INSPIRE
Infrastructure for Spatial Information in Europe

D2.8.III.16 Data Specification on Sea Regions – Draft Guidelines

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Foreword
How to read the document?

This document describes the *"INSPIRE data specification on Sea Regions – Guidelines"* version 2.0 as developed by the Thematic Working Group (TWG) *Oceanographic geographical features / Sea regions* using both natural and a conceptual schema language. This version is now available for the public consultation. Based on the results of the consultation (received comments and the testing reports), the final version 3.0 will be prepared by the TWGs.

The data specification is based on a common template used for all data specifications and has been harmonised using the experience from the development of the Annex I data specifications.

This document provides guidelines for the implementation of the provisions laid down in the draft Implementing Rule for spatial data sets and services of the INSPIRE Directive.

This document includes two executive summaries that provide a quick overview of the INSPIRE data specification process in general, and the content of the data specification on *Sea Regions* in particular. We highly recommend that managers, decision makers, and all those new to the INSPIRE process and/or information modelling should read these executive summaries first.

The UML diagrams (in Chapter 5) offer a rapid way to see the main elements of the specifications and their relationships. The definition of the spatial object types, attributes, and relationships are included in the Feature Catalogue (also in Chapter 5). People having thematic expertise but not familiar with UML can fully understand the content of the data model focusing on the Feature Catalogue. Users might also find the Feature Catalogue especially useful to check if it contains the data necessary for the applications that they run. The technical details are expected to be of prime interest to those organisations that are/will be responsible for implementing INSPIRE within the field of *Sea Regions.*

The technical provisions and the underlying concepts are often illustrated by examples. Smaller examples are within the text of the specification, while longer explanatory examples and descriptions of selected use cases are attached in the annexes.

In order to distinguish the INSPIRE spatial data themes from the spatial object types, the INSPIRE spatial data themes are written in *italics.*

The document will be publicly available as a 'non-paper'. It does not represent an official position of the European Commission, and as such cannot be invoked in the context of legal procedures.

Interoperability of Spatial Data Sets and Services – General Executive Summary

The challenges regarding the lack of availability, quality, organisation, accessibility, and sharing of spatial information are common to a large number of policies and activities and are experienced across the various levels of public authority in Europe. In order to solve these problems it is necessary to take measures of coordination between the users and providers of spatial information. The Directive 2007/2/EC of the European Parliament and of the Council adopted on 14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment.

INSPIRE will be based on the infrastructures for spatial information that are created and maintained by the Member States. To support the establishment of a European infrastructure, Implementing Rules addressing the following components of the infrastructure are being specified: metadata, interoperability of spatial data themes (as described in Annexes I, II, III of the Directive) and spatial data services, network services and technologies, data and service sharing, and monitoring and reporting procedures.

INSPIRE does not require collection of new data. However, after the period specified in the Directive[1] Member States have to make their data available according to the Implementing Rules.

Interoperability in INSPIRE means the possibility to combine spatial data and services from different sources across the European Community in a consistent way without involving specific efforts of humans or machines. It is important to note that "interoperability" is understood as providing access to spatial data sets through network services, typically via Internet. Interoperability may be achieved by either changing (harmonising) and storing existing data sets or transforming them via services for publication in the INSPIRE infrastructure. It is expected that users will spend less time and efforts on understanding and integrating data when they build their applications based on data delivered within INSPIRE.

In order to benefit from the endeavours of international standardisation bodies and organisations established under international law their standards and technical means have been utilised and referenced, whenever possible.

To facilitate the implementation of INSPIRE, it is important that all stakeholders have the opportunity to participate in specification and development. For this reason, the Commission has put in place a consensus building process involving data users, and providers together with representatives of industry, research and government. These stakeholders, organised through Spatial Data Interest Communities (SDIC) and Legally Mandated Organisations (LMO)[2], have provided reference materials, participated in the user requirement and technical[3] surveys, proposed experts for the Data Specification Drafting Team[4] and Thematic Working Groups[5].

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[1] For all 34 Annex I,II and III data themes: within two years of the adoption of the corresponding Implementing Rules for newly collected and extensively restructured data and within 5 years for other data in electronic format still in use

[2] Number of SDICs and LMOs on 8/6/2011 was 461 and 249 respectively

[3] Surveys on unique identifiers and usage of the elements of the spatial and temporal schema,

[4] The Data Specification Drafting Team has been composed of experts from Austria, Belgium, Czech Republic, France, Germany, Greece, Italy, Netherlands, Norway, Poland, Switzerland, UK, and the European Environmental Agency

[5] The Thematic Working Groups of Annex II and III themes have been composed of experts from Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, Turkey, UK, the European Commission, and the European Environmental Agency

This open and participatory approach was successfully used during the development of the data specification on Annex I data themes as well as during the preparation of the Implementing Rule on Interoperability of Spatial Data Sets and Services[6] for Annex I spatial data themes.,

The development framework elaborated by the Data Specification Drafting Team aims at keeping the data specifications of the different themes coherent. It summarises the methodology to be used for the data specifications and provides a coherent set of requirements and recommendations to achieve interoperability. The pillars of the framework are four technical documents:

- The Definition of Annex Themes and Scope[7] describes in greater detail the spatial data themes defined in the Directive, and thus provides a sound starting point for the thematic aspects of the data specification development.

- The Generic Conceptual Model[8] defines the elements necessary for interoperability and data harmonisation including cross-theme issues. It specifies requirements and recommendations with regard to data specification elements of common use, like the spatial and temporal schema, unique identifier management, object referencing, a generic network model, some common code lists, etc. Those requirements of the Generic Conceptual Model that are directly implementable will be included in the Implementing Rule on Interoperability of Spatial Data Sets and Services.

- The Methodology for the Development of Data Specifications[9] defines a repeatable methodology. It describes how to arrive from user requirements to a data specification through a number of steps including use-case development, initial specification development and analysis of analogies and gaps for further specification refinement.

- The "Guidelines for the Encoding of Spatial Data"[10] defines how geographic information can be encoded to enable transfer processes between the systems of the data providers in the Member States. Even though it does not specify a mandatory encoding rule it sets GML (ISO 19136) as the default encoding for INSPIRE.

Based on these framework documents and following the successful development of the Annex I Data specifications (Technical Guidelines) and the Implementing Rules, the new Thematic Working Groups have created the INSPIRE data specification for each Annex II and III theme. These documents – at the version 2.0 – are now publicly available for INSPIRE stakeholders for consultation. The consultation phase covers expert review as well as feasibility and fitness-for-purpose testing of the data specifications.

The structure of the data specifications is based on the "ISO 19131 Geographic information - Data product specifications" standard. They include the technical documentation of the application schema, the spatial object types with their properties, and other specifics of the spatial data themes using natural language as well as a formal conceptual schema language[11].

A consolidated model repository, feature concept dictionary, and glossary are being maintained to support the consistent specification development and potential further reuse of specification elements. The consolidated model consists of the harmonised models of the relevant standards from the ISO 19100 series, the INSPIRE Generic Conceptual Model, and the application schemas[12] developed for

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[6] Commission Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services, published in the Official Journal of the European Union on 8th of December 2010.

[7] *http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.3_Definition_of_Annex_Themes_and_scope_v3.0.pdf*

[8] *http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.5_v3.3.pdf*

[9] *http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.6_v3.0.pdf*

[10] *http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.7_v3.2.pdf*

[11] UML – Unified Modelling Language

[12] Conceptual models related to specific areas (e.g. INSPIRE themes)

each spatial data theme. The multilingual INSPIRE Feature Concept Dictionary contains the definition and description of the INSPIRE themes together with the definition of the spatial object types present in the specification. The INSPIRE Glossary defines all the terms (beyond the spatial object types) necessary for understanding the INSPIRE documentation including the terminology of other components (metadata, network services, data sharing, and monitoring).

By listing a number of requirements and making the necessary recommendations, the data specifications enable full system interoperability across the Member States, within the scope of the application areas targeted by the Directive. They will be published (version 3.0) as technical guidelines and will provide the basis for the content of the Amendment of the Implementing Rule on Interoperability of Spatial Data Sets and Services for data themes included in Annex II and III of the Directive. The Implementing Rule Amendment will be extracted from the data specifications keeping in mind short and medium term feasibility as well as cost-benefit considerations. The Implementing Rule will be legally binding for the Member States.

In addition to providing a basis for the interoperability of spatial data in INSPIRE, the data specification development framework and the thematic data specifications can be reused in other environments at local, regional, national and global level contributing to improvements in the coherence and interoperability of data in spatial data infrastructures.

Sea Regions – Executive Summary

The INSPIRE Sea Region theme describes what most users would refer to as “the sea”. It allows for the concept of named seas e.g. Black Sea and for subdivsisions and aggregation of seas according to a range of physical or chemical properties. This inlcudes the sea bed and sea surface. Importantly it also provides common definitions for concepts such as ‘shoreline’.

A Sea Region may seem to be a simple and obvious INSPIRE theme to define as the concept is well known to European citizens. However, when attempts were made to model Sea Regions its was discovered than many overlaps exist between Sea Region and other INSPIRE Themes, notable the other marine theme ‘Oceanographic Geographicical Features’. In the first instance it is therefore important to distinguish between SR and OF. The TWG found a number of difficulties with this definition in D2.3 (Definition of Themes and Scope) and therefore proposed the following definition to resolve any ambiguity.

> “Sea Region is a defined area of common (physical) characteristics. An Oceanographic Geographical Feature represents the (physical or chemical) properties of the Sea Region. A Sea Region may have other properties that are not an Ocean Feature, for example bathymetry (Elevation theme) and properties of the sea bed.” A Sea Region will typically be represented as a vector dataset whereas an Ocean Feature will be a grid dataset or other coverage type”.

The key relationships between SR and other INSPIRE themes are summarised as:

- *‘Located In’* Another INSPIRE theme could represent features physically located in a Sea Region. For example a transport network (shipping lane) is located in a Sea Region
- *‘Specialisation Of’* Another INSPIRE theme could represent features that are a specialisation of the general Sea Region type. Many of these features are not geometrically different to Sea Regions, e.g. a Marine Protected Area is a Sea Region with addition rules defining its extent based on legislation
- *‘Property Of’* Another INSPIRE theme could represent features that are properties of the Sea Region in some respect. Ocean Geographical Features and Elevation are key examples of this.

Grouping these relationships in this way is a useful approach to aid understanding, but there is also a practical question that it raises. Many users will want to undertake queries based on these high-level relationships such as ‘Find me all Environmental Monitoring Facilities located in a SeaRegion’ or ‘find me all protected sites located in a SeaRegion’. This raises the question as to whether such relationships need to be explicitly modelled; after consideration its was decided that this should not be the case as it creates extra complexity that outweighs the convenience of the relationship.

There are five themes that are particularly important in their relationships to Sea Region and these are:

- Elevation (EL): A key property of the Sea Region in that it represents the depth of that Sea Region. It should be noted that although a SeaRegion area can vary with tidal extent, the depth can only be established by intersection with an EL dataset.
- Hydrography (HY): Categorises Sea Region types
- Geographic Names (GN): The GN model is used for the named Sea Regions
- Ocean Geographic Features (OF): Like the Elevation theme, Oceanographic Geographical Features are a key property of a Sea Region that will be used in many implementations
- Area Management / Restriction / Regulation Zones and Reporting Units (AM): Several of the specialisations of Sea Regions are Area Management or Reporting Units, i.e. areas of the sea established as reporting units because of their common physical/chemical characteristics. We have taken the approach that such specialisations are first and foremost Sea Regions.

- Administrative Units (AU): Several specialisations of Sea Regions are also Administrative Units that are neglected from the AU theme. Until a revision of the AU theme takes place we have included these feature types in the Sea Regions theme.

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1 Scope

This document specifies a harmonised data specification for the spatial data theme *Sea Regions* as defined in Annex III of the INSPIRE Directive.

This data specification provides the basis for the drafting of Implementing Rules according to Article 7 (1) of the INSPIRE Directive [Directive 2007/2/EC]. The entire data specification will be published as implementation guidelines accompanying these Implementing Rules.

2 Overview

2.1 Name

INSPIRE data specification for the theme Sea Regions.

2.2 Informal description

Definition:

"Physical conditions of seas and saline water bodies divided into regions and sub-regions with common characteristics."
[Directive 2007/2/EC]

Description:
"Sea Region is a defined marine area of common physical and/or chemical characteristics. A Sea Region will contain Oceanographic Geographical Features (Annex III) that represents the precise physical or chemical properties of the Sea Region. A Sea Region may have other properties that are not an Oceanographic Geographical Feature, for example bathymetry (Elevation theme - Annex II) and shipping lanes (Transport theme – Annex I). A Sea Region will be a vector dataset and not be represented as a 'coverage' (ISO 19126) where as an Oceanographic Geographical Feature will."

2.2.1 Concept and Scope

A Sea Region is a **2D geometry** of an area that is covered by an ocean, sea or similar salt water body. Its boundaries are attributed to physical or chemical processes, for example:

- Salinity (distance inland for a river)
- Current circulation
- Land mass boundaries
- Depth (shelf sea, intertidal areas, abyss)
- Sea bed cover (e.g. sand) or sea surface cover (e.g. ice)
- In theory any physical or chemical basis can be used **provided** there is a rule or convention for its use and establishment.

A Sea Region has some **temporal aspects** and seasonal variations, notably tides (MHWS, MLWS, MHWN, MLWN) which vary the extent of the Sea Region and it can be covered for all or part of the time such as sea ice. Although a Sea Region class can be specifically associated with the surface or bed of the sea, there is no explicit 'z' coordinate associated with them.

Where possible and practical, the Sea Region specification is based on features defined by the International Hydrographic Organisation (IHO), in particular by the IHO S-57 standard. These features

are routinely used in member states in the form of nautical navigation charts and there is an existing governance structure in place for their maintenance and update.

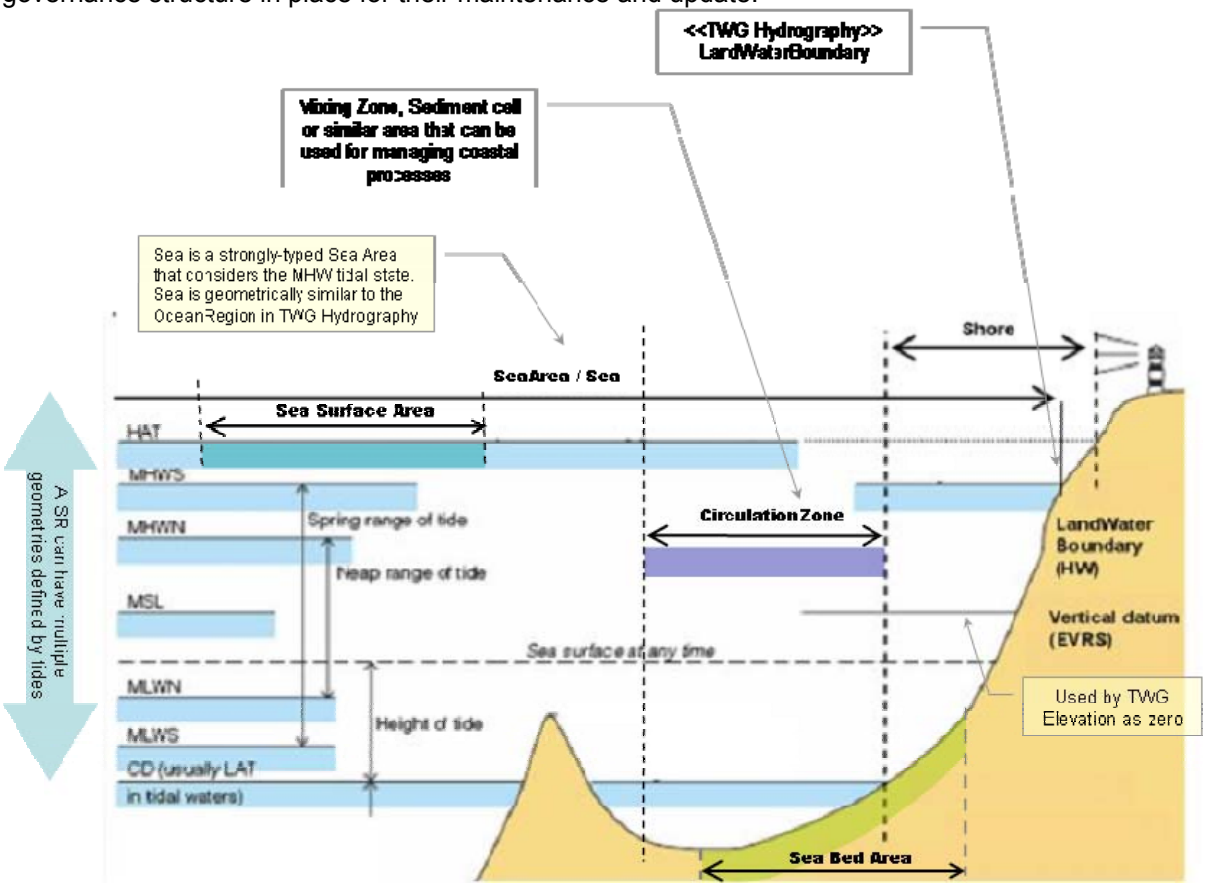


Figure 1 Sea Region types and extent for different tidal states (adapted from IHO H20)

2.2.1.1. Examples of Sea Regions

Based on the above scope, the following are examples of Sea Regions

- "North Sea" (i.e. any common-usage named sea or ocean)
  - A water body with an identified boundaries based on land and/or common circulation patterns around the sea
- "Sediment Cell"
  - A water body where the net sediment budget is (close to) zero, typically used for coastal erosion management.
- "Circulation Cell"
  - A water body which is the fate for all pollutants entering the water body, typically used for coastal water quality management for example in the Water Framework Directive
- "Seabed Area"
  - Any area of sea characterised by common seabed coverage or depth (e.g. Dogger Bank).
- "Exclusive EconomicZone" (UNCLOS)[13]
  - An administrative area recognised by the United Nations, based on the offshore extent from a low tidal boundary

2.2.1.2. What a Sea Region is not

A Sea Region is NOT

- anything with boundaries that not based or linked to physical or chemical conditions such as Marsden Squares used by ICES
- The bathymetry (depth of the sea)

[13] This is included in Sea Regions a this stage. This concept will be moved to Administrative Units during the revision of that specification.

- An Ocean Feature such as 'temperature' or 'tidal currents' (but note, analysis of an Ocean Feature can define a Sea Region and Ocean Geographic Features will be properties of a Sea Region)

2.2.1.3. Use Case

The following use cases were used to help formulate the scope of the SeaRegions specification and are discussed in more detail in Annex B.

- LocatedIn Use Case
  This general use case is aimed at the user simply needing to understand whether an area or object is located in the marine environment:

  "Albert works for the European Environment Agency. He would like to understand which Protected Sites are located in the marine environment. To do this he would like to view a simple map of all the EU projected sites overlaid on the extent of the European marine areas. As an extension to this query he would like to understand which of these Protected Sites are fully immersed and those that are covered by water as part of the tidal cycle."

- Flooding Use Case
  Flood Risk Management was suggested as cross-theme use case. In this respect the Sea Regions TWG considered the role of Sea Regions in flood risk management:

  "Maria works for ECWMF and is preparing a risk assessment of Europe to storm surges and coastal flood events. To calculate the risk she requires the extent of the highest probable water level around the European coastline".

- Water Framework Directive Use Case
  This use case is set to clarify the need of Sea Regions to support the Water Framework Directive. It can also be used for as a general pollution monitoring use case:

  "Miguel needs to construct a catchment model that starts at sea (sea region) and connects to a river networks. The Sea Region is a sink for the network. Miguel needs to be able to view which Sea Regions the catchment discharge into and what mechanisms are in place to monitor the quality of the water in this Sea Region (Environmental Monitoring Facilities Annex III)."

2.3 Normative References

[Directive 2007/2/EC] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

[ISO 19107] EN ISO 19107:2005, Geographic Information – Spatial Schema

[ISO 19108] EN ISO 19108:2005, Geographic Information – Temporal Schema

[ISO 19108-c] ISO 19108:2002/Cor 1:2006, Geographic Information – Temporal Schema, Technical Corrigendum 1

[ISO 19111] EN ISO 19111:2007 Geographic information - Spatial referencing by coordinates (ISO 19111:2007)

[ISO 19113] EN ISO 19113:2005, Geographic Information – Quality principles

[ISO 19115] EN ISO 19115:2005, Geographic information – Metadata (ISO 19115:2003)

[ISO 19118] EN ISO 19118:2006, Geographic information – Encoding (ISO 19118:2005)

[ISO 19123] EN ISO 19123:2007, Geographic Information – Schema for coverage geometry and functions

[ISO 19135] EN ISO 19135:2007 Geographic information – Procedures for item registration (ISO 19135:2005)

[ISO 19138] ISO/TS 19138:2006, Geographic Information – Data quality measures

[ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation

[OGC 06-103r3] Implementation Specification for Geographic Information - Simple feature access – Part 1: Common Architecture v1.2.0

NOTE This is an updated version of "EN ISO 19125-1:2006, Geographic information – Simple feature access – Part 1: Common architecture". A revision of the EN ISO standard has been proposed.

[Regulation 1205/2008/EC] Regulation 1205/2008/EC implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata

[Directive 2008/56/EC] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)

[Directive 2000/60/EC] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for community action in the field of water policy.

[IHO S-57] International Hydrographic Organization - Transfer Standard for Digital Hydrographic Data

[IHO S-100] International Hydrographic Organization – Universal Hydrographic Data Model

[IHO S-52] International Hydrographic Organization - Specifications for Chart Content and Display Aspects of ECDIS

2.4 Terms and definitions

General terms and definitions helpful for understanding the INSPIRE data specification documents are defined in the INSPIRE Glossary[14].

2.5 Symbols and abbreviations

[14] The INSPIRE Glossary is available from http://inspire-registry.jrc.ec.europa.eu/registers/GLOSSARY

2.6 Notation of requirements and recommendations

To make it easier to identify the mandatory requirements and the recommendations for spatial data sets in the text, they are highlighted and numbered.

IR Requirement X	Requirements that are reflected in the Implementing Rule on interoperability of spatial data sets and services are shown using this style.

DS Requirement X	Requirements that are not reflected in the Implementing Rule on interoperability of spatial data sets and services are shown using this style.

Recommendation 1 Recommendations are shown using this style.

2.7 Conformance

DS Requirement 1	Any dataset claiming conformance with this INSPIRE data specification shall pass the requirements described in the abstract test suite presented in Annex A.

3 Specification scopes

This data specification does not distinguish different specification scopes, but just considers one general scope.

NOTE For more information on specification scopes, see [ISO 19131:2007], clause 8 and Annex D.

4 Identification information

NOTE Since the content of this chapter was redundant with the overview description (section 2) and executive summary, it has been decided that this chapter will be removed in v3.0.

5 Data content and structure

IR Requirement 1	Spatial data sets related to the theme *Sea Regions* shall be provided using the spatial object types and data types specified in the application schema(s) in this section.

IR Requirement 2	Each spatial object shall comply with all constraints specified for its spatial object type or data types used in values of its properties, respectively.

Recommendation 1	The reason for a void value should be provided where possible using a listed value from the VoidValueReason code list to indicate the reason for the missing value.

NOTE The application schema specifies requirements on the properties of each spatial object including its multiplicity, domain of valid values, constraints, etc. All properties have to be reported, if the relevant information is part of the data set. Most properties may be reported as "void", if the data set does not include relevant information. See the Generic Conceptual Model [INSPIRE DS-D2.5] for more details.

5.1 Basic notions

This section explains some of the basic notions used in the INSPIRE application schemas. These explanations are based on the GCM [DS-D2.5].

5.1.1 Stereotypes

In the application schemas in this sections several stereotypes are used that have been defined as part of a UML profile for use in INSPIRE [INSPIRE DS-D2.5]. These are explained in Table 1 below.

Table 1 – Stereotypes (adapted from [INSPIRE DS-D2.5])

Stereotype	Model element	Description
applicationSchema	Package	An INSPIRE application schema according to ISO 19109 and the Generic Conceptual Model.
featureType	Class	A spatial object type.
type	Class	A conceptual, abstract type that is not a spatial object type.
dataType	Class	A structured data type without identity.
union	Class	A structured data type without identity where exactly one of the properties of the type is present in any instance.
enumeration	Class	A fixed list of valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list.
codeList	Class	A flexible enumeration that uses string values for expressing a list of potential values.
placeholder	Class	A placeholder class (see definition in section 5.1.2).
voidable	Attribute, association role	A voidable attribute or association role (see definition in section 5.1.3).
lifeCycleInfo	Attribute, association role	If in an application schema a property is considered to be part of the life-cycle information of a spatial object type, the property shall receive this stereotype.
version	Association role	If in an application schema an association role ends at a spatial object type, this stereotype denotes that the value of the property is meant to be a specific version of the spatial object, not the spatial object in general.

5.1.2 Placeholder and candidate types

Some of the INSPIRE Annex I data specifications (which were developed previously to the current Annex II+III data specifications) refer to types that thematically belong and were expected to be fully specified in Annex II or III spatial data themes. Two kinds of such types were distinguished:

- *Placeholder types* were created as placeholders for types (typically spatial object types) that were to be specified as part of a future spatial data theme, but which was already used as a value type of an attribute or association role in this data specification.

  Placeholder types received the stereotype «placeholder» and were placed in the application schema package of the future spatial data theme where they thematically belong. For each placeholder, a definition was specified based on the requirements of the Annex I theme. The Annex II+III TWGs were required to take into account these definitions in the specification work of the Annex II or III theme.

  If necessary, the attributes or association roles in the Annex I data specification(s) that have a placeholder as a value type shall be updated if necessary.

- *Candidate types* were types (typically spatial object types) for which already a preliminary specification was given in the Annex I data specification. Candidate types did not receive a specific stereotype and were placed in the application schema package of the future spatial data theme where they thematically belong. For each candidate type, a definition and attributes and association roles were specified based on the requirements of the Annex I theme. The Annex II+III TWGs were required to take into account these specifications in the specification work of the Annex II or III theme.

  If the type could not be incorporated in the Annex II or III data specification according to its preliminary specification, it should be moved into the application schema of the Annex I theme where it had first been specified. In this case, the attributes or association roles in the Annex I data specification(s) that have the type as a value type shall be updated if necessary.

Open issue 1: For all Annex II+III themes for which placeholders and candidate types were specified in an Annex I data specification, it should be clearly indicated in the data specification, how the placeholder and candidate types were taken into account. If the proposed solution would require any changes to an Annex I data specification (and the corresponding section in the IR for interoperability of spatial data sets and services), this should also be clearly indicated.

A thorough investigation of the implications of the proposed changes of candidate types (in particular related to requirements of Annex I maintenance) will have to be performed for v3.0 of the data specifications.

5.1.3 Voidable characteristics

If a characteristic of a spatial object is not present in the spatial data set, but may be present or applicable in the real world, the property shall receive this stereotype.

If and only if a property receives this stereotype, the value of *void* may be used as a value of the property. A *void* value shall imply that no corresponding value is contained in the spatial data set maintained by the data provider or no corresponding value can be derived from existing values at reasonable costs, even though the characteristic may be present or applicable in the real world.

It is possible to qualify a value of void in the data with a reason using the VoidValueReason type. The VoidValueReason type is a code list, which includes the following pre-defined values:

- *Unpopulated*: The characteristic is not part of the dataset maintained by the data provider. However, the characteristic may exist in the real world. For example when the “elevation of the water body above the sea level” has not been included in a dataset containing lake spatial

objects, then the reason for a void value of this property would be 'Unpopulated'. The characteristic receives this value for all objects in the spatial data set.
- *Unknown*: The correct value for the specific spatial object is not known to, and not computable by the data provider. However, a correct value may exist. For example when the "elevation of the water body above the sea level" *of a certain lake* has not been measured, then the reason for a void value of this property would be 'Unknown'. This value is applied on an object-by-object basis in a spatial data set.

NOTE It is expected that additional reasons will be identified in the future, in particular to support reasons / special values in coverage ranges.

The «voidable» stereotype does not give any information on whether or not a characteristic exists in the real world. This is expressed using the multiplicity:
- If a characteristic may or may not exist in the real world, its minimum cardinality shall be defined as 0. For example, an if an Address may or may not have a house number, the multiplicity of the corresponding property shall be 0..1.
- If at least one value for a certain characteristic exists in the real world, the minimum cardinality shall be defined as 1. For example, if an Administrative Unit always has at least one name, the multiplicity of the corresponding property shall be 1..*.

In both cases, the «voidable» stereotype can be applied. A value (the real value or void) only needs to be made available for properties that have a minimum cardinality of 1.

5.1.4 Code lists and Enumerations

5.1.4.1. Style

All code lists and enumerations use the following modelling style:
- No initial value, but only the attribute name part, is used.
- The attribute name conforms to the rules for attributes names, i.e. is a lowerCamelCase name. Exceptions are words that consist of all uppercase letters (acronyms).

5.1.4.2. Governance of code lists

Two types of code lists are defined in INSPIRE. These two types are distinguished using the tagged value "extendableByMS" in the UML data model:
- *Code lists that **may not** be extended by Member States.* For these code lists, the tagged value is set to "false". They shall be managed centrally in the INSPIRE code list register, and only values from that register may be used in instance data.
- *Code lists that **may** be extended by Member States.* For these code lists, the tagged value is set to "true".

5.2 Application schema Sea Regions

5.2.1 Description

5.2.1.1. Narrative description and UML Overview

The Sea Region package structure is shown below in Figure 2. A Sea Region comprises three packages; a mandatory core, a set of optional extension elements and an addendum package.

The core Sea Region package describes a Sea Region which is a type of HydroObject as described in the Annex1 theme Hydrology. This means that a Sea Region can clearly be identified as being related to 'water'. In Hydrology certain specialisations of Sea Region were suggested as directly inheriting

from HydroObject, however we suggest that this is not appropriate and that core specialisations of Sea Region should relate to a single parent class call *SeaArea*. The Extension package covers features that can be used to further classify a SeaArea according to a particular physical or chemical characteristic. The Addendum package covers candidate feature types for 'marine administrative units' to be included in a revision of Administrative Units (Annex 1).

Open issue 2: The feature type OceanRegion should be removed from the Hydrology theme and replaced with SeaRegion;;SeaArea instead

A detailed overview of the FeatureTypes contained within Sea Region packages is given in the following sections.

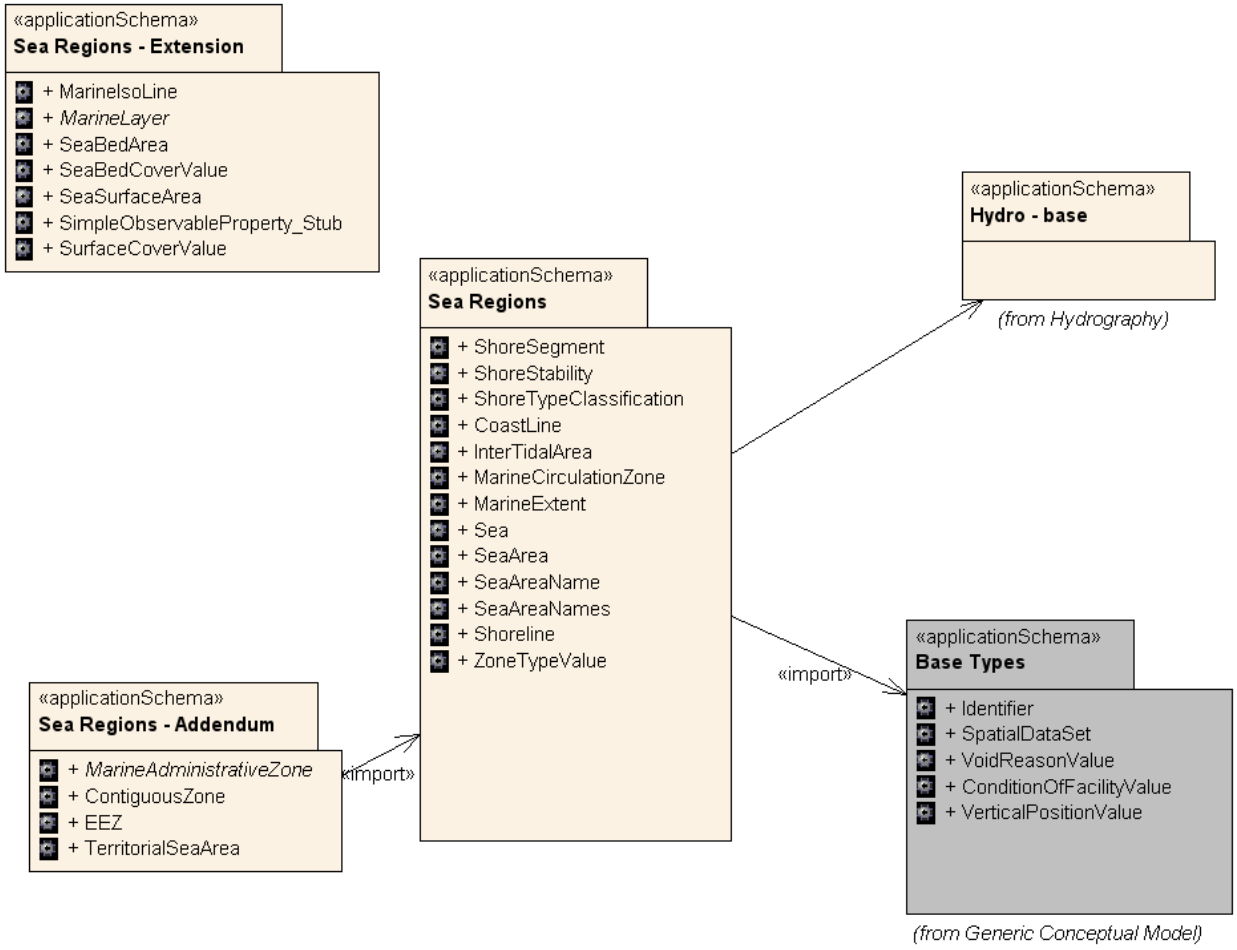


Figure 2 – UML package diagram: SeaRegions packages

Sea Region Core

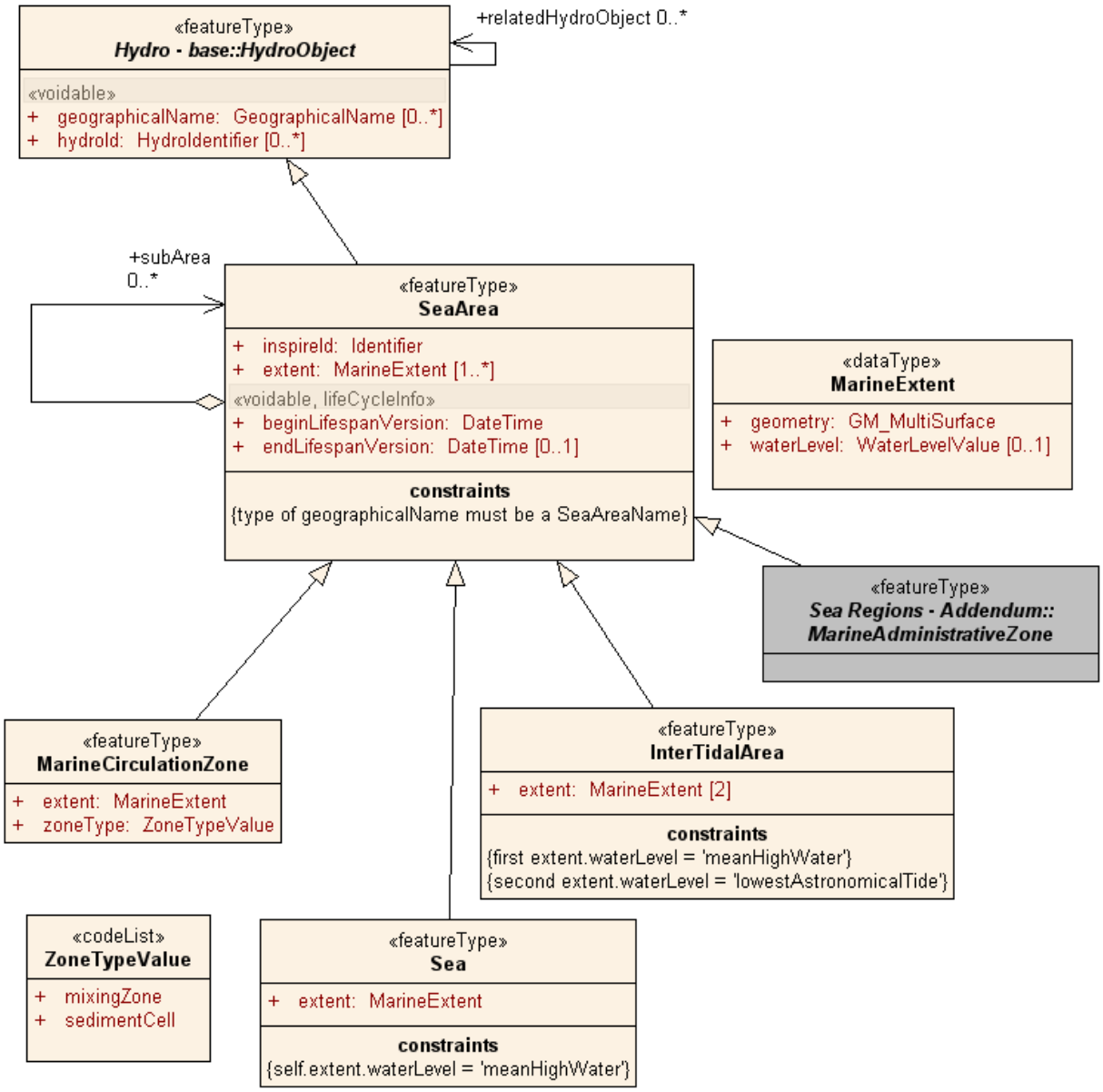


Figure 3 – UML class diagram: Overview of Sea Areas

SeaArea is the parent for core Sea Region types. It has a geometry described as a GM_MultiSurface, however a feature instance may contain multiple instances of this geometry to describe a Sea Region according to the tidal state. This is described by the MarineExtent dataType and its associated enumeration to different tidal states (WaterLevelValue). In many real world applications tidal affects make little difference to the geometry, however there a number of regions where these differences are very significant. Most Sea Region feature types are specialisations of the generic SeaArea parent, with particular rules defining the extents of the GM_MultiSurface. These rules are specified in various international conventions, agreements and legislation. A Sea Region may have associated Oceanographic Geographical Features describing such things as the temperature, salinity, currents or waves in that Sea Region but this is not expressly modelled.

SeaArea: A Sea Region at any of the enumerated tidal states. At least one tidal state is required. This allows for the definition of arbitrary Sea Regions, or Sea Regions with agreed definitions at a

particular tidal state. An example of where such a specialisation could be required is the extent of the North Sea at HAT for the purpose of flood hazard mapping.

Open issue 1: The codelists for SeaAreaNames is still to be finalised. It should be based on the recommendation of the MSFD. The expectation is that the list will be hierarchical.

Sea: A SeaArea with its extent at MHW. Sea will be the general case where users need a marine region to search within or view sea extents on a map.

MarineCirculationZone: are a further specialisation of SeaArea. Two examples have been identified in reference material: SedimentCell and mixingZone. These specialisations represent SeaAreas that may be used for the purpose of coastal erosion management and coastal water quality monitoring. As such they may be referred to by the Area Management and Reporting Unit theme, but this will not apply to all MarineCirculationZones.

Open issue 2: Feedback would be welcome on whether marine circulation zone should be specialised further.

InterTidalArea: is another specialisation of SeaArea used explicitly define the inter-tidal extent of a SeaArea. Inter-tidal area is defined as the area between the Mean High Water and Lowest Astronomical Tide (IHO reference). IntertidalArea is similar to the concept of 'Shore' in Hydrography. The same tidal extents are used however different geometries are used. Shore is proposed to be managed by the LandCover theme.

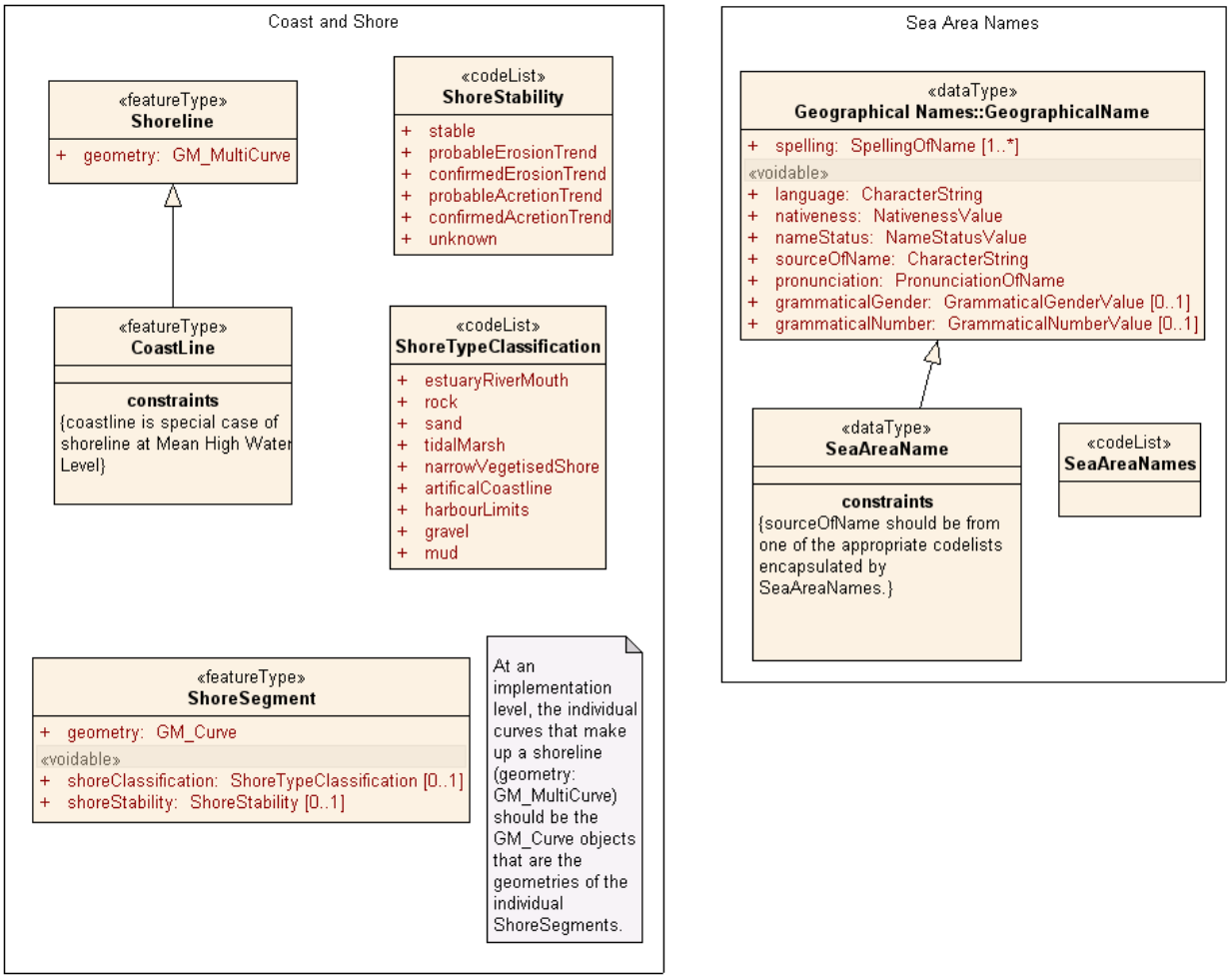


Figure 4 – UML class diagram: Overview of Shorelines, Coastlines and SeaAreaNames

Shoreline: Shore line is the boundary of a SeaArea; SeaArea is a GM_MultiSurface where as Shoreline is a GM_multicurve. Coastline is a specialisation of shoreline when the SeaArea is Sea, i.e the shoreline when the water level is equal to MHW. Coastline is similar to the concept of LandWaterBoundary in Hydrography. The same tidal extents are used, however different geometries are used. LandWaterBoundary is managed by the Hydrography theme.

ShoreSegment: A Shoreline is made up of many ShoreSegments, each of which may be classified according to stability (eroding, stable etc) and shore type (sand, mud etc). The geometry objects used to define these curves shall be used in aggregation to create the Shoreline geometry object. i.e. the GM_Curve geometries of the individual ShoreSegments make up the GM_MultiCurve geometry of the ShoreLine.

Sea Region Extension

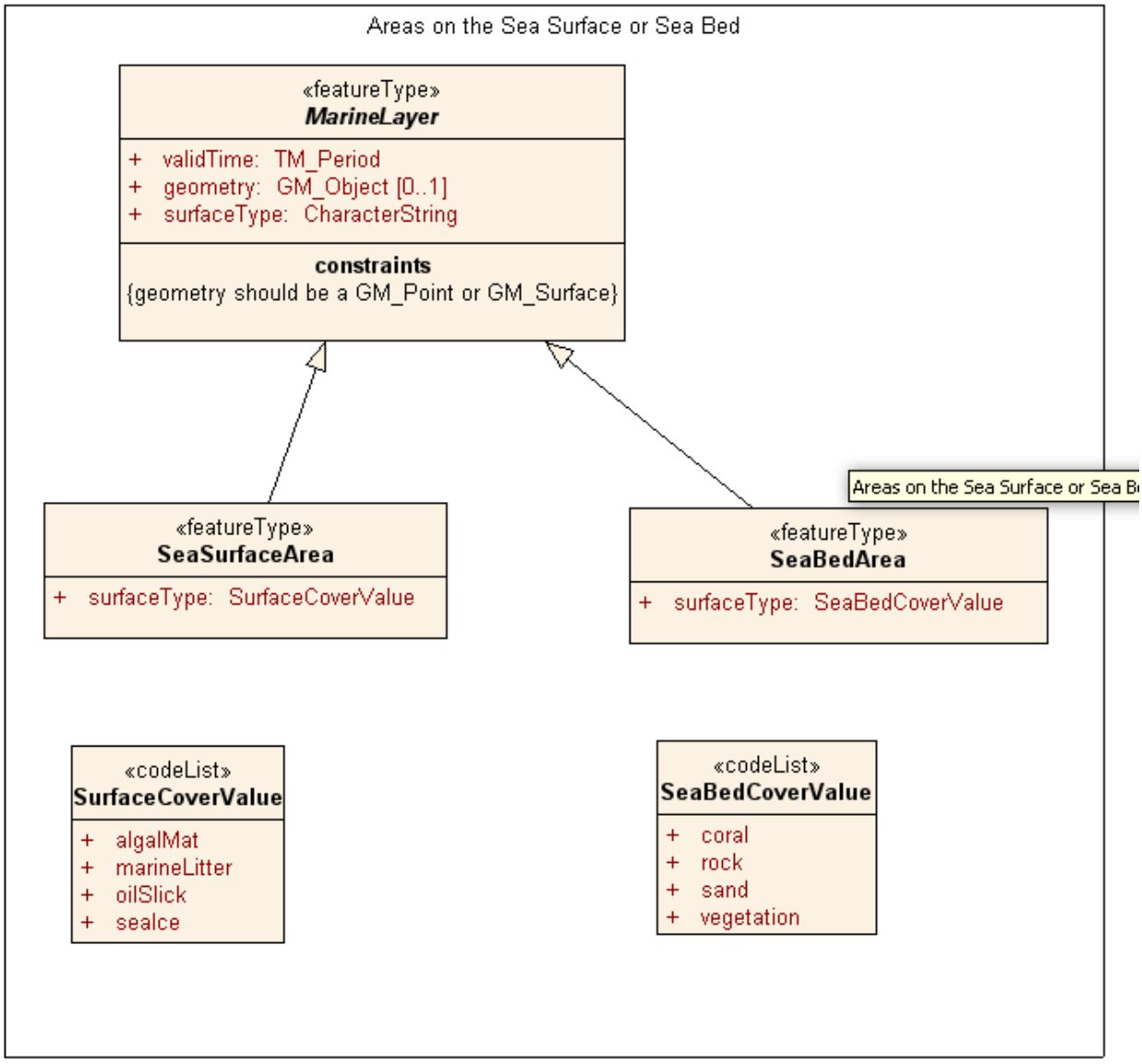


Figure 5 – UML class diagram: Overview of SeaBed and SeaSurface

MarineLayer is an abstract class that describes any surface or bottom layer that may cover a Sea Region. Examples of such layers identified in the reference material include oil, algal blooms and ice (surface) and rock, gravel sand, vegetation (sea bed). As these phenonema have a dynamic characteristic, the extent they describe (GM_Surface) has a validity period. A MarineLayer may not be associated with a particular SeaArea. A SeaArea may have multiple sheets and marine sheets can overlap each other. Subsequent revisions of this specification may lead to more detailed attribution of MarineLayer types.

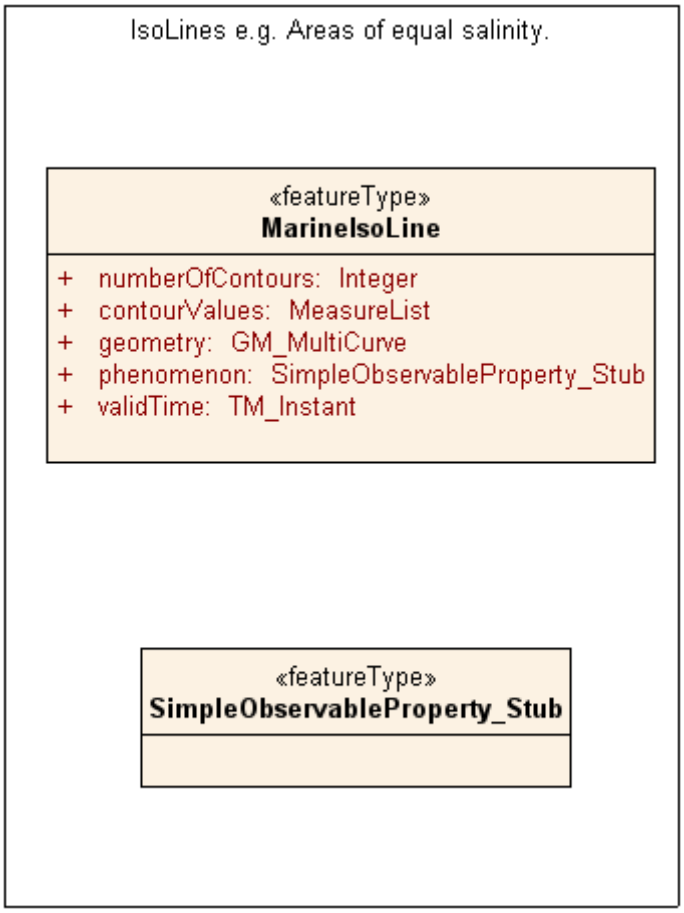


Figure 6 – UML class diagram: Overview of IsoLines

MarineIsoline is a FeatureType that describes contours for a given phenomena of a Sea Region or Regions. Although it may not be explicitly associated with a particular Sea Region or regions, where such
associations do exists, MarineIsoline must not extend beyond the Sea Region. This Feature Type is typically used to display temperature contours, waveclimate contours, or co-tidal lines

Sea Region Addendum

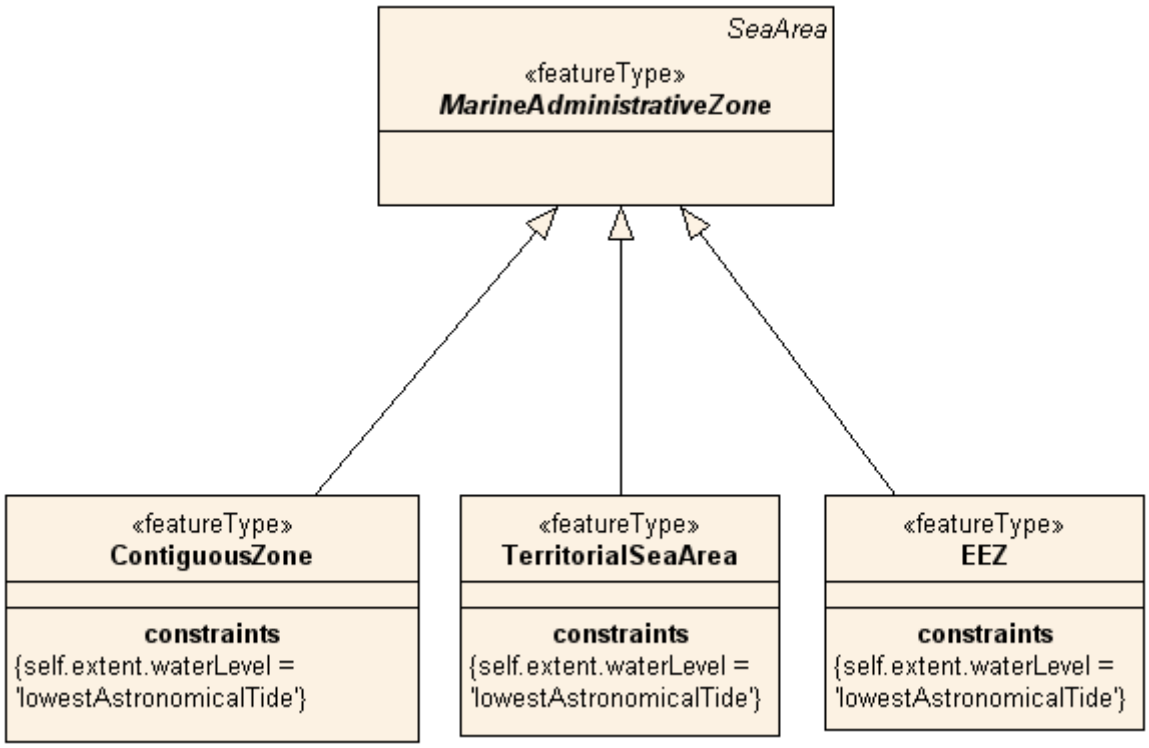


Figure 7 – UML class diagram: Overview of MarineAdminstrativeZones

MarineAdministrativeZone is another specialisation of SeaArea. Unlike MarineCirculationZones, MarineAdministrativeZones have boundaries that are based on 'political analysis' of physical parameters rather than the underlying physical parameters directly. It has been agreed that marine administrative zones should really be part of the AU theme, but they are included here for completeness until the AU theme revision process is established.

Open issue 3: The attributes of the MarineAdministrativeZone specialisations are still to be finalised.

Open issue 4: Opinions on the contents of *all* codelists are welcomed.

5.2.1.2. Consistency between spatial data sets

There are some constraints that apply to the various specialisations of SeaRegion. For example Sea is defined as a SeaArea at mean high water, so the value of the waterLevel attributes of the MarineExtent must be 'meanHighWater' for Sea. Likewise coastline is defined as the shoreline at meanHighWater. There are similar waterLevel constraints for The MarineAdministrativeZones and InterTidalAreas.

5.2.1.3. Identifier management

The WaterLevelValue codelist is defined and managed in the Hydrodraphy theme.

Discussion: It still needs to be determined which codelists are to be used for SeaAreaNames, SurfaceCoverValue and SeabedCoverValue. Likewise their corresponding governance framework

5.2.1.4. Geometry representation

IR Requirement 3	The value domain of spatial properties used in this specification shall be restricted to the Simple Feature spatial schema as defined by EN ISO 19125-1.

DS Requirement 2	SeaRegions are not represented at higher than 2-dimensional geometries

NOTE The specification restricts the spatial schema to 0-, 1-, 2-, and 2.5-dimensional geometries where all curve interpolations are linear.

NOTE The topological relations of two spatial objects based on their specific geometry and topology properties can in principle be investigated by invoking the operations of the types defined in ISO 19107 (or the methods specified in EN ISO 19125-1).

5.2.1.5. Temporality representation

The application schema(s) use(s) the derived attributes "beginLifespanObject" and "endLifespanObject" to record the lifespan of a spatial object.

The attributes "beginLifespanVersion" specifies the date and time at which this version of the spatial object was inserted or changed in the spatial data set. The attribute "endLifespanVersion" specifies the date and time at which this version of the spatial object was superseded or retired in the spatial data set.

NOTE 1 The attributes specify the beginning of the lifespan of the version in the spatial data set itself, which is different from the temporal characteristics of the real-world phenomenon described by the spatial object. This lifespan information, if available, supports mainly two requirements: First, knowledge about the spatial data set content at a specific time; second, knowledge about changes to a data set in a specific time frame. The lifespan information should be as detailed as in the data set (i.e., if the lifespan information in the data set includes seconds, the seconds should be represented in data published in INSPIRE) and include time zone information.

NOTE 2 Changes to the attribute "endLifespanVersion" does not trigger a change in the attribute "beginLifespanVersion".

Recommendation 2	If life-cycle information is not maintained as part of the spatial data set, all spatial objects belonging to this data set should provide a void value with a reason of "unpopulated".

In addition, the abstract MarineLayer feature type is a representation of a real world object at a particular time. For example, SeaSurfaceArea::SurfaceCoverValue=OilSlick is a concrete example of this class. MarineLayer therefore has a ‘validTime’ attribute which describes the instant at which the feature has a particular geometry (and related SeaArea).

5.2.2 Feature catalogue - Sea Regions

Table 3 - Feature catalogue metadata

Feature catalogue name	INSPIRE feature catalogue Sea Regions
Scope	Sea Regions
Version number	0.1
Version date	2010-10-27
Definition source	INSPIRE data specification Sea Regions

Table 4 - Types defined in the feature catalogue

Type	Package	Stereotypes	Section
CoastLine	Sea Regions	«featureType»	5.2.2.1.1
InterTidalArea	Sea Regions	«featureType»	5.2.2.1.2
MarineCirculationZone	Sea Regions	«featureType»	5.2.2.1.3
MarineExtent	Sea Regions	«dataType»	5.2.2.2.1
Sea	Sea Regions	«featureType»	5.2.2.1.4
SeaArea	Sea Regions	«featureType»	5.2.2.1.5
SeaAreaName	Sea Regions	«dataType»	5.2.2.2.2
SeaAreaNames	Sea Regions	«codeList»	5.2.2.3.1
ShoreSegment	Sea Regions	«featureType»	5.2.2.1.6
ShoreStability	Sea Regions	«codeList»	5.2.2.3.2
ShoreTypeClassification	Sea Regions	«codeList»	5.2.2.3.3
Shoreline	Sea Regions	«featureType»	5.2.2.1.7
ZoneTypeValue	Sea Regions	«codeList»	5.2.2.3.4

5.2.2.1. Spatial object types

5.2.2.1.1. CoastLine

CoastLine

Subtype of:	Shoreline
Definition:	A special case of a shoreline defined as the shoreline at Mean High Water.
Description:	This feature type is designed for the general use case where the land:sea boundary is required to support general discovery and viewing of datasets. It is not designed to infer any political boundaries. The purpose is to provide a consistent overview of European marine extent and for this reason a single tidal extent is selected. This is consistent with IHO-57 definitions
Status:	Proposed
Stereotypes:	«featureType»
URI:	null

Constraint: coastline is special case of shoreline at Mean High Water Level

Natural language:	coastline is special case of shoreline at Mean High Water Level The boundary between land and sea to be used for viewing, discovery and general purpose applications where the marine extent of the land is required. Where there is not siginificant variation in water level, MSL can be used as a substitute for MHW.
OCL:	

5.2.2.1.2. InterTidalArea

InterTidalArea

Subtype of:	SeaArea
Definition:	The Intertidal area, defined as the area between Mean High Water and Zero metres (usually LAT).
Description:	The part of the marine environment that is exposed (not covered in water) during a normal tidal cycle. The extent of intertidal area can vary in accordance with the tidal range at the location.
Status:	Proposed

InterTidalArea	
Stereotypes:	«featureType»
URI:	null
Attribute: extent	
Value type:	MarineExtent
Definition:	Extent of the Intertidal Area. Cardinality of 2.
Description:	Extent of the Intertidal Area. Cardinality of 2. The first extent should be at mean high water (MHW) and the second at lowest astronomical tide (LAT).
Multiplicity:	2
Constraint: first extent.waterLevel = 'meanHighWater'	
Natural language:	first extent.waterLevel = 'meanHighWater' The extent of the seaArea at the MHW tidal state. This constraint can be relaxed if there is not significant tidal variation in water level and MSL can be used in the alternative.
OCL:	
Constraint: second extent.waterLevel = 'lowestAstronomicalTide'	
Natural language:	second extent.waterLevel = 'lowestAstronomicalTide' The extent of the seaArea at the LAT tidal state. This constraint can be relaxed if there is not significant tidal variation in water level and MSL can be used in the alternative.
OCL:	

5.2.2.1.3. MarineCirculationZone

MarineCirculationZone	
Subtype of:	SeaArea
Definition:	An sea area defined by physical limitations on circulation.
Description:	
Status:	Proposed
Stereotypes:	«featureType»
URI:	null
Attribute: extent	
Value type:	MarineExtent
Definition:	The extent of the MarineCirculationZone at a particular tidal state Extent of the Marine Circulation Zone.
Description:	
Multiplicity:	1
Attribute: zoneType	
Value type:	ZoneTypeValue
Definition:	The type of the Marine circulation zone, e.g. sedimentCell.
Description:	
Multiplicity:	1

5.2.2.1.4. Sea

Sea	
Subtype of:	SeaArea
Definition:	Extent of sea at High Water (meanHighWater).

Sea	
Description:	An area of sea, bounded by land and adjacent sea regions. May contain smaller scale sea regions. Has common large scale circulation patterns, in part defined by its land boundaries. High Water is taken to be mean high water. Applies to common names areas of sea, e.g. North Sea, Agean Sea etc. (Source: IHO S23 SeaRegion) Note: An update of the IHO S23 definition from 1953 was created in 2002, but the update was never approved and was withdrawn from public access January 13 2010 (see http://eastsea.khoa.go.kr/eng/open_content/iho/magazine.asp). The SeaVox sea areas definitions are similar to the proposed IHO 2002 definitions and SeaDataNet is expected to adopt the use of the them. Presently SeaDataNet uses an extended version of the IHO 1953, that is kept compatible with the SeaVox Sea Areas. The SeaVox Sea Areas can be downloaded from VLIZ in Belgium (http://www.vliz.be/vmdcdata/vlimar/downloads.php#SeaVox) NOTE: OceanRegion was originally proposed by Annex 1 as a direct specialisation of Hydro-base::HydroObject with the following attributes, definition and description: OLD Definition - as proposed by Annex 1 One of the three large regions of the world-wide ocean, each with associated sub- and marginal areas and subject to an independent flow-regime. OLD Description - as proposed by Annex 1 SOURCE [DFDD]. NOTE Regarded as a candidate spatial object in Annex II theme 'Sea Regions' due to the close fit to the definition in 2007/2/EC Ann III. 16.
Status:	Proposed
Stereotypes:	«featureType»
URI:	null

Attribute: extent	
Value type:	MarineExtent
Definition:	The extent of the Sea at Mean High Water
Multiplicity:	1

Constraint: extent.waterLevel must be meanHighWater	
Natural language:	Sea is defined at Mean High Water. This constraint can be relaxed if there is not significant tidal variation in water level
OCL:	inv: self.extent.waterLevel = 'meanHighWater'

5.2.2.1.5. SeaArea

SeaArea	
Subtype of:	HydroObject
Definition:	An area of sea defined according to its physical and chemical characteristics. It may have multiple geometries (extent) to represent different tidal states.
Description:	A SeaArea is a type of HydroObject as described in the Annex1 theme Hydrography. It has geometry described by one or more GM_MultiSurfaces. Multiple geometries are allowed to enable a SeaArea to be described according to different tidal states. Typically, specialisations of SeaArea will restrict the geometry to a particular tidal state or set of tidal states. SeaAreas include named seas such as 'Baltic Sea' and also un-named areas of sea that have particular chemical and physical characteristics. SeaAreas are 2D objects and carry no explicit information about the depth of the sea, this is specified in the INSPIRE Elevation Theme.
Status:	Proposed
Stereotypes:	«featureType»
URI:	null

SeaArea

Attribute: beginLifespanVersion

Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.
Multiplicity:	1
Stereotypes:	«voidable,lifeCycleInfo»

Attribute: endLifespanVersion

Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.
Multiplicity:	0..1
Stereotypes:	«voidable,lifeCycleInfo»

Attribute: extent

Value type:	MarineExtent
Definition:	The extent of the Sea Area at a particular tidal state.
Multiplicity:	1..*

Attribute: inspireId

Value type:	Identifier
Definition:	"External object identifier of the spatial object.".
Description:	"An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world phenomenon.".
Multiplicity:	1

Association role: subArea

Value type:	SeaArea
Definition:	SeaAreas can consist of sub areas. e.g. A SeaArea defining all european seas could be an aggregation of multiple SeaAreas (North Sea, Mediterranean Sea etc)
Multiplicity:	0..*

Constraint: type of geographicalName must be a SeaAreaName

Natural language:	type of geographicalName must be a SeaAreaName
OCL:	inv: self.geographicalName=oclIsKindOf(SeaAreaName)

5.2.2.1.6. ShoreSegment

ShoreSegment

Definition:	A ShoreSegment is a section of shore line.
Description:	Where it is possible to provide attributes about shore stability (eroding, stable etc) and/or shore type (sand, rock, harbour etc). Then the Shore Segment should be used in place of the GML LineString element to describe curve segments.
Status:	Proposed
Stereotypes:	«featureType»
URI:	null

Attribute: geometry

Value type:	GM_Curve
Definition:	The geometry of the ShoreSegment.
Multiplicity:	1

ShoreSegment

Attribute: shoreClassification

Value type: ShoreTypeClassification
Definition: The primary type of the shore segment, taken from the ShoreTypeClassification codelist.
Multiplicity: 0..1
Stereotypes: «voidable»

Attribute: shoreStability

Value type: ShoreStability
Definition: The primary stability type of the shore segment, taken from the ShoreStability codelist.
Multiplicity: 0..1
Stereotypes: «voidable»

5.2.2.1.7. Shoreline

Shoreline

Definition: Boundary around SeaArea.
Description:
Status: Proposed
Stereotypes: «featureType»
URI: null

Attribute: geometry

Value type: GM_MultiCurve
Definition: The geometry of the Shoreline.
Multiplicity: 1

5.2.2.2. Data types

5.2.2.2.1. MarineExtent

MarineExtent

Definition: The extent of a sea area for a given tidal state
Description: The expected 2D geometric extent of a SeaArea for a particular tidal state.
Status: Proposed
Stereotypes: «dataType»
URI: null

Attribute: geometry

Value type: GM_MultiSurface
Definition: The geometry of the Marine Extent.
Description: A GM_MultiSurface is used as at different tidal states, areas of sea may become land-locked and therefore unconnected even though they are still part of the sea. This is primarily a consideration for local scale seas.
Multiplicity: 1

Attribute: waterLevel

Value type: WaterLevelValue
Definition: Water level at which the extent is valid.
Multiplicity: 0..1

5.2.2.2.2. SeaAreaName

SeaAreaName

Subtype of: GeographicalName

SeaAreaName	
Definition:	The name of a SeaArea, extends GeographicalName from Annex 1.
Description:	SeaAreaName is populated from a controlled vocabulary of names that can be assigned to a SeaArea. This can include well known names such as “Adriatic Sea” as well as identifiers such as ‘Ebro Delta’ or ‘Dogger Bank’.
Status:	Proposed
Stereotypes:	«dataType»
URI:	null

Constraint: sourceOfName should be from one of the appropriate codelists encapsulated by SeaAreaNames.

Natural language:	A SeaAreaName must take a value from a code list of SeaAreaNames proposed by INSPIRE.
OCL:	inv: self.sourceOfName.oclIsKindOf(SeaAreaNames)

5.2.2.3. Code lists

5.2.2.3.1. SeaAreaNames

SeaAreaNames	
Definition:	Codelist for sea area name geographical name values (should be based on MSFD list).
Description:	A list of names that can be attributed to a SeaArea. The list can be heirarchical to reflect different scales of SeaArea, for example Adriatic is a child of Eastern Mediterranean which is a child of Mediteranean. -- Governance -- As a minimum the codelist should be based on EU MSFD list of seaAreas. The list may be extended by Member States.
Status:	Proposed
Stereotypes:	«codeList»
Governance:	May be extended by Member States.
URI:	

5.2.2.3.2. ShoreStability

ShoreStability	
Definition:	Codelist to describe the stability of shore segments.
Description:	Shore stability types taken from: ref: CORINE coastal erosion atlas.ISBN 92-826-8506-3, European Communities 1998.
Status:	Proposed
Stereotypes:	«codeList»
Governance:	May not be extended by Member States.
URI:	

Value: confirmedAcretionTrend

Definition:	Stretch of shore is confirmed to be acreting.

Value: confirmedErosionTrend

Definition:	Stretch of shore is confirmed to be eroding.

Value: probableAcretionTrend

Definition:	Stretch of shore is probably eroding.

Value: probableErosionTrend

Definition:	Stretch of shore is proably eroding.

Value: stable

ShoreStability	
Definition:	Stretch of shore is stable.
Value: unknown	
Definition:	Stability of stretch of shore is unknown.

5.2.2.3.3. ShoreTypeClassification

ShoreTypeClassification	
Definition:	Codelist to describe the type of shore segments.
Status:	Proposed
Stereotypes:	«codeList»
Governance:	May not be extended by Member States.
URI:	
Value: artificalCoastline	
Definition:	Shore type is artificial.
Value: estuaryRiverMouth	
Definition:	Shore type is estuary/river mouth.
Value: gravel	
Definition:	Shore type is gravel.
Value: harbourLimits	
Definition:	Shore type is harbour limits.
Value: mud	
Definition:	Shore type is mud.
Value: narrowVegetisedShore	
Definition:	Shore type is vegetised.
Value: rock	
Definition:	Shore type is rock.
Value: sand	
Definition:	Shore type is sand.
Value: tidalMarsh	
Definition:	Shore type is tidal marsh.

5.2.2.3.4. ZoneTypeValue

ZoneTypeValue	
Definition:	Codelist for types of marine circulation zones
Description:	Marine circulation zones are very generic and the ZoneTypeValues allows for the circulation zone to be further classified. -- Governance -- No national or international governance of marine circulation zones has been identified. The INSPIRE list may be extended by Member States.
Status:	Proposed
Stereotypes:	«codeList»
Governance:	May not be extended by Member States.
URI:	
Value: mixingZone	

ZoneTypeValue	
Definition:	A SeaArea where discharges to the SeaArea are effectively dispersed such that outside this area there is no significant trace of the discharge. This could include the discharge of fresh water from a river, discharge of cooling water from a power station or discharge of primary treated sewage. Such zones are used for the management of marine pollution.
Value: sedimentCell	
Definition:	A SeaArea where the net sediment transport in and out of the area is close to zero. Such cells are used for the management of coastal erosion and typically have a hierarchy corresponding to cell, sub-cell and management unit.

5.2.2.4. Imported types (informative)

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

5.2.2.4.1. DateTime

DateTime	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19103:2005 Schema Language::Basic Types::Primitive::Date and Time [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.2.4.2. GM_Curve

GM_Curve	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19107:2003 Spatial Schema:: Geometry::Geometric primitive [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.2.4.3. GM_MultiCurve

GM_MultiCurve	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19107:2003 Spatial Schema:: Geometry::Geometric aggregates [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.2.4.4. GM_MultiSurface

GM_MultiSurface	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19107:2003 Spatial Schema:: Geometry::Geometric aggregates [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.2.4.5. GeographicalName

GeographicalName	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Themes::Annex I::Geographical Names::Geographical Names [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]
Definition:	Proper noun applied to a real world entity.

5.2.2.4.6. HydroObject

HydroObject (abstract)

HydroObject (abstract)	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Themes::Annex I::Hydrography::Hydro - base [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]
Definition:	An identity base for hydrographic (including man-made) objects in the real world.
Description:	NOTE Derived 'views' of real-world hydrographic objects are represented through specialisations in other application schemas; all representations of the same real-world object share a common geographic name or hydrographic identifier.

5.2.2.4.7. Identifier

Identifier	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Generic Conceptual Model::Base Types [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]
Definition:	External unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object.
Description:	NOTE1 External object identifiers are distinct from thematic object identifiers. NOTE 2 The voidable version identifier attribute is not part of the unique identifier of a spatial object and may be used to distinguish two versions of the same spatial object. NOTE 3 The unique identifier will not change during the life-time of a spatial object.

5.2.2.4.8. WaterLevelValue

WaterLevelValue	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Themes::Annex I::Hydrography::Hydro - Physical Waters [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]
Definition:	The tidal datum / waterlevel to which depths and heights are referenced.
Description:	SOURCE [Codelist values based on DFDD].

5.2.3 Feature catalogue - Sea Regions extension

Table 3 - Feature catalogue metadata

Feature catalogue name	INSPIRE feature catalogue Sea Regions - Extension
Scope	Sea Regions - Extension
Version number	0.1
Version date	2010-10-27
Definition source	INSPIRE data specification Sea Regions - Extension

Table 4 - Types defined in the feature catalogue

Type	Package	Stereotypes	Section
MarineIsoLine	Sea Regions - Extension	«featureType»	5.2.2.1.1
MarineLayer	Sea Regions - Extension	«featureType»	5.2.2.1.2
SeaBedArea	Sea Regions - Extension	«featureType»	5.2.2.1.3
SeaBedCoverValue	Sea Regions - Extension	«codeList»	5.2.2.2.1
SeaSurfaceArea	Sea Regions - Extension	«featureType»	5.2.2.1.4
SimpleObservableProperty_Stub	Sea Regions - Extension	«featureType»	5.2.2.1.5

Type	Package	Stereotypes	Section
SurfaceCoverValue	Sea Regions - Extension	«codeList»	5.2.2.2.2

5.2.3.1. Spatial object types

5.2.3.1.1. MarineIsoLine

MarineIsoLine	
Definition:	A set of contours representing the value of some phenomenon at a particular time
Description:	A representation of any physical or chemical phenomeon related to the SeaArea. MarineIsoLine should be derived from an OceanGeographicFeature of the same phenomenon. MarineIsoLine is an abstraction of the 'real world' to provide an overview of the expected conditions of a SeaArea. Examples would include salinity contours, depth contours, significant wave height.
Status:	Proposed
Stereotypes:	«featureType»
URI:	null
Attribute: contourValues	
Value type:	MeasureList
Definition:	Values attributed to the contour lines.
Multiplicity:	1
Attribute: geometry	
Value type:	GM_MultiCurve
Definition:	Geometry of the contours
Multiplicity:	1
Attribute: numberOfContours	
Value type:	Integer
Definition:	Number of contours
Multiplicity:	1
Attribute: phenomenon	
Value type:	SimpleObservableProperty_Stub
Definition:	The property represented by the contours (e..g wave height)
Multiplicity:	1
Attribute: validTime	
Value type:	TM_Instant
Definition:	The time at which this isoline is representative.
Multiplicity:	1

5.2.3.1.2. MarineLayer

MarineLayer (abstract)	
Definition:	A MarineLayer describes any layer that may cover any part of a sea surface or sea bottom
Description:	Examples of surface layers identified in the reference material include oil, algal blooms and ice. Examples of seabed layer identified in the reference material include sediment type and presence or absence of vegetation. As these phenomena have a dynamic characteristic, the extent they describe (GM_Surface) has a validity period. A marineLayer may not be associated with a particular SeaArea. A SeaArea may have multiple MarineLayers and MarineLayers can overlap each other.
Status:	Proposed
Stereotypes:	«featureType»

MarineLayer (abstract)	
URI:	null
Attribute: geometry	
Value type:	GM_Object
Definition:	Geometry of the Marine Layer
Multiplicity:	0..1
Attribute: surfaceType	
Value type:	CharacterString
Definition:	Surface type of the Marine Layer.
Multiplicity:	1
Attribute: validTime	
Value type:	TM_Period
Definition:	Time period for which the marine layer is valid.
Multiplicity:	1
Constraint: geometry should be a GM_Point or GM_Surface	
Natural language:	A marineLayer can be represented as either a surface or a point. The point type geometry reflects the reality that many marineLayers are identified by point observations.

5.2.3.1.3. SeaBedArea

SeaBedArea	
Subtype of:	MarineLayer
Definition:	An area of the sea bed with some identified type of cover. e.g. an area of vegetation or sediment type.
Description:	This describes a sea region according to the characteristics of the sea bed rather than characteristics of the water column in general. It does not include the subsea geology and is analogous to the concept of LandCover (INSPIRE Annex III).
Status:	Proposed
Stereotypes:	«featureType»
URI:	null
Attribute: surfaceType	
Value type:	SeaBedCoverValue
Definition:	Surface type of sea bed
Multiplicity:	1

5.2.3.1.4. SeaSurfaceArea

SeaSurfaceArea	
Subtype of:	MarineLayer
Definition:	An area of the sea surface with some type of cover e.g. an area of sea ice
Description:	This describes a sea region according to the characteristics of the sea surface rather than characteristics of the water column in general. It is analogous to the concept of LandCover (INSPIRE Annex III).
Status:	Proposed
Stereotypes:	«featureType»
URI:	null
Attribute: surfaceType	
Value type:	SurfaceCoverValue
Definition:	Surface type of sea area

SeaSurfaceArea	
Multiplicity:	1

5.2.3.1.5. SimpleObservableProperty_Stub

SimpleObservableProperty_Stub	
Definition:	Placeholder for observable property class -- Definition --
Status:	Proposed
Stereotypes:	«featureType»
URI:	null

5.2.3.2. Code lists

5.2.3.2.1. SeaBedCoverValue

SeaBedCoverValue	
Definition:	Codelist for types of cover found on sea beds
Description:	Managed vocabularly of SeaBed cover types. For the INSPIRE V2.0 release this list is purely indicative an recommendations for a definitive is sought. -- Governance -- May be extended by member states
Status:	Proposed
Stereotypes:	«codeList»
Governance:	May not be extended by Member States.
URI:	
Value: coral	
Definition:	Cover type is coral
Value: rock	
Definition:	Cover type is rock
Value: sand	
Definition:	Cover type is sand
Value: vegetation	
Definition:	Cover type is vegetation

5.2.3.2.2. SurfaceCoverValue

SurfaceCoverValue	
Definition:	Codelist for types of cover found on sea surfaces
Description:	Managed vocabularly of SeaBed cover types. For the INSPIRE V2.0 release this list is purely indicative an recommendations for a definitive list is sought.
Status:	Proposed
Stereotypes:	«codeList»
Governance:	May not be extended by Member States.
URI:	
Value: algalMat	
Definition:	Cover type is Algal Mat
Value: marineLitter	
Definition:	Cover type is marine litter
Value: oilSlick	
Definition:	Cover type is oil slick

SurfaceCoverValue
Value: seaIce
Definition: Cover type is sea ice

5.2.3.3. Imported types (informative)

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

5.2.3.3.1. CharacterString

CharacterString	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19103:2005 Schema Language::Basic Types::Primitive::Text [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.3.3.2. GM_MultiCurve

GM_MultiCurve	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19107:2003 Spatial Schema:: Geometry::Geometric aggregates [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.3.3.3. GM_Object

GM_Object (abstract)	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19107:2003 Spatial Schema:: Geometry::Geometry root [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.3.3.4. Integer

Integer	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19103:2005 Schema Language::Basic Types::Primitive::Numerics [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.3.3.5. MeasureList

MeasureList	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19136 GML::basicTypes [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.3.3.6. TM_Instant

TM_Instant	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19108:2006 Temporal Schema::Temporal Objects [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.3.3.7. TM_Period

TM_Period

TM_Period	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Foundation Schemas::ISO TC211::ISO 19108:2006 Temporal Schema::Temporal Objects [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]

5.2.4 Feature catalogue - Sea Regions addendum

Table 3 - Feature catalogue metadata

Feature catalogue name	INSPIRE feature catalogue Sea Regions - Addendum
Scope	Sea Regions - Addendum
Version number	0.1
Version date	2010-10-27
Definition source	INSPIRE data specification Sea Regions - Addendum

Table 4 - Types defined in the feature catalogue

Type	Package	Stereotypes	Section
ContiguousZone	Sea Regions - Addendum	«featureType»	5.2.2.1.1
EEZ	Sea Regions - Addendum	«featureType»	5.2.2.1.2
MarineAdministrativeZone	Sea Regions - Addendum	«featureType»	5.2.2.1.3
TerritorialSeaArea	Sea Regions - Addendum	«featureType»	5.2.2.1.4

5.2.4.1. Spatial object types

5.2.4.1.1. ContiguousZone

ContiguousZone	
Subtype of:	MarineAdministrativeZone
Definition:	A zone contiguous to a coastal State's territorial sea, which may not extend beyond 24 nautical miles from the baselines from which the breadth of the territorial sea is measured. Source: IHO Dictionary,S-32, 5th Edition
Description:	The contiguous zone is a zone adjacent to the territorial sea. In the contiguous zone a coastal state may exercise the control necessary to prevent and punish infringements of its customs, fiscal, immigration, or sanitary laws and regulations within its territory or territorial sea.
Status:	Proposed
Stereotypes:	«featureType»
URI:	null

Constraint: self.extent.waterLevel = 'lowestAstronomicalTide'

Natural language:	The contiguous zone is defined seaward from the position of the lowest astronomical tide.

5.2.4.1.2. EEZ

EEZ	
Subtype of:	MarineAdministrativeZone
Definition:	Exclusive Economic Zone:An area, not exceeding 200 nautical miles from the baselines from which the breadth of the territorial sea is measured. Source: IHO Dictionary,S-32, 5th Edition
Description:	Under the 1982 Law of the Sea Convention, coastal states are entitled to an exclusive economic zone extending no further than 200 nautical miles from the baselines. In contrast to the continental shelf, an exclusive economic zone must be explicitly proclaimed or installed by the coastal state and includes, besides the seabed and its subsoil, the waters super-adjacent to the seabed.
Status:	Proposed

EEZ	
Stereotypes:	«featureType»
URI:	null

Constraint: self.extent.waterLevel = 'lowestAstronomicalTide'

Natural language:	The EEZ is defined seaward from the position of the lowest astronomical tide

5.2.4.1.3. MarineAdministrativeZone

MarineAdministrativeZone (abstract)	
Subtype of:	SeaArea
Definition:	. An abstract sea region defined politically by international treaties and conventions
Description:	A marine administrative zone is a sea region that is defined for cadastral or administrative purposes. It is not established for marine management or regulation, that is covered in the Area management/restriction/regulation zones and reporting areas (AM) (INSPIRE Annex III)
Status:	Proposed
Stereotypes:	«featureType»
URI:	null

5.2.4.1.4. TerritorialSeaArea

TerritorialSeaArea	
Subtype of:	MarineAdministrativeZone
Definition:	The territorial sea is a belt of water of a defined breadth but not exceeding 12 nautical miles measured seaward from the territorial sea baseline. Source: IHO Dictionary, S-32, 5th Edition --Description -- This sovereignty is limited by the customary right of innocent passage through the territorial sea for ships of all states. Passage has to be continuous and expeditious, except in cases of force majeure or distress. Passage is innocent so long as it is not prejudicial to the peace, good order, or security of the coastal state. The meaning of innocent passage is further elaborated in article 19 of the 1982 Law of the Sea Convention.
Status:	Proposed
Stereotypes:	«featureType»
URI:	null

Constraint: self.extent.waterLevel = 'lowestAstronomicalTide'

Natural language:	

5.2.4.2. Imported types (informative)

This section lists definitions for feature types, data types and enumerations and code lists that are defined in other application schemas. The section is purely informative and should help the reader understand the feature catalogue presented in the previous sections. For the normative documentation of these types, see the given references.

5.2.4.2.1. SeaArea

SeaArea	
Package:	INSPIRE_DS_Model::INSPIRE Consolidated UML Model::Themes::Annex III::Sea Regions::Sea Regions [Include reference to the document that includes the package, e.g. INSPIRE data specification, ISO standard or the GCM]
Definition:	An area of sea defined according to its physical and chemical characteristics. It may have multiple geometries (extent) to represent different tidal states.

SeaArea	
Description:	A SeaArea is a type of HydroObject as described in the Annex1 theme Hydrography. It has geometry described by one or more GM_MultiSurfaces. Multiple geometries are allowed to enable a SeaArea to be described according to different tidal states. Typically, specialisations of SeaArea will restrict the geometry to a particular tidal state or set of tidal states. SeaAreas include named seas such as 'Baltic Sea' and also un-named areas of sea that have particular chemical and physical characteristics. SeaAreas are 2D objects and carry no explicit information about the depth of the sea, this is specified in the INSPIRE Elevation Theme.

6 Reference systems

6.1 Coordinate reference systems

6.1.1 Datum

IR Requirement 4	For the coordinate reference systems used for making available the INSPIRE spatial data sets, the datum shall be the datum of the European Terrestrial Reference System 1989 (ETRS89) in areas within its geographical scope, and the datum of the International Terrestrial Reference System (ITRS) or other geodetic coordinate reference systems compliant with ITRS in areas that are outside the geographical scope of ETRS89. Compliant with the ITRS means that the system definition is based on the definition of the ITRS and there is a well established and described relationship between both systems, according to EN ISO 19111.

6.1.2 Coordinate reference systems

IR Requirement 5	INSPIRE spatial data sets shall be made available using one of the three-dimensional, two-dimensional or compound coordinate reference systems specified in the list below. Other coordinate reference systems than those listed below may only be used for regions outside of continental Europe. The geodetic codes and parameters for these coordinate reference systems shall be documented, and an identifier shall be created, according to EN ISO 19111 and ISO 19127.

1. Three-dimensional Coordinate Reference Systems
   - Three-dimensional Cartesian coordinates
   - Three-dimensional geodetic coordinates (latitude, longitude and ellipsoidal height), using the parameters of the GRS80 ellipsoid

2. Two-dimensional Coordinate Reference Systems
   - Two-dimensional geodetic coordinates, using the parameters of the GRS80 ellipsoid
   - Plane coordinates using the Lambert Azimuthal Equal Area projection and the parameters of the GRS80 ellipsoid
   - Plane coordinates using the Lambert Conformal Conic projection and the parameters of the GRS80 ellipsoid
   - Plane coordinates using the Transverse Mercator projection and the parameters of the GRS80 ellipsoid

3. Compound Coordinate Reference Systems
   - For the horizontal component of the compound coordinate reference system, one of the two-dimensional coordinate reference systems specified above shall be used
   - For the vertical component on land, the European Vertical Reference System (EVRS) shall be used to express gravity-related heights within its geographical scope
   - Other vertical reference systems related to the Earth gravity field shall be used to express gravity-related heights in areas that are outside the geographical scope of EVRS. The geodetic codes and parameters for these vertical reference systems shall be documented and an identifier shall be created, according to EN ISO 19111 and ISO 19127
   - For the vertical component measuring the depth of the sea floor, where there is an appreciable tidal range, the Lowest Astronomical Tide shall be used as reference surface. In marine areas without an appreciable tidal range, in open oceans and effectively in waters that are deeper than 200 m, the depth of the sea floor shall be referenced to the Mean Sea Level
   - For the vertical component measuring depths above the sea floor in the free ocean, barometric pressure shall be used
   - For the vertical component in the free atmosphere, barometric pressure, converted to height using ISO 2533:1975 International Standard Atmosphere shall be used

6.1.3 Display

IR Requirement 6 For the display of the INSPIRE spatial data sets with the View Service specified in D003152/02 Draft Commission Regulation implementing Directive 2007/2/EC of the European Parliament and of the Council as regards Network Services, at least the two dimensional geodetic coordinate system shall be made available.

6.1.4 Identifiers for coordinate reference systems

IR Requirement 7 For referring to the non-compound coordinate reference systems listed in this Section, the identifiers listed below shall be used.

For referring to a compound coordinate reference system, an identifier composed of the identifier of the horizontal component, followed by a slash (/), followed by the identifier of the vertical component, shall be used.

- ETRS89-XYZ for Cartesian coordinates in ETRS89
- ETRS89-GRS80h for three-dimensional geodetic coordinates in ETRS89 on the GRS80 ellipsoid
- ETRS89-GRS80 for two-dimensional geodetic coordinates in ETRS89 on the GRS80
- EVRS for height in EVRS
- LAT for depth of the sea floor, where there is an appreciable tidal range
- MSL for depth of the sea floor, in marine areas without an appreciable tidal range, in open oceans and effectively in waters that are deeper than 200m
- ISA for pressure coordinate in the free atmosphere
- PFO for Pressure coordinate in the free ocean
- ETRS89-LAEA for ETRS89 coordinates projected into plane coordinates by the Lambert Azimuthal Equal Area projection

- ETRS89-LCC for ETRS89 coordinates projected into plane coordinates by the Lambert Conformal Conic projection
- ETRS89-TMzn for ETRS89 coordinates projected into plane coordinates by the Transverse Mercator projection

6.2 Temporal reference system

IR Requirement 8 The Gregorian Calendar shall be used for as a reference system for date values, and the Universal Time Coordinated (UTC) or the local time including the time zone as an offset from UTC shall be used as a reference system for time values.

6.3 Theme-specific requirements and recommendations on reference systems

There are no theme-specific requirements or recommendations on reference systems.

7 Data quality

Open issue 5: For version 3.0 this section shall include a structured definition of quality rules for Sea Regions. For version 2.0 input from SDICs and LMOs is invited as to what are suitable quality measures.

For example:

Topological
A sea sub area must be wholly be within the sea area or its parents. A sub-sea area can have 1..* parents and all parents are of the same heirarchical level
A shoreline must fully overlap with the edge of a SeaArea of the equivalent tidal state
No marineLayer can exist beyond the SeaArea at HAT
No marineIsoLine can exist beyond the SeaArea at HAT

Positional Accuracy
Does S-57 / S-44 say anything about positional accuracy at various chart levels?

This chapter includes a description of data quality elements and sub-elements as well as the associated data quality measures (section 7.1). The selected data quality measures should be used to evaluate quality of data sets for a specific data quality element / sub-element. The evaluation can be performed at the level of spatial object, spatial object type, dataset or dataset series.

The results of the evaluation are then reported at the spatial object type or dataset level in metadata utilising the same data quality elements and measures (see chapter 8).

NOTE The selection of appropriate data quality measures represents the first step towards the harmonisation of documenting data quality.

In addition, for some of the data quality elements described in section 7.1, minimum data quality requirements or recommendations may be defined. These are described in the section 1.2.

Recommendation 1 If data quality information is required at spatial object level then it should be modelled in the data model as an attribute of a relevant spatial object type.

7.1 Data quality elements and measures

No data quality elements for quantitative evaluation are defined for this theme.

7.2 Minimum data quality requirements and recommendations

No minimum data quality requirements are defined.

8 Dataset-level metadata

Metadata can be reported for each individual spatial object (spatial object-level metadata) or once for a complete dataset or dataset series (dataset-level metadata). Spatial object-level metadata is fully described in the application schema (section **5**). If data quality elements are used at spatial object level, the documentation shall refer to the appropriate definition in section 7. This section only specifies dataset-level metadata elements.

For some dataset-level metadata elements, in particular on data quality and maintenance, a more specific scope can be specified. This allows the definition of metadata at sub-dataset level, e.g. separately for each spatial object type. When using ISO 19115/19139 to encode the metadata, the following rules should be followed:

- The scope element (of type DQ_Scope) of the DQ_DataQuality subtype should be used to encode the scope.
- Only the following values should be used for the level element of DQ_Scope: Series, Dataset, featureType.
- If the level is featureType the levelDescription/MDScopeDescription/features element (of type Set< GF_FeatureType>) shall be used to list the feature type names.

NOTEThe value featureType is used to denote spatial object type.

Mandatory or conditional metadata elements are specified in Section 8.1. Optional metadata elements are specified in Section 8. The tables describing the metadata elements contain the following information:

- The first column provides a reference to a more detailed description.
- The second column specifies the name of the metadata element.
- The third column specifies the multiplicity.
- The fourth column specifies the condition, under which the given element becomes mandatory (only for Table 2 and Table 3).

8.1 Common metadata elements

IR Requirement 9 The metadata describing a spatial data set or a spatial data set series related to the theme **Sea Regions** shall comprise the metadata elements required by Regulation 1205/2008/EC (implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata) for spatial datasets and spatial dataset series (Table 2) as well as the metadata elements specified in Table 3.

Table 2 – Metadata for spatial datasets and spatial dataset series specified in Regulation 1205/2008/EC (implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata)

Metadata Regulation Section	Metadata element	Multiplicity	Condition
1.1	Resource title	1	
1.2	Resource abstract	1	
1.3	Resource type	1	
1.4	Resource locator	0..*	Mandatory if a URL is available to obtain more information on the resource, and/or access related services.
1.5	Unique resource identifier	1..*	
1.7	Resource language	0..*	Mandatory if the resource includes textual information.
2.1	Topic category	1..*	
3	Keyword	1..*	
4.1	Geographic bounding box	1..*	
5	Temporal reference	1..*	
6.1	Lineage	1	
6.2	Spatial resolution	0..*	Mandatory for data sets and data set series if an equivalent scale or a resolution distance can be specified.
7	Conformity	1..*	
8.1	Conditions for access and use	1..*	
8.2	Limitations on public access	1..*	
9	Responsible organisation	1..*	
10.1	Metadata point of contact	1..*	
10.2	Metadata date	1	
10.3	Metadata language	1	

Table 3 – Mandatory and conditional common metadata elements

INSPIRE Data Specification Sea Regions **Section**	**Metadata element**	**Multiplicity**	**Condition**
8.1.1	Coordinate Reference System	1	
8.1.2	Temporal Reference System	0..*	Mandatory, if the spatial data set or one of its feature types contains temporal information that does not refer to the Gregorian Calendar or the Coordinated Universal Time.
8.1.3	Encoding	1..*	
8.1.4	Character Encoding	0..*	Mandatory, if an encoding is used that is not based on UTF-8.
8.1.5	Data Quality – Logical Consistency – Topological Consistency	0..*	Mandatory, if the data set includes types from the Generic Network Model and does not assure centreline topology (connectivity of centrelines) for the network.

8.1.1 Coordinate Reference System

Metadata element name	**Coordinate Reference System**
Definition	Description of the coordinate reference system used in the dataset.
ISO 19115 number and name	13. referenceSystemInfo
ISO/TS 19139 path	referenceSystemInfo
INSPIRE obligation / condition	mandatory
INSPIRE multiplicity	1
Data type(and ISO 19115 no.)	189. MD_CRS
Domain	Either the referenceSystemIdentifier (RS_Identifier) or the projection (RS_Identifier), ellipsoid (RS_Identifier) and datum (RS_Identifier) properties shall be provided. NOTE More specific instructions, in particular on pre-defined values for filling the referenceSystemIdentifier attribute should be agreed among Member States during the implementation phase to support interoperability.
Implementing instructions	
Example	referenceSystemIdentifier: code: ETRS_89 codeSpace: INSPIRE RS registry

Example XML encoding	<gmd:referenceSystemInfo> <gmd:MD_ReferenceSystem> <gmd:referenceSystemIdentifier> <gmd:RS_Identifier> <gmd:code> <gco:CharacterString>ETRS89 </gco:CharacterString> </gmd:code> <gmd:codeSpace> <gco:CharacterString>INSPIRE RS registry</gco:CharacterString> </gmd:codeSpace> </gmd:RS_Identifier> </gmd:referenceSystemIdentifier> </gmd:MD_ReferenceSystem> </gmd:referenceSystemInfo>
Comments	

8.1.2 Temporal Reference System

Metadata element name	**Temporal Reference System**
Definition	Description of the temporal reference systems used in the dataset.
ISO 19115 number and name	13. referenceSystemInfo
ISO/TS 19139 path	referenceSystemInfo
INSPIRE obligation / condition	Mandatory, if the spatial data set or one of its feature types contains temporal information that does not refer to the Gregorian Calendar or the Coordinated Universal Time.
INSPIRE multiplicity	0..*
Data type(and ISO 19115 no.)	186. MD_ReferenceSystem
Domain	No specific type is defined in ISO 19115 for temporal reference systems. Thus, the generic MD_ReferenceSystem element and its reference SystemIdentifier (RS_Identifier) property shall be provided. NOTEMore specific instructions, in particular on pre-defined values for filling the referenceSystemIdentifier attribute should be agreed among Member States during the implementation phase to support interoperability.
Implementing instructions	
Example	referenceSystemIdentifier: code: GregorianCalendar codeSpace: INSPIRE RS registry

Example XML encoding	<gmd:referenceSystemInfo> <gmd:MD_ReferenceSystem> <gmd:referenceSystemIdentifier> <gmd:RS_Identifier> <gmd:code> <gco:CharacterString>GregorianCalendar</gco:CharacterString> </gmd:code> <gmd:codeSpace> <gco:CharacterString>INSPIRE RS registry</gco:CharacterString> </gmd:codeSpace> </gmd:RS_Identifier> </gmd:referenceSystemIdentifier> </gmd:MD_ReferenceSystem> </gmd:referenceSystemInfo>
Comments	

8.1.3 Encoding

Metadata element name	**Encoding**
Definition	Description of the computer language construct that specifies the representation of data objects in a record, file, message, storage device or transmission channel
ISO 19115 number and name	271. distributionFormat
ISO/TS 19139 path	distributionInfo/MD_Distribution/distributionFormat
INSPIRE obligation / condition	mandatory
INSPIRE multiplicity	1
Data type (and ISO 19115 no.)	284. MD_Format
Domain	See B.2.10.4. The property values (name, version, specification) specified in section 9 shall be used to document the default and alternative encodings.
Implementing instructions	
Example	name: **Sea Regions** GML application schema version: version **2.0**, GML, version 3.2.1 specification: D2.8.**III**.**16** Data Specification on **Sea Regions** – Draft Guidelines
Example XML encoding	<gmd:MD_Format> <gmd:name> <gco:CharacterString> **Sea Regions** GML application schema </gco:CharacterString> </gmd:name> <gmd:version> <gco:CharacterString>**2.0**, GML, version 3.2.1</gco:CharacterString> </gmd:version> <gmd:specification> <gco:CharacterString>D2.8.**III**.**16** Data Specification on **Sea Regions** – Draft Guidelines</gco:CharacterString> </gmd:specification> </gmd:MD_Format>
Comments	

8.1.4 Character Encoding

Metadata element name	**Character Encoding**
Definition	The character encoding used in the data set.
ISO 19115 number and name	
ISO/TS 19139 path	
INSPIRE obligation / condition	Mandatory, if an encoding is used that is not based on UTF-8.
INSPIRE multiplicity	0..*
Data type (and ISO 19115 no.)	
Domain	
Implementing instructions	
Example	-
Example XML encoding	<gmd:characterSet> <gmd:MD_CharacterSetCode codeListValue="8859part2" codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodelists.xml#CharacterSetCode">8859-2</gmd:MD_CharacterSetCode> </gmd:characterSet>
Comments	

8.1.5 Data Quality – Logical Consistency – Topological Consistency

Metadata element name	**Data Quality – Logical Consistency – Topological Consistency**
Definition	Correctness of the explicitly encoded topological characteristics of the dataset as described by the scope
ISO 19115 number and name	18. dataQualityInfo
ISO/TS 19139 path	dataQualityInfo
INSPIRE obligation / condition	Mandatory, if the data set includes types from the Generic Network Model and does not assure centreline topology (connectivity of centrelines) for the network.
INSPIRE multiplicity	0..*
Data type (and ISO 19115 no.)	115. DQ_TopologicalConsistency
Domain	Lines 100-107 from ISO 19115
Implementing instructions	This metadata should be filled, at least, with these elements: - valueUnit: UnitOfMeasure - value: Record
Example	
Example XML encoding	
Comments	See clauses on topological consistency in section 7 for detailed information. This metadata element is mandatory if connectivity is not assured for network centrelines in the dataset. In this case the *Connectivity tolerance* parameter – as described in section 7 – must be provided in order to ensure automatic and unambiguous creation of centreline topology in post-process.

8.2 Metadata elements for reporting data quality

Recommendation 2 For reporting the results of the data quality evaluation quantitatively, the data quality elements and measures defined in chapter 7 should be used.

The scope for reporting may be different from the scope for evaluating data quality (see section 7). If data quality is reported at the data set or spatial object type level, the results are usually derived or aggregated.

Metadata element name	**See chapter 7**
Definition	See chapter 7
ISO 19115 number and name	80. report
ISO/TS 19139 path	dataQualityInfo/*/report
INSPIRE obligation / condition	optional
INSPIRE multiplicity	0..*
Data type (and ISO 19115 no.)	Corresponding DQ_xxx element from ISO 19115, e.g. 109. DQ_CompletenessCommission
Domain	Lines 100-107 from ISO 19115 100. nameOfMeasure : CharacterString [0..*] 101. measureIdentification : MD_Identifier [0..1] 102. measureDescription : CharacterString [0..1] 103. evaluationMethodType : DQ_EvaluationMethodTypeCode [0..1] 104. evaluationMethodDescription : CharacterString [0..1] 105. evaluationProcedure : CI_Citation [0..1] 106. dateTime : DateTime [0..*] 107. result : DQ_Result [1..2]
Implementing instructions	**Recommendation 3** For each DQ result included in the metadata, at least the following properties should be provided: 100. nameOfMeasure NOTE This should be the name as defined in Chapter 7. 103. evaluationMethodType 104. evaluationMethodDescription NOTE If the reported data quality results are derived or aggregated (i.e. the scope levels for evaluation and reporting are different), the derivation or aggregation should also be specified using this property. 106. dateTime NOTE This should be data or range of dates on which the data quality measure was applied. 107. result NOTE This should be of type DQ_QuantitativeResult
Example	
Example XML encoding	
Comments	See Chapter 7 for detailed information on the individual data quality elements and measures to be used.

Open issue 6: In the ongoing revision of ISO 19115 and development of new ISO 19157 standard (Geographic Information – Data quality), a new element is introduced (DQ_DescriptiveResult). This element enables to describe and report qualitative results of the data quality evaluation and could be

used instead of DQ_QuantitativeResult. Once the new (version of the) standards are approved, these guidelines will be revisited and be updated if necessary.

Open issue 7: For reporting compliance with minimum data quality requirements and recommendations specified in section 7, the INSPIRE conformity metadata element should be used.

However, since this issue is part of the larger discussion on the Abstract Test Suite and the definition of conformance classes for the data specification, detailed instructions on how to provide metadata on compliance with minimum data quality requirements and recommendations will only be provided for v3.0.

8.3 Theme-specific metadata elements

No mandatory theme-specific metadata elements are defined for this theme.

No optional theme-specific metadata elements are defined for this theme.

8.4 Guidelines on using metadata elements defined in Regulation 1205/2008/EC

8.4.1 Conformity

The *Conformity* metadata element defined in Regulation 1205/2008/EC allows to report the conformance with the Implementing Rule for interoperability of spatial data sets and services or another specification. The degree of conformity of the dataset can be *Conformant* (if the dataset is fully conformant with the cited specification), *Not Conformant* (if the dataset does not conform to the cited specification) or *Not evaluated* (if the conformance has not been evaluated).

Recommendation 4 The Conformity metadata element should be used to report conceptual consistency with this INSPIRE data specification. The value of Conformant should be used for the Degree element only if the dataset passes all the requirements described in the abstract test suite presented in Annex A. The Specification element should be given as follows:
- title: “INSPIRE Data Specification on <Theme Name> – Draft Guidelines”
- date:
  - dateType: publication
  - date: 2011-06-20

Open issue 8: Conformance testing is still an open issue under discussion.

Instructions on conformance testing and a common abstract test suite (including detailed instructions on how to test specific requirements) will be added at a later stage.

This may also lead to an update of the recommendations on how to fill the conformity metadata element.

8.4.2 Lineage

Recommendation 5 Following the ISO 19113 Quality principles, if a data provider has a procedure for quality validation of their spatial data sets then the data quality elements listed in the Chapters 7 and 8 should be used. If not, the *Lineage* metadata element (defined in Regulation 1205/2008/EC) should be used to describe the overall quality of a spatial data set.

According to Regulation 1205/2008/EC, lineage "is a statement on process history and/or overall quality of the spatial data set. Where appropriate it may include a statement whether the data set has been validated or quality assured, whether it is the official version (if multiple versions exist), and whether it has legal validity. The value domain of this metadata element is free text".

The Metadata Technical Guidelines based on EN ISO 19115 and EN ISO 19119 specify that the statement sub-element of LI_Lineage (EN ISO 19115) should be used to implement the lineage metadata element.

Recommendation 6 To describe the transformation steps and related source data, it is recommended to use the following sub-elements of LI_Lineage:
- For the description of the transformation process of the local to the common INSPIRE data structures, the LI_ProcessStep sub-element should be used.
- For the description of the source data the LI_Source sub-element should be used.

NOTE 1 This recommendation is based on the conclusions of the INSPIRE Data Quality Working Group to avoid overloading of the overall lineage statement element with information on the transformation steps and related source data.

NOTE 2 In order to improve the interoperability, domain templates and instructions for filling these free text elements (descriptions) may be specified in an Annex of this data specification.

Open issue 9: The suggested use of the LI_Lineage sub-elements needs to be discussed as part of the maintenance of the INSPIRE metadata Technical Guidelines.

8.4.3 Temporal reference

According to Regulation 1205/2008/EC, at least one of the following temporal reference metadata elements shall be provided: temporal extent, date of publication, date of last revision, date of creation. If feasible, the date of the last revision of a spatial data set should be reported using the *Date of last revision* metadata element.

9 Delivery

9.1 Delivery medium

DS Requirement 3 Data conformant to this INSPIRE data specification shall be made available through an INSPIRE network service.

DS Requirement 4	All information that is required by a calling application to be able to retrieve the data through the used network service shall be made available in accordance with the requirements defined in the Implementing Rules on Network Services.

EXAMPLE 1 Through the Get Spatial Objects function, a download service can either download a pre-defined data set or pre-defined part of a data set (non-direct access download service), or give direct access to the spatial objects contained in the data set, and download selections of spatial objects based upon a query (direct access download service). To execute such a request, some of the following information might be required:

- the list of spatial object types and/or predefined data sets that are offered by the download service (to be provided through the Get Download Service Metadata operation),
- and the query capabilities section advertising the types of predicates that may be used to form a query expression (to be provided through the Get Download Service Metadata operation, where applicable),
- a description of spatial object types offered by a download service instance (to be proviced through the Describe Spatial Object Types operation).

EXAMPLE 2 Through the Transform function, a transformation service carries out data content transformations from native data forms to the INSPIRE-compliant form and vice versa. If this operation is directly called by an application to transform source data (e.g. obtained through a download service) that is not yet conformant with this data specification, the following parameters are required:
Input data (mandatory). The data set to be transformed.

- Source model (mandatory, if cannot be determined from the input data). The model in which the input data is provided.
- Target model (mandatory). The model in which the results are expected.
- Model mapping (mandatory, unless a default exists). Detailed description of how the transformation is to be carried out.

9.2 Encodings

9.2.1 Default Encoding(s)

DS Requirement 5	Data conformant to the application schema(s) defined in section 5 shall be encoded using the encoding(s) specified in this section.

9.2.1.1. Default encoding for application schema Sea Regions

Name: Sea Regions GML Application Schema
Version: version 2.0, GML, version 3.2.1
Specification: D2.8.**III**.**16** Data Specification on **Sea Regions** – Draft Guidelines
Character set: UTF-8

9.2.1.2. Default encoding for application schema Sea Regions - Extension

Name: Sea Regions – Extension GML Application Schema
Version: version 2.0, GML, version 3.2.1
Specification: D2.8.**III**.**16** Data Specification on **Sea Regions** – Draft Guidelines
Character set: UTF-8

9.2.1.3. Default encoding for application schema Sea Regions - Addendum

Name: Sea Regions – Addendum GML Application Schema

Version: version Sea Regions, GML, version 3.2.1
Specification: D2.8.**III**.**16** Data Specification on **Sea Regions** – Draft Guidelines
Character set: UTF-8

The GML Application Schemas are distributed in a zip-file separately from the data specification document.

9.2.2 Alternative Encoding(s)

None

10 Data Capture

10.1 Data sources and Scales

Many of the Features specified within the scope of SeaRegions are realised as datasets by national hydrogaphic and marine mapping agencies. A list of these agencies is contained within Annex C of this document. These datasets are used by national hydrographic agencies to produce marine navigation charts at a range of spatial scales shown in the table below. The scales are indicative as the chart level embraces a range of scales depending in the geography of the area to be charted.

IHO Chart Level	Indicative Scale	Inspire Hierachy	Inspire Example
Overview (International)	1:2,000,000	1	World
General (International)	1:1,000,000	1	European
Coastal (International)	1:300,000	2	Regional Sea (Mediterranean, Baltic)
Sub-Coastal (International)	1:150,000	3	Sub-regional Sea (Adriatic. Bay of Biscay)
Approach	1:50,000	4	Local Area (Bay of Naples)
Harbour	1:10,000	4	Local harbour area
Berthing	1:3,000	n/a	n/a

Open issue 10: SDICs and LMOs are invited to comment on the appropriateness of these scales.

The expected content of the data sets at these different scales is given in the following sections:

10.1.1 Level 1 European Scale (~1:1,000,000)

Mandatory Items
Sea to hierarchy level 2
Coastline to hierarchy level 2
Marine Administrative Zone

Recommendation 7 The aim is to establish a single dataset for each Level 1 sea. Given this aim, MS should agree responsibilities for establishing level 2 datasets that can be integrated to

10.1.2 Level 2/3 Regional Scale (~1:300,000)

Mandatory Items

Sea to level hierarchy 3
Coastline to level hierarchy 3
Marine Administrative Zone

Optional Items
SeaAreas
Marine Circulation Zones
Marine iso-line
Marine layers

10.1.3 Level 4 Local Scale (~1:50,000, ~1:10,000)

Mandatory Items
Sea to level hierarchy 4
Coastline to level hierarchy 4
SeaAreas to level hierarchy 4 (MHWS, MLWS, HAT, LAT)
Marine Administrative Zone

Optional Items
Shoreline (MHWS, MLWS, HAT, LAT expected)
Inter-tidal area
Marine layers
Marine Circulation Zones
Marine iso-line

10.2 Dataset Updates

DS Requirement 6	Datasets compliant with the SeaRegions specification should be updated as a minimum with the same frequency as datasets used to generate navigation charts by national hydrographic and marine mapping agencies.

Recommendation 8 Local scale datsasets should be updated on at least a five yearly-basis

10.3 Taking account marine dynamics

10.3.1 Areas with no appreciable tidal range

In areas of Europe where there is no appreciable variation in water level due to tidal variations, a single value for water level can be used. This is consistent with the recommendation of the IHO S-57. In such cases this needs to be indicated in the metadata for the dataset.

Recommendation 9 Where an area has no appreciable tidal range then MSL can be used in alternative to MHW.

10.3.2 Morphodynamics and Coastal Erosion

The SeaRegion specification does not require updating to take account of short term morphodynamics such as those occurring as a result of storm events. In areas of significant long term coastal erosion it would be good practice to provide updates to the dataset at a local scale on a bi-annual basis, but this is not mandated. A qualitiaitve shoreline erosion or accretion trend can be included as an attribute to a Shoreline feature.

Recommendation 10 Coastal erosion is a European consideration. It needs to be determined how coastal erosion (natural risk zone) links to the Sea Regions specification and how the actual dynamics of coastal erosion are documented.

11 Portrayal

This clause defines the rules for layers and styles to be used for portrayal of the spatial object types defined for this theme.

In section 11.1, the *types* of layers are defined that are to be used for the portrayal of the spatial object types defined in this specification. A view service may offer several layers of the same type, one for each dataset that it offers on a specific topic.

Section 11.2 specifies the styles that shall be supported by INSPIRE view services for each of these layer types.

In section 11.3, further styles can be specified that represent examples of styles typically used in a thematic domain. It is recommended that also these styles should be supported by INSPIRE view services, where applicable.

Where XML fragments are used in these sections, the following namespace prefixes apply:

- sld="http://www.opengis.net/sld" (WMS/SLD 1.1)
- se="http://www.opengis.net/se" (SE 1.1)
- ogc="http://www.opengis.net/ogc" (FE 1.1)

IR Requirement 10	If an INSPIRE view services supports the portrayal of data related to the theme **Sea Regions**, it shall provide layers of the types specified in this section.

DS Requirement 7	If an INSPIRE view network service supports the portrayal of spatial data sets corresponding to the spatial data theme **Sea Regions**, it shall support the styles specified in section 11.2. If no user-defined style is specified in a portrayal request for a specific layer to an INSPIRE view service, the default style specified in section 11.2 for that layer shall be used.

Recommendation 11	In addition to the styles defined in section 11.2, it is recommended that, where applicable, INSPIRE view services also support the styles defined in section 11.3.

11.1 Layers to be provided by INSPIRE view services

Layer Name	Layer Title	Spatial object type(s)	Keywords
<Name used by an application to access the layer>	<Human readable title>	<spatial object type(s) or other description of the layer content>	<Keywords>

11.1.1 Layers organisation

None.

11.2 Styles to be supported by INSPIRE view services

Open issue 11: Please see Annex D for proposed portrayal styles. SLDs for these styles will be provided with version 3.0 of this data specification, but for version 2.0 we invite comment on the appropriateness of the styles.

11.3 Other recommended styles

None

Bibliography

[DS-D2.3] INSPIRE DS-D2.3, Definition of Annex Themes and Scope, v3.0, *http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.3_Definition_of_Annex_Themes_and_scope_v3.0.pdf*

[DS-D2.5] INSPIRE DS-D2.5, Generic Conceptual Model, v3.1, *http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.5_v3.1.pdf*

[DS-D2.6] INSPIRE DS-D2.6, Methodology for the development of data specifications, v3.0, *http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.6_v3.0.pdf*

[DS-D2.7] INSPIRE DS-D2.7, Guidelines for the encoding of spatial data, v3.0, *http://inspire.jrc.ec.europa.eu/reports/ImplementingRules/DataSpecifications/D2.7_v3.0.pdf*

[ISO 19101] EN ISO 19101:2005 Geographic information – Reference model (ISO 19101:2002)

[ISO 19103] ISO/TS 19103:2005, Geographic information – Conceptual schema language

[ISO 19107] EN ISO 19107:2005, Geographic information – Spatial schema (ISO 19107:2003)

[ISO 19108] EN ISO 19108:2005 Geographic information - Temporal schema (ISO 19108:2002)

[ISO 19111] EN ISO 19111:2007 Geographic information - Spatial referencing by coordinates (ISO 19111:2007)

[ISO 19115] EN ISO 19115:2005, Geographic information – Metadata (ISO 19115:2003)

[ISO 19118] EN ISO 19118:2006, Geographic information – Encoding (ISO 19118:2005)

[ISO 19135] EN ISO 19135:2007 Geographic information – Procedures for item registration (ISO 19135:2005)

[ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation

[OGC 06-103r3] Implementation Specification for Geographic Information - Simple feature access – Part 1: Common Architecture v1.2.0

[Directive 2008/56/EC] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)

[Directive 2000/60/EC] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for community action in the field of water policy

[IHO S-57] International Hydrographic Organization - Transfer Standard for Digital Hydrographic Data

[IHO S-100] International Hydrographic Organization – Universal Hydrographic Data Model

[IHO S-52] International Hydrographic Organization - Specifications for Chart Content and Display Aspects of ECDIS

Annex A
(normative)

Abstract Test Suite

Any dataset conforming to this INSPIRE data specification shall meet all requirements specified in this document.

Open issue 12: Conformance testing is still an open issue under discussion.

Instructions on conformance testing and a common abstract test suite (including detailed instructions on how to test specific requirements) will be added at a later stage.

Annex B
(informative)
Use cases

This annex describes the use cases that were used as a basis for the development of this data specification.

B.1 Reporting of Marine Protected Sites

Use Case Description	
Name	Periodic Reporting on Marine Protected Sites
Primary actor	Environmental Compliance Manager
Goal	To report which EU Protected Sites are located in the marine environment and classify which of these Protected Sites are fully immersed and those that are exposed as part of the tidal cycle
System under consideration	GIS
Importance	medium
Description	To produce a map of all EU marine protected sites and report on their number, total area and inter-tidal area. Each site is to be attributed to a named sea region as identified in the MSFD.
Pre-condition	None
Post-condition	Report on EU protected sites in the marine environment to provide evidence of compliance to EU policy
Flow of Events – Basic Path	
Step 1.	Obtain dataset of EU protected sites and load into GIS
Step 2.	Obtain dataset of EU Sea areas at Mean High Water and load into GIS
Step 3.	Obtain dataset of EU inter-tidal areas at Mean High Water and load into GIS
Step 4.	Calculate intersects between data sets in GIS
Step 5.	Report on number and area of intersects for each named Sea Area
Flow of Events – Alternative Paths	
None	
Data set: EU protected sites	
Description	Vector data set containing polygons for each EU protected site EU protected sites
Type	Input
Data provider	National or European Environment Agency
Geographic scope	EU
Thematic scope	EU protected site (AM Theme)
Scale, resolution	1:250,000
Delivery	FTP download or WFS

Use Case Description	
Documentation	-
Data set: EU Sea Areas	
Description	**EU Sea Areas**
Type	Input
Data provider	National or European Environment Agency
Geographic scope	EU
Thematic scope	EU sea areas (SR Theme)
Scale, resolution	1:250,000
Delivery	FTP download or WFS
Documentation	-
Data set: EU protected sites	
Description	**EU Inter Tidal Area**
Type	Input
Data provider	National or European Environment Agency
Geographic scope	EU
Thematic scope	EU sea areas (SR Theme)
Scale, resolution	1:250,000
Delivery	FTP download or WFS
Documentation	-

B.2 Water Framework Directive Catchment Model

Use Case Description	
Name	Water Framework Directive Catchment Model
Primary actor	Hydraulic Engineer
Goal	To construct and validate a model for the marine sink of a river catchment
System under consideration	Numerical Hydraulic Model and GIS
Importance	medium
Description	Construct a catchment model that starts at the sea (sea region) and connects to a river network. The Sea Region is a sink for the network. The model needs to be able to represent which (sub) SeaRegions the catchment discharge into and what mechanisms are in place to monitor the quality of the water in these Sea Regions (Environmental Monitoring Facilities Annex III)."
Pre-condition	Catchment river network and associated hydraulic model simulating flows along this network
Post-condition	Model that calculates volume discharge and associated pollutant contents to the marine environment
Flow of Events – Basic Path	
Step 1.	Obtain dataset of **Sea Regions** containing **marine circulation zones** in the vicinity of the river network discharge

Use Case Description	
Step 2.	Obtain dataset of monitoring stations (EF theme) – if any – intersecting with the identified Sea Regions
Step 3.	Extend river network model with marine circulation zones
Step 4.	Validate simulated discharge to marine circulation zones using water quality data from the monitoring stations (OF theme)
Step 5	Run model to give simulations of pollutant loadings to the marine environment
Flow of Events – Alternative Paths	
None	
Data set: Local Sea Regions	
Description	Vector data set containing polygons of marine circulation zones within a Sea Area
Type	Input
Data provider	National or European Environment Agency
Geographic scope	Local
Thematic scope	Marine Circulation Zones (SR Theme)
Scale, resolution	1:10,000
Delivery	FTP download or WFS
Documentation	-
Data set: Monitoring Stations	
Description	Water Quality Monitoring Station
Type	Input
Data provider	National or European Environment Agency
Geographic scope	Local
Thematic scope	Environmental Monitoring Facility (EF Theme)
Scale, resolution	1:10,000
Delivery	FTP download or WFS
Documentation	-
Data set: Water Quality	
Description	<Water Quality data from monitoring station
Type	Input
Data provider	National or European Environment Agency
Geographic scope	Local
Thematic scope	Point Observation Series (OF Theme)
Scale, resolution	1:10,000
Delivery	SOS
Documentation	-

B.3 Coastal Flood Hazard Map

Use Case Description	
Name	<Coastal Flood Hazard Mapping>
Primary actor	<Hydraulic Engineer>
Goal	<To construct a map of the hazard faced by coastal communities from flooding form the sea from extreme waves>
System under consideration	<Hydraulic Model >
Importance	<high>
Description	Establish a map that shows the extreme of waves predicted at a given coastal location. The map shows the wave extreme wave height (m). This task negates the affect of surge effects and is based on a hindcast of measured wave data.
Pre-condition	<Hydraulic model for waves and suitable offshore measured wave data>
Post-condition	<Dataset of wave heights along the shoreline at HAT.>
Flow of Events – Basic Path	
Step 1.	For the area of interest Intersect **seaArea at HAT (SR)** with bathymetry (EL) to create a dataset of sea depth.
Step 2.	Use sea depth data set to build a hydraulic wave model for transforming offshore wave conditions inshore.
Step 3.	Generate a wave climate from a pointObservationSeries of wave height and wave direction.
Step 4.	Use the hydraulic model to transform the wave climate from its observed location to the shoreline.
Step 5	Repeat process to establish nearshore wave climate at a number of locations along the shoreline.
Flow of Events – Alternative Paths	
None	
Data set: <SeaArea>	
Description	< Vector data set of Sea Area at HAT>
Type	Input
Data provider	<National Hydrographic or marine mapping Agency>
Geographic scope	<Local>
Thematic scope	< SeaArea (SR Theme)>
Scale, resolution	<1:10,000>
Delivery	<FTP download or WFS>
Documentation	<->
Data set: <Bathymetry>	
Description	<Coverage data set of bathymetry>
Type	Input
Data provider	< National Hydrographic or marine mapping Agency>
Geographic scope	<Local>
Thematic scope	<Bathymetry (EL theme)
Scale, resolution	<1:10,000>

Use Case Description	
Delivery	<FTP download or WFS>
Documentation	<->
Data set: <Offshore Wave Data>	
Description	<Wave height and direction observed for a period of ideally 10 years or more>
Type	Input
Data provider	<National or European Environment Agency>
Geographic scope	<Regional>
Thematic scope	< Point Observation Series (OF Theme)>
Scale, resolution	<1:10,000>
Delivery	<SOS>
Documentation	<->
Data set: <Extreme Wave Data>	
Description	<Extreme Wave height predicted at locations along a shoreline>
Type	Output
Data provider	<National or European Environment Agency>
Geographic scope	<Local>
Thematic scope	< Point Observation Collection (OF Theme)>
Scale, resolution	<1:10,000>
Delivery	<WFS>
Documentation	<->

Annex C
(informative)
Scope of Sea Regions

C.1.1 Relationship between Sea Regions and Ocean Features

This Section describes the relationship between the two themes Sea Regions and Ocean Geographic Features recommended by the TWG. It revises the scope and definitions suggested in Inspire Document D2.5 to provide greater clarity for both data providers and data users. D2.5 adopted the following definition:

> "*Both 'Oceanographic geographical features' and 'Sea-regions' are concerned with physical conditions of marine water-masses. (This is a similar overlap to that which exists for themes "Atmospheric Conditions" and "Meteorological geographical features".) To resolve the ambiguity, we consider the multi-level approach to data needs assessment applied in ETC. Data at local or regional level are often needed for management and policy implementation, while lower resolution ('smaller scale') data are often required for reporting and policy development/evaluation. The latter includes summaries and integrated data products. D2.5 regarded the "Sea regions" theme as focussing on the local/regional level coastal zone. "*

After due consideration the TWG found some difficulties with this definition; in particular how to apply it in practice as the "spatial scale" discrimination is not very precise. The TWG concluded that the representation of the data provides a better discrimination as it is aligned to both distinct data users and data providers. The TWG therefore proposed the following definition:

> *"A Sea Region is a defined area of common (physical or chemical) characteristics. An Ocean Geographic Feature represents the (physical or chemical) properties of the Sea Region. A Sea Region may have other properties that are not an Ocean Feature, for example bathymetry (Elevation theme) and properties of the sea bed." A Sea Region will typically not be represented as a 'coverage', where as an Ocean Feature will.*

Accordingly the Sea Region theme is aligned with the marine spatial planning and marine resource management user community and the data that is supplied by national hydrographic and marine mapping organisations. The Ocean Geographic Features theme is aligned with the community responsible for monitoring and reporting of the state of the marine environment and the data that is supplied by national marine laboratories and environment agencies. A dataset from the SeaRegions theme will typically be used in a traditional GIS context and a dataset from the Ocean Geographic Feature theme will typically be used in a statistical or trend analysis package.

C.1.2 Relationship between Sea Regions and other Inspire Themes

The TWG considered the key relationships between SeaRegions and the other Inspire themes. The purpose of this was to clarify the boundaries between these themes and to establish rules for "what is in and what is out" of scope. The results of this summarised in Figure 1.

There are three key relationship types that exist between themes are:

- *'Located In'* Another Inspire theme could represent features physically located in a SeaRegion. For example a transport network (shipping lane) is located in a Sea Region
- *'Specialisation Of'* Another Inspire theme could represent features that are a specialisation of the general Sea Region type. Many of these features are not geometrically different to Sea Regions, e.g. a Marine Protected Area is a Sea Region with addition rules defining its extent based on legislation.
- *'Property Of'* Another Inspire theme could represent features that are properties of the Sea Region in some respect. Ocean Geographic Features and Elevation are key examples of this.

Grouping these relationships in this way is a useful approach to aid understanding, but there is also a practical question that it raises. Many uses will want to undertake queries such as 'Find me all Environmental Monitoring Facilities located in a SeaRegion' or 'find me all protected sites located in a SeaRegion'. This raises the question as to whether the 'locatedIn' relationship needs to be explicitly documented. A key principle established during the drafting process however was that if a relationship could be determined from a geographic query then the relationship should not be explicitly encoded.

There are five themes that are particularly key in their relationships to Sea Region and these are:

- Elevation: A key property of the Sea Region in that it represents the depth of that Sea Region. It should be noted that although a Sea Region area can vary with tidal extent, the actual depth of the ocean can only be established by intersection with a dataset from the Elevation theme.
- Hydrography: Provides some base features and scoping for Sea Regions.
- Ocean Geographic Features: Like the Elevation theme, Ocean Geographic Features are a key property of a Sea Region and covers observations and measurements of phenonema such as temperature, salinity and currents. A Sea Region may be derived from analysis of an Ocean Geographic Features, for example areas of common temperature characteristics.
- Area Management and Reporting Units: Several of the specialisations of SeaRegions are Management and Reporting Units, i.e. areas of the sea established as reporting units because of their common physical/chemical characteristics. We have taken the approach that such specialisations are first and foremost a type of Sea Regions, however some of these will be designated as reporting units by other themes.
- Administrative Units: Several specialisations of Sea Regions are also Administrative Units. Concepts such as Territorial Sea or Exclusive Economic Zone (EEZ) are part-based and physical processes and part based on political decisions. Such marine administrative units were neglected from the Administrative Units theme when it was drafted. The Administrative Units theme is to be revised at some time, but in the interim they have been included it in the Sea Regions theme.

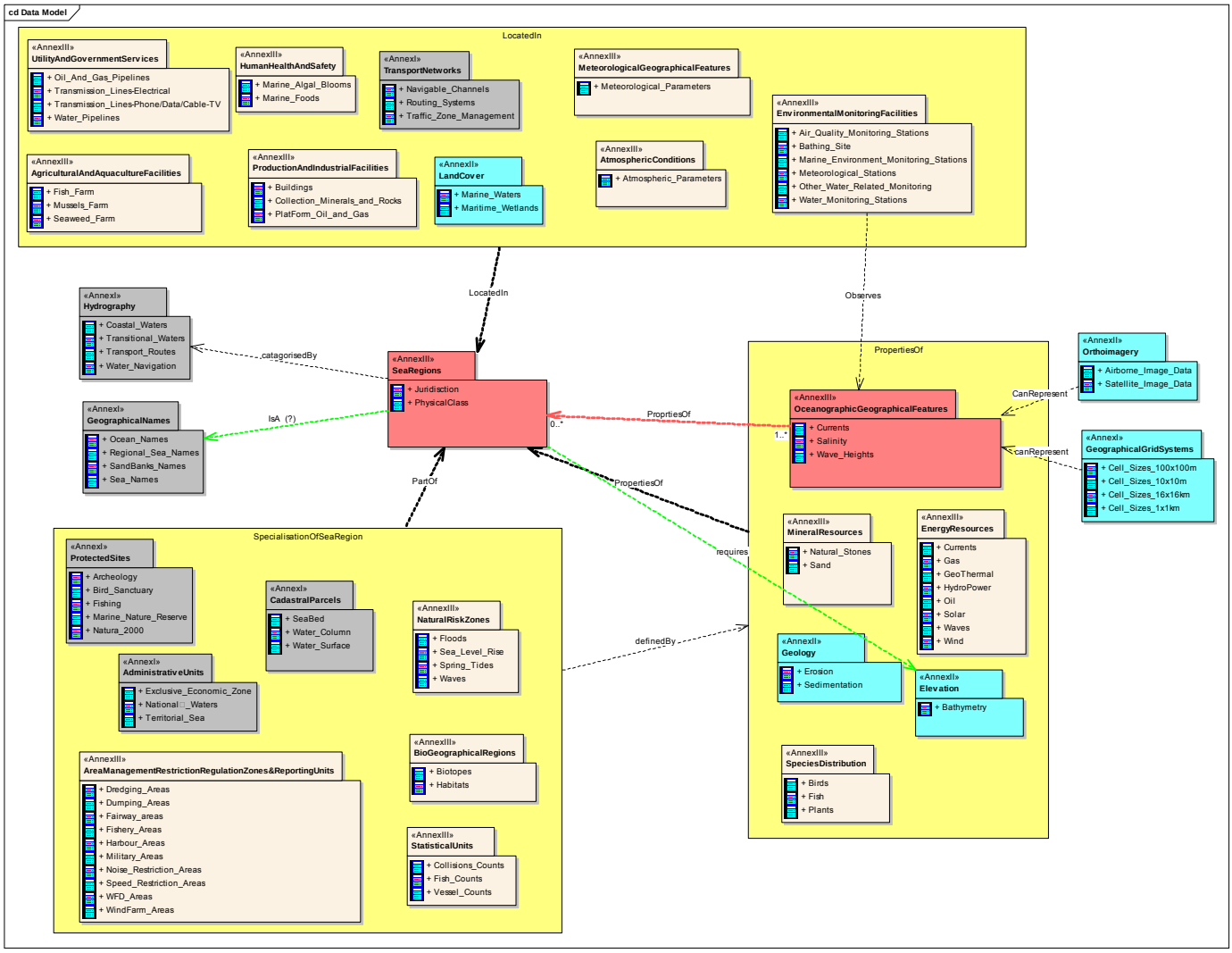


Figure 1 Key Relationships between Sea Regions and other Inspire Themes

C.1.3 Links with the Hydrography Theme

This section discusses the explicit relationship between Sea Regions and the Hydrography theme.

OceanRegion

OceanRegion was originally proposed by Annex 1 as a direct specialisation of Hydro-base::HydroObject (see below for attributes, definition and description). This is similar to the SeaRegions::Sea feature type adopted by the Sea Regions TWG and both OceanRegion and Sea are modelled in a similar way. There are however differences that would benefit from harmonisation of the models

Open issue 13: OceanRegion should be revised to ensure consistency with Sea

5.3.2.4.6 OceanRegion

OceanRegion	
Package:	Sea Regions [Candidate type that might be extended in Annex II/III INSPIRE data specification]
Definition:	One of the three large regions of the world-wide ocean, each with associated sub- and marginal areas and subject to an independent flow-regime.
Description:	SOURCE [DFDD]. NOTE Regarded as a candidate spatial object in Annex II theme 'Sea Regions' due to the close fit to the definition in 2007/2/EC Ann III. 16.
Status:	Proposed
Stereotypes:	«featureType»
Attribute: beginLifespanVersion	
Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.
Multiplicity:	1
Stereotypes:	«voidable,lifeCycleInfo»
Attribute: endLifespanVersion	
Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.
Multiplicity:	0..1
Stereotypes:	«voidable,lifeCycleInfo»
Attribute: geometry	
Value type:	GM_Surface
Definition:	The geometry of the ocean region, as a surface.
Multiplicity:	0..1
Stereotypes:	«voidable»
Attribute: inspireId	
Value type:	Identifier
Definition:	External object identifier of the ocean region.
Description:	NOTE An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world phenomenon.
Multiplicity:	1
Association role: foreshore	
Value type:	Shore
Definition:	The part of the shore or beach which lies between the low water mark and the upper limit of normal wave action.
Description:	SOURCE [DFDD].
Multiplicity:	0..*
Stereotypes:	«voidable»

LandWaterBoundary

LandWaterBoundary is comparable to the concept of Shoreline in the Sea Regions theme. They are modelled in similar ways however Shoreline only applies to marine waters, where as LandWaterBoundary applies to all water bodies. SeaRegion::Shoreline also allows for the shoreline to be attributed. In practice a marine LandWaterBoundary should always be consistent with Shoreline. There is no need for revisions to allow for greater harmonisation

5.3.2.1.8 LandWaterBoundary

LandWaterBoundary	
Definition:	The line where a land mass is in contact with a body of water.
Description:	SOURCE [DFDD]. NOTE The plane of reference for the land-water boundary should be a high water datum, such as 'Mean High Water Springs', 'High Water' or 'Mean Higher High Water'. Where there is little appreciable change in waterlevels / tide at the adjacent shore, then 'Mean Sea Level' or 'Local Datum' may be used.
Status:	Proposed
Stereotypes:	«featureType»
Attribute: beginLifespanVersion	
Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.
Multiplicity:	1
Stereotypes:	«voidable,lifeCycleInfo»
Attribute: endLifespanVersion	
Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.
Multiplicity:	0..1
Stereotypes:	«voidable,lifeCycleInfo»
Attribute: geometry	
Value type:	GM_Curve
Definition:	The geometry of the land-water boundary, as a curve.
Multiplicity:	1
Attribute: inspireId	
Value type:	Identifier
Definition:	External object identifier of the land-water boundary.
Description:	NOTE An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world phenomenon.
Multiplicity:	1
Attribute: origin	
Value type:	OriginValue
Definition:	Origin of the land-water boundary.

Figure 2 LandWaterBoundary Feature Type (from Hydrography)

Shore

Shore is a feature type proposed in Hydrography for inclusion in the LandCover theme. Shore is similar in concept to the InterTidalArea feature type in Sea Regions. The conceptual distinction is that inter-tidal area only applies to land that is immersed by water – or more strictly to the areas of sea where water is not present during a tidal cycle. Shore and InterTidalArea can co-exist and a useful quality test is that Shore should always have a greater crossshore extent than InterTidalArea. Shore caries the type ShoreTypeValue which is a subset of SeaBedAreaType.

5.3.2.4.9 Shore

Shore	
Package:	LandCover [Candidate type that might be extended in Annex II/III INSPIRE data specification]
Subtype of:	HydroObject
Definition:	The narrow strip of land in immediate contact with any body of water including the area between high and low water lines.
Description:	SOURCE [IHO S-32]. NOTE Regarded as a candidate spatial object in Annex II theme 'Land cover' due to unconsolidated shore inclusion in coastal land-cover classificaction schemes.
Status:	Proposed
Stereotypes:	«featureType»

Figure 3 Shore Feature Type (from Hydrography)

Annex D
(informative)
Illustrative Portrayal Section

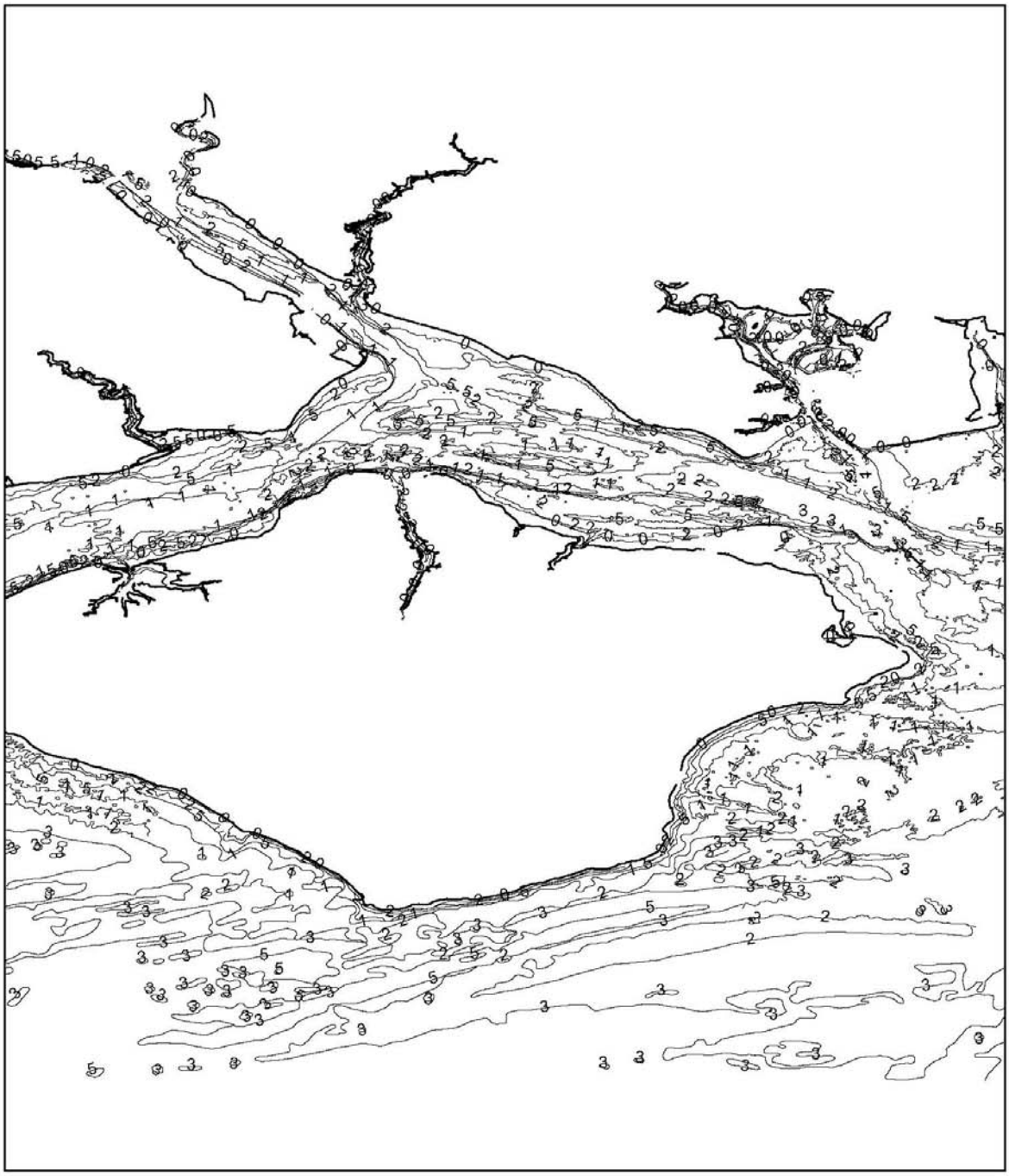
This section illustrates the portrayal requirements which shall be described formally using Styled Layer Decriptors in Chapter 11 in later versions of this specification.

SEAREGIONS - MarineIsoLine

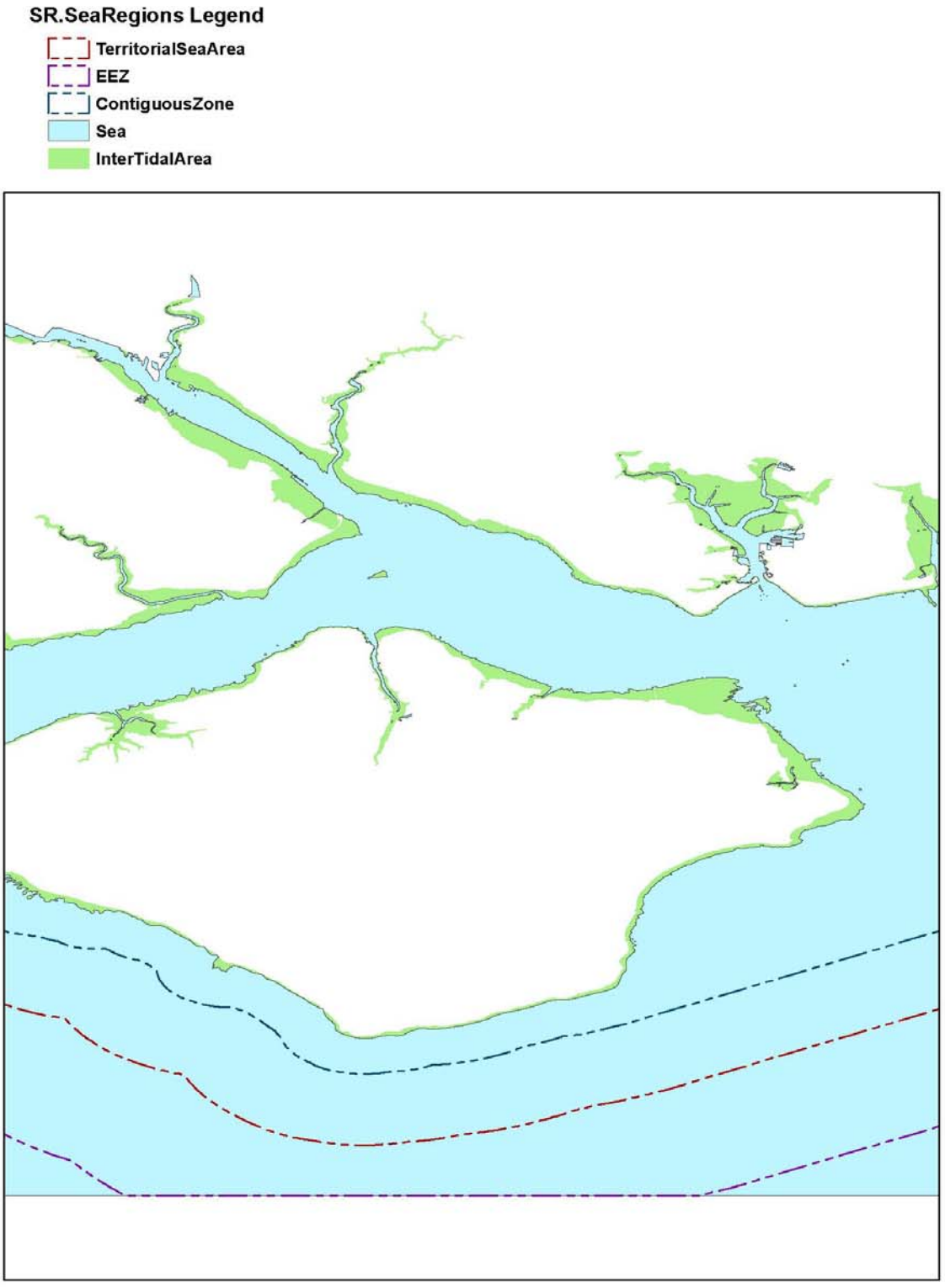
SR.SeaRegions Legend

— **CoastLine**

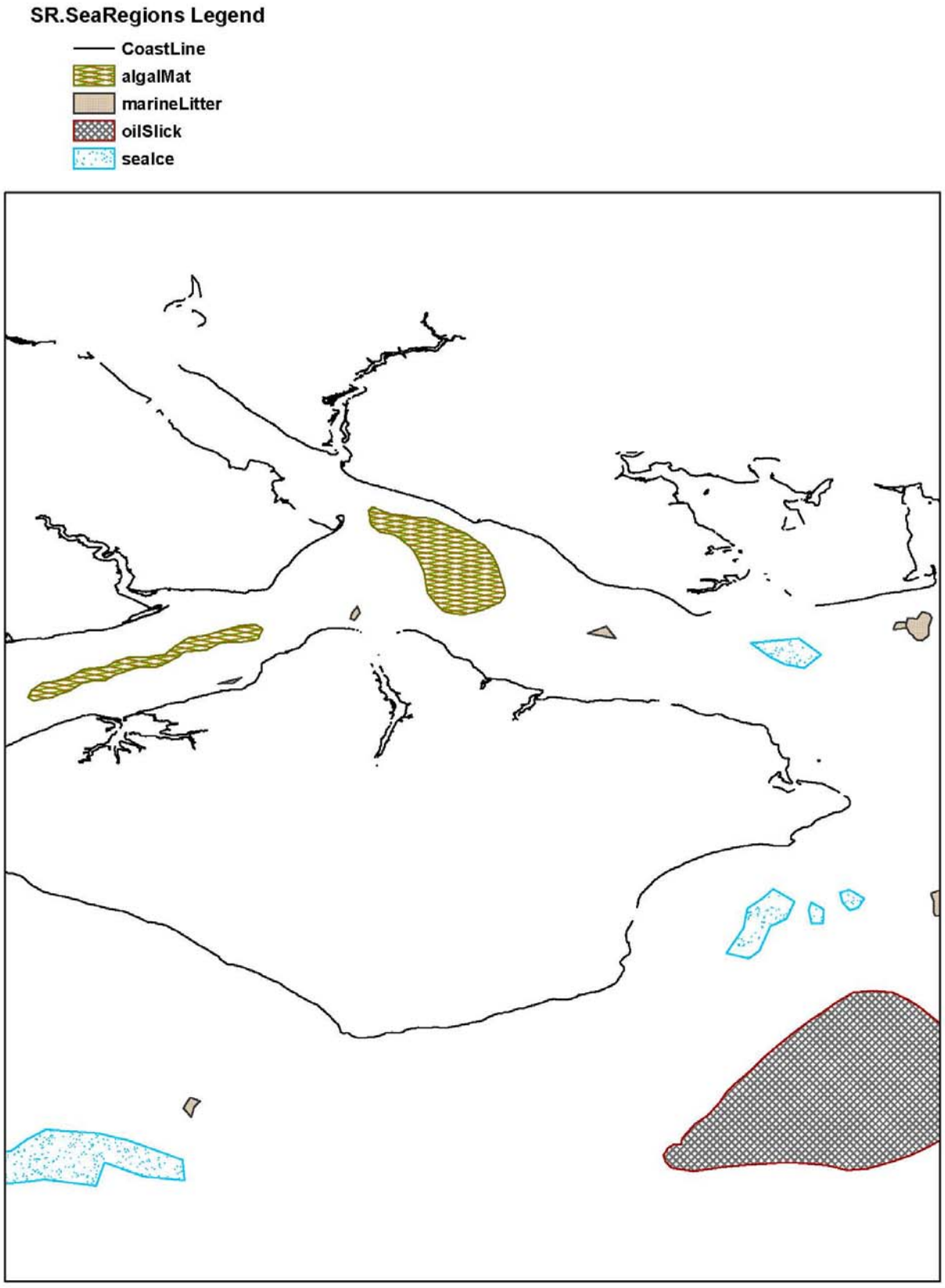
— **MarineIsoLine**



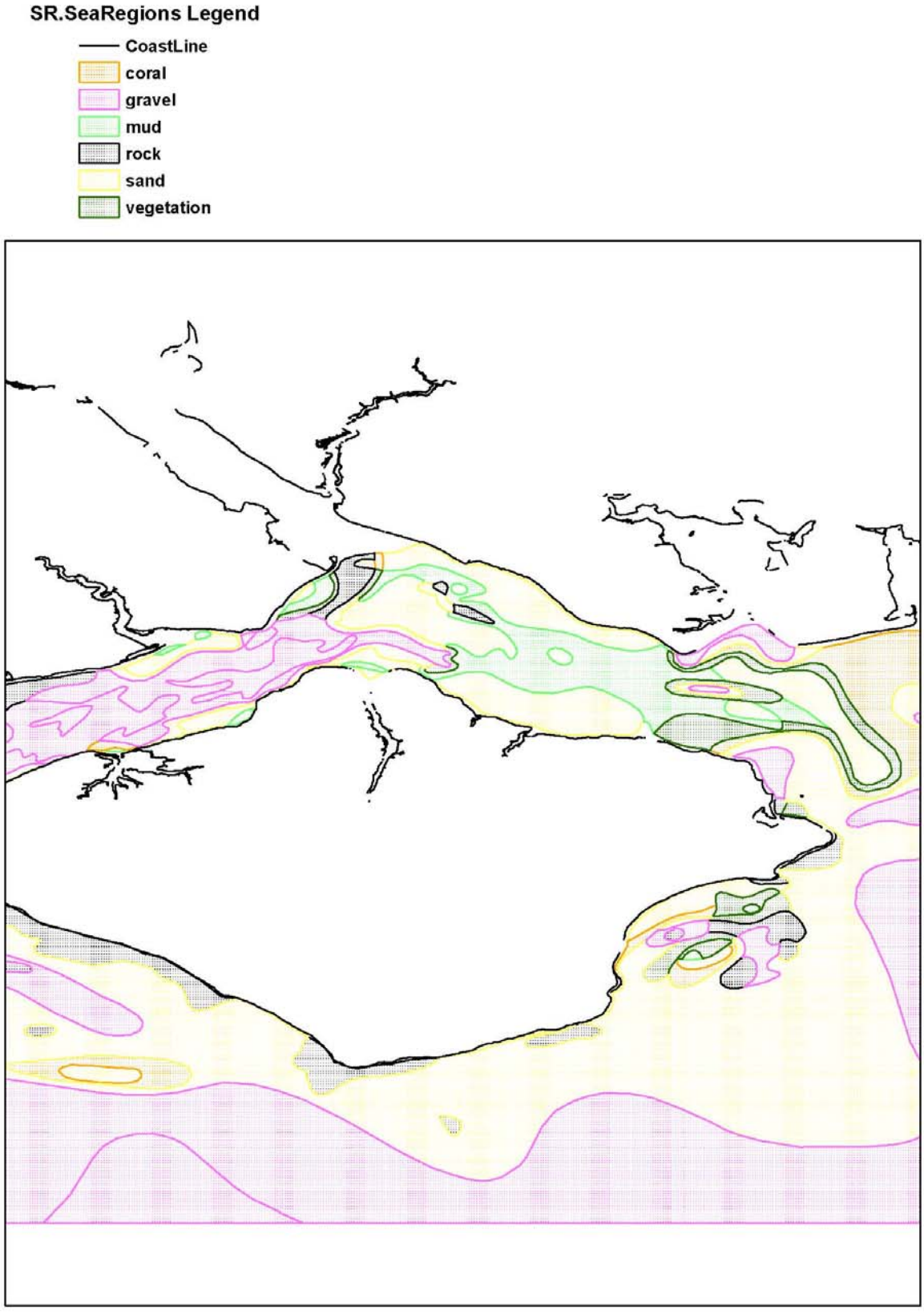
SEAREGIONS - MarineAdministrativeZone



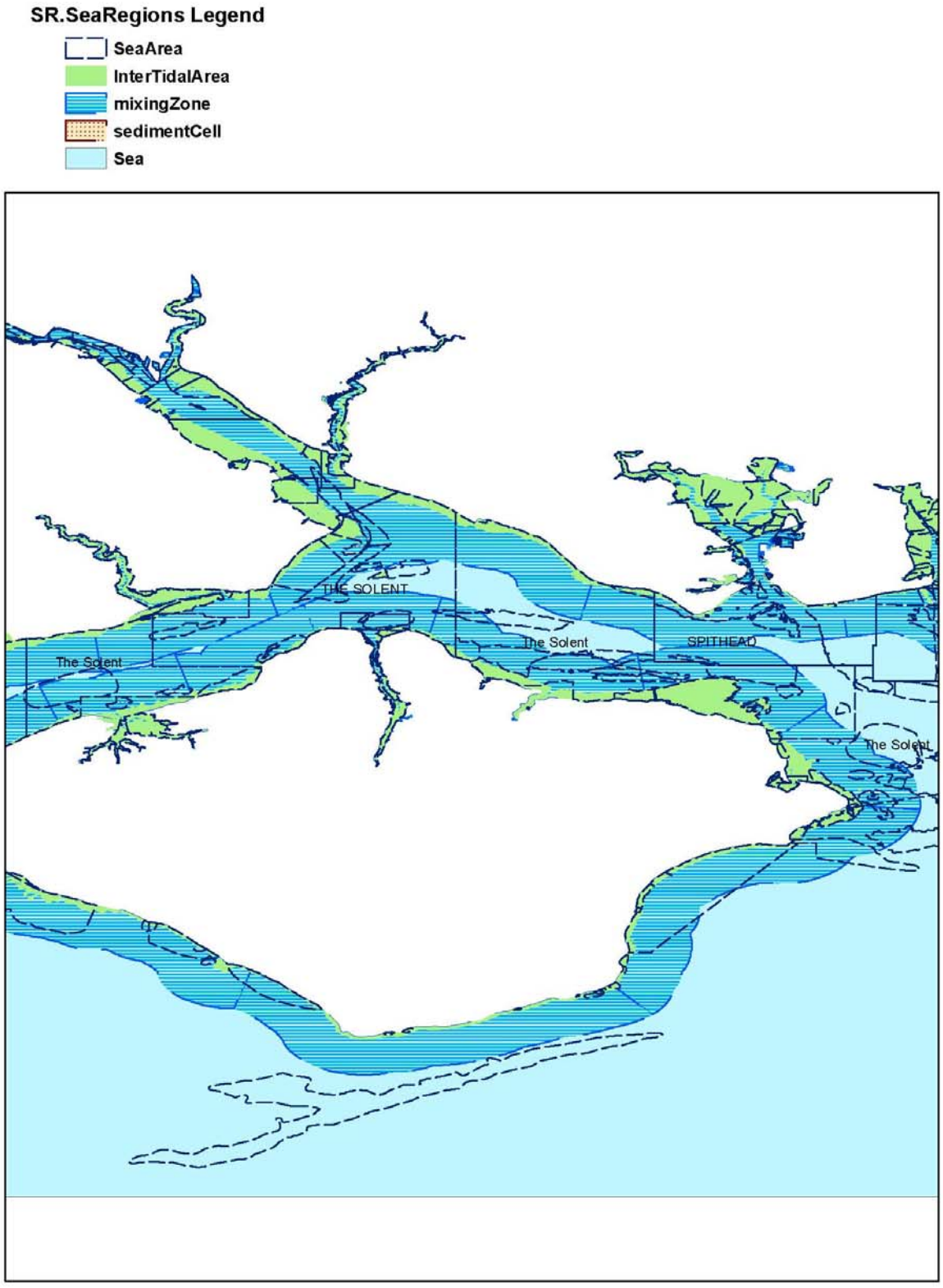
SEAREGIONS - SeaSurfaceArea



SEAREGIONS - SeaBedArea



SEAREGIONS - SeaArea




SR.SeaRegions Legend
CoastLine
MarineIsoLine
TerritorialSeaArea
EEZ
ContiguousZone
SeaArea
algalMat
marineLitter
oilSlick
sealce
mixingZone
sedimentCell
coral
gravel
mud
rock
sand
vegetation
Sea
InterTidalArea