



# *Harmonisation of Baltic Sea ENCs*

2025-xx-xx

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## Document control

Date	Approved by	Changes
2025-xx-xx	Baltic Sea Hydrographic Commission	First edition

## Introduction

Lessons learned since the implementation of S-57 have showed that establishing harmonisation routines prior to production minimises duplication of effort for hydrographic offices as well as ensuring seamless and safe navigation for mariners. Extensive work was carried out between 2007-2008 by the Baltic Sea ENC Harmonisation Working Group (BSEHWG) to analyse the differences between BSHC ENC's and to establish a framework for harmonisation. This was followed by a multi-year effort to implement the harmonisation of ENC's to the current level. As we near the implementation of S-100 and the dual-fuel period, it is important that new opportunities for harmonisation are discussed and decided upon so as to ensure continued harmonisation of ENC's in the Baltic Sea. Since the implementation of the original harmonisation recommendations, HO's now have an additional 15 years of experience of ENC production. This acquired knowledge allows us to re-evaluate the recommendations in the BSEHWG report as well as formulate new recommendations required by S-101 ENC's. With this in mind, it was agreed at BSHC28 that these discussions would be handled under the umbrella of the Baltic Sea e-Navigation Project.

## Baltic Sea e-navigation project

The Baltic Sea e-Nav project (BS e-Nav) is a transnational cooperation between hydrographic offices around the Baltic Sea, academia and industrial partners, co-funded by the European Union as part of their interregional cooperation programme (Interreg Baltic Sea Region). The project aims to facilitate the next generation of navigational products and services in accordance to the new international standards which in turn will ensure safer, greener, more efficient navigation of our oceans. A vital part of enabling these results is ensuring the harmonisation between these new products.

## Methodology

The S-101 harmonisation project team consisted of representatives from hydrographic offices (HO's) in Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden and has been carried out by means of two VTC meetings, two in-person meetings and correspondence via email.

The first VTC meeting took place in January 2024 with participants from each member state. Representatives agreed upon a proposed timeline (figure 1 below) for the work ahead as well as the suggested communication methods. Through correspondence, a baseline review in the form of a questionnaire was drawn up focussing on HO's experiences with the current S-57 recommendations, the need for new S-101 specific recommendations and each HO's thoughts on a harmonised S-101 roll-out plan in the Baltic Sea (Annex B). The results were summarised and distributed in preparation for the first in-person meeting. The summary of the results can be found in Annex C.

The first in-person meeting took place in May 2024 in Stockholm in conjunction with the BSICCWG annual meeting. The aim was to discuss the outcome of the questionnaire and try to discern topics/themes for harmonisation that needed to be discussed further. By clarifying and specifying what needed to be harmonised early on in the process allowed for more efficient discussions at the next in-person meeting.

The second in-person meeting took place in September 2024 in Tallinn in conjunction with the BSHC annual meeting. For each of the topics specified at the last in-person meeting, the representatives discussed possible methods and the extent to which each topic should be harmonised. It was also decided that a first draft of the new recommendation report would be available for review 31<sup>st</sup> October.

A final VTC meeting took place in November 2024 where comments acquired over the review period for the first draft of the report were discussed. Together, any queries or suggestions were clarified and used to amend the final report.

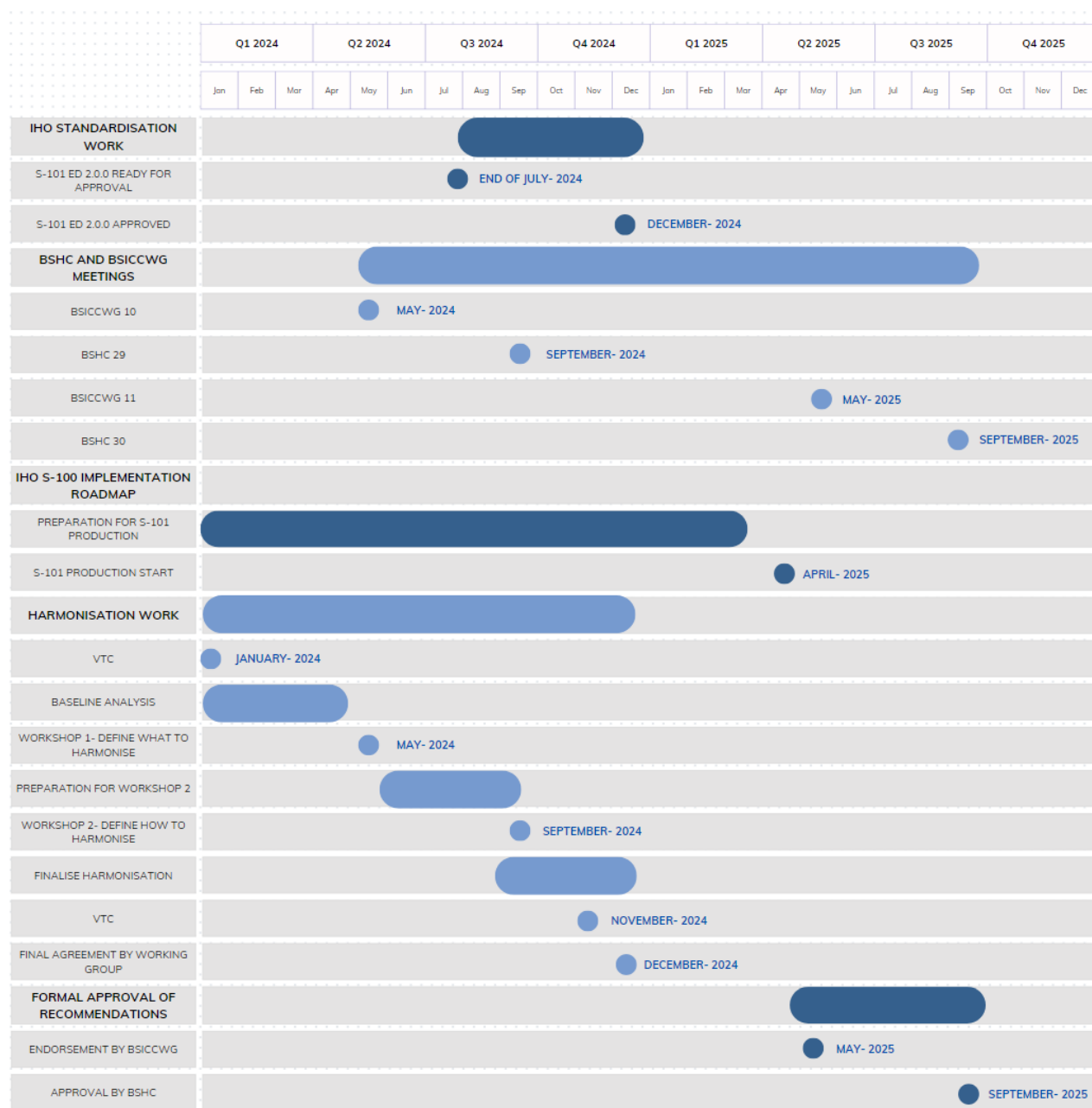


Figure 1. Timeline for the project

### Promotion of regional approaches

Regional harmonisation of ENC's is important to achieve consistency across the region, making the charts more readable, but also to reduce the uncertainty that can easily arise for the end user when data looks different in neighbouring areas.

BSHC believes that these recommendations may be valuable for other sea areas and recommends that other RHCs try to define regional implementations to IHO consistency recommendations in their regions. BSHC is willing to share its experiences on this issue.

- The BSICCWG Chair should inform WENDWG about these recommendations.
- The NSICCWG has been kept informed as the work has progressed.

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## Harmonisation recommendations for Baltic Sea ENC

When the current harmonisation recommendations were adopted, a timetable for implementing the agreed harmonisation was also set. The BSICCWG has been tasked with monitoring this work and has found that all agreed actions have been implemented. The updated harmonisation recommendations that have now been produced therefore aim to keep our ENC (both S-57 and the forthcoming S-101) harmonised over time.

### Harmonisation of scales

The harmonisation of display scales between countries is important to avoid having part of the ECDIS screen overscaled at certain zoom levels and to avoid clutter. Further, non-harmonised display scales will lead to inconsistency in the presentation of data (and density of data) between two ENC.

The harmonisation of large scale ENC (navigational purposes Harbour and Berthing in S-57) is less critical in the Baltic Sea. Data in these scales cover mostly water of one country. The effects of disharmony between different countries for these scales are therefore limited. It is regarded as more important to be able to display the unique conditions of every harbour in the best way than to achieve complete harmonisation.

#### Recommendation 1: Harmonisation between ENC

1a) The ENC should be in harmony with other ENC within the producers' portfolios.

1b) ENC bordering the North Sea should be harmonised with adjacent ENC.

#### Recommendation 2: Harmonisation of small and medium scale ENC

On the Baltic Sea, the following scales should be used:

S-57		S-101			
Navigational purpose	Compilation Scale	Minimum Display Scale*	Optimum Display Scale	Maximum Display Scale**	Drawing index***
Overview	1 500 000	NULL	1 500 000	750 000	1
General	180 000	1 500 000	180 000	90 000	2
Coastal	90 000	180 000	90 000	45 000	3
Approach	22 000	90 000	22 000	11 000	4

\* The values in the table assume that all harmonised scales are used. Minimum Display Scale must always be equal to Optimum Display Scale for next smaller scale and Minimum Display Scale must be NULL for the smallest scale ENC.

\*\* The values replicate the behaviour of an S-57 ECDIS, but a different value may be set at the discretion of the data producer.

\*\*\* The value must be equal to the "Intended Usage" subfield in the equivalent S-57 ENC to create a seamless presentation between S-57 and S-101 ENC.

#### Recommendation 3: Harmonisation of large scale ENC

The scale of large scale ENC (compilation scale/optimum display scale larger than 22 000) in border areas should be agreed bilaterally between the producing countries.

#### **Recommendation 4: Exceptions in the use of scales**

If a Hydrographic Office (HO) wants to use scale values other than those recommended in Recommendation 2 above, it may do so if all of the following conditions are met:

- i. the values used support the overall intention of these harmonisation recommendations
- ii. use of it is agreed bilaterally with neighbouring HO's concerned, in order to avoid inconsistencies at the border, and
- iii. every effort is made to minimise possible inconsistencies due to deviations from the recommended scale.

#### **Harmonisation of scale minimum (SCAMIN)**

Use of the attribute scale minimum is important to avoid a cluttered screen for the end user. The use of a regionally adopted scale minimum policy avoids inconsistency that creates confusion for the mariner. Since the adoption of the current harmonisation recommendations, the methodology for assigning scale minimum values in the Baltic Sea recommendations has been implemented as an example in the S-57 UOC and the S-101 DCEG. The main difference is that intermediate scale steps have been added between the steps in the current Baltic Sea SCAMIN policy, which are the recommended compilation scales – 1. The intermediate steps allow for more fine-tuning of the scale minimum values, but their implementation would require a revision of the steps for each feature class.

One alternative is to fully implement the example policy contained in the S-57 UOC/S-101 DCEG. A table describing the differences between the current Baltic Sea policy and the one contained in the S-57 UOC is provided in Annex D. The annex also contains screenshots from a test area in The Sound where the IHO example policy has been applied on the Swedish side while the Baltic Sea policy is used on the Danish side. The tests in this area show that the IHO sample policy creates a vertical inconsistency in that some objects are hidden when the user zooms out but reappear when the user zooms out further so that the next smaller scale appears.

The conclusion is that the IHO model policy cannot be implemented without further analysis and fine-tuning. As no strong comments have been made on the current policy, it has been retained but updated to include new feature classes in S-101.

#### **Recommendation 5: Use of scale minimum**

All BSHC countries should follow the scale minimum policy in Annex E.

#### **Harmonisation of features**

In such confined waters as in the Baltic Sea, the mariners will constantly be navigating using ENC's from several countries at the same time. It is therefore important to provide a seamless display where the ENC content is harmonised. Harmonised encoding of bathymetric information is important both to provide a clear visual presentation to the mariner and to achieve the expected results of the anti-grounding functionality in the ECDIS. Consistency in the representation of different real world features, both in terms of the feature classes used and the interpretation of the standards, is also important to ensure that the displayed information is fully understandable to the mariner.

### **Recommendation 6: Harmonisation of features continuing/extending over national borders**

All BSHC countries should ensure that bilateral agreements are in place with their neighbouring countries concerning harmonisation of features continuing/extending over national borders.

### **Recommendation 7: Depth contour intervals**

If the IHO recommended contour intervals are not applicable, or if additional intervals are needed, implementation should be agreed bilaterally/multilaterally so that possible inconsistencies to the mariners can be avoided.

### **Recommendation 8: The use of features to ensure consistency**

8a) All BSHC countries are encouraged to raise encoding inconsistencies to BSICCWG to ensure consistency between the Baltic Sea ENCs.

8b) All BSHC countries should present magnetic variation data as areas.

### **Recommendation 9: Adoption of new concepts and feature classes**

The BSICCWG should agree on joint plans and a time schedule for the adoption of new feature classes or concepts on their products.

For S-101, a plan for implementation of the concepts Update Information and Interoperability identifier should be agreed in the BSICCWG before they are introduced in ENCs.

### **Recommendation 10: Special circumstances**

If found necessary, it is possible to deviate from the recommendations. When doing so, the relevant HO should make every effort to minimise the effect of any inconsistencies that may occur. This should be done through bilateral/multilateral agreements and through harmonisation of data in order to ensure that no serious disharmony is introduced to the ENCs.

### **Production routines to ensure harmonisation**

Well established production routines are important to keep the ENCs harmonised over time. Having these routines as part of each HO's production process allows the harmonisation to be a continuous work and not a 'one and done' action.

### **Recommendation 11: Checking harmonisation before publishing ENCs**

All BSHC countries should check and carry out harmonisation before launching updates or new editions of ENCs.

### **Recommendation 12: Buffer zones along the national borders**

All BSHC countries should check that there are no gaps between cells at national borders by establishing a buffer zone of up to 5 metres, if necessary.

### **Recommendation 13: Adoption of new versions of ENC related standards**

The BSICCWG should monitor the development of ENC related standards and assess the impact for the Baltic Sea ENCs. BSICCWG should, if appropriate, agree on joint plans and time schedules for adoption of new versions of ENC related standards (e.g. new edition of S-100 or S-101).



## Baltic Sea roll-out plan for S-101

Each Regional Hydrographic Commission should report an implementation plan for S-100 products to WENDWG. The Baltic Sea Hydrographic Commission has delegated this task to the Baltic Sea International Chart Coordination Working Group (BSICCWG). WENDWG will monitor the publication of S-100 products globally. This will feed into the IHO Secretariat's annual report to the IMO sub-committee on navigation, communication and search and rescue (NCSR).

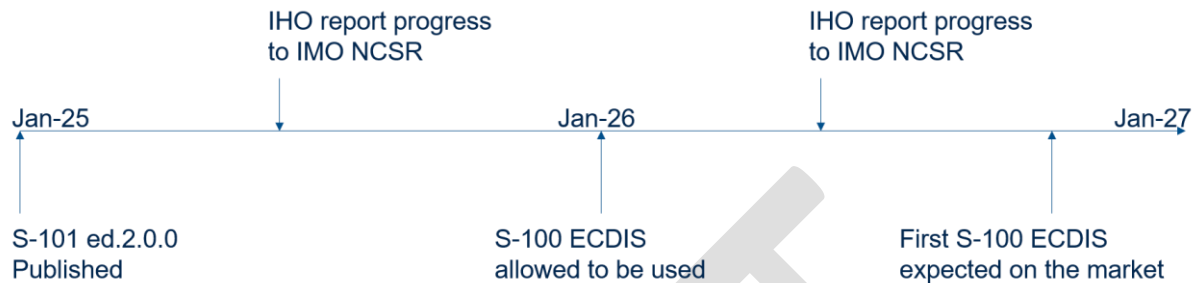


Figure 2. A timeline describing the path from the release of S-101 ed.2.0.0 until the first S-100 ECDIS are expected to be on the market.

## Different approaches to the roll-out

Two different approaches for prioritisation have been identified in the discussions;

- A scale based approach means that the products are released based on scales where the full coverage of the largest scale is released first followed by the full coverage of the second largest scale and so on.
- An area based approach means that the water is divided in different areas where the ENC's in the highest prioritised area are released before continuing with the second highest prioritised area and so on. In this approach, the smallest scale ENC's could be excluded from the prioritised areas and released at a later stage.

There are different rationales behind the selection of each respective approach. The main factors affecting this decision are the nature of the area and the ENC coverage. If a port and the approach to the port is covered by one scale that is suitable for navigating to the port, a scale based approach can be used. However, if the fairway into the port is covered by a smaller scale ENC than the port, it makes no sense for the user of an S-100 ECDIS if only the largest scale within the port is released as S-101. This would mean that the user cannot make use of e.g. high density bathymetry in S-102. In this case, an area based roll-out approach would give more value for the end user.

## The need for a synchronised roll-out

The need of synchronisation in the roll-out between the countries is highly dependent on how fast the countries will publish their S-101 ENC's. The faster all S-101 ENC's are published, the less the need for a synchronised roll-out plan.

Following a deep discussion, it was agreed that each country should start the S-101 production according to the priorities in their national roll-out plan. The BSICCWG should monitor progress as part of its regular work plan. The status of the roll-out plans will be reviewed at the BSICCWG meeting in May 2025. At the next meeting in May 2026, the current coverage should be reviewed and a common prioritisation for the areas without S-101 coverage should be agreed.

## Reporting of roll-out plan and progress

All BSHC countries should report their planned S-101 coverage in INTGIS III.

## Annex A - List of participants

### **Denmark**

Bruno Cardoso

Nikolaj Møller

### **Estonia**

Nele Kaurla

Merili Lindpere

### **Finland**

Jukka Helminen

Mikko Hovi

Teppo Kuusijärvi

Jarmo Mäkinen

### **Germany**

Arvid Elsner

Iji Kim

Sylvia Spohn

### **Latvia**

Linda Purina

### **Lithuania**

Mindaugas Zakarauskas

### **Poland**

Karol Grzelak

Adam Kłosiński

### **Sweden**

Elisabeth Farrington

Klas Östergren

## Annex B – Baseline questionnaire to Baltic Sea Hydrographic Offices

<b>Section 1 – Evaluation of current harmonisation guidelines</b> <i>This section aims at evaluating the current harmonisation recommendations specifically for S-57 ENC.</i>		
	Question	Possible answer
<b>Q1</b>	Does the Hydrographic Office in your country find the current harmonisation recommendations relevant (for S-57)?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Partially</li> </ul>
Q1.1	If the above answer is NO or PARTIALLY, what do you think is missing or what changes do you think are needed?	Free text
<b>Q2</b>	Does the Hydrographic Office in your country check the harmonisation for both your own and neighbouring countries before launching ENC?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
Q2.2	If the above answer is YES, how do you check (please describe the method)	Free text
<b>Q3</b>	Does the Hydrographic Office in your country follow the SCAMIN recommendations agreed by BSHC?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Partially</li> </ul>
Q3.1	If the answer is NO, what is the reason for not using the recommended SCAMIN values?	Free text
Q3.2	If partially, describe how you differ from the recommendations and the problems you have experienced using the SCAMIN recommendations.	Free text
<b>Q4</b>	Does your country have sufficient ENC coverage (in relevant scales) of its waters along all the borderlines to your neighbouring countries in the Baltic Sea?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
Q4.1	If the answer is NO, please list which areas and for what scales you deem the coverage insufficient.	Free text
Q4.2	If the above answer is NO, do you have a timeline for these changes?	Free text
<b>Q5</b>	Has your Hydrographic Office received any end-user feedback related to ENC harmonisation between our countries?	Free text
<b>Section 2 – New requirements for harmonisation guidelines related to S-101</b> <i>This section aims at evaluating the need for updated harmonisation recommendations based on the upcoming situation with both S-101 and S-57 ENCs (and later S-101 only)</i>		
	Question	Possible answer
<b>Q6</b>	Since there are new possibilities in the S-101 data model, it is interesting to know how your Hydrographic Office is planning your production during the dual-fuel period.	<ul style="list-style-type: none"> <li>• Initial data migration to S-101 and then produce S-57 by backwards conversion.</li> <li>• Producing S-101 from current S-57 data.</li> </ul>

<b>Q7</b>	Does the Hydrographic Office in your country find the current harmonisation recommendations relevant (for S-101)?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Partially</li> </ul>
Q7.1	If the above answer is NO or PARTIALLY, what do you think is irrelevant for S-101?	Free text
<b>Q8</b>	Does the Hydrographic Office in your country see new subjects that need to be harmonised for S-101 that are not included in the current recommendations?	Free text
<b>Q9</b>	Currently (for S-57 ENC's), compilation scales 1:22 000, 1:90 000, 1:180 000 and 1:1 500 000 are harmonised in the Baltic Sea. Does your Hydrographic Office consider these scales relevant as Optimum Display Scales for S-101?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
Q9.1	If the above answer is NO, please explain your reasoning. If you have any suggestions regarding relevant scales, please include them.	Free text
<b>Q10</b>	Does your Hydrographic Office consider that the dual-fuel production (both S-57 and S-101) hinders the utilisation of S-101 to its full potential?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
Q10.1	If the above answer is YES, please describe how.	Free text
<b>Section 3 – Evaluate need of a harmonised roll-out plan for S-101 in the Baltic Sea</b> <i>This section aims at evaluating whether there is a need for harmonisation of the roll-out of new S-101 ENC's.</i>		
	<b>Question</b>	<b>Possible answer</b>
<b>Q11</b>	Does the Hydrographic Office in your country have a roll-out plan for S-101 including prioritised geographical areas?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
Q11.1	If the above answer is YES, please list your top prioritised areas.	Free text
<b>Q12</b>	What are your thoughts or plans concerning the roll out? e.g. Is it preferable to: - release all scales in a specified geographic area simultaneously? - have a roll-out be based on scales (all products in one scale prioritised over products in another scale)? - release larger scales in prioritised geographical areas before producing smaller scales? - ...	Free text
<b>Q13</b>	Does your Hydrographic Office consider the status of your Baltic Sea Chart Datum 2000 relevant for your roll-out plan?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>

Q13.1	If the above answer is YES, how does the implementation status affect your S-101 roll-out plan (or vice versa)?	Free text
<b>Q14</b>	Does the Hydrographic Office in your country see a need for harmonising the roll-out of S-101 in the Baltic Sea?	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>
Q14.1	If the above answer is YES, what do you consider important when planning a harmonised roll out?	Free text

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## Annex C – Result from baseline questionnaire to Baltic Sea Hydrographic Offices

Total number of respondents: 8

### Section 1 – Evaluation of current harmonisation guidelines

**Q1 Does the Hydrographic Office in your country find the current harmonisation recommendations relevant (for S-57)?**

	n	Percent
Yes	8	100%

**Q2 Does the Hydrographic Office in your country check the harmonisation for both your own and neighbouring countries before launching ENC?**

	n	Percent
Yes	8	100%

**Q2.1 If the above answer is YES, how do you check (please describe the method)**

Summarised responses
All participants perform a visual control against neighbouring ENC cells.  Other methods include PRIMAR VRC Check tool, IC-ENC check tool and consultations with neighbours.

**Q3 Does the Hydrographic Office in your country follow the SCAMIN recommendations agreed by BSHC?**

	n	Percent
Yes	8	100%

**Q4 Does your country have sufficient ENC coverage (in relevant scales) of its waters along all the borderlines to your neighbouring countries in the Baltic Sea?**

	n	Percent
Yes	7	87,5%
No	1	12,5%

**Q4.1 If the answer is NO, please list which areas and for what scales you deem the coverage insufficient.**

Responses
No data in Approach (1 : 22 000) usage band

**Q4.2 Do you have a timeline for these changes?**

Responses
We are planning to create 1 : 22 000 ENCS by 2027

**Q5 Has your Hydrographic Office received any end-user feedback related to ENC harmonisation between our countries?**

Summarised responses
No

## Section 2 – New requirements for harmonisation guidelines related to S-101

**Q6 Since there are new possibilities in the S-101 data model, it is interesting to know how your Hydrographic Office is planning your production during the dual-fuel period.**

	n	Percent
Initial data migration to S-101 and then produce S-57 by backwards conversion.	4	50%
Producing S-101 from current S-57 data.	4	50%

**Q7 Does the Hydrographic Office in your country find the current harmonisation recommendations relevant (for S-101)?**

	n	Percent
Yes	3	37,5%
Partially	5	62,5%

**Q7.1 If the above answer is NO or PARTIALLY, what do you think is irrelevant for S-101?**

Summarised responses
Participants consider some of the existing S-57 ENC harmonization recommendations irrelevant or not applicable for S-101 ENCs, foremost usage bands and related compilation scales as this has a different meaning in S-101. The recommendation for “Training and Education” is also suggested as irrelevant due to mariners now having over 15 years of experience with ENC.

**Q8 Does the Hydrographic Office in your country see new subjects that need to be harmonised for S-101 that are not included in the current recommendations?**

Summarised responses
<ul style="list-style-type: none"> <li>• Bridges</li> <li>• MRNs</li> <li>• Display scales</li> <li>• Traffic Separation Scheme/Deep-Water Route features</li> <li>• Magnetic variation</li> <li>• Quality of bathymetric data</li> <li>• CATZOC</li> </ul>



**Q9 Currently (for S-57 ENC), compilation scales 1:22 000, 1:90 000, 1:180 000 and 1:1 500 000 are harmonised in the Baltic Sea. Does your Hydrographic Office consider these scales relevant as Optimum Display Scales for S-101?**

	n	Percent
Yes	7	87,5%
No	1	12,5%

**Q9.1 If the above answer is NO, please explain your reasoning. If you have any suggestions regarding relevant scales, please include them.**

Responses
We think that the scales are relevant but we can discuss if it's relevant to have four harmonised scales or if it would be preferable to only have three.

**Q10 Does your Hydrographic Office consider that the dual-fuel production (both S-57 and S-101) hinders the utilisation of S-101 to its full potential?**

	n	Percent
Yes	2	25%
No	6	75%

**Q10.1 If the above answer is YES, please describe how**

Summarised responses
Potentially limiting functionality by not retiring S-57 earlier as some functionality may be too difficult to manage with dual fuel. Other concerns include time restraints having to put in double the effort to maintain two product of similar function.

## Section 3 – Evaluate need of a harmonised roll-out plan for S-101 in the Baltic Sea

### Q11 Does the Hydrographic Office in your country have a roll-out plan for S-101 including prioritised geographical areas?

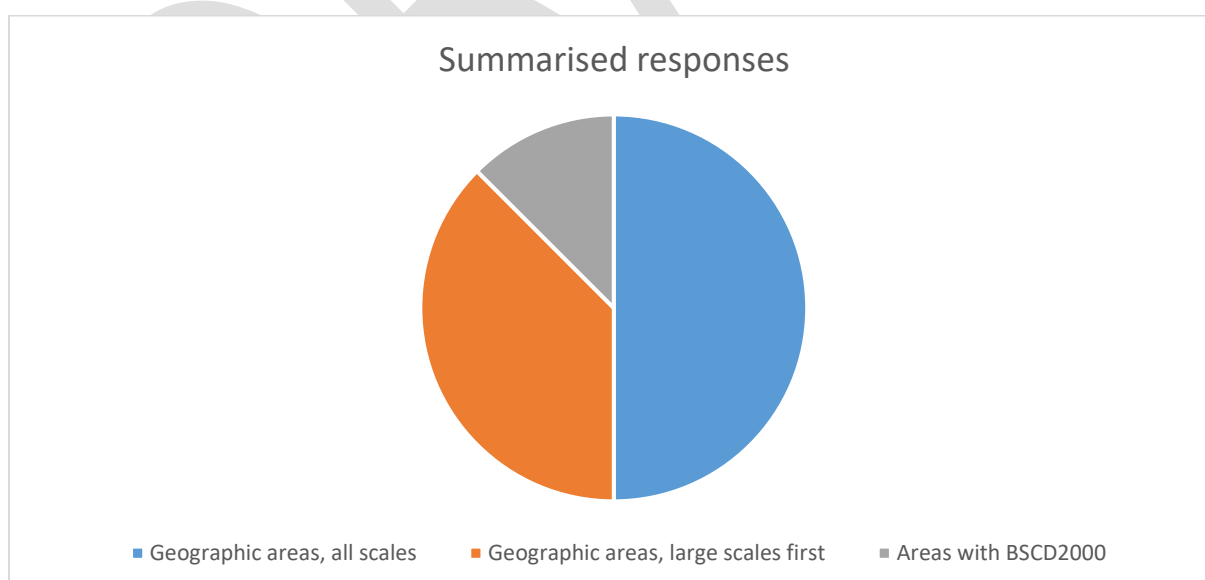
	n	Percent
Yes	5	62,5%
No	3	37,5%

#### Q11.1 If the above answer is YES, please list your top prioritised areas

Summarised responses
<ul style="list-style-type: none"> <li>• Larger ports and their approaches</li> <li>• Major shipping routes</li> <li>• Areas where BSCD2000 has been implemented</li> </ul>

### Q12 What are your thoughts or plans concerning the roll out?

- release all scales in a specified geographical area simultaneously?
- have a roll-out be based on scales (all products in one scale prioritised over products in another scale)?
- release larger scales in prioritised geographical areas before producing smaller scales?



Responses
We will likely roll out in regional areas throughout the scales. We are keen to reach full coverage as soon as possible. We have concerns about the ECDIS usability and display. The ECDIS will allow

the mariner will be able to choose to use either S-57 or S-101 datasets interchangeably (if they had purchased both). Until early 2024 we were under the impression that the ECDIS would preferentially choose S-101 if both were present. We presumed that once we had full coverage of S-101 ENC's we only needed to worry about consistency between S-57 & S-57 cells or S-101 & S-101 cells. However, we will also need to ensure consistency between S-57 & S-101 ENC's until S-57 is retired. We foresee some potential issues with this due to the differences in encoding between S-57 and S-101, especially with scales and data coverages.

We plan to release all scales (but maybe not the equivalent to General) in one area at the same time. We think that this will be the best solution for the mariners during the roll-out when S-101 and S-57 ENC's will be used side-by-side.

Our goal is to release all scales in a specified geographic area simultaneously

We plan to release the geographic area with the largest coverage and best scale first (this would correspond to the current Approach coverage).

We plan to start with Ports, then proceed to Approaches etc.

We start with ENC's which are in the new height system and have required attributes for better conversion to S-101 filled.

Our plan is to release all scales in a specified geographical area simultaneously

The standard is still in development and not all data sets are ready for release, it would be advantage to release the larger scales first and afterwards to further ones.

**Q13 Does your Hydrographic Office consider the status of your Baltic Sea Chart Datum 2000 relevant for your roll-out plan?**

	n	Percent
Yes	5	62,5%
No	3	37,5%

**Q13.1 If the above answer is YES, how does the implementation status affect your S-101 roll-out plan (or vice versa)?**

Responses
We have changed our plan for our BSCD2000 implementation to prioritise areas where we want to start producing S-100 products.
in 2024-2025 we should complete the implementation of BSCD2000 in the S-57 database
We have a plan to begin the implementation process with ENC's which are in the new height system.
All Berthing and Harbour ENC's are in the new system and the process is ongoing with Approach ENC's which we hope to finish by the end of 2026.
See previous answers. We don't have any plans to publish S-101 ENC's in MSL.
Well our current S57 cells are in BHS77 height system and S101 are intended to be in LAS07 (BSCD 2000), the total package we think to release at 2026

**Q14 Does the Hydrographic Office in your country see a need for harmonising the roll-out of S-101 in the Baltic Sea?**

	n	Percent
Yes	6	75%
No	2	25%

**Q14.1 If the above answer is YES, what do you consider important when planning a harmonised roll out?**

Responses
<ul style="list-style-type: none"> <li>• Regional roll out is important, so the mariner can have a seamless display and how data is depicted in the pick reports.</li> <li>• Potentially the busiest shipping routes</li> <li>• Linked to areas where it is beneficial to produce other S-1xx products, such as S-102. There is limited benefit to the mariner if only S-101 data is available.</li> </ul> <p>It would be interesting to receive mariner feedback on whether they can detect a significant difference between S-57 and S-101 on an ECDIS and whether there are usability issues.</p>
Depending on the schedule of the HO's, compared to the schedule of ECDIS type approval, it could be relevant to harmonise the roll-out to create a larger combined coverage of S-101 within the Baltic Sea.
To start first with the largest coverage and best scale (this would correspond to the current Approach coverage).
May be it is necessary to define prioritized areas or scales
<p>In this case we would be at the same level and in the information field that if a problem should arise, it would be easier to find a solution.</p> <p>It would also be easier for the end user to follow up.</p>
This could be a topic to discuss at least.

## Final thoughts

**Q15 Any additional comments?**

Responses
<p>Interesting survey. In our opinion, each HO is looking for its own way to S-100 (S-101). We have a new specification for the next product (S-101), but developers still have a lot of work to do to support converters and file mapping. Agreeing on even preliminary harmonization guidelines will facilitate HO efforts, and later, as our experience grows - the guidelines can be further developed or improved/revised.</p>
<p>to Q6: Before the data base has migrated and the needed SW is available we have to produce S-101 from current S-57 data.</p>

## Annex D – Comparison between Baltic Sea SCAMIN policy and IHO sample policy

### Comparison table

The table below compares the SCAMIN values for each navigational purpose between the Baltic Sea SCAMIN Policy and the UOC sample SCAMIN Policy. The recommended compilation scale for each navigational purpose have been used in the comparison.

The cells including the UOC SCAMIN value is colour coded as follows:

Green = Same value in both policies

Blue = Larger value in the UOC policy than in the Baltic Sea policy. This means that the feature is presented at smaller scales using the Baltic Sea policy.

Orange = Smaller value in the UOC policy than in the Baltic Sea policy. This means that the feature is presented at smaller scales using the UOC policy.

The column “Prim” indicates the geometric primitive for the feature (point/line/area).

Baltic Sea SCAMIN policy						UOC sample SCAMIN policy				
OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
ACHARE	3	1499999	699999	179999	P/A		2	349999	179999	59999
ACHARE	3	1499999	699999	179999	P/A	If RESTRN defined	3	499999	259999	89999
ACHBRT	2	699999	349999	89999	P/A		1	259999	119999	44999
ADMARE					A		3	499999	259999	89999
AIRARE	2	699999	349999	89999	P/A	If CONVIS = 1 (visually conspicuous)	NOT SET			
AIRARE	2	699999	349999	89999	P/A		1	259999	119999	44999
ARCSLN					A		4	699999	349999	119999
ASLXLN					L		4	699999	349999	119999
BCNCAR	3	1499999	699999	179999	P		3	499999	259999	89999
BCNISD	3	1499999	699999	179999	P		4	699999	349999	119999
BCNLAT	3	1499999	699999	179999	P		3	499999	259999	89999
BCNSAW	3	1499999	699999	179999	P		3	499999	259999	89999
BCNSPP	3	1499999	699999	179999	P		3	499999	259999	89999
BERTHS	2	699999	349999	89999	P/L/A		1	259999	119999	44999
BOYCAR	3	1499999	699999	179999	P		3	499999	259999	89999
BOYINB	3	1499999	699999	179999	P		3	499999	259999	89999
BOYISD	3	1499999	699999	179999	P		4	699999	349999	119999
BOYLAT	3	1499999	699999	179999	P		3	499999	259999	89999
BOYSAW	3	1499999	699999	179999	P		3	499999	259999	89999
BOYSPP	3	1499999	699999	179999	P		3	499999	259999	89999

Baltic Sea SCAMIN policy

UOC sample SCAMIN policy

OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
BRIDGE					P/L/A	Covered by an area <b>DEPARE</b> , <b>DRGARE</b> , or <b>UNSAE</b> object. Note that the point primitive does not display in ECDIS (see clause 4.8.10)	4	699999	349999	119999
BRIDGE					P/L/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous) and covered by an area <b>LNDARE</b> . Note that the point primitive does not display in ECDIS (see clause 4.8.10)	NOT SET			
BRIDGE					P/L/A	Covered by an area <b>LNDARE</b> . Note that the point primitive does not display in ECDIS (see clause 4.8.10)	1	259999	119999	44999
BUAARE	2	699999	349999	89999	A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous) or CATBUA = 5 (city)	NOT SET			
BUAARE	2	699999	349999	89999	P/A	If CATBUA = 4 (town)	2	349999	179999	59999
BUAARE	2	699999	349999	89999	P/A		1	259999	119999	44999
BUISGL	1	349999	179999	44999	P/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous) or FUNCTN contains value 33 (light support)	3	499999	259999	89999

Baltic Sea SCAMIN policy						UOC sample SCAMIN policy				
OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
BUISGL	1	349999	179999	44999	P/A	If FUNCTN = 2 (harbour masters office) or 3 (customs office or CONVIS = 2 (not visually conspicuous)	2	349999	179999	59999
BUISGL	1	349999	179999	44999	P/A		1	259999	119999	44999
C_AGGR					N/A		NOT SET			
C_ASSO					N/A		NOT SET			
CANALS					L		1	259999	119999	44999
CANALS					A		4	699999	349999	119999
CAUSWY	2	699999	349999	89999	L/A		2	349999	179999	59999
CBLARE	2	699999	349999	89999	A	If RESTRN defined	3	499999	259999	89999
CBLARE	2	699999	349999	89999	A		2	349999	179999	59999
CBLOHD					L	Covered by an area <b>DEPARE</b> , <b>DRGARE</b> , or <b>UNSARE</b> object	4	699999	349999	119999
CBLOHD					L	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
CBLOHD					L		1	259999	119999	44999
CBLSUB	2	699999	349999	89999	L		3	499999	259999	89999
CGUSTA	2	699999	349999	89999	P		1	259999	119999	44999
CHKPNT	2	699999	349999	89999	P/A		1	259999	119999	44999
COALNE					L		NOT SET			
CONVYR					L/A	Covered by an area <b>DEPARE</b> , <b>DRGARE</b> , or <b>UNSARE</b> object	4	699999	349999	119999
CONVYR					L/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
CONVYR					L/A		1	259999	119999	44999
CONZNE					A		3	499999	259999	89999
COSARE					A		3	499999	259999	89999
CRANES	2	699999	349999	89999	P/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			



Baltic Sea SCAMIN policy

UOC sample SCAMIN policy

OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
CRANES	2	699999	349999	89999	P/A		1	259999	119999	44999
CTNARE	2	699999	349999	89999	P/A		4	699999	349999	119999
CTRPNT	2	699999	349999	89999	P		3	499999	259999	89999
CTSARE	2	699999	349999	89999	P/A		1	259999	119999	44999
CURENT	2	699999	349999	89999	P		3	499999	259999	89999
CUSZNE					A		2	349999	179999	59999
DAMCON					P/L/A		1	259999	119999	44999
DAMCON					L/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous) or if seaward edge is coincident with the coastline (see clause 4.8.5)	NOT SET			
DAYMAR	2	699999	349999	89999	P	If Slave SCAMIN must match that of Master	3	499999	259999	89999
DEPARE					A		NOT SET			
DEPCNT					L	If VALDCO = 0 (drying line) or 30 (default safety contour ref S-52)	4	699999	349999	119999
DEPCNT					L		2	349999	179999	59999
DISMAR	2	699999	349999	89999	P		2	349999	179999	59999
DMPGRD	2	699999	349999	89999	P/A	If RESTRN defined	3	499999	259999	89999
DMPGRD	2	699999	349999	89999	P/A		2	349999	179999	59999
DOCARE					A		1	259999	119999	44999
DRGARE					A		NOT SET			
DRYDOC	2	699999	349999	89999	A		1	259999	119999	44999
DWRTCL					L		NOT SET			
DWRTPT					A		NOT SET			
DYKCON	2	699999	349999	89999	L/A	If seaward edge is coincident with the coastline (see clause 4.8.7)	NOT SET			
DYKCON	2	699999	349999	89999	L		1	259999	119999	44999
EXEZNE					A		3	499999	259999	89999
FAIRWY					A		3	499999	259999	89999
FERYRT	2	699999	349999	89999	L/A		3	499999	259999	89999

Baltic Sea SCAMIN policy						UOC sample SCAMIN policy				
OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
FLODOC					L	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
FLODOC					L		1	259999	119999	44999
FLODOC					A		NOT SET			
FNCLNE	2	699999	349999	89999	L	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
FNCLNE	2	699999	349999	89999	L		1	259999	119999	44999
FOGSIG	3	1499999	699999	179999	P	If Slave SCAMIN must match that of Master	3	499999	259999	89999
FORSTC	2	699999	349999	89999	P/L/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
FORSTC	2	699999	349999	89999	P/L/A		1	259999	119999	44999
FRPARE	2	699999	349999	89999	A		2	349999	179999	59999
FSHFAC	2	699999	349999	89999	P/L/A		2	349999	179999	59999
FSHGRD	2	699999	349999	89999	A		1	259999	119999	44999
FSHZNE					A		3	499999	259999	89999
GATCON	2	699999	349999	89999	P/L/A		2	349999	179999	59999
GATCON	2	699999	349999	89999	P/L/A	If covered by <b>DEPARE</b> or <b>DRGARE</b> objects; or is coincident with the coastline	NOT SET			
GRIDRN	2	699999	349999	89999	P/A	Note that the point primitive does not display in ECDIS (see clause 4.6.6.6)	1	259999	119999	44999
HRBARE	2	699999	349999	89999	A		3	499999	259999	89999
HRBFAC	2	699999	349999	89999	P/A		1	259999	119999	44999
HULKES					P		1	259999	119999	44999
HULKES					P	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
HULKES					A		NOT SET			
ICEARE					A		3	499999	259999	89999

## Baltic Sea SCAMIN policy

## UOC sample SCAMIN policy

OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
ICNARE	2	699999	349999	89999	P/A		1	259999	119999	44999
ICNARE	2	699999	349999	89999	P/A	If RESTRN defined	3	499999	259999	89999
ISTZNE					A		NOT SET			
LAKARE	2	699999	349999	89999	A		1	259999	119999	44999
LIGHTS	3	1499999	699999	179999	P	If Slave SCAMIN must match that of Master	4	699999	349999	119999
LITFLT	3	1499999	699999	179999	P		4	699999	349999	119999
LITVES	3	1499999	699999	179999	P		4	699999	349999	119999
LNDARE					P/L/A		NOT SET			
LNDELV	2	699999	349999	89999	P	If CONVIS = 1 (visually conspicuous)	NOT SET			
LNDELV	2	699999	349999	89999	P/L		3	499999	259999	89999
LNDMRK	3	1499999	699999	179999	P/L/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous) or FUNCTN contains value 33 (light support)	NOT SET			
LNDMRK	3	1499999	699999	179999	P/L/A		1	259999	119999	44999
LNDRGN	2	699999	349999	89999	P/A		1	259999	119999	44999
LOCMAG	2	699999	349999	89999	P/L/A		3	499999	259999	89999
LOGPON					P/A	Covered by an area <b>DEPARE</b> , <b>DRGARE</b> , or <b>UNSAE</b> object	4	699999	349999	119999
LOGPON					P/A		1	259999	119999	44999
LOKBSN					A		1	259999	119999	44999
M_ACCY					A		NOT SET			
M_COVR					A		NOT SET			
M_CSCL					A		NOT SET			
M_HOPA					A		NOT SET			
M_NPUB					A		NOT SET			
M_NSYS					A		NOT SET			
M_QUAL					A		NOT SET			
M_SDAT					A		NOT SET			
M_SREL					A		NOT SET			
M_VDAT					A		NOT SET			

Baltic Sea SCAMIN policy						UOC sample SCAMIN policy				
OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
MAGVAR	2	699999	349999	89999	P/L/A		1	259999	119999	44999
MARCUL	2	699999	349999	89999	P/L/A	If EXPSOU = 2 (shoaler than range of the surrounding depth area) and VALSOU ≤ 30	4	699999	349999	119999
MARCUL	2	699999	349999	89999	P/L/A	If RESTRN defined	3	499999	259999	89999
MARCUL	2	699999	349999	89999	P/L/A		1	259999	119999	44999
MIPARE	2	699999	349999	89999	P/A		3	499999	259999	89999
MORFAC	1	349999	179999	44999	P/L/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
MORFAC	1	349999	179999	44999	P/L/A		2	349999	179999	59999
NAVLNE	2	699999	349999	89999	L		3	499999	259999	89999
NEWOBJ					P/L/A		4	699999	349999	119999
OBSTRN	2	699999	349999	89999	P/L/A		NOT SET			
OBSTRN	2	699999	349999	89999	P/ L/A	If VALSOU > 30 and EXPSOU ≠ 2 (shoaler than range of the surrounding depth area)	4	699999	349999	119999
OFSPLF					P/A	Not covered by an area <b>OSPARE</b>	4	699999	349999	119999
OFSPLF					P/A	Covered by an area <b>OSPARE</b>	3	499999	259999	89999
OILBAR					L		4	699999	349999	119999
OSPARE	2	699999	349999	89999	A		4	699999	349999	119999
PILBOP	3	1499999	699999	179999	P/A		3	499999	259999	89999
PILPNT	1	349999	179999	44999	P	Where used to mark position of <b>LIGHTS</b> object in water	4	699999	349999	119999
PILPNT	1	349999	179999	44999	P	If CONVIS = 1 (visually conspicuous)	NOT SET			
PILPNT	1	349999	179999	44999	P		2	349999	179999	59999
PIPARE	2	699999	349999	89999	P/A		3	499999	259999	89999
PIPOHD					L	Covered by an area <b>DEPARE</b> , <b>DRGARE</b> , or <b>UNSARE</b> object	4	699999	349999	119999

Baltic Sea SCAMIN policy

UOC sample SCAMIN policy

OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
PIPOHD					L	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
PIPOHD					L		1	259999	119999	44999
PIPSOL	2	699999	349999	89999	P/L	Covered by an area <b>DEPARE</b> , <b>DRGARE</b> , or <b>UNSARE</b> object. Note that the point primitive does not display in ECDIS (see clause 11.6.1)	3	499999	259999	89999
PIPSOL	2	699999	349999	89999	P/L	Covered by an area <b>LNDARE</b> object. Note that the point primitive does not display in ECDIS (see clause 11.6.1)	1	259999	119999	44999
PONTON					L		2	349999	179999	59999
PONTON					L	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
PONTON					A		NOT SET			
PRCARE					P/A		NOT SET			
PRDARE	2	699999	349999	89999	P/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
PRDARE	2	699999	349999	89999	P/A		1	259999	119999	44999
PYLONS					P/A	Covered by an area <b>DEPARE</b> , <b>DRGARE</b> , or <b>UNSARE</b> object	NOT SET			
PYLONS					P/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
PYLONS					P/A		1	259999	119999	44999
RADLNE	2	699999	349999	89999	L		3	499999	259999	89999

Baltic Sea SCAMIN policy						UOC sample SCAMIN policy				
OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
RADRFL	The same as the master				P	If Slave SCAMIN must match that of Master	3	499999	259999	89999
RADRNG	2	699999	349999	89999	A		3	499999	259999	89999
RADSTA	2	699999	349999	89999	P	If Slave SCAMIN must match that of Master	2	349999	179999	59999
RAILWY	1	349999	179999	44999	L		1	259999	119999	44999
RAPIDS	2	699999	349999	89999	P/L/A	Note that the point primitive does not display in ECDIS (see clause 4.7.7.1)	1	259999	119999	44999
RCRTCL					L		3	499999	259999	89999
RCTLPT					P/A		3	499999	259999	89999
RDOCAL	3	1499999	699999	179999	P/L		3	499999	259999	89999
RDOSTA	2	699999	349999	89999	P	If Slave SCAMIN must match that of Master	1	259999	119999	44999
RECTRC					L/A		3	499999	259999	89999
RESARE	2	699999	349999	89999	A		3	499999	259999	89999
RETRFL	2	699999	349999	89999	P	If Slave SCAMIN must match that of Master	3	499999	259999	89999
RIVERS					L		1	259999	119999	44999
RIVERS					A		4	699999	349999	119999
ROADWY	1	349999	179999	44999	P/L/A	Note that the point primitive does not display in ECDIS (see clause 4.8.8)	1	259999	119999	44999
RSCSTA	2	699999	349999	89999	P		3	499999	259999	89999
RTPBCN	2	699999	349999	89999	P	If Slave SCAMIN must match that of Master	3	499999	259999	89999

Baltic Sea SCAMIN policy						UOC sample SCAMIN policy				
OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
RUNWAY	2	699999	349999	89999	P/L/A	If CONVIS = 1 (visually conspicuous). Note that the point primitive does not display in ECDIS (see clause 4.8.12)	NOT SET			
RUNWAY	2	699999	349999	89999	P/L/A	Note that the point primitive does not display in ECDIS (see clause 4.8.12)	1	259999	119999	44999
SBDARE	2	699999	349999	89999	P/L/A		1	259999	119999	44999
SEAARE	2	699999	349999	89999	P/A		1	259999	119999	44999
SILTNG	1	349999	179999	44999	P/A	If CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			
SISTAT	2	699999	349999	89999	P/A		1	259999	119999	44999
SISTAW	2	699999	349999	89999	P	If Slave SCAMIN must match that of Master	1	259999	119999	44999
SISTAW	2	699999	349999	89999	P	If Slave SCAMIN must match that of Master	1	259999	119999	44999
SLCONS					P/L/A		NOT SET			
SLOGRD	2	699999	349999	89999	P/A		3	499999	259999	89999
SLOTOP	2	699999	349999	89999	L		3	499999	259999	89999
SMCFAC	2	699999	349999	89999	P/A		1	259999	119999	44999
SNDWAV	2	699999	349999	89999	P/L/A		3	499999	259999	89999
SOUNDG	2	699999	349999	89999	P		1	259999	119999	44999
SPLARE	2	699999	349999	89999	P/A	If RESTRN defined	3	499999	259999	89999
SPLARE	2	699999	349999	89999	P/A		1	259999	119999	44999
SPRING	2	699999	349999	89999	P		1	259999	119999	44999
STSLNE					L		3	499999	259999	89999
SUBTLN	2	699999	349999	89999	A		3	499999	259999	89999
SWPARE	2	699999	349999	89999	A		3	499999	259999	89999
T_HMON					P/A		1	259999	119999	44999
T_NHMN					P/A		1	259999	119999	44999
T_TIMS					P/A		1	259999	119999	44999
TESARE					A		3	499999	259999	89999
TIDEWY	2	699999	349999	89999	L/A		1	259999	119999	44999

Baltic Sea SCAMIN policy						UOC sample SCAMIN policy				
OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
TOPMAR	The same as the master				P	If Slave SCAMIN must match that of Master	3	499999	259999	89999
TS_FEB					P/A		3	499999	259999	89999
TS_PAD					P/A		2	349999	179999	59999
TS_PNH					P/A		2	349999	179999	59999
TS_PRH					P/A		2	349999	179999	59999
TSELNE					L		NOT SET			
TSEZNE					A		NOT SET			
TSSBND					L		NOT SET			
TSSCRS					A		NOT SET			
TSSLPT					A		NOT SET			
TSSRON					A		NOT SET			
TS-TIS					P/A		2	349999	179999	59999
TUNNEL	2	699999	349999	89999	L/A	Covered by an area <b>DEPARE</b> , <b>DRGARE</b> , or <b>UNSAE</b> object. Note that the point primitive does not display in ECDIS (see clause 4.8.3)	4	699999	349999	119999
TUNNEL	2	699999	349999	89999	L/A	Covered by a <b>LNDARE</b> object. Note that the point primitive does not display in ECDIS (see clause 4.8.3)	1	259999	119999	44999
TWRTPT					A		NOT SET			
UNSAE					A		NOT SET			
UWTROC	2	699999	349999	89999	P		NOT SET			
UWTROC	2	699999	349999	89999	P	If VALSOU > 30 and EXPSOU ≠ 2 (shoaler than range of the surrounding depth area)	4	699999	349999	119999
UWTROC	2	699999	349999	89999	P	Covered by an area <b>OBSTRN</b> object	2	349999	179999	59999
VEGATN	2	699999	349999	89999	P/L/A	If CONVIS = 1 (visually conspicuous)	NOT SET			



Baltic Sea SCAMIN policy

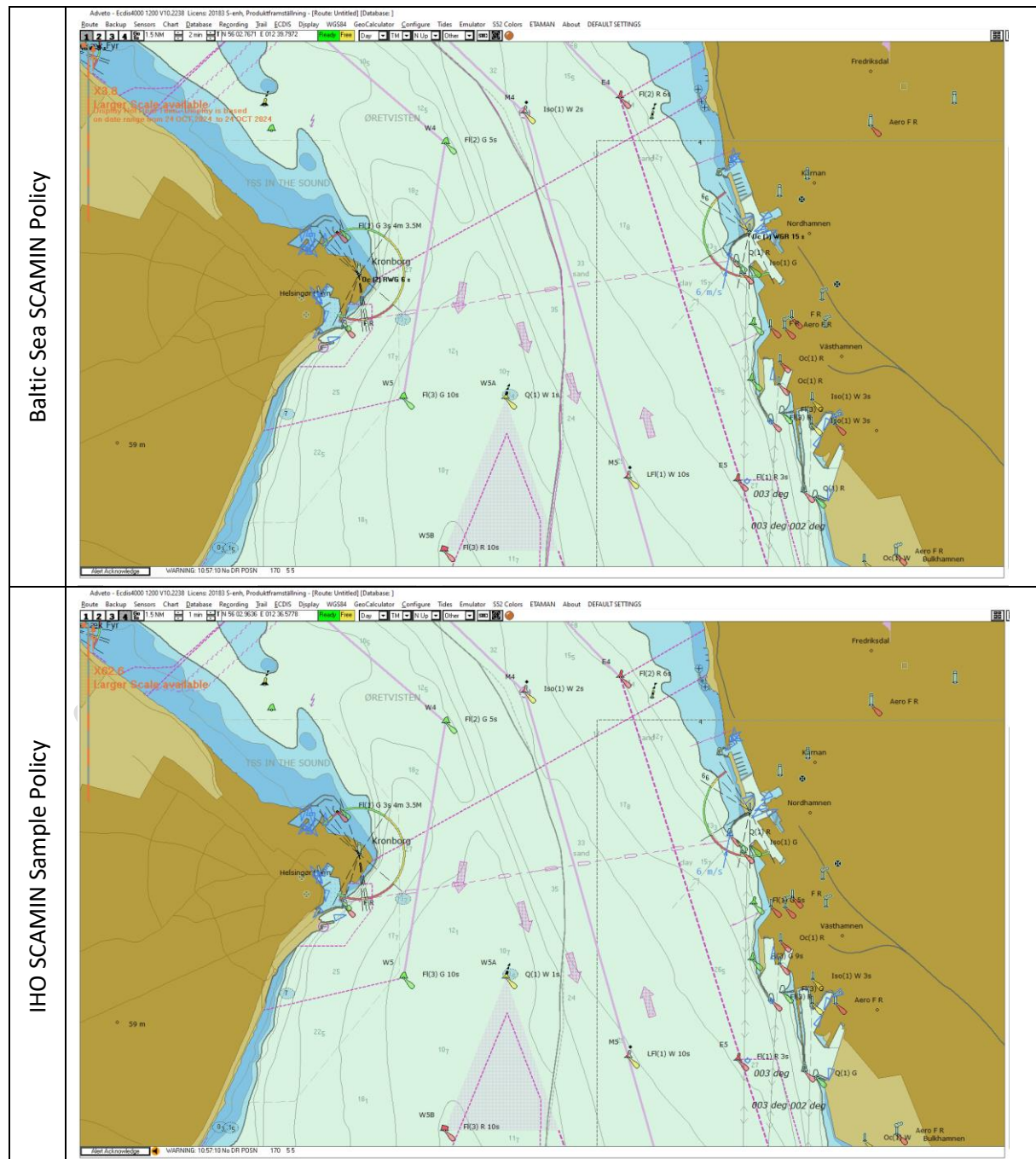
UOC sample SCAMIN policy

OBJECT	SCAMIN Steps	General	Coastal	Approach	PRIM.	CONDITION	SCAMIN STEPS	General	Coastal	Approach
VEGATN	2	699999	349999	89999	P/L/A		1	259999	119999	44999
WATFAL	2	699999	349999	89999	P/L	If CONVIS = 1 (visually conspicuous). Note that the point primitive does not display in ECDIS (see clause 4.7.7.2)	NOT SET			
WATFAL	2	699999	349999	89999	P/L	Note that the point primitive does not display in ECDIS (see clause 4.7.7.2)	1	259999	119999	44999
WATTUR	2	699999	349999	89999	P/L/A		3	499999	259999	89999
WEDKLP	2	699999	349999	89999	P/A		3	499999	259999	89999
WRECKS	2	699999	349999	89999	P/A		NOT SET			
WRECKS	2	699999	349999	89999	P/A	If CATWRK = 1 or (VALSOU > 30 and EXPSOU ≠ 2 (shoaler than range of the surrounding depth area))	3	499999	259999	89999
WRECKS	2	699999	349999	89999	P/A	CONVIS = 1 (visually conspicuous) or CONRAD = 1 (radar conspicuous)	NOT SET			

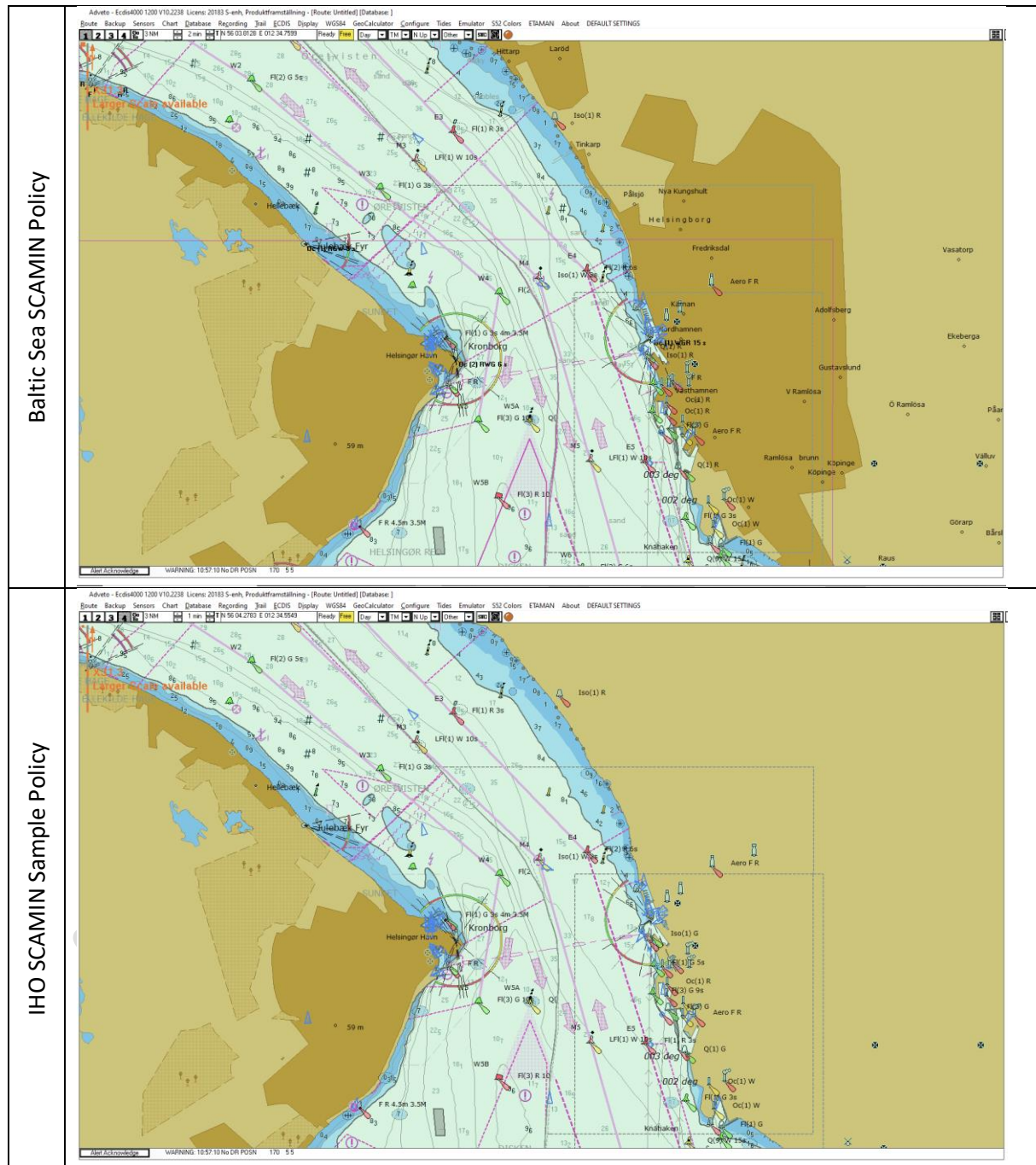
## Evaluation in ECDIS

Three existing Swedish S-57 ENC's were modified by using the IHO SCAMIN sample policy (as implemented in CARIS HPD). These were then loaded into an ECDIS and compared with the same datasets using the Baltic Sea SCAMIN policy. The screenshots below show the two variants of the datasets in different viewing scales. The Danish datasets have not been modified and use the Baltic Sea policy.

### Approach ENC's – Selected Viewing scale 1,5M (1:22 000)

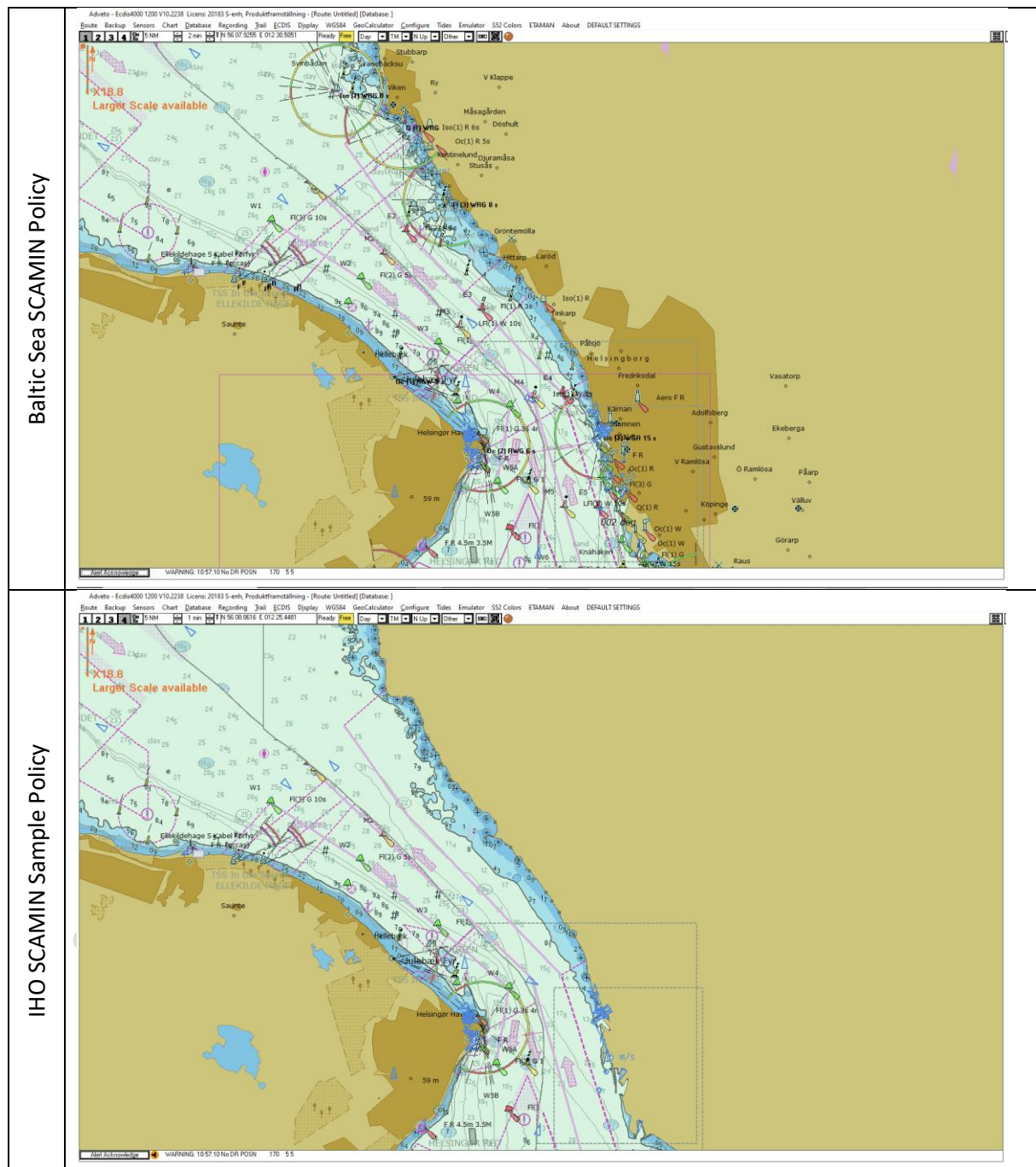


## Approach ENCs – Selected Viewing scale 3M (1:45 000)

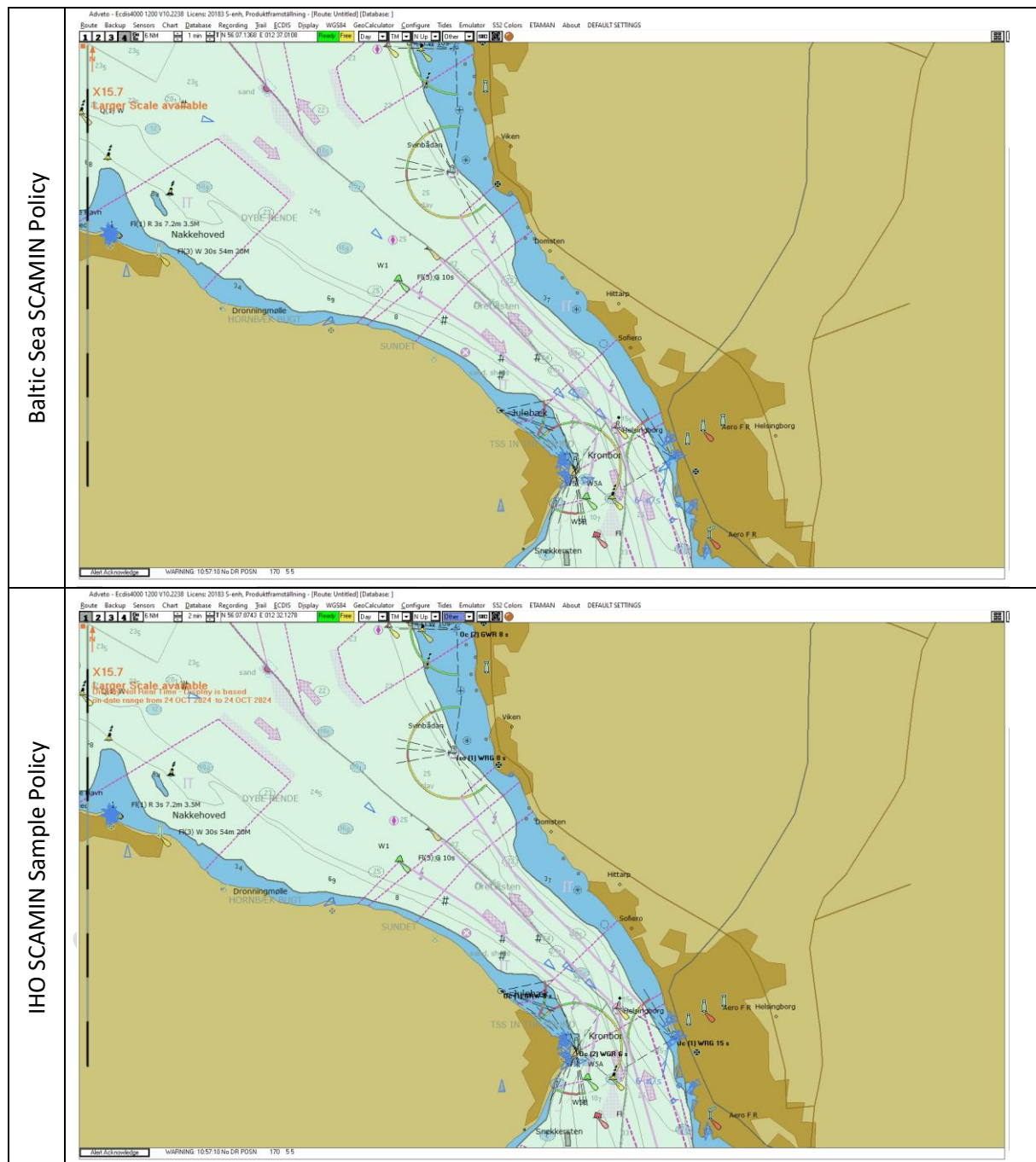




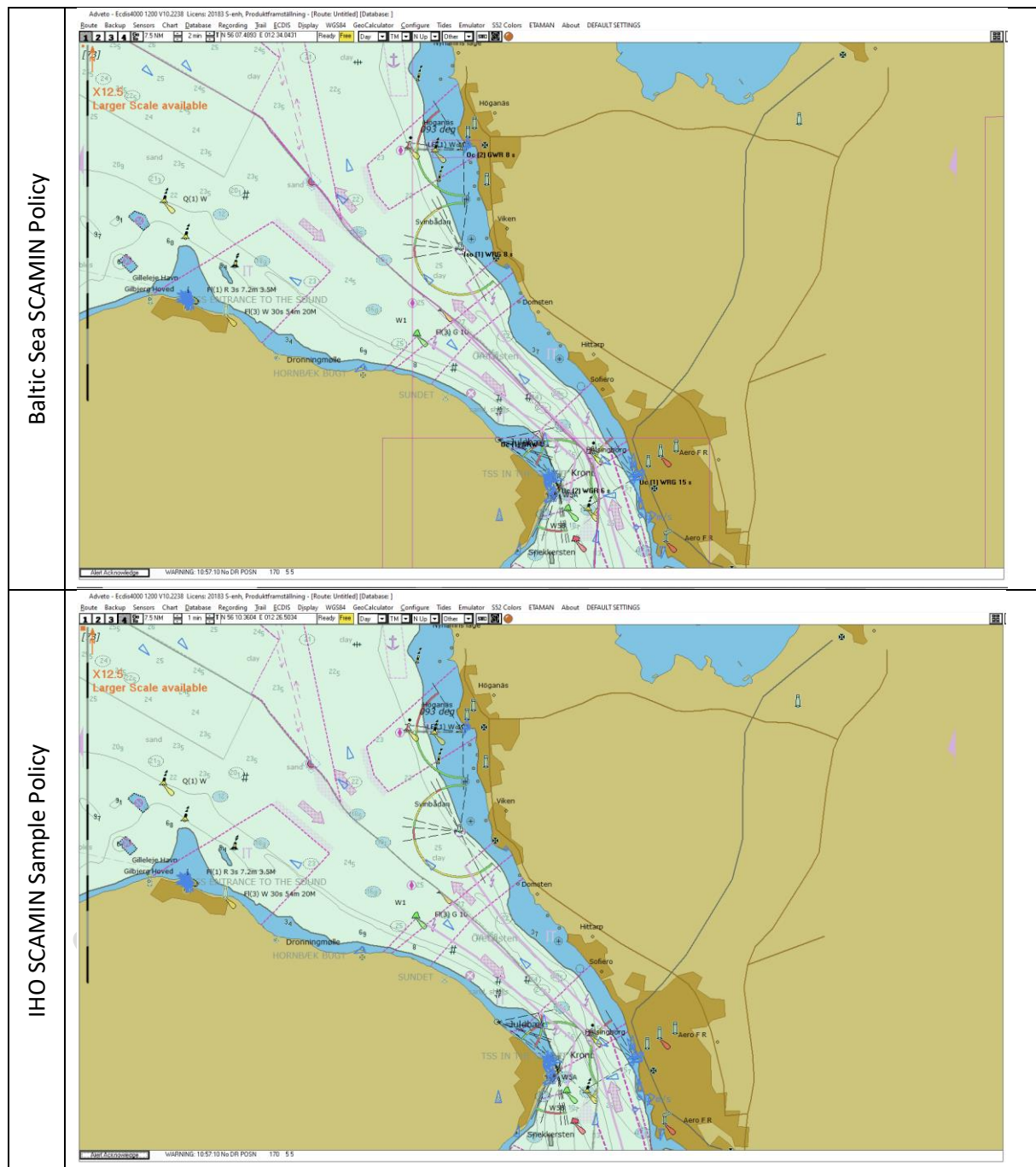
## Approach ENCs – Selected Viewing scale 5M (1:75 000)



## Coastal ENCs – Selected Viewing scale 6M (1:90 000)

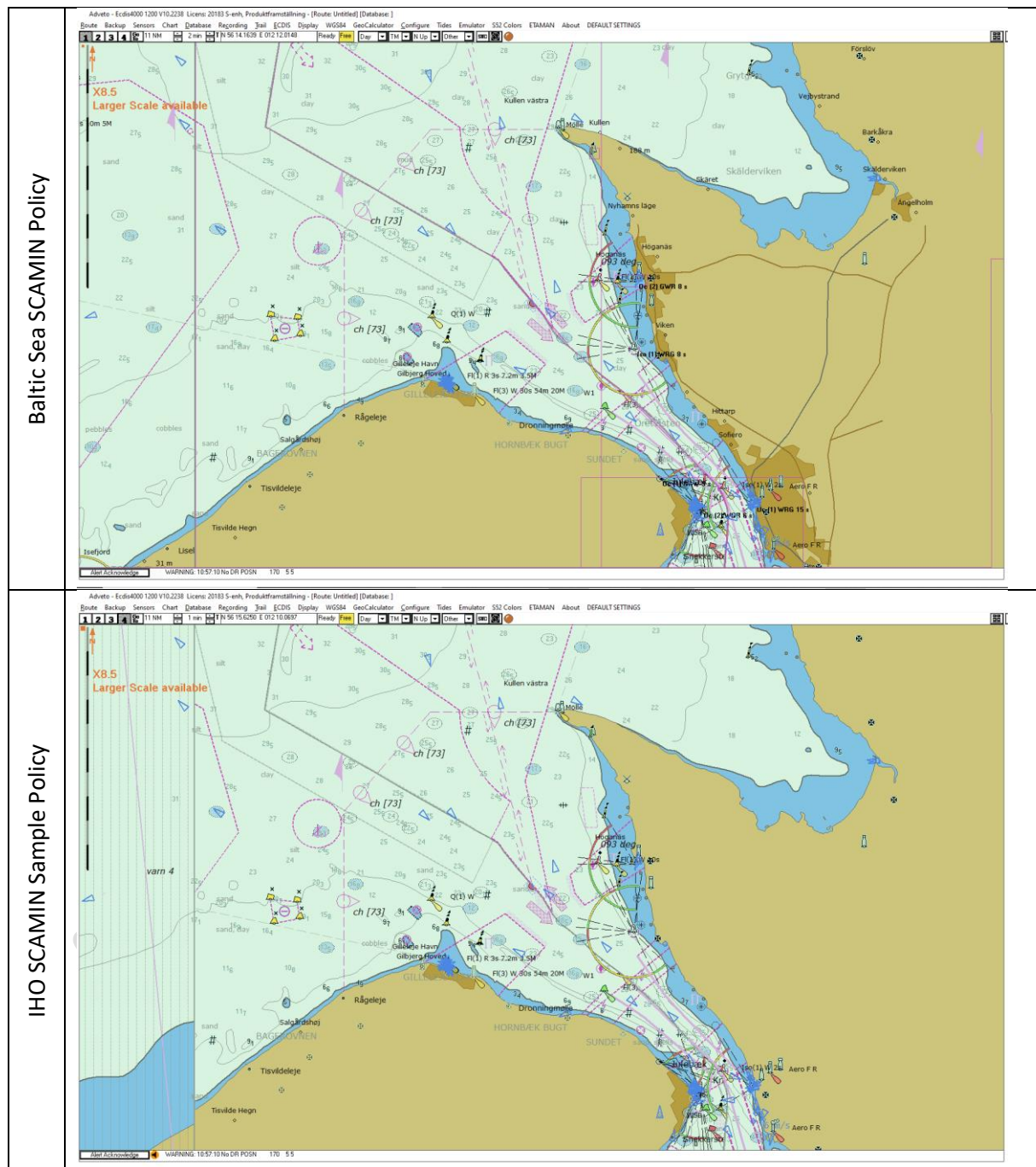


## Coastal ENC's – Selected Viewing scale 7,5M (1:112 500)

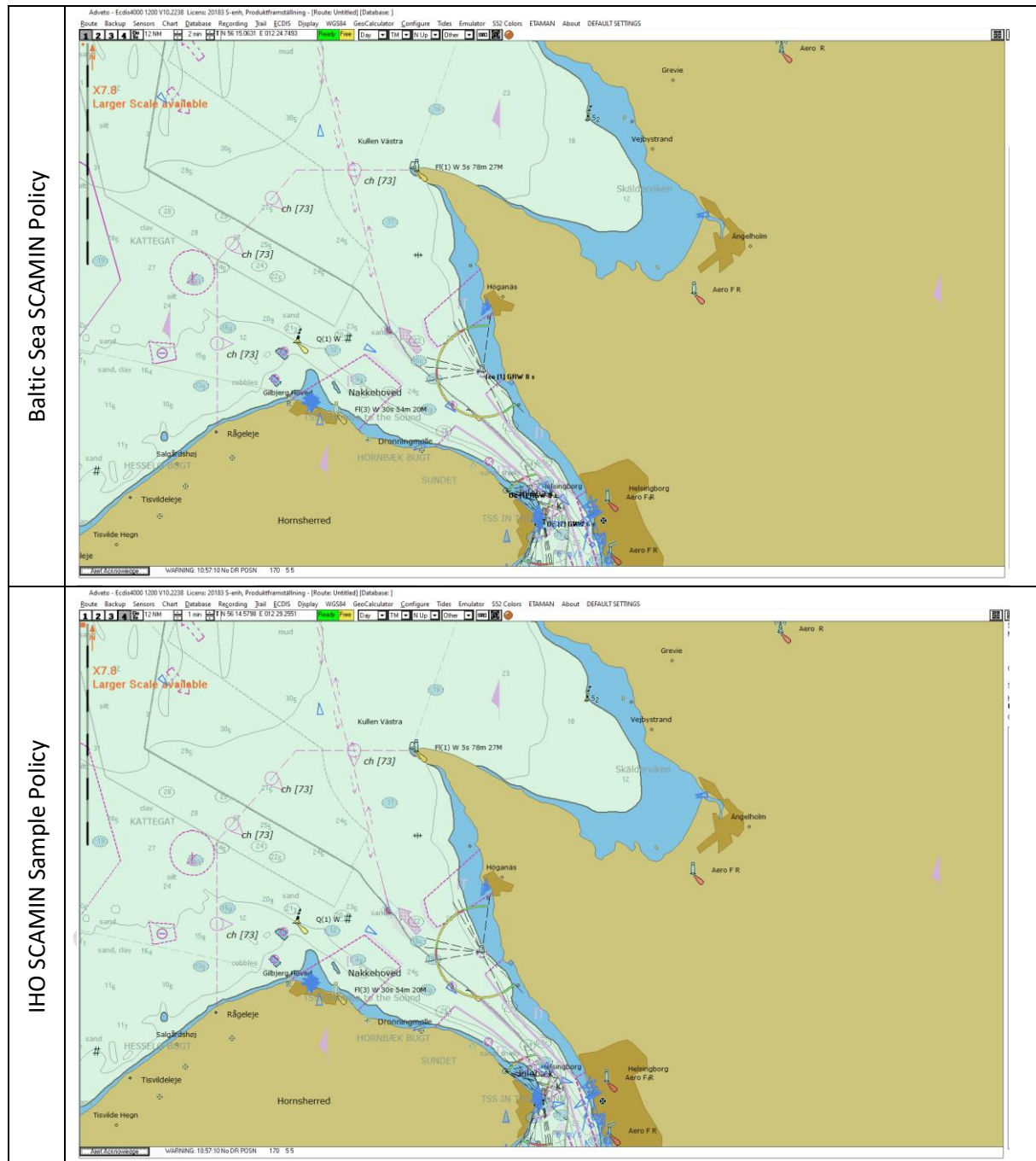




## Coastal ENCs – Selected Viewing scale 11M (1:165 000)

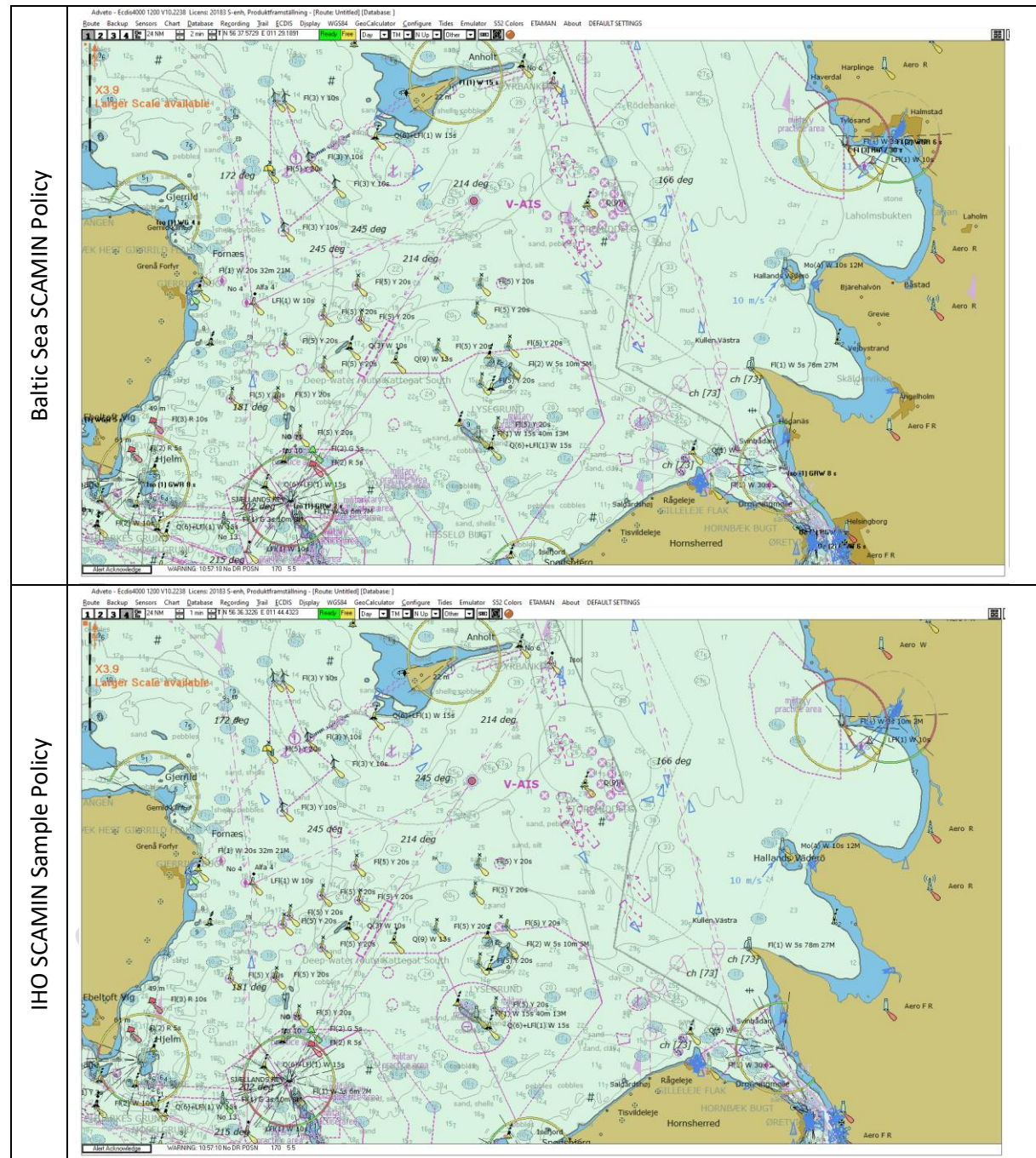


## General ENC's – Selected Viewing scale 12M (1:180 000)





## General ENCs – Selected Viewing scale 24M (1:360 000)



## Annex E – Baltic Sea scale minimum policy

### Introduction

This scale minimum policy describe how the scale minimum values should be assign for the ENC's in harmonised scales within the Baltic Sea. The scale minimum values are assigned using the methodology described in the S-57 UOC section 2.2.7.1 and S-101 DCEG section 2.5.9. However, the scale steps tables in section 1 and 2 of this policy must be used.

For ENC's with a larger compilation scale/optimum display scale than 22000, the data producer decides which scale steps to use if scale minimum values are assigned.

### 1. Scale steps used to assign scale minimum

The scale steps in the table below should be used to assign scale minimum values for the harmonised scales. For larger scale ENC's, the data may add steps with a larger scale from the steps table in S-57 UOC section 2.2.7.1 and S-101 DCEG section 2.5.9.

Scale steps used to assign scale minimum
19999999
9999999
4999999
2999999
1499999
699999
349999
179999
89999
44999

### 2. Scale minimum steps per feature class

Scale minimum steps per feature class			Scale minimum per compilation/ optimum display scales			
S-57	S-101	Steps	1 500 000	180 000	90 000	22 000
ACHARE	AnchorageArea	3	9999999	1499999	699999	179999
ACHARE	MooringArea	3	9999999	1499999	699999	179999
ACHBRT	AnchorBerth	2	4999999	699999	349999	89999
ADMARE	AdministrationArea					
ADMARE	PilotageArea					
ADMARE	VesselTrafficService					
AIRARE	AirportAirfield	2	4999999	699999	349999	89999
N/A	ArchipelagicSeaLane					

Scale minimum steps per feature class			Scale minimum per compilation/ optimum display scales			
S-57	S-101	Steps	1 500 000	180 000	90 000	22 000
ARCSLN	ArchipelagicSeaLaneArea					
ASLXIS	ArchipelagicSeaLaneAxis					
BCNCAR	CardinalBeacon	3	9999999	1499999	699999	179999
BCNISD	IsolatedDangerBeacon	3	9999999	1499999	699999	179999
BCNLAT	LateralBeacon	3	9999999	1499999	699999	179999
BCNSAW	SafeWaterBeacon	3	9999999	1499999	699999	179999
BCNSPP	SpecialPurposeGeneralBeacon	3	9999999	1499999	699999	179999
BERTHS	Berth	2	4999999	699999	349999	89999
BOYCAR	CardinalBuoy	3	9999999	1499999	699999	179999
BOYINB	InstallationBuoy	3	9999999	1499999	699999	179999
BOYISD	IsolatedDangerBuoy	3	9999999	1499999	699999	179999
BOYLAT	LateralBuoy	3	9999999	1499999	699999	179999
BOYSAW	SafeWaterBuoy	3	9999999	1499999	699999	179999
BOYSPP	SpecialPurposeGeneralBuoy	3	9999999	1499999	699999	179999
BOYSPP	EmergencyWreckMarkingBuoy	3	9999999	1499999	699999	179999
BRIDGE	Bridge					
BRIDGE	SpanFixed					
BRIDGE	SpanOpening					
BUAARE	BuiltUpArea	2	4999999	699999	349999	89999
BUISGL	Building	1	2999999	349999	179999	44999
C_AGGR	N/A					
C_ASSO	N/A					
CANALS	Canal					
CAUSWY	Causeway	2	4999999	699999	349999	89999
CBLARE	CableArea	2	4999999	699999	349999	89999
CBLOHD	CableOverhead					
CBLSUB	CableSubmarine	2	4999999	699999	349999	89999
CGUSTA	CoastGuardStation	2	4999999	699999	349999	89999
CHKPNT	Checkpoint	2	4999999	699999	349999	89999
COALNE	Coastline					
N/A	CollisionRegulationsLimit	3	9999999	1499999	699999	179999
CONVYR	Conveyor					
CONZNE	ContiguousZone					
COSARE	ContinentalShelfArea					
CRANES	Crane	2	4999999	699999	349999	89999
CTNARE	CautionArea	2	4999999	699999	349999	89999
CTRPNT	N/A	2	4999999	699999	349999	89999
CTSARE	CargoTransshipmentArea	2	4999999	699999	349999	89999
CURRENT	CurrentNonGravitational	2	4999999	699999	349999	89999
CUSZNE	CustomZone					

Scale minimum steps per feature class			Scale minimum per compilation/ optimum display scales			
S-57	S-101	Steps	1 500 000	180 000	90 000	22 000
DAMCON	Dam					
DAYMAR	Daymark	2	4999999	699999	349999	89999
DEPARE	DepthArea					
DEPCNT	DepthContour					
N/A	DiscolouredWater					
DISMAR	DistanceMark	2	4999999	699999	349999	89999
DMPGRD	DumpingGround	2	4999999	699999	349999	89999
DOCARE	DockArea					
DRGARE	DredgedArea					
DRYDOC	DryDock	2	4999999	699999	349999	89999
N/A	DeepWaterRoute					
DWRTCL	DeepWaterRouteCentreline					
DWRTPT	DeepWaterRoutePart					
DYKCON	Dyke	2	4999999	699999	349999	89999
EXEZNE	ExclusiveEconomicZone					
FAIRWY	Fairway					
N/A	FairwaySystem					
FERYRT	FerryRoute	2	4999999	699999	349999	89999
FLODOC	FloatingDock					
FNCLNE	FenceWall	2	4999999	699999	349999	89999
FOGSIG	FogSignal	3	9999999	1499999	699999	179999
FORSTC	FortifiedStructure	2	4999999	699999	349999	89999
FRPARE	FreePortArea	2	4999999	699999	349999	89999
FSHFAC	FishingFacility	2	4999999	699999	349999	89999
FSHGRD	FishingGround	2	4999999	699999	349999	89999
FSHZNE	FisheryZone					
GATCON	Gate	2	4999999	699999	349999	89999
GRIDRN	Gridiron	2	4999999	699999	349999	89999
HRBARE	HarbourArea	2	4999999	699999	349999	89999
HRBFAC	HarbourFacility	2	4999999	699999	349999	89999
HULKES	Hulk					
ICEARE	IceArea					
ICNARE	N/A	2	4999999	699999	349999	89999
N/A	IslandGroup					
ISTZNE	InshoreTrafficZone					
LAKARE	LakeArea	2	4999999	699999	349999	89999
LIGHTS	LightAirObstruction	3	9999999	1499999	699999	179999
LIGHTS	LightAllAround	3	9999999	1499999	699999	179999
LIGHTS	LightFogDetector	3	9999999	1499999	699999	179999
LIGHTS	LightSector	3	9999999	1499999	699999	179999

Scale minimum steps per feature class			Scale minimum per compilation/ optimum display scales			
S-57	S-101	Steps	1 500 000	180 000	90 000	22 000
LITFLT	LightFloat	3	9999999	1499999	699999	179999
LITVES	LightVessel	3	9999999	1499999	699999	179999
LNDARE	LandArea					
LNDELV	LandElevation	2	4999999	699999	349999	89999
LNDMRK	Landmark	3	9999999	1499999	699999	179999
LNDMRK	WindTurbine	3	9999999	1499999	699999	179999
LNDRGN	LandRegion	2	4999999	699999	349999	89999
N/A	LocalDirectionOfBuoyage	3	9999999	1499999	699999	179999
LOCMAG	LocalMagneticAnomaly	2	4999999	699999	349999	89999
LOGPON	LogPond					
LOKBSN	LockBasin					
M_ACCY	QualityOfNonBathymetricData					
M_COVR	DataCoverage					
M_CSCL	N/A					
M_HOPA	N/A					
M_NPUB	InformationArea					
M_NSYS	NavigationalSystemOfMarks					
M_QUAL	QualityOfBathymetricData					
M_SDAT	SoundingDatum					
M_SREL	QualityofSurvey					
M_VDAT	VerticalDatumOfData					
MAGVAR	MagneticVariation	2	4999999	699999	349999	89999
MARCUL	MarineFarmCulture	2	4999999	699999	349999	89999
N/A	MarinePollutionRegulationsArea					
MIPARE	MilitaryPracticeArea	2	4999999	699999	349999	89999
MORFAC	Bollard	1	2999999	349999	179999	44999
MORFAC	Dolphin	1	2999999	349999	179999	44999
MORFAC	MooringBuoy	1	2999999	349999	179999	44999
N/A	MooringTrot					
NAVLNE	NavigationLine	2	4999999	699999	349999	89999
NEWOBJ	VirtualAISaidToNavigation	3	9999999	1499999	699999	179999
OBSTRN	Obstruction	2	4999999	699999	349999	89999
OBSTRN	FoulGround	2	4999999	699999	349999	89999
OFSPLF	OffshorePlatform					
OILBAR	OilBarrier					
OSPARE	OffshoreProductionArea	2	4999999	699999	349999	89999
N/A	PhysicalAISaidToNavigation	The same as the equipment feature				
PILBOP	PilotBoardingPlace	3	9999999	1499999	699999	179999
PILPNT	Pile	1	2999999	349999	179999	44999
PIPARE	SubmarinePipelineArea	2	4999999	699999	349999	89999



Scale minimum steps per feature class			Scale minimum per compilation/ optimum display scales			
S-57	S-101	Steps	1 500 000	180 000	90 000	22 000
PIPOHD	PipelineOverhead					
PIPSOL	PipelineSubmarine/OnLand	2	4999999	699999	349999	89999
PONTON	Pontoon					
PRCARE	PrecautionaryArea					
PRDARE	ProductionStorageArea	2	4999999	699999	349999	89999
PYLONS	PylonBridgeSupport					
RADLNE	RadarLine	2	4999999	699999	349999	89999
RADRFL	RadarReflector	The same as the master/equipment feature				
RADRNG	RadarRange	2	4999999	699999	349999	89999
RADSTA	RadarStation	2	4999999	699999	349999	89999
N/A	RangeSystem					
RAILWY	Railway	1	2999999	349999	179999	44999
RAPIDS	Rapids	2	4999999	699999	349999	89999
RCRTCL	RecommendedRouteCentreline					
RCTLPT	RecommendedTrafficLanePart					
RDOCAL	RadioCallingInPoint	3	9999999	1499999	699999	179999
RDOSTA	RadioStation	2	4999999	699999	349999	89999
RECTRC	RecommendedTrack					
RESARE	RestrictedArea	2	4999999	699999	349999	89999
RETRFL	Retroreflector	2*	4999999	699999	349999	89999
RIVERS	River					
ROADWY	Road	1	2999999	349999	179999	44999
RSCSTA	RescueStation	2	4999999	699999	349999	89999
RTPBCN	RadarTransponderBeacon	2	4999999	699999	349999	89999
RUNWAY	Runway	2	4999999	699999	349999	89999
RUNWAY	Helipad	2	4999999	699999	349999	89999
SBDARE	SeabedArea	2	4999999	699999	349999	89999
SEAARE	SeaAreaNamedWaterArea	2	4999999	699999	349999	89999
SILTNC	SiloTank	1	2999999	349999	179999	44999
SISTAT	SignalStationTraffic	2	4999999	699999	349999	89999
SISTAW	SignalStationWarning	2	4999999	699999	349999	89999
SLCONS	ShorelineConstruction					
SLOGRD	SlopingGround	2	4999999	699999	349999	89999
SLOTOP	SlopeTopline	2	4999999	699999	349999	89999
SMCFAC	SmallCraftFacility	2	4999999	699999	349999	89999
SNDWAV	Sandwave	2	4999999	699999	349999	89999
SOUNDG	DepthNoBottomFound	2	4999999	699999	349999	89999
SOUNDG	Sounding	2	4999999	699999	349999	89999
SPLARE	SeaplaneLandingArea	2	4999999	699999	349999	89999
SPRING	Spring	2	4999999	699999	349999	89999

Scale minimum steps per feature class			Scale minimum per compilation/ optimum display scales			
S-57	S-101	Steps	1 500 000	180 000	90 000	22 000
STSLNE	StraightTerritorialSeaBaseline					
N/A	StructureOverNavigableWater					
SUBTLN	SubmarineTransitLane	2	4999999	699999	349999	89999
SWPARE	SweptArea	2	4999999	699999	349999	89999
T_HMON	N/A					
T_NHMN	N/A					
T_TIMS	N/A					
TESARE	TerritorialSeaArea					
N/A	TextPlacement	Must be <= associated feature				
TIDEWY	Tideway	2	4999999	699999	349999	89999
TOPMAR	N/A	The same as the master				
TS_FEB	TidalStreamFloodEbb					
TS_PAD	TidalStreamPanelData					
TS_PNH	N/A					
TS_PRH	N/A					
TSELNE	SeparationZoneOrLine					
TSEZNE	SeparationZoneOrLine					
N/A	TrafficSeparationScheme					
TSSBND	TrafficSeparationSchemeBoundary					
TSSCRS	TrafficSeparationSchemeCrossing					
TSSLPT	TrafficSeparationSchemeLanePart					
TSSRON	TrafficSeparationSchemeRoundabout					
TS-TIS	N/A					
TUNNEL	Tunnel	2	4999999	699999	349999	89999
N/A	TwoWayRoute					
TWRTPT	TwoWayRoutePart					
UNSARE	UnsurveyedArea					
N/A	UpdateInformation					
UWTROC	UnderwaterAwashRock	2	4999999	699999	349999	89999
VEGATN	Vegetation	2	4999999	699999	349999	89999
WATFAL	Waterfall	2	4999999	699999	349999	89999
WATTUR	WaterTurbulence	2	4999999	699999	349999	89999
WEDKLP	WeedKelp	2	4999999	699999	349999	89999
WEDKLP	Seagrass	2	4999999	699999	349999	89999
WRECKS	Wreck	2	4999999	699999	349999	89999

\* If part of a structure/equipment relationship, the scale minimum value should be same as for the equipment feature.

### 3. Scale minimum value of an individual feature depends on the scale minimum value in a smaller scale ENC

If the disappearance and reappearance of an individual object is of concern in the transition from a larger scale ENC to a smaller scale ENC, then that individual object in the larger scale ENC should have the same SCAMIN as in the smaller scale ENC. This option should only be used after proper consideration.

### 4. Special circumstances

If found necessary, it is possible to deviate from these rules. When doing so the HO should make every effort to minimize the effect of any inconsistencies that may occur. This should be done through bilateral/multilateral agreements and through harmonising of data in order to ensure that no serious disharmony is introduced into the presentation of ENCs.

DRAFT





**International Hydrographic Organisation  
Baltic Sea Hydrographic Commission**

**The Baltic Sea Harmonisation Working Group  
(BSEHWG)**

**Final report**  
[18 June 2008]



## Resume

At the 12<sup>th</sup> conference of the Baltic Sea Hydrographic Commission (BSHC) in June 2007, the need for a study of the level of harmonisation of the Baltic Sea Electronic Navigational Charts (ENCs) was recognised. This is considered critical for safe navigation and to ensure that the ENCs are used as widely as possible when sailing in the Baltic Sea. Therefore the Baltic Sea ENC Harmonisation Working Group (BSEHWG) was established with the main purpose of identifying and analysing existing inconsistencies in Baltic Sea ENCs and proposing solutions to avoid inconsistencies.

The work has resulted in a number of recommendations. Following are the recommendations related to production of ENCs and recommendations related to the future work with implementation of harmonised ENCs.

### **Recommendation 1: Navigational purpose *Overview***

- 1a) *Overview* navigational purpose should be in harmony with other navigational purposes within the producers' portfolios.
- 1b) The *Overview* cell should be harmonised with adjacent cells in the North Sea.

### **Recommendation 2: Navigational purpose *Harbour and Berthing***

The *Harbour* and *Berthing* navigational purposes should be in harmony with other navigational purposes within the producers' portfolios.

### **Recommendation 3: Use of Compilation Scale**

On the Baltic Sea, the following values for the compilation scales should be used:

180,000	( <i>General</i> )
90,000	( <i>Coastal</i> )
22,000	( <i>Approach</i> )

### **Recommendation 4: Exceptions in the use of Compilation Scale**

If a Hydrographic Office (HO) wants to use a compilation scale other than those recommended above, it may do so if all the following conditions are met:

- i) the value used is in line with the intention of the IHO CL 47/2004
- ii) use of it is agreed bilaterally with neighbouring HO(s) concerned, in order to avoid inconsistencies at the border, and
- iii) every effort is made to minimise possible inconsistencies due to deviations from the recommended compilation scale.

### **Recommendation 5: Use of SCAMIN**

BSHC should adopt the guidelines as stated in the Annex J.

**Recommendation 6: Contour intervals**

- 6a) The BSEHWG proposes that the BSHC establishes a Working Group to study possibilities for Harmonisation of the Conveying and Presentation of Depth Information for both ENC's and paper charts.
- 6b) Meanwhile, if the IHO recommended contour intervals are not applicable, or if additional intervals are needed, implementation should be agreed bilaterally/multilaterally so that possible inconsistencies to the mariners could be avoided.

**Recommendation 7: Harmonisation of features continuing/extending over national borders**

All BSHC countries should ensure that bilateral agreements are in place with their neighbouring countries concerning harmonisation of features continuing/extending over national borders.

**Recommendation 8: Checking harmonisation before launching new ENC's**

All BSHC countries should check and carry out harmonisation before launching updates or new editions of ENC's.

**Recommendation 9: Buffer zones along the national borders**

All BSHC countries should check that there are no gaps between cells at national borders by establishing a buffer zone of up to 5 metres, if necessary.

**Recommendation 10: Adoption of new versions of ENC related standards**

The BSHC should agree on joint plans and time schedules for the adoption of new versions of ENC related standards (e.g. S-57 Ed. 3.1.1 or S-101).

**Recommendation 11: Adoption of new object classes**

The BSHC should agree on joint plans and a time schedule for the adoption of new object classes on their products.

**Recommendation 12: The use of objects to ensure consistency**

12a) BSHC should encourage all countries to make further studies of the use of objects in the Baltic Sea ENC's and report to the following BSHC meeting.

12b) BSHC should decide on proper actions to ensure ENC consistency as far as possible.

**Recommendation: 13: Special circumstances**

If found necessary it is possible to deviate from the recommendations. When doing so, the relevant HO should make every effort to minimise the effect of any inconsistencies that may occur. This should be done through bilateral/multilateral agreements and through harmonisation of data in order to ensure that no serious disharmony is introduced to the ENC's.

**Recommendation 14: Promotion of regional approaches**

BSHC should ask the IHO Committee on Hydrographic Requirements for Information Systems (CHRIS) to consider appropriate actions to recommend other Regional Hydrographic Commissions (RHCs) to adopt regional implementations to IHO consistency recommendations within their sea areas.

**Recommendation 15: Training and education**

All relevant bodies are encouraged to continue the education of mariners regarding '*ECDIS*', '*ECS*', '*ENC*' and '*Electronic chart*'.

**Recommendation 16: Follow-up of implementation**

All BSHC countries should follow the time schedule for the implementation of all relevant recommendations as stated in Annex L.

**Recommendation 17: Reporting of the implementation of the recommendations**

BSHC members should report annually to BSHC Conferences on the implementation of these recommendations.

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# 1. The BSEHWG

## 1.1 Background

At the 12<sup>th</sup> BSHC Conference in June 2007, the need for a study of the level of harmonisation of the ENC's in the Baltic Sea region was recognised. The study should support ENC consistency and a common level of IHO data quality. This work is considered critical to making ECDIS more user-friendly, expanding the use of ENC's and ECDIS and increasing the safety of navigation on the Baltic Sea.

Therefore the BSHC established the BSEHWG with a task to identify and analyse existing inconsistencies within ENC's in the Baltic Sea and propose solutions to avoid inconsistencies in the future. This work has been carried out in accordance with existing guidelines and recommendations issued by the IHO and the RENCs.

The BSEHWG was established immediately after the 12<sup>th</sup> BSHC Conference; all nations of the Baltic Sea were invited. The Working Group has been chaired by Denmark and its membership includes Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, (Russia) and Sweden.

Three workshops have been held in Copenhagen - the first in January 2008, the second in March 2008 and the third in June 2008. All have had the aim of developing concrete solutions for harmonisation of ENC's. At the final workshop, the BSEHWG fulfilled its mission and completed a report for the 13<sup>th</sup> BSHC Conference.

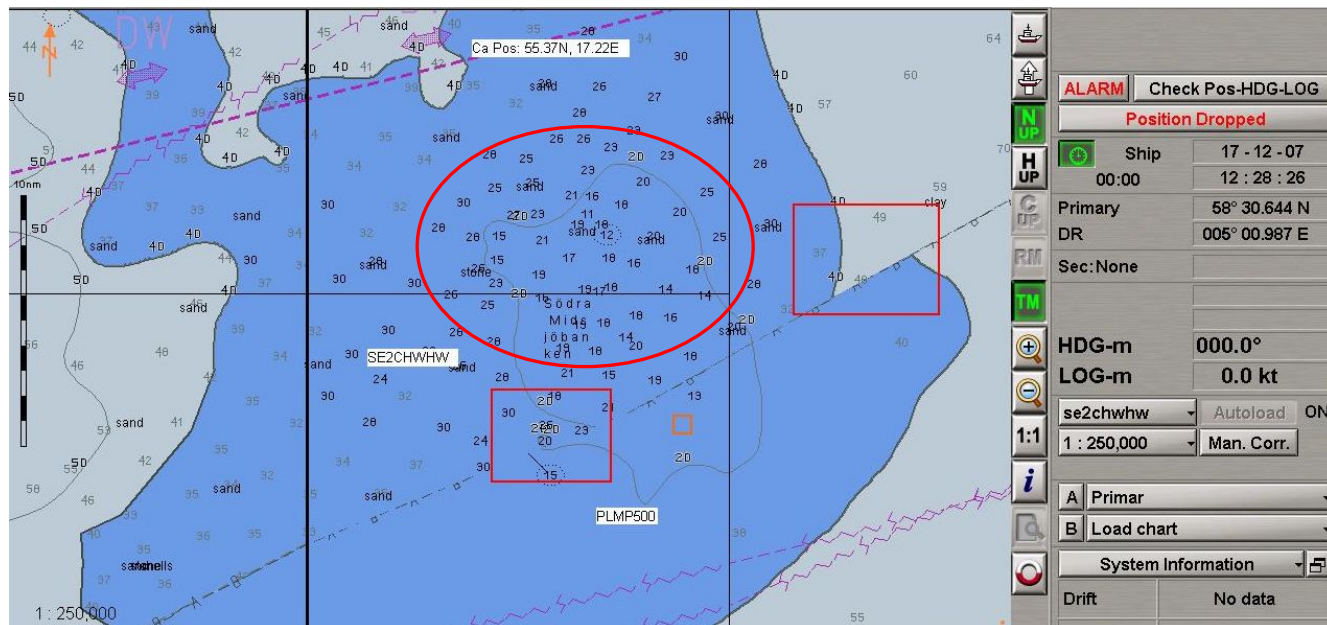


Fig. 1.1 Examples of inconsistencies between Swedish and Polish ENC's shown on an ECDIS display.

Figure 1.1 demonstrates some examples of inconsistencies between Swedish and Polish ENC's shown on an ECDIS display. The red ellipse shows the differences in the density of soundings. The two red boxes show gaps in the 20 metre depth contours/areas and the 40

and 50 metre depth contours/areas. Sweden uses 40 metre contours and Poland uses 50 metre contours.

## **1.2 Terms of Reference**

At its 12<sup>th</sup> Conference, the BSHC recognised the need to study the harmonisation of the ENC's in the Baltic Sea in order to ensure ENC consistency and a common level of IHO data quality. Therefore the 12<sup>th</sup> BSHC Conference established the BSEHWG with the task to study the level of harmonisation of the ENC's in the Baltic Sea.

This was decided with reference to:

- IHO Work Programme 2008 – 2012: Task 3.3.4 ENC Production, Distribution and Update,
- IHO CL 32/2007: Recommendations for Consistent ENC Data Encoding,
- WEND Report to the XVII IH Conference [CONF.17/WP.3 Page 6] and
- WEND principle 2.8.

### **The Working Group should:**

- Identify and analyse existing inconsistencies in Baltic Sea ENC's.
- Propose solutions and measures to avoid inconsistencies in the future.
- Arrange a harmonisation workshop by the end of 2007 with the aim of developing concrete solutions for harmonising the ENC's.
- If necessary, propose amendments to the IHO and RENC recommendations.
- Present a final report to the BSHC. This should include an action plan with specified time schedule for future ENC harmonisation.
- If deemed feasible, send reports to relevant IHO and IMO bodies.

### **Procedure**

- The Working Group is open to all BSHC Members and Associate Members; all are strongly encouraged to contribute to the work of the BSEHWG.
- The BSEHWG should be chaired by one of the Member States, as elected at the Conference.
- The BSEHWG should work as far as possible in accordance with existing guidelines and recommendations issued by the IHO and the Regional Electronic Navigational Centres (RENCs).
- When feasible, the BSEHWG should consult the World-wide Electronic Navigational Chart Database (WEND) Task Group, CHRIS Committee and its Working Groups or other relevant bodies.



- The BSEHWG should inform the NSHC and the NHC to harmonise with the North Sea ENCs as far as possible.
- The members of the BSEHWG should have access to unencrypted ENCs.
- The work of the BSEHWG will be carried out primarily by correspondence (via e-mail). The members are strongly encouraged to reply without unnecessary delay.
- The BSEHWG should report to the BSHC 13<sup>th</sup> Conference.

### 1.3 Baltic Sea ENCs and the BSEHWG Membership

Under the International Hydrographic Organisation there are 15 Regional Hydrographic Commissions (RHC), among them the Baltic Sea Commission (BSHC). All the countries around the Baltic Sea are members or associate members of the BSHC. The current coverage of the Baltic Sea ENCs can be seen in Figure 1.2.

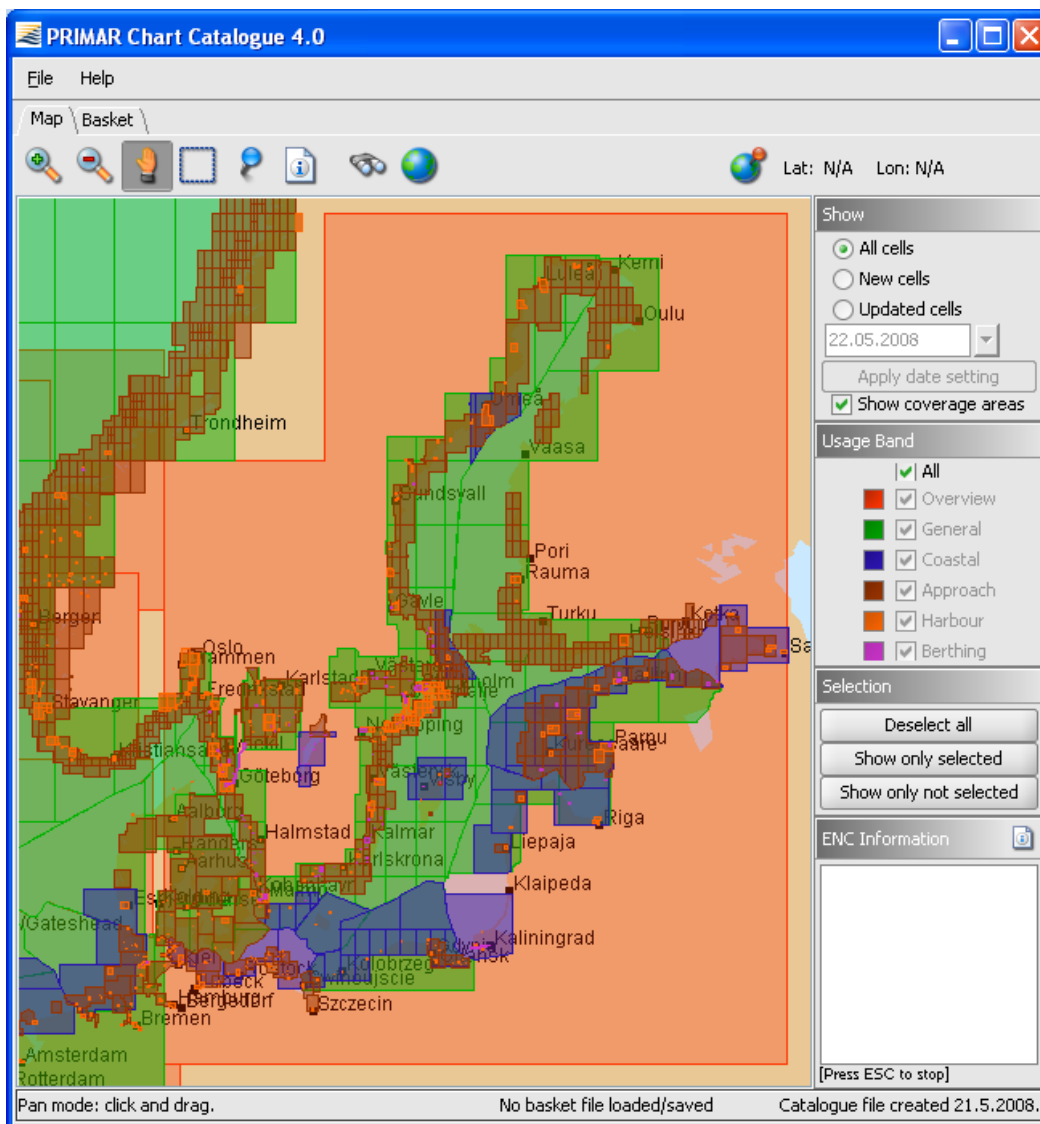


Fig. 1.2 ENC Coverage on the Baltic Sea

## 1.4 BSEHWG Work Plan

The BSEHWG Work Plan and time schedule were approved at the 12<sup>th</sup> BSHC Conference in Klaipeda in June 2007. A diagram showing the Work Plan can be seen in Figure 1.3.

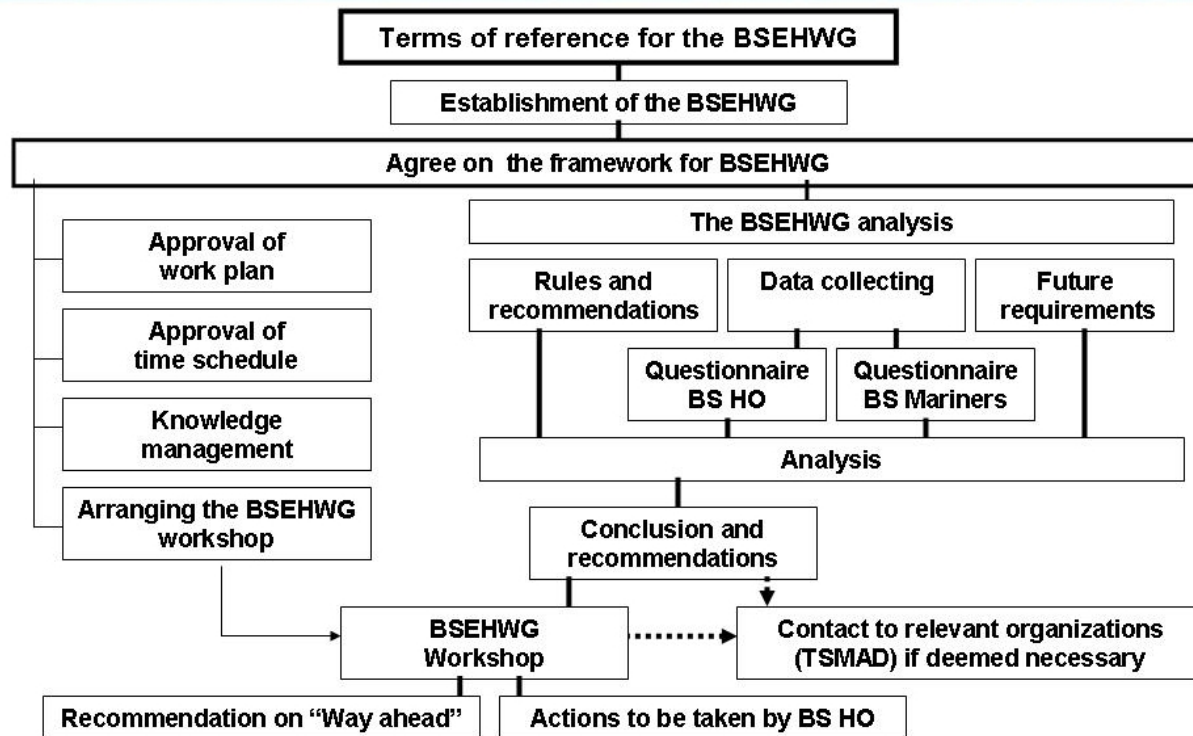


Fig. 1.3 The BSEHWG Work Plan

## 1.5 Conduct of the BSEHWG work

### 1.5.1 Communication within BSEHWG

Denmark, Estonia, Finland, Germany, Latvia, Poland and Sweden have participated in the work of the BSEHWG.

### 1.5.2 BSEHWG Meetings

An important issue for the working group has been to share knowledge and experience. This has been done at the three workshops. An additional meeting was held in connection with the second workshop with the purpose of exchanging experience with ENC production.

A questionnaire was sent out to the Baltic Sea Hydrographic Offices prior to the first workshop in January 2008. The questionnaire dealt with the use of ENC and the results were discussed

at the workshop. After the workshop a questionnaire was sent out the mariners sailing in the Baltic Sea and the results were discussed at the second workshop in Copenhagen late March. After this workshop a follow up questionnaire with some clarifying questions was sent to the Baltic Sea Hydrographic Offices. Based on the analysis from these questionnaires, the identified inconsistencies and the knowledge of the BSEHWG members, the BSEHWG developed and agreed on 17 recommendations to improve ENC consistency and avoid inconsistencies in the future. The BSEHWG discussed and approved the draft report at the third and final workshop in Copenhagen on 11 June 2008.

### **1.5.3 Liaison with IHO bodies and RENCs**

The ENC harmonisation actions within the BSHC were reported to the 1<sup>st</sup> Extraordinary WEND meeting on 30 October 2007 (*Doc. X-WEND1-05C*). The WEND noted the report and encouraged appropriate regional cooperation. The WEND Committee strongly encouraged HOs to follow the IHO guidelines on consistency of ENC data, especially the use of SCAMIN and noted that RENCs and RHCs have a vital role to play in ensuring the consistency of ENCs. The Committee also agreed that ENC coverage and consistency are of equal priority.

#### *WEND Task Group*

The WEND Task Group met at the end of January 2008 to prepare the IHO's contribution to IMO NAV/54. At this meeting, Finland discussed possible contribution to this work. The WEND Task Group was not expecting any reports from RHCs and thus there was no need to include BSEHWG findings in the IHO report to NAV/54. The IHO report to NAV54 will include a statement that there are some harmonisation activities going on in some RHCs, without further details.

#### *Committee on Hydrographic Requirements for Information Systems (CHRIS)*

The BSEHWG work was reported by Denmark, Finland and Sweden to the CHRIS19 meeting in November 2007 (*Doc. CHRIS19-06.1D*). The main concern was the proposed new rules on the use of the Scale minimum (SCAMIN) attribute. The CHRIS supported BSEHWG's work. The BSEHWG was invited to report on the ENC Consistency issue to CHRIS20 in order to take the group's findings and recommendations into consideration.

More specifically, these Member States considered that the Transfer Standard Maintenance and Application Development (TSMAD) recommendations in Doc. CHRIS19-06.1C are not mature enough, and that more testing is needed before they can be accepted. Sweden reported that The Baltic Sea Hydrographic Commission has established a Baltic Sea ENC Harmonisation Working Group (BSEHWG) that will report by the end of July 2008. The findings and recommendations from the BSEHWG were requested for consideration. Canada and Germany supported these views, indicating that this issue should be resolved before CHRIS-20 in November 2008. France also supported this position, stated that France does not currently apply SCAMIN and suggested that another possible solution be developed. A solution may be a common set of rules on SCAMIN that would be applied at the ECDIS display level rather than ENC compilation. This did not receive support – it being considered as unwise to allow the level of display to be determined by the wide variety of OEM software used in ECDIS.

CHRIS 19 outcome:

- The Committee endorsed the revised version of “*Recommendations for Consistent ENC Encoding*”, as an Annex to S-65 – *ENC Production Guidance*, noting its importance in support of the recent IHC resolution on ENC coverage and consistency.
- The Committee invited the BSEHWG to report on ENC Consistency to CHRIS-20. (Action 19/8 – BSEHWG).

*Transfer Standard Maintenance and Application Development Working Group (TSMADWG)*  
France presented a paper regarding the SCAMIN issue to the TSMAD 16<sup>th</sup> meeting on 5-9 May 2008 in Cape Town, South Africa.

*North Sea Hydrographic Commission (NSHC)*  
Denmark presented the current status of the BSEHWG work at the 28<sup>th</sup> NSHC meeting on 21-25 April 2008 in Elsinore, Denmark.

*Nordic Hydrographic Commission (NHC)*  
Denmark presented the current status of the BSEHWG work at 52<sup>nd</sup> NHC meeting on 6-8 May 2008 in Norrköping, Sweden.

*Regional Electronic Navigational Centres (RENCs)*  
The current status of the BSEHWG work was reported at the Joint Technical Experts Working Group (JTEWG) meeting on 15 April 2008 in Stavanger, Norway.

#### **1.5.4 Liaison with other HOs**

The chairman of CHRIS (UKHO) has continually been informed on the Working Group's progress and attended the final workshop in June.

#### **1.5.5 Liaison with private companies**

BSEHWG intended to examine how private companies (e.g. Transas, Jeppesen) handle the inconsistencies between countries, but did not succeed in acquiring information on this topic. However, the BSEHWG noted that it is not possible to have better ENCs than source data.

## 2. Background information

### 2.1 Relevant regulations

#### *Presentation of ECDIS and ENC*

Electronic Navigational Charts consist of digitised data conforming to the IHO's S -57 ENC Product Specification, which records all the relevant charted features necessary for safe navigation, such as coastlines, bathymetry, buoys, lights, etc. The basic unit of geographic coverage (analogous to a paper chart) is termed a cell. An Electronic Chart Display and Information System (ECDIS) will convert the ENC into a System ENC (SENC) in an internal format optimised for efficient display.

Within the ECDIS, the features and their attributes (e.g. position, colour, and shape) can be selectively displayed and queried, creating the potential to manipulate the chart image displayed on screen.

This not only provides ENC users with control over what level and type of detail they wish to see, but can also be linked to other onboard systems to provide additional features such as automatic warning alarms and indications.

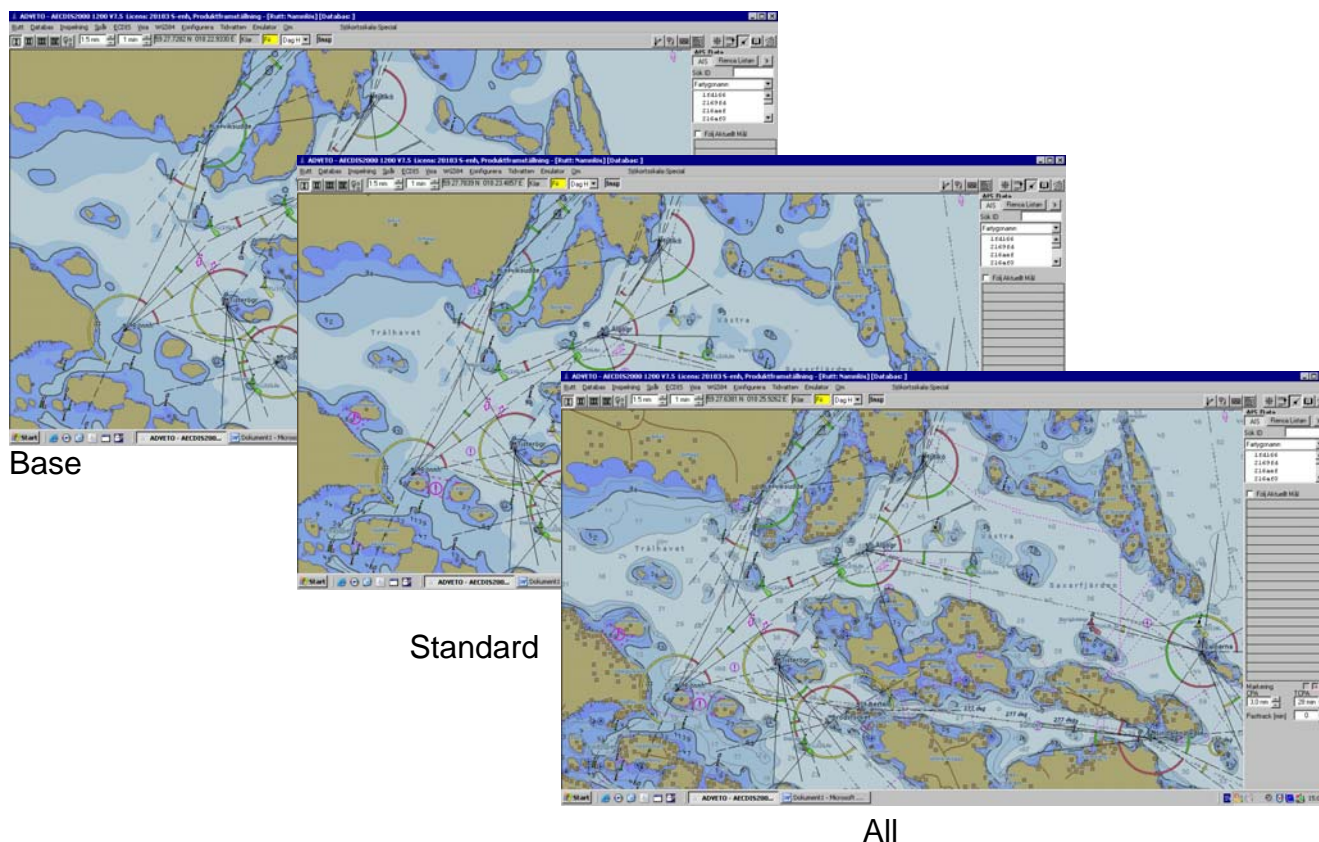


Fig. 2.1 shows various levels of details displayed from the same cell.

### *IHO Circular letters*

The IHO has published three Circular Letters on ENC harmonisation issues: CL 47/2004: Improving ENC Consistency, CL 32/2007: Improving ENC consistency and CL 64/2007 Consistent Encoding of ENCs. These include Guidance on ENC harmonisation, especially related to the use of Compilation scale and SCAMIN. However, these documents do not give enough guidance for detailed consistent implementation.

### *S-52 Display Standard*

While S-57 defines what information can be encoded and how it is to be structured, it says nothing about how that data can be displayed. When ENC data is used in an ECDIS, this is defined within S-52. This specifies not only the symbology to be used but also the full range of conditional rules that govern their use.

### *S-63 Data encryption*

The IHO publication S-63 includes the IHO Data Encryption Scheme. This describes the role and functions needed for ENC protection and safe distribution. The IHB will act as a Schema Administrator.

### *S-100, S-101 Future ENC standards*

The IHO is developing future ENC standards. The S-100 describes the IHO Geospatial Standard for Hydrographic Data. Draft Version 0.0.0 was published in January 2008 for comments. The S-101 will be ENC Product Specifications and intended to be released after S-100 has been released. IHO S-57 Edition 3.1 will continue to be used for many years to come- even after S-100 has been released. As such, Hydrographic Offices should continue to produce S-57 ENC data to meet IMO ECDIS Performance Standard requirements, and to maintain world-wide ENC coverage. Any future ENC Product Specification will take several years to develop after publication of the S-100 base standard.

### *Official Vector Charts*

ENCs are official vector-based electronic charts designed to meet the relevant chart carriage requirements of the Safety of Life At Sea (SOLAS) convention. When displayed within certain parameters and using a type approved ECDIS, ENCs fully satisfy SOLAS chart carriage requirements, and so can be used as the primary means of navigation.

## **Presentation of relevant regulations**

The IHO S-65 provides guidance for ENC production. Below are some extracts from S-65. Relevant regulations of the IHO publication S-65 are listed in Annex B.

The Safety of Life at Sea (SOLAS) convention of the International Maritime Organisation (IMO) includes a number of pertinent requirements:

- That nations shall publish nautical information necessary for safe navigation; this includes systematic updating with all necessary safety-critical information
- That ships shall carry nautical charts. The use of an ECDIS meets this requirement. Such charts (paper or electronic) shall be “issued by or on behalf of a Government

authorised hydrographic office or other relevant government institution”; in other words they must be ‘official charts’.

The IMO’s ECDIS Performance Standard further mandates that “*The chart information to be used in ECDIS should be the latest edition of that originated by a government authorised hydrographic office, and conform to IHO standards.*”

In order to be a legal equivalent of paper charts, the ECDIS must be type approved in accordance with Standard 61174 of the International Electrotechnical Commission (IEC) and have appropriate backup arrangements.

### **Responsibilities of Hydrographic Offices for Producing ENCs**

The responsibilities of Hydrographic Offices for the production and distribution of ENCs are defined in the WEND principles. (M-3, Resolutions of the IHO, K2.19) as follows:

- The preparation and provision of digital data and its subsequent updating for waters of national jurisdiction.
- Validating the data.
- Employing a recognised standard of quality management (e.g. ISO 9000) to ensure high quality of the ENC services.
- Ensuring compliance with all relevant IHO and IMO standards and criteria (including IHO S-57, IHO S-52, or their replacements).
- Providing timely updates to the ENC for the mariner.

Reference is made throughout this document to the relevant WEND principles that support some of the stages of the ENC production processes. For full details of the WEND principles refer to M-3 - Resolutions of the IHO, Resolution K2.19, Principles of the Worldwide Electronic Navigational Chart Database (WEND).



### 3. Study of current situation

Some examples of how different countries are encoding their ENCs are given in section 3.1. These examples illustrate some of the inconsistencies caused by the use of different depth contours and depth areas, the different use of compilation scale, different data content and the heterogeneous use of SCAMIN.

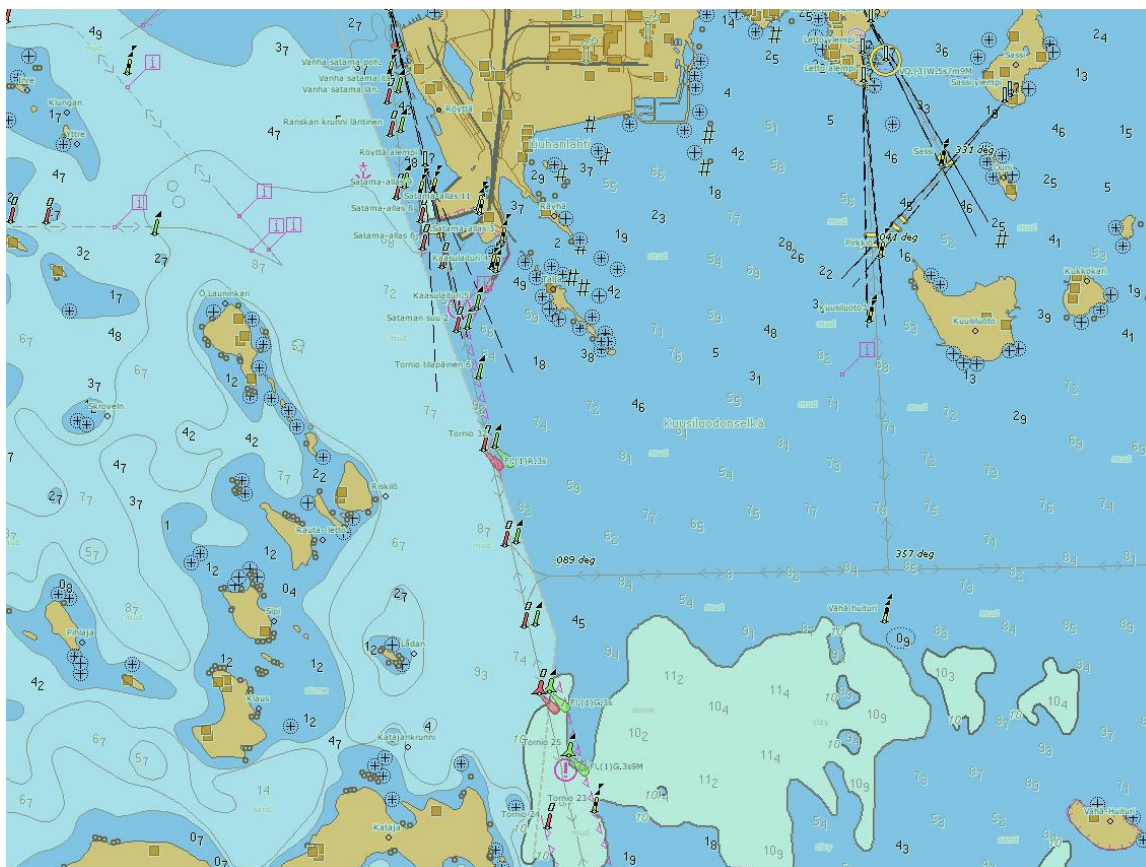
The BSEHWG has sent questionnaires to Baltic Sea Hydrographic Offices and to mariners on the Baltic Sea to get information on the encoding of ENCs and found inconsistencies. These questionnaires are dealt in sections 3.2 and 3.3 below.

#### 3.1 Found Example cases

The following illustrates two cases of inconsistency in the Baltic Sea between Finland and Sweden (Bay of Bothnia) and two example cases found by PRIMAR.

More example cases found between Finnish and Swedish ENCs can be found in [Annex C](#) and additional cases found by PRIMAR can be found in [Annex D](#).

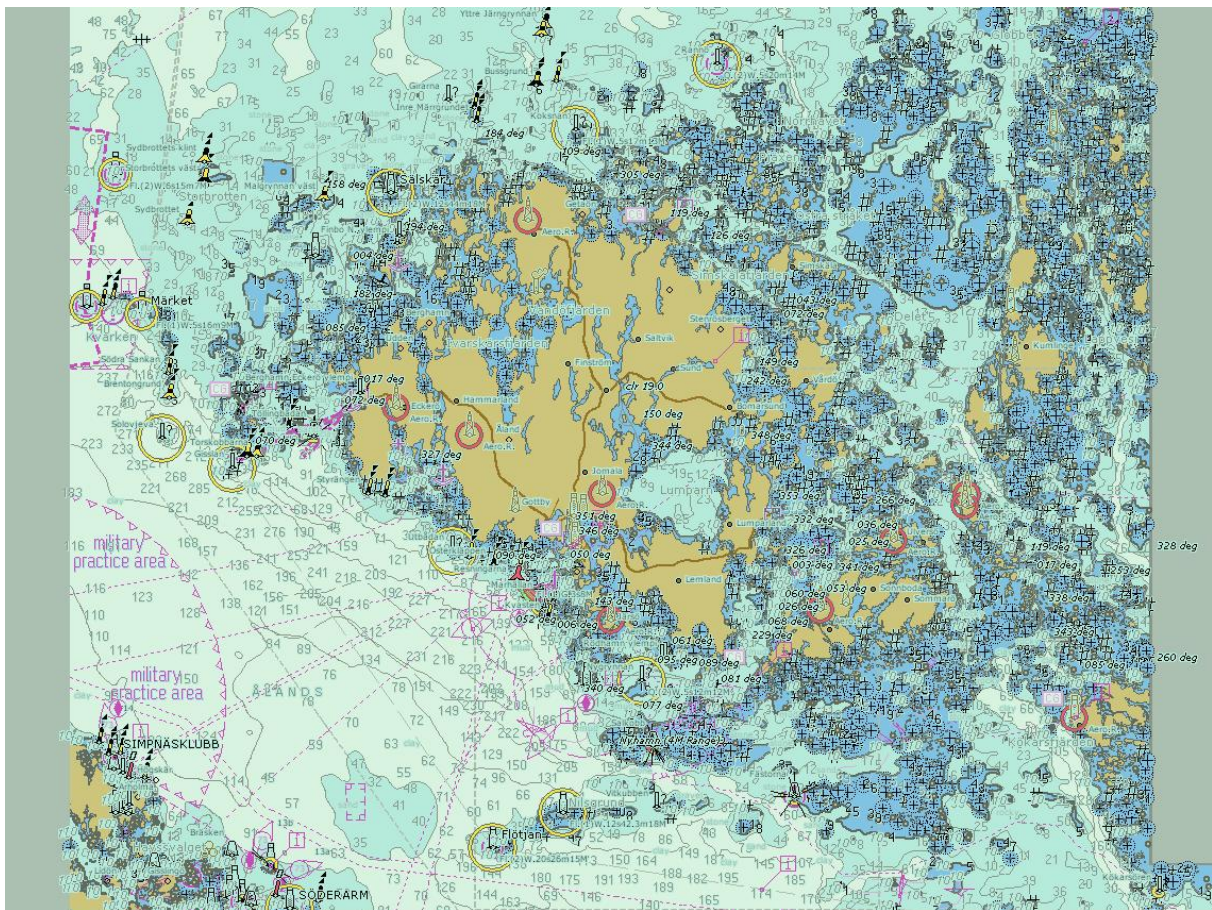
Case1: Display scale: 1:25 000  
SWE cell: SE4CJ4YO compilation scale: 1:22 000  
FIN cell: FI4DJ76O compilation scale: 1:25 000



*Fig. 3.1 shows discontinuing depth areas between Finland and Sweden*



**Case 2:** Display scale: 1: 326566  
 SWE cells: SE2CIIQ4, SE2CIEA4 compilation scale: 1:90 000, 1:90 000  
 FIN cell: FI29ARCW compilation scale: 1:180 000



*Fig. 3.2 shows cluttered display. Point objects clutter the display on Finnish side.*

**Comments:**

There are a lot of point objects (especially rocks) in the Finnish cell.  
 The density of soundings is also high.



**Case 3:** Display scale: 1: 400 000 and 300 000  
 FI cell: FI29GOFW SCAMIN value for Cable, submarine: 349 999  
 EE cell: EE203053 SCAMIN value for Cable, submarine: 699 999

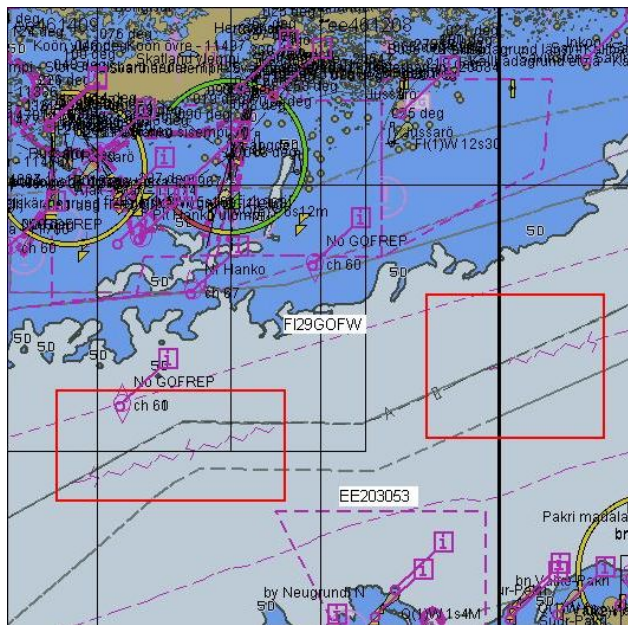


Fig. 3.3

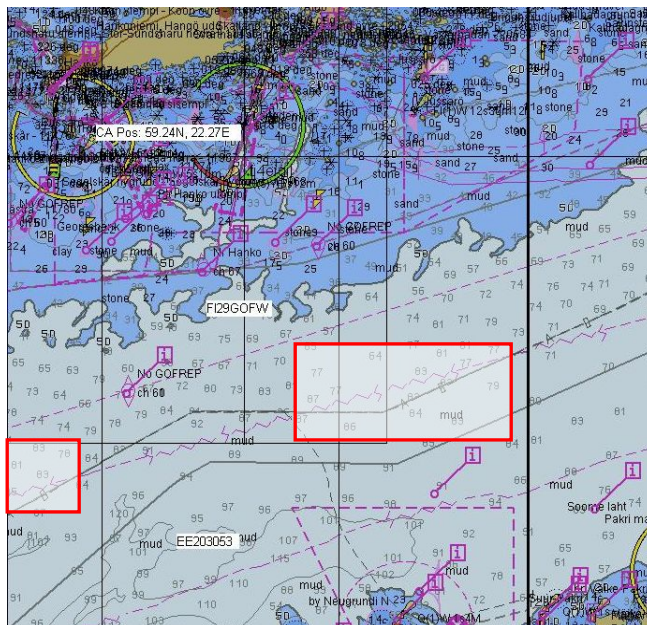


Fig. 3.4

*Different SCAMIN values causes that the cable isn't visible in both cells with a display scale 1: 400 000 (Fig. 3.3) but visible in both cells with a display scale 1: 300 000 (Fig. 3.4).*

**Case 4:** Display scale: 1: 400 000 and 300 000  
 SE cell: SE2CHWHS SCAMIN value for Cable, submarine: 349 999  
 PL cell: PL2MP500 SCAMIN value for Cable, submarine: 2 999 999  
 DK cell: DK2BORN SCAMIN value for Cable, submarine: none



Fig. 3.5

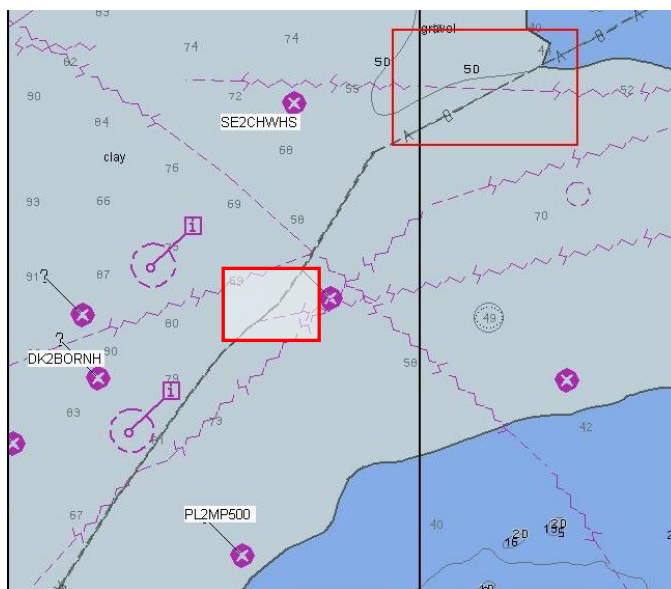


Fig. 3.6

*Different use of SCAMIN values in the Swedish and the Polish cells and no use of SCAMIN in the Danish cell. The 2 cables furthest down are cut at the border. The cable at the top isn't visible in both cells with a display scale 1: 400 000 (Fig. 3.5) but visible in both cells with a display scale 1: 300 000 (Fig. 3.6).*

### **3.2 Questionnaire to Baltic Sea Hydrographic Offices**

The BSEHWG prepared two sets of questionnaires to ascertain a status of ENC coverage and use in the Baltic Sea region. One set of questionnaires was sent to the Baltic Sea Hydrographic Offices and dealt mainly with ENC coverage in waters along borders and technical details on the use of ENCs. Information from all countries except Russia and Lithuania was obtained. Annex E provides the full text of the questionnaire. Annex F provides a complete spread sheet of answers from each Hydrographic Office. The most important issues and answers are listed below.

#### **Following of IHO recommendations for compilation scale (Q.4)**

- The majority of the BSHC Hydrographic Offices are implementing the IHO recommendations for compilation scale or intend to do so in the near future. However, the following values differ from the IHO recommendations: 2 000, 5 000, 7 500, 10 000 and 25 000.
- This could be one of major obstacles to obtaining consistency in the future.

#### **Assigning the ENCs to the six different navigational purposes (Q.5)**

- Only Poland is completely fulfilling the IHO recommendations for the navigational purposes.

#### **Use of the attribute SCAMIN (Q.6)**

- All BSHC countries except Denmark are encoding their ENCs with the attribute SCAMIN.
- However, there none of the countries are following the suggested IC-ENC SCAMIN rules. Only a few countries have encoded the attributes in similar ways. See details in the SCAMIN spreadsheet, Annex G.
- A spread sheet regarding the use of SCAMIN based on the IHO Circular Letter 64/2007 was sent to each Baltic Sea Hydrographic Office. The Hydrographic Offices were asked to indicate values where they differ from the recommendations in CL 64/2007.
- The use of the attribute SCAMIN was so unique in each country that it was found feasible to propose a regional way for the Baltic Sea to use the attribute SCAMIN.

### **Depth contour intervals used in ENC production (Q.7)**

- Today none of the Baltic Sea Hydrographic Offices apply the same depth contour intervals.
- This issue is highly related to paper charts and harmonisation may require much work.
- No country expressed plans to change the use of their depth contour intervals in the near future.

### **Encoding of objects Cable submarine (CBLSUB) and Cable area (CBLARE) (Q.13)**

- The use of the objects CBLSUB and CBLARE differ from country to country.
- Sometimes this causes inconsistencies at borderlines. One reason could be the different use of compilation scale and use of navigational purposes.

### **Exchange of borderline data with neighbouring countries - the use of a 5 metre overlapping buffer zone (Q.19)**

- All countries exchange border data in some way with at least some of their neighbouring countries or intend to do so in the future.

### **Agreed to edit data on neighbouring country's area (Q.26)**

- Poland and Estonia have agreed that if important waterways are split by national borders, then the neighbouring Hydrographic Offices are permitted to edit data on behalf of the other.

## **3.3 Questionnaire to mariners sailing on the Baltic Sea**

Based on the results from the questionnaires to the Hydrographic Offices, a second questionnaire was sent to mariners who sail on the Baltic Sea using ENCs (see [Annex H](#)). The questions dealt with the use of ECDIS and ENCs. This questionnaire was intended to acquire information on how mariners experience ENC consistency and if they have any problems with the existing ENCs. We received 25 responses; 21 were valid. The complete questionnaire and responses can be found in [Annex I](#).

The majority of the responding mariners are satisfied with the use of ECDIS and ENCs and don't have any problems with the current presentation or consistency between neighbouring countries.

The most important issues and answers are listed below.

**90 % of the mariners use ECDIS onboard.**

**73% of the mariners who use ECDIS use ENCs (Q.3b)**

Those mariners who do not use ENCs in ECDIS reported following comments:

**Comments from the mariner:** Not global coverage. Not same marine mark [navaids] as on paper chart and ENC. In some cases big differences between marks (boarder lines for anchorage areas, land marks or some other areas, and TSS.) on paper chart than on ENC. Generally system working better with ECDIS not ENC.

**Reply from the BSEHWG:** *Global coverage continuously expanding. It is true that there are some differences in ECDIS and paper chart symbolisation, but both have been designed to give optimal readability and performance in their respective media.*

**73% of the mariners using ECDIS and ENCs reported having no problems concerning the presentation in the ECDIS display. (Q.4a)**

**27% of the mariners using ECDIS and ENCs reported some problems concerning the presentation in the ECDIS display.**

The following problems were described:

**Comments from the mariner:** There is too much information especially on larger scales. Overview becomes messy and hardly useable. VTS and reporting lines and points are not clear enough - gets muddled up with shooting areas and special areas etc.

**Reply from the BSEHWG:** *The issue of cluttered presentation is addressed by the BSEHWG Recommendations regarding SCAMIN.*

**Comments from the mariner:** Wrecks with unknown depth and wrecks with less water than specified for shallow water are presented with the same symbol. The problem with the cells to Kaliningrad has just been solved. The ECDIS did not show contents of cells even though permits were available.

**Reply from the BSEHWG:** *Wrecks with unknown depth are potentially dangerous, so the presentation makes sense. If different symbols are regarded as necessary, then this is an issue for S-52. However, the problem could be solved if the VALSOU of the wreck always was encoded. However, this could be a laborious task for HOs. The problem with permits should be solved with the ENC distributor.*

**Comments from the mariner:** When buying charts in ECDIS the Sound charts are shown in a square but when receiving you only get the Danish side of the Sound. You also have to buy the Swedish charts in order to have full coverage. It could be great if Hydrographic Offices in DK and SE joined charts in order to buy cells with entire Sound

as coverage. Same occur also in other countries. This is the problem with ECDIS. Only UK makes useful cells without interest of its own nation.

***Reply from the BSEHWG:*** According to the WEND principles each country produces ENC's of only their own national jurisdiction, and therefore the cells cannot be joined across boundaries. The RENCs and ENC distributors offer services covering this issue.

### **3.4 Man-made interfaces**

Some of the problems regarding the inconsistency could be lack in the mariners' education regarding 'ECDIS', 'ECS', 'ENC' and 'Electronic chart'.

The BSEHWG has not studied this issue.

## 4. Analysis of current situation

### 4.1 Status in the Baltic Sea

Based on the questionnaires described in Chapters 3.2 and 3.3, the current status of the issues of greatest importance for future harmonisation of ENC's are given below.

- Denmark:** There is sufficient ENC coverage of the waters along the borders. ENC's have not been produced from scratch. The recommendations for compilation scale follow the IHO recommendations. The SCAMIN attribute is not used in ENC production. The use of navigational purposes differs from the recommendations from IHO.
- Estonia:** There is sufficient ENC coverage of the waters along the borders. In some cases ENC's have been produced from scratch. The recommendations for compilation scale follow the IHO recommendations. The SCAMIN attribute is used in ENC production. The use of navigational purposes differs from the recommendations from IHO.
- Finland:** The planned adequate coverage has not yet been reached on waters along the borders to Sweden and Russia. ENC's are produced from the same database as paper charts, not from scratch. Compilation scales do not completely follow the IHO recommendations. The SCAMIN attribute is used in the ENC production.
- Germany:** There is sufficient ENC coverage of the waters along the borders. Some ENC's have been produced from scratch. Settings of navigational purpose, compilation scale and SCAMIN vary from IHO recommendations but the deviance is so small that it has no effect for handling data in an ECDIS. All borders have 5 m overlap and are harmonised with neighbouring ENC's.
- Latvia:** There is full ENC coverage of the waters along the borders. In most cases large scale ENC's have been produced from scratch. The recommendation for compilation scale follows the IHO recommendations. The SCAMIN attribute is used for the ENC production. The use of navigational purposes differs from the recommendations from IHO.
- Poland:** There is sufficient ENC coverage of the waters along the borders. ENC has not been produced from scratch. The recommendations for compilation scale follow the IHO recommendations. The SCAMIN attribute is used for the ENC production. The use of navigational purposes corresponds to the recommendations from IHO.
- Sweden:** There is sufficient ENC coverage of the Swedish waters. In some areas the information in the ENC's have been produced from scratch. The compilation scales follow the IHO recommendations, but the navigational purposes differ from the recommendations for some of the navigational purposes.

In general the ENC coverage on the Baltic Sea is sufficient along the borders. The recommendations for Compilation Scale from IHO are followed in some countries and not in others. Although the SCAMIN attribute is used in general, the code is not the same for each object, so there is still an inconsistency. The use of navigational purpose differs in general from the recommendations from IHO.

The BSEHWG noted that the ENC cells in navigational purposes “Harbour” and “Berthing” are disjointed, and no obvious inconsistencies exist. However, these navigational purposes should be in harmony with other navigational purposes within the producers’ portfolios.

## **4.2 Issues considered by the BSEHWG**

The IHO has published three Circular Letters on ENC harmonisation issues as mentioned in chapter 2. However, these documents do not give enough guidance for detailed consistent implementation.

The BSEHWG decided consider the issues listed below. These are listed according to their estimated priority. The priority is defined as a view of reliability and general view of the ENCs and not as a real danger for collision etc.

- 1. Compilation scale and Navigational purpose**
- 2. Scale minimum (SCAMIN)**
- 3. Depth contour intervals and depth areas**
- 4. Harmonisation of features continuing/extending over national borders**
- 5. Checking of harmonisation before launching ENCs**
- 6. Buffer zones along national borders**

### **Compilation scales and Navigational purpose**

The problem of lack of harmonisation in compilation scales and navigational purposes between two countries will be that one cell will become overscaled at certain zoom levels and the data will appear cluttered. Further, there will be inconsistency in the presentation of data (and density of data) between the two cells.

The harmonisation of the navigational purposes *Harbour* and *Berthing* is less critical in the Baltic Sea. Data in these navigational purposes only cover waters of one country. The effects of disharmony between different countries are therefore limited. It is regarded as more important to be able to display the special conditions of each harbour in the best way than to achieve complete harmonisation.

### **Scale minimum (SCAMIN)**

If SCAMIN is not used, the features may become cluttered on an ECDIS screen. This reduces the visibility considerably when zooming out. By implementing a common way to encode the attribute SCAMIN, the inconsistencies between neighbouring countries could be avoided.



The BSEHWG believes that a complete harmonisation of the use of SCAMIN may not be possible worldwide. From the mariners' point of view this may not be a major obstacle. It is more important that the harmonisation has been done as far as possible at a regional basis. The BSEHWG has worked towards the development of regional interpretations of the IHO recommendations for the Baltic Sea which do not require too many resources to implement, and which could be automated.

The BSEHWG proposes this approach to be considered for other sea areas by other Regional Hydrographic Commissions.

### **Depth contours and depth areas**

Use of different contour intervals and depth areas causes the most visible inconsistencies on ECDIS display. Harmonisation of these gives great benefits to mariners.

However, the BSEHWG has noted that depth contours and depth areas are related to the source data and the content of databases, and would be very resource- and time- consuming to change.

### **Harmonisation of features continuing/extending over national borders**

Some features, e.g. Cables or Cable areas, do not continue smoothly – or at all - over national borders. This may reduce the reliability of ENC's to their users.

This issue should be relatively easy to fix bilaterally or multilaterally within a relatively short period of time.

### **Buffer zones along national borders**

In case of even small gaps between two cells, some ECDIS systems will, when passing this gap, immediately zoom out to the "world wide chart". To avoid this effect, it is critical that the ENC's are cross-checked with a 5 metres overlap of their national borders.

## **4.2.1 Compilation scale and Navigational purpose**

Present status:

Most of the Baltic Sea countries are following the recommendations set at the IHO CL 47/2004 (and its revised version CL 32/2007). However, these specifications do not have unique recommendations, in that they have more than one recommended value for compilation scales. This causes inconsistencies between the ENC's of neighbouring countries. To avoid these inconsistencies, it was agreed that more specific recommendations are needed.

Recommendation according to CL47/2004 is as following:

Navigational Purpose	Name	Scale Range	Available Compilation Scales	Matching Scale Ranges
1	Overview	<1:1,499,999	3,000,000 and smaller 1,500,000	200 NM 96 NM
2	General	1:350,000 – 1:1,499,999	700,000 350,000	48 NM 24 NM
3	Coastal	1:90,000 – 1:349,999	180,000 90,000	12 NM 6 NM
4	Approach	1:22,000 – 1:89,999	45,000 22,000	3 NM 1.5 NM
5	Harbour	1:4000 – 1:21,999	12,000 8000 4000	0.75 NM 0.5 NM 0.25 NM
6	Berthing	> 1:4000	3999 and larger	< 0.25 NM

Table 4.1 shows the difference Compilation Scales according to each Navigational purpose

The current use of Compilation Scales and Navigational purposes for each country in the Baltic Sea:

	COMPILATION SCALE				
	General	Costal	Approach	Harbour	Berthing
IHO Recommendations	350 000 700 000	90 000 180 000	22 000 45 000	4 000 8 000 12 000	> 4 000
FINLAND	180 000	N/A	25 000	12 000	N/A
SWEDEN	90 000	45 000 (50 000)	22 000 (30 000)	8 000 12 000	2 000 4 000
ESTONIA	250 000	90 000	45 000	10 000 25 000	2 000 5 000 7 500
POLAND	350 000	90 000	22 000	4 000 8 000 12 000	N/A
GERMANY	N/A	50 000 – 150 000	20 000 – 50 000	2 000 – 20 000	> 5 000
LITHUANIA	No info?	No info?	No info?	No info?	No info?
DENMARK	180 000 350 000	(45 000) 90 000	22 000 45 000	4 000 8 000 12 000	N/A
LATVIA	180 000	90 000	22 000	7 500 8 000 10 000	2 000 5 000
RUSSIA	No info?	No info?	No info?	No info?	No info?

Table 4.2 shows the different use of Compilation Scales and Navigational purposes for each country

The lack of harmonisation in compilation scales and navigational purposes between two countries will cause a cell to turn to “overscale status” at certain zoom levels, and the data will appear partly obscured. There will also be inconsistency in the content of data (and density of data) between the two cells. See an example in Figure 4.1.



Fig. 4.1 Over scale shown near borderline between two countries ENC's

It was agreed that there should be one set of recommended, common compilation scales.

### Navigation purpose *Overview*

There is only one *Overview* cell on the Baltic Sea and thus there is no need for harmonisation of this navigational purpose. Therefore, it is not presented in table 4.2. However, the *Overview* navigational purpose should be in harmony with other navigational purposes within the producers' portfolios. The *Overview* cell should be harmonised with adjacent cells in the North Sea.

#### Recommendation 1: Navigational purpose *Overview*

- 1a) *Overview* navigational purpose should be in harmony with other navigational purposes within the producers' portfolios.
- 1b) The *Overview* cell should be harmonised with adjacent cells in the North Sea.

### Navigation purposes *Harbour* and *Berthing*

The harmonisation of the navigational purposes *Harbour* and *Berthing* are less critical in the Baltic Sea. The reason is that data in these navigational purposes in principle only cover one country's waters and are generally not joined to other nations' ENC's. The effects of disharmony between different countries are therefore limited and unlikely to cause inconsistencies affecting the navigator's display.

It is regarded as more important to be able to display the special conditions of every harbour in the best way than to achieve complete harmonisation. However, the *Harbour* and *Berthing* navigational purposes should be in harmony with other navigational purposes within the producers' portfolios.

**Recommendation 2: Navigational purpose *Harbour* and *Berthing***

**The *Harbour* and *Berthing* navigational purposes should be in harmony with other navigational purposes within the producers' portfolios.**

**Navigational purposes *General*, *Coastal* and *Approach*.**

Compilation scale 180,000 for *General* navigational purpose does not accord with the recommendations of CL 47/2004, but it was estimated that this fits most appropriately to the situation of the Baltic Sea. It was also noted that most of the BSHC countries already use this value and the remaining HOs are considering the possibility of changing to this value.

Compilation scale 90,000 for *Coastal* navigational purpose is in accordance with the recommendation of CL 47/2004 and most of the BSHC countries already use this value.

Compilation scale 22,000 for *Approach* navigational purpose is in accordance with the recommendation of CL 47/2004 and most of the BSHC countries already use this value.

It was decided that common compilation scale values should be used in navigational purposes *General*, *Coastal* and *Approach*.

**Recommendation 3: Use of Compilation Scale**

**On the Baltic Sea, the following values for the compilation scales should be used:**

<b>180,000</b>	<i>(General)</i>
<b>90,000</b>	<i>(Coastal)</i>
<b>22,000</b>	<i>(Approach)</i>

**Recommendation 4: Exceptions in the use of Compilation Scale**

**If a Hydrographic Office (HO) wants to use a compilation scale other than those recommended above, it may do so if all the following conditions are met:**

- i) the value used is in line with the intention of the IHO CL 47/2004**
- ii) use of it is agreed bilaterally with neighbouring HO(s) concerned, in order to avoid inconsistencies at the border, and**
- iii) every effort is made to minimise possible inconsistencies due to deviations from the recommended compilation scale.**

#### 4.2.2 Scale minimum (SCAMIN)

SCAMIN is a significant point where inconsistency of presentation is one of the most conspicuous problems for end-users. Each country has a unique way of assigning the SCAMIN attribute to objects and choosing navigational purpose and compilation scale. This gives a very significant inconsistency in its presentation in ECDIS.

The unique ways of encoding this attribute range from not using the attribute at all to using it in such a way that the presentation of the ENC is similar to the paper chart. The S-65 ([Annex B](#)) recommends using SCAMIN in a more complex way where the selection is displayed in higher detail when different attribution criteria are chosen.

Between these is an easy and simple method that could be assigned automatically by using a selection at object level. This method is also immediately implementable in all participating countries and therefore the BSEHWG proposes that this approach should be used on the Baltic Sea. The proposal is in line with the Circular Letter 47/2004.

[Annex J](#) gives additional guidance for the use of SCAMIN to Circular Letter 47/2004 in order to improve ENC consistency in the Baltic Sea.

#### Recommendation 5: Use of SCAMIN

**BSHC should adopt the guidelines as stated in [Annex J](#).**

#### 4.2.3 Depth contour intervals and depth areas

Current status:

It is noted that there is a variety of depth contour intervals and corresponding depth areas on the Baltic Sea ENCs. The following intervals are in use:

Depth Contours	0	2	3	4	5	6	10	15	17	20	30	40	50	100	150	200
Denmark		X		X		X	X		(X)	X	X	X	X	X		
Estonia	X	X			X		X			X			X	X		X
Finland							X			X		(X)	X	X		X
Germany	X	X	(X)		X		X		(X)	X	X	(X)	X			
Latvia		X			X		X	(X)		X			X	X	(X)	X
Lithuania																
Poland		X			X		X	X		X			X	X		
Russia																
Sweden			X			X	X	X		X		(X)	X	X		X

Table 4.2: Contour intervals in use in Baltic Sea Hydrographic Offices.

These values are in accordance with the IHO recommendation (M-4 Section B-411):

*The standard series of depth contour lines to be charted is: drying line (where tides are appreciable), 2, 5, 10, 20, 30, 50, 100, 200, 300, 400, 500, 1000, 2000 m, etc. The 2 and 5 m contours may be omitted where they serve no useful purpose. It is not necessary for the complete sequence of contours to be shown, e.g. on steep slopes and around isolated pinnacles.*

*Supplementary contours, e.g. at 3, 8, 15, 25, 40, 75 m and multiples of 10 or 100 m may be shown, if the available data permit, to delineate particular bathymetric features where soundings would otherwise be the only depth information over a large area, or for the benefit of particular categories of shipping. The 2500 m contour may be required for measuring continental shelf limits (see UNCLOS Article 76).*

*Other contours: In waters where the 4 or 6 metres contours have been surveyed and charted these contours may be shown in place of the standard ones, provided they are labelled with their values (even where otherwise defined by a shallow water tint).*

*If there are any inconsistencies in the contour intervals between neighbouring countries it should be treated bilaterally.*

The most important issue is the harmonisation of depth areas that may have a shallow water colour on ECDIS display. These have caused the most obvious inconsistencies. The contours drawn by a single line without a depth area may not create so clear inconsistencies even if they do not match.

However, it should be noted that the depth areas as well as the depth contours are highly related to the existing source data, the content of databases and existing intervals on printed charts. If depth areas and contour intervals are changed in ENCs, this will likely require updates to the corresponding paper charts. The BSEHWG believes that, for Hydrographic Offices, it may be difficult to change the depth contour intervals and it may take a long transition period. Thus the BSEHWG proposes that the BSHC establishes a Working Group for Harmonisation of the Conveying and Presentation of Depth Information for both ENCs and paper charts.

Meanwhile, if the IHO recommended contour intervals are not applicable, or if additional intervals are needed, implementations should be agreed bilaterally/multilaterally so that possible inconsistencies to the mariners could be avoided.

#### **Recommendation 6: Contour intervals**

- 6a) The BSEHWG proposes that the BSHC establishes a Working Group to study possibilities for Harmonisation of the Conveying and Presentation of Depth Information for both ENCs and paper charts.**
- 6b) Meanwhile, if the IHO recommended contour intervals are not applicable, or if additional intervals are needed, implementation should be agreed bilaterally/multilaterally so that possible inconsistencies to the mariners could be avoided.**

#### 4.2.4 Harmonisation of features continuing/extending over national borders

There are several features that cross or extend over national borders, including e.g. Cable, submarine, Cable areas, Caution areas, Restricted areas, Military practice area and Traffic Separation schemes.

##### **Recommendation 7: Harmonisation of features continuing/extending over national borders**

**All BSHC countries should ensure that bilateral agreements are in place with their neighbouring countries concerning harmonisation of features continuing/extending over national borders.**

#### 4.2.5 Checking harmonisation before launching new ENCs

It is important that HOs consult their neighbouring countries about the harmonisation of new ENCs or new editions before launching or publishing them. Appropriate procedures and communication for this should be established on a bilateral or multilateral basis.

##### **Recommendation 8: Checking harmonisation before launching new ENCs**

**All BSHC countries should check and carry out harmonisation before launching updates or new editions of ENCs.**

#### 4.2.6 Buffer zones along the national borders

The aim of establishing a 5 metre buffer zones along national borders will ensure that there are no gaps or overlaps between neighbouring ENCs.

##### **Recommendation 9: Buffer zones along the national borders**

**All BSHC countries should check that there are no gaps between cells at national borders by establishing a buffer zone of up to 5 metres, if necessary.**

#### 4.3 Issues to be considered by the BSHC

To ensure that the previous recommendations are followed in the best manner, the following recommendations to the BSHC are proposed for BSHC approval.



#### 4.3.1 Harmonise the adoption of new versions of ENC related standards

The BSEHWG has noted that there are different plans to adopt new versions of ENC related standards, e.g. S-57. In order to have consistency among future versions of ENC related standards, a harmonised time schedule for adopting new versions is needed. It is recommended that the BSHC agrees on these harmonised time schedules.

##### **Recommendation 10: Adoption of new versions of ENC related standards**

**The BSHC should agree on joint plans and time schedules for the adoption of new versions of ENC related standards (e.g. S-57 Ed. 3.1.1 or S-101).**

#### 4.3.2 Harmonise the adoption of new object classes

The BSEHWG has noted that there is a need to have harmonised plans for adopting new object classes when the need arises (e.g. on PSSA areas, NEWOBJ, etc.) on the Baltic Sea ENCs and other products. It is important to use same information and similar layouts on additional general information (e.g. on PSSA areas) on the Baltic Sea ENCs and other products. It is recommended that the BSHC agrees to harmonise these plans and time schedules.

##### **Recommendation 11: Adoption of new object classes**

**The BSHC should agree on joint plans and a time schedule for the adoption of new object classes on their products.**

#### 4.3.3 Harmonise the use of objects

The BSEHWG has noted that countries have different objects in use or that they use the same objects in different ways, as is the case with *unused cables*. The use of objects on the Baltic Sea ENCs and other products should be harmonised.

##### **Recommendation 12: The use of objects to ensure consistency**

**12a) BSHC should encourage all countries to make further studies of the use of objects in the Baltic Sea ENCs and report to the following BSHC meeting.**

**12b) BSHC should decide on proper actions to ensure ENC consistency as far as possible.**

The BSEHWG has noted some special circumstances where exceptions to these recommendations may be needed.

**Recommendation: 13: Special circumstances**

If found necessary it is possible to deviate from the recommendations. When doing so, the relevant HO should make every effort to minimise the effect of any inconsistencies that may occur. This should be done through bilateral/multilateral agreements and through harmonisation of data in order to ensure that no serious disharmony is introduced to the ENC.

**4.3.4 Promotion of regional approaches**

The BSEHWG believes that its recommendations may be valuable for other sea areas and recommends that other RHCs try to define regional implementations to IHO consistency recommendations in their regions. BSHC is willing to share its experiences on this issue.

**Recommendation 14: Promotion of regional approaches**

BSHC should ask the IHO Committee on Hydrographic Requirements for Information Systems (CHRIS) to consider appropriate actions to recommend other Regional Hydrographic Commissions (RHCs) to adopt regional implementations to IHO consistency recommendations within their sea areas.

**4.3.5 Analysis of the consequences of the inconsistencies to mariners**

The questionnaire to mariners and its findings are described in section 3.3. The majority of the responding mariners are satisfied with the use of ECDIS and ENC and don't have any problems with the current presentation or consistency between neighbouring countries.

The replies to the questionnaire to mariners demonstrate significant confusion regarding the differentiation of "ECDIS", "ECS", "ENC" and "Electronic chart". All relevant bodies are encouraged to continue the education of mariners. These may include Hydrographic Offices, IHO RHCs and Committees (CHRIS, WEND) and their Working Groups, RENCs, etc.

**Recommendation 15: Training and education**

All relevant bodies are encouraged to continue the education of mariners regarding 'ECDIS', 'ECS', 'ENC' and 'Electronic chart'.

#### 4.3.6 Reporting the implementation of the recommendations

The BSEHWG believes that monitoring the implementation of these recommendations is important. The Baltic Sea countries should follow the time schedule for implementation, as agreed in [Annex L](#). The BSEHWG proposes that this monitoring should be a standing agenda item on BSHC Conferences and the BSHC Members should report this annually.

##### **Recommendation 16: Follow-up of implementation**

**All BSHC countries should follow the time schedule for the implementation of all relevant recommendations as stated in [Annex L](#).**

##### **Recommendation 17: Reporting of the implementation of the recommendations**

**BSHC members should report annually to BSHC Conferences on the implementation of these recommendations.**

#### 4.4. Summary of Recommendations

A summary of recommendations is provided in [Annex L](#).

This annex also includes an estimated time schedule for the implementation of the recommendations.

The recommendations are in line with the IHO recommendations on ENC consistency (e.g. CL 47/2004, CL 32/2007 and S-65), except the use of compilation scale for General and for the use of SCAMIN.

#### 4.5. Implementation plan

Proposed actions and time schedule

- |               |  |
|---------------|--|
| <b>8/2008</b> | BSHC/13 to approve the report and its recommendations<br>BSHC/13 to establish the Working Group as proposed in Recommendation 6 and to approve its TORs and ROPs |
| <b>9/2008</b> | BSHC to report to CHRIS/20   |
| <b>ASAP</b>   | HOs to implement those recommendations that require no further studies. These are recommendations 1, 2, 3, 4, 5, 7, 8, 9 15, 16.                                 |

**Yearly** BSHC members to report annually to BSHC Conferences on the implementation of these recommendations

## 5. Conclusions

The BSEHWG believes that it has found many practical recommendations. The recommendations are in line with relevant IHO recommendations. If these are implemented, the consistency of the Baltic Sea ENC's will be improved. This will foster a wider use of ECDIS and ENC's and thus increase the safety of navigation.

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