



S-100WG5 DQWG Report

S-100WG5-03.8



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DQWG15, 4 – 7 February 2020, Monaco

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- 12 delegates from 10 Member States. (Brazil, Denmark, Finland, France, Italy, Netherlands, Norway, Sweden, United Kingdom, United States)
- 2 representatives from RENCs (IC-ENC, PRIMAR)
- 4 expert contributors (ESRI, Teledyne-CARIS, 7Cs, University of New Hampshire)
- 2 stakeholders (CSMART, INTERTANKO)
- 1 NGIO (Inland ENC Harmonisation Group)
- 2 IHO Secr. Staff



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DQWG Terms of Reference

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- Overall Objective: To ensure that the data quality aspects are addressed in an appropriate and harmonized way for all S-100 based product specifications.

Tasks:

- Develop a Data Quality Checklist
- Review S-100 Product Specifications for DQ aspects
- Monitor ISO / other international standards for DQ aspects
- Provide guidance to HOs on data quality aspects
- Provide data quality educational material for the end user
- Review methodology for the display of quality information
- Propose new DQ topics for consideration by HSSC



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Data Quality Checklist

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Version Number	Date	Author	Purpose
-	09 May 2018	R.Broekman	Data Quality Checklist, draft 0.3 (IHO-DQWG)
0.2	20 Aug 2018	R. Mayankar, E.Mong	First draft of S-97 part C prepared from Data Quality Checklist draft 0.3
1.0.0 RCI	13 May 2019	R. Mayankar, E.Mong	DQWG revisions, IHO Secretariat styling; S-100WG4 decisions, references updated following publication of S-100 4.0.0
1.0.0	xxx 2019	S-100WG	First edition



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Data Quality Checklist - Contents

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1. Overview
2. Introduction
3. References
4. Terms and abbreviations
5. Overview of Data Quality Measures
6. Recommendations for Product Specification Developers
7. Data Quality Measures
8. Minimum Standard for Data Validation (under development)



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Tools/guidance documents for PS developers/HOs/RENCs

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- NOAA will host a Data Quality collaborative wiki access (May 2020)
- This DQ wiki will contain tools and guidance documents

- Current guidance documents are:
 1. DQWG15-04.1C Explaining feature catalogues
 2. DQWG15-04.3A Data validation ISO principles
 3. DQWG15-04.4A How to evaluate a S-100 Exchange Set

- Current tools are:
 1. DQWG15-04.1B S-1xx Feature Catalogue Dictionary by DQWG
 2. DQWG15-04.5B S-101 Feature Catalogue by DQWG
 3. NLHO validation software



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Standardization within the S-100 Hydrographic Domain

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- S-101 ENC production systems and validation tools to be ready **by end 2022**, training can be provided

S-100 PS	Name	Developed by (accountable/executing)	Latest available Edition
S-101	Electronic Navigational Chart	S-100WG / <u>S-101PT</u>	Ed 1.0.0
S-102	Bathymetric Surface	S-100WG / <u>S-102PT</u>	Ed 2.0.0
S-104	Water Level Information for Surface Navigation	TWCWG	Not available at this time
S-111	Surface Currents	TWCWG	Ed 1.0.0
S-122	Marine Protected Area	NIPWG	Ed 1.0.0
S-123	Radio Services	NIPWG	Ed 1.0.0
S-124	Navigational Warnings	NIPWG	Not available at this time
S-129	Under Keel Clearance Management	S-100WG / <u>S-129PT</u>	Ed 1.0.0



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Validation of S-100 Feature Catalogues

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- NLHO has produced software that can automatically validate the published Feature Catalogue against the published XML Validation Schema (.xsd)
- DQWG has tested this for the PS of S-122, S-123 and S-127
- The software is also capable of testing the XML Validation Schema's against each other (Validating the Validators)
- Results are provided in the report to S-100WG
- S-100WG is recommended to provide XML Validation Schema's for S-101, S-102 and S-129 at the earliest opportunity

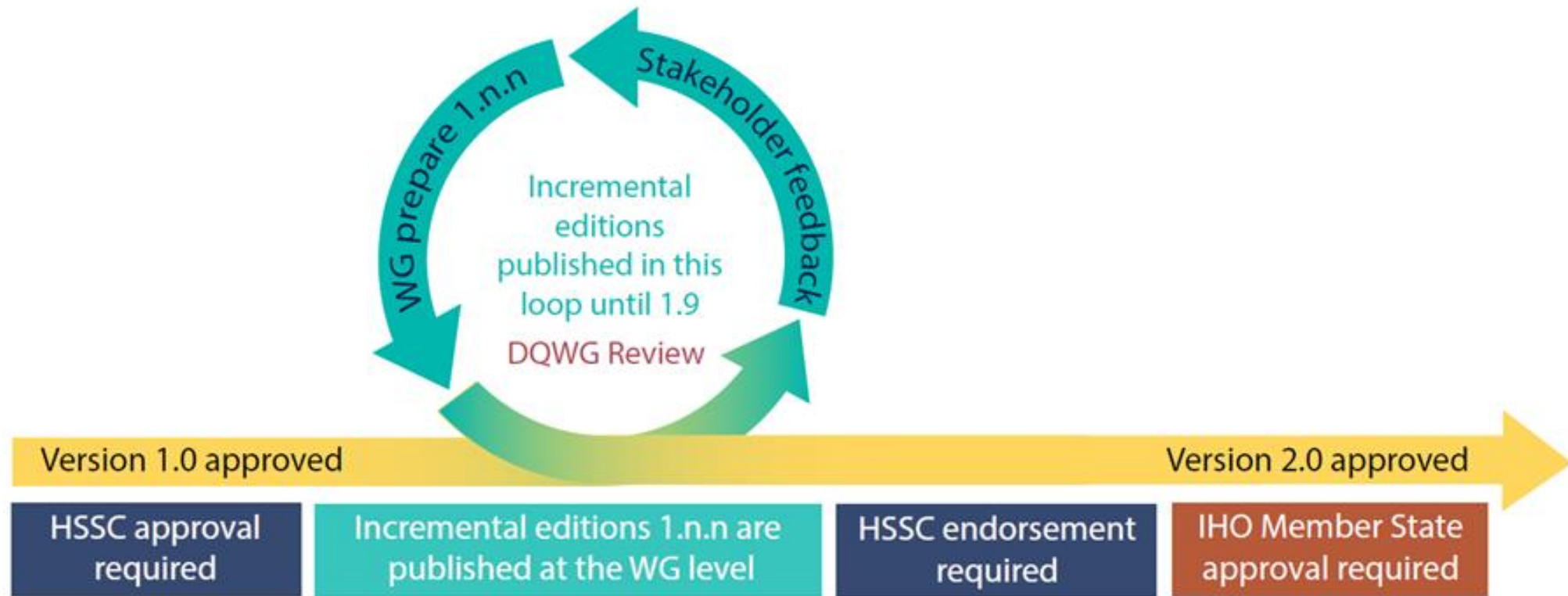


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Proposed Review Cycle for WG/PT Ed 1.0.0 -> Ed 1.9.n

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Proposed Review Cycle for WG/PT Development Phase





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Review S-101 Product Specification/Feature Catalogue

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name	Quality of Bathymetric Data (n..n = multiplicity)
definition	An area within which a uniform assessment of the quality of the bathymetric data exists
code	QualityOfBathymetricData
Alias	M_QUAL
Attribute ref	Category of Temporal Variation (1..1)
Attribute ref	Data assessment (1..1)
Attribute ref	depthRangeMaximumValue (0..1)
Attribute ref	depthRangeMinimumValue (0..1)
Attribute ref	featuresDetected (1..1)
Attribute ref	fullSeafloorCoverageAchieved (1..1)
Attribute ref	horizontalPositionUncertainty (1..1)
Attribute ref	surveyDateRange (1..1)
Attribute ref	verticalUncertainty (1..1)
Feature use type	meta
permittedPrimitives	surface



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Recommendations

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- The end user is familiar with the concept Zone of Confidence
- Recommend to rename Quality of Bathymetric Data to Zone of Confidence
- The attribute Category of Temporal Variation is not functioning well
- It was introduced to allow HOs to inform the Mariner for Areas of continual change (ref S-4 art. B-416)
- DQWG drafted a “decision tree” to allow HOs to make an assessment of the value of Quality of Bathymetric Data
- In areas of continual and rapid change, a S-44 1A survey would then directly be downgraded to QoBD = 4 (CATZOC = C)
- Recommend to remove Category of Temporal Variation, but include an attribute Temporal validity that can check the current date and the survey date range, if the level of Confidence is still valid
- If the HO considers that the uncertainty level increases, it should adjust the horizontalPositionUncertainty and verticalUncertainty accordingly



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Review S-102

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- Questions at DQWG-15 about Vertical Datum
- S-102 Ed 2.0.0 par 4.4.2.1 S-102 Coverages states: “The units of the depth values are in metres, and the sign convention is for z to be positive for values above the vertical datum. The reference vertical datum for the surface is one of the mandatory Metadata items. This sign convention follows directly from the right-hand coordinate system definition to which the standard adheres.”
- When combining S-101 and S-102, there should be a validation check at metadata level if the S-101 and S-102 are using the same vertical coordinate reference system for the entire geographic area they both publish. If not, parts of the S-101 and/or S-102 should have additional vertical datums populated as attribute
- DQWG-15 identified an issue with rounding of depths in ENCs



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Rounding of depths in paper charts

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- In paper charts, S-4 art. B-412 states:
Rounding of depths, including drying heights, must always be on the safe (shoaler) side (that is: soundings must be rounded down and drying heights rounded up, if necessary). The rounding should be:
 - to the nearest decimetre between 0,1 and 21m;
 - to the nearest half metre from 21 to 31m;
 - thereafter, to the nearest metre.

However, these soundings must be adjusted as a function of the degree of accuracy with which depths were actually measured, so that the precision with which soundings are recorded on charts can never be misleading as to the accuracy of such soundings



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Rounding of depths in electronic charts (S-57/S-101)

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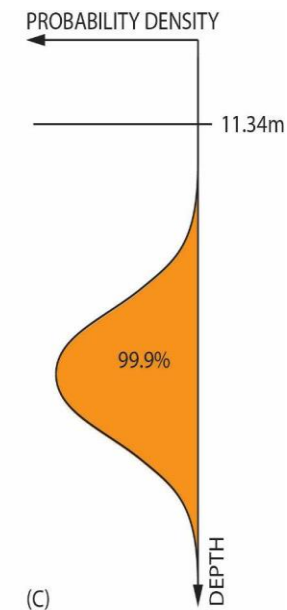
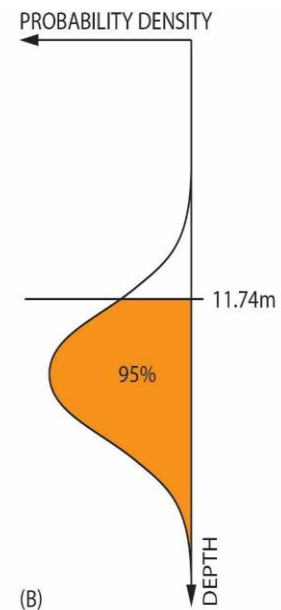
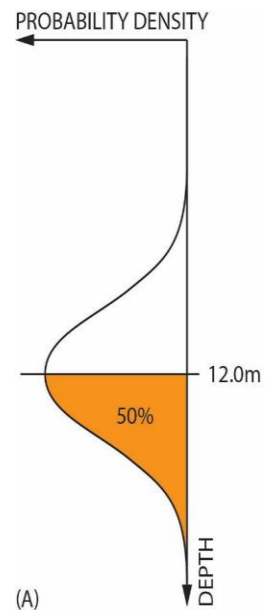
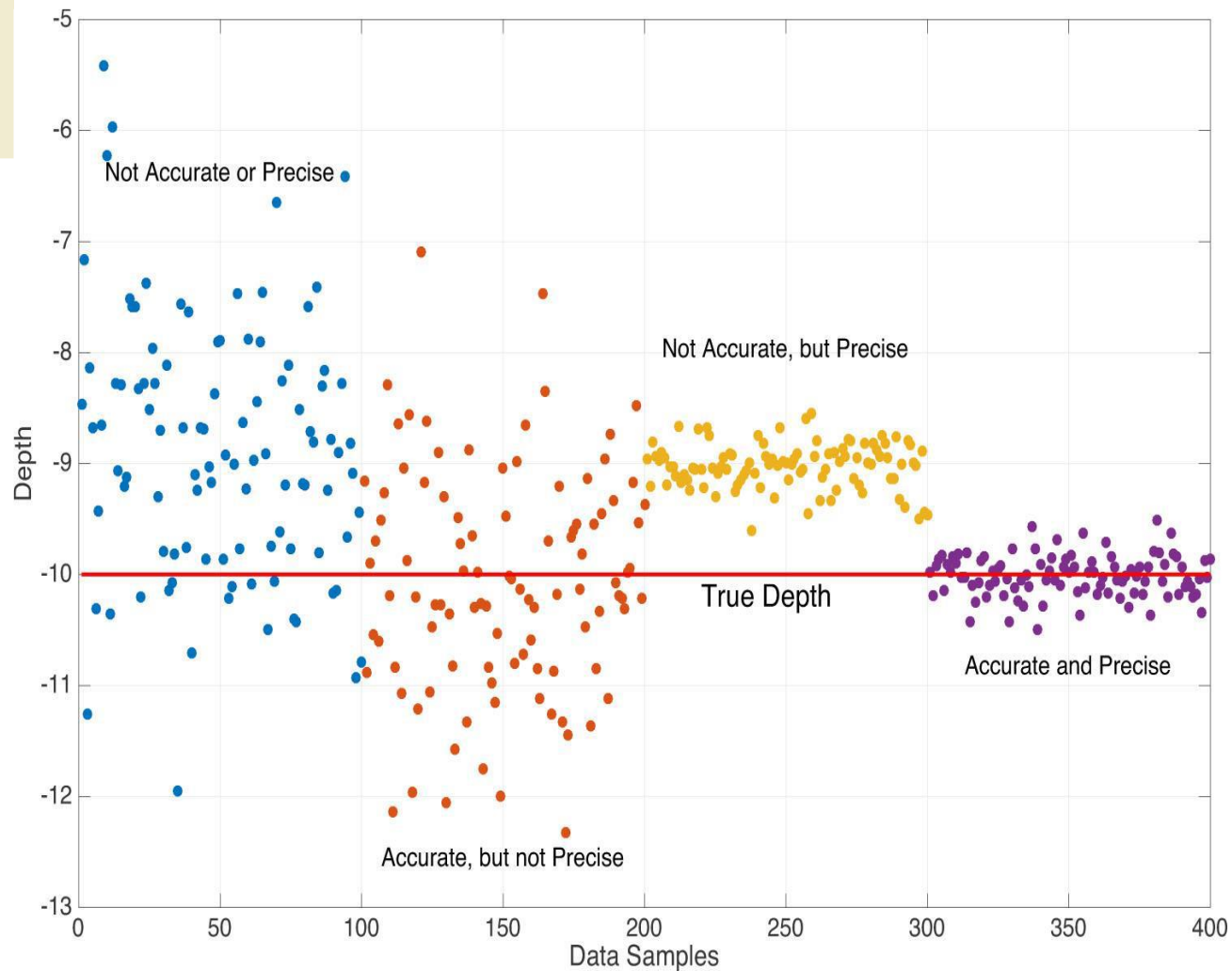
- In electronic charts the point cloud of a MBES is gridded, in each gridcell the shallowest depth is calculated at the highest detail level
- The least depth value of the grid is maintained as a Sounding in an ENC
- The depth value is rounded according to the S-4 art. B-412 in the portrayal process of S-52
- Some HOs change the original value according to S-4 art B-412 to facilitate S-57 and paper chart production from the same source
- This will create a mismatch when using S-101 and S-102 data
- It will increase the mismatch when verticalUncertainty is applied (ref S-100WG5-07.6 Conversion of M_QUAL/CATZOC to S-101)



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Rounding of depths - CSBWG guidance

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Review methodology for the display of quality information

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- Top priority for DQWG is to provide recommendations for modelling the quality of bathymetric data in S-101 ENCs
- Some use cases highlighted the critical role of these components for route planning and route monitoring for mariners
- Examples from Italy and Norway demonstrated the potential for data quality indicators for improving safe navigation but also highlighted the complex situations in some coastal areas
- DQWG members came to a unanimous draft agreement to HSSC 12 (ref DQWG15-05.7A)

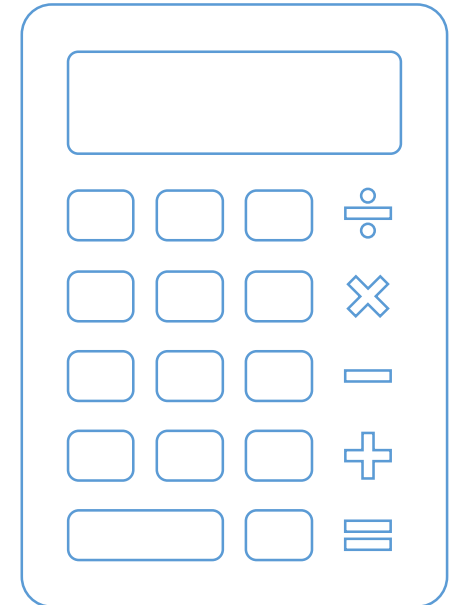


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Populating uncertainty values during conversion to S-101



POSACC/SOUACC populated in S-57 ENC?



- The Position Uncertainty is calculated using the CATZOC value (A2 = 20m, B = 50 m, C/D = 500 m)
- The Depth Uncertainty is calculated based on the known depth and overlying CATZOC value
- For OBSTRN, UWTRC, WRECKS with unknown depth, the DRVAL2 of the DEPART where the object is located in will be used, this will produce the safest uncertainty value



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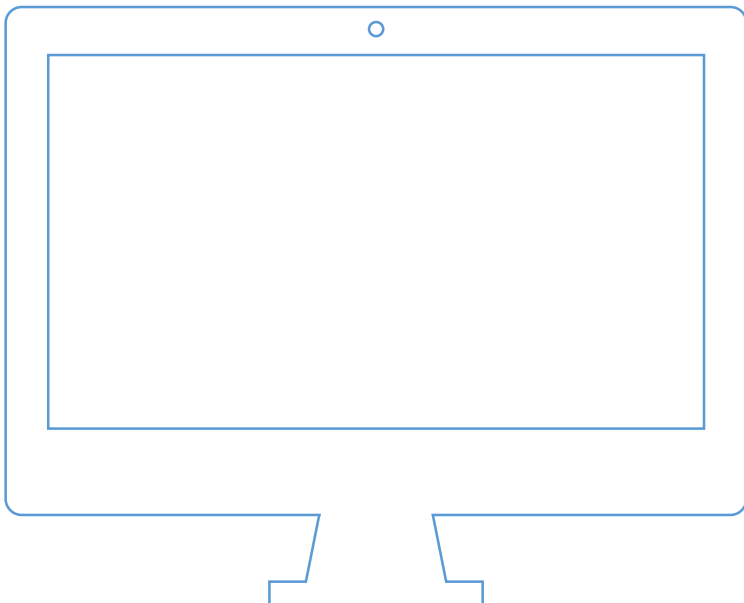
Boolean for portrayal of uncertainty values in S-101

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- Obstructions
- Soundings
- Under water rocks
- Wrecks

- horizontalPositionUncertainty values
- verticalUncertainty values



Default value to allow Uncertainty Portrayal is automatically set to OFF, to avoid screen clutter



HO's can adjust the Uncertainty values, HO's can decide which OBSTRN, SOUNDG, UWTRC and WRECKS should be allowed to show their Uncertainty values



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ENCs in 2030 - Levels of Service

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1. UKC shore based service (highest level of confidence)
2. High density, highly informative ENC (with uncertainty values activated)
3. High density ENC (uncertainty values present but not activated)
4. Standard ENC (as produced today in 2020)



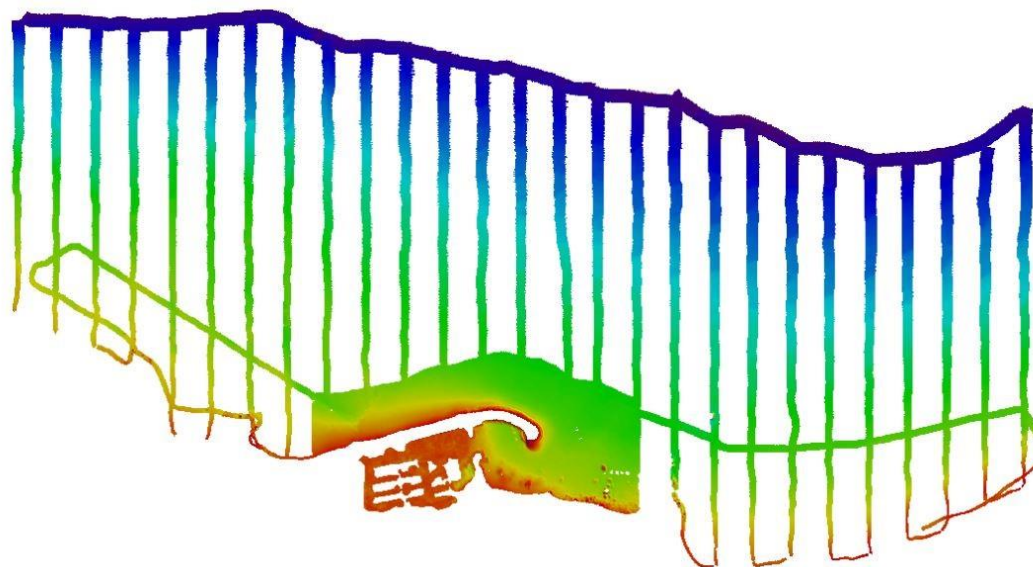


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Example between S-44 and S-101

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- Example from Italy: a MBES survey with large areas inbetween “multi-singlebeam survey”
- Highest possible CATZOC value = B, depth accuracies are at A1 level
- In S-101, assigning the vertical Uncertainties to the Soundings maintains the depth accuracies of the MBES part of the area





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DQWG15, Monaco 4-7 February 2020