



S-101 Project Team

**“Scales” Sub-Group**

**VTC Meeting 16<sup>th</sup> November 2021**

14:00 – 17:00 CET



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# MEETING AGENDA

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S101PT_"Scales" subWG Meeting			
Draft Agenda and Logistics Information			
(16th November 2021)			
Scales in S-101			
14:05 - 14:20		DCEG + PS	Part 1: Review definitions for Maximum and Minimum Display Scales
14:20 - 14:30			Part 2: References to compilation scale.
14:30 - 14:50			Part 3: Review of the Product specification
14:50 - 15:10			Part 4: Review of the DCEG
Break (10 min)			
S-101 datasets loading and unloading strategy			
15:20 - 16:20		PS	Review of PS clause 4.7
scale minimum			
16:20 - 16:30		DCEG	scale minimum steps and standard scales
16:30 - 16:50			Mandating ECDIS viewing scales?
16:50 - 17:00			Step 1 for dangers in Foul Areas?
17:00	Meeting Closes	N/A	



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# PRESENTATION CONVENTIONS

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**1.3.1 Text highlighted in yellow provides reference to PS or DCEG clause number**

*Text in black italic are extracts from current PS or DCEG*

*Text in black italic is **highlighted in blue** to identify the text that is questioned.*

*Texts in red are comments*

**Proposals are highlighted in green**



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# PART 1: DEFINITION FOR MAXIMUM AND MINIMUM DISPLAY SCALES

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## Initial considerations to agree on

**Maximum** and **minimum display scales** define the scale range at which data is intended to be used.

**Maximum display scale** is the scale that controls the over-scale indication.

**Minimum display scale** is the Mariner Selected Viewing Scale (MSVS) from which the ENC is no more displayed (unless no smaller scale dataset is available).

- Considering 2 datasets with scale ranges 8 000 – 45 000 for dataset 1 and 22 000 – 90 000 for dataset 2.
- What happens when the MSVS is 45 000?
- If both datasets are displayed:
  - Dataset 1 will have many objects not be displayed because of scale minimum;
  - Dataset 2 seems more suitable at that scale.

Proposal: A dataset is not displayed when the MSVS = minimum display scale

This is confirmed by the 4 scenarios in PS 4.7.1

- If this is agreed, then **minimum display scale** is not « really » *the smallest intended viewing scale for the data*.
- However, suggest to leave the definition as it is (the loading strategy will give and implement the details).

To be discussed



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# PART 1: DEFINITION FOR MAXIMUM AND MINIMUM DISPLAY SCALES

## DCEG

### 1.3.1 Terms and definitions

- **maximum display scale:** the largest value of the ratio of the linear dimensions of **features** of a **dataset** presented in the display and the actual dimensions of the **features** represented (largest scale) of the scale range of the **dataset**
- **minimum display scale:** the smallest value of the ratio of the linear dimensions of **features** of a **dataset** presented in the display and the actual dimensions of the **features** represented (smallest scale) of the scale range of the **dataset**
  - Not sure these definitions are “understandable”.
  - Not for point symbols (even not for line features, due to generalization).

### 2.5.5 Seamless ENC coverage

- The mandatory attribute **maximum display scale** is used to indicate the largest intended viewing scale for the data.
- The mandatory attribute **minimum display scale** is used to indicate the smallest intended viewing scale for the data.
  - **Proposal: copy the above definitions in 1.3.1**

### 28.8 maximum display scale (CSCALE)

- **Maximum display scale:** IHO Definition: The largest intended viewing scale for the data. → OK

### 28.11 minimum display scale

- **Minimum display scale:** IHO Definition: The smallest intended viewing scale for the data. → OK



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# PART 1: DEFINITION FOR MAXIMUM AND MINIMUM DISPLAY SCALES

## S-101 Product Specification

### 1.3.2 Terms and definitions

- **Maximum Display Scale:** The larger(erst) value of the ratio of the linear dimensions of **features** of a **dataset** presented in the display and the actual dimensions of the features represented (largest scale) of the scale range of the **dataset**.
- **Minimum Display Scale:** The smaller(est) value of the ratio of the linear dimensions of **features** of a **dataset** presented in the display and the actual dimensions of the features represented (smallest scale) of the scale range of the **dataset**.
  - **Proposal: copy definitions from DCEG 2.5.5 here:**

*The mandatory attribute **maximum display scale** is used to indicate the largest intended viewing scale for the data.*

*The mandatory attribute **minimum display scale** is used to indicate the smallest intended viewing scale for the data.*



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# PART 2: REFERENCES TO COMPILATION SCALE

## S-57 UOC

**2.2.6:** *The compilation scale should be considered as the optimum display scale of ENC data.*

## S-101 Product Specification (1 occurrence)

### 4.5.3 Data Coverage rules

- The **maximum display scale** is considered to be the equivalent of the compilation scale of the data.
  - S-57 ENC can be zoom X2 in from compilation scale, but S-101 ENC maximum display scale cannot be zoomed in.
  - Compilation scale often associated to “*The scale at which the data was originally complied*” (“original” paper chart). (References to paper chart have been deleted in the DCEG).
  - Compilation scale is one thing, the largest scale at which the data can be used is another (data reliability/accuracy).
  - **Proposal: delete this sentence which brings ambiguity.**

## DCEG (5 occurrences of « compilation scale »)

### 2.5.9 Sample scale minimum policy

- The **scale minimum** value of an individual occurrence of a feature should be set to either 1, 2, 3 or 4 steps smaller scale than the maximum display scale of the smallest scale ENC that the feature would appear on (that is, assuming full coverage **across all compilation scales**).
  - **Proposal: delete “(that is, assuming full coverage across all compilation scales)”, or replace by “across all scale ranges”.**

### 2.5.9 Scale minimum table 2.8 (2 occurrences)

- **scale minimum** should be applied so that the least significant soundings (depths) are set to 1 step progressing to 4 steps for the most significant, **above the compilation scale** in order to achieve a gradual reduction in the soundings (depths) displayed as the user zooms out.
  - **Proposal: delete “above the compilation scale” or replace by “above the maximum display scale”**



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## PART 2: REFERENCES TO COMPILATION SCALE

### Definitions : Compilation scale

#### DCEG (5 occurrences)

##### 8.5 Dyke

- *At large compilation scales, the dyke crown (the topline of the dyke) may be encoded as a Slope Topline feature (see clause 5.15), with attribute category of slope = 2 (embankment).*
  - **Proposal: delete "compilation"**

##### 8.11.2 Flood barrage

- *If it is required to encode the fixed part of a flood barrage, and the flood barrage is inside an area which is navigable at compilation scale, it must be done using a Dam feature.*
  - The meaning here is "navigable with the current data set"
  - **Proposal: replace by "which is navigable across the data coverage scale range"**





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# PART 3: REVIEW OF THE PRODUCT SPECIFICATION

## 4.5.2 Dataset rules

- In order to facilitate the efficient processing of ENC data the geographic coverage of a given maximum display scale **may be split into multiple datasets**.
  - The only reason for this guidance is to avoid too heavy datasets.

- If dataset >10MB → MUST be split,
- Proposal: replace "may" by "must"**
- Proposal: add (see clause 4.5.4)**

→ In order to facilitate the efficient processing of ENC data the geographic coverage of a given maximum display scale **must** be split into multiple datasets (see clause 4.5.4).

- Datasets must not cross the 180° meridian; this includes both the Data Coverage features and **the bounding box** for the dataset.
  - Where is the bounding box defined?

### 12.1.2.3 S100\_DataCoverage

S100_DataCoverage
+ ID: Integer
+ boundingBox: EX_GeographicBoundingBox
+ boundingPolygon: EX_BoundingPolygon [1..*]
+ maximumDisplayScale: Integer [0..1]
+ minimumDisplayScale: Integer [0..1]

12.1 – Figure 26

Name	Multiplicity	Value	Type	Remarks
S100_DataCoverage	-	-	-	-
ID	1		Integer	Uniquely identifies the coverage
boundingBox	1		EX_GeographicBoundingBox	
boundingPolygon	1..*		EX_BoundingPolygon	
maximumDisplayScale	1		Integer	Must be one of the following values: 1000

- Bounding boxes and polygons are described (in the xml Exchange Catalogue) for each individual Data Coverage feature, but not for the entire dataset.
- Is the bounding box the exact total coverage of Data Coverage features, or the englobing rectangle?
- Cannot find where the dataset bounding box is defined...
- Proposal: define the bounding box and ensure it is well described in 12.1.2.3**



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# PART 3: REVIEW OF THE PRODUCT SPECIFICATION

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## 4.5.3 Data Coverage rules

- The **data boundary** of the base dataset is defined by the extent of the **Data Coverage** features and must be contained within the bounding box.
  - Data boundary is only found here in the PS. Is this useful?
  - Should not we rather give reference to the bounding box?
  - **Proposal: Delete this sentence or reword it.**
- Datasets may overlap, however there must be no overlapping **Data Coverage** features of the same **maximum display scale**, except at the agreed adjoining national data limits, where, if it is difficult to achieve a perfect join, **a 5 metre overlapping buffer zone may be used**; and for this situation, there must be no gaps in data.
  - of the same maximum display scale:**
    - Note: adjoining ENC's from neighbouring countries may not have the same maximum display scale.
    - **Proposal: replace "of the same maximum display scale" by "of overlapping scale ranges"**
  - a 5 metre overlapping buffer zone may be used:**
    - The current text does not mandate overlapping buffer zone, but then states that there must be no gaps...
    - The current text seems to say that if a buffer zone exists, it must be 5 metres large,
    - **Proposal: replace by: "an up to 5 metre overlapping buffer zone must be used"**
- When a dataset has multiple **Data Coverage** features then the **maximum display scale** of the dataset must be equal to the largest **maximum display scale** of the **Data Coverage** features.
  - Think this is more Dataset rules than Data Coverage rules.
  - **Proposal: Move this sentence into 4.5.2 (Dataset rules), after the 2<sup>nd</sup> paragraph.**

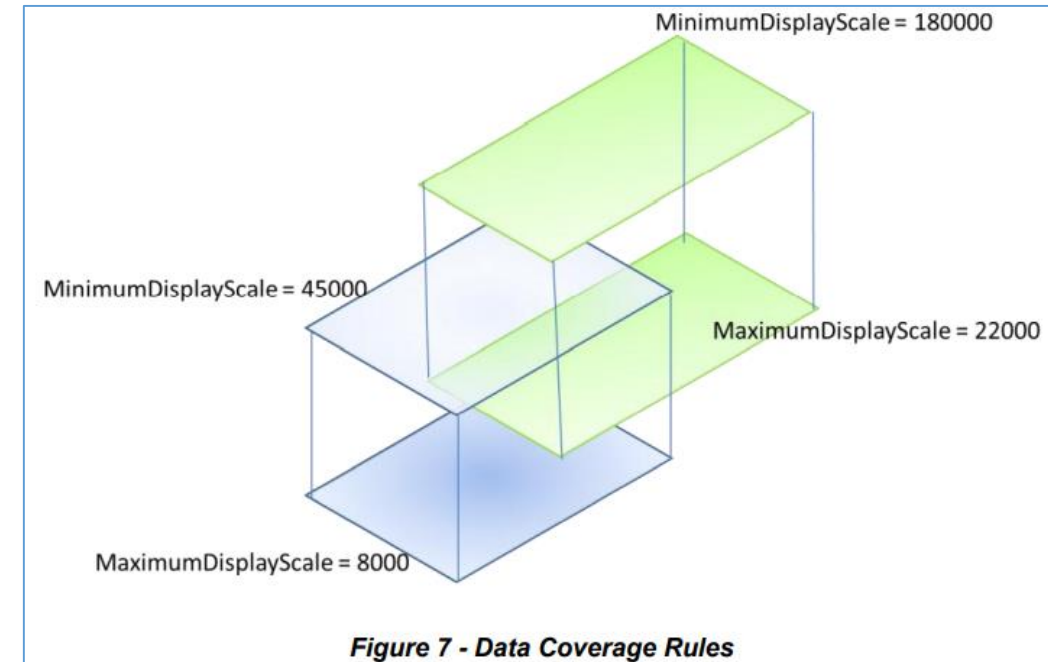
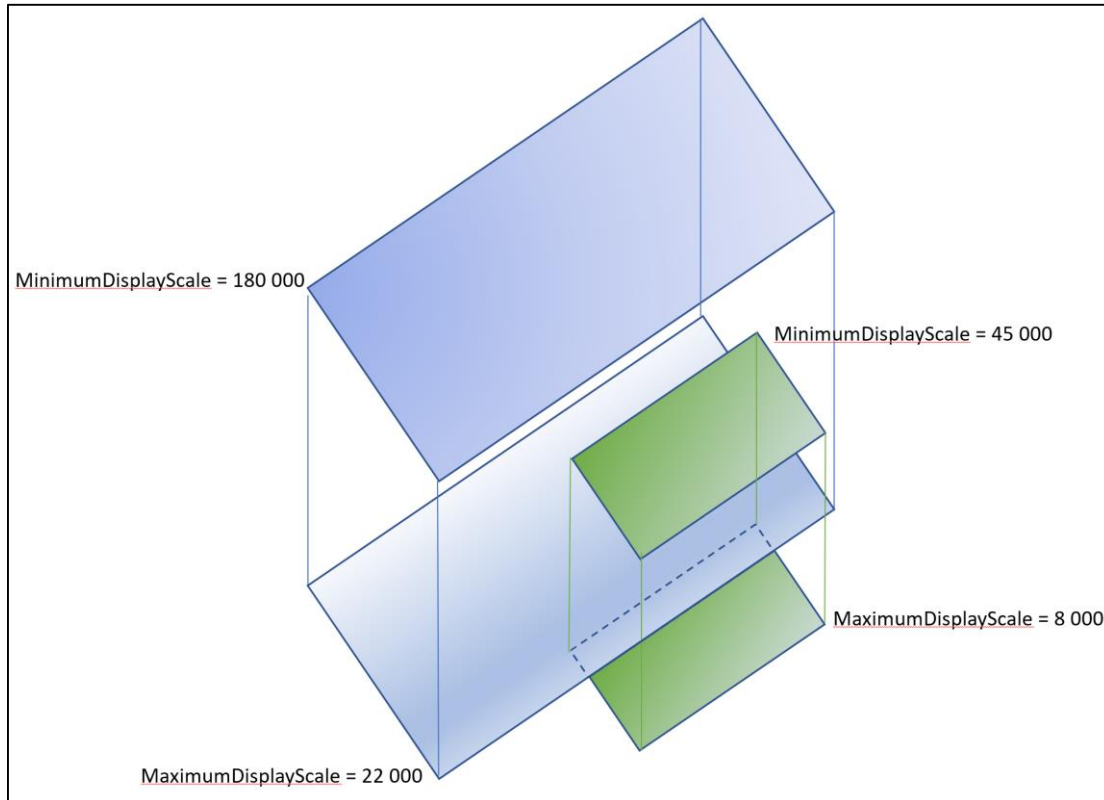


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# PART 3: REVIEW OF THE PRODUCT SPECIFICATION

## 4.5.3 Data Coverage rules

- Figure 7 does not seem realistic: 2 data sets of about the same extent, but with different Max/Min Scales (the use case is not obvious).
- Proposal: review the figure as below:**





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# PART 3: REVIEW OF THE PRODUCT SPECIFICATION

## 4.6 Display Scale Range

- When the systems viewing scale is smaller than the value indicated by **minimum display scale**, features within the **Data Coverage** feature are not displayed, **except where the SENC does not contain a dataset covering the area at a smaller scale, in which case the dataset will be displayed at all smaller scales.**
  - At smaller scale than minimum display scale, the ENC will have scale minimum steps applied.
  - Why not let the ECDIS system display their shoreline as is done currently?
  - **Proposal: delete the last part of the sentence: "When the systems viewing scale is smaller than the value indicated by minimum display scale, features within the Data Coverage feature are not displayed."**
- When own ship's position is covered by a dataset with a larger **maximum display scale** than the mariner's selected viewing scale (MSVS) an indication is required and should be shown on the same screen as the chart display.
  - The intention of this sentence is to give the mariner an indication that a larger scale dataset is available, but is not displayed because the MSVS is too small.
  - The sentence does not look correct as it should quote the minimum display scale (not the maximum).
  - An example of the indication could be added.
  - **Proposal: "When own ship's position is covered by a dataset with a larger minimum display scale than the mariner's selected viewing scale (MSVS) an indication such as "Better scale ENC available" is required and should be shown on the same screen as the chart display."**
  - Is this guidance "portrayal" or "ECDIS functionality"? Is it to be in S-101 PS or in IMO or ECDIS standard? **To be discussed.**



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# PART 4: REVIEW OF THE DCEG

## Review of the DCEG

### 2.5.1 ENC data coverage

- *When a feature extends across datasets of overlapping scale ranges, its geometry must be split at the boundaries of the Data Coverage features and its complete attribute description must be repeated in each dataset.*
  - Can't really understand the purpose of this sentence...
  - **Proposal: delete this sentence**



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## PART 4: REVIEW OF THE DCEG

### 2.5.5 Seamless ENC coverage

- 2<sup>nd</sup>§ : "... in relation to the **user** selected viewing scale in the ECDIS. "
  - Proposal: replace "user" by "mariner's"**
- Table 2.5
  - Are there use cases for maximum display scale=10,000,000? (or even 3,500,000)?
  - After checking the IHO ENC portfolio, there are GB UB1 cells with CSCL = 20,000,000... (Arctic area, but not only.

Scale
NULL (only allowed on <b>minimum display scale</b> where the <b>maximum display scale</b> = 10,000,000)
1:10,000,000
1:3,500,000
1:1,500,000
1:700,000
1:350,000
1:180,000
1:90,000
1:45,000
1:22,000
1:12,000
1:8,000
1:4,000
1:3,000
1:2,000
1:1,000

Table 2.5 - Maximum and minimum display scale values



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## PART 4: REVIEW OF THE DCEG

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### 2.5.5 Seamless ENC coverage

- *The Data Coverage features within a dataset must not overlap, however Data Coverage features from different datasets may overlap if they have differing maximum display scales. All data within a dataset must have the same minimum display scale, but portions of a dataset can have a different maximum display scale, depending on the best scale required for navigation in an area for the purpose of the ENC data.*
- *There must be no gaps in data between adjoining datasets if they share the same scale range in part or in full. Similarly, there must be no overlapping data between datasets if they share same scale range in part or in full, except at the agreed adjoining producer data limits, where, if it is difficult to achieve a perfect join, a 5 metre overlapping buffer zone may be used.*
  - Text highlighted in blue not easy to understand (Figure needed?) Shouldn't we refer to "identical minimum display scale" rather than "scale range in part or in full"?
  - This information is already (even if slightly differently said) in the PS (§4.5.3)
  - Guidance should be in one document or another. Suggest to have:
    - guidance on ENC metadata (including limits) in the PS, and
    - data encoding proper in the DCEG.
  - **Proposal: delete these two paragraphs from the DCEG.**

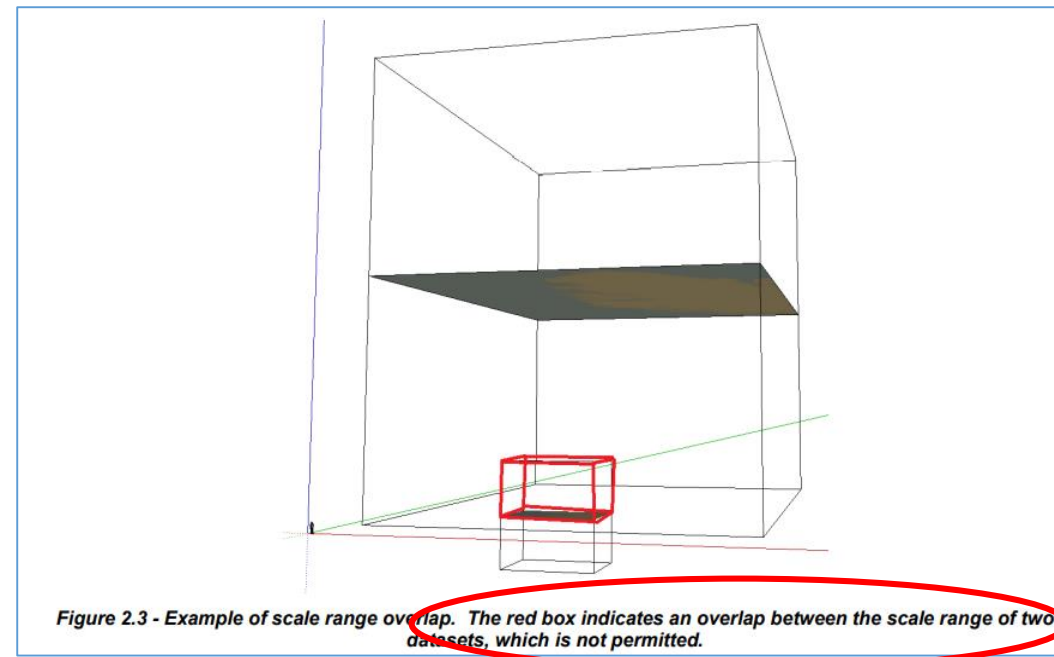


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## PART 4: REVIEW OF THE DCEG

### 2.5.5 Seamless ENC coverage

- Can't see what is wrong in the example (it is the common situation).
- **Proposal: delete these paragraphs from the DCEG.**



- *In areas which include neighbouring producer nations, Hydrographic Offices should co-operate to agree on dataset boundaries and ensure no data overlap within scale ranges. Where possible, adjoining nations should agree on common data boundaries within a technical arrangement based on cartographic convenience and benefit to the mariner. Suitable communications between neighbouring nations should be put in place to ensure data consistency across dataset boundaries. These should include exchange mechanisms to allow access to each other's ENCs.*
  - Shouldn't this rather be in the PS?
  - **Proposal: move this paragraph to the PS.**





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# PART 5: LOADING/UNLOADING STRATEGY

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## 4.7.1 Dataset Loading Algorithm

- Dataset drawing order and link to lettres X, Y, Z is not easy to understand.
- Figure not easy to understand with no Graphics Windows.
- The rules for selecting / not selecting the data sets could be easily explained by sentences (and examples in figures 9 to 12)

**Proposal: replace by: « Dataset display priority order (X over Y, Y over Z) »**

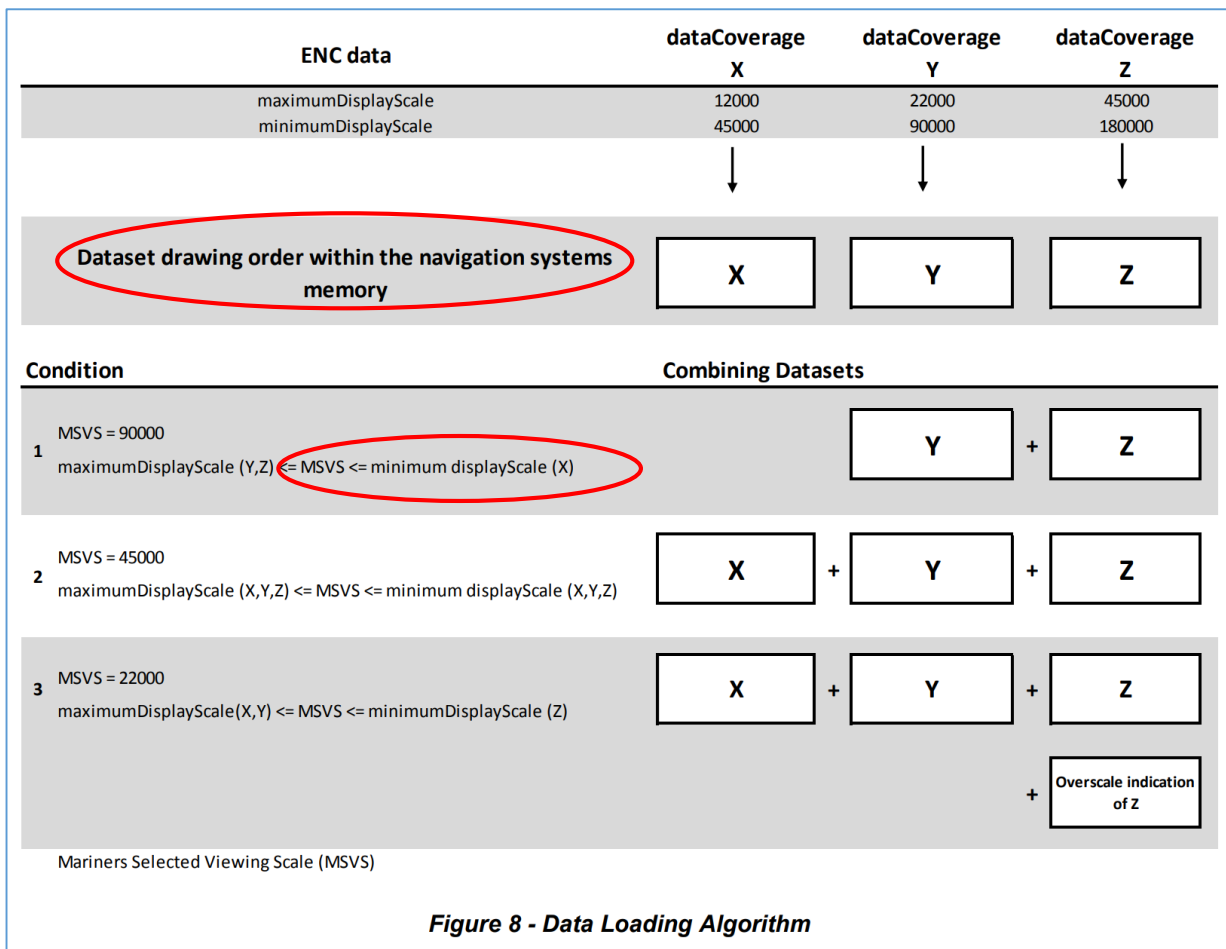
- Case 1: Dataset Y should not display as minimum display scale = MSVS

**Proposal: delete dataCoverage Z and change to read: « MSVS < minimum display scale (X,Y) »**

- Case 2: Dataset X should not display as minimum display scale = MSVS

**Proposal: delete dataCoverage X and change to read: « MSVS < minimum display scale (Y,Z) »**

**Proposal: review Figure 8 to add a graphics window, or delete the figure as Figures 9 to 12 are very explicit.**





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# PART 5: LOADING/UNLOADING STRATEGY

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## 4.7.1 Dataset Loading Algorithm

a. All **Data Coverage** areas within the graphics window **within scale range (covered by the MSVS)** are firstly ordered by **maximum display scale** and secondly by the largest percentage of coverage if **Data Coverage** areas have the same **maximum display scale**.

- A scale range cover a MSVS (not the opposite)
- a. and b.: what is the point in ordering the Data Coverages by the percentage of coverage. If confirmed, may need to be explained (by a figure?)
- **Proposal a.: « All Data Coverage areas within the graphics window with scale range covering the MSVS are ordered by maximum display scale. »**

b. **All other smaller scale Data Coverage** areas within the graphics window are firstly ordered by **maximum display scale** and secondly by the largest percentage of coverage if **Data Coverage** areas have the same **maximum display scale**.

- This may not be needed
- **Proposal b.: « If Data Coverages from the first list do not completely cover the graphics window, all other smaller scale Data Coverage areas within the graphics window are ordered by maximum display scale. »**

d. If adjacent **data coverages** have the same **maximum display scale** they should be drawn so that all features of a given display priority from the adjacent **data coverages** are drawn prior to drawing features of the next display priority.

- What is meant by this sentence ?
- If confirmed, would need a Figure to explain the use case.
- **To be discussed.**

3. If the mariner selects an individual dataset to load it must be displayed at its **maximum display scale**, that is MSVS is set to the **maximum display scale** of the selected dataset, and then the algorithm is used to fill the graphics window.

- This implies that the dataset is by default displayed at the limit of the overview. **To be discussed.**
- Is this guidance to be in the S-101 PS or in ECDIS standards? **To be discussed.**



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# PART 5: LOADING/UNLOADING STRATEGY

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## Dataset with multiple Data Coverages

- Are objects split (optional or not?) at the Data Coverage limit?
- What are the Pros and Cons?
- If not, the Dataset must be drawn once only, not to draw the objects several times.
- The number of data coverage features in a dataset is not limited
- Guidance on good practice for datasets with multiple data coverages may be needed in the PS or DCEG.
- **To be discussed**



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# PART 5: LOADING/UNLOADING STRATEGY

NIWC inputs in the Github – 16 November 2021

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- Question: Is an S-101 *dataCoverage* feature intended to serve the same purpose as an S-57 ENC M\_CSCL meta feature?
- Recommendation: load/unload/display S-101 datasets in their entirety, not by individual data coverages.
  - Matches existing OEM loading strategies wrt treatment of M\_CSCL?
  - Matches data producer expectations wrt portrayal?
  - This is the strategy currently implemented by our test bed, but full implementation requires additional metadata as recommended below.
- Recommendation: *dataCoverages* within a dataset should always be drawn “side-by-side” (seamless presentation; all drawing instructions of priority one from all *dataCoverages*, followed by all drawing instructions of priority two from all *dataCoverages*, etc.) regardless of scale.
  - Matches existing OEM implementations wrt treatment of M\_CSCL?
  - Matches data producer expectations wrt portrayal?
  - This is the rendering algorithm currently implemented by our test bed.
- Recommendation: provide S100\_DatasetDiscoveryMetadata.*minimumDisplayScale*
  - Each S-101 dataset should have a maximum and minimum display scale to support data loading/unloading.
  - Currently only *maximumDisplayScale* is provided in S-101 (S-101 PS v1.0.0).
- Recommendation: provide S100\_DataCoverage.*optimumDisplayScale*
  - each S-101 data coverage should indicate the compilation scale to support the display of the overscale indication and/or pattern.
- Recommendation: remove S100\_DataCoverage.*maximumDisplayScale/minimumDisplayScale*
  - Not needed if the dataset is loaded/unloaded/displayed in its entirety.
- Question: How to determine when to display datasets “side-by-side” (seamless presentation)?
  - S-52 requirement applies when navigational purpose is shared by two datasets.
  - S-101 requirement in 4.7.1.1.d applies when maximum display scale is shared by adjacent data coverages.
    - Implies that data coverages are drawn independently, but this can cause features to be obscured (e.g., light sectors within a single dataset with multiple data coverages).
    - Need to determine when two datasets should/should not obscure one another (stacked vs. side-by-side).
  - No S-98 requirement.



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# PART 6: SCALE MINIMUM

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## Initial considerations

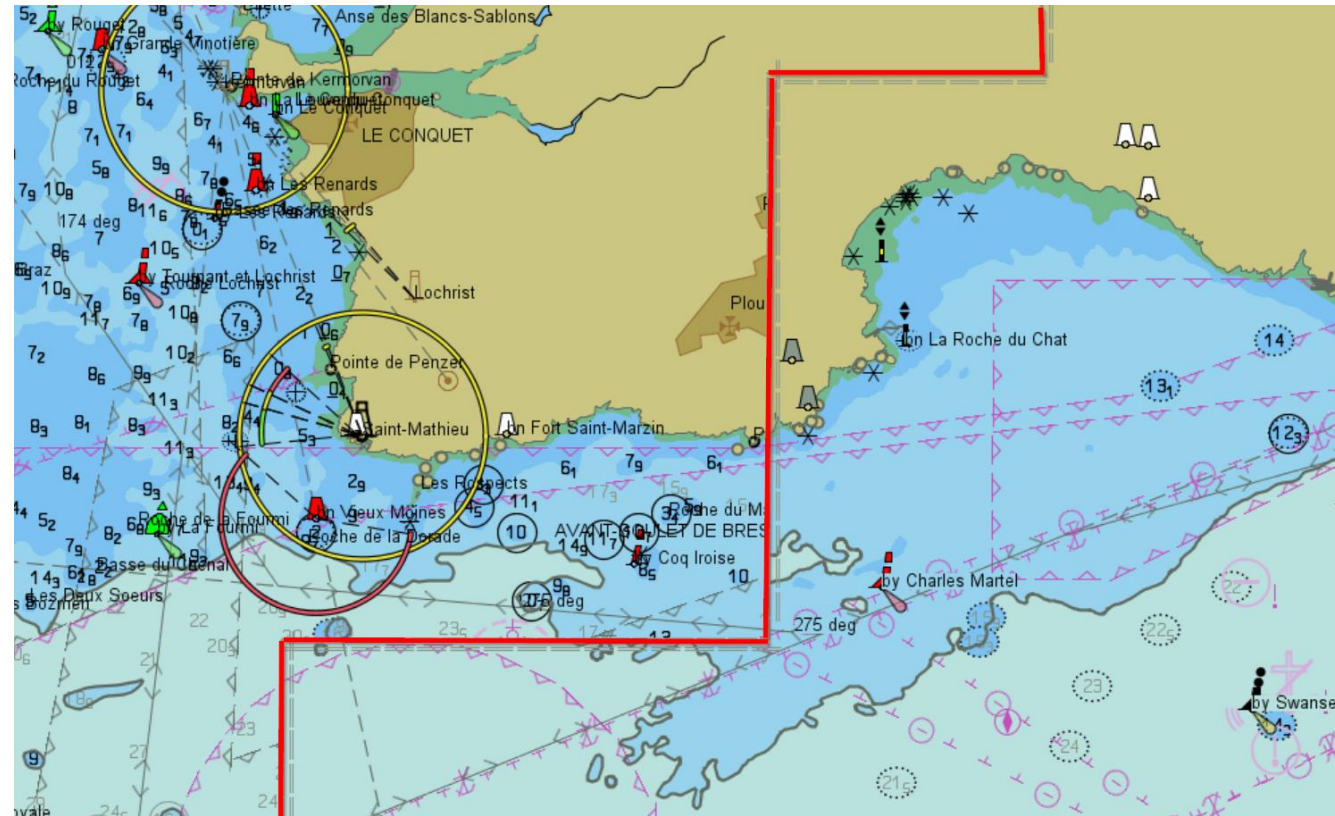
- SCAMIN is the only attribute the cartographer can use to control the display of the ENC on the ECDIS (apart from producing a « readable » ENC at compilation scale).
- A « good » SCAMIN encoding should enable:
  - Seamless zooms in and out on the ENC series
  - No screen clutter, whatever the viewing scale
- In the current version of the DCEG, scale minimum policy is a copy of S-57 SCAMIN policy.
- The major « shortcoming » of current SCAMIN on ENCs is not the UOC policy proper, but rather the fact that (very?) few HOs implemented the following rules:
  - *If the same object exists in cells of different Navigational Purposes, the same SCAMIN value should be assigned to each occurrence of the object.*
  - *Linear and area objects (excluding those objects subject to extensive generalisation for example **DEPCNT**) that extend beyond the coverage of a cell and exist in an overlapping smaller Navigational Purpose cell should be assigned the same SCAMIN value as the SCAMIN value of the corresponding object in the smaller scale cell.*
  - *The SCAMIN value of an individual occurrence of an object should be set to either 1, 2, 3 or 4 steps smaller scale than the compilation scale of the smallest scale ENC that the object would appear on (that is, assuming full coverage across all Navigational Purposes).*
- The reason for the above « shortcoming » is that SCAMIN values are often calculated at the « individual » ENC product level. Production tools and/or processes do not always offer to encode SCAMIN in the source database (what probably would be a major improvement).
- Viewing scales are not mandated for ECDIS systems
  - HOs can encode the « best » SCAMIN values, if the ECDIS viewing scales are not consistent with these values, the work is worthless!



# IHO PART 6: SCALE MINIMUM

## Initial considerations

- Example of what the mariner can see when the SCAMIN policy is not fully applied by a producing authority.





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# PART 6: SCALE MINIMUM

## Scale minimum and standard scales

- The table shows in grey, for S-57 ENC SCAMIN steps that are not « implemented » as the smaller scale ENC is displayed.

INTU	UB6	UB5	UB4	UB3
Paper Chart Scale	10 000	25 000	50 000	150 000
ENC CSCL	8 000	22 000	45 000	90 000
Step 1	11 999	29 999	59 999	119 999
Step 2	17 999	44 999	89 999	179 999
Step 3	21 999	59 999	119 999	259 999
Step 4	29 999	89 999	179 999	349 999

- A draft scheme for S-101 scale ranges:

	scale minimum	Max/Min DS	Scale ranges		
		180 000			
	179 999				
	119 999				
FR3		90 000			
	89 999				
	59 999				
FR4		45 000			
	44 999				
	29 999				
		22 000			
	21 999				
	17 999				
FR5		12 000			

→ The situation will be about the same

Possibility: scale minimum policy such that all steps are implemented between Max. and Min. display scales

But this would require more scale minimum values...

Is there a real need to go so far? Probably needs testing with a dataset series before decision.

To be discussed



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# PART 6: SCALE MINIMUM

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## Mandating the ECDIS viewing scales

### Current situation

- Currently, ECDIS systems have viewing scales based on radar ranges (CSCL values).
- It seems that some ECDIS slightly deviated from these scales (to be confirmed).
- Between these « standard » values, there is no rules in terms of zoom progressivity, or alignment on SCAMIN values+1.

### Avantages of mandating the viewing scales

- All ECDIS systems will behave in the same way (in the spirit of the IMO « S-Mode »).
- The HOs will have a real control on how their data is displayed.
- The scale minimum encoding will be efficient.

### Mandating the viewing scales: YES/NO – WHERE?

- Is there a consensus on trying to mandate ECDIS systems viewing scales?
- If yes, where should this be? (probably in IEC 61174) and/or S-98
- **To be discussed**





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# PART 6: SCALE MINIMUM

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## Mandating the ECDIS viewing scales

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- Is there a consensus on trying to mandate ECDIS systems viewing scales?
- If yes, where should this be? (probably in IEC 61174) and/or S-98
- **To be discussed**



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## PART 6: SCALE MINIMUM

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### Improvement of the scale minimum table

- With the HOs experience on S-57 SCAMIN, there seems to be some points that can be improved.
- France will prepare a paper on this for S-101PT8.
- One point is the scale minimum steps on point objects covered by a foul area.
- In these areas (and in non navigable areas in general), should not we have a step 1 for most points objects (underwater rocks, wrecks, soundings, etc.) ?
- **To be discussed.**



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**THANK YOU!**