SDB Day 2018

6 & 7 June 2018

Herrsching, Germany

Quality Indication of SDB Data in ECDIS

Friedhelm Moggert-Kägeler, SevenCs

SevenCs Software

Introduction of SevenCs

Introduction SevenCs

- Located in Hamburg, founded in 1992
- 7Cs belongs to ChartWorld International group of companies (*Digital Chart Agent, ECDIS Manufacturer, VAR, ENC and SENC distribution services*)
- Products and Services related to ENC / ECDIS
- Long term member of IHO Working Groups
  - S-100 Working Group, ENC Working Group
  - Contributor to S-100/S-101 Testbed

ChartWorld
ECDIS as a Service

SevenCs

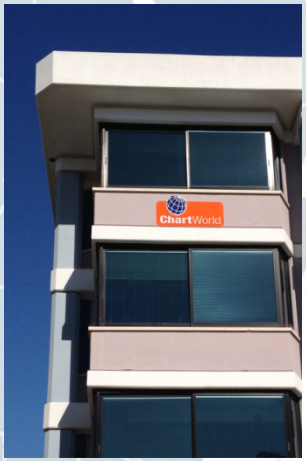
Founded in **1992**

80+ Employees

4 Office locations

Hamburg

Limassol

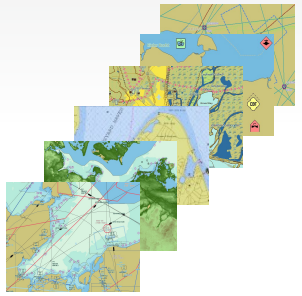


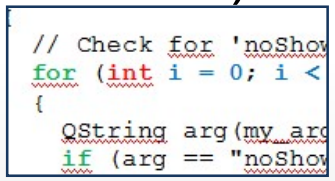
Tokyo

Singapore

SevenCs - Products and Services

- ECDIS Kernel software
- Web based solutions for electronic charts
- Chart Production/Validation Software
- Navigation Software (ECS, PPU)
- Software Development (e.g. ECDIS for ChartWorld)
- Training and Consulting





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SDB for Chart Production

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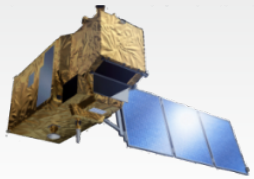
SDB Source Data



- Origin of data is different from traditional hydrographic survey data
- Specific processing methods
- Resulting SDB provided in common bathymetric data formats
  - Gridded Bathymetry (S-102, BAG, ASCII Grid, …)
  - XYZ point clouds
- Accuracy: 0.5m + 0.1 * depth (20m => 2.5)

Chart production with SDB data

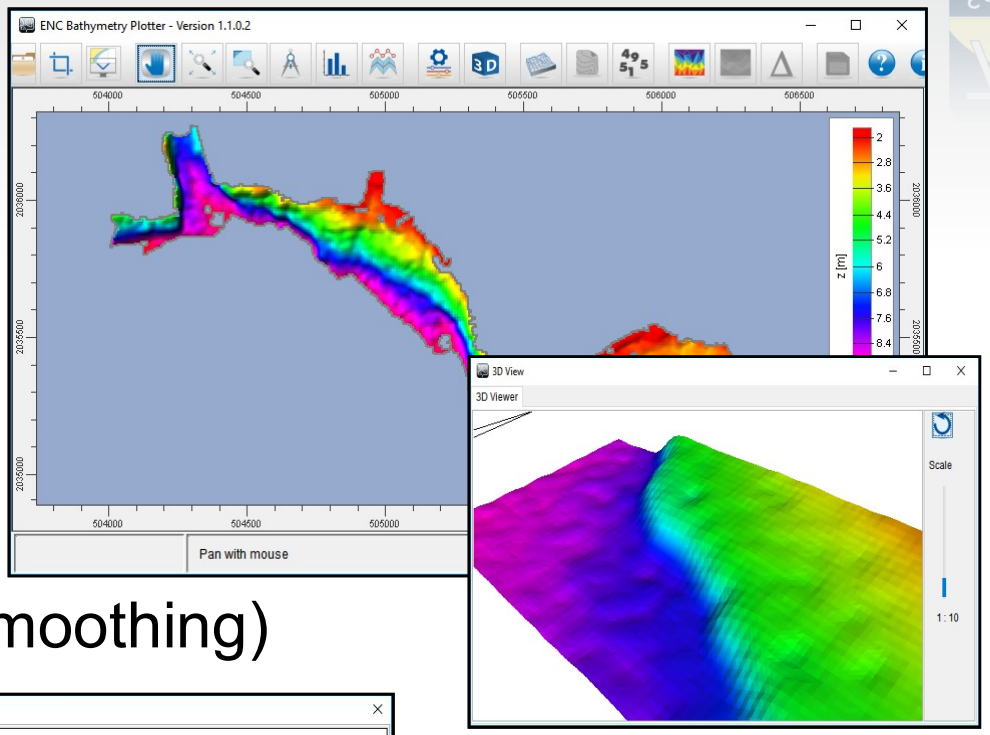
Existing solutions for management and processing of bathymetric data can be used:

1. Import of SDB data

```
5040006.99;2035935.00;-4.63
5040006.99;2035932.99;-4.71
5040008.99;2035937.00;-4.60
5040008.99;2035935.00;-4.62
5040008.99;2035932.99;-4.73
5040008.99;2035931.00;-4.79
5040010.99;2035938.99;-4.59
5040010.99;2035937.00;-4.63
5040010.99;2035935.00;-4.68
5040010.99;2035932.99;-4.73
```

Chart production with SDB data

2. Review of data,



3. Modelling

(Generalization and Smoothing)

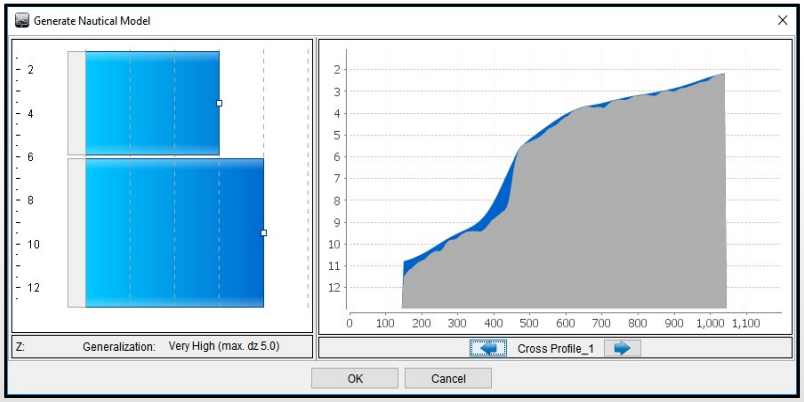


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Chart production with SDB data

4. Contour generation and sounding selection

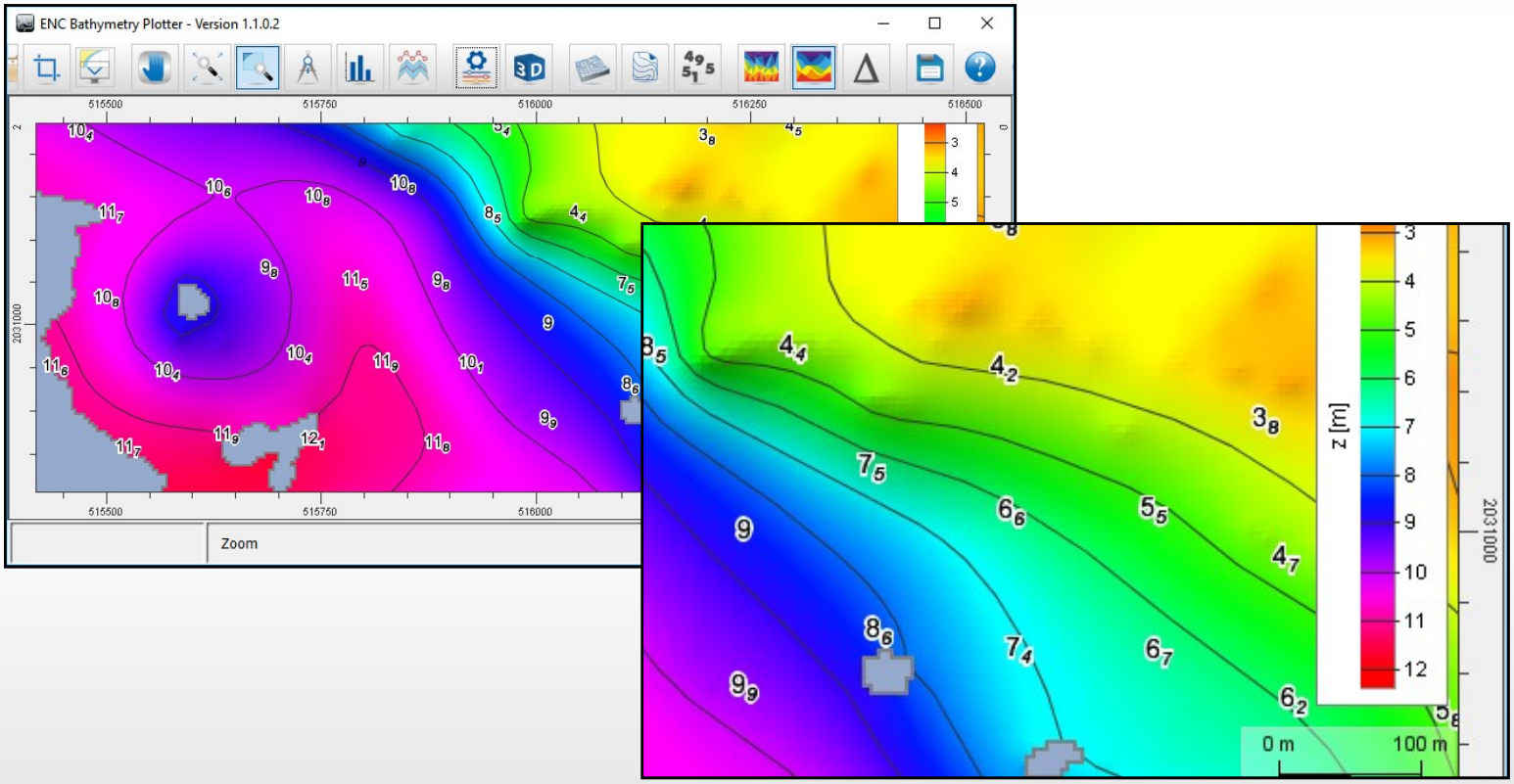

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Chart production with SDB data

4. S-57 encoding (feature creation, accuracy information)

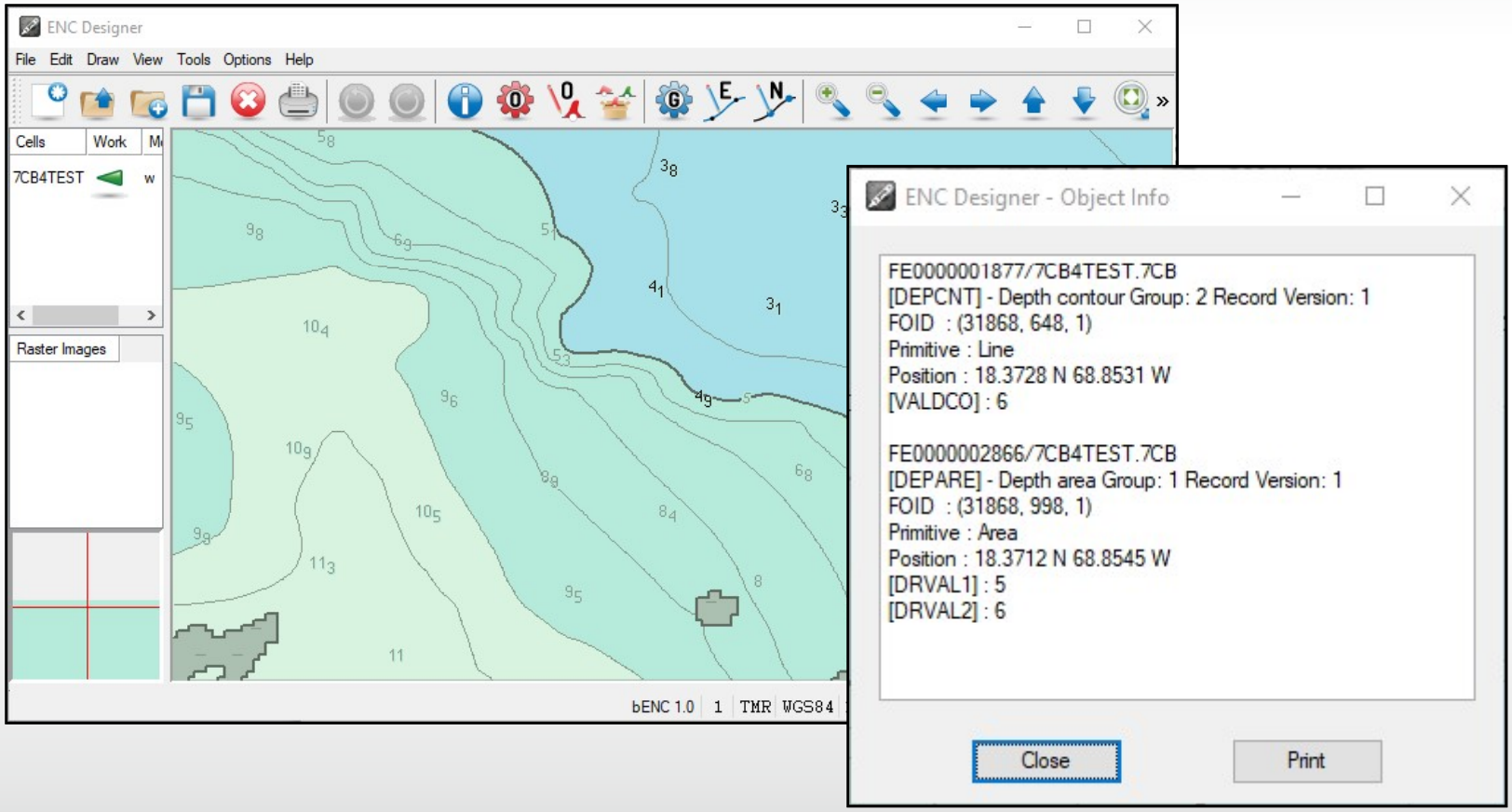

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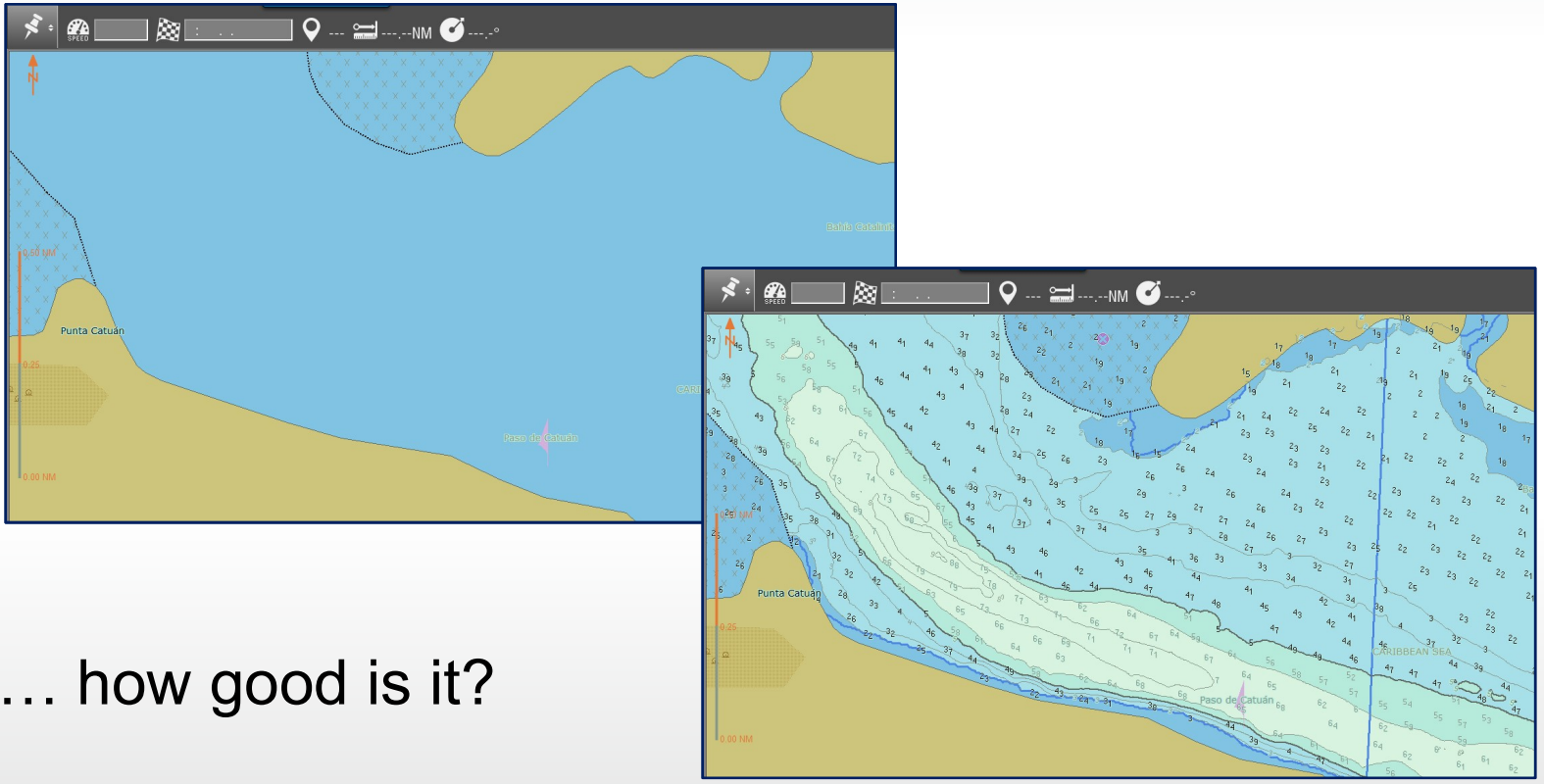
Chart production with SDB data

5. SDB data in navigation system …



… how good is it?

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Accuracy in ENCs

Accuracy Information in ENCs

- Quality of Data (M_QUAL)
- Minimum criteria for position and depth accuracy and seafloor coverage
- Zone of Confidence (CATZOC) 5 Categories:

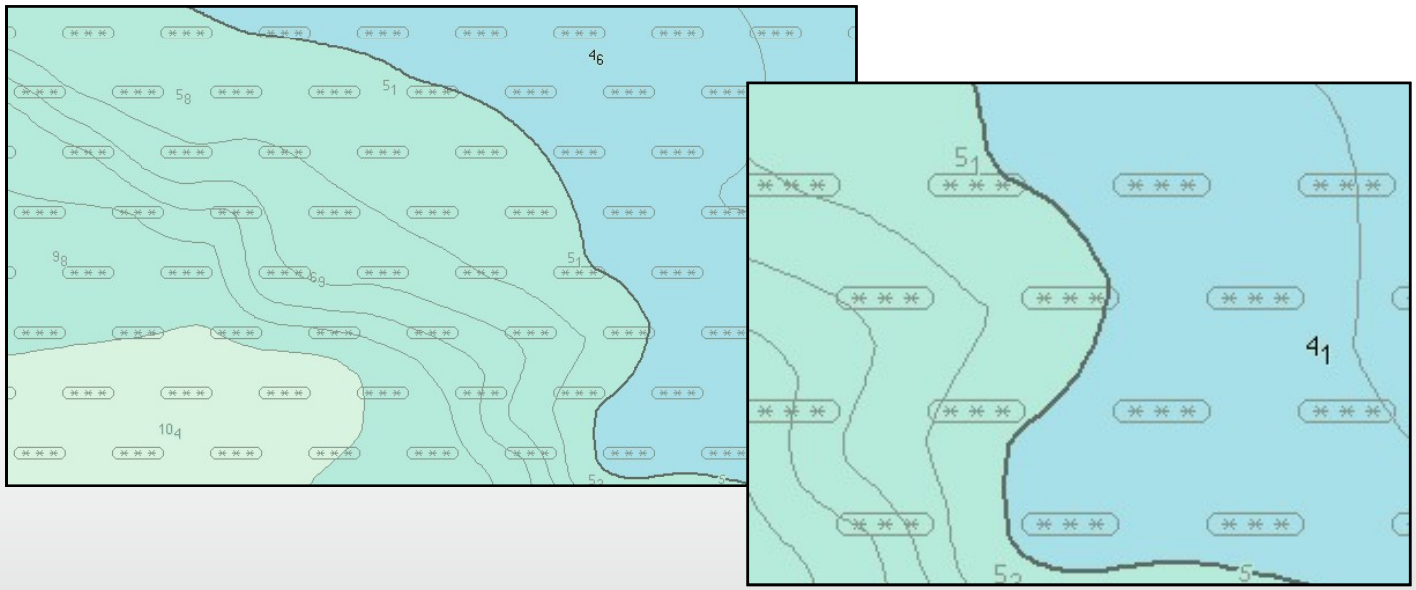
  A1, A2, B, C, D, U
- Components
  - Position Accuracy, Depth Accuracy
  - Seafloor coverage (e.g. full area search)
  - Typical survey characteristics

CATZOC Table

ZOC	Position Accuracy	Depth Accuracy	Seafloor Coverage	Typical Survey Characteristics
A1	± 5 m + 5% depth	=0.50 + 1%d	Full area search undertaken. Significant seafloor features detected and depths measured.	… high position and depth accuracy achieved using **DGPS** … and **multibeam-system** …
A2	± 20 m	= 1.00 + 2%d	Full area search undertaken. Significant seafloor features Detected and depths measured.	… position and depth accuracy less than ZOC A1… using a **modern echo sounder**
B	± 50 m	= 1.00 + 2%d	Full area search not achieved; uncharted features, hazardous to surface navigation are not expected but may exist.	… similar depth but **lesser position accuracies** than ZOC A2
C	± 500	= 2.00 + 5%d (10m => 2.5m) (20m => 3.0m)	Full area search not achieved, depth anomalies may be expected.	Low accuracy survey or data **collected on an opportunity basis** such as soundings on passage.
D	worse	worse	Full area search not achieved, large depth anomalies may be expected.	**Poor quality data** or data that cannot be assessed due to lack of information
U	Unassessed			

CATZOC information in ECDIS

- “Star Symbols” are used
- Number of stars correspond to ZOC category
- “The more the better …”



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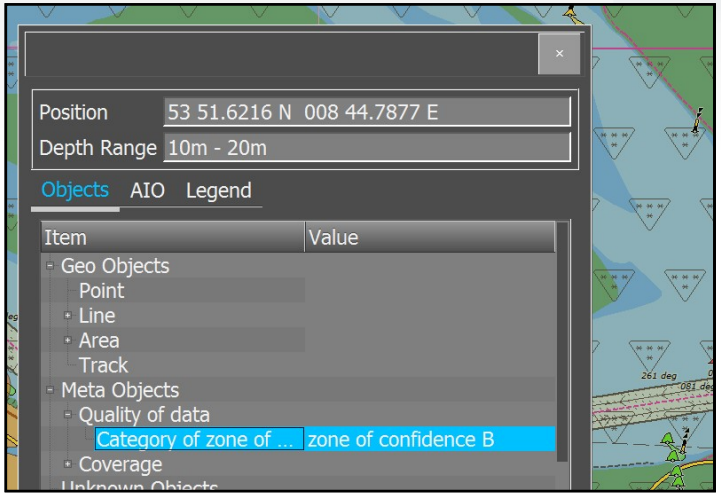
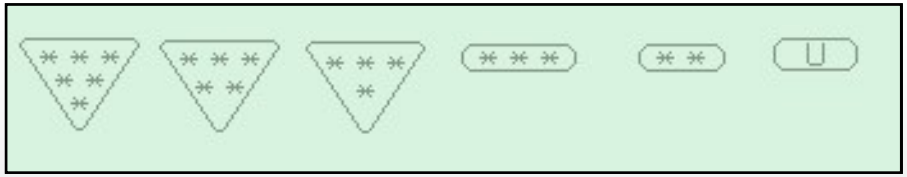
CATZOC information in ECDIS

- CATZOC can also be queried

  in Pickreport



- Mariners can derive CATZOC from number of stars



CATZOC assessment for SDB

What CATZOC for SDB data?

ZOC	Position Accuracy	Depth Accuracy	Seafloor Coverage	Typical Survey Characteristics
A1	± 5 m + 5% depth	=0.50 + 1%d	Full area search undertaken. Significant seafloor features detected and depths measured.	… nigh position and depth accuracy achieved using **DGPS** … and **multibeam-system** …
A2	± 20 m	= 1.00 + 2%d	Full area search undertaken.	… position and … than …
B			… to surface navigation are not expected but may exist.	… **accuracies** than ZOC A2
C	± 500	= 2.00 + 5%d (10m => 2.5m) (20m => 3.0m)	Full area search not achieved, depth anomalies may be expected.	Low accuracy survey or data **collected on an opportunity basis** such as soundings on passage.
D	worse	worse	Full area search not achieved, large depth anomalies may be expected.	**Poor quality data** or data that cannot be assessed due to lack of information
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Rule: The lowest rating for any individual component within that area determines which ZOC category is assigned

CATZOC Guide for Mariners'

- Draft IHO S- 67 "Mariners' Guide to Accuracy of ENCs"
- Describes impact of ZOC categories upon mariners:
  - **ZOC A1** and **A2**: navigate with confidence, very small possibility that a significant feature may remain undetected.
  - **ZOC B**: unlikely that uncharted dangers exist.
  - **ZOC C**: hazardous uncharted features may be expected.
  - **ZOC D**: sparse data or not surveyed at all, high degree of caution

Does ZOC C apply to SDB?

S-57/S-67 interpretation of ZOC C

- Depth anomalies may be expected (undetected ‘surprises),
- Low accuracy survey or data collected on an opportunity basis (e.g. soundings on passage),
- avoid these areas if possible (particularly in coastal waters),
- strong possibility of undetected features,
- considered inadequately surveyed,
- hazardous uncharted features may be expected,
- particularly in reef and rocky areas,
- Caution close to shore or adjacent reefs, where depths may rise rapidly from the sea floor.

Questions

- Does ZOC C describe SDB accuracy appropriately?
- Extension of ZOC categories required?
- Should IHO introduce an SDB specific ZOC category?
- What would be the appropriate advise to mariners sailing on SDB data?
- How does S-101 deal with quality information of bathymetric data?

Thank you very much

for your attention

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