



# Morecambe Offshore Windfarm: Generation Assets Environmental Statement

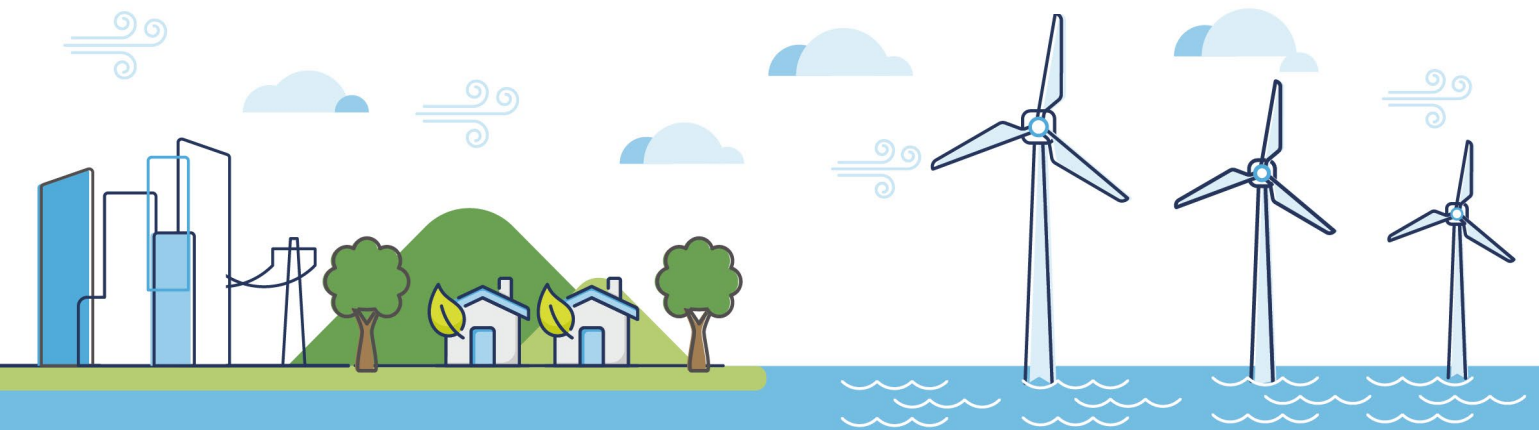
## Volume 5

## Chapter 10 Fish and Shellfish Ecology Figures

PINS Document Reference: 5.3.10

APFP Regulation: 5(2)(a)

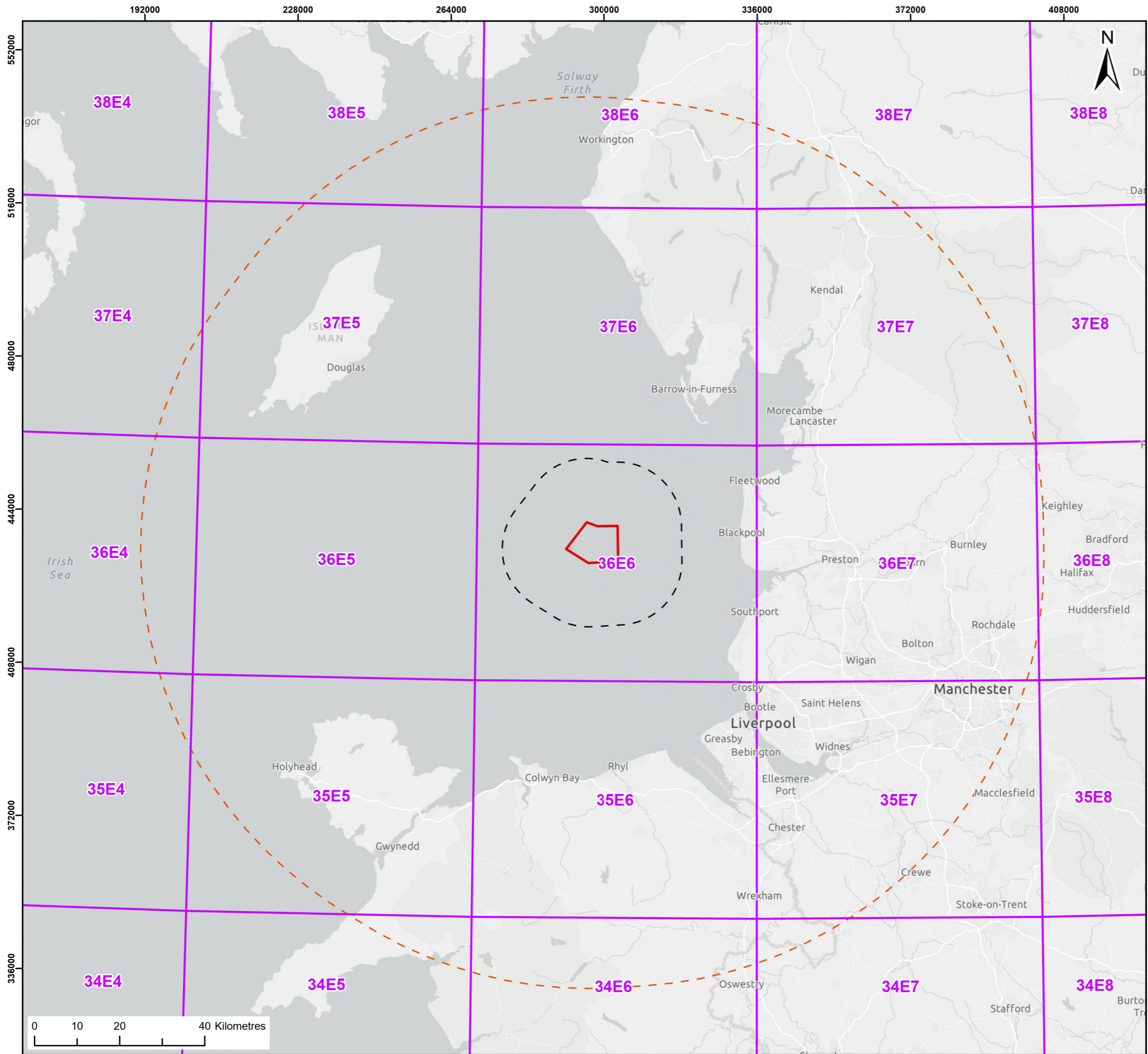
Rev 02



## Document History

<b>Doc No</b>	MOR001-FLO-CON-ENV-FIG-1100	<b>Rev</b>	02
<b>Alt Doc No</b>	PC1165-RHD-ES-XX-DG-Z-0010		
<b>Document Status</b>	Approved for Use	<b>Doc Date</b>	October 2024
<b>PINS Doc Ref</b>	5.3.10	<b>APFP Ref</b>	5(2)(a)

Rev	Date	Doc Status	Originator	Reviewer	Approver	Modifications
01	May 2024	Approved for Use	Royal HaskoningDHV	Morecambe Offshore Windfarm Ltd	Morecambe Offshore Windfarm Ltd	n/a
02	October 2024	Approved for Use	Royal HaskoningDHV	Morecambe Offshore Windfarm Ltd	Morecambe Offshore Windfarm Ltd	Updated Figure 10.6 and new Figure 10.10 following comments from Natural England & The Planning Inspectorate



**Legend:**

- Morecambe Offshore Windfarm Site
- ICES Rectangles
- 15km Potential Zone of Influence (ZOI)
- 100km Potential Zone of Influence (ZOI)

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**Report:**  
**Morecambe Offshore Windfarm: Generation Assets Environmental Statement**

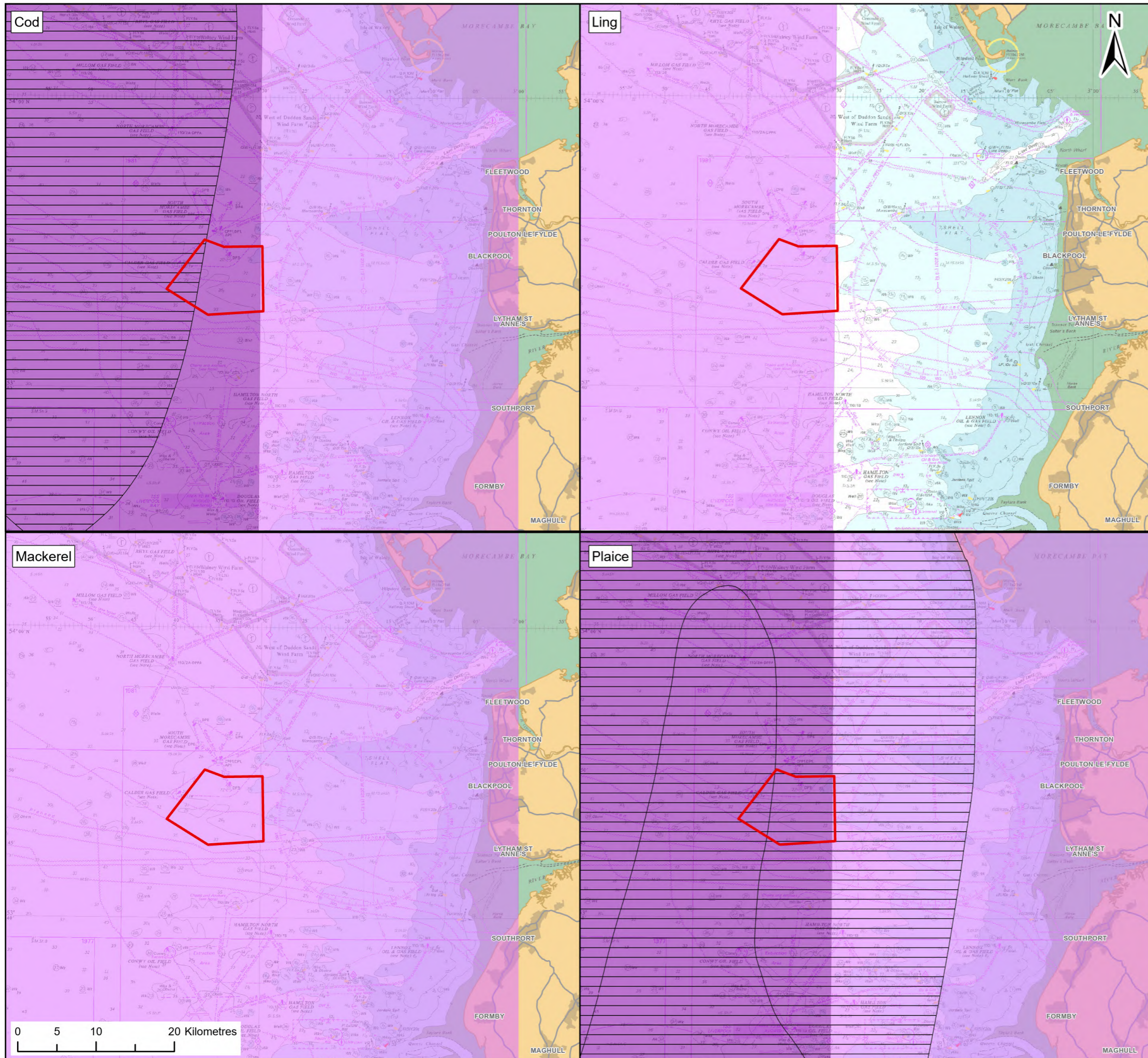
**Title:**  
**Morecambe Offshore Windfarm Site location and ICES Rectangles**

**Figure:** 10.1      **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0034

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	12/07/2023	JT	GC	A3	1:900,000
P02	27/03/2024	JH	SB	A3	1:900,000

**Co-ordinate system:** WGS 1984 UTM Zone 30N





**Legend:**

- Morecambe Offshore Windfarm Site
- Spawning grounds (Coul et al, 1998)

**Spawning grounds (Ellis et al, 2010)**

**Intensity**

- High
- Low

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Environmental Statement

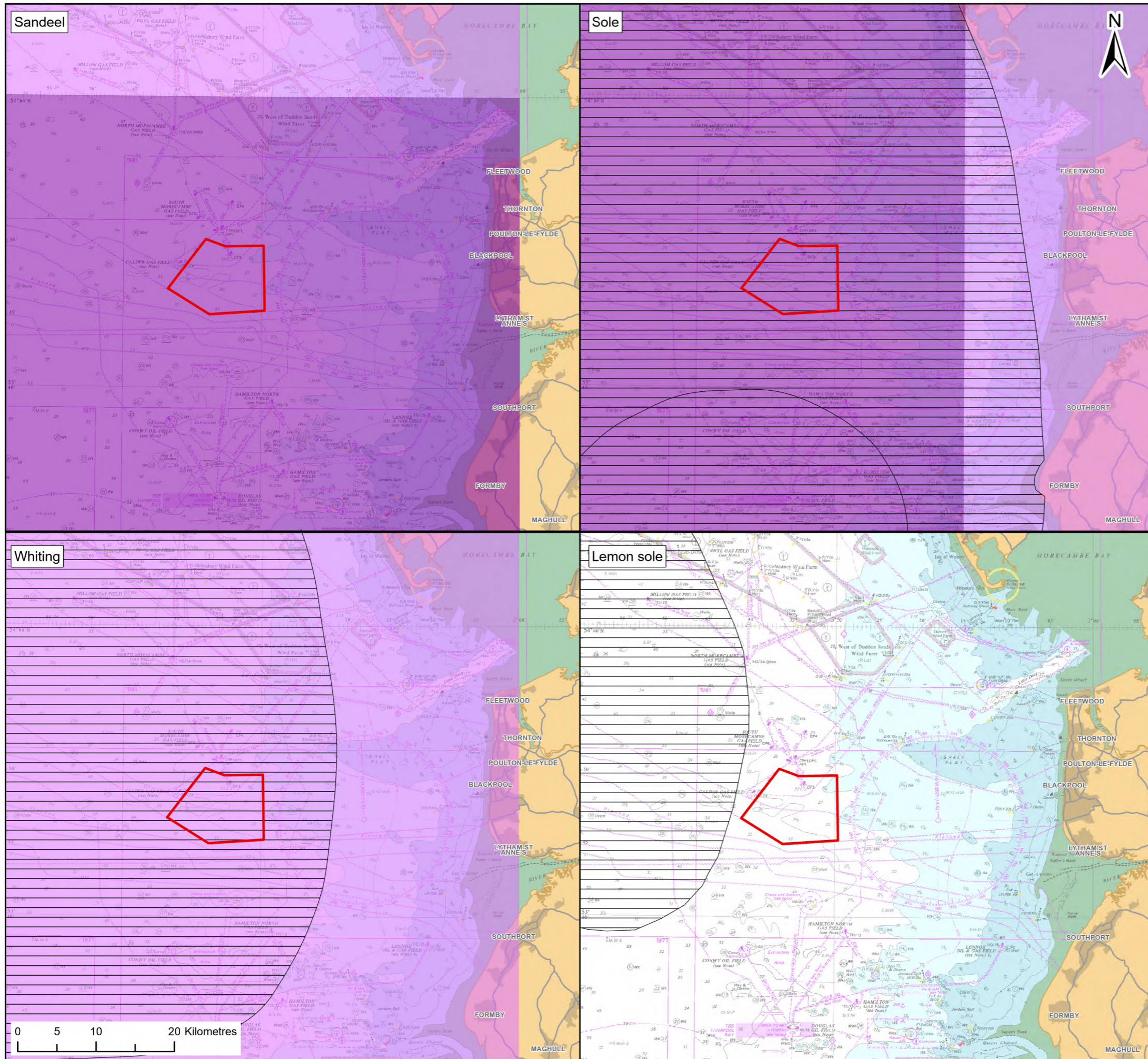
**Title:**  
Spawning grounds overlapping  
the Fish and Shellfish Ecology Study Area

**Figure:** 10.2a      **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0035

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	12/07/2023	JT	GC	A3	1:500,000
P02	27/03/2024	JH	SB	A3	1:500,000

Co-ordinate system: WGS 1984 UTM Zone 30N





**Legend:**

- Morecambe Offshore Windfarm Site
- Spawning grounds (Coul et al, 1998)

**Spawning grounds (Ellis et al, 2010)**

**Intensity**

- High
- Low

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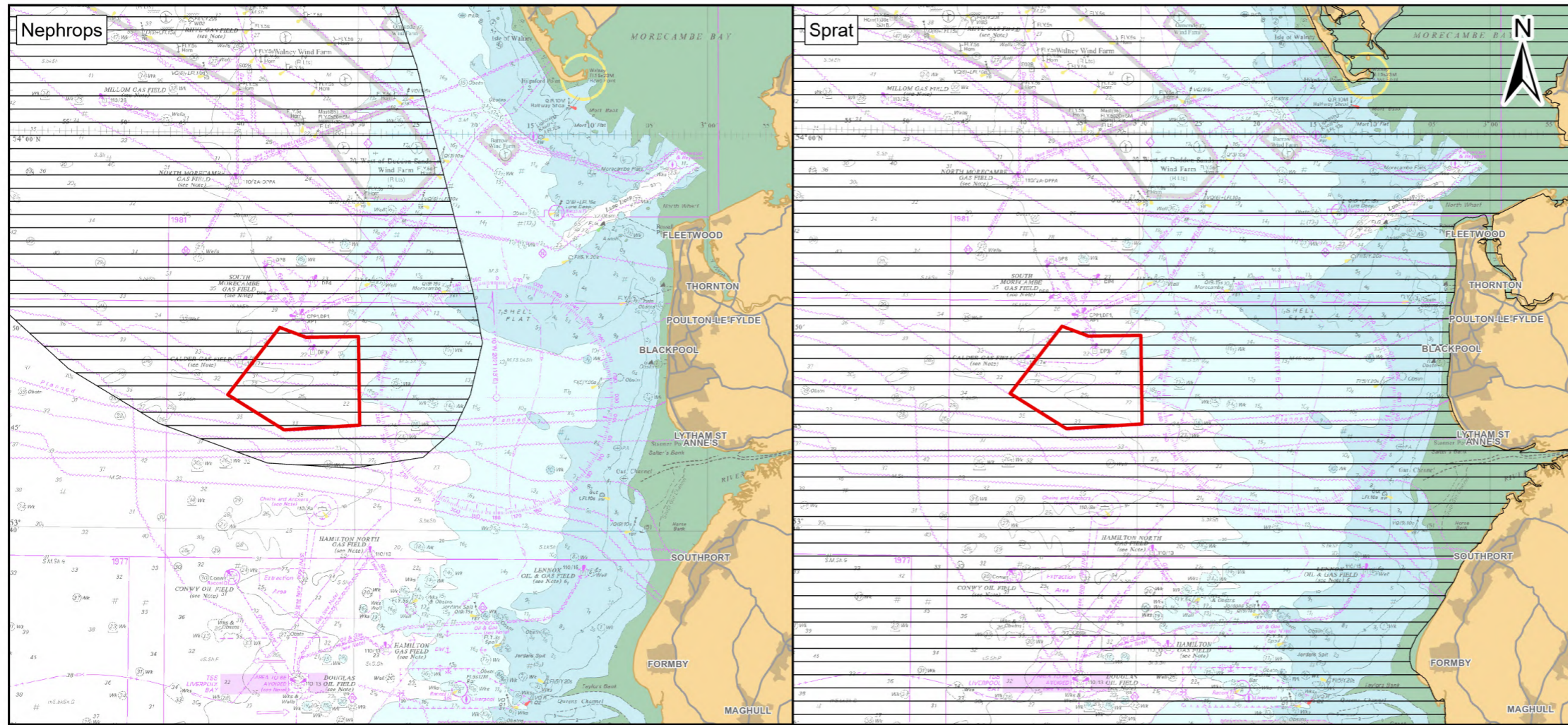
**Title:**  
Spawning grounds overlapping the Fish and Shellfish Ecology Study Area

**Figure:** 10.2b      **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0035

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P02	27/03/2024	JH	SB	A3	1:500,000

Co-ordinate system: WGS 1984 UTM Zone 30N





Legend:

- Morecambe Offshore Windfarm Site
- Spawning grounds (Coul et al, 1998)

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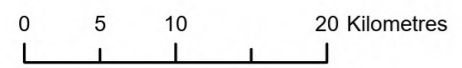
Report:  
Morecambe Offshore Windfarm: Generation Assets  
Environmental Statement

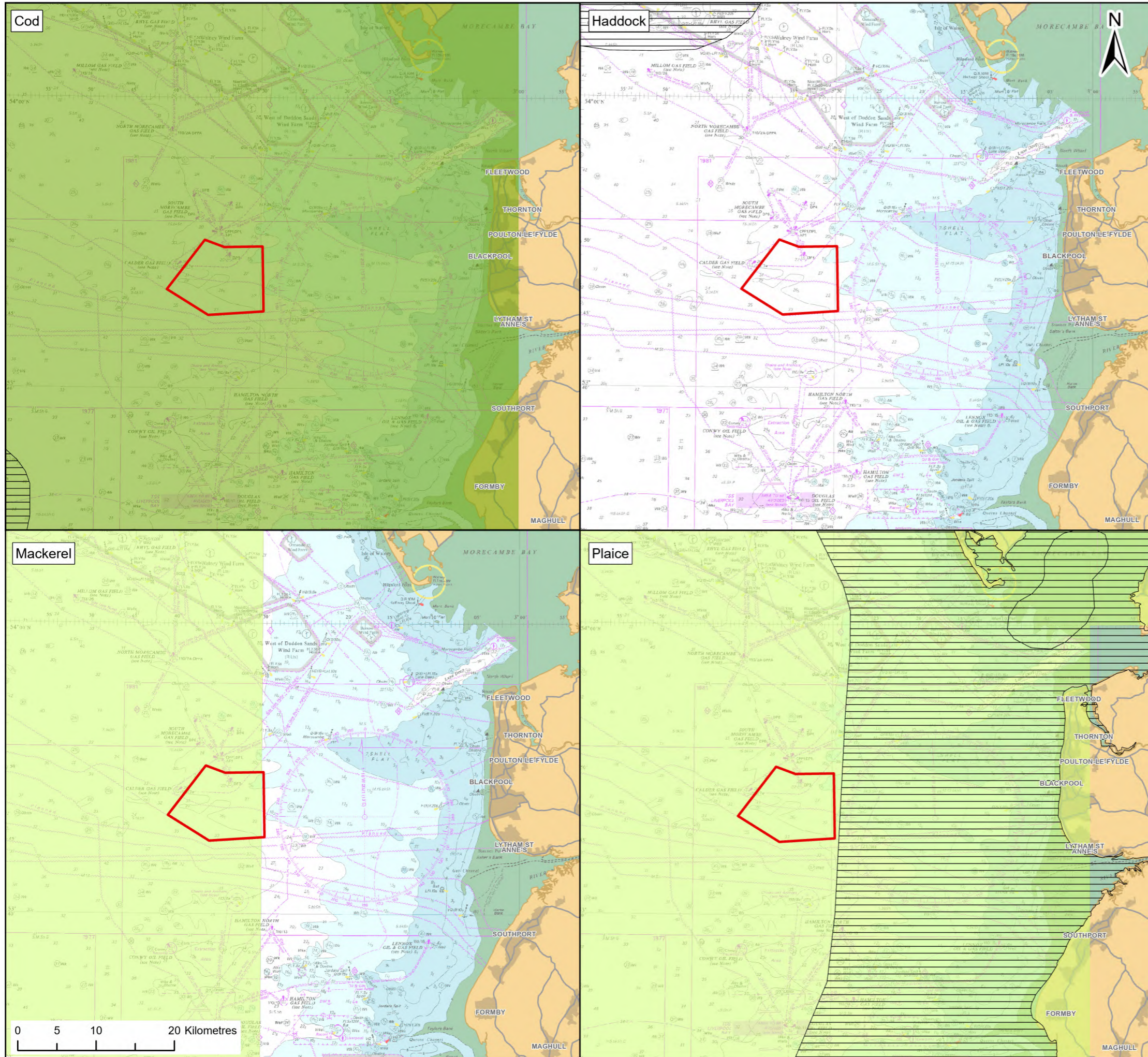
Title:  
Spawning grounds overlapping  
the Fish and Shellfish Ecology Study Area

Figure: 10.2c      Drawing No: PC1165-RHD-ES-OF-DR-Z-0035

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	12/07/2023	JT	GC	A3	1:500,000
P02	27/03/2024	JH	SB	A3	1:500,000

Co-ordinate system: WGS 1984 UTM Zone 30N





**Legend:**

- Morecambe Offshore Windfarm Site
- Nursery grounds (Coul et al, 1998)

**Nursery grounds (Ellis et al, 2010)**

**Intensity**

- High
- Low

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**Report:**  
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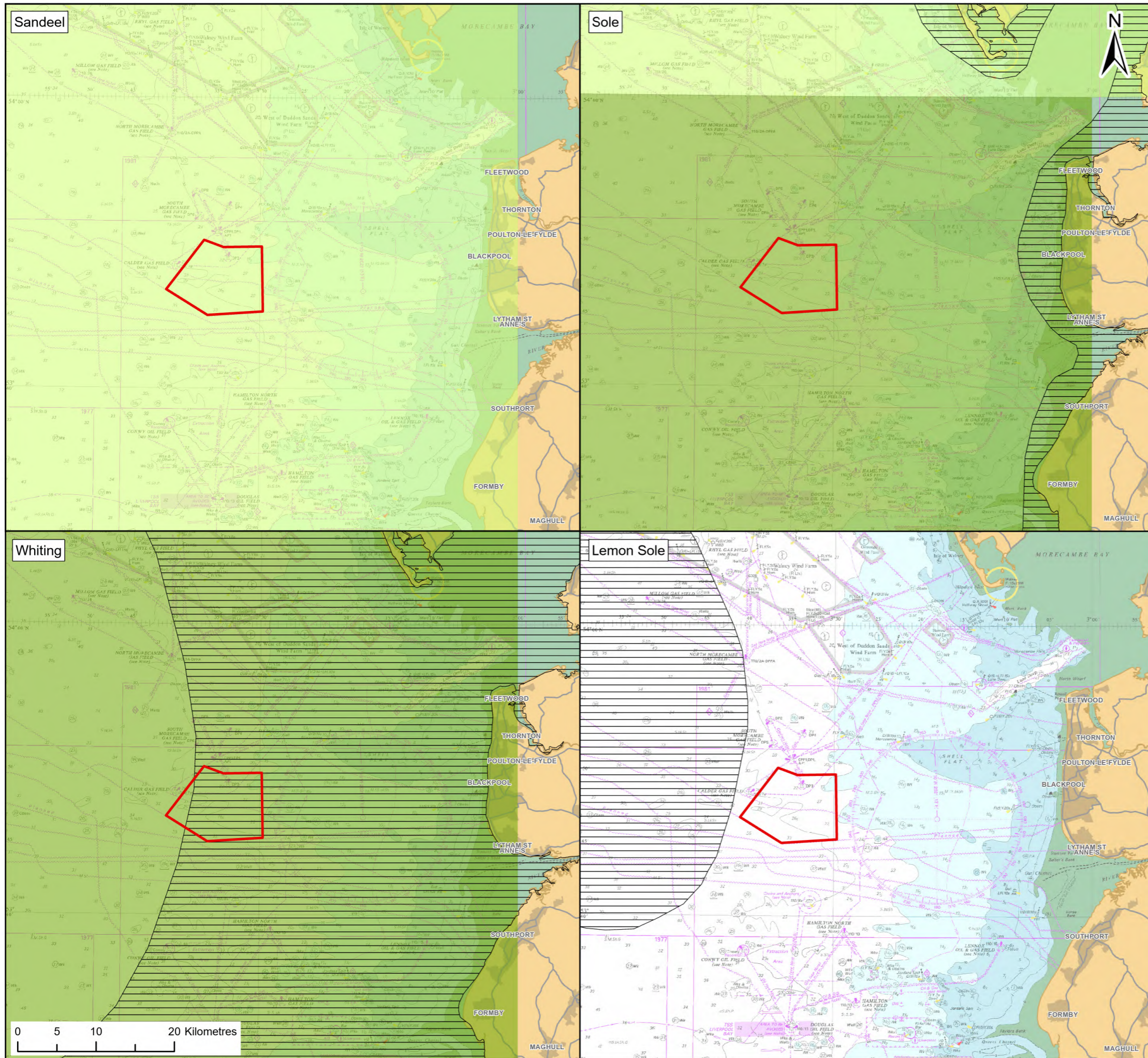
**Title:**  
Nursery grounds overlapping  
the Fish and Shellfish Ecology Study Area

**Figure:** 10.3a      **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0036

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P01	12/07/2023	JT	GC	A3	1:500,000
P02	28/03/2024	JH	SB	A3	1:500,000

Co-ordinate system: WGS 1984 UTM Zone 30N





**Legend:**

- Morecambe Offshore Windfarm Site
- Nursery grounds (*Coull et al, 1998*)

**Nursery grounds (*Ellis et al, 2010*)**

**Intensity**

- High
- Low

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**Report:**  
Morecambe Offshore Windfarm: Generation Assets  
Environmental Statement

**Title:**  
Nursery grounds overlapping  
the Fish and Shellfish Ecology Study Area

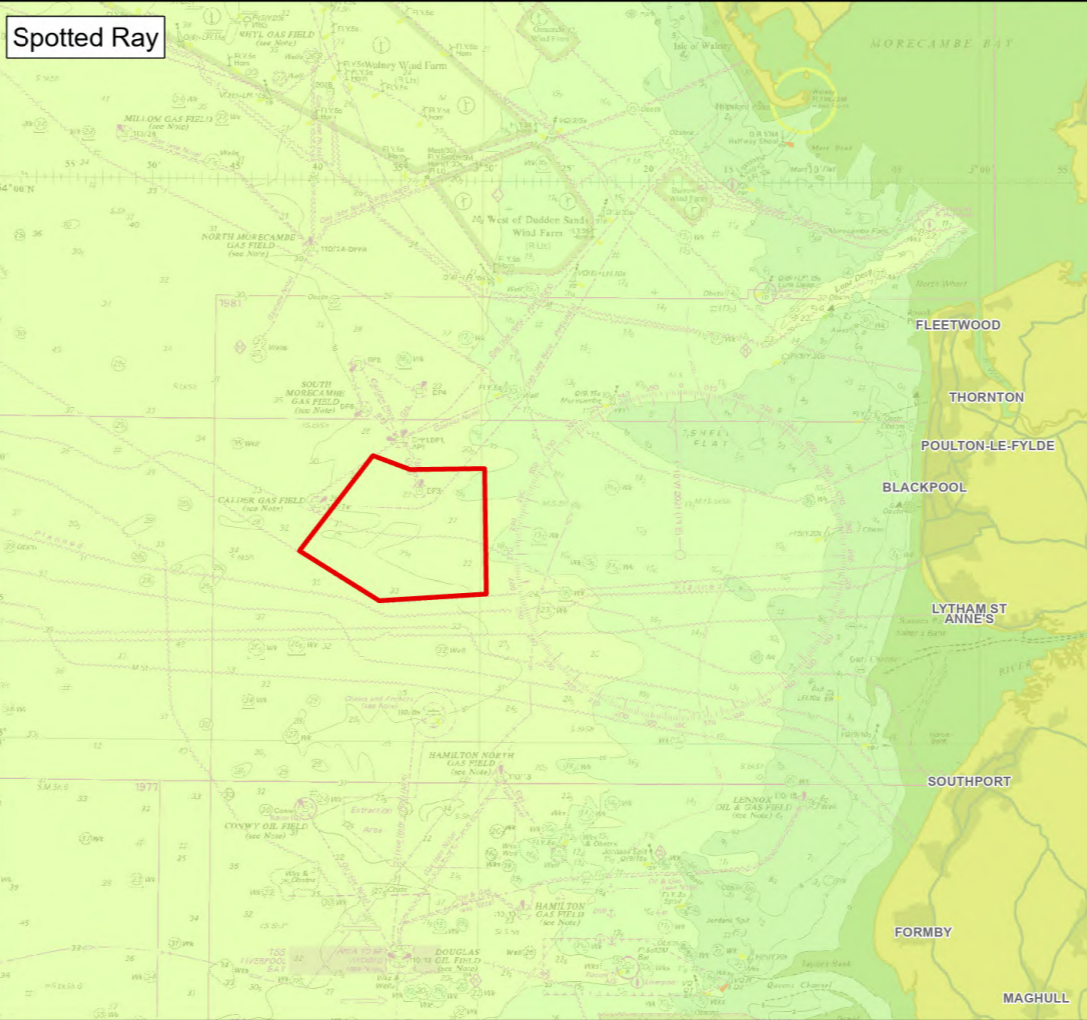
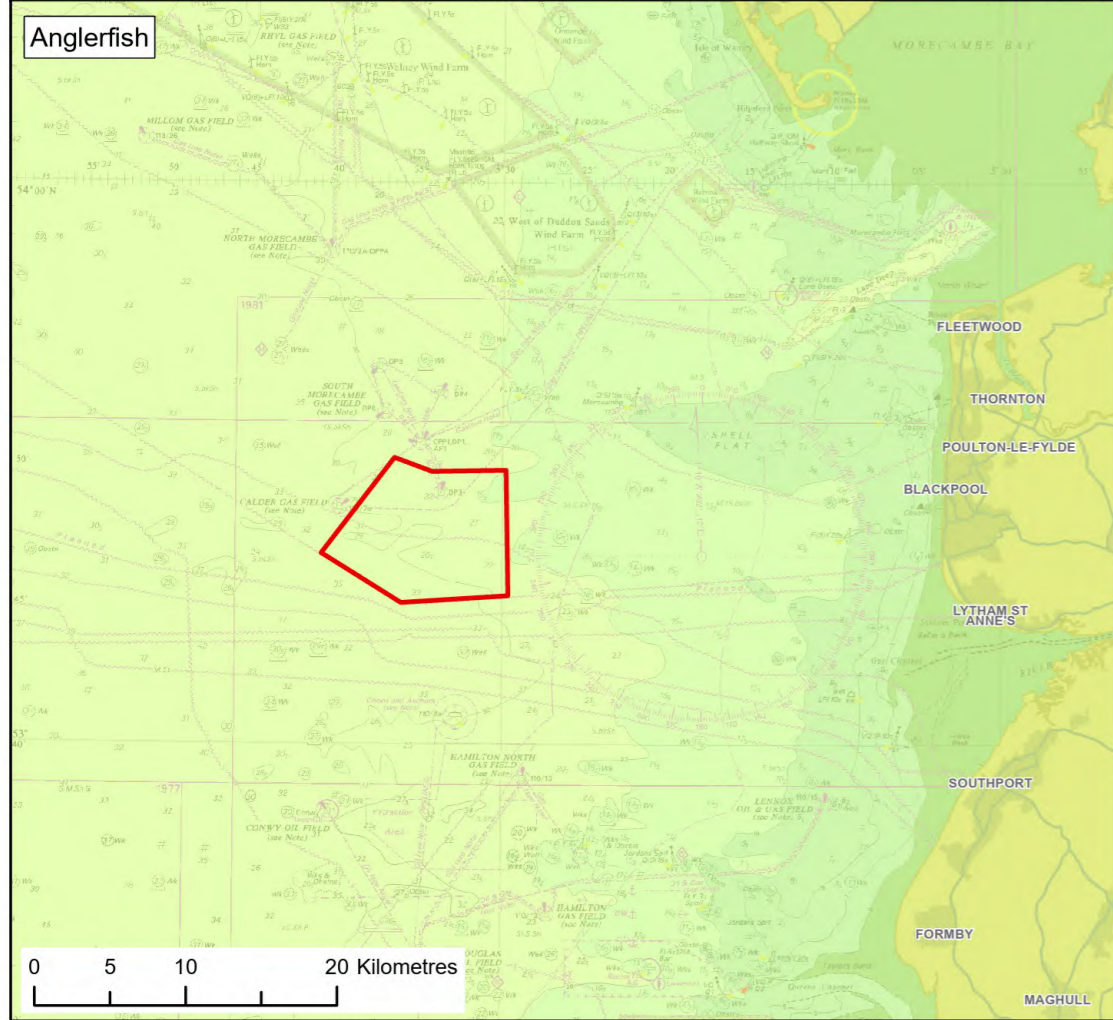
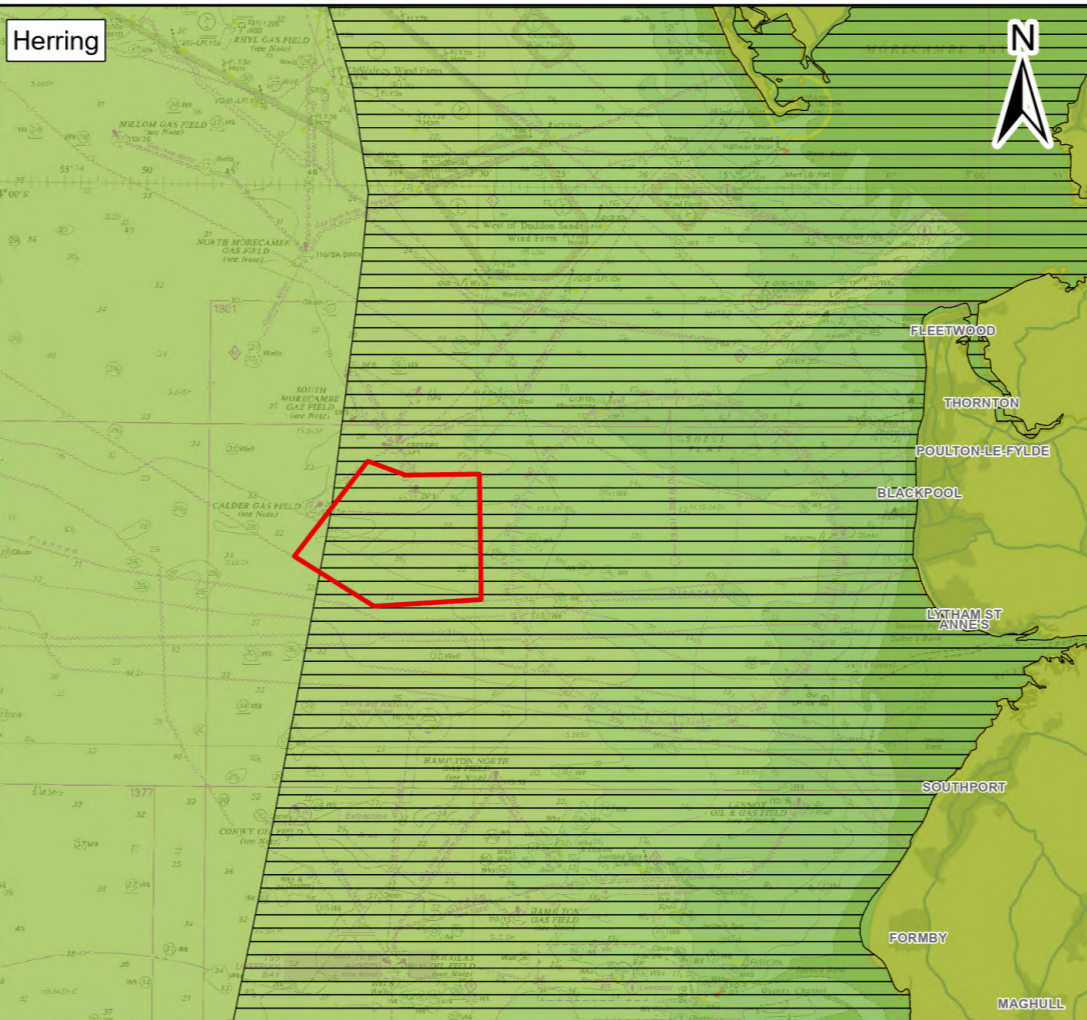
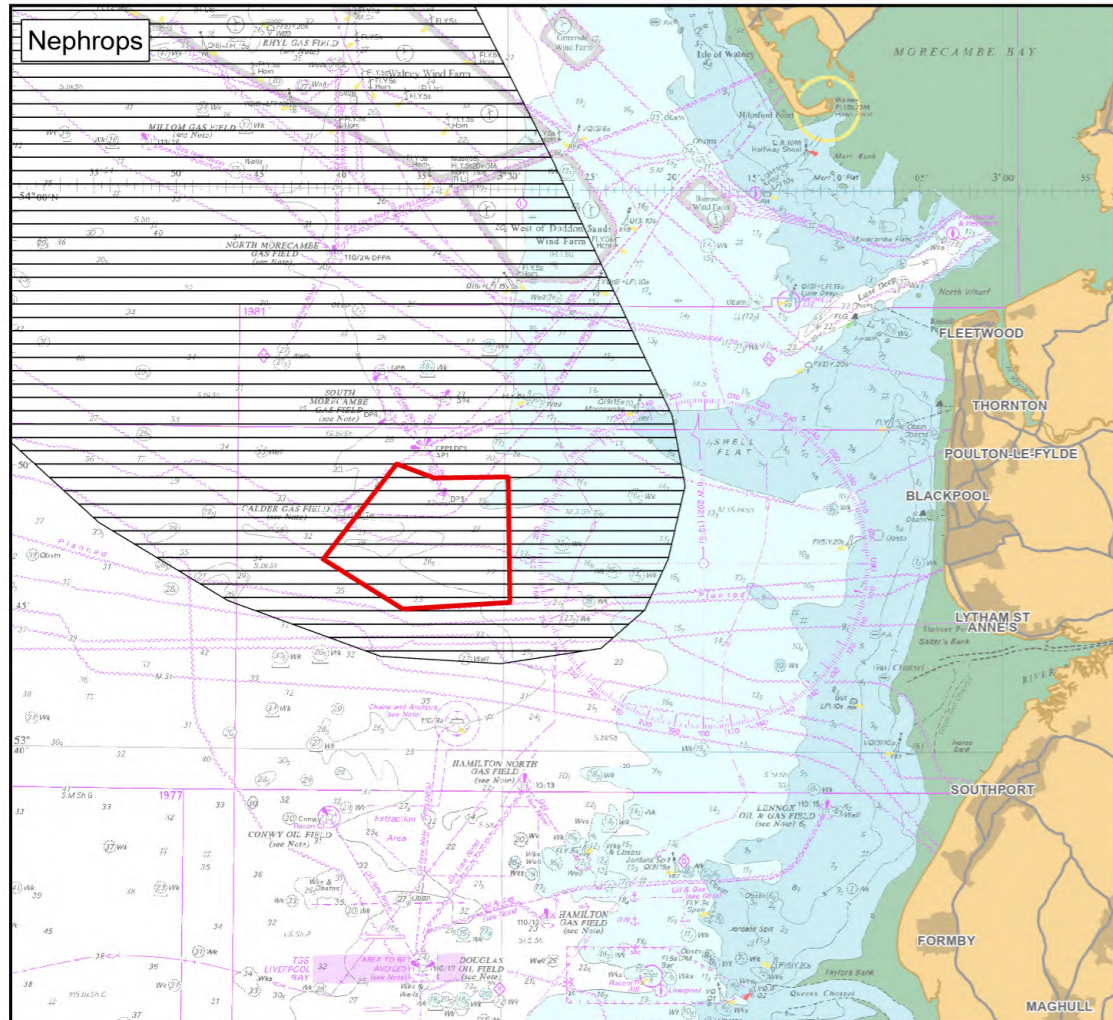
**Figure:** 10.3b     **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0036

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P02	28/03/2024	JH	SB	A3	1:500,000

Co-ordinate system: WGS 1984 UTM Zone 30N







Legend:

Morecambe Offshore Windfarm Site

Nursery grounds (Coul et al, 1998)

**Nursery grounds (Ellis et al, 2010)**

**Intensity**

High

Low

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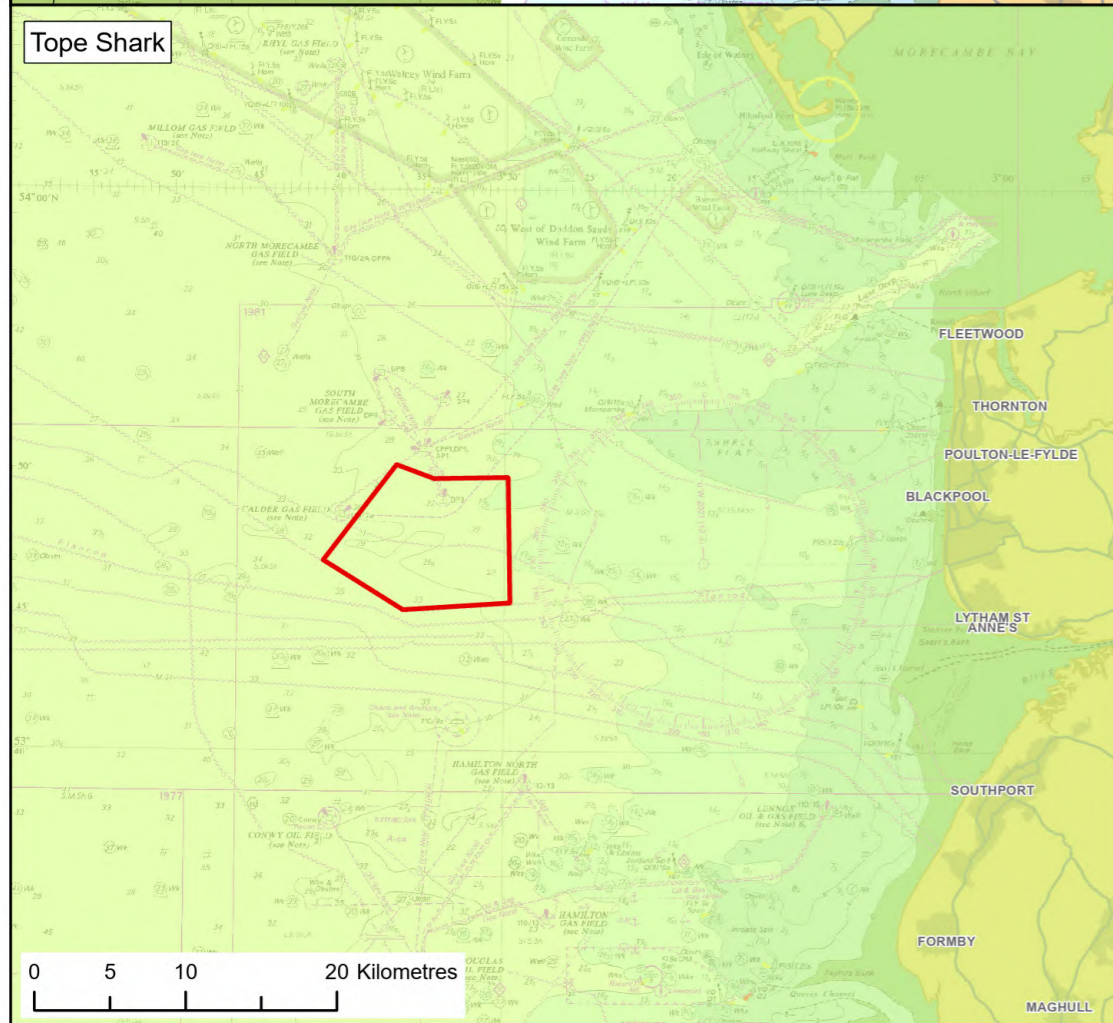
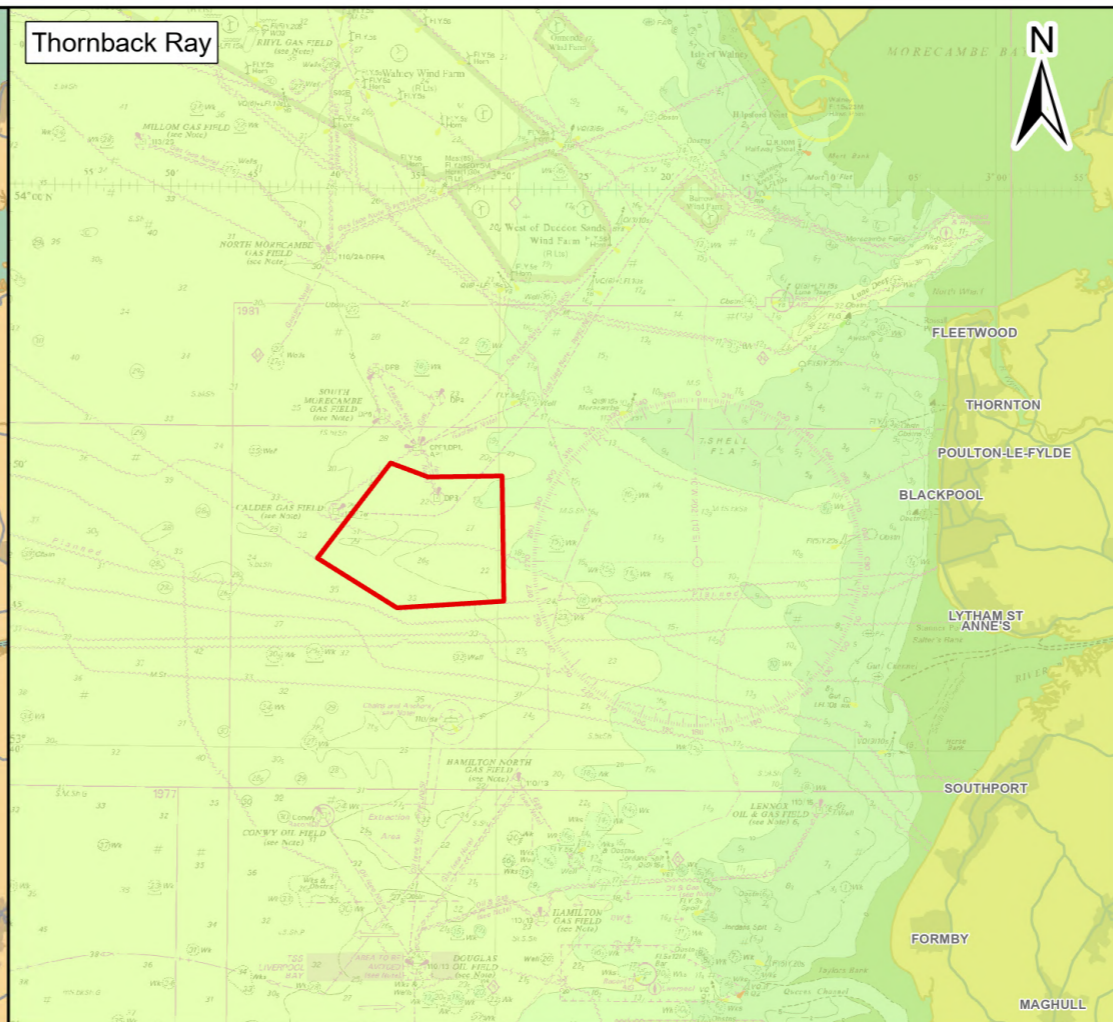
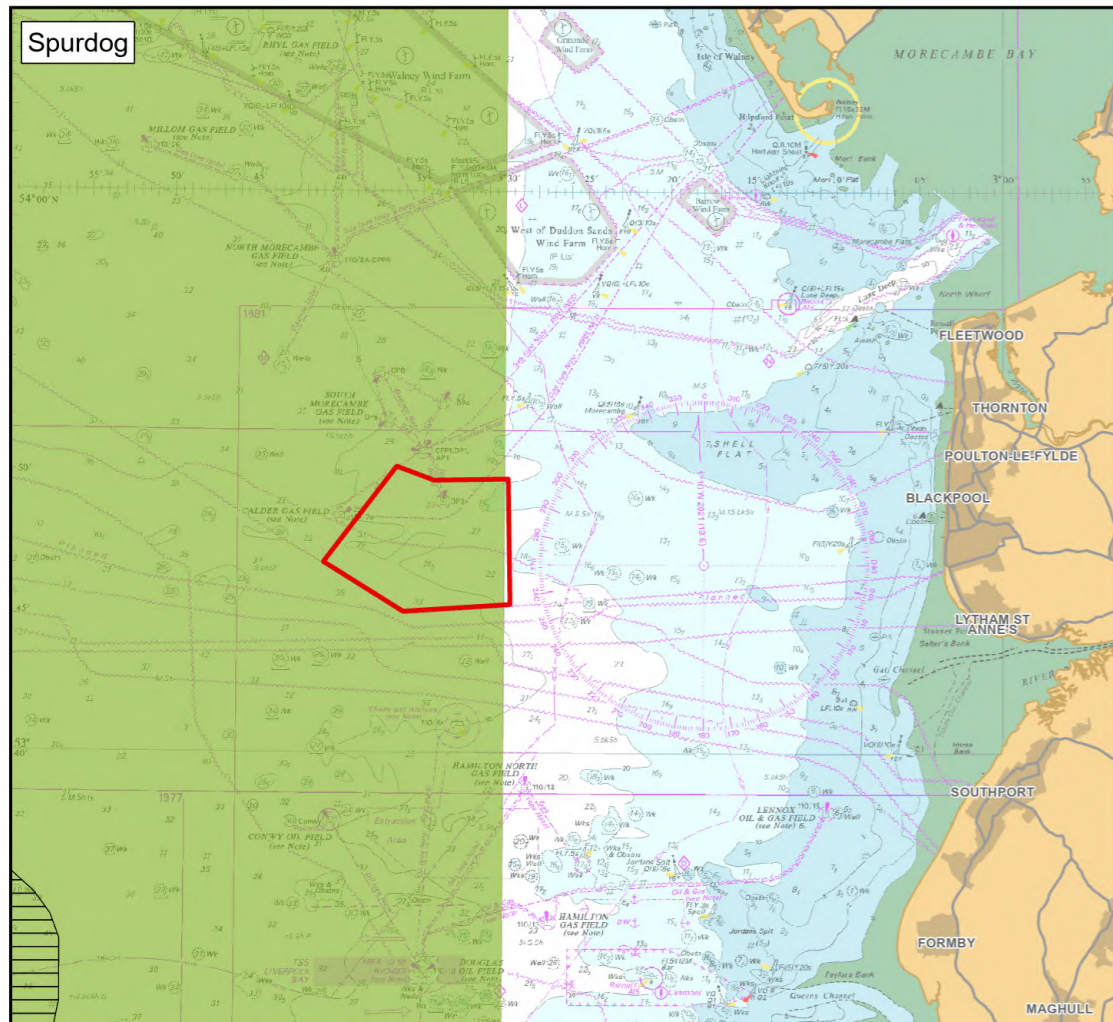
Title:  
Nursery grounds overlapping  
the Fish and Shellfish Ecology Study Area

Figure: 10.3c Drawing No: PC1165-RHD-ES-OF-DR-Z-0036

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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P02	28/03/2024	JH	SB	A3	1:500,000

Co-ordinate system: WGS 1984 UTM Zone 30N





**Legend:**

- Morecambe Offshore Windfarm Site
- Nursery grounds (*Coul et al, 1998*)

**Nursery grounds (*Ellis et al, 2010*)**

**Intensity**

- High
- Low

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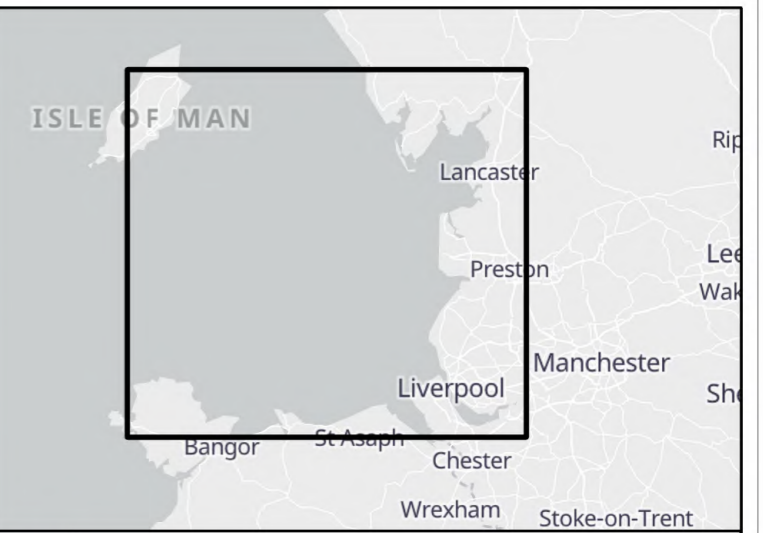
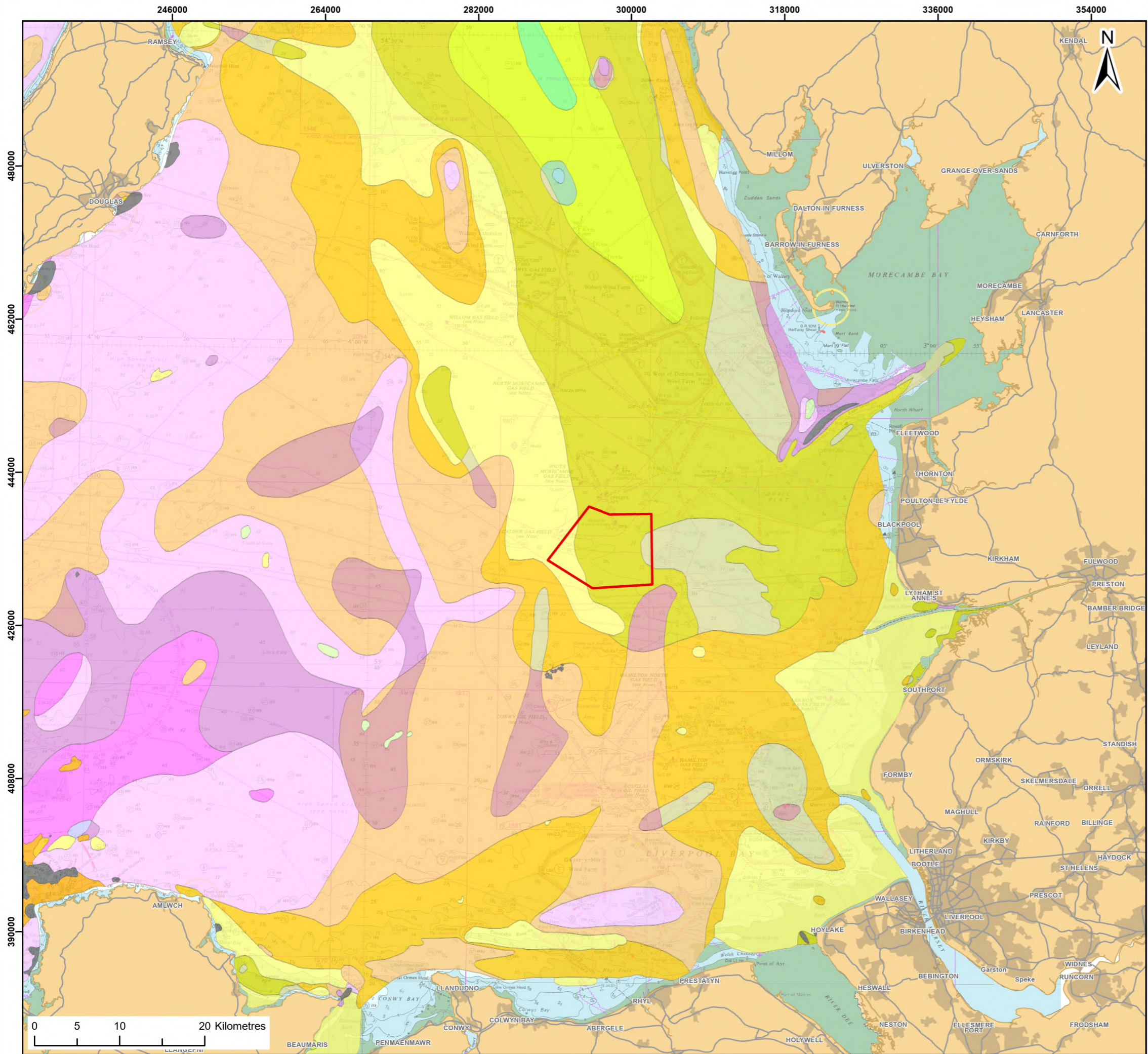
**Title:**  
Nursery grounds overlapping the Fish and Shellfish Ecology Study Area

**Figure:** 10.3d     **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0036

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	12/07/2023	JT	GC	A3	1:500,000
P02	28/03/2024	JH	SB	A3	1:500,000

Co-ordinate system: WGS 1984 UTM Zone 30N





**Legend:**

Morecambe Offshore Windfarm Site	MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - GRAVELLY MUDDY SAND (SEA BED SEDIMENT, BASED ON FOLK)
<b>Seabed Sediments</b>	MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - SAND (SEA BED SEDIMENT, BASED ON FOLK)
MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - MUDDY SANDY GRAVEL (SEA BED SEDIMENT, BASED ON FOLK)	MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - GRAVELLY SAND (SEA BED SEDIMENT, BASED ON FOLK)
MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - GRAVEL (SEA BED SEDIMENT, BASED ON FOLK)	MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - SLIGHTLY GRAVELLY MUDDY SAND (SEA BED SEDIMENT, BASED ON FOLK)
MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - MUD (SEA BED SEDIMENT, BASED ON FOLK)	MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - MUDDY SAND (SEA BED SEDIMENT, BASED ON FOLK)
MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - SANDY MUD (SEA BED SEDIMENT, BASED ON FOLK)	MARINE SEDIMENTS, PLEISTOCENE (UNDIFFERENTIATED) - DIAMICTON
MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - SLIGHTLY GRAVELLY MUD (SEA BED SEDIMENT, BASED ON FOLK)	PALAEOZOIC OR QUATERNARY ROCK AND SEDIMENT (UNDIFFERENTIATED) [OFFSHORE ONLY] - ROCK AND SEDIMENT
	PRE-QUATERNARY ROCKS (UNDIFFERENTIATED) - ROCK

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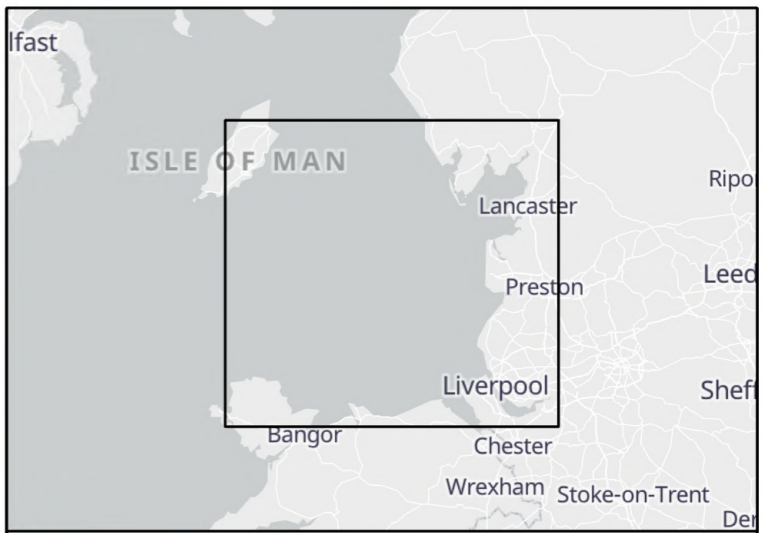
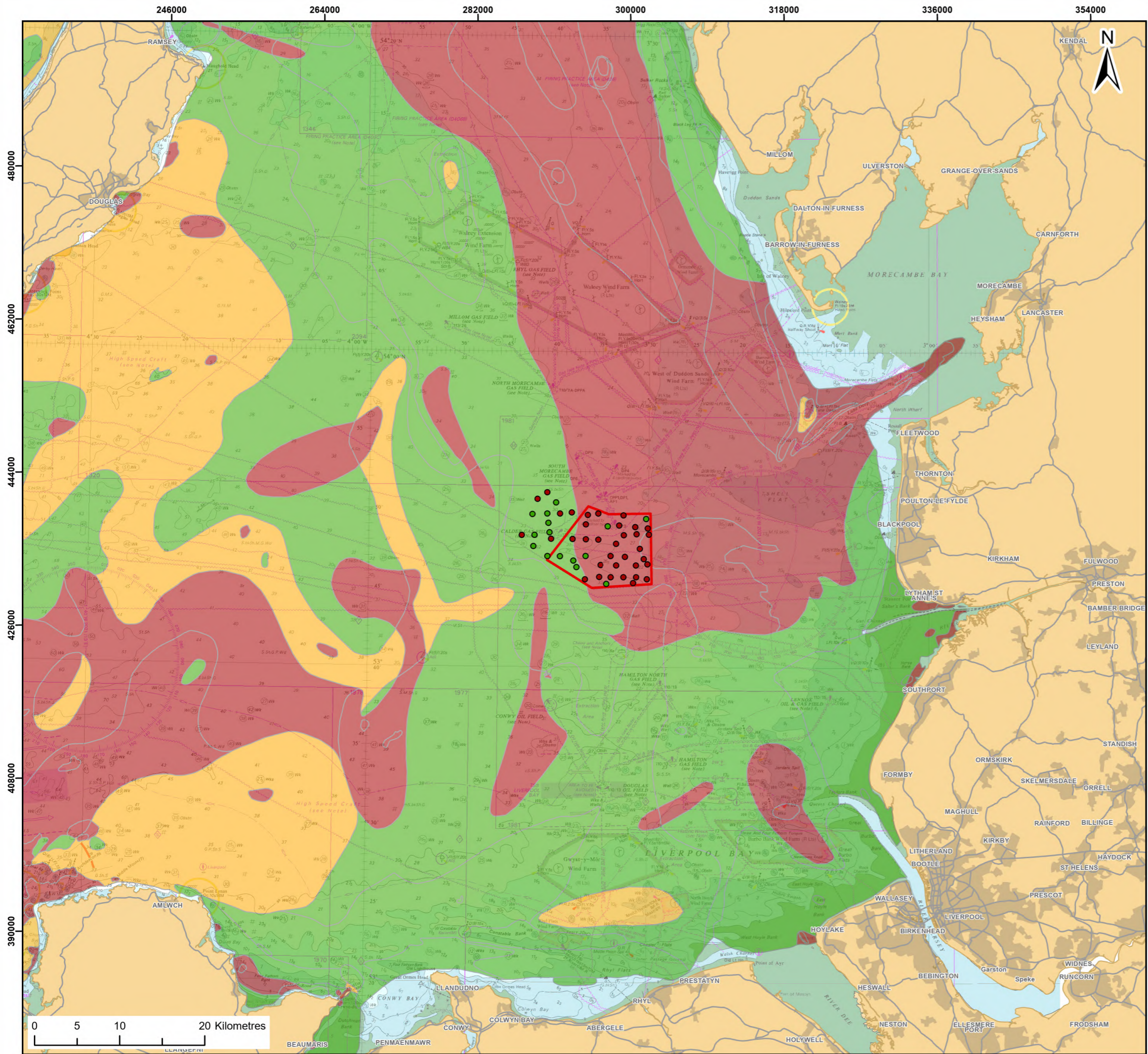
**Title:**  
Seabed sediment types in the Irish Sea (Folk, 1954)

**Figure:** 10.4      **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0037

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	12/07/2023	JT	GC	A3	1:450,000
P02	28/03/2024	JH	SB	A3	1:450,000

Co-ordinate system: WGS 1984 UTM Zone 30N





**Legend:**

Morecambe Offshore Windfarm Site

**Sandeel habitat preference (Particle Size Analysis data)**

- Preferred
- Marginal
- Unsuitable

**Sandeel habitat preference (EMODnet data)**

- Preferred
- Marginal
- Unsuitable

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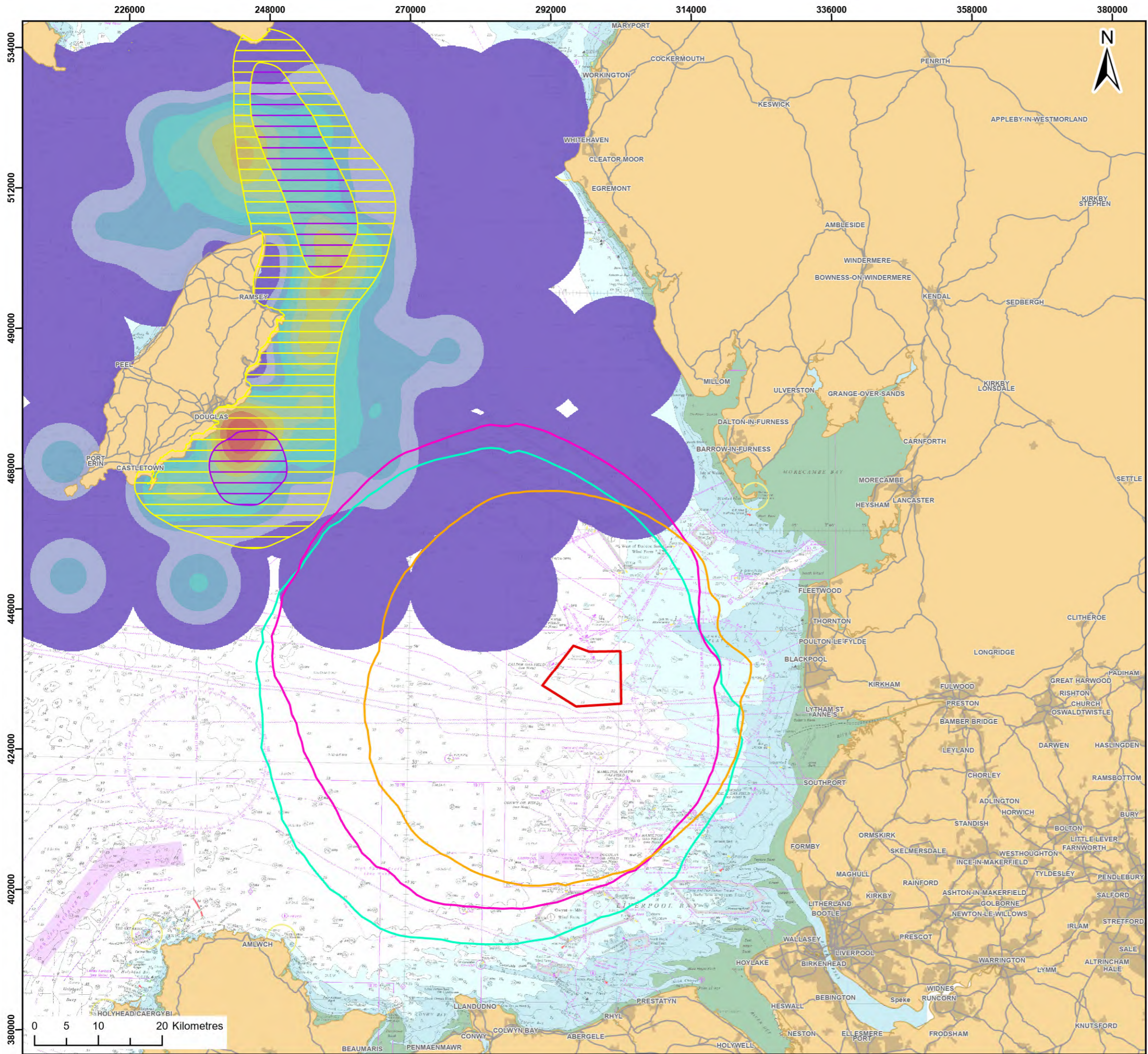
**Title:**  
Sandeel habitat and spawning ground suitability based on site specific PSA data, broadscale sediment data, and Ellis et al. (2012)

**Figure:** 10.5      **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0102

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	21/11/2023	JH	SB	A3	1:450,000
P02	28/03/2024	JH	SB	A3	1:450,000

Co-ordinate system: WGS 1984 UTM Zone 30N





**Legend:**

- Morecambe Offshore Windfarm Site
- Spawning Grounds (Coul et al, 1998)**
- Intensity
  - Higher
  - Lower
- 135dB SEL<sub>ss</sub> Herring Behavioural Response Thresholds at Maximum Monopile Hammer Energy (6,600kJ)**
- East Modelling Location
- North-West Modelling Location
- South-West Modelling Location
- Average Number of Larvae per m<sup>2</sup> (2012 - 2021)**

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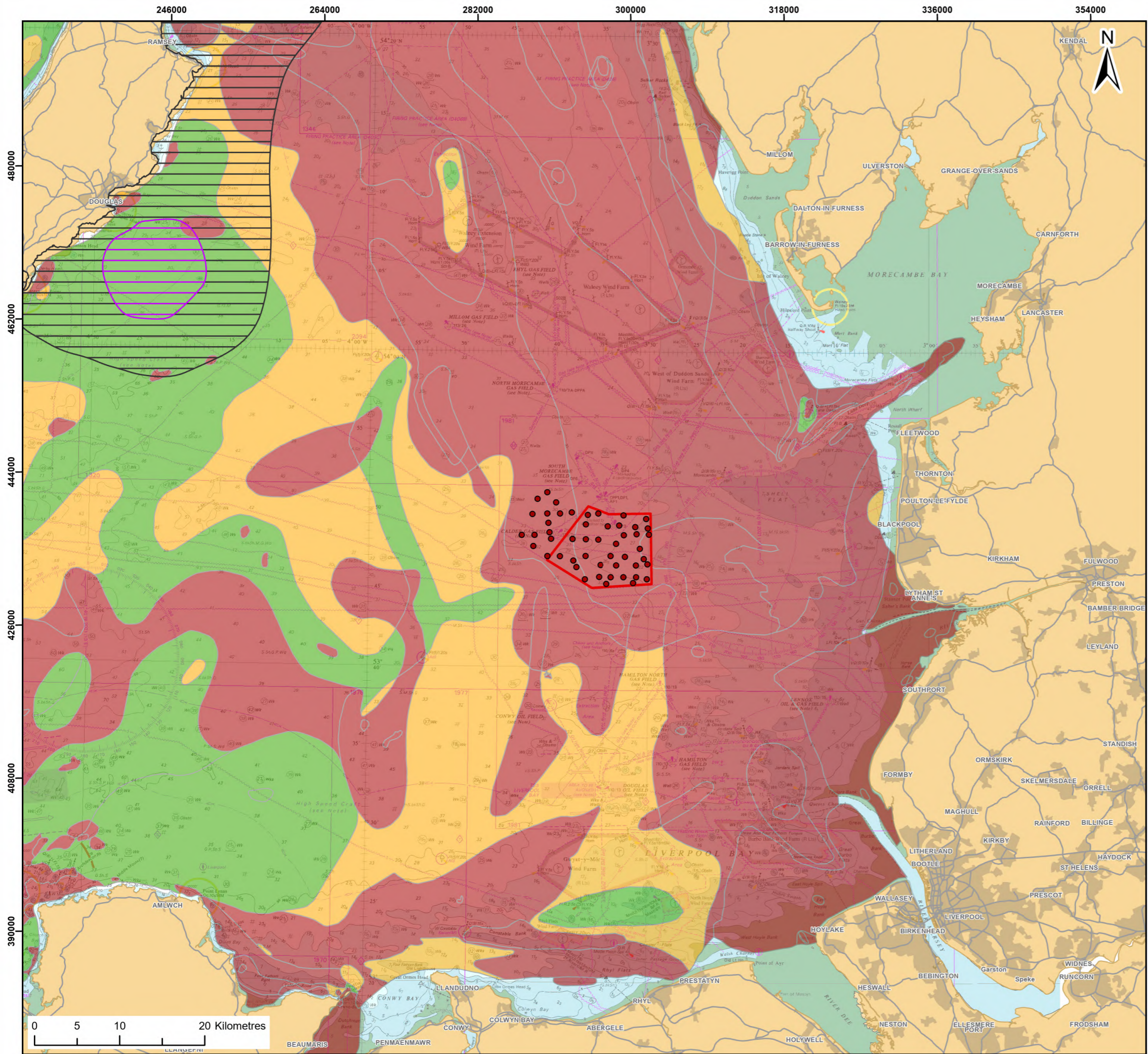
**Report:**  
Morecambe Offshore Windfarm: Generation Assets Environmental Statement

**Title:**  
Herring spawning grounds and noise contours

**Figure:** 10.6      **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0038

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P03	16/04/2024	JH	SB	A3	1:600,000
P04	30/08/2024	SB	EB	A3	1:600,000

Co-ordinate system: WGS 1984 UTM Zone 30N



**Legend:**

- Morecambe Offshore Windfarm Site

**Herring habitat preference (Particle Size Analysis data)**

- Preferred
- Marginal
- Unsuitable

**Herring habitat preference (EMODnet data)**

- Preferred
- Marginal
- Unsuitable

**Spawning Grounds (Coull *et al.*, 1998)**

**Intensity**

- Higher
- Lower

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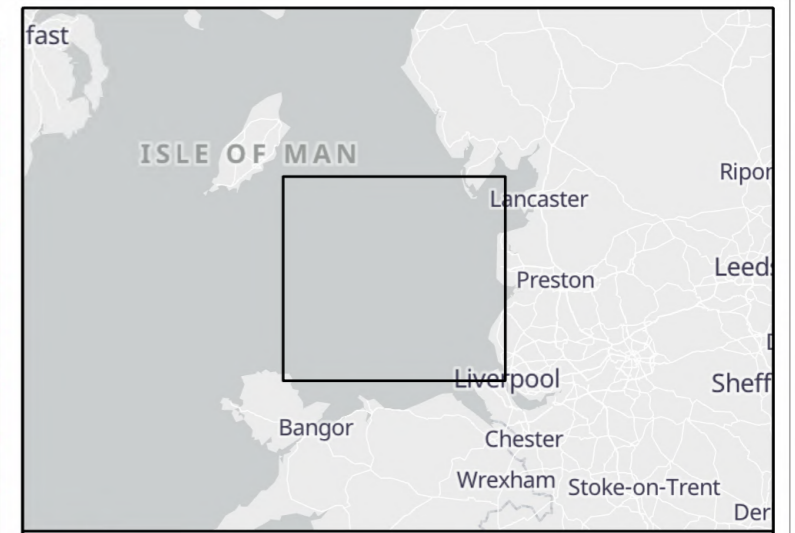
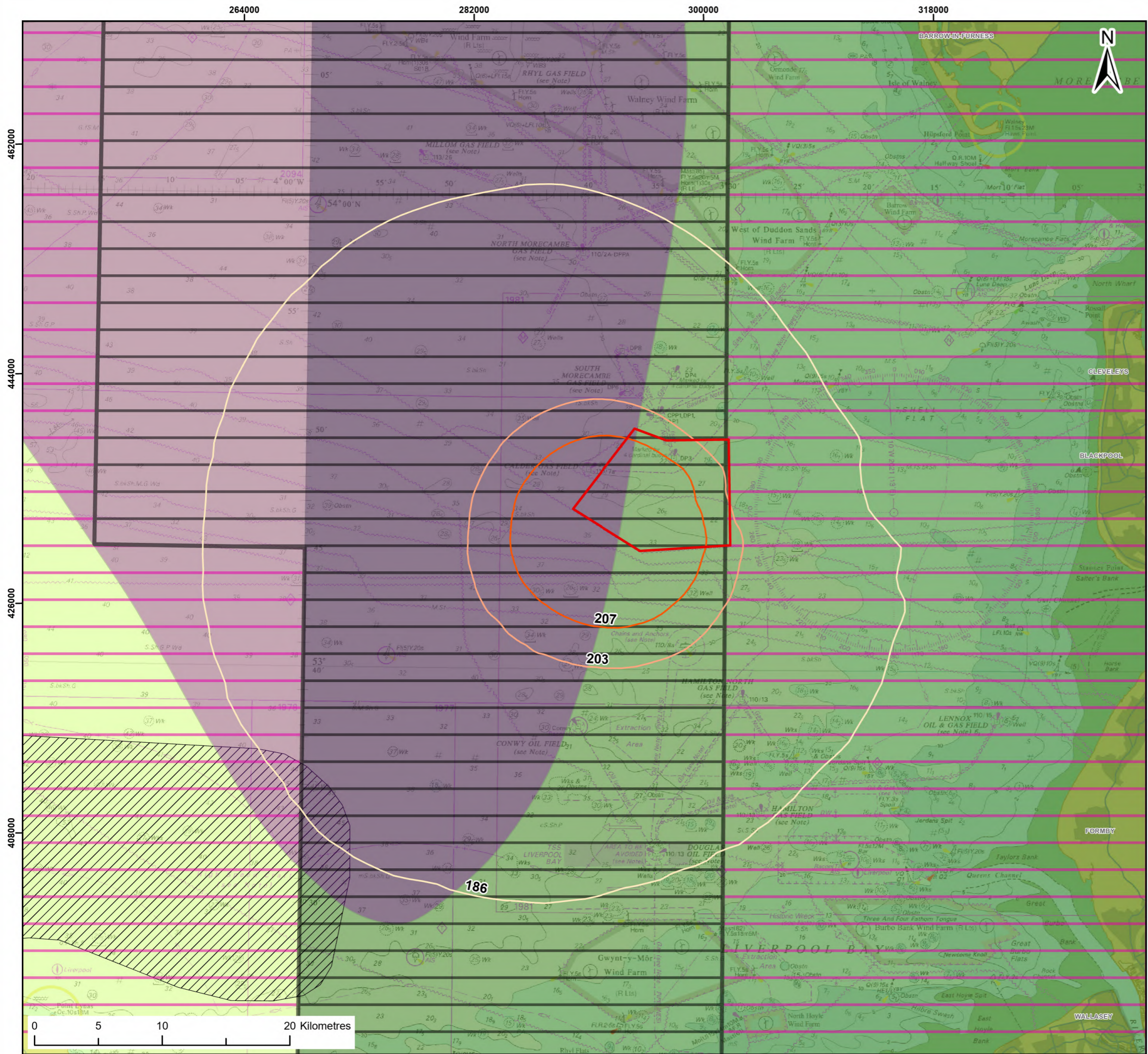
**Title:**  
Herring spawning ground suitability based on site specific PSA data, broadscale EMODnet sediment data, and Coull *et al.* (1998)

**Figure:** 10.7      **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0103

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	21/11/2023	JH	SB	A3	1:450,000
P02	28/03/2024	JH	SB	A3	1:450,000

**Co-ordinate system:** WGS 1984 UTM Zone 30N





**Legend:**

- Morecambe Offshore Windfarm Site

**Spawning and nursery grounds**

- Spawning grounds (Coul et al, 1998)
- Nursery grounds (Coul et al, 1998)

**Spawning grounds (Ellis et al, 2012)**

- High
- Low

**Nursery grounds (Ellis et al, 2012)**

- High
- Low

**Piling noise impact ranges (Popper et al, 2014)**

- 207dB - Mortality and potential mortal injury
- 203dB - Recoverable injury
- 186dB - Temporary Threshold Shift

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**Title:**  
Worst-case piling noise impact ranges (based on Popper et al. (2014)) and Atlantic cod spawning and nursery grounds for three sequentially piled monopiles within 24 hours

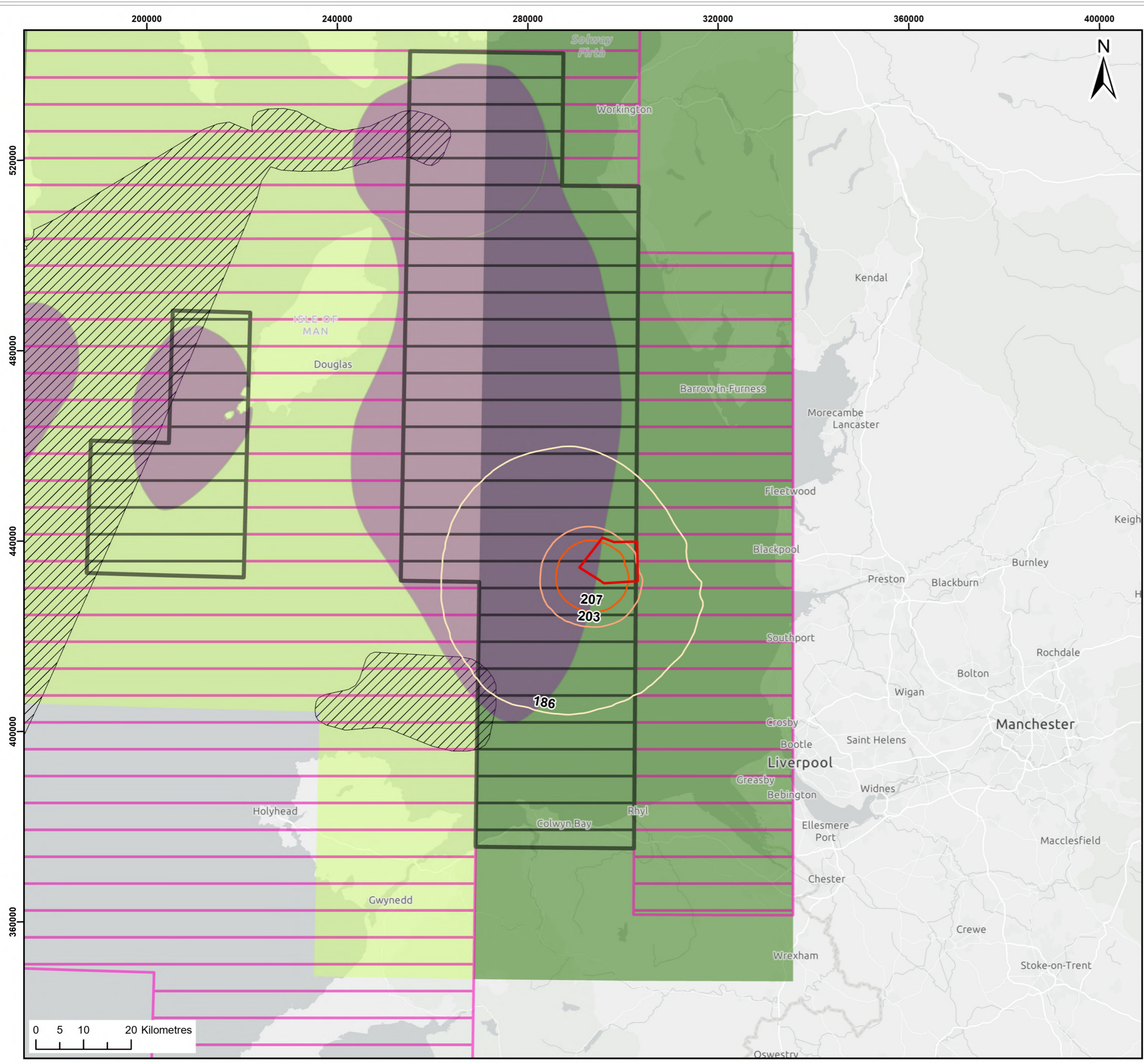
Figure: 10.8a Drawing No: PC1165-RHD-ES-OF-DR-Z-0119

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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P02	17/05/2024	JH	SB	A3	1:300,000

Co-ordinate system: WGS 1984 UTM Zone 30N

**MORECAMBE**

**Royal HaskoningDHV**  
Enhancing Society Together



**Legend:**

- Morecambe Offshore Windfarm Site
- Spawning and nursery grounds**
- Spawning grounds (Coul et al, 1998)
- Nursery grounds (Coul et al, 1998)
- Spawning grounds (Ellis et al, 2012)**
- High
- Low
- Nursery grounds (Ellis et al, 2012)**
- High
- Low
- Piling noise impact ranges (Popper et al, 2014)**
- 207dB - Mortality and potential mortal injury
- 203dB - Recoverable injury
- 186dB - Temporary Threshold Shift

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**Report:**  
Morecambe Offshore Windfarm: Generation Assets Environmental Statement

**Title:**  
Worst-case piling noise impact ranges (based on Popper et al. (2014)) and Atlantic cod spawning and nursery grounds for three sequentially piled monopiles within 24 hours

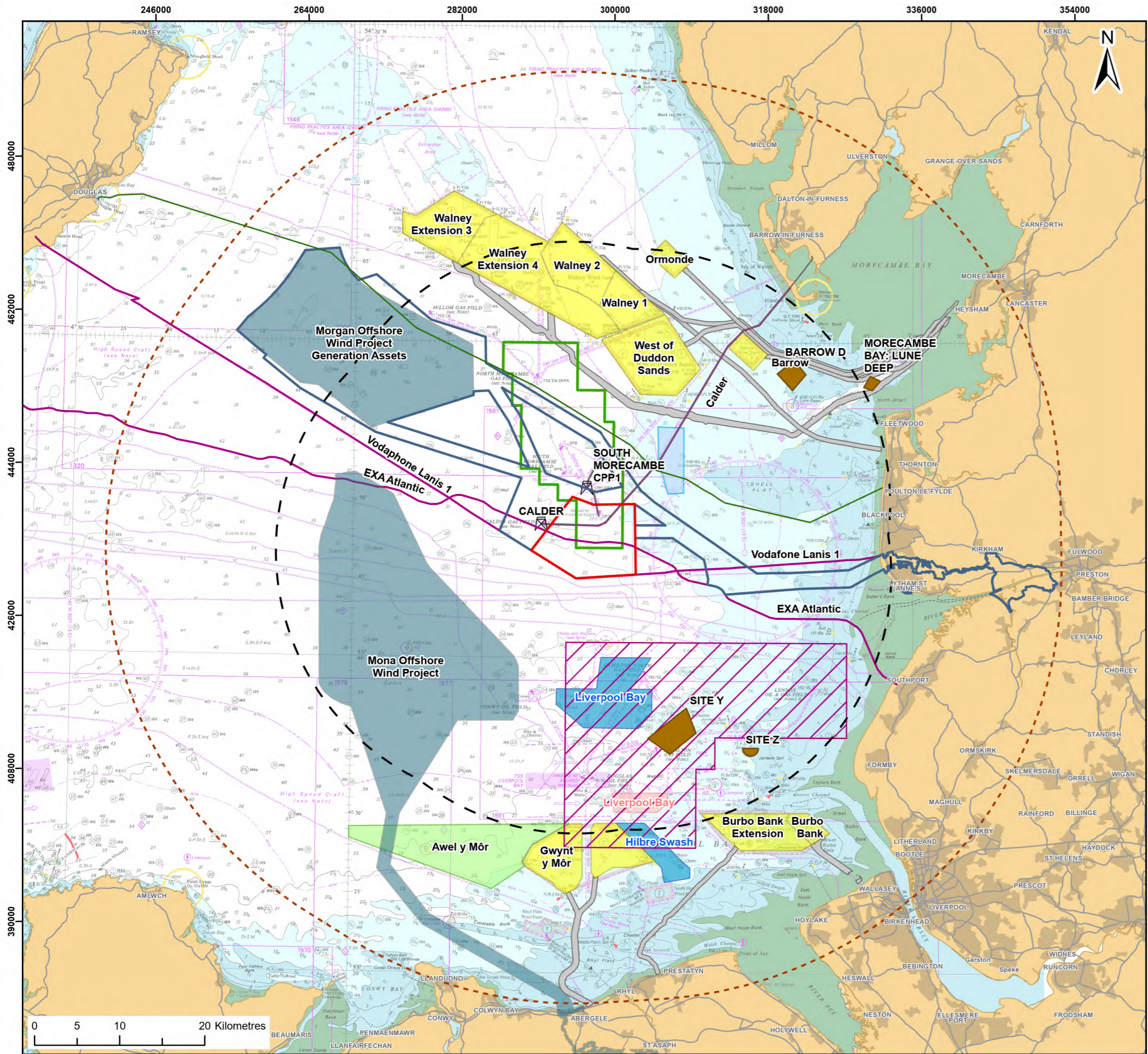
Figure: 10.8b      Drawing No: PC1165-RHD-ES-OF-DG-Z-0152

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	07/05/2024	JH	SB	A3	1:800,000

Co-ordinate system: WGS 1984 UTM Zone 30N







**Legend:**

- Morecambe Offshore Windfarm Site
- Morgan and Morecambe Offshore Wind Farms: Transmission Assets (In Planning)
- Morecambe Offshore Windfarm Site - 30km buffer
- Morecambe Offshore Windfarm Site - 50km buffer
- Offshore platform
- Oil & Gas Pipeline
- Telecom cables
- Isle of Man Interconnector
- Disposal Sites
- Gateway Gas Storage Project
- Carbon Capture Storage License (CS004)
- Carbon Capture Storage Area (EIS Area 1)
- Offshore Wind Cable Agreements
- Minerals & Aggregates Site Agreements
- Exploration and Option Area
- Production Agreement Area

**Windfarm status**

- Fully commissioned
- Consented
- In Planning

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**Report:**  
Morecambe Offshore Windfarm: Generation Assets Environmental Statement

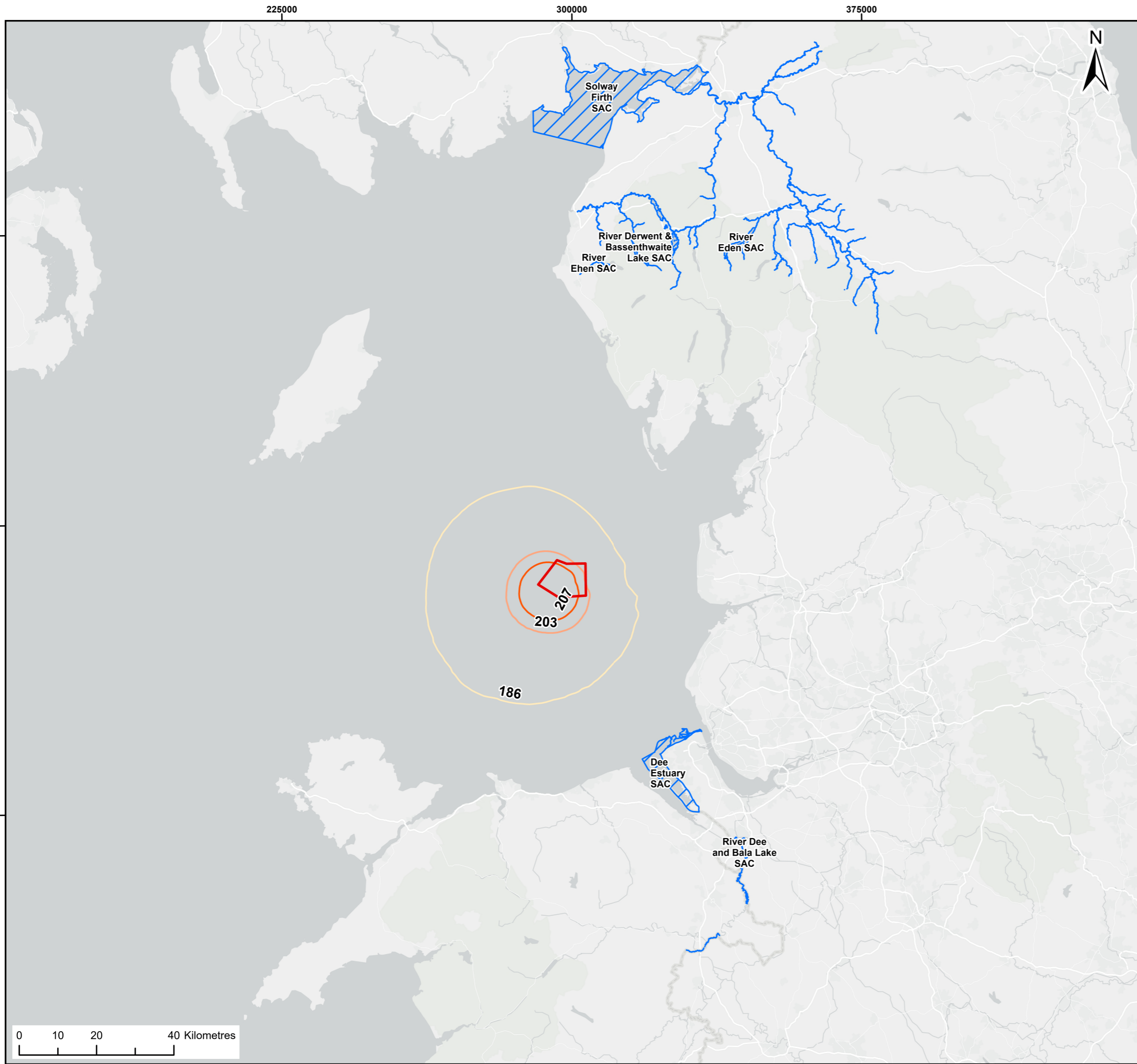
**Title:**  
Other plans, projects and activities included in the Cumulative Effects Assessment for fish and shellfish ecology

**Figure:** 10.9      **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0105

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	21/11/2023	JH	SB	A3	1:450,000
P02	05/04/2024	JH	SB	A3	1:450,000

**Co-ordinate system:** WGS 1984 UTM Zone 30N





**Legend:**

- Morecambe Offshore Windfarm Site
- Special Areas of Conservation (SAC) screened for Annex II fish species

**Piling noise impact ranges (Popper et al, 2014)**

- 207dB - Mortality and potential mortal injury
- 203dB - Recoverable injury
- 186dB - Temporary Threshold Shift

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**Report:** Morecambe Offshore Windfarm: Generation Assets Environmental Statement

**Title:** Worst-case piling noise impact ranges (based on Popper et al. (2014)) and Special Areas of Conservation (SACs) designated for Annex II fish species

**Figure:** 10.10 **Drawing No:** PC1165-RHD-ES-OF-DG-Z-0158

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	24/09/2024	JH	SB	A3	1:1,000,000

Co-ordinate system: WGS 1984 UTM Zone 30N

