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Norwegian Coastal Administration (NCA)

HSSC7 9 - 13 November 2015 Busan - Republic of Korea

Requirements relating to sector lights for Electronic
Navigational Chart (ENC) Product Specifications

B E Krosness - Principal Engineer (Nautical)

About the presentation

- Coastal navigation
- Portrayal of sector lights on ECDIS [with ENCs]
- Legacy IHO [product] specifications / standards
- IHO and IALA product specifications

Coastal navigation – Ships ≥ 24 m
Figures based on AIS and NMD* incident database
(Continued next slide)

Type of water	Average shipkm 2011-2013	Ship incidents/ mill. shipkm
Fjord**	3 769 522	5.6
Coast inside of baseline	32 912 072	3.0
Territorial waters	8 871 686	0.3
Contiguous zone	6 041 933	0.1
Ocean areas***	19 458 790	0.5
	71 054 002	1.88

*Norwegian Maritime Directorate
**Note: Average shipkm to small
***Parts of North Sea, Norwegian Sea (incl. Jan Mayen), Barents Sea (incl. Svalbard)

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Ship category	Average shipkm 2011-2013	Ship incidents/ mill. shipkm
Break bulk cargo	16 441 764	1.3
Reefer	1 723 663	1.2
Container	1 041 203	2.0
Ro-Ro cargo	1 128 885	1.8
Bulk	4 245 641	3.2
Oil tanker	2 497 019	0.6
Gas carrier	1 376 006	0.3
Chemical tanker	4 310 843	1.1
Passenger*	4 222 625	2.2
Passenger Ro-Ro*	8 836 591	5.2
Passenger cruise	1 173 613	1.6
Offshore supply	3 754 913	1.3
Other offshore service	995 677	1.6
Other	5 701 596	1.5
Fishing	13 612 953	1.0
	71 054 002	1.9

*Average shipkm combined, corrected for lack of AIS data, should be about 17 mill.

Coastal navigation – Ships ≥ 24 m
Figures based on AIS and NMD incident database
(Continued)

- Annual ship traffic in internal waters around 36.7 mill. shipkm

- Groundings represent 46 % of incidents 2004-2013

- Rough figures: 60 reported groundings a year

- Position error as a cause for grounding is reduced by around 15 percentage points since the mid 1980s

- Reduction can be attributed to improved AtoNs, VTS, GNSS (GPS), ENC - ECDIS, ISM Code

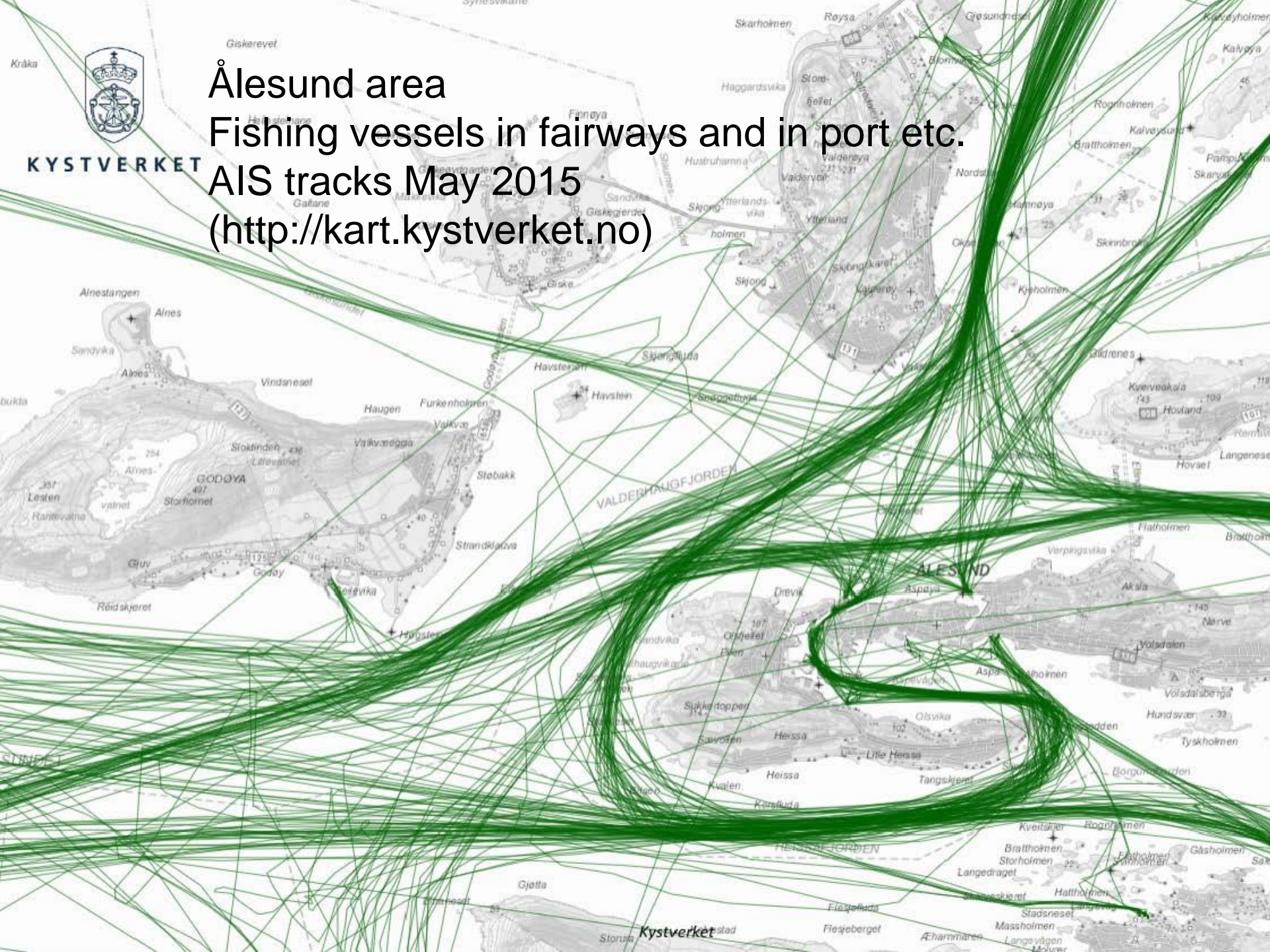- Finding: Genuine ENCs is essential for safe navigation

Ålesund area
Fishing vessels in fairways and in port etc.
AIS tracks May 2015
(http://kart.kystverket.no)

Fairways and Aids to Navigation (AtoN)

Aids to navigation

Fairways

- Ca. 1925 sector lights ≈ one third of the AtoNs with light signal
- Ca. 15 000 AtoNs without light signal

Category	Number	Nautical miles
Main	213	3 880
Secondary	862	6 620
(2011)	1 075	10 500

Note:
In addition a number of minor fairways (boat leads)

Absolute vs. Relative navigation

ECDIS facilities are used as the principal method of planning and executing *Pilotage* by many ships

- Advantages (selected):
  - Interfacing with navigational aids (GNSS, radar, AIS)
  - Situational awareness
- Disadvantages (selected):
  - Limitation of [software] drawing tools
  - 'Skill fade' of paper (print) chart navigation technique
- Issue:
  - ECDIS users commonly rely on GNSS, i.e. with absolute positions referenced to the centre of the earth
  - ECDIS also used for *Pilotage* relative to AtoNs and other local features

Cf. (in part) THE PRINCIPLES OF NAVIGATION, The Admiralty Manual of Navigation Volume 1 Para 1321.

Use of ECDIS with radar support and paper (print) chart navigation techniques in *Pilotage** waters

- Visual control of track by use of AtoN

  (cf. 'Seaman's Eye', 'visual readability of the fairway')
- Position fixing
  - Visual bearing (preferably 3 bearings)
  - Visual bearing and radar distance
  - Radar bearing and distance
  - Abeam AtoN and estimated distance (cf. 'Seaman's Eye')
- Leading marks (Producing a leading line)
- Headmark / Sternmark
- Clearing leading marks
- Clearing bearings
- Safe water remaining – 6° rule (cf. Radian rule)

*Pilotage. Navigation of ship by methods that do not require celestial observations

IALA Guideline No. 1041 - Sector lights

- A sector light is an aid to navigation that displays different colours and/or rhythms over designated arcs. The colour of the light provides directional information to the mariner.

- A sector or a limit between two sectors may indicate a fairway, a turning point, a junction with other channels, a hazard or something else of importance for the navigator.

Portrayal of sector lights in ENC
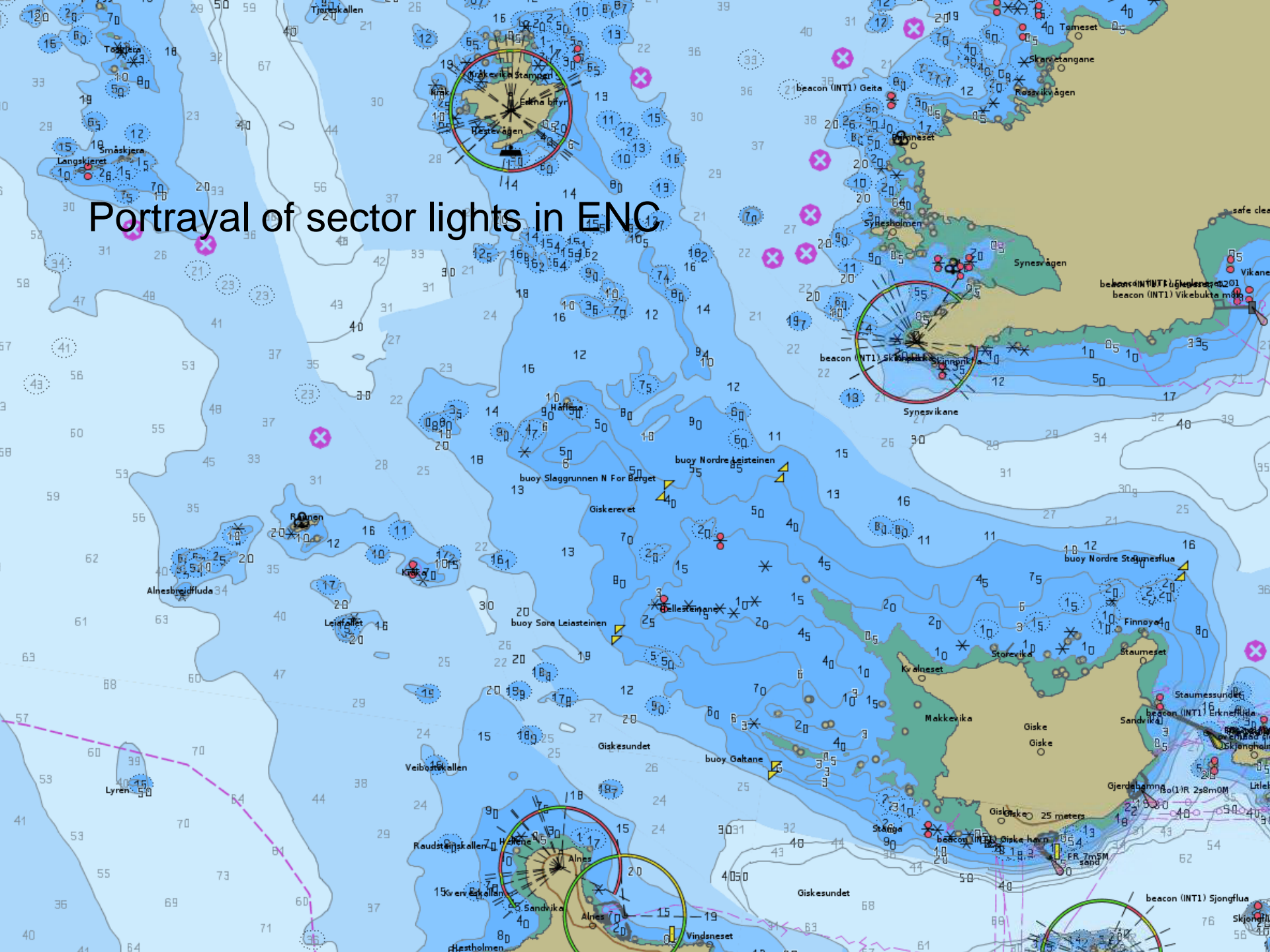
NHS chart in
NCA Nautical information system
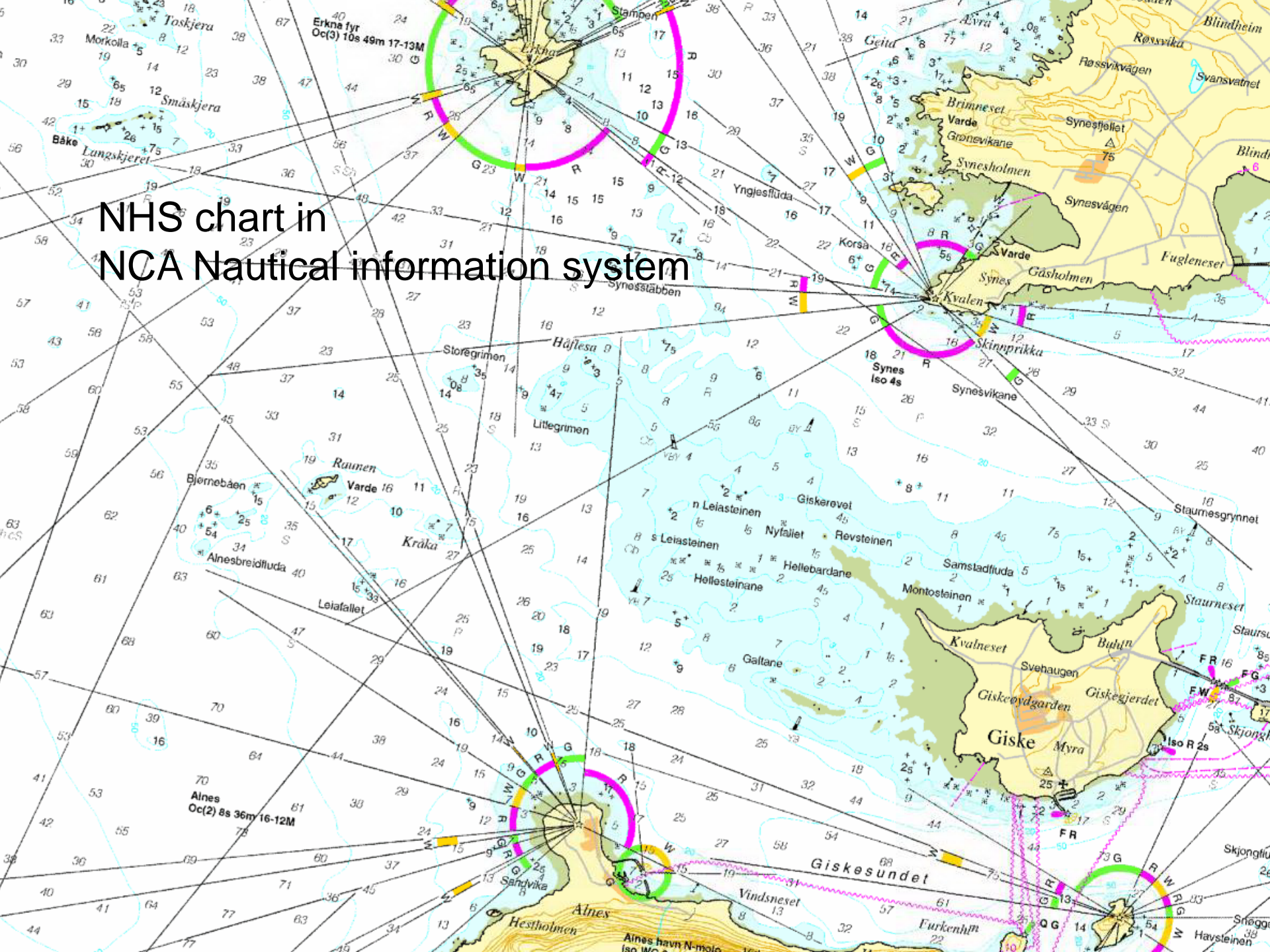
Sector light data entry box – NCA Nautical information system

Sektorer for fyr/lykt : 338700 Alnes

Sektorer for fyr/lykt : 338700 Alnes

S.Nr.	Retning Sektorlinje 1 (°)	Retning sektorlinje 2 (°)	Lengde sektorlinje 1 (m)	Lengde sektorlinje 2 (m)	Sektor radius	Beskrivelse	Lysfarge
1	41,099998	52,200001	3704	9816	600	Fra V av Leistaskjæret til N av 10m Djupeflusteinen.	Grønn
2	52,200001	54,900002	9816	12964	600	Til 210m SØ av Høgeskjæret jst.	Hvit
3	54,900002	65,800003	12964	20650	600	Til NV av 16m gr. NV av Grasøyane og S av 4m Rautenflu.	Rød
4	65,800003	73	20650	20187	600	Til 340m N av Grøiven.	Grønn
5	73	76,599998	20187	20187	600	Til klar S av 9m Håflua og S av 9m Golla.	Hvit
6	76,599998	97,300003	20187	5556	600	Til klar N av 16m Olsflua og N av Vallabåane.	Rød
7	97,300003	115	5556	3889	600	Til kar SV av Alnesbreidflua.	Hvit
8	115	130,800003	3889	9260	600	Til klar NØ av Bjømebåen og NØ av Klovskallen v/Fauskane.	Grønn
9	130,800003	131,899994	9260	4260	600	Til klar SV av Oddebåen og Alnesraunen.	Hvit
10	131,899994	150,100006	4260	8890	600	Til klar NØ av Leiafalla og Kråka jst.	Rød
11	150,100006	152,5	8890	8056	600	Til klar SV av Storegrimen og Dyngeskallen.	Hvit
12	152,5	176,899994	8056	4445	600	Til klar Ø av 3,6m Synesstabben.	Grønn
13	176,899994	288,200012	4445	1204	600	Til innpå Godøy NØ.	Rød

Lagre og oppdater   Skjul andre   Skriv inn antall sektorer for nytt fyr/ny lykt:

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www.kystverket.no

Sector lights being used in all the Nordic countries – Example from Danish waters
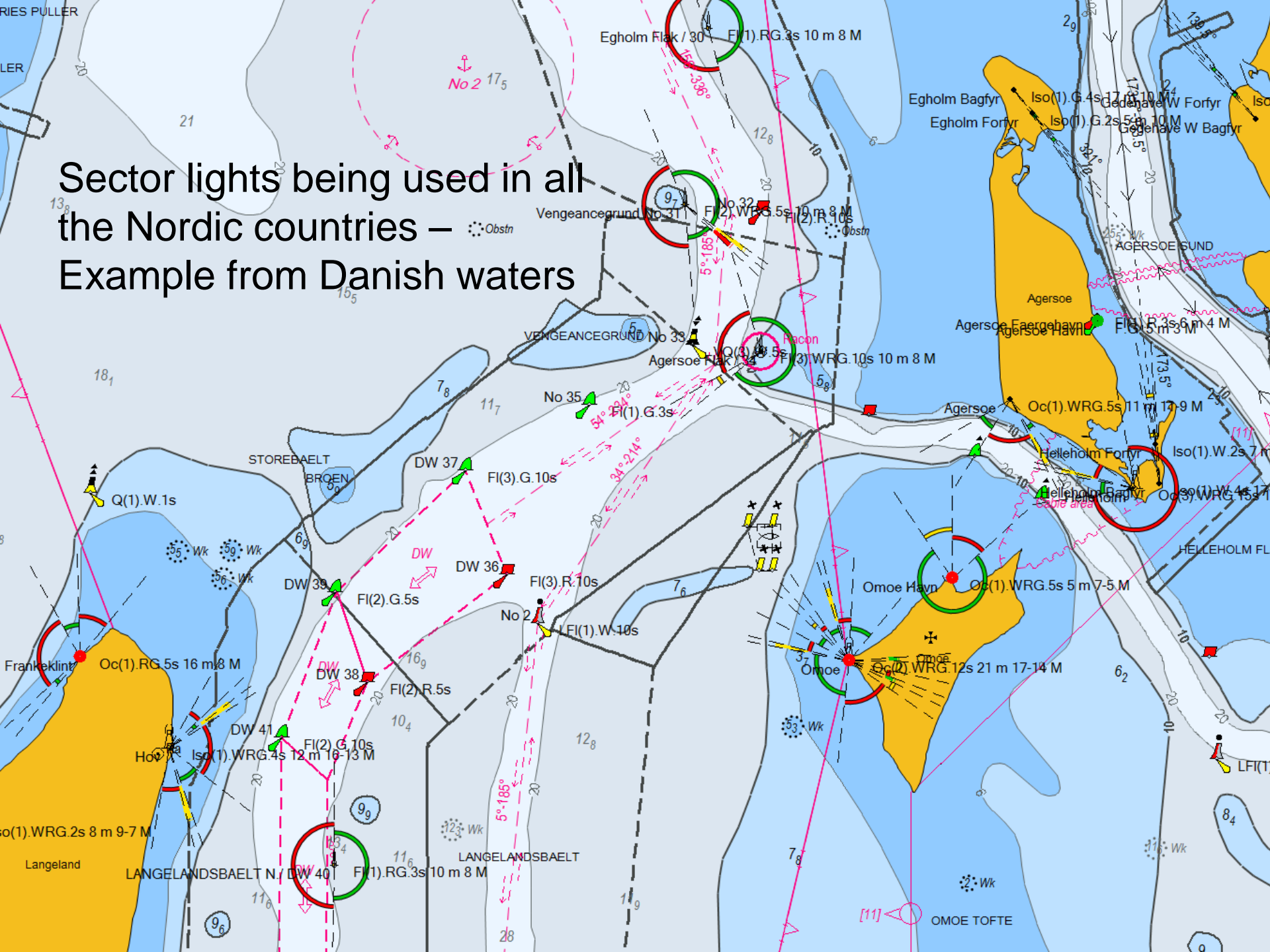
IHO S-4 REGULATIONS OF THE IHO FOR INTERNATIONAL (INT) CHARTS AND CHART SPECIFICATIONS OF THE IHO

- IHO S-4 Part B B-475 'SECTOR LIGHTS AND OTHERS NOT VISIBLE ALL ROUND' gives instructions for the portrayal of sector lights in paper (print) charts:

  'Sector limits should cover the area where they are useful to mariners. They must not extend beyond the nominal range of a light. Very short arcs may be omitted.'

IHO S-52 SPECIFICATIONS FOR CHART CONTENT AND DISPLAY ASPECTS OF ECDIS

- Fewer instructions on portrayal of AtoNs than S-4
- No guidance regarding portrayal of sector lights
- States that it should be read in conjunction with MSC.232(82) IMO Performance Standards for ECDIS

- 3.3.1 Reproduction of paper chart symbols on ECDIS
  - Light sectors. It should be possible, on request, for the mariner to be capable of identifying the colour of the sectors affecting the ship, even if the lights involved are off the display.

IMO MSC.232(82) IMO Performance Standards for ECDIS Appendix 2

- SENC INFORMATION AVAILABLE FOR DISPLAY DURING ROUTE PLANNING AND ROUTE MONITORING

  Standard display consisting of:

  ...

  .3 buoys, beacons, other aids to navigation and fixed structures

  All other information, to be displayed individually on demand, for example:

  ...

  .4 details of aids to navigation

  Note: Aids to navigation are not part of the 'Display base' which has to be permanently shown on the ECDIS display.

  Not discussed in this presentation: 'Selection of which AtoN to portray in which user band?' / 'What is a major aid ?'

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IHO S-57 IHO TRANSFER STANDARD for DIGITAL HYDROGRAPHIC DATA

- S-57 Appendix A Chapter 2 – Attributes

  CATLIT - Category of light

  The list of about 20 expected inputs does not include sector lights.

  VALNMR - Value of nominal range

  The value is the nominal range at which an object can be seen or a signal detected.

  Comment: Apparently there are no 'FEATURE OBJECT ATTRIBUTES' for the range of a light where it is useful for the mariner

IHO S-57 APPENDIX B.1
Annex A - Use of the Object Catalogue for ENC

- The use of Global Navigation Satellite Systems (GNSS) as an integral component of ECDIS has raised questions as to the level of topographic detail that is required in ENCs to enable safe navigation using ECDIS. When determining the topographic information necessary for inclusion in ENC, all operational conditions of vessels must be taken into consideration, including the potential for corruption or failure of a vessel's GNSS reception. Such a failure would require the mariner to navigate by fixing their position using traditional methods, necessitating a sufficient level of depiction of topographic detail in the ENC to facilitate navigation using these methods, appropriate to the Navigational Purpose of the ENC.

- In addition, mariners will continue to use visual or radar fixing as an independent method of confirming the position of their vessel as shown on the ECDIS, in order to gain a greater level of confidence in terms of their navigation.

IHO S-12 STANDARDIZATION of LIST OF LIGHTS

- The present S-12 data set may not be adequate for the exchange of data between AtoN providers and hydrographic offices

- Column 6 – Range

  Ranges of lights are given in nautical miles (M): in bold type if equal to or greater than 15 M, in normal type if less. When a light has differing ranges depending on its sector colours, these are given against the corresponding colours. Further, referring to IALA, it states that ranges should be nominal.

  Comment: This information only is not adequate for the portrayal of light sectors in ENCs with a range where they are useful for the mariner.

IHO S-100 UNIVERSAL HYDROGRAPHIC DATA MODEL
Part 2a – Feature Concept Dictionary Registers
Appendix 2A – A (informative)
A.1 Example of a complex attribute

(A feature concept dictionary specifies definitions that may be used to describe geographic information.)

- The simple attributes used in "lightSector" are:
  - sectorLimit1 (type Real)
  - sectorLimit2 (type Real)
  - colour (type Enumeration)
  - valueOfNominalRange (type Real)

Comment: Value of the useful range of a 'light sector' for the mariner is not [at present] part of the [simple] attributes

IHO S-100 UNIVERSAL HYDROGRAPHIC DATA MODEL
Part 2b – Portrayal registers
(Reserved for portrayal schema which are under development.)

- The Portrayal register at registry.iho.int comprises AlphaCodes for the following:
  - Point Symbols
  - Pattern Symbols
  - Complex Line Styles
  - Colour Symbols
- AlphaCodes from IHO S-100 A.1 Example of a complex attribute, LITSEC, RHYLGT, SGSQIN and SIGSEQ

  Question(s):

  Is there an inconsistency?

  Would it be possible to create a portrayal catalogue from the register?

IHO S-101 ENC – New Structures - Lights

- Introduces more specific light features to simplify encoding

- Adds a light sector complex attribute to cover light sectors

  (Ref IALA S-100 Workshop, June 2013)

  Question(s):

  Is there a need for harmonization between the IHO S-101 ENC and IALA S-201 Aid to Navigation Information product specifications?

  Is some of the work being done on the specifications redundant?

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IALA Recommendations and Guidelines

- IALA Recommendation e-NAV-147 Product Specification Development and Management

- IALA Guideline No. 1087 Procedures for the Management of the IALA Domains under the IHO GI Registry

- IALA Guideline No. 1088 Introduction to Preparing S-100 Product Specifications

- IALA Guideline No. 1106 Producing an IALA S-100 Product Specification (Proposed revision named 'IALA S-200 …')

  Comment: Making of IHO S-100 Product Specifications requires specialist knowledge of data modelling. Accomplishment nevertheless depends on cooperation between the feature object owner and the data modelling specialist.

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The IALA Product specification template
(IALA Guideline No. 1106 - based on IHO S-100)

Content

1) Overview
2) Specification scopes
3) Data product identification
4) Data content and structure
5) Data quality
6) Data capture and classification
7) Data maintenance
8) Portrayal
9) Data product format (Encoding)
10) Data product delivery
11) Metadata

Appendix 1 Product Specification template

1 OVERVIEW
<This clause provides general introductory information about the product specification>

1.1 Introduction
<Provide a general introduction regarding the intent and use of this product specification

1.2 References
S-100 IHO Universal Hydrographic Data Model
1.3 Terms, definitions and abbreviations
1.3.1 Use of Language
Within the scope of this product specification:
- "Must" indicates a mandatory requirement.
- "Should" indicates an optional requirement, that is the recommended process to be followed, but is not mandatory.
- "May" means "allowed to" or "could possibly", and is not mandatory.

1.3.2 Terms and Definitions
<Insert Terms and Definitions>

1.3.3 Abbreviations
<Insert Abbreviations>
IALA-AISM International Association marine aids to navigation and Lighthouse Authorities
CRS Coordinate Reference System
ECDIS Electronic Chart Display Information System
EPSG European Petroleum Survey Group
ENC Electronic Navigational Chart
IHO International Hydrographic Organization
IMO International Maritime Organization
ISO International Organization for Standardization

1.4 Product specification metadata
<This information uniquely identifies this Product Specification and provides information about its creation and maintenance.>
Title: *<title of the product specification>*
X-### Version: 0.0.0 *<version of the product specification following 1.4.1.5>*
S-100 Version: 1.0.0 *<version of S-100 used in the creation of this product specification>*
Date: *<date of the creation or last update of this product specification>*
Language: *<language(s) of the product specification, English is mandatory, other languages may be included>*
Classification: 001 - unclassified
Contact: IALA-AISM
10, rue des Gaudines
78100 Saint Germain en Laye, France
Telephone: +33 1 34 51 70 01 Fax: +33 1 34 51 82 05
URL: http://registry.iho.int/s100_gi_registry/ProductSpecificationRegister/ps_home.php