American National Standard
for Information Technology—

Geographic Information Framework – Data Content Standards For Transportation: Inland Waterways

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(Part XXX)

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American National Standard

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Foreword

The primary purpose of is profile is to support the use and exchange of river (inland waterway) information. The Inland Waterway (IW), a Transportation sub-theme for the Geospatial-One-Stop (GOS), is a profile of the International Hydrographic Office (IHO) standard S57 data exchange format. This effort is a derivative of an ongoing program within the U.S. Army Corps of Engineers (USACE), called the Inland Electronic Navigation Charts (IENCs). The IENCs are posted on the Internet for direct download for use as navigational charts for several of the major rivers within the United States.

The IW is one of five sub-themes within the transportation theme that provides a multi-modal view of transportation, such as road infrastructures, rail systems, air transportation, and conveyances or public transit. The IW is unique, in that the USACE maintains 8,200 miles of rivers in 22 states. Being an integral part of the GOS, the IW will enable a capability to construct a detailed multi-modal description of a transportation system. Additional benefits of the IW being part of the GOS include the establishment and availability of IW data through Web data services throughout the GOS community of users.

This profile of the current IHO standard has been developed to fulfill one of the objectives of the National Spatial Data Infrastructure (NSDI) – to create common geographic base data for seven critical data themes, known as Framework data, reflecting their critical importance as geographic infrastructure. The overall GOS standard is intended to support the data standardization needs of both the Geospatial One Stop e-government initiative and various Homeland Security activities to realize the goals and objectives of the NSDI in information exchange.

Suggestions for improvements of this standard are welcome. They should be sent to

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This profile of the IHO standard was processed and approved within the GOS for submittal to ANSI by the Accredited Standards Committee – INCITS/L1. Committee approval of this Standard does not necessarily imply that all committee members voted for its approval.

1 Scope of this Standard

The purpose of the Inland Waterway (IW) data content profile is to provide common definitions and syntax to enable the use and exchange of these data. The IW profile, in conjunction with the other sub-theme standards within the Transportation Theme, provide the means to construct a complex multi-modal model from disparate data collections and from a variety of different government entities. The data for the IW is provided directly from the U.S. Army Corps of Engineers (USACE). Unlike other themes or sub-themes, the USACE is the only federal government body that maintains the data that describe the navigable inland waterways, and thus the only distributor of this data. The IW profile provides the data content and structure that will be available through the GOS.

Section 6 of this document describes an abstract or conceptual model of the IW content, expressed in the Unified Modeling Language (UML). The use of UML and abstract modeling concepts allows the standard to be technology independent but permits current and future implementation cases that can be derived from the UML model. This model provides a descriptive notation of the common content and structure of the data that is available through the GOS. This document also describes the feature types, their definitions, attributes, and relationships. This profile permits multiple versions and representations of features.

The audience of this document includes IW data users, maintainers, and distributors. The content is intended to support the requirements of transportation and natural resource managers, environmental and water resources agencies, and hydrographic applications designers and developers. Specific guidance on the implementation of this document for specific user communities will be made through external guidance or policy documents.

This profile applies to Framework IW data produced by USACE and disseminated by any organization participating in the National Spatial Data Infrastructure (NSDI). For federal government agencies, Executive Order 12906, [6] states "…federal agencies collecting or producing geospatial data, either directly or indirectly (e.g., through grants, partnerships, or contracts with other entities), shall ensure, prior to obligating funds for such activities, that data will be collected in a manner that meets all relevant standards adopted through the Federal Geographic Data Committee (FGDC) process." Once adopted by the FGDC, ANSI standards must be implemented by federal agencies.

2 Normative References

The following standards contain provisions, which through reference in this text constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

[1] IHO Special Publication No. 57, *Edition 3.1, IHO Transfer Standard for Digital Hydrographic Data.*

[2] FGDC-STD-001-1998, *Content Standard for Digital Geospatial Metadata (version 2.0).*

[3] INCITS 353.2002, *Spatial Data Standard for Facilities, Infrastructure and Environment*

[4] ISO/IEC 8211, "*Information processing - Specification for a data descriptive file for information interchange*"

[4] ISO 19115, *Geographic Information—Metadata*.

[5] Executive Order 12906, 1994, *Coordinating Geographic Data Acquisition and Access: the National Spatial Data Infrastructure*

[6] Executive Order 12906, April 13, 1994, edition of the Federal Register, Volume 59, Number 71, pp. 17671-17674.

3 Definitions

Definitions applicable to this standard are listed below.

Depth Contour: A **contour** of equal water depth, which is sometimes significantly displaced outside of soundings, symbols and other chart detail, for clarity as well as generalization. Depth contours, therefore, often represent an approximate location of the line of equal depth as related to the surveyed line delineated on the source.

Mile Marker: A distance mark not physically installed, denoting a system of reference for position along a waterway.

Sailing Line: The generally accepted course or route on inland rivers used for navigation by commercial vessels. The line may not be in the center of the river or waterway.

4 Symbols (and abbreviations)

Symbols and associated abbreviations applicable to this standard are listed in the Base Transportation Standard.

5 The Inland Waterways Model

5.1 Introduction

This data dictionary describes the characteristics of the inland waterway classes defined in the following UML diagram. Each UML model class equates to a data dictionary entity.

5.1.1 Name/role name

A label assigned to a data dictionary entity or to a data dictionary element. Entity names start with an upper case letter. Spaces do not appear in an entity name. Instead, multiple words are concatenated, with each new subword starting with a capital letter (example: XnnnYmmm). Entity names are unique within the entire data dictionary of this Standard. Element names are unique within an entity, not the entire data dictionary of this Standard. Element names are made unique, within an application, by the combination of the entity and element names (example: MD_Metadata.characterSet). Role names are used to identify abstract model associations and are preceded by “Role name:” to distinguish them from other elements

5.1.2 Definition

The metadata entity/element description.

5.1.3 Obligation/Condition

5.1.3.1 General

This is a descriptor indicating whether an entity or element shall always be documented or sometimes be documented (i.e. contains value(s)). This descriptor may have the following values: M (mandatory), C (conditional), or O (optional).

5.1.3.2 Mandatory (M):

The entity or element shall be documented.

5.1.3.3 Conditional (C):

Specifies an electronically manageable condition under which at least one entity or element is mandatory. ‘Conditional’ is used for one of the three following possibilities:

— Expressing a choice between two or more options. At least one option is mandatory and must be documented.

— Documenting an entity or element if another element has been documented.

— Documenting a element if a specific value for another element has been documented. To facilitate reading by humans, the specific value is used in plain text (ex. "C/not defined by encoding?”). However, the code shall be used to verify the condition in an electronical user interface.

If the answer to the condition is positive, then the entity or the element shall be mandatory.

5.1.3.4 Optional (O):

The entity or the element may be documented or may not be documented. Optional entities and optional elements have been defined to provide a guide to those looking to fully document their data. (Use of this common set of defined elements will help promote interoperability among geographic data users and producers world-wide.) If an optional entity is not used, the elements contained within that entity (including mandatory elements) will also not be used. Optional entities may have mandatory elements; those elements only become mandatory if the optional entity is used.

5.1.3.5 Maximum occurrence

Specifies the maximum number of instances the entity or the element may have. Single occurrences are shown by “1”; repeating occurrences are represented by “N”. Fixed number occurrences other than one are allowed, and will be represented by the corresponding number (i.e. “2”, “3”…etc).

5.1.4 Data type

Specifies a set of distinct values for representing the entities; for example, integer, real, string, and Boolean. The data type attribute is also used to define associations.

5.1.5 Domain

The domain specifies the values allowed or the use of free text. "Free text" indicates that no restrictions are placed on the content of the field. Integer-based codes shall be used to represent values for domains containing codelists.

6 Conceptual Model for the Inland Waterway

Subsections are presented below for this UML model. The following information includes a narrative for context and understanding, and a table to define the contents.

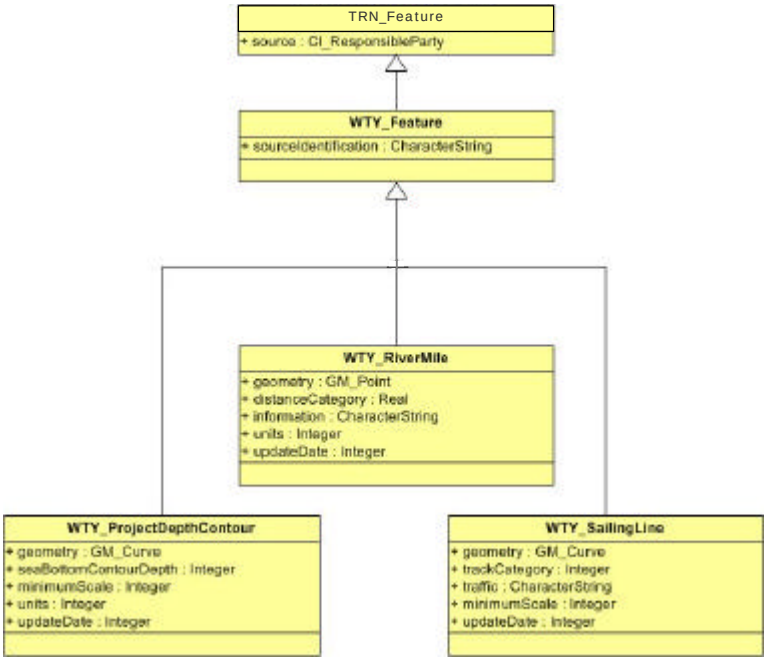

Figure 1 - Primary UML Classes for the inland waterway

6.1 WTY_Feature

The WTY_Feature class for the Inland Waterway model are a collection of three features and their attributes for the river selected. The model inherits feature geometry from the ISO 19107 as modeled by the Open GIS Consortium (OGC). The WTY_ProjectDepthContour class is a set

of segments that describe the depth contour of 9 feet either side of the river. This contour is a class containing polylines forming an imaginary boundary in the waterway. The WTY_RiverMile class describes the abstraction of the mile markers along the river for navigation. This class can be a specialization of the TransPoint class that is an abstract class for all Transportation themes. The WTY_SailingLine class describes the sailing line, or recommended transit route, based on sufficient water depth and permitted passage along the river, between the 9-foot contours.

6.2 The Inland Waterway Data Dictionary

The following table describes the contents of the Inland Waterway model.

	Name / Role Name	Definition	Obligation Condition	Maximum Occurrence	Data type	Domain
1.	WTY_Feature	The collection of all three features and their attributes for the river selected	M	1	Class <<Abstract>>	
2.	sourceIdentification	A unique character string to identify the set of data	M	1	Character strir	sourceIdentificat
3.	WTY_ProjectDepthContour		M		Specialized Cla (WTY_Feature	
4.	geometry	The depth contour between the riverbanks of 9 feet for the entire length of the river	M	1		GM_Curve
5.	seaBottomContourDepth	The vertical dimension, in U.S. Survey feet, referenced to the sounding datum.	M	1	Real	
6.	minimumScale	Recommended minimum scale for viewing	O	1	Integer	
7.	units	A formatted attribute to store U.S. Survey Feet	M	1	Character strir	
8.	updateDate	The date which a segment of this feature was updated with new data	M	1	Integer	
9.	WTY_RiverMile		M		Specialized Cla (WTY_Feature	
10.	geometry	A unique point abstraction of the river's mile marker	M	1		GM_Point
11.	distanceCategory	The distance between mile markers	M	1	Real	
12	information	Additional information relative the river mile	O	1	Character Strir	
13	units	A formatted attribute to store U.S. Survey Feet	M	1	Character strir	
14.	updateDate	The date which a segment of this feature was updated with new data	M	1	Integer	
15.	WTY_SailingLine		M		Specialized Cla (WTY_Feature	
16.	geometry	The centre line along the river, between the two 9 foot contours, which may not be the physical centre of the river or waterway.	M	1		GM_Curve
17.	trackCategory	A track recommended to all or certain vessels	M	1	Integer	
18.	traffic	Two-way traffic permitted	M	1	Character Strir	
19.	minimumScale	Recommended minimum scale for viewing	O	1	Integer	
20	updateDate	The date which a segment of this feature was updated with new data	M	1	Integer	

7 Conformance Testing

The intention of the abstract portion of this standard is to declare all relevant information structures that should be stored in (or converted to or from) systems containing inland waterway data. Strict conformance to such an abstract model is difficult if not impossible to test by automated means.