridge FL068 Rhuddlan Town Banks DE116 Bont Newydd Cave DE115 Cefn Cave FL015 Twthill (Further & Additional Areas) FL129 Part of Site of Norman Borough DE146 Llys Euryn Medieval House, Llandrillo-yn-Rhos DE114 Castell Cawr Hillfort DE037 Bedd-y-Cawr Hillfort DE071 Bryn Euryn Camp DE031 The Mount, Abergele

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
		FL186 First World War Practice Trenches at Bodelwyddan Park FL136 Clive Engine House, Meliden DE038 Ffynnon Fair (Well), Cefn FL102 Criccin Cross
Listed buildings 626	c.10km	6 x Grade I 1460 Cathedral Church of St. Asaph 1361 Bodrhyddan Hall 229 Kinmel 242 Llwyni Lodge, also known as the Golden Lodge and Gate Lodge 231 Gwrych Castle including attached walls and towers and Stable Block. 14977 Rhuddlan Castle 60 x Grade II* 560 x Grade II
Conservation areas 18	c.10km	Llanelian-yn-rhos Llandrillo yn rhos Rhuddlan Bodelwyddan Abergele Meliden Ffordd Penrhwylfa Colwynbay Pwllycrochan Old Colwyn Rhyl, River Street Dyserth Meliden Central Prestatyn High Street

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
		Betws in Rhos St. George Colwyn Bay town centre Rhyl Seabank Road Rhyl Central St Asaph
Registered Park and Garden 4	c.20km	3 x Grade II* Bodrhyddan Kinmel Park Gwrych Castle 1 x Grade II - Bodelwyddan Castle
Historic Landscapes of Wales 2	c.10km	No4 Lower Elwy Valley (Special Landscape) No39 Creuddyn and Conwy (Outstanding)

10.2.5 Legislation, Planning Policy and Guidance

940 The following list comprises key statutory, policy and national guidance that have relevance to the Archaeology and Cultural Heritage assessment:

- Overarching National Policy Statements EN – 1 (Energy)[34] and EN – 3 (Renewable Energy Infrastructure)[35] (published by the Department of Energy and Climate Change July 2011) contain Sections 5.8 and 2.5.34 respectively, which outline the need to assess potential impacts on the historic environment, and for planning authorities to balance potential harm against need to deliver national targets for renewable energy and emissions reductions. Section 5.8.18 in EN – 1 discusses the potential effects from new development to the setting of designated heritage assets and states that planning authorities should seek to "*preserve those elements of the setting that make a positive contribution to, or better reveal the significance of, the asset*";
- The Historic Environment (Wales) Act 2016 is the primary statutory tool for protecting historic assets and sustainable management of the historic environment. It is designed to enable greater transparency into decisions taken on the historic environment and to make it a statutory requirement for information on the historic environment to be safe-guarded for the public good;
- National policy within Wales is set out in by Planning Policy Wales Edition 10, December 2018 ("PPW"), in which Section 5.7 states the importance of Renewable Energy, and Section 6.1 The Historic Environment (within the chapter on Distinctive and Natural Places) explains the need for a reasonable and proportionate impact assessment to ensure proposed development is sustainable and to prevent unnecessary harm to historic assets;
- PPW is supported by Technical Advice Note 24: The Historic Environment (May 2017) which is designed to assist local authorities with developing their local plans and for determination of planning applications or listed building consent in relation to historic assets. The Welsh Ministers and Planning Inspectors will consider these guidance documents when considering the proposal;

34 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf

35 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47856/1940-nps-renewable-energy-en3.pdf

- The two principal guidance documents that will be followed in this assessment are those produced by Cadw on behalf of the Welsh Government for managing historic assets: Heritage Impact Assessment in Wales (May 2017a) and the Setting of Historic Assets in Wales (2017b); and
- Cadw's Conservation Principles for the sustainable management of the historic environment in Wales (March 2011) will also be used to establish objective assessment of the value and significance of historic assets within and surrounding the proposed development site

10.2.6 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

941 As appropriate the baseline survey and impact assessment will be guided by the Chartered Institute for Archaeologists' *Standard and Guidance for Historic Environment Desk-Based Assessment*. Further guidance from Cadw's series on "Managing" will be followed for assessing the *Setting of Historic Assets in Wales*, and *for Heritage Impact Assessment in Wales* will be used for undertaking the details assessment. In addition, Cadw's guidance Conservation Principles for the *Sustainable Management of the Historic Environment in Wales* will be applied to inform the general approach towards the EIA.

942 It is proposed that the Archaeology and Cultural Heritage assessment will employ two Study Areas. The first of these will be for the direct and indirect impacts for onshore assets (see Table 78) comprising the onshore ECR and substation 'the inner Study Area', whilst the second will be for the indirect visual impact from the offshore turbines 'the wider Study Area'.

943 It is proposed that the inner Study Area for the assessment will comprise an area up to 2 km from the proposed substation site when selected, and 500m from the preferred ECR corridor. This will allow sufficient understanding of the local historic environment to make an assessment of the significance of known assets, and the potential for currently unknown assets to occur, within the boundary of construction groundworks. The buffer around groundworks (2km for substation and 500m for the cable corridor) will allow analysis of indirect effects to be carried out on all DHAs within these zones (see Table 78).

944 The extent of the wider Study Area has been defined through analysis of the zone of theoretical visibility (ZTV) of the offshore wind turbines and review against heritage assets located onshore which might be susceptible to significant change and therefore should be assessed in the Archaeology and Cultural Heritage assessment. An initial wider Study Area is presented in Figure 71 for review at scoping, which includes Beaumaris WHS as well as a zone west of the inner Study Area to include Llandudno and the Great Orme. This will be discussed and agreed with Cadw and other relevant stakeholders as part of the Evidence Plan process for the project.

945 It is proposed that the assessment for the potential onshore visual impacts from the offshore turbines will be limited to specific assets whose heritage significance is related to maritime and long distance views that might be changed by the proposed offshore array such as port facilities, lighthouses, castles or hillforts.

TABLE 79 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR ONSHORE HISTORIC ENVIRONMENT

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
10.2.1	Direct permanent: Disturbance and damage to archaeological remains	The impact of construction activities such as ECR and substation would involve groundworks which are likely to physically disturb, and damage buried archaeological remains.	Desk-study of known assets, and subject to consultation with Cadw and GAT, field visit walk-over survey, geophysical prospection, and intrusive trial trenching (subject to land access agreements) to identify survival of previously unknown historic assets. A site inspection will be carried out over sensitive areas of the onshore ECR and substation site to establish the condition of known historic assets and identify the potential for the existence of additional assets not currently identified. Specific areas for field study, including geophysical survey and trial trenching, will be identified following initial analysis of the baseline data which can be used to define sensitivity and potential for unknown buried remains.
10.2.2	Indirect temporary: visual change, noise, air	The construction of substation and ECR might result in temporary impacts on designated historic assets within close	Assessment of visual, noise, air quality impacts on designated historic assets, making use of the relevant assessments (visual impact, acoustics, air quality) as

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	pollution, vibration, change to hydrological conditions	proximity through the noise and dust generated by construction, or vibration from heavy machinery, as well as visual change whilst construction is in progress.	appropriate that might be affected whilst construction is in progress through comparison of existing baseline conditions against projected change. Site visits will also be used to help with assessment of the potential visual impact on designated historic assets through development within their setting. It will also identify the contemporary existing environment (including historic and modern developments and land-use) to help understand the setting of DHAs and the degree of change that the proposed development might introduce.
OPERATION			
10.2.3	Indirect permanent: visual change, change to hydrological conditions	The impact of the WTGs and substation which would remain for c.25 years (a generation) would be considered permanent through the indirect impact of a change to heritage significance through development within the setting of the historic asset.	For designated assets within 500m of the substation, or those DHAs which have a maritime attribute (i.e. a function, or designed view related to the sea towards the proposed extension) the following approach will be adopted. Analysis of heritage significance of asset, and what within its setting contributes to that heritage significance, and how it would be changed by the proposed development. In addition to synthesis of existing knowledge, a site visit will be conducted to see

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			the asset in its setting, and visual modelling will be used to help assess the final effect. To assist with the indirect impact assessment for both Study Areas, a staged approach will be undertaken. Field inspections will be made after a filtering exercise to identify those DHAs that will not experience visual change and can be scoped out (see Table 3). This will be achieved by comparison within GIS of mapped DHAs to the ZTV data and aerial imagery (to check for vegetation and contemporary structures in proximity and screening the assets). It is proposed that non-designated historic assets in general will be scoped out, except in relation to areas of groundworks where physical direct impacts will occur. Where it is found that the proposed change to the baseline setting cannot affect specific assets this will be noted in the ES and no further assessment of such assets undertaken. For assessment of the offshore turbines, the potential indirect visual impact on Grade II listed buildings or Registered Parks and Gardens (RPGs) will be scoped out, as the likelihood of significant effects on

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			their heritage significance is greatly reduced due to distance from the turbines. The provisional ZTV modelling suggests onshore visibility from the turbines would be limited to the coastal belt and zones such as the Clwyd Valley. Within these zones assets of the highest significance which do not have a heritage significance associated with the sea, will be scoped out as the existence of turbines 10km out to sea will not be of relevance for impacting on their heritage significance. An initial assessment will be made of the Historic Landscapes to understand whether any of their character areas have a particular affinity with a maritime setting, and if not, then these will be scoped out.

TABLE 80 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR CONSTRUCTION, OPERATION AND DECOMMISSIONING PHASES

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
ALL PHASES		
10.2.4	Indirect visual impact on historic assets without maritime associations	In the wider Study Area, the potential impacts from WTGs on the onshore historic environment loses relevance when the heritage significance of the asset's function and outlook is predominantly terrestrial.
10.2.5	Indirect visual impact on historic assets with no visibility of development	Within both Study Areas assets that are outside of the ZTV will be excluded from assessment as it is very unlikely, they will receive significant indirect impacts.
10.2.6	Indirect visual impact on non-designated historic assets	Within the inner Study Area assessment of potential indirect impacts would focus on designated historic assets, and those other assets which are of demonstrably similar national importance.

946 For those DHAs which show a potential significant change to their setting in both inner and wider Study Areas by proximity to the substation, or through the offshore array being visible, further analysis will be undertaken to assess the level of impact. The ZTV mapping uses a bare earth model and even when it suggests potential visibility of the proposed turbines from DHAs, intervening vegetation and structures might screen views. It is envisaged that representative designated assets, either individually or in associated groups, will be inspected where there is reason to predict significant intervisibility with the offshore array.

947 It is not proposed that all DHAs within the wider Study Area will need detailed assessment, but a representative selection of these might require computer modelling (wirelines and/or photomontages) to assist in compiling a robust evidence base for assessment. Some of these locations might coincide with the Landscape and Visual Impact Assessment viewpoints, and the following list suggests some DHAs which on current information are likely to benefit from this approach:

- Beaumaris Castle;
- Conwy Castle (LB3250);

- Colwyn Bay town centre conservation area and LBs;
- Rhyl Seabank Road conservation area;
- Llandudno conservation area;
- Hwylfa'r Ceirw stone alignment (CN132); and
- Bryn Euryn Camp (DE071).

Assessment of heritage significance

948 Analysis of the designated historic assets and historic mapping will allow synthesis and interpretation of the historic development of the asset in its setting and enable the heritage significance to be established in accordance with Cadw's *Heritage Impact Assessment in Wales* (Section 4.2) and *Conservation Principles for the sustainable management of the historic environment in Wales*. This analysis will also establish what comprises the setting for the designated historic assets, and what elements of that setting contribute to how the asset is experienced, understood and appreciated. Assessment of the heritage significance (sensitivity) of the asset will use the criteria in the following table.

TABLE 81 - LEVELS OF HERITAGE SIGNIFICANCE

HERITAGE SIGNIFICANCE	EXPLANATION
Highest	World heritage sites Scheduled monuments Grade I and II* listed buildings Grade I and II* registered parks and gardens Designated battlefields Protected wrecks Non-designated assets of equivalent national significance
High	Grade II listed buildings Grade II registered parks and gardens Conservation areas Non-designated assets of equivalent significance Archaeological sites which are of particular individual importance within the regional archaeological resource
Medium	Archaeological sites of local importance
Low	Sites that are of minor importance or with little remaining to justify a higher category
Negligible	Negligible or no heritage significance
Unknown	Further information is required to assess the potential of these sites

Assessment of potential Impacts

949 The proposed development would result in change to the existing baseline, and change might be considered as impacts according to the degree of change caused to heritage significance. The assessment will identify impacts and effects as direct or indirect, adverse or beneficial, and short-term, long-term or permanent. Direct impacts are those which physically alter an asset and therefore its heritage significance; indirect impacts are those which affect the heritage significance of an asset by causing change within its setting.

950 Cadw's guidance *Managing: Setting of Historic Assets in Wales* will be followed which includes a four-stage process in assessment of impacts:

- Stage 1: Identify the historic assets within the inner Study Area, and those that have a maritime relevance for the outer Study Area;
- Stage 2: Define and Analyse the Setting;
- Stage 3: Evaluate the Potential Impact of Change or Development; and
- Stage 4: Consider Options to Mitigate the Impact of a Proposed Change or Development

Mitigation measures adopted as part of the project

951 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for impacts on archaeology and cultural heritage receptors. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

952 Innogy are committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 79 and Table 3.

953 Embedded mitigation is likely to include the following:

- Avoidance of impact through cable route selection (e.g. avoiding designated sites), where practicable;
- Appropriate archaeological investigation, recording, analysis and dissemination of the results.
- Avoidance of impact through methodology selection (e.g. HDD at sensitive locations);
- Development of a Code of Construction Practice (CoCP);
- Development of, and adherence to, a Decommissioning Plan.

954 The requirement for and feasibility of any further mitigation measures will be consulted upon with statutory consultees throughout the EIA process. Mitigation for visual impacts from the substation could include screening by planting trees or hedges in particularly sensitive locations.

Potential cumulative effects

955 A cumulative effect is considered to occur when there is:

- An effect on an asset or group of assets due to changes which would be caused by the main development under assessment; and
- An effect on the same asset or groups of assets which would be caused by another development or developments.

956 Consideration of the other potential contributor developments would be limited to those of the following kind:

- Wind farm developments which have been applied for with decision pending; and
- Wind farm developments which been granted permission but not yet implemented.

957 Effects from operational wind farms and those under construction would be included in the baseline position. Consultation with Cadw and Conwy and Denbighshire County Councils will assist with identifying developments to be considered within the cumulative assessment. Single turbine schemes, and all turbines below 50m will be outside the scope.

10.2.7 Summary of next steps

958 During the EIA, liaison will take place with the Seascape and Landscape Visual Impact assessors and their visual models will be used to help identify potential assets for assessment because of change from the offshore turbines. This will specifically include WHS at Beaumaris and Conwy, and also selected assets of the highest significance such as Penrhyn Castle. Onshore, once the preferred cable route and substation location have been decided, a staged approach for preliminary desk studies, geophysical surveys and trial trenching will be undertaken to establish the baseline. A ZTV will be used to assist with identifying which assets will need assessment due to potential indirect visual impacts from the substation.

959 Consultation with respect to the method of assessment employed and the designated historic assets to be assessed, will be undertaken with via the Evidence Plan process with Cadw (SAMs, Grade I and II* LBs and Registered Parks and Gardens), Conwy and Denbighshire Councils (Grade II LBs and RPGs, conservation areas), and GAT and CPAT (for non-designated heritage assets).

10.2.8 Further considerations for Consultees

i. Do you agree that the data sources identified are sufficient to inform the onshore Archaeology and Cultural Heritage baseline for the Awel y Môr OWF PEIR and ES?

ii. Which specific designated historic assets should be assessed (if any) for the potential indirect visual impact from the offshore turbines? Note that ZTVs and wirelines will help in filtering down the potential assets that might be affected, and representative viewpoints for asset groups (such as coastal conservation areas and listed buildings) will need to be agreed.

iii. Do you agree that all the protected areas within the Study Area have been identified?

iv. Have all potential impacts resulting from Awel y Môr OWF been identified for archaeology and cultural heritage receptors?

v. Do you agree that the impacts described in Table 80 can be scoped out?

vi. For those impacts scoped in (Table 79), do you agree that the methods described are sufficient to inform a robust impact assessment?

vii. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on Archaeology and Cultural Heritage receptors?

viii. Do you have any specific requirements for the Archaeology and Cultural Heritage methodology?

10.3 Airbourne Noise and Vibration

10.3.1 Introduction

960 This Section of the Scoping Report identifies the noise and vibration sensitive receptors of relevance to the Awel y Môr OWF onshore ECR search area and substation. Additionally, this Section identifies both onshore and offshore noise sensitive receptors of relevance to the offshore components of Awel y Môr.

961 This Section describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF from airbourne noise and vibration and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

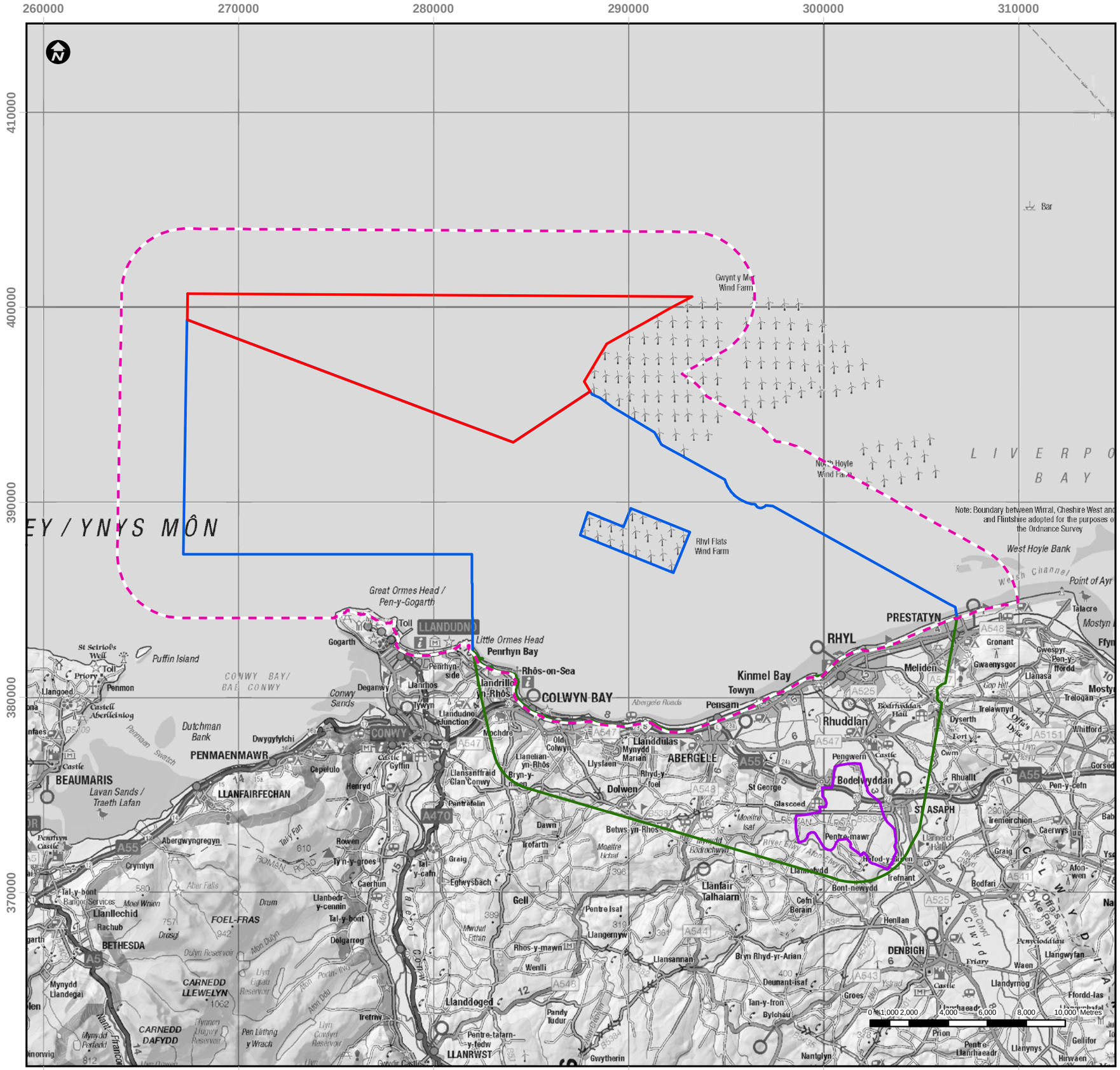
962 The effects of subsea noise and vibration from the construction, operation and maintenance, and decommissioning of the offshore components are covered in Section 7.2 of this Scoping Report.

10.3.2 Study Area

963 The noise and vibration Study Area for scoping is defined as the area within the Awel y Môr OWF onshore and offshore ECR search area, the substation search area and the array area as defined in Figure 72.

964 Upon finalisation of the Awel y Môr OWF onshore ECR corridor, the noise and vibration Study Area will be refined to include the temporary and permanent land take for the onshore elements of Awel y Môr OWF, the location of the Awel y Môr OWF onshore substation, and the closest Noise Sensitive Receptors (NSRs), if necessary, in consultation with the relevant Local Authorities and any other relevant stakeholders. The extent of the study area for the generation of offshore airbourne noise and vibration, to include the closest NSRs, will also be reviewed once the array boundary is finalised.

965 The Study Area will be reviewed and amended in response, for the PEIR, to such matters as refinement of the onshore (and offshore) ECR, landfall, substation and the identification of additional constraints (environmental and/ or engineering). This is expected to result in a significant reduction in the size of the Study Area as it is refined to more closely follow the route of the preferred onshore cable corridor, and preferred locations for the landfall and substation when these are selected during 2020.


260000
270000
280000
290000
300000
310000
410000
400000
390000
380000
370000
Bar
Gwynt y Mor Wind Farm
North Hoyle Wind Farm
Rhyl Flats Wind Farm
L I V E R P O O L
B A Y
Note: Boundary between Wirral, Cheshire West and and Flintshire adopted for the purposes o the Ordnance Survey
West Hoyle Bank
Welsh Channel
Point of Ayr
Great Ormes Head / Pen-y-Gogarth
LLANDUDNO
Little Ormes Head
Penrhyn Bay
Rhôs-on-Sea
COLWYN BAY
PRESTATYN
RHYL
Kinmel Bay
Towyn
Pensarn
Abergele Roads
Rhuddlan
Meliden
Gronant
Gwaenysgor
Llanasa
Trelogan
Mostyn
Ffyn
Talacre
Gwespyr
Pen-y-ffordd
Trelawnyd
Whitford
Gorsedd
Pen-y-cefn
Tremeirchion
Caerwys
Graig
Afon-wen
Bodfari
Cefn Berain
Henllan
Llandyrnog
Llangwyfan
Penycloddiau
Waen
Ffordd-las
Llanynys
Hirwaen
Gellifor
Nantglyn
Prion
Pentre Llanrhaeadr
DENBIGH
Friary
Castle
Groes
Llanrhaeadr
Bont-newydd
Llanfair Talhaiarn
Llansannan
Brynrhyd-yr-Arian
Deunant-isaf
Tan-y-fron
Bylchau
Llanddoged
Pandy Tudur
Pentre-tafarn-y-fedw
LLANRWST
Gwytherin
Trefnw
Wenlli
Rhos-y-mawn
Llangernyw
Pentre Isaf
Gwaun Ciwyd
Afon Clwyd
Offas Dyke Path
Bodelwyddan
St George
Glascoed
ST ASAPH
Pentre-mawr
Trefnant
Llannerch Hall
Rhuallt
Pengwern Castle
Bodrhyddan Hall
Dyserth
Cwm
Llyn
Moelfre Isaf
Moelfre Uchaf
Dawn
Betws yn-Rhos
Trofarth
Llanelian-yn-Rhôs
Llysfaen
Old Colwyn
Llanddulas
Mynydd Marian
Rhyd-y-foel
ABERGELE
Bryn-y-maen
Llansantffraid Glan Conwy
Mochdre
Colwyn
Dolwen
Pentrelafan
Eglwysbach
Graig
Tal-y-cafn
Rowen
Ty'n-y-groes
Caerhun
Llanbedr-y-cennin
Tal-y-bont
Dolgarrog
Gelli
Drum
Moel Wnion
Aber Falls
Tal-y-bont
Bangor Services
Llanllechid
Rachub
FOEL-FRAS
BETHESDA
Dulyn Reservoir
Afon Dulyn
Llyn Eigiau Reservoir
Llyn Cowlyd Reservoir
Llyn Dinas
Llyn Llydaw Reservoir
Pen Llithrig y Wrach
Tryfan
CARNEDD LLEWELYN
1062
CARNEDD DAFYDD
Mynydd Perfedd
Mynydd Llandegai
Penmaenmawr Slwtch
Dutchman Bank
Lavan Sands / Traeth Lafan
BEAUMARIS
PENMAENMAWR
LLANFAIRFECHAN
Abergwyngregyn
Crymlyn
Penrhyn Castle
Capelulo
Henryd
Dwygyfylchi
CONWY
Castle
Gyffin
Deganwy
Llanrhos
Llandudno Junction
Conwy Sands
Afon Conwy
Afon Gyrach
Afon Ddu
Afon Pobtu-Wen
Afon Llugwy
Afon Caseg
Afon Lledr
Afon Conwy
Afon Dulyn
Afon Gwyrfai
Afon Llyfni
Afon Llugwy
Afon Ogwen
Afon Cegin

10.3.3 Baseline data

966 No baseline sound monitoring has been undertaken to date. Once the noise and vibration Study Areas has been refined (as described in paragraph 962), baseline conditions will be established by undertaking baseline noise surveys. The survey locations will be identified from a review of the Awel y Môr OWF onshore ECR corridor, the onshore substation location (refer to chapter 5 for route/site selection process), the offshore Array locations and the locations will be representative of the closest NSRs to the development area. The survey locations for these baseline surveys will be agreed with Environmental Health Officers of the Local Authorities.

967 The surveys will be undertaken during suitable weather conditions over a 96-hour period to include a weekend. The measured noise data will be used to derive ambient and background sound levels for both daytime and night-time periods. The surveys and data screening will be in accordance with the requirements of British Standard BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*' and British Standard 7445:1991 '*Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use*'.

968 A review of the baseline data contained within Environmental Statements for other developments relevant to Awel y Môr OWF has been undertaken. The review has helped inform of the pre-existing background noise environment at those locations likely to be affected by the development. The application documents for the following projects were utilised in establishing an understanding of the baseline environment: Gwynt y Mor OWF; North Hoyle OWF; Rhyl Flats OWF and Burbo Bank OWF.

10.3.4 Baseline environment

969 A large proportion of the onshore search area is located within a rural location, which may be indicative of low ambient noise levels. The areas around the North Wales coastline will have higher ambient noise levels due to the urban development along the extent of the coast and due to the road network system, which crosses throughout the area.

970 In relation to the generation of airbourne noise from the offshore construction and operational phases, NSRs may include offshore oil and gas accommodation, and manned working platforms; commercial shipping; fishing vessels; near shore leisure and recreational receptors and near shore onshore receptors. The baseline environment at each of these receptors is likely to be impacted by the existing nearby activities to the NSRs from existing operational OWFs and by commercial and fishing vessels and other noise generating installations.

Designated sites

971 There are no international, national or local designations specifically related to matters of noise and vibration, or how it should be controlled. Noise and vibration effects have the potential to impact upon sensitive receptors, including residential properties, members of the public using publicly accessible resources (for example, PRoWs, common land, playing fields, visitor attractions), wildlife, commercial properties and designated heritage assets.

10.3.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

972 The assessment will be conducted in accordance with *The Guidelines for Environmental Noise Impact Assessment*, produced by the Institute of Environmental Management and Assessment (IEMA), and published in October 2014.

973 The guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines provide specific support on how noise impact assessments fit within the EIA process. They cover:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effect of changes in noise levels.

974 Construction noise for onshore receptors will be assessed in accordance with BS5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. This standard sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.

975 Construction noise for offshore receptors will be assessed in accordance with *The Merchant Shipping and Fishing Vessels Control of Noise at Work Regulations* for occupational receptors and the *Offshore Technology Report* for offshore accommodation receptors.

976 Compliance with the specified guidance is expected when assessing the impact of construction noise upon the existing noise environment at nearby sensitive receptors.

977 Noise generated by construction traffic will be assessed in accordance with the guidance in the Design Manual for Roads and Bridges (DMRB), Volume 11 (Environmental Assessment), Section 3 (Environmental Assessment Techniques), Part 7 (HA 213/08 – Noise and Vibration). The additional vehicles associated with the development (i.e. off-site traffic during construction) will be undertaken based on the results of a transport assessment (refer to Section 10.4) and with reference to the DMRB.

978 The effects of vibration resulting from construction activities will be assessed in accordance with BS5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*. This standard sets out recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels, including industry-specific guidance. Guidance is provided concerning methods of measuring vibration and assessing its effects on the environment.

979 Compliance with BS5228-1:2009+A1:2014 is expected when assessing the impact of construction vibration upon the existing vibration environment at nearby sensitive receptors.

980 Operational sound associated with the onshore substation only, will be assessed in accordance with BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*. This standard is intended to be used to assess the potential adverse impact of sound, of an industrial and/or commercial nature, at nearby sensitive receptor locations within the context of the existing sound environment.

981 The assessment of impacts contained in BS4142:2014+A1:2019 is undertaken by comparing the sound rating level, i.e. the specific sound level of the source plus any penalties, to the measured representative background sound level immediately outside the sensitive receptor location. Consideration is then given to the context of the existing sound environment at the sensitive receptor location to assess the potential impact.

982 Operational sound associated with the offshore turbine array on all identified NSRs will be assessed. Although ETSU-R-97 is the recognised guidance for the assessment of onshore wind farms on residential NSRs, is not intended for assessment of noise from offshore wind farms. However, the guidance provided in ETSU-R-97 and the Institute of Acoustics (IoA) Good Practice Guide (GPG) may be relevant for establishing background noise levels and for the derivation of daytime and night-time noise limits or for the simplified (<35dBA) assessment at the identified NSRs. Derived noise limits would be implemented for the assessment of impacts. Additionally, it is suggested that the specific sound level of the source be assessed against the limits stated in the World Health Organisation (WHO) *Environmental Noise Guidelines for the European Region – Guideline Values for Community Noise in Specific Environments* for sleep disturbance inside bedrooms during the night-time hours. Consultation with the relevant Local Authorities will be required in order to agree the methodology to be implemented for the assessment of operational noise from the OWF.

983 For ecological receptors, the assessment of noise effects during construction and operation will make reference to AQTAG09 (Air Quality Technical Advisory Group 09), *Guidance on the effects of industrial noise on wildlife,* which is intended to be used to assess the potential adverse impact of sound, of an industrial and/or commercial nature on wildlife. The guidance enables planning officers involved with Pollution Prevention and Control applications for installations with relevant noise emissions and relates these to the requirements of the Habitats Regulations.

984 The effects of subsea noise and vibration from the construction, operation and maintenance, and decommissioning of the offshore components on ecological receptors are covered in Chapter 9 of this Scoping Report.

Potential project impacts

985 A range of potential impacts of noise and vibration have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The impacts that are proposed to be scoped into the Awel y Môr OWF EIA are outlined in Table 82, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

986 Based on the baseline noise and vibration information currently available and the project description, a number of impacts are proposed to be scoped out of the EIA for noise and vibration. These impacts are described in Table 83, together with a justification for scoping them out.

TABLE 82 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR ONSHORE NOISE AND VIBRATION

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
10.3.1	Temporary increase in noise and vibration due to onshore cable route construction.	The impact of noise and vibration from construction activities due to the onshore cable route construction phase. The main noise sources from construction activities to include operational mobile plant for trenching / excavation and associated HGV movements. This is applicable for the selected landfall location and the associated onshore cable corridor where underground cable installation passes close to NSRs.	A desk-based study to identify noise and vibration sensitive receptors would be undertaken and where appropriate baseline measurements would be made at representative NSR locations agreed with the EHO for the relevant local authority. The noise levels associated with construction will be predicted at the identified NSRs implementing the proprietary noise modelling software CadnaA®, which incorporates the calculation methodology outlined in BS5228:2009+A1:2014. The predicted noise levels will then be assessed in accordance with BS5228:2009+A1:2014 Part 1 – Noise. The vibration levels associated with each construction phase will be predicted and

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			assessed in accordance with BS5228:2009+A1:2014 Part 2 – Vibration. The significance of effects will be determined with reference to the Guidelines for Environmental Noise Impact Assessment 2014, as published by the Institute of Environmental Management and Assessment (IEMA). The results of the modelling and prediction work will be assessed in accordance with the relevant criteria to identify the significance of construction noise and vibration impacts. Where appropriate, specific mitigation measures will be detailed to prevent, reduce or offset any significant adverse effects, and the likely residual effects after these measures have been employed.
10.3.2	Temporary increase in noise and vibration due to onshore substation construction.	The impact of noise and vibration from construction activities due to the substation construction phase on the nearest noise and vibration sensitive receptors. Construction noise sources will be from operational mobile	As above for noise and vibration impact number 10.3.1.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		plant for excavation, laying foundations and piling if required.	
10.3.3	Temporary increase in noise and vibration during the construction of the extension to the existing NGET onshore substation at Bodelwyddan.	The impact of noise and vibration on the nearest sensitive receptors from construction activities associated with the construction of the Bodelwyddan substation extension. Noise sources from construction as above in 10.3.2	As above for noise and vibration impact number 10.3.1.
10.3.4	Temporary increase in noise levels due to construction traffic.	The impact of noise due to the increase in the number of construction related vehicles at the nearest NSRs during the onshore cable route and substation construction phases.	A desk-based study to identify noise sensitive receptors along the construction haul routes would be undertaken. The specific sound levels generated by construction traffic movements travelling to and from the site will be predicted at the properties using CadnaA® and the calculation methodologies contained in BS5228:2009+A1:2014. The predicted noise levels would then be assessed in accordance with DMRB.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			The significance of effects will be determined with reference to the IEMA Guidelines. The results of the modelling and prediction work will be assessed in accordance with the relevant criteria to identify the significance of construction traffic impacts. Where appropriate, specific mitigation measures will be detailed and the likely residual effects after these measures have been employed.
10.3.5	Temporary increase in noise and vibration due to offshore construction activities	The impact of noise and vibration from construction activities due to the offshore construction phase on the nearest noise and vibration sensitive receptors. Offshore construction noise may arise from: pile driving; vessel movements and cable laying.	For onshore receptors, as above for noise and vibration impact number 10.3.1. For offshore receptors, assessments will be in accordance with *The Merchant Shipping and Fishing Vessels Control of Noise at Work Regulations* for occupational receptors and the *Offshore Technology Report* for offshore accommodation receptors.
10.3.6	Temporary increase in noise due to construction activities on wildlife.	The impact of construction noise on the nearest ecological receptors	A desk-based study to identify ecological receptors and cross reference with ecology/ornithology for data relating to

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			designated nature conservation areas and sensitive species from publicly available sources. The specific sound levels generated by construction activities will be predicted at the ecological receptors using CadnaA® and the calculation methodologies contained in BS5228:2009+A1:2014. The predicted noise level would be assessed at the nearest ecological receptors in conjunction with AQTAG09. In accordance with the IEMA Guidelines noise impact may be determined by comparing the predicted noise level with an absolute noise limit. The significance of any effects will be determined and if necessary, mitigation measures proposed.
OPERATION			
10.3.7	Operation of the onshore substation on the nearest noise sensitive receptors.	The impact of noise due to the operational substation on the nearest NSRs.	A desk-based study to identify noise sensitive receptors would be undertaken and where

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			appropriate baseline noise measurements would be made. The noise levels associated with the operation of the substation will be predicted at the identified NSRs implementing the proprietary noise modelling software CadnaA®, which incorporates the calculation methodology in this instance the calculation algorithms contained in ISO 9613-2:1996-2 would be utilised. The predicted noise levels would be assessed at the nearest noise-sensitive receptors in conjunction with BS4142:2014+A1:2019. The significance of effects will be determined with reference to the IEMA Guidelines. Predicted noise levels will be assessed in accordance with the relevant criteria to identify the significance of operational impacts. Where appropriate, specific mitigation measures will be detailed and the likely residual effects after these measures have been employed.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
10.3.8	Operation of the extended onshore NGET substation extension at Bodelwyddan on the nearest noise sensitive receptors.	The impact of noise due to the extension to the Bodelwyddan substation on the nearest NSRs.	As above for noise impact number 10.3.7.
10.3.9	Operation of the onshore substations on wildlife.	The impact of noise due to the onshore substation and the extension to the Bodelwyddan substation on ecological receptors.	A desk-based study to identify ecological receptors would be undertaken and where appropriate baseline noise measurements would be made. The noise levels associated with the operation of the substation will be predicted at the identified NSRs implementing the proprietary noise modelling software CadnaA®, which incorporates the calculation methodology in this instance the calculation algorithms contained in ISO 9613-2:1996-2 would be utilised. The predicted noise level would be assessed at the nearest ecological receptors in conjunction with AQTAG09. The significance of effects will be determined with reference to the IEMA Guidelines. Predicted

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			noise levels will be assessed in accordance with the relevant criteria to identify the significance of operational impacts on ecological receptors. Where appropriate, specific mitigation measures will be detailed and the likely residual effects after these measures have been employed.
10.3.10	Operation of the offshore wind farm on the nearest noise sensitive receptors.	The impact of noise due to the operational offshore wind farm on the nearest NSRs. Operational noise will include aerodynamic noise from wind turbine blades passing through the air and mechanical noise from the gearbox and generator of the turbines.	The noise levels of the operational OWF will be predicted in accordance with the guidance provided in ETSU-R-97 and the IOA GPG. Additionally, it is suggested that the specific sound level of the source be assessed against the limits stated in the World Health Organisation (WHO) Environmental Noise Guidelines for the European Region – Guideline Values for Community Noise in Specific Environments. Consultation with the EHOs at the relevant Local Authorities will be required in order to agree a methodology for assessment. For offshore receptors assessments will be in accordance with *The Merchant Shipping and Fishing Vessels Control of Noise at Work*

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			Regulations for occupational receptors and the *Offshore Technology Report* for offshore accommodation receptors.
DECOMMISSIONING			
10.3.11	Temporary increase in noise and vibration as a result of cable decommissioning.	The decommissioning of the Awel y Môr OWF onshore ECR could directly affect sensitive receptors. Decommissioning noise sources will be from operational mobile plant for excavation and HGV movements.	As above for noise and vibration impact number 10.3.1.
10.3.12	Temporary increase in noise and vibration as a result of the decommissioning of the onshore substation.	The decommissioning of the onshore substation could directly affect sensitive receptors. Decommissioning noise sources will be from operational mobile plant for excavation, laying foundations and piling if required.	As above for noise and vibration impact number 10.3.1.
10.3.13	Temporary increase in noise and vibration as a result of the decommissioning of the	The decommissioning of the Awel y Môr OWF offshore components could directly affect sensitive	As above for noise and vibration impact number 10.3.5.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	offshore components of the project.	receptors. Decommissioning noise associated with vessel movements and cable recovery.	

TABLE 83 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR ONSHORE NOISE AND VIBRATION

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
OPERATION		
10.3.14	Vibration effects arising from the operation of the substation.	It is considered unlikely that the operation of the substation will lead to any significant vibration effects. The substation will have few moving parts and the generation of vibration by mechanical displacement is unlikely. Therefore, subject to consultation with the Local Authority EHO and feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
10.3.15	Noise and vibration effects associated with the operation of the underground cable.	It is considered unlikely that the operation of the underground cable will lead to any significant noise and vibration effects. The underground cable will have no moving parts and hence no generation of vibration through any mechanical periodic oscillations. Therefore, subject to consultation with the Local Authority Environmental Health Officers and feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.

Mitigation measures adopted as part of the project

987 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for impacts on noise and vibration receptors. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

988 Innogy is committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 82 and Table 83.

989 It is proposed that a Noise and Vibration Plan is produced which will specify the Best Practicable Means (BPM) of controlling noise from the construction sites. It is anticipated that measures that may be included in the plan are:

- all plant to have noise emission levels that comply with the limiting levels defined in relevant legislation;
- plant and materials would be operated and handled in accordance with best practise such as minimising noise emissions; and
- plant would be subject to regular maintenance and kept in good working order in meet manufacturers' noise emission levels.

990 BPM would also be included in the Noise and Vibration Plan to minimise the effects of vibration from construction activities. Measures provided to illustrate the range of techniques available may include:

- where practicable, stationary plant would be isolated using resilient mountings,
- plant would be operated in a proper manner with respect to minimising vibrations;
- consideration would be given to the most suitable plant and hours of working for the operations (which would be subject to agreement with the LPA) which may give rise to perceptible vibrations and where practicable, these would be replaced by less intrusive plant and/or working methods; and
- control of vibration at sources, where practicable, by reducing the speed of plant.

991 With regards to the operational noise of the proposed Awel y Môr OWF onshore substation and the proposed extended NGET substation at Bodelwyddan the requirement and feasibility of any mitigation measures will be dependent on the significance of the effects on noise and vibration. The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

992 Cumulative impacts in terms of noise and vibration arising from Awel y Môr OWF alongside other projects within the noise and vibration Study Area from other industries/activities (e.g. industrial development, coastal infrastructure associated with oil and gas activities or electrical infrastructure) would be most likely to occur during the construction phase.

993 The predicted effects of construction and operation from Awel y Môr OWF on noise and vibration are considered to be localised to within the noise and vibration Study Area. However, there is potential for cumulative effects to occur from other projects or activities within the Awel y Môr OWF noise and vibration Study Area where projects or plans could act collectively with Awel y Môr OWF to affect sensitive receptors.

994 The following projects or activities will be considered within the onshore Study Area:

- Other offshore wind farms and associated onshore cabling and infrastructure;
- Onshore energy generation projects (excluding householder scale projects);
- Road and rail projects;
- Major residential, commercial and leisure projects; and
- Minerals extraction and landfill projects.

995 Awel y Môr OWF will monitor the status of identified and emerging projects throughout the preapplication phase and consider these within the assessment of cumulative impacts within the EIA as necessary.

Potential transboundary Impacts

996 Due to the localised nature of any potential impacts, transboundary impacts are unlikely to occur with regard to noise and vibration from Awel y Môr OWF and therefore it is proposed that this impact will be scoped out from further consideration within the EIA.

10.3.6 Summary of next steps

997 Once the noise and vibration Study Areas has been refined following selection of the preferred Awel y Môr OWF onshore ECR and onshore substation location (refer to Chapter 5 for route/site selection process), baseline conditions will be established by undertaking baseline noise surveys. The survey locations will be identified from a review of the proposed cable corridor and substation location and the locations will be representative of the closest NSRs to the development area. Survey locations will be agreed with Environmental Health Officers of the Local Authorities concerned through ongoing engagement. Upon collection of this baseline data, Innogy will proceed with the assessment methodology set out in Table 82.

998 It is assumed that the potential impacts associated with the decommissioning phase would be similar to, and no worse than, those presented for the construction phases.

10.3.7 Further considerations for Consultees

999 Specific questions relating to the scope of the noise and vibration assessment are detailed below:

i. Do you agree that the proposed surveys will be sufficient to inform the onshore noise baseline for the Awel y Môr OWF and ES, subject to further consultation on locations once the route and substation location has been identified?

ii. Have all potential impacts resulting from Awel y Môr OWF been identified for the noise and vibration sensitive receptors?

iii. Do you agree that the impacts described in Table 83 can be scoped out?

iv. For those impacts scoped in (Table 82), do you agree that the methods described are sufficient to inform a robust impact assessment?

v. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on noise and vibration sensitive receptors?

vi. Do you have any specific requirements for the noise and vibration modelling methodology?

10.4 Traffic and transport

10.4.1 Introduction

1000 This Section of the Scoping Report identifies the traffic and transportation receptors of relevance to the Awel y Môr OWF onshore ECR search area and substation. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on traffic and transportation and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

1001 Potential effects on access routes and users of Public Rights of Way (PRoW) and disruption to the railway and local and strategic road networks are included, with consideration of the effects of noise from vehicular traffic resulting from the construction of the onshore components of Awel y Môr OWF presented separately in Section 10.3 Airborne Noise and Vibration.

10.4.2 Study Area

1002 The Study Area has been defined as a 1km buffer around the onshore ECR search area, as shown in Figure 73. It is assumed that all potential traffic and transport impacts will either be at or near to the construction sites, which will be within this area, and on the routes to and from the Strategic Road Network (SRN), which are also captured by the 1km buffer. Elements of the Study Area of relevance to traffic and transport includes the Local Road Network (LRN), the SRN, the North Wales Main Line (Railway) and a network of PRoW and Active Travel Routes. The key road and rail network in the Study Area is shown in Figure 73.

1003 The LRN in the Study Area is maintained by Denbighshire County Council (DCC) and Conwy County Borough Council (CCBC), with a number of key 'A' roads apparent, including:

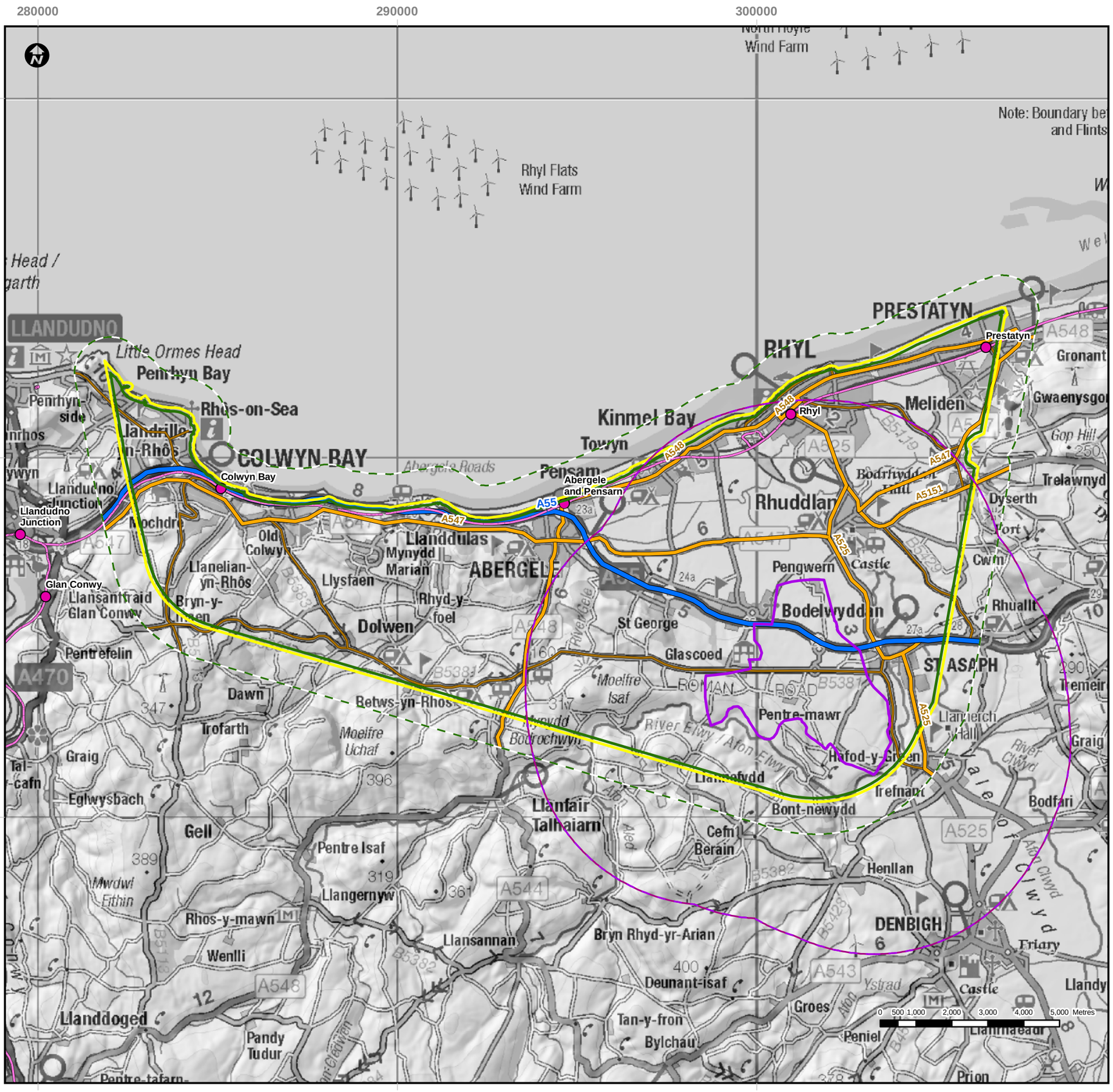
- A547 (between Colwyn bay and Prestatyn);
- A548 (between the B5381 and Prestatyn);
- A525 (between Rhyl and St. Asaph); and
- A5151 (at Rhuddland).

1004 There are also a number of key 'B' and unclassified roads, including:

- B5381 (between Dolwen and St. Asaph);
- B5383 (between Old Colwyn and Dolwen);
- St. Asaph Avenue;
- Ronaldsway; and
- Gors Road.

1005 The SRN in the Study Area, maintained by North and Mid Wales Trunk Road Agency (NMWTRA), comprises the A55 North Wales Expressway between Junction 20 (B5115) and Junction 27 (A525). The North Wales Main Line in the Study Area runs between Colwyn Bay, following the coast to Prestatyn, with intermediate stations at; Abergele and Pensarn and Rhyl. There is an extensive network of PRoW throughout the Study Area, which is also considered in Section 10.8 Landscape and Visual and Section 10.9 Socioeconomics and Tourism.

1006 The Study Area will be reviewed and amended in responses, for the Preliminary Environmental Information Report (PEIR), to such matters as refinement of the onshore (and offshore) Export Cable Routes (ECR) and the identification of additional constraints (environmental and/ or engineering). This is expected to result in a significant reduction in the size of the Study Area as it is refined to more closely follow the route of the preferred onshore cable corridor, and preferred locations for the landfall and substation when these are selected during 2020. As the project progresses, and the Study Area refined, this will be discussed with relevant stakeholders through the Evidence Plan process.



Overview map



Legend

- Onshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area 1km Buffer
- Substation Search Area
- Substation Search Area 5km Buffer
- Railway Station
- North Wales Main Railway Line
- A55 North Wales Expressway
- A Road
- B Road
- Study Area

Cartographic information

Coordinate System: British National Grid
NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel Y Môr**

TITLE Key Road and Rail Links in the Study Area

DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:110,000	@DIN A3

REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.4 - Transport\AyM_Innogy_WF_UK_DIN_TrafficAndTransport_KeyRoadAndRailLinks.mxd

10.4.3 Baseline data

1007 The data used for the purposes of scoping are as follows:

- Department for Transport (DfT) Traffic flow data on the LRN and SRN I the Study Area at the locations shown in Table 84;
- Existing bus and rail routes serving the Study Area (a broad overview); and
- Details of the PRoW and Active Travel Routes in the Study Area (a broad overview).

1008 The following additional existing data are available and will be used to inform the PEIR and assessment within the Environmental Statement (ES), once the Study Area has been refined as set out in paragraph 6:

- Traffic data on the LRN and SRN from the Welsh Government (locations have been requested, to be confirmed);
- Speed data on the LRN and SRN from the Welsh Government (locations have been requested, to be confirmed);
- Collison data on the LRN and SRN from the Welsh Government;
- Existing pedestrian, cycle, bus and rail routes serving the Study Area (a detailed analysis);
- PRoW network (a detailed analysis);
- Active travel routes (Existing Route Maps and Integrated Network Maps);
- Highway boundary plans to assess any new access onto the LRN;
- Details of Abnormal Indivisible Load (AIL) routes;
- Details of extant permissions (committed development) and associated traffic flows on the LRN and SRN in the Study Area; and
- Details of sensitive receptors (such as junctions operating over capacity, district centres, hospitals, schools, leisure facilities etc.).

1009 Additional data will be obtained to inform the ES once the cabling sites and substation location have been identified and the scope of assessment agreed including:

- Automatic Traffic Count (ATC) data on highway links (Classified, 24-hour, seven-day counts, including speeds); and

- Classified Turning Count data and queue lengths at junctions (07:00 to 10:00 and 16:00 to 19:00, weekday counts).

1010 The likely additional data requirements are detailed further in Table 85.

10.4.4 Baseline environment

Highway network

1011 The highway network comprises a key route on the SRN between the east and west of the Study Area (A55) connecting a number of LRN 'A' roads, at Grade Separated Junctions, running east to west and north to south, providing a core access 'grid' for vehicular traffic throughout the area.

1012 To provide some context, Table 84 provides some current traffic flows using the DfT data, including Heavy Goods Vehicle (HGV) proportions, at key sections of the LRN and SRN.

TABLE 84 – EXISTING TRAFFIC COUNT DATA (2-WAY AADT)

COUNT LOCATION	YEAR	TOTAL FLOW	HGV	HGV (%)
A55 between Junction 22 and 23	2018 estimate from 2017 count	56,230	2,966	5.3
A55 between Junction 23 and 23a	2018 estimate from 2017 count	55,655	2,452	4.4
A55 between Junction 23a and 24	2018 estimate from 2017 count	42,545	2,241	5.3
A55 between Junction 25 and 26	2018 estimate from 2017 count	45,953	2,945	6.4
A55 between Junction 27 and 27a	2018 estimate from 2016 count	41,303	2,564	6.2
A525 south of A55 Junction 27a	2018 estimate from 2014 count	1,470	42	2.9
A525 north of A55 Junction 27	2018 estimate from 2015 count	16,824	492	2.9
A547 at Rhuddlan	2018 estimate from 2015 count	13,552	232	1.7
A525 at Rhuddlan	2018 count	23,221	502	2.2
A547 west of Rhuddlan	2018 estimate from 2016 count	14,218	297	2.1
A547 east of Rhuddlan	2018 estimate from 2015 count	10,911	263	2.4
A547 west of A55 Junction 24	2018 estimate from 2015 count	11,507	456	4.0
A547 west of Abergele	2018 estimate from 2016 count	7,077	74	1.0

1013 Whilst the data in Table 84 is available (should it be required), whether it is used in the EIA will depend on the location of the onshore ECR and substation, identification of haul routes and availability of other data from the Welsh Government. The majority of the counts are estimated from previous years and therefore if it proposed to use it in the PEIR and ES, its use will be agreed with DBC, CCBC and the Welsh Government, as set out in Table 85

1014 Confirmation has been sought from the Welsh Government on the existing traffic counts that it holds for the A55 and any useable data will be reviewed, as set out in Table 85.

Public transport network

1015 There are regular rail services between the three railway stations within the Study Area (Colwyn Bay, Abergele & Pensarn and Rhyl) and Conwy, Bangor, Llandudno, Holyhead, Manchester Airport, Manchester Piccadilly, Crewe and Chester.

1016 The bus network in the Study Area consists of inter-urban routes between Rhyl, Colwyn, Abergele and St Asaph, to other urban areas in the locality such as Conwy, Bangor, Denbigh, Llandudno and locations outside of the locality, such as Chester. There are also local bus services that serve each of the urban areas and their hinterlands.

1017 A detailed review of public transport provision in the Study Area will be undertaken once the onshore ECR and substation location have been defined. This review will identify opportunities for construction workers to travel to and from the construction sites by bus or rail.

PRoW

1018 The network of PRoW across the Study Area consist of Footpaths, Bridleways and Restricted Byways and Byways.

1019 For Denbighshire, the locations of the PRoW are available at:

- http://www.rowmaps.com/ or via a public viewing of a definitive map.

1020 For Conwy, a definitive map is available at:

- https://www.conwy.gov.uk/en/Resident/Leisure-sport-and-health/Coast-and-Countryside/Public-Rights-of-Way.aspx

1021 A detailed review of the PRoW will be undertaken once the onshore ECR and substation location have been defined. This will identify all PRoW that will be affected (directly and indirectly) by construction activity and to identify any that require assessing in the ES.

Active travel routes

1022 In September 2014, the Welsh Government introduced the Active Travel (Wales) Act which makes it a legal requirement for local authorities in Wales to map and plan for suitable routes for active travel. The Existing Route Maps (ERMs) and Integrated Network Maps (INMs) for Denbighshire and Conwy are available at:

- https://www.denbighshire.gov.uk/en/resident/parking-roads-and-travel/cycling-and-walking/active-travel.aspx; and
- https://www.conwy.gov.uk/en/Resident/Parking-Roads-and-Travel/Active-Travel/Active-Travel-Wales-Act-2013.aspx

1023 A detailed review of the ERM and INMs will be undertaken once the onshore ECR and substation location have been defined. This will identify those that will be affected (directly and indirectly) by construction activity and to identify any that require assessing in the ES.

10.4.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

1024 The assessment of potential traffic impacts will be undertaken with reference to the following key guidance documents:

- Department for Communities and Local Government (DCLG) Planning Practice Guidance - Overarching principles on Travel Plans, Transport Assessments and Statements. This contains overarching principles on Travel Plans, Transport Assessments and Statements; and
- Guidance for Environmental Assessment of Road Traffic (GEART). This contains the principle guidelines for the assessment of the environmental impacts of road traffic associated with new developments. GEART was published by the Institute of Environmental Assessment in January 1993. The guidance provides a framework for the assessment of traffic borne environmental impacts, such as pedestrian severance and amenity, driver delay, accidents and safety; and noise, vibration and air quality.

- Design Manual for Roads and Bridges (DMRB) LA112 Population and Human Health, Highways England (2019) gives guidance on assessing a scheme's impact on the journeys which people make in its locality. It considers journeys made by people as pedestrians (including ramblers), cyclists and equestrians.

1025 The DCLG guidance sets out how the transport impacts of a proposed development on the highway and public transport networks should be assessed within a Transport Assessment and, should include measures to promote sustainable travel through the preparation of a Travel Plan and identify mitigation measures to address any impacts. These are the requirements for assessment as set out in the Overarching National Policy Statement for Energy (EN-1) and therefore the assessment will take account of this guidance.

1026 In terms of the assessment of the associated environmental impacts of a proposed development, GEART states that to determine the scale and extent of the assessment, and the level of effect a proposed development will have on the surrounding road network, the following two 'rules' should be followed:

- Rule 1 - Include road links where flows are predicted to increase by more than 30% or where the number of HGVs is predicted to increase by more than 30%; and
- Rule 2 - Include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

1027 Rules 1 and 2 are used as a screening tool to determine whether or not a full assessment of effects on routes within the Study Area is required as a result of intensification of road traffic. Where anticipated construction traffic volumes are not greater than 30% (or 10% at sensitive locations), a detailed assessment of effects is not necessary, as set out in Table 85.

1028 The significance of likely effects will then be determined by the consideration of the sensitivity of receptors to change, taking account of the specific issues relating to the Study Area, and then the magnitude of that change, as set out in Table 85.

Potential project impacts

1029 At this stage, the traffic and transport assumptions regarding the construction phase of the onshore elements of Awel y Môr OWF are as follows:

- Deliveries by HGV to and from the A55;
- There will be a series of construction compounds with direct access onto the LRN. The majority of HGV and Light Goods Vehicle (LGV) movements would be to and from these sites. The location of these is to be determined upon selection of the preferred route and the substation;
- A haul route along the LRN would be identified and agreed with stakeholders between these compounds and the A55; and
- Horizontal Direction Drilling (HDD) will be used underneath the railway, the A55 and any other strategic routes crossed.

1030 Based on the above, a range of potential impacts have been identified which may occur during the construction phase of Awel y Môr OWF. The impacts that innogy is proposing to scope into the Awel y Môr OWF EIA are outlined in Table 85, together with a description of proposed additional data collection and supporting analyses to enable an assessment of the impact.

1031 Based on the baseline information currently available and the project description, a number of impacts have been identified at this stage to be scoped out of the assessment for traffic and transport. These are shown in Table 86.

TABLE 85 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR TRAFFIC AND TRANSPORT

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
10.4.1	Driver severance and delay	The potential delays to existing drivers and their potential severance from other areas	The expected vehicle movements (LGVs and HGVs) associated with the construction phase of the onshore elements of Awel y Môr OWF will be established (for each construction site and corresponding link route with the A55), using detailed project description information provided by innogy and where necessary using previous project experience to inform the assessment using a range of assumptions, such as timing, frequency and distribution of movements. The peak period of construction will be used as a worst-case scenario, for a robust assessment, which will be identified using an indicative construction programme. The forecast vehicle movements to and from each construction site will be agreed with Expert Topic Group (ETG) members prior to assessment and predicted profile across the day will be established. Where predicted construction traffic volumes are greater than the Rule 1 and 2 thresholds, the significance of the effects on receptors adjacent to highway links and junctions that form the haul routes to and from the A55 will be evaluated using GEART.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
			Existing traffic data will be reviewed, and new traffic counts (and queue length surveys where appropriate) will be commissioned where required, following a review of the highway links / junctions to be included in the assessment. This will be undertaken upon confirmation of the preferred cable route and substation location and establishment of the proposed routing to the A55. Percentage impacts (total traffic and HGV) of the proposed development on Annual Average Daily Traffic (AADT) at the identified links will be established and based on the identification of GEART Rule 1 or Rule 2 for each link, the magnitude of impact will be established. GEART indicates that traffic flows would have to increase by more than 30% in order for a 'slight' change in severance to occur, 60% for a 'moderate' change to occur and 90% for a 'substantial' change to occur. The significance of effect will be determined based on the magnitude of impact, receptor sensitivity and professional judgement. GEART notes that the driver delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. Junction capacity assessments will be undertaken at any sensitive locations on the LRN and SRN (to be agreed with ETG members) as part of the Transport Assessment element

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
			of the ES. The assessment of junction capacity and delay will be undertaken through the use of standard practice analytical tools and junction analysis programs.
10.4.2	Community severance	The potential severance to communities	The AADT percentage impacts identified for Impact 10.4.1 will be used to assess against GEART, which indicates that traffic flows would have to increase by more than 30% in order for a 'slight' change in severance to occur, 60% for a 'moderate' change to occur and 90% for a 'substantial' change to occur. In addition to the GEART guidance, Volume 11, Section 3 Part 8 of the DMRB, provides guidance to both the direct effects of a new scheme, and to effects caused by increases in traffic levels on existing roads. The guidance provides example definitions of where severance could be experienced and notes that for pedestrians crossing at grade, a 'slight' severance with less than 8,000 AADT, a 'moderate' severance with 8,000 to 16,000 AADT and a 'significant' severance with over 16,000 AADT. The DMRB guidance also notes that *"Given that relief of severance is not significant where traffic flows are already relatively low, the guidelines do not apply to roads with an existing AADT flow of less than 8,000 vehicles"*

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
			In this context where traffic flows on a road are less than 8,000 vehicles AADT, severance is considered unlikely to occur. The significance of effect will be determined based on the magnitude of impact (as per GEART), receptor sensitivity and professional judgement.
10.4.3	Road safety / vulnerable road users	The potential effect on users of the road, particularly. pedestrians/cyclists	An examination of the existing collisions occurring on the haul routes for construction over the previous three-year period will be undertaken to identify any areas of the highway with concentrations of collisions with similar patterns, or roads with collision rates that are higher than national averages (Road Casualties Great Britain, DfT, 2018 or 2019 if available) This will be undertaken upon confirmation of the preferred cable route and substation location and establishment of the proposed routing to the A55. These sites will be considered sensitive to changes in traffic flows (sensitive receptors) and therefore a more detailed analysis of significance will be undertaken in the context of the proposals. The significance of effect will be determined based on the magnitude of impact, receptor sensitivity and professional judgement.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
10.4.4	Dust and dirt	The potential effect of dust, dirt and other detritus being brought onto the road.	The AADT percentage impacts identified for Impact 10.4.1 will be used to assess against GEART. which indicates that traffic flows would have to increase by more than 30% in order for a 'minor' change to occur and 60% for a 'moderate' or 'major' change. The significance of effect will be determined based on the magnitude of impact, receptor sensitivity and professional judgement.
10.4.5	Hazardous and dangerous loads	The potential effect on existing road users and local residents caused by the movement of abnormal loads.	A qualitative assessment of the proposed AIL will be undertaken. Once the haul route for any AIL has been identified, swept path analyses will be undertaken as part of an Abnormal Load Assessment Report (ALAR) to identify any sections of the route that might require improvements (which may be temporary) to ensure the safe movement of the AIL to the construction site. The significance of effect will be determined based on the magnitude of impact, receptor sensitivity and professional judgement.
10.4.6	Users of PRoW	The potential effect of users of PRoW	Upon confirmation of the preferred cable route and substation location, all PRoW directly affected will be identified using the definitive maps. This would take account of access roads where these cross PRoW. These will be cross-referenced with the Active Travel Routes identified by DCC and CCBC.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
			The qualitative assessment of the impacts of construction works affecting the PRoW and Active Travel Routes will be undertaken. Mitigation measures for each PRoW will be identified, which may include temporary diversion or temporary closures in some cases. The mitigation will be agreed with stakeholders (DCC and CCBC) and incorporated into a PRoW Management Plan.
DECOMMISSIONING			
10.4.7	Impacts during decommissioning	Decommissioning impacts: similar in nature to those during construction but would be more limited in geographical extent and timescale.	At this stage the future baseline conditions cannot be predicted accurately and both the proposals for decommissioning and the future regulatory context are unknown. A detailed assessment of decommissioning impacts is therefore not proposed to be undertaken. Instead it is proposed to assume that impacts from decommissioning would be similar to those for construction (albeit over a reduced timescale and affecting a smaller area since the assets will already be in situ) and that a similar range of embedded mitigation measures would be implemented.

TABLE 86 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR TRAFFIC AND TRANSPORT

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
10.4.8	Noise	Whilst the potential impact of traffic and transport on noise will be appropriately assessed within the ES, being partly based on information and assessments presented within the traffic and transport chapter will be used, this aspect will be considered in detail within the Airborne Noise and vibration chapter (Section 10.3),and is thus scoped out of this chapter. The proposed scope for this aspect is set out in Section 10.3.
10.4.9	Disruption to the railway	It is proposed to use HDD under the railway. Notwithstanding the appropriate investigations for the feasibility of using this method at the required location (see Section 10.7 Geology and Ground Conditions), and the necessary consultation with Network Rail on any approvals required, the operation of rail services should not be affected and therefore no specific traffic and transportation impacts associated with the railway will be considered in Section 10.4 Traffic and Transport .
OPERATION		
10.4.10	Any impacts during operation	The operation of the onshore components of the proposed development (including the substation) will not require any permanent personnel and maintenance and repairs will only be required infrequently. Therefore, there will be a negligible number of associated vehicles on the highway network, with none for the majority of the time. Impacts on traffic and transportation during operation are therefore proposed to be scoped out.

Mitigation measures adopted as part of the project

1032 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for traffic and transport impacts. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

1033 Innogy is committed to implementing these measures, in addition to standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 86.

1034 Measures adopted as part of the project will include:

- HDD under key infrastructure, such as the railway and the A55;
- Development of, and adherence to, a Construction Traffic Management Plan (CTMP) for each construction site;
- Minimise the use of HGV traffic on local highways by using the temporary easements where practicable / required (to be detailed in the CTMP), whilst taking into account ecological and archaeological issues;
- Development of, and adherence to, PRoW Management Plans; and
- Preparation of a Travel Plan (TP) to endeavour to minimise the impact of vehicle movements associated with construction workers, including the promotion of public transport and car sharing.

1035 Additional mitigation measures that may be considered, where appropriate include:

- Temporary Construction Compounds (TCC) to increase efficiency of HGV vehicle movements to and from construction sites; and
- Minibuses for construction workers.

1036 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process, based on the findings of the detailed assessments.

Potential cumulative impacts

1037 The cumulative impact assessment methodology will be based on that described in Chapter 4: Environmental Impact Assessment Approach and Methodology, adapted to make it applicable to onshore traffic and transport.

1038 The methodology will also be aligned with the approach to the assessment of cumulative impacts that has been applied by Ministers when consenting offshore windfarms and confirmed in recent consent decisions. It also follows the approach set out in guidance from the Planning Inspectorate (Planning Inspectorate 2015).

1039 The potential impacts that would be scoped in and out of the cumulative impact assessment are those listed in Table 85 and Table 86.

1040 Offshore wind: there is a potential for cumulative traffic and transport impacts due to operational, consented and planned offshore wind farms.

1041 The relevant vehicle flows will be added to the forecast vehicular flows for Awel y Môr OWF and the same approach for assessing each of the impacts identified in Table 85 will be undertaken to identify the likely cumulative impact.

1042 Other activities: The construction vehicle movements forecast within the Study Area associated with any other Nationally Significant Infrastructure Projects that may coincide with the construction phase of Awel y Môr OWF will also be considered. These will be identified at the PEIR stage.

1043 The relevant vehicle flows will be added to the forecast vehicular flows for Awel y Môr OWF and the same approach for assessing each of the impacts identified in Table 85 will be undertaken to identify the likely cumulative impact.

Potential transboundary impacts

1044 Chapter 4: Environmental Impact Assessment Approach and Methodology provides details of the approach that will be taken for assessing the transboundary impacts, which is not expected to be relevant to traffic and transport for the onshore elements of Awel y Môr OWF as traffic and transportation effects arising as a result of the proposed development would be localised and would not be experienced across international boundaries.

10.4.6 Summary of next steps

1045 The next steps will be as follows:

- refinement of the Study Area following selection of the preferred ECR and substation location;
- undertake a comprehensive review of baseline data identified in Section 10.4.3 supplemented by direct communication with stakeholders through the ETG process;

- agree locations for ATCs and classified turning counts at junctions as set out in Section 10.4.3;
- assemble project specific data and / or assumptions regarding anticipated traffic generation once length of ECR known and site for sub-station identified;
- engage with other specialist EIA teams such as socio-economic and LVIA to understand likely impacts on tourism and community receptors; and
- finalise methodology accounting for the above and agree with ETG.

10.4.7 Further considerations for Consultees

i. Do you agree that the data sources identified are sufficient to inform the traffic and transport baseline for the Awel y Môr OWF PEIR and ES?

ii. Do you agree that all the protected areas within the Study Area have been identified?

iii. Have all potential impacts resulting from Awel y Môr OWF been identified for traffic and transport receptors?

iv. Do you agree that the impacts described in Table 86 can be scoped out?

v. For those impacts scoped in (Table 85), do you agree that the methods described are sufficient to inform a robust impact assessment?

vi. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on traffic and transport receptors?

vii. Do you have any specific requirements for the traffic and transport modelling methodology?

10.5 Air Quality

10.5.1 Introduction

1046 This Section of the Scoping Report identifies the air quality receptors of relevance to the Awel y Môr OWF onshore ECR search area and sub-station. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on air quality and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

10.5.2 Study Area

1047 The Study Area for assessment of air quality effects is based on Institute of Air Quality Management guidance36. Air quality and dust sensitive receptors will be assessed within the following Study Area:

- Human receptor locations sensitive to dust within 350m of proposed construction phase activities;
- Receptors sensitive to air pollution situated within 200m of the road network to be utilised by construction traffic; and
- Ecological receptor locations sensitive to dust within 50m of the proposed construction phase activities.

1048 The Study Area will be reviewed and amended in response to such matters as refinement of the onshore (and offshore) ECR and the identification of additional constraints (environmental and/ or engineering). This is expected to result in a significant reduction in the size of the Study Area as it is refined to more closely follow the route of the preferred onshore cable corridor, and preferred locations for the landfall and sub-station when these are selected during 2020.

10.5.3 Baseline data

1049 The baseline data for this topic will be primarily gathered from published sources that are available online. The baseline data that has been accessed for this scoping desk study will be supplemented by other data sources identified following direct contact with the relevant local authorities, as follows:

[36] Institute of Air Quality Management 2014, Guidance on the assessment of dust from demolition and construction

- Department for Environment, Food & Rural Affairs (DEFRA) – Interactive Air Quality Management Area (AQMA) Boundaries map (DEFRA, 2016a);
- Air Quality Progress Reports from Denbighshire County Council and Conwy Borough County Council published in accordance with the Local Air Quality Management (LAQM) process; and
- any additional data sets identified through feedback from stakeholders.

10.5.4 Baseline environment

1050 The onshore search area is located within the local authority areas of Denbighshire and Conwy. Existing emissions sources within the Study Area are likely to be primarily the road network, especially the A55 dual carriageway, the coast road through Rhyl (A548) and link roads within urban areas such as the A547.

1051 There are currently no likely exceedances of the Air Quality Objectives in Denbighshire and Conwy and no Air Quality Management Areas (AQMA) have been declared in the Study Area or adjoining areas.

1052 Air quality and dust sensitive receptors within the onshore search area include the following:

- Residential receptor locations;
- Other sensitive human receptors; and
- Ecological receptor locations sensitive to dust.

1053 Residential receptor locations within the Study Area include a number of built up areas including Colwyn, Abergele and Rhyl. In addition, residential properties are located outside of the main built up areas throughout the Study Area.

1054 Other sensitive human receptors include schools, medical centres and hotels. For the Study Area, this category of receptor includes the main accident and emergency hospital for the area, Glan Clwyd Hospital, which is located at Bodelwyddan, within the Study Area. Other human receptors include users of leisure, recreation and tourism assets such as the Wales Coast Path and the Public Right of Way network, employment areas, including the St Asaph Business Park, and holidaymakers along the seafront.

1055 Ecological receptors include nature conservation designations such as Traeth Pensarn Site of Special Scientific Interest (SSSI) and a number of limestone woodland SSSIs around Llandulais.

Designated sites

1056 There are no air quality designations within the Denbighshire County Council and Conwy Borough County Council areas.

10.5.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

1057 The assessment will be carried out in accordance with guidance provided by the Institute for Air Quality Management (IAQM) in the IAQM, February 2014 '*Guidance on the Assessment of Dusts from Demolition and Construction*'. The guidance includes advice on the sensitivity of receptors.

1058 A risk-based approach will be used to assess the impacts of project activities. The dust assessment will also define the suitable level of mitigation required based upon the risk of dust impacts.

1059 An initial screening assessment will be conducted to determine positions where detailed assessment of road traffic emissions is required. The assessment will use the screening criteria provided in IAQM & Environmental Protection UK, 2015 'Planning for Air Quality' guidance to determine where detailed assessment of road traffic emissions is required. The technical approach to the air quality assessment will be in accordance with DEFRA (2016b), 'Local Air Quality Management Technical Guidance'.

Potential project impacts

1060 The potential impacts associated with the construction phase of Awel y Môr OWF are:

- Construction dust impacts - the generation of dust and particulates (e.g. from excavation or movement of dry materials) potentially having an adverse impact on sensitive receptors through soiling of surfaces, and effects on human health through fine particulate matter; and
- Increase in traffic based air quality pollutant concentrations - exhaust emissions from construction traffic having the potential to contribute to local ambient concentrations of nitrogen dioxide (NO_2), and particulate matter (PM10 and PM2.5), resulting in potential effects on human health, and exceedance of critical loads for nitrogen deposition on sensitive habitats. It should be noted that the potential impacts will be reviewed once more information is known about the scale and location of traffic generation as it may be possible to scope out traffic effects.

1061 Subject to the proviso noted above on traffic effects, the construction effects set out above will be scoped into the air quality assessment; this is summarised in Table 87. Decommissioning effects are considered likely to be the same as construction effects but may be of more limited scale and geographical extent if a decision is made that the underground cables would remain *in situ*.

1062 During the operational phase of the development, effects are likely to be negligible. Operation of the proposed built infrastructure (the substation) and maintenance activities would not lead to a significant change in vehicle flows within the Study Area.

1063 It is therefore proposed, following feedback from this Scoping Report, that operational effects will be scoped out from further consideration within the EIA, as set out in Table 88.

TABLE 87 - IMPACTS PROPOSED TO BE SCOPED IN TO THE AIR QUALITY ASSESSMENT

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION AND DECOMMISSIONING			
10.5.1	Construction dust nuisance impacts	Generation of dust and particulates (e.g. from excavation or movement of dry materials) potentially having an adverse impact on sensitive receptors through soiling of surfaces.	A risk-based approach will be used to assess the impacts of construction activities. The assessment will be carried out in accordance with guidance provided by the Institute for Air Quality Management (IAQM) in the IAQM, February 2014 '*Guidance on the Assessment of Dusts from Demolition and Construction*'. The dust assessment will also define the suitable level of mitigation required based upon the risk of dust impacts.
10.5.2	Construction dust health impacts	Generation of dust and particulates (e.g. from excavation or movement of dry materials) potentially having an adverse impact on human health.	A risk-based approach will be used to assess the impacts of construction activities. The assessment will be carried out in accordance with guidance provided by the Institute for Air Quality Management (IAQM) in the IAQM, February 2014 '*Guidance on the Assessment of Dusts from Demolition and Construction*'. The dust assessment will also define the suitable level of mitigation required based upon the risk of dust impacts.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
10.5.3	Traffic pollutants health impacts	Increase in traffic based air quality pollutant concentrations caused by exhaust emissions from construction traffic resulting in potential effects on human health.	An initial screening assessment will be conducted to determine positions where detailed assessment of road traffic emissions is required. The assessment will use the screening criteria provided in IAQM & Environmental Protection UK, 2015 '*Planning for Air Quality*' guidance to determine where detailed assessment of road traffic emissions is required. The technical approach to the air quality assessment will be in accordance with DEFRA (2016b), '*Local Air Quality Management Technical Guidance*'.
10.5.4	Traffic pollutants ecological impacts	Increase in traffic based air quality pollutant concentrations caused by exhaust emissions from construction traffic resulting in exceedance of critical loads for nitrogen deposition on sensitive habitats.	An initial screening assessment will be conducted to determine positions where detailed assessment of road traffic emissions is required. The assessment will use the screening criteria provided in IAQM & Environmental Protection UK, 2015 '*Planning for Air Quality*' guidance to determine where detailed assessment of road traffic emissions is required. The technical approach to the air quality assessment will be in accordance with DEFRA (2016b), '*Local Air Quality Management Technical Guidance*'.

TABLE 88 - IMPACTS PROPOSED TO BE SCOPED OUT OF THE AIR QUALITY ASSESSMENT

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
10.5.5	Construction traffic effects	The possibility of scoping out traffic effects will be reviewed once further information is available as to the scale and location of traffic generation.
OPERATION		
10.5.6	Operational phase traffic movements and other works	The operational phase is expected to give rise to only limited and intermittent traffic movements and other maintenance activity that would result in negligible air quality effects.
DECOMMISSIONING		
10.5.7	Decommissioning phase traffic movements and other works	Decommissioning effects are considered likely to be the same as construction effects but may be of more limited scale and geographical extent if a decision is made that the underground cables would remain in situ.

Mitigation measures adopted as part of the project

1064 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for impacts on sensitive receptors. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

1065 Innogy is committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 87 and Table 88.

1066 Measures adopted as part of the project will include development of, and adherence to, the following measures during the construction and decommissioning phases:

- An Air Quality Management Plan (part Code of Construction Practice); and
- Construction and decommissioning works would be undertaken in accordance with best practice measures that are proportional to the likely impacts.

1067 The proposed best practice measures will be based on the IAQM 2014 guidance which sets out generic guidance for construction and demolition sites comprising detailed measures for communicating with stakeholders, site management, planning and maintenance, operation of vehicles and machinery, monitoring, and waste management, the aim being to minimise amenity and health impacts on receptors.

1068 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process. Any requirement for additional air quality and dust mitigation measures will be determined through liaison with stakeholders such as the Environmental Health Officer (EHO) as part of the air quality impact assessment.

Potential cumulative impacts

1069 Cumulative impacts will be considered as part of the EIA process (refer to Chapter 4 for details), adapted to make it applicable to onshore hydrology, hydrogeology and flood risk. This will include a desk-top exercise and consultation with stakeholders to identify relevant potential projects within the same surface and groundwater catchments, with which there could be interactions.

1070 The methodology will also be aligned with the approach to the assessment of cumulative impacts that has been applied by Ministers when consenting offshore windfarms and confirmed in recent consent decisions. It also follows the approach set out in guidance from the Planning Inspectorate (Planning Inspectorate 2015) and from the renewables industry (RenewableUK 2013 and The Crown Estate, 2019).

1071 It is proposed that the air quality assessment will consider cumulative effects arising from potentially concurrent construction of Awel y Môr OWF and other major infrastructure projects within 550m of the Study Area that would lead to significant increases in dust or air pollutant emissions. The potential impacts that would be scoped into the cumulative impact assessment are construction and decommissioning impacts and any potential for cumulative impact would be dependent on phasing of the other major developments considered.

Potential transboundary Impacts

1072 There is not considered to be any potential for transboundary impacts due the distance between the source of emissions and other EU member states.

10.5.6 Summary of next steps

1073 The next steps will be as follows:

- Review feedback from stakeholders obtained as part of the scoping process;
- Gather baseline air quality data from published sources and through direct contact with local authorities;
- Identify sensitive receptors, including data on sensitive habitats in conjunction with onshore ecology team, following selection of the ECR;
- Identify activities that may give rise to air quality impacts;
- Review and revise proposed environmental management measures; and

- Undertake assessment as outlined in this Section.

10.5.7 Further considerations for Consultees

i. Do you agree that the data sources identified are sufficient to inform the air quality baseline for the Awel y Môr OWF PEIR and ES?

ii. Have all potential air quality impacts resulting from Awel y Môr OWF been identified for the relevant receptors?

iii. Do you agree that the impacts described in Table 88 can be scoped out?

iv. For those impacts scoped in (Table 87), do you agree that the methods described are sufficient to inform a robust impact assessment?

v. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential onshore effects of Awel y Môr OWF on air quality receptors?

vi. Do you have any specific requirements for the assessment methodology?

10.6 Hydrology, Hydrogeology and Flood Risk

10.6.1 Introduction

1074 This Section of the Scoping Report identifies the hydrology, hydrogeology and flood risk receptors of relevance to the Awel y Môr OWF onshore ECR search area and substation. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on hydrology, hydrogeology and flood risk and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

1075 The water environment includes watercourses and surface water drainage, groundwater below the onshore element of the proposals and onshore flood risk. Offshore aspects of the water environment are covered separately in Section 7.1 Physical Processes.

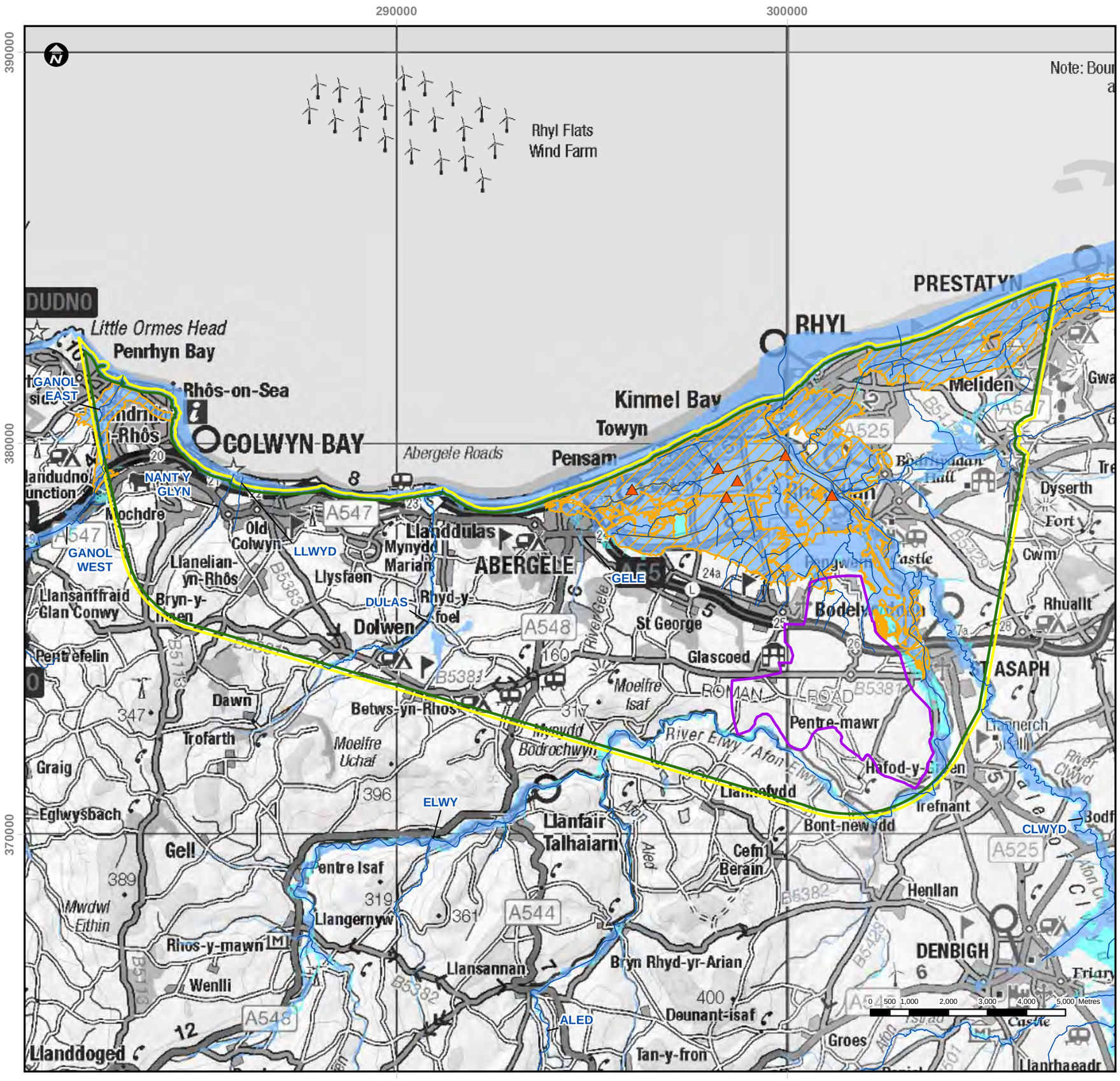
10.6.2 Study Area

1076 The Study Area for the Onshore Hydrology, Hydrogeology and Flood Risk scoping includes land onshore from Mean High Water Springs (MHWS) and is defined by the search area shown in Figure 74. For the purpose of scoping, the whole of the search area has been taken into consideration, however it is noted that this area will be refined and amended for the Preliminary Environmental Information Report (PEIR) following identification of constraints, selection of routing for the onshore ECR and substation location, as well as feedback received within the scoping opinion and through the Evidence Plan process.

1077 The search area extends along the North Wales coastline from Penrhyn Bay in the west to Prestatyn in the east and inland to the south. The western extent of the Study Area covers an area up to 8km inland from the coast approximately following the B5381 from Bryn-y-maen, through Dolwen to Betws-yn-Rhos. The eastern extent of the Study Area extends further from the coast including the Afon Elwy valley to the south west of St Asaph and the Afon Clwyd estuary.

1078 Topography across the western extent of the search area rises from the coast to hills up to 300m above Ordnance Datum (aOD). Some moderate valley slopes are noted to the south of Colwyn Bay associated with watercourses draining these areas. To the east of the search area the topography is dominated by the low-lying land associated with the Clwyd estuary, including the lower reaches of the Afon Gele catchment and land to the east of Abergele and south of Rhyl. Further south, land rises gently up to St Asaph and up to around 100m aOD along the Afon Elwy valley.

1079 The Study Area will be reviewed and amended in responses, for the PEIR, to such matters as refinement of the onshore (and offshore) ECR and the identification of additional constraints (environmental and/ or engineering). This is expected to result in a significant reduction in the size of the Study Area as it is refined to more closely follow the route of the preferred onshore cable corridor, and preferred locations for the landfall and substation when these are selected.



Overview map



Legend

- Onshore Export Cable Route Search Area
- Substation Search Area
- Study Area
- Pumping Stations
- Main Rivers
- Floodzone 3
- Floodzone 2
- Areas Benefitting From Flood Defences

Cartographic information

Coordinate System: British National Grid

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited Windmill Hill Business Park, Whitehill Way, Swindon, Wiltshire, SN5 6PB	**PROJECT**	Offshore Windpark **Awel Y Môr**
TITLE	Hydrology Designations and Pumping Stations	
DRAWN writson	**DATE** 05/03/2020	**SCALE** 1:100,000
		SIZE @DIN A3
		REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.6 - Hydrology\AyMext_Innogy_WF_UK_DIN_HydroDesingationsAndPumpingStns.mxd

10.6.3 Baseline data

1080 Baseline data to inform scoping for Hydrology and Hydrogeology has been taken from publicly available information and opensource data from a range of sources. The data review includes:

- Lle Geo-Portal, Welsh Government and Natural Resources Wales (NRW):
  - Flood Zone and Development Advice Map data relating to flood risk;
  - Spatial Flood Defence data and mapping;
  - Flood Warning and Flood Alert Areas;
  - Main Rivers;
  - Historic and active landfill sites;
  - Water Framework Directive (WFD) surface water and groundwater classification data; and
  - Groundwater Source Protection Zones (SPZ).
- British Geological Survey (BGS) GeoIndex mapping:
  - Geology – artificial ground, mining, superficial deposits, bedrock;
  - Borehole data; and
  - Aquifer designation and groundwater vulnerability.
- Department for Environment, Food and Rural Affairs (DEFRA) MAGIC website:
  - Statutory and non-statutory environmental designations.
- Cranfield Soil and Agrifood Institute Soilscapes map viewer:
  - Soil type and character.
- North West and North Wales Coastal Group:
  - North West England and North Wales Shoreline Management Plan SMP2.
- Conwy County Borough Council and Denbighshire County Council:
  - Local Flood Risk Management Strategy; and
  - Strategic Flood Consequence Assessment.

1081 Third party data from bodies such as Local Authorities, NRW and DEFRA's MAGIC website has been used to characterise the sensitivity of water features and identify any water dependent designated areas.

1082 Reports prepared to support previous planning applications for other similar scale schemes in the local area have also been reviewed to inform this scoping report. It is however noted that these reports would specifically relate to defined cable corridors or infrastructure locations and a significant period of time has elapsed since previous applications were submitted. Projects reviewed include:

- Gwynt y Môr Offshore Wind Farm;
- Burbo Bank Extension Offshore Wind Farm; and
- North Wales Wind Farm Connections.

1083 Preparation of the scoping report and work to prepare the PEIR/ES will also include targeted data requests and consultation with a number of stakeholders and regulatory bodies. The information and data to be requested will include:

- NRW:
  - Flood modelling and mapping, flood defence asset information and flood event history;
  - Catchment data for the surface water catchments of Dulas Ganol, Gele, Elwy and Clwyd Lower relating to water quality and WFD classification;
  - Aquifer data for the Conwy, Clwyd Silurian, Clwyd Triassic Sandstone and Clwyd Carboniferous Limestone groundwater units relating to water levels, water quality and WFD classification;
  - Pumping station details and operational records for land drainage pumping stations in the Afon Gele catchment; and
  - Licenced abstractions or water users.
- Conwy County Borough Council and Denbighshire County Council
  - Registered private water supplies;
  - Sustainable drainage guidance to meet SuDS Approval Bodies (SAB) requirements; and
  - Local flood event history.

1084 Review and survey of any public or private water supply abstraction sources may be required depending on the location and type of supply registered.

10.6.4 Baseline environment

1085 Land within the search area is drained by a number of significant watercourses, taking runoff from hills to the south of the search area to the coast. Afon Ganol and Afon Dulas drain small catchments through the urban area of Colwyn Bay to the west of the search area, discharging to the coast at Penrhyn Bay and Llanddulas respectively. The east of the search area drains to the lower reaches of Afon Clwyd, including tributaries of Afon Elwy which has a confluence with the Afon Clwyd to the north of St Asaph and Afon Gele which drains low lying land around Abergele and Towyn. None of the surface watercourses are linked to environmentally designated areas however it is noted that the watercourses discharge into Liverpool Bay which is designated as a Special Protection Area (SPA).

1086 Groundwater beneath the search area is present within Principal bedrock aquifers of the Clwyd Limestone group and Kinnerton Sandstone Formation. Less sensitive Secondary A bedrock aquifers are present within the Gloddaeth Purple sandstone Formation and the mudstones of the Ffernant Formation and the Warwickshire Group. The remaining area is underlain by Elwy Formation mudstone, siltstone and sandstone which is classed as Secondary B aquifer. Where present, superficial deposits underlying the Search Area comprise mainly of Tidal Flat Deposits, Devensian Diamicton Till and Glaciofluvial Deposits. These deposits are generally classed as Secondary (undifferentiated or Secondary A) aquifers.

1087 No groundwater SPZs are noted within the search area however one is noted immediately south east of the search area in the Vale of Clwyd and a further zone is noted to the east to the north of Caerwys.

1088 Fluvial and tidal flood risk mapping shows a significant proportion of land within the search area to be at risk of inundation during extreme flood events. Risks identified to the west and south of the area are generally localised and confined to the immediate watercourse corridor. To the east of the search area the Afon Gele catchment is noted to drain a large area of low-lying land associated with the mouth of the Clwyd estuary which is shown to be at risk of flooding. Away from the urban areas of Abergele and Rhyl on the coast, this land is primarily agricultural use and is served by a number of pumping stations to manage drainage, irrigation and flood risk. Large parts of this floodplain are defined as benefitting from flood defences which means that these areas should not flood during a 1% Annual Exceedance Probability (AEP) fluvial or 0.5% AEP tidal event. It is noted that the search area for the substation has taken flood risk constraints into consideration at the design stage and the area generally avoids areas shown to be at risk of flooding.

Designated sites

1089 Table 89 below details the statutory environmentally designated sites within the onshore search area or within areas close to and in hydraulic continuity with the search area. These sites are detailed in Figure 74. A number of the designations are for flora or fauna which will have some level of dependency on the water environment.

TABLE 89 - ENVIRONMENTAL DESIGNATIONS WITH RELEVANCE TO THE ONSHORE SEARCH AREA FOR AWEL Y MÔR OWF

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
INTERNATIONAL		
Liverpool Bay SPA	Downstream from the Awel y Môr OWF onshore ECR search area	The site qualifies under the Birds Directive (2009/147/EC) for a number of Annex 1 and migratory bird species.
NATIONAL		
Bryn Euryn SSSI	Coincident with the Awel y Môr OWF onshore ECR search area	Bryn Euryn is designated for a range of grassland communities and other plant species on limestone crag outcrops.
Mynydd Marian SSSI	Coincident with the Awel y Môr OWF onshore ECR search area	Mynydd Marian is of special interest for its range of limestone grassland communities and a population of the dwarf race of silver studded blue butterfly.
Llanddulas Limestone and Gwyrch Castle Wood SSSI	Coincident with the Awel y Môr OWF onshore ECR search area	Llanddulas Limestone and Gwyrch Castle Wood is of special interest for limestone grassland, heath and woodland communities, as well as its populations of vascular plants; bryophytes; butterflies; moths and a winter roost of lesser horseshoe bat.
Coed y Gopa SSSI	Coincident with the Awel y Môr OWF onshore ECR search area	This site is designated for its species interest as a winter roost of lesser horseshoe bat.
Traeth Pensarn SSSI	Coincident with the Awel y Môr OWF onshore ECR search area	Traeth Pensarn is of special botanical interest for its vegetated shingle beach plant communities.
Coedydd ac Ogofau Elwy a Meirchion SSSI and SAC	Coincident with and to the south of the Awel y Môr OWF onshore ECR search area	Features of the site that are of interest include semi-natural broadleaved woodland, with associated scarce lower plants, populations of important flowering plants, fossil and artefact bearing sediments at Pontnewydd, Cefn and Galltfaenan Caves.

10.6.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

1090 There are no published guidelines or criteria for assessing and evaluating effects on hydrology or hydrogeology within the context of an EIA. The proposed assessment will therefore be based on a methodology derived from the Institute of Environmental Management and Assessment (IEMA) guidance. The methodology sets out a list of criteria for evaluating the environmental effects and is outlined in Chapter 4.

1091 Professional judgement and a qualitative risk assessment methodology will be used to assess the findings in relation to each of these criteria to give an assessment of significance for each potential impact.

1092 Once the impact significance and likelihood of occurrence have been assessed these will then be combined to determine the likelihood of each potential effect occurring. Effects assessed as minor negative or less would be considered not significant in terms of the EIA regulations. If the assessment results in moderate or major negative effects, then this effect would be considered to be significant.

1093 This approach provides a mechanism for identifying the areas where site specific mitigation measures will be required and for identifying mitigation measures appropriate to the risk presented by the development proposals. This approach also allows effort to be focused on reducing risk where the greatest benefit may result.

Legislation and Planning Policy Guidance

1094 Regard will be given to technical guidance and other codes of best practice during the design phase of the development, in order to limit;

- The potential for contamination of ground and surface waters;
- The potential for flooding to be caused to the existing water environment and surrounding sensitive users; and
- Other potential impacts on the water environment.

1095 The Hydrology and Hydrogeology assessment of impact will therefore be in accordance with the following:

European Legislation

1096 The Water Framework Directive (2000/60/EC) (the WFD) provides the foundation for the protection of the UK's water environment. The WFD seeks to protect all elements of the water cycle and to enhance the quality of groundwater, surface waters, estuaries and coastal waters. The Directive is transposed and implemented within England through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Chapter 7 also makes reference to the WFD in assessment of the offshore water environment.

1097 The Groundwater Directive (2006/118/EC, including amendments to Annex II detailed under Directive 2014/80/EU) (the GWD) is designed to combat groundwater pollution and sets out procedures for assessing quality of groundwater. Aspects of the GWD are transposed and implemented through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, the Environmental Permitting (England and Wales) Regulations 2016 and the Groundwater (England and Wales) Regulations 2009.

1098 The Floods Directive (2007/60/EC) requires assessment of all watercourses and coastlines to determine risk of flooding and action to take adequate and coordinated measures to reduce this flood risk. The Flood Risk Regulations 2009 transpose the EU Floods Directive into law in England and Wales.

National Legislation

1099 The objectives of the directives discussed above that are relevant to this assessment are met through the following UK legislation, relevant to the protection of the water environment:

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 transposes the WFD and aspects of the GWD into UK legislation;
- The Groundwater (England and Wales) Regulations 2009 implements in England and Wales Article 6 of the GWD which details measures to prevent or limit inputs of pollutants into groundwater;
- The Environmental Permitting (England and Wales) Regulations 2016 consolidate and replace the Environmental Permitting (England and Wales) Regulations 2010, which have been amended 15 times to date. The 2010 Regulations are still in force and are the main implementing regulations for the environmental permitting regime;

- The Flood Risk Regulations 2009 transposes the EU Floods Directive into UK legislation and sets out requirements of the Environment Agency (EA), NRW and local authorities in preparing assessments and mapping of flood risk for each river basin district in England and Wales;
- Flood and Water Management Act 2010 includes provision for the management of risk in connection with flooding and sets out requirements for SABs in preparing strategies for local flood risk management;
- The Water Resources Act 1991 and amendment (England and Wales) Regulations 2009. The Act regulates water resources, water quality and flood defence. The amended Regulations make changes to the powers for carrying out anti-pollution works and serving notices;
- The Land Drainage Act 1991 and 1994 sets out requirements for maintenance of watercourses by riparian owners;
- Environment Act, 1995 sets out roles and responsibilities for NRW; and
- The Private Water Supplies (Wales) Regulations 2017 transpose requirements of European Law on the quality of water intended for human consumption from private abstractions.

National and Local Planning Policy and Strategy

1100 The following national and local policy and guidance is considered relevant for the Awel y Môr OWF EIA in relation to the water environment:

- Planning Policy Wales
  - In Wales, Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government and includes a framework for ensuring that development is delivered sustainably whilst striving to improve social, economic and cultural well-being. Technical Advice Notes (TANs) have been developed to supplement PPW and to provide guidance on a number of key issues and sensitivities. Of relevance to this assessment is TAN 15: Development and Flood Risk, 2004. The TAN introduces a precautionary framework, informed by a development advice map and associated 'development advice zones' (A, B and C (C1 and C2)) which may be used to trigger planning tests in relation to flood risk. In July 2004 the Welsh Assembly Government published Development Advice Maps (DAMS) to accompany the latest version of TAN 15 – Development and Flood Risk. Only the DAMS, which accompany TAN 15, should be used to identify relevant planning zones and whether a site falls within them. TAN 15 informs Section 5.7 'Flood Risk' of the Overarching National Planning Policy Statement for Energy (EN-1) and Section 2.4 'Climate change adaptation' of the National Policy Statement for Electricity Networks Infrastructure (EN-5).
  - It is noted that at the time of reporting consultation is being sought on a revised version of TAN15 which has been released in draft format. This emerging guidance will be taken into consideration as part of the assessment as it is likely that a revised TAN15 would be released prior to the Development Consent Order (DCO) submission.
- Denbighshire County Council Local Development Plan 2006 – 2021
- Development policies of relevance in terms of the water environment and flooding are listed below.
  - Policy RD 1 - Sustainable development and good standard design
  - Development proposals will be supported within development boundaries provided that all the following criteria are met: …

- … vi) Does not unacceptably affect the amenity of local residents, other land and property users or characteristics of the locality by virtue of increased activity, disturbance, noise, dust, fumes, litter, drainage, light pollution etc., and provides satisfactory amenity standards itself; …
- … xi) Satisfies physical or natural environmental considerations relating to land stability, drainage and liability to flooding, water supply and water abstraction from natural watercourse;
- Policy VOE6 – Water management
- All development will be required to incorporate water conservation measures, where practicable. Major development proposals (greater than 1,000 sqm floorspace or 10 dwellings) should be accompanied by a Water Conservation Statement.
- All development will be required to eliminate or reduce surface water run-off from the site, where practicable. The run-off rates from the site should maintain or reduce pre-development rates.

- Conwy County Borough Council Local Development Plan 2006 – 2021
- Development policies of relevance in terms of the water environment and flooding are listed below.
  - Strategic Policy DP/1 – Sustainable development Principles
  - 1. Development will only be permitted where it is demonstrated that it is consistent with the principles of sustainable development. All developments are required to: …
  - … f) Take account of and address the risk of flooding and pollution in the form of noise, lighting, vibration, odour, emissions or dust in line with Policies DP/2 and DP/3 …
  - … 2. Development proposals should also where appropriate: …
  - … g) Take account and address the potential impact of climate change in line with Strategic Policy NTE/1;
  - h) Protect the quality of natural resources including water, air and soil in line with Strategic Policy NTE1;
  - Strategic Policy DP/3 – Promoting Design Quality and Reducing Crime
  - 1. All new development will be of high quality, sustainable design which provides usable, safe, durable and adaptable places, and protects local character and distinctiveness of the Plan Area's built historic and natural environment. The Council will require development to: …

- … f) Provide sustainable urban drainage systems to limit waste water and water pollution and reduce flood risk in line with national guidance and Policy NTE/8 – 'Sustainable Drainage Systems'.
- Policy NTE/8 – Sustainable Drainage Systems:

1. The use of Sustainable Drainage Systems will be required wherever reasonably practicable with preference for onsite disposal and where satisfactory arrangements can be put in place for the long term maintenance of those systems. Where this is not proposed a developer will need to justify that discharge is necessary and is adequately controlled.

2. Subsequent preference for surface water drainage will be for:

a) Drainage to a surface water body (river, lake etc.) subject to appropriate treatment and attenuation;

b) Drainage to surface water sewer;

c) Drainage to combined sewer.

3. The developer must demonstrate that higher preference drainage options are unfeasible before proposing less sustainable options.

Other Relevant Guidance

1101 Relevant UK guidance on good practice for construction projects that will be referenced during assessment is detailed in the following documents.

- Control of Water Pollution from Construction Sites (C532), Construction Industry Research and Information Association (CIRIA) 2001;
- Environmental Good Practice on Site (C741), CIRIA 2015a;
- Control of Water Pollution from Linear Construction Projects: Site Guide (C649), CIRA 2006b;
- Control of Water Pollution from Linear Construction Projects (C648), CIRA 2006;
- NRW's Guidance for Pollution Protection – Works and maintenance in or near water, version 1.2, February 2018; and
- The Suitable Drainage System (SuDS) Manual (C753), CIRIA 2015b.

1102 The CIRIA guidance provides help on environmental good practice for the control of water pollution arising from construction activities. It focuses on the potential sources of water pollution from within construction sites and the effective methods of preventing its occurrence.

1103 The NRW guidance is part of a wider suite of guidance for pollution prevention (GPP) relating to environmental good practice. The full suite can be found on the NetRegs website at https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/.

1104 The SuDS Manual incorporates the latest research, industry practice and guidance for design, delivery and maintenance of Sustainable Drainage Systems (SuDS).

Potential project impacts

1105 A range of potential impacts on the water environment have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The impacts that have been scoped into the Awel y Môr OWF EIA are outlined in Table 90, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact. Based on the baseline information currently available and the project description, a number of potential impacts have been identified to be scoped out of the assessment. These are detailed in Table 91 .

TABLE 90 - IMPACTS PROPOSED TO BE SCOPED INTO THE ASSESSMENT FOR ONSHORE HYDROLOGY AND HYDROGEOLOGY

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
10.6.1	Direct. Temporary. Generation of turbid runoff which could enter the water environment.	Construction activities will include clearance of surface vegetation and topsoil; stockpiling of removed materials; excavation for cable trenches; management of spoil from directional drilling; dewatering of excavations; and reinstatement of land following works.	Awel y Môr OWF onshore ECR: Existing data from the British Geological Survey for superficial and bedrock geology and soil information from Cranfield Soil and Agrifood Institute will be used to describe the baseline geological environment (this is detailed further under Section 10.7 of this Scoping Report). Site visits will be undertaken of key points along the onshore ECR (landfall point, substation location, watercourse crossing points, etc.), once the location for the onshore ECR and associated substation are proposed, to review any particular sensitivity with respect to the water environment. Typical sensitivities would include: ▪ Surface watercourses; ▪ Water abstraction points; ▪ Water dependent habitats; and

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			▪ Coastal environment. Measures described in NRW Guidance for Pollution Protection notes, and CIRIA guidance will be formalised within the draft CoCP. This will define principles for management of surface water runoff on areas of construction, handling and stockpiling of soils and stripped surface cover and control of vehicle movements. Existing water quality as documented by NRW will be reviewed in order to develop an understanding of baseline characteristics for surface water and groundwater catchments. The anticipated potential for turbid runoff to enter the water environment will be localised and short term only.
10.6.2	Direct and Indirect. Permanent. Changes to surface water runoff patterns which	The following construction phase activities have the potential to affect flood risk: ▪ Rremoval of surface vegetation; ▪ Compacting of soils through vehicle movement;	NRW Development Advice Maps and Flood Zoning will be used to inform a Flood Consequence Assessment for proposed development activities. Further information relating to pumped surface water drainage networks within the Afon Gele catchments will be requested from NRW. This data

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	could affect flood risk.	▪ Development of temporary compounds; ▪ Cable trenching excavations; and ▪ Dewatering of excavations.	will be used to inform the assessment as and where required once the onshore ECR is known.
10.6.3	Direct. Permanent. Potential for damage to flood defence infrastructure.	Onshore ECR may cross existing flood defence infrastructure and construction could alter the operation effectiveness or structural integrity.	NRW Inspire opensource data will be reviewed to determine the location of formal flood defence infrastructure. Consultation with NRW will be undertaken to confirm the location of key infrastructure. This data may include, raised earth embankments, hard engineered flood defence walls and surface water pumping stations. Design of the onshore ECR will include the option of Horizontal Directional Drilling (HDD) beneath key sensitive infrastructure, larger watercourses and sensitive habitats where practical.
10.6.4	Direct. Permanent. Pollution to groundwater through piling.	Any piling or deep excavation works have the potential for impacting groundwater resources and creating a pathway for pollutants.	Existing data from the British Geological Survey for superficial and bedrock geology and soil information from Cranfield Soil and Agrifood Institute will be used to describe the baseline geological environment. The location of infrastructure in the final design solutions will

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			determine the need for any piling. If a risk is identified at this point, a Piling Risk Assessment would be prepared.
OPERATION			
10.6.5	Direct. Permanent. Changes to surface water drainage at substation location	Development of the substation will alter the nature of land cover at the site of development and is likely to increase surface water runoff to the local surface water environment or drainage network.	Engagement with the relevant SuDS Approval Body will determine the level of detail required in regard to design of the surface water drainage strategy to support the DCO application. An outline drainage strategy would be prepared as an appendix to the Flood Consequence Assessment (FCA) which would set out the strategy for management of surface water runoff at the site of the substation. The drainage strategy would follow SuDS principles.
DECOMMISSIONING			
10.6.6	Direct. Temporary. Generation of turbid runoff which could	It is proposed that the substation electrical infrastructure and building foundations would be removed as part of the decommissioning phase. Closer to the time of decommissioning, it may be decided that removal of certain infrastructure	The risks identified and mitigation recommendations made with regard to construction earthworks would apply. However, it is noted that works would likely be limited to removal

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	enter the water environment.	would lead to greater environmental impacts than leaving components in situ, in which case certain components may be left buried (e.g. onshore cables, jointing pits and transition pits). The decommissioning methodology cannot be finalised until immediately prior to decommissioning; but would be in line with relevant policy at that time.	of surface features only (i.e. underground cables are unlikely to be removed at decommissioning).

TABLE 91 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR HYDROLOGY AND HYDROGEOLOGY

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
10.6.7	Operation Phase: Any impact on WFD status for assessed surface water or groundwater bodies.	Land within the ECR will be fully reinstated following cable trenching and/or HDD operations. There will be no significant change to surface land use, runoff regimes, hydrogeological recharge and no potential for entrainment of pollutants to the water environment. Subject to agreement with stakeholders and feedback from the same following review of this Scoping Report, Awel y Môr OWF intends to scope this impact out of further consideration within the EIA.
10.6.8	All phases: Accidental spillages and leakages of oils, fuel and other polluting substances which could potentially enter the water environment.	The impact of pollution including accidental spills and contaminant releases associated with the construction or operation of infrastructure may lead to direct impact to the receiving water environment. Implementation of principles within the draft CoCP will ensure that all potential spills or leaks would be identified early and contained at source with limited potential for mobilisation of any significant pollution to the water environment. Subject to consultation with stakeholders and feedback received on this Scoping Report, Awel y Môr OWF intends to scope this impact out of further consideration within the EIA.

1106 It is acknowledged that detailed design and permitting of any watercourse or flood defence crossing would need to be agreed by licence, with the appropriate regulatory agency and this process would be separate to the DCO application process. Any work on:

- Main Rivers (including associated flood defences) or on coastal sea defences will require an Environmental Permit from NRW; and
- Non-Main Rivers will require Ordinary Watercourse Consent from Conwy County Borough Council or Denbighshire County Council.

Mitigation measures adopted as part of the project

1107 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for impacts on hydrology and hydrogeology receptors. These are presented below. These will evolve over the design process as the EIA progresses and in response to consultation.

1108 Innogy are committed to implement these measures, also in addition to relevant standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 90 and Table 91.

1109 Measures adopted as part of the project will include:

- Avoidance of impact through design by selecting an ECR option, where practicable, that avoids areas sensitive to the water environment (e.g. environmentally designated sites, sources of water use/abstraction) and minimises watercourse crossing points;
- Avoidance of impact through cable installation methodology (e.g. HDD at sensitive points where practicable, in particular flood defences or significant watercourse crossings);
- Development of, and adherence to, a CoCP which would set out principles for storage and handling of oils, fuel or any other potentially polluting substance, management of surface water and soil management;
- During the construction phase, any onshore piling operations would require a Piling Risk Assessment; and
- Development of, and adherence to, a Decommissioning Plan.

1110 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA and DCO process.

Potential cumulative impacts

1111 Cumulative impacts will be considered as part of the EIA process (refer to Chapter 4 for details), adapted to make it applicable to onshore hydrology, hydrogeology and flood risk. This will include a desk-top exercise and consultation with stakeholders to identify relevant potential projects within the same surface and groundwater catchments, with which there could be interactions.

1112 The methodology will also be aligned with the approach to the assessment of cumulative impacts that has been applied by Ministers when consenting offshore windfarms and confirmed in recent consent decisions. It also follows the approach set out in guidance from the Planning Inspectorate (Planning Inspectorate 2015) and from the renewables industry (RenewableUK 2013 and The Crown Estate, 2019).

1113 The potential impacts that would be scoped into the cumulative impact assessment are construction and decommissioning impacts. Any potential for cumulative impact would be dependent on phasing of the other major developments considered. Plans and programmes for other developments are unlikely to generate additional significant adverse cumulative effects, unless they:

- Impact a Main River Ordinary Watercourse;
- Significantly impact groundwaters in the vicinity of the ECR, landfall or substation; or
- Adversely impact catchments within the search area.

1114 Wherever possible cumulative assessment will be quantitative, however the level of data available and the ease with which impacts can be combined across different developments is variable. Where quantitative assessment is not possible, a qualitative assessment will be undertaken.

Potential transboundary Impacts

1115 Due to the localised nature of any potential impacts, transboundary impacts are unlikely to occur and therefore it is suggested that this impact with respect to hydrology and hydrogeology is scoped out from consideration within the EIA.

10.6.6 Summary of next steps

1116 This Scoping assessment has been undertaken based on desk-based information. Further information and data will be required to identify the potential impacts upon the water environment in relation to the onshore Study Area. This will include a detailed review and assessment of the onshore ECR and onshore substation site.

10.6.7 Further considerations for Consultees

i. Do you agree that the data sources identified (Section 10.6.3) are sufficient to inform the onshore hydrology and hydrogeology baseline for the Awel y Môr OWF PEIR and ES?

ii. Have all potential impacts resulting from Awel y Môr OWF been identified for water environment receptors?

iii. Do you agree that the impacts described in Table 91 can be scoped out?

iv. For those impacts scoped in (Table 90), do you agree that the methods described are sufficient to inform a robust impact assessment?

v. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on Hydrology and Hydrogeology receptors?

10.7 Geology and Ground Conditions

10.7.1 Introduction

1117 This Section of the Scoping Report identifies the geology, ground conditions and land quality receptors of relevance to the Awel y Môr OWF onshore ECR search area and sub-station. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on geology, ground conditions and land quality and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

10.7.2 Study Area

1118 The Study Area that has been adopted for scoping covers the same extents as the Awel y Môr OWF onshore ECR and substation search area.

1119 The Study Area will be reviewed and amended in response, for the PEIR, to such matters as refinement of the onshore (and offshore) ECR and the identification of additional constraints (environmental and/or engineering). The extent of the final Study Area will be further refined upon selection of the location of the proposed substation. This is expected to result in a significant reduction in the size of the Study Area as it is refined to more closely follow the route of the preferred onshore cable corridor, and preferred locations for the landfall and sub-station when these are selected during 2020.

10.7.3 Baseline data

1120 In order to describe the geological and land quality baseline across the wider onshore search area this initial scoping assessment has made use of the following data sources:

- Aerial photography;
- Old-maps.co.uk for historical Ordnance Survey maps (where available);
- British Geological Survey (BGS) mapping;
  - Minerals Resource map for north east Wales;
  - Aggregates Safeguarding map for north east Wales;
  - Solid and superficial geology;
  - Borehole logs; and

- Historic mining areas.

- GoogleEarth mapping for details of current, and where available former, land use;
- The Coal Authority website;
- data.gov.uk website;
  - Historical landfill records.
- Natural Resources Wales website;
  - Historic and active landfill sites;
  - Groundwater Source Protection Zones (SPZ); and
  - Permitted industrial and commercial facilities.
- Department for Environment, Food and Rural Affairs (DEFRA) MAGIC website;
  - Statutory and non-statutory environmental designations.

1121 The data review has identified sites across the onshore search area benefitting from protection (e.g. geological sites of special scientific interest and safeguarded mineral areas) and those that have been subject to potentially contaminative activity and, therefore, have a greater likelihood of representing significant sources of ground contamination.

1122 Once the proposed location of the ECR has been selected there may be a requirement to source additional third-party data (e.g. Groundsure environmental database reports, historical Ordnance Survey maps) for individual parcels of land identified as higher risk through the desktop review. This requirement would be reviewed upon completion of the desktop review of data listed above in this Section.

10.7.4 Baseline environment

1123 This Section gives a general overview of baseline conditions across the onshore search area highlighting areas with a history of development (particularly for commercial and industrial use), former military installations such as airfields, areas of quarrying that have subsequently been subject for landfilling, former mining areas and areas with an increased risk of unexploded ordnance (UXO).

1124 Map information obtained from the Department for Environment, Food & Rural Affairs (DEFRA) MAGIC website identified numerous Sites of Special Scientific Interest (SSSI) within the onshore search area. Potentially sensitive geological SSSI designations within the onshore search area are listed in Table 92 below.

TABLE 92 - ENVIRONMENTAL DESIGNATIONS WITH RELEVANCE TO THE ONSHORE AREA OF SEARCH FOR AWEL Y MÔR OWF

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
Coedydd ac Ogofau Elwy a Meirchion SSSI and SAC	Coincident with and to the south of the Awel y Môr OWF onshore ECR search area	Features that are of interest include fossil and artefact bearing sediments at Pontnewydd, Cefn and Galltfaenan Caves.

1125 The Coedydd ac Ogofau Elwy a Meirchion SSSI is located close to the village of Henllan approximately 5km north-west of Denbigh and is centred on National Grid Reference SJ022702. The area of the designation is understood to be 82.7ha. The primary geological features of interest are listed as the Galltfaenan, Cefn and Pontnewydd Caves.

1126 The area around Rhyl is underlain by Permian Rocks that have been designated as a potentially sensitive Principal Aquifer. A second Principal Aquifer, Dinantian Rocks (undifferentiated), is mapped further to the west around Llanddulas. The Colwyn Bay Area is underlain by Ludlow Rocks (undifferentiated) and this strata is denoted as a Secondary (B) Aquifer.

1127 Superficial deposits mapped within the search area comprise Blown Sand, Till and Alluvium, all of which have been classified as Unproductive Strata.

1128 No Environment Agency designated groundwater Source Protection Zones (SPZ) are mapped within the onshore search area.

1129 The River Clwyd is located on the western portion of the search area and to the south of this river are numerous small water bodies likely to represent field drains/ditches. The River Dulas and Nant y Flynnon are situated on the central and western portions of the search area respectively. The Irish Sea borders the site to the north.

Mineral safeguarding areas

1130 A review of BGS map information identified several safeguarded mineral and aggregate areas within the onshore area of search. An extract of BGS Mineral Resource Map for the north east Wales region is presented as in Appendix A.

1131 Potentially significant areas of safeguarded mineral deposits identified within the onshore ECR search area include the following:

- Limestone deposits (shaded light blue in Appendix F) associated with the Dinantian Rocks mapped upon the central portion of the site; and
- Superficial deposits of sands and gravels associated with deposits of Blown Sand (orange shaded areas located on the north eastern portion of the search area), Glacial Sand and Gravel (pink shaded areas located on the north western portion of the search area) and Alluvium (yellow shaded areas associated with surface water features traversing the central portion of the search area).

Commercial/industrial activities

1132 Sites with a history of industrial/commercial use located in the vicinity of urban settlements such as Colwyn Bay, Abergalem, Rhylm, St Asaph, Bodelwydden and Prestatyn have the greatest potential to be impacted by contamination. Activities that are likely to be present in the search area could potentially comprise the following:

- Petrol filling stations (PFS);
- Vehicle repair/maintenance businesses and similar engineering works;
- Metal manufacturing, refining and finishing works;
- Railway land;
- Timber treatment and manufacturing works;
- Oil refineries and bulk storage facilities;
- Dockyards and associated dockland; and
- Chemical works.

1133 Notwithstanding the above, it is considered likely that the final ECR is likely to be positioned to avoid significantly developed urban areas and as such the ECR is more likely to traverse agricultural land that is less likely to be impacted by contamination.

Waste recycling & disposal facilities

1134 Potentially significant historical landfill facilities within the search area are listed in Table 93.

TABLE 93 - HISTORICAL LANDFILL SITES IDENTIFIED WITHIN THE ONSHORE AREA OF SEARCH FOR AWEL Y MÔR OWF

SITE	DATES OF OPERATION	WASTE ACCEPTED
Llanddulas Quarry, Old Colywn	1974-1975	Industrial, commercial
Llanddulas Beach Landfill	1987-1993	Household
Knowles Glan Hafod, Penmaenrhos	1984-1986	Inert

1135 Other waste facilities that may be located within the onshore search area include the following:

- As yet unidentified current and historical landfill sites;
- Waste recycling and treatment sites;
- End of life vehicle processing facilities (i.e. scrapyards); and
- Sewage works.

Mining areas

1136 The Coal Authority indicates that the central portion of the onshore search area, located between Abergele and Prestatyn and incorporating St Asaph and land to the immediate east of Denbigh, is within a surface coal resource area and abandoned mines are therefore potentially present. However, Coal Authority records do not denote any 'Development High Risk Areas' within the onshore search area.

1137 The only portion of the onshore search area that falls within a coal mining reporting area is a thin strip of coastline between Abergele and Prestatyn. It should be noted that this area is also mapped as extending out a significant distance north west into the Irish Sea/Liverpool Bay.

Unexploded ordnance

1138 Historical industrial/commercial areas located in coastal towns such as Colwyn Bay, Rhyl and Prestatyn may have been subject to bombing during World War Two and as such there is a conceptual risk that unexploded ordnance could be present within the soils underlaying the onshore ECR search area.

10.7.5 Policy and Regulatory context

1139 National Policy Statements set out the primary policy test against which the application for a DCO for the proposed development will be considered.

1140 The Overarching National Policy Statement for Energy (EN-1) (Ref 11.15) and National Policy Statement for Electricity Networks Infrastructure (EN-5) (Ref 11.16) were adopted by Parliament in July 2011. The documents provide the main policy tests in relation to the Proposed Development. Elements of NPS EN-1 and NPS EN-5 that are relevant to this chapter are listed below:

- EN-1, 5.3.3: 'Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of … geological conservation importance';
- EN-1, 5.3.3: 'Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of … geological conservation importance';
- EN-1, 5.3.7: 'As a general principle, and subject to the specific policies below, development should aim to avoid significant harm to … geological conservation interests, including through mitigation and consideration of reasonable alternatives …; where significant harm cannot be avoided, then appropriate compensation measures should be sought';
- EN-1, 5.10.8: 'Applicants should … identify any effects and seek to minimize impacts on soil quality taking into account any mitigation measures proposed. For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination'; and

- EN-5, 2.2.6: ' ..developers will be influenced by Schedule 9 to the Electricity Act 1989, which places a duty on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to 'have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest.

1141 The Construction Design and Management Regulations 2015 (CDM 2015) are also relevant as they govern the way construction projects are planned to ensure overall health, safety and welfare of all parties.

Planning Policy Wales (PPW, Edition 10, December 2018) & and the UK's Contaminated Land Regime

1142 National Planning Policy in Wales is set out in The Welsh Government (2016) Planning Policy Wales Edition 9 (PPW) (Ref 11.17).

The Best and Most Versatile Agricultural Land

1143 It is likely that this development will occupy some agricultural land and, in part, areas of previously developed brownfield land. The development will involve earthworks and the stripping of topsoil and subsoil, with some being reused.

1144 PPW states that local planning authorities should take into account the benefits of the "best and most versatile agricultural land" when considering whether significant development of agricultural land is necessary. The best and most versatile agricultural land is defined as Grades 1, 2 and 3a by policy guidance and some 7% of land in Wales falls within this classification.

1145 PPW states that 'planning applications and local development plans should include survey evidence when they cover grade 1, 2 or 3a land'.

The Natural Environment: Soils

1146 PPW states that the planning system should protect valued soils and prevent the adverse effects of unacceptable levels of pollution. This is because soil is an essential finite resource that provides important 'ecosystem services'. As part of the Government's 'Safeguarding our Soils' strategy, DEFRA published a code of practice on the sustainable use of soils on construction sites which was intended to be helpful in development design and setting planning conditions[37]. After discussing legislation relevant at the time, the code covers:

[37] Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Defra, 2009

- pre-construction planning including soil resource surveys;
- soil management during construction; and
- landscape, habitat or garden creation.

Land Affected by Contamination

1147 The PPW has a core aim to encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value.

1148 PPW directs those involved in development to ensure sites are suitable for use and not be capable of being determined as contaminated land under Part 2A – which means that the category of land, post remediation (if required) should be considered.

The Contaminated Land Regime

1149 Specific UK legislation and guidance on the assessment of contaminated land is principally provided under:

- Part 2A of the EPA 1990, as inserted by Section 57 of the Environment Act 1995;
- The Contaminated Land (Wales) Regulations 2006 (No.2989 W.278) make provision, in relation to Wales, for the identification and remediation of contaminated land under Part 2A of the Environmental Protection Act 1990; and
- The Environment (Wales) Act 2016 is legislation introduced by the National Assembly for Wales that established necessary legislation to enable a more sustainable and coordinated approach to the planning and management of the natural resources of Wales.

1150 Overall, the regime advocates a precautionary approach to dealing with contaminated land, there is clear direction to avoid the "excessive cost burdens" of "wastefully expensive remediation".

1151 The normal procedure for assessing land dictates that potential contaminant Sources, Pathways and Receptors should be considered within the context of potential contaminant linkages (PCL's) and that an evaluation of the risks associated with each linkage should drive decisions regarding the status of the land as contaminated, unaffected by contamination or requiring further investigation.

1152 Under Part 2A the starting point should be that land is not contaminated land unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with the Statutory Guidance, should be considered as meeting the Part 2A definition of contaminated land.

1153 Under Part 2A, risks should be considered only in relation to the current use of the land. "Current use" means:

- The use which is being made of the land currently;
- Reasonably likely future uses of the land that would not require a new or amended grant of planning permission;
- Any temporary use to which the land is put, or is likely to be put, from time to time within the bounds of current planning permission; and
- Likely informal use of the land, for example children playing on the land, whether authorised by the owners or occupiers, or not.

1154 Sites subject to Detailed Inspection under Part 2A by Local Authorities should be classified as Categories 1 to 4. For clarity:

- Category 1: describes land which is clearly problematic;
- Categories 2 and 3: cover the less straightforward land where detailed consideration is needed before deciding whether it is Category 2 (contaminated land requiring remedial action) or Category 3 (not contaminated land) - wider socio-economic factors come into play if health risks assessment fails to produce a decision; and
- Category 4: describes land that is clearly not contaminated land.

1155 The Category 4 test is particularly important in this instance as it defines when land is clearly not 'contaminated land' in the legal sense. It introduces the idea that it would be exceptional for land exhibiting normal background levels of contamination or contaminant levels below published assessment criteria to be considered as 'contaminated land'.

10.7.6 Proposed approach to the Environmental Impact Assessment

Guidance

1156 The following guidance documents have been referenced when devising the assessment methodology:

- A key item of guidance is the Environment Agency's (EA) Model Procedures; Contaminated Land Report 11 (CLR 11), which indicates that a Conceptual Site Model (CSM) should identify those contamination sources, pathways and receptors which are "likely" to represent an "unacceptable" risk either to human health or the surrounding environment;
- Contaminated Land Statutory Guidance 2012 (ref: WG19243) was issued by the Welsh Government and is intended to explain how Local Authorities should implement the regime as detailed by EPA 1990, including how they should go about deciding whether land is contaminated land in the legal sense of the term;
- Construction Industry Research and Information Association (CIRIA) C552 (Contaminated Land Risk Assessment. A guide to good practice) examines the risk assessment of contaminated land and explains the key elements of risk assessment practices and procedures; and
- Environmental impact assessment guidance produced by CIRIA, Institute of Environmental Management and Assessment (IEMA) and the Highways Agency in the Design Manual for Roads and Bridges, Volume 11 Environmental Assessment[38].

Proposed assessment methodology

Methodology – Land quality assessment

1157 The first assessment, a land quality assessment, takes account of the development proposals which introduces humans and property to this site. The individual risk assessments consider the potential for existing ground conditions to harm site users, damage property/buildings and pollute the wider environment.

1158 The methods to be followed in the assessment of land quality are detailed in various guidance documents. The overarching guidance document is Contaminated Land Report 11 (CLR11) entitled "Model Procedures for the Management of Land Contamination". The Model Procedures are intended to assist all those involved in dealing with land contamination, including landowners, developers, professional advisors, regulatory bodies and financial providers.

[38] Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 3, Part 11, Geology and Soils (Highways Agency, 1993) and DMRB, Volume 11 Environmental Assessment, Section 2, Part 5, HA205/08 Assessment and Management of Environmental Effects Highways Agency (Highways Agency, 2008)

1159 The Model Procedures are split into three stages: risk assessment, options appraisal and remediation.

1160 The first stage, risk assessment, is an essential component in achieving effective management of the risks from land contamination. The Environmental Statement will rely on information and risk assessments presented as appendices, and these are likely to comprise detailed desk studies supported, where necessary, by targeted ground investigations and quantitative risk assessments.

1161 If needed, mitigatory measures will form part of a remediation strategy and implementation plan.

Unexploded ordnance (UXO)

1162 It should be noted that for the purposes of the chapter, unexploded ordnance (UXO) will be assessed alongside other geohazards such as ground-based contaminants, hazardous gases, etc. In effect, UXO will be treated as a "Source" of hazard in a risk-based approach. This is judged appropriate as, whilst there is no legislation specifically dealing with UXO, health and safety legislation such as the CDM Regulations and Health and Safety at Work Act effectively place obligations to ensure appropriate assessment and mitigation measures, if required.

Methodology – Development impact assessment

1163 The second assessment, the Development Impact Assessment, will discuss the potential impacts of the proposed development on soils and near surface geological deposits via physical-movement and pollution. The assessment will consider impacts during construction and operation of the development. Appropriate mitigation measures will be identified where predicted impacts during construction and operation are significant. Generally speaking, it will not be possible to quantify these effects, and so qualitative assessments will be carried out based on available knowledge and professional judgement.

1164 The methodology to be used draws on EIA guidance produced by CIRIA, IEMA and the Highways Agency in the Design Manual for Roads and Bridges, Volume 11 Environmental Assessment.

1165 The Environmental Statement will also likely rely on some form of Agricultural Land Classification and Soil Resources report.

Potential project impacts

1166 By following the method laid out above the applicant will present various risk assessments and consider the potential for existing ground conditions and UXO to harm future site users, damage future buildings, pollute water or the wider environment including plants. In this case, the risk assessments will likely show that baseline conditions across the majority of the site will comprise undeveloped agricultural land and that the site can be made suitable for its new use.

1167 Notwithstanding the above, a range of potential impacts on human, environmental and built receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The potential impacts to be considered by the Awel y Môr OWF EIA are outlined in Table 3, together with a description of any proposed additional data collection and supporting assessments (e.g. detailed desk study research, targeted site investigation, quantitative and quantitative risk assessments etc.) to enable an assessment of the impact.

1168 It should be noted however that this initial assessment presented as Table 94 is based upon identified land uses and contaminative activities identified across the wider onshore search area, and subsequent to finalisation of the ECR and substation location it may be possible to discount their presence and therefore the associated potential impacts.

1169 Based on the information currently available, the proposed onshore search area and the project description as detailed by Chapter 3 a number of impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 95, together with a justification for scoping them out.

TABLE 94 - IMPACTS PROPOSED TO BE SCOPED INTO THE ASSESSMENT FOR ONSHORE GEOLOGY AND GROUND CONDITIONS

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES
CONSTRUCTION			
10.7.1	Short term risks to construction workers during development of ECR and associated infrastructure.	Site workers could be exposed to contaminated soils and groundwater during the construction phase via the direct contact, ingestion and dust inhalation exposure pathways.	The presence of significant contamination along the large majority of the ECR is deemed unlikely as the final route is most likely to avoid significantly developed areas and traverse open farmland. However, the presence of localised sources of contamination cannot be ruled out at this initial stage. Once the ECR is finalised it will be necessary to carry out a detailed desk-based assessment supported by purchased environmental database and historical map information. In accordance with current guidance, this information would then be used to prepare a Conceptual Site Model (CSM) that would explore the relationships between sources, pathways and receptors of contamination. Any complete pollutant linkages identified by the CSM would represent a potential risk that may warrant further investigation. This could include site investigation, the recovery of soil and water samples for chemical analysis and the provision of an interpretative quantitative risk assessment. These findings would be used to establish the likely magnitude of potential effects (i.e. whether they are long, medium or short-term; or whether the effect is temporary/reversible or permanent) as well as the sensitively of the
10.7.2	Risks to off site human receptors, such as occupants of residential properties bordering the ECR.	Dusts generated during the construction phase could pose a risk to off site human receptors via the inhalation exposure pathway. Such risks would be particularly pertinent if asbestos was identified in soils.	
10.7.3	Risks posed to sensitive surface water and	Ground disturbance or the removal of hardstanding could increase the potential for	

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES
	groundwater resources.	leaching and the mobilisation of soluble contaminants.	receptor that could be impacted. The receptor importance/sensitivity and subsequent magnitude of change would be assessed as a function of one another to determine the significance of each effect. Information relating to any identified sources of contamination that could pose a risk by the dust inhalation exposure pathway (i.e. soils with the potential to be impacted by asbestos) will be used to inform the Air Quality assessment (Section 10.5) and the resulting mitigation measures that may be required. This will in turn inform the health assessment (Section 10.10)
10.7.4		Leaks and/or spills of contaminants, such as fuels and oils, used and stored during the construction phase.	Bulk storage of potential contaminants judged to be relatively unlikely during construction phase. Risks would be ameliorated by adopting good working procedures and control measures i.e. appropriate storage facilities, spill response plans etc.
10.7.5	Construction phase impacts upon soil/land quality	Compaction, erosion and reduction of structural properties due to disaggregation. Localised excavation and loss of soil resources.	Potential impacts could arise if poor working practices are adopted during the construction phase. Plant and vehicle movements should be carefully managed to ensure that the structural properties of soils, and their effectiveness as a growth medium for plants, are not significantly impacted. Exposure of soils subsequent to vegetation clearance, particularly on any sloping areas, should be avoided to prevent significant erosion. The complete loss of soil resources along

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES
		Impact upon sensitive geological designations such as SSSIs.	limited sections of the ECR where intrusive construction works are more prominent cannot be completely ruled out. The receptor importance/sensitivity and subsequent magnitude of change would be assessed as a function of one another to determine the significance of each effect.
10.7.6	Sterilisation of mineral deposits	Construction of the ECR upon areas of safeguarded deposits of minerals and aggregates	Where possible, the ECR should be positioned to avoid potentially sensitive mineral deposits as detailed by the north east Wales mineral and aggregate safeguarding plans. Where mineral deposits cannot be avoided a method by which they can be excavated and sustainably used as part of the wider OWP project should be developed.
10.7.7	Disturbance of UXO	Excavations could disturb UXO resulting in a risk of explosion.	Should the final ECR and substation be located within more developed coastal areas that may have been subject to bombing during the second world war it would be necessary to undertake a more detailed desk based UXO survey to identify historically impacted areas. Works located within areas that are identified as being at risk from the presence of UXO would need to be subject to a watching brief by a specialist surveyor so that ordnance can be readily and safely identified.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES
			Magnetometer surveys may be required during the progression of exploratory boreholes so that works can be halted if potential UXO is encountered.
OPERATION			
10.7.8	Ingress and accumulation of hazardous ground gases	Ground gases generated by deposits of fill could accumulate in confined spaces, such as structures and deep excavations, resulting in the accumulation of poor air quality and a risk of asphyxiation and explosion.	Risks would only be applicable if the ECR was located on or near significant deposits of fill with the potential to generate ground gases such as methane and carbon dioxide. Such sources could be identified via detailed desk-based research of purchased environmental database information. The risks would only be applicable if any structures of infrastructure associated with the ECR included confined spaces in which ground gases could accumulate.
10.7.9	Structures and services laid in direct contact with contaminated soils and groundwater	Certain contaminants can have a long-term impact on the integrity of subsurface materials such as buried concrete and plastic service pipes.	Information obtained during ground investigations targeting potential sources for contamination could be referenced during the design phase ensuring selection of appropriate materials that provide adequate protection from contaminated soils and/or groundwater.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES
DECOMMISSIONING			
10.7.10	Short term risks to construction workers during decommissioning of ECR and associated infrastructure	Site workers could be exposed to contaminated soils and groundwater during the decommissioning phase via the direct contact, ingestion and dust inhalation exposure pathways.	Any significant risks posed by contaminated soils or groundwater are likely to be established during the construction phase and as such appropriate control measures could be implemented during decommissioning. It is considered that there is a negligible risk of activities during the operation phase significantly impacting soil and ground water quality, and as such the risks identified during construction are likely to be exacerbated during the operation phase. Information relating to identified sources of contamination will be used to inform the Air Quality assessment (Section 10.5) and the mitigations measures required to prevent the generation and inhalation of contaminated dusts.
10.7.11	Risks to off site human receptors, such as occupants of residential properties bordering the ECR.	Dusts generated during the decommissioning phase could pose a risk to off site human receptors via the inhalation exposure pathway.	
10.7.12	Risks posed to sensitive surface water and groundwater resources.	Leaks and/or spills of contaminants, such as fuels and oils, during the decommissioning phase.	Bulk storage of potential contaminants judged to be relatively unlikely during decommissioning phase. Risks would be ameliorated by adopting good working procedures and control measures i.e. appropriate storage facilities, spill response plans etc.

TABLE 95 - IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR ONSHORE GEOLOGY AND GROUND CONDITIONS

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
OPERATION		
10.7.13	Operational impacts on geology/ground conditions and associated longer term risks to human and environmental receptors	Significant ground disturbance is considered relatively unlikely during the operation phase. Furthermore, contractors appointed to carry out repair/maintenance activities would be informed of any issues relating to ground contamination identified during the construction phase and would therefore adopt appropriate working methods and control measures to ameliorate any potential risks and associated impacts.
10.7.14	Loss of agricultural land from operation of underground cables	The construction of the ECR would be carried out in controlled and considered manor so as not have any long-term impact upon agricultural land. Furthermore, the final ECR is likely to be positioned to avoid potentially sensitive land uses where possible.
10.7.15	Routine maintenance effects on sterilisation of minerals and loss of agricultural land.	Large scale works maintenance works are judged to be relatively unlikely during the operation phase. Localised activities would be subject to control measures to ameliorate and small-scale risks and impacts.

Mitigation measures adopted as part of the project

1170 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for impacts on ground conditions and the resulting impacts upon potentially sensitive human, environmental and built receptors. These are presented below, and these will continue to evolve over the development process as the EIA progresses and in response to consultation.

1171 Innogy are committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Tables 3 and 4.

1172 Measures adopted as part of the project will include:

- Consideration of potentially significant conceptual sources of contamination, sensitive geological designations and safeguarded mineral deposits during selection of final ECR and substation location, where practicable. Avoidance of areas identified as high risk and/or sensitively will negate the requirement for detailed assessments and potentially onerous mitigation measures;
- Construction and maintenance workers should develop task specific method statements and risk assessments that specifically reference any potentially significant sources of ground contamination identified by the desk and site-based assessments carried out to support the preparation of the final ES chapter;
- Selection and use of appropriate robust personal protective equipment (PPE) by all site workers;
- Provision of appropriate spill kits on all site plant and in areas where fuels or other potentially contaminative liquids/chemicals are both used and stored;
- Production of a Soil Management Plan which may include the following range of measures:
  - Use of appropriate dust suppression measures, particularly during periods of dry weather when dust generation is most likely;
  - Management of stockpiles, including placement on impermeable surfaces and the provision of covering, to avoid leaching of any contaminants;

- Management of plant and vehicle movements to prevent significant compaction of soils and a reduction in their structural properties essential for plant growth;
- Prevent long term exposure of soils during construction, particularly within any sloping areas, to reduce the risk of wind and water erosion and the resulting impacts upon soil quality;

- Management of plant and vehicles through the CEMP and CTMP to minimise the spread of detritus onto the public highway;
- Adopt appropriate safe working practices that consider the potential for hazardous ground gases ingress and accumulation in confined spaces. The use of gas protection measures, such as impermeable membranes and ventilation, may be required if any permanent structures are to be located in proximity to identified sources of ground gases such as a landfill site; and
- Development of, and adherence to, a Decommissioning Plan.

1173 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

1174 Cumulative impacts will be considered as part of the EIA process (refer to Chapter 4 for details), adapted to make it applicable to geology and ground conditions. This will include a desk-top exercise and consultation with stakeholders to identify relevant potential projects within the local area, with which there could be interactions.

1175 The methodology will also be aligned with the approach to the assessment of cumulative impacts that has been applied by Ministers when consenting offshore windfarms and confirmed in recent consent decisions. It also follows the approach set out in guidance from the Planning Inspectorate (Planning Inspectorate 2015) and from the renewables industry (RenewableUK 2013 and The Crown Estate, 2019).

1176 The risks posed to human receptors, including site workers and occupants/users of adjacent sites, could potentially be exacerbated if the ECR was to border any other significant proposed developments. Risks to controlled water receptors could be increased if significant works adjoining the ECR also resulted in activities such as soil stockpiling and the removal of hardstanding, as this could have a cumulative impact upon the leaching of soluble contaminants. A concentration of plant and machinery would also increase the risk of an escape from fuel and chemical storage facilities.

1177 Based upon the size of the search area considered by this scoping exercise it is not possible to ascertain whether any significant off-site developments could have a cumulative impact upon the final ECR. Once a more specific potential route is established it would be prudent to identify any activities that could result in a cumulative impact by reviewing Planning Inspectorate and Local Authority planning records and conducting walkover inspections at any higher risk locations.

Potential transboundary Impacts

1178 Based upon the nature of the site, and the anticipated baseline ground conditions as identified by this initial assessment, it is considered that any impacts, if present, will be relatively localised. It is therefore judged that there will not be any transboundary impacts relating to geology and ground conditions.

10.7.7 Summary of next steps

1179 In accordance with current guidance and best practice, the assessment of potentially contaminated sites should commence with a desk-based assessment.

1180 Once the route of the ECR is refined the initial stage of assessment would comprise a review of available desktop information This assessment would highlight any potentially contaminative sites that would warrant further, more robust assessment. It should be noted that such assessments will be used to inform the route options assessment and as such high-risk areas are likely to be avoided where at all possible.

1181 Areas identified as being more likely to be impacted by contamination could subsequently be subject to a more detailed desk-based assessment akin to a Phase I Primary Land Quality Risk Assessment (PLQRA). These assessments would be based upon a review of purchased environmental database and historical map records and, where necessary, site walkover surveys. The purpose of any such targeted qualitative risk assessments would be to provide a more comprehensive understanding of potential sources, pathways and receptors of contamination and their likely relationships. These would be presented in a Conceptual Site Model that would identify potentially pollutant linkages by which a sensitive receptor could be linked to source of contamination by an exposure pathway.

1182 If/where potentially significant pollutant linkages are established this is likely to trigger further phases of assessment that could comprise intrusive ground investigation, the recovery of soil and water samples for laboratory chemical analysis and the provision of a quantitative risk assessment.

1183 The size of the area(s) requiring investigation will be devised with reference to the likely significance of the identified sources of contamination and the sensitivity of the constructions works and environmental setting of each defined Study Area.

1184 The findings of the initial phases of assessment, and the nature and extend of any identified contamination, could then be used to inform working practices and the design of the final ECR. Where the risks cannot be ameliorated through the adoption of control measures consideration may need to be given to localised remediation.

1185 With regards to safeguarded deposits of minerals and aggregates, these should be avoided by the ECR if possible. If this is not achievable, consideration should be given to the types of minerals that could be disturbed and whether these could be excavated and sustainably reused as part of the wider OWF development.

1186 Should the final ECR transverse any potentially sensitive sites subject to geological designations consideration will need to be given to the nature of the mitigation and control measures adopted to ensure that they are appropriately robust and afford the underlying soils and rocks appropriate protection.

1187 UXO is considered unlikely to have a significant impact upon the selected ECR and substation location as this initial assessment identified limited areas of historical commercial and residential development that may have been subject to significant bombing during the second world war. However, it may be prudent to undertake a specialist desk based UXO assessment so that any appropriate mitigation measures can be adopted if required.

10.7.8 Further considerations for Consultees

1188 The further consideration for consultees regarding potential impacts upon geology and ground conditions are as follows:

i. Do you agree that the risks and impacts associated with contaminated land are unlikely to be significant across the large majority of any ECR, and that any subsequent, more detailed assessments are most likely to target localised impacts?

ii. Do you agree that the proposed phased approach to the assessment of risk and associated impacts are sufficient to inform the onshore baseline ground conditions for the Awel y Môr OWF PEIR and ES?

iii. Are there any potentially significant sources of ground contamination/contaminative activities within the search area that have not been identified by the initial data review?

iv. Have all potentially sensitive receptors within the wider search area been identified?

v. Do you agree that the impacts described in Table 95 can be scoped out?

vi. For those impacts scoped in (Table 94), do you agree that the methods described are sufficient to inform a robust impact assessment?

10.8 Onshore Landscape and Visual Impact Assessment

10.8.1 Introduction

1189 This Section of the Scoping Report identifies the landscape and visual receptors which are of relevance to the Awel y Môr OWF onshore ECR and substation search areas. It considers the potential landscape and visual impacts from the construction, operation and maintenance, and decommissioning of the onshore components of Awel y Môr OWF. It defines the proposed scope of the landscape and visual impact assessment (LVIA) for the onshore components of Awel y Môr OWF EIA. An overview of the proposed approach and methodology for undertaking the LVIA is also provided.

1190 The LVIA for the onshore ECR will cover all terrestrial elements of Awel y Môr OWF from the cable landfall point. All seaward components of Awel y Môr OWF from the cable landfall point are covered by the seascape, landscape and visual impact assessment for the offshore environment (Section 9.4).

10.8.2 Study Area

1191 For the purpose of the Scoping Report, the Study Area for landscape and visual issues comprises a combination of the onshore ECR search area with a 1km buffer around it and the substation search area with a further 5km buffer around it.

1192 The Study Area for the LVIA will be reviewed once a preferred ECR and substation site has been selected to ensure it is considered appropriate. This review will include the analysis of a zone of theoretical visibility (ZTV) for the ECR and substation and the identification of viewpoints for inclusion in the LVIA. Any refinement of this approach in the context of landscape and visual receptors will be addressed in the PEIR and discussed with stakeholders via the Evidence Plan process. For the purpose of the LVIA during the EIA, it is proposed that the Study Area will comprise a 1km corridor either side of the centre of the ECR and 5km from the boundary of the substation site. The extent of the proposed Study Area is based on knowledge of the characteristics of the proposed development, the local landscape, the key changes that are likely to occur and experience of other similar scale developments. In the case of the substation, the potential height of the permanent structures (anticipated to be up to 15m above ground level) has also informed the extent of the proposed Study Area.

1193 The review of the Study Area may also be influenced by the identification of additional constraints (environmental and/or engineering) and feedback through the scoping opinion and Evidence Plan process. This is expected to result in a significant reduction in the size of the Study Area as it is refined to more closely follow the route of the preferred onshore cable corridor, and preferred locations for the landfall and substation when these are selected during 2020.

10.8.3 Baseline data

1194 A range of data sources are available for the LVIA including:

- Mapping:
  - OS 1:50,000 and 1:25,000 mapping; and
  - Ordnance Survey (OS) Terrain 50 and Terrain 5 DTM data;
- OS Open Data:
  - National landscape planning designations;
  - Settlements, roads, railways and public rights of way; and
  - National Trails;
- Landscape Character Assessments (National, County & District scale):
  - National Landscape Character Areas (Wales);
  - LANDMAP maps and surveys; and
  - Conwy and Denbighshire Landscape Sensitivity and Capacity Assessment for Wind Energy Development, May 2013;
- Landscape Planning Context and Designations:
  - Clwydian Range and Dee Valley Area of Outstanding Natural Beauty (AONB) Management Plan 2014-2019;
  - Supplementary Planning Guidance Note: Clwydian Range and Dee Valley Area of Outstanding Natural Beauty (June 2018);
  - Register of Landscapes, Parks and Gardens of Special Historic Interest in Wales (Cadw);
  - Register of Landscapes of Outstanding Historic Interest in Wales (Cadw and Natural Resources Wales);
  - Register of Landscapes of Special Historic Interest in Wales (Cadw and Natural Resources Wales);
  - Local Council Planning Portals/Development Plans;
  - Local landscape designations; and

- Conwy Deposit Local Development Plan 2007-2022 (Revised edition 2011) Revised Background Paper 27 – Submission, Special Landscape Areas, August 2012.

10.8.4 Baseline environment

1195 This Section provides a high-level summary of the landscape and visual receptors that form part of the existing environment within the Study Area.

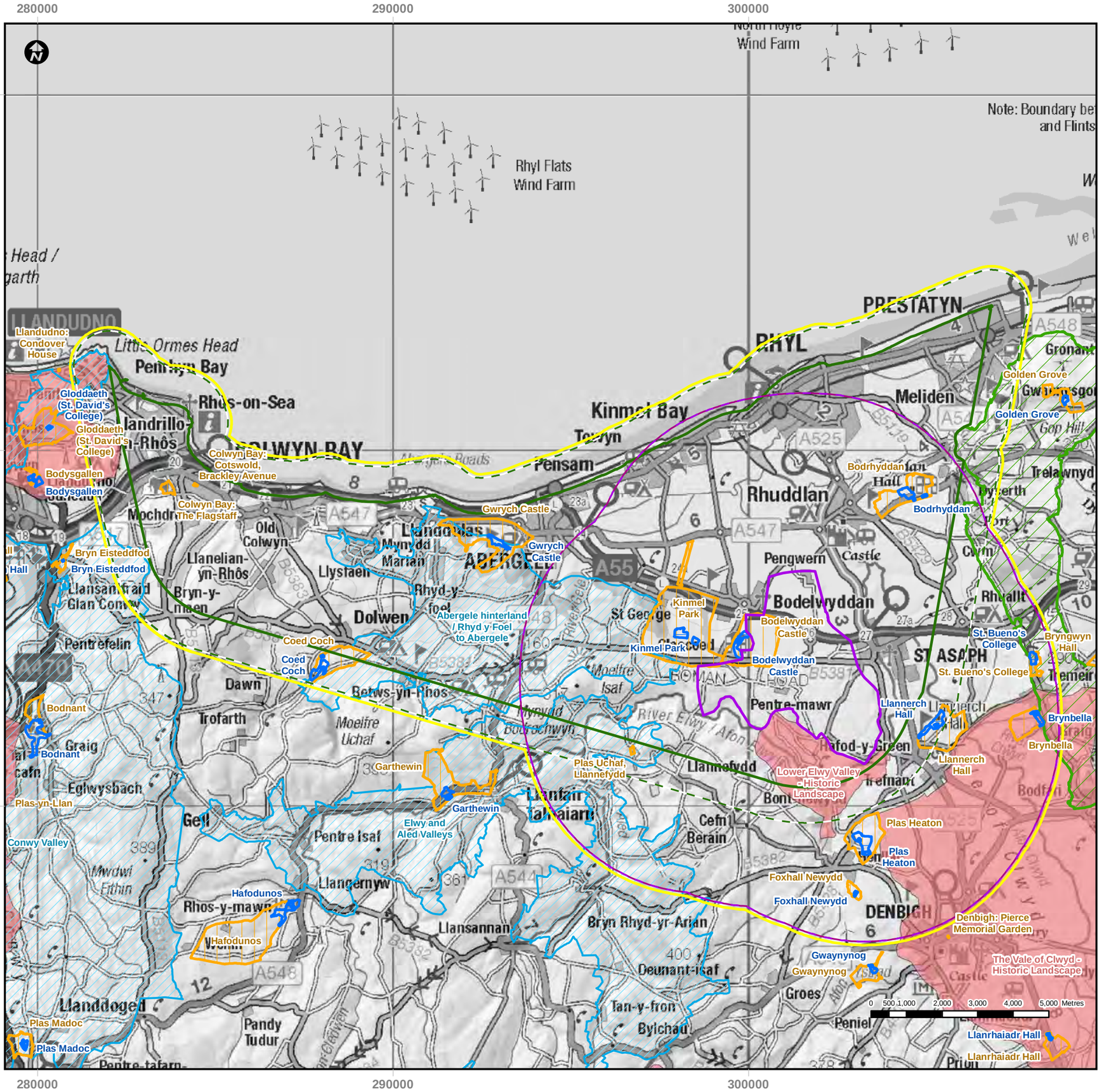
Landscape character

1196 Landscape character within the onshore search area and associated buffers applied for the LVIA, includes a number of landscape character types and areas. The National Landscape Character Areas for Wales (Natural Resources Wales, 2014) provide a broad description of the landscape. The Study Area lies within five National Landscape Character Areas (NLCA):

- NLCA07 Conwy Valley;
- NLCA08 North Wales Coast;
- NLCA09 Rhos;
- NLCA11 Vale of Clwyd; and
- NLCA12 Clwydian Range

1197 The majority of the Study Area lies within NLCA08 North Wales Coast. This comprises a settled coastline, backed by limestone hills. The steep slopes lie close to the coastline in the western part of the NLCA, concentrating development and transport links in the lower lying coastal landscape. In the central part of the NLCA, the hill steps further away from the coastline and the broad Vale of Clwyd lies further east. The NLCA is flanked to the east by the ridge of the Clwydian Range of hills.

1198 Much of the coastal strip has been developed for tourism, with Victorian seaside resorts such as Llandudno and Rhyl, together with country hotels and more recent developments including holiday camps and caravan parks. Inland are several estates and wooded parklands, such as Bodelwyddan, Bodrhyddan and Kinmel, which are included in the designated sites Section below and Figure 75.



Overview map



Legend

- Onshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area 1km Buffer
- Substation Search Area
- Substation Search Area 5km Buffer
- Study Area
- Gardens and Kitchen Gardens
- Park Boundaries
- Areas of Outstanding Natural Beauty
- Special Landscape Areas
- Historic Landscapes

Cartographic information

Coordinate System: British National Grid

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData.
Contains Natural Resources Wales Information © Natural Resoures Wales and Database Right. All rights Reserved.
Contains Conwy Council information licensed under the Open Government Licence v3.0.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel Y Môr**

TITLE Landscape Designations

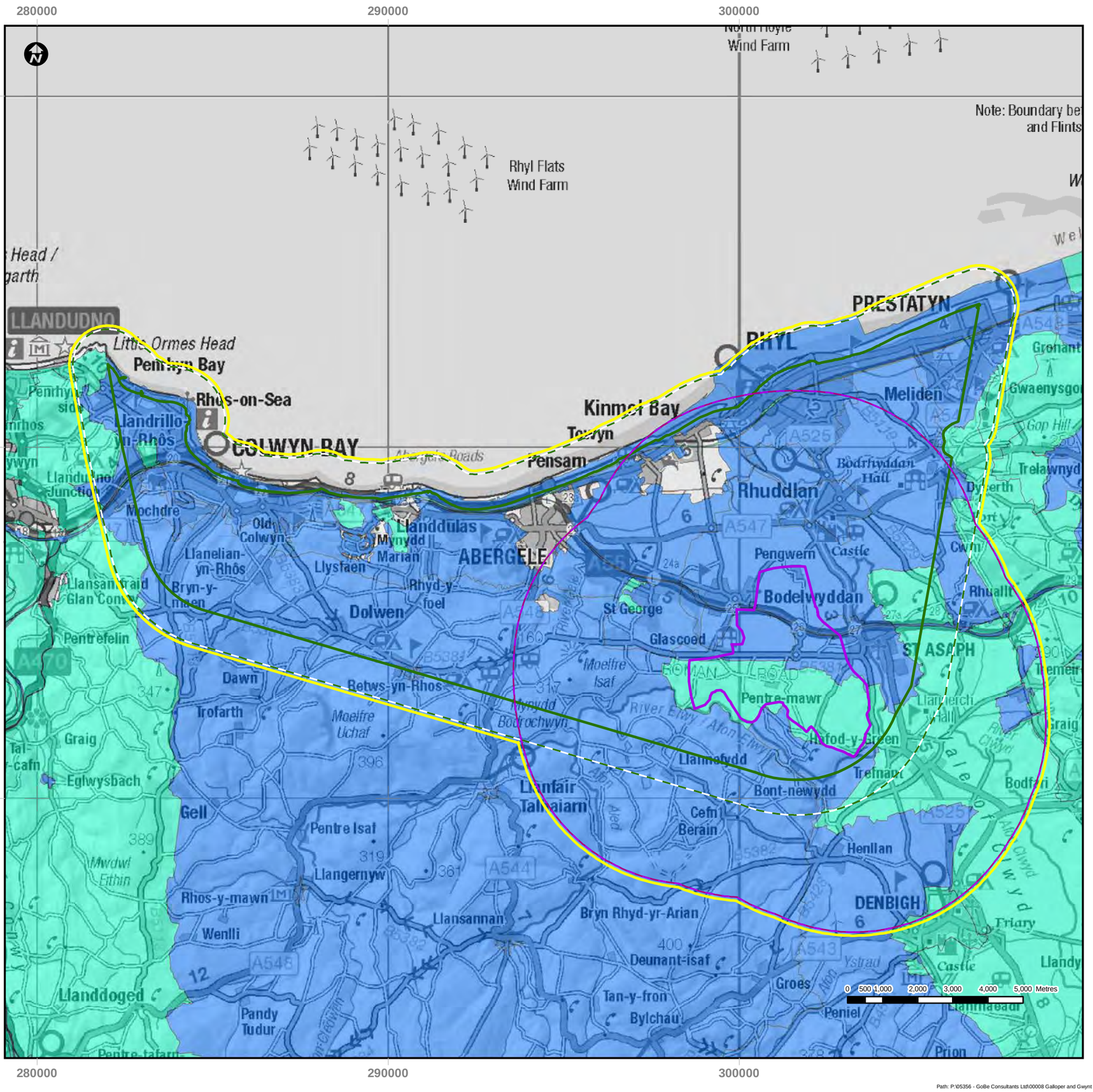
DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:110,000	@DIN A3

REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.8 - Landscape\Landscape Designations\AyM_Innogy_WF_UK_DIN_LandscapeAndVisual_LandscapeDesignations.mxd

1199 The Conwy and Denbighshire Landscape Sensitivity and Capacity Assessment for Wind Energy Development (Conwy County Borough Council and Denbighshire County Council, May 2013) divides the landscape into areas of Broad Landscape Character and smaller scale Landscape Units. In the absence of a published landscape character assessment it is anticipated these will form an appropriate basis for the baseline landscape assessment for the LVIA.

1200 Initial review of LANDMAP has been undertaken as part of the preparation of the Scoping Report, including all five Aspects (Cultural Landscapes, Geological Landscapes, Historic Landscapes, Landscape Habitats and Visual and Sensory). Figure 76 to Figure 80 show Aspect Areas that have been evaluated as high or outstanding in LANDMAP, as this is likely to be indicative of landscape value and be an influencing factor in landscape sensitivity judgements. Much of the Study Area has been given an evaluation of high or outstanding in at least one of the LANDMAP Aspects. The identification of local landscape designations in Conwy has considered LANDMAP, and therefore the Special Landscape Areas designated by Conwy County Borough Council draw together the LANDMAP judgements. The Special Landscape Areas are outlined in the Designated Sites Section below.



Overview map



Legend

- Onshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area 1km Buffer
- Substation Search Area
- Substation Search Area 5km Buffer
- Study Area

LANDMAP Cultural Landscape Evaluation

- High
- Outstanding

Cartographic information

Coordinate System: British National Grid

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights Reserved.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT	
Offshore Windpark **Awel Y Môr**	

TITLE

LANDMAP Aspect Area - Cultural Landscape

DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:110,000	@DIN A3

REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.8 - Landscape\LANDMAP Aspect Areas\AyM_Innogy_WF_UK_DIN_LandscapeAndVisual_LANDMAP_CulturalLandscapes.mxd

280000 290000 300000

390000 380000 370000

North Hoyle Wind Farm

Rhyl Flats Wind Farm

Note: Boundary be and Flints

Head / garth

LLANDUDNO

Little Ormes Head

Penrhyn Bay

Rhos-on-Sea

Llandrillo-yn-Rhôs

COLWYN BAY

Kinmel Bay

Towyn

Pensarn

RHYL

PRESTATYN

Meliden

Gronant

Gwaenysgor

Gop Hill

Trelawnyd

Dyserth

Bodrhyddan Hall

Rhuddlan

Llanddulas

ABERGELE

Pengwern Castle

Bodelwyddan

St George

Glascoed

ST ASAPH

Rhuallt

Tremeirchion

Llanelian-yn-Rhôs

Llysfaen

Mynydd Marian

Llansantffraid Glan Conwy

Bryn-y-maen

Dolwen

Rhyd-y-foel

Pentrefelin

Dawn

Betws-yn-Rhos

Trofarth

Moelfre Uchaf

Moelfre Isaf

Mynydd Bodrochwyn

Pentre-mawr

Rhyd-y-Groes

Llannefydd

Llanfair Talhaiarn

Bont-newydd

Trefnant

Cefn Berain

Henllan

Bodfari

Graig

Eglwysbach

Gell

Pentre Isaf

Llangernyw

Rhos-y-mawn

Wenlli

Llansannan

Bryn Rhyd-yr-Arian

Deunant-isaf

Tan-y-fron

Bylchau

Groes

DENBIGH

Friary

Castle

Llandyrnog

Llanrhaeadr

Peniel

Prion

Llanddoged

Pandy Tudur

Pentre-tafarn-

Afon Elwy

Afon Clwyd

Afon Aled

Mwdwl Eithin

Ystrad

A470 A55 A547 A548 A525 A544 A543 A494

0 500 1,000 2,000 3,000 4,000 5,000 Metres

Overview map



Legend

- Onshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area 1km Buffer
- Substation Search Area
- Substation Search Area 5km Buffer
- Study Area

LANDMAP Geological Landscape Evaluation

- High
- Outstanding

Cartographic information

Coordinate System: British National Grid

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights Reserved.

Fferm Wynt Alltraeth

AWEL Y MÔR

Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT	
Offshore Windpark	**Awel Y Môr**

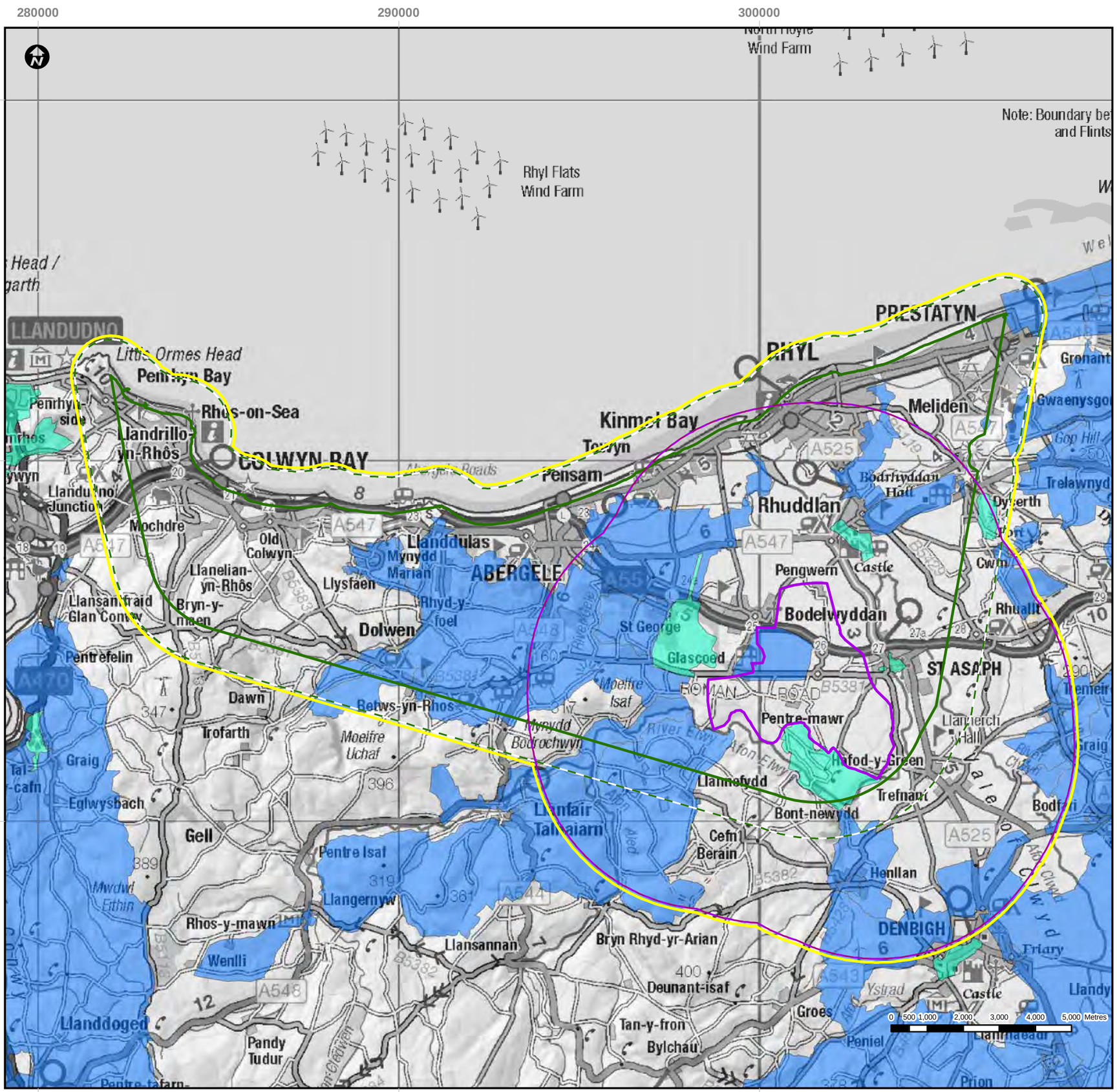
TITLE

LANDMAP Aspect Area - Geological Landscape

DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:110,000	@DIN A3

REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.8 - Landscape\LANDMAP Aspect Areas\AyM_Innogy_WF_UK_DN_LandscapeAndVisual_LANDMAP_GeologicalLandscapes.mxd



Overview map



Legend

- Onshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area 1km Buffer
- Substation Search Area
- Substation Search Area 5km Buffer
- Study Area

LANDMAP Historic Landscape Evaluation

- High
- Outstanding

Cartographic information

Coordinate System: British National Grid

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights Reserved.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited Windmill Hill Business Park, Whitehill Way, Swindon, Wiltshire, SN5 6PB	**PROJECT** Offshore Windpark **Awel Y Môr**

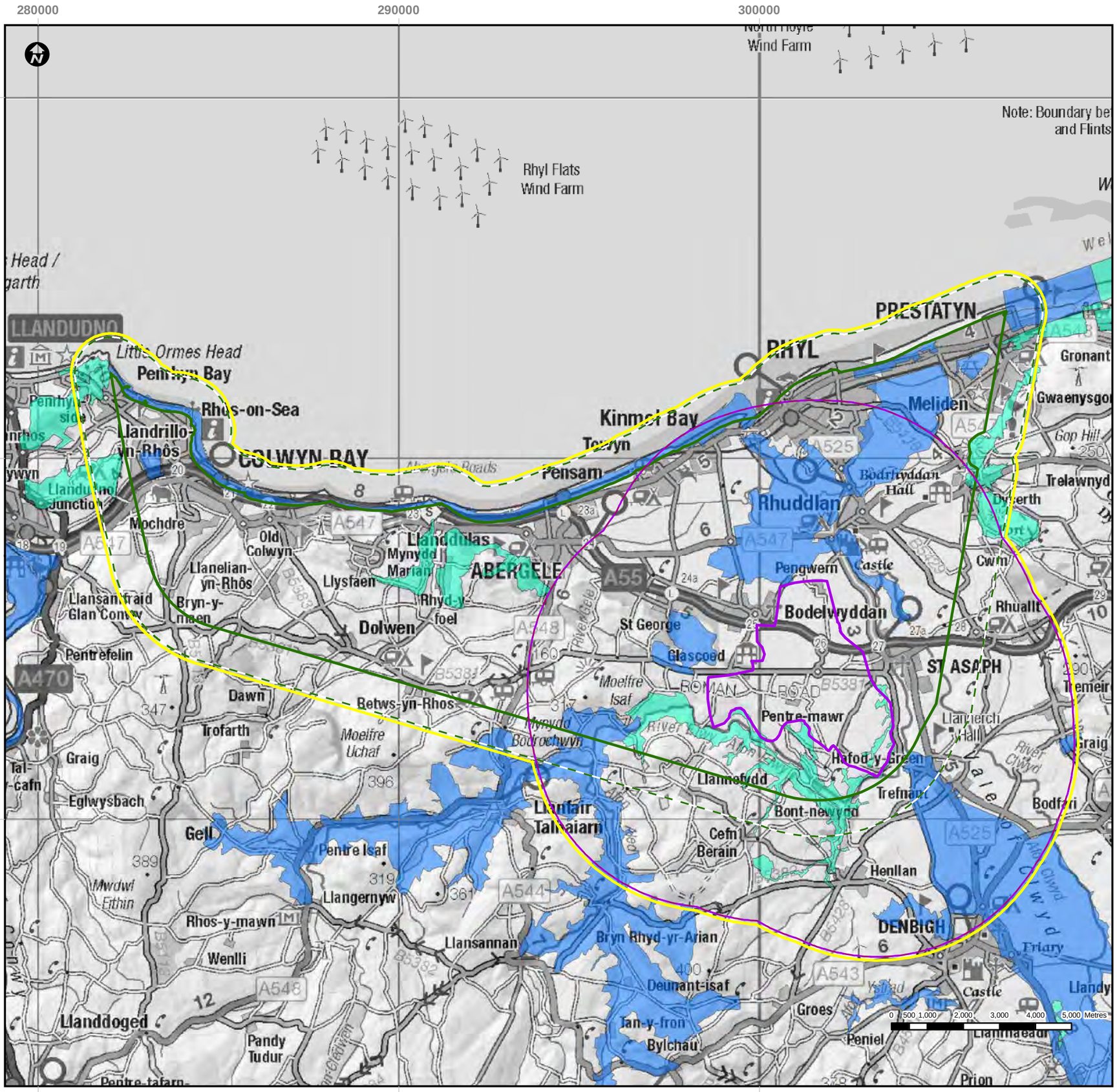
TITLE

LANDMAP Aspect Area - Historic Landscape

DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:110,000	@DIN A3

REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.8 - Landscape\LANDMAP Aspect Areas\AyM_innogy_WF_UK_DIN_LandscapeAndVisual_LANDMAP_HistoricLandscapes.mxd



Overview map



Legend

- Onshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area 1km Buffer
- Substation Search Area
- Substation Search Area 5km Buffer
- Study Area

LANDMAP Landscape Habitats Evaluations

- High
- Outstanding

Cartographic information

Coordinate System: British National Grid

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights Reserved.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

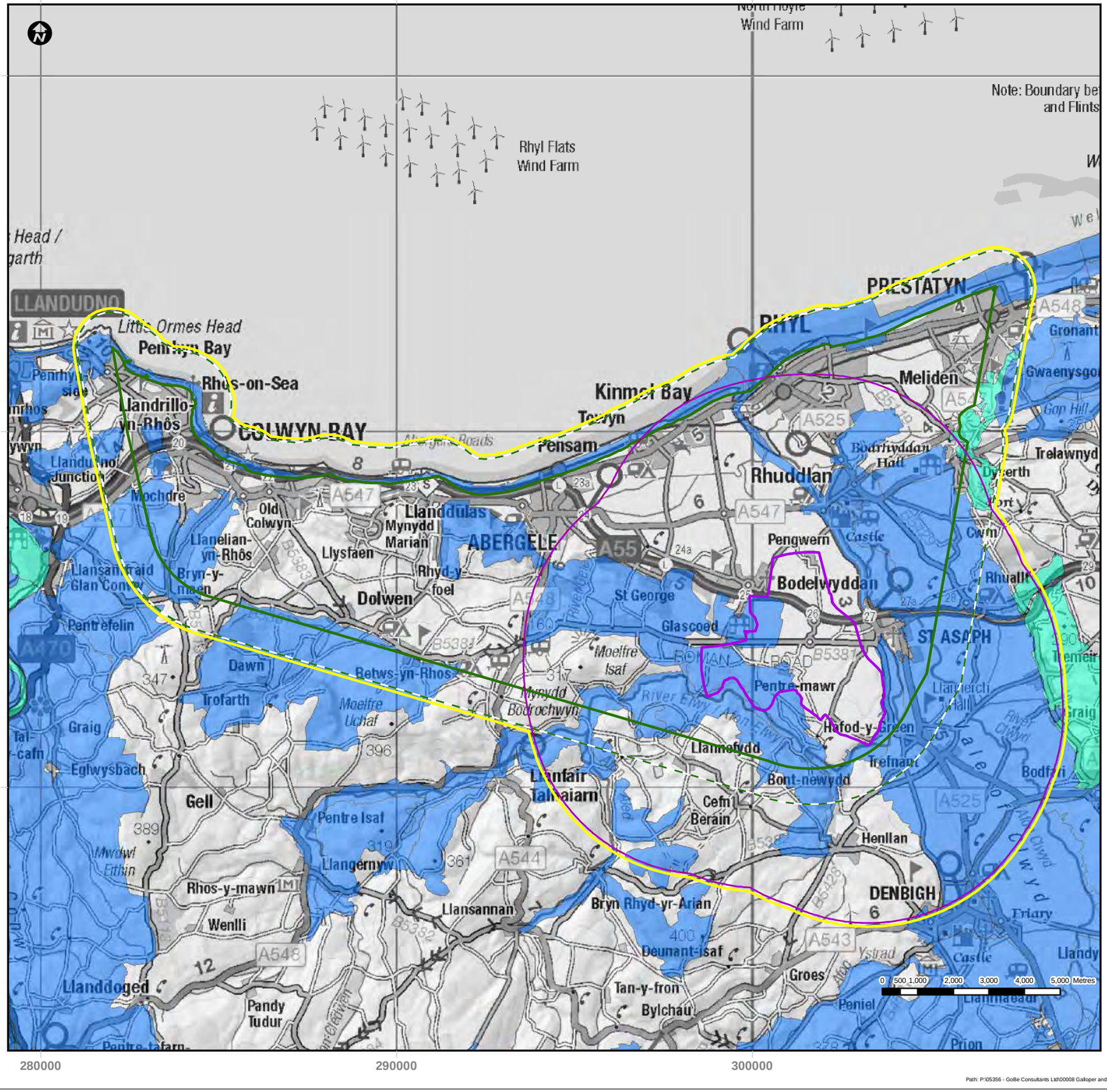
PROJECT Offshore Windpark **Awel Y Môr**

TITLE LANDMAP Aspect Area - Landscape Habitats

DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:110,000	@DIN A3

REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.8 - Landscape\LANDMAP Aspect Areas\AyM_Innogy_WF_UK_DIN_LandscapeAndVisual_LANDMAP_LandscapeHabitats.mxd



Overview map



Legend

- Onshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area 1km Buffer
- Substation Search Area
- Substation Search Area 5km Buffer
- Study Area

LANDMAP Visual and Sensory Evaluation

- High
- Outstanding

Cartographic information

Coordinate System: British National Grid

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights Reserved.

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited Windmill Hill Business Park, Whitehill Way, Swindon, Wiltshire, SN5 6PB	**PROJECT** Offshore Windpark **Awel Y Môr**

TITLE

LANDMAP Aspect Area - Visual and Sensory

DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:110,000	@DIN A3

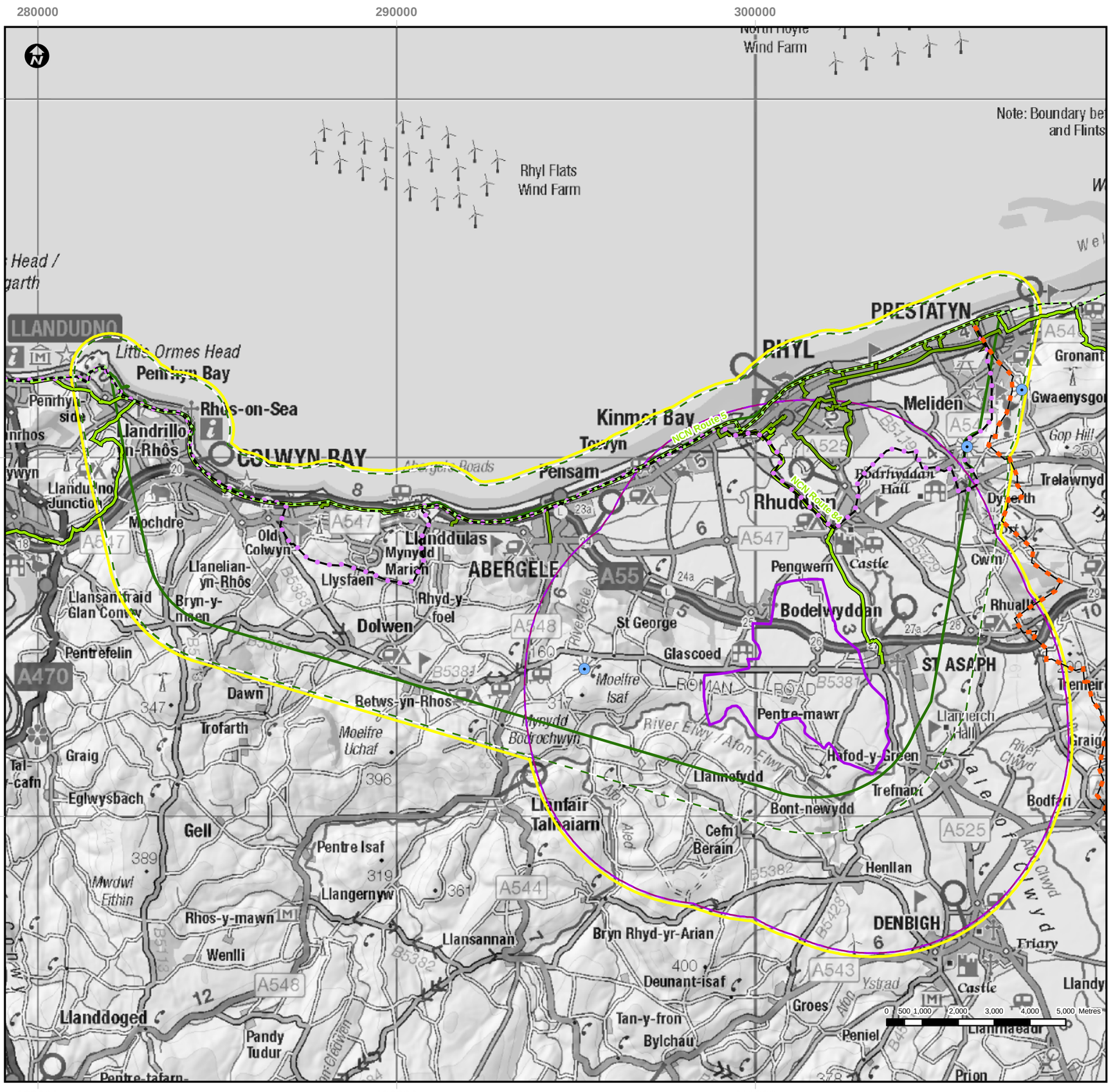
REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.8 - Landscape\LANDMAP Aspect Areas\AyM_Innogy_WF_UK_DIN_LandscapeAndVisual_LANDMAP_VisualSensory.mxd

Visual receptors

1201 The diversity and scale of the Study Area and associated buffers for the LVIA results in a wide range of visual receptors being included, which are illustrated by Figure 81. Key considerations in the context of this analysis include:

- Residents (including settlements and dispersed residential properties);
- Leisure users, including people using Public Rights of Way, Open Access Land, promoted walking and cycling routes and visiting local attractions and recreational resources such as marked viewpoints, landmarks, beaches, golf courses etc.; and
- Users of transport routes, including the road and rail networks.



Overview map



Legend

- Onshore Export Cable Route Search Area
- Onshore Export Cable Route Search Area 1km Buffer
- Substation Search Area
- Substation Search Area 5km Buffer
- Study Area
- OS Marked Viewpoints
- Wales Coastal Path
- North Wales Path
- Offa's Dyke Path
- National Cycle Route
- NCN Link

Cartographic information

Coordinate System: British National Grid
NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData
Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights Reserved.
National Cycle Route data supplied by Sustrans and contains Ordnance Survey data © Crown copyright and database right (2018).

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel Y Môr**

TITLE Visual Receptors

DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:110,000	@DIN A3

REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.8 - Landscape\Visual Receptors\AyM_Innogy_WF_UK_DIN_LandscapeAndVisual_VisualReceptors.mxd

Residents

1202 The coast of mainland North Wales within the onshore search area is relatively densely settled, with multiple towns along its length, such as Conwy, Llandudno, Colwyn Bay, Abergele, Rhyl and Prestatyn. Many of these settlements in North Wales also form popular tourist destinations. Inland from the coastline the settlement pattern is generally smaller in scale and more dispersed in pattern. Larger inland settlements include St Asaph, Bodelwyddan, Rhuddlan and Dolwen.

Leisure and recreation

1203 There are numerous footpaths and bridleways, areas of Open Access Land and promoted cycling routes that provide access to the countryside and coastlines.

1204 Of particular note are the long distance promoted routes. In North Wales this includes part of the Wales Coast Path, which lies along or in close proximity to the coastline. In addition, the northern end of Offa's Dyke Path lies largely to the east of the onshore search area with much of this part of the path route over the higher ground of the Clwydian Range of hills. Offa's Dyke Path terminates at Prestatyn, just within the onshore search area.

1205 There are several cycle routes within the Study Area. These include part of National Cycle Network Route 5 along the North Wales coast, and part of National Cycle Network Route 84 from Rhyl to St Asaph. National Cycle Network Route 84 currently comprises a relatively short route, but it is intended that this will extend from Rhyl to Oswestry in Shropshire.

1206 There are Ordnance Survey marked viewpoints at Moelfre Isaf, Graig Fawr and on the north west facing hillside above Prestatyn. The first of these marked viewpoints is within the Study Area, whilst the two further locations are both within 1km to the east. These are positioned on elevated ground, where expansive open views can be obtained.

1207 There are numerous other opportunities for leisure and recreation through the Study Area such as the beaches and resort towns along the North Wales coast.

1208 It is not proposed specifically to consider any offshore leisure based visual receptors as part of the LVIA for terrestrial elements of the proposed development. This is due to the likely limited relative scale and duration of such construction activities from offshore locations, the developed nature of this part of the coast and the distance to the area in which the substation is proposed to be located from the coastline.

Transport routes

1209 There are multiple transport routes within the landward component of the Study Area. Primary roads are typically located close to the coastline and lower lying landscape to the south. However, the A548 and A525 run north-south through parts of the Study Area.

1210 There is one railway line within the Study Area. This is routed close to the coastline between Prestatyn and Colwyn Bay.

1211 As with offshore leisure based visual receptors, and for similar reasons, it is not proposed to specifically consider any offshore transport routes as part of the LVIA for terrestrial elements of the proposed development.

Designated sites

1212 Table 96 below provides an overview of designated sites in the context of the Study Area and associated buffers for the LVIA. The table includes designated sites that are within the Study Area and a 1km buffer from this, together with a 5km buffer from the Substation Search Area. Figure 75 shows the location and extent of the designations in relation to the Study Area.

TABLE 96 – LANDSCAPE RELATED DESIGNATIONS WITH RELEVANCE TO THE SCOPE OF THE LANDSCAPE AND VISUAL IMPACT ASSESSMENT FOR THE ONSHORE ELEMENTS OF AWEL Y MÔR OWF

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
NATIONAL		
Clwydian Range and Dee Valley AONB	Adjacent to eastern edge of Study Area.	The Clwydian Range was designated as an AONB in 1985 and subsequently extended to include the Dee Valley in in 2011. The Clwydian Range comprises a chain of heather moorland clad summits with hillforts. The Dee Valley lies to the south and contains the historic settlement of Llangollen together with the World Heritage Site of the Pontcysyllte Aqueduct and Llangollen Canal.
Bodelwyddan Castle	Within Study Area	Grade II. Well-preserved mid-sized 18th and 19th century landscape park surrounding Bodelwyddan Castle, with pleasure grounds and formal former kitchen garden.
Bodrhyddan	Within Study Area	Grade II*. Landscape park with formal garden of parterre and topiary, and informal garden.
Brynbella	c. 2.5km to the east of Study Area, within potential 5km buffer for substation	Grade II. Late 18th century small park and informal garden.
Coed Coch	Within Study Area	Grade II. Small 18th and 19th century landscape park with artificial lake, pleasure grounds and 19th century tree planting.
Colwyn Bay: Cotswold, Brackley Avenue	Within Study Area	Grade II. Remains of spacious Edwardian town garden with Arts and Crafts elements contemporary with the house, and Japanese garden.

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
Colwyn Bay: The Flagstaff (Welsh Mountain Zoo)	Within Study Area	Grade II. Partial remains of formal and informal gardens overlooking Colwyn Bay.
Foxhall Newydd	c. 3km to the south of Study Area within potential 5km buffer for substation	Grade II. Earthwork remains of 17th century formal garden, with garden enclosures, walled garden and semi-ancient woodland.
Gwrych Castle	Within Study Area	Grade II*. Gothic park with walling, lodges, and towers around Gwrych Castle, includes large scale walled and turretted terraced garden.
Kinmel Park	Within Study Area	Grade II*. House prominently set in a medium sized landscape park, with well-preserved formal garden and walled garden.
Llannerch Hall	Within 1km to the east of Study Area	Grade II. Site of famous Welsh historic garden with earthworks, formal terraced garden with canal woodland garden and walled garden.
Plas Uchaf, Llannefydd	Within 1km to the south of Study Area	Grade II. Survival, in slightly ruinous state, of a formal 17th or 18th century walled and terraced garden attached to a manor house.
Plas Heaton	c. 1km to the south of Study Area, within potential 5km buffer for substation	Grade II. Landscape park with informal woodland garden and circuit walk.
St Beuno's College	c. 3km to the east of Study Area, within potential 5km buffer for substation	Grade II. 19th century designed garden attached to a religious house.
Vale of Clwyd Landscape of Historic Interest in Wales	c. 1km to the south east of Study Area within potential 5km buffer for substation	Broad lowland river valley edged by the Clywdian Hills. Contain s evidence of late prehistoric and medieval land use, defensive chain of Iron Age hillforts, medieval estate enclosures, and Denbigh and Ruthin defended towns and castles.

SITE	CLOSEST DISTANCE TO AWEL Y MÔR OWF	FEATURES OR DESCRIPTION
Creuddyn and Conwy Landscape of Historic Interest in Wales	Adjacent to the western edge of Study Area	Coastal landscape comprising the Great and Little Orme's Heads and lower part of the Conwy estuary and its hinterland in north Snowdonia. Contains evidence of diverse land use and settlement from early prehistoric period to the present.
Lower Elwy Valley Landscape of Historic Interest in Wales	Within Study Area	Steep-sided gorge part of a narrow river valley to the west of the Vale of Clywd. Includes a group of caves containing internationally significant Quarternary geological and archaeological deposits.
LOCAL		
Great Orme and Creuddyn Peninsular	Just within/adjacent to the very western edge of Study Area	A locally significant landscape that is both locally and regionally rare. Valued for its proximity to Llandudno. Under pressure from infill development.
Rhyd Y Foel to Abergele	Within Study Area	A locally important landscape values for its under-development and proximity to the coastal urban belt.
Elwy and Aled Valleys	Within southern part of Study Area	A locally important landscape with sensitivities identified in all landscape layers of LANDMAP.
Conwy Valley	Just within/adjacent to the very western edge of Study Area	A locally important landscape with sensitivities identified in all landscape layers of LANDMAP. Under pressure from new development. Important relationship with Snowdonia National Park.

10.8.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

1213 The assessment will be based on recognised guidelines, principally the 3rd edition of the Guidelines for Landscape and Visual Impact Assessment (GLVIA 3) (Landscape Institute and Institute of Environmental Management and Assessment, 2013). The process followed will conform to the recommendations of GLVIA 3 as well as professional experience, focusing on likely significant impacts, rather than assessing all potential impacts. This will allow determination of the key residual impacts resulting from the proposed development and inform proposed mitigation. Photomontages and visualisations will be based on SNH's Visual Representation of Wind Farms (February 2017) and the Landscape Institute's Visual Representation of Development Proposals (September 2019).

1214 It is anticipated that detailed methodology will be agreed with stakeholders through the Evidence Plan and will also be set out in the PEIR. This Section describes the broad principles and approach that will be applied. The key assessment stages will be:

- Confirming the scope of the assessment, in terms of Study Area extent, key viewpoints and LVIA content, including cumulative considerations;
- An iterative approach to the mitigation of potentially significant adverse impacts through the assessment process;
- Preparation of the LVIA and accompanying drawings and visualisations; and
- The LVIA will include judgements in relation to the susceptibility, value and sensitivity of landscape and visual receptors, the predicted magnitude of change and the predict level of impacts/impacts and whether these will be significant.

1215 We anticipate that the LVIA will concentrate upon a focused Study Area as set out in Section 10.8.2 above. However, if necessary, important receptors beyond this area will also be considered. This Study Area is based on knowledge of the characteristics of the proposed development, the local landscape, the key changes that are likely to occur and experience of other similar scale developments. In the case of the substation, the potential height of the permanent structures (anticipated to be up to 15m above ground level) has also informed the extent of the proposed Study Area. The Study Area will be based on the extent of the proposed development, not site-centred, and will be confirmed through consultation.

Landscape

1216 The assessment of potential landscape effects will concentrate on the Study Area for the LVIA. A character assessment will establish the baseline landscape conditions and examine the sensitivity of the context of the ECR and substation site and surrounding Study Area to the potential changes associated with the proposed development.

1217 The assessment will require a combination of desk study and fieldwork. The desk study and baseline assessment will include analysis of published information on landscape character and landscape designations. This will inform judgements in relation to the value, susceptibility and sensitivity of landscape receptors.

1218 The landscape assessment will use the published landscape character assessments, refined through fieldwork, to establish the existing baseline landscape character of the Study Area and identify distinct landscape character types. The location, use, landscape elements, scale, nature of views and landscape quality of character areas/types will be described. Landscape character will be assessed, and potential impacts identified based on the principles set out in GLVIA 3. A review of published information has identified several key documents that inform this, as set out above in Section 10.8.4 Baseline Data. The LVIA will take into consideration the potential impacts of the proposal on relevant landscape designations.

1219 The assessment will identify key characteristics of the landscape and visual context that may inform the design of the proposed development. The emphasis of the baseline study will be the recording and describing of existing features that are important in the local context and their contribution to character.

1220 The significance of the potential landscape impacts will be determined using professional judgement and a robust method. The evaluation of potential impacts will focus on impacts on landscape features and elements, and the perception of landscape character.

Visual

1221 Potentially sensitive visual receptors will be located within the LVIA Study Area. These include residents, users of PRoW, road users and tourists/visitors to the coast and surrounding landscape. The visual assessment will be based on:

- The analysis of the ZTV for the proposed development;
- Field survey to review potential visibility and the changes that will occur; and
- Views from agreed viewpoints representing sensitive visual receptors within the Study Area at a range of distances and directions from the proposed development.

1222 The viewpoint assessment will be carried out to determine the potential impacts of the proposed development on specific receptors and viewpoints within the LVIA Study Area. However, important viewpoints beyond this will also be considered if appropriate. Viewpoints proposed for inclusion in the assessment will be agreed through consultation with relevant consultees. The viewpoints will allow an assessment of the key element of the proposed development to be made from a range of locations within the Study Area. It is also expected that viewpoints will be selected to support the assessment of impacts on the cultural heritage assets, these may be specific to the cultural heritage assessment or used in both this and the LVIA.

1223 The existing and predicted view of the proposed development will be described and illustrated using photography. A 35mm equivalent camera (i.e. a full frame digital single lens reflex camera) with a 50mm lens is the chosen format for recording the viewpoint photography, which is endorsed as the most suitable camera combination/focal length for landscape and visual impact assessment work. For each viewpoint, the photography will be presented showing the existing view, together with visualisations (e.g. wireline and photomontage as appropriate) to illustrate the predicted view of the proposed development. The visualisations will be prepared in accordance with relevant good-practice guidance e.g. SNH's Visual Representation of Wind Farms (February 2017) and the Landscape Institute's Visual Representation of Development Proposals (September 2019). It may be appropriate to consider the need for photography that reflects views seen in different seasons at certain locations and the need for this will be agreed with key consultees as part of the viewpoint selection process.

1224 As with the assessment of landscape impacts, the significance of the potential visual impacts will be determined using professional judgement and a robust method. The evaluation of potential impacts will focus on how changes resulting from the proposed development are predicted to affect visual amenity within the Study Area.

Potential project impacts

1225 A range of potential impacts on landscape and visual receptors have been identified, which may occur during the construction, operation and maintenance, and decommissioning of the onshore components of Awel y Môr OWF. The potential impacts that have been scoped into the Awel y Môr OWF EIA are outlined in Table 97, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. predicted visibility modelling) to enable an assessment of the potential impacts.

1226 Based on the information currently available and the project description, a number of potential impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 98, together with a justification for scoping them out.

TABLE 97 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR THE LVIA

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
10.8.1	Direct temporary loss/disturbance of landscape features and elements, and potential impacts on the perception of landscape character.	The impact of construction activities such as vegetation removal and soil stripping within the onshore ECR and substation site and the construction of new above ground structures at the substation site will directly affect features and elements of the landscape, with associated effects on the perception of landscape character.	The LVIA will consider the potential impacts of the construction phase on landscape receptors. This will include desk based and field survey work for both the ECR and substation site. A ZTV will be prepared to inform evaluation of the extent of potential effects on the perception of landscape character. Viewpoint photography will be undertaken at agreed locations to record the baseline and inform the prediction of potential effects. Whilst the viewpoints are more specifically linked with the assessment of effects on visual receptors they will also help inform and illustrate the landscape impact assessment work.
10.8.2	Impacts of the construction phase on visual amenity.	The impact of construction activities such as vegetation removal and soil stripping within the onshore ECR and substation site and the construction of new above ground structures at	The LVIA will consider the potential impacts of the construction phase on visual receptors. This will include desk based and field survey work around both the ECR and substation site. A ZTV

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		the substation site will affect visual receptors, with the LVIA focussed on those receptors within the Study Area (where significant effects are more likely to occur).	will be prepared to inform evaluation of the extent of potential effects on visual amenity. Viewpoint photography will be undertaken at agreed locations to record the baseline and inform the prediction of potential visual effects.
OPERATION			
10.8.3	Potential effects on the perception of landscape character resulting from the operational substation.	The presence of the operational substation will result in potential effects on landscape character.	The LVIA will consider the potential effects of the operational phase on landscape receptors. It is anticipated that assessment will be focussed on the 5km area surrounding the substation site. This will include desk based and field survey work, which will overlap with similar work undertaken for the substation in relation to the construction phase. A ZTV will be prepared to inform evaluation of the extent of potential effects on landscape character. Viewpoint photography (expected to be consistent with those used for the construction phase) will be undertaken at agreed locations, expected to be consistent with the construction phase work, to record the baseline and inform the

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			prediction of potential effects. Again, whilst the viewpoints are more specifically linked with the assessment of effects on visual receptors they will also help inform and illustrate the landscape impact assessment work.
10.8.4	Potential effects on visual amenity resulting from the operational substation.	The presence of the operational substation will affect views experienced by people living in, visiting or travelling through the Study Area. Effects could result from visual intrusion or obstruction of existing views.	The LVIA will consider the potential effects of the operational phase on visual receptors. It is anticipated that assessment will be focussed on the 5km area surrounding the substation site. This will include desk based and field survey work, which will overlap with similar work undertaken for the substation in relation to the construction phase around both the onshore ECR and substation site. A ZTV will be prepared to inform evaluation of the extent of potential effects on visual amenity. Viewpoint photography (expected to be consistent with those used for the construction phase) will be undertaken at agreed locations to record the baseline and inform the prediction of potential visual effects.

TABLE 98 – IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR LVIA

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
10.8.5	Landscape and visual effects resulting from construction traffic	The baseline environment includes a number of relatively busy roads and construction traffic will largely blend with this context. In addition, construction traffic at any specific location is likely to occur for a relatively short duration. Significant landscape and visual effects are unlikely to occur in relation to construction traffic.
10.8.8	Night time landscape and visual effects during construction	Limited artificial light sources are proposed along the ECR or at the substation during the construction phase due to the proposed duration of working hours. There may be temporary short-term lighting e.g. to support security measures or a specific construction activity. However, these are unlikely to result in significant landscape and visual effects.
OPERATION		
10.8.6	Effects on landscape and visual receptors resulting from the underground cables during the operational phase.	The key landscape and visual effects will occur during the construction phase. The cable is designed to be maintenance free and works will only be required in exceptional circumstances. Once the land is restored any potential landscape and visual effects associated with this phase are unlikely to be significant.
10.8.7	Effects on landscape and visual receptors resulting from maintenance activities at the substation.	Whilst the presence of the operational substation will be a key component of the LVIA, specific maintenance activities are likely to be short in duration and any associated landscape and visual effects are unlikely to be significant.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
10.8.8	Night time landscape and visual effects during operation	No permanent artificial light sources are proposed along the ECR or at the substation. There may be temporary short-term lighting associated with maintenance activities, or to support security measures. However, these are unlikely to result in significant landscape and visual effects.
10.8.9	Residential visual amenity	The potential for visual effects along the onshore ECR are unlikely to be overbearing or overwhelming due to the short term and temporary nature of this phase. The potential for overbearing or overwhelming visual effects during the operational phase of the substation are unlikely due to the relatively limited height of structures that will form part of the substation. However, the potential requirement for residential visual amenity assessment will be reviewed and confirmed once the substation site is known.
DECOMMISSIONING		
10.8.10	Effects on landscape and visual effects resulting from decommissioning	Effects on landscape and visual receptors resulting from the decommissioning will be comparable with, but less than the construction phase. The underground ducting will be left in situ following the operational phase, reducing the potential for loss or disturbance to landscape features and elements.

Mitigation Measures adopted as part of the project

1227 As part of the design process for the onshore elements of Awel y Môr OWF, a number of designed-in measures are proposed to reduce the potential for impacts on landscape and visual receptors. These are presented below and will evolve over the development process as the EIA progresses and in response to consultation.

1228 Innogy is committed to implement these measures and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 97 and Table 98.

1229 Key designed-in mitigation for the onshore ECR and substation relate to the route and site selection process. This will include the micro-siting of the route and substation to avoid important landscape features or elements, e.g. important hedgerows, trees and areas of woodland where possible. The avoidance of relevant landscape designations e.g. Special Landscape Areas, historic parks and gardens and historic landscapes, will reduce potential landscape effects.

1230 Measures adopted as part of the project could include:

- Development of, and adherence to, a Code of Construction Practice (CoCP);
- Development of a Landscape Mitigation Plan as necessary, which will include
  - Consideration of screening options such as planting and earthworks, this could include offsite works if considered necessary;
  - Reinstatement and restoration of the onshore ECR and construction compounds following the construction phase; and
- Avoiding permanent artificial light sources along the ECR or at the substation;
- Development of, and adherence to, a Decommissioning Plan.

1231 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

1232 The cumulative impact assessment methodology will be based on that described in Chapter 4: Environmental Impact Assessment Approach and Methodology, adapted to make it applicable to landscape and visual impact assessment for the onshore components of the project.

1233 The methodology will also be aligned with the approach to the assessment of cumulative impacts set out in guidance from the Planning Inspectorate (Planning Inspectorate 2015) and from the renewables industry (RenewableUK 2013 and The Crown Estate, 2019) as applied in recent offshore wind consent decisions.

1234 Potential landscape and visual impact would be scoped into the cumulative impact assessment. Potential impacts to be scoped out of the assessment are consistent with Table 98 above

1235 Other activities that could potentially have a cumulative impact on onshore landscape and visual receptors in the context of the ECR and substation are:

- Other proposed large-scale infrastructure projects;
- Proposed linear developments such roads, pipelines and electricity transmission networks; and
- Major leisure/tourism and residential developments.

Potential Transboundary Impacts

1236 Due to the localised nature of any potential landscape and visual impacts associated with the onshore components of Awel y Môr OWF, transboundary impacts are unlikely to occur and therefore it is proposed that this impact will be scoped out from further consideration within the EIA.

10.8.6 Summary of next steps

1237 The proposed approach to the EIA is to commence work on the LVIA, including the activities described in Section 10.8.5 above. Key points for discussion and agreement with relevant stakeholders include:

- Confirmation of the Study Area for inclusion in the LVIA;
- Agreement on the viewpoints to be included in the LVIA, together with any seasonal requirements; and
- Agreement on the scope of any required cumulative assessment.

10.8.7 Further considerations for Consultees

i. Do you agree that the data sources identified are sufficient to inform the onshore LVIA baseline for the Awel y Môr OWF PEIR and ES?

ii. Do you agree that all the relevant designated sites and areas have been identified?

iii. Have the key potential impacts resulting from the onshore components of Awel y Môr OWF been identified for landscape and visual receptors?

iv. Do you agree that the impacts described in Table 98 can be scoped out?

v. For those impacts scoped in (Table 97), do you agree that the method outlined in Section 10.8.5 are sufficient to inform a robust impact assessment?

vi. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the onshore components of Awel y Môr OWF on landscape and visual receptors?

10.9 Socio-economic and Tourism

10.9.1 Introduction

1238 This Section identifies the socio-economic and tourism receptors of relevance to the Awel y Môr OWF onshore ECR search area and sub-station. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on socio-economic and tourism and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

1239 Effects on waterborne recreation are covered in Section 9.2 (Shipping and Navigation) and Section 9.6 (Other Marine Users and Activities) of this Scoping Report.

10.9.2 Study Area

1240 The nature of the effects to be considered by the socio-economic and tourism assessment apply at a range of spatial levels. A three-tier approach has therefore been adopted to define the Study Area, as shown in Figure 82. The three spatial levels and associated relevant receptors are defined as follows:

Local Area of Influence

1241 The Local Area of Influence (LAI) forms the focus for assessment of both direct and indirect effects on those receptors that are likely to experience effects at a local level, specifically land use and tourism assets. It includes the onshore ECR and substation search area for the Awel y Môr OWF and extends beyond it to include a buffer of at least 5km (Figure 82). Receptors include businesses and attractions associated with the local visitor economy such as tourist attractions, as well as community facilities and services. They also include tourism receptors such as beach users and users of long-distance routes and Public Rights of Way. Where a receptor is located close to the boundary (for example, where a village straddles the boundary of the 5km buffer) this has been accounted for and the buffer distance extended accordingly. It is anticipated that this LAI will be refined significantly when the preferred route corridor and sub-station are identified (refer to Chapter 5 Site Selection and Alternatives). Further details are presented in Section 10.9.6 relating to Next Steps.

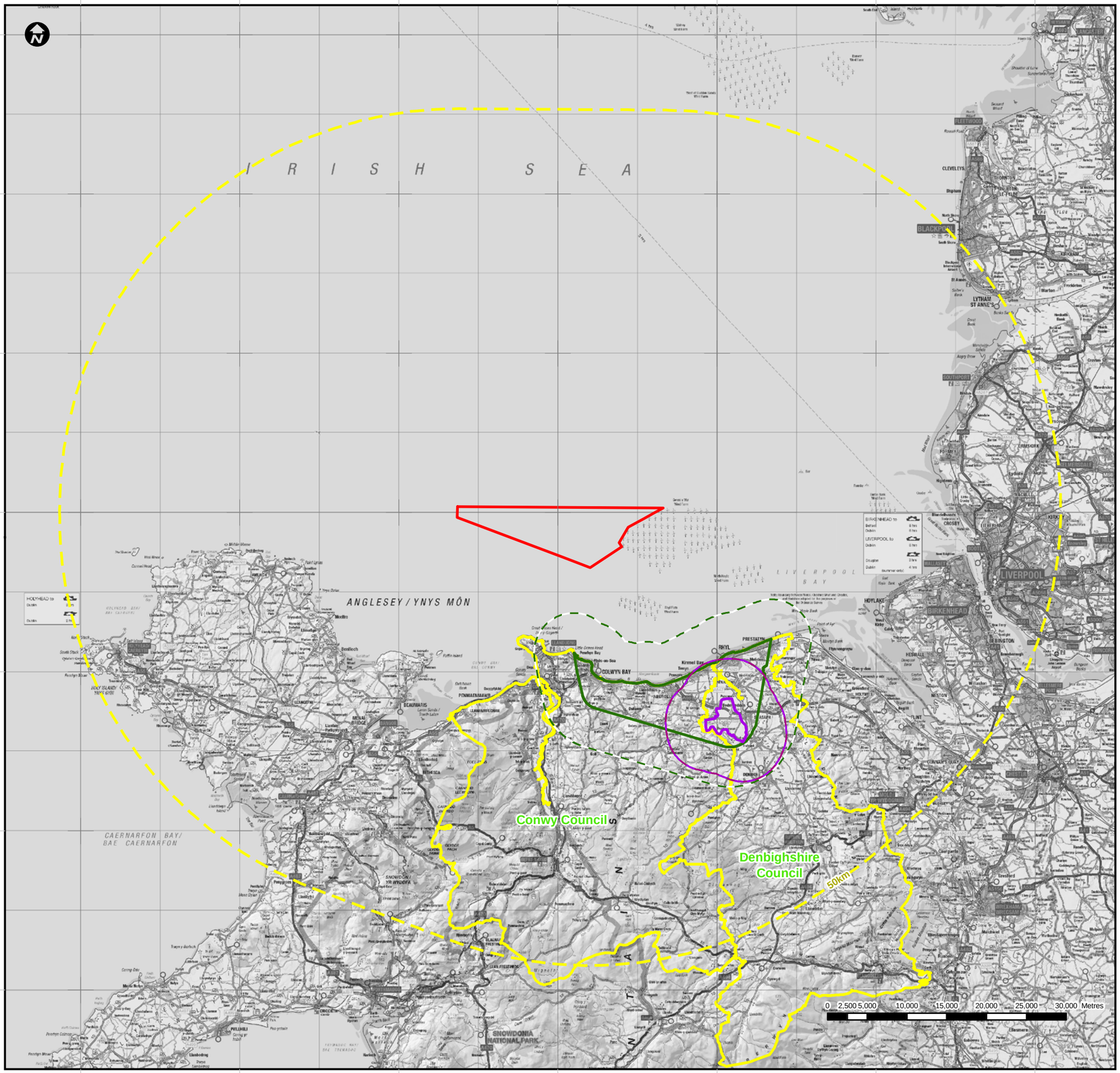
Local Study Area

1242 The Local Study Area (LSA) is intended to encompass the local area within which significant effects on employment and the local economy could occur. The LSA is set at the boundary of the two 'host' local authorities for the onshore works, Denbighshire and Conwy, within which the majority of the local supply chain and labour market effects that could occur would be experienced.

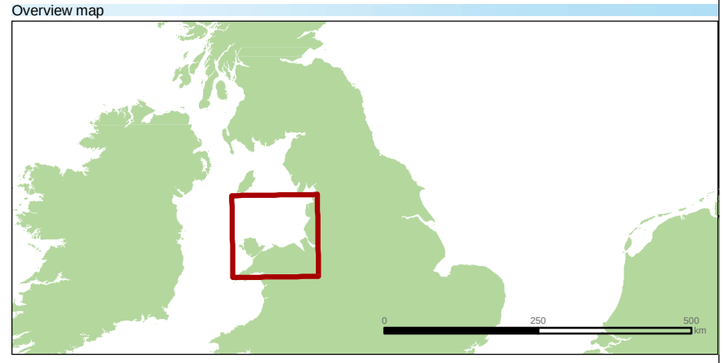
Wider Study Area

1243 The Wider Study Area (WSA) extends to a wider area to take account of the potential for effects on the tourism economy as a result of the visual impact of the presence of the turbines. A preliminary WSA of 50km from the offshore arrays is proposed, to be consistent with the Zone of Theoretical Visibility (ZTV) for the turbines which is illustrated in the SLVIA offshore chapter (Section 9.4); this may be refined at EIA stage depending on the findings of the landscape and visual impact assessment (LVIA). The relevant receptor for the WSA is the tourism economy as a whole.

1244 It is expected that, as the project progresses, the Study Area will be reviewed and amended in response to such matters as refinement of the onshore (and offshore) ECR and the identification of additional constraints (environmental and/ or engineering). This is expected to result in a significant reduction in the size of the Study Areas, in particular the LAI, as they are refined to more closely follow the route of the preferred onshore cable corridor, and preferred locations for the landfall and sub-station when these are selected during 2020.



Overview map



Legend

- Substation Search Area
- Substation Search Area 5km Buffer
- Onshore Export Cable Route Search Area
- Local Area of Influence (Onshore Export Cable Route Search Area 5km Buffer)
- Local Study Area
- Array Extension Area
- Wider Study Area (Array Extension Area 50km Buffer)

Cartographic information

Coordinate System: British National Grid

NOT TO BE USED FOR NAVIGATION

Map information

Contains OS OpenData

Contains ONS Geography Open Data

Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

innogy Renewables UK Limited
Windmill Hill Business Park,
Whitehill Way, Swindon, Wiltshire, SN5 6PB

PROJECT Offshore Windpark **Awel Y Môr**

TITLE Socio-Economic and Tourism - Proposed Study Areas

DRAWN	DATE	SCALE	SIZE
writson	05/03/2020	1:500,000	@DIN A3

REV 02

Path: P:\05356 - GoBe Consultants Ltd\00008 Galloper and Gwynt y Mor\Tech\GIS\Gwynt y Mor\Dwgs\Wking\2019 12 Scoping\10.9 - Socio Economic\AyM_Innogy_WF_UK_DIN_SocioEconomicAndTourism_ProposedStudyAreas.mxd

10.9.3 Baseline data

1245 An initial desk-based study has been undertaken to identify sources of pre-existing data of relevance that could inform the EIA. The following existing sources have been identified:

- Office of National Statistics, Welsh Government StatsWales and other governmental published sources - demographic and labour market characteristics (covering the occupational profile and the availability of skills within the labour force); employment, economic activity and unemployment trends; commuting and travel to work relationships; business demography: the number, size profile and sectoral representation of the business base;
- Conwy County Council, Economic Growth Strategy (2017 – 2027);
- Denbighshire County Council, Economic & Community Ambition Strategy (2013 - 2023);
- North Wales Economic Ambition Board 2017, North Wales Growth Deal;
- Welsh Government StatsWales, - Wales tourism accommodation occupancy surveys;
- Denbighshire and Conwy County Councils' - Destination Management Plans;
- Scarborough Tourism Economic Activity Monitor (STEAM) for Denbighshire and Conwy;
- Tourism Partnership North Wales - Tourism Strategy for North Wales 2010-2015;
- Visit Britain -Great Britain Day Visits Survey 2018;
- Welsh Government - National Survey for Wales: population health;
- NHS Wales - Health in Wales statistics and data;
- NHS Wales Directory;
- Local Development Plan policies and land allocations for Denbighshire and Conwy;
- OS postcode data - businesses, tourism attractions and community services;
- OS mapping / MAGIC map / definitive map - Public Rights of Way; and
- Wales Coast Path / SUSTRANS / Long Distance Walkers Association - long distance routes.

1246 A literature review will be undertaken of published studies of the effects on the tourism economy arising from the presence of wind farms. Relevant studies that have been undertaken to predict the likely effects of new wind farms on tourism include:

- ICM Research, 2012 North Wales Tourist Survey: Face to face survey of tourists in five tourism locations in North Wales. The study sought to explore the impact of operational wind farms on visitors' experiences and likelihood of making future visits;
- Lilley *et al*. (2010). The Effect of Wind Power Installations on Coastal Tourism;
- Npower Renewables, 2005 Socio-economic impact assessment of the Gwynt y Môr Offshore Wind Farm. Included a survey of businesses which asked questions relating to expected tourism impacts;
- NFO Study for Wales Tourism Board, 2003: Investigation into the potential impact of wind farms on tourism in Wales. The objective of the study was to establish and quantify the impact that the development of onshore and offshore wind farms could have on tourism in Wales and to review its existing policy statement on wind farm development; and
- NWP, (2002). Socio-Economic Impact Assessment of North Hoyle Offshore Wind Farm.

10.9.4 Baseline environment

Overview

1247 The onshore search area is located within a part of North Wales that is characterised by a ribbon of holiday and tourism accommodation and attractions along the coastal strip between Colwyn Bay and Prestatyn, incorporating the tourism centres of Abergele, Towyn, Kinmel Bay and Rhyl.

Local Area of Influence

1248 As noted above, the LAI for the assessment of tourism assets currently extends 5km beyond the boundary of the onshore search area.

1249 Two nationally important long distance routes pass through the LAI: the Wales Coast Path, which follows the seafront to the north of the coastal railway line throughout the onshore search area, and National Cycle Route (NCR) 5 Reading to Holyhead, which also largely follows the seafront and is traffic free for most of the Prestatyn to Colwyn Bay section.

1250 The proposed NGET substation extension at Bodelwyddan and connection to the national grid is located close to the St Asaph Business Park, one of the strategic business centres for North Wales. The Business Park is described by Denbighshire County Council as a modern and regionally significant site, home to cutting-edge science, engineering, energy, creative and service sectors.

1251 The main A&E hospital for the area, Glan Clwyd Hospital, is located at Bodelwyddan.

Local Study Area

1252 As of 2018, Denbighshire had a total population of 95,330 and Conwy 117,181[39]. Both authority areas are experiencing net inward migration. Denbighshire and Conwy have a Working Age Population of 43,000 and 49,800 respectively. Commuting patterns in Denbighshire show that outward and inward commuting are largely in balance, whereas Conwy exhibits net outward commuting of 4,900, or 10% of the working population[40].

1253 Both Denbighshire and Conwy had an employment rate of just over 73% in 2019[41], similar to the average for Wales and slightly below the UK average of 75.5%. Unemployment rates are shown by StatsWales[42] as being 3% or below for both authorities in 2019 (although a data quality warning is given); this is below the Wales average of 4.2% and below the UK average of 4%.

1254 Gross Value Added (GVA) is the value generated by any unit engaged in the production of goods and services and is often used as a measure of prosperity. In North Wales as a whole, GVA per head was £20,753 in 2017. Denbighshire and Conwy were both below the North Wales' average at £17,886 and £16,053 respectively. The figure for the UK as a whole is £27,298 per head[43].

39 https://statswales.gov.wales/Catalogue/Population-and-Migration/Population/Estimates/Local-Authority/populationestimates-by-localauthority-year accessed Dec 2019

40 Welsh Government (May 2019): Summary Statistics for Welsh Economic Regions: North Wales

41 https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Persons-Employed/employmentrate-by-welshlocalarea-year-gender accessed Dec 2019

42 https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Unemployment/ILO-Unemployment/ilounemploymentrates-by-welshlocalareas-year accessed Dec 2019

43 Welsh Government StatsWales (2019a): Gross Value Added by Measure

1255 The Denbighshire Destination Management Plan (Denbighshire County Council, 2016) states that tourism injects much needed revenue into the local economy (£479 million STEAM 2016) and supports over 6,250 jobs in the County (STEAM 2016). The Destination Conwy Management Plan (Conwy County Council, 2019) also states that tourism is a priority sector for Conwy; tourism's value to the local economy is estimated to be worth £887.62million, supporting over 12,319 jobs in the county (STEAM 2017 data).

Wider Study Area

1256 The WSA potentially includes the whole of the North Wales coastal area as well as inland to include the whole of Conwy, Anglesey and parts of Snowdonia National Park. This area includes Llandudno and the summit of Snowdon, and a wide range of visitor attractions including Bodnant Garden and Welsh Mountain Zoo in Colwyn Bay, Adventure Parc Snowdonia at Dolgarrog and Conwy Castle. The WSA also includes coastal areas of Merseyside and south Lancashire as far as north as Blackpool; within this area are a number of visitor attractions and popular seaside destinations such as Southport and Lytham St Anne's.

1257 In 2018, the Wales accommodation occupancy survey reported[44] marked differences in occupation rates between different types of accommodation. Occupancy rates were lowest in the guest house/ B&B sector (35%) compared with 55% for cottages and apartments and average room occupancy of 66% for hotels. Data for North Wales indicate that occupancy rates are higher on the coast than inland, and that there is a marked seasonality in occupancy rates with rates being significantly higher in the summer (May – October) period. Comparable data are not available for the English part of the WSA.

Designated sites

1258 There are no specific designations for socio-economic or tourism assets. Certain designations that may be relevant in attracting visitor numbers, such as World Heritage Site status or National Park, will be reported in the relevant topic chapter and the socio-economic assessment will consider the potential for effects on visitor numbers to the designated attraction.

[44] Visit Wales Accommodation Occupancy Survey Annual Report 2018

1259 There are two sites within the WSA that are designated by the United Nation's Educational, Scientific and Cultural Organisation (UNESCO) as World Heritage Sites: Conwy Castle (one of four sites which form the Castles and Town Walls of Edward I), and the Pontcysyllte Aqueduct, near Llangollen. The Slate Mining Landscape of North West Wales in Gwynedd was submitted in a formal nomination to UNESCO on 254 January 2020. Visitor attractions that have a World Heritage Site status are considered to be of high sensitivity as the designation raises their profile globally.

1260 The northern part of Snowdonia National Park is located within the WSA.

10.9.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

1261 There is no industry standard guidance for this assessment, although *Overarching National Policy Statement for Energy* (NPS) EN-1 describes the approach to be taken where a project is likely to have socio-economic impacts at local or regional levels. Paragraph 5.12.3 requires applicants to consider all socio-economic impacts, which may include:

- The creation of jobs and training opportunities;
- The provision of additional local services and improvements to local infrastructure, including the provision of educational and visitor facilities;
- Effects on tourism;
- The impact of a changing influx of workers during the different construction, operation and decommissioning phases of the energy infrastructure. This could change the local population dynamics and could alter the demand for services and facilities in the settlements nearest to the construction work (including community facilities and physical infrastructure such as energy, water, transport and waste). There could also be effects on social cohesion depending on how populations and service provision change as a result of the development; and
- Cumulative effects – if development consent were to be granted for a number of projects within a region and these were developed in a similar timeframe, there could be some short-term negative effects, for example a potential shortage of construction workers to meet the needs of other industries and major projects within the region.

1262 EN-1 also requires consideration of how the development's socio-economic impacts correlate with local planning policies. Paragraph 5.12.5 states that socio-economic impacts may be linked to other impacts, for example the visual impact of a development, as this may also have an impact on tourism and local businesses.

1263 *NPS for Electricity Networks Infrastructure* (NPS EN-5) sets out additional technology-specific considerations for electricity networks beyond those described in NPS EN-1. None of these elaborate further on the socio-economic or land use considerations set out in NPS EN-1.

1264 While not specific to electricity infrastructure, the Design Manual for Roads and Bridges (DMRB) provides useful context for the Socio-Economic, Recreation and Land Use assessment. The document includes guidance for assessing impacts on land use and for assessing the community impacts of linear infrastructure.

1265 The proposed method for assessment, based on experience on similar projects, is detailed below and will take into consideration any matters raised in this scoping exercise. The assessment will:

- Consider the social and economic policy context at the local, regional and national level;
- Review socio-economic and tourism baseline conditions within the relevant Study Areas;
- Assess the likely scale, scope, permanence and significance of identified effects, taking account of any embedded environmental or social measures proposed within the proposed development;
- Recommend mitigation measures, where appropriate; and
- Assess cumulative effects of the scheme with other proposed schemes.

1266 Receptors will be identified for each of the three tier Study Areas. Receptor sensitivity will be based on its importance or scale and the ability of the baseline to absorb or be influenced by the identified effects. For example, a receptor (such as the local construction supply chain or a long-distance route) is considered less sensitive if there are alternatives with capacity within the relevant Study Area. In assigning receptor sensitivity, consideration has been given to the following:

- The capacity of the receptor to absorb or tolerate change;
- Importance of the receptor e.g. local, regional, national, international;
- The availability of comparable alternatives;

- The ease at which the resource could be replaced; and
- The level of usage and nature of users (e.g. sensitive groups such as people with disabilities).

1267 In order to aid clear and robust identification of significant effects, specific and targeted criteria for defining the magnitude of impacts have been developed for this assessment based on experience on other similar projects. The following four levels of magnitude will be adopted using professional judgement: high; medium; low and negligible. These reflect the level of change relative to baseline conditions and /or whether the change would affect a large proportion of the existing resident population or would result in a major change to existing patterns of use. These impacts can be beneficial, adverse or neutral.

1268 The level of effect of an impact on socio-economic receptors is initially assessed by combining the magnitude of the impact and the sensitivity of the receptor. Where an effect is classified as major, this is considered to represent a 'significant effect' in terms of the EIA Regulations. Where an effect is classified as moderate, this may be considered to represent a 'significant effect' but would be subject to professional judgement and interpretation, particularly where the sensitivity or impact magnitude levels are not clear or are borderline between categories or the impact is intermittent. Effects that are assessed as minor and below are not considered to be significant in EIA terms.

1269 Effects can be beneficial, neutral or adverse and these would be specified where applicable. It should be noted that significant effects need not be unacceptable or irreversible.

1270 A statement of residual effects, following consideration of any specific mitigation measures, will be provided.

1271 As noted in Section 9.6 of this Scoping Report, it is proposed that a standalone chapter will be included in the PEIR/ES for the assessment for the potential effects (both onshore and offshore) on tourism and recreation resulting from the proposed development.

Potential project impacts

1272 A range of potential socio-economic and tourism impacts have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The impacts that have been scoped into the Awel y Môr OWF EIA are outlined in Table 99 together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) to enable an assessment of the impact.

1273 Based on the socio-economic and tourism information currently available and the project description, a number of impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 100, together with a justification for scoping them out.

TABLE 99 - IMPACTS PROPOSED TO BE SCOPED IN TO THE SOCIO-ECONOMIC AND TOURISM ASSESSMENT

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
10.9.1	Beneficial effects on economy (labour market and GVA) within the LSA including local supply chain	Impacts on the local labour market, GVA and supply chain within the LSA are likely to be experienced during the construction phase; the impacts may be beneficial due to the creation of direct, indirect and induced jobs for local people	Quantitative modelling will be undertaken of the effects of increased spending in the local economy due to the construction of Awel y Môr OWF. The modelling will take account of expenditure within the LSA arising from direct investment in goods and services, and the multiplier effects arising from increased spending. Inputs into the economic model will make use of estimates of expenditure provided by innogy based on its experience elsewhere within the UK, and published data from standard sources such as the Office of National Statistics.
10.9.2	Disruption to community and tourism receptors within the LAI	Impacts due to construction of the onshore infrastructure on community and tourism receptors may occur due to severance of	The assessment will consider the characteristics of any potential disruptive activities that occur adjacent to, or along the access route to, sensitive community and tourism receptors. The assessment will make use of published data, web-based

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		access routes, noise and vibration, and visual impact.	searches and data gathered for other topics such as LVIA, Traffic & Transport and Noise. It should be noted that a significant effect for another impact, such as visual, does not necessarily mean there will be a significant socio-economic effect, and equally care will be taken to ensure that there is no 'double-counting' of effects. If required, consultation will be undertaken with stakeholders. No requirement for new data is envisaged.
10.9.3	Displacement of tourism visitors within the LSA	There is potential for an influx of workers during the construction period to create a demand for local accommodation that may lead to competition for accommodation with tourist visitors, although current information (see Chapter 3 Project Description) indicates that worker numbers may not be sufficient to create a significant effect. Impacts on	Estimates will be provided of the number of construction workers who are likely to commute to work, and those who are likely to require accommodation locally. Data will be gathered on accommodation levels (bed spaces) and occupancy rates for both serviced and non-serviced accommodation, and analysis undertaken to identify any potential hotspots. No requirement for new data is envisaged. If a significant effect is not predicted the issue will be scoped out of the EIA.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		accommodation are most likely to occur during the peak summer season.	
10.9.4	Demand for healthcare services within the LSA	There is potential for an influx of workers during the construction phase to create a demand for local health care services that may lead to undue pressure on the system.	Demand for healthcare services may arise in relation to workers who are not resident in the LSA but are staying in temporary accommodation during the week, or even for periods of months at a time. It is currently uncertain as to what the proposed scale of this demand is likely to be, and further work will be undertaken prior to EIA assessment to understand whether the scale of the influx would be sufficient to result in a significant effect. If a significant effect is not predicted the issue will be scoped out of the EIA. If it appears likely that the level of demand could be substantial, then the assessment will consider the capacity within the local health care system, including GP practices and hospitals, to accommodate the increased demand. The study will make use of online data sources and consultation with stakeholders such as Public Health Wales.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
10.9.5	Impact on tourism receptors and tourism economy within the WSA	There may be an impact on the visitor economy if the visual impact of the construction of the turbines were to deter potential visitors.	A review will be undertaken of relevant published studies, especially those where wind farms have been built, or are proposed, in an area where the tourism sector makes an important contribution to the local economy. Where possible, consideration will be given to feedback from local businesses with regard to existing wind farms. It is not proposed to undertake a bespoke study of effects within the WSA. The assessment will take account of findings from the LVIA with regard to impacts from key tourism receptors such as Penmon Point and Colwyn Bay promenade.
OPERATION			
10.9.6	Economy (labour market and GVA) including local supply chain within the LSA	Impacts on the local labour market, GVA. and supply chain within the LSA are likely to be experienced during the	Quantitative modelling will be undertaken of the effects of increased spending in the local economy due to the operation of Awel y Môr OWF. The modelling will take account of expenditure within

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
		operational phase; the impacts may be beneficial due to the creation of direct, indirect and induced jobs for local people due to jobs being created and services provided for the maintenance of the wind farm and associated infrastructure.	the LSA arising from direct investment in goods and services, and the multiplier effects arising from increased spending. Inputs into the economic model will make use of estimates of expenditure provided by the applicant based on its experience elsewhere within the UK, and published data from standard sources such as the Office of National Statistics. If a significant effect is not predicted the issue will be scoped out of the EIA.
10.9.7	Long term impact on tourism receptors and tourism economy within the WSA	There may be an impact on the visitor economy if the visual impact of the turbines were to deter potential visitors.	A review will be undertaken of relevant published studies, especially those where wind farms have been built, or are proposed, in an area where the tourism sector makes an important contribution to the local economy. Where possible, consideration will be given to feedback from local businesses with regard to existing wind farms. The assessment will take account of findings from the LVIA with regard to impacts from key tourism

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
			receptors such as Penmon Point and Colwyn Bay promenade.

TABLE 100 - IMPACTS PROPOSED TO BE SCOPED OUT OF SOCIO-ECONOMIC AND TOURISM ASSESSMENT

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
CONSTRUCTION		
10.9.8	Impact of construction on demand for housing and schools	The construction phase of the Awel y Môr OWF are expected to be relatively short term activities that would not lead workers to relocate to the area with their families. There is therefore not expected to be an influx of workers seeking housing and schools' services in the LSA. Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
OPERATION		
10.9.9	Impact on local area of influence due to presence of onshore infrastructure during operational phase.	The above ground presence of the onshore infrastructure during the operational phase will be restricted to the substation, which will have a limited sphere of visual influence that will be further reduced by proposed mitigation measures. Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
DECOMMISSIONING		
10.9.10	Any impacts during decommissioning	Socio-economic and tourism effects arising from decommissioning works are likely to be of a similar nature, but smaller scale and geographical extent, to construction. It is therefore intended to scope this impact out of further consideration within the EIA.

Mitigation Measures adopted as part of the project

1274 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for impacts on sensitive receptors such as tourism assets and community facilities. In addition, Awel y Môr OWF proposes to adopt measures that will enhance the socio-economic benefits realised by the local communities through job opportunities and provision of services. These are presented below. These will evolve over the development process as the EIA progresses and in response to consultation.

1275 Innogy is committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 97 and Table 98.

1276 Measures adopted as part of the project will include development of, and adherence to, the following measures during the construction and decommissioning phases:

- Code of Construction Practice;
- Construction Traffic Management Plan; and
- PRoW Management Plan.

1277 In addition, innogy is committed to the renewable energy industries' Sector Deal with the government, in which the sector is aiming for a 60% lifetime UK content in domestic projects, (up from the current 50%) and targeting increasing UK content in the capital expenditure phase.

1278 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative impacts

1279 Chapter 4 sets out the proposed EIA methodology and provides a description of how potential cumulative effects will be assessed. The methodology will be aligned with the approach to the assessment of cumulative impacts that has been applied by Ministers when consenting offshore windfarms and confirmed in recent consent decisions. It also follows the approach set out in guidance from the Planning Inspectorate (Planning Inspectorate 2015) and from the renewables industry (RenewableUK 2013 and The Crown Estate, 2019).

1280 The socio-economic and tourism assessment will consider cumulative effects arising from the following:

- Disruption caused to tourism assets and community facilities within the LAI arising from concurrent construction of Awel y Môr OWF and other major infrastructure projects;
- Effects on the labour supply within the LSA arising from concurrent construction of Awel y Môr OWF and other major infrastructure projects affects could be adverse due to competition for resources or beneficial due to enhanced training and skills development;
- Effects on health care provision within the LSA arising from concurrent construction of Awel y Môr OWF and other major infrastructure projects; and
- Effects on the tourism economy in the longer term within the WSA arising from the presence of the wind turbines in combination with other major infrastructure projects.

1281 Currently no information is known regarding the potential overlap between the project and any other large-scale projects.

Potential transboundary Impacts

1282 There are not expected to be any transboundary effects with regard to socioeconomics and tourism due the distance between the areas where effects would be experienced and other EU member states.

10.9.6 Summary of next steps

1283 The next steps will be as follows:

- refinement of the LAI Study Area following selection of the preferred ECR and substation location. As set out in Section 10.9.2 this will be refined to the corridor and sub-station boundary plus a 5km buffer;
- refinement of the WSA Study Area if there is any change to the footprint of the offshore works and the extent of the SLVIA;
- undertake a comprehensive review of baseline data from published sources supplemented by direct communication with stakeholders such as Visit Wales and the Public Health Wales;
- assemble project specific data and / or assumptions regarding likely investment and procurement strategy as basis for economic modelling;

- assemble project specific data and / or assumptions regarding influx of workers to allow assessment of impact on health care services; and
- engage with other specialist EIA teams such as traffic & transport and LVIA to understand likely impacts on tourism and community receptors.

10.9.7 Further considerations for Consultees

i. Do you agree that the data sources identified are sufficient to inform the onshore socio-economic and tourism baseline for the Awel y Môr OWF PEIR and ES?

ii. Have all potential socio-economic and tourism impacts resulting from Awel y Môr OWF been identified for onshore socio-economic and tourism receptors?

iii. Do you agree that the impacts described in Table 100 can be scoped out?

iv. For those impacts scoped in (Table 99), do you agree that the methods described are sufficient to inform a robust impact assessment?

v. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential onshore effects of Awel y Môr OWF on onshore socio-economic and tourism receptors?

vi. Do you have any specific requirements for the economic modelling methodology?

10.10 Public Health

10.10.1 Introduction

1284 This Section of the Scoping Report identifies the public health receptors of relevance to the Awel y Môr OWF. It describes the potential effects from the construction, operation and maintenance, and decommissioning of the Awel y Môr OWF on public health receptors and sets out the proposed scope of the EIA. The proposed methods for the EIA are also presented.

1285 Public health is an inherent part of a number of technical areas assessed within the EIA, including flood risk, air quality, noise and vibration, traffic and transport, landscape and visual impact assessment and tourism and recreation. This chapter provides a summary of the conclusions for each relevant EIA Scoping chapter's assessment, which are referenced below, and provides a further assessment of the potential effects arising from electromagnetic fields (EMF), as these effects are not considered in any other chapters in the context of public health.

1286 This public health assessment should be read alongside the following chapters of this Scoping Report, which are referred to and drawn upon throughout this chapter:

- Section 10.3: Airbourne Noise and Vibration.
- Section 10.4: Traffic and Transport;
- Section 10.5: Air Quality;
- Section 10.6: Hydrology, hydrogeology and flood risk;
- Section 10.7: Geology and Ground conditions;
- Section 10.8: Onshore Landscape and Visual Impact Assessment; and
- Section 10.9: Socio-Economics and Tourism.

10.10.2 Study Area

1287 For each of the effects considered (see Section 10.10.5) the Study Area will be drawn from the relevant technical assessments (Sections 10.3 to 10.9) of this Scoping Report).

1288 Within this Scoping Report, the Study Area considered for the EMF effects will be the onshore scoping boundary (see Figure 2).

10.10.3 Baseline data

1289 The baseline environment data for each potential health impact (excluding EMF) is provided in Sections 10.3 to 10.9. This chapter has not sought to duplicate that information and instead focusses on providing a description of the existing environment with only with regards to EMF.

Relevant guidance

1290 The assessment of the EMF presented in this Scoping Report is based on the most up to date published literature and guidance.

1291 Planning policy relating to health, which is of relevance to the proposed development, is provided by the National Policy Statements (NPSs). These provide the primary basis for the recommendations made by the Examining Authority (the Planning Inspectorate) to the Secretary of State for Business Energy and Industrial Strategy on applications for development consent for nationally significant renewable energy projects. Overarching guidance on nationally significant energy projects is provided in National Policy Statement for Energy (NPS EN-1) (DECC, 2011a).

1292 Guidance specifically relating to onshore grid connections is provided in EN-5 (DECC, 2011b). This policy focuses on guidance primarily in relation to overhead lines which is not applicable to Awel y Môr as all export transmission cables from the offshore array, through to the landfall location (when defined) and onward to the substation would be buried. Whilst it is noted that some works may be required at the Bodelwyddan substation to accommodate the Awel y Môr project these will not pose a risk to public health as they will be undertaken on a secure (National Grid) site with restricted access.

1293 There are no statutory regulations in the UK with regard to exposure to EMF. However, in 2004 the Government adopted guidelines published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP, 1998) in accordance with the terms of the 1999 EU Council recommendation on limiting public exposure to EMF (EU, 1999). The criteria establish acceptable limits for exposure of the public to EMF that adopt a precautionary approach taking into account various scenarios and potentially more vulnerable groups (such as infants).

1294 The ICNIRP 'reference levels' for the public are:

- 100 microteslas (μT) for magnetic fields; and
- 5 kilovolts (kV) per metre for electric fields.

1295 While the ICNIRP 'basic restriction' for levels of public exposure are higher at:

- 360 μT for magnetic fields; and
- 9 kV per metre for electric fields.

1296 In the ICNIRP guidelines and the EU Recommendation, the actual limit is the basic restriction. The reference levels are not limiting but are guides to when detailed investigation of compliance with the actual limit, the basic restriction, is required. If the reference level is not exceeded, the basic restriction cannot be exceeded, and no further investigation is needed. If the reference level is exceeded, the basic restriction may or may not be exceeded.

1297 In 2016, Public Health Wales (PHW) produced a briefing to summarise the evidence about the effects of public health effects of radio waves from mobile phone base stations (PHW, 2016). The briefing was produced with support from Public Health England's Centre for Radiation, Chemical and Environmental Hazards. The briefing noted that the radio wave emissions [from phone masts] should meet the ICNIRP guidelines. The PHW website[45] provides linked the Public Health England's published documents and recommendations on EMF (see below).

1298 If the fields produced by an item of equipment are lower than 9 kV/m and 360 μT, the fields corresponding to the ICNIRP basic restriction, it is compliant with the ICNIRP guidelines and hence with Public Health England (PHE) recommendations and Government policy. If the fields are greater than these values, it is still compliant with Government policy if the land use falls outside the residential and other uses specified in the Code of Practice (DECC, 2012a) and it may still be compliant if the fields are non-uniform.

[45] http://www.wales.nhs.uk/sitesplus/888/page/87301

10.10.4 Baseline environment

1299 The baseline environment for each potential health impact (excluding EMF) is described in Sections 10.3 to 10.9. This chapter has not sought to duplicate that information and instead focusses on providing a description of the existing environment with regards to EMF.

1300 EMFs are produced both naturally and as a result of certain human activities. The earth has a magnetic field produced by currents deep inside the core of the planet; the earth is also subject to electric fields produced by electrical activity in the atmosphere such as thunderstorms. The direction of the Earth's magnetic field is normally constant, varying in size only slowly over time, and is referred to as a static or "DC" field. The Earth's magnetic field is approximately 50 μT in the UK. Other fields that alternate in their intensity more frequently over time are referred to as alternating or "AC" fields. EMFs are inevitable wherever electricity is produced, distributed, and used, including electrical substations, power lines and from household electrical equipment.

1301 Electric fields are produced by voltage. Voltage is the pressure behind the flow of electricity. Electricity inside UK homes is at 230 volts (V), whereas electrical distribution systems in the UK utilise much higher voltages generally from 11,000 to 400,000 volts (11 kV to 400 kV). The higher the voltage the greater the electric field, which is measured in volts per metre (V/m). Electric fields are eliminated when electrical cables are buried due to the effect of the ground and protective sheath surrounding the cable.

1302 Magnetic fields are produced by current, which is a measure of the flow of electricity. Generally, the higher the current (measured in amperes or amps) the greater the magnetic field. Magnetic fields are measured in microteslas (μT).

1303 Onshore export cables are proposed to be buried within the onshore ECR search area – see Chapter 5.

Designations

1304 All designations of relevance have been outlined within Sections 10.3 to 10.9 of this Scoping Report.

10.10.5 Proposed approach to the Environmental Impact Assessment

Proposed assessment methodology

1305 There are no specific guidelines for the assessment of health impacts within EIA. The National Policy Statement for Energy (EN-1) states that where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate.

1306 EN-1 indicates that direct impacts on health may include:

- Increased traffic;
- Air or water pollution;
- Dust;
- Odour;
- Hazardous waste and substances;
- Noise;
- Exposure to radiation; and
- Increases in pests.

1307 It is proposed that the health assessment of the EIA will be a signposting chapter, which highlights the key information and findings in the relevant EIA chapters and provides an assessment of the significance of EMF effects. Further details are provided in Section 10.10.6.

1308 Feedback will be sought from consultees on potential health impacts, with particular reference to the Health and Safety Executive, Public Health Wales and the Environmental Health Officers from the Local Authorities.

Potential project impacts

1309 A range of potential impacts on public health have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of Awel y Môr OWF. The impacts that are proposed to be scoped into the Awel y Môr OWF EIA are outlined in Table 101, together with a description of any proposed additional data collection (e.g. site-specific surveys) and/or supporting analyses to enable an assessment of the impact.

1310 Based on the baseline information currently available and the project description (see Chapter 3), several impacts are proposed to be scoped out of the EIA for this topic. These impacts are described in Table 102, together with a justification for scoping them out.

TABLE 101 - IMPACTS PROPOSED TO BE SCOPED IN TO THE ASSESSMENT FOR PUBLIC HEALTH

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
CONSTRUCTION			
10.10.1	Impact on health due to air emissions including dust	The generation of dust and particulates (e.g. from excavation or movement of dry materials) could potentially have an adverse impact on human health. Exhaust emissions from construction traffic have the potential to contribute to local ambient concentrations of nitrogen dioxide (NO_2), and particulate matter (PM10 and PM2.5), resulting in potential effects on human health.	For information on the proposed approach see Table 76 presented in Section 10.3.
10.10.2	Impacts on health due to water emissions	Construction activities such as clearance of surface vegetation, could result in run-off of materials into the local water sources.	For information on the proposed approach see Table 90 presented in Section 10.6.
10.10.3	Impacts on health due to soil emissions (including	Ground disturbance or the removal of hardstanding could increase the potential for leaching and the mobilisation of soluble contaminants.	For information on the proposed approach see Table 94 presented in Section 10.7.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	hazardous waste and substances)	In addition, leaks and/or spills of contaminants, such as fuels and oils, used and stored during the construction phase could occur.	
10.10.4	Impacts on health due to noise and vibration disturbance	The impact of noise and vibration from construction activities due to the onshore cable route installation and substation construction could result in disturbance of local residence and commercial properties.	For information on the proposed approach see Table 82 presented in Section 10.3.
10.10.5	Temporary loss of access to green space	Impacts due to construction of the onshore infrastructure on community and tourism receptors may occur due to severance of access routes, and/or visual impact.	For information on the proposed approach see Table 99 presented in Section 10.9.
10.10.6	Disruption to local road network	The potential delays to existing routes and the potential severance of routes which could reduce the access to services (such as GPs and hospitals) and amenities (as recreational activities)	For information on the proposed approach see Table 85 presented in Section 10.4.
OPERATION			
10.10.7	Impacts on health due	Residential and commercial properties could be affected by the operational noise associated	For information on the proposed approach see Table 82 presented in Section 10.3.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	to noise disturbance from the onshore substation	with the onshore substation (and associated infrastructure)	
10.10.8	Changes in green space	The installation of below ground infrastructure and associated recovery of the land may affect the ability to utilise green space. In addition, the siting of the project specific substation may result in a loss of green space.	For information on the proposed approach see Table 99 presented in Section 10.9.
10.10.19	Improvement of air quality relative to alternative fuel sources such as coal and gas power stations	The health benefits of moving to OWF may be notable, particularly for regions that rely more heavily on coal to generate electricity. Replacing coal and oil with OWF will reduce emissions of air pollutants like fine particulate matter, nitrogen oxide and sulphur dioxide. These pollutants can form smog, soot and ozone. When people downwind are exposed to them, they can develop incapacitating and deadly diseases (Buonocore, 2018).	Evidence based on a literature review will be presented within the chapter to identify key beneficial effects on health from OWF relative to alternative forms of energy generation.
DECOMMISSIONING			

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
10.10.10	Impact on health due to air emissions including dust	The generation of dust and particulates (e.g. from excavation or movement of dry materials) potentially having an adverse impact on human health. Exhaust emissions from traffic associated with decommissioning could have the potential to contribute to local ambient concentrations of nitrogen dioxide (NO_2), and particulate matter (PM10 and PM2.5), resulting in potential effects on human health.	For information on the proposed approach see Table 87 presented in Section 10.5.
10.10.11	Impacts on health due to water emissions	Decommissioning activities such as clearance of surface vegetation, could result in run-off of materials into the local water sources.	For information on the proposed approach see Table 90 presented in Section 10.6.
10.10.12	Impacts on health due to soil emissions (including hazardous	The potential ground disturbance or the removal of hardstanding could increase the potential for leaching and the mobilisation of soluble contaminants. In addition, leaks and/or spills of contaminants, such as fuels and oils, used and stored during the decommissioning phase could occur.	For information on the proposed approach see Table 94 presented in Section 10.7.

IMPACT NUMBER	IMPACT	DESCRIPTION	PROPOSED APPROACH TO ASSESSMENT INCLUDING DESCRIPTION OF ANY NEW DATA COLLATION REQUIRED AND ANY ANALYSES (SUCH AS MODELLING)
	waste and substances)		
10.10.13	Impacts on health due to noise and vibration disturbance	The impact of noise and vibration from the decommissioning activities of onshore infrastructure could result in disturbance of local residence and commercial properties.	For information on the proposed approach see Table 82 presented in Section 10.3.
10.10.14	Temporary loss of access to green space	Impacts due decommissioning of the onshore infrastructure on community and tourism receptors may occur due to severance of access routes, noise and vibration, and/or visual impact.	For information on the proposed approach see Table 99 presented in Section 10.9.
10.10.15	Disruption to local road network (reduced access to services and amenities)	The potential delays to existing routes and the potential severance of routes which could reduce the access to services (such as GPs and hospitals) and amenities (as recreational activities)	For information on the proposed approach see Table 85 presented in Section 10.4.

TABLE 102 - IMPACTS PROPOSED TO BE SCOPED OUT OF ASSESSMENT FOR PUBLIC HEALTH

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
OPERATIONS AND MAINTENANCE		
10.10.16	Impact on health due to air emissions including dust and emissions	The operational phase is expected to give rise to only limited and intermittent traffic movements and other maintenance activity that would result in negligible air quality effects. No planned activities during the operation phase, such as excavation, are anticipated and so dust generation is not anticipated. Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
10.10.17	Impacts on health due to water emissions	No planned activities during the operation phase are anticipated which could result in notable additional run-off into the water environment. Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
10.10.18	Impacts on health due to soil emissions (including hazardous waste and substances)	No planned activities during the operation phase are anticipated which could result in the mobilisation of contaminants and hazardous substances. Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
10.10.19	Disruption to local road network (reduced access to services and	The notable disruptions are anticipated due to the low numbers of vehicles anticipated to be required during the O&M phase.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
	amenities)	Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
ALL PROJECT PHASES		
10.10.20	Impacts on health due to electromagnetic radiation	All electrical infrastructure will have to comply with ICNIRP guidelines (as outlined above) by being designed to comply with current guidelines on levels of public exposure and design of electrical infrastructure. As such the impact will be of negligible magnitude and as explained in Chapter 4 this would not result in significant effects in EIA terms. Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
10.10.21	Impacts from major disasters	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations 2017) require significant risks to the receiving communities and environment, for example through major accidents or disasters, to be considered. Similarly, significant effects arising from the vulnerability of the proposed development to major accidents or disasters should be considered. Relevant risks will be covered in the topic chapters within this PEIR/ ES. A major accident, as defined in the Control of Major Accident Hazards (COMAH) Regulations 2015 (as amended), means "an occurrence (including in particular, a major emission, fire or explosion) resulting from uncontrolled developments in the course of the operation of any establishment and leading to serious danger to human health or the environment, immediate or delayed, inside or outside the establishment and involving one or more dangerous substances".

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		Offshore wind developments have an intrinsically low risk of causing major accidents. The turbines, blades towers and foundation bases of offshore wind farms have an excellent safety record with a very low failure rate and are positioned many kilometers offshore away from populated areas and the public. On the rare occasion that offshore turbine blades have been lost into the sea or damage has been caused to a turbine by a fire within the nacelle, this has not resulted in injury. The performance of each turbine is constantly monitored through the SCADA system sending performance data through to a central, partly automated monitoring and control centre. As a result a problem can be quickly detected and pre-prepared safety management action plans rapidly enacted. Whilst exposed power cables on the seabed can pose a snagging risk to shipping and fishing vessels, the projects export and array cables will be buried where possible to protect the cables and remove the snagging risk. This will be discussed in detail in the shipping and navigation EIA assessment, which also discusses the risk that the increased vessel movements to and from the site may pose to navigational safety during construction and operational phases. The buried cables onshore and offshore pose very little risk to the public as they are designed to 'trip out' automatically should any failure in insulation along the cable be detected. The onshore project substation will be located away from populated areas where possible. The risk of substation fires is historically low; however, substation fires can impact the supply of electricity and create a localised fire hazard. The highest appropriate levels of fire protection and resilience will be specified for the onshore project substation to minimise fire risks.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		The small quantities of lubricants, fuel and cleaning equipment required within the project will be stored in suitable facilities designed to the relevant regulations and policy design guidance. The offshore wind industry strives for the highest possible health and safety standards across the supply chain. However, there have been incidents including a small number of worker fatalities during the construction and operation of offshore wind farms. Risks to the public onshore and sea users offshore during construction have been minimised through the use of controlled construction sites onshore and vessel safety zones offshore. Safety zones are temporary exclusion zones enacted during construction, allowing the Applicant and its contractors to control vessel movement to enable safe construction works to proceed. Onshore, controlled or closed construction sites will be operated where construction works are undertaken in sections where access is strictly controlled during the period when the works are ongoing. The Applicant recognises the importance of the highest performance levels of health and safety to be incorporated into the project. There is a commitment to adhere to a high level of process safety, from design to operations and for all staff, contractors and suppliers to have a high level of safety awareness and knowledge of safety and safe behaviour. The Applicant will enact a Code of Conduct for suppliers, contractors and subcontractors. They must all comply with the Code as well as health and safety legislation. The Applicant will ensure that employees have undergone necessary health and safety training.

IMPACT NO	IMPACT	JUSTIFICATION FOR SCOPING OUT
		With a commitment to the highest health and safety standards in design and working practises enacted, none of the anticipated construction works or operational procedures are expected to pose an appreciable risk of major accidents or disasters. In conclusion, the risk of 'major accidents and/or disasters' occurring associated with any aspect of the project, during the construction, operation and decommissioning phases is anticipated to be negligible. Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
10.10.23	Pests	No pathways are anticipated to result in the increase of pests. Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.
10.10.24	Odours	No notable odours are anticipated during any of the phases of the project. Therefore, subject to feedback received on this Scoping Report, it is intended to scope this impact out of further consideration within the EIA.

Mitigation Measures adopted as part of the project

1311 As part of the design process for Awel y Môr OWF a number of designed-in measures are proposed to reduce the potential for impacts on public health receptors. These are presented within the relevant chapters which inform the health assessment (Sections 10.3 to 10.9). These will evolve over the development process as the EIA progresses and in response to consultation.

1312 The Applicant are committed to implement these measures, and also various standard sectoral practices and procedures. It is therefore considered that these measures are inherently part of the design of Awel y Môr OWF and hence have been considered in the judgments as to which impacts can be scoped in/out presented in Table 101 and Table 102.

1313 It should be noted that the onshore cables will be buried which will significantly reduce the exposure to electromagnetic radiation. The onshore substation will be adequately secured and accessed only by authorised personnel with appropriate training and safety equipment. As well as this, all infrastructure built will comply with the government guidelines on electromagnetic radiation emission (ICNIRP, 1998; DECC, 2012a; DECC, 2012b; ENA, 2017).

1314 The additional measures adopted as part of the project will also include:

- Development of, and adherence to, a CoCP;
- Development of, and adherence to, an appropriate PEMP; and
- Development of, and adherence to, a Decommissioning Plan.

1315 The requirement and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

Potential cumulative effects

Non-radiative cumulative effects

1316 As noted in Chapter 4, the Applicant will undertake an inventory of any planning applications or plan which may result in identification of other projects which have the potential for cumulative effects with Awel y Môr. However, it is anticipated that due to the localised nature of any potential impacts, cumulative impacts are unlikely to occur unless there is overlap with the onshore ECR working areas – see Sections 10.3 to 10.9. It is therefore proposed that cumulative impacts will be considered following the creation of the project list which the Applicant will consider cumulatively. If agreed as appropriate, the Applicant will seek to scope out cumulative impacts with the relevant consultees (such as PHW) under the Evidence Plan.

EMF cumulative effects

1317 There is potential for cumulative exposure to electromagnetic radiation as a result of operational power production facilities and transmission infrastructure around the onshore cable route. However, as noted above all electrical infrastructure will have to comply with ICNIRP guidelines by being designed to comply with current guidelines on levels of public exposure and design of electrical infrastructure. As such, cumulative EMF effects are not anticipated. Therefore, it is suggested that this impact will be scoped out from further consideration within the EIA for public health.

Potential transboundary impacts

1318 Due to the localised nature of any potential impacts, transboundary impacts are no anticipated to occur. Therefore, it is suggested that this impact will be scoped out from further consideration within the EIA for public health.

10.10.6 Summary of next steps

1319 The proposed approach to the assessment for public health PEIR chapter will first include the definition of the worst-case scenarios on which the assessments will be based.

1320 The assessment will include the identification and review of the potential public health impacts during construction, operation and decommissioning. It is proposed that the EIA assessment will be a signposting chapter, which highlights the key information and findings in the relevant EIA chapters and indicates where further information is provided in the PEIR/ ES.

10.10.7 Further considerations for Consultees

i. Have all potential impacts resulting from Awel y Môr OWF been identified for public health receptors?

ii. Do you agree that the impacts described in Table 102 can be scoped out?

iii. Do you agree that the cumulative impacts can be scoped out?

iv. Do you agree that the transboundary impacts can be scoped out?

v. For those impacts scoped in (Table 101), do you agree that the methods described are sufficient to inform a robust impact assessment?

vi. Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of Awel y Môr OWF on EMF receptors (please note proposed mitigation measures to address other impacts which may affect health are dealt with in the other relevant chapters)?

vii. Do you agree that providing a sign-posting chapter is a proportionate and adequate assessment of public health?

11 Summary of EIA Scoping

1321 This Section presents an overview of the potential impacts which are proposed to be scoped in (and considered further) or scoped out (not considered further) for the EIA for the Awel y Môr OWF. The information is presented as series of tables (Table 103 to Table 106 below).

TABLE 103 - SUMMARY OF POTENTIAL OFFSHORE ENVIRONMENT – PHYSICAL ENVIRONMENT IMPACTS

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
PHYSICAL PROCESSES					
Potential changes to suspended sediment concentrations, bed levels and sediment type	✓	×	✓	×	×
Potential changes to landfall morphology	✓	×	✓	×	×
Potential changes to the tidal regime	×	✓	×	×	×
Potential changes to the wave regime	×	✓	×	×	×
Potential changes to the sediment transport regime	×	✓	×	×	×
Scour	×	✓	×	×	×
Sediment plumes	×	×	×	✓	×
WATER AND SEDIMENT QUALITY					
Deterioration in water quality due to re-suspension of sediments	✓	×	✓	×	×
Release of contaminants from disturbed sediments	✓	×	✓	×	×
Accidental releases or spills of construction materials or chemicals	✓	×	✓	×	×
Accidental releases or spills of construction materials or chemicals - designated sites	×	✓	×	×	×
Release of drilling mud from HDD at the landfall – Construction only	×	×	×	×	×

TABLE 104 - SUMMARY OF POTENTIAL OFFSHORE ENVIRONMENT – BIOLOGICAL ENVIRONMENT IMPACTS

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
BENTHIC AND INTERTIDAL ECOLOGY					
Habitat disturbance	✓	✓	✓	×	×
Temporary increase in suspended sediment and sediment deposition	✓	×	✓	✓	×
Direct and indirect seabed disturbances leading to the release of sediment contaminants	✓	×	✓	×	×
Increased risk of introduction or spread of Marine Invasive Non-Native Species (MINNS)	✓	✓	✓	×	×
Long-term habitat loss / alteration	×	✓	✓	✓	×
Colonisation of hard substrates	×	✓	×	✓	×
Changes to seabed habitats arising from effects on physical processes	×	✓	×	✓	×
Noise pollution on benthic ecology during foundation installation	×	×	×	×	×
Accidental pollution	×	×	×	×	×
Indirect disturbance of benthic species from EMF generated by inter-array and export cables	×	×	×	×	×
FISH AND SHELLFISH RESOURCE					
Mortality, injury, behavioural impacts and auditory masking arising from noise and vibration	✓	×	✓	✓	✓
Temporary increase in SSC and sediment deposition	✓	×	✓	✓	✓
Direct and indirect seabed disturbances leading to the release of sediment contaminants	✓	×	✓	×	✓

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
Impacts on fishing pressure due to displacement	✓	✓	✓	×	✓
Long-term loss of habitat due to the presence of turbine foundations, scour protection and cable protection	×	✓	×	×	✓
Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection	×	✓	×	×	✓
Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species arising from construction activities	×	×	×	×	×
Accidental pollution events during the construction phase resulting in potential effects on fish and shellfish receptors	×	×	×	×	×
EMF effects arising from cables during operational phase	×	×	×	×	×
Direct disturbance resulting from maintenance during operational phase	×	×	×	×	×
MARINE MAMMALS					
Piling during construction may result in hearing damage/auditory injury (PTS)	✓	×	×	×	×
Piling during construction may result in behavioural disturbance/ displacement	✓	×	×	✓	✓
Disturbance (other construction/decommissioning activities)	✓	×	✓	✓	✓
PTS (UXO)	✓	×	×	×	×
Disturbance (UXO)	✓	×	×	✓	✓
Collision risk (vessel)	✓	✓	✓	×	×

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
Disturbance (vessel)	✓	✓	✓	✓	✓
Change in water quality and SSC	✓	×	✓	×	×
Change in fish abundance/ distribution	✓	✓	✓	×	×
PTS from decommissioning activities	×	×	✓	×	×
Accidental pollution	×	×	×	×	×
Temporary threshold shift (TTS)	×	×	×	×	×
Operational noise	×	×	×	×	×
EMF	×	×	×	×	×
ORNITHOLOGY					
Direct temporary habitat loss/ disturbance due to construction	✓	×	✓	×	×
Indirect impacts on IOFs due to impacts on prey species due to construction	✓	×	✓	×	×
Operational disturbance and displacement	×	✓	×	✓	✓
Indirect impacts on IOFs through direct effects on prey species and habitats	×	✓	×	×	×
Collision Risk	×	✓	×	✓	✓
Indirect impacts through effects on prey species and habitats: accidental pollution during construction	×	×	×	×	×
Operational disturbance and displacement (offshore ECR corridor)	×	×	×	×	×
Barrier effects during operation	×	×	×	×	×

TABLE 105 - SUMMARY OF POTENTIAL OFFSHORE ENVIRONMENT – HUMAN ENVIRONMENT IMPACTS

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
COMMERCIAL FISHERIES					
Reduction in access to, or exclusion from established fishing grounds	✓	✓	✓	✓	×
Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	✓	✓	✓	✓	×
Displacement or disruption of commercially important fish and shellfish resources	✓	✓	✓	✓	×
Physical presence infrastructure leading to gear snagging	×	✓	✓	×	×
Additional steaming to alternative fishing grounds for vessels that would otherwise fish within the Awel y Môr OWF area (during construction, operation and maintenance, and decommissioning)	×	×	×	×	×
Increased vessel traffic associated with Awel y Môr OWF within fishing grounds leading to interference with fishing activity	×	×	×	×	×
SHIPPING AND NAVIGATION					
Traffic displacement	✓	✓	✓	✓	×
Increased vessel to vessel collision risk between third party vessels resulting from displacement and proximity to routeing measures	✓	×	✓	✓	×
Increased vessel to vessel collision risk between a third-party vessel and a project vessel	✓	✓	✓	✓	×
Reduced access to local ports	✓	✓	✓	✓	×
Vessel to structure allision risk	×	✓	×	×	×

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
Reduction of under keel clearance resultant of cable protection	×	✓	×	×	×
Anchor interaction with subsea cables	×	✓	×	×	×
Interference with communications and position fixing equipment	×	✓	×	×	×
Reduction of Search and Rescue (SAR) capability due to increased incident rates and reduced access	×	✓	×	×	×
MILITARY AND CIVIL AVIATION					
Creation of an obstruction.	✓	✓	✓	×	×
Impact on aviation radar systems.	×	✓	✓	×	×
Impact to PEXA	×	×	×	×	×
Impacts from the offshore ECR	×	×	×	×	×
Impact to radar systems	×	×	×	×	×
Impact to SSR systems	×	×	×	×	×
Impact to Chester Airport PSR	×	×	×	×	×
Impact to Clee Hill PSR	×	×	×	×	×
Impact to Aberporth PSR	×	×	×	×	×
Impact to Meteorological Radar	×	×	×	×	×
SEASCAPE, LANDSCAPE AND VISUAL IMPACT ASSESSMENT					
Impact (daytime) of the array area on seascape character within Welsh Marine Plan areas	✓	✓	✓	✓	×
Impact (daytime) of the array area on landscape character receptors	✓	✓	✓	✓	×

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
Impact (daytime) of the array area on onshore visual receptors	✓	✓	✓	✓	×
Impact (night time) of the array area lighting on onshore visual receptors during operation.	×	✓	×	×	×
Impacts relating to the offshore cable route construction, operation and decommissioning.	×	×	×	×	×
Impacts on seascape character within the English Marine Plan Areas.	×	×	×	×	×
Impacts on landscape character receptors (including landscape planning designations) in Denbighshire, Flintshire and the English parts of the Study Area.	×	×	×	×	×
Impacts on landscape character beyond coastal character types/areas except where they are also covered by the AONB or National Park designations.	×	×	×	×	×
Impact on receptors at night due to lighting of infrastructure within the array area where they are located east of Conwy or in England.	×	×	×	×	×
Cumulative impact with other forms of development (except for onshore wind farms with WTGs of greater than 50m to tip and offshore renewables development).	×	×	×	×	×
ARCHAEOLOGY AND CULTURAL HERITAGE					
Total or partial loss of archaeological receptors (scour)	×	✓	×	×	×
Total or partial loss of archaeological receptors (penetration and compression)	×	✓	✓	×	×
Total or partial loss of archaeological receptors during the decommissioning phase due to the draw-down of sediments	×	×	✓	×	×

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
Removal of sediment containing undisturbed archaeological contexts leading to total loss of the receptor during preparation of the seabed for WTGs and offshore substation foundations	×	×	×	×	×
Intrusion of piling foundations disturbing archaeological contexts leading to a partial or total loss of the receptor	×	×	×	✓	×
Compression of stratigraphic contexts containing archaeological material from combined weight of foundation, transition piece, tower, and wind turbine	×	×	×	✓	×
Disturbance of sediment containing potential archaeological receptors (material and contexts) during inter-array and export cable laying operations	×	×	×	✓	×
OTHER MARINE USERS AND ACTIVITIES					
Impacts on offshore windfarms: The impact of construction activities such as potential for physical disruption or damage within the construction footprint of the export cable	✓	×	×	×	×
Potential impacts on non-OWF cables and pipelines: construction activities of export cables has the potential to damage the existing non-OWF cable and pipeline infrastructure	✓	×	✓	×	×
Direct effects on carbon capture projects/features/infrastructure assets	✓	×	✓	×	×
Potential impact on recreational watersports users	✓	✓	✓	✓	×
Potential impact on commercial and recreational angling	✓	✓	✓	✓	×
Potential impacts on cables	×	✓	×	×	×

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
Direct effects on other offshore wind farms from construction of the turbines and associated infrastructure within the array	×	×	×	×	×
Direct impacts on oil and gas infrastructure (surface or subsurface) from construction activities such as increased vessel traffic and the potential for physical disruption or damage within the construction footprint	×	×	×	×	×
Direct impacts on non OWF cables from construction activities such as increased vessel traffic and the potential for physical disruption or damage within the construction footprint	×	×	×	×	×
Direct effects on nuclear cooling and intake systems	×	×	×	×	×
Direct effects on aggregate sites	×	×	×	×	×
Direct impacts on offshore disposal areas	×	×	×	×	×
Direct effects on military infrastructure or areas	×	×	×	×	×
Direct impacts on other OWF	×	×	×	×	×
Direct impacts on oil and gas infrastructure	×	×	×	×	×
Direct impacts on cables	×	×	×	×	×
Presence of the project during construction, operation and decommissioning phases may interfere with the conduct of planned seismic surveys	×	×	×	✓	×

TABLE 106 - SUMMARY OF POTENTIAL ONSHORE ENVIRONMENT

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
TERRESTRIAL ECOLOGY AND NATURE CONSERVATION					
Permanent and temporary loss of habitat	✓	×	✓	×	×
Impacts upon protected species or upon their resting or breeding sites	✓	×	✓	×	×
Habitat fragmentation and species isolation	✓	×	✓	×	×
Spread of invasive non-native species (INNS)	✓	×	✓	×	×
Accidental pollution	✓	×	✓	×	×
Planned maintenance at the substation: disturbance	×	✓	×	×	×
Disturbance via noise and light during operation of the substation	×	✓	×	×	×
Planned cable checks and maintenance along the ECR	×	✓	×	×	×
Impacts to fish at watercourse crossings	×	×	×	×	×
Impacts to certain designated sites	×	×	×	×	×
Impacts to certain local wildlife sites - those >200m from the ECR and substation footprints and have no mobile notified features (e.g. bats and birds) and/or no hydrological connection.	×	×	×	×	×
Cable checks and cable maintenance	×	×	×	×	×
Cumulative impacts on mobile features (such as birds or bats)	×	×	×	✓	×
Transboundary impacts on little tern	×	×	×	×	✓

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
ARCHAEOLOGY					
Disturbance and damage to archaeological remains	✓	×	×	×	×
Indirect temporary: visual change, noise, air pollution, vibration, change to hydrological conditions	✓	×	×	×	×
Indirect permanent: visual change, change to hydrological conditions	×	✓	×	×	×
Indirect visual impact on historic assets without maritime associations	×	×	×	×	×
Indirect visual impact on historic assets with no visibility of development	×	×	×	×	×
Indirect visual impact on non-designated historic assets	×	×	×	×	×
AIRBORNE NOISE AND VIBRATION					
Temporary increase in noise and vibration due to onshore cable route construction/decommissioning	✓	×	✓	✓	×
Temporary increase in noise and vibration due to onshore substation construction/decommissioning	✓	×	✓	✓	×
Temporary increase in noise and vibration during the construction of the extension to the existing NGET onshore substation at Bodelwyddan	✓	×	×	×	×
Temporary increase in noise levels due to construction traffic	✓	×	×	×	×
Temporary increase in noise and vibration due to offshore construction activities	✓	×	×	×	×
Temporary increase in noise due to construction activities on wildlife	✓	×	×	×	×

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
Operation of the onshore substation on the nearest noise sensitive receptors	×	✓	×	×	×
Operation of the extended onshore NGET substation extension at Bodelwyddan on the nearest noise sensitive receptors	×	✓	×	×	×
Operation of the onshore substation on wildlife	×	✓	×	×	×
Operation of the offshore wind farm on the nearest noise sensitive receptors.	×	✓	×	×	×
Temporary increase in noise and vibration as a result of the decommissioning of the offshore components of the project.	×	×	✓	×	×
Vibration effects arising from the operation of the substation.	×	×	×	×	×
Noise and vibration effects associated with the operation of the underground cable.	×	×	×	×	×
TRAFFIC AND TRANSPORT					
Driver severance and delay	✓	×	✓	✓	×
Community severance	✓	×	✓	✓	×
Road safety / vulnerable road users	✓	×	✓	✓	×
Dust and dirt	✓	×	✓	✓	×
Hazardous and dangerous loads	✓	×	✓	✓	×
Users of PRoW	✓	×	✓	✓	×
Noise from traffic	×	×	×	×	×
Disruption to railway	×	×	×	×	×
AIR QUALITY					

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
Construction dust nuisance impacts	✓	×	✓	✓	×
Construction dust health impacts	✓	×	✓	✓	×
Traffic pollutants health impacts	✓	×	✓	✓	×
Traffic pollutants ecological impacts	✓	×	✓	✓	×
Construction traffic effects	×	×	×	×	×
Operational phase traffic movements and other works	×	×	×	×	×
Decommissioning phase traffic movements and other works	×	×	×	×	×
HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK					
Direct and temporary. Generation of turbid runoff which could enter the water environment	✓	×	✓	✓	×
Direct and indirect, permanent. Changes to surface water runoff patterns which could affect flood risk	✓	×	×	✓	×
Direct and permanent. Potential for damage to flood defence infrastructure	✓	×	×	✓	×
Direct and permanent. Pollution to groundwater through piling.	✓	×	×	✓	×
Direct and permanent. Changes to surface water drainage at substation location	×	✓	×	×	×
Any impact on WFD status for assessed surface water or groundwater bodies.	×	×	×	×	×
Accidental spillages and leakages of oils, fuel and other polluting substances which could potentially enter the water environment.	×	×	×	×	×
GEOLOGY AND GROUND CONDITIONS					

	CONSTRUCTION	OPERATION	DECOMMISSIONING	CUMULATIVE EFFECTS	TRANSBOUNDARY EFFECTS
Short term risks to construction workers during development of ECR and associated infrastructure.	✓	×	✓	×	×
Risks to offsite human receptors, such as occupants of residential properties bordering the ECR.	✓	×	✓	✓	×
Risks posed to sensitive surface water and groundwater resources.	✓	×	✓	×	×
Construction phase impacts upon soil/land quality	✓	×	×	×	×
Sterilisation of mineral deposits	✓	×	×	×	×
Disturbance of UXO	✓	×	×	×	×
Ingress and accumulation of hazardous ground gases	×	✓	×	×	×
Structures and services laid in direct contact with contaminated soils and groundwater	×	✓	×	×	×
Operational impacts on geology/ground conditions and associated longer term risks to human and environmental receptors	×	×	×	×	×
Loss of agricultural land from operation of underground cables	×	×	×	×	×
Routine maintenance effects on sterilisation of minerals and loss of agricultural land	×	×	×	×	×
Leaching of soluble contaminants	×	×	×	✓	×
risk of an escape from fuel and chemical storage facilities	×	×	×	✓	×
Generation of dust	×	×	×	×	✓
Releases of mobile organic contaminants such as petroleum hydrocarbons	×	×	×	×	✓

LANDSCAPE AND VISUAL					
Direct temporary loss/disturbance of landscape features and elements, and potential impacts on the perception of landscape character	✓	×	×	✓	×
Impacts of the construction phase on visual amenity	✓	×	×	✓	×
Potential effects on the perception of landscape character resulting from the operational substation	×	✓	×	✓	×
Potential effects on visual amenity resulting from the operational substation	×	✓	×	✓	×
Landscape and visual effects resulting from construction traffic	×	×	×	×	×
Night time landscape and visual effects	×	×	×	×	×
Effects on landscape and visual receptors resulting from the underground cables	×	×	×	×	×
Effects on landscape and visual receptors resulting from maintenance activities at the substation	×	×	×	×	×
Effects on landscape and visual effects resulting from decommissioning	×	×	×	×	×
Residential visual amenity	×	×	×	×	×
SOCIOECONOMICS AND TOURISM					
Beneficial effects on economy (labour market and GVA) within the LSA including local supply chain	✓	✓	×	×	×
Disruption to community and tourism receptors within the LAI	✓	×	×	✓	×
Displacement of tourism visitors within the LSA	✓	×	×	×	×
Demand for healthcare services within the LSA	✓	×	×	✓	×
Impact on tourism receptors and tourism economy within the WSA	✓	✓	×	✓	×
Economy (labour market and GVA) including local supply chain within the LSA	×	✓	×	×	×
Impact of construction on demand for housing and schools	×	×	×	×	×

Impact on local area of influence due to presence of onshore infrastructure during operational phase	×	×	×	×	×
Effects on the labour supply within the LSA arising from concurrent construction of Awel y Môr OWF and other major infrastructure projects: affects could be adverse due to competition for resources or beneficial due to enhanced training and skills development	×	×	×	✓	×
HEALTH					
Impact on health due to air emissions including dust	✓	×	✓	×	×
Impacts on health due to water emissions	✓	×	✓	×	×
Impacts on health due to soil emissions (including hazardous waste and substances)	✓	×	✓	×	×
Impacts on health due to noise disturbance	✓	×	✓	×	×
Temporary loss of access to green space	✓	×	✓	×	×
Disruption to local road network (reduced access to services and amenities)	✓	×	✓	×	×
Impacts on health due to noise disturbance from the onshore substation	×	✓	×	×	×
Changes in green space	×	✓	×	×	×
Improvement of air quality relative to alternative fuel sources such as coal and gas power stations	×	✓	×	×	×
Impacts on health due to electromagnetic radiation	×	×	×	×	×
Impacts from major disasters	×	×	×	×	×
Pests	×	×	×	×	×
Odours	×	×	×	×	×

12 Proposed content of the Environmental Statement

1322 The structure of the ES will enable robust and consistent consideration of the significance of effects, including cumulative impacts, as set out in Chapter 3, above.

1323 The technical chapters for inclusion in the ES will be informed by the Scoping Opinion that will be provided by PINS in response to this Scoping Report. The matters that innogy and its project team considers are suitable to be included in the ES as well as those matters that are considered appropriate to scope out, are summarised within each of the technical chapters above. An overview of the proposed chapters is provided in Table 107.

1324 It should be noted that it is proposed that a standalone chapter will be included in the ES for the assessment for the potential effects on tourism resulting from the proposed development.

1325 Technical supporting information and principal drawings will be provided as appendices to the main ES. A non-technical summary will also accompany the main technical element of the ES. The approach to the ES will be in accordance with good practice guidance provided by recognised bodies such as the Institute of Environmental Management & Assessment.

1326 The assessment of each topic (for example fish and shellfish, infrastructure and other users, and onshore biodiversity) will form a separate chapter within the ES. For each topic chapter, the following aspects will be addressed:

- Statutory and policy context: will provide a summary of the relevant legislation and national policy that have been taken into account in assessing each individual topic;
- Consultation: will provide a summary of the consultation responses received to date from statutory consultees and outcomes of the Scoping process, PEIR and the ongoing Evidence Plan process;
- Scope and methodology: will provide detail confirming the extent of the study area, describing baseline data sources and survey methodology and topic specific detail on the approach to the impact assessment;
- Description of the existing environment;

- Key parameters for assessment provides a summary of the potential effects and identifies and justifies the maximum adverse scenario assessed for each effect;
- Embedded mitigation: provides detail on any mitigation measures that have been identified and adopted as part of the evolution of the project design (i.e. embedded into the project design) of relevance to the topic;
- Environmental assessment: presents an assessment of the significance of any identified effects and the magnitude of the potential impacts that may arise during the construction, O&M and decommissioning of the development, taking account of any embedded mitigation; identification of any further relevant mitigation measure to avoid, reduce and if possible remedy any adverse effects; and assessment of the confidence of any assessments of effect;
- Identification of residual impacts (taking into account embedded and further mitigation, where relevant);
- Inter-relationships: provides an assessment of the potential for and significance of any effects on the topic area from multiple impacts arising from the Awel y Môr development (for example direct impacts of noise from piling plus indirect impacts from potential sediment plumes changing the nature of feeding or spawning grounds on fish and shellfish together could have an effect significance greater than either impact assessed individually);
- Cumulative impacts: provides an assessment of any cumulative impacts arising from interaction with other projects, plans or activities (onshore and in UK territorial waters);
- Transboundary impacts (offshore only): provides an assessment of any impacts from Awel y Môr on the environment of other European Economic Area states; and
- Identification of any further monitoring required and, where relevant, in principle monitoring plans have been drafted to accompany the development consent application.

TABLE 107 – PROPOSED STRUCTURE OF ES FOR AWEL Y MÔR OWF

CHAPTER TITLE
Non-technical summary
Scoping Opinion
Introduction
Policy and Legislation
Environmental Impact Assessment Approach and Methodology
Site selection and alternatives
Offshore Assessments ▪ Physical Processes; ▪ Water and Sediment Quality; ▪ Benthic and Intertidal Ecology; ▪ Fish and Shellfish Ecology; ▪ Marine Mammals; ▪ Offshore Ornithology; ▪ Commercial Fisheries; ▪ Shipping and Navigation; ▪ Military and Civil Aviation; ▪ Seascape, Landscape and Visual Impact Assessment; ▪ Archaeology and Cultural Heritage; and ▪ Other Marine Users and Activities.
Onshore Assessments ▪ Terrestrial Ecology and Nature Conservation; ▪ Archaeology and Cultural Heritage; ▪ Airbourne Noise and Vibration; ▪ Traffic and Transport; ▪ Air Quality; ▪ Hydrology and Flood Risk; ▪ Geology and Ground Conditions; ▪ Landscape and Visual; ▪ Socioeconomics; ▪ Tourism and recreation; and ▪ Health.
Technical Annexes to support technical chapters

13 References

Abdullah, M.I. and Royle, L.G. (1973). 'Chemical evidence for the dispersal of the River Mersey run off in Liverpool Bay'. Estuarine and Coastal Shelf Science. Vol 1, pp 401 – 409.

ABP Marine Environmental Research (ABPmer) and HR Wallingford (2009). 'Coastal Process Modelling for Offshore Wind farm Environmental Impact Assessment: Best Practice Guide'. For COWRIE. [http://www.offshorewindfarms.co.uk].

ABP Marine Environmental Research (ABPmer) and METOC, (2002). 'Potential effects of offshore wind developments on coastal processes'.

ABP Marine Environmental Research (ABPmer), Centre for Environment, Fisheries and Aquaculture Science (Cefas) and HR Wallingford (2007). 'Review of Round 1 Sediment process monitoring data - lessons learnt. (Sed01)'.

ABP Marine Environmental Research (ABPmer), HR Wallingford and Cefas (2010). 'Further review of sediment monitoring data'. (COWRIE ScourSed-09).

ABP Marine Environmental Research (ABPmer), Met Office and Proudman Oceanographic Laboratory (POL) (2008a). 'Atlas of UK Marine Renewable Energy Resources: Atlas Pages'. A Strategic Environmental Assessment Report, March 2008. Produced for BERR. Available: [http://www.renewables-atlas.info/].

ABP Marine Environmental Research (ABPmer), Met Office and SeaRoc UK Ltd (2008b). 'Guidelines in the use of metocean data through the lifecycle of a marine renewables development'.

Air Quality Technical Advisory Group 2009 (AQTAG09) (2009). 'Guidance on the effects of industrial noise on wildlife'.

Aron, H., Eno, C. and Jones, B. (2014). 'Natural Resources Wales (NRW): FishMap Môn Project Report 2014'.

Baines, M. E. and Evans, P. G. H. (2012). 'Atlas of the Marine Mammals of Wales. Countryside Council for Wales (CCW)'.

Balmer, D., Gillings, S., Caffrey, B., Swann, B., Downie, I. and Fuller, R. (2013). 'Bird Atlas 2007-11: The Breeding and Wintering Birds of Britain and Ireland'. BTO Books, Thetford.

Bamber, R.N. (1988). 'A survey of the intertidal soft-sediment fauna of the Mersey Estuary', March 1987. Unpublished, Central Electricity Generating Board (Reports Group Report no: RD/L/3338/R88).

Band, W. (2012). Using a collision risk model to assess bird collision risks for offshore wind farms. The Crown Estate Strategic Ornithological Support Services (SOSS) report SOSS-02. SOSS Website. Original published September 2011, extended to deal with flight height distribution data March 2012.

Bell, M (2007). 'Prehistoric Coastal Communities: The Mesolithic in western Britain', CBA Research Report 149 (York: Council for British Archaeology).

BHP Billiton Petroleum Ltd (2001). 'Liverpool Bay Oil and Gas Production Operations'. Environmental Statement (Document no: H-000-BR-030 Rev.2).

Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. and Dunn, F. (2014). 'Analytical and methodological development for improved surveillance of the Great Crested Newt', in Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (*Triturus cristatus*) environmental DNA.

BirdLife International (2004). 'Birds in Europe: population estimates, trends and conservation status'. (Birdlife Conservation Series No. 12). BirdLife, Cambridge.

Blyth-Skyrme, R.E. (2010a). '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.

Blyth-Skyrme, R.E. (2010b). 'Options and opportunities for marine fisheries mitigation associated with wind farms: Summary report for COWRIE contract FISHMITIG09'. COWRIE Ltd, c/o Nature Bureau, Newbury, UK. 8pp.

Bradbury, G., Trinder, M., Furness, B., Banks, A. N., Caldow, R. W. G. and Hume, D. (2014). 'Mapping Seabird Sensitivity to Offshore Wind farms'. PLoS ONE 9(9): e106366. doi:10.1371/ journal.pone. 0106366

Brasseur, S., Aarts, G., Meesters, E., van Polanen Petel, T., Dijkman, E., Cremer, J. and Reijnders, P. (2012). 'Habitat preference of harbour seals in the Dutch coastal area: analysis and estimate of effects of offshore wind farms.'

Bright, P.W., Morris, P.A. and Mitchell-Jones, A. (2006). 'Dormouse Conservation Handbook 2nd Edition', (Peterborough: English Nature).

British Geological Survey (BGS) (1995). In Barne, J.H. (Editor), Robson, C. F. (Editor), Kaznowska, S. S. (Editor), Davidson, N. C. (Editor), Doody, J. P. (Editor), (eds), 'Coasts and seas of the United Kingdom, Region 12 Wales: Margam to Little Orme and Region 13 Norther Irish Sea: Colwyn Bay to Stranraer including the Isle of Man'. JNCC, Peterborough.

British Geological Survey (BGS) (2020). 'Geology of Britain viewer'. Available: [http://mapapps.bgs.ac.uk/geologyofbritain/home.html], [Accessed: January 2020]

British Standard (BS) (1991). 'BS7445:1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use'.

British Standard (BS) (2009a). 'BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise'.

British Standard (BS) (2009b). 'BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration'.

British Standard (BS) (2019). 'BS4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'.

British Standards Institution (BSI) (2015). 'Environmental impact assessment for offshore renewable energy projects'. Standard number: PD 6900:2015.

Brooks, A. J., Whitehead, P. A. and Lambkin, D. O. (2018). 'Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects.' NRW Report No: 243, 119 pp, Natural Resources Wales, Cardiff.

Brown, A. and Grice, P. (2005). 'Birds in England'. T and AD Poyser, London.

Buonocore, J. (2018), 'The public health benefits of adding offshore wind to the grid' Available: [https://phys.org/news/2018-06-health-benefits-adding-offshore-grid.html], [accessed: January 2020]

Cadw (1999). 'Caring for Coastal Heritage', Welsh Historic Monuments.

Cadw (2011). 'Conservation Principles for the sustainable management of the historic environment in Wales'.

Cadw (2017a). 'Managing: Heritage Impact Assessment in Wales '.

Cadw (2017b). 'Managing: Setting of Historic Assets in Wales'.

Cadw and Icomos UK (1995). 'Register of Landscapes Parks and Gardens of Special Historic Interest in Wales, Part 1 Parks and Gardens – Clywyd'. CADW, Cardiff.

Cadw, Countryside Council for Wales (CCW) and Icomos UK (1998). 'Register of Landscapes of Outstanding Historic Interest in Wales'. CADW, Cardiff.

Cadw, Countryside Council for Wales (CCW) and Icomos UK (2001). 'Register of Landscapes of Special Historic Interest in Wales'. CADW, Cardiff.

Celtic Offshore Wind Farm Ltd (COWL) (2001). 'Rhyl Flats Offshore Wind Farm Environmental Statement'.

Centre for Economics and Business Research Ltd (CEBR) (2012). 'The macroeconomic benefits of investment in offshore wind A scenario-based assessment of the economic impacts on the UK of alternative realisations of offshore wind capacity'.

Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2001). 'The impact of disposal of marine dredged material on the Thanet Coast and Sandwich Bay Candidate Special Areas of Conservation (cSACs)'. Cefas Contract ReportAA001.

Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2004). 'Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of Food and Environment Protection Act 1985 and Coastal Protection Act 1949 requirements – Version 2'. Prepared by CEFAS on behalf of the Marine Consents and Environment Unit (MCEU)

Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2010). 'Strategic review of offshore wind farm monitoring data associated with FEPA licence conditions – annex 4: underwater noise'. Cefas report: ME1117.

Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2011).'Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects'.

Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2012). 'Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects'. Report reference: ME5403 – Module 15.

Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2016). 'Suspended Sediment Climatologies around the UK. Report for the UK Department of Energy and Climate Change's offshore energy Strategic Environmental Assessment programme'.

Centre for Marine and Coastal Studies (CMACS) (2005a). 'Gwynt y Môr Offshore Wind Farm - Marine Ecology Technical Report', report to Npower Renewables (Report no: J3004/2005).

Centre for Marine and Coastal Studies (CMACS) (2005b). 'Rhyl Flats Offshore Wind Farm Benthic Grab Survey 2006 Monitoring Report', report to RWE npower renewables (Report no: J3039/04-07 v.1.0).

Centre for Marine and Coastal Studies (CMACS) (2011). 'Gwynt y Môr Offshore Wind Farm - Pre-construction Baseline Benthic Grab Survey, 2010/11', report to Gwynt y Môr OWF Ltd.

Chanin, P. (2003a). 'Ecology of the European Otter', in Conserving Natura 2000 Rivers, Ecology Series No. 10, (Peterborough: English Nature).

Chanin, P. (2003b). 'Monitoring the Otter', in Conserving Natura 2000 Rivers, Monitoring Series No 10, (Peterborough: English Nature).

Chartered Institute for Archaeologists (2014). 'Standard and guidance for historic environment desk-based assessment'.

Chartered Institute of Ecology and Environmental Management (CIEEM) (2017). 'Guidelines for Preliminary Ecological Appraisal', 2nd edition, Winchester.

Chartered Institute of Ecology and Environmental Management (CIEEM) (2019). 'Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1'. Chartered Institute of Ecology and Environmental Management, Winchester.

Clarke, L. J., Banga, R., Robinson, G. I., Lindenbaum, C. P., Morris, C. W. and Stringell, T. B. (2018). 'Grey Seal (*Halichoerus grypus*) Pup Production and Distribution in North Wales, 2017'. Natural Resources Wales (NRW), Bangor.

Clwydian Range and Dee Valley AONB (2014). 'Clwydian Range and Dee Valley AONB Management Plan 2014-2019'. Available:

[http://www.clwydianrangeanddeevalleyaonb.org.uk/plans-and-strategies/].

Coles, B.J. (1998). 'Doggerland: a speculative survey', Proceedings of the Prehistoric Society, 64: 45-81.

Collaborative Offshore Wind Research Into The Environment (COWRIE) (2007). 'Historic Environment Guidance for the Offshore Renewable Energy Sector', Wessex Archaeology.

Collaborative Offshore Wind Research Into The Environment (COWRIE) (2008a). 'Establishing best practice for the documentation and dissemination of marine biological data', Available: [https://www.thecrownestate.co.uk/media/5902/km-ex-pc-method-092008-establishing-best-practice-for-the-documentation-and-dissemination-of-marine-biological-data.pdf], [Accessed: November 2019].

Collaborative Offshore Wind Research Into The Environment (COWRIE) (2008b). 'Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy'.

Collins, J. (ed), (2016). 'Bat Surveys for Professional Ecologists: Good Practice Guidelines', 3rd Edition, (London: The Bat Conservation Trust).

Committee on Climate Change (2011). 'The Renewable Energy Review'. Available: [https://www.theccc.org.uk/publication/the-renewable-energy-review/], [Accessed: October 2019].

Construction Industry Research and Information Association (CIRIA) (2001). 'Control of Water Pollution from Construction Sites (C532)'.

Construction Industry Research and Information Association (CIRIA) (2006a). 'Control of Water Pollution from Linear Construction Projects (C648)'.

Construction Industry Research and Information Association (CIRIA) (2006b). 'Control of Water Pollution from Linear Construction Projects: Site Guide (C649)'.

Construction Industry Research and Information Association (CIRIA) (2015a). 'Environmental Good Practice on Site (C741)'.

Construction Industry Research and Information Association (CIRIA) (2015b). 'The Suitable Drainage System (SuDS) Manual (C753)'.

Conwy Borough Council (2014). 'Conwy Local Development Plan 2007 – 2022', Supplementary Planning Guidance, LDP 11: Landscape Sensitivity and Capacity Assessment for Onshore Wind Turbine Development -Landscape Character Maps.

Conwy County Borough Council (2006). 'Local Development Plan (2006 – 2021)'.

Conwy County Borough Council (2011). 'Preliminary Flood Risk Assessment'.

Conwy County Borough Council (2012). 'Conwy Deposit Local Development Plan 2007-2022 (Revised edition 2011) Revised Background Paper 27 – Submission, Special Landscape Areas'.

Conwy County Borough Council (2013a). 'Conwy Local Flood Risk Management Strategy'.

Conwy County Borough Council (2013b). 'Conwy and Denbighshire Landscape Sensitivity and Capacity Assessment for Wind Energy Development'.

Conwy County Borough Council (2019). 'Replacement Local Development Plan 2018-2033 Background Paper, BP 35: Flood Risk and Development Opportunities'.

Cook, A. S. C. P., Humphries, E. M., Masden, E. A. and Burton, N. H. K. (2014). 'The avoidance rates of collision between birds and offshore turbines'. BTO research Report No 656 to Marine Scotland Science.

Cook, A. S. C. P., Wright, L. J. and Burton, N. H. K. (2012). 'A review of flight heights and avoidance rates of birds in relation to offshore wind farms'. The Crown Estate (TCE) Strategic Ornithological Support Services (SOSS). SOSS Website.

Copping, A. (2018). 'The State of Knowledge for Environmental Effects Driving Consenting/Permitting for the Marine Renewable Energy Industry'. Prepared for Ocean Energy Systems On behalf of the Annex IV Member Nations.

Coull, K. A., Johnstone, R. and Rogers, S. I. (1998), 'Fishery Sensitivity Maps in British Waters'. Published and distributed by UKOOA Ltd.

Countryside Council for Wales (CCW) (2004). 'Phase I- Intertidal Survey- Standard Report', 11.55.2 Arfon Clwyd to Llanddulas.

Cramp S. and Simmons K.E.L. (Eds.) (1977 - 1994). The Birds of the Western Palearctic. Oxford University Press, Oxford.

Cranfield Soil and Agrifood Institute (2020). 'Soilscapes' map viewer. Available: [http://www.landis.org.uk/soilscapes/], [Accessed: January 2020]

Czech-Damal, N. U., Dehnhardt, G., Manger, P. and Hanke, W. (2013). 'Passive electroreception in aquatic mammals'. Journal of Comparative Physiology A-Neuroethology Sensory Neural and Behavioral Physiology 199:555-563.

Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). 'The Water Vole Mitigation Handbook', The Mammal Society Mitigation Guidance Series, Fiona Mathews and Paul Chanin (eds.), (London: The Mammal Society).

Degraer, S., Brabant, R. and Rumes, B. (Eds.) (2010). 'Offshore wind farms in the Belgian part of the North Sea: Early environmental impact assessment and spatio-temporal variability'. Royal Belgian Institute of Natural Sciences, Management Unit of the North S: 53–68.

Del Hoyo, J., Elliott, A. and Sargatal, J. (Eds.) (1992 – 2011). 'Handbook of the Birds of the World'. Lynx Editions, Madrid.

Dellino-Musgrave, V. and Heamagi, C. (2010). 'Our Marine Historic Environment: Enhancing the National Monuments Record. Phase 1: Identifying the Scale of the Problem', English Heritage.

Denbighshire County Council (2006). 'Local Development Plan (2006 – 2021)'.

Denbighshire County Council (2014). 'Denbighshire Local Flood Risk Management Strategy'.

Denbighshire County Council (2016). 'Air Quality Progress Report 2016'.

Denbighshire County Council (2018). 'Denbighshire Flood Consequence Assessment – Level 1' (JBA Consulting).

Denbighshire County Council, Flintshire County Council, Wrexham County Borough Council, and Clwydian Range and Dee Valley Area of Outstanding Natural Beauty (AONB) (2018). 'Supplementary Planning Guidance Note: Clwydian Range and Dee Valley Area of Outstanding Natural Beauty (AONB)'.

Department for Business, Energy and Industrial Strategy (BEIS) (2013). 'Offshore wind industrial strategy: business and government action', Available: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/243987/bis-13-1092-offshore-wind-industrial-strategy.pdf], [Accessed: November 2019].

Department for Business, Energy and Industrial Strategy (BEIS) (2019). 'Offshore Oil and Gas Licensing 31st Seaward Round: Habitats Regulations Assessment, Draft Appropriate Assessment: Irish Sea'. Available: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/777001/31st_Round_AA_Irish_Sea_-_Consultation_Draft.pdf]

Department for Business, Energy and Industrial Strategy (BEIS) (2020). 'UK electricity generation, trade, consumption, July to September 2019'. Available: [https://www.gov.uk/government/statistics/electricity-section-5-energy-trends], [Accessed: February 2020].

Department for Business, Enterprise and Regulatory Reform (BERR) in association with Defra (2008). 'Review of Cabling Techniques and Environmental Effects applicable to the Offshore Wind farm Industry'.

Department for Environment, Food and Rural Affairs (Defra) (2004). 'Model Procedures for the Management of Land Contamination, Contaminated Land Report 11 (CLR11)'.

Department for Environment, Food and Rural Affairs (Defra) (2005). 'Chapter 5: The Irish Sea. In Report 5: Integrated regional assessment'.

Department for Environment, Food and Rural Affairs (Defra) (2009). 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites'. Available: [https://assets.publishing.service.gov.uk/government/uploads/system/upl

oads/attachment_data/file/716510/pb13298-code-of-practice-090910.pdf], [Accessed: December 2019]

Department for Environment, Food and Rural Affairs (Defra) (2012a). 'Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance'.

Department for Environment, Food and Rural Affairs (Defra) (2012b). 'Habitats Regulations: Evidence plans for Nationally Significant Infrastructure Projects'.

Department for Environment, Food and Rural Affairs (Defra) (2016a). 'Interactive Air Quality Management Area (AQMA) Boundaries map'.

Department for Environment, Food and Rural Affairs (Defra) (2016b). 'Local Air Quality Management Technical Guidance'.

Department for Environment, Food and Rural Affairs (Defra) (2020a). 'MAGIC' website. Available: [https://magic.defra.gov.uk/MagicMap.aspx], [accessed: January 2020].

Department for Environment, Food and Rural Affairs (Defra) (2020b). 'Shellfish Classifications England and Wales 2019-2020'. Available: [https://www.food.gov.uk/sites/default/files/media/document/classification-list-23-jan-2020.docx.pdf], [Accessed: January 2020]

Department of Energy and Climate Change (DECC) (2009). 'The UK renewable energy strategy'

Department of Energy and Climate Change (DECC) (2011). National Policy Statement for Renewable Energy Infrastructure (EN3).

Department of Energy and Climate Change (DECC) (2011a). 'Overarching National Policy Statement for Energy (EN-1)', Available: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf], [Accessed: September 2019].

Department of Energy and Climate Change (DECC) (2011b). 'National Policy Statement for Renewable Energy Infrastructure (EN-3)', Available: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47856/1940-nps-renewable-energy-en3.pdf], [Accessed: September 2019].

Department of Energy and Climate Change (DECC) (2011c). 'National Policy Statement for Electricity Networks Infrastructure (EN-5)'.

Department of Energy and Climate Change (DECC) (2011d). 'The Carbon Plan - reducing greenhouse gas emissions'.

Department of Energy and Climate Change (DECC) (2012a). 'Power Lines: Demonstrating compliance with EMF public exposure guidelines – a Voluntary Code of Practice'.

Department of Energy and Climate Change (DECC) (2012b). 'Optimum Phasing of high voltage double-circuit Power Lines – a Voluntary Code of Practice'.

Department of Energy and Climate Change (DECC) (2014). 'Updated energy and emissions projections'.

Department of Energy and Climate Change (DECC) (2016). 'UK Offshore Energy Strategic Environmental Assessment. OWESEA3 March 2016: Appendix 1a.7 – Marine and Other Mammals'.

Design Manual for Roads and Bridges (DMRB) (2020). 'Volume 11 (Environmental Assessment), Section 3 (Environmental Assessment Techniques), Part 7 (HA 213/08 – Noise and Vibration)'.

Diederichs, A., Nehls, G., Dähne, M., Adler, S., Koschinski, S. and Verfuß, U. (2008). 'Methodologies for measuring and assessing potential changes in marine mammal behaviour, abundance or distribution arising from the construction, operation and decommissioning of offshore windfarms'.

Dierschke, V., Furness, R.W., Gray, C.E., Petersen, I.K., Schmutz, J., Zydelis, R. and Daunt, F. (2017). 'Possible behavioural, energetic and demographic effects of displacement of red-throated divers'. JNCC Report No: 605. JNCC, Peterborough.

Diesing, M and Stephens, D. (2018). 'UK shelf and North Sea quantitative sediment composition predictions'. Cefas, UK. V1. Available: [https://doi.org/10.14466/CefasDataHub.49].

Donovan, C. (2018). 'Stochastic Band CRM – GUI User Manual', Draft V1.0, 31/03/2017.

Drewitt, A.L. and Langston, R.H.W. (2006). 'Assessing the impacts of wind farms on birds'. Ibis, 148 (Suppl. 1), 4-7.

Duckett, A. (2018). 'Cardigan Bay bottlenose dolphin (*Tursiops truncatus*) connectivity within and beyond marine protected areas'. Bangor University.

Dyer, K. R., Moffat, T. J. (1998). 'Fluxes of suspended matter in the East Anglian plume Southern North Sea'. Continental Shelf Research, 18, 1311-1331.

Eaton, M. A., Aebischer, N. J., Brown, A. F., Hearn, R. D., Lock, L., Musgrove, A. J., Noble, D. G., Stroud, D. A. and Gregory, R. D. (2015). 'Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man'. British Birds 108, pp: 708–746.

Ellis, J.R., Milligan, S.P. Readdy, L. Taylor, N. and Brown, M.J. (2012). 'Spawning and nursery grounds of selected fish species in UK waters'. Cefas Scientific Series Technical Report 147.

EMU Ltd. (2008). 'Kentish Flats Offshore Wind Farm Turbine Foundation Faunal Colonisation Diving Survey'. Report No. 08/J/1/03/1034/0839.

Energy Networks Association (ENA) (2017). 'EMFs The Facts'. Available: [http://www.emfs.info/wp-content/uploads/2017/09/EMF_The_Facts_250917.pdf], [Accessed: January 2020].

Environment Agency (2017). 'Water Framework Directive assessment: estuarine and coastal waters'. Available: [https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters], [Accessed: December 2019].

Environment Agency (2019). 'Coastal flood boundary conditions for the UK: update 2018'. Report SC060064/TR6.

European Union (1999). 'Council Recommendation on the limitation of exposure of the general public to electromagnetic fields (0 Hz – 300 GHz)'. Official Journal of the European Communities 1999/519/EC.

European Union Data Collection Framework (EU DCF) (2019). 'Data by quarter-rectangle: Tables and maps of effort and landings by ICES statistical rectangles'.

Evans, P. and Shepherd, B. (2001). 'Cetaceans in Liverpool Bay and Northern Irish Sea'. Sea Watch Foundation, Oxford. Pp: 20.

Feingold, D. and Evans, P. G. (2014). 'Bottlenose dolphin and harbour porpoise monitoring in Cardigan Bay and Pen Llŷn a'r Sarnau Special Areas of Conservation 2011-2013'. Natural Resources Wales (NRW) Evidence Report Series Report No: 4, 120 pp, Natural Resources Wales, Bangor.

Fisheries Liaison with Offshore Wind and Wet Renewables Group (FLOWW) (2014). 'Best Practice Guidance for Offshore Renewable Developments: Recommendations for Fisheries Liaison'. Available: [https://www.thecrownestate.co.uk/media/1775/ei-km-in-pc-fishing-012014-floww-best-practice-guidance-for-offshore-renewables-developments-recommendations-for-fisheries-liaison.pdf], [Accessed: November 2019]

Fisheries Liaison with Offshore Wind and Wet Renewables Group (FLOWW) (2015). 'FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds'. Available: [https://www.thecrownestate.co.uk/media/1776/floww-best-practice-guidance-disruption-settlements-and-community-funds.pdf], [Accessed: November 2019].

Fitch, S., Gaffney, V., Ramsey, E. and Kitchen, E. (2011). 'West Coast Palaeolandscapes Survey', University of Birmingham and Dyfed Archaeological Trust.

Flemming, N. (2005). 'The scope of Strategic Environmental Assessment of the Irish Sea Area SEA6 in regard to prehistoric archaeological remains', (London: UK Department of Trade and Industry).

Frost, T. M., Austin, G. E., Calbrade, N. A., Mellan, H. J., Hearn, R. D., Robinson, A. E., Stroud, D. A., Wotton, S. R. and Balmer, D. E. (2019). 'Waterbirds in the UK 2017/18: The Wetland Bird Survey'. BTO, RSPB and JNCC, in association with WWT. British Trust for Ornithology, Thetford.

Frost, T. M., Leaper, R., Mieszkowska, Nova., Moschella, P., Murua, J. and Smyth, C. (2004), 'Recovery of a Biodiversity Action Plan Species in Northwest England: possible role of climate change, artificial habitat and water quality amelioration', Marine Biological Association (MBA) Occasional Publications No.16.

Fugro-EMU (2014). 'Review of environmental data associated with post-consent monitoring of licence conditions of offshore wind farms'. MMO Project No: 1031.

Furness, R.W. (2015). 'Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS)'. Natural England Commissioned Report Number 164.

Furness, R.W. and Wade, H. M. (2012). 'Vulnerability of Scottish seabirds to offshore wind turbines'. The Scottish Government, Edinburgh. Available: [http://www.scotland.gov.uk/Resource/0040/00401641.pdf].

Furness, R.W., Wade, H.M. and Masden, E.A. (2013). 'Assessing vulnerability of marine bird populations to offshore wind farms'. Journal of Environmental Management, 119, 56-66.

Garthe, S and Hüppop, O. (2004). 'Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index'. Journal of Applied Ecology, 41, 724-734.

Garwood, P. and Foster-Smith, R. (1991). 'Intertidal survey from Rhos Point to New Brighton', Nature Conservancy Council (CSD Report no: 1,194).

Gifford (2005). 'Gwynt y Môr Offshore Wind Farm: Cultural Heritage Technical Report', npower renewables, Report No. 10746.R03.

Gilbert, G., Gibbons, D. and Evans J. (1998). 'Bird Monitoring Methods: A Manual of Techniques for Key UK Species', (Bedfordshire: RSPB).

Gill, A. B. and Bartlett, M. (2010). 'Literature review on the potential effects of electromagnetic fields and subsea noise from marine renewable energy developments on Atlantic salmon, sea trout and European eel'. Scottish Natural Heritage (SNH) Commissioned Report No. 401.

Gill, A. B., Huang, Y., Gloyne-Philips, I., Metcalfe, J., Quayle, V., Spencer, J. and Wearmouth, V. (2009). COWRIE 2.0 Electromagnetic Fields (EMF) Phase2: EMF-sensitive fish response to EM emissions from sub-sea electricity cables of the type used by the offshore renewable energy industry. Report to Collaborative Offshore Wind Research into the Environment (COWRIE).

Gohin, F. (2011). 'Annual cycles of chlorophyll-a, non-algal suspended particulate matter, and turbidity observed from space and in-situ in coastal waters'. Ocean Sci., 7, 705-732. doi:10.5194/os-7-705-2011.

Goold, J., Calderan, S. and Goold, L. (2005). 'Baseline Visual & Acoustic Marine Mammal Surveys at Gwynt y Môr'. Final Report to npower renewables Institute of Environmental Science University of Wales, Bangor June 2005.

Gray, M., Stromberg, P-L., Rodmell, D. (2016). 'Changes to fishing practices around the UK as a result of the development of offshore windfarms – Phase 1 (Revised)'. The Crown Estate, 121 pages. ISBN: 978-1-906410-64-3.

Hammond, P. S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M., 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'.

Hammond, P. S., MacLeod, K., Berggren, P., Borchers, D. L., Burt, L., Cañadas, A., Desportes, G., Donovan, G. P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M., Lovell, P., Øien, N., Paxton, C. G. M., Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., Swift, R., Tasker, M. L., Teilmann, J., Van Canneyt, O. and Vázquez, J. A. (2013). 'Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management'. Biological Conservation 164:107-122.

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.

Health & Safety Exectutive (HSE) (2001). 'Offshore Technology Report: Noise and Vibration OTO 068/2001'.

Health & Safety Exectutive (HSE) (2015). 'Control of Major Accident Hazards (COMAH) Regulations 2015'. Available: [https://www.hse.gov.uk/pUbns/priced/l111.pdf], [Accessed: January 2020].

Heinänen, S. and Skov, H. (2015). 'The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area'. JNCC Report No: 544, JNCC, Peterborough.

Her Majesty's Government (2016). Andrea Leadsom Speech to Utility Week Energy Summit. Available: [https://www.gov.uk/government/speeches/andrea-leadsom-speech-to-utility-week-energy-summit], [Accessed: November 2019]

Her Majesty's Government (2017). 'Building our Industry Strategy: Green Paper'. Available: [https://beisgovuk.citizenspace.com/strategy/industrial-strategy/supporting_documents/buildingourindustrialstrategygreenpaper.pdf], [Accessed: November 2019]

Highways Agency (1993). 'Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 3, Part 11, Geology and Soils'.

Highways Agency (2008). 'Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 2, Part 5, HA205/08 Assessment and Management of Environmental Effects Highways Agency'.

Highways England (2019). 'Design Manual for Roads and Bridges LA112 Population and Human Health'.

Hoffman, E., Astrup, J., Larsen, F, Munch-Petersen, S. and Støttrup, J. (2000). 'Effects of marine windfarms on the distribution of fish, shellfish and marine mammals in the Horns Rev area'. Report to ELSAMPROJEKT A/S, Danish Institute for Fisheries Research.

Holling, M. and the Rare Breeding Birds Panel (2011). 'Rare breeding birds in the United Kingdom in 2009'. British Birds, 104, 476–537.

Horswill, C., O'Brien, S.H. and Robinson, R.A. (2017). 'Density dependence and marine bird populations: are wind farm assessments precautionary?' Journal of Applied Ecology 54, 1406-1414.

HR Wallingford, ABPmer and Cefas (2007). 'Dynamics of scour pits and scour protection - Synthesis report and recommendations. (Sed02)'.

Innogy (2020). 'Awel y Môr Habitats Regulation Assessment: Screening Report'.

Institute of Acoustics (IoA) (2014). 'A Good Practice Guide (GPG) to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'.

Institute of Air Quality Management (IAQM) (2014). 'Guidance on the assessment of dust from demolition and construction'.

Institute of Air Quality Management (IAQM) and Environmental Protection UK (2015). 'Planning for Air Quality'.

Institute of Ecology and Environmental Management (IEEM) (2010). 'Guidelines for ecological impact assessment in Britain and Ireland - Marine and Coastal'. Institute of Ecology and Environmental Management, Winchester Hampshire.

Institute of Environmental Management and Assessment (IEMA) (2003). 'Guidance for Environmental Assessment of Road Traffic'.

Institute of Environmental Management and Assessment (IEMA) (2014). 'Guidelines for Environmental Impact Assessment', IEMA Lincoln.

Institute of Environmental Management and Assessment (IEMA) (2016). 'Guide to Shaping Quality Development', IEMA Lincoln.

Institute of Environmental Management and Assessment (IEMA) (2017). 'Delivering Proportionate EIA - A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice, IEMA Lincoln.

International Association of Lighthouse Authorities (IALA) (2013). 'O-139 the Marking of Man-Made Offshore Structures'. Edition 2. Saint Germaine en Laye, France: IALA.

International Commission on Non-Ionizing Radiation Protection (ICNIRP) (1998). 'Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)'. Health Phys, 74: 494-522.

International Maritime Organization (IMO) (1974). 'International Convention for the Safety of Life at Sea'. London: IMO.

International Maritime Organization (IMO) (1977). Convention on the International Regulations for Preventing Collisions at Sea – Annex 3. London: IMO.

International Maritime Organization (IMO) (2018). 'Revised Guidelines for Formal Safety Assessment (FSA)'. London: IMO.

International Organization for Standardization (ISO) (1996). '9613-2:1996-2 - Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation'.

Jacobs (2018a). 'Wylfa Newydd Project 5.2 Shadow Habitats Regulations Assessment Report (Part 1/2)'. PINS Reference Number: EN010007. Application Reference Number: 5.2.

Jacobs (2018b). 'Wylfa Newydd Project 6.4.88 ES Volume D - WNDA Development App D13-6 - Marine Mammal Baseline Review'. PINS Reference Number: EN010007. Application Reference Number: 6.4.88.

Jarrett, D., Cook, A.S.C.P., Woodward, I., Ross, K., Horswill, C., Dadam, D. and Humphreys, E.M. (2018). 'Short-term behavioural responses of wintering waterbirds to marine activity'. Scottish Marine and Freshwater Science 9 (7).

Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M. and Burton, E.H.K. (2014a). 'Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines'. Journal of Applied Ecology, 51, 31-41.

Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M. and Burton, N.H.K. (2014b). 'Corrigendum'. Journal of Applied Ecology, 51, doi: 10.1111/1365-2664.12260.

Joint Nature Conservation Committee (JNCC) (2019). 'Sandbanks which are slightly covered by sea water all the time'. Available: [https://sac.jncc.gov.uk/habitat/H1110/], [Accessed: November 2019].

Joint Nature Conservation Committee (JNCC) (2019a). 'European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)' Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S1349 - Bottlenose dolphin (*Tursiops truncatus*) UNITED KINGDOM.

Joint Nature Conservation Committee (JNCC) (2019b). 'European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)'. Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S1350 - Common dolphin (*Delphinus delphis*) UNITED KINGDOM.

Joint Nature Conservation Committee (JNCC) (2019c). 'European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)'. Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018

Conservation status assessment for the species: S1351 - Harbour porpoise (*Phocoena phocoena*) UNITED KINGDOM.

Joint Nature Conservation Committee (JNCC) (2019d). 'European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)'. Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S1364 - Grey seal (*Halichoerus grypus*) UNITED KINGDOM.

Joint Nature Conservation Committee (JNCC) (2019e). 'European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)'. Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S2030 - Risso's dolphin (*Grampus griseus*) UNITED KINGDOM.

Joint Nature Conservation Committee (JNCC) (2019f). 'European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)'. Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S2618 - Minke whale (*Balaenoptera acutorostrata*) UNITED KINGDOM.

Joint Nature Conservation Committee (JNCC) and Natural England (2011). 'General advice on assessing potential impacts of and mitigation for human activities on Marine Conservation Zone (MCZ) features, using existing regulation and legislation'.

Joint Nature Conservation Committee (JNCC) and Statutory Nature Conservation Bodies (SNCBs) (2017). 'Joint SNCB Interim Displacement Advice Note'. Natural Resources Wales, Department of Agriculture, Environment and Rural Affairs and Northern Ireland Environment Agency, Natural England, Scottish Natural Heritage and Joint Nature Conservation Committee.

Joint Nautical Archaeology Policy Committee (JNAPC) (2006). 'JNAPC Code of Practice for Seabed Development'.

Kenyon, N. and Cooper, B. (2005). 'Sand Banks, Sand Transport and Offshore Wind Farms'. Report by ABP Marine Environmental Research (ABPmer).

Kerckhof, F., Rumes, B., Norro, A., Jacques, T. G. and Degraer, S. (2010). 'Chapter 5. Seasonal variation and vertical zonation of the marine biofouling on a concrete offshore windmill foundation on the Thorntonbank (southern North Sea)'.

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. JNCC, Peterborough.

Krone, R., Gutow, L., Joschko, T. J. and Schröder, A. (2013). 'Epifauna dynamics at an offshore foundation - Implications of future wind power farming in the North Sea'. Marine Environmental Research 85: 1–12.

Landscape Institute (2019). 'Visual Representation of Development Proposals, Technical Guidance Note 06/19'.

Landscape Institute and Institute of Environmental Management & Assessment (IEMA) (2013). 'Guidelines for Landscape and Visual Impact Assessment', Third Edition (GLVIA 3).

Langley, I., Rosas da Costa Oliver, T., Hiby, L., Morris, C. W., Stringell, T. B. and Pomeroy, P. (2018). 'EIRPHOT: A critical assessment of Wales' grey seal (*Halichoerus grypus*) photo-identification database'. Natural Resources Wales (NRW) Evidence Report Series Report No: 280, 94pp, Natural Resources Wales (NRW), Bangor.

Langston, R. H. W. (2010). 'Offshore wind farms and birds: Round 3 zones, extensions to Round 1 and Round 2 sites and Scottish Territorial Waters'. RSPB Research Report No. 39. RSPB, Sandy.

Langton, T., Beckett, C. and Foster, J. (2001). 'Great Crested Newt Conservation Handbook', (Halesworth: Froglife).

Latham, J., Sherry, J. and Rothwell, J. (2013). 'Ecological Connectivity and Biodiversity Prioritisation in the Terrestrial Environment of Wales'. CCW Staff Science Report No. 13/3/3, (Bangor: Terrestrial Ecosystem Group, Countryside Council for Wales).

Leopold, M. F. and Verdaat, H. J. P. (2018). 'Pilot field study: observations from a fixed platform on occurrence and behaviour of common guillemots and other seabirds in offshore wind farm Luchterduinen (WOZEP Birds-2)'. Wageningen Marine Research Report C068/18.

Lindeboom, H. J., Kouwenhoven, M. J., Bergman, J. N., Bouma, S., Brasseur, S., Daan, R., Fijn, R. C., de Haan, D., Dirksen, S.,van Hal, R., Hille Ris Lambers, R., ter Hofstede,R., Krijgsveld, K. L., Leopold, M. and Scheidat, M. (2011). 'Short-term ecological effects of an offshore wind farm in the Dutch coastal zone; a compilation'. Environmental Research Letters 6:1-13.

Linley, E. A., Wilding, T. A., Black, K., Hawkins, A., Mangi, S. (2008). 'Review of the reef effects of offshore wind farm structures and their potential for enhancement and mitigation'. Report from PML Applications Ltd and the Scottish Association for Marine Science (SAMS) to the Department for Business, Enterprise and Regulatory Reform (BERR): 132.

Lockwood, S. (2005). 'A Strategic Environmental Assessment of the Fish & Shellfish Resources with Respect to Proposed Offshore Wind Farms in the Eastern Irish Sea'. Report RWE Innogy. pp 105.

Mackie, A. S. Y. (1990). 'Offshore benthic communities of the Irish Sea, in The Irish Sea: an environmental review. Part 1'. Nature conservation, (eds), Irish sea study group, pp169-218. Liverpool University Press.

Macleod, K., Burt, M., Cañadas, A., Rogan, E., Santos, B., Uriarte, A., Van Canneyt, O., Vázquez, J. and Hammond, P. (2009). 'Design-based estimates of cetacean abundance in offshore European Atlantic waters'. Appendix I in the Final Report of the Cetacean Offshore Distribution and Abundance in the European Atlantic.

Madsen, P. T., Wahlberg, M., Tougaard, M., Lucke, K. and Tyack, P. (2006). 'Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs'. Marine Ecology Progress Series 309:279-295.

Manley, J. (1989). 'Rhyl and Coastal Evolution', Journal of Flintshire Historical Society, 32: 1-15.

Marchant, J. (1983). 'Common Bird Census Instructions', British Trust for Ornithology.

Marine management Organisation (MMO) (2014). 'Review of Post-Consent Offshore Wind Farm Monitoring Data Associated with Marine Licence Conditions'. A report produced for the Marine Management Organisation, pp 194. MMO Project No: 1031. ISBN: 978-1-909452-24-4.

Marine Management Organisation (MMO) (2019). 'IFISH database with landing statistics data for UK registered vessels for 2013 to 2017 with attributes for: landing year; landing month; vessel length category; country code; ICES rectangle; vessel/gear type; species; live weight (tonnes); and value; and landing year; landing month; vessel length category; country code; vessel/gear type; port of landing; species; live weight (tonnes); and value'.

Marine Pollution Monitoring Management Group (MPMMG) (1998). 'National Monitoring Programme Survey of the Quality of UK Coastal Waters'. Aberdeen.

Maritime and Coastguard Agency (MCA) (2015). 'Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms', Southampton: MCA.

Maritime and Coastguard Agency (MCA) (2016). 'MGN 543 (Merchant and Fishing) Safety of Navigation OREIs – Guidance on UK Navigational Practices, Safety and Emergency Response'. Southampton: MCA.

Maritime and Coastguard Agency (MCA) (2018). 'Annex 5 to MGN 543. Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response'. Southampton: MCA.

Masden, E. A., Haydon, D. T., Fox, A. D. and Furness, R. W. (2010). 'Barriers to movement: Modelling energetic costs of avoiding marine wind farms amongst breeding seabirds'. Marine Pollution Bulletin, 60, 1085-1091.

Masden, E. A., Reeve, R., Desholm, M., Fox, A. D., Furness, R. W. and Haydon, D. T. (2012). 'Assessing the impact of marine wind farms on birds through movement modelling'. Journal of the Royal Society Interface, 9, 2120-2130.

Mendel, B., Schwemmer, P., Peschko, V., Müller, S., Schwemmer, H., Mercker, M. and Garthe, S. (2019). 'Operational offshore wind farms and associated ship traffic cause profound changes in distribution patterns of loons (*Gavia spp.*)'. Journal of Environmental Management 231, 429-438.

Minesto (2016). 'Deep Green Holyhead Deep Project Phase 1 Environmental Impact Assessment'.

Minister for Climate Change and Industry (2017). 'Clean Growth Strategy'. Available: [https://www.gov.uk/government/speeches/the-clean-growth-strategy], [Accessed: October 2019].

Ministry of Agriculture, Fisheries and Food (MAFF) (1991). 'Monitoring and surveillance of non-radioactive contaminants in the aquatic environment and activities regulating the disposal of wastes at sea, 1988 – 89'. Aquatic Environment Monitoring Report, MAFF Directorate of Fisheries Research, Lowestoft, 26, p 90.

Ministry of Housing, Communities and Local Government (2014). 'Planning Practice Guidance - Overarching principles on Travel Plans, Transport Assessments and Statements'. Available: [https://www.gov.uk/guidance/travel-plans-transport-assessments-and-statements].

Ministry of Housing, Communities and Local Government (2019). 'National Planning Policy Framework'. Available: [https://www.gov.uk/government/publications/national-planning-policy-framework--2], [Accessed: March 2019]

Monkman, G., Cambie, G., Hyder, K., Armstrong, M., Roberts, A. and Kaiser, M. J. (2015). 'Socioeconomic and Spatial Review of Sea Angling in Wales'. Fisheries and Conservation Report No. 52, Bangor University. pp. 176.

Musgrove, A. J., Aebischer, N. J., Eaton, M. A., Hearn, R. D., Newson, S. E., Noble, D. G., Parsons, M., Risely, K. and Stroud, D. A. (2013). 'Population estimates on birds in Great Britain and the United Kingdom'. British Birds, 106, 64–100.

National Trails (2020). Available: [https://www.nationaltrail.co.uk/].

National Grid (2003). 'The Horlock Rules'. Available: [https://www.nationalgrid.com/sites/default/files/documents/13796-The%20Horlock%20Rules.pdf], [Accessed February 2020].

Natural Resources Wales (NRW) (2015). 'National Seascape Assessment for Wales Evidence Report No: 80'.

Natural Resources Wales (NRW) (2018). 'NRW's Guidance for Pollution Protection - Works and maintenance in or near water, version 1.2'.

Natural Resources Wales (NRW) (2019a). 'GN030 Benthic habitat assessment guidance for marine developments and activities: Guidance for undertaking benthic marine habitat survey and monitoring'. NRW, Bangor.

Natural Resources Wales (NRW) (2019b). 'Seascape and visual sensitivity to offshore wind farms in Wales: Strategic assessment and guidance'. Available: [https://cdn.naturalresources.wales/media/689504/cym-evidence-report-315-seascape-and-visual-sensitivity-to-offshore-wind-farms-in-wales.pdf], [Accessed: February 2019].

Natural Resources Wales (NRW) (2020a). 'Interactive Maps - Landmap'. Available: [https://landmap-maps.naturalresources.wales/].

Natural Resources Wales (NRW) (2020b). 'Water Framework Directive (WFD) Coastal Waterbodies Cycle 2'. Available: [http://lle.gov.wales/catalogue/item/WaterFrameworkDirectiveCoastalWaterbodiesCycle2/?lang=en], [Accessed: January 2020].

Natural Resources Wales (NRW) and Welsh Local Government Association (2017). 'Updated Local Authority services and the water environment - Advice note on the Water Framework Directive'.

NIRAS (2017). 'Gwynt y Môr Yr 1 Post Construction Benthic Survey Technical Report, April 2017', report to Gwynt y Môr OWF Ltd.

Norman, D. L., Brown, J. M., Amoudry, L. O. and Souza, A. J. (2014). 'Processes controlling stratification in Liverpool Bay'. National Oceanographic Centre, internal document 10.

Normandeau, Exponent, Tricas, T. and Gill, A. (2011). 'Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species'. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region, Camarillo, CA. OCS Study BOEMRE 2011-09.

North Wales Combined Authority (2017). 'Air Quality Progress Report'.

North West and North Wales Coastal Group (2012). 'North West England and North Wales Shoreline Management Plan SMP2' (Halcrow Group Ltd.).

Norton, M. G., Jones, P. G. W., Franklin, A. and Rowlatt, S. M. (1984). 'Water quality studies around the sewage sludge dumping site in Liverpool Bay'. Estuarine and Coastal Shelf Science, Vol 19, pp 53–67.

NPower Renewables (2004). 'Gwynt y Môr Offshore Wind Farm, Final Environmental Assessment Scoping Report'.

NPower Renewables (2005). 'Gwynt y Mor Offshore Wind Farm Environmental Statement Volume 1 & 2'

NPower Renewables (2007). 'North Hoyle Offshore Windfarm, Annual FEPA Monitoring Report (2005-6)'.

Offshore Renewable Energy (ORE) Catapult (2017). 'Cost Reduction Monitoring Framework'.

OSPAR (The Convention for the Protection of the Marine Environment of the North-East Atlantic) (2005). '2005 Assessment of data collected under the Co-ordinated Environmental Monitoring Programme (CEMP)'. ISBN 1-904426-77-8. Available: [https://www.ospar.org/documents?v=7017], [Accessed: January 2020].

OSPAR (The Convention for the Protection of the Marine Environment of the North-East Atlantic) (2008a). 'Assessment of the environmental impact of offshore wind-farms'.

OSPAR (The Convention for the Protection of the Marine Environment of the North-East Atlantic) (2008b). 'OSPAR Guidance on Environmental Considerations for Offshore Wind Farm Development'. Reference number: 2008-3.

Pale Blue Dot Energy & Axis Well Technology (2016). 'Progressing Development of the UKs Strategic Carbon Dioxide Storage Resource: A summary of Results from the Strategic UK co2 Storage Appraisal Report'.

Palmer, M., Howard, T., Tinker, J., Lowe J.A., Bricheno L., Calvert D., Edwards T., Gregory J., Harris G.R., Krijnen J. and Roberts, C. (2018). 'UKCP18 Marine Report'.

Pantin, J.R., Murray, L. G., Hinz, H., Le Vay, L. and Kaiser, M. J. (2015). 'The Inshore Fisheries of Wales: a study based on fishers' ecological knowledge'. Fisheries & Conservation report No. 42, Bangor University. Pp: 60.

Paxton, C., Scott-Hayward, L., Mackenzie, M., Rexstad, E. and Thomas, L. (2016). 'Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resources'.

Pesante, G., Evans, P. G. H., Baines, M. E. and McMath, M. (2008). 'Abundance and Life History Parameters of Bottlenose Dolphin in Cardigan Bay: Monitoring 2005-2007'. CCW Marine Monitoring Report No: 61. 81pp.

Planning Inspectorate (PINS) (2012a). 'Scoping Opinion: Proposed East Anglia THREE Offshore'.

Planning Inspectorate (PINS) (2012b). 'Advice Note 9: Rochdale Envelope'. Available: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf], [Accessed: September 2019].

Planning Inspectorate (PINS) (2015a). 'Advice Note 17: Cumulative Effects Assessment relevant to nationally significant infrastructure projects'. Available: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf], [Accessed: October 2019].

Planning Inspectorate (PINS) (2015b). 'Advice Note 18: The Water Framework Directive'. Available: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/06/advice_note_18.pdf], [Accessed: January 2020].

Planning Inspectorate (PINS) (2016). 'Scoping Opinion: Proposed Norfolk Vanguard Offshore Wind Farm'.

Planning Inspectorate (PINS) (2017a). 'Advice Note 3: EIA consultation and notification (version 7)'. Available: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/07/advice_note_3_v5.pdf], [Accessed: January 2020].

Planning Inspectorate (PINS) (2017b). 'Advice Note 7: EIA: Process, Preliminary Environmental Information, and Environmental Statements'. Available: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/12/Advice-note-7.pdf], [Accessed February 2020].

Planning Inspectorate (PINS) (2018a). 'Advice Note 9: Using the Rochdale Envelope'. Available: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf], [Accessed: February 2020].

Planning Inspectorate (PINS) (2018b). 'Advice Note 12: Transboundary Impacts and Process'. Available: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/04/Advice-note-12v2.pdf], [Accessed: February 2020].

Planning Inspectorate (PINS) (2019). 'Advice Note 17: Cumulative effects assessment relevant to nationally significant infrastructure projects'. Available: [https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf], [Accessed: February 2020]

Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D., Bartol, S., Carlson, Th., Coombs, S., Ellison, W. T., Gentry, R., Hal vorsen, M. B., Lokkeborg, S., Rogers, P., Southall, B. L., Zeddies, D. G. and Tavolga, W. N. (2014). 'ASA S3/SC1. 4 TR-2014 Sound Exposure Guidelines for Fishes and Sea Turtles. A Technical Report Prepared by ANSI-Accredited Standards Committee S3/SC1 and Registered with ANSI', New York: Springer International Publishing, 33–51.

Preston, A., Jefferies, D.F., Dutton, J.W.R., Harvey, B.R. and Steele, A.K. (1972). 'British Isles coastal waters: The concentration of selected heavy metals in sea water, suspended matter and biological indicators – a pilot survey'. Environmental Pollution, Vol 3, pp 69 – 82.

Public Health Wales (2016). 'Radiation'. Available: [http://www.wales.nhs.uk/sitesplus/888/page/87301].

Pye, K. and Blott, S. J. (2017). 'Barkby Beach to Point of Ayr: Geomorphology Review'. Report to Flintshire Council and Denbighshire Council. KPAL Report 21009.

RenewableUK (2013). 'Cumulative Impact Assessment Guidelines - Guiding Principles for Cumulative Impact Assessment in Offshore Wind Farms'.

RenewableUK (2017). 'Report on Offshore Wind UK Content'.

Research Council of Norway (2012). 'Long-term Effects of Discharges to Sea from Petroleum-Related Activities. The Results of Ten Years of Research'. A sub-programme under the Ocean and Coastal Areas (Havkyst) programme, PROOFNY and the concluded PROOF research programme. ISBN 978-82-12-03027-5.

Rice, K.A. and Putwain, P.D. (1987). 'The Dee and Mersey Estuaries, Environmental Background', Environmental Advisory Group for Shell UK Ltd.

Robinson, R.A. (2005). 'Bird Facts: profiles of birds occurring in Britain and Ireland'. British Trust for Ornithology (BTO) Research Report 407, BTO, Thetford.

Robinson, S. P., Theobald, P. D., Hayman, G., Wang, L. S., Lepper, P. A., Humphrey, V. and Mumford, S. (2011). 'Measurement of underwater noise arising from marine aggregate dredging operations – MEPF report 09/P108'. Marine Aggregate Levy Sustainability Fund (MALSF).

Rogan, E., Breen, P., Mackey, M., Cañadas, A., Scheidat,M., Geelhoed, S. and Jessopp, M. (2018). 'Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2015-2017'. Department of Communications, Climate Action & Environment and National Parks and Wildlife Service (NPWS), Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland. 297pp.

Royal Haskoning DHV (2019). 'Morlais Project Environmental Statement: Chapter 12: Marine Mammals Vol.1. Applicant: Menter Môn Morlais Limited'. Document Reference: PB5034-ES-012. Version F3.0.

Royal Yachting Association (RYA) (2015). 'The RYA's Position on Offshore Energy Developments: Paper 1 – Wind Energy'. Southampton: RYA.

Royal Yachting Association (RYA) (2019). 'UK Coastal Atlas of Recreational Boating'. Available: [https://www.rya.org.uk/knowledge-advice/planning-environment/Pages/uk-coastal-atlas-of-recreational-boating.aspx].

Rudland, D. J., Lancefield, R. M., Mayell, P.N (2001). 'Contaminated Land Risk Assessment: A Guide to Good Practice (C552)', CIRIA, 2001.

Russell, D. J., Brasseur, S. M., Thompson, D., Hastie, G. D., Janik, V. M., Aarts, G., McClintock, B. T., Matthiopoulos, J., Moss, S. E. and McConnell, B. (2014). 'Marine mammals trace anthropogenic structures at sea'. Current Biology 24: R638-R639.

Russell, D. J., Jones, E. and Morris, C. (2017). 'Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals'. Scottish Marine and Freshwater Science Vol 8, No 25.

RWE (2003). 'North Hoyle Offshore Wind Farm Environmental Statement'.

RWE (2005). 'Gwynt y Môr Offshore Wind Farm - Coastal Process Study'.

Scheidat, M., Tougaard, J., Brasseur, S., Carstensen, J., van Polanen Petel, T. Teilmann, J. and Reijnders, P. (2011). 'Harbour porpoises (*Phocoena phocoena*) and wind farms: a case study in the Dutch North Sea'. Environmental Research Letters 6:1-10.

Scottish Natural Heritage (SNH) (2003). 'Best Practice Guidance - Badger Surveys', Inverness Badger Survey 2003, Commissioned Report No. 096.

Scottish Natural Heritage (SNH) (2017). 'Visual Representation of Wind Farms, Version 2.2'.

Seafish (2012). 'Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments'. Available: [http://www.seafish.org/media/634910/ukfen%20ia%20best%20practice%20guidance.pdf], [Accessed: November 2019]

SeaScape Energy (2002). 'Burbo Bank Offshore Wind Farm Environmental Statement'.

Southall, B., Finneran, J. J., Reichmuth, C., Nachtigall, P. E., Ketten, D. R., Bowles, A. E., Ellison, W. T., Nowacek, D. and Tyack, P. (2019). 'Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects'. Aquatic Mammals 45:125-232.

Speakman, J., Gray, H. and Furness, L. (2009). 'University of Aberdeen report on effects of offshore wind farms on the energy demands of seabirds'. Report to the Department of Energy and Climate Change (DECC).

Special Committee on Seals (SCOS) (2019). 'Scientific Advice on Matters Related to the Management of Seal Populations: 2018'.

StatsWales, Welsh Government (2019a). 'Annual Population Survey / Local Labour Force Survey: Summary of economic activity'. Available: [https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Persons-Employed/employmentrate-by-welshlocalarea-year-gender], [Accessed: December 2019].

StatsWales, Welsh Government (2019b). 'Mid-year population estimates (1991 onwards), by Welsh local authorities, English regions and UK countries, for single year of age and gender'. Available: [https://statswales.gov.wales/Catalogue/Population-and-Migration/Population/Estimates/Local-Authority/populationestimates-by-localauthority-year], [Accessed: December 2019].

StatsWales, Welsh Government, (2019c). 'Annual Population Survey / Local Labour Force Survey: Summary of economic activity'. Available: [https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Unemployment/ILO-Unemployment/ilounemploymentrates-by-welshlocalareas-year].

Statutory Nature Conservation Bodies (SNCBs) (2017). 'Joint SNCB Interim Displacement Advice Note. Advice on how to present assessment information on the extent and potential consequences of seabird displacement from offshore wind farm (OWF) developments'.

Stern Report (2006). 'The Stern Review on the Economics of Climate Change, 2006'.

Stienen, E.W., Waeyenberge, V., Kuijken, E. and Seys, J. (2007). 'Trapped within the corridor of the southern North Sea: the potential impact of offshore wind farms on seabirds'. In Birds and Wind farms. de Lucas, M., Janss, G.F.E. and Ferrer, M. (Eds). Quercus, Madrid.

Stone, C.J. Webb, A., Barton, C., Ratcliffe, N., Reed, T.C., Tasker, M.L., Camphuysen, C.J. and Pienkowski, M.W. (1995). 'An atlas of seabird distribution in north-west European waters'. JNCC, Peterborough.

Stringell, T. B., Millar, C. P., Sanderson, W. G., Westcott, S. M. and McMath, M. J. (2014). 'When aerial surveys will not do: grey seal pup production in cryptic habitats of Wales'. Journal of the Marine Biological Association of the United Kingdom:1-5.

Summary Report to the Offshore Wind Programme Board. (2016). Available: [http://crmfreport.com/], [Accessed: November 2019].

Sustrans (2020). 'cycle route information'. Available: [https://www.sustrans.org.uk/].

Teilmann, J., Tougaard, J. and Carstensen, J. (2006a). 'Summary on harbour porpoise monitoring 1999-2006 around Nysted and Horns Rev Offshore Wind Farms'.

Teilmann, J., Tougaard, J., Cartensen, J., Dietz, R. and Tougaard, S. (2006b). 'Summary on seal monitoring 1999-2005 around Nysted and Horns Rev Offshore Wind Farms'.

Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A. S. C. P., Roos, S., Bolton, M., Langston, R. H. W. and Burton, N. H. K. (2012). 'Seabird foraging ranges as a preliminary tool for identifying Marine Protected Areas. Biological Conservation, 156, 53-61.

The Crown Estate (TCE) (2010). 'Model Clauses for Archaeological Written Schemes of Investigation', Wessex Archaeology.

The Crown Estate (TCE) (2012). 'UK Fisheries Information Project (UKFIM) mapping'.

The Crown Estate (TCE) (2014). 'Protocol for Archaeological Discoveries: Offshore Renewables Project', Wessex Archaeology. Prepared by Wessex Archaeology for The Crown Estate. Available: [https://www.wessexarch.co.uk/sites/default/files/field_file/2_Protocol%20For%20Archaeological%20Discoveries.pdf], [Accessed: November 2019].

The Crown Estate (TCE) (2019a). 'Cable Route Protocol'. Available: [http://marinedataexchange.co.uk/search?q=#fq=fq%3DDeveloperName%253A(%2522Habitats%2520Regulations%2520Assessment%2520(HRA)%2522)], [Accessed: February 2019]

The Crown Estate (TCE) (2019b). 'Cumulative Effects Assessment Tool – Scoping Study'. Final Report by NIRAS Consulting Ltd.

The Crown Estate (TCE) (2019c). 'OWF Extensions Plan-level Habitats Regulations Assessment. Report to Inform an Appropriate Assessment 38255_NIRAS_REP_014 V3.5'.

The Crown Estate (TCE) (2019d). 'Plan-level Habitats Regulations Assessment For The 2017 Offshore Wind Farm extensions, Cable Route Protocol'. Available: [http://marinedataexchange.co.uk/ItemDetails.aspx?id=11338].

The Inter-Agency Marine Mammal Working Group (IAMMWG) (2015). 'Management Units for cetaceans in UK waters'. JNCC Report 547, ISSN 0963-8091.

The National Grid Company (2003). NGC Substations and the environment: guidelines on siting and design. Available: [https://www.nationalgrid.com/sites/default/files/documents/13796-The%20Horlock%20Rules.pdf].

The Stationery Office (TSO) (2009a). 'The Carbon Budgets Order 2009'. Available: [http://www.legislation.gov.uk/uksi/2009/1259/contents/made], [Accessed: October 2019].

The Stationery Office (TSO) (2009b). 'The UK Renewable Energy Strategy'. Available: [https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228866/7686.pdf], [Accessed: October 2019].

The Stationery Office (TSO) (2011). 'The Carbon Budgets Order 2011'. Available: [http://www.legislation.gov.uk/uksi/2011/1603/made], [Accessed: October 2019].

The Stationery Office (TSO) (2016), 'The Carbon Budgets Order 2016'. Available: [http://www.legislation.gov.uk/uksi/2016/785/made], [Accessed: October 2019].

The Working Group on Noise from Wind Turbines (1996). 'The Assessment and Rating of Noise from Wind Farms', ETSU Report for the DTI, ETSU-R-97.

UK Energy Research Centre (2018). 'The Security of UK Energy Futures'. Available: [http://www.ukerc.ac.uk/publications/uk-energy-security.html].

UK Habitat Classification Working Group (2018). 'UK Habitat Classification User Manual'. Available: [http://ecountability.co.uk/ukhabworkinggroup-ukhab], [Accessed: December 2019].

United Kingdom Hydrographic Office (UKHO) (2011). 'NP37 Admiralty Sailing Directions West Coasts of England and Wales Pilot Book 18th Edition'. Taunton: UKHO.

United Kingdom Hydrographic Office (UKHO) (2019). 'Admiralty Marine Data Portal'. Available: [https://www.gov.uk/guidance/inspire-portal-and-medin-bathymetry-data-archive-centre], [Accessed: Dec 2019].

Visit Wales (2018). 'Accommodation Occupancy Survey Annual Report 2018'.

Waggitt, J. J., Evans, P. G. H., Andrade, J., Banks, A. N., Boisseau, O., Bolton, M., Bradbury, G., Brereton, T., Camphuysen, C. J., Durinck, J., Felce, J., Fijn, R. C., Garcia-Baron, I., Garthe, S., Geelhoed, S. C. V., Gilles, A., Goodall, M., Haelters, J., Hamilton, S., Hartny-Mills, L., Hodgins, N., James, K., Jessopp, M., Kavanagh, A. S., Leopold, M., Lohrengel, K., Louzao, M., Markones, N., Martinez-Cediera, J., O'Cadhla, O., Perry, S. L., Pierce, G. J., Ridoux, V., Robinson, K. P., Santos, M. B., Saavedra, C., Skov, H., Stienen, E. W. M., Sveegaard, S., Thompson, P., Vanermen, N., Wall, D., Webb, A., Wilson, J., Wanless, S. and Hiddink, J. G. (2019). 'Distribution maps of cetacean and seabird populations in the North-East Atlantic. Journal of Applied Ecology'.

Welsh Government (2006). 'Environmental Protection, Wales. The Contaminated Land (Wales) Regulations (2006)'.

Welsh Government (2016). 'Planning Policy Wales, Edition 10'.

Welsh Government (2017). 'Technical Advice Notice 24: The Historic Environment'.

Welsh Government (2018a). 'Energy Generation in Wales'. Available: [https://gov.wales/sites/default/files/publications/2019-10/energy-generation-in-wales-2018.pdf], [Accessed: February 2020].

Welsh Government (2018b). 'Planning Policy Wales version 10 (Chapter 6 The Historic Environment p123-8'.

Welsh Government (2019a). 'Gross Value Added by Measure'.

Welsh Government (2019b). 'Summary Statistics for Welsh Economic Regions: North Wales'.

Welsh Government (2019c). 'Welsh National Marine Plan'.

Welsh Government and Natural Resources Wales (NRW) (2020), 'Lle Geo-Portal, Lle – Map Browser'. Available: [http://lle.gov.wales/map], [Accessed: January 2020]

Wernham, C.V., Toms, M.P., Marchant, J.H., Clark, J.A., Siriwardena, G.M. and Baillie, S.R. (eds). (2002). 'The Migration Atlas: Movements of the birds of Britain and Ireland'. T. and A.D. Poyser, London.

Wessex Archaeology (WA) (2005). 'Liverpool Bay Pilot Area (England's Historic Seascapes)', Wessex Archaeology.

Wessex Archaeology (WA) (2012). 'Gwynt y Môr Offshore Windfarm: Archaeological Assessment of Geophysical Data', Report No. 70061.01.

Wessex Archaeology (WA) and NPower Renewables (2005). 'Gwynt y Môr Offshore Wind Farm- Environmental Statement, Gifford November 2005 Gwynt Y Mor-Offshore Wind Farm- Cultural Heritage Technical Report'.

Westcott, S. and Stringell, T. (2004). 'Grey seal distribution and abundance in North Wales, 2002-2003'. Countryside Council for Wales (CCW).

Whalley, C., Rowlatt, S., Bennet, M. and Lavell. D. (1999). 'Total Arsenic in Sediments from the Western North Sea and the Humber Estuary'. Marine Pollution Bulletin, 38, (5), pp. 394-400.

Wilhelmsson, D., Malm, T. and Ohman, M.C. (2006). 'The influence of offshore windpower on demersal fish'. ICES Journal of Marine Science, 63: 775-784.

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 Report of work carried out by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate'. British Trust for Ornithology (BTO) Research Report No. 724. BTO, Thetford.

World Health Organisation (WHO) (2018). 'Environmental Noise Guidelines for the European Region – Guideline Values for Community Noise in Specific Environments'.

Wright, L. J., Ross-Smith, V. H., Massimino, D., Dadam, D., Cook, A. S. C. P. and Burton, N. H. K. (2012). 'Assessing the risk of offshore windfarm development to migratory birds designated as features of UK Special Protection Areas (and other Annex I species)'. Strategic Ornithological Support Services. Project SOSS-05. British Trust for Ornithology (BTO) Research Report No. 592.