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The Present Status of Small Scale ENC Coverage with Respect to the Allocation of cells to Usage Bands 1 (Overview) and 2 (General).

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Introduction

The concept of separating ENCs into usage bands provides data producers with a mechanism to create cells designed for six distinct navigational purposes, each having different levels of content (e.g. contour intervals) and degrees of generalization. Similar Navigational Purposes (see table 1 below) are also used for paper chart series.

Subfield content	ENC Navigational purpose
1	overview
2	general
3	coastal
4	approach
5	harbour
6	berthing

Table 1

The observations presented below are based on the supposition that most ENCs have been derived from paper charts and therefore have similar characteristics in terms of their content, generalization and, (to a lesser extent) coverage. As it was not possible to determine the scales of ENC source data, a combination of the Compilation Scale and cell size have been used to estimate the scale of source data. It is assumed that an ENCs Compilation Scale (CSCALE) is comparable its source chart scale and its cells limits approximate those of the source paper chart.

The scales chosen for port approach, harbour and berthing paper charts, are largely dependent on factors such as the available source data, the size of the harbour and the extent of the port area. As these factors vary from port to port, the scales and chart coverage may vary accordingly. Similarly coastal charts (usage band 3) also need to take into account additional factors such as the nature of coastal area and density of shipping. Consequently the scales and extents chosen for these charts may also vary from area to area.

Small scale charts and ENC cells often extend beyond national charting limits and provide extensive coverage of the high seas. Their content is usually reduced to significant navigational features, and is often highly generalized. The compilations scales chosen for these products are not as heavily influenced by littoral coastal conditions and therefore provide an opportunity for the development of harmonized, consistent word wide chart coverage. This has been achieved for paper charts and has been implemented within the framework of the small scale INT chart series. These charts are based on a common set of specifications and have harmonized scales, content and presentation. This does not however appear to be the case for small scale ENCs.

The intention of this paper is to present the status of small scale ENC production, and to highlight some inconsistencies that may be undermining efforts to achieve harmonized consistent small scale coverage.

The ENC cell limits shown in the diagrams below were obtained from the IC-ENC web site and show ENCs that are available from IC-ENC and Primar Stavanger.

Guidance on Allocating Small Scale ENC to Appropriate Usage Bands

The S-57 ENC Product Specification does not provide guidance on the appropriate scales ranges to be used for each of the 6 Navigational Purposes, however some advice is provided in IHO publication S-65 and the SCAMIN Paper approved by the 16th CHRIS meeting. Both propose that there should be a correlation between scale range and navigational purpose as shown in the table below.

(From the SCAMIN Paper in the TSMAD web page). Usage Bands ***"****HOs must assign each ENC to a usage band based on the ENC's compilation scale and determined by the following ranges:"*)

Usage Band	Name	Scale Range	Available Compilation Scales
1	Overview	<1:1499999	3000000 1500000
2	General	1:180000 – 1:1499999	700000 350000 180000
3	Coastal	1:45000 – 1:179999	90000 45000
4	Approach	1:22000 – 1:44999	22000
5	Harbour	1:4000 – 1:21999	12000 8000
6	Berthing	> 1:4000	4000 and larger

Furthermore S-65 states that: "*The inter-relationship and interaction between usage bands, SCAMIN and compilation scale are particularly problematic and it is difficult (impossible?) to formulate voluntary guidelines that resolve all of the problems and that are acceptable to all HOs with differing views of these issues".*

Not withstanding the above, it is proposed that better guidance and coordination is needed for small scale ENCs of Usage Bands 1 and 2. As these cells often cover international water and are not influenced by local coastal conditions to the same extent as larger scale national ENCs, guidance is needed to ensure better harmonization with respect to the source data used, the selection of appropriate compilation scales, and cell coverage/extent schemes. It is recommended that this should take account of existing IHO specifications for small scale INT charts, and should be coordinated by Regional Hydrographic Commissions.

This is consistent with WEND Principle 2.4 which states that "*The INT chart system is a useful basis for initial area selection for producing ENC" and INT chart ranges*. IHO publication M-11, Section C-101.1 describes small scale INT charts as: "*Two schemes of international (INT) charts on scales of 1:2 000 000 and smaller, that have been established under the auspices of the International Hydrographic Bureau (IHB). These charts have been designed to provide complete and comprehensive small-scale coverage, usable by all nations, for the world's oceans".*

Present Status of Small Scale ENC Coverage

ENCs assigned to usage band 1 have compilation scales (CSCALE) values that range between 1:10 000 000 and 1:300 000. In Figure 1 below, all Navigational Purpose 1 cells shown in red have CSCALE set to a value between 300 000 and 1 500 000 whereas for those shown in black, CSCALE is set to a value between 1 500 000 and 10 000 000. Cells assigned to Navigational Purpose 2 are shown in yellow.

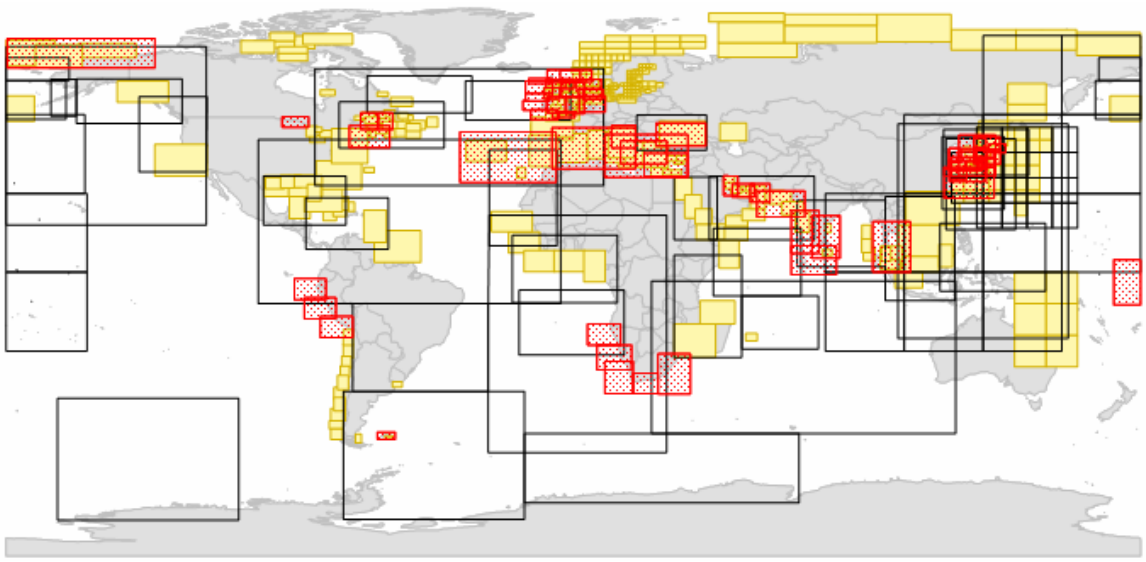

Figure 1 - Navigational Purpose 1
(Cells with CSCALE set to a value between 1 500 000 and 300 000 are shown in red).

Figure 2 below shows Navigational Purpose 2 ENC coverage. Cells with CSCALE set to a value between 1 500 000 and 300 000 are shown in red.

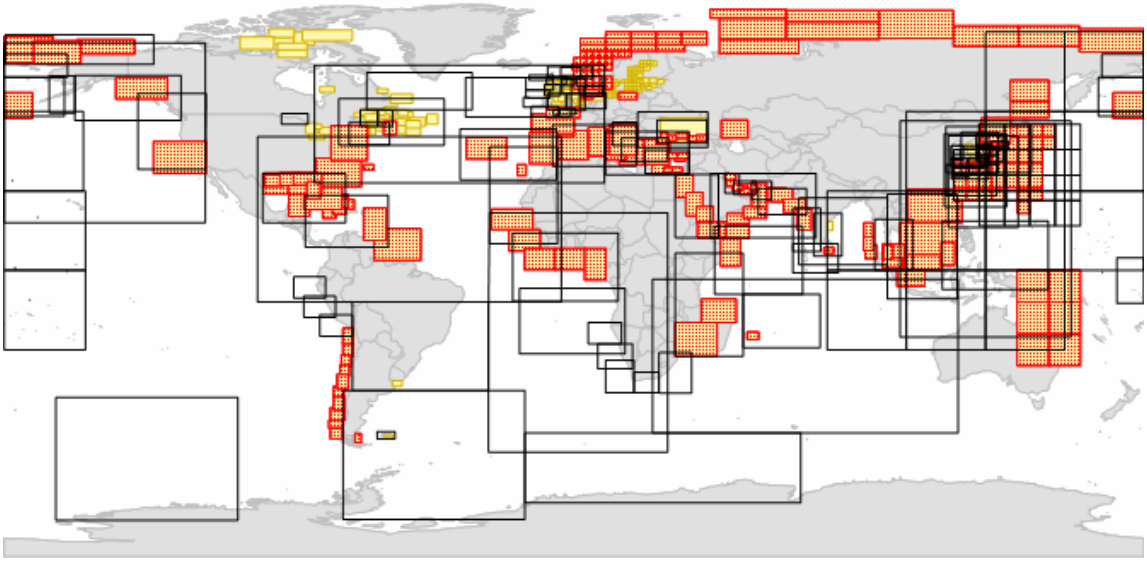

Figure 2 - Navigational Purpose 2
(Cells with CSCALE set to a value between 1 500 000 and 300 000 are shown in red).

Table 2 – shows the number of cells allocated to NP1 and NP 2 usage bands in slightly finer granularity.

Scale Ranges	Cells assigned to Navigational Purpose 1	Navigational Purpose 2
1:10 000 000 to 1:8 000 000	16 cells	0 cells
1:8 000 000 to 1: 7 000 000	0	0
1:7 000 000 to 1:6 000 000	0	0
1: 6 000 000 to 1:5 000 000	0	0
1: 5 000 000 to 1:4 000 000	1	0
1:4 000 000 to 1:3 000 000	25	0
1:3 000 000 to 1:2 000 000	24	0
1:2 000 000 to 1: 1 000 000	**23**	**48**
1:1 000 000 to 1: 300 000	**45**	**168**

Table 2

Conclusion.

It is evident from Table 2 above that ENC producers have different perceptions about the allocation of cells to usage bands 1 and 2. Assuming that the CSCALE value and the coverage limits (shown in the diagram above) provide an indication of the scale of the source chart(s) used, it must be concluded that there are large variances in the degree of generalization between cells assigned to usage band 1. It is proposed that this will frustrate attempts to achieve display consistency, through the harmonization of CSCALE and the application of SCAMIN. Unless ENCs assigned to usage band 1 are based on charts that have similar scales (and similar levels generalization), it is proposed that the recommendations outlined in CHRIS paper (CHRIS19-06.1C - Recommendations for Consistent ENC Data Encoding) will not be affective in certain areas.

A second issue relating overlapping data also needs to be highlighted. The S-57 ENC Product Specification states that *"Cells with the same navigational purpose may overlap. However, data within the cells must not overlap"* (Section 2.2 - Cells). For large scale usage bands this can be easily managed as most (or all) ENC cells fall within a producer's national charting area. This is not the case for small scale usage bands. For example ENC producer state A may produce a navigational purpose 1 ENC based on a 1: 10 000 000 INT chart that covers the coast areas of producer states B, C and D. These producer states may also be in the process of producing navigational purpose 1 cells based on larger scale charts. Whenever one of these (larger scale) cells is issued, it will be necessary to revise the 1: 10 000 000 cell in order to remove the content (data) for the area covered by the new cell. As producer nations increasingly allocate national ENC cells to usage bands 1 and 2, the maintenance task associated with existing small scale (INT) cells will increase exponentially.

Recommendations.

It is proposed that WEND Principal *2.4 ("The INT chart system is a useful basis for initial area selection for producing ENCs")* be applied more rigorously for the assignment of ENC to usage band 1 (Overview). Furthermore it is suggested that Regional Hydrographic Commissions assume the responsibility for the planning, production and maintenance of Navigational Purpose 1 cells. The allocation of cells to usage band 1 should be the prerogative of RHCs, whereas usage bands 2 to 6 should be available for national ENC production.

If this is considered for implementation, Regional Hydrographic Commissions will need to take note of WEND Principal 2.3 (b), which states:
"2.3 By the dates established by IMO, Member States will strive to either:
a. Provide the necessary ENC coverage, or
b. Agree with other States to produce the necessary ENC coverage on their behalf. IHO will address overall coverage on a regional basis through Regional Hydrographic Commissions".

Figure 3 below was presented to the 8th South West Pacific Hydrographic meeting which took place in Papeete, French Polynesia between the18 and 21 September 2007. It illustrates the Australian Hydrographic Offices production scheme for Navigational Purpose 1 ENCs and demonstrates how small scale ENC production could be coordinated on a regional basis.

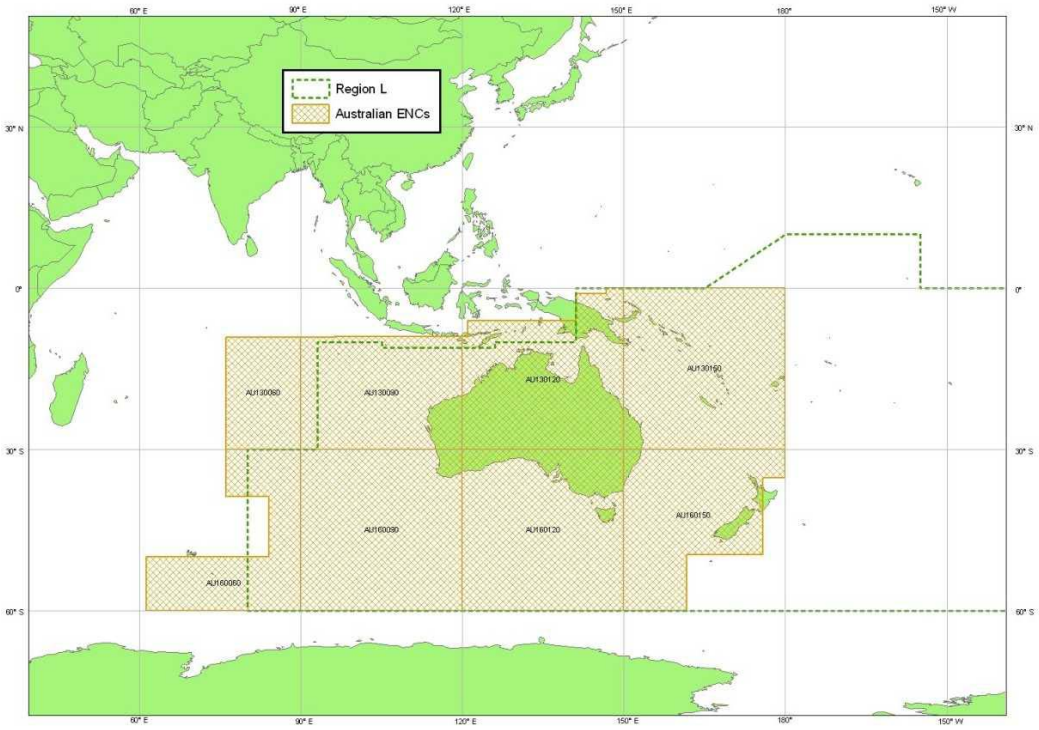
60° E
90° E
120° E
150° E
180°
150° W
30° N
0°
30° S
60° S
Region L
Australian ENCs
AU130080
AU130090
AU130120
AU130150
AU160090
AU160120
AU160150
AU160060

Figure 3