Outer Dowsing Offshore Wind

Environmental Statement

Chapter 9 Benthic and Intertidal Ecology

Volume 3 Appendices

Appendix 9.5

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ENVISION

Outer Dowsing Export Cable Corridor Sabellaria Review

Jan / 2024

Review and Interpretation of Survey Data

Site

Outer Dowsing Offshore Wind Farm

Prepared for

GOBE

Prepared by

ENVISION

Author(s)

Ian Sotheran
Charlotte Aldis

PREPARED FOR	GOBE
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PREPARED BY

ENVISION
Mallan House
Bridge End
Hexham
Northumberland
NE46 4DQ
United Kingdom

T: +44 (0)1434 60 76 71
E: mail@envision.uk.com

NOTES

ENVISION's environmental policy involves the use of renewable electricity and recycled paper that is manufactured using wind-generated electricity

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1. Introduction

An offshore geophysical and benthic sample data collection campaign, and subsequent data analysis and interpretation, has been undertaken for Outer Dowsing Offshore Wind export cable corridor (ECC). Analyses of the benthic sample data have shown that the biotope *Sabellaria spinulosa* on stable circalittoral mixed sediment (SS.SBR.PoR.SspiMx) potentially occurs within the ECC (GEOxyz, 2022[i]), however no clear signature is evident from the interpretation of the geophysical data.

Outer Dowsing OWF ECC passes through the Inner Dowsing, Race Bank and North Ridge Special Area of Conservation (SAC) (Figure 1) which includes a range of marine habitats and is designated for sandbanks and biogenic reef.

The biotope SS.SBR.PoR.SspiMx is a component part of *S. spinulosa* reefs, but Annex I reefs are not always present where the biotope occurs. Therefore a review of all available data pertaining to the likelihood, presence, distribution, and nature of *S. spinulosa* biotopes and reefs within the Outer Dowsing OWF cable corridor has been undertaken with the specific aims of:

i. Identifying the presence and extent of any *S. spinulosa* reef within the Outer Dowsing OWF export cable corridor and which fall within the Inner Dowsing, Race Bank and North Ridge SAC.

ii. If found, to assess any areas in context with the protected features within the SAC.

In addition to geophysical data and sample data available for the Outer Dowsing OWF export cable corridor (GEOxyz, 2022[i]) sample data from the Regional Seabed Monitoring Plan (RSMP) baseline assessment dataset (Cooper & Barry, 2017[ii]) and data from National Databases (DASHH[iii], OBIS[iv], MEDIN[v]) which includes ENVISION archive samples were also investigated. Information from these was used to inform the study and establish the location and probabilities of potential Annex I *Sabellaria spinulosa* reef within the export cable corridor.

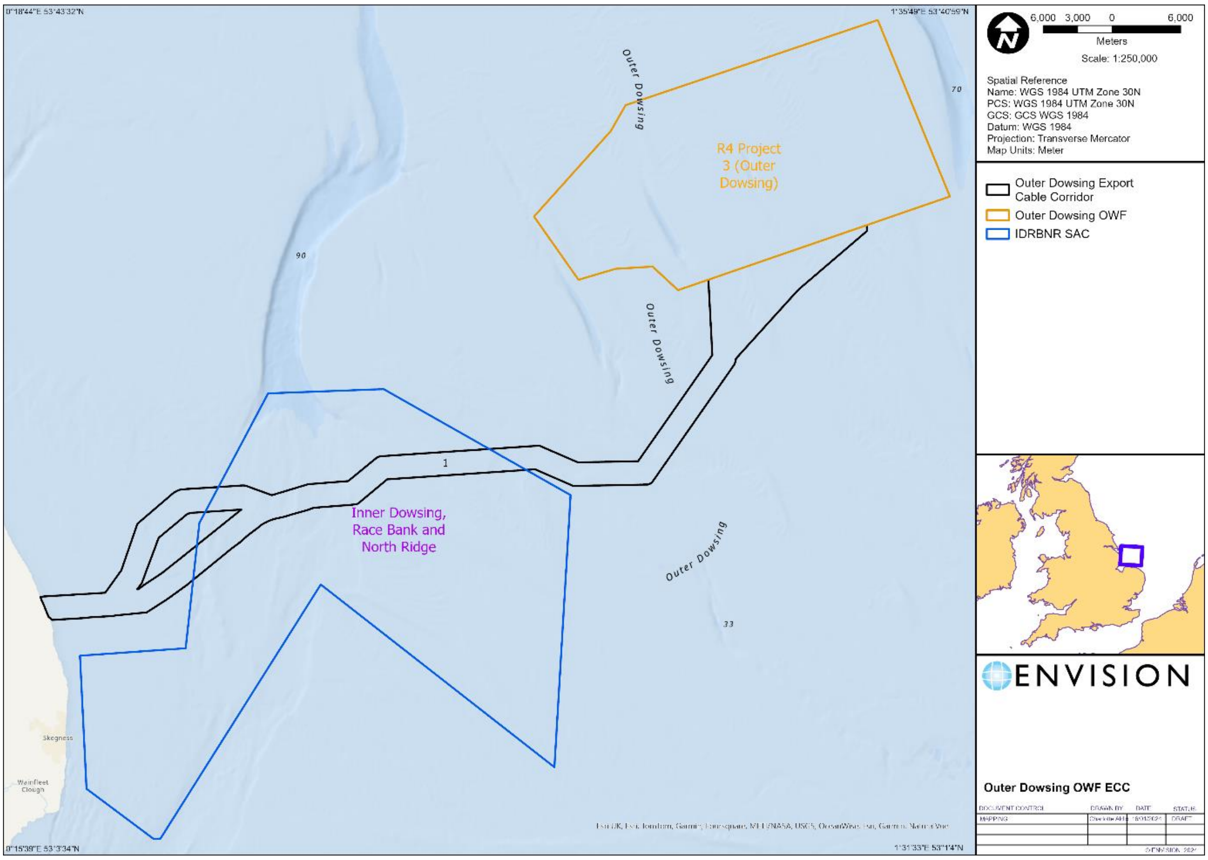

Figure 1.
Outer Dowsing OWF and ECC, and Inner Dowsing, Race Bank and North Ridge SAC.

2. Methodology

The overarching strategy for the interpretation is to combine information from the geophysical data with the benthic sample data using image processing and spatial statistical analysis. This process uses the sample data to 'ground truth' the geophysical data, a strategy which is described in the Mapping European Seabed Habitats (MESH) documentation from which Figure 2 is taken (MESH, 2008[vi]). The existing geophysical data require processing and interpolation prior to integration so that the data are in a suitable format for the mathematical analyses. The main outputs are descriptions of habitats and distribution maps.

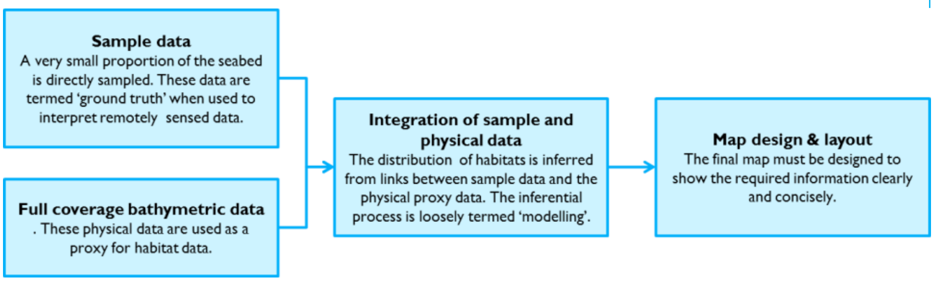

Figure 2. *A flow chart of the main stages in making a habitat map by integrating sample data and full coverage physical data.*

Several approaches have been used to map the export cable corridor, and the resultant maps from each combined to produce an ensemble map incorporating confidence.

2.1. Geophysical Data

Geophysical data were available for the Outer Dowsing export cable corridor area. Of the data available, the most suitable for habitat mapping and detection of *S. spinulosa* reefs were bathymetry and backscatter, supported by rugosity information which is a derivative of the bathymetric data, and variance information which is a derivative of the backscatter data. These data have been incorporated within a geographic information system and processed to produce derived data sets which can be used to predict benthic habitat variability or complexity within the areas surveyed. Examples of these data sets are presented for Outer Dowsing OWF export cable route in Figure 3, Figure 4, Figure 5 and Figure 6.

All geophysical data (bathymetry, sidescan and backscatter) were gridded data at a resolution of 1 metre (Figure 3). In addition to detailing the depth of the seafloor, bathymetry can be used to derive other parameters such as an index of rugosity which can highlight where the seabed is variable in nature.

Seabed terrain heterogeneity can indicate the complexity of a habitat and is known to be correlated to the distribution of benthic fauna (Tappin *et al*., 2011)[vii] and associated with areas of *S. spinulosa* reefs and this has been used to detect reefs around the UK (McIlwaine, 2017[viii] & MESL, 2012[ix]). Rugosity (Figure 4) was calculated using a terrain ruggedness index which produces gridded data suitable for analysis, using the method from Riley *et al*., (1999)[x]. Other derivates from bathymetry such as slope and aspect were excluded from analysis as they are too closely correlated to depth and can overly influence the mapping process.

Backscatter data (Figure 5) was used with the variability of the data (Figure 6) to indicate the heterogeneity of seabed habitats and this derivative was incorporated into the habitat mapping process.

All data layers were standardised to 5 metre pixel raster images[1] with the same geographic bounds in order to perform mathematic and statistical calculations and classifications.

The data shown in Figure 3, Figure 4, Figure 5 and Figure 6 are examples of the data used and show the data within the funnel area of the export cable corridor, as the scale of maps and data of the whole project area do not lend themselves to project wide maps within this report. Data for the whole project area have been used and are available digitally.

It should be noted that there are some artefacts within the backscatter data which related to either data collection or processing which are exhibited as 'step' change in contrast or as a linear feature of high variability. Any outputs have been reviewed with these artefacts in mind to ensure no undue influence on interpretation of geophysical data has occurred.

[1] *A raster image is a rectangular grid of values of a regular size (pixels) which form an image of the data.*

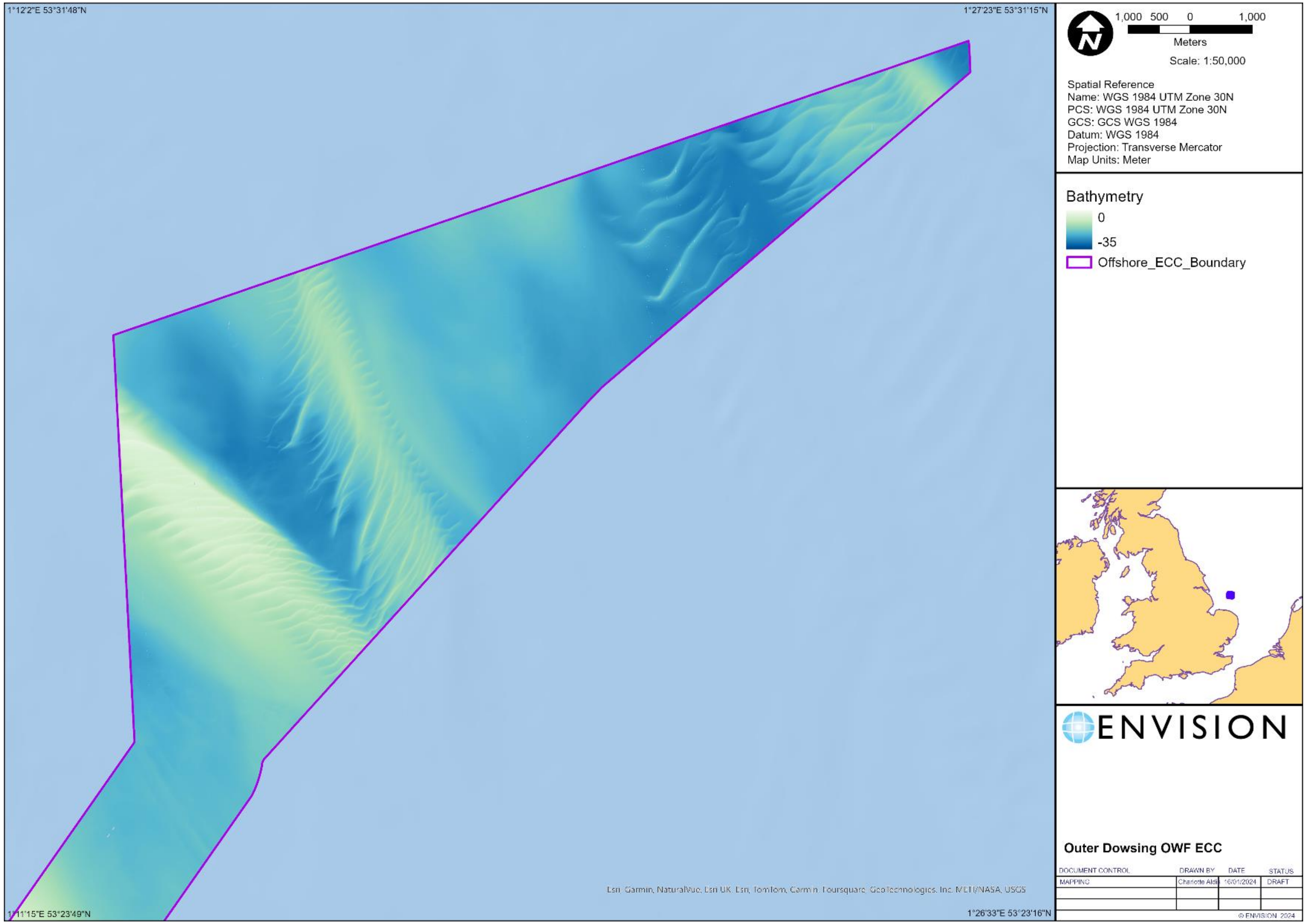

Figure 3.
Bathymetry within the funnel area of the export cable corridor for Outer Dowsing OWF.

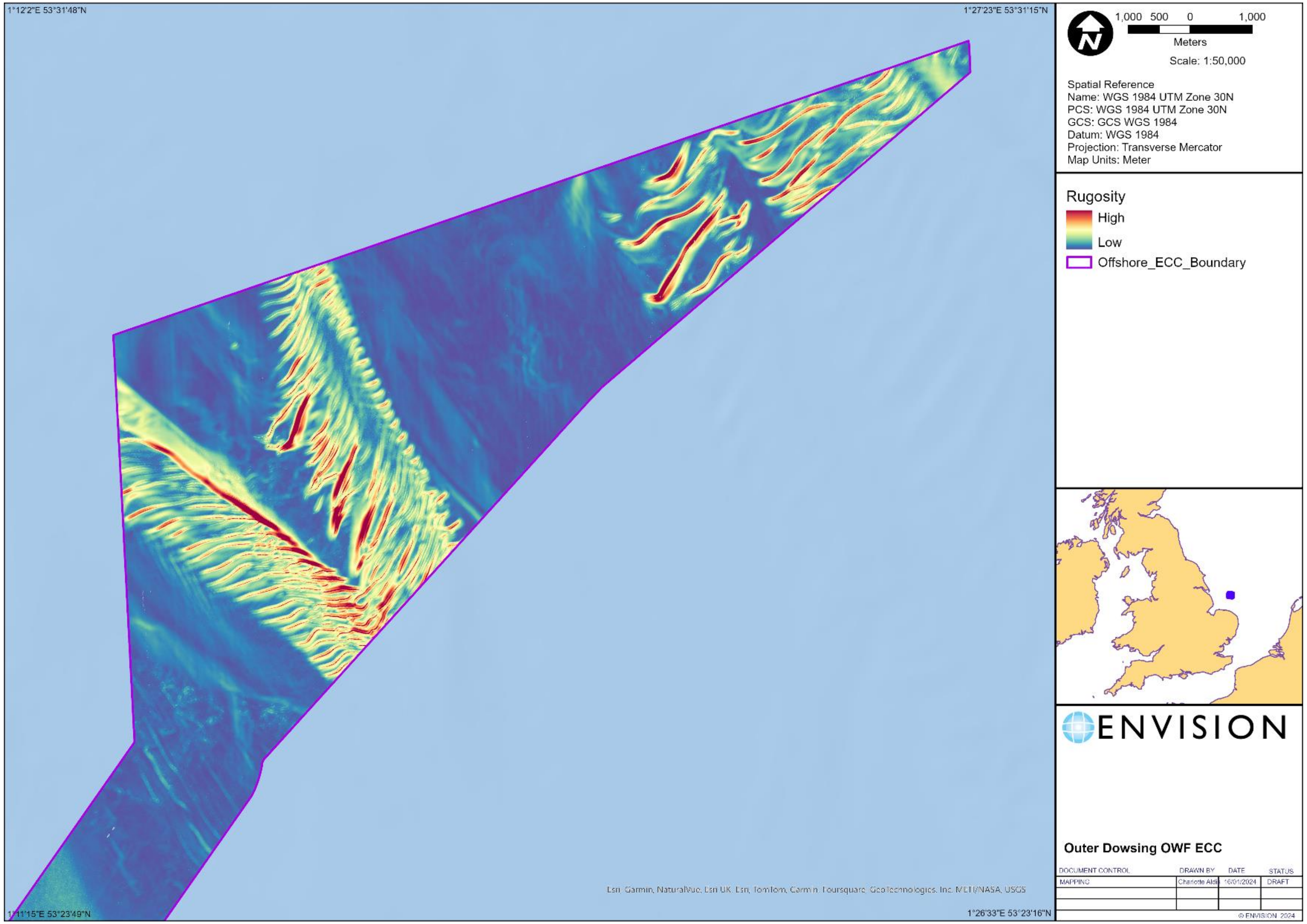

Figure 4.
Rugosity derived from bathymetric data within the funnel area of the export cable corridor for Outer Dowsing OWF. High rugosity can be indicative of more heterogenic habitats, and vice versa.

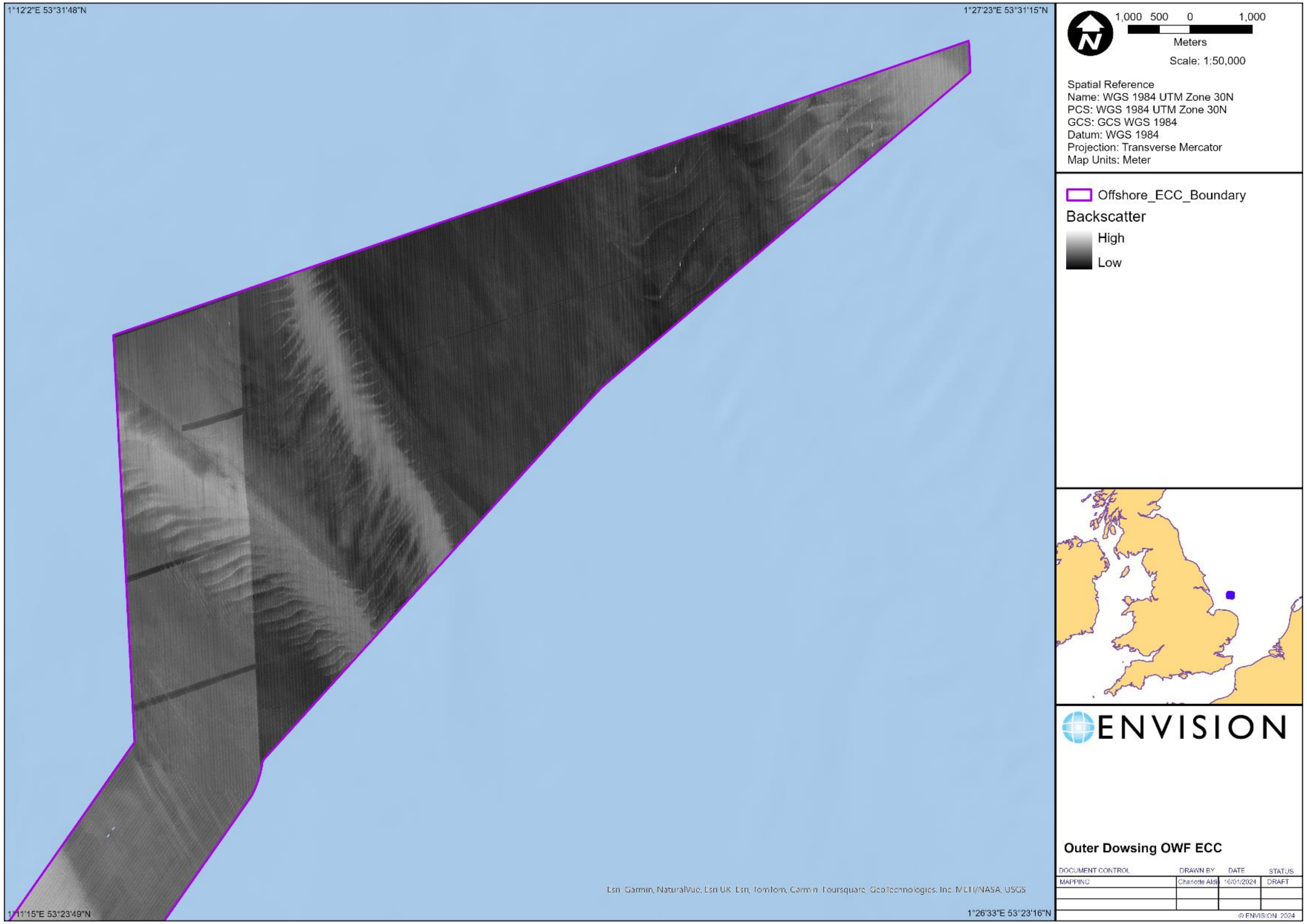

Figure 5.
Backscatter data from the funnel area of the export cable corridor for Outer Dowsing OWF.

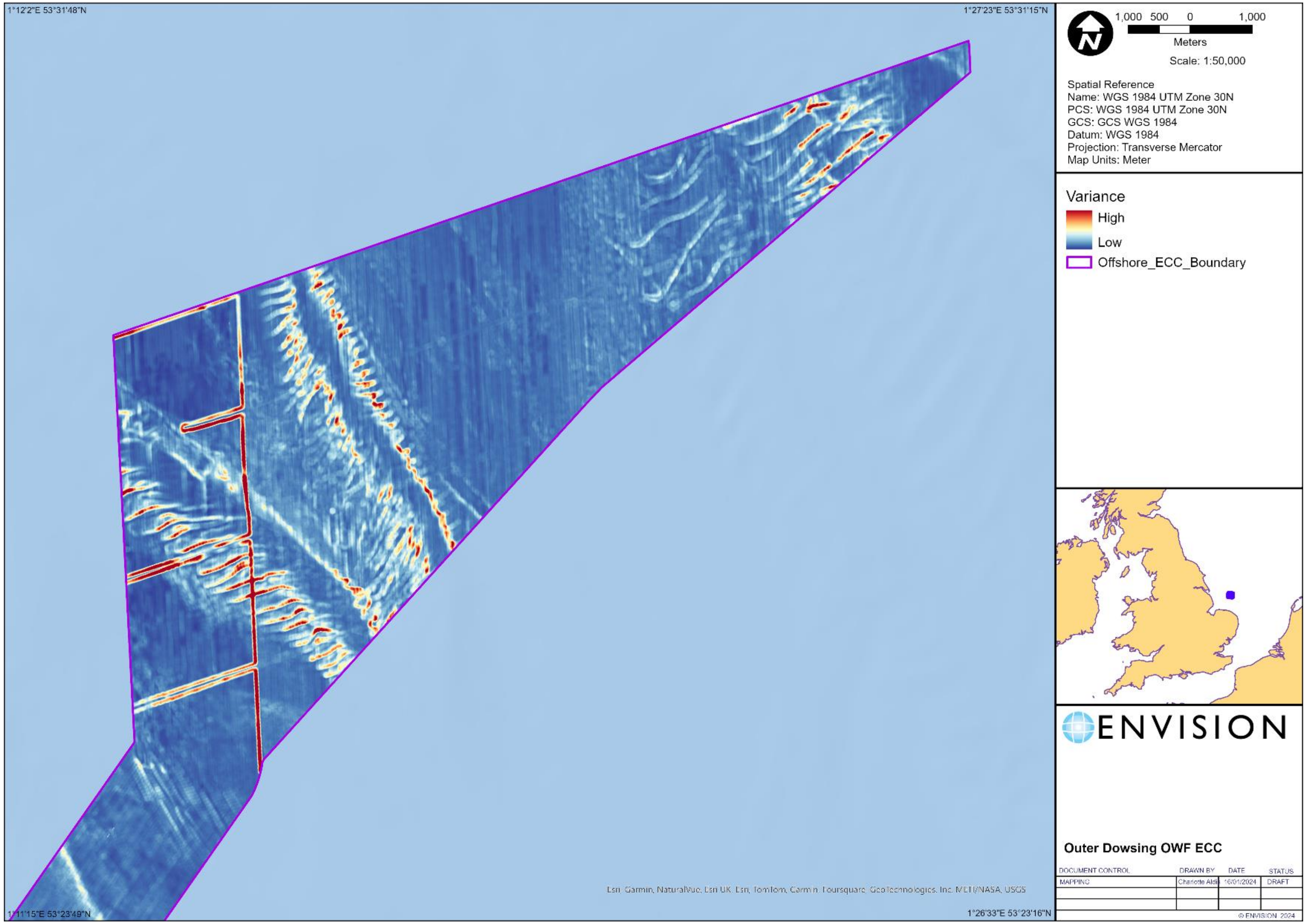

Figure 6.
Variability of backscatter data within the funnel area of the export cable corridor for Outer Dowsing OWF. High variability can be indicative or more heterogenic seabed habitats, and vice versa.

(NB Data collection/processing artefact visible as linear features).

2.2. Sample Data

Sample data from stations within the Outer Dowsing OWF export cable corridor were collected as part of the environmental baseline survey (EBS) and habitat assessment survey (HAS), the result of which are reported within the Benthic Ecology Technical Report (ECC) (GEOxyz, 2022[i]). Full particle size distribution analysis (PSD) data, benthic infauna from grabs, with example images and descriptions from video footage were available for the majority of sample stations.

Regional and other datasets were sourced from the Regional Seabed Monitoring Plan (RSMP) baseline assessment dataset (Cooper & Barry, 2017[ii]). These data incorporate a range of surveys from a variety of sources with accompanying infauna and PSA data. Other samples were available from national databases and include ENVISION archive datasets and these were also used within the mapping process.

The majority of grab samples from the EBS and HAS had not been attributed to a Marine Nature Conservation Review (MNCR)[xi] or European Nature Information System (EUNIS)[xiii] marine habitat category therefore the physical parameters (PSD) were used to attribute each sample with a Marine Nature Conservation Review (MNCR) Level 3 category based upon the varying percentages of gravels, sands and muds (after Long, 2006[xii]) (Figure 7).

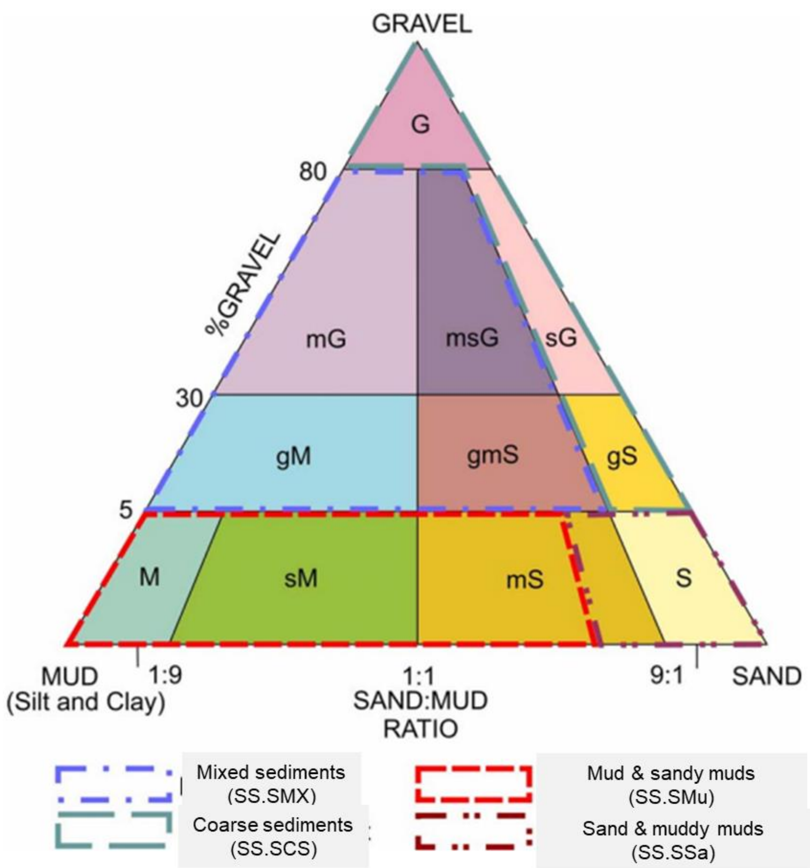

Figure 7.
The Folk sediment triangle showing Folk classes and the relationship to MNCR Level 3 habitats.

Video samples from the EBS and HAS had been attributed a Level 4 or Level 5 MNCR habitat/biotope and these have been used to inform the study, along with numbers of *Sabellaria spinulosa* individuals present in infauna grabs. Where habitat categories included a biological or depth element then these samples were pooled (i.e. SS.SSa.IMuSa and SS.SSa.CMuSa were given the habitat SS.SSa.IMuSa / CMuSa) as infaunal communities typical of both infralittoral and circalittoral habitats can occur throughout the ECC and these cannot be strictly defined by depth. Grouping these habitats to a level which represents the physical nature of the sediments ensures both circalittoral and infralittoral habitat classes can occur throughout the ECC within the habitat mapping process. Stills from the video data and grab sample data have been reviewed and assessed for the presence of *S. spinulosa* and were used to assess the likelihood of reef habitat occurring in the vicinity of each sample.

All samples were attributed to a Marine Nature Conservation Review (MNCR)[xi] habitat. For mapping purposes, the marine habitat categories used are shown in Table 1 and Table 2, with the corresponding European Nature Information (EUNIS)[xiii] marine habitat category (2012 and 2022). Sample distributions are presented in Figure 8, Figure 9, Figure 10, Figure 11 and Figure 12.

Table 1.

Level 3 marine habitat categories used within the mapping process.

MNCR Habitat/Biotope	Description	EUNIS 2012	EUNIS 2019
SS.SSa	Sublittoral sands and muddy sands	A5.2	MB5 – Infralittoral sand / MC5 – Circalittoral sand
SS.SCS	Sublittoral coarse sediment (unstable cobbles and pebbles, gravels and coarse sands)	A5.1	MB3 – Infralittoral coarse sediment / MC3 – Circalittoral coarse sediment
SS.SMx	Sublittoral mixed sediment	A5.4	MB4 – Infralittoral mixed sediment / MC4 – Circalittoral mixed sediment
SS.SBR (not reef)	Sublittoral biogenic reefs on sediment	A5.6	MB2 – Infralittoral biogenic habitat / MC2 – Circalittoral biogenic habitat

Table 2.

Level 4/5 marine habitat categories used within the mapping process.

MNCR Habitat/Biotope	Description	EUNIS 2012	EUNIS 2019
SS.SSa.IFiSa / CFiSa	Infralittoral fine sand / Circalittoral fine sand		MB5 – Infralittoral sand / MC52 – Atlantic circalittoral sand
SS.SSa.IMuSa / CMuSa	Infralittoral muddy sand / Circalittoral muddy sand	A5.24 / A5.26	MB5 – Infralittoral sand / MC52 – Atlantic circalittoral sand
SS.SCS.CCS	Circalittoral coarse sediment	A5.14	MC32 – Atlantic circalittoral coarse sediment

MNCR Habitat/Biotope	Description	EUNIS 2012	EUNIS 2019
SS.SMx.CMx	Circalittoral mixed sediment	A5.44	MC42 – Atlantic circalittoral mixed sediment
SS.SBR.PoR (not reef)	Polychaete worm reefs (on sublittoral sediment)	A5.61	MC221 – Worm reefs in the Atlantic circalittoral zone
SS.SBR.PoR.SspiMx (not reef)	*Sabellaria spinulosa* on stable circalittoral mixed sediment	A5.611	MC2211 – *Sabellaria spinulosa* on stable Atlantic circalittoral mixed sediment

The habitat of SS.SBR.PoR have been used to identify samples with elevated numbers of *Sabellaria spinulosa* within them but have not been assessed as reef. Therefore, this habitat should not be considered a reef habitat, but as a Level 3 version of SS.SBR.PoR.SspiMx, as supporting evidence is not available to allow a full reefiness assessment to be made. Alternatively, this habitat (SS.SBR.PoR) could be considered as an impoverished version of SS.SBR.PoR.SspiMx. Where the biotope SS.SBR.PoR.SspiMx has been attributed to a sample, this has been determined within the EBS, from a reefiness assessment after Gubbay, 2007[xiv]. All samples attributed with SS.SBR.PoR.SspiMx have been assessed an ‘not reef.’

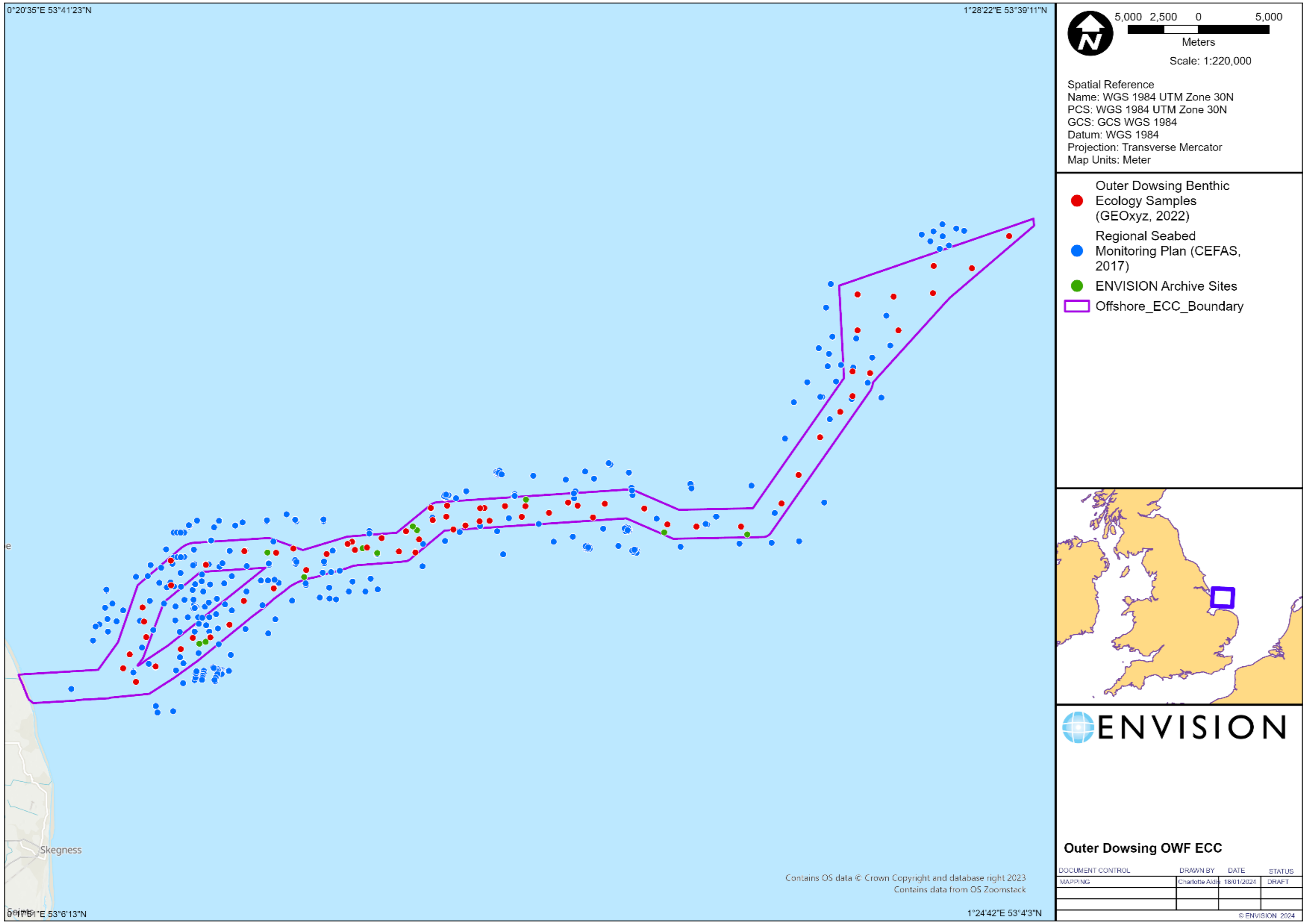

Figure 8.
Sample stations showing data sources used within the mapping process.

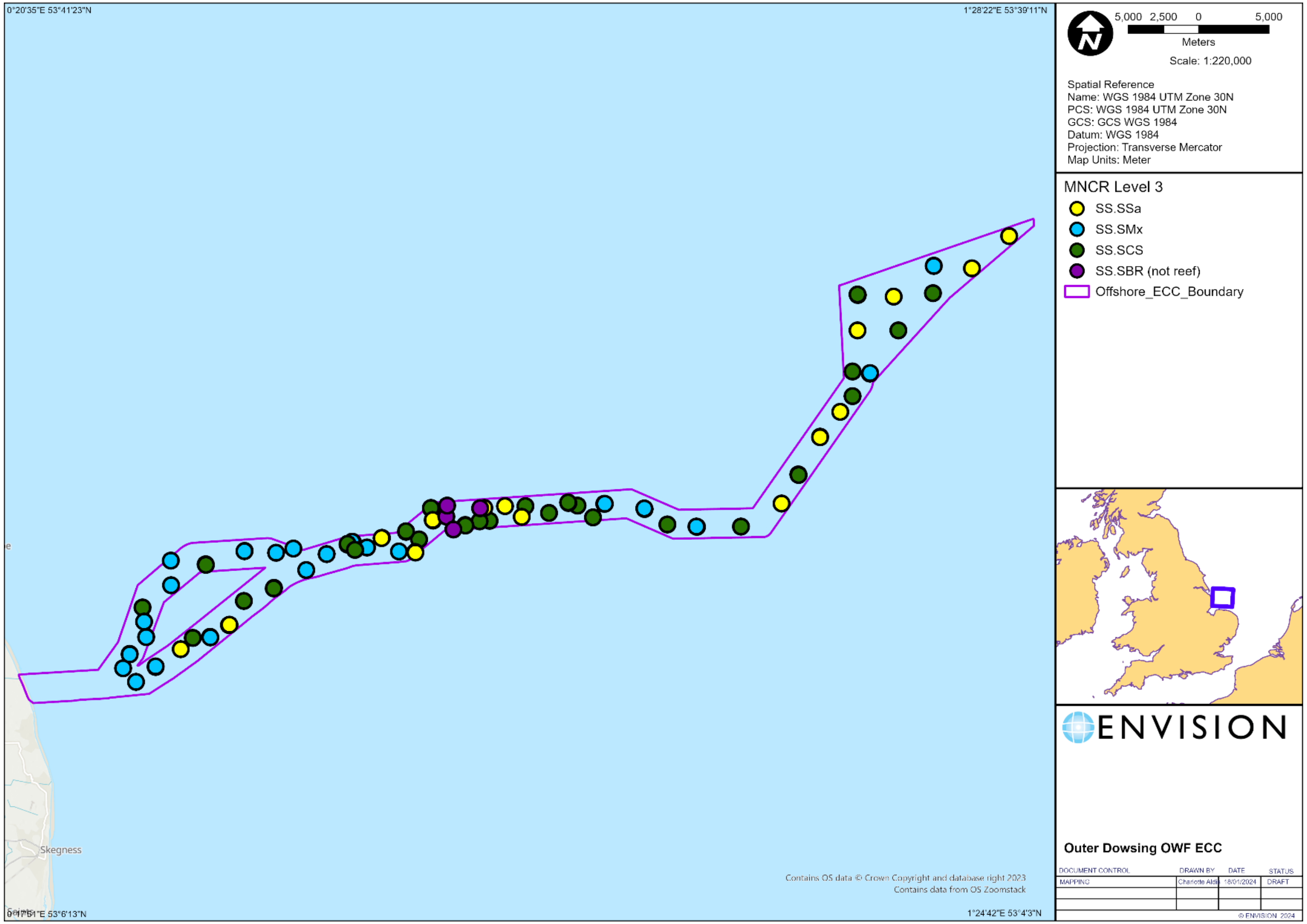

Figure 9.
Distribution of Level 3 benthic samples within from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

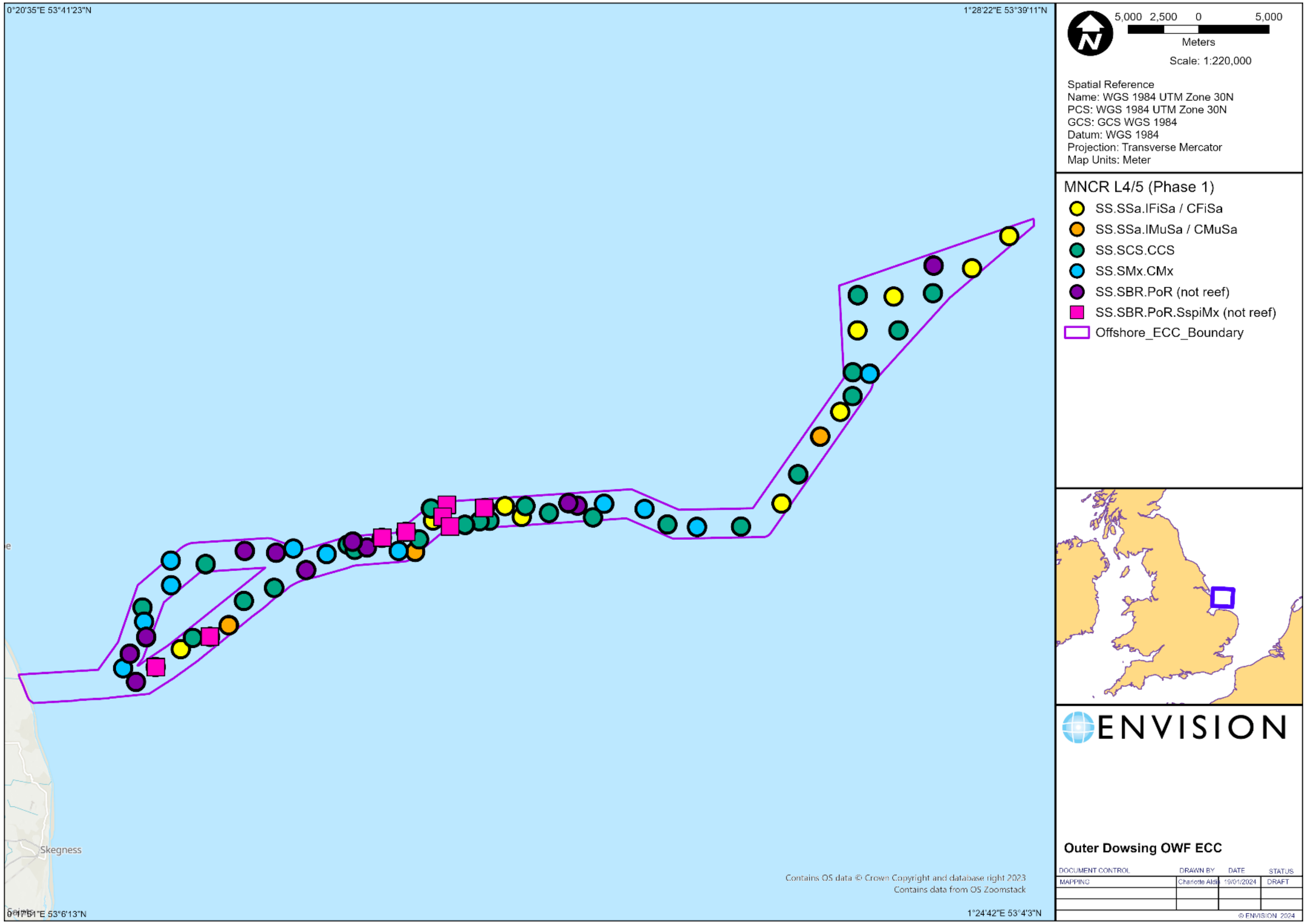

Figure 10.
Distribution of Level 4 benthic samples from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

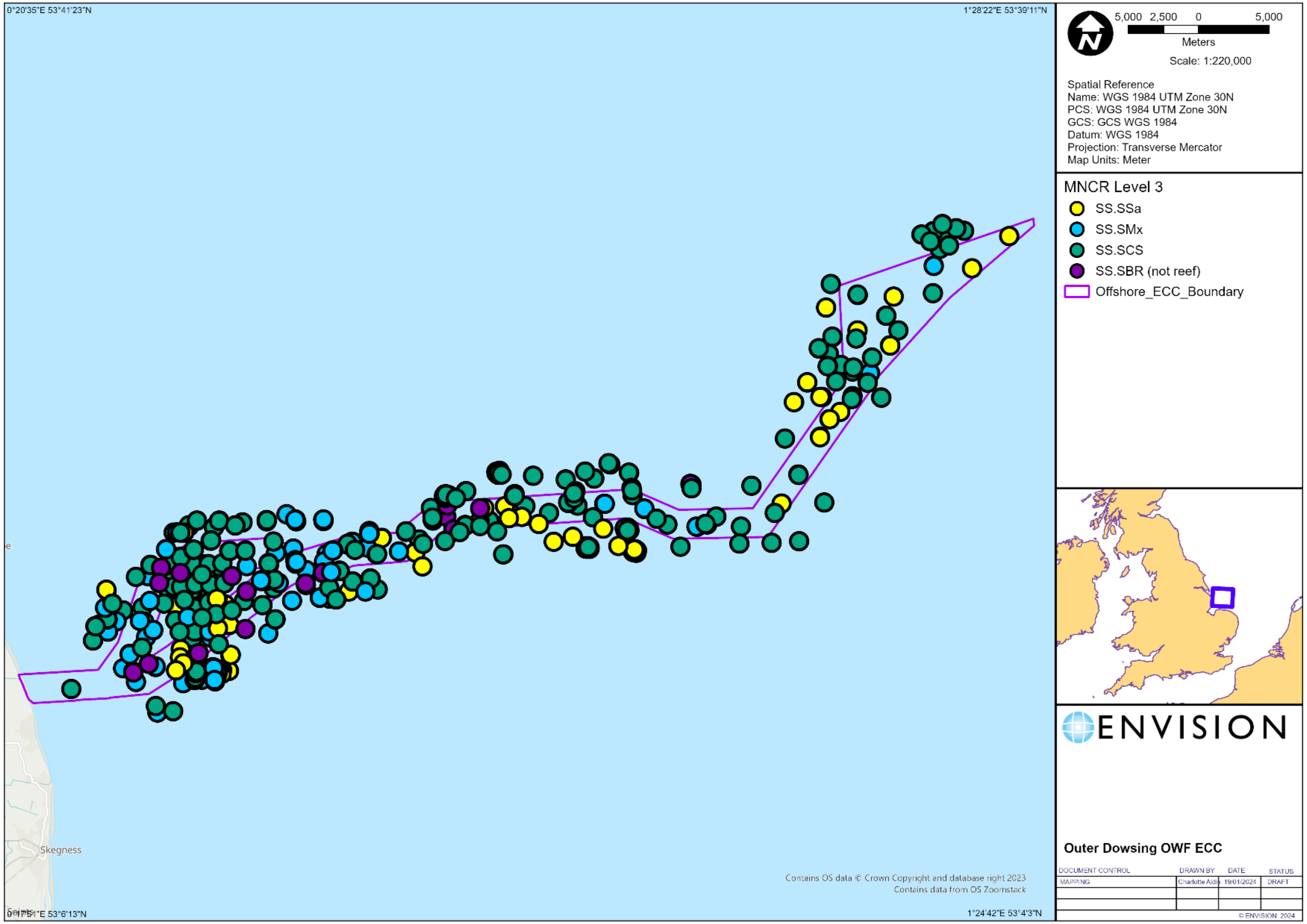

Figure 11.
Distribution of Level 3 benthic habitats from samples within and adjacent to Outer Dowsing OWF export cable route from various sources.

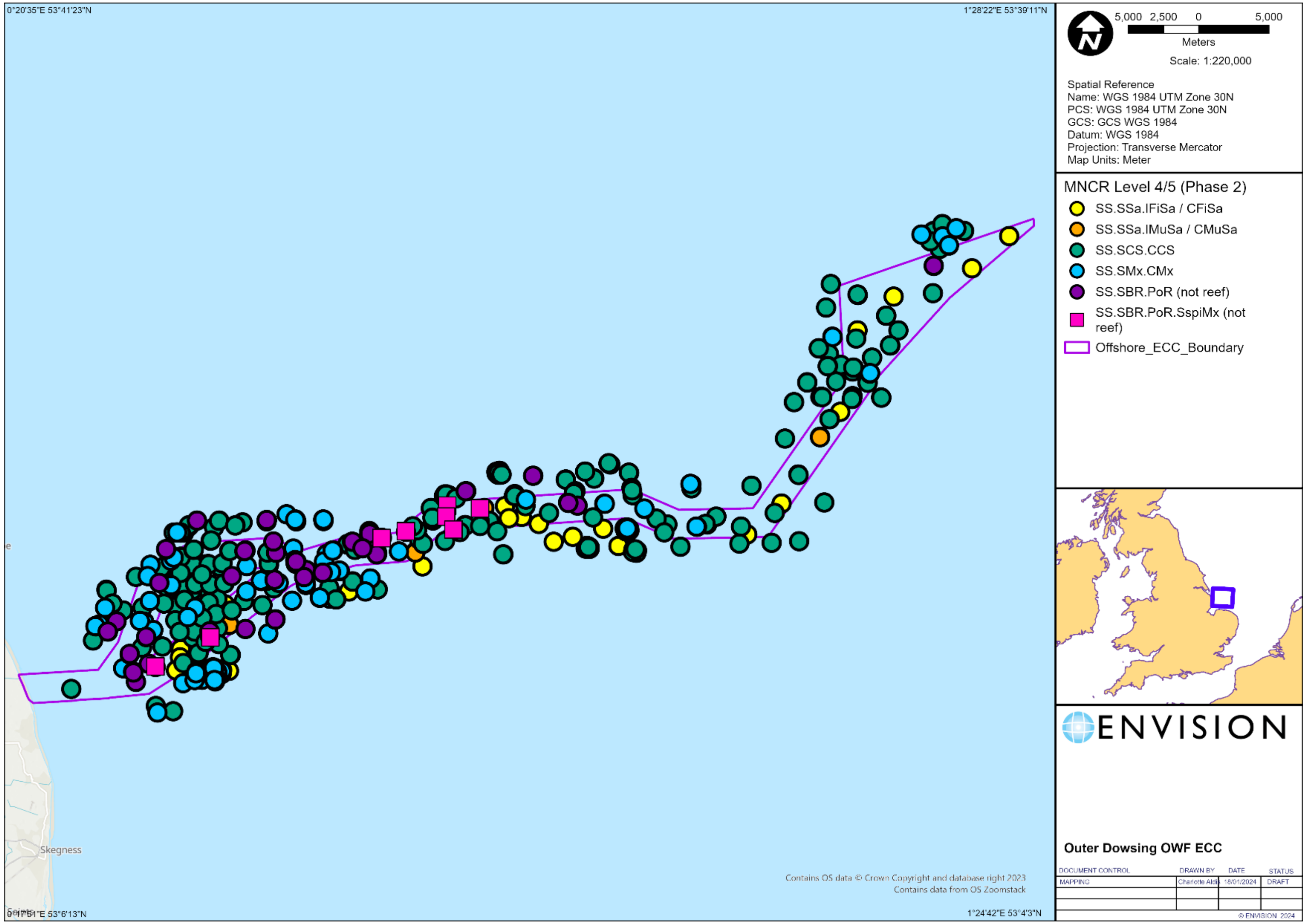

Figure 12.
Distribution of Level 4/5 benthic habitats from samples within and adjacent to Outer Dowsing OWF export cable route from various sources.

2.3. *Sabellaria spinulosa* Review

Sabellaria spinulosa is a ubiquitous species found in varying abundances throughout the North Sea present as solitary individuals, thin crusts, or reef systems; the biotope SS.SBR.PoR.SspiMx is commonly attributed to samples with elevated numbers of individuals. The main focus of the study was to assess the likelihood, presence, distribution, and nature of *Sabellaria spinulosa* reef existing within the Outer Dowsing export cable corridor area. Therefore, an assessment was made of the currently mapped distribution of the biotope SS.SBR.PoR.SspiMx along with the samples which contributed to the mapping of these extents, and samples from other datasets which may inform the distribution of the biotope and whether reef habitat is present. Further review of sample data and supporting evidence has been undertaken and the habitat maps refined.

Published data (JNCC,2022a[xv]) on the distribution of *Sabellaria spinulosa* reefs shows areas of reef, point locations of known reef and areas with varying probabilities of reef occurring but which are managed as reef. There are also underlying data from habitat suitability modelling which provides the probability of *Sabellaria spinulosa* (JNCC, 2022b[xvi]). These data along with abundance of *Sabellaria spinulosa* in grab samples records and presence within other sample data (see section 2.2) are shown in Figure 13.

This figure shows the ECC have areas considered to be suitable (0.6-1) for *Sabellaria spinulosa* reefs in the 'mid-section' of the ECC and there is one location within the ECC which is managed as reef and has high confidence associated with this. *Sabellaria spinulosa* abundance are also elevated adjacent to this location. One other location is recorded as having *Sabellaria spinulosa* reef present within the North section of the ECC where the route bifurcates. With the offshore section (Funnel) there is lower suitability for *Sabellaria spinulosa* reefs (0.6) and there are no areas managed or identified as reef, additionally *Sabellaria* abundances within samples are relatively low.

Habitat maps from the environmental baseline and habitat assessment survey (Figure 16) show areas mapped as SS.SBR.PoR.SspiMx (*Sabellaria spinulosa* on stable circalittoral mixed sediment) within the southern section of the inshore ECC, the middle section of the ECC and the offshore (Funnel) section but these are identified as 'non-reef' habitats with sample data which supports this, typically limited to encrusting hard substrates such as cobbles and pebbles but with some increased biodiversity.

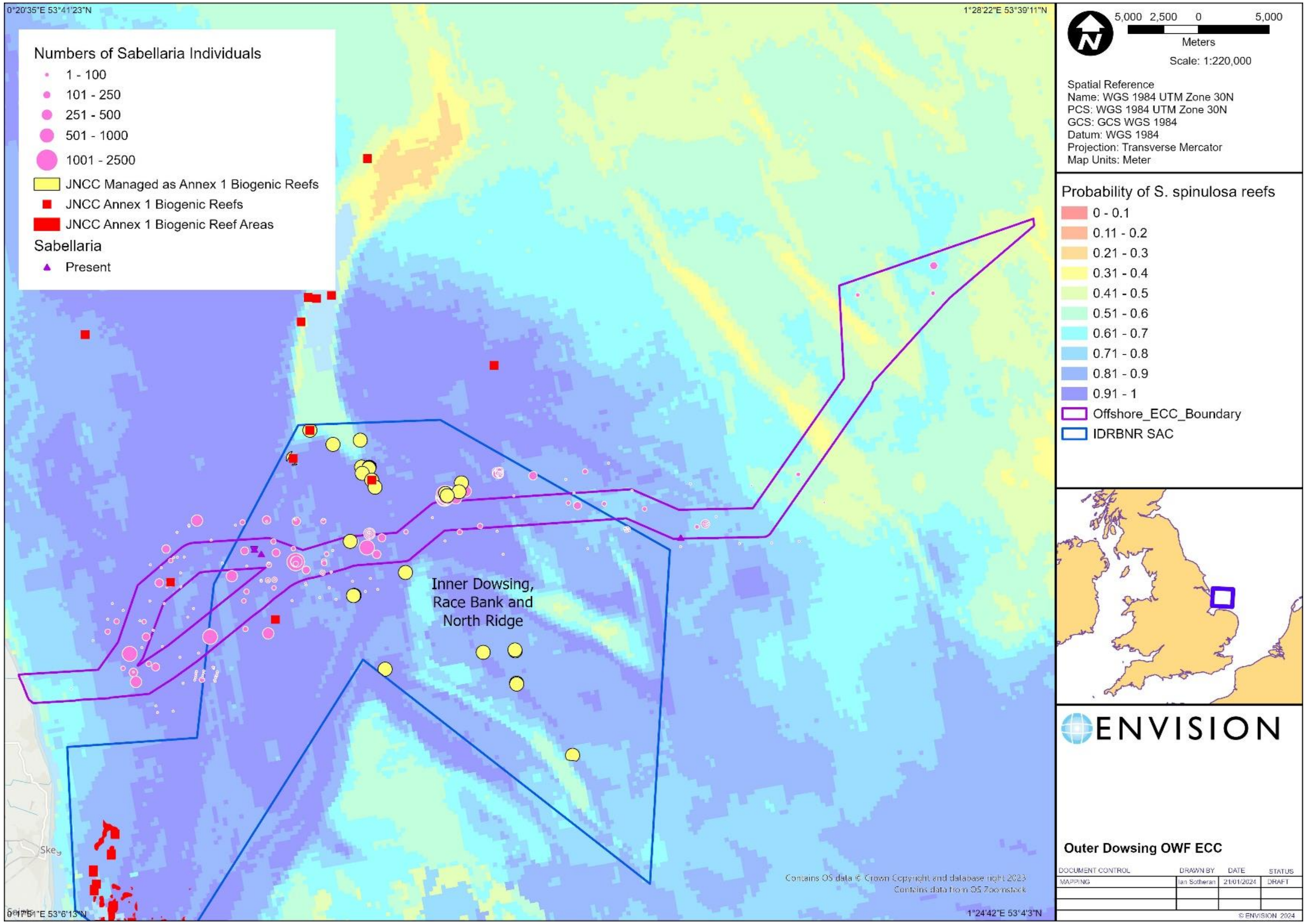

Figure 13.
Summary of Sabellaria spinulosa reef habitat suitability and abundance within and adjacent to the ECC.

2.4. Reef Assessment of Samples

Sample data from Cooper & Barry, 2017[ii] were reviewed by assessing the numbers of *Sabellaria spinulosa* individuals recorded within samples additionally the numbers of *Sabellaria spinulosa* within the environmental baseline survey (EBS) and habitat assessment survey (HAS) have been considered when producing habitat maps and extents and nature of any *Sabellaria spinulosa* habitats.

In addition to reviewing the current mapped habitat extents, all available sample data, and ensemble mapping techniques (see Section 2.6) were used to build habitat distribution maps of the area. This method uses multiple mapping processes, with the aim of improving map performance and outputs by combining the results of several mapping techniques to produce a refined 'ensemble map'.

The resulting maps are compared and where there is consensus, this builds confidence in the mapped areas and enables a final, refined map to be produced which is supported by available datasets with underlying confidence. This map incorporates appropriate levels of precaution in terms of how the sample data are assessed and used within the mapping processes.

2.5. Integration of Sample and Physical Data

Supervised or Modelled Feature Mapping uses statistical classification procedures to predict habitat distribution using ground truth datasets to interpret geophysical and other environmental coverages (usually termed "supervised classification"). The overarching strategy for this interpretation is to gather information from the physical data sets and relate these directly or statistically to the parameters which help determine the distribution and likelihood of a habitat or feature occurring. These relationships are built and investigated using spatial data analysis such as but not limited to supervised classification, cluster analysis, and segmentation classification or object-based image analysis.

The ground truth point data were buffered to create a training area of 10m radius around each point and these areas associated with the appropriate habitat category. The integration analysis was performed within the GIS and image processing software and the training areas were used to extract values from each of the geophysical layers that could be associated with the biological habitat classes. These values were used to create a statistical 'signature' for each class with these signatures then applied to the whole geophysical data set. A schematic diagram illustrating the main stages in the analytical process is shown in Figure 14.

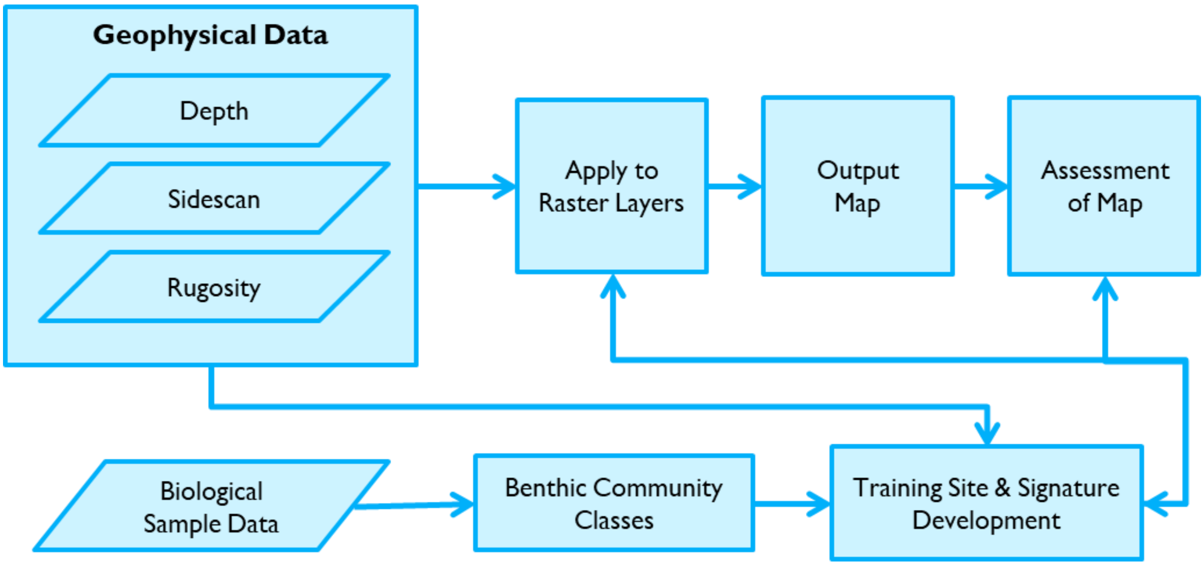

Figure 14.
Schematic diagram outlining the main stages in the modelling of the distribution of biota classes.

2.6. Ensemble Mapping

A range of mapping processes have been applied which employ the principles shown in Figure 15; these range from image processing classification systems to topographic analysis classification, and rule-based modelling. Current opinion (Lillis *et al.*, 2016[xvii], Diesing & Stephens, 2015[xviii]) is that there is no best process to use, with each having merits and downsides. To accommodate this and to provide an additional level of confidence in the mapping processes, a system of 'ensemble mapping' has been employed.

Ensemble mapping involves the creation of several iterations of benthic habitats and sediment maps each using a different mapping process. Whilst each of these iterations may have lower or higher confidences, or be more appropriate for specific habitats or datasets, they are combined and compared to produce benthic habitat and ecological characterisation of the area using the best current evidence base and as such be in line with regulatory guidelines. This process is summarised in Figure 15.

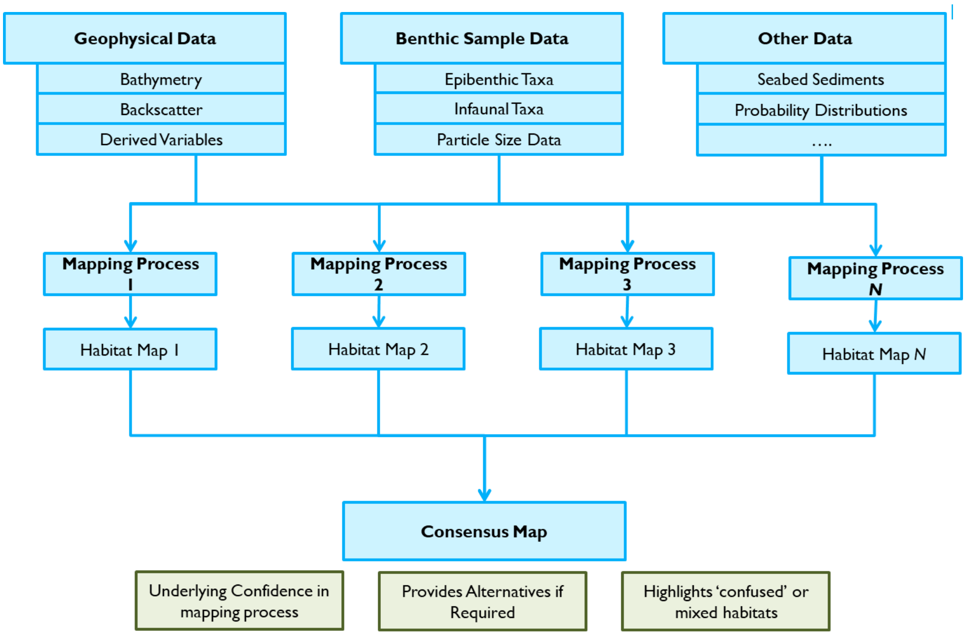

Figure 15. *Summary of data flow and outputs from the ensemble mapping process*

Three resultant habitat maps were incorporated into the ensemble mapping process:

1. The existing habitat map from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).
2. A newly derived habitat map using benthic ecology and geophysical survey datasets (GEOxyz, 2022[i]).
3. A newly derived map incorporating benthic ecology and geophysical survey datasets (GEOxyz, 2022[i]) and sample data from all other available datasets.

Each habitat map was reviewed to determine the confidence in the classification and mapping process, and where algorithms over or under predicted any habitat types. Using a 'Random Forest classification' to produce the habitat maps provided a relatively high accuracy output and showed habitat distributions which were supported by sample data within and adjacent to the ECC. Random forest classification is a machine learning algorithm, which creates multiple decision trees from a randomly selected subset of the training areas, and the outputs from each decision tree are then evaluated to determine the final habitat class to be mapped based upon the average value or majority class from all the decision trees generated. Prediction probabilities were calculated using 'Random Forest classification' within 'Vision using Generic Algorithms'[2] (VIGRA) and are incorporated within the final outputs to show where habitat distributions have low, moderate or high confidence.

2.7. Assumptions

Several assumptions have been made within this review which should be considered when utilising any data or outputs. Any habitat classes which were attributed to samples from the environmental and habitat assessment survey were considered to be accurate, and whilst the process of how they were assigned has been reviewed the underlying dataset have not been queried extensively. Likewise, the results from video footage analysis have been relied upon, a review of example still images and

[2] *VIGRA - Vision with Generic Algorithms Version 1.11.1 by Ullrich Köthe*

descriptions and analyses has been undertaken but original video footage has not been reviewed. The original characterisation habitat map has been used as supplied no detailed method of how this map was produced is provided within the EBS and HAS report and GIS data were ambiguous.

Within the mapping processes undertaken as part of this study there are underlying statistical processes and parameters which have inherent assumptions and caveats, and these have been accepted and incorporated within any outputs.

2.8. Confidence and Certainty

The mapping/classification procedure also calculates the probability of the occurrence of each habitat class over the zone wide area. The final output maps show the habitat class which has the maximum probability for each area, although other classes could be assigned to the area, but with lower probability values. Certainty measurements compare the competing probabilities for all the classes, and classification certainty is taken to mean the likelihood of the maximally predicted class being present as compared to other classes. Maps of underlying confidence, derived from the classification process, were also made available within the GIS to provide contextual data to aid in decision making processes with regards to the predicted distribution of the marine benthic habitats.

3. Results

The main outputs of this review are a series of maps showing the distribution of habitats from the various mapping methods, with a consensus map showing the distribution of marine habitats from the current understanding of the area in question.

Figure 16 shows the distribution of seabed features from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

Figure 17 (and detailed maps presented in Appendix A - Map Portfolio: Project Specific MNCR Level 3) show the distribution of Level 3 marine habitats using data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]). This provides a broadscale habitat map which shows a variety of sediment habitats within the outer area (Funnel) of the ECC; within the middle section coarser sediment (SS.SCS) dominated with mixed (SS.SMx) habitats becoming more frequent within the nearshore areas. The middle section of the ECC is shown to have an area of SS.SBR (not reef) habitat which extends across the width of the ECC.

Figure 18 (and detailed maps presented in Appendix B - Map Portfolio: Project Specific MNCR Level 4/5) show the distribution of Level 4 and Level 5 marine habitats using data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]). This provides a broadscale habitat map which shows a variety of sediment habitats within the outer area (Funnel) of the ECC, within the middle section coarser sediment (SS.SCS.CCS) dominated with mixed (SS.SMx.CMx) habitats becoming more frequent within the nearshore areas. The middle section of the ECC is shown to have an area of SS.SBR.PoR.SspiMx (not reef) which extends across the width of the ECC, and further down into the nearshore area. An area of SS.SBR.PoR is also shown in the middle to nearshore section of the ECC.

Figure 19 (and detailed maps presented in Appendix C - Map Portfolio: All Data MNCR Level 3) show the distribution of Level 3 marine habitats derived using a relatively large set of sample data which have been allocated to habitat type based on the properties of the sediment within the samples, to supplement the site specific data were used to generate the preceding Level 3 habitat maps (Figure 17). Introducing these additional data slightly alters the distribution of habitats within the Outer Dowsing OWF export cable corridor, in that within the nearshore areas the seabed is mapped as coarse sediment (SS.SCS) whereas the previous maps have shown predominately mixed sediment habitats (SS.SMx) within these areas. Minor change is observed in the outer area (Funnel) of the ECC. Within the middle section of the ECC, there is a slight change to the distribution of SS.SBR (not reef) across the width of the ECC, with very patchy distribution present down from the middle section to the nearshore area.

Figure 20 (and detailed maps presented in Appendix D - Map Portfolio: All Data MNCR Level 4/5) is considered to show the distribution of habitats which best represents the current datasets. These show the distribution of Level 4 marine habitats derived using a relatively large set of sample data which have been allocated to habitat type based on the properties of the sediment within the samples to supplement the site specific data used to generate the preceding Level 4 habitat maps (Figure 18). Introducing these additional data alters the distribution of habitats within the Outer Dowsing OWF export cable corridor. The map shows that the majority of Outer Dowsing OWF ECC is dominated by coarse sediments (SS.SCS.CCS) throughout, with occasional dispersed soft sediments such as fine sands (SS.SSa.IFiSa / CFiSa) and muddy sands (SS.SSa.IMuSa / CMuSa). The outer area (Funnel) of the ECC has a variety of habitats, with the middle section of the ECC predominately coarse with some patches of mixed (SS.SMx.CMx) habitat, and the nearshore section again being predominately coarse with patchy areas of finer and muddier sands, and an area of mixed habitat. Within the middle section of the ECC there is an area of SS.SBR.PoR.SspiMx (not reef) habitat and some further patchiness down towards the nearshore section. Additionally, within the nearshore section, there is patchy areas of the habitat SS.SBR.PoR (not reef).

Figure 21 is a map which represents the underlying confidence in the ensemble map which has been produced. This confidence is based upon the number of times each of the maps are in agreement. Habitat areas which are consistently mapped the same having the highest confidence and those which are confused throughout the maps having the lowest confidence. The attributed level of confidence should be considered when using the distribution of habitats within any decision-making processes.

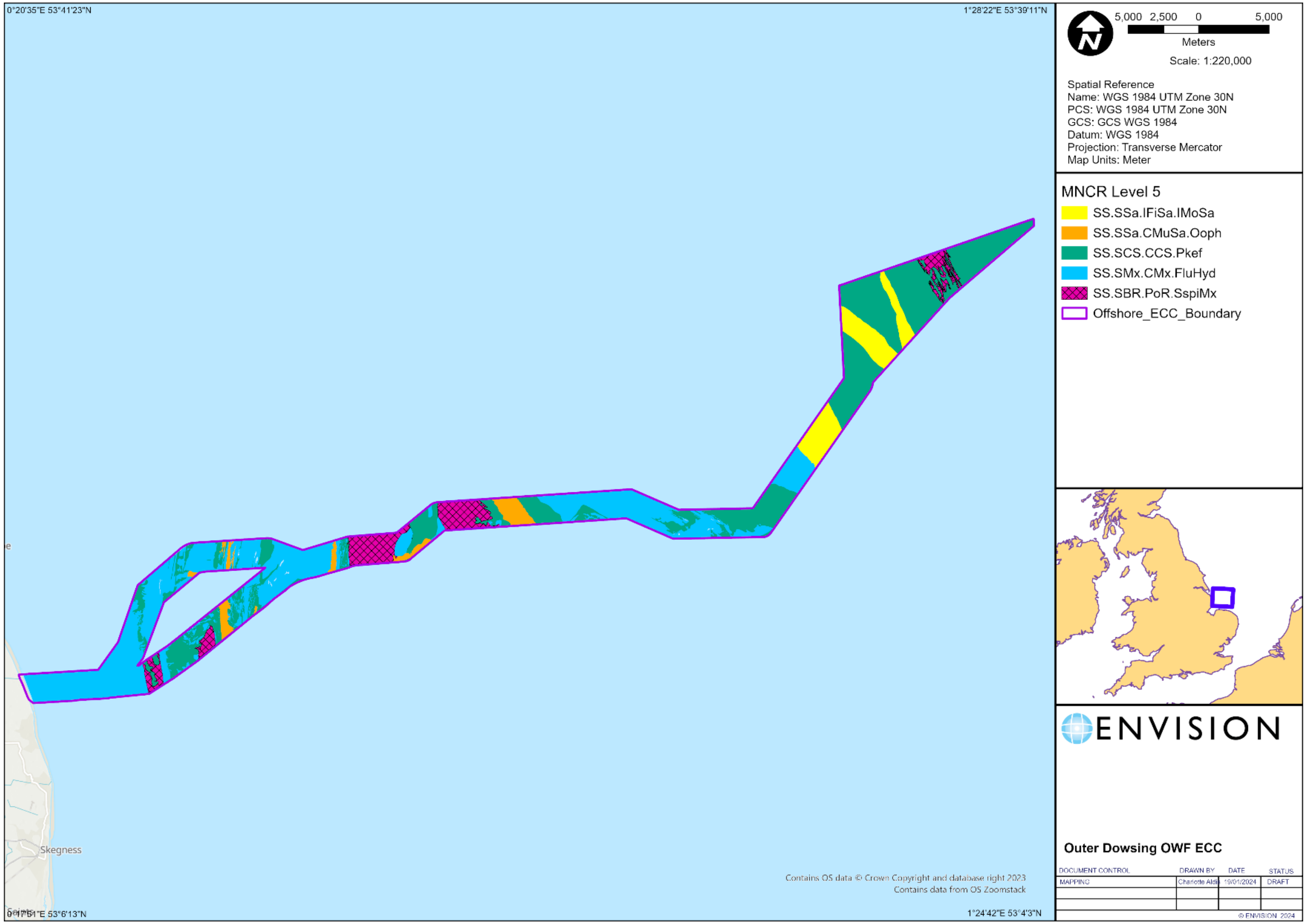

Figure 16.
Marine habitat map from environmental baseline survey (EBS) (GEOxyz, 2022[i]).

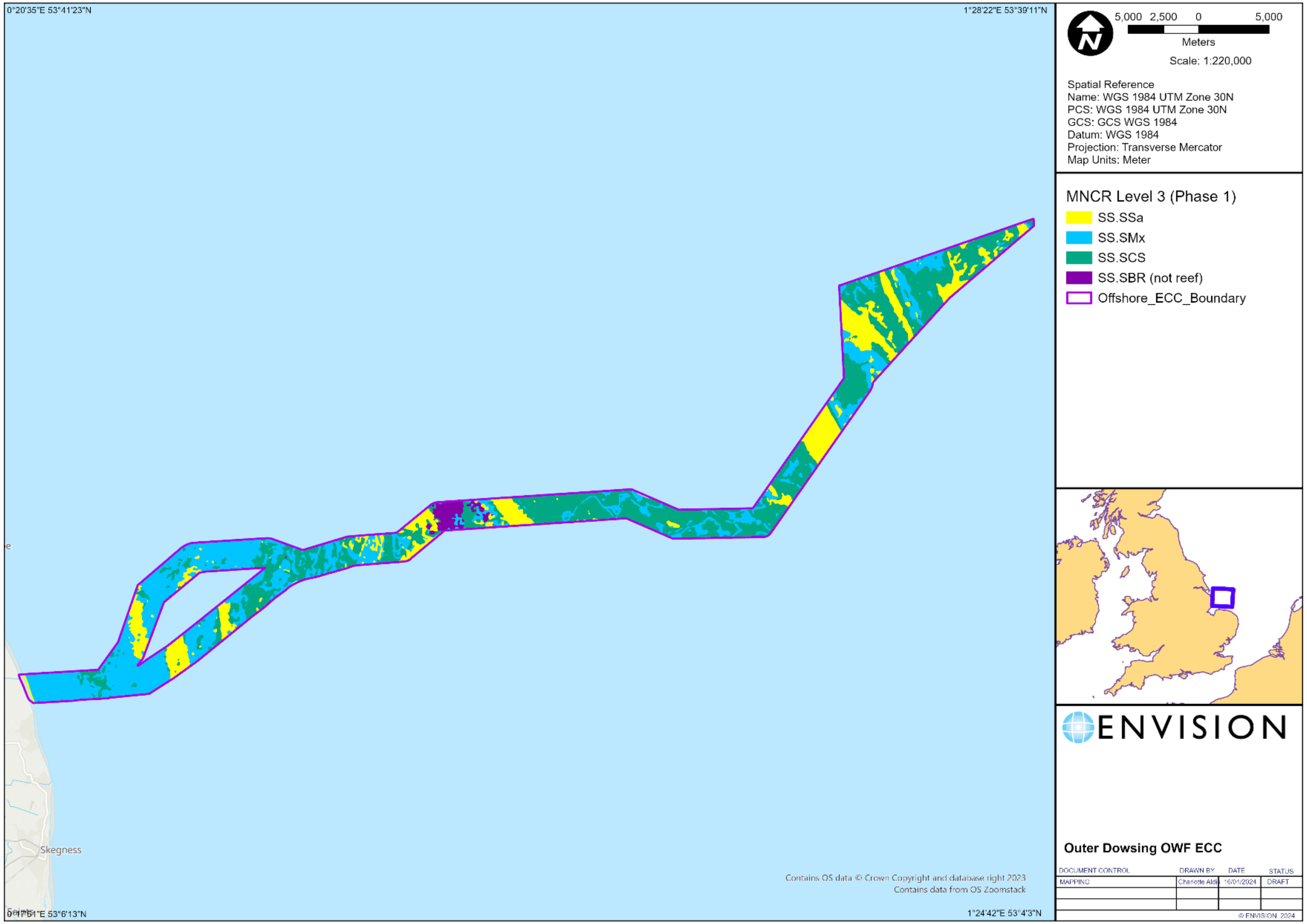

Figure 17.
Marine habitat map at Level 3 MNCR for Outer Dowsing OWF ECC, produced using project specific data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

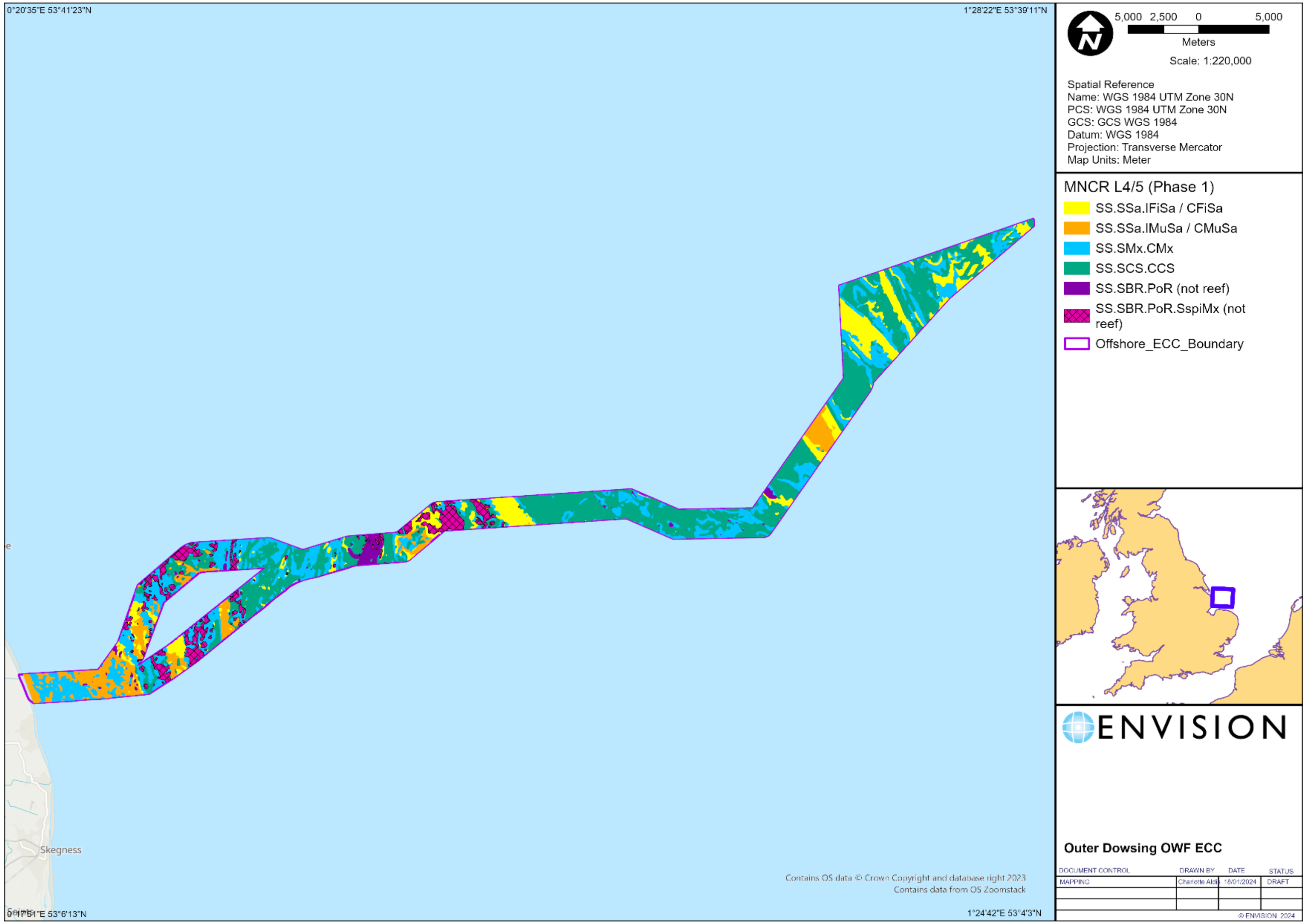

Figure 18.
Marine habitat map at Level 4 MNCR for Outer Dowsing OWF ECC, produced using project specific data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

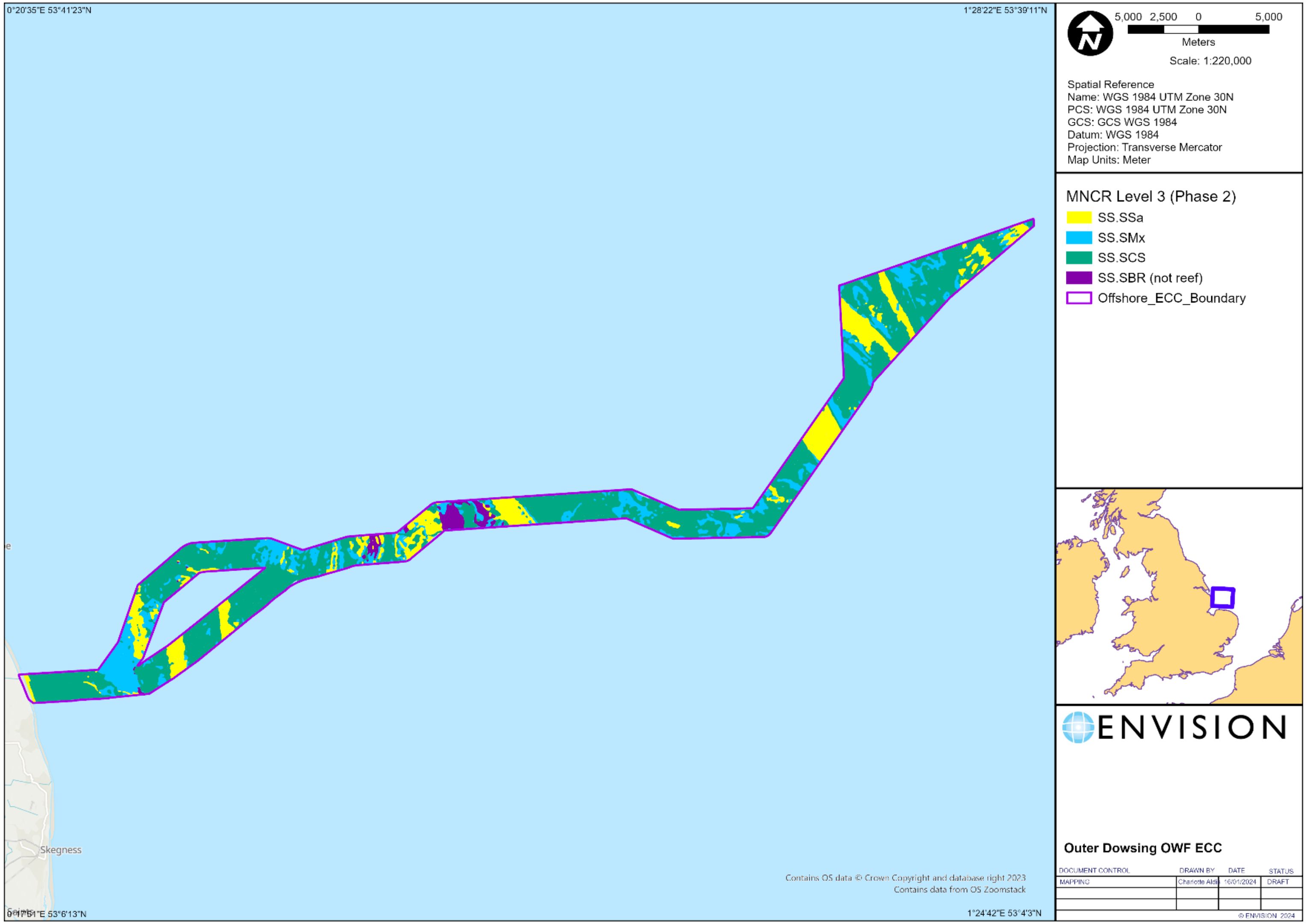

Figure 19.
Marine habitat map at Level 3 MNCR for Outer Dowsing OWF ECC, produced using all available data from a variety of sources.

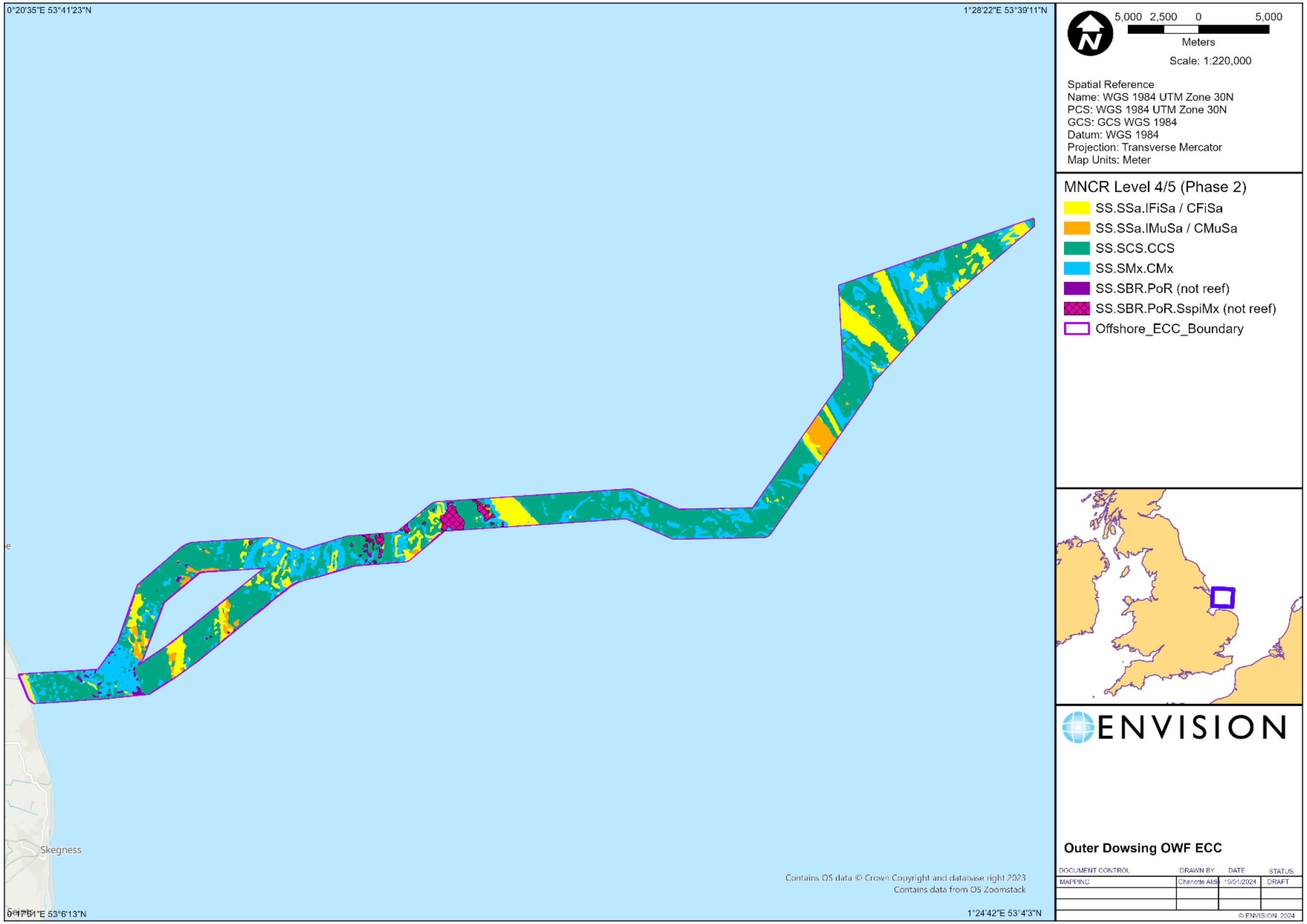

Figure 20.
Marine habitat map at Level 4 MNCR for Outer Dowsing OWF ECC, produced using all available data from a variety of sources.

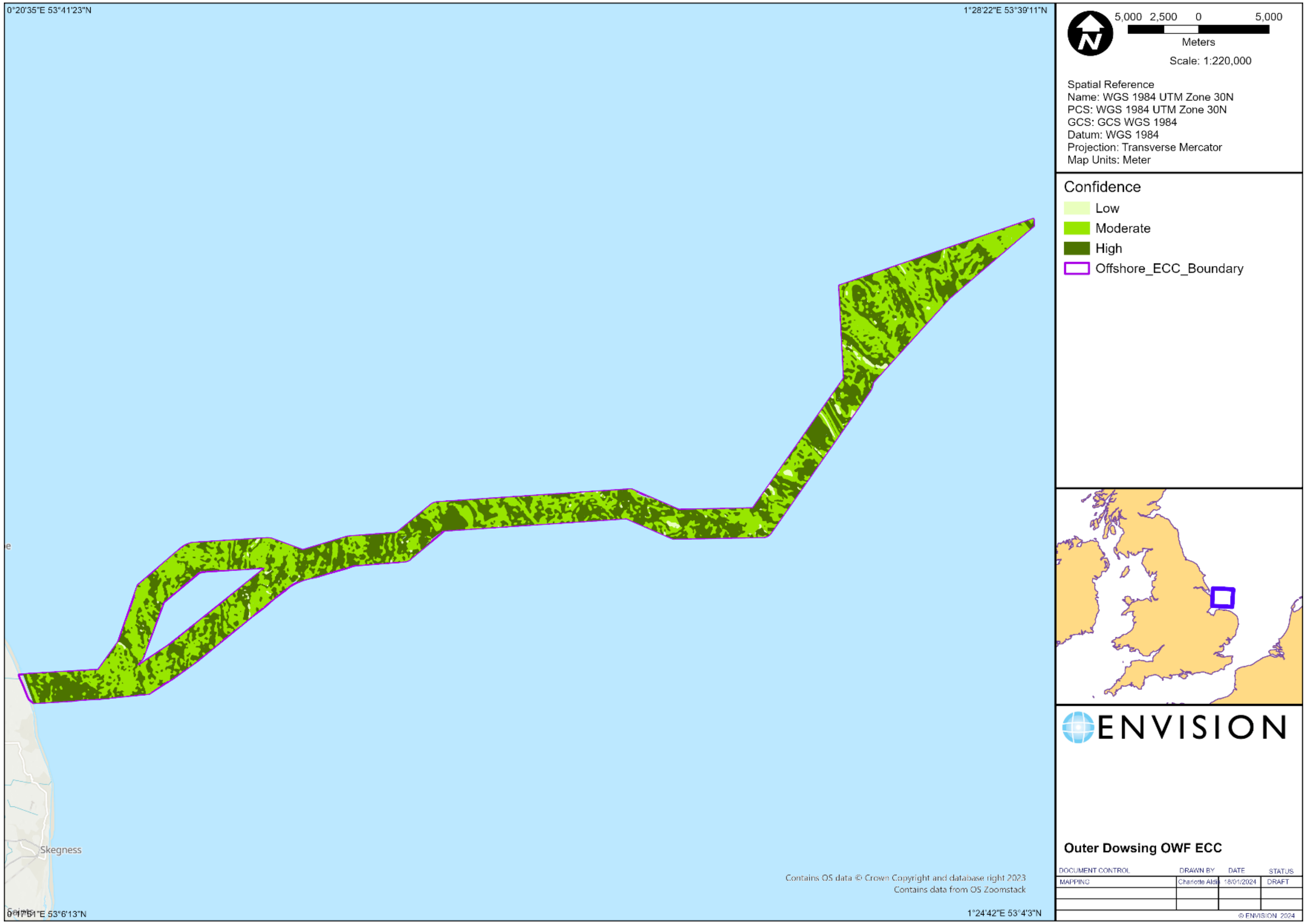

Figure 21.
Underlying confidence of the Level 4/5 MNCR marine habitat map which incorporates all available data from a variety of sources.

3.1. Current Distribution of *Sabellaria spinulosa* Reefs

The data from the environmental baseline and habitat assessment survey found no *Sabellaria spinulosa* reef to occur with the ECC or Inner Dowsing, Race Bank and North Ridge SAC. Examination of other sample data show there to be elevated numbers of *S. spinulosa* in the area but analysis of video and imagery records in accordance with guidance following Gubbay, 2007[xiv] show these have been assessed as 'not-reef' due to reduced elevation from the surrounding seabed and patchiness of distribution. Geophysical data, side scan sonar and multi-beam bathymetry concur with this assessment and whilst sidescan sonar suggests areas of variable seafloor in and adjacent to areas where *S. spinulosa* are found in relatively high abundances bathymetry does not support reef systems being present. The habitats of SS.SBR.PoR and SS.SBR.PoR.SspiMx, *Sabellaria spinulosa* on stable circalittoral mixed sediment, are predicted to occur in several areas of the ECC, predominantly in the mid and near shore section, which are supported by sample data showing elevated abundance of *Sabellaria spinulosa*. However, these areas are attributed as 'not reef' as the sample data do not indicate the presence of reef (Figure 22).

Sabellaria spinulosa reefs are known to be ephemeral and are affected by physical disturbances which can lead to impoverished communities being present, with the relatively high abundance of *S. spinulosa* in the area. Development of reefs from the current habitat is possible and whilst reefs can recover quickly from short or intermediate levels of disturbance it is recommended site specific sampling is used to assess the condition of the SS.SBR.PoR.SspiMx habitats prior to and subsequent to any activity which may physical disturb the habitats.

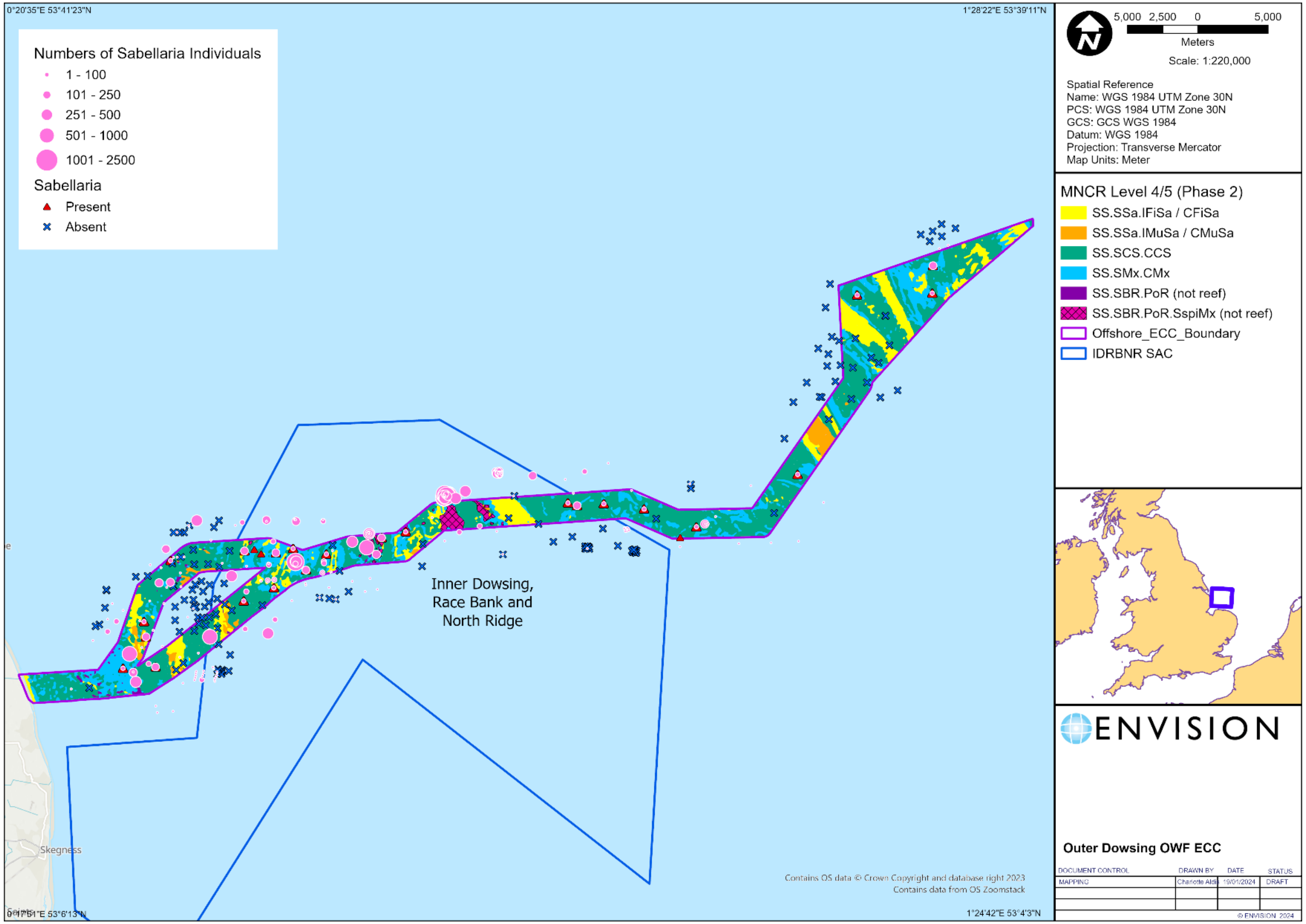

Figure 22.
Numbers of Sabellaria individuals, with further presence and absence data for the Outer Dowsing OWF ECC and surrounding areas.

4. Summary

This review of the Outer Dowsing Offshore Wind export cable corridor (ECC) was specifically focused on the potential presence of *Sabellaria spinulosa* reefs within the corridor. The cable corridor intersects the Inner Dowsing, Race Bank, and North Ridge Special Area of Conservation (SAC), designated for sandbanks and biogenic reef. The principal objectives of this review involve the identification and evaluation of *Sabellaria spinulosa* reefs within the ECC, using project specific and third-party data sources, which include geophysical, benthic sample, and regional seabed monitoring data.

The methodological framework integrates geophysical data with benthic sample data through geospatial statistical analyses. Seabed characteristics such as rugosity, backscatter variability, and bathymetry are used to predict the distribution of seabed habitats. The sample dataset includes information derived from environmental baseline and habitat assessment surveys, supplemented by datasets from national databases. The study also reviews *Sabellaria spinulosa* distribution, abundance, and reef suitability, considering data from the Joint Nature Conservation Committee (JNCC) and habitat suitability modelling.

A series of habitat maps at varied MNCR habitat classification hierarchy (Level 3, Level 4/5) have been produced using an ensemble habitat mapping approach. Supporting data such as underlying confidence demonstrate the levels of certainty within the resulting maps.

The distribution of *Sabellaria spinulosa* within the ECC is shown to be located within the middle section and nearshore areas of the cable corridor but project specific sample data demonstrates the absence of confirmed reefs in the area.

5. Appendices

5.1. Appendix A - Map Portfolio: Project Specific MNCR Level 3

Map 1 – ECC Funnel Area

Map 2 – ECC Middle Area

Map 3 – ECC Nearshore Area

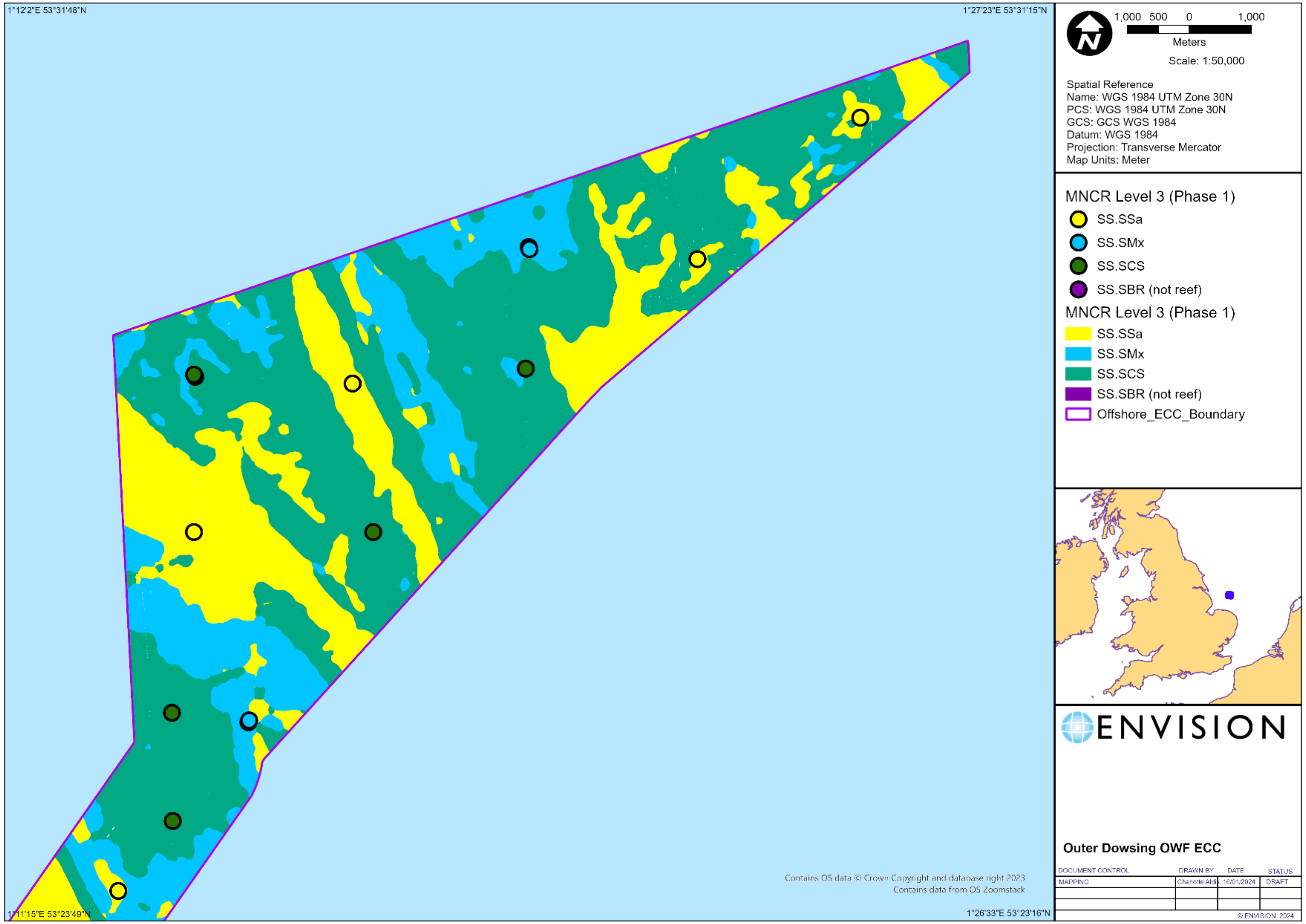

Figure 23.
Marine habitat map at Level 3 MNCR for Outer Dowsing OWF ECC Funnel Area, produced using project specific data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

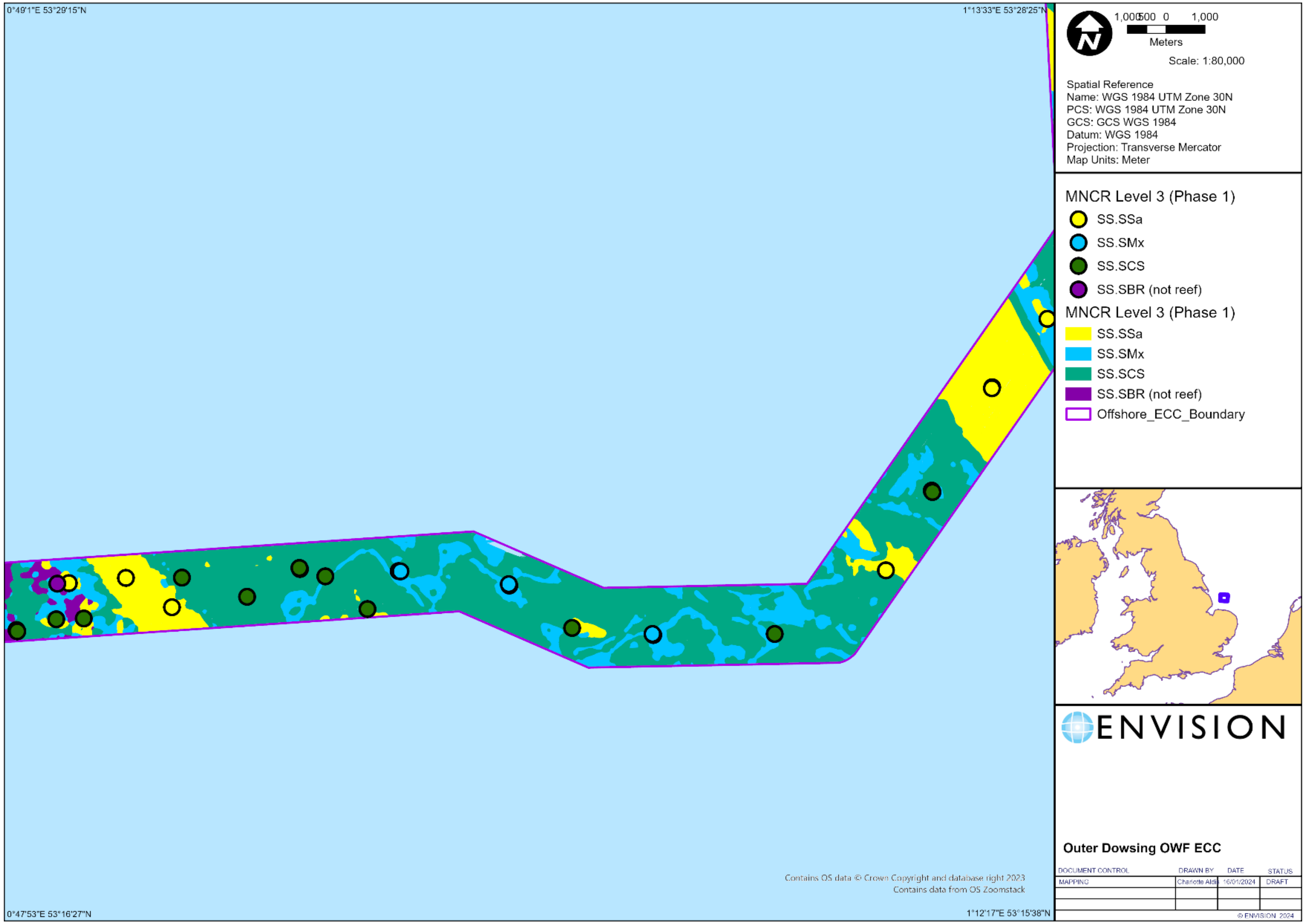

Figure 24.
Marine habitat map at Level 3 MNCCR for Outer Dowsing OWF ECC Middle Area, produced project specific data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

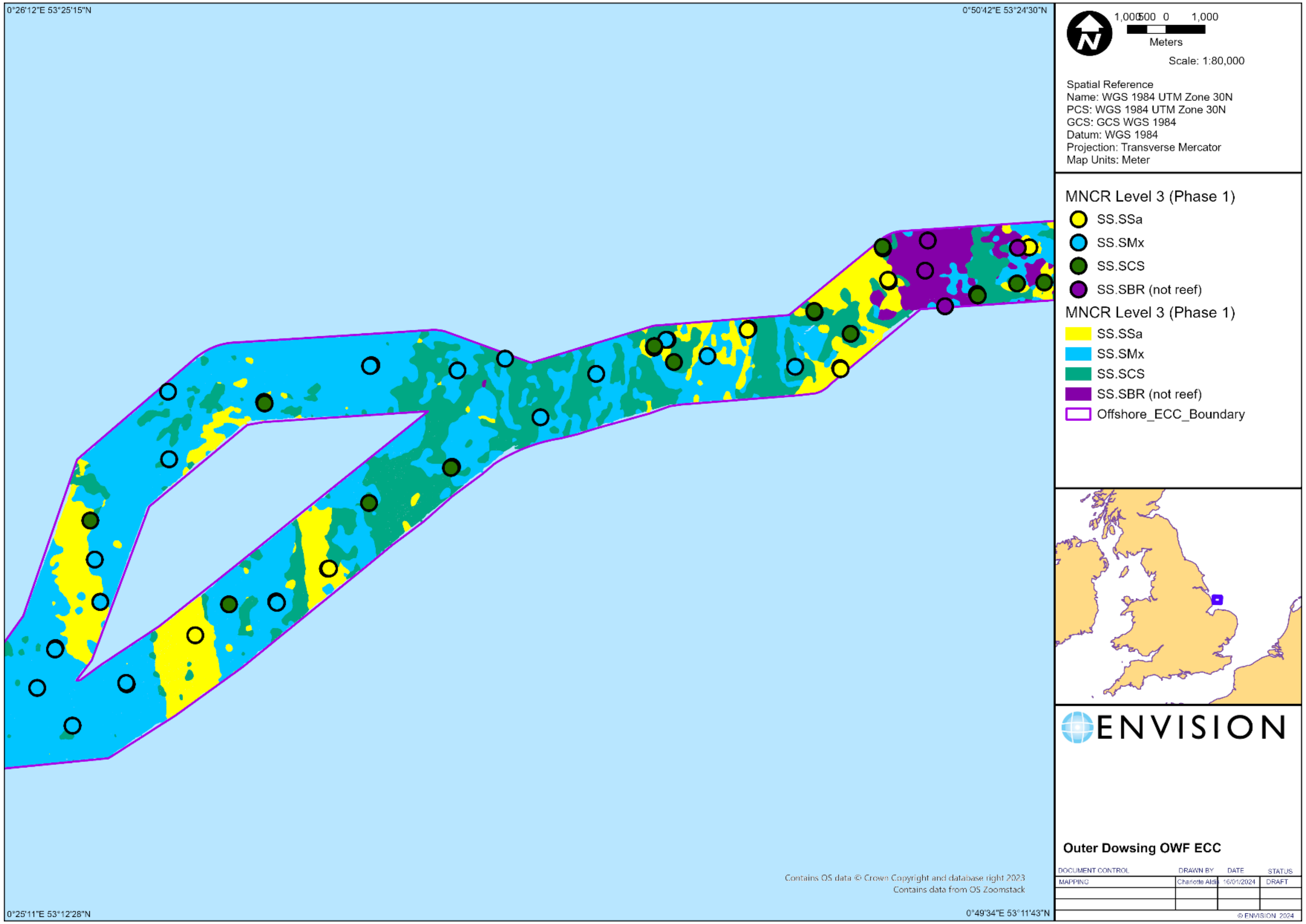

Figure 25.
Marine habitat map at Level 3 MNCR for Outer Dowsing OWF ECC Nearshore Area, produced using project specific data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

5.2. Appendix B - Map Portfolio: Project Specific MNCR Level 4/5

Map 1 – ECC Funnel Area

Map 2 – ECC Middle Area

Map 3 – ECC Nearshore Area

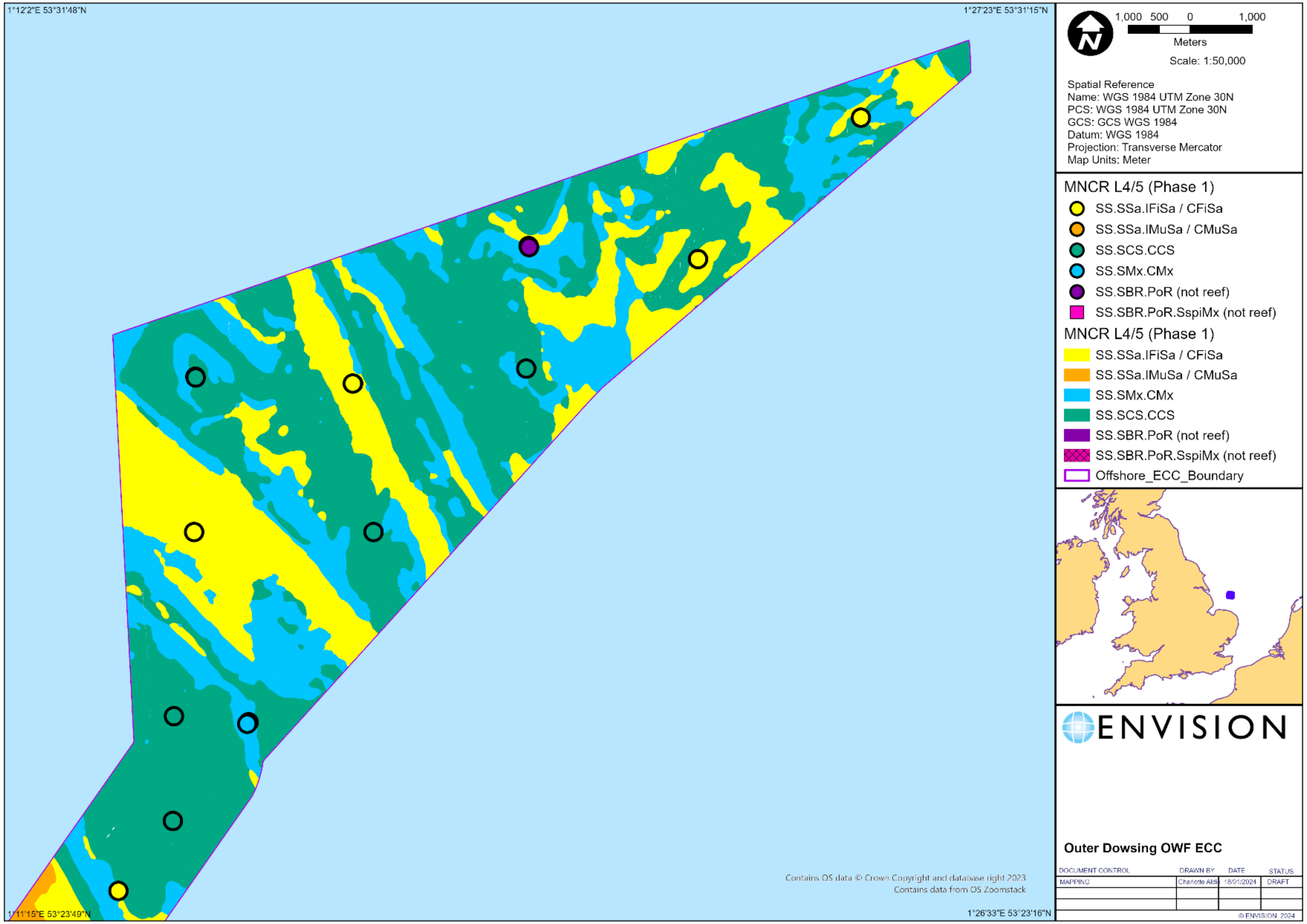

Figure 26.
Marine habitat map at Level 4 MNCR for Outer Dowsing OWF ECC Funnel Area, produced project specific data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

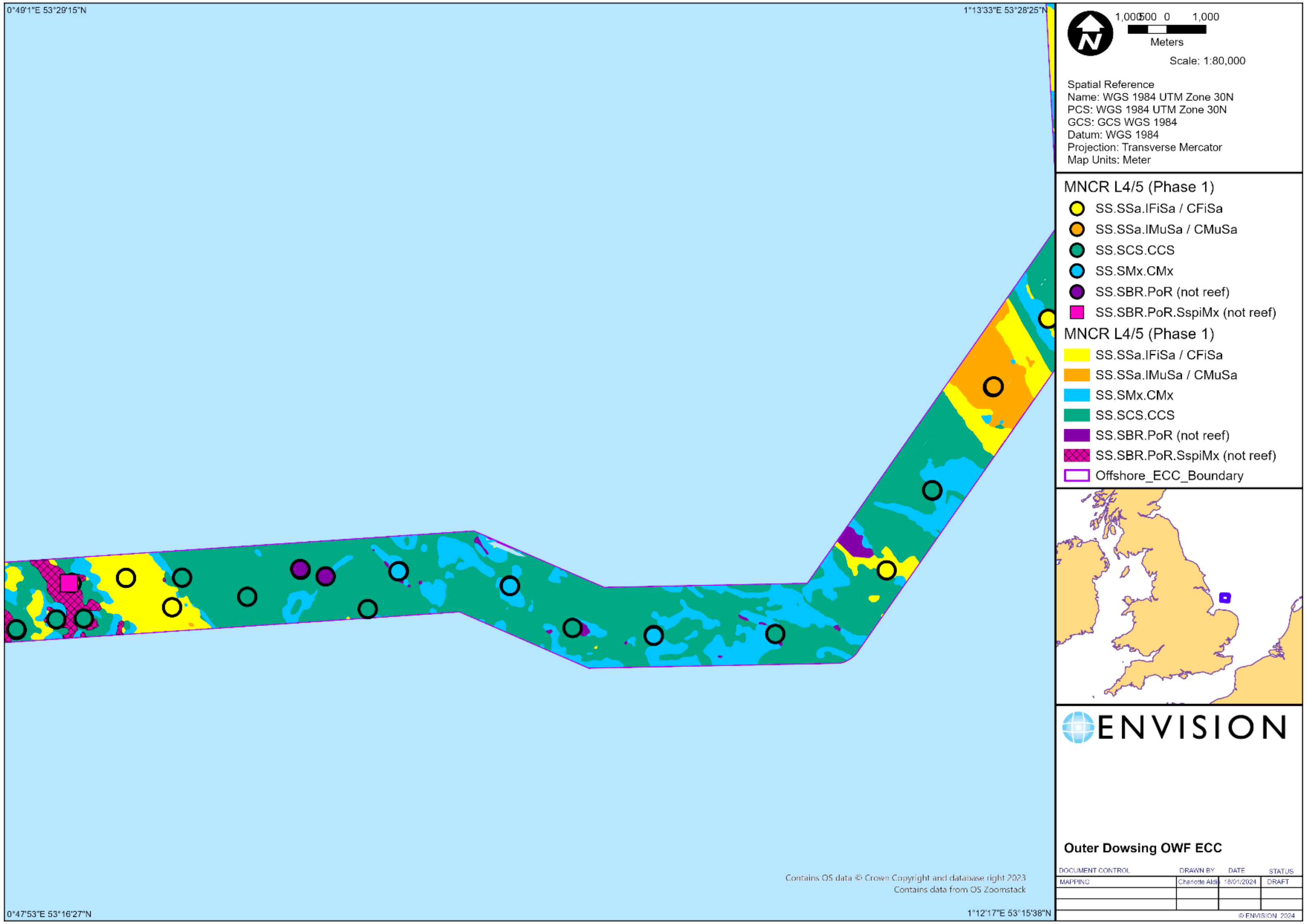

Figure 27.
Marine habitat map at Level 4 MNCR for Outer Dowsing OWF ECC Middle Section, produced using project specific data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

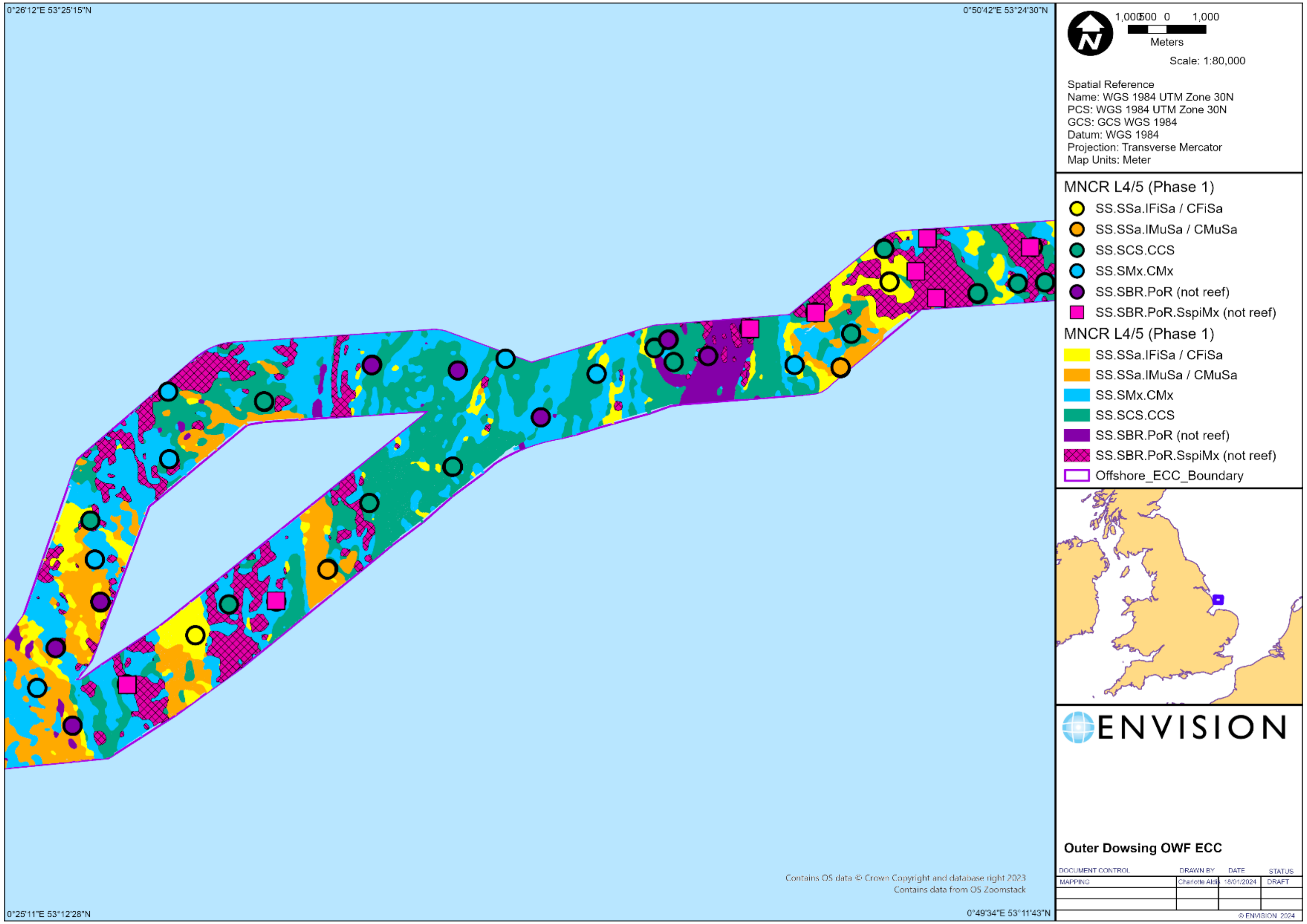

Figure 28.
Marine habitat map at Level 4 MNCR for Outer Dowsing OWF ECC Nearshore Area, produced using project specific data from the environmental baseline survey (EBS) (GEOxyz, 2022[i]).

5.3. Appendix C - Map Portfolio: All Data MNCR Level 3

Map 1 – ECC Funnel Area

Map 2 – ECC Middle Area

Map 3 – ECC Nearshore Area

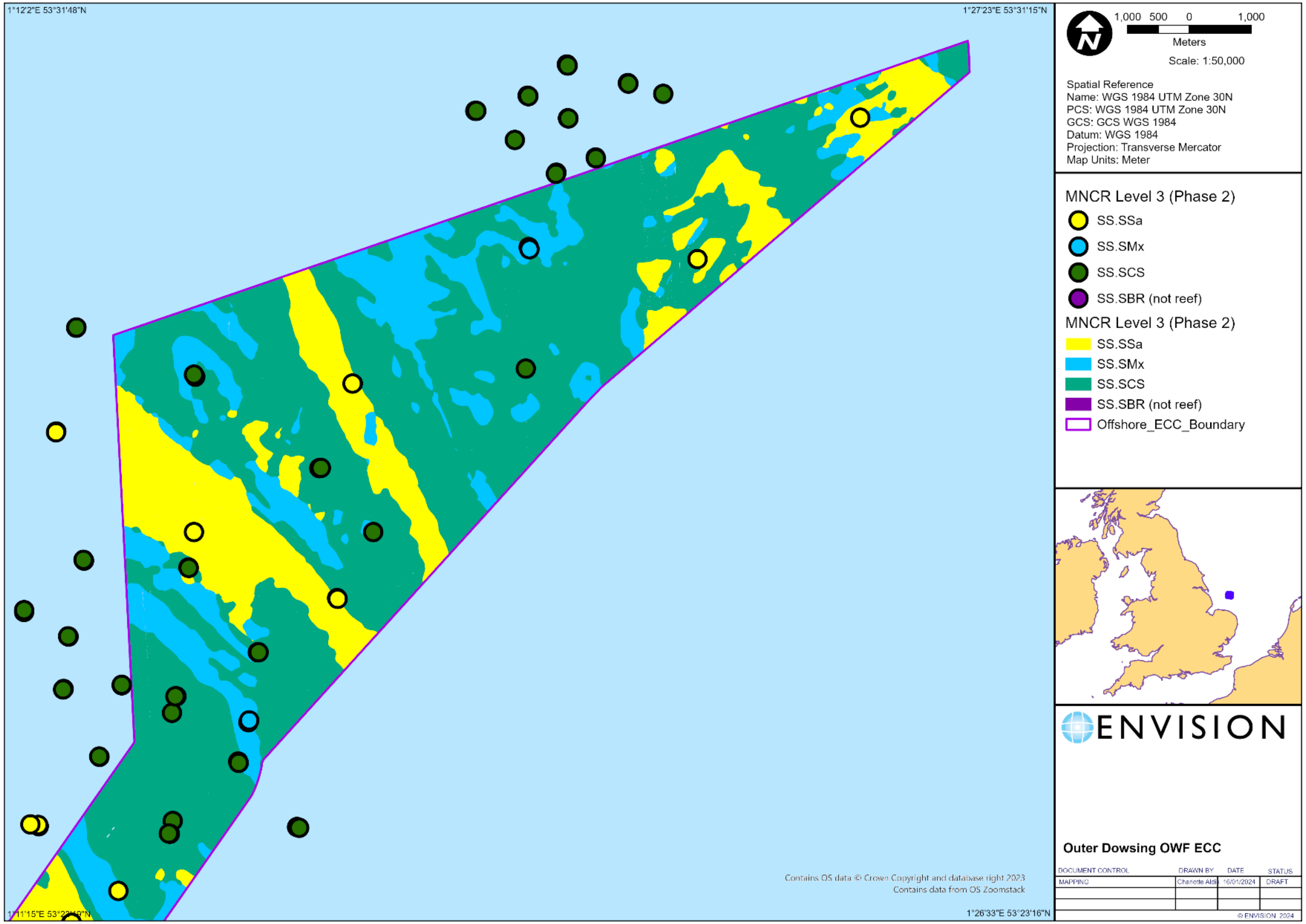

Figure 29.
Marine habitat map at Level 3 MNCR for Outer Dowsing OWF ECC Funnel Area, produced using all available data from a variety of sources.

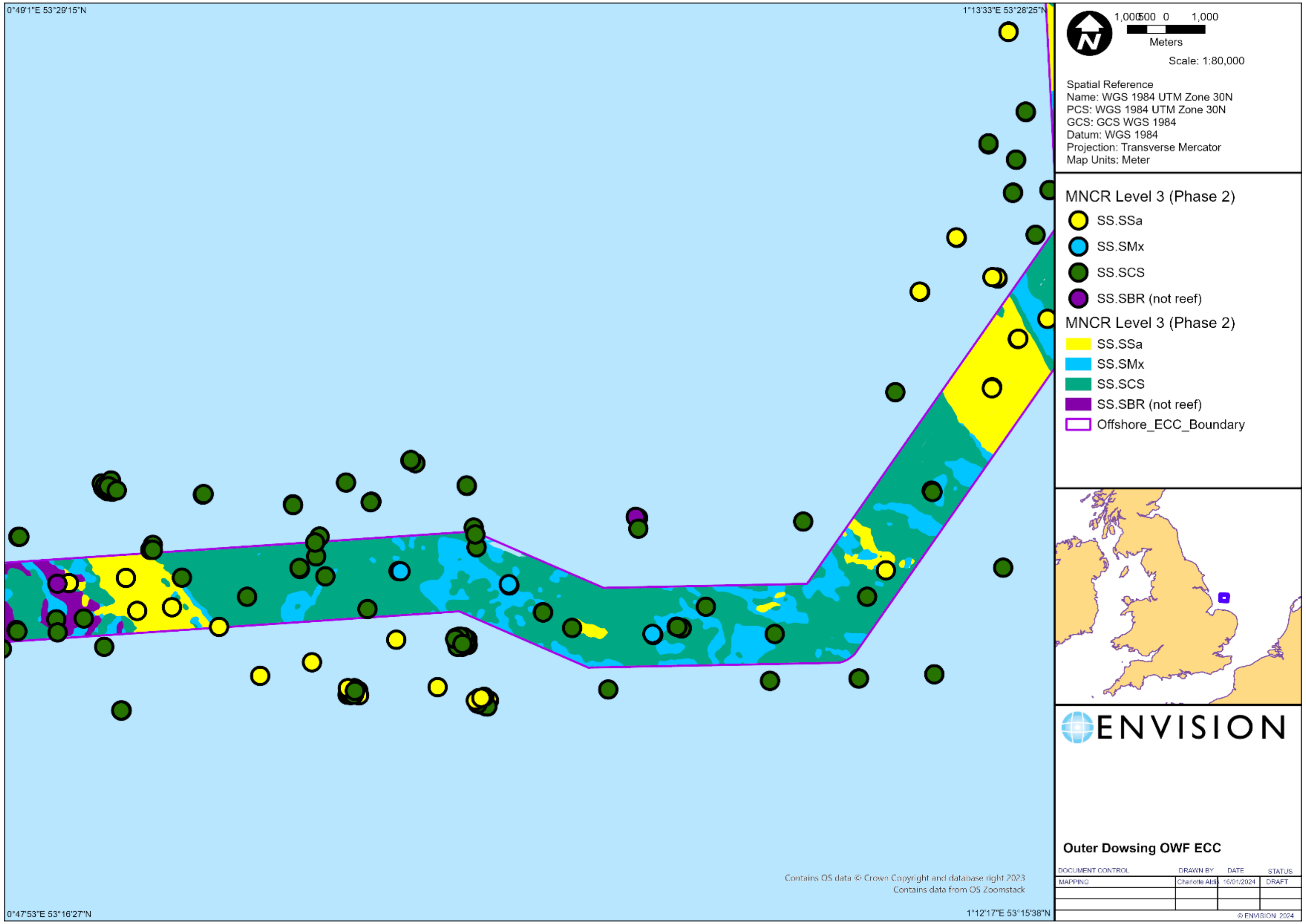

Figure 30.
Marine habitat map at Level 3 MNCR for Outer Dowsing OWF ECC Middle Area, produced using all available data from a variety of sources.

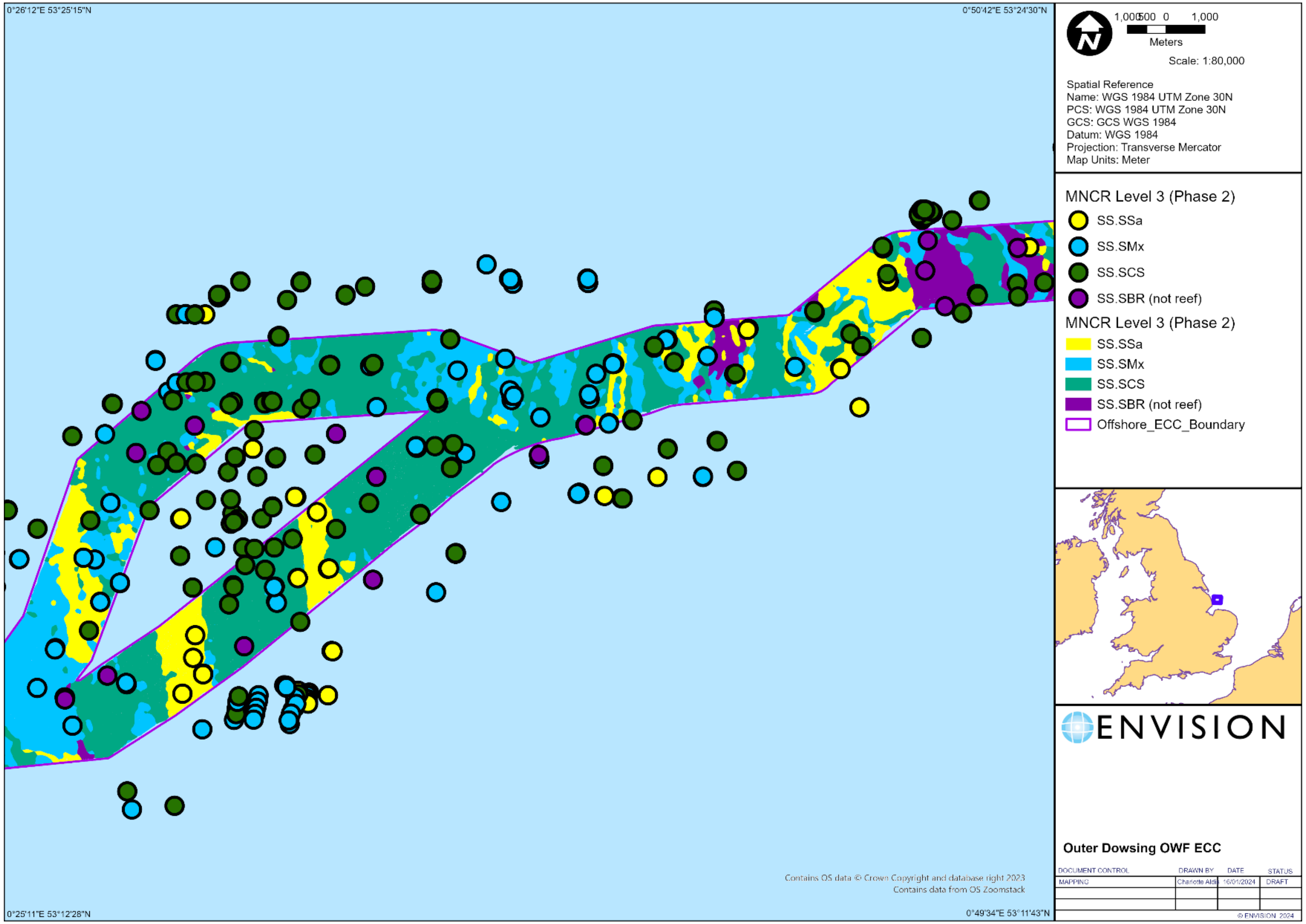

Figure 31.
Marine habitat map at Level 3 MNCR for Outer Dowsing OWF ECC Nearshore Area, produced using all available data from a variety of sources.

5.4. Appendix D - Map Portfolio: All Data MNCR Level 4/5

Map 1 – ECC Funnel Area

Map 2 – ECC Middle Area

Map 3 – ECC Nearshore Area

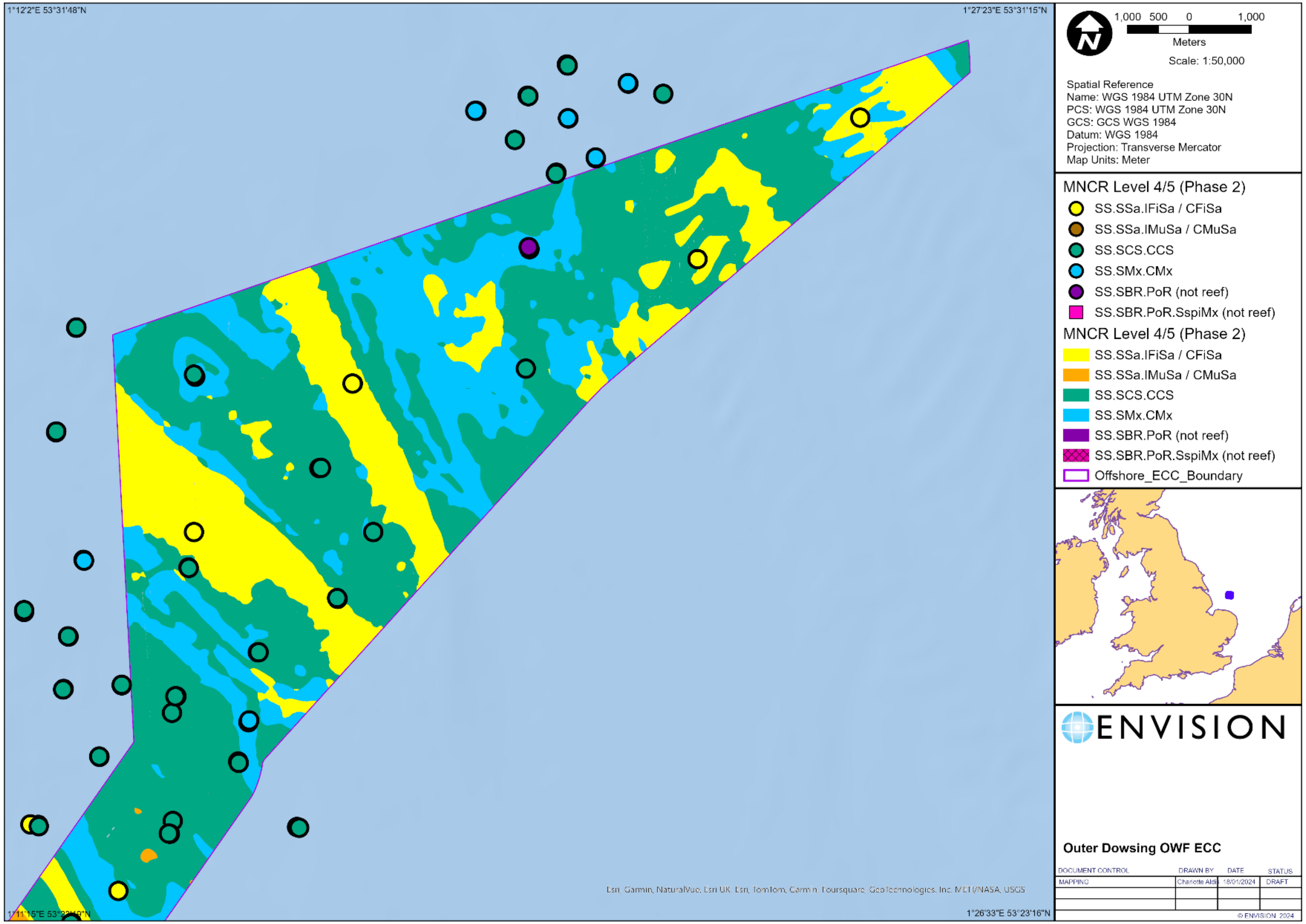

Figure 32.
Marine habitat map at Level 4/5 MNCR for Outer Dowsing OWF ECC Funnel Area, produced using all available data from a variety of sources.

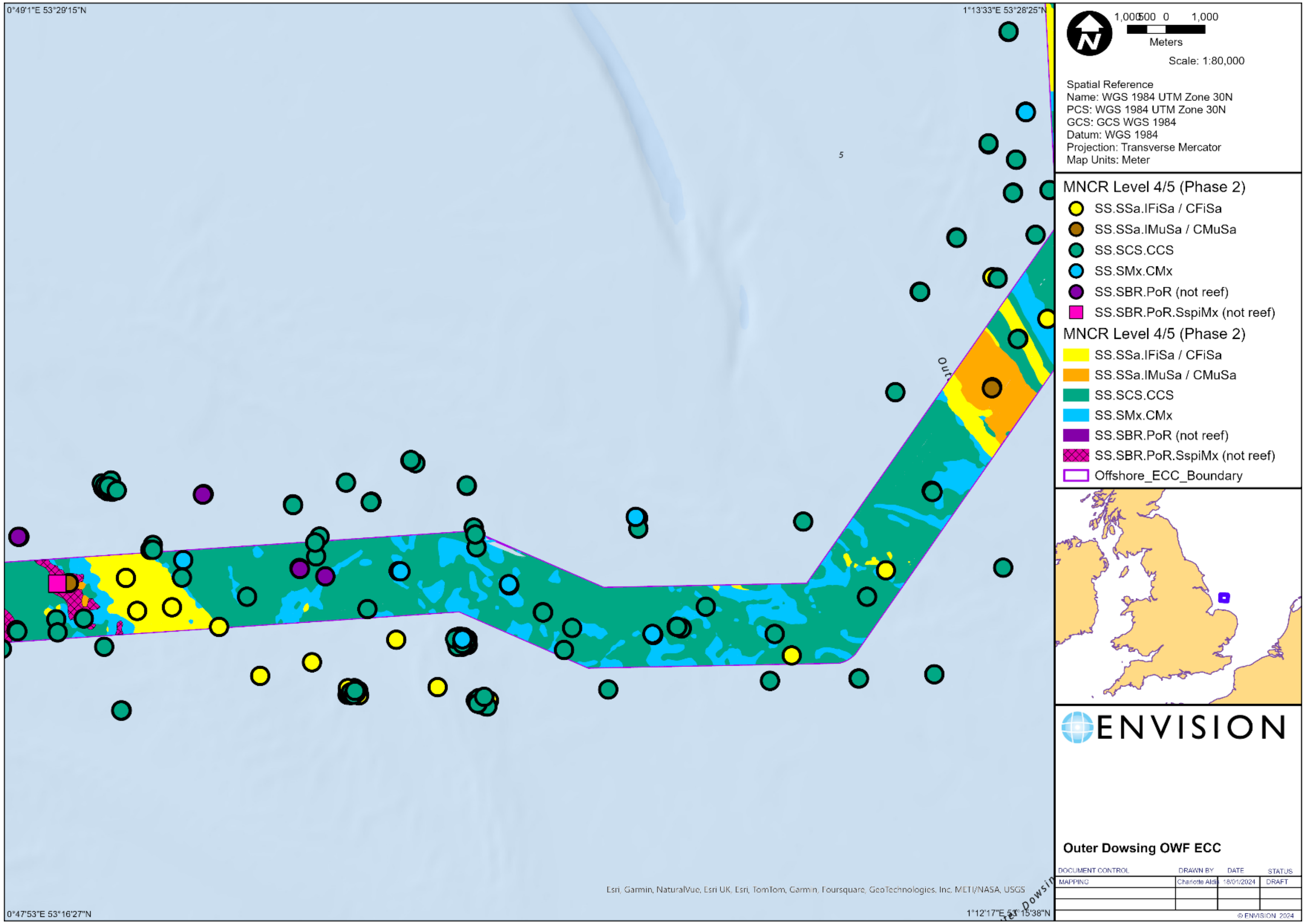

Figure 33.
Marine habitat map at Level 4/5 MNCR for Outer Dowsing OWF ECC Middle Area, produced using all available data from a variety of sources

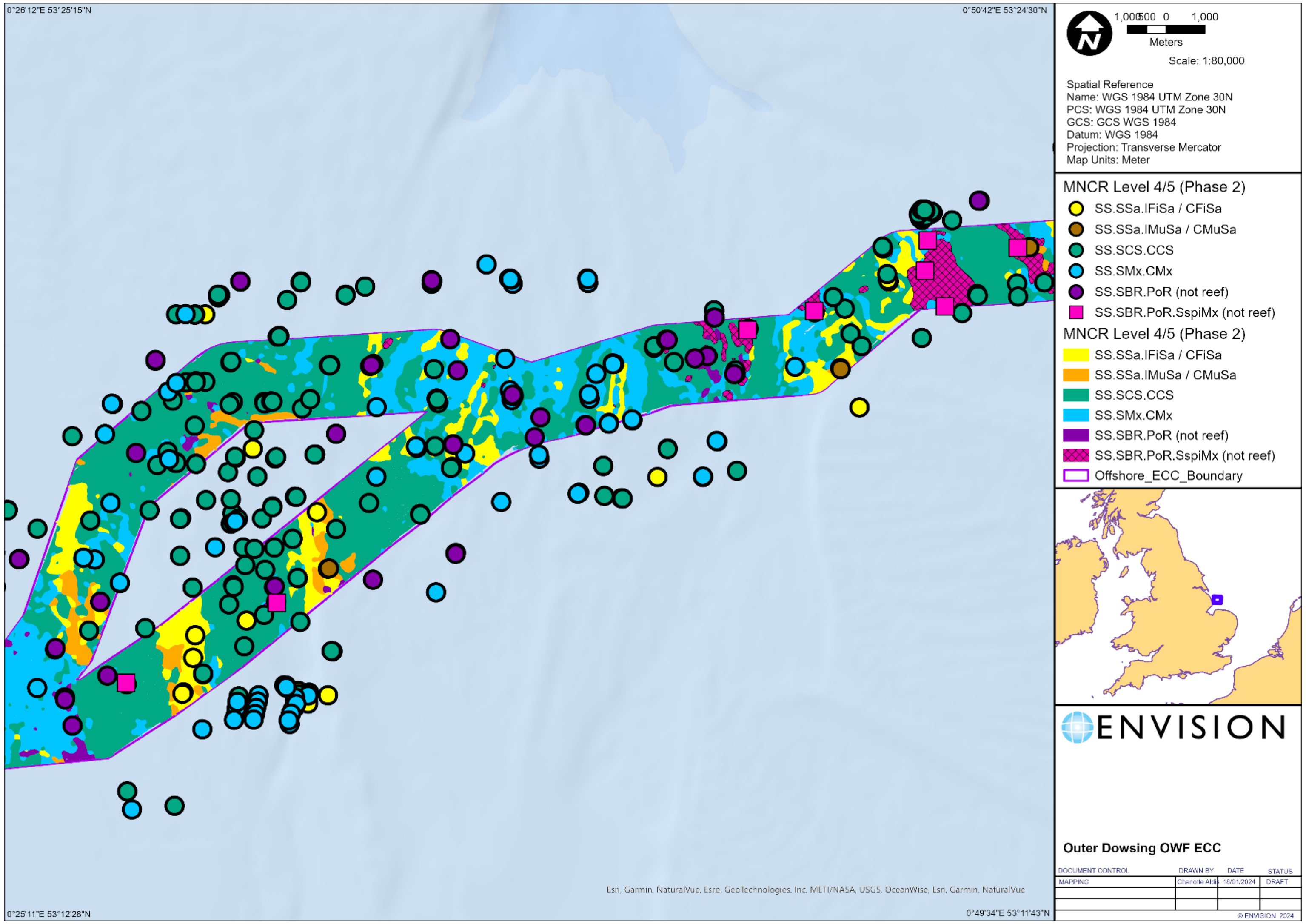

Figure 34.
Marine habitat map at Level 4/5 MNCR for Outer Dowsing OWF ECC Nearshore Area, produced using all available data from a variety of sources.

6. References

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