UNIFIED OFFSHORE WIND DATA MODEL

Technical Guidance

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Contents

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About this document

This document is the Technical Guidance for the Offshore Wind Data Model (OWDM). It provides guidance on the purpose, scope, design principles, standards, and data architecture of the OWDM, and should be used as a reference for understanding the technical requirements and application of the model.

This Technical Guidance is intended to be read alongside the accompanying Data Dictionary, which provides the detailed field-level and domain-level definitions required to implement and populate the model consistently by users.

1. Introduction

Through the Unison Project (2025-2026), a consortium of offshore wind industry partners collaborated to create the Offshore Wind Data Model (OWDM).

The OWDM represents a de facto industry standard for structuring and exchanging data during the construction phase of fixed-bottom offshore wind development, enabling consistency, interoperability, and shared understanding across stakeholders.

This document provides guidance for the implementation and use of the OWDM, including its purpose, scope, core principals, usage, standards, data architecture, and governance.

This document should be used as a reference for understanding the technical requirements and application of the OWDM. The accompanying Data Dictionary provides the detailed field-level and domain-level definitions required to implement and populate the model.

2. Model purpose and scope

2.1. Objectives

The offshore wind industry has lacked a standardised approach to managing, analysing, and visualising the geospatial data exchanged during the project development lifecycle. As the number of data providers and consumers increases, variation in data requests and recording practices has led to increased risk of inconsistencies and errors, leading to increased costs.

The OWDM addresses this by providing a standardised structure for exchanging data during the construction phase of development. It serves as an agreed starting point for the delivery of construction-phase data that can be adopted consistently and, where needed, extended to meet project-specific requirements.

Core Purpose: To ensure data consistency, interoperability, and traceability among stakeholders involved in offshore wind construction activities.

Users: Primary users include offshore wind developers and EPCI (Engineering, Procurement, Construction, and Installation) contractors.

2.2. Scope

The OWDM facilitates data exchange and use during the construction phase of offshore wind projects. This includes some preparatory works and related surveys, such as boulder relocation and clearance, through to the installation of offshore assets, including foundations, cable laying, and topside components.

For the purposes of OWDM, *offshore* refers to construction activities and components located seaward of the landfall point, where the export cable comes ashore. Therefore, this excludes the activities related to onshore substations and ports.

In-scope and out of scope phases of offshore wind activities are indicated in Table 1.

Table 1: Standard offshore wind project development activities and inclusion in OWDM scope

Out of scope	In-scope
Offshore resource and metocean assessments	
Offshore environmental surveys (e.g. ornithological, benthic, marine mammals) and impact assessments	
Offshore geological and hydrographical surveys	
Front-end engineering and design (FEED) studies	
Onshore surveys and impact assessments	
Logistics and port assessments	
	Construction-related surveys
	Seabed preparation
	Foundation installation
	Offshore cable installation
	Offshore topside installation
Onshore substation and grid connection installation	
Onshore operations base development	
Operational monitoring (e.g. service operation vessels)	
Planned maintenance and service (e.g. blade inspection)	
Decommissioning activities	

The current version of the OWDM is designed to support fixed-bottom offshore wind construction use cases. This was agreed by the Unison project partners during scoping, recognising that floating offshore wind introduces additional components, such as mooring systems, dynamic cables, and floating substructures, that would require additional geospatial layers and field definitions to support the positioning and monitoring of non-static assets. Future iterations of the OWDM should consider the inclusion of floating offshore wind, building on emerging industry alignment and standard practices as they develop.

2.3. Extensibility

The OWDM is not intended to be exhaustively prescriptive, as it cannot anticipate all project-specific requirements. It may occasionally be necessary to extend the OWDM to accommodate the specific requirements of a particular project, market, or contractual arrangement. However, the core OWDM structure shall remain unchanged, with any project-specific or market-specific requirements captured through additional tables, fields, or datasets. Additions to existing core schema elements, including data structures, field definitions, or domain values, shall be formally agreed between the relevant data exchange parties (typically the developer and contractor) at project inception, and documented as part of the project data agreements. It is recommended that a GIS specialist or construction specialist with knowledge of the OWDM is engaged to support these agreements.

As technology, markets, and operational practices within the offshore wind sector continue to evolve, it may become necessary to update the OWDM to reflect emerging industry needs. Where extensions demonstrate common patterns or are repeatedly adopted across multiple projects, consideration should be given to their inclusion in future versions of the core standard. Refer to Section 3 (Governance) for further detail.

3. Governance

The OWDM was developed through the Unified Offshore Wind Data Model (Unison) Joint Industry Project consortium between July 2025 and September 2026. As delivery lead for the Unison project, the OWDM is published and hosted on the Carbon Trust website, with Carbon Trust retaining responsibility for maintaining access to the current version of the model. At the time of the initial release of the model and the publication of this documentation, there is no formal update schedule or agreement in place.

Users experiencing difficulties accessing the OWDM or associated materials should contact the Carbon Trust directly at client.support@carbontrust.com

4. Usage

4.1. Implementation guidance

To ensure consistent application of the OWDM, the following practices should be followed:

- Adhere to specific geodetic parameters defined by the developer and specified for the project for which OWDM is being used. In the absence of a clear specification document clearly state the Coordinate Reference Systems (CRS) and vertical CRS used and their implementation. Additional information on CRS in reference to the OWDM can be found in section 5.4.
- Follow clear naming conventions for deliverables, e.g., OWDM_ProjectCode_Scope_Version_Date
- Run standard topology and data quality checks, such as:
    - No unresolved node errors or line segment intersections
    - Polyline features should not contain undershoots, overshoots, or duplicate entities,
    - Polyline splits should only occur at nodes and logical intersections
    - Unnecessary polyline splits should be removed
    - No polygon slivers, no self-crossing polygon boundaries, no polygons with negative area.

- Where data is delivered in a geodatabase or other software-specific format, adhere to the agreed minimum software version requirements to ensure backward compatibility
- Follow this Technical Guidance and the accompanying Data Dictionary when implementing and populating the model
- Note that nine common fields (DATE, TIME, FEATURE_ID, CONTRACTOR_NAME, REVISION, REVISION_DATE, PCRS_IDENTIFIER, VCRS_IDENTIFIER, DATA_SOURCE) appear across every geospatial layer in the OWDM. These capture generic metadata such as record identification, revision tracking, coordinate reference systems, contractor responsibility, and data origin.

4.2. Single project vs multi-project implementations

The OWDM can be implemented at both single-project and multi-project levels, depending on organisational needs and system architecture.

Single-project implementations typically apply the model within a defined project scope, with data structures aligned to project-specific agreements. Multi-project implementations are more likely to be managed within enterprise systems and may require additional alignment, depending on governance structures and organisational requirements.

5. Model standards

5.1. Terminology

Table 2 outlines the terminology used in the OWDM, data dictionary and the technical guidance documents. Figure 1 illustrates the hierarchy of the model.

Table 2: Terminology used to describe OWDM-construction

Terminology	Definition
Data group	An illustrative grouping of data categories organised under a common theme to support understanding and navigation of the model.
Data category	A set of related geospatial layers grouped under a shared theme, representing a distinct aspect of construction-phase data.
Geospatial layer	A dataset that stores geographic features of a single geometry type (point, polyline, or polygon) with a defined set of associated fields.
Field	A defined attribute within a geospatial layer used to store a specific type of information for each feature.
Domain	A rule that constrains the permissible values that can be assigned to a field.

Domain coded value	A predefined, allowable value within a domain that can be assigned to a field.

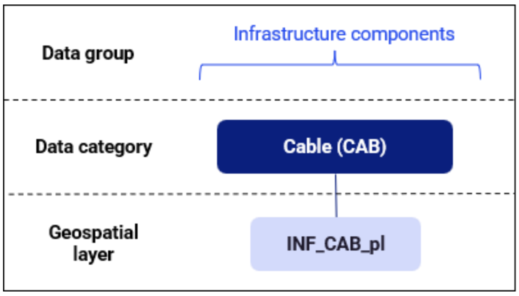

Figure 1: OWDM hierarchy example

5.2. Data types and formats

Geospatial data types

The OWDM primarily uses vector data structures to represent spatial features, including point, polyline, and polygon geometries.

- Point geometry is used to represent discrete locations or individual assets
    - e.g., foundation positions, HDD entry points.
- Polyline geometry is used to represent linear features or routes
    - e.g., pre-lay grapnel runs, vessel tracks.
- Polygon geometry is used to represent areas or spatial extents
    - e.g., asset protection zones, jack-up vessel footprints.

Field level data types

Each geospatial feature and table record is supported by fields. These fields are defined using standard data types to ensure consistent implementation and to provide appropriate constraints on data input and exchange.

- String: used for identifiers, names, and descriptive information
    - e.g., FEATURE_ID, TYPE, DATA_SOURCE.
- Double: used for measured values requiring precision, such as coordinates, distances, and depths
    - e.g., EASTING, FEATURE_LENGTH.
- Short integer: used for values where decimal precision is not required
    - e.g., LEG_NUMBER
- Date: used for general dates, revision dates, installation dates, and validity periods
    - e.g., REVISION_DATE.

Where numeric precision is required, all Double fields in the OWDM use Precision 38 and Scale 8, and all Short Integer fields use Precision 5 and Scale 0. This standardisation supports consistency across implementations.

5.3. Naming conventions

To ensure consistency across the OWDM, standardised naming conventions are applied to fields, domains, and domain coded values.

- All field names and domain names use Upper Snake Case
  - e.g., FEATURE_ID, DATA_SOURCE, UNIT_OF_MEASURE.
- Geospatial layers use a consistent naming convention combining a codified layer name with a geometry suffix.
  - For example, _pt is used to represent point geometry. PRP_PLGR_pt therefore represents the Pre-Lay Grapnel Run dataset with point geometry, under the Preparation Activity (PRP) data group.
  - The full layer nomenclature structure is

    [GROUP]_[CATEGORY]_{AdditionalDescriptor}_{Status/Type}_[geometry]

    Where:
    - '[ ]' means the level of detail is required, and '{ }' is optional.
    - AdditionalDescriptor provides further detail on what the layer is.
    - Status/Type indicates the status or type of the layer e.g. INF_CAB_EVENT_pt (using AdditionalDescriptor) or INF_CAB_AsTRENCHED_pt (using Status/Type).

- Domains that are unique to data categories or geospatial layers are prefixed with the corresponding category/layer abbreviation
  - e.g., BND_TYPE for boundary types, ASSETPRO_TYPE for asset protection types, CABLE_COMPOSITION for cable material composition, TOPSIDE_COMPONENT_TYPE for topside components.
- Domain coded values use sentence case for display values
  - e.g., Site boundary, HDD entry.

5.4. Coordinate Reference Systems (CRS)

Geodesy is a critical component of any offshore wind project, particularly during construction, where accuracy and installation tolerances become essential.

The OWDM provides attribute fields to accurately record all coordinates relevant to installation and preparation operations, with the precision required for installation scopes.

Coordinate representation

For point datasets, the following fields are recorded:

- EASTING
- NORTHING
- LONGITUDE
- LATITUDE

For polygon datasets, the following fields are recorded:

- EASTING_CENTROID
- NORTHING_CENTROID

CRS consistency, implementation and identification

All spatial data should be referenced to a single, consistent CRS for each project. The use of multiple coordinate reference systems within a dataset is not recommended unless explicitly required by a regulatory or project specific requirement. Where multiple CRS are required, this must be clearly defined and agreed between developers and contractors, with all CRS explicitly documented.

The OWDM is provided as a software agnostic template and does not enforce or implement a specific CRS. It is the responsibility of users to configure and apply the appropriate CRS within their chosen software environment, in accordance with project-specific geodetic requirements.

The OWDM uses European Petroleum Survey Group (EPSG) codes as the standard method for identifying CRS. CRS identifiers are stored in the PCRS_IDENTIFIER and VCRS_IDENTIFIER fields, as EPSG codes only (numeric values, without the 'EPSG:' prefix). Alternative CRS approaches can be used and should be documented separately if agreed between developer and contractor during project scoping and contract agreements.

Vertical reference systems

In addition to horizontal positioning, it is essential to clearly define the vertical reference system (VCRS) used.

The OWDM includes fields to capture vertical CRS information associated with the dataset in each geospatial layer. As with horizontal CRS, the OWDM does not enforce a specific vertical CRS, and it is the responsibility of users to configure and document the appropriate vertical datum in line with project requirements.

Dynamic CRS considerations

The OWDM template does not explicitly capture information relating to CRS epoch or transformations, which may be required for dynamic reference systems.

Where dynamic CRS are used, this information should be clearly defined and agreed between developers and contractors and documented outside the OWDM structure to ensure consistency and full interoperability.

2D and 3D considerations

The OWDM is primarily a 2D model but is designed to be 3D aware and ready. All geometry types in Version 1 have been implemented as Z-enabled (PointZ, PolylineZ and PolygonZ) as a standard implementation approach, ensuring consistency across the model. The presence of a Z-enabled geometry does not imply that the Z-dimension will be populated for every geospatial layer, and in practice only a subset of layers is expected to require its use. Implementation of 3D elements is subject to agreement between developers and contractors, and the level of 3D support may vary depending on the software used to implement the model.

5.5. Domains

The OWDM uses domains to standardise field data inputs across geospatial layers and ensure consistency in data exchange.

Global domains are used across multiple geospatial layers (e.g. UNIT_OF_MEASURE), providing a standardised set of values to support measurement fields, such as units associated with depth or penetration values. Layer specific domains apply to individual geospatial layers (e.g. BND_TYPE), defining the allowable values for attributes specific to that layer, such as boundary type classifications.

All domain definitions and domain coded values are provided in the Data Dictionary.

5.6. Measurement units

The OWDM adopts a standardised approach to measurement units. A single, global domain (UNIT_OF_MEASURE) is used across all relevant fields, providing a consistent set of domain coded values (e.g. metre, kilometre, tonne).

All domain coded values for units of measure are provided in the Data Dictionary.

5.7. Temporality

The OWDM supports temporal representation of construction data through a hybrid approach, depending on the dataset.

For datasets with significantly different data exchange requirements between construction lifecycle stages, temporality is managed using separate layers. This approach is applied to three geospatial layers, including, Cable As Trenched point layer (INF_CAB_AsTRENCHED_pt), Cable As Laid point layer (INF_CAB_AsLAID_pt), and Cable As Built point layer (INF_CAB_AsBUILT_pt).

For other datasets in OWDM requiring temporal representation, temporality is managed through a temporal status field. This field, TEMPORAL_STATUS, has an associated domain, TEMPORALITY, which includes the following values: As Planned, As Laid, As Trenched, As Built, and As Found. All domain coded values are defined in the Data Dictionary.

This hybrid approach minimises null values and allows select geospatial layers to include fields specific to the relevant lifecycle stage where required.

6. Data architecture overview

The OWDM comprises 11 data categories, each containing one or more geospatial layers. To support understanding and implementation, these data categories are grouped into four illustrative data groups: non-infrastructure activities, infrastructure components, vessels, and reference and constraints.

Figure 2

For detailed definitions of geospatial layers, fields, and domains, users should refer to the OWDM Data Dictionary.

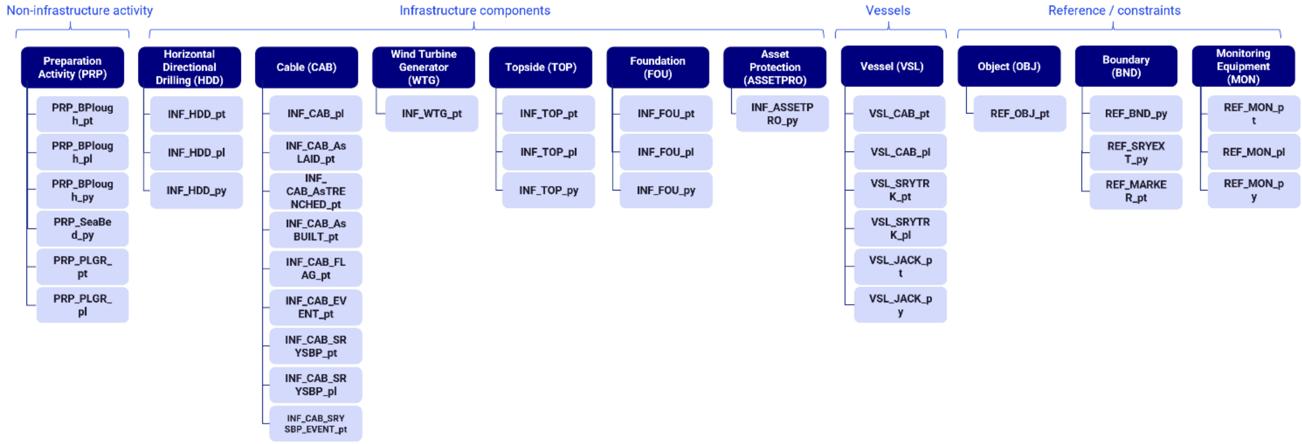

Figure 2: OWDM schema

6.1. Non-infrastructure activity

This data group captures data for construction-related activities that do not form part of permanent offshore wind infrastructure. This includes data category construction activity, with associated data subcategories:

Data Category: Preparation Activity (PRP_[CATEGORY])

- **Boulder Plough:** Captures the spatial extent and operational parameters of seabed clearance activities undertaken to remove or displace boulders prior to installation.
- **Seabed Preparation Activity:** Records the spatial extent and characteristics of seabed preparation works, including clearance type, volume, and affected area.
- **Pre-Lay Grapnel Run:** Represents pre-installation operations carried out to clear debris along cable routes prior to cable laying activities.

6.2. Infrastructure components

This data group represents the physical offshore wind assets installed during construction, along with the protection measures applied to those assets. This includes data categories Horizontal Directional Drilling, Cable, Wind Turbine Generator, Topside, Foundation and Asset Protection, with associated data subcategories:

Data category: Horizontal Directional Drilling (INF_HDD)

- **Horizontal Directional Drilling:** Captures the geometry and characteristics of trenchless drilling operations used to install cables at landfall or constrained locations.

Data category: Cable (INF_CAB)

- **Cable:** Represents the offshore electrical cable route as a continuous polyline, holding route-level attributes such as cable specification, voltage, system type, and burial design targets. Separate As-Laid, As-Trenched and As-Built point layers capture cable position at successive stages of installation.
- **Flag:** Records positional markers and deviations along cable routes, capturing the flag type (e.g. marker, deviation).
- **Event**: Records discrete events occurring during cable installation using standardised event codes.
- **Survey Seabed Preparation:** Captures survey observations along cable routes before and after seabed preparation works, recording survey type and seabed level measurements.
- **Survey Seabed Preparation Event:** Records discrete events identified during seabed preparation surveys along cable routes.

Data category: Wind Turbine Generator (INF_WTG)

- **Wind Turbine Generator:** Records the installed location and key attributes of offshore wind turbine generators within the wind farm, including hub height, rotor diameter, rated capacity, manufacturer, model, and commissioning date.

Data category: Topside (INF_TOP)

- **Topside:** Captures the spatial position and characteristics of offshore topside components.

Data category: Foundation (INF_FOU)

- **Foundation:** Represents the position, geometry, and key attributes of installed foundation structures, including their orientation and installation parameters.

Data category: Asset Protection (INF_ASSETPRO)

- **Asset Protection:** Captures installed protection measures applied to infrastructure, such as rock dumping or other protective interventions.

6.3. Vessels

This data group captures data related to vessels involved in construction phase activities. This includes data category vessels with associated data subcategories:

Data category: Vessels (VSL_[CATEGORY])

- **Cable Vessel:** Records the position of vessels involved in cable installation, with cable-specific installation parameters (tension, cable speed, departure angles). This differs from Survey Vessel Track, which captures positional data associated with survey activities.
- **Survey Vessel Track:** Captures vessel movement and track data associated with survey and monitoring activities. This layer should also be used to capture ROV (Remotely Operated Vehicle) track data, with the TASK and VESSEL_NAME fields used to differentiate between vessel and ROV positional data.

- **Jack Up**: Represents the location and operational footprint of jack up vessels used during construction activities.

6.4. Reference and constraints

This data group provides supporting spatial and contextual data required to interpret construction activities. This includes data categories object, boundary, and monitoring, with associated data subcategories.

Data category: Object (REF_OBJ)

- **Object Relocation**: Records the location and characteristics of objects encountered during construction, including their identification, relocation, and management.

Data category: Boundary (REF_[CATEGORY])

- **Boundary Reference**: Defines spatial boundaries, extents, and zones relevant to the project and construction activities, e.g. operational areas.
- **Survey Extents**: Defines the spatial extent of survey areas associated with construction activities, capturing the survey extent identifier, associated survey file name, and feature area.
- **Boundary Marker:** Captures the location of physical markers (e.g. buoys, posts, signs) used during construction activities.

Data category: Monitoring (REF_MON)

- **Monitoring Equipment**: Captures the location and attributes of monitoring equipment used to observe environmental or construction-related conditions.

7. Data Dictionary

The Data Dictionary provides detailed definition of fields and their associated domains needed to support consistent implementation and population across developers and contractors.

The Data Dictionary is available on the Carbon Trust website: The standard geospatial data model for the construction phase of fixed-bottom offshore wind development.

Abbreviations

Abbreviation	Definition
2D	Two-dimensional
3D	Three-dimensional
ADOC	Actual Depth of Cover
ADOL	As Built Depth of Lowering
AP	Asset Protection
ASB	As Built
ASBL	As-laid Seabed Level
ASL	As Laid
ASSETPRO	Asset Protection
AST	As Trenched
BFL	Backfill Level
BND	Boundary
CAB	Cable
CRP	Cable Reference Point
CRS	Coordinate Reference System
CT	Carbon Trust
DCC	Distance Cross Course
DOCR	Depth of Cover Requirement
DOLR	Depth of Lowering Requirement
EPCI	Engineering, Procurement, Construction, and Installation
EPSG	European Petroleum Survey Group
EVNT	Event
FEED	Front-End Engineering and Design
FLG	Flag
FOU	Foundation
GIS	Geographic Information System
GUS	Gusset Plate
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IMO	International Maritime Organization
INF	Infrastructure Components
JIP	Joint Industry Programme
KP	Kilometre Point
MBES	Multi-Beam Echo Sounder

MON	Monitoring
OBJ	Object
OWDM	Offshore Wind Data Model
PCRS	Projected Coordinate Reference System
PLGR	Pre-Lay Grapnel Run
POSBL	Post Seabed Level
PRP	Preparation Activity
PSBL	Pre Seabed Level
PSC	Project Steering Committee
PTC	Project Technical Committee
QA/QC	Quality Assurance / Quality Control
REF	Reference and Constraints
ROV	Remotely Operated Vehicle
SBD	Seabed
SBP	Seabed Preparation
SRY	Survey
SRYEXT	Survey Extents
SRYSBP	Survey Seabed Preparation
TOC	Top of Cable
TOP	Topside
TP	Transition Piece
TRG	Technical Review Group
UXO	Unexploded Ordnance
VCRS	Vertical Coordinate Reference System
VRT	Vertical Reference
VSL	Vessel
WTG	Wind Turbine Generator
XML	eXtensible Markup Language

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