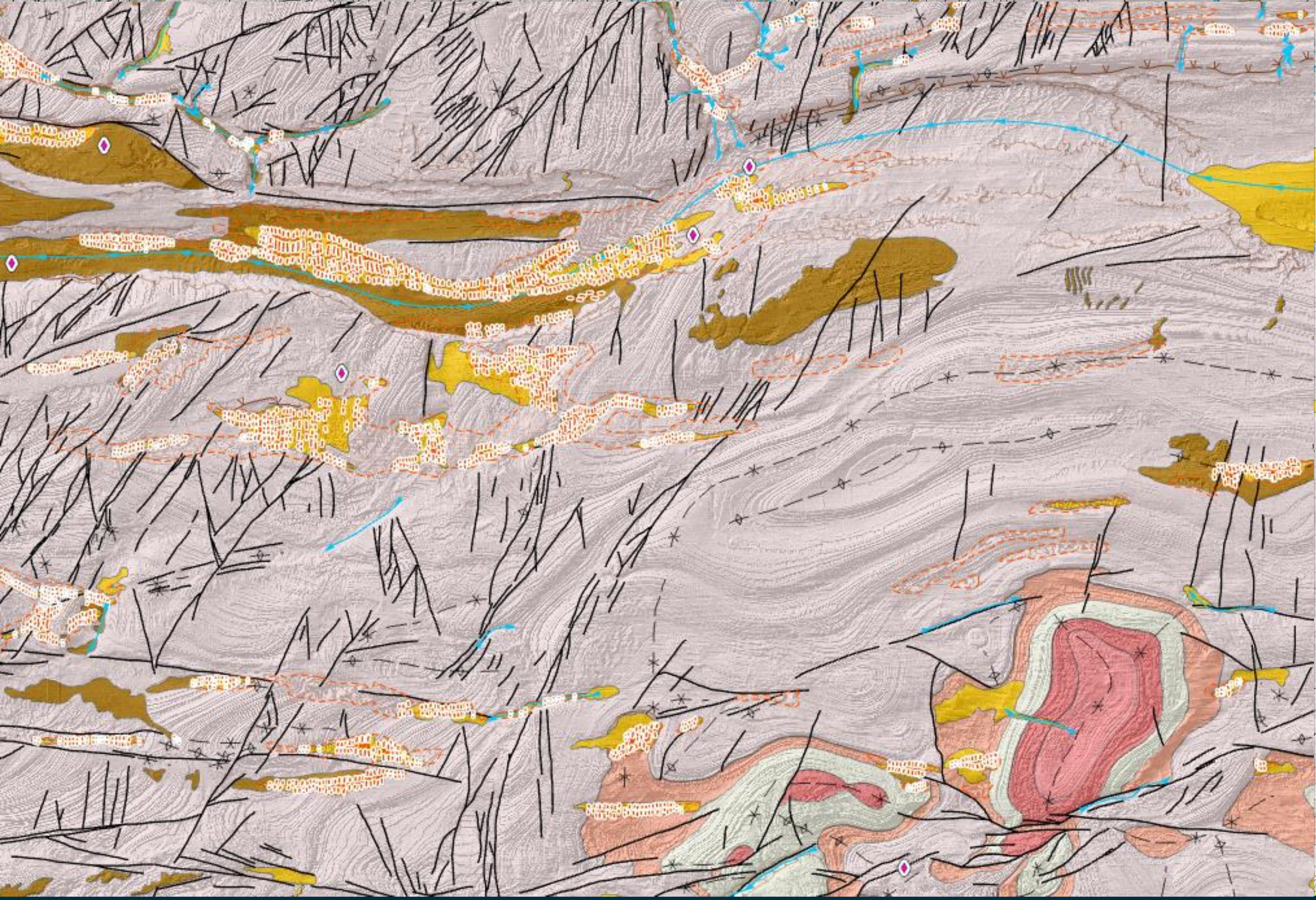

MARINE GEOSCIENCE PROGRAMME

User Guide of BGS Seabed Geology 10k: Bristol Channel (v.2)

Open Report OR/25/041

British Geological Survey

BRITISH GEOLOGICAL SURVEY

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Keywords

Bristol Channel, Seabed Geology, Offshore bedrock, Seabed Sediments, Structural Geology, Geomorphology.

Map

Seabed Geology 10k: Bristol Channel

Front cover

Extract from Seabed Geology 10k: Bristol Channel (v.2) dataset, showing the Substrate and Structural Geology, and Seabed Geomorphology.

Bibliographical reference

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BRITISH GEOLOGICAL SURVEY

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Foreword

The British Geological Survey (BGS) is a world-leading geological survey, focusing on public-good science for government, and research to understand earth and environmental processes.

We are the UK's premier provider of objective and authoritative geoscientific data, information, and knowledge to help society to:

- use its natural resources responsibly
- manage environmental change
- be resilient to environmental hazards

We provide expert services and impartial advice in all areas of geoscience. As a public sector organisation, we are responsible for advising the UK Government on all aspects of geoscience as well as providing impartial geological advice to industry, academia and the public. Our client base is drawn from the public and private sectors both in the UK and internationally.

The BGS is a component body of the Natural Environment Research Council (NERC), part of UK Research and Innovation (UKRI).

DATA PRODUCTS

The BGS produces a wide range of data products that align to government policy and stakeholder needs. These include baseline geological data, engineering properties and geohazards datasets. These products are developed using in-house scientific and digital expertise, and are based on the outputs of our research programmes and substantial national data holdings.

Our products are supported by stakeholder focus groups, identification of gaps in current knowledge and policy assessments. They help to improve understanding and communication of the impact of geo-environmental properties and hazards in Great Britain, thereby improving society's resilience and enabling people, businesses, and the government to make better-informed decisions.

SEABED GEOLOGY MAP PRODUCTS

The BGS is undertaking a marine mapping programme that provides detailed and accurate characterisation of the Seabed Geology, integrating Substrate Geology, Structural Geology and Seabed Geomorphology. These detailed digital map products are intended as enabling resources to support a diverse range of offshore activities and applications, including scientific research, offshore development, and conservation initiatives. These geological products also provide a new and unique resource to better inform marine spatial planning and management.

The BGS Seabed Geology 10k: Bristol Channel (v2) digital map portrays the distribution of the different types of bedrock and sediments that are interpreted to represent the geology of the seabed, at a scale of 1:10 000, over an extended area from (v1). It also includes the distribution of the main seabed morphological and geomorphological features (*e.g.,* ridges, and palaeocannels) and the principal structural features observed at rockhead (*e.g.*, faults, fractures).

Acknowledgements

The BGS Seabed Geology 10k: Bristol Channel (v.2) dataset is a digital geological map portraying the seabed geology of the Bristol Channel. This dataset depicts the geological interpretation and mapping done at 1:10 000 scale in 2019 by Emrys Phillips, Gareth Carter, Rhian Kendall, Rachael Ellen and Jeremy Everest. Version 2 updates were undertaken between 2020 and 2025by Rhian Kendall and Helen Burke.

This mapping was based primarily on the high-resolution multibeam echo-sounder (MBES) bathymetry data collected by the Civil Hydrography Programme (CHP), which is administered by the Maritime and Coastguard Agency (MCA) and delivered in partnership with the UK Hydrographic Office (UKHO). MBES backscatter, physical samples (e.g. grabs, cores, and boreholes), academic papers and previous geological mapping at broader scales (250k and 50k scales) were also used to further inform the geological interpretation.

We would like to thank several individuals who have contributed to the review, digital compilation, and release of the BGS Seabed Geology 10k: Bristol Channel (v.2) geospatial dataset, in particular: Joana Gafeira, Simon Piper, Helen Burke, Leanne Hughes and Deborah Daley, Christian Bonde, and Dayton Dove.

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Summary

The BGS Seabed Geology 10k: Bristol Channel (v.2) digital map comprises three complimentary components: 1) Substrate Geology, showing the distribution of Bedrock and Superficial geological units interpreted to be dominant within the top 1 m below seabed; 2) Structural Geology, delineating the principle structural features such as faults and folds observed at rockhead; and 3) Seabed Geomorphology, classifying the physical morphology and interpreted geomorphic character of the seabed.

This geospatial product is the result of analysing, interpreting, and classifying a number of high-resolution, multibeam echo-sounder (MBES) bathymetry datasets, supported by further data and information, e.g., MBES backscatter, physical samples (*e.g.,* grabs, cores, and boreholes), seismic data, academic and publicly accessible industry literature, and previous BGS mapping (e.g.,1:250k maps).

The bedrock geology comprises Palaeozoic and Mesozoic sedimentary rocks, often significantly fractured and faulted, with bedrock outcropping widely at seabed across the central axis of the Bristol Channel, as well as on bathymetric highs within Swansea Bay, and the areas west of Carmarthen Bay towards St. Govan's Head. Mapped superficial deposits include marine Sands, Gravels, and Muds, potentially underlain by further Quaternary deposits in places (e.g. Swansea Bay). The Seabed Geomorphology records a range of relict features and active processes, including: Palaeochannels and Palaeoshorelines that are associated with the development of the palaeo Severn. Numerous landforms are mapped, e.g., Negative and Positive Lineaments associated with tidal scour, and several arcuate Ridges that are potentially indicative of past glacial processes. Active marine sedimentary features include numerous current-induced Bedforms and several large Sediment Banks associated with adjacent coastal headlands.

The dataset citation, metadata and overview can be found here: British Geological Survey (2025): BGS Seabed Geology 10k: Bristol Channel version 2.0. British Geological Survey. OR/25/041. https://doi.org/10.5285/f7816c02-4e24-4563-988d-b4678115052a.

The information provided in this user guide is intended to provide a quick-start guide to using and understanding this BGS digital product.

1 Introduction

The BGS Seabed Geology 10k: Bristol Channel (v.2) digital map provides detailed and accurate characterisation of the seabed geology, based on high-quality seabed (e.g., high-resolution bathymetry) and shallow-subsurface data (Figure 1). This product incorporates three complimentary map components, *Substrate Geology*, *Structural Geology,* and *Geomorphology,* each presented at 1:10 000 scale, and provided as discrete layers for viewing within a Geographic Information System (GIS). The *Substrate Geology* shows the distribution of bedrock and unlithified superficial deposits (series of polygons) present at seabed or immediately below the thin veneer of seabed sediments (this can be thought of as the 'one metre principle' described below); The *Structural Geology* represents the structural features observed at rockhead as a polylines layer, and *Geomorphology* consist of points, polylines, and polygons layers to portray the main seabed morphological and geomorphological features.

The geological character of the seabed and shallow sub-surface is important to a range of uses and stakeholders. The BGS fine-scale Seabed Geology maps are intended as enabling resources to support a diverse range of offshore activities and applications including scientific research, resource development (e.g., offshore renewables), conservation efforts, and marine management.

Substrate Geology

This digital map layer shows the dominant geological unit interpreted to be present within the top 1 m below seabed. This general approach is followed in order to characterise the geological substrate present below the frequently thin and potentially ephemeral/mobile seabed sediment (SBS) layer (i.e., consider the offshore SBS as akin to an onshore 'pedogenic soil' layer). At any given location, the mapped geological substrate may comprise either a Bedrock, or Superficial geological unit. The Superficial units may include Quaternary sediment units, thicker deposits of unconsolidated marine sediment, or any other unconsolidated unit (e.g., talus).

Structural Geology

This map layer delineates principle structural features such as fractures, faults, and folds observed at rockhead. The structural features currently captured on these maps is restricted to significant fractures and fold hinges. Features are only marked as faults as opposed to fractures where bedding is clearly offset.

Seabed Geomorphology

Portraying the Seabed Geomorphology involves describing the morphological character of the seafloor, which integrated with further supporting data and contextual information, potentially enables further detailed interpretation of the environmental origin/evolution, compositional character, and potential mobility/vulnerability of seabed features.

In principle, the Seabed Geomorphology mapping workflow follows the '2-part' approach, which has semi-independent descriptions of 1) Morphology, and 2) Geomorphology (e.g., Nanson et al., 2023). Morphological features are those characterised only by the surface (seabed) expression of their physical attributes (i.e., size, shape, configuration, texture); Geomorphological features are defined by the geological process(es) that created that morphology. As such, 'Morphology' provides the fundamental objective physical description of the of the feature(s), whereas 'Geomorphology' also requires an interpretation of the genesis of the feature(s).

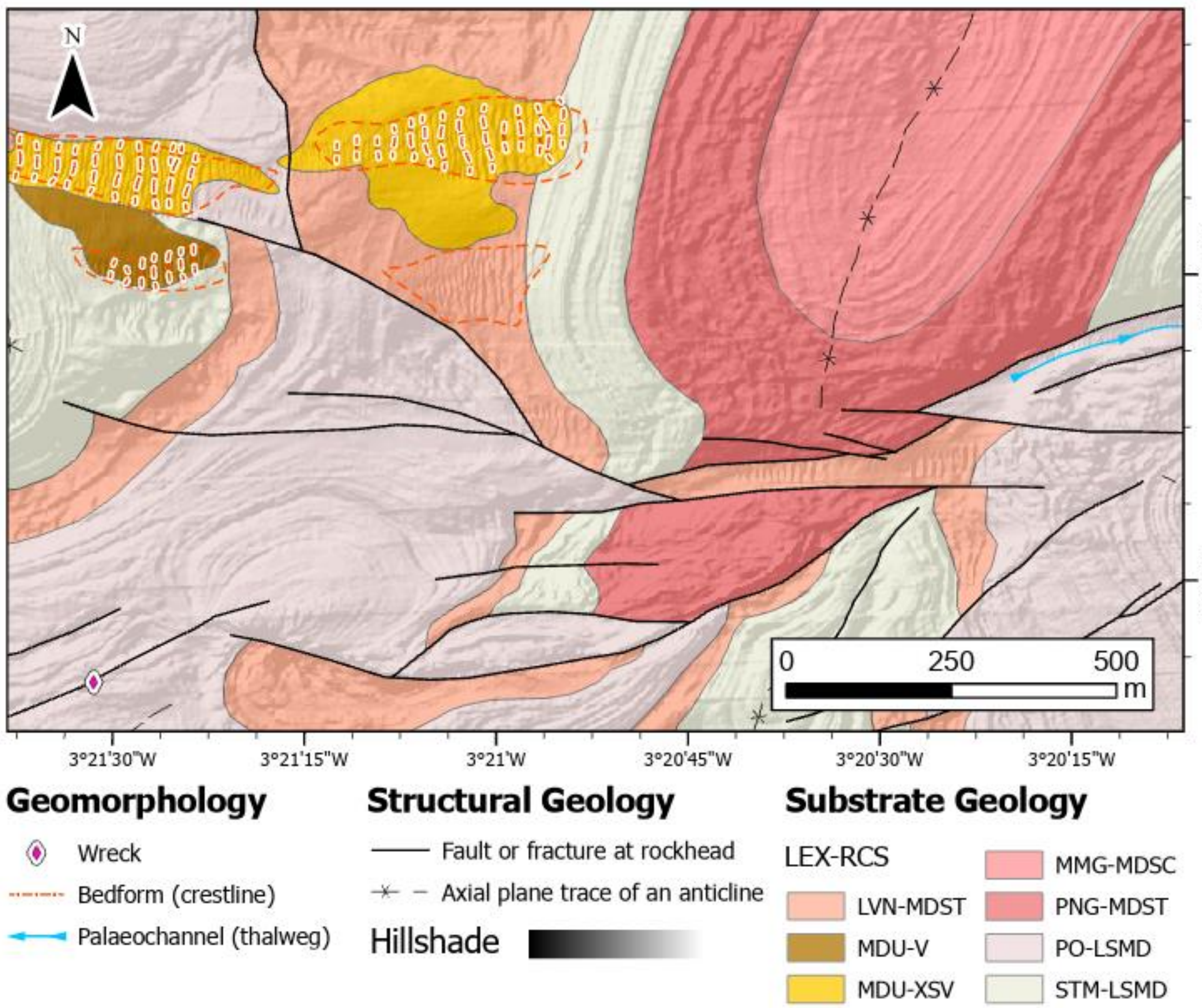

Figure 1 - Extract of the BGS Seabed Geology 10k: Bristol Channel (v.2) digital map. Showing the three layers of the dataset (*Seabed Substrate*, *Geomorphology* and *Structural Geology*) draped over the hillshade derived from MB data acquired by the CHP.
Note that the legend only shows the features visible in the map extract.

2 Methodology

The information provided in the BGS Seabed Geology 10k: Bristol Channel (v.2) dataset has been compiled via a process of geological interpretation and domain analysis, digital capture of seabed topographic features, and data processing and harmonisation.

2.1 SOURCE DATA OVERVIEW

The geological mapping is based primarily on high-resolution multibeam datasets (with a spatial resolution of 2m) acquired on behalf of the Civil Hydrography Programme (CHP) managed by the Maritime and Coastguard Agency (MCA), and delivered in partnership with the UK Hydrographic Office (UKHO) via Open Government Licence (OGL) (Figure 2).

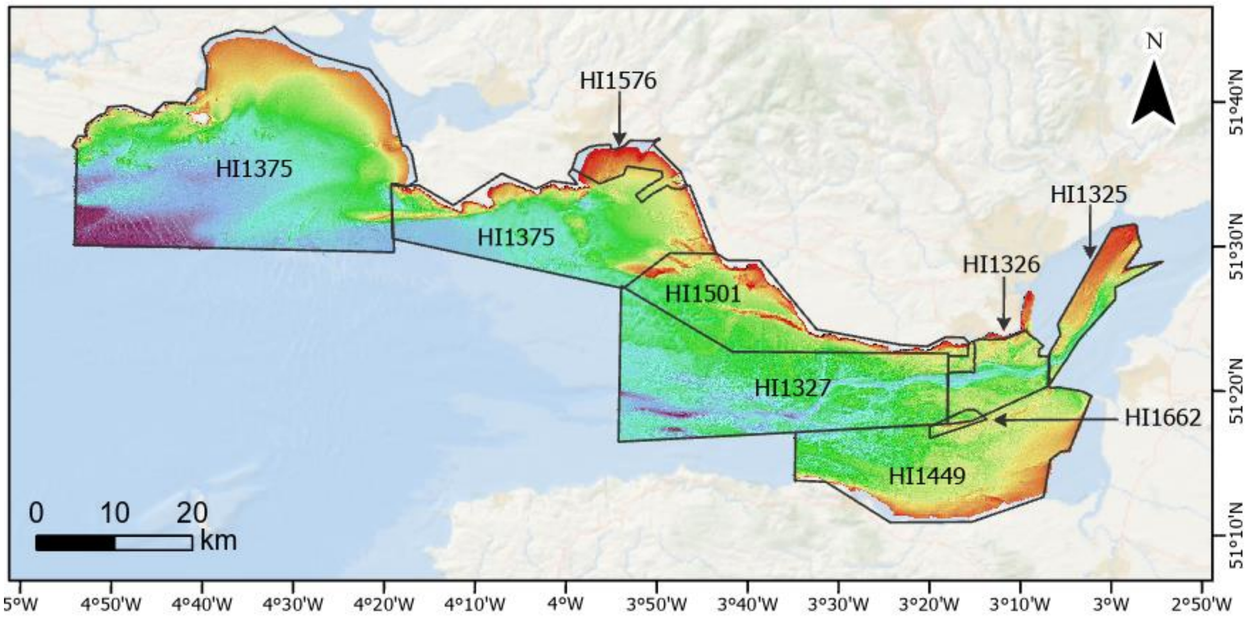

Figure 2 – Location map of the nine CHP multibeam datasets used for the BGS Seabed Geology 10k: Bristol Channel (v.2).
This image contains data acquired by the MCA © Crown copyright 2025.

MBES backscatter, physical samples (e.g. grabs, cores, and boreholes) and previous geological mapping were also used to further inform the geological interpretation. In addition, OS topographic maps, BGS geological maps at 1:50 000 scale and hillshade Digital Terrain Models (DTMs) for the adjacent onshore areas were also used to ensure that the onshore geological mapping corresponds to that mapped onshore, to facilitate the future development of a "seamless" onshore-offshore geological map for the Bristol Channel region.

2.2 GEOLOGICAL INTERPRETATION – APPROACH

The geological interpretation of multibeam echo-sounder (MBES) bathymetry is similar to onshore methods of terrain analysis (specifically that which utilises LiDAR), where the surveyor is seeking to identify domains (areas) of similar geology, structural bedrock (where present) lineaments (lines) that either bound the domains, or crosscut, or displace them, and geomorphic features whose morphology provides evidence on both environmental history and shallow sub-surface composition.

The MBES bathymetry can be used, for example, to identify changes in the general 'texture' of the seabed (finer-grained deposits have smoother seafloor expressions than rough, rocky or cobbly surfaces) or recognise the morphology, orientation and configuration of seabed features at multiple spatial scales. MBES backscatter data are a co-registered dataset acquired simultaneously with the bathymetry data. While bathymetry measures seabed depth, backscatter measures the intensity of the return acoustic signal (Lurton et al., 2015). The backscatter data can therefore be used as a proxy for seabed hardness, and seabed sediment composition (e.g., discriminating between unconsolidated marine sediment).

Importantly, continuous and geographically-extensive MBES bathymetry and backscatter datasets bring enhanced value to existing seabed and shallow sub-surface data (e.g., sediment cores and seismic data), permitting detailed and accurate mapping of the seabed geology. The combination of seabed morphology and acoustic signature coupled with groundtruthing and sub-surface data allows geoscientists to identify areas exhibiting similar rock and deposit characteristics, as well as seabed forms that can imply geological 'processes', such as overriding by glacier ice or mobility of sedimentary bedforms.

The high-resolution of the multibeam data and the use of derived, visualisation layers (such as hillshade and slope) reveal in detail the seabed morphology and allow the identification of numerous seabed features in a GIS.

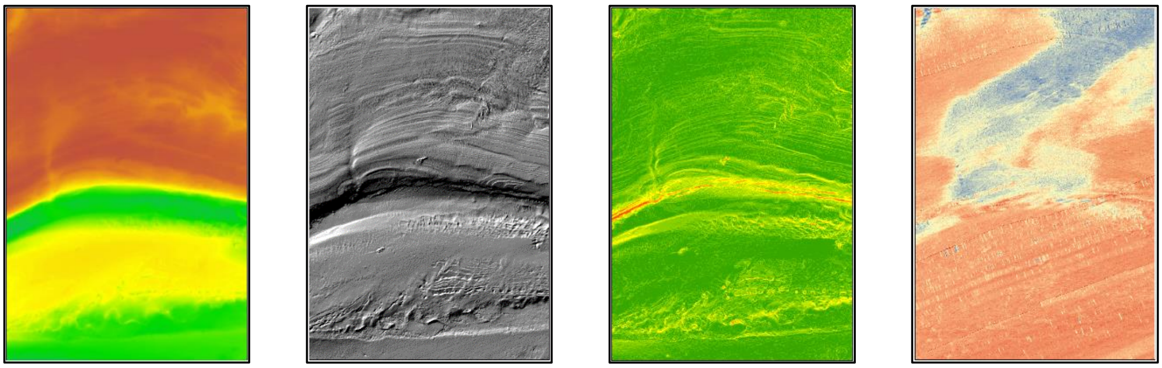

Figure 3 – Extracts of the bathymetry, hillshade, slope and backscatter multibeam data used during the geological interpretation.
This image contains data acquired by the MCA © Crown copyright 2025.

2.3 DIGITAL CAPTURE

The geological linework for the BGS Bristol Channel dataset (v.2) was done at a scale of 1:5 000 to 1:7 000 scales, for use at an intended working scale of 1:10 000. The data was captured and is provided using the projected coordinate system EPSG:32630 (WGS 84 / UTM Zone 30N).

The geological interpretation and digital capture were completed in an ArcGIS^{TM} environment

The attribute fields provided with the dataset are described further in section 3.

2.3.1 Substrate Geology

For the Substrate Geology layer, all map areas covered by either a Bedrock or Superficial unit.

The distribution of bedrock and superficial deposits were mapped as independent layers comprising polygons with geological attribution to describe their stratigraphical age (based on the BGS Lexicon of Named Rock Units), and their lithological composition (as defined in the BGS Rock Classification Scheme) (e.g., Figure 5).

2.3.1.1 Bedrock Geology

Bedrock is mapped where the geologist can observe characteristic morphologies and features within the bathymetry data, such as bedrock bedding, folding, and fractures. Classification of bedrock units is informed by further supporting data and information which may include boreholes, previous offshore mapping, and adjacent onshore mapping and data.

Bedrock classification is provided to the highest detail possible according to available data and information. In the Bristol Channel map area, bedrock units are mapped to SuperGroup, Group and Formation level depending on local circumstances, and interpretation confidence.

2.3.1.2 Superficial Geology

Superficial deposits include all unlithified deposits, such as Quaternary (unconsolidated or consolidated), modern marine or Holocene marine sediment, mass movement, and bedrock rubble/talus (Stoker et al., 2011). Interpretation of superficial deposits is largely based upon sediment core data, observable changes in seabed texture (bathymetry), seismic and backscatter data where appropriate, as well as previous geological mapping (BGS, commercial, and academic). The Seabed Geomorphology layers may also be used to guide, or even delimit superficial boundaries (e.g., 'area of sediment waves' = province of marine sediment (e.g. MDU-S)).

For Holocene – modern marine sediments, a simple 6 class system has been adopted with undefined proportions of Gravel, Sand and Mud (Table 1). While bathymetry, backscatter and sediment samples sometimes invite more detailed linework and specific classification (e.g. Folk classes), low density of sediment samples and variable backscatter data quality preclude this approach being applied consistently across this broad mapping area, that incorporates multiple datasets from variable sources.

- Using the Lex code: MDU (Marine Deposits Unconsolidated)
    - E.g., a marine sandy gravel would be mapped 'MDU-XSV', where the 'X' stands for undefined proportions;

V	Gravel
XSV	Sand and Gravel
S	Sand
XSM	Sand and Mud
M	Mud
XVSM	Gravel, Sand and Mud

Table 1. Simplified classification scheme for Marine Deposits Unconsolidated (MDU).

2.3.2 Structural Geology

This layer delineates the principle structural features such as faults, folds, or fractures observed at rockhead within the MBES bathymetry data. Structural lineaments are captured as polylines where observed in the MBES bathymetry data. They are most frequently observed where bedrock is mapped within the Substrate Geology layer, however they are also mapped where superficial deposits are mapped over the bedrock surface. In this later case, independent evidence (e.g., sediment cores) suggests that superficial deposits are at least one metre in thickness, but that the structural lineaments have sufficiently significant morphology as to be apparent through the superficial deposits.

2.3.3 Seabed Geomorphology

Seabed Geomorphology mapping generally follows the 'two-part' mapping approach developed by BGS together with other international marine mapping groups (Dove et al., 2016). 'Morphology' terms and glossary definitions are given in Dove et al. (2020), and an updated 'Geomorphology' classification is given in Nanson et al. (2023).

This approach involves an independent assessment of 'Morphology' and 'Geomorphology', in which the Morphology defines the fundamental physical shape of feature (e.g., 'Bathymetric High > Mound > Streamlined Mound'), and the Geomorphology describes the interpreted origin, or process association of features (e.g., 'Glacial > Subglacial Landform > Streamlined landform > Drumlin. Morphology features are characterised only by the feature's form, i.e., size, shape, configuration, texture, whereas the Geomorphology features are defined by both their form and the environmental and interpreted geomorphological process(es) that created that morphology.

Only seabed features that have discernible morphological expression are mapped, i.e., not features (Figure 6). All features mapped have a Morphology class assigned, whereas the Geomorphology class is only attributed where the mapper feels confident in their interpretation. The attribute fields provided with the digital map are described further in section 4.

2.4 DATASET PROCESSING

During the geological interpretation, data was captured in several independent layers within a BGS·SIGMA database. To create the final dataset, it was required to compile and merge the linework of six layers: *Mass Movement Deposit Boundary* (lines), *Linear Landform and Bedform* (lines), *Fault or Fracture Trace* (lines), *Fold Axial Plane Trace* (lines), *Superficial deposits* (polygons) and *Bedrock* (polygons). This compilation of linear and polygon features is shown in Figure 4.

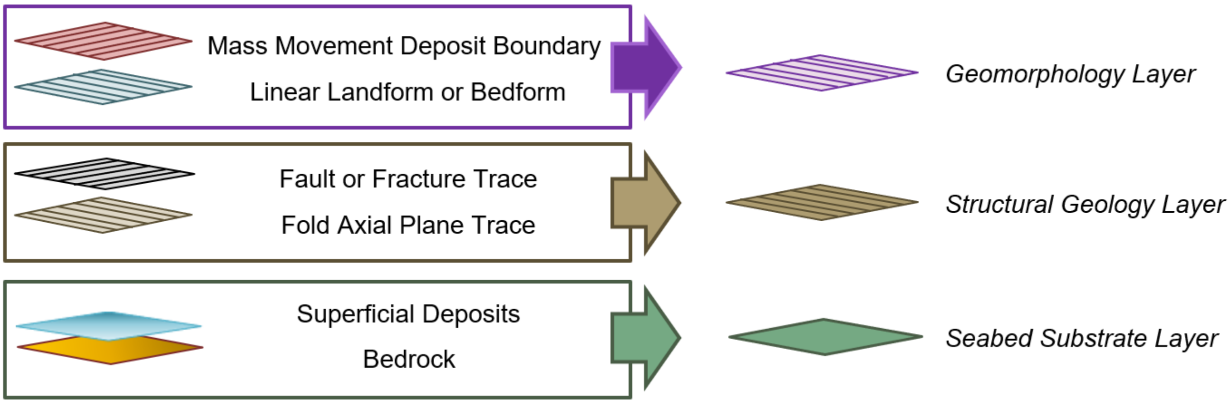

Figure 4 – Schematic representation of the transition from the layer used during the geological mapping and the final layer that comprised BGS Seabed Geology 10k: Bristol Channel (v.2).

The *Mass Movement Deposits Boundary* and *Linear Landform and Bedform* were used to create the *Geomorphology Layer* by merging the two layers and complementing the attribution table to include additional morphological and geomorphological information, such RELIEF_TYP and FEATURE_C that provide respectively the relief type (e.g. Bathymetric high) and the class of geomorphological feature (e.g. Current-induced bedform).

The layers *Fault or Fracture Trace* and *Fold Axial Plane Trace* were used to create the *Structural Geology Layer* by erasing the segments that are overlying the layer *Superficial Deposits and then* by merging the two layers.

The BGS layers *Superficial deposits* (polygons) and *Bedrock* (polygons) were used to create the *Substrate Geology* layer by erasing the areas of the bedrock polygons that are covered by superficial deposits and after merging the two layers into one single layer.

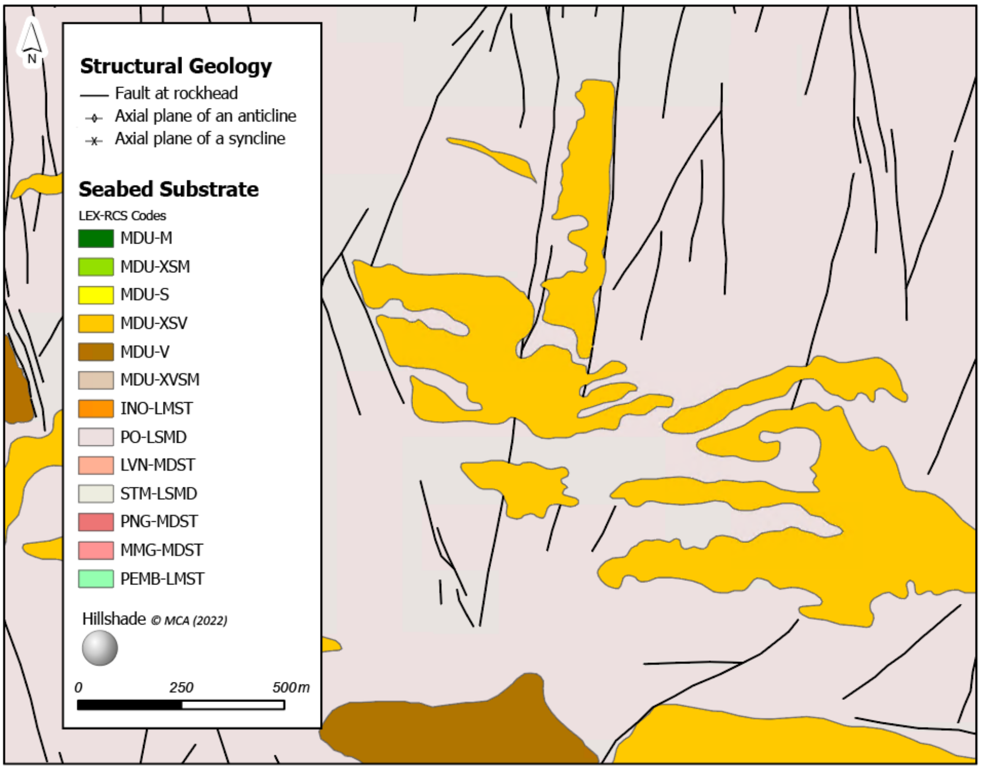

Figure 5 - Extract from the BGS Seabed Geology 10k: Bristol Channel dataset showing the *Structural Geology* and *Seabed Substrate* layers.

3 Seabed Geology – Summary

The Bristol Channel is a large estuary and river system extending from the Celtic Sea eastwards to the limit of tidal influence along the River Severn at Gloucester. The channel separates South Wales from Devon and Somerset and has the second largest tidal range in the world.

3.1 SUBSTRATE AND STRUCTURAL GEOLOGY

The seabed of the Bristol Channel is in part covered by superficial sediments but much of the area, particularly within the central axis of the main channel) is also swept free of sediment cover allowing for the detailed mapping of bedrock features. The bedrock geology of the eastern part of the map area shows a pattern of small outcrops of much fractured Carboniferous rocks (Pembroke Limestone Group), unconformably overlain by rocks of the Triassic Mercia Mudstone Group. During the late Triassic and Lower Jurassic, marine transgression led to the deposition of the Penarth Group and then the marine Lias Group units are deposited (Including Blue Lias Formation which is divided into the St Marys Well Bay, Lavernock Shales and Porthkerry members). The youngest bedrock unit identified is the Inferior Oolite Group which records deposition in a shallow shelf sea. In the western part of the map the Mesozoic sediments are a not recorded, instead a folded, faulted and thrust succession is exposed at seabed, comprising Silurian to Carboniferous aged rocks.

All of the rocks were subsequently deformed, probably by the Alpine orogeny which has caused a network of folding, fracturing and faulting which is especially apparent deforming and offsetting the well bedded Porthkerry Member and Inferior Oolite groups rocks. The northeast-southwest orientation of inner part of the Bristol Channel, is influenced by the Severn Estuary Fault Zone; a dextral strike-slip fault which is considered to have been active during the early Carboniferous. Comparable northeast-southwest-trending faults have been recognised within the eastern part of the area covered by this dataset where they dissect earlier formed folds and offset bedding within the Porthkerry Member.

The east-west-trending faults and fractures within the inner Bristol Channel are interpreted as forming part of the Central Bristol Channel Fault Zone (CBCFZ); a major fault system which is believed to have developed in response to the extensional reactivation of an underlying Variscan thrust during the Mesozoic. Northwest-southeast-trending faults within the Bristol Channel, including the Sticklepath-Lustleigh and Watchet (also known as Cothelstone) faults, are interpreted as older Variscan structures which were reactivated in response to tectonic events during the Mesozoic and Cenozoic. West-northwest and east-southeast trending folding, faulting, and thrusts associated with Variscan deformation are recognised in the lower Palaeozoic rocks that are exposed at seabed within Carmarthen Bay.

Superficial sediment cover at seabed is dominant away from the central axis of the Bristol Channel, e.g. within Swansea Bay and Carmarthen Bay. Superficial sediments identified within the dataset comprise marine deposits which include Gravel, Sand, and Mud, as well as areas with mixed proportions of Gravel, Sand, and Mud. Further Quaternary deposts may be present in places (e.g. Swansea Bay) below the marine deposits at seabed. The deposits of sand and gravel within the central part of the dataset are related to areas of potentially mobile sediment within the Bristol Channel. Developed upon these superficial sediments are a range of current-induced, potentially mobile bedforms associated with recent or contemporary marine processes within a tidal dominated environment.

3.2 SEABED GEOMORPHOLOGY

The Seabed Geomorphology across the Bristol Channel records a range of relict features and active processes. Evidence of fluvial processes is found in the form of the palaeo-Severn river channel and its tributaries (Gibbard et al., 2017; Gibbard and Lewin, 2003). These palaeo-channels are incised into the bedrock in the central and inner parts of the Bristol Channel with their margins being denoted by marked breaks in slope (convex and concave). Breaks of slope within the largest channel marking the main course of the palaeo River Severn are considered to mark the variably degraded edges of former river terraces. Several Palaeoshorelines are also identified. Several large arcuate Ridges within Swansea Bay may record past glaciation encroaching into the modern Bristol Channel (i.e. moraines) (Gibbard et al., 2017). Channels observed landward of the outermost Ridge appear to be incised into both Quaternary deposits and bedrock.

Active marine sedimentary features include numerous current-induced Bedforms (aka dunes or sediment waves) and larger Sediment Banks. In particular, the floors of the larger channels are locally covered by marine sand and/or gravel with well-developed current-induced bedforms on the surface of these superficial deposits. The predominantly north-south trend of the crestlines of the bedforms is consistent with the deposits being variably reworked by tidal currents flowing roughly parallel to the central axis of the Bristol Channel. Fields of Sediment Waves and Megaripples are also mapped in areas of high bedform density. Several larger, presumed Holocene 'Sediment Banks' are also mapped, and typically associated with adjacent coastal headlands. Within the central axis of the Bristol Channel, the surface of the superficial sediments and bedrock is relatively smooth and/or incised by long linear positive and negative features formed as a result of scouring of the seabed by strong bottom currents.

4 Technical Information

4.1 SCALE

This dataset is produced for use at 1:10 000 scale. The multibeam data was used with spatial resolution of 2m, but due to the nominal scale of the dataset the minimum mappable feature size is in principle 10 m x 10 m.

4.2 COVERAGE

The BGS Seabed Geology 10k: Bristol Channel dataset covers a large part of the Bristol Channel, extending from near Swansea in the East, and near St. Govan's Head in the West, a total area of more than 2600 km^2 (Figure 6).

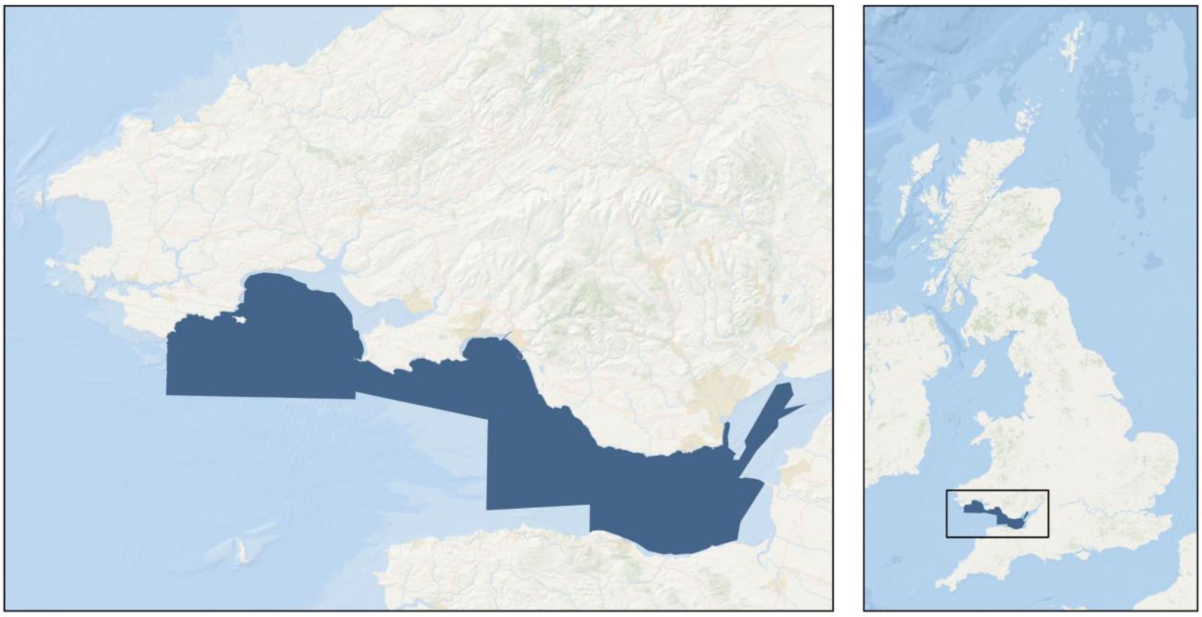

Figure 6 - Coverage of BGS Seabed Geology 10k: Bristol Channel shown in dark blue. Background image from World Ocean Base dataset compiled by Esri, Garmin, GEBCO, NOAA NGDC, and others (Ocean Basemap).

4.3 ATTRIBUTE DESCRIPTION

Each geological theme (map layer) in BGS Seabed Geology 10k: Bristol Channel (v.2) contains a series of attribute fields. Attribution is specific to the layers, for example, bedrock objects are attributed with lithostratigraphy, chronostratigraphy or lithodemic class, whereas the *Structural Geology* layer with features such as fractures is not. Table 2, Table 3 and Table 4 describe the attribute fields in each layer. Note the following abbreviations are used as attribute values: N/A - Not applicable and N/D - Not defined.

Table 2 - Names and their descriptions of the attribute table fields of the polygonal features in the *Seabed Substrate* layer of the BGS Seabed Geology 10k: Bristol Channel (v.2).

Field name	Description
BGS_ID	Unique ID for each polygon
BGSTYPE	The BGS Geology theme: e.g. BEDROCK, SUPERFICIAL
LEX_RCS	The two-part code, LEX & RCS, used to label the geological units in BGS Geology data: e.g. PNG-MDST
LEX_RCS_D	Description of the two-part code above giving the name and the lithology of the unit: e.g. Penarth Group-Mudstone
LEX	Lexicon (or LEX) code. First part of the LEX_RCS label. Up to 5 characters (mostly letters). An abbreviation of the rock unit or deposit as listed in the BGS Lexicon of Named Rock Units: e.g. LI
LEX_D	Description of the Lexicon code above giving the name of the unit: e.g. LIAS GROUP is the full name of the unit coded as LI
RCS	The RCS code (or an abbreviation for the string of RCS codes given in full in RCS_X)

RCS_X	RCS codes. An alternative code abbreviation (or a string of such codes joined by + signs with square brackets used for subordinate types), each up to 6 characters, for the type of rock or lithology as based on the hierarchical BGS Rock Classification Scheme (RCS): e.g. MDST + LMST
RCS_D	Description of the RCS code(s) above giving the lithology of the unit: e.g. MUDSTONE and LIMESTONE
RANK	Rank of the unit in the lithostratigraphical or lithodemic hierarchy: e.g. GROUP
PARENT_DESC	Name of the 'parent' unit of greater rank, where applicable: e.g. Blue Lias Formation
MB_EQ_D	Name at member level, where applicable.
FM_EQ_D	Name at formation level, where applicable
SUBGP_EQ_D	Name at subgroup level, where applicable
GP_EQ_D	Name at group level, where applicable
MAX_TIME_Y	Maximum age (in years), of the oldest time division in which the geological unit was formed: e.g. 170300000
MIN_TIME_Y	Minimum age (in years), of the youngest time division in which the geological unit was formed: e.g. 163500000
MAX_TIME_D	Maximum or oldest age of the unit, to the most accurate time (or geochronological) division possible: e.g. ALBIAN
MIN_TIME_D	Minimum or youngest age of unit, to the most accurate time (or geochronological) division possible: e.g. APTIAN
MAX_AGE	Maximum age. Name of the age of maximum geochronological time applicable: e.g. RYAZANIAN
MAX_EPOCH	Maximum epoch. Name of the epoch of maximum geochronological time applicable: e.g. CARADOC
MAX_PERIOD	Maximum period. Name of the period of maximum geochronological time applicable: e.g. CARBONIFEROUS
MAX_ERA	Maximum era. Name of the era of maximum geochronological time applicable: e.g. PALAEOZOIC
MAX_EON	Maximum eon. Name of the eon of maximum geochronological time applicable: e.g. PROTEROZOIC
MIN_AGE	Minimum age. Name of the age of minimum geochronological time applicable: e.g. BARREMIAN
MIN_EPOCH	Minimum epoch. Name of the epoch of minimum geochronological time applicable: e.g. ASHGILL
MIN_PERIOD	Minimum period. Name of the period of minimum geochronological time applicable: e.g. PERMIAN
MIN_ERA	Minimum era. Name of the era of minimum geochronological time applicable: e.g. MESOZOIC
MIN_EON	Minimum eon. Name of the eon of minimum geochronological time applicable: e.g. PHANEROZOIC
PREV_NOM	Previous name for lexicon code due to pending updates.
LEX_WEB	The LEX_WEB link provides a direct hyperlink to the definition of the particular geological unit in the BGS Lexicon of Named Rock Units: e.g. http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=PNG
RCS_WEB	The RCS_WEB link provides a direct hyperlink to the definition of the particular type of rock or lithology as based on the BGS Rock Classification Scheme (RCS): e.g. https://webapps.bgs.ac.uk/bgsrcs/rcs_details.cfm?code=MDST
BGSREF	BGS reference colour for the polygon based on the LEX_ROCK code pair. The default printing colour defined as a 3-digit number:
RED	The equivalent red channel colour of the intended colour

GREEN	The equivalent green channel colour of the intended colour
BLUE	The equivalent blue channel colour of the intended colour
HEX	The equivalent HEXadecimal value of the intended colour
NOM_SCALE	Nominal scale used to prepare the digital data: e.g. 10000. Also gives an indication of scale-dependant accuracy
DATASET	Official name of the dataset
VERSION	Version of the digital data. The version number is changed when a new dataset is released following major changes

Table 3 - Names and their descriptions of the attribute table fields of the linear features in the *Structural Geology* layer of the BGS Seabed Geology 10k: Bristol Channel (v.2).

Field name	Description
BGS_ID	Unique ID for each polyline
BGSTYPE	The BGS Geology theme, it can be FAULT or FOLD AXIS
FEATURE_D	Description of the geological feature e.g. Axial plane trace of an anticline
NOM_SCALE	Nominal scale used to prepare the digital data: e.g. 10000. Also gives an indication of scale-dependant accuracy
DATASET	Official name of the dataset
VERSION	Version of the digital data. The version number is changed when a new dataset is released following major changes

Table 4 - Names and their descriptions of the attribute table fields of the linear features in the *Geomorphology* layer of the BGS Seabed Geology 10k: Bristol Channel (v.2).

Field name	Description
BGS_ID	Unique ID for each polyline
BGSTYPE	Geological theme, it can be MORPHOLOGICAL or GEOMORPHOLOGICAL
FEATURE_D	Description of seabed feature type: e.g. Bedform (Crestline)
MORPH_FEAT	Description of the feature according to its morphologic type, regardless of the geological process: e.g. Crestline of a ridge
MORPH_ATTR	Description of any particular morphological attribute: e.g. elongated
MORPH_TYP	Type of morphology: e.g., Lineament
ASSOC_REL	Associated relief: e.g. Bathymetric high, Slope inflexion
ORIG_ENV	The original environment represents the geological setting contemporaneous of the development of the seabed feature e.g. Marine, Glacial
FEATURE_C	Type of class of geomorphological features according to the geological process that formed the feature, when known e.g. Current-induced bedform
NOM_SCALE	Nominal scale used to prepare the digital data: e.g. 10000. Also gives an indication of scale-dependant accuracy
DATASET	Official name of the dataset

VERSION	Version of the digital data. The version number is changed when a new dataset is released following major changes

4.4 DATA FORMAT

The BGS Seabed Geology 10k: Bristol Channel (v.2) data are in vector format and comprise seven geospatial data layers: one *Substrate Geology* layer (comprised of polygons), two *Structural Geology* layers (comprised of polylines) and four *Geomorphology* layers (two comprised of polygons, one comprised of polylines and one comprised of points).

They are released in ESRI shapefile format. Other vector formats are available on request. More specialised formats may be available but may incur additional processing costs. Please email BGS Enquiries (enquiries@bgs.ac.uk) to request further information.

4.5 DATASET HISTORY

The BGS Seabed Geology 10k: Bristol Channel dataset was created in 2022. This version (v.2) update was created in 2025.

4.6 DISPLAYING THE DATA

It is recommended that the Substrate Geology layer should be displayed based on the "LEX_RCS" field in the attribute table (Table 5) whereas, the Structural Geology layer and Geomorphology layers should be displayed based on "FEATURE_D" (Tables 6 to 9). The "LEX_RCS" field provides an abbreviation of the rock or deposit unit as listed in the BGS Lexicon of Named Rock Units and the type of rock (lithology) or sediment according to the hierarchical BGS Rock Classification Scheme. The "FEATURE_D" field provides a description of the geological feature delineated. The Structural Geology and the Geomorphology layers should display above the Seabed Substrate layer, to allow the best visualisation and clarity of the map objects.

Table 5 - Colour symbology intended for the *Seabed Substrate* layer based on field "LEX_RCS".

ABM-MDST	224	176	224	#E0B0E0	
AVO-LSMD	176	201	201	#B0C9C9	
BDS-STMD	201	117	84	#C97554	
BISHM-MDSS	237	255	176	#EDFFB0	
CHAM-LSMD	237	117	201	#ED75C9	
CL-LMST	148	255	224	#94FFE0	
CL-LSSM	148	255	224	#94FFE0	
DEVC-ROCK	148	237	237	#94EDED	
DEV-MFIRSA	201	117	148	#C97594	

DYBN-MDSL	255	84	0	#FF5400	
HASA-SDST	237	54	117	#ED3675	
INO-LMST	255	148	0	#FF9400	
LI-ROCK	201	148	148	#C99494	
LUDL-SDST	148	176	237	#94B0ED	
LVN-MDST	255	176	148	#FFB094	
MIH-ARSD	255	148	148	#FF9494	
MMG-MDSC	255	148	148	#FF9494	
PEMB-LMST	148	255	176	#94FFB0	
PNG-MDST	237	117	117	#ED7575	
PO-LSMD	237	224	224	#EDE0E0	
SES-SDST	237	224	201	#EDE0C9	
STM-LSMD	237	237	224	#EDEDE0	
SWLCM-MDSS	224	224	224	#E0E0E0	
TRIA-BREC	255	117	54	#FF7536	
MDU-M	0	117	0	#007500	
MDU-S	255	255	0	#FFFF00	
MDU-V	176	117	0	#B07500	
MDU-XSM	148	224	0	#94E000	
MDU-XSV	255	201	0	#FFC900	
MDU-XVSM	224	201	176	#E0C9B0	

Table 6 - Symbology intended for the *Structural Geology* layers based on field “FEATURE_D”.

FEATURE_D	Symbol
Fault at rockhead	

Fault thrust observed on hanging wall side	
Axial plane trace of an anticline	
Axial plane trace of a syncline	

Table 7 - Symbology intended for the *Geomorphology points* layer based on field "FEATURE_D".

FEATURE_D	Symbol
Artificial mound	
Wreck	

Table 8 - Symbology intended for the *Geomorphology* lines layer based on field "FEATURE_D".

FEATURE_D	Symbol
Bedform (crestline)	
Concave break of slope	
Convex break of slope	
Current induced bedform	
Negative lineament	
Palaeochannel (thalweg)	
Palaeoshoreline	
Pipeline or cable mark (centreline)	
Positive lineament	
Ridge (crestline)	
Sediment bank (crestline)	

Table 9 - Symbology intended for the *Geomorphology polygon* layers based on field "FEATURE_D".

Anthropogenic debris	

Bedform scour	
Depression	
Excavated trench	
Coastal Platform	
Ridge	
Sediment bank	
Sediment drift	
Megaripples field	
Sediment waves and megaripples field	
Sediment waves field	

5 Limitations

5.1 DATA CONTENT

The BGS Seabed Geology 10k: Bristol Channel (v.2) portrays the distribution of the different types of bedrock and unconsolidated superficial deposits and also includes the distribution of the main seabed morphological features and structural features observed at rockhead. Some features, such as bedforms crests will be identified by only a subset of selective, representative digitisation. The mapping, description and classification of the seabed geology are based upon the interpretations and evidence available at the time.

5.2 SCALE

This digital map at 1:10 000 scale is generalised and the geological interpretation should be used only as a guide to the geology at a local level, not as a site-specific geological plan based on detailed site investigations. Do not over-enlarge the data; for example, do not use 1:10 000 nominal scale data at 1:5 000 working scale.

5.3 ACCURACY/UNCERTAINTY

Linework provided within this digital map has been interpreted from multibeam bathymetry data, with a grid cell size of 4 m, and a working scale of 1:10 000. It is not possible to provide a consistent level of accuracy for all objects in a geological map. For example, a sharp geological boundary will be captured with greater accuracy (and precision), than a conceptual, gradational boundary.

The Seabed Geomorphology layer inherently supports finer-scale mapping that the substrate mapping as linework and boundaries are based only on seabed morphology (i.e. high-resolution bathymetry). There is greater uncertainty with the Substrate Geology layer, as while boundaries and classification are informed by the high-resolution bathymetry and backscatter data, interpretation is also based on discontinuous sub-surface and further seabed data with lower, and sometimes disparate sample density (e.g., sediment cores, seismic data).

This is even more marked on geological maps of the seabed, based on the remote geophysical data and limited ground-truthing data. Marine in situ measurement techniques (e.g. grabs, cores and underwater video footage) reveal detailed information of the seabed substrate and provide, in general, an accurate representation of the local seabed. However, the seabed sampling that underpins this dataset was principally collected at a reconnaissance level and, therefore, the data could be several kilometres apart and may not always be sufficient to represent the sediment heterogeneity. Backscatter and texture analyse of the bathymetric data also indicate the boundaries between sediment types. However, it will depend heavily on the relationship between the different seabed substrates being mapped. For example, a sharp boundary separating two contrasting sediments types is likely to be more accurately mapped, with greater certainty than a diffuse or gradational boundary between two similar seabed substrates (e.g. sand and sand and gravel).

In addition, the user of this digital map should also be aware that it should be considered a “snapshot in time” of a transitory reality due to the high mobility of certain sedimentary deposits. Within the most dynamic areas, the spatial distribution of these deposits may change dramatically over time due to the local hydrodynamic regime, plus the seafloor may have been subjected to a range of anthropogenic disturbances (e.g. dredging of sediments).

5.4 DISCLAIMER

The use of any information provided by the British Geological Survey (‘BGS’) is at your own risk. Neither BGS nor the Natural Environment Research Council (NERC) or UK Research and Innovation (UKRI) gives any warranty, condition or representation as to the quality, accuracy or completeness of the information or its suitability for any use or purpose. All implied conditions relating to the quality or suitability of the information, and all liabilities arising from the supply of the information (including any liability arising in negligence) are excluded to the fullest extent permitted by law. No advice or information given by BGS, NERC, UKRI or their respective employees or authorised agents shall create a warranty, condition or representation as to the quality, accuracy or completeness of the information or its suitability for any use or purpose.

6 Frequently asked questions

Q: What does this dataset show?

A: The BGS Seabed Geology 10k: Bristol Channel (v.2 digital map products comprise three complimentary components: 1) Substrate Geology, showing the distribution of Bedrock and Superficial geological units interpreted to be present within the top 1 m below seabed; 2) Structural Geology, delineating the principle structural features such as faults and folds observed at rockhead; and 3) Seabed Geomorphology, classifying the physical morphology and interpreted geomorphic character of the seabed.

Q: What are the different colours on the map for?

A: The different colours are to show the different rock units and types of seabed substrate, as listed in the BGS Lexicon of Named Rock Units.

Q: How accurate is this dataset?

A: The geological interpretation that was undertaken to create this map was done to be viewed at a scale of 1:10 000 scale. Users should be aware that geological maps are a compilation of inferred features. It is not possible to provide a consistent level of accuracy for all objects in a geological map. Further details about the accuracy of this dataset are provided in the 'Limitations' section of this report.

Q: How often will this dataset be updated?

A: As more multibeam datasets became available in the area, future versions of this dataset are likely to expand its geographic coverage. However, dates for new version releases are, as yet, undetermined. BGS will contact licence holders with information on future releases of this dataset once they become available.

Q: Where can I get digital data?

A: This dataset is licenced from BGS, subject to certain standard terms and conditions. However, an increasing number are available for view or download. Many products also offer sample data downloads and user guides to help you decide if the data is suitable for you.

Q: In what formats can these data be provided?

A: This is available in a range of GIS formats, including ArcGIS (.shp), ArcInfo Coverages and MapInfo (.tab). More specialised formats may be available but may incur additional processing costs. Please email BGS Enquiries (enquiries@bgs.ac.uk) to request further information.

Q: I don't have a GIS. Can I still view the data?

A: Yes! Our Offshore Map Viewer is a good place to start. It is an online data and GIS service that covers a very wide range of marine geoscience research.

Q: Can I use this dataset as part of a commercial application?

A: Please refer to the licencing terms supplied alongside the dataset. For further queries regarding the licencing terms of our products, please contact digitaldata@bgs.ac.uk.

Q: I think the geology map might be wrong. What can I do?

A: We make every effort to ensure that our digital data reflects our best understanding of the geology of the Bristol Channel. Sometimes our interpretations need to be revised as new evidence (such as new multibeam data) are obtained and simple errors sometimes get through our quality assurance procedures. We are currently working on a web service to improve notifications of errors that have been found and corrected; we hope to make this available soon. If you think you have spotted a problem with our datasets please let us know.

7 References

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Glossary

Jargon	Explanation
ArcGIS	Geographic Information System (GIS) software for working with maps and geographic information maintained by the Environmental Systems Research Institute (ESRI).
Attribute	Named property of an entity. Descriptive information about features or elements of a database. For a database feature like census tract, attributes might include many demographic facts including total population, average income, and age. In statistical parlance, an attribute is a variable, whereas the database feature represents an observation of the variable.
Backscatter data	Data that was acquired with a sonar system capable of measuring the intensity of the return acoustic signal (echo) backscattered by the seafloor. The intensity of the return signal results from a complex combination of acoustic and geophysical processes, accounting for both transmitting and recording electronics of the sonar and intricate physical phenomenon occurring both in the water column and at the seafloor. New methods of analysing backscatter data have increased its potential for seabed characterisation.
Bathymetry	The measurement of the water depth in oceans, seas, or lakes over an area of seabed. In other words, bathymetry is the underwater equivalent to topography.

Bedrock	The main mass of rocks forming the earth, laid down prior to 2.588 million years ago. Present everywhere, whether exposed at the surface in rocky outcrops or concealed beneath superficial deposits, artificial ground or water. Formerly called solid.
Epoch	Geological unit of time during which a rock series is deposited. It is a subdivision of a geological period.
ESRI	Environmental Systems Research Institute (ESRI) is an international supplier of Geographic Information System (GIS) software, web GIS and geodatabase management applications.
Geophysical data	Data that has been acquired by recording and analysing measurements of the Earth's physical properties, such as electrical, gravity, magnetic, radioactivity and seismic properties.
Geospatial data	Data that has a geographical component to it. This means that the records in a dataset have locational information directly linked to them, such as geographic data in the form of coordinates, address, city, or postcode.
Lexicon	Vocabulary defining rock names, the BGS Lexicon of Named Rock Units database provides BGS definitions of terms that appear on our maps and in our publications. https://www.bgs.ac.uk/lexicon/home.html
Lithological units	A rock identifiable by its general characteristics of appearance colour, texture and composition defined by the distinctive and dominant, easily mapped and recognizable petrographical or lithological features that characterize it.
Lithology	Rocks maybe defined in terms of their general characteristics of appearance: colour, texture and composition. Some lithologies may require a microscopical or chemical analysis for the latter to be fully determined.
Lithostratigraphy	Age and lithology. Many rocks are deposited in layers or strata and the sequence of these strata can be correlated from place to place. These sequences of different rock types are used to establish the changing geological conditions or the geological history of the area over time. The description, definition and naming of these layered or stratified rock sequences is termed lithostratigraphy (rock stratigraphy). Lithostratigraphy is fundamental to most geological studies. Rock units are described using their gross compositional or lithological characteristics and named according to their perceived rank (order) in a formal hierarchy. The main lithostratigraphical ranks in this hierarchy are Bed (lowest)>Member,>Formation>Subgroup>Group>Supergroup (highest). The units are usually named after a geographical locality, typically the place where exposures were first described.
Multibeam data	Data that was acquired with a multibeam echosounder. This type of sonar system emits sound waves in a fan shape. Multibeam systems acquire both bathymetry (depth) and backscatter (intensity) data. The amount of time taken for the sound waves to bounce off the seabed and return to a

	receiver is used to determine water depth. Whereas, the return intensity (i.e. how much of a transmitted acoustic signal is bounced back) reflects the nature of the seabed and can be used to determine the type of material or sediment on the seafloor.
Polygon	Polygons are a representation of areas. A polygon is defined as a closed line or perimeter completely enclosing a contiguous space and is made up of one or more links.
Scale	The relation between the dimensions of features on a map and the geographic objects they represent on the Earth, commonly expressed as a fraction or a ratio. A map scale of 1/100,000 or 1:100,000 means that one unit of measure on the map equals 100,000 on the earth.
Sedimentary	Rocks that originated from the broken up, or dissolved and re-precipitated, particles of other rocks. Examples include claystone, mudstone, siltstone, shale, sandstone, limestone and conglomerate. Sedimentary rocks cover more than two-thirds of the Earth's surface. They are formed from the weathering and erosion products of rock material, which have been transported (usually by water or wind), redeposited and later lithified.
Sediments	Mud, sand, gravel, boulders, bioclastic material (shells, plants), and other matter carried and deposited by water, wind, or ice.
Shapefile	The shapefile format is a geospatial vector data format for geographic information system software. It is developed and regulated by ESRI as a mostly open specification for data interoperability among ESRI and other GIS software products.
Superficial	The youngest geological deposits formed during the most recent period of geological time, the Quaternary. They range in age from about 2.6 million years ago to the present.
Vector	A representation of the spatial extent of geographic features using geometric elements (such as point, curve, and surface) in a coordinate space.