International Hydrographic Organization
IHO
Organisation Hydrographique Internationale

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Minutes of 15th DQWG Meeting

IHO Secretariat, Monaco (4-7 February 2020)

FINAL MINUTES

1. OPENING AND ADMINSTRATIVE ARRANGEMENTS

The Chair opened the meeting and welcomed all to the IHO Secretariat in Monaco. Dr. Mathias Jonas, Secretary-General of the IHO, welcomed the participants and gave a short opening address. He invited the DQWG to pursue its important cross-cutting role under the HSSC in support of the development of the S-100 Implementation Roadmap, endorsed by the IHO Council in October 2019; and stressed the importance of the IHO Geospatial Information Registry and its content for contributing to standardization and consistency between S-100 based products. He also informed the meeting on the outcome of the 7th session of the NCSR[1] in January 2020 where the proposed introduction of S-101 ENCs as a transfer standard for official charts in ECDIS was acknowledged and is planned to be included in the programme of the work of the IMO.

The meeting was attended by eleven delegates from ten Member States (Brazil, Denmark, Finland, France, Italy, Netherlands (Chair), Norway, Sweden, United Kingdom and United States (Vice-Chair)); two representatives of the RENCs (IC-ENC, PRIMAR); four Expert Contributors (ESRI, 7Cs, Teledyne-CARIS, University of New Hampshire[2]); two stakeholders (CSMART[3], INTERTANKO); and a representative from the Inland ENC Harmonization Group. Australia provided important submission documents. Apologies were received from Canada and India at the last minute, expressing their regret not being able to attend. The IHO Secretariat was represented by Assistant Director Yves Guillam for HSSC and Technical Standards Support Officer Jeff Wootton. Assistant Director Alberto Costa Neves for IRCC attended part of the meeting.

The agenda was adopted without changes. The existing Terms of Reference were updated to reflect the decisions made by HSSC-11 in 2019. The content of the DQWG part of the new IHO webpage was discussed. US-NOAA offered to host a Data Quality collaborative Wiki Access enabling the DQWG to post Guidelines, Tools and Validation Results (**Action 15/01a – Vice-Chair**). The current Miscellaneous Documents will be removed, as they no longer serve a purpose. The Reference Documents will be moved to the Wiki once available. National methodologies from Survey Data to CATZOC will be moved to the Wiki and updated with available input from Member States (**Action 15/01b – Chair**).

2. MATTERS ARISING AND HSSC WORK GROUP REPORTS

Chair presented the HSSC Report to C-3, showing that Data Quality is a key component of the IHO Strategic Plan and the Timeline/Status of various S-1xx Product Specifications. The List of Decisions and Actions from HSSC-11 was reviewed. The report from the S-100WG showed the proposed review cycle for WG/PT development phase between version 1.0.0 and 1.9.n of S-100 based Product Specifications. DQWG is requested to perform a review upon request of a WG/PT within 30 working days when an updated Edition is made publicly available. All members agreed to this proposal. (**Decision 15/02**).

[1] Sub-Committee on Navigation, Communications and Search and Rescue (IMO).
[2] Via videoconference call.
[3] Carnival's Center for Simulator Maritime Training.

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Noting the possible changes to be made to S-100 based Product Specifications between an Edition 1.n.n/1.9.n and Edition 2.0.0, Yves Guillam proposed to make sure that the loop of the quality safeguard is closed before publication of Ed 2.0.0 of the Standard/Product Specification. Recommendation to be made to HSSC12. (**Action 15/03 – Chair**).

Paper 15-02.3.1A was moved to Thursday. Paper 15-02.3.2A was discussed, Quality of Horizontal measurement – submitted by France via the S-101PT. It was noted that there is a misalignment in the definitions between the Hydrographic Dictionary, the S-4 Standard and the S-57/S-101 Standard. To be further discussed at item 5: Review appropriate methodology for the display of quality information.

The final minutes of NCWG-5 were briefly discussed. Screen clutter and the question of the new visualization methodology for bathymetric data quality in ECDIS to be mandatory or not were the main issues. NCWG-5 did not find agreement on Guidance for coloured CATZOCs on paper charts.

There was no report received from the NIPWG. DQWG Chair is working in close liaison with the NIPWG Chair so as to validate the Feature Catalogues that have been published under the authority of NIPWG.

France presented the Report from the TWCWG. Their tasks related to S-100 are S-111 (Surface Currents) and S-104 (Water Level Information for Surface Navigation). S-111 Ed.1.0.0 was published in December 2018. S-104 Ed.1.0.0 is scheduled for May 2020. TWCWG introduced the attribute timeUncertainty in the S-1xx domain. To be checked against other published Feature Catalogues. (**Action 15/04 – Chair**).

The HSPT reported the status of S-44 Edition 6 draft version 1.8.0. Point of interest for the DQWG is the connection of accuracy between S-44 and S-101, to be discussed at agenda item 5.

The Chair presented an Informative paper from Sea-ID about Crowd Sourced Bathymetry and then the relation between S-4, accuracy of depth/position and S-101/S-102. The most modern GNSS receivers will use Precise Point Position methodology, obtaining sub decimetre positioning accuracy (both horizontally and vertically) with reference to the International Terrestrial Reference Frame, realization 2014 (ITRF14). The IHO publication S-60, User's Handbook on Datum Transformations involving WGS 84 has the latest update August 2008. This publication should be updated to include ITRF14 and its relation to WGS 84. Recommendation to be made to HSSC-12, including a proposal for the addition of a possible work item (Low priority) in the DQWG Work Plan to check the relevance of IHO Publication 60. (**Action 15/05 – Chair**).

The minutes of meeting 14 were accepted without changes. Status of the pending action items:

- 14/01 completed.
- 14/02 no longer required.
- 14/03 work in progress.
- 14/04 guidance and software tools are available, work in progress up to Ed.1.9.n.
- 14/05 work in progress at agenda item 3.
- 14/06 no longer required.
- 14/07 completed.
- 14/11 to be discussed at agenda item 5.
- 14/12 completed.
- 14/13 overtaken by IALA NAV GUIDE – Marine Aids to Navigation Manual Ed. 2018.

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3. PROVIDE DATA QUALITY EDUCATION MATERIAL FOR THE USE OF MARINERS

The Chair introduced the draft S-67 Mariner's Guide to the Accuracy of Depth Information in ENCs. This document was initially drafted by Australia (Mike Prince) in 2017 as Ed 0.4. At HSSC-9, DQWG proposed to publish this document as a standard (S-67) such that it closely relates to the existing publication S-66 "Facts about Electronic Charts and Carriage Requirements". At HSSC-9, France requested the HSSC to ask the NCWG and the ENCWG to review this document prior to submission by DQWG. At HSSC-11 INTERTANKO commented on the development of S-67 and asked the IHO for a pragmatic and workable approach when developing this standard, stating that clear guidance for the Mariners and unambiguous use of ZOC is much appreciated by the industry, training centres and mariners.

DQWG has worked during 2019 by correspondence on this document. A Letter was sent out on 17th July 2019 to all DQWG members and the Chair of NCWG and ENCWG to actively participate in the review of Ed 0.9. The deadline for review was set to 15th December 2019. In total 323 comments were submitted by 17 different organizations, creating a review document of 47 pages.

Representatives of CSMART and INTERTANKO both responded very positive to this development and encouraged the DQWG to maintain the momentum. Mr. Jeff Wootton led an ad hoc sub-group to address the remaining issues, with the aim that the DQWG should be able to submit the final proposed Edition 1.0.0 for the endorsement of HSSC at their next meeting. (**Action 15/06 – Wootton, Action 15/07 – Chair**)

It was noted that UKHO has taken over the maintenance of INT-1 (English version) and has published a national publication Section V on Data Quality. Noting that S-67 already includes some excerpts of S-4, it was recommended that a final check be made across S-67 and INT-1 before publication of a new version of the English version of INT1, to avoid possible inconsistencies (**Action 15/14 – UK/Chair**).

END OF DAY 1.

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4. REVIEW S-100 BASED PRODUCT SPECIFICATIONS

NLHO has developed software to cross-check automatically the feature catalogues (FCs) of different product specifications. The Chair performed a live demonstration of this software on his laptop, showing how to validate a feature catalogue against its associated XML Definition Schema, for S-122, S-123 and S-127. Next, the XML Definition Schema's of S-122, S-123 and S-127 were tested against each other (validating the validators). This independent (from IHO Geospatial Information Registry) analysis tool looks very promising for data quality checks, datasets validation and product interoperability. Assistant Directors Anthony Pharaoh and David Wyatt of the Secretariat attended this session.

The Chair showed the S-100 Technical Readiness Levels (ref HSSC11-05.1D) indicating that S-1xx Product Specifications between Ed 1.0.0 and 1.9.n should develop Data Quality Checks, Test Data Sets and Data Validation checks. DQWG has an advisory role regarding Data Quality Checks and Data Validation.

The Chair showed the excel sheet providing the general overview of the published S-1xx Feature Catalogues. Today, there are in total eight different FCs at Ed.1.0.0 or higher. This document provides an overview of the published elements and in which FC they are used. This effort was done manually. NGA offered to write a software script that automatically translates a FC into an understandable excel format for all HO's. (**Action 15/08 – Bozarth**)

Three Guidance documents were presented: Explaining Feature Catalogues; Data Validation ISO Principles; and How to Evaluate a S-1xx Exchange Set. DQWG members are encouraged to share these documents within their own organization.

A paper by S-100WG, Reporting Data Quality for S-100 Datasets, was discussed. The outcome was that DQWG agreed to the recommendation to update S-1xx part 4C with ISO-19157 (**Action 15/09 – Chair**). Other requested items were considered not to be addressed by this WG at this time. A standalone report is better than reporting Data Quality within the Exchange Set. Accepted/notAccepted for distribution is a key component. IC-ENC currently envisages providing separate exchange sets for its Value Added Resellers (VARs). However, they may provide combined and tailored exchange sets to their customers. PRIMAR will probably be delivering both single and multiple products exchange sets, based on distributor/end user requirements. HO's are encouraged to report exceptions to the rule to the RENCs.

The S-101 Feature Catalogue and the associated Decision Tree for allocating the appropriate CATZOC value were discussed. UK indicated feeling uncomfortable with the attribute Category of Temporal Variation. If a survey is carried out in a remote area where there has never been a full sea bottom coverage before, it is very difficult to establish if the seabed is changeable or not. The default option would then be to downgrade to a low CATZOC value but this does not justify the cost and accuracy of the initial survey. In addition, it was noted that there are several different approaches between Member States to translate the quality of a survey to a CATZOC value. Some use M_SREL (optional), some not. UK proposed that the attribute 'unlikely to change' could be modified into 'unlikely to have changed'. After some discussion, it was agreed to propose to S-101PT to remove the attribute Category of Temporal Variation from the Quality of Bathymetric Data feature. But that a method is required, that will allow degrading the CATZOC value over time in areas of unstable seabed. (**Action 15/10 – Chair**).

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Yves Guillam also suggested recommending at HSSC-12 that S-124 (Navigational Warnings) Product Specification is included in the scope of the review process by the DQWG.

END OF DAY 2.

5. REVIEW APPROPRIATE METHODOLOGY FOR THE DISPLAY OF QUALITY

One of the top priorities of the DQWG is to provide recommendations for modelling the quality of bathymetric data in S-101 ENCs. Going forward on the decision made by HSSC-11 to continue the development, several DQWG members had provided ENC S-57 test data. The Chair had added circles of uncertainty (20m for A2, 50m for B, 500m for C and D) and returned the results to the individual member states.

The Chair presented the conditional visualization methodology that was agreed upon at DQWG-14. Next Italy and Norway presented their findings. In Norwegian waters with CATZOC C, this would lead to significant additional screen clutter, and most likely be turned off by the Mariner. Another example was the entrance to a bay that would effectively be closed by overlapping circles of uncertainty.

Australia submitted a paper “Uncertainty of measurements and ECDIS performance”, a proposal to explore the possibility of implementing the use of positional, horizontal and vertical accuracies by ECDIS in-built route checking safety functions. This paper was thoroughly discussed as it suggests HOs to start populating HORACC, VERACC, SOUACC and POSACC in S-57 datasets. On paper a good idea but the internal resources required for HOs is a limiting factor. In addition, the screen clutter it may generate needs to be resolved, especially for complex situations in coastal waters. The horizontal uncertainty of a Depth Contour in S-57 was included in the discussion, in particular by the representatives of mariners who raised this as a matter of concern.

In the afternoon, the representative from the University of New Hampshire came online via videoconference. He presented an alternative portrayal methodology (to the star symbols) based on the display principle of overlays, that Better Data is Clear and Crisp, Worse Data is Fuzzy and Noisy. The proposed solution for an Overview is a Texture of lines. A proposal to integrate into ECDIS was broken down in four parts: 1) Overview, 2) Safety Zone, 3) Safety Course and 4) Watch Area.
Visualization of circles of uncertainty of static objects (OBSTRN, SOUNDG, UWTROC and WRECKS) is related to the chart scale. In a 1:160k scale, a circle of radius 50m would become 0.3125 mm radius at compilation scale and not being able to portray. The presentation concluded with the statement “any functionality in order to succeed must be fully embraced and accepted by the users”. (AHO)

The presentation was well received and discussed with current shallow water pattern; dashed lines versus solid lines; and thickness of lines. ESRI inquired if there was a common grid origin to be used, the emphasis is placed on avoiding any potential for different alignment of the pattern between multiple loaded cells.

After the online videoconference, the discussion on the methodology continued. France expressed their concern if S-101 ENCs could still produce S-57 CATZOC values, going into the Dual Fuel ECDIS transition of S-101 and S-57. After that, the rounding of depths was discussed. Both France and Italy indicated that they round the depths in the S-57 ENC according to the S-4 guideline. Other members do not change the depth value and use the portrayal mechanism of S-52 to round the depths according to the S-4 guideline.

There was also a discussion on the horizontal accuracy of depth contours and if these are part of M_QUAL/CATZOC. Technically they are not listed as an attribute under CATZOC, so would the same horizontal accuracy still be applicable (20m for A2, 50m for B, and 500m for C/D)? Contour

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lines are derived product information from the shape of the seabed and the soundings in the source surveys. It is currently up to the judgment of the Cartographer where the contour line is positioned. In S-57, the Cartographer can attribute the contour line as approximate, giving it a dashed appearance instead of a solid line in the ECDIS.

At the end of the day, no consensus could be reached between the members on the conditional visualization methodology. The discussion is scheduled to continue on the next day.

END OF DAY 3.

At the start of day, 4 the Chair presented a concept based on the discussions from the day before "Conversion of M_QUAL CATZOC to S-101." The proposal is to copy the original S-57 CATZOC value to the S-101 ENC. During the conversion process, the associated horizontal and vertical uncertainty values are calculated automatically, if not already available, and populated for OBSTRN, SOUND, UWTROC and WRECKS. There will be Boolean parameter OFF/ON to allow to show this to the Mariner or to be used or not by autonomous ships. The default setting is OFF, thus avoiding screen clutter. The HOs can change the value (after making an assessment of the accuracy of the individual objects) and then decide which ones should be made visible to the Mariner upon his request. The idea is to have four different levels of service for ENCs in 2030: 1) UKC management 2) high density, highly informative (with used uncertainty levels), 3) high density (uncertainty values not used) and 4) standard ENCs.

This solution will also resolve the issue of downgrading accuracy between S-44 and S-101. The original accuracy of the survey is maintained in the chart product. ESRI provided some good examples of alerting the mariner by single circles that partially overlap -> creating one polygon -> creating an area with a filled colour.

In the end, all DQWG members agreed to this proposal: 1) no effort required during conversion, 2) portrayal of uncertainty for individual features is default OFF and will by default not be used by autonomous ships or current ECDIS when route planning/monitoring.

These generic recommendations to be reported to HSSC-12 (**Action 15/11 – Chair**) and submitted to the S-101 Project Team/S-100WG for their consideration (**Action 15/12 – Chair**).

There was also a discussion on the name of the feature Quality of Bathymetric Data. For the end user this is quite confusing. The current S-57 uses the attribute Category of Zones of Confidence in data which seems to be well understood by the mariner community for now at least as a concept if not in details (so the strong requirement for the publication of S-67). In the end, it was decided that a proposal should be made to S-100WG/S-101PT to rename the feature Quality of Bathymetric Data into Zones of Confidence. (**Action 15/13 – Chair**).

6. NEW DATA QUALITY TOPICS FOR CONSIDERATION BY HSSC

This item was not discussed due to the limited time remaining. The paper Concept of Uncertainty Zones for individual ships is on the agenda of the next S-100WG5 meeting (March 2020).

7. PROVIDE GUIDANCE ON DATA QUALITY TO HOs

Pending the outcome of Action 15/10, the guidance document for HOs should include the conversion of M_QUAL/CATZOC to S-101 and the connection between S-44 and S-101 regarding Horizontal Accuracy, Depth Accuracy etc.

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8. REVIEW OF DQWG WORKPLAN AND LIST OF DECISIONS AND ACTIONS

The list of decisions and actions was reviewed.

9. DATE & LOCATION OF THE NEXT MEETING

It was suggested that the DQWG should try to raise the awareness of other MS who cannot participate in the meeting in general or who are not Members of the Working Group, as this topic becomes more and more important (safety of navigation, grounding cases, autonomous shipping, production concerns, concerns from S-44 to CATZOC and equivalent in S-101, etc.). It was agreed that the next meeting should take place in Asia as no Member state from this region is currently involved in DQWG matters. For three consecutive years, the meeting has taken place in Europe. Yves Guillam agreed to contact Asian Member States on behalf of the Chair requesting them to consider the possibility of hosting DQWG-16 (**Action 15/16 – Yves**). Monaco is a backup option.

10. CLOSURE OF THE MEETING

At next year's meeting, a vote for Chair, Vice Chair and Secretary is required, according to the procedures of the DQWG applicable after IHO Assembly meetings. The current Vice-Chair has indicated he will not continue in his role. The Chair expressed his thanks to all members for their active participation and open discussions. The meeting was closed at 12.45 hours.

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ANNEX A – Terms of Reference

Terms of Reference are available at:

https://iho.int/en/basic-wg-documents-6

ANNEX B – List of Decision and Actions

LIST OF DECISIONS & ACTIONS ARISING FROM DQWG-15

Agenda item	Subject	Actions (in bold, action by)	Target Date/Event	Status (20 March 2020)
1	DQWG webpage	Host a Data Quality collaborative Wiki Access (**15/01a – US/Vice-Chair**)	30 April	In progress
1	DQWG webpage	Remove Miscellaneous Documents, move Reference Documents to DQ wiki website. (**15/01b** – **Chair**)	30 April	Planned
2	Data Quality Review	Review S-1xx PS/FC upon request by WG/PT between Edition 1.0.0 and 1.9 as many times as needed, within 30 working days. (**15/02** - **Decision**)	N.A	Done
2	Close the review loop	Recommendation to be made to HSSC12. (**15/03 - Chair**)	20 March	Completed
2	timeUncertainty	Check the model components across S-1xx for timeUncertainty as introduced by TWCWG. (**15/04 - Chair**)	01 July	Planned
2	S-60 update	Recommendation to be made to HSSC-12 to update S-60 to include ITRF14. (**15/05 - Chair**)	20 March	Completed
3	S-67 Ed 1.0.0	Resolve remaining comments/issues for S-67 by correspondence. (**15/06 – Wootton (lead)**, AU, BR, FR, IT, SE, US, CSMART, INTERTANKO)	15 March	Completed
3	S-67 Ed 1.0.0	Submit S-67 Ed 1.0.0 for endorsement to HSSC-12 (**15/07 - Chair)**	20 March	Completed
4	S-1xx Feature Catalogues	Develop software to translate Feature Catalogue into excel format. (**15/08 - Bozarth**)	01 May	Work in Progress
4	Reporting Data Quality for S-100 Datasets	Update S-100 part 4c with ISO-19157. (**15/09 - Chair**)	01 July	Planned

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Agenda item	Subject	Actions (in bold, action by)	Target Date/Event	Status (20 March 2020)
4	S-101 Product Specifications	Advise S-101PT to remove the attribute Category of Temporal Variation (**15/10 – Chair**)	03 March	Completed
5	Methodology to visualize quality	Agreed generic recommendation to be reported at HSSC-12 (**15/11 – Chair**)	HSSC-12	Completed
5	Methodology to visualize quality	Submit recommendations to S-101PT/S-100WG (**15/12 – Chair**)	S-100WG5	Completed
4	Name of QoBD	Recommend to S-100WG/S-101PT to consider to rename the feature Quality of Bathymetric Data into Zone of Confidence (**15/13 – Chair**)	S-101PT	Completed
3	INT-1 section V	Monitor and report inconsistencies between S-67 and INT-1 section V (**15/14 – UK/Chair**)	HSSC-12	Work in Progress
5	Methodology to visualize quality	Report the queries related to POSACC/SOUACC encoding related to the objects OBSTRN, SOUNDG, UWTROC and WRECKS (**15/15 - PRIMAR**)	HSSC-12	Completed
9	Next meeting	Guillam to contact Asian Member States requesting to host DQWG-16.	Feb 2021	Work in Progress

ANNEX C – DQWG Work Plan

DQWG WORK PLAN 2020-2021

Tasks

A. Develop and maintain a data quality checklist for product specification developers;
B. Periodically review S-100 based product specifications to ensure the data quality aspects have been taken into consideration if deemed necessary;
C. Monitor periodically developments of ISO and other international standards regarding data quality information, and advise accordingly;
D. Provide guidance on data quality aspects to hydrographic offices, in particular to ensure harmonized implementation;
E. Proivde data quality educational material for the use of mariners;
F. Review appropriate methodology for the display of quality information to product specification developers;
G. Propose new data quality topics for consideration by HSSC.

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Work Items

Task	Work Item	Priority H=High M= Medium L=Low	Milestones	Start Date	End Date	Status P=planned O=Ongoing C=Completed	Contact Person	Affected Pubs/ Standards	Remarks
A.2	Provide graphical examples of DQ measures.	M	HSSC-12	2019	2020	C	R.Broekman	S-97 Part C	DQWG15-04.3A
B.2	Development of a minimum standard for Data Validation in S-1xx based products.	H	S-101 Ed.2.0.0	2018	2022	O	R.Broekman	S-1xx	DQWG15-05.4A, action S-100WG5-4.15
C.1	Review S-100 Section 4C.	M	DQWG-16	2017	2021	P	R.Broekman	S-100	DQWG15-04.4B
D.2	Provide guidance documentation how to populate CATZOC values.	H	S-101PT5	2018	2021	O	R.Broekman	S-101 DCEG	Related to task E.1
D.3	Provide guidance documentation on the transition from S-57 CATZOC to S-101 QoBD.	H	S-101PT5	2019	2021	O	R.Broekman	S-101 DCEG	HSSC12-05.5A
E.1	Submit Edition 1.0.0 of S-67 for endorsement by HSSC.	H	HSSC-12	2018	2020	C	R.Broekman	S-4, S-57, S-101	HSSC12-05.5A
E.3	Consider a video version of S-67 when approved by MS.	L	S-101 Ed.2.0.0	2021	2022	P	R.Broekman	S-4, S-57, S-101	After task E.1
F.1	Continue development of portrayal of bathymetry quality in S-101	H	S-101 Ed.2.0.0	2017	2022	O	R.Broekman	S-101 DCEG	Autonomous shipping.
G.1	Recommend HSSC to updateS-60 to include ITRF14	L	HSSC-13	2020	2021	P	R.Broekman	S-60	None.