

S-101 and Navigational Purpose

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for

S-101PT5

Conclusions

The absence of navigational purpose in S-101 poses seemingly insurmountable challenges to ensuring a safe and effective ECDIS chart presentation, and may preclude a satisfactory chart presentation during “dual fuel” transition to S-101.

Large scale errors can result from the absence of compilation scale in S-101. These errors may cause issues with dual-fuel presentation.

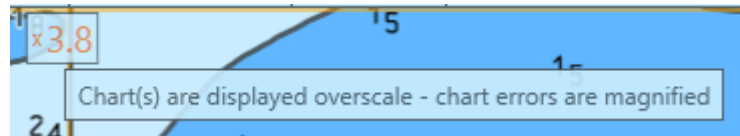
These issues are compounded by use of converted data.

S-57 ENC / S-52: Compilation Scale

- Unconstrained value domain
 - Encoded density of linear features limited to 0.3 mm @ compilation scale

- Requirements

- Overscale indication:



- Overscale pattern:



- Data loading (as a proxy for SCAMIN / SCAMAX)
 - No requirement

S-57 ENC / S-52: Navigational Purpose

- Constrained to one of six values
 - Overview, General, Coastal, Approach, Harbour, Berthing

- Requirements

- No overlapping data within a navigational purpose
- Scale boundaries / Chart catalogue
 - Show boundaries of navigational purpose
- Seamless presentation

To ensure seamless presentation of a single intended usage (navigational purpose) all objects of same display priority from all cells in same intended usage must be drawn together.

- Data loading (as a proxy for SCAMIN / SCAMAX)
 - No requirement



S100/S101_DatasetDiscoveryMetadata

- Attribute *specificUsage*
 - CharacterString inherited from *S100_DatasetDiscoveryMetadata*
 - “For example, in the case of ENCs this would be a Navigational Purpose classification”
 - Encoding is unclear
 - Value: {1} to {3}
 - Remarks show 1. Port Entry, 2. Transit, and 3. Overview
 - Enumerated value encoded in CharacterString?
- Attribute *maximumDisplayScale*
 - Integer inherited from *S100_DatasetDiscoveryMetadata*
 - “The maximum scale with which the data is displayed”
 - Constrained by S-101 to one of fifteen values
 - *Largest maximum display scale of the datasets data coverage features*

S100/S101_DataCoverage

- Attribute *maximumDisplayScale*
 - Integer inherited from *S100_DataCoverage*
 - “The maximum scale with which the data is displayed”
 - Constrained by S-101 to one of fifteen values
- Attribute *minimumDisplayScale*
 - Integer inherited from *S100_DataCoverage*
 - “The minimum scale with which the data is displayed”
 - Constrained by S-101 to one of sixteen values
 - Unclear how to encode NULL
 - Rather than using NULL, the multiplicity should be 0..1

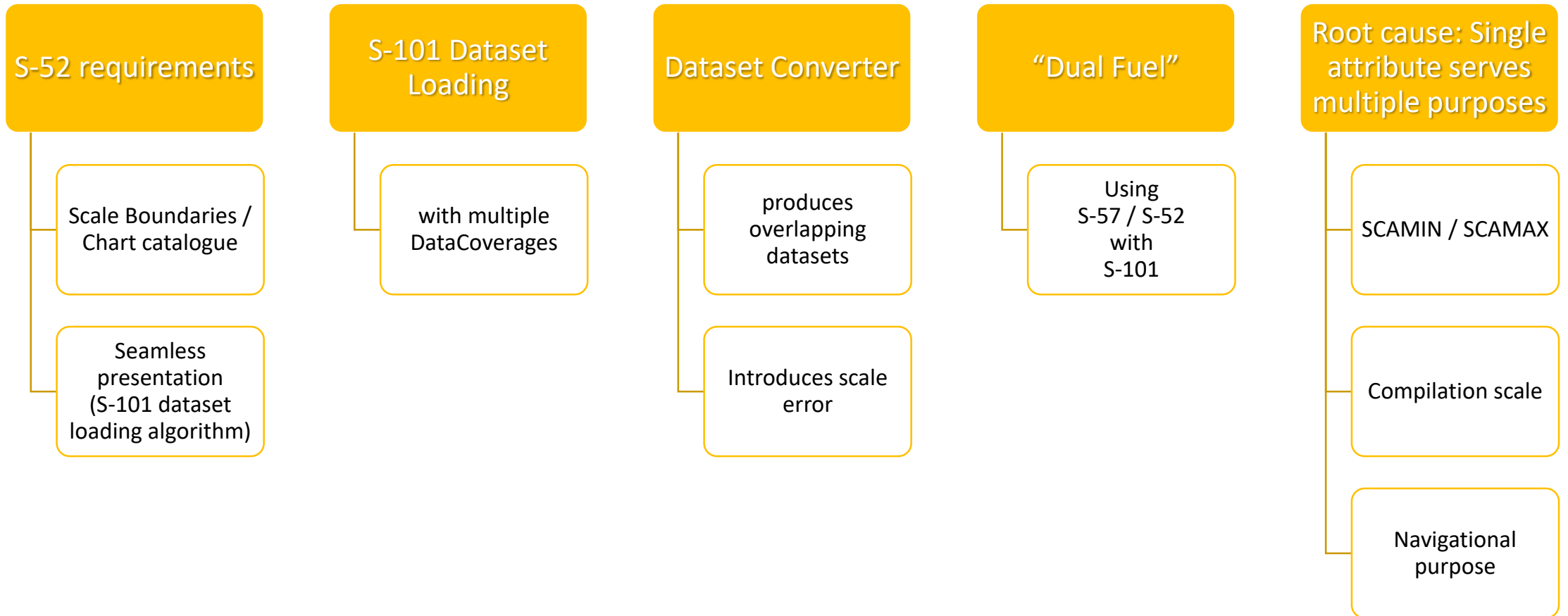
S-101: Navigational Purpose?

- Attribute *specificUsage*
 - Unused by any S-101 requirements (e.g. data overlaps)
- Attribute *maximumDisplayScale*
 - Proxy for compilation scale
 - Constrained to one of fifteen values
 - Requires mapping S-57 requirements related to compilation scale (an unconstrained value) to an enumeration
 - Proxy for navigational purpose
 - Requires mapping S-57 requirements related to navigational purpose (six values) to an enumeration
 - No guidance for data producers?
 - Proxy for SCAMIN / SCAMAX
 - Based on RADAR range scales, but only for 21" 4:3 monitors
 - No constraint on ECDIS / user selection of display scale

S-101: Navigational Purpose?

- Attribute *maximumDisplayScale*
 - S-101 PS 4.5.3 Data Coverage rules
 - No overlapping data coverage features of the same maximum display scale
 - [...] maximum display scale of the dataset must be equal to the largest maximum display scale of the data coverage features
 - Maximum display scale is considered to be the equivalent of the compilation scale
 - S-101 PS 4.6 Display Scale Range
 - Max / min display scale turns viewing of data coverage features on / off
 - S-101 PS 4.7 Dataset Loading and Unloading
 - Max / min display scale of the data coverage used to control loading and viewing of data (SCAMIN / SCAMAX)
 - S-101 required algorithm with no S-52 equivalent

Issues



Scale Boundaries / Chart Catalogue

- S-52: Only significant changes from one navigational purpose to another must appear
- Requires combining data coverages by *maximumDisplayScale* into fifteen separate sets of outlines

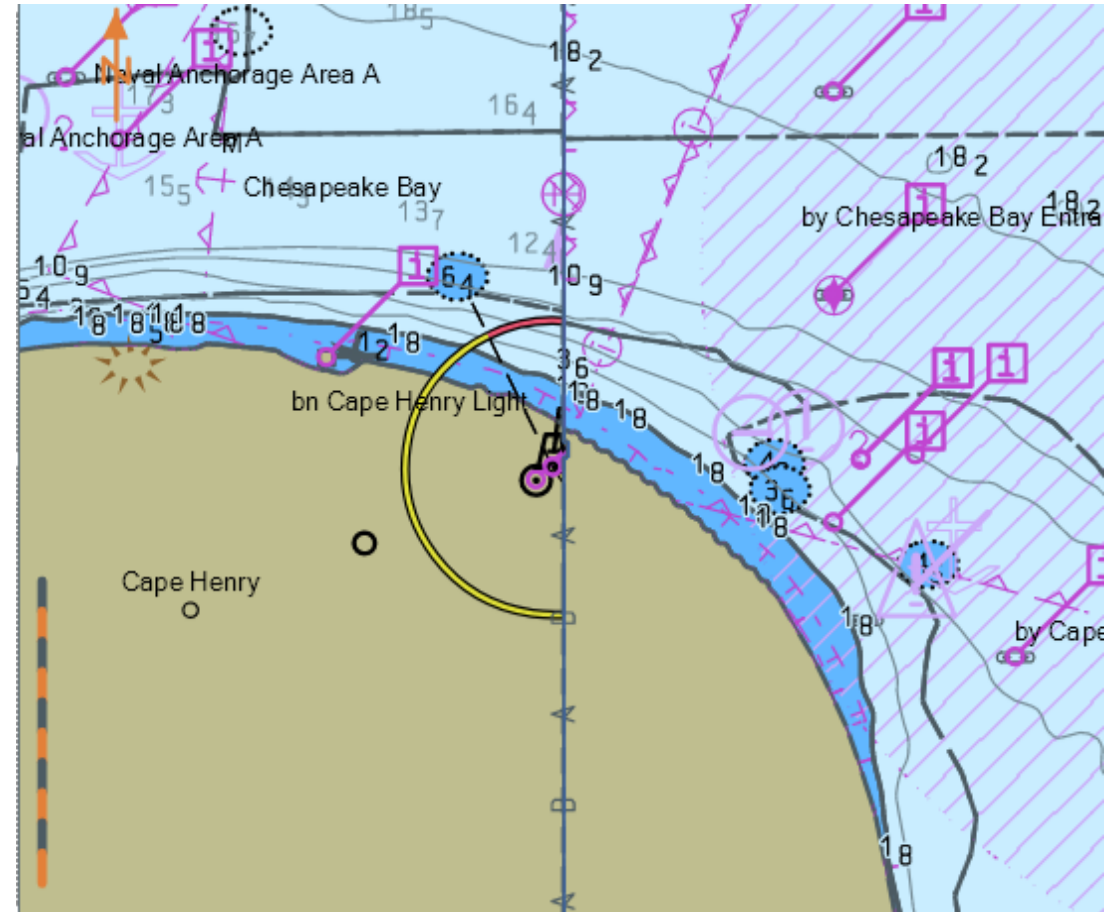


S-101 Dataset Loading: Multiple Data Coverages

- Loading rules dictate that display of individual coverages is driven by the *maximumDisplayScale* attribute
 - Currently, each data coverage can have a different *maximumDisplayScale*
 - A dataset can therefore have multiple navigational purposes
- How to assign each feature and spatial to a single data coverage?
 - Limited / no topology between data coverage and feature / spatial objects
 - Data coverage tessellated by skin of the earth features
 - Can't add associations from spatial to a feature object
- How to independently toggle display of data coverages?
 - No specific support in S-100 part 9 for portraying a partition of a dataset

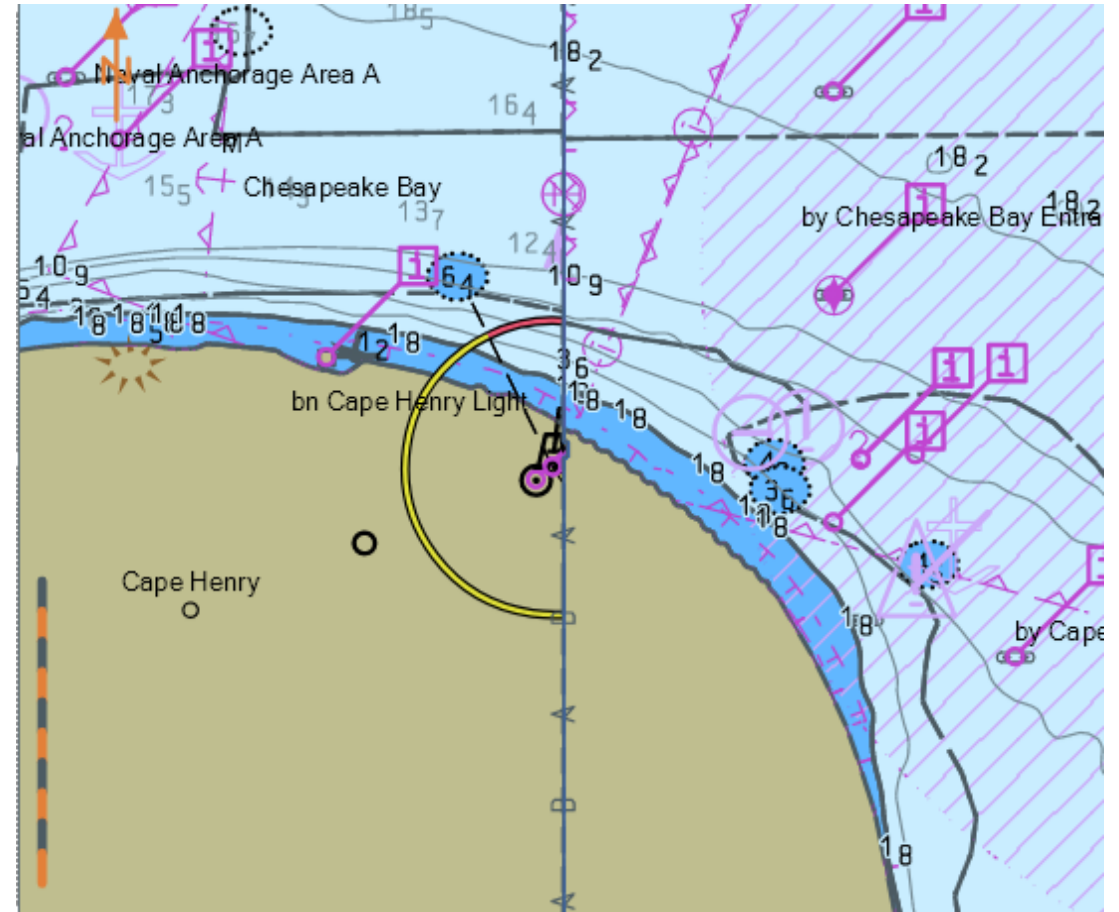
S-101 Dataset Loading: Navigational Purpose

- 4VA12M on left
 - S-57 1:80k to S-101 1:45k
- 5VA13M on right
 - S-57 1:40k to S-101 1:22k
- Mapping introduces scale error
 - Converter issue
 - Limited number of scales constrains mapping
- Navigational purpose dictated by choice of compilation scale



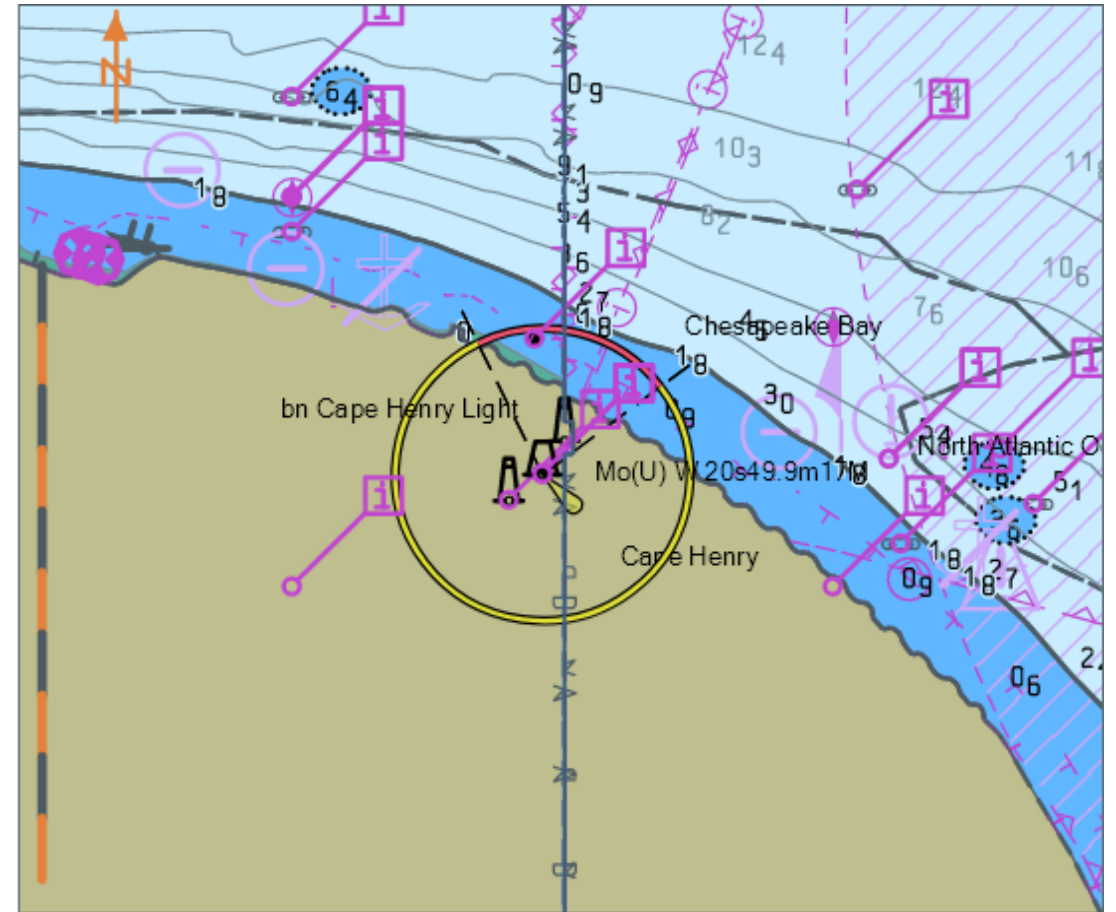
S-101 Dataset Loading: Navigational Purpose

- Charts from different usage bands should not be presented together
 - except when filling in gaps / no data areas
- S-101 requires data producers to manage 15 seamless usage bands



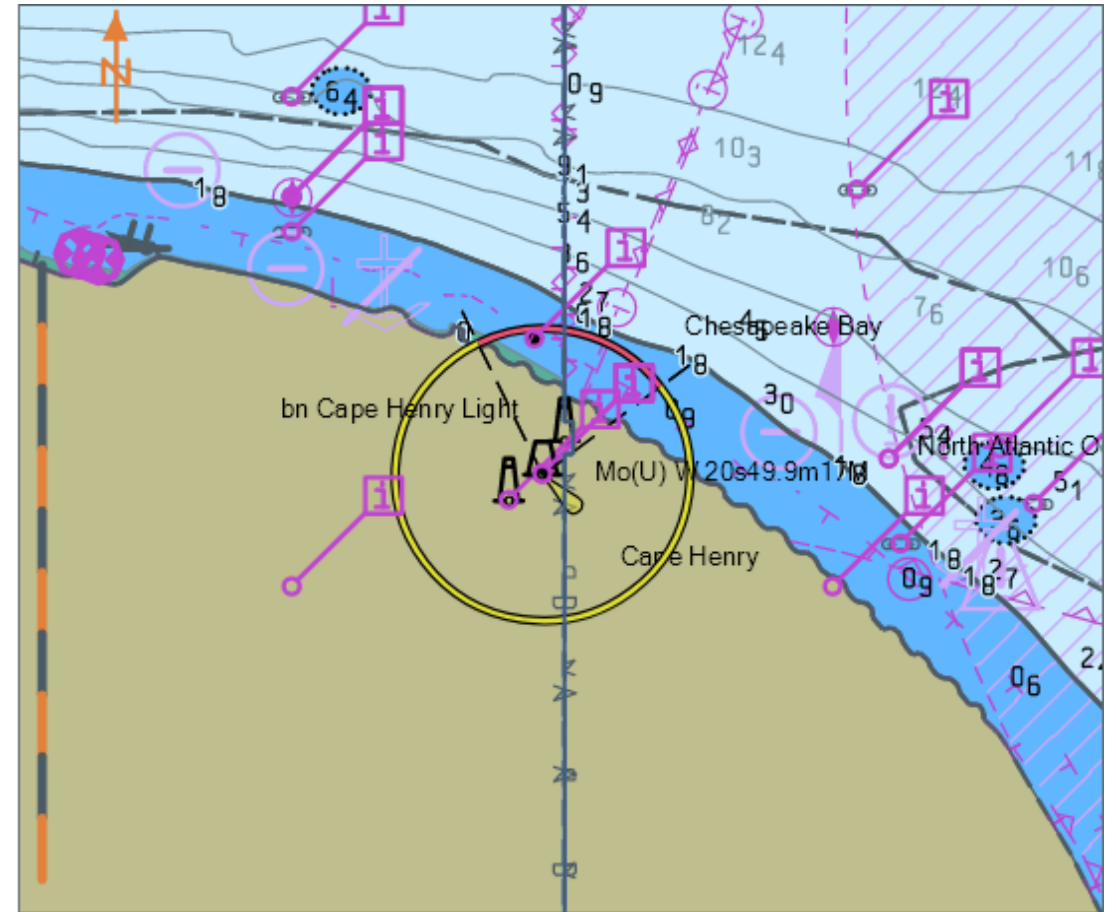
S-101 Dataset Loading: Navigational Purpose

- 5VA19M on left
 - S-57 1:20k -> S-101 1:12k
- 5VA13M on right
 - S-57 1:40k -> S-101 1:22k
- Charts from same usage band should be displayed together regardless of scale
 - Using S-52 rule for seamless presentation



S-52 Seamless Presentation

- Charts of same navigational purpose should be drawn side-by-side / interleaved
 - Regardless of scale
 - Requires compilation scale to be independent of navigational purpose



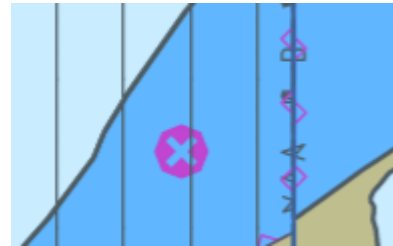
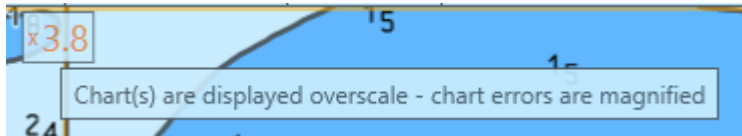
Dataset Converter: Overlapping Datasets

- Limited selection of scale values can drive mapping of overlapping charts from different usage bands to the same *maximumDisplayScale*
 - Seamless presentation rule applied (same scale)
 - Two conflicting safety contours displayed due to overlapping data
- Adding independent navigational purpose attribute would allow shared scale value with different usage bands



Dataset Converter: Scale Error

- Converter must map unconstrained S-57 compilation scale to one of fifteen values
- Can result in more than 50% error in scale factor



Dual Fuel: Challenges

- No mapping from S-57 ENC usage bands to S-101 *maximumDisplayScale*
 - Impossible to produce a shared presentation
 - Impossible to convert data and ensure correct presentation with multiple charts
- No compilation scale in S-101
 - Can't accurately determine whether S-57 ENC or S-101 is better scale data

Recommendations:

S100/S101_DatasetDiscoveryMetadata

1. Add navigational purpose
 - *S100/S101_DatasetDiscoveryMetadata specificUsage*
 - Clarify encoding and S-101 constraints (e.g. “1” or “Harbour”, etc.)
 - Using values from S-57 ENC simplifies mapping S-52 requirements to S-101
 - Minimizes changes to OEM ECDIS systems
2. Update *S100/S101_DatasetDiscoveryMetadata maximumDisplayScale*
 - The largest compilation scale of the data coverage features
 - Remove constraint on scale value
 - Can be constrained by constraining *S100_DataCoverage optimumDisplayScale*
3. Add *S100/S101_DatasetDiscoveryMetadata minimumDisplayScale*
 - The smallest compilation scale of the data coverage features
 - No constraint on scale value

Recommendations:

S100/S101_DataCoverage

4. Add *S100/S101_DataCoverage optimumDisplayScale*
 - Chart compilation scale
 - Simplifies mapping of S-52 requirements to S-101
 - Eliminate scale errors
 - Supports dual fuel (determination of best scale data)
 - Should value domain be constrained?
5. Remove (no longer used)
 - a) *S100/S101_DataCoverage maximumDisplayScale*
 - b) *S100/S101_DataCoverage minimumDisplayScale*
 - Display of *DataCoverage* determined by dataset navigational purpose
 - Maximum and minimum display scale are not useful to toggle the display of individual datasets without knowledge of which other datasets are selected for display
 - A navigational purpose comprised of multiple datasets generates a seamless display

Recommendations: S-101 Product Specification

6. Remove or update definition of Spatial Resolution on page 12
 - a) Remove table 1
7. Update S-101 PS 4.5 to reflect recommended changes
 - a) All data coverages within a dataset share a single navigational purpose
 - b) Data coverages within a dataset must not overlap
 - c) The optimum display scale is considered to be the equivalent of the compilation scale of the data
8. Remove S-101 PS 4.6 (duplicates information in 4.7)
9. Update S-101 PS 4.7 – gather feedback from OEMs / ENCWG
 - Select navigational purpose based on optimum display scale of available datasets and selected display scale
 - Load datasets of selected navigational purpose, then fill in from more general usage bands
 - All data coverages within a dataset must be loaded and unloaded together
 - Add seamless presentation requirement for data from same navigational purpose
 - Or remove – no matching S-52 requirement
10. Update dataset converter or resource production of data which conforms to these changes

Next Steps

