

Morecambe Offshore Windfarm: Generation Assets Environmental Statement

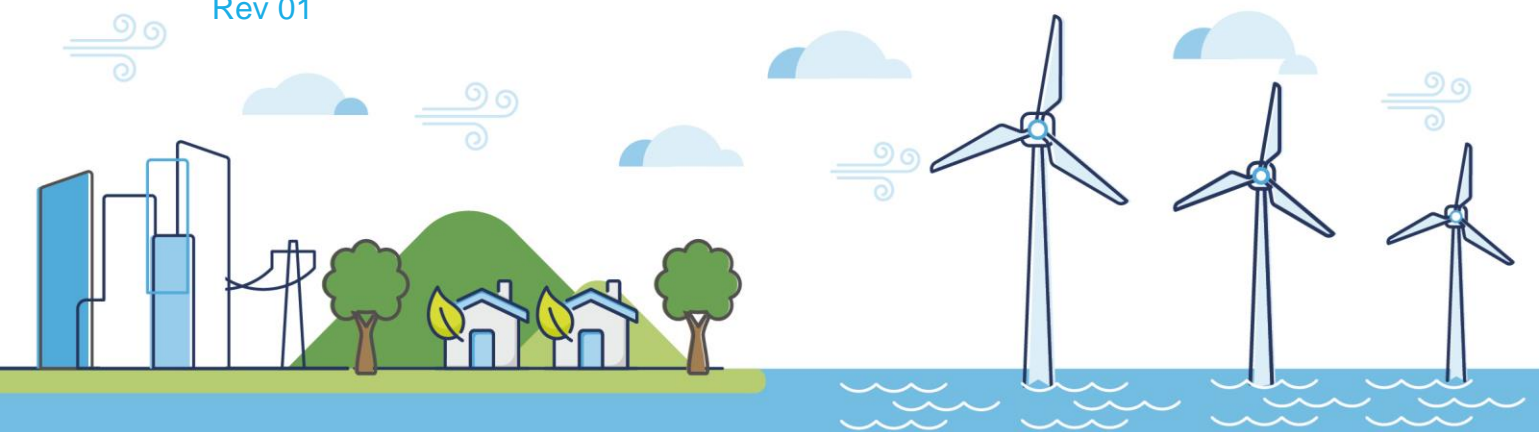
Volume 5

Chapter 9 Benthic Ecology Figures

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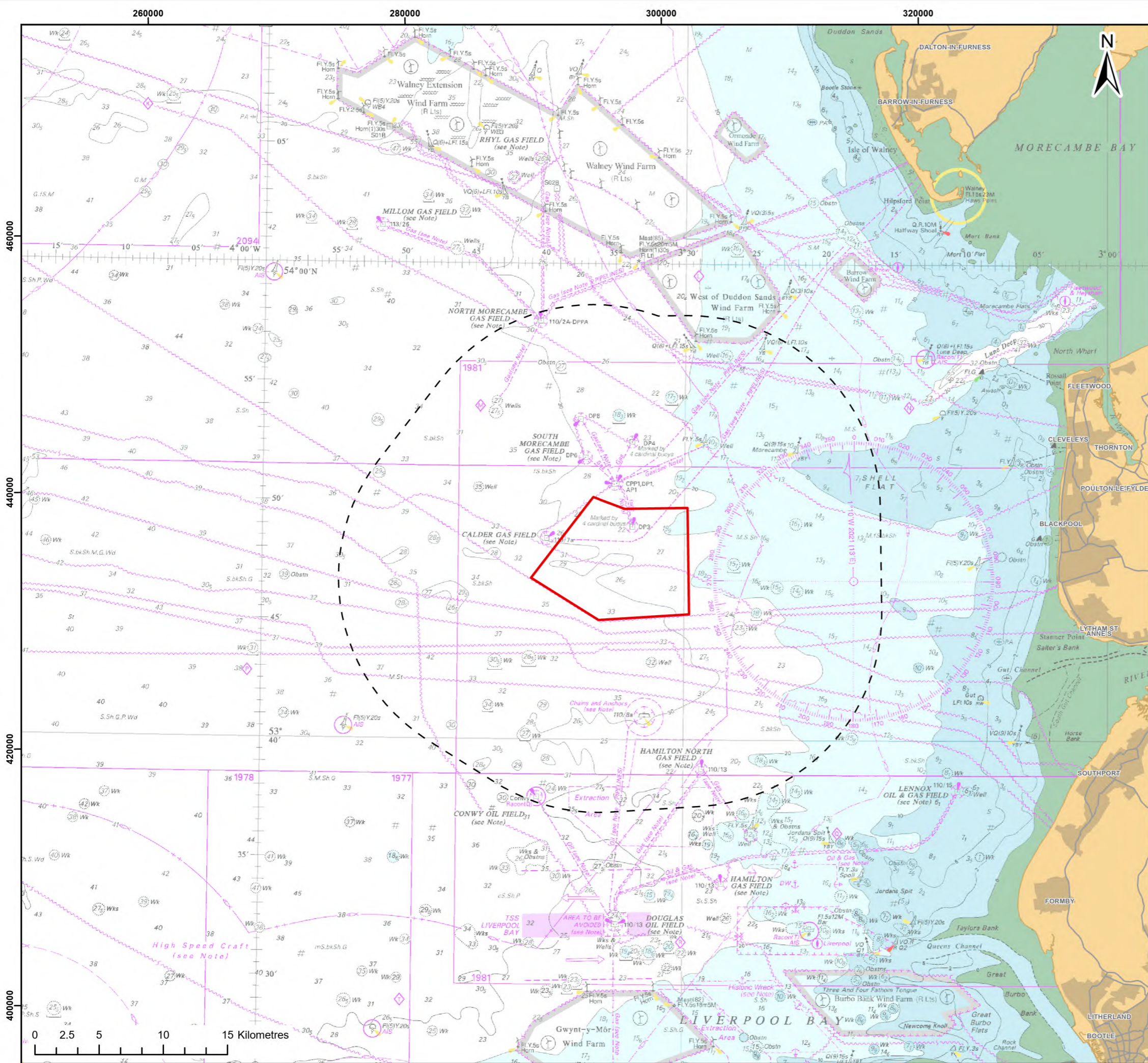
Rev 01



Document History

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01	May 2024	Approved for Use	Royal HaskoningDHV	Morecambe Offshore Windfarm Ltd	Morecambe Offshore Windfarm Ltd	n/a



Legend:

- Morecambe Offshore Windfarm Site
- 15km Potential Zone of Influence (Zoi)

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Report:
Morecambe Offshore Windfarm: Generation Assets Environmental Statement

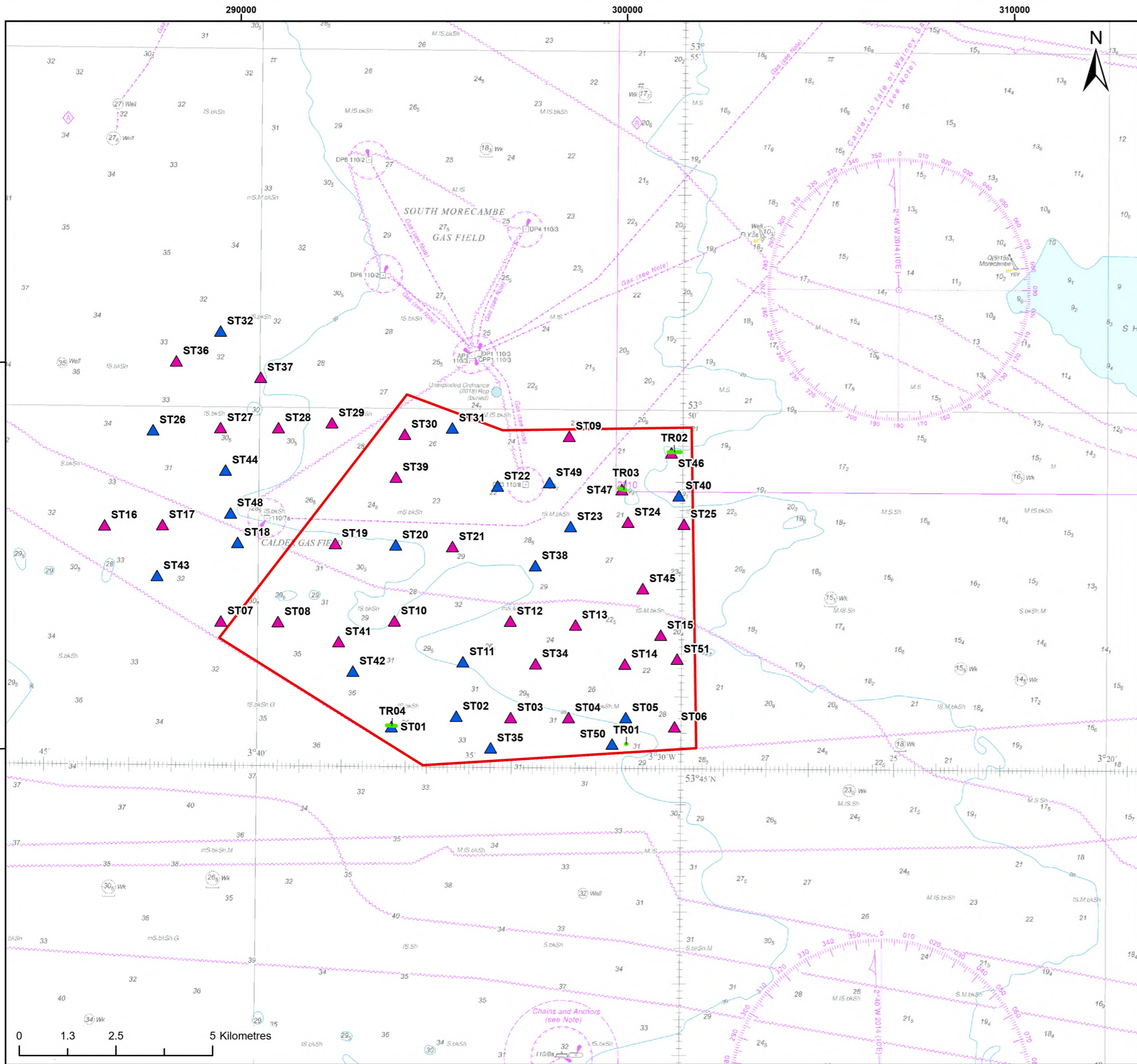
Title:
Benthic Ecology Study Area and 15km Zone of Influence (Zoi)

Figure: 9.1 **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0021

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	20/03/2024	JH	SB	A3	1:300,000

Co-ordinate system: WGS 1984 UTM Zone 30N





- Legend:**
- Morecambe Offshore Windfarm Site
 - 2022 Benthic Survey Drop Down Camera (DDC) transect locations
- 2022 Benthic Survey grab sample**
- ▲ PSD (Particle Size Distribution) & macrobenthos
 - ▲ PSD (Particle Size Distribution), macrobenthos & contaminants

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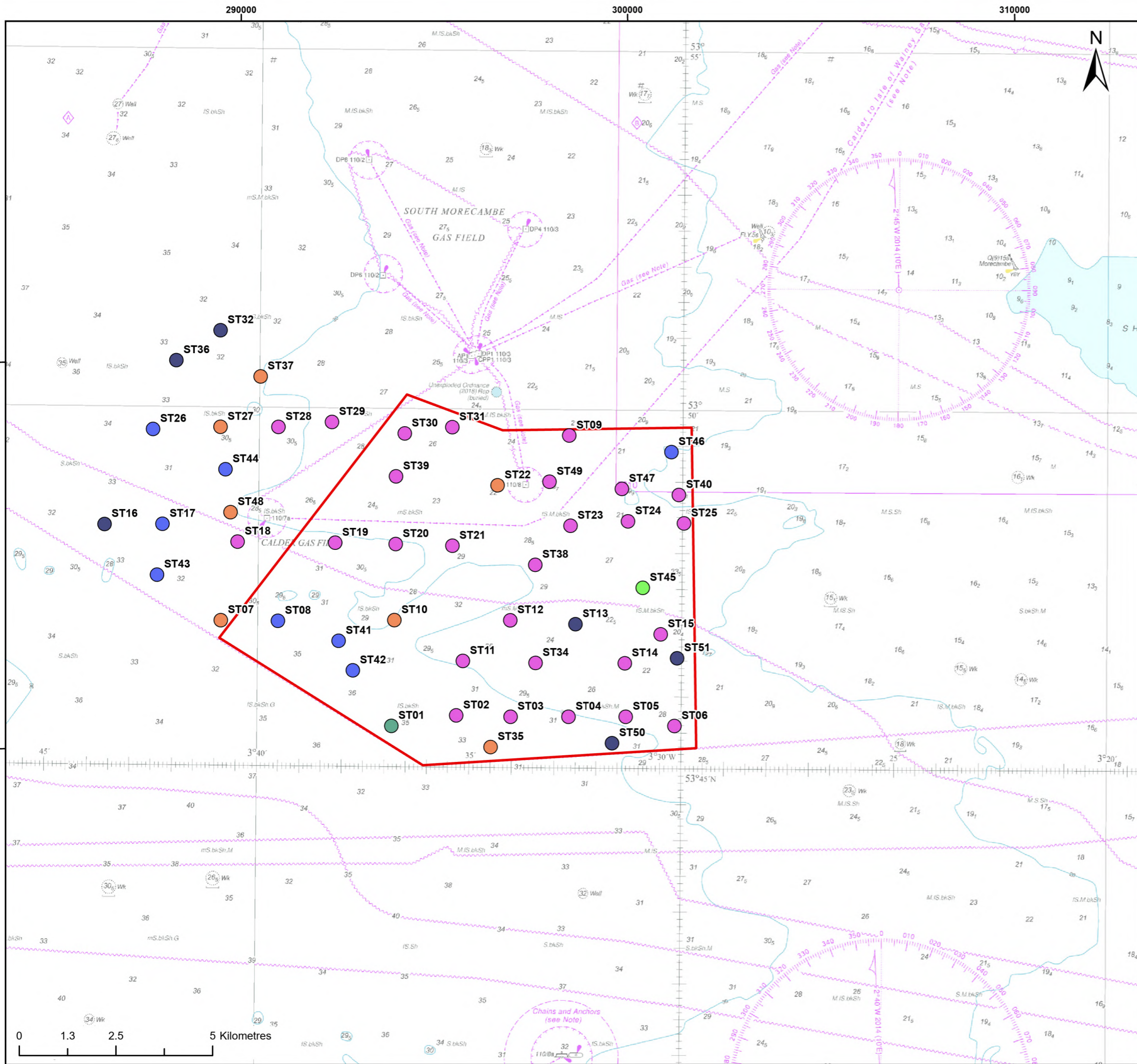
Title:
2022 Benthic Survey Grab Sample and Drop Down Camera (DDC) Transect Locations (Ocean Ecology Limited, 2022)

Figure: 9.2 **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0022

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	20/03/2024	JH	SB	A3	1:100,000

Co-ordinate system: WGS 1984 UTM Zone 30N





Legend:

- Morecambe Offshore Windfarm Site

2022 Benthic Survey textural group classification (Folk, 1954)

- Sand
- Slightly Gravelly Sand
- Slightly Gravelly Muddy Sand
- Gravelly Muddy Sand
- Muddy Sand
- Sandy Mud

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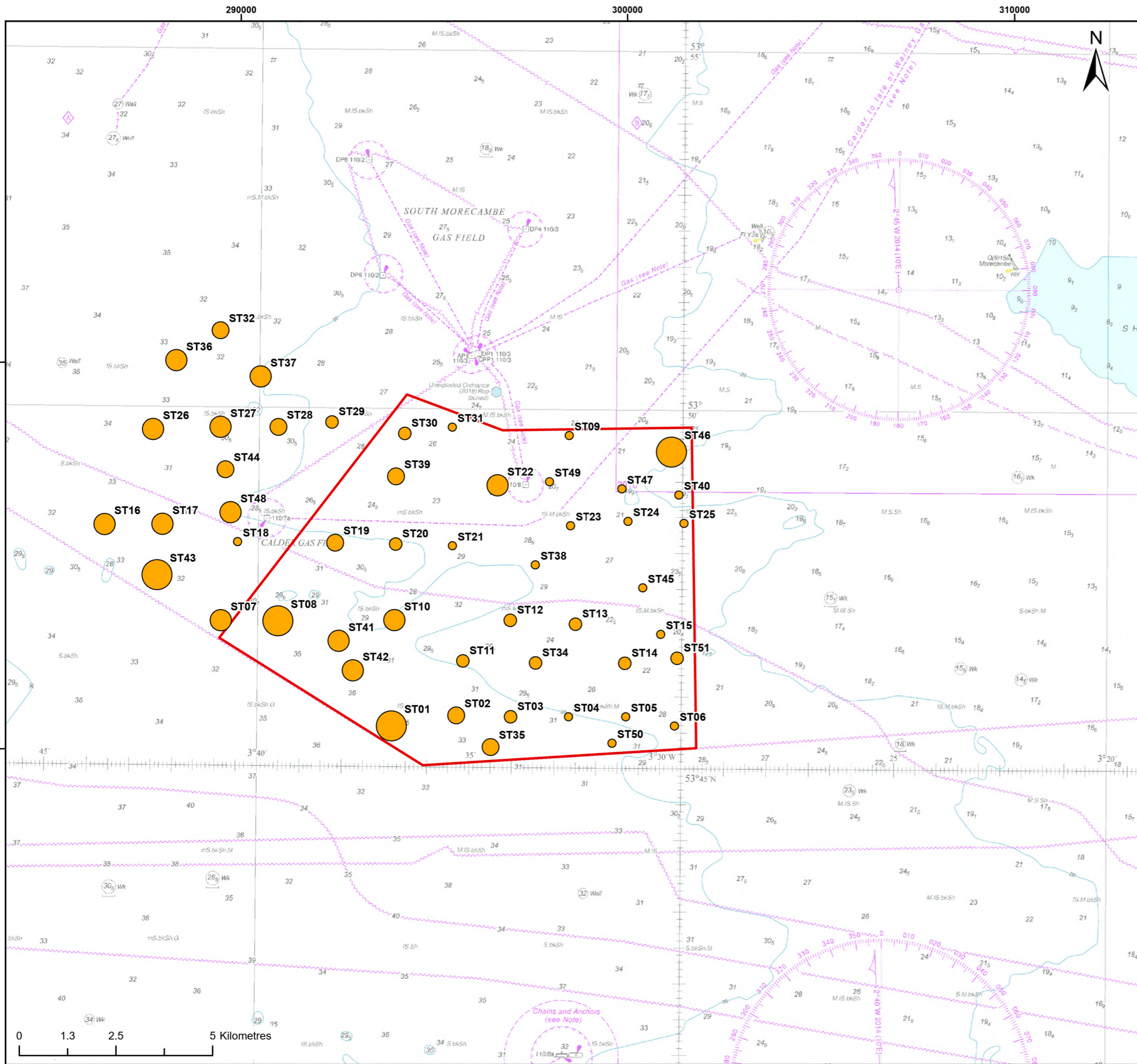
Title:
2022 Benthic Survey Textural Group Classification (Folk, 1954)

Figure: 9.3 **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0023

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	25/04/2024	JH	SB	A3	1:100,000

Co-ordinate system: WGS 1984 UTM Zone 30N





Legend:

Morecambe Offshore Windfarm Site

2022 Benthic survey mean sediment size (micrometres)

- 35.5 - 99.5
- 99.5 - 160.9
- 160.9 - 261.6
- 261.6 - 340.4
- 340.4 - 536.1

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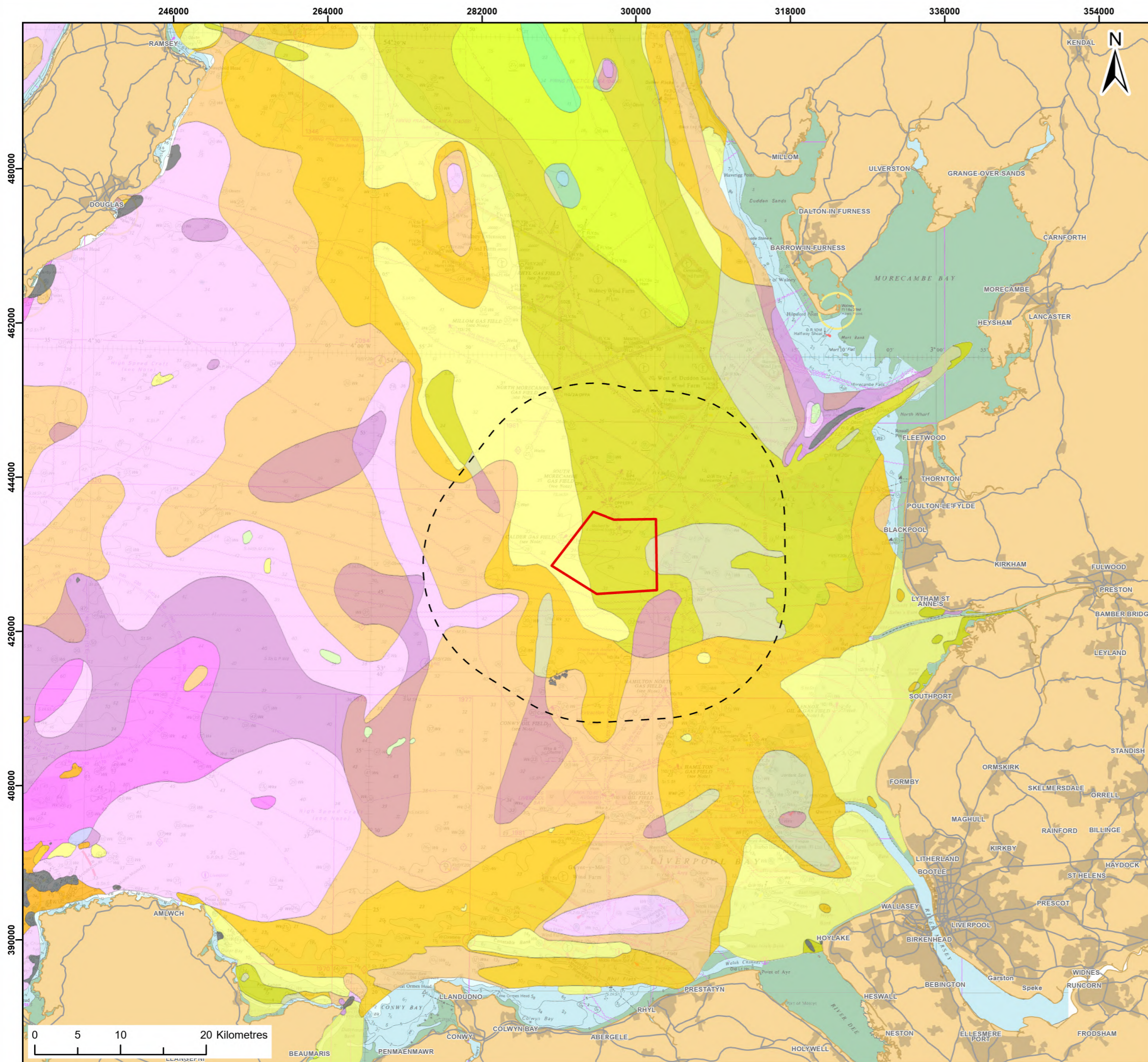
Title:
2022 Benthic Survey Mean Sediment Size (micrometres) (Ocean Ecology Limited, 2022)

Figure: 9.4 Drawing No: PC1165-RHD-ES-OF-DR-Z-0024

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	25/04/2024	JH	SB	A3	1:100,000

Co-ordinate system: WGS 1984 UTM Zone 30N





Legend:

- Morecambe Offshore Windfarm Site
- 15km Potential Zone of Influence (Zol)

Seabed Sediments

- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - MUDDY SANDY GRAVEL (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - GRAVEL (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - SANDY GRAVEL (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - MUD (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - SANDY MUD (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - SLIGHTLY GRAVELLY MUD (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - GRAVELLY MUDDY SAND (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - SAND (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - GRAVELLY SAND (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - SLIGHTLY GRAVELLY MUDDY SAND (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, HOLOCENE (UNDIFFERENTIATED) - MUDDY SAND (SEA BED SEDIMENT, BASED ON FOLK)
- MARINE SEDIMENTS, PLEISTOCENE (UNDIFFERENTIATED) - DIAMICTON
- PALAEOZOIC OR QUATERNARY ROCK AND SEDIMENT (UNDIFFERENTIATED) [OFFSHORE ONLY] - ROCK AND SEDIMENT
- PRE-QUATERNARY ROCKS (UNDIFFERENTIATED) - ROCK

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Report:

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Environmental Statement

Title:

Sediment Types in the Irish Sea
Using Folk (1954) Classifications

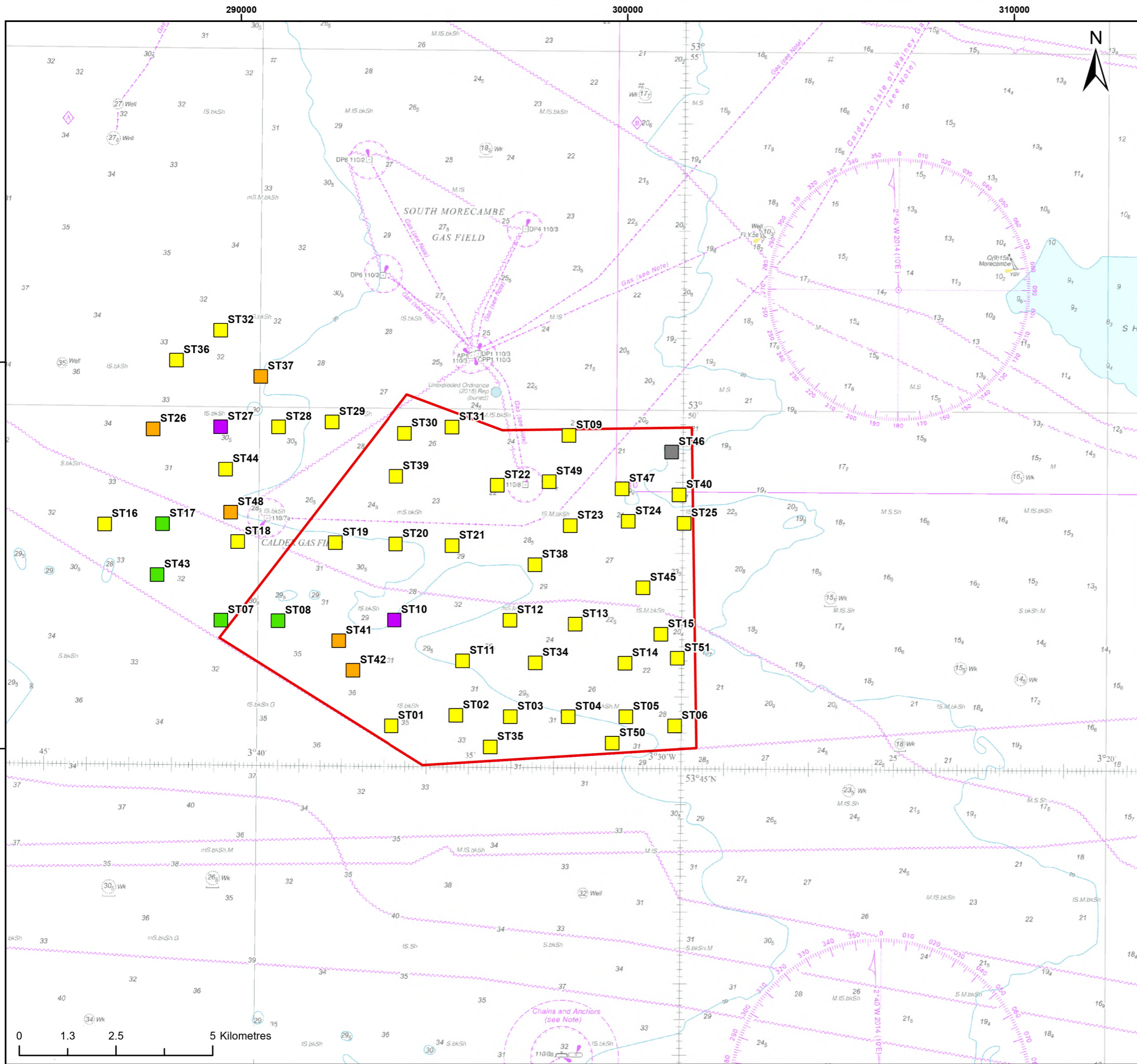
Figure: 9.5

Drawing No: PC1165-RHD-ES-OF-DR-Z-0025

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	25/04/2024	JH	SB	A3	1:450,000

Co-ordinate system: WGS 1984 UTM Zone 30N





Legend:

- Morecambe Offshore Windfarm Site
- A (average similarity 41.79)
- B (average similarity 37.80)
- C (average similarity 45.33)
- D (average similarity 34.11)
- Outlier

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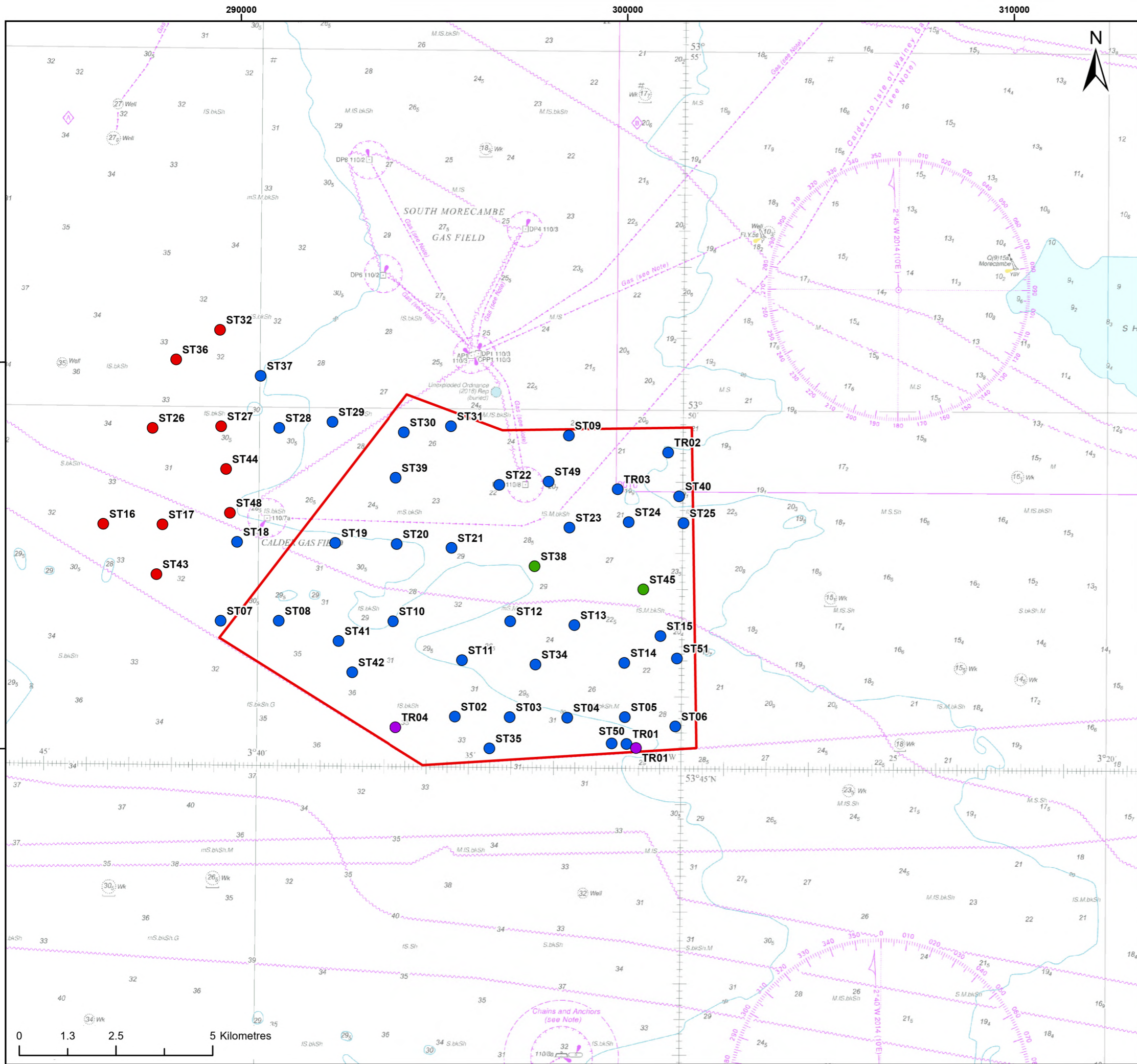
Title:
2022 Benthic Survey Macroinvertebrate Groupings (similarity slice 31%) (Ocean Ecology Limited, 2022)

Figure: 9.6 **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0026

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	20/03/2024	JT	GC	A3	1:100,000

Co-ordinate system: WGS 1984 UTM Zone 30N





- Legend:**
- Morecambe Offshore Windfarm Site
 - A5.44 - Circalittoral mixed sediments
 - A5.25 - Circalittoral fine sand
 - A5.26 - Circalittoral muddy sand
 - A5.35 - Circalittoral sandy mud

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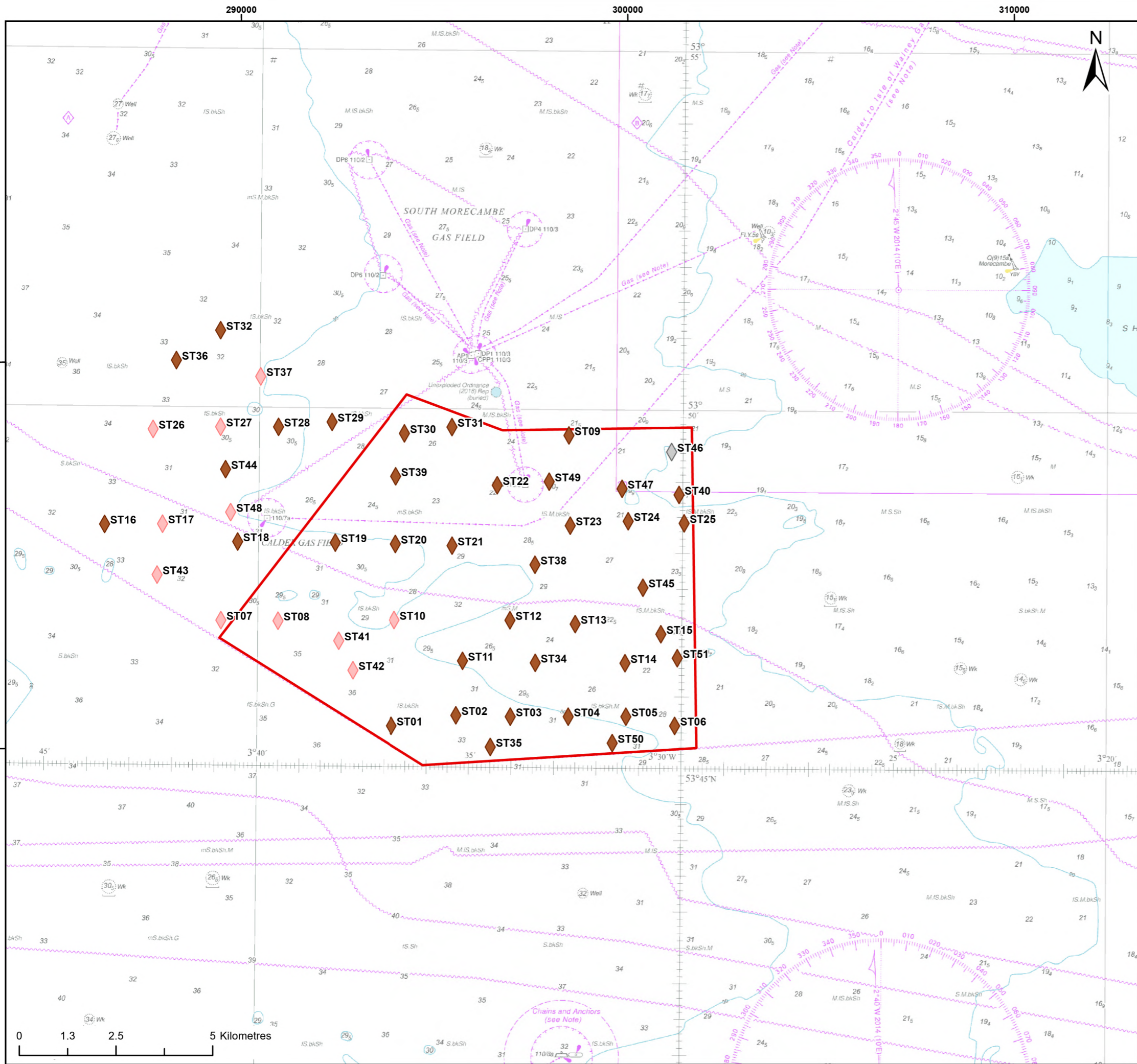
Title:
 2022 Benthic Survey Habitat Assignment (EUNIS level 4)

Figure: 9.7 **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0027

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	20/03/2024	JT	GC	A3	1:100,000

Co-ordinate system: WGS 1984 UTM Zone 30N





- Legend:**
- Morecambe Offshore Windfarm Site
 - 2022 Benthic Survey biotope assignment (EUNIS level 5)**
 - ◆ A5.252 *Abra prismatica*, *Bathyporeia elegans* and polychaetes in circalittoral fine sand
 - ◆ A5.351 *Amphiura filiformis*, *Mysella bidentata* and *Abra nitida* in circalittoral sandy mud
 - ◆ Not assigned

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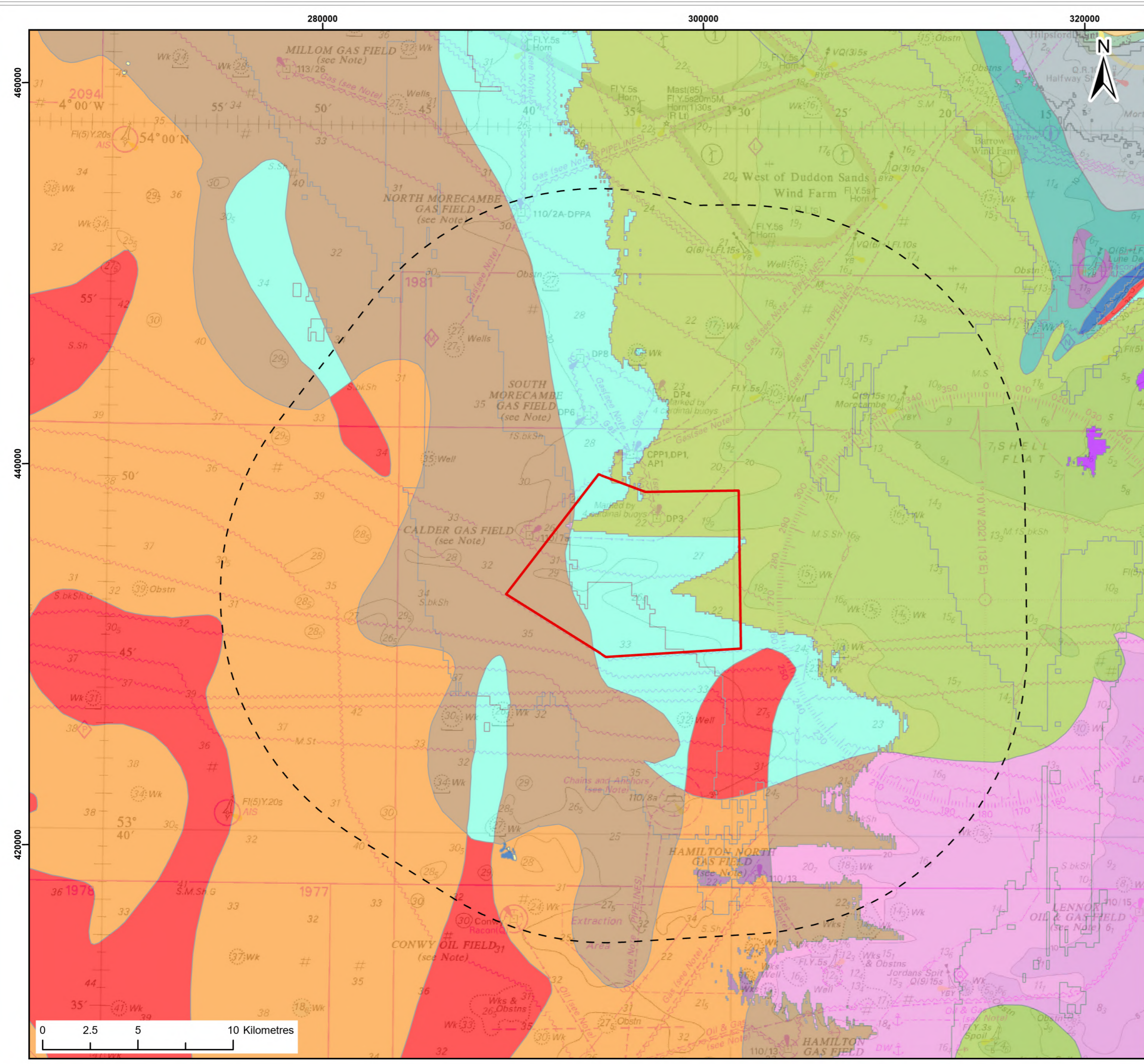
Title:
2022 Benthic Survey Biotope Assignment (EUNIS level 5)

Figure: 9.8 Drawing No: PC1165-RHD-ES-OF-DR-Z-0028

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	20/03/2024	JT	GC	A3	1:100,000

Co-ordinate system: WGS 1984 UTM Zone 30N





Legend:

Morecambe Offshore Windfarm Site	A5.27: Deep circalittoral sand
15km Potential Zone of Influence (Zol)	A5.33: Infralittoral sandy mud
EUNIS broadscale habitats (2012 classification)	
A4.27: Faunal communities on deep moderate energy circalittoral rock	A5.35: Circalittoral sandy mud
A5.14: Circalittoral coarse sediment	A5.37: Deep circalittoral mud
A5.15: Deep circalittoral coarse sediment	A5.43: Infralittoral mixed sediments
A5.25 or A5.26: Circalittoral fine sand or Circalittoral muddy sand	A5.44: Circalittoral mixed sediments
A5: Sublittoral sediment	A5.45: Deep circalittoral mixed sediments
Na	

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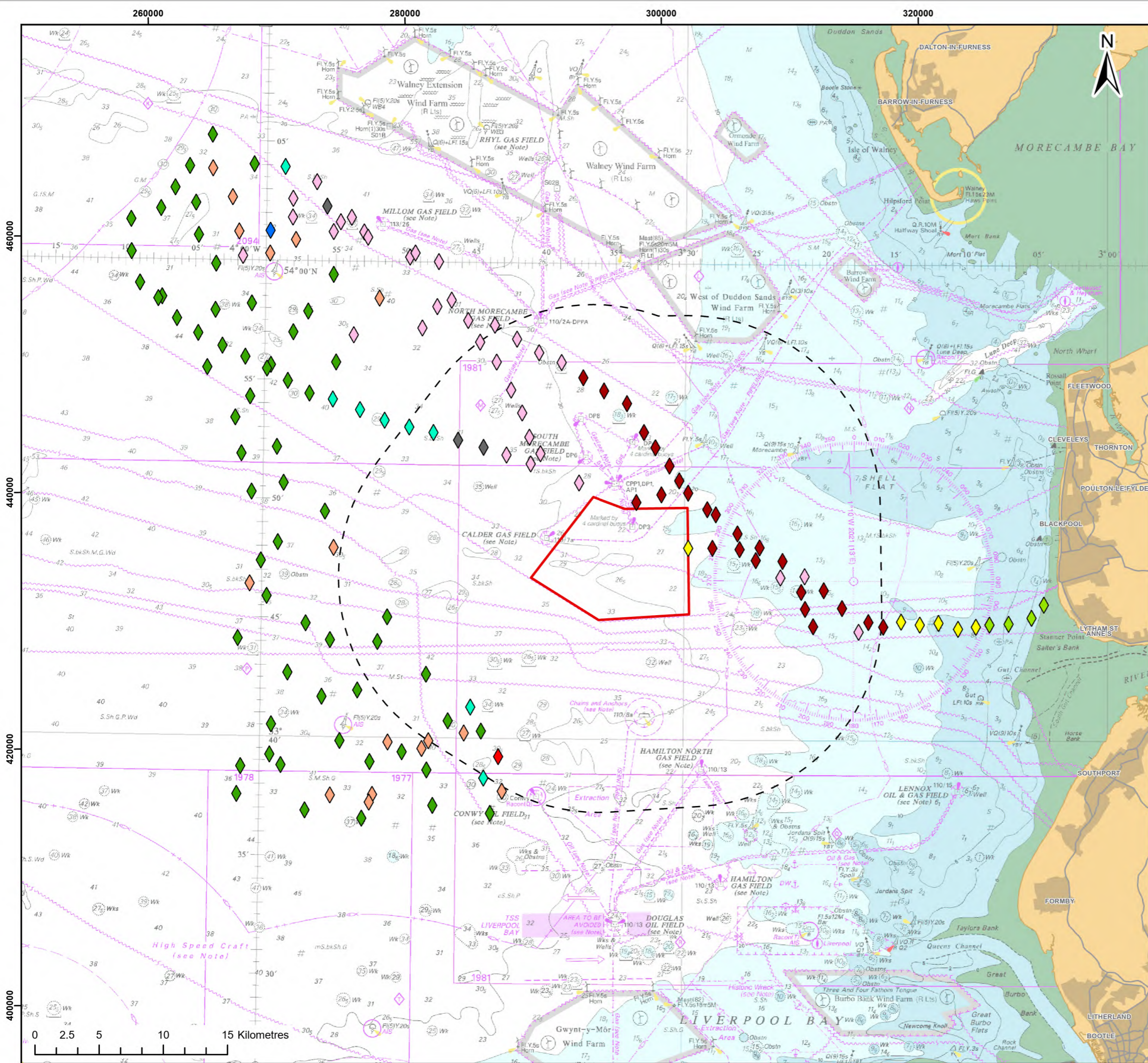
Title:
EUSeaMap2021 Broadscale EUNIS Habitats

Figure: 9.9 **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0029

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	20/03/2024	JT	GC	A3	1:200,000

Co-ordinate system: WGS 1984 UTM Zone 30N





Legend:

- Morecambe Offshore Windfarm Site
- 15km Potential Zone of Influence (Zol)

2021 Morgan and Mona OWF Benthic Baseline Survey Biotope Assignment

- ◆ A5.14 Circalittoral coarse sediment
- ◆ A5.45 Deep circalittoral mixed sediments
- ◆ A5.44 Circalittoral mixed sediments
- ◆ A5.355 Lagis koreni and Phaxas pellucidus in circalittoral sandy mud
- ◆ A5.451 Polychaete-rich deep Venus community in offshore mixed sediments
- ◆ A5.443 Mysella bidentata and Thyasira spp. in circalittoral muddy mixed sediment

2022 Morecambe and Morgan Transmission Assets Benthic Baseline Survey Biotope Assignment

- ◆ A5.351 Amphiuira filiformis, Mysella bidentata and Abra nitida in circalittoral sandy mud
- ◆ A5.355 Lagis koreni and Phaxas pellucidus in circalittoral sandy mud
- ◆ A5.451 Polychaete-rich deep Venus community in offshore mixed sediments
- ◆ A5.261 Abra alba and Nucula nitidosa in circalittoral muddy sand or slightly mixed sediment
- ◆ A5.443 Mysella bidentata and Thyasira spp. in circalittoral muddy mixed sediment
- ◆ A5.251 Echinocyamus pusillus, Ophelia borealis and Abra prismatica in circalittoral fine sand
- ◆ A5.25 Circalittoral fine sand

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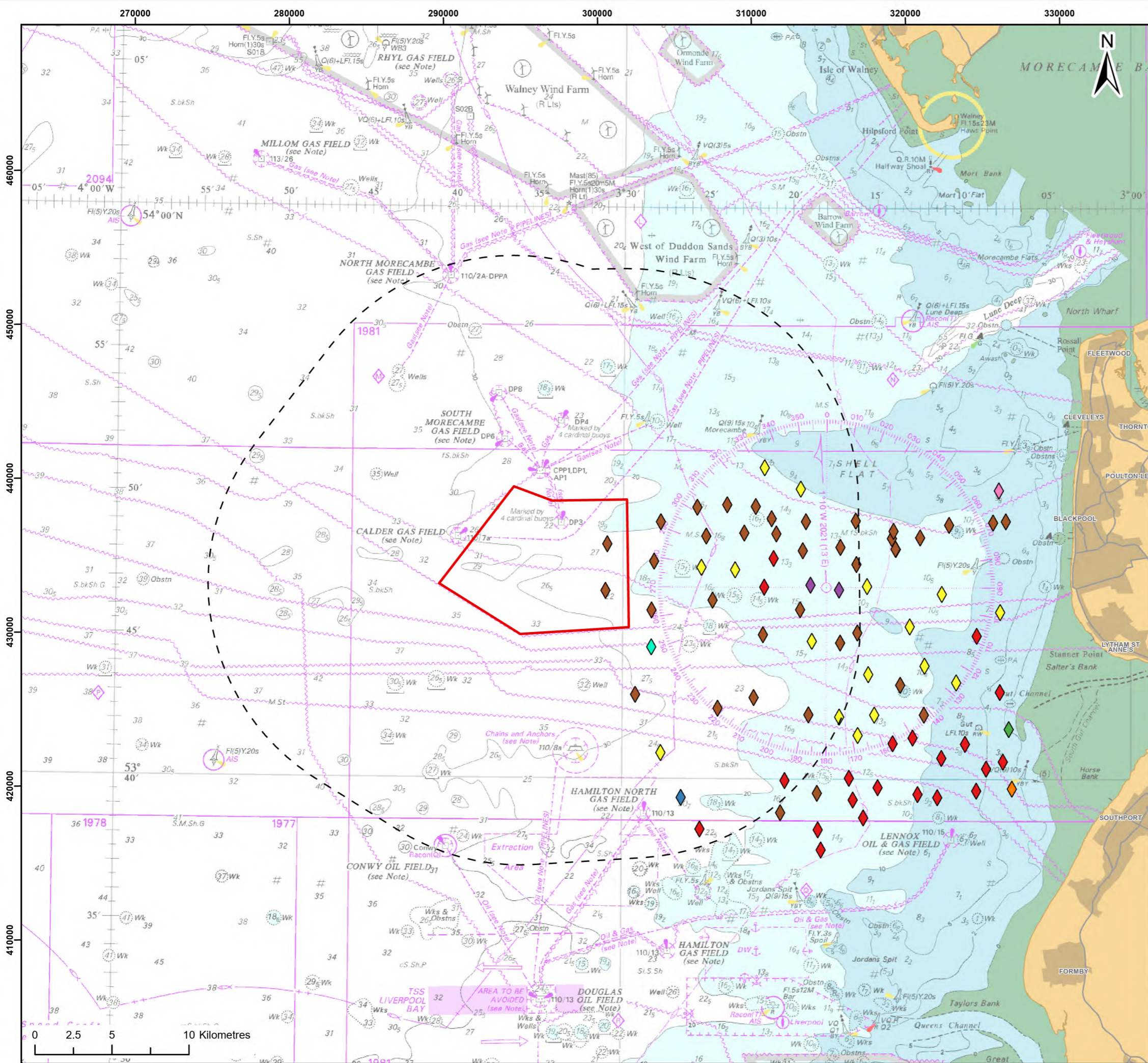
Title: 2021 Morgan and Mona OWF Benthic Baseline Survey Biotope Assignment & 2022 Morecambe and Morgan Transmission Assets Benthic Baseline Survey Biotope Assignment

Figure: 9.10 **Drawing No:** PC1165-RHD-ES-OF-DG-Z-0070

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	20/03/2024	SB	GC	A3	1:300,000

Co-ordinate system: WGS 1984 UTM Zone 30N





- Legend:**
- Morecambe Offshore Windfarm Site
 - 15km Potential Zone of Influence (ZoI)
- 2015 Fylde MCZ Baseline Survey biotope assignment (EUNIS level 5 biotopes)**
- ◆ A5.133 *Moerella* spp. with venerid bivalves in infralittoral gravelly sand
 - ◆ A5.135 *G. lapidum* in impoverished infralittoral mobile gravel and sand
 - ◆ A5.137 *L. conchilega* and other polychaetes in tide swept infralittoral sand and mixed gravelly sand
 - ◆ A5.241 *E. cordatum* and *Ensis* spp. in lower shore and shallow sublittoral slightly muddy fine sand
 - ◆ A5.242 *F. fabulina* and *M. mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand
 - ◆ A5.261 *A. alba* and *N. nitidosa* in circalittoral muddy sand or slightly mixed sediment
 - ◆ A5.351 *A. filiformis*, *M. bidentata* and *A. nitida* in circalittoral sandy mud
 - ◆ A5.355 *L. koreni* and *P. pellucidus* in circalittoral sandy mud
 - ◆ A5.443 *M. bidentata* and *Thyasira* spp. in circalittoral muddy mixed sediment

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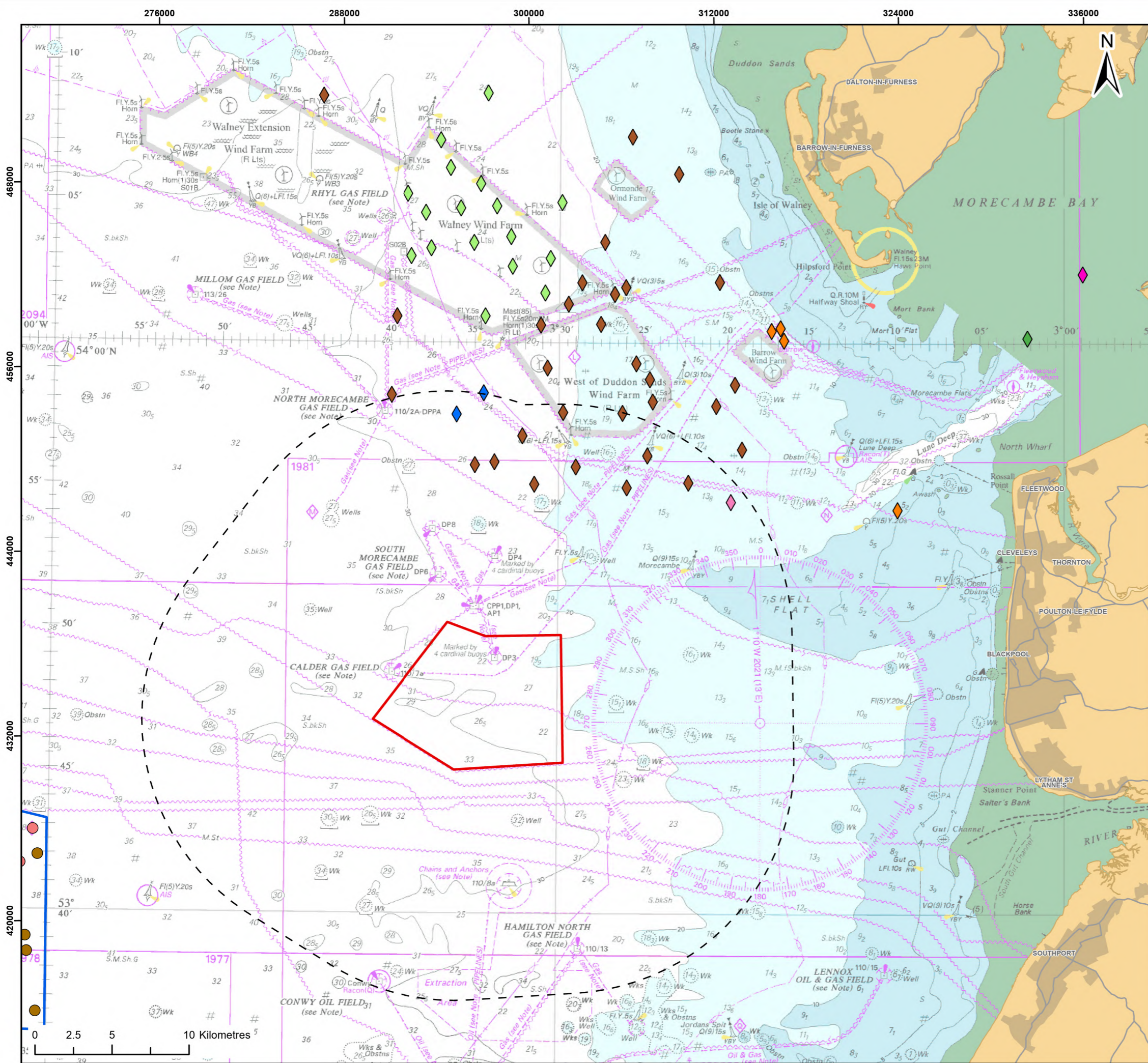
Title:
2015 Fylde MCZ Baseline Survey Biotope Assignment (EUNIS level 5 biotopes)

Figure: 9.11 Drawing No: PC1165-RHD-ES-OF-DR-Z-0030

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	21/03/2024	JH	SB	A3	1:250,000

Co-ordinate system: WGS 1984 UTM Zone 30N





Legend:

- Morecambe Offshore Windfarm Site
- 15km Potential Zone of Influence (Zoi)
- Proposed Rhiannon OWF Site (Cancelled project)

2012 West of Duddon Sands OWF benthic baseline survey biotope assignment (EUNIS level 5)

- ◆ A5.351 Amphura filiformis, Mysella bidentata and Abra nitida in circalittoral sandy mud
- ◆ A5.355 Lagis koreni and Phasax pellucidus in circalittoral sandy mud and A5.261 Abra alba and Nucula nitidosa in circalittoral muddy sand
- ◆ A5.361 Seapens and burrowing megafauna in circalittoral fine mud

2014 Walney OWF year 3 post-construction benthic survey biotope assignment (EUNIS level 5)

- ◆ A5.137 L. conchilega and other polychaetes in tide-swept infralittoral sand and mixed gravelly sand
- ◆ A5.233 N. cirrosa and Bathyporeia spp. in infralittoral sand
- ◆ A5.242 F. fabulina and M. mirabilis with venerid bivalves and amphipods in infralittoral compacted fine muddy sand
- ◆ A5.35 Circalittoral sandy mud
- ◆ A5.351 A. filiformis, M. bidentata and A. nitida in circalittoral sandy mud

2013 Rhiannon OWF Benthic Survey

- A5.14 Circalittoral coarse sediment
- A5.445 Ophiotrix fragilis and/or Ophiocoma nigra brittlestar beds on sublittoral mixed sediment

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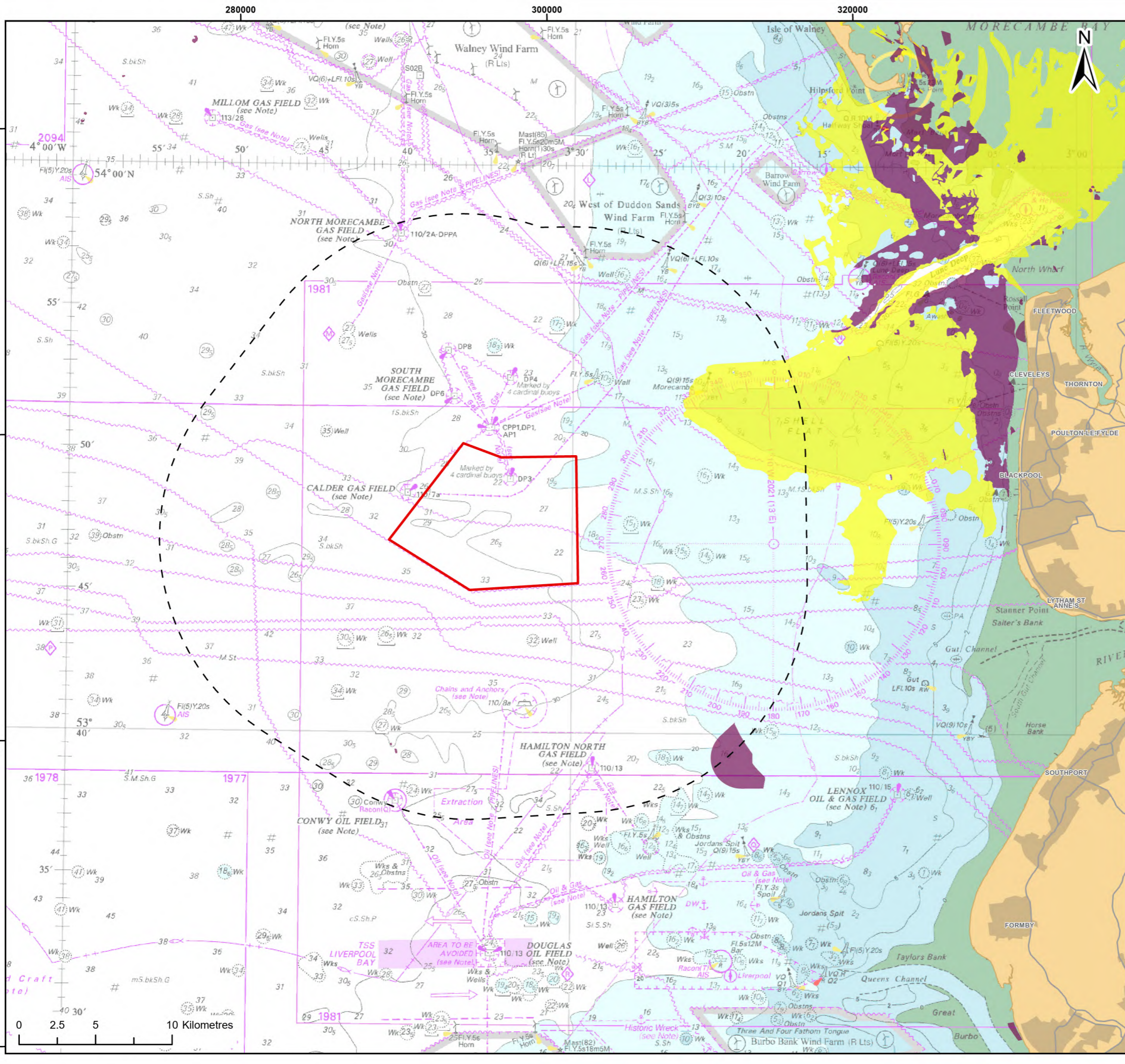
Title: 2012 West of Duddon Sands OWF Benthic Baseline Survey Biotope Assignment (EUNIS level 5) & 2014 Walney OWF Year 3 Post-construction Benthic Survey Biotope Assignment (EUNIS level 5)

Figure: 9.12 **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0031

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	21/03/2024	JT	GC	A3	1:250,000

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Legend:

- Morecambe Offshore Windfarm Site
- 15km Potential Zone of Influence (Zoi)
- Annex I Sandbanks
- Annex I Reef

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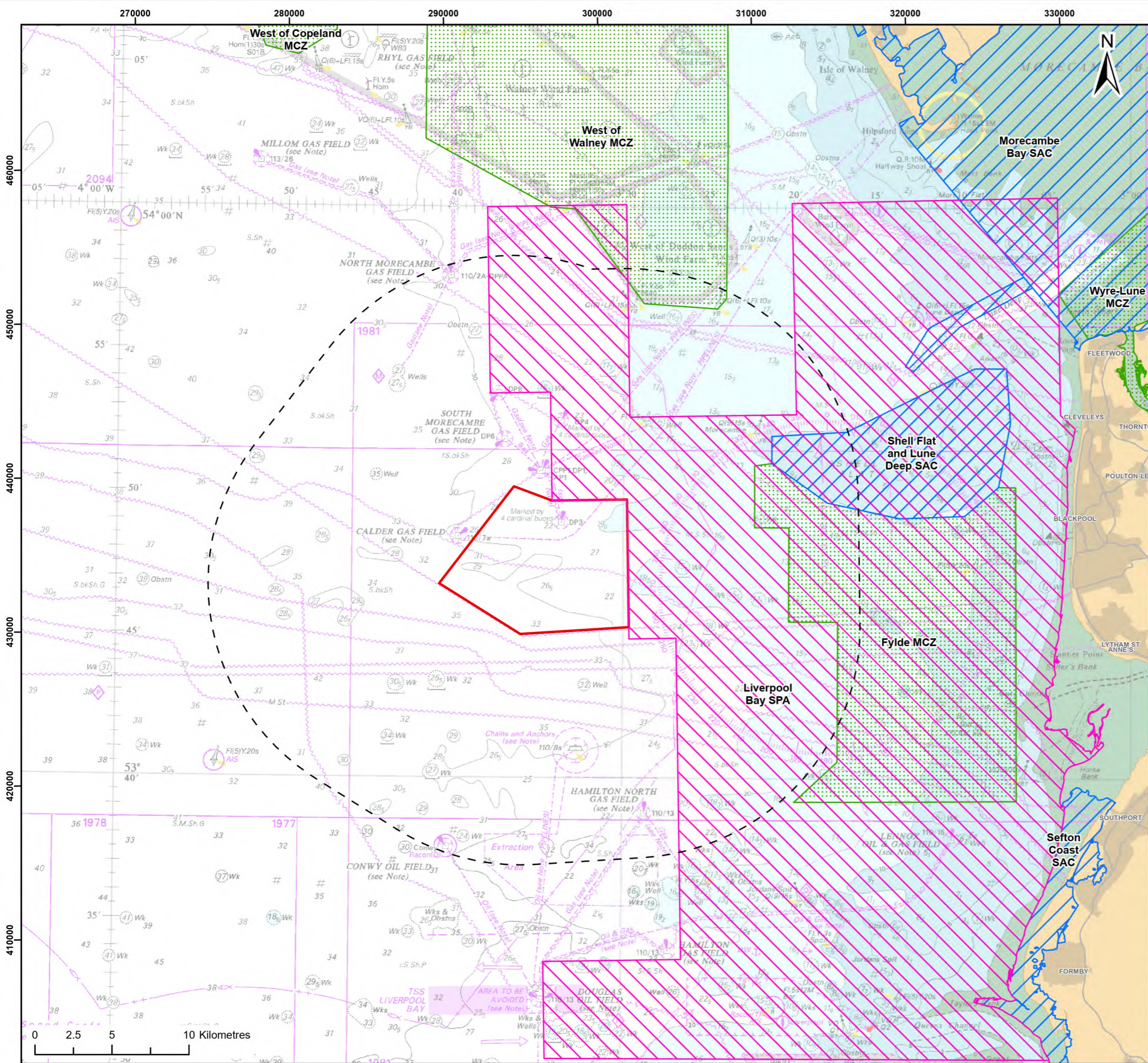
Title:
Annex I Sandbanks and Reef (JNCC)

Figure: 9.13 **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0032

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	21/03/2024	JT	GC	A3	1:250,000

Co-ordinate system: WGS 1984 UTM Zone 30N





- Legend:**
- Morecambe Offshore Windfarm Site
 - 15km Potential Zone of Influence (ZoI)
 - Marine Conservation Zone (MCZ)
 - Special Areas of Conservation (SAC)
 - Special Protection Area (SPA)

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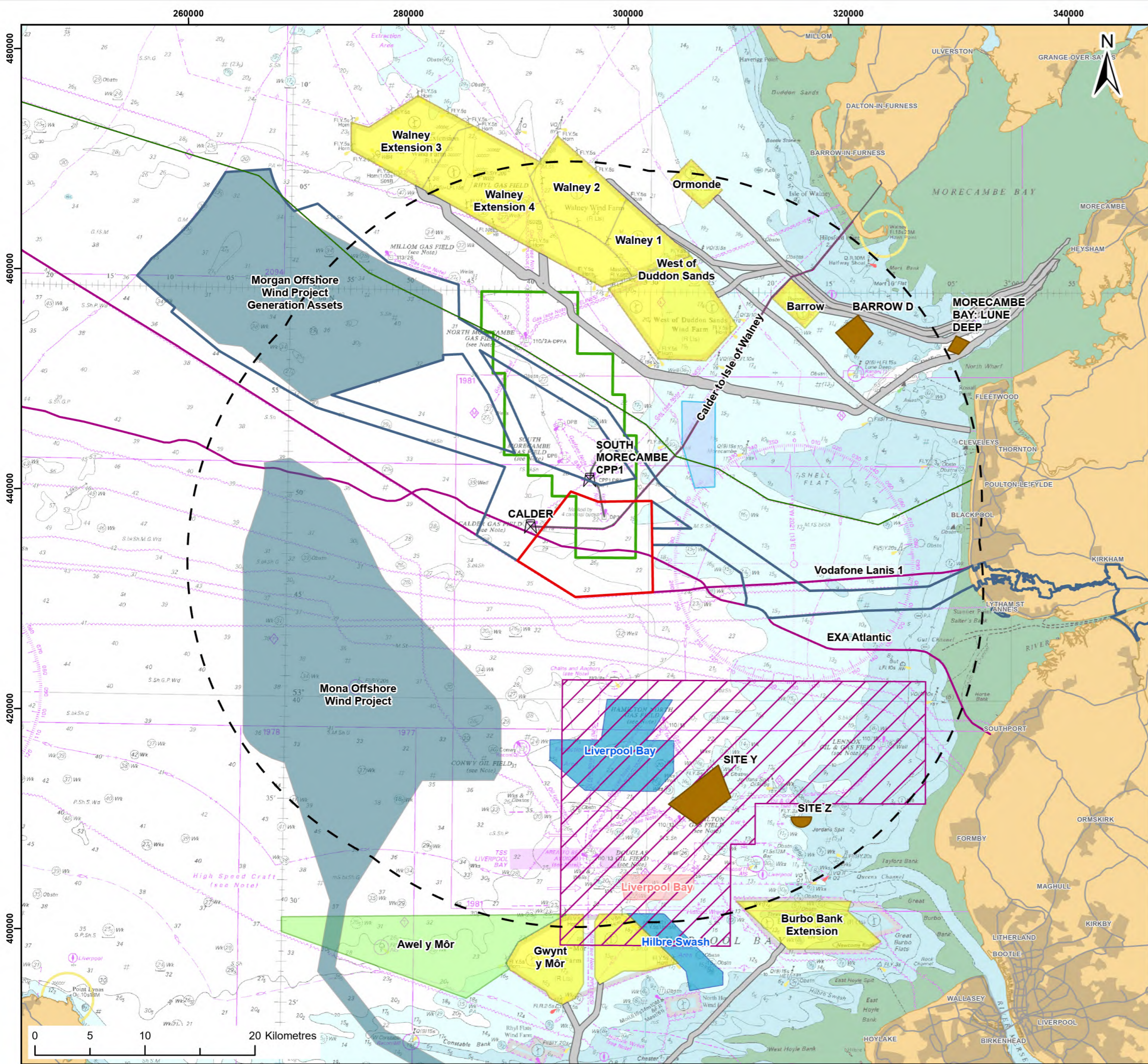
Title:
Marine Protected Area Designations for Benthic Features in the Irish Sea

Figure: 9.14 **Drawing No:** PC1165-RHD-ES-OF-DR-Z-0033

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	21/03/2024	JT	GC	A3	1:250,000

Co-ordinate system: WGS 1984 UTM Zone 30N





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

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

Figure: 9.15 Drawing No: PC1165-RHD-ES-OF-DR-Z-0104

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	21/11/2023	JH	SB	A3	1:350,000

Co-ordinate system: WGS 1984 UTM Zone 30N

