Falmouth Bay to St Austell Bay SPA Drop Down Video and Acoustic Survey Maerl Mapping: St Austell Bay 2023

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Foreword

Natural England commissions a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Natural England, with project partners Cornwall Wildlife Trust (CWT) and Cornwall Inshore Fisheries Conservation Authority (CIFCA), were funded by the G7 Legacy Project to carry out mapping of maerl within St Austell Bay, Cornwall. The site, which is part of the Falmouth Bay to St Austell Bay Special Protection Area was selected based on information from Seasearch surveys and previous mapping which indicated the presence of this irreplaceable habitat (Tillin *et al.*, 2022).

Cornwall Wildlife Trust commissioned CIFCA to carry out sidescan sonar and drop-down video surveys in St Austell Bay to improve understanding of the maerl habitat. Video and still transects were undertaken, focusing on capturing a good spread across the bay and recording transitions from one habitat to another, based on the sidescan sonar and bathymetric data. Natural England commissioned Envision Marine Ltd to analyse the data and to train a model to produce maps indicating the extent and quality of maerl within the bay.

The results show that there is presently extensive maerl which is widespread across St Austell Bay. Most of the bay has a low density of live maerl and a high density of dead maerl within a depth range of 8 to 23m.

Whilst the mapping process revealed sublittoral coarse sediment with maerl present in large areas throughout St Austell Bay, areas of maerl beds (≥5% live maerl) are present only in smaller areas. It should also be noted that non-maerl habitats were under-sampled and therefore the mapping process is likely to over-predict the presence of maerl in the bay. Recommendations were made regarding the sample design of future surveys and for further refinement of the maerl categorisation system.

This result of this work has been crucial for improving the understanding of the distribution of maerl around the south coast of Cornwall.

Executive summary

Maerl is the name used for several free-living, unattached coralline red algae species that grow unattached on the seabed. Dense beds of maerl can be structurally complex and some can support high benthic biodiversity and biomass, or rare and endemic species.

Natural England aimed to assess the distribution, extent and range of subtidal maerl communities in the Falmouth to St Austell Bay Special Protection Area (SPA) using sidescan acoustic and underwater imagery data collected by the Cornwall Inshore Fisheries and Conservation Authority (CIFCA) from summer 2023 to May 2024. Falmouth to St Austell Bay SPA was designated to protect certain bird species and their supporting habitats, which can include maerl biotopes.

ENVISION were commissioned by Natural England to carry out underwater imagery analysis to quantify live and dead subtidal maerl and assess the distribution of habitats in St Austell Bay. Data were classified using a novel maerl categorisation system (Axelsson, 2023) and also interpreted and classified to create habitat maps. These maps and data were used to compare previous extents of maerl in the SPA, using data collected by CIFCA during a previous survey in 2016.

Methodology

The approach undertaken for imagery analysis was in line with current guidance but modified and agreed with Natural England for this contract. The video footage was initially viewed in order to be split into segments based on changes in broadscale habitat types. The imagery was also reviewed to record features of conservation interest (e.g. reefs), and information such as anthropogenic impacts.

For each image and video segment, a record was made of the percentage cover of live maerl, dead maerl and total maerl cover, the substratum, maerl structure, the broadscale habitat, MNCR habitat/biotope and imagery quality. Also recorded, where appropriate, was a category from the maerl categorisation system, an MNCR secondary habitat/biotope, and any features of conservation interest, Habitats Directive Annex 1 Habitats, litter as well as any observations or comments from the analyst.

Further interpretation of the data involved combining the geophysical data and its derivatives (bathymetry, rugosity, sidescan sonar, sidescan sonar variability) with the biological sample data (underwater imagery data analysis results). Image processing and spatial statistical analysis were used for incorporation of the sample data to ‘ground truth’ the geophysical data. This resulted in habitat maps and spatial presentation of the data.

Imagery Analysis Results

The predominant habitat observed during imagery analysis was coarse sediment, with

varying amounts of maerl (live/dead). This was often observed in mobile waves comprised of dead maerl and maerl sediment with a low percentage cover of live maerl at the peripheries. Areas of infralittoral and circalittoral rock were also recorded, as well as sand (with some silt) and seagrass beds, with relatively little conspicuous biota observed overall. Six broadscale habitats were noted during imagery analysis, with nine biotopes recorded in the video imagery and one additional biotope in the still imagery. The maerl categorisation system was applied to some of the imagery data; the remaining imagery was recorded as 'uncategorised' due to inconsistencies in category definitions, with the reasons explained.

The habitat FOCI and OSPAR habitat 'Maerl Beds' was recorded from the imagery, as well as the FOCI habitats 'Subtidal Sands and Gravels' and 'Seagrass Beds', and the OSPAR habitat 'Zostera beds'. Annex I features were also assessed, with possible 'Bedrock reef' and 'Stony reef' being recorded at this site. The only occurrence of Non-native Invasive Species recorded was one observation of possible cf. *Styela clava,* however analysis did not include full taxonomic identification of all biota. Litter was identified in three video segments and was the only anthropogenic impact observed in the imagery.

Imagery quality can influence resulting data quality. This was assessed and still imagery proved to be of relatively good quality, with poorer video imagery quality. The results of the still image analysis were used to inform the video analysis results to ensure consistency throughout the dataset.

Habitat maps and distribution

The distribution of the habitats/biotopes, percentage cover of live/dead maerl and maerl categories recorded during analysis were displayed within GIS and presented in maps, along with confidence scores and underlying probability maps to aid assessment of certainty in the mapped areas.

The distribution of 'Maerl beds' (SS.SMp.Mrl), with over 5% live maerl, is predicted in relatively small areas in the centre of the bay, and smaller patches inshore. Nearshore areas are comprised of seagrass beds, transitioning into areas predicted to be inshore infralittoral rock in a habitat mosaic with coarse sediment habitats including maerl (<5% live maerl), which are also predicted throughout the majority of the bay. Maerl (live or dead) was observed in just over 91% of images analysed, and live maerl in approx. 70% of images, however less than half (48%) of images with maerl had live maerl of ≥2% cover, reflecting the low proportion of live maerl in the area.

Overall, the distribution of the habitats mapped in 2024 are broadly supportive of the maps produced in 2016, however due to differences in analytical techniques, the mapping categories and interpretive methods used, comparisons were limited.

It should be noted that ground truth samples were targeted towards areas of maerl, with only limited samples of non-maerl habitats to inform the limit extents, therefore there is likely to have been overprediction of the distribution of habitats containing maerl. Recommendations were made regarding the sample design of future surveys and for review and clarification of maerl bed habitat definitions and the maerl categorisation system.

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Introduction

Natural England aimed to assess the distribution, extent and range of subtidal maerl communities in the Falmouth to St Austell Bay Special Protection Area (SPA) using acoustic data from the Cornwall Inshore Fisheries and Conservation Authority (CIFCA) Summer 2023 survey and drop-down video (DDV) from CIFCA surveys in December 2023 and May 2024.

ENVISION were commissioned by Natural England to carry out imagery analysis to quantify live and dead subtidal maerl and assess the distribution of habitats in St Austell Bay. Imagery was classified using the maerl categorisation system (Axelsson, 2023), with notes recorded on the application of the system. Interpretation and classification of the acoustic and imagery data was also commissioned to create habitat maps for the areas within the SPA. These maps and data were used to compare previous extent of maerl in the SPA using previous data collected during the 2016 CIFCA acoustic and DDV survey.

ENVISION carried out analysis of 987 still images and 14 hours and 15 minutes of video from 45 stations (Figure 1). The imagery was acquired by CIFCA using a 'STR SeaSpyder' drop-camera system, with a downward facing camera equipped with four high density LED 20w lamps and four dual lasers for precise imagery scaling (see survey report in Appendix 5). ENVISION also undertook interpretation of geophysical data including sidescan sonar data supplied by CIFCA and Southwest Regional Coastal Monitoring Programme (2024)/Maritime and Coastguard Agency (2021) bathymetry data, supplemented by bathymetry data from EMODnet (2019). This report summarises the analyses from the CIFCA 2023/2024 surveys and makes comparisons with previous data where possible.

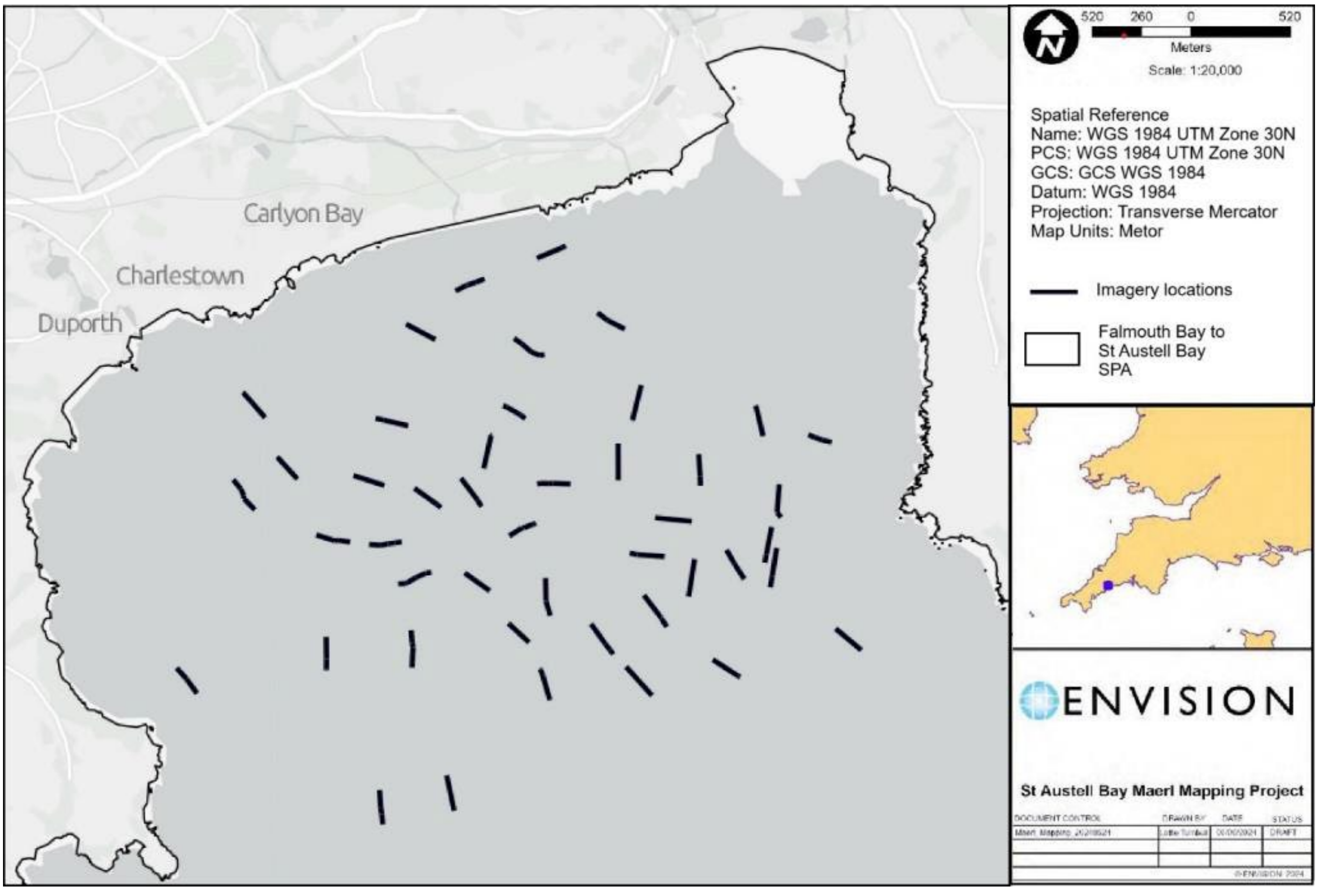

Figure 1. Locations of the sample stations within the Falmouth Bay to St Austell Bay SPA.
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Methodology

Imagery analysis

Imagery was reviewed, processed, and analysed in accordance with current guidelines, such as the standards for analysis in Visual Seabed Surveys (BS EN 16260:2012) and Turner and others (2016) and incorporated modifications following the scope of work as agreed with Natural England. The imagery was reviewed for features of conservation interest (FOCI), including Annex I reef assessment following the appropriate JNCC guidance notes (Gubbay, 2007; Irving, 2009; Golding and others, 2020). The results of analyses are described below and resulting data provided in MS Excel spreadsheet proformas.

Video footage was initially viewed rapidly in order to assess the video quality and split it into segments based on areas of continuous broadscale habitat type greater than or equal to 5m. Brief changes in habitat type lasting less than 5m were considered as incidental patches and recorded as part of the habitat description, or as a ‘habitat mosaic’. Other contextual information was also recorded such as any anthropogenic impacts or features of conservation interest.

All data were recorded as each still image and video was analysed and MEDIN (2024) compliant proforma spreadsheets were used to input imagery data and metadata. For each image and video segment, a record was made of the:

- Percentage cover of dead maerl
- Percentage cover of live maerl
- Total percentage cover of maerl
- Substratum
- Structure
- Broadscale habitat
- MNCR habitat/biotope
- Imagery quality

Where appropriate, a record was made of the:

- Category and group from the maerl categorisation system (Table 1)
- MNCR secondary habitat/biotope
- Any relevant features of conservation interest
- Habitats Directive Annex 1 Habitats
- Litter (using the categories listed in Annex 5.1 of the Joint Research Centres Guidance on Monitoring of Marine Litter in European Seas (Hanke and others, 2013))
- Any observations or comments from the analyst.

As the quality of the still imagery was better than that of the video footage, results of the still image analysis were cross-checked and used to inform the video analysis results to ensure consistency throughout the dataset.

For application of the maerl categorisation system, analysts allocated maerl categories to each image or video segment following the category descriptions presented in Table 1 (Axelsson, 2023). Where some imagery data did not fit with the specific criteria for the maerl categories, these were recorded as ‘uncategorised’, and reasons were noted. The physical structure was recorded as either ‘Yes’ or ‘No’: ‘Yes’ was recorded when the maerl in the imagery exhibited a 3D structure, was characterised as raised, and with a depth over 10cm; ‘No’ was recorded when the maerl lacked one or more of these components. Live maerl was recorded where thalli were over 1cm across and exhibited a 3D structure. The live/dead column was interpreted as the percentage of total maerl that was living (e.g. 1% live maerl in an image with a total of 20% maerl (live and dead) would result in a live/dead value of 5%), which was applied after agreement with NE regarding use of the categorisation table (not during allocation of biotopes).

With no clear definition of Maerl Beds being available at the time of reporting, the ‘Maerl beds’ biotope (SS.SMp.Mrl) was allocated to imagery with over 20% total maerl and over 5% live maerl recorded (≥5% of total image contained live maerl, with thalli over 1cm across and a 3D structure). Imagery with over 20% total maerl but under 5% live maerl recorded were allocated the biotope ‘SS.SCS [<5% Live Maerl]’ to represent habitats which were largely comprised of dead maerl and maerl sediment. Substrate with less than 20% cover of total maerl was recorded as the habitat SS.SCS, ‘Sublittoral coarse sediment (unstable cobbles and pebbles, gravels and coarse sands)’. ‘Sublittoral seagrass beds’ (SS.SMp.SSgr) were recorded where there was over five percent cover of seagrass in each still image or video segment.

During analysis, pink crusts were observed on rocks which looked similar to live maerl in colour/texture but were difficult to distinguish from Corallinaceae crusts from imagery alone (without genetic evidence). As a precautionary measure, where these were observed/recorded, ‘Corallinaceae crusts’ were noted within the analysis proforma.

A reference collection was built as the analysis progressed to aid quality control (QC) and consistency of identification during analysis, along with providing example imagery of habitats observed. Good quality images were noted and collated for each habitat/maerl category recorded.

Table 1. Table from Axelsson (2023) showing categories of maerl bed habitats in England. (*live/dead fraction part of total % cover column; substratum = characterising/dominant substrata; Condition / sensitivity = environmental suitability for restoration on a scale from 1 to 5, where 1 is poor and 5 is optimal).

Category	Group	Maerl bed habitat	Physical size	Structure	% cover	Live/dead*	Substratum
A	1	**Dense Maerl** 'live & dead'	≥25m²	3D; raised; ≥10cm depth	≥20%	≥5% live	Maerl
	2	**Dense Maerl** 'dead'	≥25m²	3D; raised; ≥10cm depth	≥20%	0% live ≥20% dead	Maerl
	3	**Dense Maerl** 'live & dead'	<25m²	3D; raised; ≥10cm depth	≥20%	≥5% live	Maerl
B	1	**Maerl Sediment** 'live & dead'	≥25m²	3D / 2D	≥5% ≤20%	5% live and dead	Gravel, sand, mud, mixed
	2	**Maerl Sediment** 'dead'	≥25m²	2D	≥5% ≤20%	Dead	Gravel, sand, mud, mixed
	3	**Maerl Sediment** 'live & dead'	Patchy	2D	≥5% ≤20%	5% live and dead	Gravel, sand, mud, mixed
C	1	**Sparse Maerl** 'live & dead'	Sparse	2D	<5% ≥1%	Live and/or dead	Gravel, sand, mud, mixed
	2	**Scattered Maerl** 'live & dead'	Scattered	2D	<1%	Live and/or dead	Gravel, sand, mud, mixed
D	1	**Maerl Veneer** 'live and dead, static'	≥25m²	2D	≥20%	≥5% live	Rock
	2	**Maerl Veneer** 'live and dead, mobile'	≥25m²	2D	≥20%	≥5% live	Rock
	3	**Maerl Veneer** 'live and dead, static'	Patchy	2D	≥5% ≤20%	≥5% live	Rock
E	1	**Potential Maerl**	Lacking detail		Lacking detail	Live and/or dead	Any suitable, near horizontal

Geophysical interpretation & habitat mapping

The overarching strategy for the interpretation of the data was to combine project specific and publicly available geophysical data with the recently collected and analysed underwater imagery data using image processing and spatial statistical analysis.

This process used 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). The geophysical data requires processing prior to integration so that the data are spatially coincident, at identical spatial resolutions and in a suitable format for the mathematical analyses.

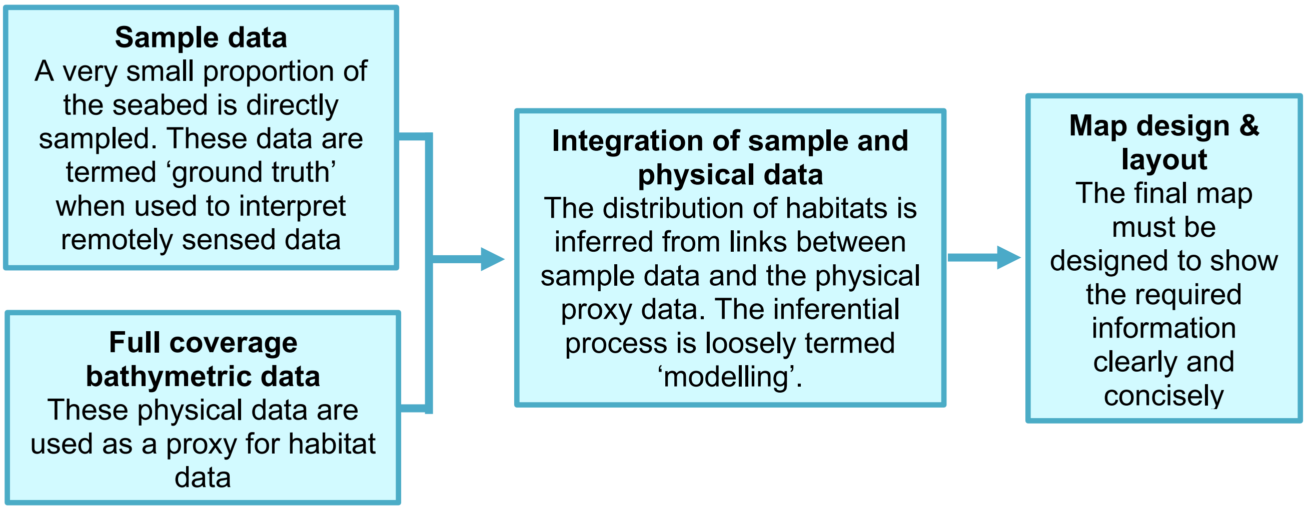

Figure 2. A flow chart of the main stages in making a habitat map by integrating sample data and full coverage physical data.

A confidence assessment is provided to assist with interpretation of the mapped outputs.

Data

Geophysical data & derivatives

All geophysical data have been incorporated within geostatistical software and geographic information system (GIS) 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 the St Austell Bay area of the SPA in Figure 3, Figure 4, Figure 5 and Figure 6 (sidescan sonar (SSS) from CIFCA (2023) and bathymetry from MCA (2024), with bathymetry data from EMODnet (2019) used to complete data for the central section of the bay). Data from MCA (2024) is at a 0.5m resolution, the infill data from EMODnet is at a relatively lower resolution. Whilst this results in an inconsistency in resolutions throughout the area of interest and is apparent in Figure 3, Figure 4 and Figure 10, the lower resolution data enables mapping of areas where otherwise data is absent.

All geophysical data (bathymetry and backscatter) were used as gridded data at a resolution of 0.5 metres. In addition to detailing the depth of the seafloor, bathymetry (Figure 3) can be used to derive other parameters, for example an index of rugosity which can highlight where the seabed is heterogeneous in nature.

Seabed terrain heterogeneity can indicate the complexity of a habitat and is known to be correlated to distribution of benthic fauna (Tappin and others, 2010). Seabed complexity/heterogeneity can be represented by rugosity, calculated using a terrain ruggedness index which produces gridded data as an image (Figure 4) suitable to incorporate into further analysis. Rugosity was derived using the method from Riley and others (1999). Other derivatives from bathymetry such as slope and aspect were not used as these are strongly correlated to depth and can overly influence the mapping process.

Sidescan sonar data (Figure 5), and the statistical variance derived from this data (Figure 6) was also used to indicate the heterogeneity of seabed habitats and this derivative was incorporated into the habitat mapping process.

All data layers were standardised to 0.5 metre pixel raster images [note [1]] with the same geographic bounds to perform mathematic and statistical calculations and classifications.

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

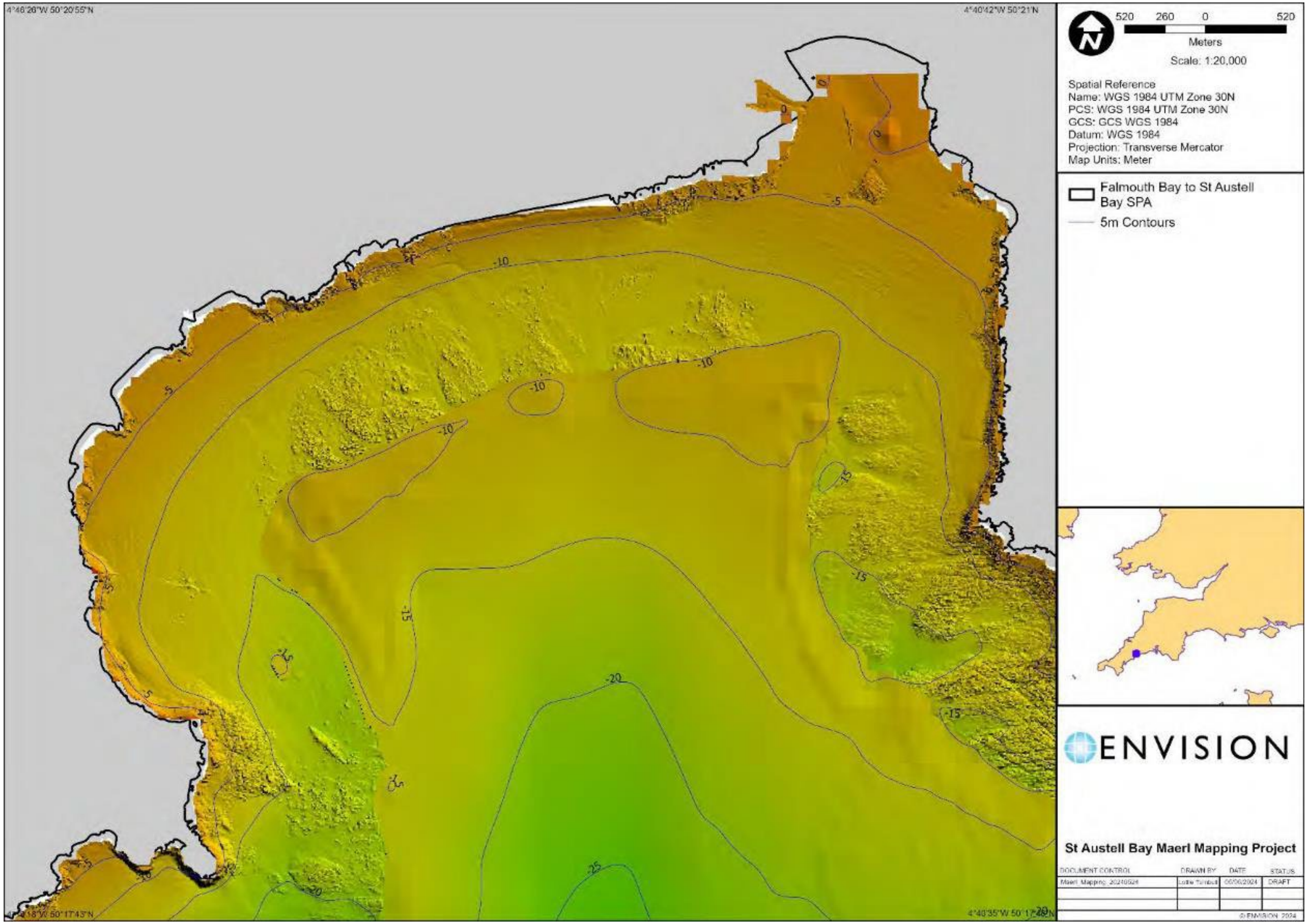

Figure 3. Multibeam bathymetry for the St Austell Bay section of the Falmouth Bay to St Austell Bay SPA.

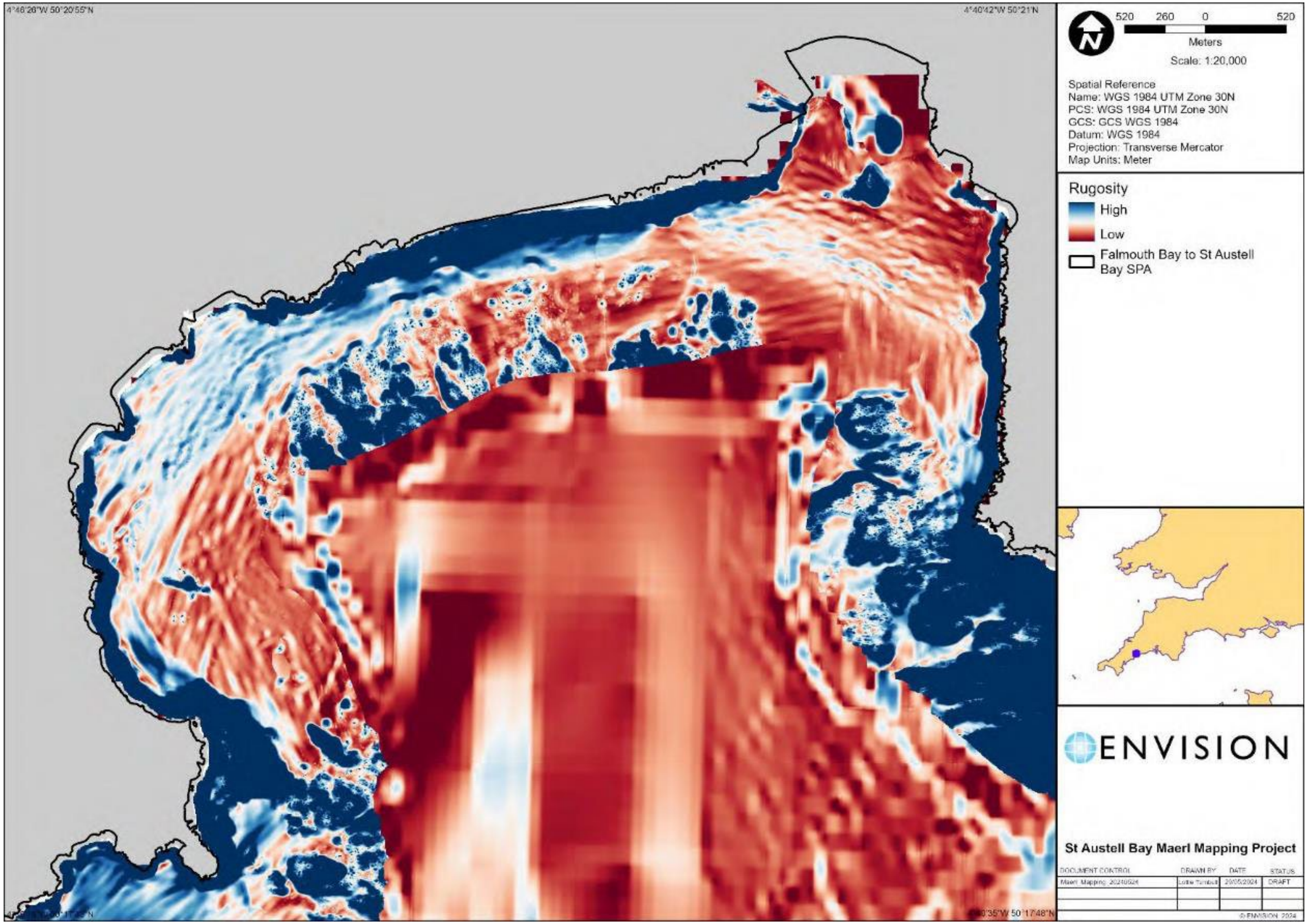

Figure 4. Rugosity derived from multibeam bathymetry for the St Austell Bay section of the Falmouth Bay to St Austell Bay SPA. High rugosity can be indicative of more heterogenic habitats, and vice versa.

Figure 5. Sidescan sonar for the St Austell Bay section of the Falmouth Bay to St Austell Bay SPA (CIFCA, 2023).

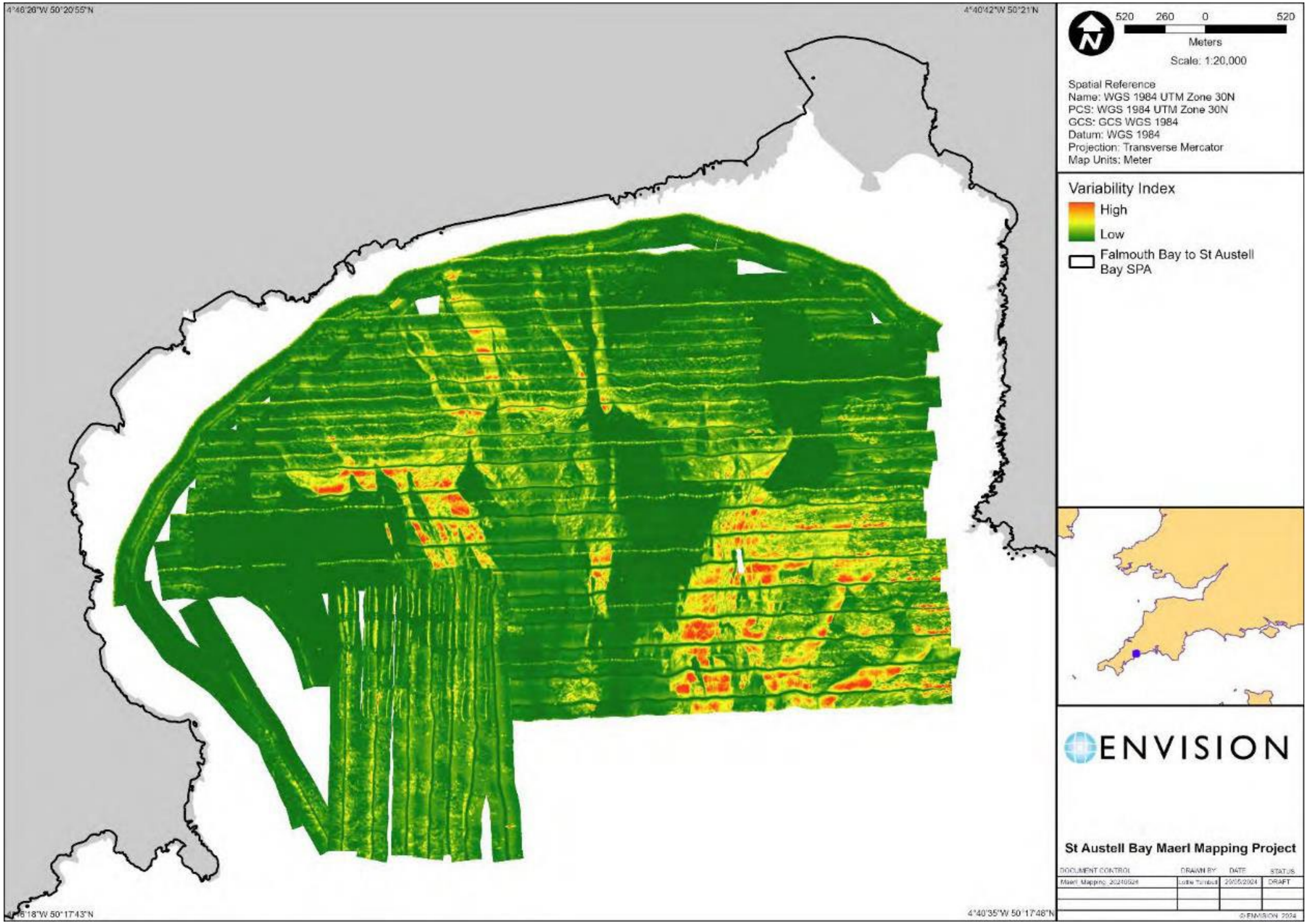

Figure 6. Variability derived from sidescan sonar for the St Austell Bay section of the Falmouth Bay to St Austell Bay SPA. High variability can be indicative of more heterogenic seabed habitats, and vice versa.

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. 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 10-meter radius training area around each video record and these areas associated with the appropriate habitat category. The 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 7.

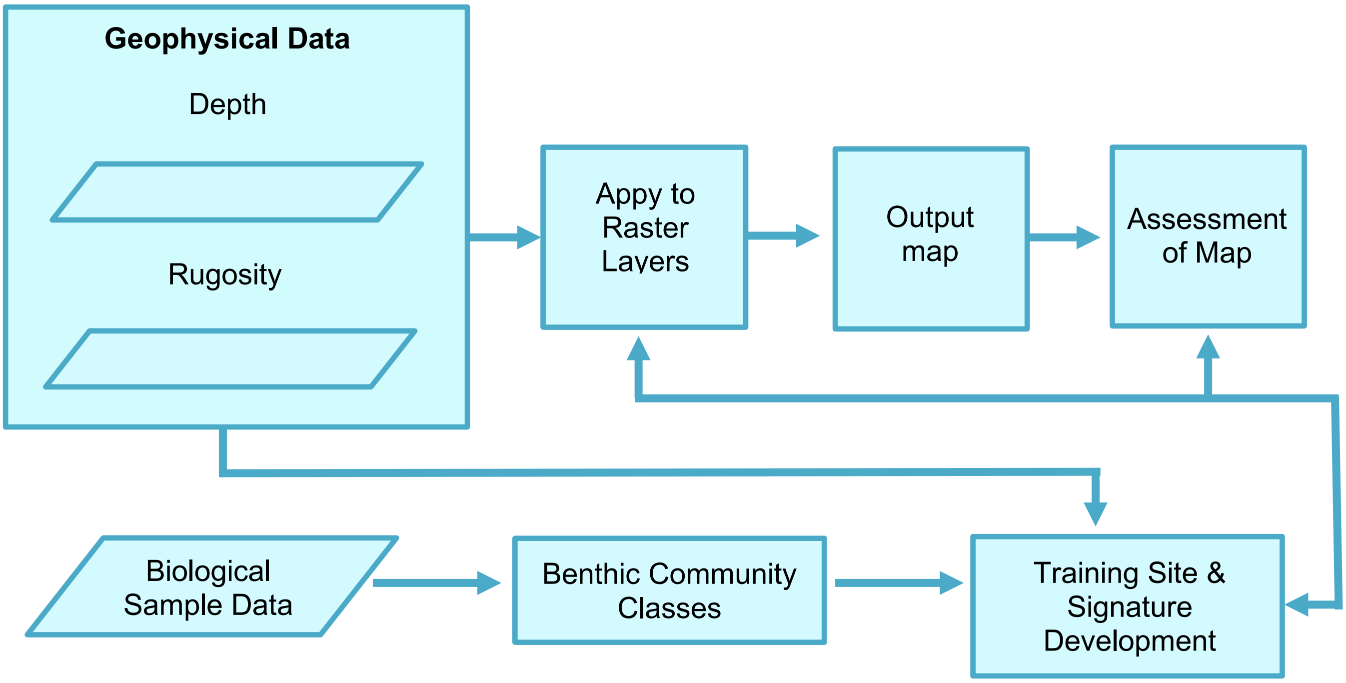

Figure 7. Schematic diagram outlining the main stages in the modelling of the distribution of biota classes

Mapping process

The machine learning tool 'Random Forest classification' was selected to produce the habitat maps as this provided a relatively high accuracy output. 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.

Confidence assessment

Confidence of the habitat distribution maps was determined using the MESH (2008) confidence assessment scoresheet and a JNCC confidence assessment method (Lillis and others, 2016).

A map of underlying probability, derived from the classification process (Random Forest classification' within 'Vision using Generic Algorithms' (ViGrA)), has also been 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.

Results

Imagery analysis

Coarse sediment habitats were found to occur in the majority of imagery. This imagery showed varying amounts of maerl (live/dead), which were often observed in waves, largely comprised of dead maerl and maerl sediment with a low percentage cover of live maerl at the peripheries. Often pebbles, shell and cobbles were present in the troughs.

Kelp and macroalgal communities were observed in shallower areas of rock habitat with occasionally sparse occurrence of epifauna such as sponges, hydroids and tunicates. Some areas of infralittoral and circalittoral rock habitats were recorded which appeared largely scoured with the only conspicuous biota being pink crusts, often adjacent to coarse sediment habitats including maerl which may form a veneer over rock in places.

Sand habitats, with the influence of finer sediments, were also recorded and mixed substrate was observed in one image, however it was difficult to ascertain the composition of silt in the substrate from imagery due to overlying coarse material.

Seagrass was recorded in still images at two locations, and mussels were observed encrusting on outcropping rock but did not form dense beds.

Overall, relatively few conspicuous fauna were observed, with only occasional occurrence of echinoderms, molluscs and crustacea.

Imagery quality was assessed and still imagery proved to be of relatively good quality, with poorer video imagery quality. The quality of imagery can influence data extraction and results.

Broadscale habitat and biotope allocation

Habitats within St Austell Bay were heterogeneous in nature and 33 of the 45 video stations were split into two or more segments on the basis of a change in broadscale habitat. Overall, there were a total of 105 video segments analysed, ranging from one to five segments per station. Furthermore, mosaic habitats were observed in 11 video segments and 38 still images. Mosaic habitats occur where two habitats are present in patchy distribution (e.g. outcropping bedrock interspersed with maerl or coarse sediment) or one habitat overlying another (e.g. maerl or coarse sediment overlying outcropping bedrock) and recorded as primary and secondary habitats/biotopes.

Six broadscale habitats were recorded during imagery analysis, including:

- Subtidal Coarse Sediment (68 segments, 673 still images)
- High Energy Infralittoral Rock (13 segments, 68 still images)
- Moderate Energy Circalittoral Rock (10 segments, 37 still images)
- Subtidal Sand (8 segments, 37 still images)
- Subtidal Macrophyte Dominated Sediment (6 segments,151 still images)
- Subtidal Mixed Sediment (1 still image)

A total of ten biotopes were recorded during analysis of the imagery, nine were recorded during analysis of the video footage and ten were recorded during analysis of the still images (Sublittoral mixed sediment (SS.SMx) was recorded in one still image only). The habitats/biotopes are summarised in Table 2 and described below, with example images shown in Figure 8 a-j. Distribution of the habitats/biotopes recorded from the video are presented in Figure 11, with metadata provided in Table 7 in Appendix 1 and results of analysis summarised in Table 8 in Appendix 2.

The ‘Maerl beds’ biotope (SS.SMp.Mrl) was allocated to imagery with over 20% total maerl and over 5% live maerl recorded (≥5% of total image contained live maerl, with thalli over 1cm across and a 3D structure). Imagery with over 20% total maerl but under 5% live maerl recorded were allocated the biotope ‘SS.SCS [<5% Live Maerl]’ to represent habitats which were largely comprised of dead maerl and maerl sediment. Substrate with less than 20% cover of total maerl was recorded as the habitat SS.SCS, ‘Sublittoral coarse sediment (unstable cobbles and pebbles, gravels and coarse sands)’. ‘Sublittoral seagrass beds’ (SS.SMp.SSgr) were recorded where there was over five percent cover of seagrass in each still image or video segment.

Table 2. Biotopes recorded during analysis of Falmouth Bay to St Austell Bay SPA maerl imagery.

MNCR Code	MNCR Classification Title
CR.MCR	Moderate energy circalittoral rock
IR.HIR	High energy infralittoral rock

MNCR Code	MNCR Classification Title
IR.HIR.KFaR	Kelp with cushion fauna and/or foliose red seaweeds
IR.HIR.KFaR.FoR	Foliose red seaweeds on exposed lower infralittoral rock
SS.SCS	Sublittoral coarse sediment (unstable cobbles and pebbles, gravels and coarse sands)
SS.SCS [<5% Live Maerl]	Sublittoral coarse sediment (unstable cobbles and pebbles, gravels and coarse sands) [<5% Live Maerl]
SS.SMp.Mrl	Maerl beds
SS.SMp.SSgr	Sublittoral seagrass beds
SS.SMx	Sublittoral mixed sediment
SS.SSa	Sublittoral sands and muddy sands

Figure 8 (a-j). Example images illustrating the habitat/biotope identified during analysis of the Falmouth Bay to St Austell Bay SPA maerl imagery © Natural England

Figure 8a. CR.MCR

Figure 8b. IR.HIR.KFaR

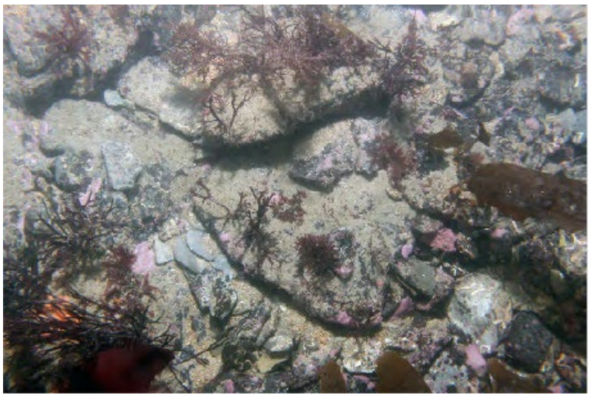

Figure 8c. IR.HIR.KFaR.FoR

Figure 8d. IR.HIR

Figure 8e. SS.SCS

Figure 8f. SS.SCS [<5% Live Maerl]

Figure 8g. SS.SMp.Mrl

Figure 8h. SS.SMp.SSgr

Figure 8i. SS.SMx

Figure 8j. SS.SSa

Maerl category allocation

The maerl categories allocated to still imagery using the maerl categorisation system as described in Axelsson (2023) are presented overlying the habitat/biotope map in Figure 28 to Figure 33 in Appendix 3- Habitat maps and distribution.

From a total of 105 video segments, maerl (either dead and/or live) was recorded in 93 segments, 48 of which were given a category from the maerl categorisation system. Overall, the category 'A1' was recorded in 22 video segments, B1 was recorded in five segments, 'B2' was recorded in one segment, 'C1' was recorded in 13 segments and 'C2' was recorded in seven segments. It was not possible to attribute a category to the remaining 45 segments where maerl was recorded.

Still imagery incorporated a wider variety of maerl categories than video footage. From a total of 970 still images, maerl (either dead and/or live) was recorded in 886 images, 537 of which were attributed to a category. In total, 224 images were recorded as 'A1', four images recorded as 'A2', three images recorded as 'A3', 115 images recorded as B1, 11 images recorded as 'B2', 80 images recorded as 'C1', 89 images recorded as 'C2', and 11 images recorded as 'D2'. It was not possible to attribute a category to the remaining 349 images where maerl was recorded.

An example image of each recorded category is shown in Figure 9 (a – j) and the video segment maerl categories are summarised in Table 8 in Appendix 2.

In the imagery where the categorisation system couldn't be applied, an image or video segment was allocated 'uncategorised'. This was applied to 45 of the video segments and 349 still images. A list of reasons why some data did not fit the categorisation system is shown below:

<u>Category A-</u>

- No option for live/dead maerl between 0% and 5%

Category B-

- No option for 2D maerl of over 20%
- No option for live/dead maerl between 0% and 5%
- Description of live/dead maerl requires clarification (should be ≥5% live?)
- No option for 3D maerl under 25m²

Category D-

- No option for 3D maerl
- No option for total maerl recorded under 5%
- No option for live maerl recorded under 5%
- No option for mobile maerl under 20%

Issues also arose relating to physical size/extent and structure, which is hard to distinguish within stills analysis. Where extent was a contributing factor towards allocation of a group these stills were cross referenced against the video segments to confirm physical size. Additionally, where thick waves of maerl were observed a depth greater than 10cm was assumed. All maerl observed was recorded as mobile rather than static due to being present in waves and with little observable epiflora or fauna.

Figure 9 (a-j). Example images illustrating the maerl categories identified during analysis of the Falmouth Bay to St Austell Bay SPA maerl imagery. © Natural England

Figure 9a. A1

Figure 9b. A2

Figure 9c. A3

Figure 9d. B1

Figure 9e. B2

Figure 9f. C1

Figure 9g: C2

Figure 9h. D2

Figure 9i. Uncategorized

Figure 9j. No Maerl

Imagery quality

Imagery was assessed using the NMBAQC image quality categories (Table 5). The video footage was allocated a quality score of ‘Poor’ in 92 video segments, ‘Very Poor’ in 13 segments and ‘Zero’ in two segments, with quality affected by the distance from the seabed and suspension of sediment which prevented a clear view of the substrate. The stills imagery was clear and of better quality, with automatic image correction (tone/contrast/colour) undertaken to improve clarity. The majority of the still images were assessed as ‘Good’ (893) quality, and the other 94 still images assessed as ‘Poor’ (72), ‘Very Poor’ (five) and ‘Zero’ (17) quality.

Due to the lower quality observed during video analysis, the percentage coverage of maerl recorded in the video footage was cross-referenced with the still images to ensure consistency throughout the dataset. Stations 21 and 32 received a quality score of 'Zero', making the data unusable. However, data collection at these stations had been repeated, allowing for further analysis.

Table 5. Summary of NMBAQC image quality categories (Turner and others, 2016).

Quality Category	Proportion of Tow Negatively Affected	Organism Enumeration	Biotopes
Excellent	<5%	Quantitative	Level 5
Good	5-20%	Quantitative	Level 5
Poor	20-50%	Qualitative	Level 3
Very Poor	50-80%	Not recommended	Level 2/3
Zero	>80%	Data not usable	Data not usable

Features of conservation interest

The habitat FOCI and OSPAR habitat 'Maerl Beds' was recorded in 529 still images and 52 video segments. The definition of these habitats does not distinguish between live and dead maerl and therefore occurrences of over 20% total maerl have been attributed with these features. The habitat FOCI 'Subtidal Sands and Gravels' was recorded in 335 images and 29 video segments and the habitat FOCI 'Seagrass Beds' and OSPAR habitat 'Zostera beds' was recorded in 21 still images and one video segment.

During analysis mussels were observed in still images and video footage at stations 38 and 39. None were allocated a habitat FOCI due to insufficient densities to record as mussel beds, however their presence was noted within the spreadsheet proformas.

The imagery was also reviewed for Annex 1 features and potential Annex 1 reef instances were identified. When determining whether an area of the seabed should be considered as Annex I stony reef, four characteristics (composition, elevation, extent, or biota) were scored to meet the criteria required to be considered as contributing to the Marine Natura site network of qualifying reefs in terms of the EU Habitats Directive (see Appendix 6 - Annex 1 stony reef assessment). Extent could not be confirmed during analysis of the still's imagery, so any possible Annex 1 reef was cross referenced against the video segments.

Within the still imagery data possible 'Bedrock reef' was recorded in 73 images and a further four images as possible 'Stony reef'. These were checked against the video footage to confirm extent and within the video data 'Bedrock reef' was recorded in 20 video segments and four video segments were recorded as 'Stony reef'.

Litter, ‘Non-native Invasive Species’ (NIS) and other impacts or modifiers

The only occurrence of Non-native Invasive Species recorded in the imagery was one observation of possible cf. *Styela clava* recorded at station 11, which was noted in the analysis proforma. It should be noted that, due to the analysis being primarily focused on assessment of percentage cover of live and dead maerl and did not include full taxonomic identification of all biota, there is the possibility NIS may have been overlooked.

Three video segments have been identified as potentially having items of anthropogenic origin in them. These were recorded in the analysis proforma, all as the Litter category ‘F5: Other’. Two items were recorded from station 33, one possible metal chain and one potential mooring block; a large concrete block with a metal chain attached. There were two instances of pieces of rope observed at station 38. No clear occurrences of any other anthropogenic impacts were observed throughout the rest of the imagery analysed.

Quality control

Quality control (QC) was carried out on approximately 10% of the videos and stills, and the results were compared and reviewed by both analysts. The quality control process showed a good degree of consistency in the results between the original analysers and the QC analyser and reflects confidence in the quality of the analysis. Where there were discrepancies between the conclusions of the original analyst and the QC analyst, the issues were explored and are summarised below. The checks and amendments made during the QC of the analysis were recorded in a spreadsheet detailing all QC procedures, to aid the reporting process.

The analysis of still imagery saw very minor differences between quality, mostly between good and excellent. There were some differences between circalittoral and infralittoral habitats, and the QC analyst recorded ‘possible encrusting maerl’ in comments additional times, probably due to showing less certainty in identification. There was one difference in broadscale habitat, the QC analyst recorded ‘Subtidal Mixed Sediments’ in one still image that the original analyst had recorded as ‘Subtidal Coarse Sediments’. This was amended to ‘Subtidal Mixed Sediments’ to agree with the possible underlying mud observed during analysis. There were minor differences between dead and total maerl percentages, which were addressed between QC analyst and original analyst. The analysis of video imagery also saw minor differences in live maerl percentages between analysts, and one video segment omitted a secondary biotope, all of which were rectified as part of final checks.

Habitat maps and distribution

The distribution of the habitats/biotopes, percentage cover of live/dead maerl and maerl categories recorded during analysis have been displayed with GIS and maps exported for presentation within this report, with accompanying shapefiles and associated metadata provided. Maps presenting data at a scale showing a full view of the bay are presented in Figure 11 to Figure 15. Figure 11 shows the distribution of habitats/biotopes recorded from the video analysis. Where videos were segmented due to changes in habitat the start locations of each segment have been used to show where each different habitat, and mosaics of these habitats, occurred.

It should be noted that ground truth samples (imagery) were targeted towards areas of maerl, rather than representative sampling planned to capture all habitats present within the bay. The mapping process relies on ground truth data to provide a reliable representation of the variety and frequency of habitats encountered. This means that if the data informing the mapping process is biased towards maerl habitats and there are only limited samples of non-maerl habitats to constrain extents and frequency of occurrence, it is likely to overpredict the distribution of habitats containing maerl (shown in Figure 11 to Figure 15). A further consideration is the distinction in acoustic signature of live and dead maerl, which is likely to be similar (and can be similar to other coarse sediment habitats such as gravel of a similar physical nature).

The distribution of habitats in Figure 11 shows areas nearest to the shore to be comprised of seagrass beds (from existing seagrass polygon provided by NE/CIFCA), transitioning into areas of inshore infralittoral rock, most of which were observed in a habitat mosaic with coarse sediment with >20% total maerl but <5% live maerl (SS.SCS [<5% Live Maerl]). A few relatively small areas of circalittoral rock are mapped in the southern central area of the bay.

The majority of the bay is predicted as the habitat SS.SCS [<5% Live Maerl], interspersed with areas of SS.SCS (reflecting areas with less than 20% total maerl).

The distribution of ‘Maerl beds’ (SS.SMp.Mrl), with over 20% total maerl and over 5% live maerl, is predicted in relatively small areas in the centre of the bay, and smaller patches between the infralittoral rock in the inshore area.

Figure 10 presents the percentage of total maerl recorded in still images overlying the habitat/biotope distribution map within St. Austell Bay. This shows that maerl (live and dead) is recorded throughout the bay, and at greater percentage cover in sample stations in northwest, central, central eastern areas.

Figure 13 presents the percentage of live maerl recorded in still images overlying the habitat/biotope distribution map within St. Austell Bay. Whilst total maerl is found in relative abundance throughout the bay, Figure 13 shows that sample stations with over 5% cover of live maerl occur within or adjacent to the relatively small areas mapped as ‘Maerl beds’ (SS.SMp.Mrl). Figure 14 shows the same information (percentage of live maerl recorded in still images) overlying only habitats recorded as maerl and habitats with <5% maerl alone.

All of the figures discussed here are presented in more detail in Appendix 3- Habitat maps and distribution where maps are provided showing the southwest, northwest, northeast and southeast sections of St. Austell Bay in more detail in Figure 16 to Figure 28.

Confidence assessment

The MESH confidence assessment scoresheet was used to determine a confidence score of 79. This score is considered relatively low: whilst the use of bespoke and recently collected geophysical data gives higher component scores, the density and representativeness of ground truthing samples in non-maerl habitats lowers the overall score.

RemoteTechniqu	RemoteCoverag	RemotePositioni	RemoteStdsAppli	RemoteVintag	BGTTechniqu	PGTTechniqu	GTPositionin	GTDensity	GTStdsApplie	GTVintage	GTInterpretatio	RemoteInterpretati	DetailLevel	MapAccurac	Remote score	GT score	Interpretation	Overall
3	2	3	3	3	2	2	3	1	3	3	2	3	2	1	93.3	76.7	66.7	79

The confidence of the habitat mapping was scored as 2 (out of 4) using the Lillis (2016) method below, which again shows decreased confidence in the habitat map.

Remote Sensing Coverage (0-2)	Distinctness of class boundaries (0-1)	Amount of sampling (0-1)	Total Score (0-4)
2	0	0	**2**

The probabilities for the habitat classes in the MNCR Level 3/4 maps are shown in Figure 8.These probabilities indicate where there is more or less ‘confusion’ in the mapped areas. Those areas with high probabilities have lower chance of being another habitat class with areas of lower probability having an increased chance. This allows confidence to be assessed spatially in addition to the above scoring mechanisms for the map.

Figure 10. Probability of the marine benthic habitats mapped at MNCR Level 3/4 in St Austell Bay, with a darker colour indicating a higher probability.

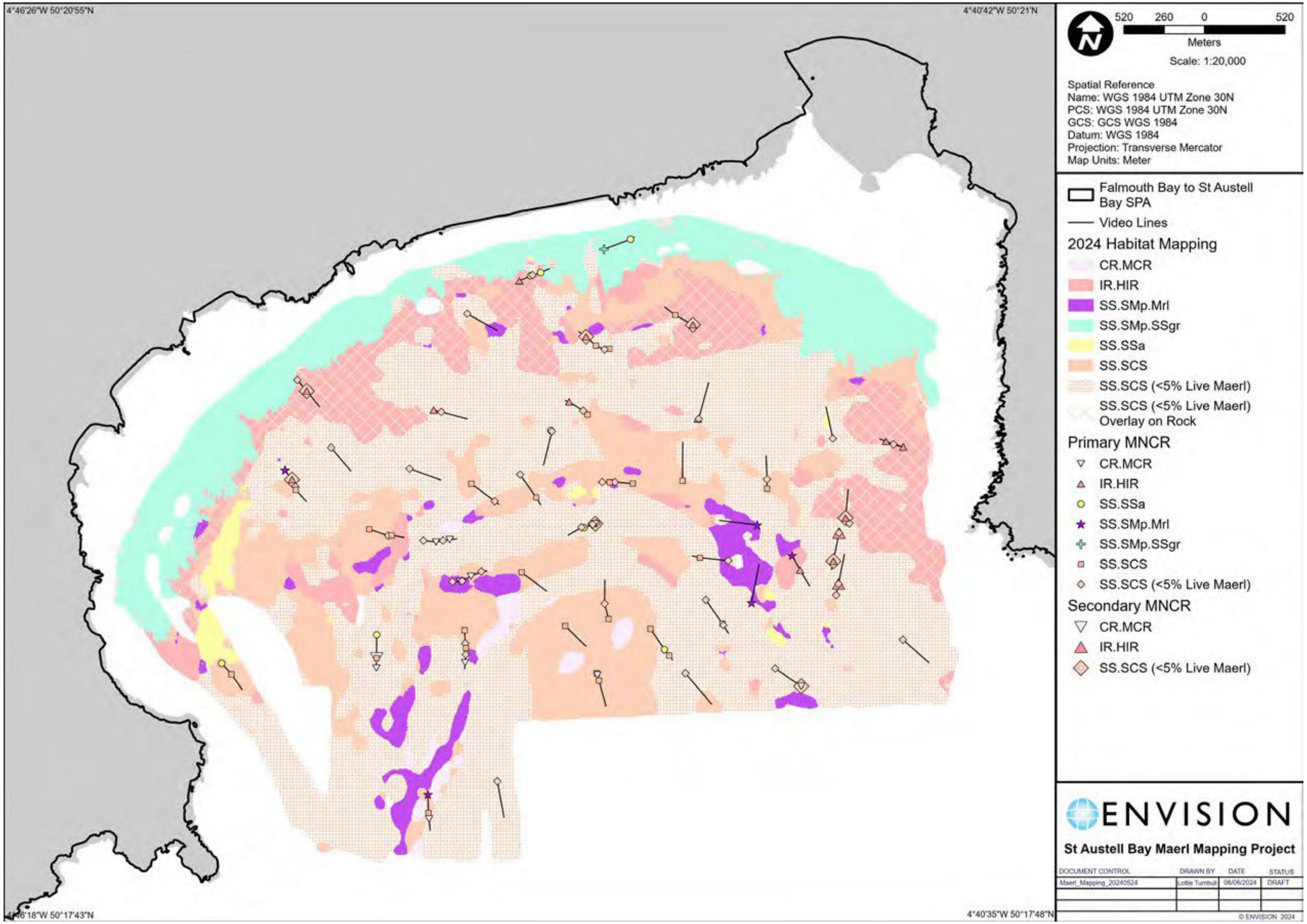

Figure 11. Distribution of the habitats/biotopes from imagery (video) analysis in St Austell Bay (presented in more detail in Figure 16 to figure 19 in Appendix 3). © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

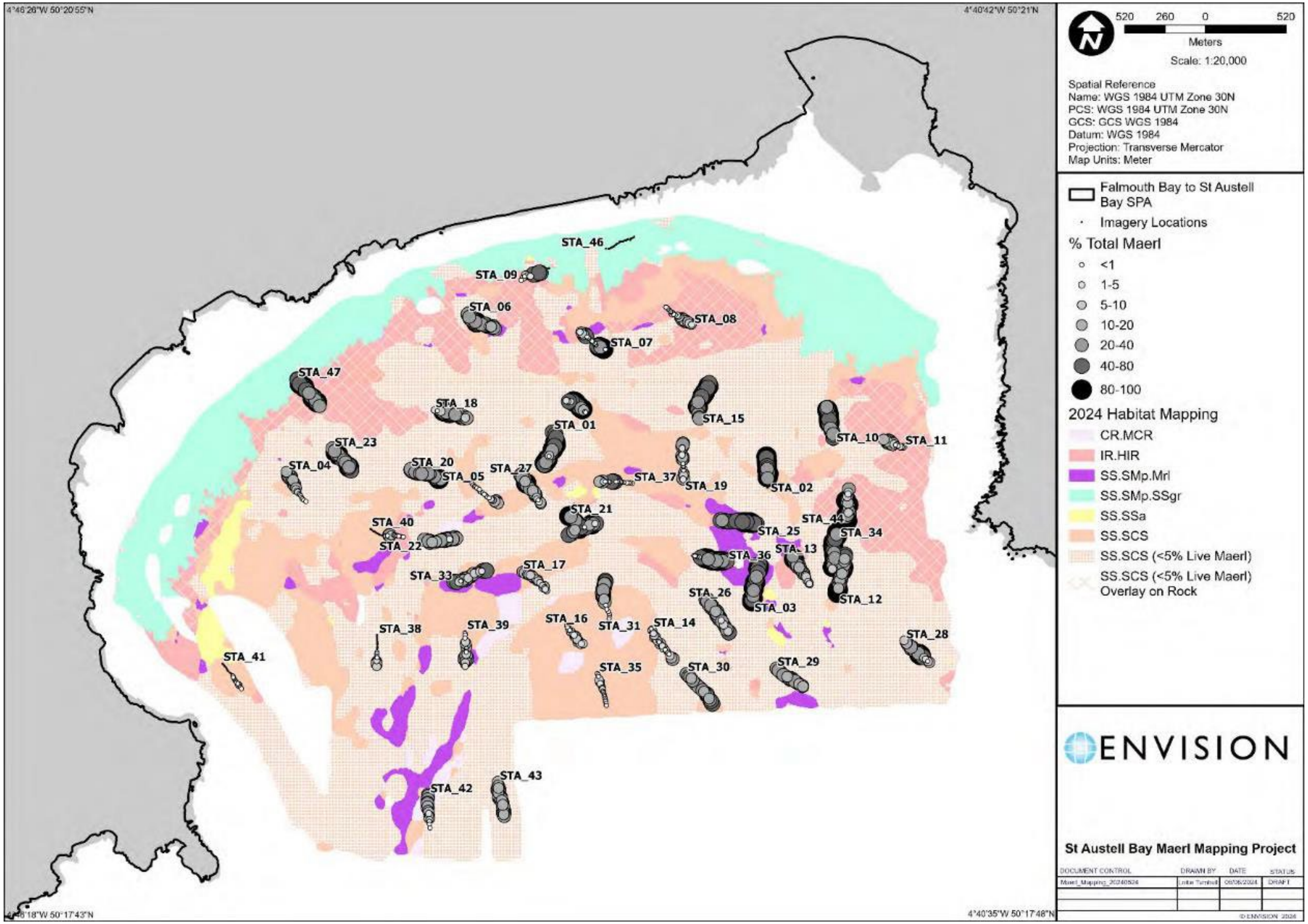

Figure 12. Marine benthic habitats at MNCR Level 3/4 and the percentage of total maerl recorded in each still image during analysis of the imagery from St Austell Bay (presented in more detail in Figure 20 to Figure 23 in Appendix 3).

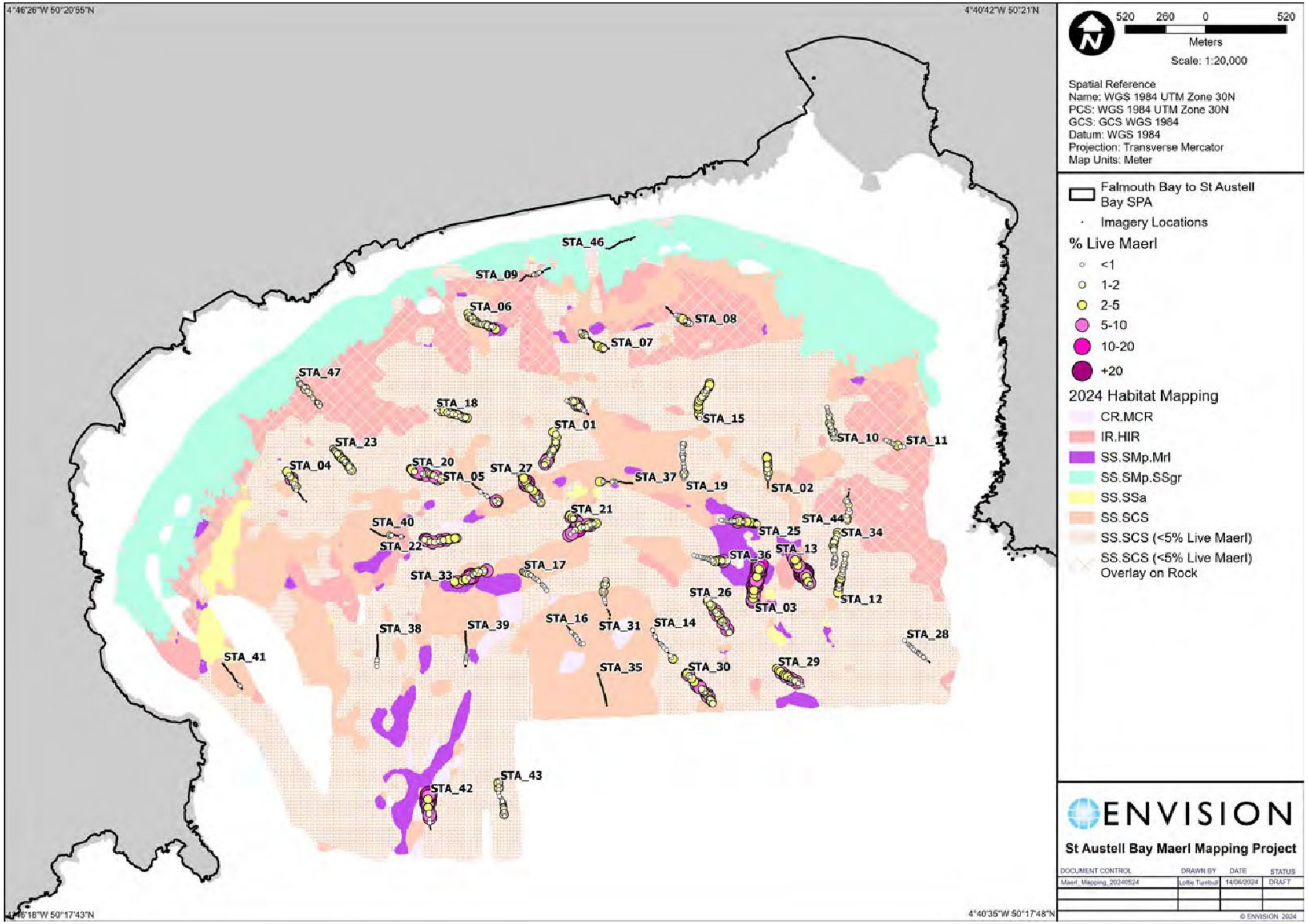

Figure 13. Marine benthic habitats at MNCR Level 3/4 and the percentage of live maerl recorded in each still image during analysis of the imagery from St Austell Bay (presented in more detail in Figure 24 to Figure 27 in Appendix 3).

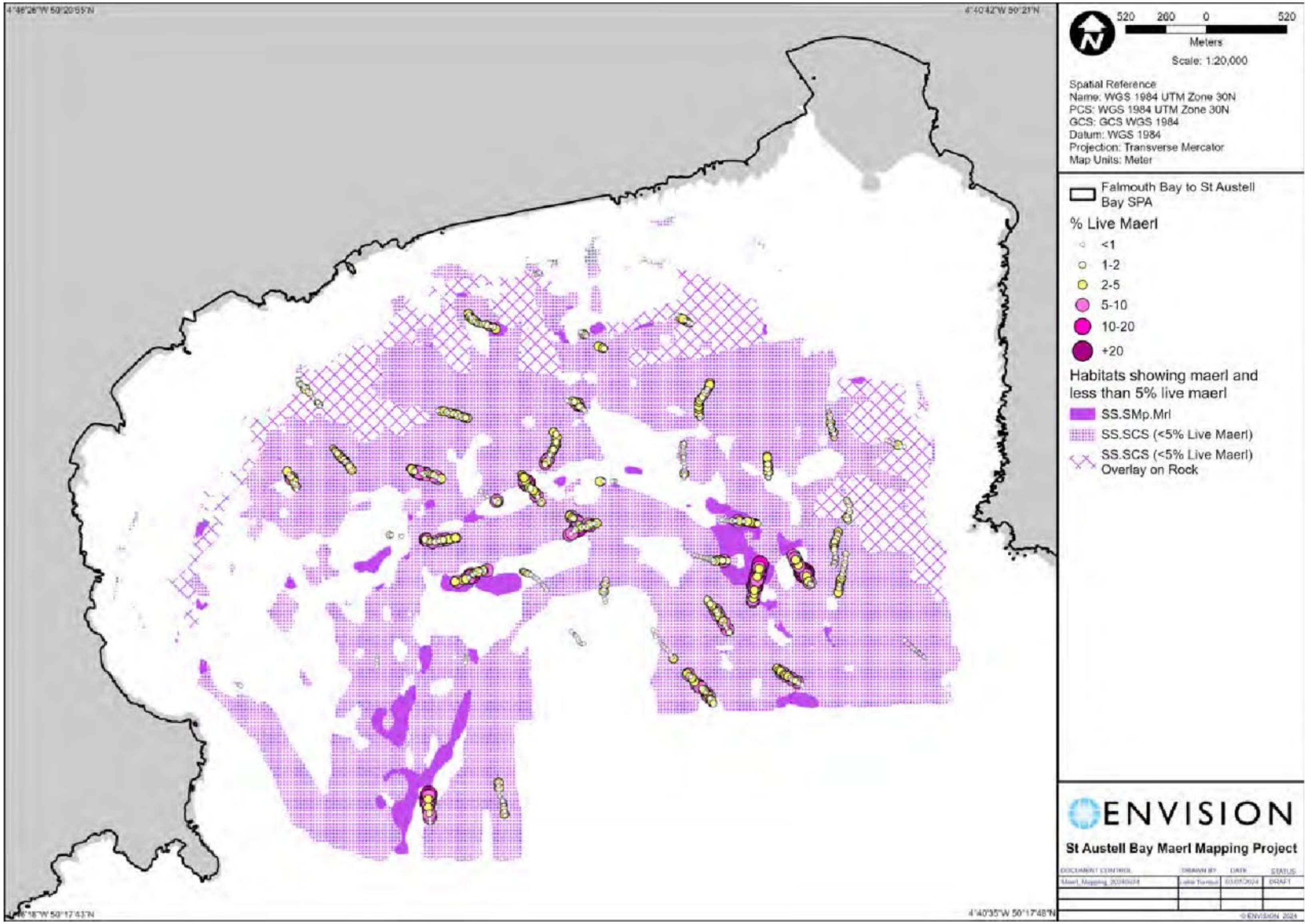

Figure 14. Map showing maerl and habitats with <5% maerl alone, with the percentage of live maerl recorded in each still image during analysis of the imagery, from St Austell Bay.

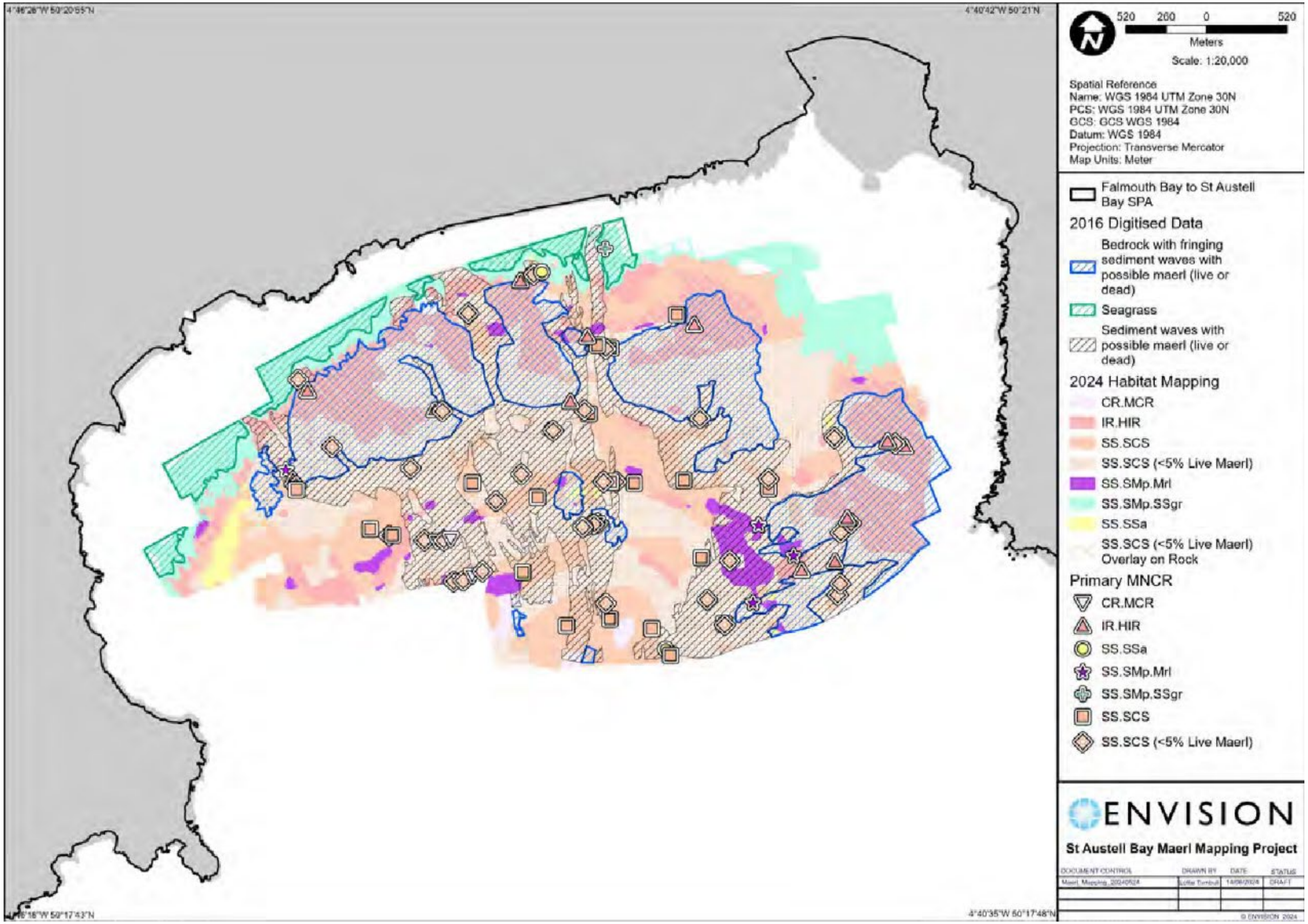

Figure 15. Marine benthic habitats at MNCR Level 3/4 in St Austell Bay from 2024 interpretation, with mapped (digitised) areas from 2016 data overlain for comparison of data. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

Comparison with existing data

Figure 15 shows the habitats/biotopes mapped at MNCR Level 3/4 in St Austell Bay from 2024 interpretation, with mapped (digitised) areas from 2016 data overlain for comparison.

The extent of the whole area mapped in 2016 differs from that in 2024 and only the area common to both interpretations have been compared (Figure 15). Additionally, the mapped categories in 2016 are non-standard with three classes used in 2016 and seven MNCR habitat and biotopes classes used in the 2024 mapping.

Interpretive methods used to produce 2016 habitat distributions relied on manual interpretation of boundaries and distributions whereas the 2024 habitat distributions are based upon data models and algorithms which may affect comparisons.

In addition to the habitat classes used, the maerl categorisation system has been applied to the 2024 data to assist interpretation whereas the 2016 data only distinguished between rock and sediment with possible maerl, and sediment with possible maerl, for variations in maerl habitats.

Comparing habitat maps from the 2016 and 2024 data shows some commonality with areas of rock from 2024, mostly being encompassed by areas identified as rock in 2016. In the remaining areas where rock was identified in 2016, the habitat mapped is 'SS.SCS [<5% Live Maerl]'. This is likely due to the methods used to determine boundaries of these habitats, with 2016 extents having been subjectively digitised from sidescan sonar data whereas 2024 extents were defined from statistical signatures produced by using ground truth samples to determine the acoustic characteristics of the seabed in the vicinity of samples. Where samples are targeted towards maerl sediment habitats, then the abundance and location of boundaries will be determined by the location of these samples. In the 2024 maps the sediment habitat is predicted to occur where the rock habitat is predicted in 2016 due to samples in these areas (or adjacent) being attributed to sediment habitat types, and to some extent, sediment forming a veneer overlying rock.

The 2024 habitat types found to occur within each of the habitats identified in 2016 are shown in Table 6 with the proportion of each habitat type occurring shown.

Table 6. Proportion of 2024 habitat types occurring within each of the 2016 identified habitats

MNCR Code	Sediment waves with possible maerl (live or dead)	Bedrock with fringing sediment waves with possible maerl (live or dead)
CR.MCR	1%	0%
IR.HIR	5%	41%

MNCR Code	Sediment waves with possible maerl (live or dead)	Bedrock with fringing sediment waves with possible maerl (live or dead)
SS.SCS	17%	3%
SS.SCS (<5% Live Maerl)	71%	55%
SS.SMp.Mrl	6%	1%
SS.SMp.SSg	1%	0%
SS.SSa	0%	0%

It can be seen where sediment waves have been identified in 2016 then over 90% of the 2024 habitats are sedimentary in nature and contain 6% maerl habitats. Rock habitats are found to occupy 6% of the areas previously identified as sediment. Habitats identified as rock in 2016 are also identified as rock within 2024 data in over 41% of the areas with 55% of the areas mapped as 'SS.SCS [<5% Live Maerl]', as explained above.

Overall, the distribution of the habitats mapped in 2024 are broadly supportive of the maps produced in 2016. However, due to differences in analytical techniques, the mapping categories and the interpretive methods employed, comparison between the two datasets is limited.

Conclusions and recommendations

Conclusion

The predominant habitat observed within St Austell Bay was coarse sediment with varying amounts of maerl (live/dead) in this high energy environment. This was often observed in mobile waves of coarse sediment, largely comprised of dead maerl and maerl gravel with low percentage cover of live maerl at the peripheries. Areas of infralittoral and circalittoral rock were also recorded, as well as sand (with some silt) and seagrass beds.

The maerl categorisation system proved difficult to apply during analysis of the datasets from St Austell Bay. Habitats observed in the imagery frequently failed to fit the criteria as described in the maerl categorisation system (Table 1, Axelsson, 2023), e.g. due to low percentage cover of live maerl, or over >20% cover of total maerl but which lacked the necessary structural attributes or when overlying rock. Revision of the maerl categorisation system is planned to address these inconsistencies in application of the categories (Natural England, pers comms., 2024).

Live maerl was observed in approx. 70% of the images analysed, and maerl (live or dead) in just over 91% of images analysed, although it should be noted that sample locations were targeted towards areas of maerl in the bay. However, whilst maerl (live and dead) of over 20% cover was observed in approx. 60% of the images with maerl, live maerl of ≥5% cover was observed in only 17%, and less than half (48%) of images with maerl had live maerl of ≥2% cover, reflecting the low proportion of live maerl in the area.

As discussed in Axelsson (2023), the architectural complexity of a maerl bed is considered important for biodiversity whether dead or live (Jackson *et al.*, 2004), however the maerl observed during the current study was often comprised of waves of dead maerl or maerl sediment, which appeared to be mobile (adjacent rock appeared scoured) with no notable associated biological communities, evidenced by very little conspicuous biota.

Whilst the mapping process reveals sublittoral coarse sediment with maerl (>20% total maerl but <5% live maerl (SS.SCS [<5% Live Maerl]) to be present in large areas throughout St Austell Bay, areas of maerl beds (≥5% live maerl) are present only in smaller areas. It should also be noted that non-maerl habitats were under sampled and therefore the mapping process is likely to over-predict the presence of maerl in the bay.

Recommendations

Based on the issues arising during imagery analysis and the subsequent mapping process, it is recommended that before further maerl habitat characterisation and mapping work is undertaken, the following points are considered:

- Review of the maerl categorisation system to fit a wider range of different maerl habitats (see inconsistencies in application of the maerl categories listed in the 'Maerl category allocation' section' in Results), also making the guidance easier to follow when applying the categories, particularly with respect to the structure and live/dead criteria.
- The sampling design of further surveys should include proportionate sampling of the variety of habitats present, not just targeting areas of maerl, to improve ground truthing and the mapping process overall.
- Clarification of the definition of maerl bed habitats, including the distinction between live and dead maerl is essential before further work is undertaken. Indistinct definitions are currently confusing for the maerl definition and categorisation process, and for further maerl habitat characterisation work and mapping.
- Condition assessment of maerl habitats should be developed to assist monitoring, which could include conspicuous features, and distinct and well-defined criteria which are simple to apply.

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Appendices

Appendix 1 – Video metadata

Table 7. Video station and segment metadata for maerl mapping project

Video Sample Reference	Habitat Segment Number	Date	Latitude Start	Longitude Start	Latitude End	Longitude End
CIFCA_StABay_01_T1_20240422_VID_13_42_52_S1	S1	22/04/2024	50.324605	-4.723203333	50.324555	-4.7231
CIFCA_StABay_01_T1_20240422_VID_13_42_52_S2	S2	22/04/2024	50.324555	-4.7231	50.32259667	-4.723791667
CIFCA_StABay_02_T1_20240418_VID_11_11_06_S1	S1	18/04/2024	50.32152833	-4.703455	50.322075	-4.703481667
CIFCA_StABay_02_T1_20240418_VID_11_11_06_S2	S2	18/04/2024	50.322075	-4.703481667	50.32343167	-4.703613333
CIFCA_StABay_03_T1_20240418_VID_13_17_09	S1	18/04/2024	50.314885	-4.704633333	50.31710833	-4.704026667
CIFCA_StABay_04_T1_20231214_VID_12_03_13_S1	S1	15/12/2023	50.32195667	-4.747241667	50.32141333	-4.746586667
CIFCA_StABay_04_T1_20231214_VID_12_03_13_S2	S2	15/12/2023	50.32141333	-4.746586667	50.32101333	-4.746271667
CIFCA_StABay_04_T1_20231214_VID_12_03_13_S3	S3	15/12/2023	50.32101333	-4.746271667	50.32082333	-4.746226667
CIFCA_StABay_04_T1_20231214_VID_12_03_13_S4	S4	15/12/2023	50.32082333	-4.746226667	50.32015667	-4.745236667
CIFCA_StABay_05_T1_20231214_VID_16_28_47_S1	S1	15/12/2023	50.32142167	-4.730305	50.32043	-4.728145
CIFCA_StABay_05_T1_20231214_VID_16_28_47_S2	S2	15/12/2023	50.32043	-4.728145	50.32027	-4.727783333
CIFCA_StABay_06_T1_20231214_VID_15_05_59	S1	15/12/2023	50.33127167	-4.731038333	50.33034667	-4.728315
CIFCA_StABay_07_T1_20240422_VID_08_30_07_S1	S1	22/04/2024	50.32942667	-4.718073333	50.32938	-4.718501667
CIFCA_StABay_07_T1_20240422_VID_08_30_07_S2	S2	22/04/2024	50.32938	-4.718501667	50.32959167	-4.719291667
CIFCA_StABay_07_T1_20240422_VID_08_30_07_S3	S3	22/04/2024	50.32959167	-4.719291667	50.33009333	-4.720203333
CIFCA_StABay_07_T1_20240422_VID_08_30_07_S4	S4	22/04/2024	50.33009333	-4.720203333	50.33038833	-4.72089
CIFCA_StABay_08_T1_20240422_VID_08_56_34_S1	S1	22/04/2024	50.33092833	-4.710531667	50.331465	-4.712145
CIFCA_StABay_08_T1_20240422_VID_08_56_34_S2	S2	22/04/2024	50.331465	-4.712145	50.331925	-4.713106667
CIFCA_StABay_09_T1_20231214_VID_14_34_02_S1	S1	15/12/2023	50.33324667	-4.726378333	50.333565	-4.72537

Video Sample Reference	Habitat Segment Number	Date	Latitude Start	Longitude Start	Latitude End	Longitude End
CIFCA_StABay_09_T1_20231214_VID_14_34_02_S2	S2	15/12/2023	50.333565	-4.72537	50.333605	-4.725193333
CIFCA_StABay_09_T1_20231214_VID_14_34_02_S3	S3	15/12/2023	50.333605	-4.725193333	50.33376333	-4.724461667
CIFCA_StABay_09_T1_20231214_VID_14_34_02_S4	S4	15/12/2023	50.33376333	-4.724461667	50.33399333	-4.723676667
CIFCA_StABay_10_T1_20240418_VID_10_40_03	S1	18/04/2024	50.324515	-4.69759	50.32634	-4.698276667
CIFCA_StABay_11_T1_20240422_VID_09_27_34_S1	S1	22/04/2024	50.32412	-4.691188333	50.324255	-4.69207
CIFCA_StABay_11_T1_20240422_VID_09_27_34_S2	S2	22/04/2024	50.324255	-4.69207	50.32441167	-4.69277
CIFCA_StABay_11_T1_20240422_VID_09_27_34_S3	S3	22/04/2024	50.32441167	-4.69277	50.32456167	-4.693348333

Video Sample Reference	Habitat Segment Number	Date	Latitude Start	Longitude Start	Latitude End	Longitude End
CIFCA_StABay_12_T1_20240418_VID_12_50_08_S1	S1	18/04/2024	50.31543333	-4.696975	50.31608833	-4.69678
CIFCA_StABay_12_T1_20240418_VID_12_50_08_S2	S2	18/04/2024	50.31608833	-4.69678	50.31780167	-4.69631
CIFCA_StABay_13_T1_20240212_VID_10_11_17_S1	S1	12/02/2024	50.31767833	-4.701058333	50.31683667	-4.70029
CIFCA_StABay_13_T1_20240212_VID_10_11_17_S2	S2	12/02/2024	50.31683667	-4.70029	50.315935	-4.6994
CIFCA_StABay_14_T1_20240212_VID_11_02_04_S1	S1	12/02/2024	50.31323	-4.713745	50.31204667	-4.71244
CIFCA_StABay_14_T1_20240212_VID_11_02_04_S2	S2	12/02/2024	50.31204667	-4.71244	50.31170333	-4.711993333
CIFCA_StABay_14_T1_20240212_VID_11_02_04_S3	S3	12/02/2024	50.31170333	-4.711993333	50.31145	-4.711673333
CIFCA_StABay_15_T1_20240418_VID_10_00_08_S1	S1	18/04/2024	50.32546833	-4.709885	50.325475	-4.70981
CIFCA_StABay_15_T1_20240418_VID_10_00_08_S2	S2	18/04/2024	50.325475	-4.70981	50.32758	-4.708991667
CIFCA_StABay_16_T1_20240212_VID_11_25_57	S1	12/02/2024	50.31327833	-4.72149	50.31213	-4.719568333
CIFCA_StABay_17_T1_20231215_VID_14_23_58	S1	15/12/2023	50.31633667	-4.725556667	50.315275	-4.723243333
CIFCA_StABay_18_T1_20231214_VID_15_34_19_S1	S1	15/12/2023	50.32562667	-4.733886667	50.325535	-4.733181667
CIFCA_StABay_18_T1_20231214_VID_15_34_19_S2	S2	15/12/2023	50.325535	-4.733181667	50.32516333	-4.730831667
CIFCA_StABay_19_T1_20240418_VID_11_40_06	S1	18/04/2024	50.32187167	-4.71115	50.324085	-4.711206667
CIFCA_StABay_20_T1_20231214_VID_15_58_34	S1	15/12/2023	50.32220333	-4.735943333	50.32159667	-4.733103333
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S1	S1	18/04/2024	50.319295	-4.71886	50.31926	-4.718976667
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S2	S2	18/04/2024	50.31926	-4.718976667	50.31921833	-4.719208333
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S3	S3	18/04/2024	50.31921833	-4.719208333	50.31901167	-4.72
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S4	S4	18/04/2024	50.31901167	-4.72	50.31903333	-4.720216667
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S5	S5	18/04/2024	50.31903333	-4.720216667	50.31855667	-4.72141
CIFCA_StABay_22_T1_20231215_VID_13_40_22_S1	S1	15/12/2023	50.31805	-4.734531667	50.317985	-4.733385
CIFCA_StABay_22_T1_20231215_VID_13_40_22_S2	S2	15/12/2023	50.317985	-4.733385	50.31807667	-4.732768333
CIFCA_StABay_22_T1_20231215_VID_13_40_22_S3	S3	15/12/2023	50.31807667	-4.732768333	50.31814	-4.732153333
CIFCA_StABay_22_T1_20231215_VID_13_40_22_S4	S4	15/12/2023	50.31814	-4.732153333	50.31820333	-4.731513333
CIFCA_StABay_23_T1_20231214_VID_12_28_23	S1	15/12/2023	50.32331833	-4.743105	50.32199167	-4.741265
CIFCA_StABay_25_T1_20240422_VID_11_57_01	S1	22/04/2024	50.31940167	-4.704283333	50.31961333	-4.707701667

Video Sample Reference	Habitat Segment Number	Date	Latitude Start	Longitude Start	Latitude End	Longitude End
CIFCA_StABay_26_T1_20240212_VID_10_38_03_S1	S1	12/02/2024	50.31498167	-4.708791667	50.31362167	-4.70722
CIFCA_StABay_26_T1_20240212_VID_10_38_03_S2	S2	12/02/2024	50.31362167	-4.70722	50.31353667	-4.70714
CIFCA_StABay_26_T1_20240212_VID_10_38_03_S3	S3	12/02/2024	50.31353667	-4.70714	50.31307667	-4.706666667
CIFCA_StABay_27_T1_20231214_VID_17_04_22_S1	S1	15/12/2023	50.32201167	-4.725896667	50.3207	-4.724383333
CIFCA_StABay_27_T1_20231214_VID_17_04_22_S2	S2	15/12/2023	50.3207	-4.724383333	50.32029667	-4.723976667
CIFCA_StABay_28_T1_20231215_VID_08_31_44	S1	15/12/2023	50.31293167	-4.69082	50.31163667	-4.688416667
CIFCA_StABay_29_T1_20231215_VID_09_06_39_S1	S1	15/12/2023	50.31108667	-4.702346667	50.310095	-4.69995
CIFCA_StABay_29_T1_20231215_VID_09_06_39_S2	S2	15/12/2023	50.310095	-4.69995	50.31003833	-4.699803333
CIFCA_StABay_30_T1_20231215_VID_09_41_09	S1	15/12/2023	50.31069333	-4.710481667	50.30893	-4.708035
CIFCA_StABay_31_T1_20240418_VID_13_50_40_S1	S1	18/04/2024	50.31374167	-4.71757	50.31462833	-4.71796
Video Sample Reference	Habitat Segment Number	Date	Latitude Start	Longitude Start	Latitude End	Longitude End
CIFCA_StABay_31_T1_20240418_VID_13_50_40_S2	S2	18/04/2024	50.31462833	-4.71796	50.31600333	-4.717991667
CIFCA_StABay_32_T1_20240422_VID_13_21_47_S1	S1	22/04/2024	50.32557667	-4.719896667	50.32579333	-4.720306667
CIFCA_StABay_32_T1_20240422_VID_13_21_47_S2	S2	22/04/2024	50.32579333	-4.720306667	50.32628833	-4.7216
CIFCA_StABay_32_T1_20240422_VID_13_21_47_S3	S3	22/04/2024	50.32628833	-4.7216	50.32636333	-4.721953333
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S1	S1	15/12/2023	50.31570167	-4.731806667	50.315715	-4.731111667
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S2	S2	15/12/2023	50.315715	-4.731111667	50.31575833	-4.73093
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S3	S3	15/12/2023	50.31575833	-4.73093	50.31604667	-4.730135
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S4	S4	15/12/2023	50.31604667	-4.730135	50.31632833	-4.729213333
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S5	S5	15/12/2023	50.31632833	-4.729213333	50.31636833	-4.728713333
CIFCA_StABay_34_T1_20240422_VID_10_52_39_S1	S1	22/04/2024	50.31905167	-4.69684	50.31739833	-4.697291667
CIFCA_StABay_34_T1_20240422_VID_10_52_39_S2	S2	22/04/2024	50.31739833	-4.697291667	50.316915	-4.697435
CIFCA_StABay_35_T1_20231215_VID_10_21_59_S1	S1	15/12/2023	50.31057167	-4.718521667	50.31047833	-4.718465
CIFCA_StABay_35_T1_20231215_VID_10_21_59_S2	S2	15/12/2023	50.31047833	-4.718465	50.31015667	-4.718313333

Video Sample Reference	Habitat Segment Number	Date	Latitude Start	Longitude Start	Latitude End	Longitude End
CIFCA_StABay_35_T1_20231215_VID_10_21_59_S3	S3	15/12/2023	50.31015667	-4.718313333	50.30867333	-4.71762
CIFCA_StABay_36_T1_20240422_VID_12_25_13_S1	S1	22/04/2024	50.31728833	-4.706826667	50.31742	-4.709406667
CIFCA_StABay_36_T1_20240422_VID_12_25_13_S2	S2	22/04/2024	50.31742	-4.709406667	50.31751667	-4.710103333
CIFCA_StABay_37_T1_20240422_VID_12_52_21_S1	S1	22/04/2024	50.32164667	-4.71565	50.321705	-4.717288333
CIFCA_StABay_37_T1_20240422_VID_12_52_21_S2	S2	22/04/2024	50.321705	-4.717288333	50.321685	-4.717756667
CIFCA_StABay_37_T1_20240422_VID_12_52_21_S3	S3	22/04/2024	50.321685	-4.717756667	50.32169	-4.71843
CIFCA_StABay_37_T1_20240422_VID_12_52_21_S4	S4	22/04/2024	50.32169	-4.71843	50.32166833	-4.718783333
CIFCA_StABay_38_T1_20231215_VID_11_50_34_S1	S1	15/12/2023	50.31251333	-4.738578333	50.31116333	-4.738528333
CIFCA_StABay_38_T1_20231215_VID_11_50_34_S2	S2	15/12/2023	50.31116333	-4.738528333	50.31058	-4.738535
CIFCA_StABay_38_T1_20231215_VID_11_50_34_S3	S3	15/12/2023	50.31058	-4.738535	50.31049667	-4.738556667
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S1	S1	15/12/2023	50.31289	-4.730601667	50.31213667	-4.730525
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S2	S2	15/12/2023	50.31213667	-4.730525	50.311865	-4.730455
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S3	S3	15/12/2023	50.311865	-4.730455	50.31149333	-4.730458333
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S4	S4	15/12/2023	50.31149333	-4.730458333	50.31101167	-4.730496667
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S5	S5	15/12/2023	50.31101167	-4.730496667	50.31066333	-4.730516667
CIFCA_StABay_40_T1_20231215_VID_14_01_45_S1	S1	15/12/2023	50.31864	-4.739476667	50.31828667	-4.73774
CIFCA_StABay_40_T1_20231215_VID_14_01_45_S2	S2	15/12/2023	50.31828667	-4.73774	50.31831167	-4.737428333
CIFCA_StABay_40_T1_20231215_VID_14_01_45_S3	S3	15/12/2023	50.31831167	-4.737428333	50.31821	-4.736316667
CIFCA_StABay_41_T1_20231214_VID_11_32_37_S1	S1	15/12/2023	50.310645	-4.752581667	50.31002	-4.751666667
CIFCA_StABay_41_T1_20231214_VID_11_32_37_S2	S2	15/12/2023	50.31002	-4.751666667	50.30914333	-4.750665
CIFCA_StABay_42_T1_20231215_VID_11_21_23_S1	S1	15/12/2023	50.30331167	-4.733595	50.30222667	-4.733496667
CIFCA_StABay_42_T1_20231215_VID_11_21_23_S2	S2	15/12/2023	50.30222667	-4.733496667	50.30189	-4.73343
CIFCA_StABay_42_T1_20231215_VID_11_21_23_S3	S3	15/12/2023	50.30189	-4.73343	50.30122667	-4.733313333

Video Sample Reference	Habitat Segment Number	Date	Latitude Start	Longitude Start	Latitude End	Longitude End
CIFCA_StABay_43_T1_20231215_VID_10_57_31	S1	15/12/2023	50.30416667	-4.727321667	50.302085	-4.72664
CIFCA_StABay_44_T1_20240422_VID_10_14_06_S1	S1	22/04/2024	50.31961667	-4.695911667	50.31992	-4.696271667
CIFCA_StABay_44_T1_20240422_VID_10_14_06_S2	S2	22/04/2024	50.31992	-4.696271667	50.32158333	-4.6961
CIFCA_StABay_46_T1_20231214_VID_13_58_56_S1	S1	15/12/2023	50.33519833	-4.71876	50.33581667	-4.716375
CIFCA_StABay_46_T1_20231214_VID_13_58_56_S2	S2	15/12/2023	50.33581667	-4.716375	50.33594167	-4.716036667
CIFCA_StABay_47_T1_20231214_VID_12_52_49_S1	S1	15/12/2023	50.32719167	-4.746323333	50.32656167	-4.745448333
CIFCA_StABay_47_T1_20231214_VID_12_52_49_S2	S2	15/12/2023	50.32656167	-4.745448333	50.32567167	-4.744253333

Appendix 2 – Video analysis summary

Table 8. Video analysis summary including broadscale habitat, MNCR code, Habitat FOCI and imagery quality for Falmouth Bay to St Austell Bay SPA

Filename	Habitat Segment Number	Broadscale Habitat	MNCR Biotope Code	Secondary MNCR Code	Maerl Category and Group
CIFCA_StABay_01_T1_20240422_VID_13_42_52_S1	S1	Subtidal Sand	SS.SSa	N/A	C2
CIFCA_StABay_01_T1_20240422_VID_13_42_52_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_02_T1_20240418_VID_11_11_06_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	N/A
CIFCA_StABay_02_T1_20240418_VID_11_11_06_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_03_T1_20240418_VID_13_17_09	S1	Subtidal Macrophyte Dominated Sediment	SS.SMp.Mrl	N/A	A1
CIFCA_StABay_04_T1_20231214_VID_12_03_13_S1	S1	Subtidal Macrophyte Dominated Sediment	SS.SMp.Mrl	N/A	A1
CIFCA_StABay_04_T1_20231214_VID_12_03_13_S2	S2	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	SS.SCS (<5% Live Maerl)	Uncategorised
CIFCA_StABay_04_T1_20231214_VID_12_03_13_S3	S3	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_04_T1_20231214_VID_12_03_13_S4	S4	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_05_T1_20231214_VID_16_28_47_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_05_T1_20231214_VID_16_28_47_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_06_T1_20231214_VID_15_05_59	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_07_T1_20240422_VID_08_30_07_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_07_T1_20240422_VID_08_30_07_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_07_T1_20240422_VID_08_30_07_S3	S3	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_07_T1_20240422_VID_08_30_07_S4	S4	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	SS.SCS (<5% Live Maerl)	Uncategorised
CIFCA_StABay_08_T1_20240422_VID_08_56_34_S1	S1	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	SS.SCS (<5% Live Maerl)	Uncategorised
CIFCA_StABay_08_T1_20240422_VID_08_56_34_S2	S2	Subtidal Coarse Sediment	SS.SCS	N/A	C1

Filename	Habitat Segment Number	Broadscale Habitat	MNCR Biotope Code	Secondary MNCR Code	Maerl Category and Group
CIFCA_StABay_09_T1_20231214_VID_14_34_02_S1	S1	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	N/A	N/A
CIFCA_StABay_09_T1_20231214_VID_14_34_02_S2	S2	Subtidal Sand	SS.SSa	N/A	N/A
CIFCA_StABay_09_T1_20231214_VID_14_34_02_S3	S3	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_09_T1_20231214_VID_14_34_02_S4	S4	Subtidal Sand	SS.SSa	N/A	N/A
CIFCA_StABay_10_T1_20240418_VID_10_40_03	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_11_T1_20240422_VID_09_27_34_S1	S1	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	N/A	Uncategorised
CIFCA_StABay_11_T1_20240422_VID_09_27_34_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised

Filename	Habitat Segment Number	Broadscale Habitat	MNCR Biotope Code	Secondary MNCR Code	Maerl Category and Group
CIFCA_StABay_11_T1_20240422_VID_09_27_34_S3	S3	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	N/A	Uncategorised
CIFCA_StABay_12_T1_20240418_VID_12_50_08_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_12_T1_20240418_VID_12_50_08_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	IR.HIR	Uncategorised
CIFCA_StABay_13_T1_20240212_VID_10_11_17_S1	S1	Subtidal Macrophyte Dominated Sediment	SS.SMp.Mrl	N/A	A1
CIFCA_StABay_13_T1_20240212_VID_10_11_17_S2	S2	High Energy Infralittoral Rock	IR.HIR	N/A	Uncategorised
CIFCA_StABay_14_T1_20240212_VID_11_02_04_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_14_T1_20240212_VID_11_02_04_S2	S2	Subtidal Sand	SS.SSa	N/A	N/A
CIFCA_StABay_14_T1_20240212_VID_11_02_04_S3	S3	Subtidal Coarse Sediment	SS.SCS	N/A	B2
CIFCA_StABay_15_T1_20240418_VID_10_00_08_S1	S1	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	N/A	Uncategorised
CIFCA_StABay_15_T1_20240418_VID_10_00_08_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_16_T1_20240212_VID_11_25_57	S1	Subtidal Coarse Sediment	SS.SCS	N/A	C2
CIFCA_StABay_17_T1_20231215_VID_14_23_58	S1	Subtidal Coarse Sediment	SS.SCS	N/A	B1

Filename	Habitat Segment Number	Broadscale Habitat	MNCR Biotope Code	Secondary MNCR Code	Maerl Category and Group
CIFCA_StABay_18_T1_20231214_VID_15_34_19_S1	S1	High Energy Infralittoral Rock	IR.HIR.KFaR	N/A	Uncategorised
CIFCA_StABay_18_T1_20231214_VID_15_34_19_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_19_T1_20240418_VID_11_40_06	S1	Subtidal Coarse Sediment	SS.SCS	N/A	B1
CIFCA_StABay_20_T1_20231214_VID_15_58_34	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S2	S2	Moderate Energy Circalittoral Rock	CR.MCR	SS.SCS (<5% Live Maerl)	Uncategorised
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S3	S3	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S4	S4	Subtidal Sand	SS.SSa	N/A	C1
CIFCA_StABay_21_T1_20240418_VID_08_48_41_S5	S5	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_22_T1_20231215_VID_13_40_22_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_22_T1_20231215_VID_13_40_22_S2	S2	Moderate Energy Circalittoral Rock	CR.MCR	N/A	Uncategorised
CIFCA_StABay_22_T1_20231215_VID_13_40_22_S3	S3	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_22_T1_20231215_VID_13_40_22_S4	S4	Moderate Energy Circalittoral Rock	CR.MCR	N/A	Uncategorised
CIFCA_StABay_23_T1_20231214_VID_12_28_23	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_25_T1_20240422_VID_11_57_01	S1	Subtidal Macrophyte Dominated Sediment	SS.SMp.Mrl	N/A	A1
CIFCA_StABay_26_T1_20240212_VID_10_38_03_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_26_T1_20240212_VID_10_38_03_S2	S2	Subtidal Coarse Sediment	SS.SCS	N/A	N/A
CIFCA_StABay_26_T1_20240212_VID_10_38_03_S3	S3	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_27_T1_20231214_VID_17_04_22_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1

Filename	Habitat Segment Number	Broadscale Habitat	MNCR Biotope Code	Secondary MNCR Code	Maerl Category and Group
CIFCA_StABay_27_T1_20231214_VID_17_04_22_S2	S2	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_28_T1_20231215_VID_08_31_44	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_29_T1_20231215_VID_09_06_39_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_29_T1_20231215_VID_09_06_39_S2	S2	Moderate Energy Circalittoral Rock	CR.MCR	SS.SCS (<5% Live Maerl)	Uncategorised
CIFCA_StABay_30_T1_20231215_VID_09_41_09	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_31_T1_20240418_VID_13_50_40_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_31_T1_20240418_VID_13_50_40_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_32_T1_20240422_VID_13_21_47_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	N/A
CIFCA_StABay_32_T1_20240422_VID_13_21_47_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_32_T1_20240422_VID_13_21_47_S3	S3	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	N/A	Uncategorised
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S2	S2	Moderate Energy Circalittoral Rock	CR.MCR	N/A	Uncategorised
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S3	S3	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S4	S4	Moderate Energy Circalittoral Rock	CR.MCR	N/A	Uncategorised
CIFCA_StABay_33_T1_20231215_VID_13_17_19_S5	S5	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_34_T1_20240422_VID_10_52_39_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	IR.HIR	Uncategorised
CIFCA_StABay_34_T1_20240422_VID_10_52_39_S2	S2	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	SS.SCS (<5% Live Maerl)	Uncategorised
CIFCA_StABay_35_T1_20231215_VID_10_21_59_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	B1
CIFCA_StABay_35_T1_20231215_VID_10_21_59_S2	S2	Moderate Energy Circalittoral Rock	CR.MCR	N/A	Uncategorised
CIFCA_StABay_35_T1_20231215_VID_10_21_59_S3	S3	Subtidal Coarse Sediment	SS.SCS	N/A	C2
CIFCA_StABay_36_T1_20240422_VID_12_25_13_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_36_T1_20240422_VID_12_25_13_S2	S2	Subtidal Coarse Sediment	SS.SCS	N/A	C1

Filename	Habitat Segment Number	Broadscale Habitat	MNCR Biotope Code	Secondary MNCR Code	Maerl Category and Group
CIFCA_StABay_37_T1_20240422_VID_12_52_21_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_37_T1_20240422_VID_12_52_21_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_37_T1_20240422_VID_12_52_21_S3	S3	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_37_T1_20240422_VID_12_52_21_S4	S4	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised

Filename	Habitat Segment Number	Broadscale Habitat	MNCR Biotope Code	Secondary MNCR Code	Maerl Category and Group
CIFCA_StABay_38_T1_20231215_VID_11_50_34_S1	S1	Subtidal Sand	SS.SSa	N/A	C2
CIFCA_StABay_38_T1_20231215_VID_11_50_34_S2	S2	Subtidal Coarse Sediment	SS.SCS	CR.MCR	B1
CIFCA_StABay_38_T1_20231215_VID_11_50_34_S3	S3	Moderate Energy Circalittoral Rock	CR.MCR	N/A	N/A
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	C2
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S3	S3	Subtidal Coarse Sediment	SS.SCS	N/A	C2
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S4	S4	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_39_T1_20231215_VID_12_17_01_S5	S5	Moderate Energy Circalittoral Rock	CR.MCR	N/A	Uncategorised
CIFCA_StABay_40_T1_20231215_VID_14_01_45_S1	S1	Subtidal Coarse Sediment	SS.SCS	N/A	N/A
CIFCA_StABay_40_T1_20231215_VID_14_01_45_S2	S2	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_40_T1_20231215_VID_14_01_45_S3	S3	Subtidal Coarse Sediment	SS.SCS	N/A	C2
CIFCA_StABay_41_T1_20231214_VID_11_32_37_S1	S1	Subtidal Sand	SS.SSa	N/A	N/A
CIFCA_StABay_41_T1_20231214_VID_11_32_37_S2	S2	Subtidal Coarse Sediment	SS.SCS	N/A	C1
CIFCA_StABay_42_T1_20231215_VID_11_21_23_S1	S1	Subtidal Macrophyte Dominated Sediment	SS.SMp.Mrl	N/A	A1
CIFCA_StABay_42_T1_20231215_VID_11_21_23_S2	S2	Subtidal Coarse Sediment	SS.SCS	N/A	B1
CIFCA_StABay_42_T1_20231215_VID_11_21_23_S3	S3	Moderate Energy Circalittoral Rock	CR.MCR	N/A	Uncategorised

Filename	Habitat Segment Number	Broadscale Habitat	MNCR Biotope Code	Secondary MNCR Code	Maerl Category and Group
CIFCA_StABay_43_T1_20231215_VID_10_57_31	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	A1
CIFCA_StABay_44_T1_20240422_VID_10_14_06_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_44_T1_20240422_VID_10_14_06_S2	S2	High Energy Infralittoral Rock	IR.HIR.KFaR.FoR	SS.SCS (<5% Live Maerl)	Uncategorised
CIFCA_StABay_46_T1_20231214_VID_13_58_56_S1	S1	Subtidal Macrophyte Dominated Sediment	SS.SMp.SSgr	N/A	N/A
CIFCA_StABay_46_T1_20231214_VID_13_58_56_S2	S2	Subtidal Sand	SS.SSa	N/A	N/A
CIFCA_StABay_47_T1_20231214_VID_12_52_49_S1	S1	Subtidal Coarse Sediment	SS.SCS (<5% Live Maerl)	N/A	Uncategorised
CIFCA_StABay_47_T1_20231214_VID_12_52_49_S2	S2	High Energy Infralittoral Rock	IR.HIR.KFaR	SS.SCS (<5% Live Maerl)	Uncategorised

Appendix 3- Habitat maps and distribution

The distribution of biotopes, the percent of total maerl and percent of live maerl allocated to still imagery during analysis are presented here, for northwest, northeast, southeast and southwest sections of St Austell Bay.

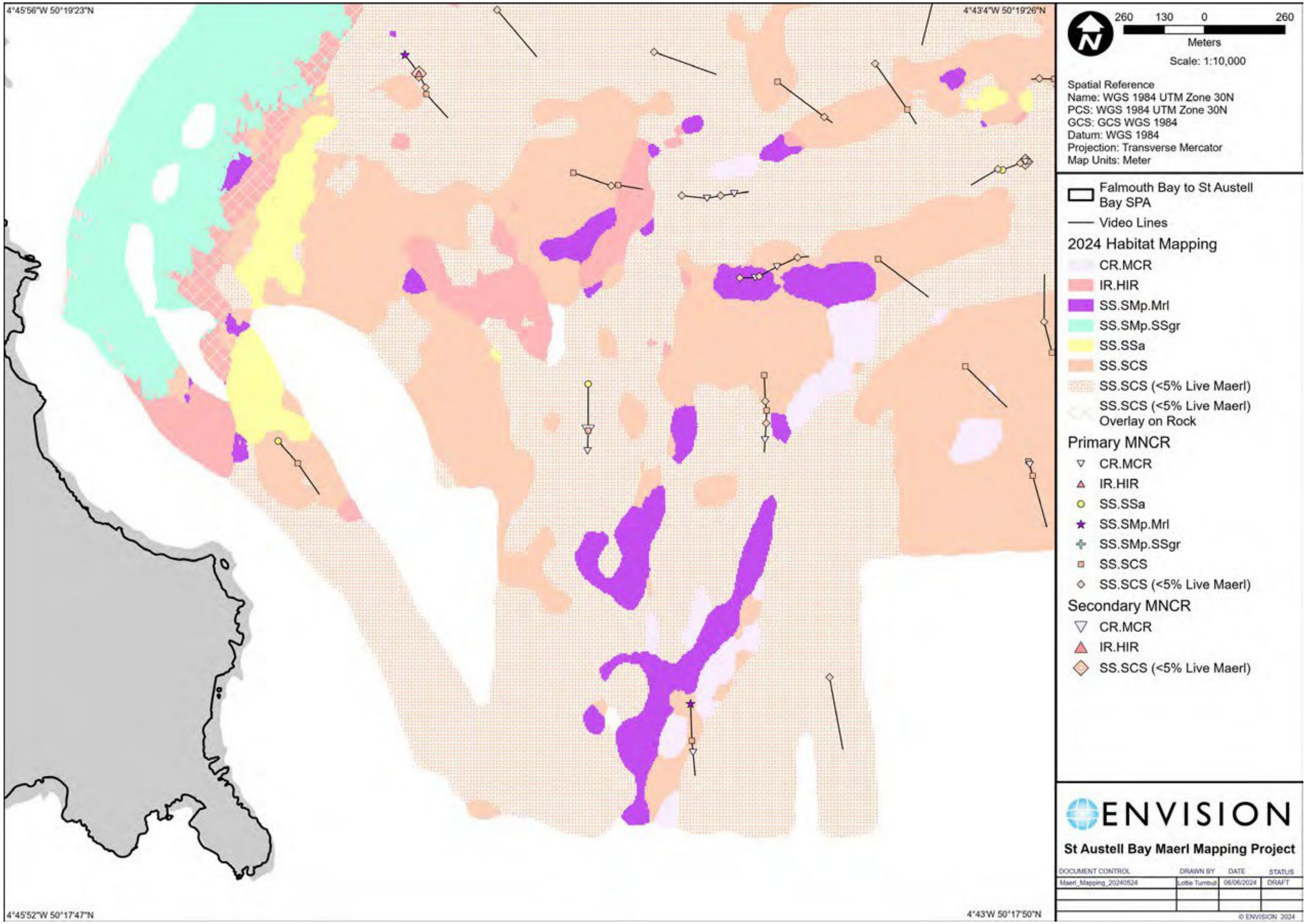

Figure 16. Distribution of the habitats/biotopes from imagery (video) analysis, southwest section of St Austell Bay.

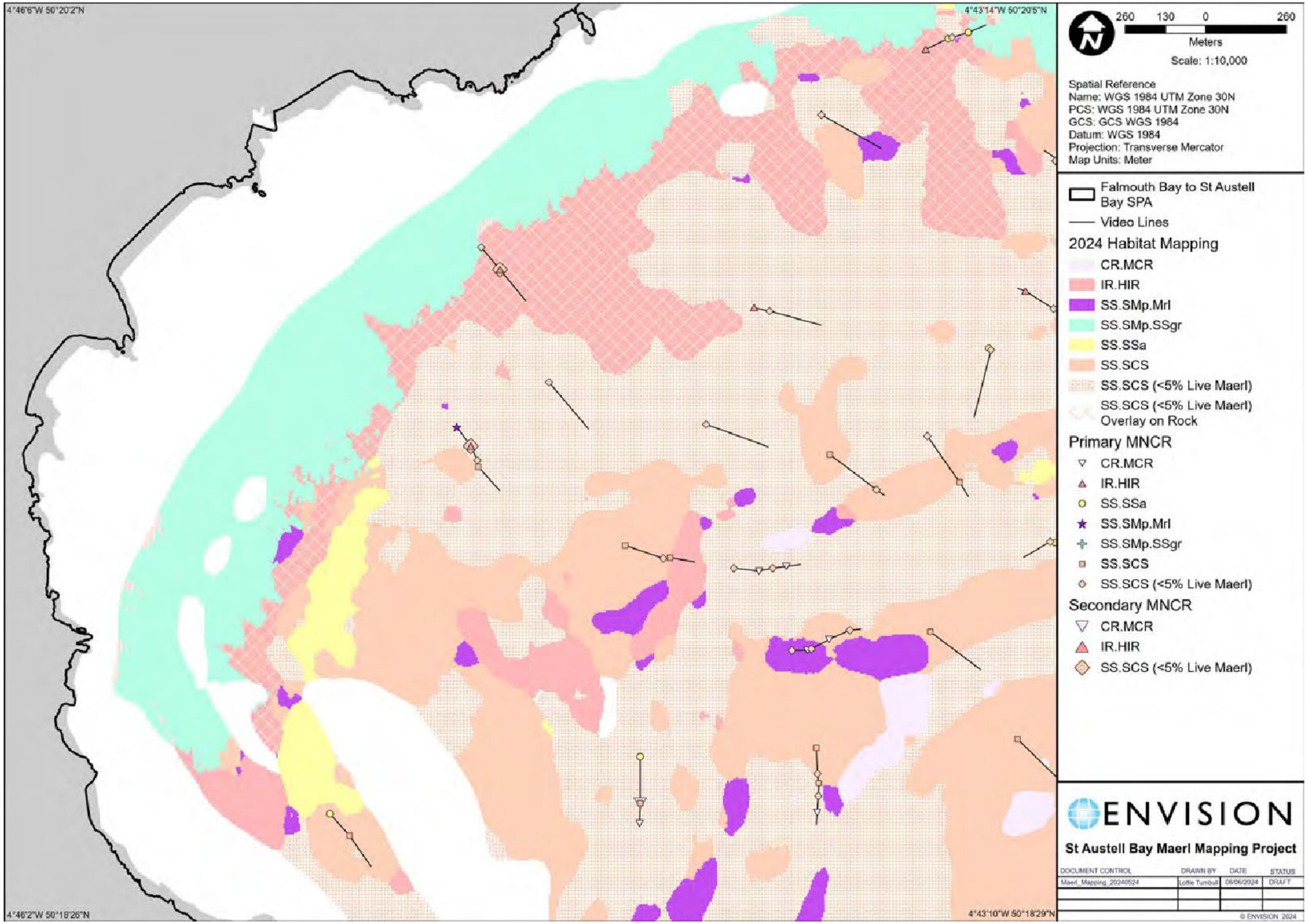

Figure 17. Distribution of the habitats/biotopes from imagery (video) analysis, northwest section of St Austell Bay.

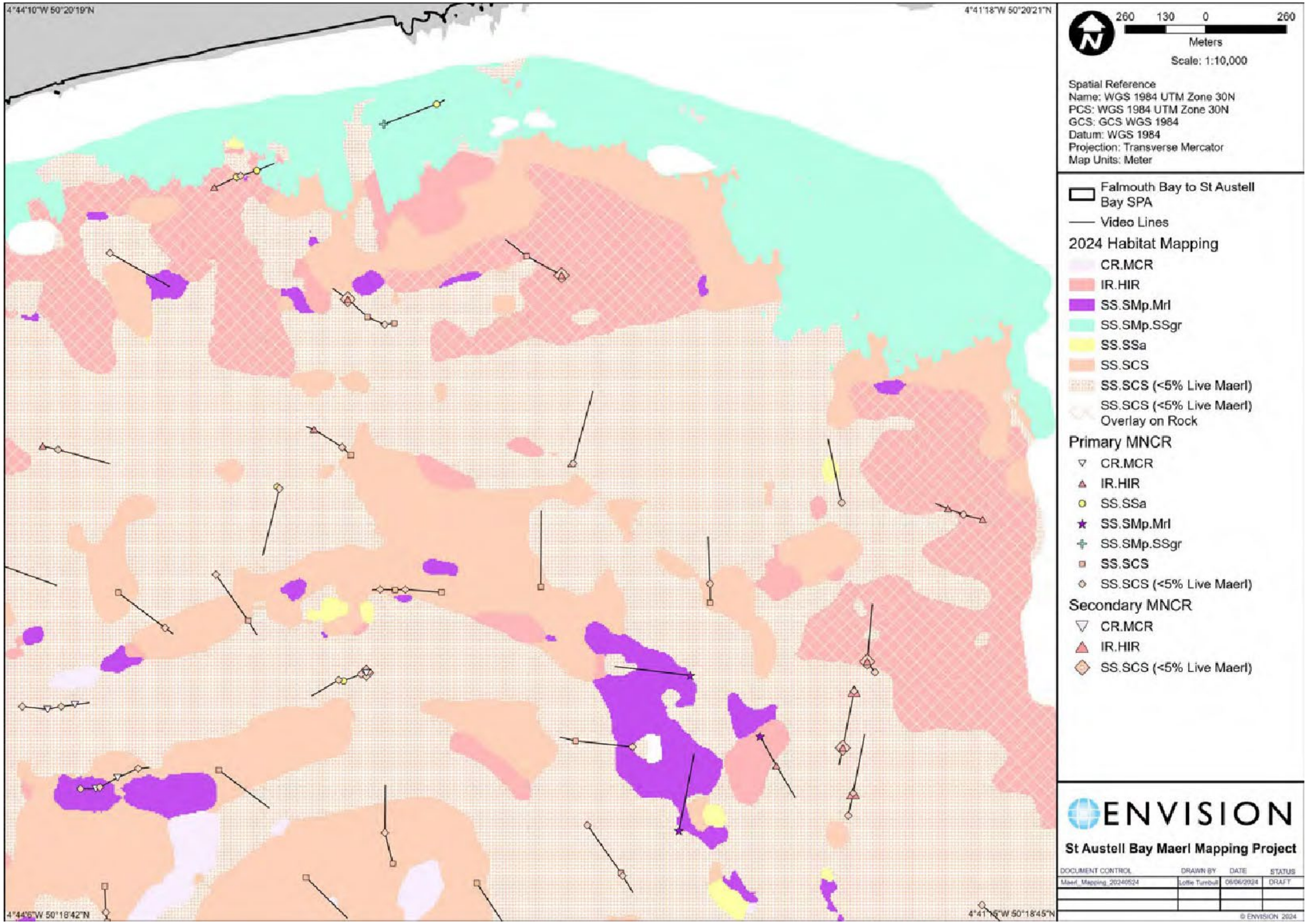

Figure 18. Distribution of the habitats/biotopes from imagery (video) analysis, northeast section of St Austell Bay.
© Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

Figure 19. Distribution of the habitats/biotopes from imagery (video) analysis, southeast section of St Austell Bay.
© Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

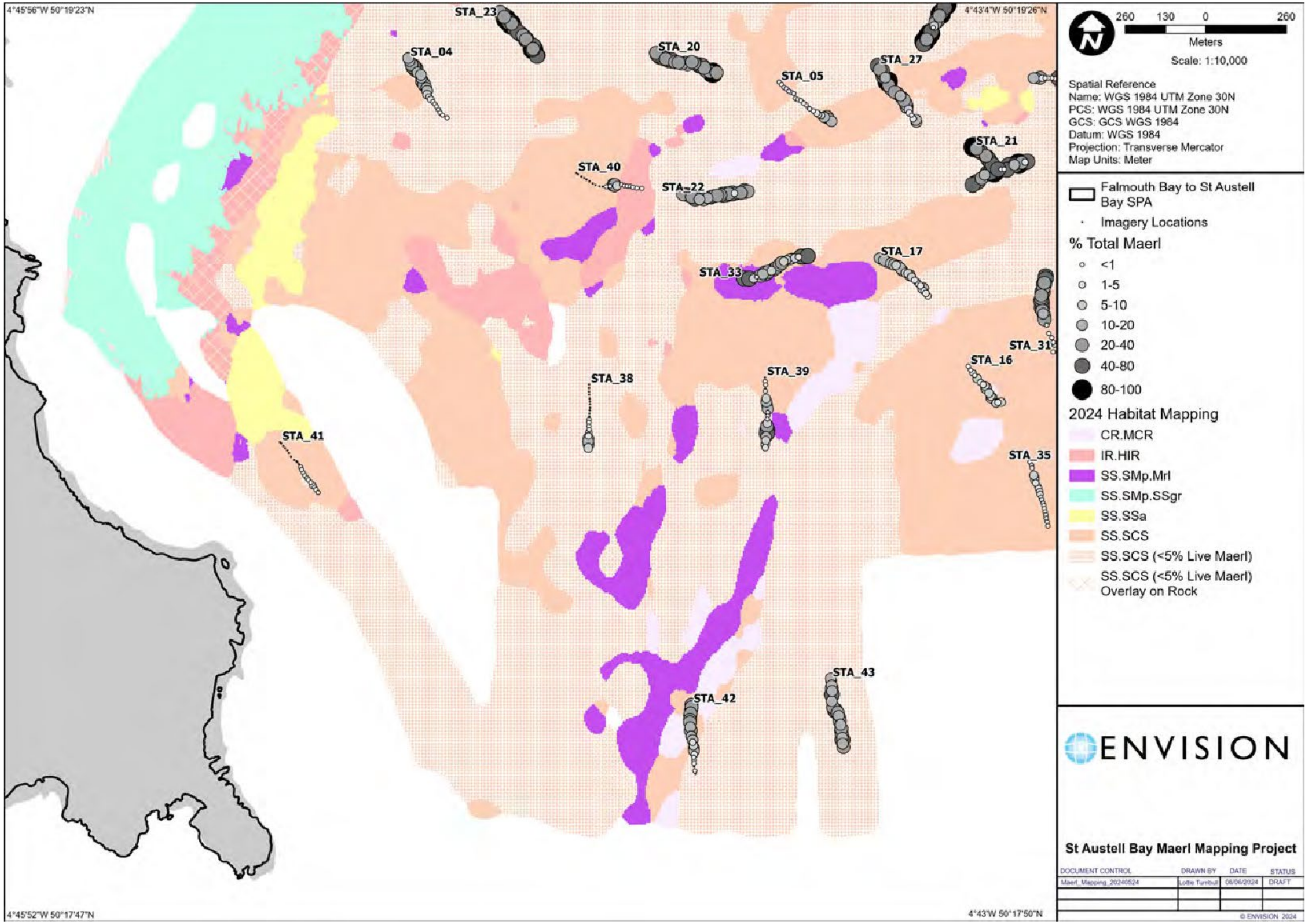

Figure 20. Marine benthic habitats at MNCR Level 3/4 and the percentage of total maerl recorded from each still image, southwest section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

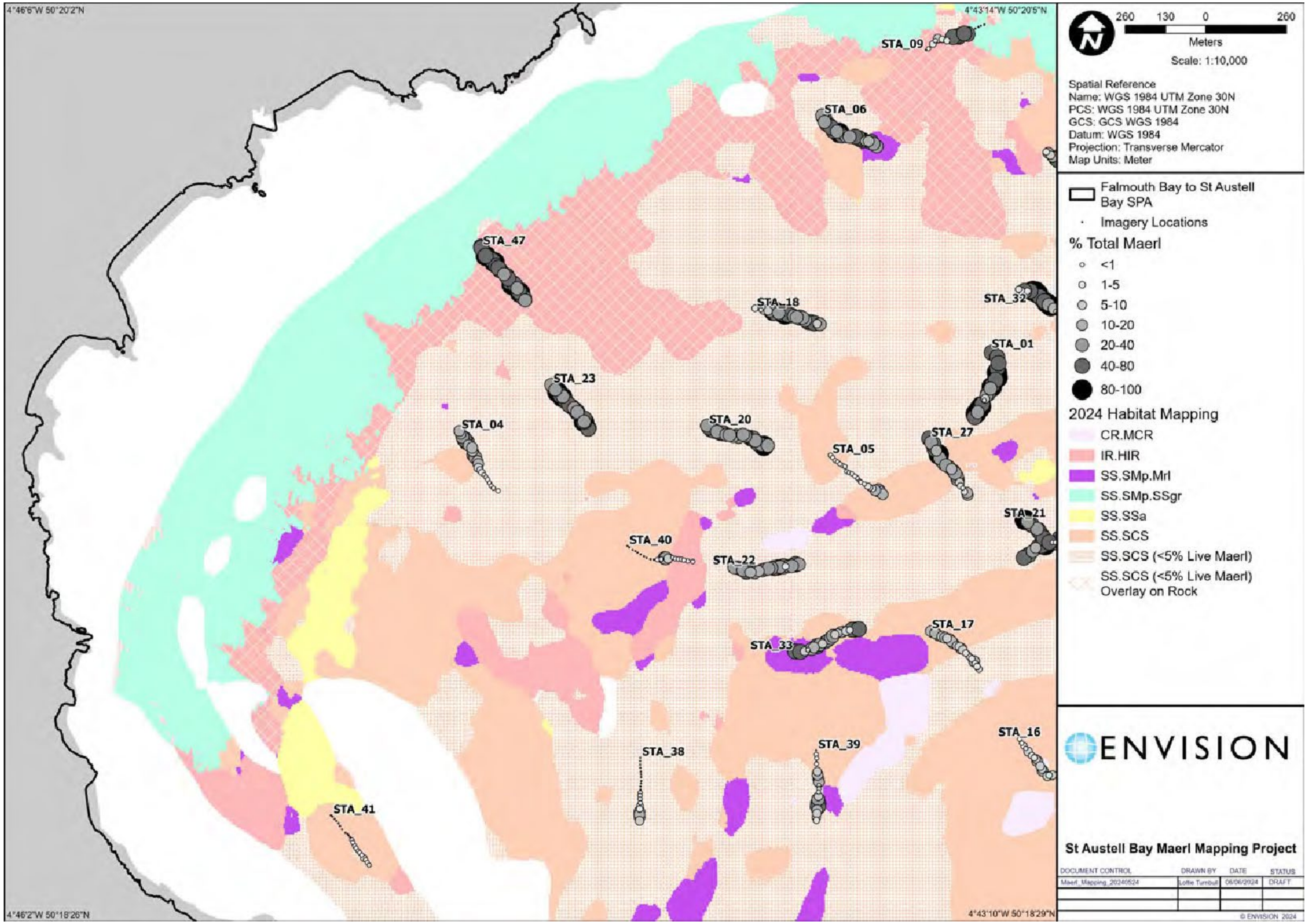

Figure 21. Marine benthic habitats at MNCR Level 3/4 and the percentage of total maerl recorded from each still image, northwest section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

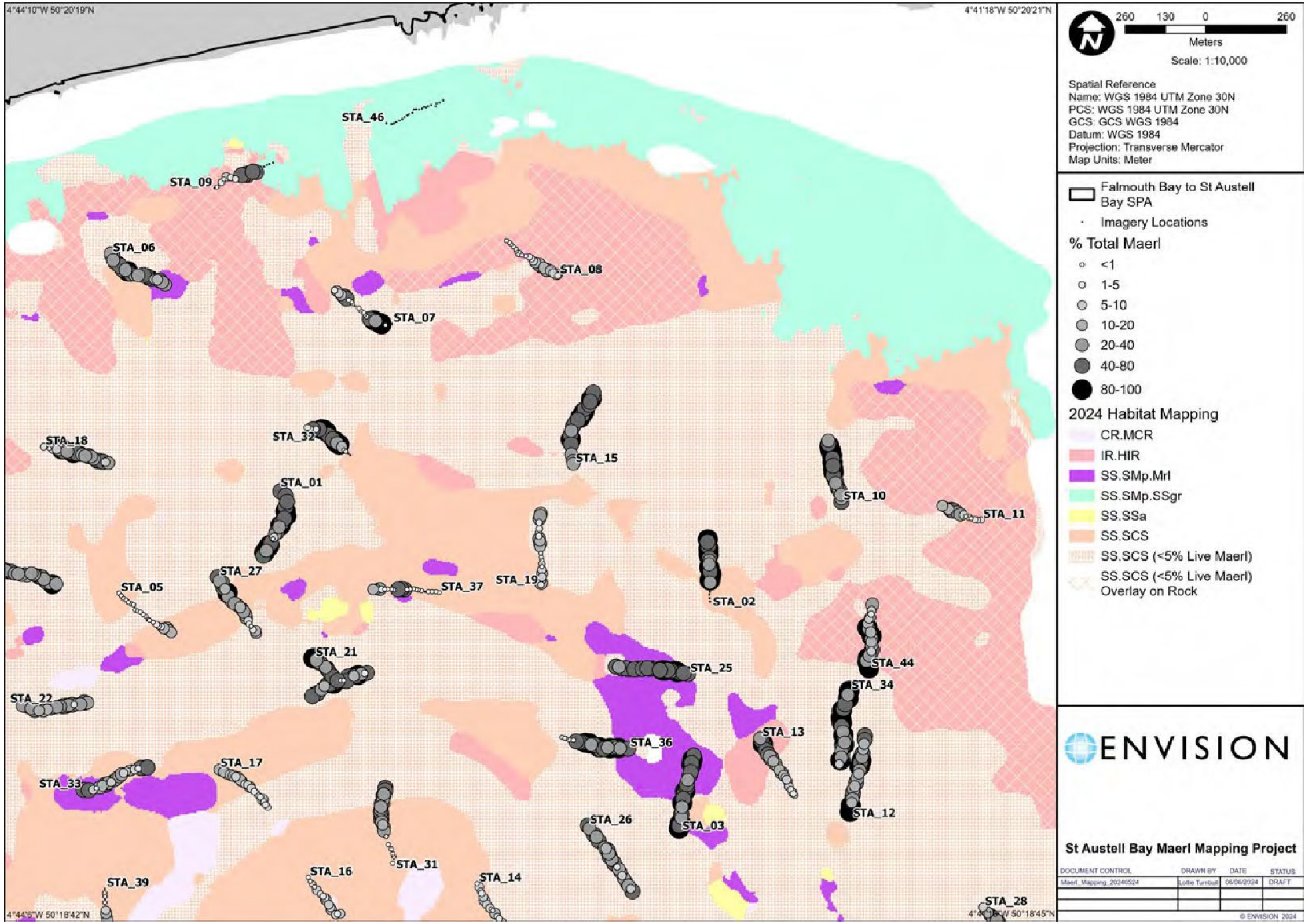

Figure 22. Marine benthic habitats at MNCR Level 3/4 and the percentage of total maerl recorded from each still image, northeast section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

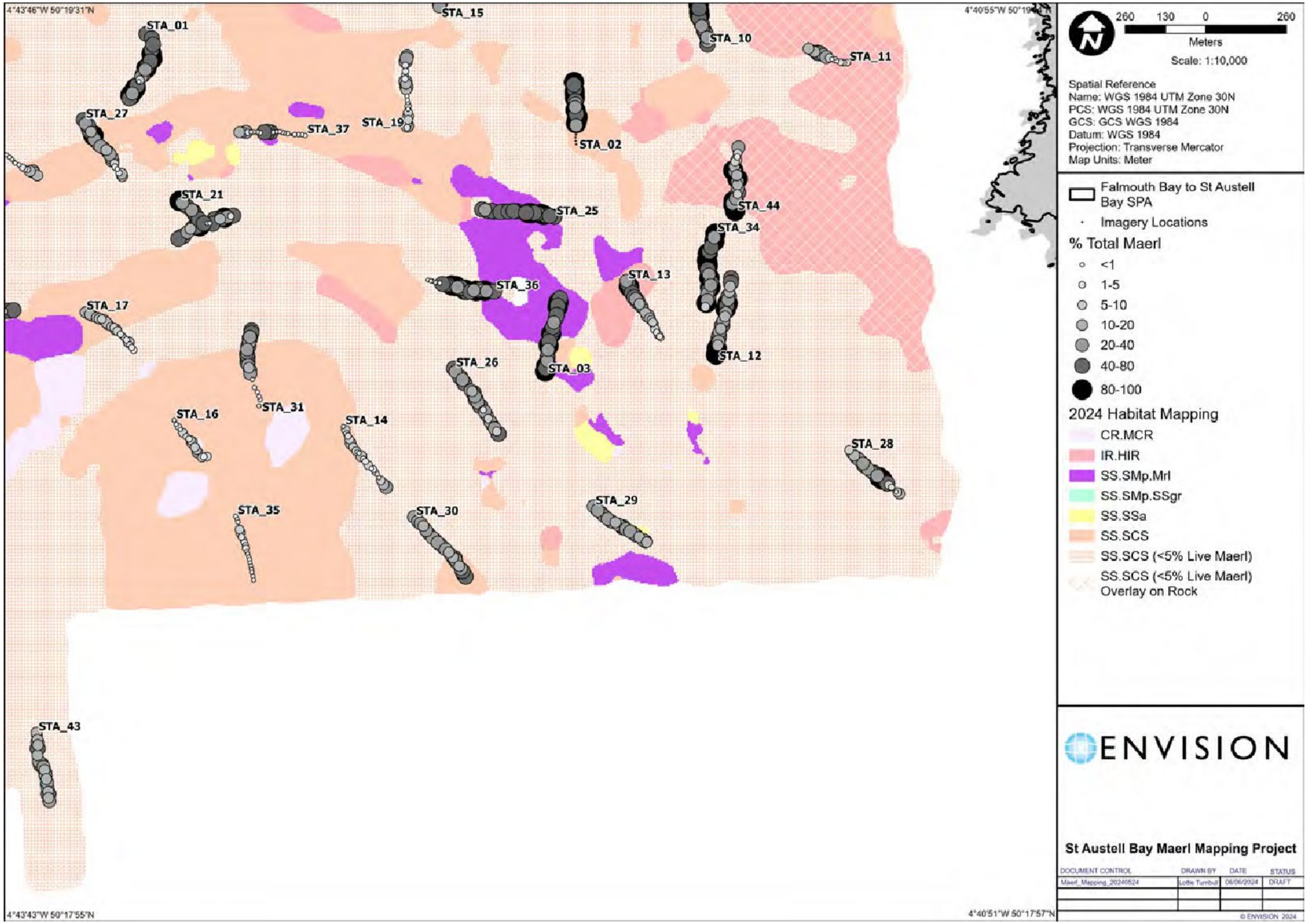

Figure 23. Marine benthic habitats at MNCR Level 3/4 and the percentage of total maerl recorded from each still image, southeast section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

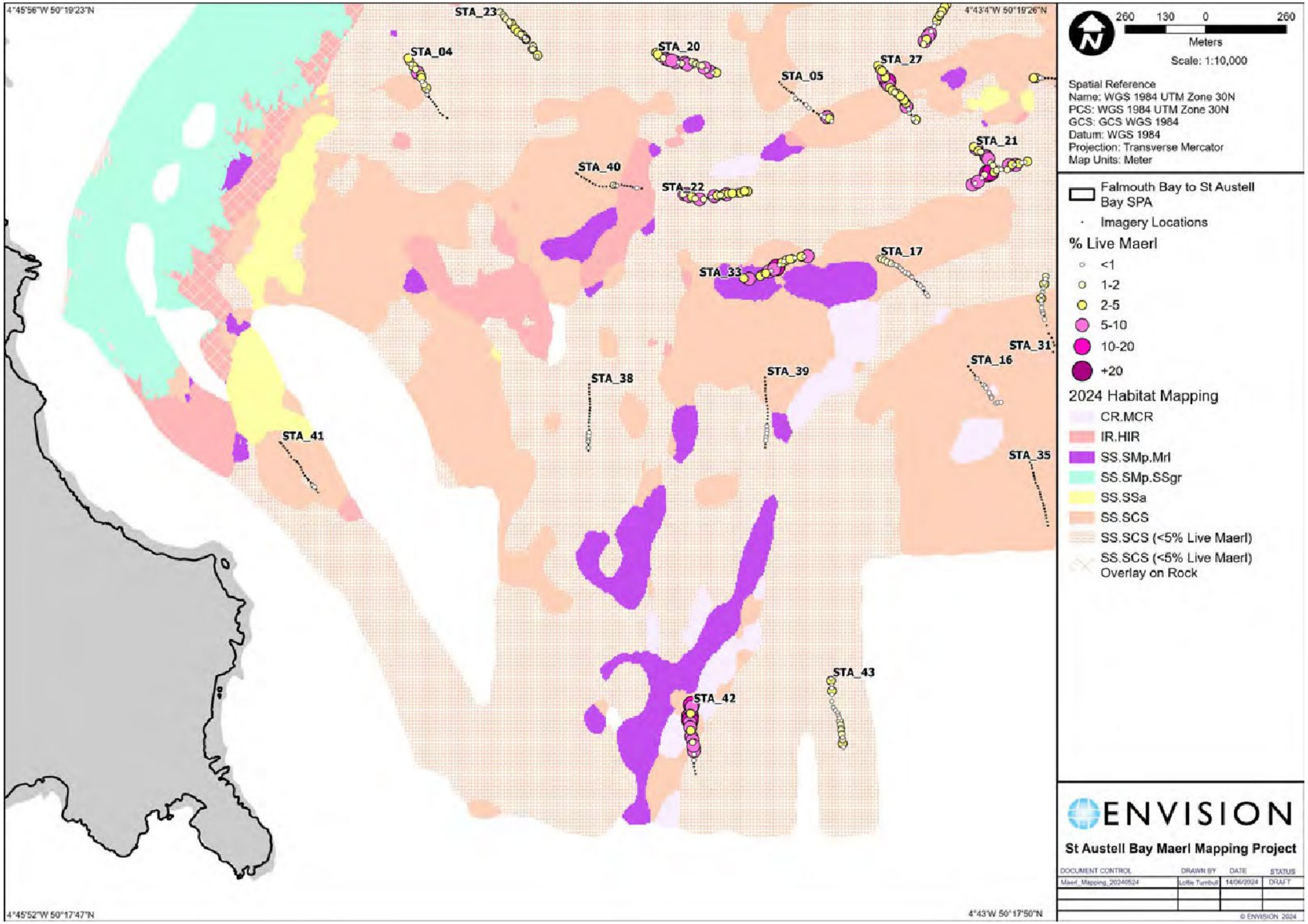

Figure 24. Marine benthic habitats at MNCR Level 3/4 and the percentage of live maerl recorded from each still image, southwest section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

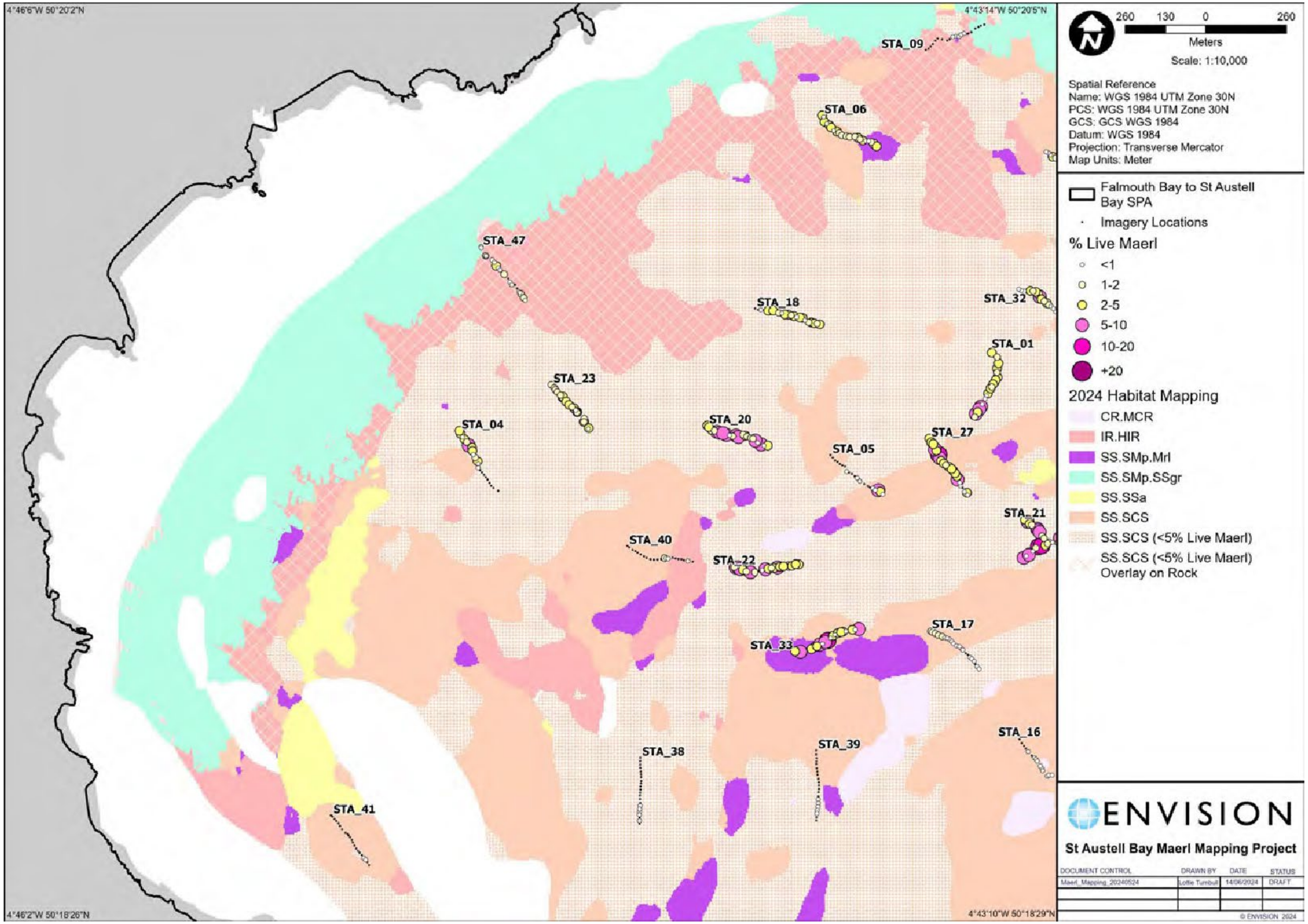

Figure 25. Marine benthic habitats at MNCR Level 3/4 and the percentage of live maerl recorded from each still image, northwest section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

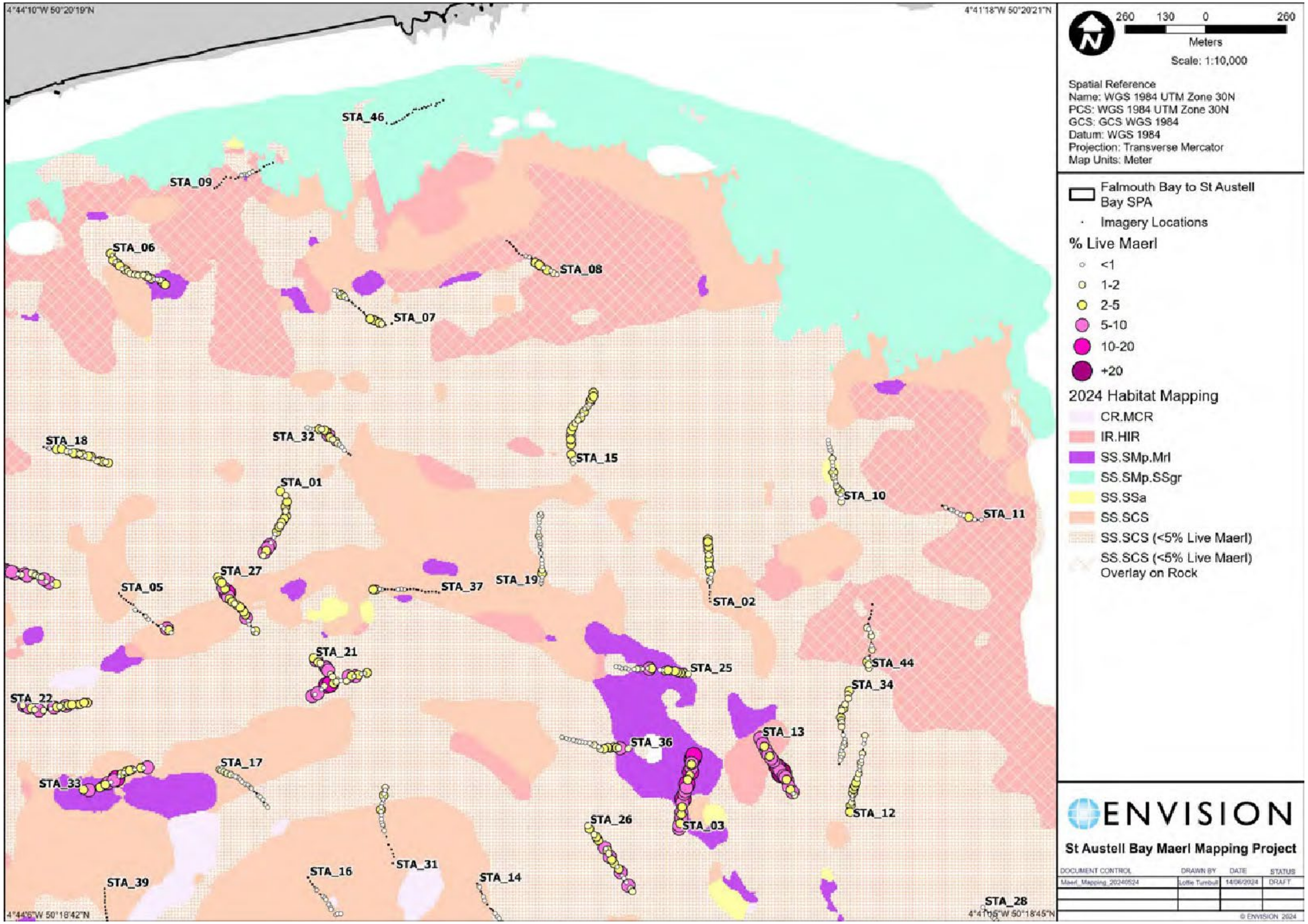

Figure 26. Marine benthic habitats at MNCR Level 3/4 and the percentage of live maerl recorded from each still image, northeast section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

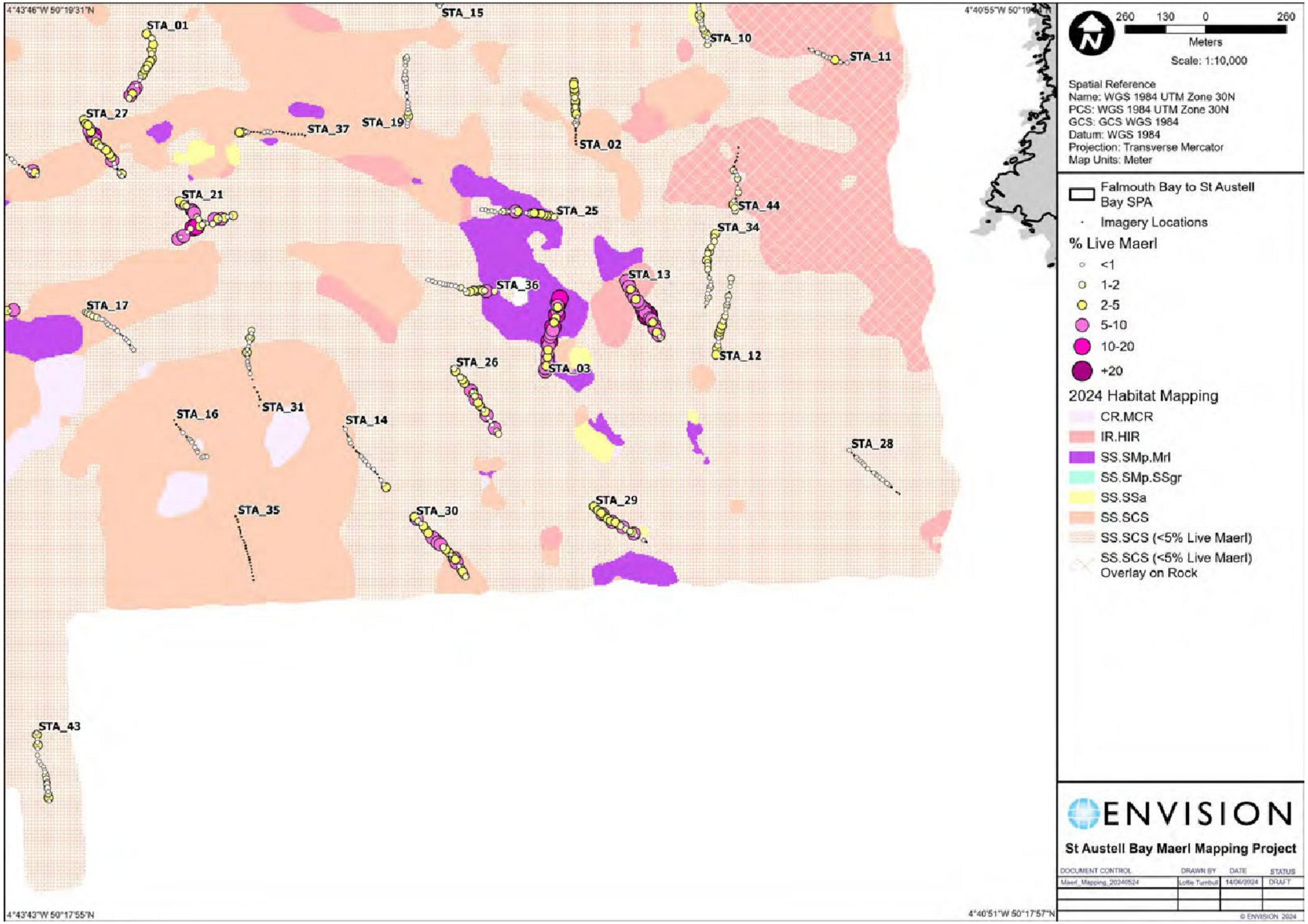

Figure 27. Marine benthic habitats at MNCR Level 3/4 and the percentage of live maerl recorded from each still image, southeast section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

Appendix 4 - Maerl categorisation system

The distribution of the maerl categories allocated to still imagery during analysis is presented here, at a whole bay scale and for northwest, northeast, southeast and southwest sections of St Austell Bay and at an example shown at the scale of three sample stations.

The spatial distribution of the categories is best viewed at single sample station scale. On a whole bay scale, resolution is lost, and it is difficult to discern the details between the still images. These are more appropriately viewed in GIS.

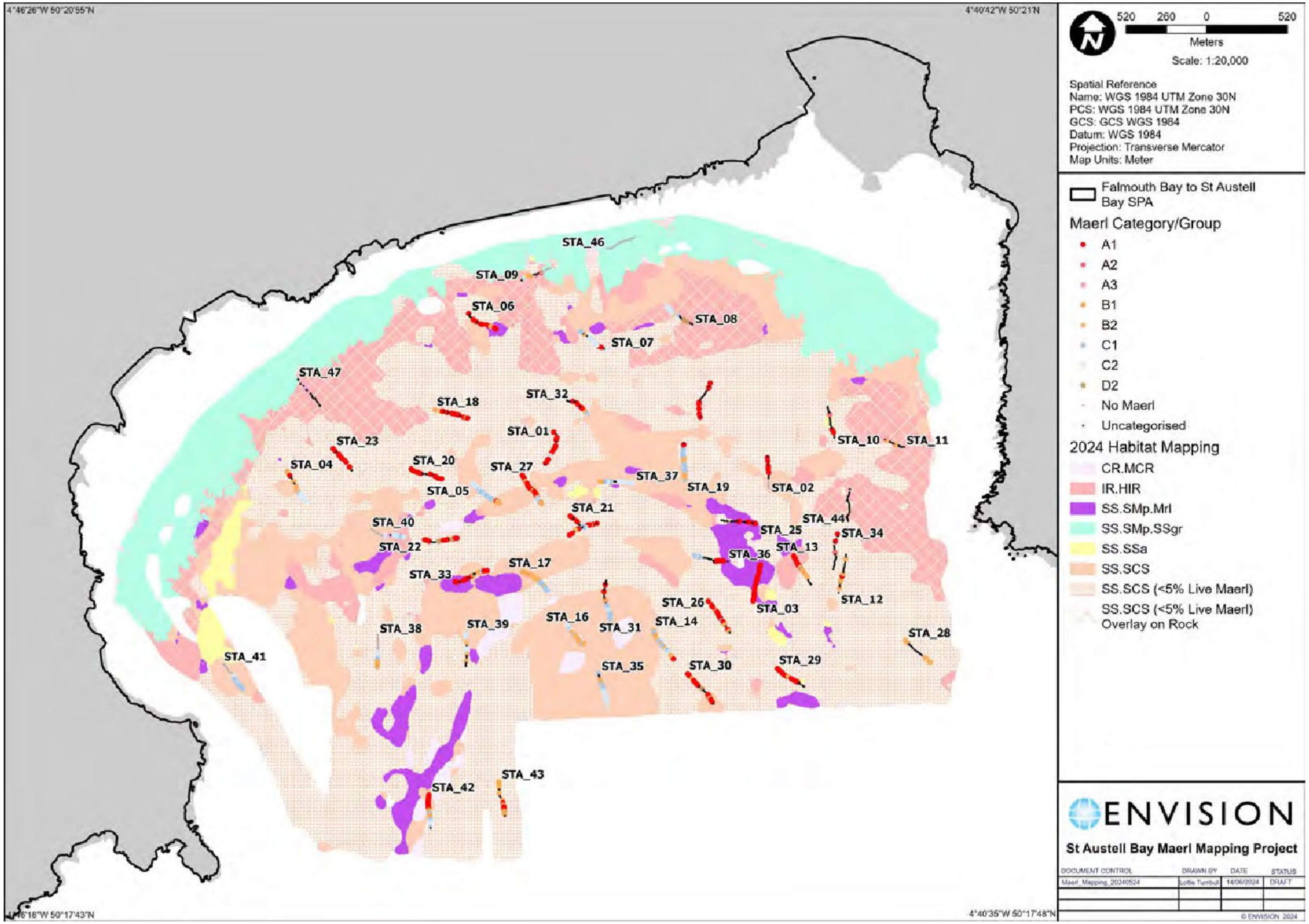

Figure 28. Marine benthic habitats at MNCR Level 3/4 and the maerl categories recorded from each still image, St Austell Bay.

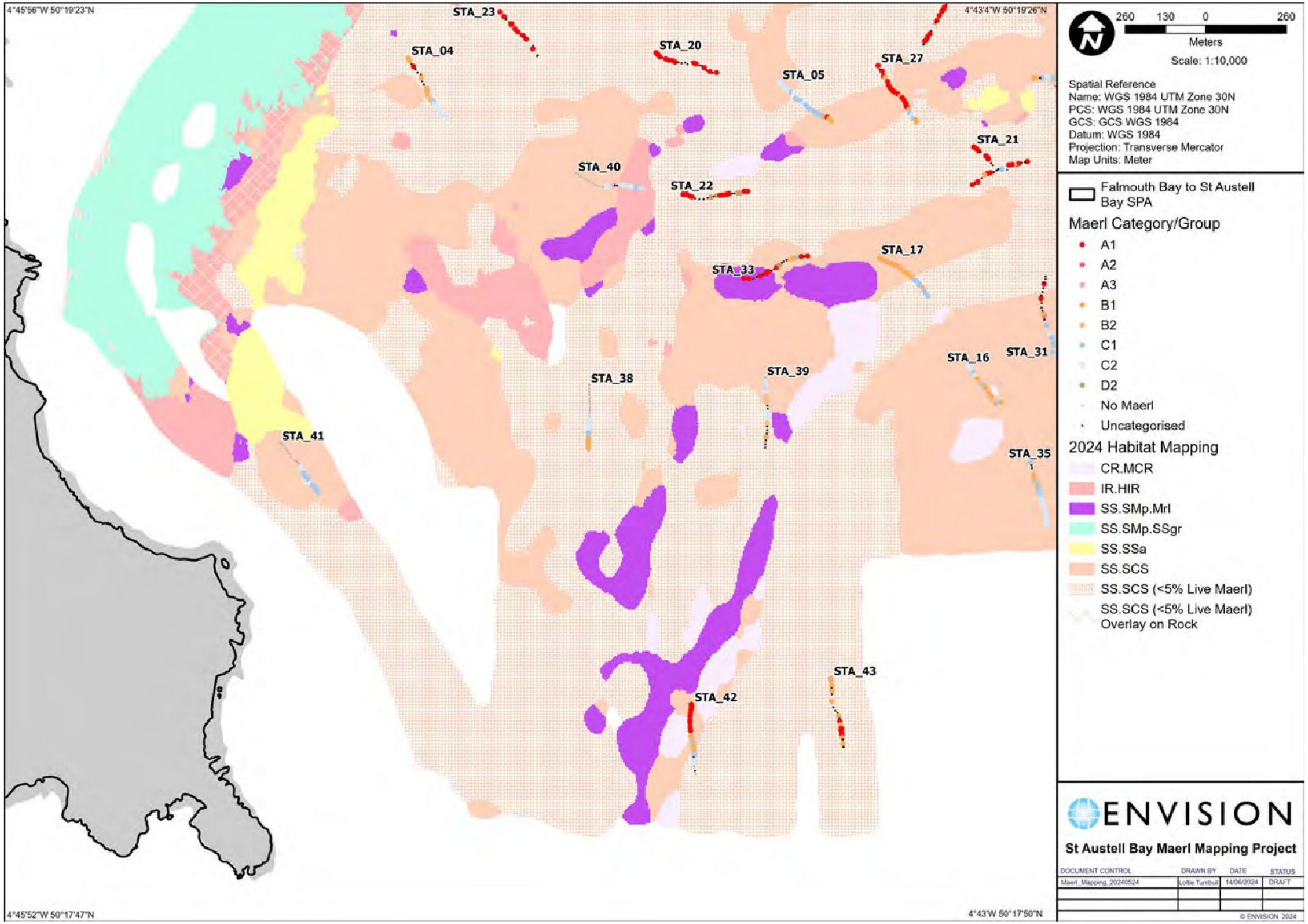

Figure 29. Marine benthic habitats at MNCR Level 3/4 and the maerl categories recorded from each still image, southwest section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

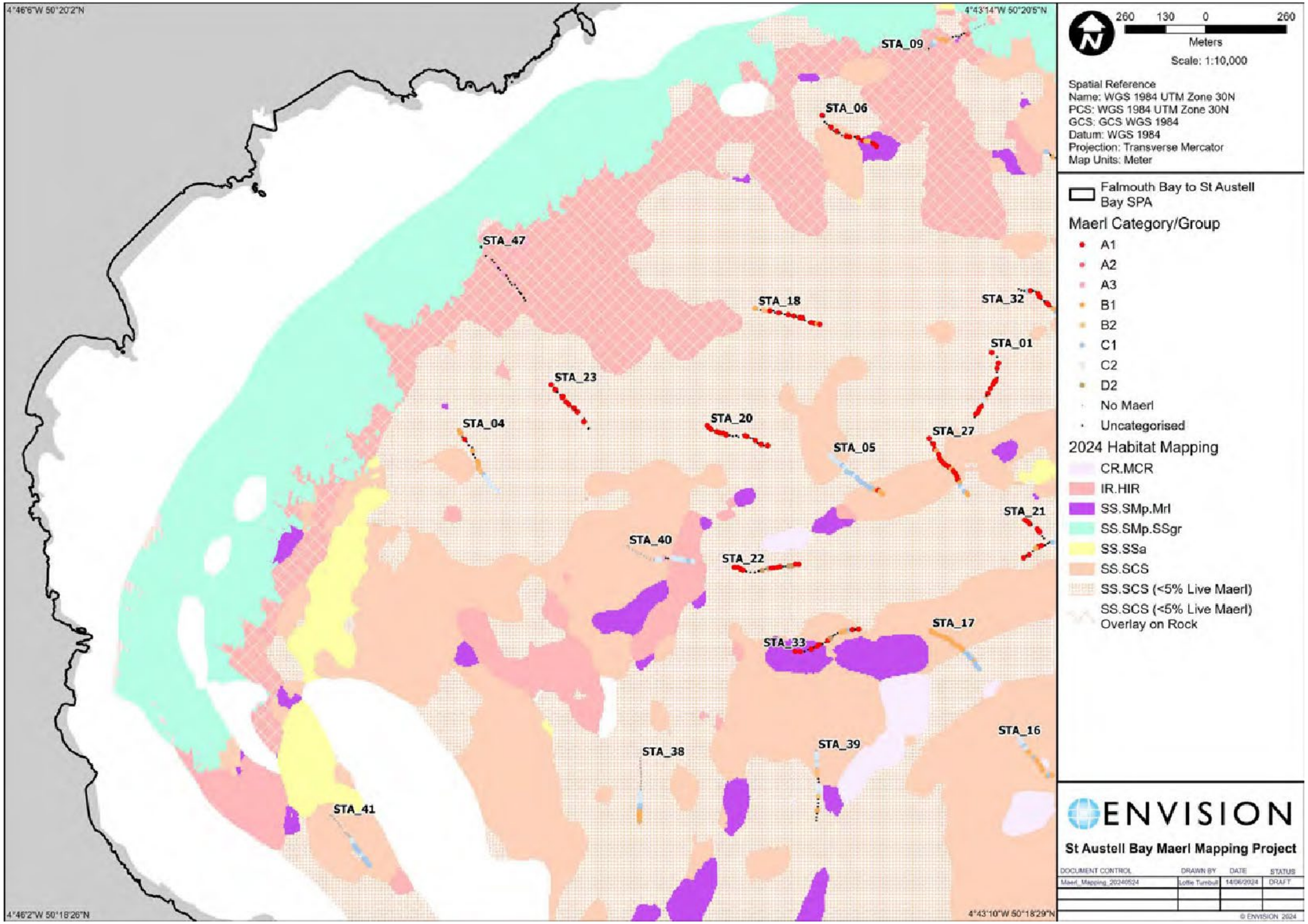

Figure 30. Marine benthic habitats at MNCR Level 3/4 and the maerl categories recorded from each still image, northwest section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

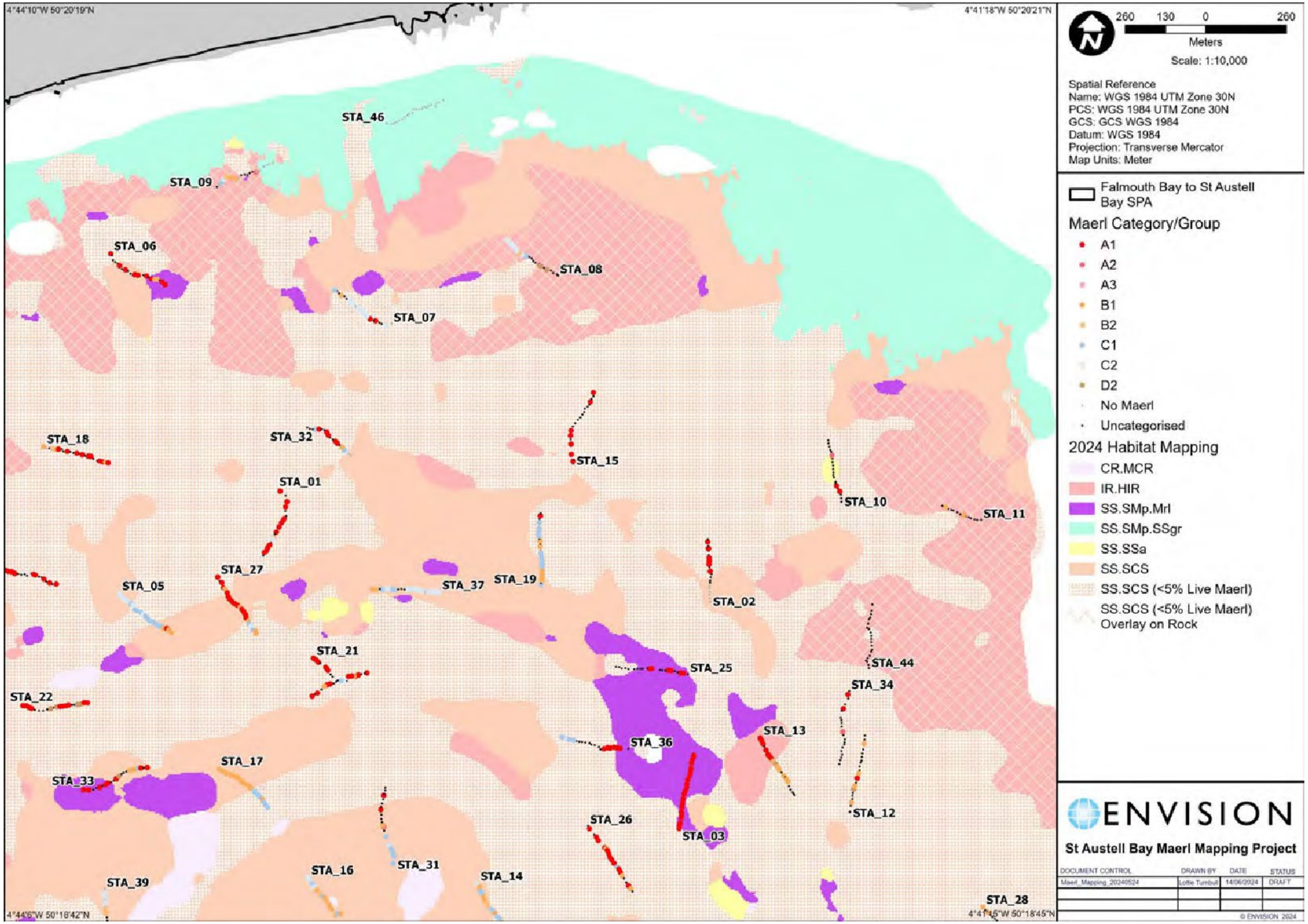

Figure 31. Marine benthic habitats at MNCR Level 3/4 and the maerl categories recorded from each still image, northeast section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

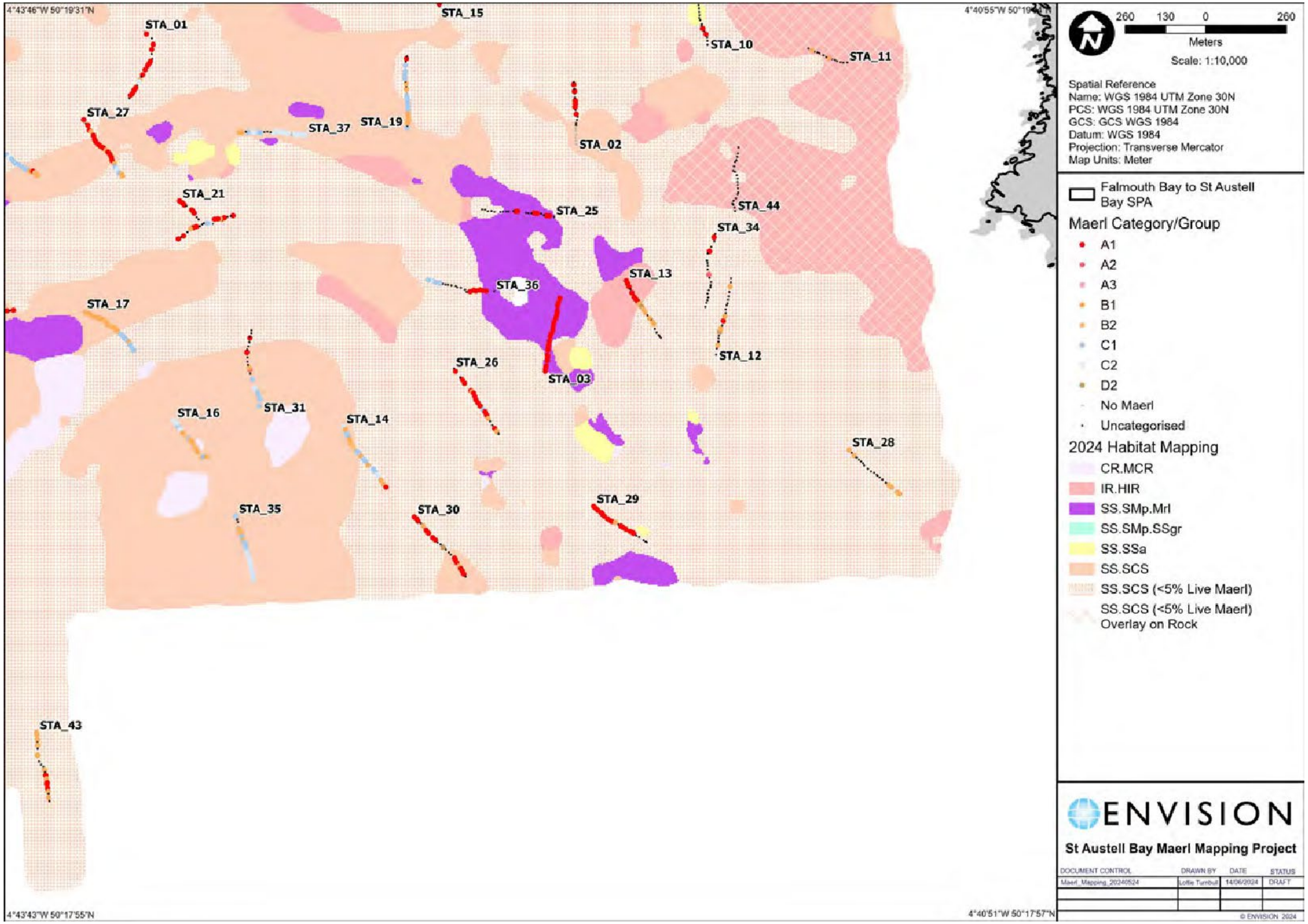

Figure 32. Marine benthic habitats at MNCR Level 3/4 and the maerl categories recorded from each still image, southeast section of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

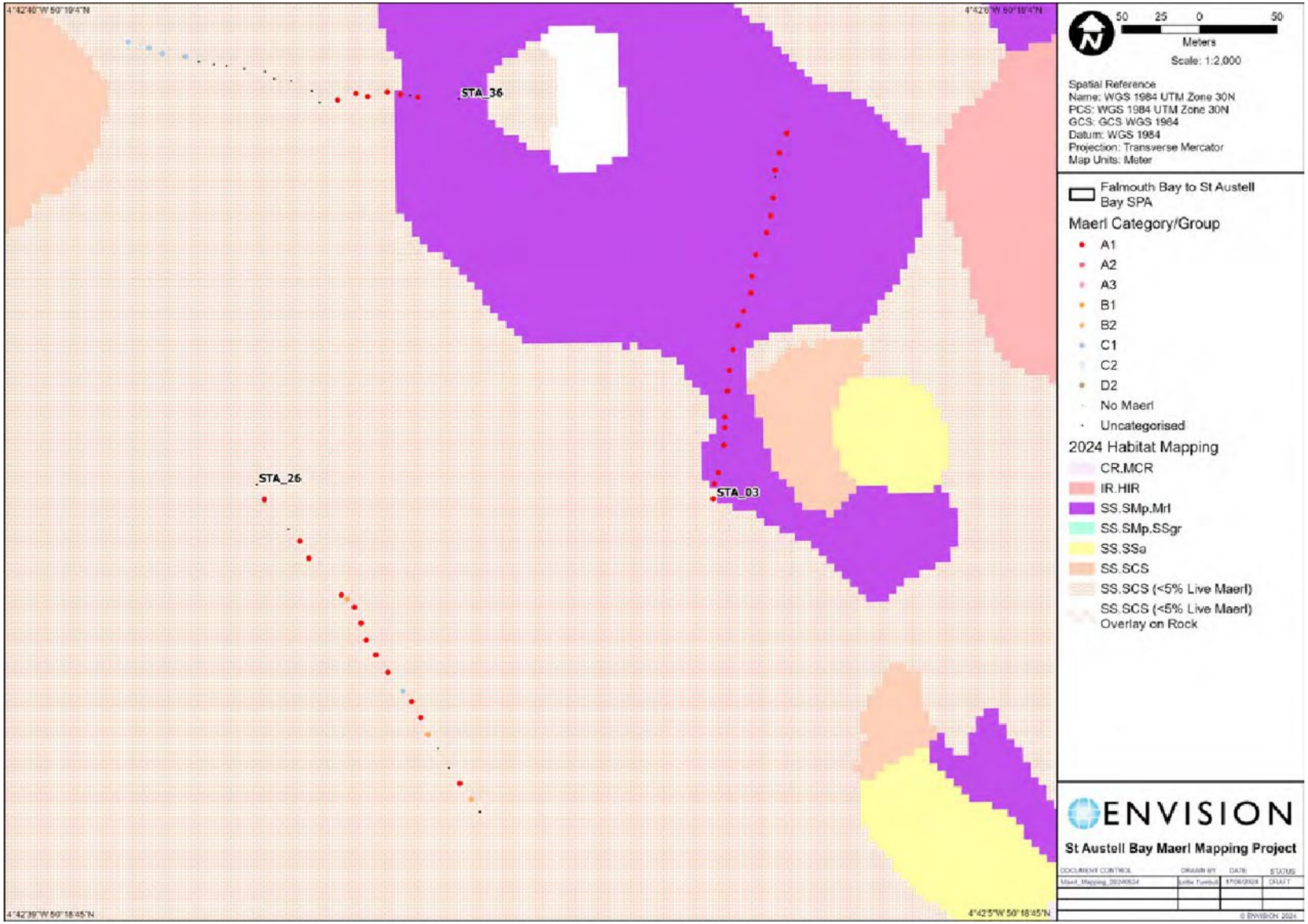

Figure 33. Marine benthic habitats at MNCR Level 3/4 and the maerl categories recorded from each still image, stations 3, 26 and 36 of St Austell Bay. © Natural England copyright. Contains Ordnance Survey data © Crown copyright and database right [2024].

Appendix 5 - Survey field report

The ground truthing survey field report is attached here for reference (Jenkin, A., Trundle, C. and Sturgeon, S. 2023. St. Austell Bay Drop Down Video Habitat Distribution Survey Field Report. Cornwall Inshore Fisheries and Conservation Authority (Cornwall IFCA), Hayle)

Appendix 6 - Annex 1 stony reef assessment

The 'reefiness' of stony reefs can be assessed using the guidance and definitions within Irving (2009), with updated guidance provided recently (Golding and others, 2020)

Characteristic	**<u>Not</u> a 'stony reef'**	**'Resemblance' to being a 'stony reef'**		
		Low[2]	Medium	High
Composition:	**<10%**	**10-40% Matrix supported**	**40-95%**	**>95% Clast supported**
Notes: Diameter of cobbles/ boulders being greater than 64mm. Percentage cover relates to a minimum area of 25m^2 This 'composition' characteristic also includes 'patchiness'				
Elevation:	**Flat seabed**	**<64mm**	**64mm-5m**	**>5m**
Notes: Minimum height (64mm) relates to minimum size of constituent cobbles. This characteristic could also include 'distinctness' from the surrounding seabed. Note that two units (mm and m) are used here.				
Extent:	**<25m^2**	**>25m^2**		
Biota:	**Dominated by infaunal species**			**>80% of species present composed of epifaunal species**

Figure 32. Table 3, from Irving (2009), reinterpreted as a formatted table.

When determining whether an area of the seabed should be considered as Annex I stony reef, if a 'low' is scored in any of the four characteristics (composition, elevation, extent or biota), as shown in Figure 32, then a strong justification would be required for this area to be considered as contributing to the Marine Natura site network of qualifying reefs in terms of the EU Habitats Directive.

The updated guidance (Golding and others, 2020) states that if the majority (three or more) of the criteria exceed 'Low', then this strong justification could result in classifying the area as having 'medium resemblance' to Annex 1 stony reef. Guidance on how to assess each criterion has been updated from Golding and others (2020):

CRITERION: Composition of reef – Assessment of the substrata of the seabed is used to determine the composition of substrate types.

Composition across the area being considered should be at least 10% cobbles (greater than 64mm in minimum diameter) or boulders (greater than 256mm in diameter). This 10% should be considered across the entire area (or at least across the minimum extent of

25m2). Stony reef habitat is inherently patchy in nature, and although composition is not a measure of patchiness it should take patchiness into account (i.e., on a patchy reef the percent cover of cobbles should take into account areas where cobbles are sparse or absent as well as areas where cobbles are abundant). Composition can be assessed using in-situ (diver) or remote (underwater imaging systems such as drop-camera/Remotely Operated Vehicle) or using acoustic remote sensing such as sidescan sonar or multibeam echosounder backscatter data.

CRITERION: Elevation of reef – Elevations of substrata is determined from any rocky protrusions rising form the seabed or where cobbles or boulders are proud of the seabed.

Elevation of the area under consideration should generally be greater than 64mm. However, matrix supported cobbles >64mm in diameter (partially buried in a sediment matrix) may still function ecologically as a reef with an associated reef community yet have an elevation of less than 64mm. Where the elevation is less than 64mm, particles must have a diameter greater or equal to 64mm to be considered as stony reef. This criterion can include consideration of topographic distinctness from the surrounding seafloor, noting the requirement for the Annex I reef to "arise from the sea floor". Clast size (considered above in composition) could be used as an approximate proxy for elevation. Topographic distinctness (height of the feature) in its broadest term, is best assessed using sidescan sonar or multibeam bathymetry data.

CRITERION: Extent of reef –extent measured from video footage is limited to the field of view, and habitat extents are likely to be larger than the linear belt transect sampled therefore extent of reef areas can be assessed from SSS and MBES data.

Extent of the area under consideration should be greater than 25m^2 (e.g., 5m x 5m / 10m x 2.5m). Note that the inherent patchiness of stony reef should be taken into account when considering extent. For example, individual patches may measure less than 25m^2, but the whole area of patchy reef may exceed 25m^2.

CRITERION: Biota supported by reef – Taxa from video analysis can be biased towards epifaunal taxa and infauna data will be used in addition to these data were available. In addition, the biota component of reef can be assessed based on diversity and morphology (reefs tend to have higher diversity).

Biota associated with the area should typically be dominated by epifaunal species. Some areas of seabed subject to scour/disturbance may have an impoverished epifaunal community, yet may still function ecologically as a reef[5]. Biota should be considered across the entire area being considered under the extent criteria, not just the cobble/boulder fraction being used to consider the composition criteria, reflecting the prevalence of an epifaunal or infaunal community. However, more detailed guidance on the biota criterion is currently being developed, with respect to assessing which biological communities are typically associated with Annex I stony reef. This may include consideration of particular species which could be used as a proxy for stability

Sites which are scored as medium or high reefiness for composition, elevation and biota characteristics will be allocated as potential Annex 1 reef.

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