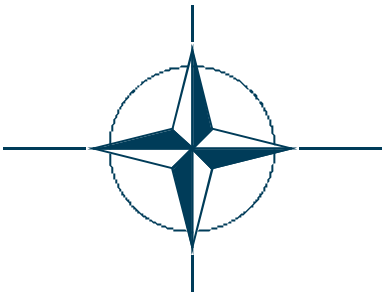
NORTH ATLANTIC TREATY ORGANISATION



(NATO)

ANNEX A

to

ADDITIONAL MILITARY LAYERS

MARITIME FOUNDATION & FACILITIES

PRODUCT SPECIFICATION

Version 2.1, 1 November 2005

Produced and issued by the United Kingdom Hydrographic Office under the direction of the Geospatial Maritime Working Group of the NATO Geographic Conference.

ANNEX A S-57 IMPLEMENTATION OF MARITIME FOUNDATION & FACILITIES (MFF) PRODUCT SPECIFICATION

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CONTENTS

A.1 AML S-57 Format Table and File Structure

A.1.1 GENERAL INFORMATION

The binary implementation of S-57 must be used for AML MFF using the Chain-Node vector model described in S-57, part 2, Theoretical Data Model.

The application profiles define the structure and content of the catalogue file and data set files in an exchange set.

A.1.1.1 Cells

In order to facilitate the efficient processing of AML data the geographic coverage of a given usage must be split into cells. Each cell of data must be contained in a physically separate, uniquely identified file on the transfer medium, known as a data set file (see section A.1.1.6 and A.1.1.7.3 of this Product Specification).

Cells are no longer constrained to be rectangular (i.e. defined by 2 meridians and 2 parallels). It is recommended that the geographic extent of the cell be chosen by the AML producer to ensure that the resulting data set file contains no more than 5 Megabytes of data. Subject to this consideration, the cell size must not be too small in order to avoid the creation of an excessive number of cells.

The co-ordinates of the vertices of the cell are encoded in decimal degrees in the catalogue file.

The area within the cell which contains data must be indicated by a meta object M_COVR with CATCOV = 1 (see section A.2.3.1 of this Product Specification). Any other area not containing data must be indicated by a meta object M_COVR with CATCOV = 2.

Cells of the same scale band (see section 2.2) may overlap. However, data within the cells must not overlap unless the cells are of different security classifications (see section 1.4.2).

Point or line feature objects which are at the border of two cells with the same intended usage must be part of only one cell. They are put in the south or west cell (i.e. north and east borders of the cell are part of the cell, south and west borders are not).

When a feature object exists in several cells its geometry must be split at the cell boundaries and its complete attribute description must be repeated in each cell.

A.1.1.2 Geometry

Edges must be encoded using SG2D fields.

The presentation of symbolised lines may be affected by line length. Therefore, the encoder must be aware that splitting a line into numerous small edges may result in poor symbolisation.

In certain circumstances, the symbolisation of an edge may need to be suppressed. This is done using the value {1} in the “Masking Indicator” [MASK] subfield of the “Feature Record to Spatial Record Pointer” [FSPT] field. If the value in the “Usage Indicator” [USAG] subfield

is set to {3} (exterior boundary truncated by the data limit), the MASK subfield must be set to {255} (null).

A.1.1.3 Groups

The group (GRUP) sub-field is not used for AML products and the value must be set to {255}null.

A.1.1.4 Language and Alphabet

A.1.1.4.1 *Language*

The exchange language must be English. Other languages may be used as a supplementary option.

In general this means that, when a national language is used in textual national attributes (NINFOM and NOBJNM), the English translation must exist in the international attributes (INFORM and OBJNAM). However, national geographic names do not need to be translated in the international attributes, they may be left in their original national language form or may be transliterated or transcribed.

A.1.1.4.2 *Use of lexical level 2*

If the national language cannot be expressed in lexical levels 0 or 1, the following rules apply:

- the exact spelling in the national language is encoded in the "National Attributes" [NATF] field (see sections A.1.2.7.3.4 and A.1.2.8.3.4) using lexical level 2
- translated text, including transliterated or transcribed national geographic names is encoded in the "International Attributes" [ATTF] field (see sections A.1.2.7.3.3 and A.1.2.8.3.3) using lexical level 0 or 1

Where possible international standards should be used for the transliteration of non-Latin alphabets.

A.1.1.5 Exchange Set

The AML MFF implements the international standard ISO/IEC 8211 as a means of encapsulating S-57 structured data. The ISO/IEC 8211 standard provides a file based mechanism for the transfer of data from one computer system to another, independent of make. In addition, it is independent of the medium used to establish such a transfer. It permits the transfer of data and the description of how such data is organised.

For a summary of the S-57 implementation of ISO/IEC 8211, refer to S-57 - Part 3: Annex A.

A.1.1.5.1 *Content of the Exchange Set*

An exchange set is composed of one and only one catalogue file and at least one data set file. Additional files can also be included in the AML exchange set. These files may be included to provide additional information within an AML product.

An exchange set may also contain an optional README file.

Exchange set

|
|--<1>-- README file (see A.1.1.7.1)
|
|--<1>-- Catalogue file (see A.1.2.6)
|
|--<R>-- Data set file (see A.1.1.6)
|
|--<R>-- Text file (see A.1.1.7.4)
|
|--<R>-- Picture file (see A.1.1.7.4)

In tables A.1.1.5.1.1 and A.1.1.5.1.2, all files contained in an Exchange Set (shown in the File Type columns) must be in the formats given in column two of the tables (File Format/Extension). The IMPL subfield values, defined in AML Product Specifications, for the Catalogue Directory field (CATD) are given in the third column (Subfield Value).

A.1.1.5.1.1 *Mandatory Exchange Set File Types*

The table below provides details of the file types and formats that are mandatory in an AML Exchange Set.

File Type	Implementation	Subfield Value
Catalogue	ASCII	ASC
Data Set	Binary	BIN

A.1.1.5.1.2 Additional Exchange Set File Types

The table below provides examples of the file contents and formats that may be included within an AML Exchange Set.

File Type	File Format/Extension	Subfield Value
Text	TXT	TXT
Picture	TIFF	TIF
Document	PDF	PDF
Document	HTML	HTM
Photo	JPEG	JPG
Video	AVI	AVI
Video	MPEG	MPG

A.1.1.5.2 *Exchange Set Naming*

All AML products will follow the exchange set naming convention specified in this section.

Format

XXMbcDDD

Where

XX = the two-letter NATO country code of the producer (NATO STANAG 1059)

M = the first character of the three-letter AML product identifier (MFF)

b = identifies whether the exchange set is a base or update exchange set.

B – Base. A base exchange set may contain original base cells, new editions and re-issues. All three are base cell files as defined in section A.1.2.7.

U – Update. An update exchange set will contain update cell files as defined in section A.1.2.8 but may also contain new editions and new base cells.

c = the security classification code:

N – COSMIC TOP SECRET
W – FOCAL TOP SECRET
T – TOP SECRET
S - SECRET
C - CONFIDENTIAL
R - RESTRICTED
U - UNCLASSIFIED

DDD =is the mandatory alphanumeric geographic area identification code. Codes for use in AML are product specific have yet to be defined. Update exchange sets may not require geographical identification in which case this field will be populated with XXX.

A.1.1.5.3 ***Directory Structure***

The following is an example directory structure for an AML MFF exchange set in MS-DOS format.

Directory of D:\UKMBUDDD

<DIR>			09-15-96	12:40p
<DIR>			09-15-96	12:40p
CATALOG[4]	031	1,584	09-15-96	12:46p CATALOG.031
UKM4U123[1]000		45,584	09-15-96	12:50p UKM4U123.000[3]
UKM4U123[1]001		1,095	09-15-96	12:54p UKM4U123.001
UKM4U123[1]002		1,722	09-15-96	12:54p UKM4U123.002
README[2]TXT		504	09-15-96	12:44p README.TXT
		5 file(s)	49,489 bytes	
		2 dir(s)	1,405,952 bytes free	

Notes:

1. UKM4U123 follows the file naming convention specified in section A.1.1.7 of this Product Specification.

2. The Exchange set directory may also contain a general README file containing ASCII text.

3. For each file in the exchange set the catalogue file must contain the name of the volume on which it is held and the full path name relative to the exchange set directory in that volume. The full path name relative to the exchange set directory must be encoded in the FILE subfield of the “Catalogue Directory” [CATD] field. The LFIL subfield of the CATD field may be used for other purposes. The full path name of the UKM4U123 file shown in the example is UKM4U123.000.

4. The catalogue file must be in the root directory of the exchange set

A.1.1.6 Data Sets

For each individual AML product, four kinds of data sets may be produced:

- new data set: no AML data has previously been produced for this area for the same purpose, or, at the same security classification
- update: changing some information in an existing data set
- re-issue of a data set: including all the updates applied to the original data set up to the date of the re-issue. A re-issue does not contain any new information additional to that previously issued by updates
- new edition of a data set: including new information which has not been previously distributed by updates

Each new data set, re-issue, or new edition is called a base cell file.

A data set containing updates to one base cell file is called an update cell file.

A.1.1.7 File Naming

AML MFF will follow the file naming convention specified below.

Format

XXMnc123.eee

Where

XX = the two-letter NATO country code of the producer (NATO STANAG 1059)

M = the first character of the three-letter AML product identifier. As defined, the overall basic AML service would be made up of seven S-57 products:

M – MFF (Maritime Foundation and Facilities)
E – ESB (Environment, Seabed and Beach)
R – RAL (Routes Areas and Limits)
L – LBO (Large Bottom Objects)
S – SBO (Small Bottom Objects)
C – CLB (Contour Line Bathymetry)
I – IWC (Integrated Water Column)

n = 'Usage Band' values and scale ranges for AML. Potential values are given below.

0 - Non-Scaled Information only
1 - < 1:100,000,000
2 - 1: 25,000,000
3 - 1: 5,000,000
4 - 1:1,000,000
5 - 1:250,000
6 - 1:50,000
7 - 1:10,000
8 - 1:2,500
9 - > 1:1,600

c = the security classification code:

N – COSMIC TOP SECRET
W – FOCAL TOP SECRET
T – TOP SECRET
S - SECRET
C - CONFIDENTIAL
R - RESTRICTED
U - UNCLASSIFIED

123 = product specific alphanumeric identification. This is dependent upon the geographical partitioning of the product and has yet to be fully defined.

eee = extension where 000 is base cell and 001, 002 etc are successive updates.

A.1.1.7.1 *README File*

The README file is an optional ASCII file of general information.

README.TXT is the mandatory name for this file.

A.1.1.7.2 *Catalogue File*

The catalogue file acts as the table of contents for the exchange set (see section A.1.1.5.3).

The catalogue file of the exchange set must be named CATALOG.EEE.
Where EEE is the edition number of S-57 used for this exchange set, i.e. 031 for this edition (3.1). No other file may be named CATALOG.

A.1.1.7.3 *Data Set Files*

Each data set file contains data for one cell (see section A.1.1.1). This includes:

- data set descriptive information that is specific to the data set
- the description and location of the real-world features

A.1.1.7.4 *Text and Picture Files*

Text and picture files do not conform to ISO/IEC 8211 and are not described in the main body of S-57. These files are specific to this Product Specification (see sections 2.5.5 and A.1.1.5.1.2).

A.1.1.8 Updating

In order to ensure that updates are incorporated in the correct sequence without any omission, the file extension and a number of subfields in the "Data Set Identification" [DSID] field are used in the following way:

file extension every new data set, re-issue or new edition must have a "000" extension. For update cell files the extension is the number of the update, ranging from "001" to "999". These numbers must be used sequentially, without omission. Number "001" is the first update after a new data set or a new edition, but not after a re-issue. The update sequence is not interrupted by a re-issue. After a re-issue, subsequent updates may be incorporated into the display system created from this re-issue or to the display system created from the original data and kept continuously updated.

edition number when a data set is initially created, the edition number 1 is assigned to it. The edition number is increased by 1 at each new edition. Edition number remains the same for a re-issue.

update number update number 0 is assigned to a new data set. The first update cell file associated with this new data set must have update number 1. The update number must be increased by one for each consecutive update, until a new edition is released. The new

edition must have update number 0. A re-issue of a data set must have the update number of the last update applied to the data set. In the case of an update cell file the file extension is the same as the update number.

update application date this date is only used for the base cell files (i.e. new data sets, re-issue, and new edition), not update cell files. All updates dated on or before this date must have been applied by the producer.

issue date date on which the data was made available by the data producer.

Table A.1.1.8.1 gives examples of the way to manage the file extension, the "Edition Number" [EDTN], the "Update Number" [UPDN], the "Update Application Date" [UADT] and the "Issue Date" [ISDT] subfields.

A.1.1.8.1 ***File Extension and Sub-field Examples***

Event	File extension	EDTN	UPDN	UADT	ISDT
New data set	.000	1	0	19950104	19950104
Update 1	.001	1	1	prohibited	19950121
Update 2	.002	1	2	prohibited	19950225
...					
Update 31	.031	1	31	prohibited	19950905
Re-issue of a data set	.000	1	31	19950905	19950910
Update 32	.032	1	32	prohibited	19951023
...					
Update 45	.045	1	45	prohibited	19951112
New edition	.000	2	0	19951201	19951201
Update 1 to edition 2	.001	2	1	prohibited	19960429
...					

This example table relates to the specifications given in S-52 Appendix 1, "Guidance on Updating the Electronic Navigational Chart", in the following way:

- The update information encoded in each individual cell file is called a sequential update.
- The collection of the update information encoded in the update cell files which have been issued since the last new data set, the last re-issue of a data set or since the last update was applied to the display system is called a cumulative update. In the example, the cumulative update for the new data set starts with update number 1. The cumulative update for the re-issue of a data set starts with update number 32. The cumulative update for a data set to which update number n has been applied starts with update number n+1.
- The update information which has been incorporated in a re-issue of a data set is called a compilation update.

Each re-issue or new edition of a data set must have the same name as the base cell file which it replaces.

The update mechanism is described in S-57 Part 3, clause 8.

In order to delete a data set, an update cell file is created, containing only the Data Set General Information record with the "Data Set Identifier" [DSID] field. The "Edition Number" [EDTN] subfield must be set to 0. This message is only used to cancel a base cell file.

To inform the user that a new edition is available, an update cell file is created, containing only the Data Set General Information record with the "Data Set Identifier" [DSID] field. The "Edition Number" [EDTN] subfield must contain a value one higher than the current edition number.

In order to modify a text, picture or application file, a new file with the same name is created.

When an object pointing to a text, picture or application file is deleted or updated so that it no longer references the file, the display system software should check to see whether any other object reference the same file, before that file is deleted.

An exchange set may contain base cell files and update cell files for the same cells. Under these circumstances the update cell files must follow on in the correct sequential order from the last update applied to the base cell file.

The record version of each feature or vector record is indicated in the "Record Version" [RVER] subfield of the "Feature Record Identifier" [FRID] field or the "Vector Record Identifier" [VRID] field. At each update of a record, this version number is incremented by 1.

A.1.1.9 Error Detection

File integrity checks are based on the CRC-32 algorithm (a 32 bit Cyclic Redundancy Check algorithm) as defined in ANSI/IEEE Standard 802.3 (section 1.6.1 refers).

A.1.1.9.1 *Implementation*

The checksums for each data set are held in the "CRC" [CRCS] subfield of the "Catalogue Directory" [CATD] field. They allow the integrity of each file in the exchange set to be checked on receipt. The CRC value computed on the received file must the same as the CRC value transmitted.

The CRC values are recorded in ASCII as a hexadecimal number most significant byte first.

A.1.1.9.2 ***Processing***

Encoding is defined by the following generating polynomial:

$$G(x) = x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$$

Processing is applied to relevant files as they appear in the exchange set.

The CRC value of the file is defined by the following process:

1. The first 32 bits of the data are complemented.
2. The n bits of the data are then considered to be the coefficients of a polynomial M(x) of degree n-1.
3. M(x) is multiplied by x^{32} and divided by G(x), producing a remainder R(x) of degree<31.
4. The coefficients of R(x) are considered to be a 32-bit sequence.
5. The bit sequence is complemented and the result is the CRC.

The hexadecimal format of CRCs are converted to ASCII characters and stored in the "Catalogue Directory" [CATD] field.

A.1.2 Application Profiles

A.1.2.1 General

The binary implementation of S-57 must be used for AML. Therefore, the "Implementation" [IMPL] subfield of the "Catalogue Directory" [CATD] field must be set to "BIN" for the data set files (see section A.1.2.6.1.1).

A.1.2.2 Catalogue and Data Set Files

These files are composed of the records and fields defined in the following tree structure diagrams (see sections A.1.2.6.1, A.1.2.7, and A.1.2.8).

The order of data in each base or update cell file is described below:

Data set file
- Data set general information record
- Data set geographic reference record (for Base application profile)
- Vector records
  - Isolated nodes (SG2D)
  - Edges
- Feature records
  - Meta features
  - Geo features (ordered from slave to master)
  - Collection features

This order of records will enable the import software to check that the child record exists each time the parent record references it (i.e. it will already have read the child record so it will know if it exists or not).

A.1.2.3 Records

Records and fields that do not appear in the following tree structure diagrams are prohibited. The order of records in the files must be the same as that described in the tree structure diagrams. The combination of the file name and the "Name" of the record must provide a unique world-wide identifier of the record.

A.1.2.4 Fields

For base cell files, some fields may be repeated (indicated by <R>) and all of their content may be repeated (indicated by *). In order to reduce the volume of data, the encoder should repeat the sequence of subfields, in preference to creating several fields.

A.1.2.5 Subfields

Mandatory subfields must be filled by a non-null value.

Prohibited subfields must be encoded as missing subfields values (see S-57 Part 3, clause 2.1). The exact meaning of missing attribute values is defined in section A.2.2.

In the tables following the tree structure diagrams, mandatory subfields are shown by "M" in the "use" column and prohibited subfields by "P" in the same column. If there is nothing in this column, it means that the use of this subfield is optional. When a subfield value is prescribed, it is indicated in the "value" column. The "comment" column contains general comments and an indication of whether the subfield is ASCII or binary coded.

A.1.2.6 Catalogue File

The catalogue has the same structure for base and update cell application profiles.

A.1.2.6.1 *Catalogue File Structure*

Catalogue file

|
|--<R>--**Catalogue Directory record**
|
|--0001-- ISO/IEC 8211 Record identifier
|
|--<1>-- CATD - Catalogue directory field

A.1.2.6.1.1 *Catalogue Directory Field (CATD)*

NB: All subfield values are encoded as ASCII.

tag	subfield name	use	value	comment
RCNM	Record name	M	CD	
RCID	Record identification number	M		
FILE	File name	M		full path name
LFIL	File long name			

VOLM	Volume	M		name of volume on which file appears
IMPL	Implementation	M	Examples ASC BIN TXT TIF PDF HTM JPG AVI MPG	 for the catalogue file for the data set files for ASCII text files (including the README.TXT file) for picture files for document files for document files for photo files for video/film files for video files
SLAT	Southernmost latitude			mandatory for data set files
WLON	Westernmost longitude			mandatory for data set files
NLAT	Northernmost latitude			mandatory for data set files
ELON	Easternmost longitude			mandatory for data set files
CRCS	CRC	M		except for README and catalogue files
COMT	Comment			

A.1.2.7 AML (Base Cell) File Structure

The two letter identifier for AML MFF base cell application profiles is MN and applies to new data sets, re-issues and new editions of a data set.

Base cell file

```
|
|--<1>--Data Set General Information record
|      |
|      |--0001 - ISO/IEC 8211 Record Identifier
|              |
|              |--<1>-- DSID - Data Set Identification field
|                           |
|                           |--<1>--DSSI - Data Set Structure Information field
|
|--<1>--Data Set Geographic Reference record
|      |
|      |--0001 - ISO/IEC 8211 Record Identifier
|              |
|              |--<1>--DSPM - Data Set Parameter field
|
|--<R>--Vector record
|      |
|      |--0001 - ISO/IEC 8211 Record Identifier
|              |
|              |--<1>--VRID - Vector Record Identifier field
```

```
|                    |
|                    |--<R>--ATTV* - Vector Record Attribute field
|                    |
|                    |--<R>--VRPT* - Vector Record Pointer field
|                    |
|                    |--<R>--SG2D* - 2-D Coordinate field
|
|--<R>--Feature record
     |
     |--0001 - ISO/IEC 8211 Record Identifier
          |
          |--<1>--FRID - Feature Record Identifier field
                    |
                    |--<1>--FOID - Feature Object Identifier field
                    |
                    |--<R>--ATTF*  - Feature Record Attribute field
                    |
                    |--<R>--NATF* - Feature Record National Attribute field
                    |
                    |--<R>--FFPT*  - Feature Record to Feature Object Pointer field
                    |
                    |--<R>--FSPT* - Feature Record to Spatial Record Pointer field
```

A.1.2.7.1 Data Set Descriptive (META) Field Content

A.1.2.7.1.1 Data Set Identification Field Structure (DSID)

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
RCNM	Record name	M	{10}	= DS, binary
RCID	Record identification number	M		binary
EXPP	Exchange purpose	M	{1}	data set is new, binary
INTU	Intended usage	M	101 102 103 104 105 106 107 108 109	= < 1:100,000,000 = 1:25,000,000 = 1: 5,000,000 = 1: 1,000,000 = 1:250,000 = 1:50,000 = 1:10,000 = 1:2,500 = > 1:1,600
DSNM	Data set name	M		file name with extension excluding path, ASCII

tag	subfield name	use	value	comment
EDTN	Edition number	M		Refer to section A.1.1.8
UPDN	Update number	M		ASCII
UADT	Update application date	M		ASCII
ISDT	Issue date	M		ASCII
STED	Edition number of S-57	M	03.1	ASCII
PRSP	Product specification	M	51	= Maritime Foundation & Facilities
PSDN	Product specification description	M	Additional Military Layers Maritime Foundation & Facilities	MFF
PRED	Product specification version number	M	2.1	ASCII
PROF	Application profile identification	M	12	= Maritime Foundation & Facilities, new
AGEN	Producing agency	M		binary
COMT	Comment	M		IDO status Protective marking Owner authority Caveat

A.1.2.7.1.2 *Data Set Structure Information Field Structure (DSSI)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
DSTR	Data structure	M	{2}	= chain node
AALL	ATTF lexical level	M	{0} or {1}	
NALL	NATF lexical level	M	{0}, {1} or {2}	
NOMR	Number of meta records	M		
NOCR	Number of cartographic records	M	{0}	cartographic records are not permitted
NOGR	Number of geo record	M		
NOLR	Number of collection records	M		
NOIN	Number of isolated node records	M		
NOCN	Number of connected node records	M		
NOED	Number of edge records	M		
NOFA	Number of face records	M	{0}	faces are not permitted in chain node structure

A.1.2.7.1.3 Data Set Parameter Field Structure (DSPM)

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
RCNM	Record name	M	{20}	= DP, binary
RCID	Record identification number	M		binary
HDAT	Horizontal geodetic datum	M	{2}	= WGS 84, binary
VDAT	Vertical datum	M		binary
SDAT	Sounding datum	M		binary
CSCL	Compilation scale of data	M		binary
DUNI	Units of depth measurement	M	{1} {2}	=metres, binary =fathoms & feet, binary
HUNI	Units of height measurement	M	{1} or {2}	1 = metres, binary 2 = feet, binary
PUNI	Units of positional accuracy	M	{1}	=metres, binary
COUN	Coordinate units	M	{1}	= lat/long, binary
COMF	Coordinate multiplication factor	M		binary, see S-57 Appendix B.1 clause 4.4
SOMF	3-D (sounding) multiplication factor	M	{10}	binary, see S-57 Appendix B.1 clause 4.4
COMT	Comment	M		ASCII

A.1.2.7.2 ***Spatial Field Content***

A.1.2.7.2.1 *Vector Record Identifier Field Structure (VRID)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
RCNM	Record name	M	{110} or {120} or {130}	= VI, isolated node = VC, connected node = VE, edge
RCID	Record identification number	M		
RVER	Record version	M		
RUIN	Record update instruction	M	{1}	= insert

A.1.2.7.2.2 *Vector Record Attribute Field Structure (ATTV)*

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Attribute value	M		ASCII value. Missing attribute value = attribute is relevant but value is unknown.

A.1.2.7.2.3 *Vector Record Pointer Field Structure (VRPT)*

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
NAME	Name	M		
ORNT	Orientation	M	{255}	= null
USAG	Usage indicator	M	{255}	= null
TOPI	Topology indicator	M	{1} or {2}	= beginning node = end node
MASK	Masking indicator	M	{255}	= null

A.1.2.7.2.4 *2-D Coordinate Field Structure (SG2D)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
YCOO	Coordinate in Y axis	M		latitude (see S-57 Appendix B.1 clause 4.4)
XCOO	Coordinate in X axis	M		longitude (see S-57 Appendix B.1 clause 4.4)

A.1.2.7.3 ***Feature Field Content***

A.1.2.7.3.1 *Feature Record Identifier Field Structure (FRID)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
RCNM	Record name	M	{100}	= FE
RCID	Record identification number	M		
PRIM	Object geometric primitive	M	{1} or {2} or {3} or {255}	= point = line = area = no geometry
GRUP	Group	M	{255}	= null
OBJL	Object label	M		binary code for an object class
RVER	Record version	M		
RUIN	Record update instruction	M	{1}	= insert

A.1.2.7.3.2 *Feature Object Identifier Field Structure (FOID)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
AGEN	Producing agency	M		
FIDN	Feature identification number	M		

tag	subfield name	use	value	comment
FIDS	Feature identification subdivision	M		

A.1.2.7.3.3 *Feature Record Attribute Field Structure (ATTF)*

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Attribute value			ASCII value. Missing attribute value = attribute is relevant but value is unknown.

A.1.2.7.3.4 *Feature Record National Attribute Field Structure (NATF)*

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Attribute value			ASCII value. Missing attribute value = attribute is relevant but value is unknown

A.1.2.7.3.5 *Feature Record to Feature Object Pointer Field Structure (FFPT)*

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
LNAM	Long name	M		binary
RIND	Relationship indicator	M	{2} or {3}	= slave, binary = peer, binary
COMT	Comment			ASCII

A.1.2.7.3.6 *Feature Record to Spatial Pointer Field Structure (FSPT)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
NAME	Name	M		
ORNT	Orientation	M	{1} or {2} or {255}	= forward = reverse = null
USAG	Usage indicator	M	{1} or {2} or {3} or {255}	= exterior = interior =exterior boundary, truncated by the data limit = null
MASK	Masking indicator	M	{1} or {2} or {255}	= mask = show = null

A.1.2.8 AML (Update) File Structure

The two letter identifier for AML MFF update cell application profiles is MR and applies to updates to a data set.

Update cell file

```
|
|--<1>--Data Set General Information record
|      |
|      |--0001 - ISO/IEC 8211 Record Identifier
|              |
|              |--<1>--DSID - Data Set Identification field
|                           |
|                           |--<1>--DSSI - Data Set Structure Information field
|
|--<R>--Vector record
|      |
|      |--0001 - ISO/IEC 8211 Record identifier
|              |
|              |--<1>--VRID - Vector Record Identifier field
|                       |
|                       |--<R>--ATTV* - Vector Record Attribute field
|                       |
|                       |--<1>--VRPC - Vector Record Pointer Control field
|                       |
|                       |--<R>--VRPT* - Vector Record Pointer field
|                       |
|                       |--<1>--SGCC - Coordinate Control field
|                       |
```

```
|                    |--<R>--SG2D* - 2-D Coordinate field
|
|--<R>--Feature record
    |
    |--0001 - ISO/IEC 8211 Record identifier
        |
        |--<1>--FRID - Feature Record Identifier field
                |
                |--<1>--FOID - Feature Object Identifier field
                |
                |--<R>--ATTF*  - Feature Record Attribute field
                |
                |--<R>--NATF* - Feature Record National Attribute field
                |
                |--<1>--FFPC - Feature Record to Feature Object Pointer Control field
                |
                |--<R>--FFPT* - Feature Record to Feature Object Pointer field
                |
                |--<1>--FSPC - Feature Record to Spatial Record Pointer Control field
                |
                |--<R>--FSPT* - Feature Record to Spatial Record Pointer field
```

A.1.2.8.1 Data Set Descriptive (META) Field Content

A.1.2.8.1.1 *Data Set Identification Field Structure (DSID)*

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
RCNM	Record name	M	{10}	= DS, binary
RCID	Record identification number	M		binary
EXPP	Exchange purpose	M	{2}	data set is a revision, binary
INTU	Intended usage	M	101 102 103 104 105 106 107 108 109	= < 1:100,000,000 = 1:25,000,000 = 1: 5,000,000 = 1: 1,000,000 = 1:250,000 = 1:50,000 = 1:10,000 = 1:2,500 = > 1:1,600
DSNM	Data set name	M		file name with extension excluding path, ASCII
EDTN	Edition number	M		Refer to section A.1.1.8

tag	subfield name	use	value	comment
UPDN	Update number	M		ASCII
UADT	Update application date	P		empty, ASCII
ISDT	Issue date	M		ASCII
STED	Edition number of S-57	M	03.1	ASCII
PRSP	Product specification	M	51	= Maritime Foundation & Facilities
PSDN	Product specification description	M	Additional Military Layers Maritime Foundation & Facilities	MFF
PRED	Product specification version number	M	2.1	ASCII
PROF	Application profile identification	M	13	= Maritime Foundation & Facilities, revision
AGEN	Producing agency	M		binary
COMT	Comment	M		IDO status Protective marking Owner authority Caveat

A.1.2.8.1.2 *Data Set Structure Information Field Structure (DSSI)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
DSTR	Data structure	M	{2}	= chain node
AALL	ATTF lexical level	M	{0} or {1}	
NALL	NATF lexical level	M	{0} or {1} or {2}	
NOMR	Number of meta records	M		
NOCR	Number of cartographic records	M	{0}	cartographic records are not permitted
NOGR	Number of geo records	M		
NOLR	Number of collection records	M		
NOIN	Number of isolated node records	M		
NOCN	Number of connected node records	M		
NOED	Number of edge records	M		
NOFA	Number of face records	M	{0}	faces are not permitted in chain node structure

A.1.2.8.2 ***Spatial Field Content***

A.1.2.8.2.1 *Vector Record Identifier Field Structure (VRID)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
RCNM	Record name	M	{110} or {120} or {130}	= VI, isolated node = VC, connected node = VE, edge
RCID	Record identification number	M		
RVER	Record version	M		
RUIN	Record update instruction	M	{1} or {2} or {3}	= insert = delete = modify

A.1.2.8.2.2 *Vector Record Attribute Field Structure (ATTV)*

NB : Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Attribute value			ASCII value, missing attribute value = attribute value is deleted or unknown (see S-57 Appendix B.1 clause 3.5.1)

A.1.2.8.2.3 *Vector Record Pointer Control Field Structure (VRPC)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
VPUI	Vector record pointer update instruction	M	{1} or {2} or {3}	= insert = delete = modify
VPIX	Vector record pointer index	M		
NVPT	Number of vector record pointers	M		

A.1.2.8.2.4 *Vector Record Pointer Field Structure (VRPT)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
NAME	Name	M		
ORNT	Orientation	M	{255}	= null
USAG	Usage indicator	M	{255}	= null
TOPI	Topology indicator	M	{1} or {2}	= beginning node = end node
MASK	Masking indicator	M	{255}	= null

A.1.2.8.2.5 *Coordinate Control Field Structure (SGCC)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
CCUI	Coordinate update instruction	M	{1} or {2} or {3}	= insert = delete = modify
CCIX	Coordinate index	M		
CCNC	Number of coordinates	M		

A.1.2.8.2.6 *2-D Coordinate Field Structure (SG2D)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
YCOO	Coordinate in Y axis	M		latitude (see S-57 Appendix B.1 clause 4.4)
XCOO	Coordinate in X axis	M		longitude (see S-57 Appendix B.1 clause 4.4)

A.1.2.8.3 ***Feature Field Content***

A.1.2.8.3.1 *Feature Record Identifier Field Structure (FRID)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
RCNM	Record name	M	{100}	= FE
RCID	Record identification number	M		
PRIM	Object geometric primitive	M	{1} or {2} or {3} or {255}	= point = line = area = no geometry
GRUP	Group	M	{255}	= null
OBJL	Object label	M		binary code for an object class
RVER	Record version	M		
RUIN	Record update instruction	M	{1} or {2} or {3}	= insert = delete = modify

A.1.2.8.3.2 *Feature Object Identifier Field Structure (FOID)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
AGEN	Producing agency	M		
FIDN	Feature identification number	M		
FIDS	Feature identification subdivision	M		

A.1.2.8.3.3 *Feature Record Attribute Field Structure (ATTF)*

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Attribute value			ASCII value. Missing attribute value = attribute value is deleted or unknown (see S-57 Appendix B.1 clause 3.5.1)

A.1.2.8.3.4 *Feature Record National Attribute Field Structure (NATF)*

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Attribute value			ASCII value. Missing attribute value = attribute value is deleted.

A.1.2.8.3.5 *Feature Record to Feature Object Pointer Control Field Structure (FFPC)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
FFUI	Feature object pointer update instruction	M	{1} or {2} or {3}	= insert = delete = modify
FFIX	Feature object pointer index	M		
NFPT	Number of feature object pointers	M		

A.1.2.8.3.6 *Feature Record to Feature Object Pointer Field Structure (FFPT)*

NB: Subfield values are encoded as ASCII or binary as indicated.

tag	subfield name	use	value	comment
LNAM	Long name	M		binary
RIND	Relationship indicator	M	{2} or {3}	= slave, binary = peer, binary
COMT	Comment			ASCII

A.1.2.8.3.7 *Feature Record to Spatial Record Pointer Control Field Structure (FSPC)*

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
FSUI	Feature to spatial record pointer update instruction	M	{1} or {2} or {3}	= insert = delete = modify
FSIX	Feature to spatial record pointer index	M		
NSPT	Number of feat ure to spatial record pointers	M		

A.1.2.8.3.8 Feature Record to Spatial Pointer Field Structure (FSPT)

NB: All subfield values are encoded as binary.

tag	subfield name	use	value	comment
NAME	name	M		
ORNT	orientation	M	{1} or {2} or {255}	= forward = reverse = null
USAG	usage indicator	M	{1} or {2} or {3} or {255}	= exterior = interior = exterior boundary, truncated by the data limit = null
MASK	Masking indicator	M	{1} or {2} or {255}	= mask = show = null

A.2 AML S-57 Data Dictionary

A.2.1 General Guidelines

A.2.1.1 Feature Object Identifiers

Each feature object must have a unique world-wide identifier. This identifier, called the feature object identifier, is formed by the binary concatenation of the contents of the subfields of the ”Feature Object Identifier” [FOID] field.

The feature object identifier may be used to identify multiple instances of the same object. For example, the same object may appear in different scale bands, or an object may be split by the cell structure. In these circumstances, each instance of this object may have the same identifier.

Feature object identifiers must not be reused, even when a feature has been deleted

A.2.1.2 Cartographic Objects

The use of cartographic objects is prohibited.

A.2.1.3 Time Varying Objects

Specific AML products may contain information about magnetic variation, tides, tidal streams and currents. However, depth information should only be displayed as it has been provided in the AML product and not adjusted by tidal height.

A.2.1.4 Prohibited Attributes

Attributes not included in this Product Specification are prohibited.

A.2.1.5 Numeric Attribute Values

Floating point or integer attribute values must not be padded by non-significant zeros (e.g. 2.5 and not 02.500) unless they are required to specify units of resolution where trailing zeros will become significant in order to distinguish between values (e.g. 3.2 may need to be differentiated from 3.200).

A.2.1.6 Text Attribute Values

The lexical level used for the “Feature Record Attribute” [ATTF] field must be 1 (ISO 8859-1) (see sections A.1.2.7.3.3 and A.1.2.8.3.3). Lexical level 1 or 2 may be used for the “Feature Record National Attribute” [NATF] field (see sections A.1.2.7.3.4 and A.1.2.8.3.4). Format effecting (C0) characters, as defined in S-57 Part 3, Annex B, are prohibited. The delete character is only used in the update mechanism (see S-57 part 3, clause 8.4.2.2.a and 8.4.3.2.a).

A.2.2 Unknown Attribute Values

In a base data set (MN application profile), when an attribute code is present but the attribute value is missing, it means that the producer wishes to indicate that this attribute value is unknown.

In a revision data set (MR application profile), when an attribute code is present but the attribute value is missing it means:

- that the value of this attribute is to be replaced by an unknown value if it was present in the original data set
- that an unknown value is to be inserted if the attribute was not present in the original data set

In both cases the missing attribute value is encoded by the means described in S-57 Part 3, clause 2.1.

A.2.3 Use of Meta Information

A.2.3.1 AML Data Set Metadata

For all AML Products, the Data Set Descriptive records (defined in the application profile structures - sections A.1.2.7.1 and A.1.2.8.1) are used to contain the metadata of the dataset. The mandatory meta information specified in section 5.3 is encoded in S-57 as indicated in the table below.

General/Production Information	Field	Sub-field
Production Agency	DSID	AGEN
Dataset Name	DSID	DSNM
Edition Number	DSID	EDTN
Date of Release	DSID	ISDT
Product Specification Description	DSID DSID	PRSP PSDN
Product Specification Version Number	DSID	PRED
Product Scale Band	DSID	INTU
Compilation Scale	DSPM	CSCL

Security Classification Information	Field	Sub-field
IDO status	DSID	COMT (stored as comma-separated values in free-text subfield)
Protective Marking	DSID	
Owner Authority	DSID	
Caveat	DSID	

Update Information	Field	Sub-field
Update Application Date	DSID	UADT
Update Number	DSID	UPDN

Datums & Units	Field	Sub-field
Horizontal Geodetic Datum	DSPM	HDAT
Vertical Datum	DSPM	VDAT
Sounding Datum	DSPM	SDAT
Co-ordinate Units	DSPM	COUN
Depth Units	DSPM	DUNI
Height/Length Units	DSPM	HUNI
Positional Accuracy Units	DSPM	PUNI

A.2.3.2 Hierarchy of Meta Data

Any meta data stored as attributes of Meta Objects, or, Geo or Spatial features will override meta information stored in the Data Set Descriptive records. The table below indicates which AML meta objects and associated attributes supersede information stored in the data set subfields (see sections A.2.3.1, A.1.2.7.1, and A.1.2.8.1).

NOTES:

In the following tables, acronyms shown in upper-case type, are those approved by the IHO for use in the S-57 data schema. However, additional acronyms have been created for use in the AML data schema. These are shown in lower-case type.

Additionally, the terms ‘specific’ and ‘generic’ are used in the tables to indicate an attribute’s association to a feature. Attributes that are ‘generic’ apply to all features listed in this Product Specification. Attributes listed as ‘specific’ relate only to those in the Real-World Features table in section 5.5.1, when included in the ‘Associated Attributes’ column.

Field	Sub-field	S-57 Meta Object	S-57 Attribute	S-57 Geo Object	S-57 Attribute
DSID	AGEN	M_PROD	AGENCY	generic	AGENCY
DSPM	CSCL	M_CSCL	CSCALE	generic	CSCALE
DSID	COMT (stored as comma-separated values in free-text subfield)	m_clas	secido	generic	secido
			secpmk	generic	secpmk
			secown	generic	secown
			seccvt	generic	seccvt

Field	Sub-field	S-57 Meta Object	S-57 Attribute	S-57 Geo Object	S-57 Attribute
DSPM	VDAT	M_VDAT	VERDAT	specific	VERDAT
DSPM	SDAT	M_SDAT	soudat	specific	soudat
DSPM	DUNI	M_UNIT	DUNITS	specific	DUNITS

A.2.4 Schema

A.2.4.1 AML Maritime Foundation and Facilities Meta Information Table

The meta information specified in section 5.3 is encoded in S-57 as indicated in the table below.

Production Information	**S-57 Meta Object**	**S-57 Attribute**	**S-57 Geo Object**	**S-57 Attribute**
Capture Date	M_PROD	RECDAT	generic	RECDAT
Copyright Statement	M_PROD	cpyrit	generic	cpyrit
Production Agency	M_PROD	AGENCY	generic	AGENCY
Producing Country	M_PROD	PRCTRY	generic	PRCTRY
Data Coverage	M_COVR	CATCOV	N/A	N/A

Security Classification Information	**S-57 Meta Object**	**S-57 Attribute**	**S-57 Geo Object**	**S-57 Attribute**
IDO status	m_clas	secido	generic	secido
Protective Marking	m_clas	secpmk	generic	secpmk
Owner Authority	m_clas	secown	generic	secown
Caveat	m_clas	seccvt	generic	seccvt

Geo-Reference Information	**S-57 Meta Object**	**S-57 Attribute**	**S-57 Geo Object**	**S-57 Attribute**
Vertical Datum	M_VDAT	VERDAT	specific	VERDAT
Sounding Datum	M_SDAT	soudat	specific	soudat
Height Units	M_UNIT	HUNITS	specific	HUNITS
Depth Units	M_UNIT	DUNITS	specific	DUNITS
Length/Width Units	M_UNIT	HUNITS	specific	HUNITS

Source Information	**S-57 Meta Object**	**S-57 Attribute**	**S-57 Geo Object**	**S-57 Attribute**
Source Date	M_CSCL	SORDAT	generic	SORDAT
Source Country	M_CSCL	SORIND	generic	SORIND
Source Agency	M_CSCL	SORIND	generic	SORIND
Source ID	M_CSCL	SORIND	generic	SORIND
Source Type	M_CSCL	SORIND	generic	SORIND
Source Scale	M_CSCL	CSCALE	generic	CSCALE

Data Quality Information	S-57 Meta Object	S-57 Attribute	S-57 Geo Object	S-57 Attribute
Absolute Horizontal Accuracy	M_ACCY (non-bathymetric data) M_QUAL (bathymetric data)	POSACC POSACC	generic generic	POSACC (spatial object) POSACC (spatial object)
Error Ellipse	M_ACCY (non-bathymetric data)	errell	generic	errell (spatial object)
Absolute Vertical Accuracy	M_ACCY	elvacc	generic	elvacc
Relative Horizontal Accuracy	M_ACCY	HORACC	generic	HORACC
Relative Vertical Accuracy	M_ACCY	VERACC	generic	VERACC
Sounding Accuracy	M_QUAL	SOUACC	specific	SOUACC
Quality of Position	M_SREL	QUAPOS	generic	QUAPOS (spatial object)
Quality of Sounding Measurement	M_SREL	QUASOU	specific	QUASOU
Technique of Sounding Measurement	M_SREL	TECSOU	specific	TECSOU
Completeness for the Product Specification	m_conf	catcnf	N/A	N/A

External Reference Information	S-57 Meta Object	S-57 Attribute	S-57 Geo Object	S-57 Attribute
Image File Link	M_NPUB	PICREP	generic	PICREP
Text File Reference	generic	TXTDSC	generic	TXTDSC
Text File Reference (in national language)	generic	NTXTDS	generic	NTXTDS
Reference to a publication	M_NPUB	PUBREF	generic	PUBREF

Other Supporting Information	S-57 Meta Object	S-57 Attribute	S-57 Geo Object	S-57 Attribute
Supporting Textual Information	generic	INFORM	generic	INFORM
Supporting Textual Information (in national language)	generic	NINFOM	generic	NINFOM

Notes:

1. When there is no meta object attribute, an individual attribute can supersede a data set subfield.

2. It is prohibited to use an attribute on an individual object, if this attribute has the same value as the general value defined by the meta object or the equivalent data set subfield.
3. It is prohibited to use a meta object, if the information given by this meta object is the same as the value given by the equivalent data set subfield.

A.2.4.2 AML Maritime Foundation and Facilities Object Table

The table below defines the S-57/AML six-letter acronym for each of the features described in section 5.5.1.

The tables provide the following details:

- feature name
- the six-character alpha-numeric code for the feature

Feature (Geo Object)	Acronym
Administration area	ADMARE
Beacon, cardinal	BCNCAR
Beacon, isolated danger	BCNISD
Beacon, lateral	BCNLAT
Beacon, safe water	BCNSAW
Beacon, special purpose	BCNSPP
Buoy, cardinal	BOYCAR
Buoy, installation	BOYINB
Buoy, isolated danger	BOYISD
Buoy, lateral	BOYLAT
Buoy, safe water	BOYSAW
Buoy, special purpose	BOYSPP
Built-up area	BUAARE
Cable area	CBLARE
Cable, submarine	CBLSUB
Coastguard station	CGUSTA
Coastline	COALNE
Deep water route centreline	DWRTCL
Deep water route composite	C_AGGR
Deep water route – part	DWRTPT
Fishing Ground	FSHGRD
Harbour area (administrative)	HRBARE
Harbour facility	HRBFAC
Ice area	ICEARE
Inshore Traffic Zone	ISTZNE
Land area	LNDARE
Light	LIGHTS
Light float	LITFLT
Light vessel	LITVES
Local magnetic anomaly	LOCMAG
Magnetic variation	MAGVAR
Marine farm / culture	MARCUL
Obstruction	OBSTRN
Offshore platform	OFSPLF

Feature (Geo Object)	Acronym
Offshore production area	OSPARE
Pipeline area	PIPARE
Pipeline, submarine/on land	PIPSOL
Precautionary area	PRCARE
Production / storage area	PRDARE
Rescue station	RSCSTA
Sea area	SEAARE
Signal station, warning	SISTAW
Tidal stream - flood / ebb	TS_FEB
Tidal stream - harmonic prediction	TS_PRH
Tidal stream – non-harmonic prediction	TS_PNH
Tidal stream - time series	TS_TIS
Tidal stream panel data	TS_PAD
Tide – harmonic prediction	T_HMON
Tide – non-harmonic prediction	T_NHMN
Tide - time series	T_TIMS
Traffic separation line	TSELNE
Traffic separation scheme boundary	TSSBND
Traffic separation scheme composite	C_AGGR
Traffic separation scheme crossing	TSSCRS
Traffic separation scheme lane part	TSSLPT
Traffic separation scheme roundabout	TSSRON
Traffic separation zone	TSEZNE
User defined	u_defd

Collection & Meta Object	Acronym
Completeness for the product specification	m_conf
Data coverage	M_COVR
Data source area	M_CSCL

A.2.4.3 AML Maritime Foundation and Facilities Attribute Table

The table below defines the S-57/AML six-letter acronym for each of the attributes described in section 5.5.2 of the Product Specification.

The tables provide the following details:

- the attribute name
- the six-character alpha-numeric code

Allowable attribute values for all the attributes listed are given in section 5.5, Schema.

Attribute	Acronym
Absolute horizontal accuracy	POSACC
Absolute vertical accuracy	elvacc
Buried depth	BURDEP
Capture date	RECDAT
Category of cardinal mark	CATCAM
Category of completeness	catcnf
Category of coverage	CATCOV
Category of harbour facility	CATHAF

Attribute	Acronym
Category of installation buoy	CATINB
Category of lateral mark	CATLAM
Category of light	CATLIT
Category of marine farm / culture	CATMFA
Category of obstruction	CATOBS
Category of offshore platform	CATOFP
Category of pipeline	CATPIP
Category of production area	CATPRA
Category of recommended track	CATTRK
Category of rescue station	CATRSC
Category of signal station, warning	CATSIW
Category of special purpose mark	CATSPM
Category of tidal stream	CAT_TS
Category of traffic separation scheme	CATTSS
Caveat	seccvt
Classification of ice	CATICE
Colour	COLOUR
Condition	CONDTN
Conspicuous, radar	CONRAD
Conspicuous, visually	CONVIS
Controlling authority	authty
Copyright Statement	cpyrit
Current velocity	CURVEL
Depth of water over feature	VALSOU
Depth range – deepest value	DRVAL2
Depth range – shoalest value	DRVAL1
Depth units	DUNITS
Elevation	ELEVAT
End date	DATEND
Error ellipse	errell
Height	HEIGHT
Height / length units	HUNITS
Image file link	PICREP
International Defence Organisation (IDO) status	secido
Jurisdiction	JRSDTN
Light characteristic	LITCHR
Limits of anchors and chains	limanc
Marks - navigational - system of	MARSYS
Name (in English)	OBJNAM
Name (in national language characters)	NOBJNM
Nationality	NATION
Nature of construction	NATCON
Orientation	ORIENT
Owner authority	secown
Producing country	PRCTRY
Product	PRODCT
Production agency	AGENCY

Attribute	Acronym
Protective marking	secpmk
Quality of position	QUAPOS
Quality of sounding measurement	QUASOU
Reference to a publication	PUBREF
Reference year for magnetic variation	RYRMGV
Relative horizontal accuracy	HORACC
Relative vertical accuracy	VERACC
Restriction(s)	RESTRN
Seasonal end date	PEREND
Seasonal start date	PERSTA
Sounding accuracy	SOUACC
Sounding datum	soudat
Source agency	SORIND (comma separated value)
Source country	SORIND (comma separated value)
Source date	SORDAT
Source ID	SORIND (comma separated value)
Source scale	CSCALE
Source type	SORIND (comma separated value)
Start date	DATSTA
Status	STATUS
Supporting textual information (in English)	INFORM
Supporting textual information (in national language characters)	NINFOM
Text file reference (in English)	TXTDSC
Text File Reference (in national language characters)	NTXTDS
Textual description	txtdes
Tidal stream – panel values	TS_TSP
Tidal stream, current – time series values	TS_TSV
Tide – accuracy of water level	T_ACWL
Tide – high and low water levels	T_HWLW
Tide – method of tidal prediction	T_MTOD
Tide – time and height differences	T_THDF
Tide – time series values	T_TSVL
Tide – value of harmonic constituents	T_VAHC
Tide, current – time interval of values	T_TINT
Time end	TIMEND
Time start	TIMSTA
Traffic flow	TRAFIC
Type of built-up area	CATBUA

Attribute	Acronym
Type of cable	CATCBL
Value of annual change in magnetic variation	VALACM
Value of local magnetic anomaly	VALLMA
Value of magnetic variation	VALMAG
Value of nominal range	VALNMR
Vertical datum	VERDAT
Vertical length	VERLEN
Water level effect	WATLEV

A.2.4.4 Mandatory Attributes

The table below specifies attributes that are mandatory to specific features in Maritime Foundation and Features. Features not included in this table have no mandatory attributes.

Feature	Attributes				
BCNCAR	CATCAM				
BCNLAT	CATLAM				
BCNSPP	CATSPM				
BOYCAR	CATCAM				
BOYINB	CATINB				
BOYLAT	CATLAM				
BOYSPP	CATSPM				
BUAARE	CATBUA				
CBLARE	CATCBL				
CBLSUB	CATCBL				
DWRTCL	CATTRK				
ISTZNE	CATTSS				
HRBFAC	CATHAF				
ICEARE	CATICE				
LIGHTS	all lights except air obstruction light or fog detector light:- if it is an air obstruction light or fog detector light:-				CATLIT
LITFLT	CONRAD				
LITVES	CONRAD				
LOCMAG	VALLMA				
M_ACCY	POSACC				
m_clas	secpmk	secown	either but not both of:	secido	seccvt
m_conf	catcnf				
M_COVR	CATCOV				
M_CSCL	CSCALE				
M_NSYS	MARSYS				
M_PROD	cpyrit	at least one of:		AGENCY	PRCTRY
M_QUAL	at least one of:		SOUACC	VERDAT	
M_NPUB	at least one of:		PICREP	PUBREF	
M_SDAT	soudat				
M_VDAT	VERDAT				
MAGVAR	RYRMGV	VALACM	VALMAG		

Feature	Attributes				
MARCUL	CATMFA				
OBSTRN	CATOBS				
OFSPLF	CATOFP				
OSPARE	CATPRA				
PIPARE	CATPIP				
PIPSOL	CATPIP				
PRDARE	CATPRA				
RDOSTA	CATROS				
RSCSTA	CATRSC				
SEAARE	OBJNAM				
SISTAW	CATSIW				
T_TIMS	TIMEND	TIMSTA	T_HWLW		
T_NHMN	T_MTOD	T_THDF			
T_HMON	T_MTOD	T_VAHC			
TS_FEB	CAT_TS	CURVEL	ORIENT		
TS_PAD	TS_TSP				
TS_PNH	T_MTOD	T_THDF			
TS_PRH	T_MTOD	T_VAHC			
TS_TIS	TIMEND	TIMESTA	TS_TSV	T_TINT	
TSSLPT	ORIENT	except when the lane part is a junction			CATTSS
TSELNE	CATTSS				
TSSBND	CATTSS				
TSSCRS	CATTSS				
TSSRON	CATTSS				
TSEZNE	CATTSS				

A.2.4.5 Mandatory Features

AML Maritime Foundation and Facilities contains the following mandatory features:

- Coastline COALNE

A.2.4.6 Attribute Definitions

AML attribute definitions, permissible values, formats, together with details of S-57 encoding, are given in the AML Object & Attribute Catalogue.

A.2.4.7 Relationships Between Features

Relationships are defined between features in AML Maritime Foundation and Facilities by using the methods specified in sections A.2.4.7.1 and A.2.4.7.2. The application of these relationships is described in section A.3, ‘AML Maritime Foundation and Facilities Guidance on Feature Coding and Attribution’.

A.2.4.7.1 Collection Objects

All association or aggregation relationships using collection objects classes ‘aggregation’ (C_AGGR), or ‘association’ (C_ASSO) are assumed to be peer to peer. The ‘Relationship Indicator’ [RIND] subfield of these collection feature records must be {3} = peer.

A.2.4.7.2 Nominated Master feature Record

All hierarchical relationships (master to slave) must be encoded by using a nominated ‘master’ feature record carrying the pointers to the ‘slave’ objects in the ‘Relationship Indicator’ [RIND] subfield in the ‘Feature Record to Feature Object Pointer’ [FFPT] field with the value {2} = slave.

A.2.4.8 Dependency Between Attributes

Refer to sections A.2.4.3 and A.3, for details of relationships between attributes.

A.3 AML MARITIME FOUNDATION AND FACILITIES Guidance on Feature Coding and Attribution

A.3.1 scope

The following clauses specify the conventions that are to be used to encode the geometry and semantic description of objects in AML Maritime Foundation and Facilities.

This document describes how to encode information that the cartographer considers relevant to a specific purpose. The content of AML Maritime Foundation and Facilities is at the discretion of the producing authority provided that the conventions described below are followed.

A.3.2 General Rules

Generally, the conventions extant in S-57 APPENDIX B.1, Annex A, Use of the Object Catalogue for ENC will also apply to the AML Maritime Foundation and Facilities product. However, there may be some cases where the range of allowable attribute values may differ, or where additional attributes apply. The following guide-lines seek to clarify such amendments or additions for use in AML Maritime Foundation and Facilities.

This document must be used in conjunction with the AML Maritime Foundation and Facilities product specification.

A.3.2.1 Sounding Datum

The default value for the entire data set is given in the 'Sounding Datum' [SDAT] subfield of the 'Data Set Parameter' [DSPM] field. If the sounding datum is different to the value given in the SDAT subfield for some part of the data set, it may be encoded as meta object M_SDAT.

The areas covered by meta objects M_SDAT must be mutually exclusive.

Meta object : Sounding datum (M_SDAT)
Attributes : soudat INFORM NINFOM

The sounding datum attribute 'soudat' can also apply on an individual object (see note).

NOTE:
When using the attributes **VALSOU; DRVAL1; DRVAL2** on an individual object the following criteria apply:
1. The 'soudat' attribute must be populated if the sounding datum:
   - differs from the sounding datum specified in the SDAT subfield of the Data Set Parameter (DSPM) field structure
   - or,
   - differs from the sounding datum attribute 'soudat' specified by a M_SDAT meta-object

A.3.2.2 Vertical Datum

The default value for the entire data set is given in the 'Vertical Datum' [VDAT] subfield of the 'Data Set Parameter' [DSPM] field. If the vertical datum is different to the value given in the VDAT subfield for some part of the data set, it may be encoded as meta object M_VDAT.

The areas covered by meta objects M_VDAT must be mutually exclusive.

Meta object : Vertical datum (M_VDAT)
Attributes : VERDAT INFORM NINFOM

The vertical datum attribute VERDAT can also apply on an individual object (see note).

NOTE:
When using the attributes **ELEVAT; elvacc; HEIGHT; VERACC; VERLEN** on an individual object the following criteria apply:
1. The VERDAT attribute must be populated if the vertical datum:

- differs from the vertical datum specified in the VDAT subfield of the Data Set Parameter (DSPM) field structure
- or,
- differs from the vertical datum attribute VERDAT specified by a M_VDAT meta-object

A.3.2.3 Units

Units are specified in the 'Units of Depth Measurement' [DUNI] subfield and 'Units of Height Measurement' [HUNI] subfield of the 'Data Set Parameter' [DSPM] field. If the units for objects in some part of the data set are different to either of the values given in the DUNI or HUNI subfields, it may be encoded as meta object M_UNIT.

The areas covered by meta objects M_UNIT must be mutually exclusive.

Meta object : Units of measurement of data (M_UNIT)
Attributes : HUNITS INFORM NINFOM
or
DUNITS INFORM NINFOM

The unit attributes 'HUNITS' and 'DUNITS' can also apply on an individual object (see note).

NOTE:
When using the attributes **BURDEP;VALSOU; DRVAL1; DRVAL2; ELEVAT; elvacc; HEIGHT; limanc; T_HWLW; T_THDF; T_TSVL; VALNMR; VERLEN; vershf** on an individual object the following criteria apply:
1. The measurement units must be set to the appropriate units using the HUNITS or DUNITS attribute if they:

- differ from the units specified in the HUNI subfield of the Data Set Parameter (DSPM) field structure
- or,
- differ from the attributes 'HUNITS' or 'DUNITS' specified by a M_UNIT meta-object

A.3.3 MARITIME FOUNDATION and FACILITIES Information

Referencing of Nautical Publications

When additional information is required from nautical publications it will be accessed by either:

- a link from specific real world objects using the TXTDSC attribute or
- using the meta object M_NPUB and the TXTDSC or PUBREF attribute to link to soft or hardcopy files respectively. One or more meta objects may cover the entire cell to provide general information such as fishery activity levels in the cell.

Port Locations

Ports are encoded using the **ADMARE** object. These may be area or point primitives depending upon the scale of compilation of the cell.
Urban areas close to the sea are encoded with the **BUAARE** object.

Aggregation (composite) features

Aggregation features can be used to combine objects that are related in some way, ie a part or component of, to form a single higher level object.

Deep Water Route Composite

If both component parts of a Deep Water Route, being the centre line and route part, are used to define a route, they may be aggregated using the "Deep Water Route Composite" feature to form a single deep water route feature. It can then be attributed as shown below:

Collection object:

	C_AGGR	Deep Water Route Composite
Attribute:	INFORM	Supporting textual information Note: if using a national language equivalent, use the NINFOM attribute.
Attribute:	OBJNAM	Route Name Note: if using a national language equivalent, use the NOBJNM attribute.
Attribute:	TXTDSC	Text file reference Note: if using a national language equivalent, use the NTXTDS attribute.

Traffic Separation Scheme Composite

Two or more of the component parts of a traffic separation scheme, being boundary, crossing, lane part, roundabout or zone, may be aggregated using the "Traffic Separation Scheme Composite" feature to form a single traffic separation scheme feature. It can then be attributed as shown below:

Collection object:

	C_AGGR	Traffic Separation Scheme Composite
Attribute:	INFORM	Supporting textual information Note: if using a national language equivalent, use the NINFOM attribute.
Attribute:	OBJNAM	Scheme Name Note: if using a national language equivalent, use the

		NOBJNM attribute.
Attribute:	TXTDSC	Text file reference Note: if using a national language equivalent, use the NTXTDS attribute.