



S-101 datasets to  
support S-64  
revision

S-164 Phase 1

September 1, 2020

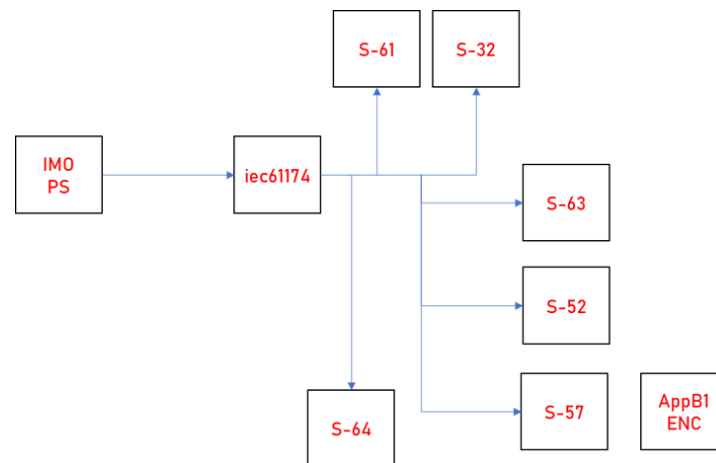
# Goals and Background

## Goals

- Overview of S-164 structure and content
- How S-164 fits with the development of standards for S-100 ECDIS
- Detail of “Phase 1” of S-164 creation

## S-64 Structure

1. Chart Loading and Updating
  2. Chart Display
  3. Chart Related Functions
  4. Alarms and Indications
    - Detection and Notification of Navigational Hazards
    - Detection of Areas for which special conditions exist
    - Detection and Notification of the Safety Contour
- S-100WG5
    - Keep Structure the same
    - Expand to include S-100 elements
    - Split into 4 phases/packages



# S-164 Structure

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## 1. Data Loading and Updating (all product specifications, including existing S-57 tests))

- Loading/Unloading of S-100 catalogues (Feature/Portrayal, Interoperability, Alarm/indication if applicable + others as defined in S-100)
- Loading/Unloading of data, S-101 and other product specifications.
- Loading of arbitrary product specifications into the system

## 2. Data Display and interoperability.

- S-101
- Other predefined S-100 product specifications (i.e. S-102, S-111)
- Arbitrary S-100 product specifications
- Testing of interoperability and flexible interrogation (i.e. S-98 + pick report formatting)
- Any co-existence tests required for side-by-side S-57/S-101 display.

## 3. Associated functions

- (existing chart display marginalia + any others required by e.g. interoperability) – expansion of existing Section 4 (“Chart Related Functions”).

## 4. Detection and Notification of:

- Navigational Hazards
- Areas for which Special conditions exist
- Rendering of safety contour
- Interoperability tests between stated S-100 product specifications using pre-defined alert/indication catalogues including safety contour rendering
- Ability of new S-100 product specifications to expose features which make up hazards, areas and safety contour to operate correctly.

## 5. Other operations specifically related to the implementation of S-100 Dual-Fuel ECDIS

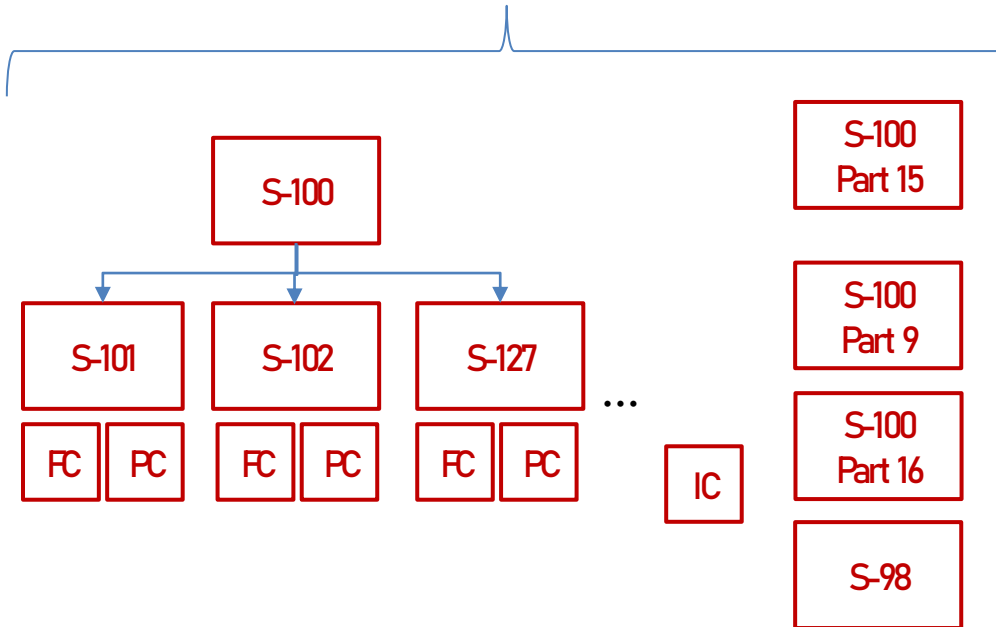
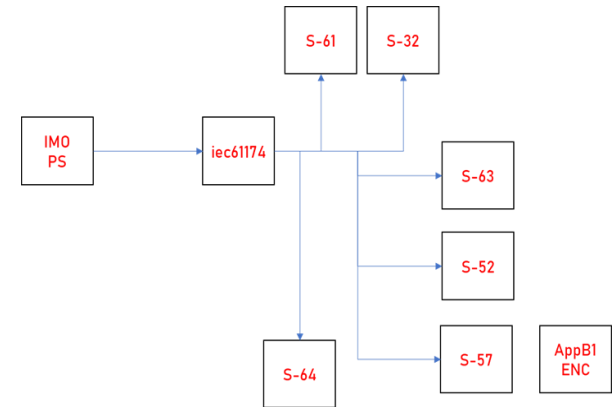
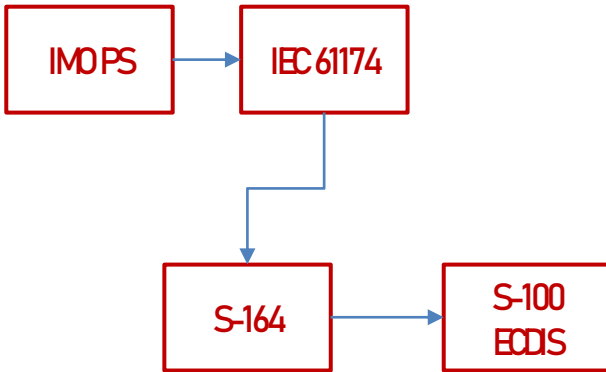
- Any co-existence tests required for side-by-side S-57/S-101 operation

# 4 Phases to create S-164

---

- Setup + Simple Migration
  - Establish new structure to hold S-164
  - Migration of existing data to new structure
  - Conversion of test datasets to S-101
- Addition of “Other” Product Specifications
  - S-100 specific features (complex attribution, information types, auxiliary file management), Conditional Symbology/Portrayal
  - New Product Specifications
  - Interoperability Level 0 - Co-Existence with other product specifications
  - Loading/Unloading/Updating functionality
- Added Functionality 1
  - Portrayal / Data Loading Strategy
  - Interoperability Level 1
  - Context Parameters
  - Interrogation
- Added Functionality 2
  - Interoperability Level 2
  - Alarm/Indication and safety contour functionality

# S-164 and the S-100 ECDIS



All the elements for the S-100 ECDIS are in place (although not all “finished”)

- Import of S-101
- Import of specified “other” S-100 PSs
- Import of “arbitrary” product specs
- ECDIS “Operation” in line with PS
- Dual Fuel (in Principle)

# Objectives for Phase 1

---

- *“Package 1 - Setup and simple migration”*
  - Establish a production environment where test datasets can be created and validated
  - Test current toolset and S-100/S-101 artifacts
  - Create S-101 versions of existing v3.0.2 data
  - Create environment suitable for review and update in future phases

# Data Input

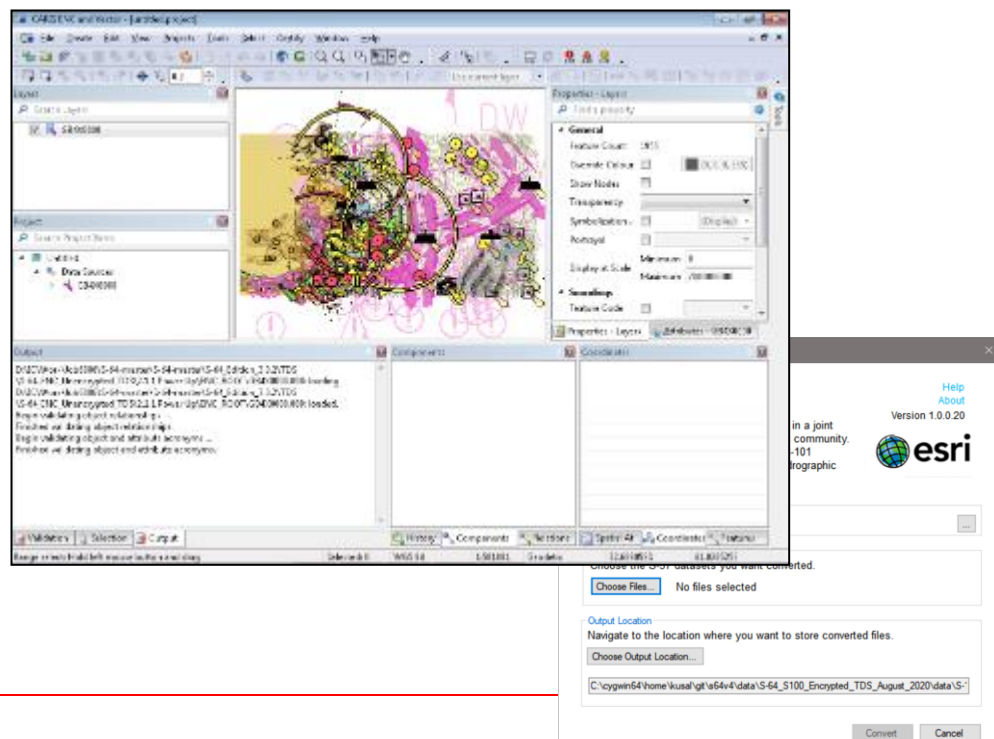
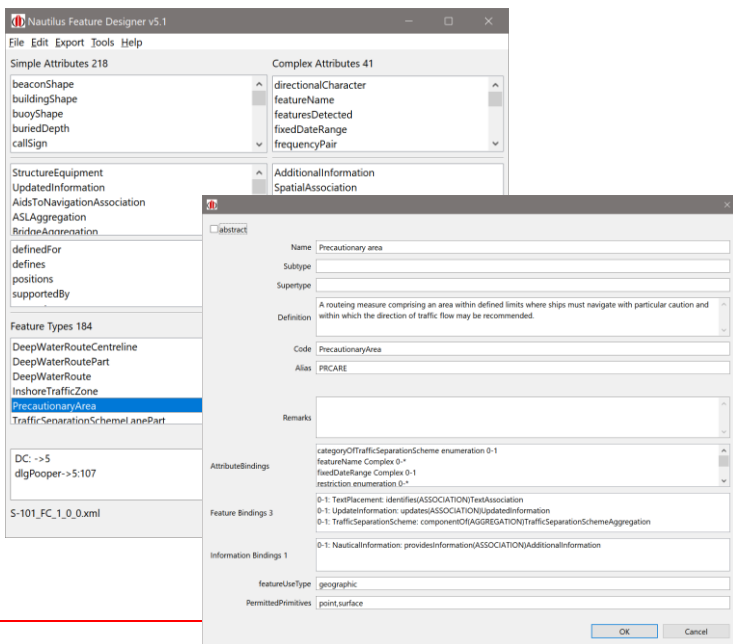
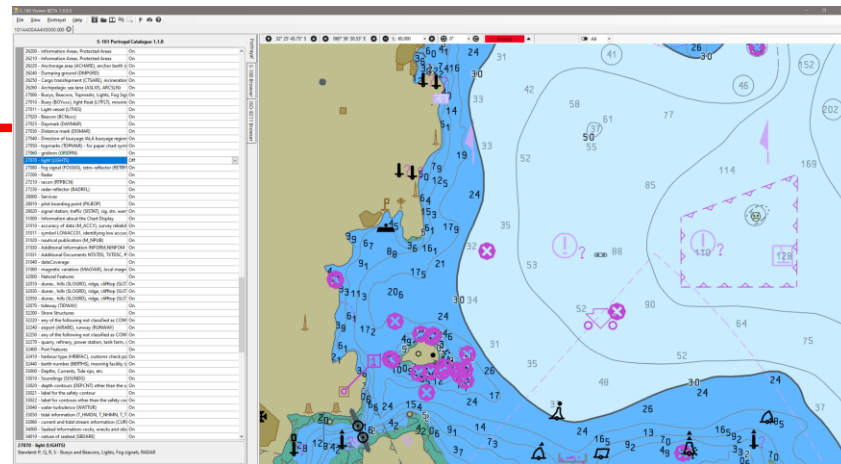
- Existing S-64 datasets (Unencrypted)
- Encrypted datasets (later)
- Feature Catalogues
  - IHO
  - Caris
- Portrayal Catalogue (NIWC)
- Test dataset manual text

The screenshot displays two windows from the 'IHO ENC Test Data Sets for ECDIS' application. The left window shows test results for 'Automatic updates of Unencrypted ENCs', specifically for 'Loading corrupted update' (Test Reference 2.2.1) and 'Loading sequential' (Test Reference 2.2.2). The right window shows a map of a coastal area with various navigational symbols and text, including a note about displaying updates at a scale of 1:20,000.

- 2.1.1 Power Up
- 2.1.5 Loading Corrupt Data
- 2.2.1 Corrupt Update
- 2.2.2 Loading of Updates
- 2.2.3 Loading of Invalid Sequence
- 2.2.4 Loading of New Update
- 2.2.5 Good Base Cells
- 2.2.5 Old Update
- 2.2.6 Re-issue
- 2.2.7 Cancellation
- 3.1 ENC Display
- 3.2 Invalid Object
- 3.3 Settings
- 3.4 Non-Official Data
- 3.6 Display Priorities
- 3.7 Overlap
- 3.7.7 Scale minimum
- 3.8.5 Non ENC data
- 3.9 Polar ENC Data
- 4.6 Accuracy
- 5.0 Navigational Hazards
- 6.0 Special Conditions
- 7.0 Safety Contour

# Environment

- CARIS S-57 Composer 4.1.2
  - CARIS S-100 module
- NIWC S-100 viewer
- ESRI converter
- IIC FC Inspector (S-101)



NEW PATHS. NEW APPROACHES





# Feature Catalogue

Nautilus Feature Designer v5.1

File Edit Export Tools Help

Simple Attributes 218

- beaconShape
- buildingShape
- buoyShape
- buriedDepth
- callSign

Complex Attributes 41

- directionalCharacter
- featureName
- featuresDetected
- fixedDateRange
- frequencyPair

StructureEquipment

UpdatedInformation

AidsToNavigationAssociati

ASLAggregation

BridgeAnnoeration

definedFor

defines

positions

supportedBy

Feature Types 184

- RadarLine
- RadarRange
- RadarStation
- AnchorageArea
- AnchorBerth
- SeanelandinoArea

-> 218 simple attributesDc  
dlgPooper->5:123

S-101FC\_1.0.0\_20190409.xml

abstract

Name: Anchorage area

Subtype:

Supertype:

Definition: An area in which vessels anchor or may anchor.

Code: AnchorageArea

Alias: ACHARE

Remarks:

AttributeBindings:

- categoryOfAnchorage enumeration 0-\*
- featureName Complex 0-\*
- fixedDateRange Complex 0-1
- periodicDateRanoe Comolex 0-\*

Feature Bindings 0

Information Bindings 0

featureUseType: geographic

PermittedPrimitives: point,surface

iho

abstract

Name: Anchorage area

Subtype:

Supertype:

Definition: An area in which vessels anchor or may anchor.

Code: AnchorageArea

Alias: ACHARE

Remarks:

AttributeBindings:

- categoryOfAnchorage enumeration 0-\*
- featureName Complex 0-\*
- fixedDateRange Complex 0-1
- periodicDateRanoe Comolex 0-\*

Feature Bindings 2

- 0-1: TextPlacement: identifies(ASSOCIATION)TextAssociation
- 0-1: UpdateInformation: updates(ASSOCIATION)UpdatedInformation

Information Bindings 1

- 0-1: NauticalInformation: providesInformation(ASSOCIATION)AdditionalInformation

featureUseType: geographic

PermittedPrimitives: point,surface

OK Cancel

caris

Feature/information associations							
Type	Association Name	Association Ends					
		Class	Role	Mult	Class	Role	Mult
Asso	Additional Information	Nautical Information	Information provided for	1,1	All Geo Features	Provides information	1,*

**Text association:** IHO Definition: A feature association for the binding between a geo feature and the cartographically positioned location for text.

**Remarks:**

- No remarks.

Role Type	Role	Associated With	Multiplicity
Association	Identifies	All Geo Features	1,1
	Positions	Text Placement	1,1

**Updated Information:** IHO Definition: A feature association for the binding between an update information metadata feature and updated feature(s) that it identifies.

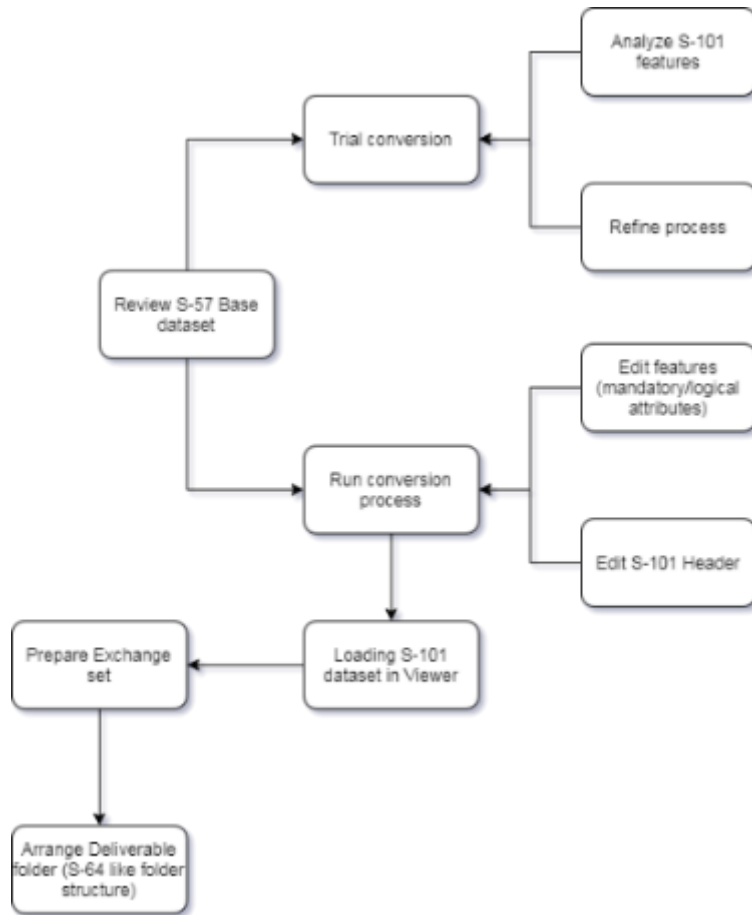
**Remarks:**

- An updated dataset feature can be any feature type instance that is subject to an ENC Update.

Role Type	Role	Associated With	Multiplicity
Association	Identifies	All Geo Features	1,*
	Updates	Update Information	1,1

- IHO Catalogue (current) doesn't contain all associations which are written in DCEG.
- Caris catalogue has these included
- Allows full range of INFORM conversions (and others)
- Need for abstract types in FC...?

# Process Definition



- **Setup**

- Setup production environment
- Define conversion, validation and test process
- Trial conversion process on basic dataset
- Design process & Review mapping rules
- Defined acceptance criteria – Valid, conforms to FC, consistent with S-100 encoding, S-101 DCEG and basic topology/geometry checks.

- **Convert S-57 TDS to S-101 TDS**

- Import Test dataset using S57 to S101 feature mapping rules
- Clean Group 1 features to align with S-101 DCEG
- Populate mandatory attributes
- Run QC checks and review geometry issues
- Rename text file names and re-assign to features
- Export Dataset
- Recreate updates (changes from S-57 updates) on S-101 base dataset
- Edit Exchange Set
  - Reissue cell
  - Cancellation update

- **Load S-101 dataset in Viewer**

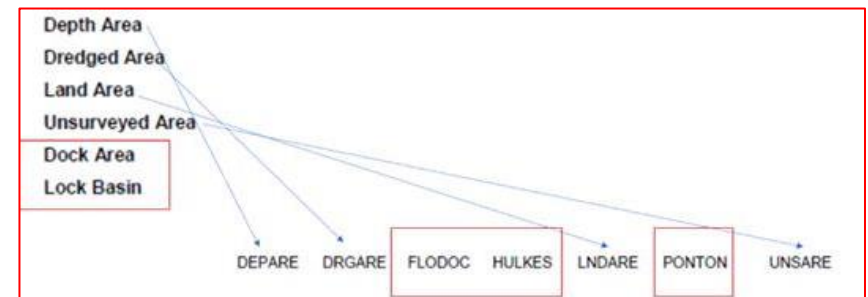
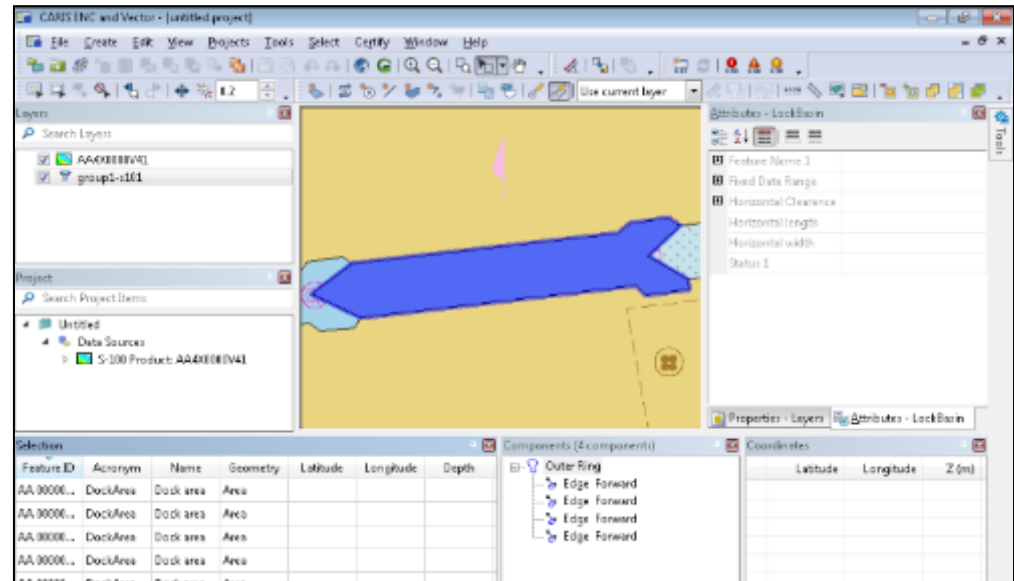
- Load and view base dataset
- Check dataset metadata and verify
- Fix any 8211 encoding issues
- If loading fails, edit dataset header using IIC tool
- Create Screenshot(s)
- Load Updates in Composer

- **Arrange datasets into S-64-like folder structure**

# AA4X0000 – Group 1 Feature Edits

“For each *DEPARE*, *DRGARE*, *LNDARE*, *DOCARE*, *LOKBSN* or *UNSARE* feature object of geometric primitive surface that *OVERLAPS* or is *WITHIN* another *DEPARE*, *DRGARE*, *FLODOC*, *HULKES*, *LNDARE*, *PONTON*, *DOCARE*, *LOKBSN* or *UNSARE* of geometric primitive surface”.

- Replaced *FLODOC*, *HULKES*, *PONTON* with *UNSARE* Feature
- Populated qualityOfbathymetry feature to the equal geometry of *UNSARE* feature



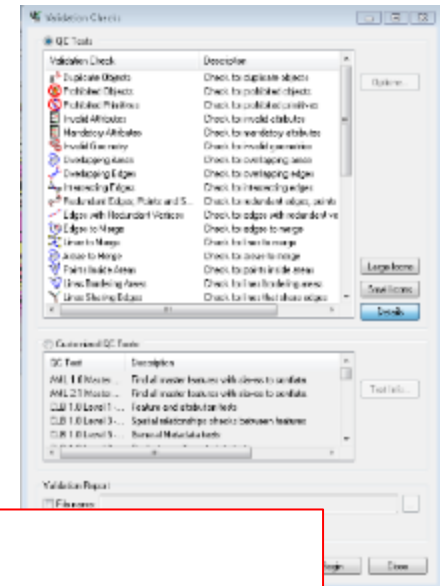
# AA4X0000 – Feature Edits

---

- Soundings with QUAPOS=5 - turned into DepthNoBottomFound features
- NEWOBJ (New Object) used to encode an unrecognised feature in S-57 transferred to VirtualAISaidToNavigation. Not all features are converted (mapping rules)
- Change of names for auxiliary files and their mappings within features
  - Example:
    - GBCHAINS.TXT to AACHAINS.TXT
    - GBDEVARE.TXT to AADEVARE.TXT
    - GBIECTMP.TXT to AAIECTMP.TXT
- Removal of any attributes not matching the feature catalogue bindings (e.g. Permanent Rivers)

# AA4X0000 – Validate through QC checks

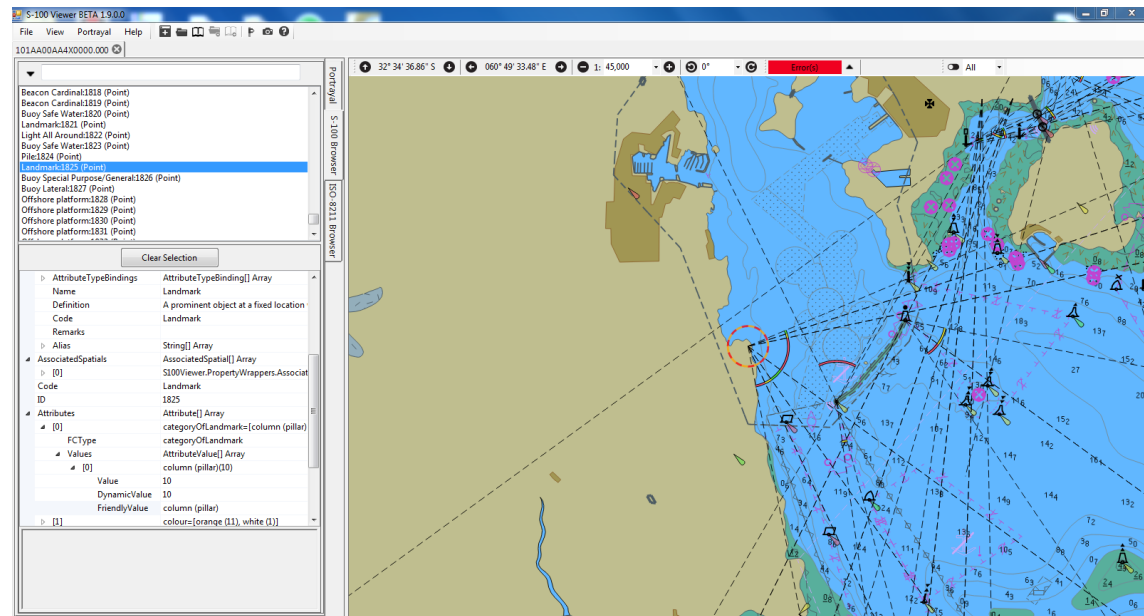
- QC Checks on all S101 datasets
- Clear critical errors with
  - Geometry
  - S-58 Depth Areas and Depth Contours
  - S-58 Orient/Usage/Mask Flags
  - Merged and Redundant Edges

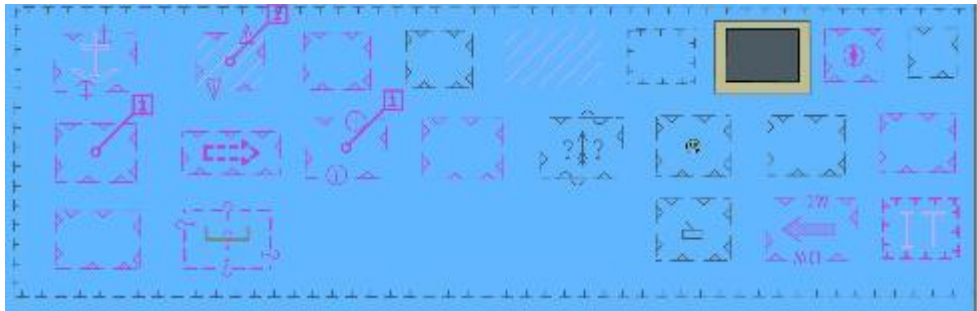
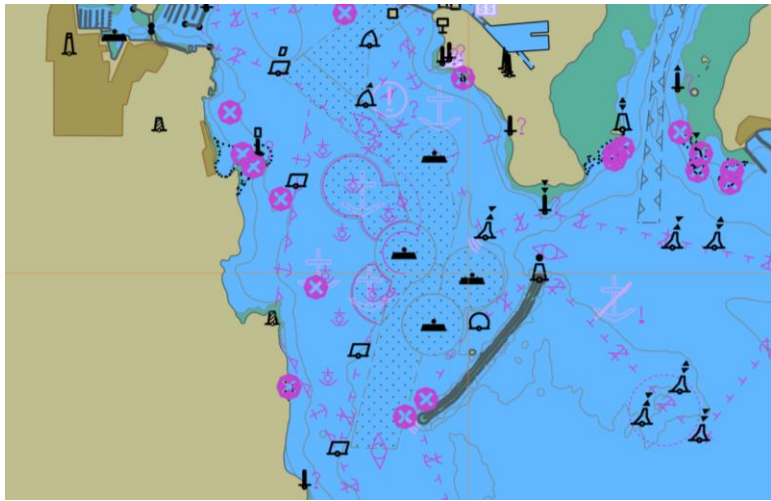
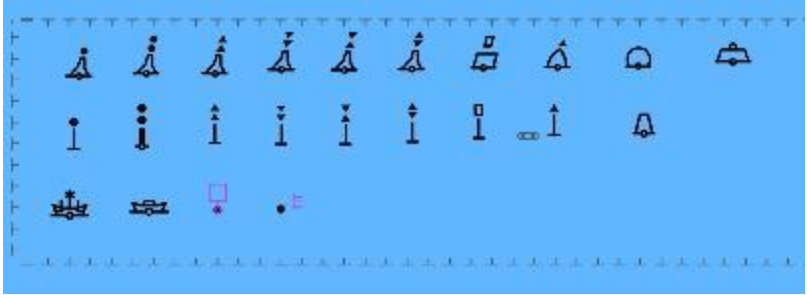
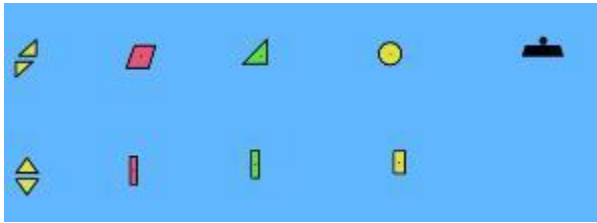
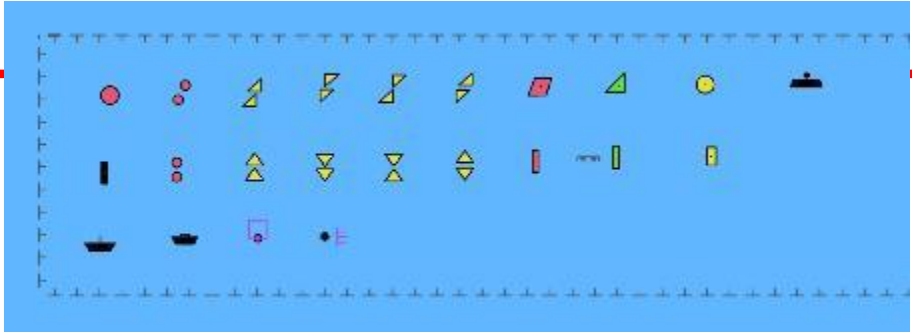
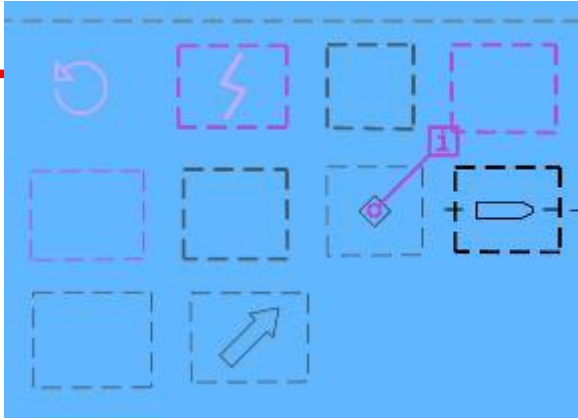


```
==== Validation Tests on Layer: AA4X000000V1 - start: Aug 18, 2020 7:09:21 PM =====
==== Validation, Duplicate Objects - start: Aug 18, 2020 7:09:22 PM =====
1 issue found.
Test ID: 20,402
Check Classification: WARNING
Description: Check that no object is duplicated (same class, same geometry)
Number of Groups of Duplicate Objects: 7
==== Validation, Duplicate Objects - end: Aug 18, 2020 7:09:22 PM (Elapsed Time: 00:00:00) =====
==== Validation, Prohibited Objects - start: Aug 18, 2020 7:09:22 PM =====
1 issue found.
Test ID: 20,416
Check Classification: ERROR
Description: Check that each feature is related to the minimum number of required features for each acronym.
Reference: Conformity to relationship definitions in the catalogue.
Solution: Add the missing feature relationships.
Number of Objects: 2
AA 0000009951 00100 PylonRidgeSupport has fewer Bridge aggregation relationships with Bridge than is required. Minimum is 1.
AA 0000009952 00100 PylonRidgeSupport has fewer Bridge aggregation relationships with Bridge than is required. Minimum is 1.
==== Validation, Prohibited Objects - end: Aug 18, 2020 7:09:22 PM (Elapsed Time: 00:00:00) =====
==== Validation, Invalid Attributes - start: Aug 18, 2020 7:09:22 PM =====
1 issue found.
Test ID: 6,016
Check Classification: INFORMATION
Description: Assigned enumerated value is not allowed for this object/attribute.
Solution: Check the enumerated value and verify it is permitted for this object/attribute pair.
Number of Objects: 17
(Select All)
AA 0000008578 00100 RestrictedAreaNavigational
Attribute: "restriction 2" Invalid Value: 9 (dredging prohibited)
Valid values are: 1 (anchoring prohibited), 2 (anchoring restricted), 7 (entry prohibited), 8 (entry restricted), 13 (no wake), 14 (area to be avoided), 25 (stopping prohibited), 26 (landing p
Attribute: "restriction 3" Invalid Value: 12 (diving restricted)
Valid values are: 13 (anchoring prohibited), 2 (anchoring restricted), 7 (entry prohibited), 8 (entry restricted), 13 (no wake), 14 (area to be avoided), 25 (stopping prohibited), 26 (landing p
AA 0000009170 00100 River
Attribute: "status" Invalid Value: 1 (permanent)
Valid values are: 5 (periodic/intermittent)
==== Validation, Invalid Attributes - end: Aug 18, 2020 7:09:23 PM (Elapsed Time: 00:00:00) =====
==== Validation, Mandatory Attributes - start: Aug 18, 2020 7:09:23 PM =====
1 issue found.
Test ID: 10,750
Check Classification: INFORMATION
```

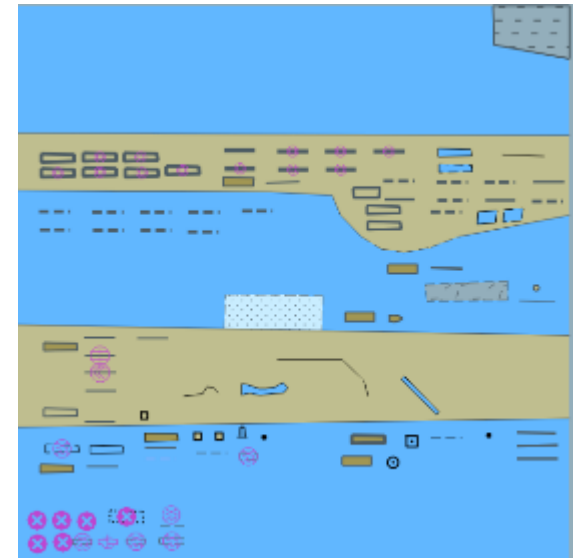
# S-101 TDS in NIWC S-100 viewer

- All test datasets load in v1.9.0 of NIWC viewer
- Portrayal, Interrogation, Relationships all function
- Issues with ISO8211 encoding, feature catalogue compatibility, some error messages
- Support from NIWC and Caris
- Good enough to make initial screenshots (stored in github)





- “Debugging” the S-64 against the S-164 datasets is not straightforward
- Impossible to compare 100% side by side – because S-101 modelling and S-57 modelling stem from different approaches. These are codified in the UOC and DCEG
- Need to go back to the tests and what drives them.
- Some tests are “exhaustive”, others are “procedural”
- The sequence is (for each existing test):
  - What does the test do? [in IMO / IHO[terms]?
  - Does the data still represent the test?
  - When the test is carried out, do the tools, catalogues and standards perform as expected – meeting the test
  - Are there any “significant” differences in display or behaviour?



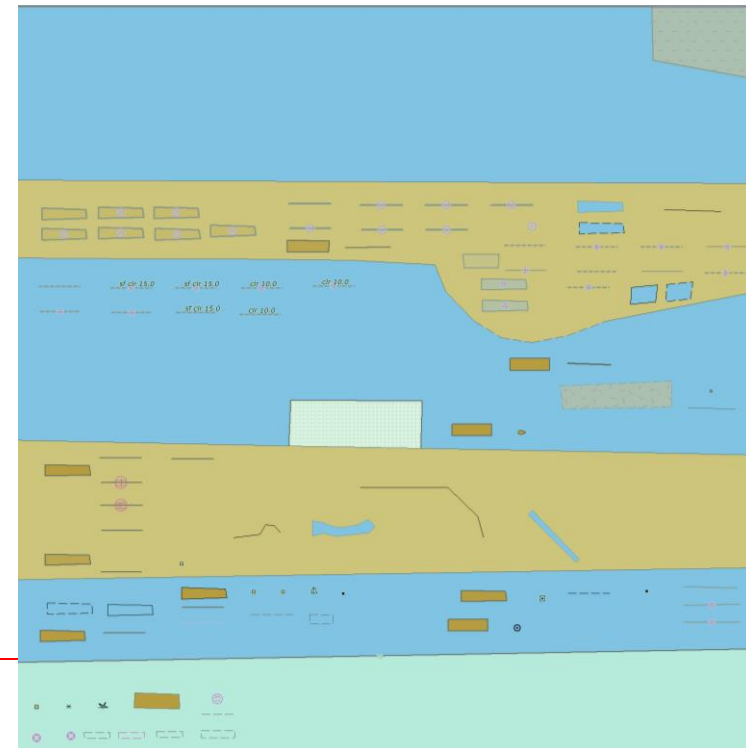
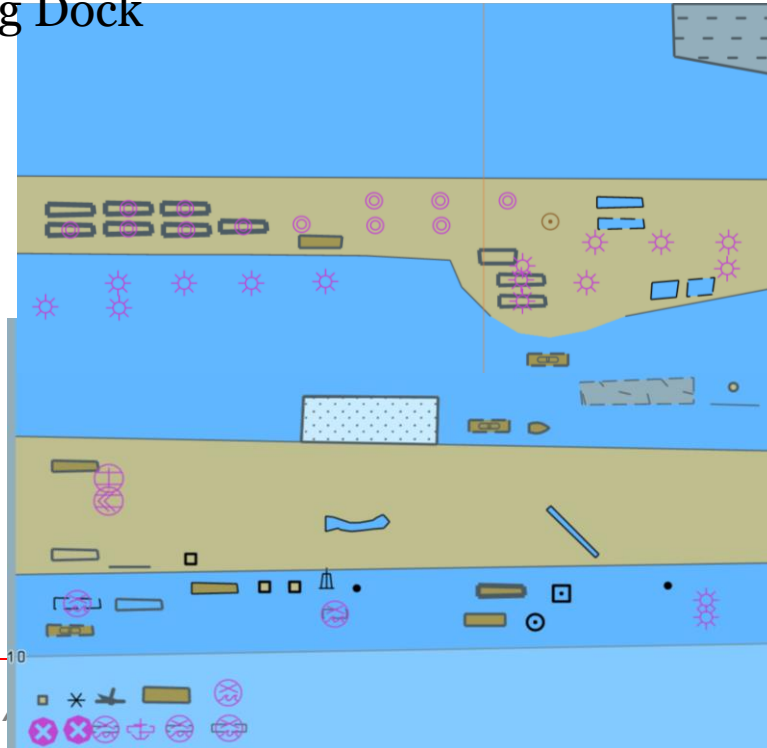


#### Test description

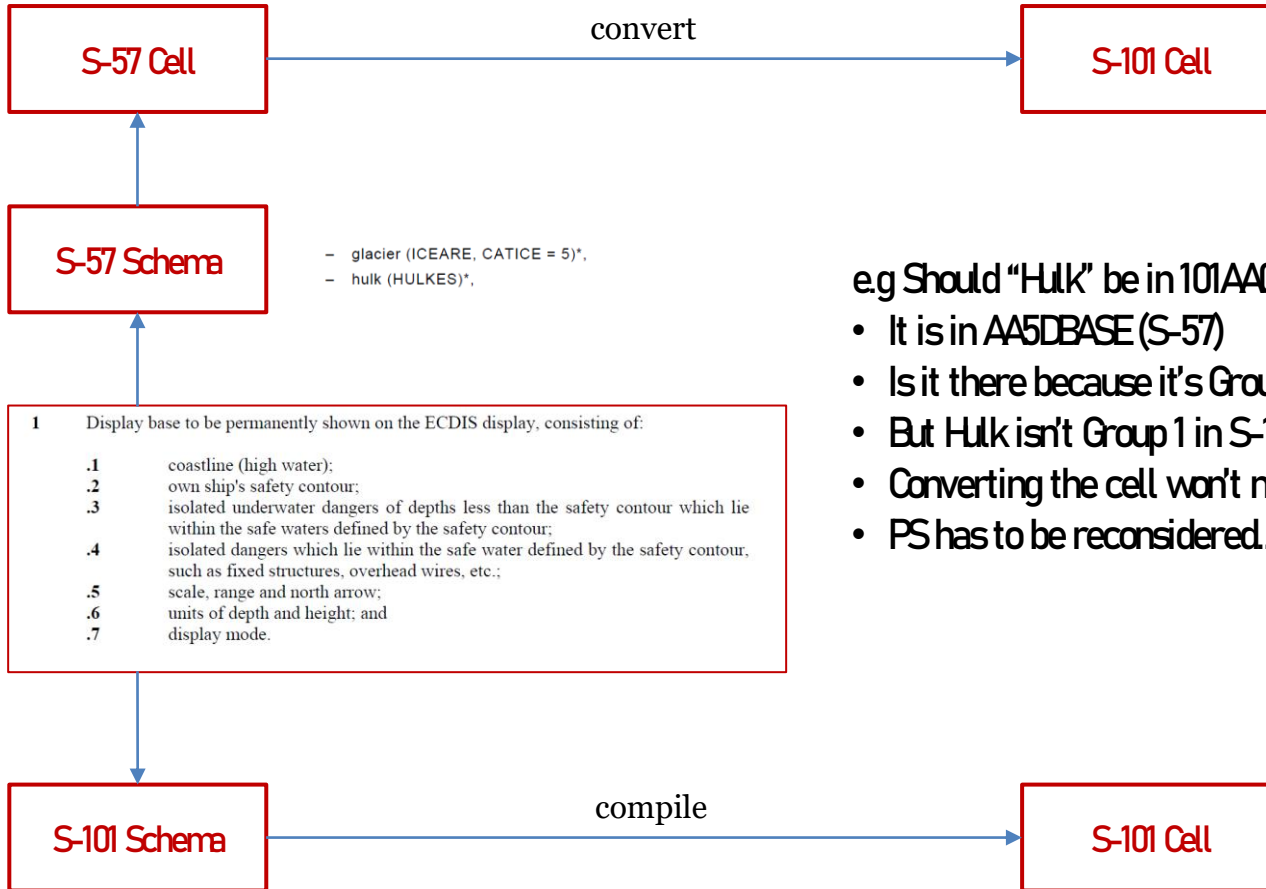
The purpose of the test is to verify by observation that ECDIS correctly displays all ENC objects included in the IMO Display Base category. The test is performed by loading to ECDIS test S-57 cell and checking

## Example: AA5DBASE

- Purpose of test is correct display of all ENC Objects in IMO Display Base
- Differences
  - Rivers (Curve)
  - Gate
  - Mooring Facility
  - Overhead Pipeline
  - Floating Dock

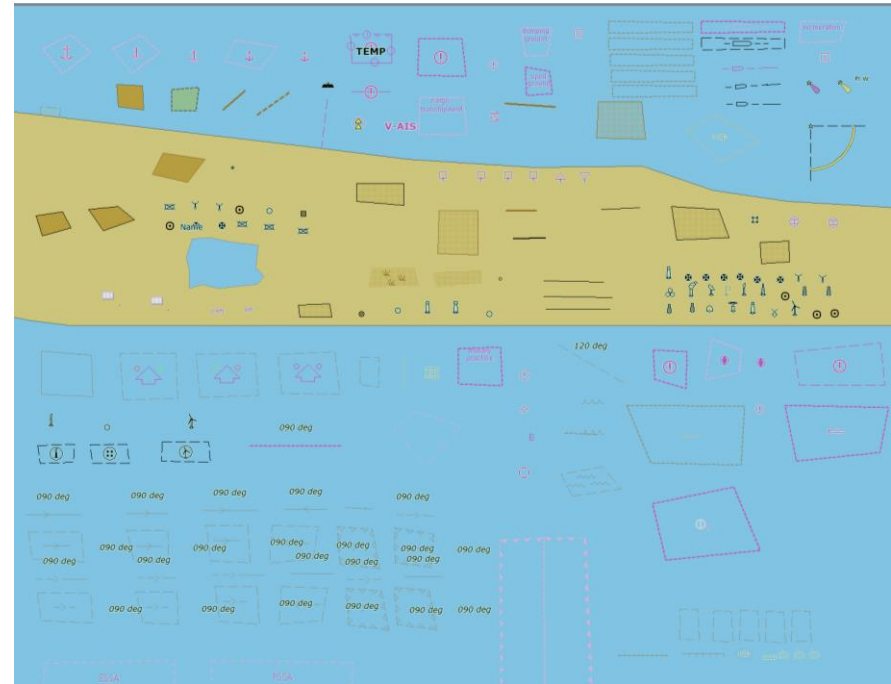
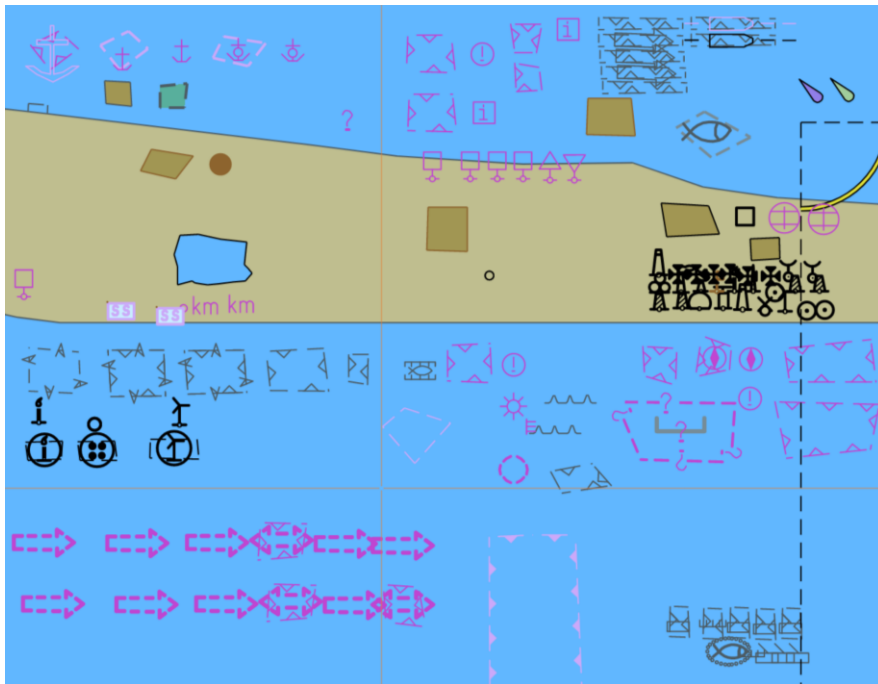


823(83)



e.g Should "Hulk" be in 101AA00AA5DBASE?

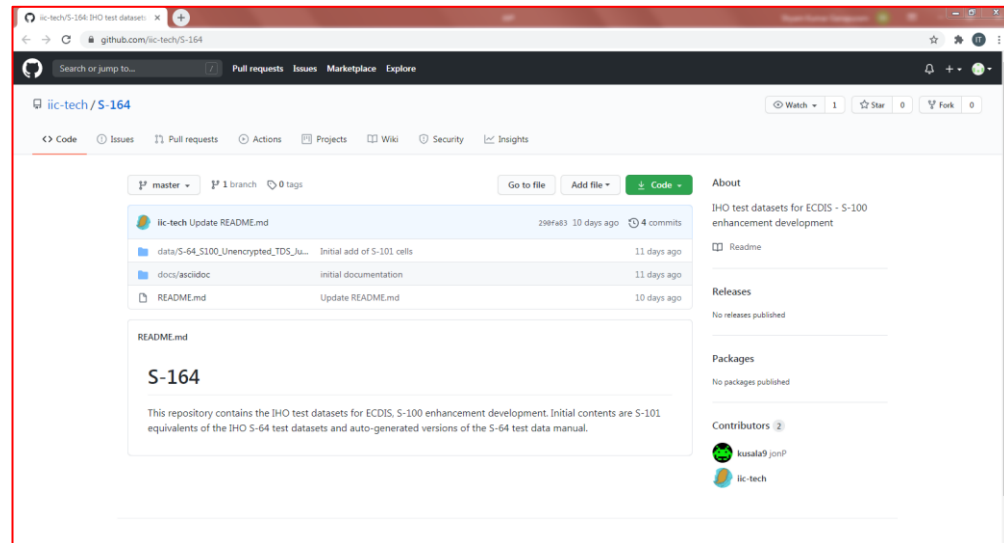
- It is in AA5DBASE (S-57)
- Is it there because it's Group 1 "permanently shown"?
- But Hulk isn't Group 1 in S-101
- Converting the cell won't necessarily be complete
- PS has to be reconsidered..



# S-64 S-101 TDS GitHub repository

<https://github.com/iic-tech/S-164>

- Repository open to all
- All test datasets
- Issues can be raised, discussed and resolved
- Hosts TDS manual source
- Full revision control
- Model used in ENC conversion (and S-58 workgroup)



# Text Dumps of Datasets

CR120/20(150/1) SpatialQuality:{ qualityOfHorizontalMeasurement=1, },  
CR120/23(150/1) SpatialQuality:{ qualityOfHorizontalMeasurement=1, },  
CR120/26(150/1) SpatialQuality:{ qualityOfHorizontalMeasurement=1, },  
CR120/1  
CR120/5  
CR120/9  
CR120/13  
CR120/17  
CR120/21(150/1) SpatialQuality:{ qualityOfHorizontalMeasurement=1, },  
CR120/2  
CR120/6  
CR120/10  
CR120/14  
CR120/18  
CC125/9  
SR130/3

FR100/1 LocalDirectionOfBuoyage LocalDirectionOfBuoyage:{ orientationValue=290, },

FR100/2 QualityOfBathymetricData QualityOfBathymetricData:{ categoryOfTemporalVariation=6, dataAssessment=3, featuresDetected{  
leastDepthOfDetectedFeaturesMeasured=0, significantFeat

uresDetected=0, }, fullSeafloorCoverageAchieved=0, horizontalPositionUncertainty:{ uncertaintyFixed, }, verticalUncertainty:{ uncertaintyFixed, }, },

FR100/251 RestrictedAreaNavigational RestrictedAreaNavigational:{ categoryOfRestrictedArea=10, restriction=1, restriction=9, restriction=12, },(150/1) NauticalInformation:{  
information:{ text=The site of historic wrecks are protected from unauthorised interference. For details see Annual Notice to Mariners ND16 and Admiralty Sailing  
Directions, }, },

FR100/252 RestrictedAreaRegulatory RestrictedAreaRegulatory:{ categoryOfRestrictedArea=10, restriction=1, restriction=9, restriction=12, },(150/1) NauticalInformation:{  
information:{ text=The site of historic wrecks are protected from unauthorised interference. For details see Annual Notice to Mariners ND16 and Admiralty Sailing Directions,  
}, },

FR100/253 Obstruction Obstruction:{ categoryOfObstruction=6, qualityOfVerticalMeasurement=2, waterLevelEffect=3, },

FR100/254 Obstruction Obstruction:{ categoryOfObstruction=6, qualityOfVerticalMeasurement=2, waterLevelEffect=3, },

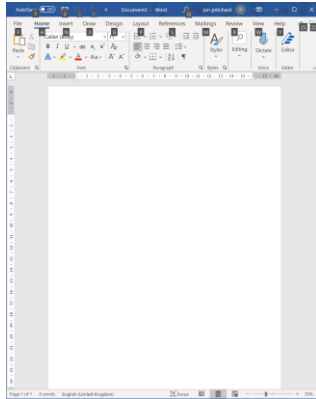
FR100/255 Obstruction Obstruction:{ categoryOfObstruction=6, qualityOfVerticalMeasurement=2, waterLevelEffect=3, },

FR100/264 LandArea LandArea:{ featureName:{ name=Monk Island, }, },

- To make it easier to keep track of, and inspect datasets and their content
- Dumps features and attribution and relationships
- Make sure exhaustive tests are specified
- Simple JSON style dump of features and geometry
- Can be auto-generated for cells and added to GitHub

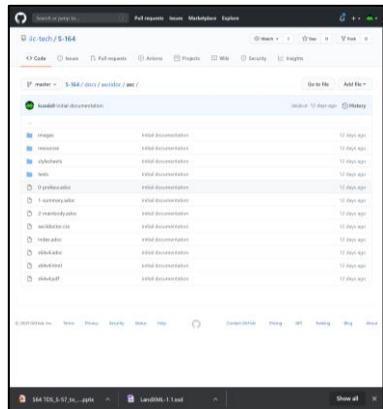
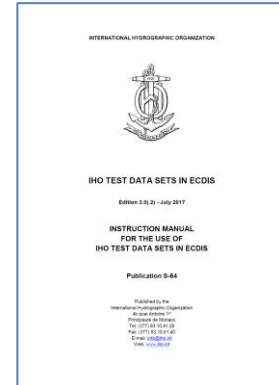
# Test Dataset Manual Creation

Now....



MS Word

SaveAs PDF



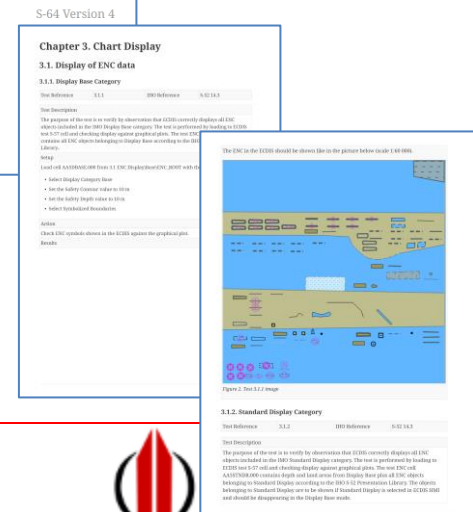
GitHub Repository



build



pdf



- Github repo stores text and screenshots under change control
- Build of PDF is done using asciidoc
- Template controls formatting
- Changes can be selectively included



# Test 3.1.2.adoc

## Standard Display Category

[width="95%",caption="",stripes="odd"]

Test Reference | 3.1.2 | IHO Reference | S-52143

[width="95%",caption="",stripes="odd"]

### Test Description

The purpose of the test is to verify by observation that ECDIS correctly displays all ENC objects included in the IMO Standard Display category. The test is performed by loading to ECDIS test S-57 cell and checking display against graphical plots. The test ENC cell AA5STNDR.000 contains depth and land areas from Display Base plus all ENC objects belonging to Standard Display according to the IHO S-52 Presentation Library. The objects belonging to Standard Display are to be shown if Standard Display is selected in ECDIS and should be disappearing in the Display Base mode.

### Setup

a) Load cell AA5STNDR.000 from 3.1 ENC Display\Standard\ENC\_ROOT with the following settings:

- \* Select Display Category Standard Display
- \* Set the Safety Contour value to 10 m
- \* Set the Safety Depth value to 10 m
- \* Select Symbolized Boundaries
- \* Select Simplified Points

### Action

Switch on Standard Display. Check ENC symbols shown in ECDIS against graphical plot.

### Results

- a) Confirm that depth and land areas from Display Base are shown
- \* The ENC in the ECDIS should be shown as in the picture below (scale 1:70 000).

.Test 3.1.2 image

image:images/3.1/AA5STNDR.png[scaledwidth=100%,align="center"]



## Chapter 3. Chart Display

### 3.1. Display of ENC data

#### 3.1.1. Display Base Category

Test Reference	3.1.1	IHO Reference	S-52 14.3
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#### Test Description

The purpose of the test is to verify by observation that ECDIS correctly displays all ENC objects included in the IMO Display Base category. The test is performed by loading to ECDIS test S-57 cell and checking display against graphical plots. The test ENC cell AA5DBASE.000 contains depth and land areas from Display Base plus all ENC objects belonging to Standard Display according to the IHO S-52 Presentation Library. The objects belonging to Standard Display are to be shown if Standard Display is selected in ECDIS and should be disappearing in the Display Base mode.

#### Setup

Load cell AA5DBASE.000 from 3.1 ENC Display\Standard\ENC\_ROOT with the following settings:

- Select Display Category Base
- Set the Safety Contour value to 10 m
- Set the Safety Depth value to 10 m
- Select Symbolized Boundaries

#### Action

Check ENC symbols shown in the ECDIS against graphical plot.

#### Results

The ENC in the ECDIS should be shown like in the picture below (scale 1:60 000).

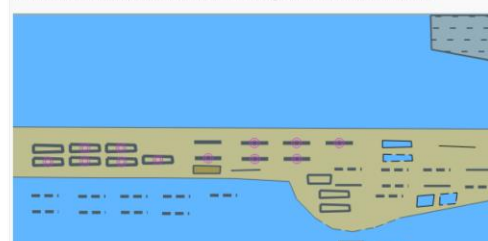


Figure 2. Test 3.1.1 image

#### 3.1.2. Standard Display Category

Test Reference	3.1.2
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#### Test Description

The purpose of the test is to verify by observation that ECDIS correctly displays all ENC objects included in the IMO Standard Display category. The test is performed by loading to ECDIS test S-57 cell and checking display against graphical plots. The test ENC cell AA5STNDR.000 contains depth and land areas from Display Base plus all ENC objects belonging to Standard Display according to the IHO S-52 Presentation Library. The objects belonging to Standard Display are to be shown if Standard Display is selected in ECDIS and should be disappearing in the Display Base mode.

10

Setup  
Load cell AA5STNDR.000 from 3.1 ENC Display\Standard\ENC\_ROOT with the following settings:

- Select Display Category Standard Display
- Set the Safety Contour value to 10 m
- Set the Safety Depth value to 10 m
- Select Symbolized Boundaries
- Select Simplified Points

#### Action

Switch on Standard Display. Check ENC symbols shown in ECDIS against graphical plot.

#### Results

- Confirm that depth and land areas from Display Base are shown
- The ENC in the ECDIS should be shown as in the picture below (scale 1:70 000).

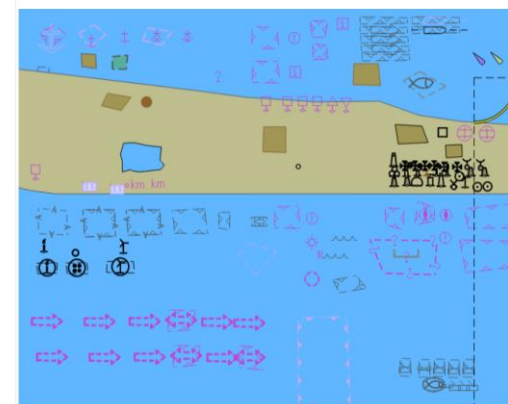
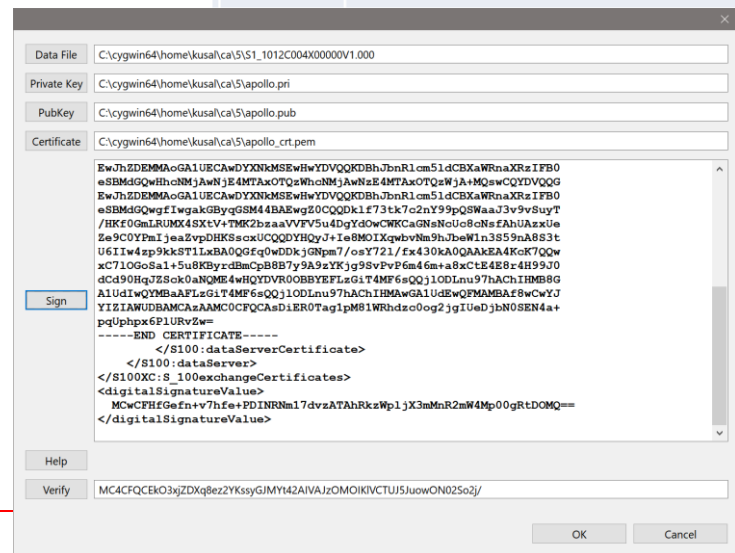


Figure 3. Test 3.1.2 image

# Encrypted test datasets

- Initial Analysis done
- Test cases to be preserved identified
- Requires building from scratch rather than conversion
  - Differences between Part 15 and S-63
  - Signing is in CATALOG.XML
  - Optional Encryption
  - ECDIS loading not fully defined
  - Status Report not defined (S-98 Annex C?)
  - Service elements?
- Some issues still to agree with implementers
- Target Phase 2
- Digital Signing Verification and Encryption tool ready to deploy

Description of encrypted test dataset cases...	
2.5.2a)	Permit with no cell permits
	Permit with wrong name
2.5.2b)	Incorrectly formatted Permit String
2.5.2c)	Invalid Checksum
2.5.2d)	Expiry within 30 days
2.5.2e)	Expired
2.5.2f)	Valid Loading
2.5.2g)	Loading from two DS
2.5.2h)	Install and deletion of permits from DS
2.5.4a)	Self-Signed data
2.5.4b)	Import of new root key
2.5.4c)	No root key installed
2.5.4d)	Expired root certificate
2.5.4e)	In correct format of root certificate
2.5.4f)	Multiple SA, in correct certs...
2.5.5a)	Invalid SA signature in a signature file.
2.5.5b)	Invalid SA root certificate (delivered)
2.5.5c)	Mixture of 1 valid and one invalid cell sig
2.5.5d)	incorrectly formatted signature (mix)
2.5.5e)	Mixture of valid and invalid base and update signatures
2.5.5f)	Multiple data servers (x2), update and base
2.5.6a)	try to install cells with expired permits
2.5.6b)	permit expiry within 30 days
2.5.6c)	Mixture of correct/incorrect cell keys in permit
2.5.6d)	Mixture of CRC valid/invalid from permit which kills updating
2.5.6e)	missing update, specified in products.txt

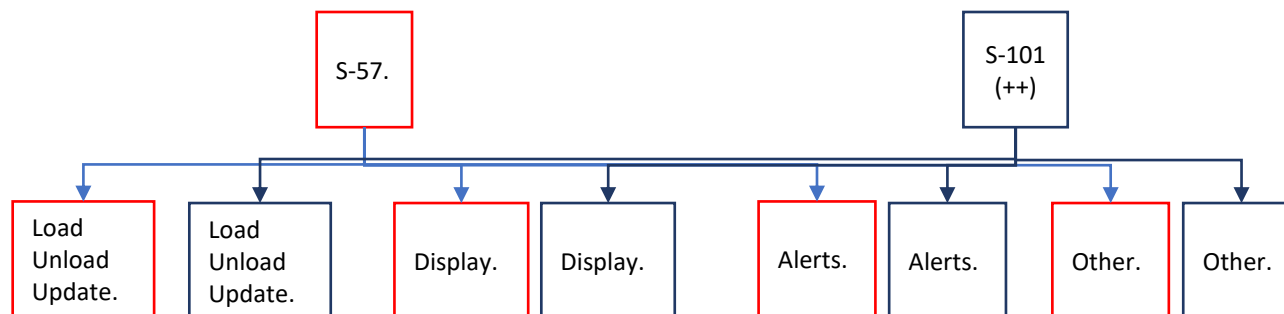




# Next Steps – Phase 2

- S-101 datasets arranged into S-164 folder structure
- This will expand in future phases to accommodate new datasets
- Refinements to data can be made to meet requirements of tests
- Need to focus on purpose of tests
- We can also now define datasets for “co-existence”
  - Partitioned between S-101 and S-57
  - Prelude to full dual fuel testing (as we define DF better)
- New product specs, full loading/unloading, use S-98 templates
- More detailed ECDIS functionality.
  - Coverage
  - Hazards/Warnings
  - Portrayal
  - Exhaustive testing

Package 2 - Addition of other product specifications	(1-4)d	New product specs including catalogues
	(1-4)f	Co-Existence with other product specifications
	(1-4)e	Loading/Unloading/Update functionality



# Priorities

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- Build a full model of the standards, references and elements making up the S-100 ECDIS manufacture, its type approval testing and live use
- Establish a full working model of Dual Fuel ECDIS which can be tested and which delivers a model capable of spanning the transition period
- Support transition efforts, data producers and validation efforts