

7<sup>TH</sup> MEETING OF THE HYDROGRAPHIC SERVICES AND STANDARDS COMMITTEE

Busan, Republic of Korea, 9-13 November 2015

## Paper for Consideration by HSSC

## Consideration of the need to establish a Hydrographic Surveys Working Group

<b>Submitted by:</b>	IHB
<b>Executive Summary:</b>	This paper summarizes the responses to IHO CL 25/2015 on the consideration of the need to establish a Hydrographic Surveys Working Group.
<b>Related Documents:</b>	Minutes of HSSC6 (paragraph 4.2 and action HSSC6/11) IHO CL 25/2015 dated 17 March - <i>Reorganized structure of the Hydrographic Services and Standards Committee (HSSC) - Consideration of the need to establish a Hydrographic Surveys Working Group</i>
<b>Related Projects:</b>	IHO Work Programme HSSC Work Programme Reorganized structure of the Hydrographic Services and Standards Committee (HSSC).

**Introduction**

1. During the consideration by HSSC6 of the re-organization of the structure of the working groups of the HSSC, concern was expressed by some Members that not a single working group in the new structure dealt with hydrographic surveying.
2. Discussion during HSSC6 indicated that there might be a need to address the use and standardization of new emerging hydrographic surveying technologies that were not already reflected in the relevant IHO standards and guidelines. The most relevant IHO Standard related to hydrographic surveying is IHO Publication S-44 – *IHO Standards for Hydrographic Surveys* – for which the edition in force is the 5th Edition. The 5th Edition was developed by the Working Group on Standards for Hydrographic Surveys (S-44WG) established in 2005 and adopted by IHO Member States in 2008. The S-44WG was then disbanded.
3. As indicated in its introduction, S-44 is intended to provide the minimum standards that are to be achieved. The publication does not describe the procedures for setting up the necessary equipment, for conducting a survey or for processing the resultant data. In this context, the need to revise S-44 should be driven by the identification of any shortcomings in the current edition or new issues arising from the development of new systems or new procedures. The discussions at the 5<sup>th</sup> Extraordinary International Hydrographic Conference (EIHC-5) on crowd-sourced bathymetry and satellite-derived bathymetry did not raise any specific requirement to revise S-44.
4. Action HSSC6/11 invited the IHB *to issue an IHO CL inviting IHO MS to provide their views on the scope, topics and work items, if any, to be addressed through the establishment of an Hydrographic Surveys WG and on their involvement if such a WG was established.* Accordingly, IHO CL 25/2015 sought the opinion of Member States, using the following questions, also attached in Annex A:
  - a. Does the 5<sup>th</sup> Edition of S-44 - *IHO Standards for Hydrographic Surveys* meet your current and foreseeable requirements?

- b. Have you identified any additional topics to be addressed by the establishment of a Hydrographic Surveys Working Group?
  - c. If a working group was established, please indicate what would be your contribution to the working group?
  - d. Any additional comments?
5. This report provides a summary of the responses to CL 25/2015.

**Summary of Responses to CL 25/2015**

6. The IHB received replies from 41 Member States. The replies are tabulated at Annex B. The reply from Australia was supplemented by the views of a port authority and two survey companies.

7. Less than half of the Member States replied to the CL, thereby indicating an interest in the issues. Less than a fifth of the Member States, 14, indicated that S-44 does not meet their current or foreseeable requirements; 27 of the replies indicated that S-44 meets their current needs. Just over a fifth of the IHO Member States, 18, supported the establishment of a new HSWG and identified additional topics to be addressed. 23 Member States did not support the establishment of a new HSWG. 14 Member States provided additional comments.

8. 25 Member States express their willingness to be involved in a Hydrographic Surveys Working Group, with 15 indicating active involvement; the remainder would participate as correspondence members. Three Member States volunteered to take on the role of vice-chair and two to act as secretary. There was no volunteer to lead a working group.

9. **Conclusion 1.** Although some strong views were expressed in the replies, there was only minority support for the establishment of a new HSWG and even less support for a review of S-44.

10. A summary analysis of the comments received is provided in Annex B. The following table lists the topics and issues raised, for which HSSC might consider identifying subordinate bodies to progress the work under the relevant task of the (draft) IHO Work Programme for 2016:

Subject	Topic/Issue	Discussion	IHO Work Programme Task and Potential HSSC action
S-44	Broaden scope	9 replies suggested a broadening of the scope of S-44 to include standards for surveys in estuarine and rivers, engineering, dredging, environmental and site surveys; this would need to be undertaken in liaison with industry	2.10.2.1 Establish S-44WG
	Continental edge surveys	Two replies highlighted a lack of standards and guidance for continental shelf edge surveys and maritime boundaries; this would need to be progressed in liaison with ABLOS	2.10.2.1 Establish S-44WG
	New technologies	14 replies noted that S-44 did not contain standards for emerging and new technologies, such as LiDAR, autonomous underwater vehicles (AUV),	2.10.2.1 Establish S-44WG and liaise with IRCC/CSBWG

Subject	Topic/Issue	Discussion	IHO Work Programme Task and Potential HSSC action
		satellite derived bathymetry, nor was there guidance on crowd-sourced bathymetry (CSB); some of these could be address by the CSBWG, the majority fall outside the CSBWG remit and would need to be addressed by another WG	
	Change focus	Four replies indicated there was a need to change from equipment focused standards to minimum data quality standards, including a move away from point measurement data to surface accuracy assessment	2.5 Task DQWG
	C-55	One reply noted the lack of standards and guidance on survey assessment for calculation of percentage area surveyed	3.4.3 Refer to IRCC/CBSC
	Depiction of data quality	Two replies highlighted the need to depict the connection between survey data quality with charted data to allow a better appreciation by the chart user	2.5 Task DQWG
C-13	Review/revision	Two replies noted that no revisions had been undertaken to include new technologies in use for the collection of survey data	1.2.4.6 Refer to IRCC/IBSC and/or CBSC and/or establish a specific WG
Data processing	Maximization of data	Four replies identified the lack of guidance and standards to maximize survey data to obtain minimum depths, backscatter and water column data	2.10.2.1 Establish S-44WG
Tides	Use of RTK	Four replies highlighted the lack of guidance and standards for the use of RTK in the determination of vertical heights in separation models	2.7.2 Task TWCWG
Post natural disasters	Surveys	One reply commented on the lack of guidance for the conduct of surveys after natural disasters	2.10.2.1 Establish S-44WG
Third party data	Data assessment	Two replies highlighted the lack of guidance and standards for	2.5

Subject	Topic/Issue	Discussion	IHO Work Programme Task and Potential HSSC action
		the assessment of third party data for inclusion in HO databases and associated products	2.10.2.1 Establish S-44WG and/or task DQWG

### Analysis of Responses

11. The responses can be considered under several headings:

- a. IHO Publication S-44 – decide whether to broaden the scope of the document beyond the current nautical charting focus in liaison with industry. Suggested areas which could be included were:
  - (1) standards and guidance for continental shelf edge surveys;
  - (2) how to incorporate new emerging technologies including crowd-sourced bathymetry and satellite derived bathymetry in liaison with the Crowd-Sourced Bathymetry Working Group (CSBWG);
  - (3) make the standards data rather than equipment driven, including requirements for full seabed coverage, object detection and positional accuracy,
  - (4) consider moving focus away from point measurements to bathymetric surface accuracy assessment; and
  - (5) how to depict data quality standards to connect survey data and charted data for better understanding and clarification by the customer.
- b. IHO Publication C-13 – up date in line with current technologies and practices, and additional focus on survey project deliverables;
- c. Data Processing – maximizing survey data to obtain minimum depths and backscatter data;
- d. Tides – appropriate standards for use of RTK in determination of vertical heights in separation models;
- e. Surveys after natural disasters – guidance and procedures for surveys after natural disasters;
- f. Third party data – guidance for assessment of third party data for inclusion in HO databases and associated products.

12. The two items, which generated the most comments, were the broadening of the scope of S-44 to include standards on traditionally non-Hydrographic Office related survey tasks and the inclusion of guidance and standards for new and emerging technologies, other than crowd-sourced bathymetry and satellite derived bathymetry. In line with new technologies and increased data volumes, there were suggestions for S-44 to refocus from point data to surface accuracies with standards for object detection, seabed coverage, backscatter and integrated position systems as well as addressing data processing and the link between survey data and its presentation for use by customers. A number of replies expressed the view that the standards should be data orientated rather than their current product focus. One reply suggested a comprehensive review of S-44 Edition 5.

13. Two replies expressed the view that IHO Publication C-13 – *Manual on Hydrography* was out of date and needed to be revised to include new technologies and methods; however the WG tasked with producing C-13 was disbanded on completion of its work and no mechanism, other than the

statement that the IHB would maintain the currency of the publication, was put in place to ensure the currency of the publication. At present the IHB does not have the resources to undertake a review and revision of C-13. Another reply suggested that C-13 should be complemented by separate guidance on specific topics. Additionally it was felt a HSWG could act as a knowledge transfer forum and develop Capacity Building (CB) guidance and requirements for Member States to meet Phase 2 of the IHO CB strategy as well as develop some guidelines on determining the values for the status of survey in IHO Publication C-55 – *Status of Hydrographic Surveying and Nautical Charting Worldwide*.

14. **Conclusion 2.** There is no majority support to establish a new HSWG but a number of issues identified fall under the remit of the disbanded S-44 WG rather than currently active subordinate bodies. It is clear there is some support, albeit not a majority, to review IHO Publication S-44 and/or to address a number of related hydrographic topics, which presently do not have a natural home amongst the current HSSC subordinate bodies.

15. **Conclusion 3.** The majority of identified topics could be allocated to existing subordinate bodies of HSSC and IRCC, although adjustment of Terms of Reference may be required to include these additional tasks.

16. **Conclusion 4.** There are five topics, that most directly relate to S-44 that do not easily lie within the scope of any of the currently established subordinate bodies or active Work Programme tasks. There may therefore be a case for re-establishing the S-44 WG or broadening the remit of the DQWG to include these topics within its Terms of Reference.

### **Stakeholders' Views**

17. At the Shallow Survey 2015 conference an Open Forum on S-44 was conducted to elicit comment and input from a broad spectrum of survey practitioners and equipment manufacturers. The discussions were led by the IHB and assisted by a panel with representatives drawn from government and industry organizations. In general all participants agreed that S-44 was appropriate for surveys for nautical charting, although it was felt there was scope to consider some improvements including a higher specification than Special Order and the format of the publication in general. It was felt there could be a consideration to re-title the publication to make it clearer that the standards were for surveys for nautical charting and that there are other documented standards for data gathering for other uses. It was felt unwise and undesirable to try and create a broader set of standards for gathering data for a variety of survey uses. The use of derogations of some requirements for non-nautical charting surveys could be better explained and the need to refer to the entire document rather than just the Table of Orders should be highlighted to ensure all specifications were met for individual survey orders. Although there was no expressed urgency for the development of standards appropriate for data obtained from Satellite Derived Bathymetry (SDB) and Crowd-sourced Bathymetry (CSB), it was suggested these could be considered in any future work.

18. At the North Sea Hydrographic Commission Re-Survey Working Group meeting held immediately after Shallow Survey 2015, the participants suggested some modularization of the standards to allow a more flexible use of the standards for non-nautical charting surveys. The challenge for HOs on how to use quality data which did not meet all requirements of a particular Order was highlighted as an issue which needs HSSC input and Member State agreement. It was felt some adjustment to Order 1b would be appropriate and necessary to include SDB data in the future, the creation of a new Order with higher specifications than Special Order, reflecting the significant equipment, techniques, software, processing and visualization advances since the publication of the 5<sup>th</sup> Edition, could be an area for consideration. There was support for a review of the publication format to clarify its contents to foster more appropriate use and better education to ensure surveys are completed to the full specifications, not just those articulated in the Table of Orders. The entire document should be used as many specifications are articulated in the text.

**Options for Consideration**

19. The IHB identifies the following options for further consideration by the HSSC:
- a. Option 1 – agree that there is insufficient support in the replies received for forming a new Hydrographic Surveys Working Group; however a number of items and tasks are identified, which may need to be addressed by HSSC and its subordinate bodies;
  - b. Option 2 – although there is no majority in the replies for the creation of a new Hydrographic Surveys Working Group, a number of Member States identify a sufficient number of items and tasks to justify the creation of a new working group, for which there is ample support and volunteers for the positions of officers;
  - c. Option 3 – agree there is insufficient support in the replies received for forming a new Hydrographic Surveys Working Group; however a number of Member States identify a sufficient number of items and tasks to consider broadening the remit of the Data Quality Working Group (DQWG), possibly to rename it to the Hydrographic Surveys Working Group (HSWG), and for the new group to be tasked with the items and tasks identified in addition to the current tasks of the DQWG;
  - d. Option 4 – take no further action other than for HSSC to highlight to existing subordinate bodies those issues which already come within their Terms of Reference and Work Plans.

**Action required of HSSC**

20. The HSSC is invited to:
- a. **Note** this report;
  - b. **Consider** if any of the four options described in paragraph 19 is an appropriate and effective way of addressing the concerns raised in the replies to IHO CL 25/2015;
  - c. **Take any other actions** considered necessary.

**Annex:**

- A. IHO CL25/2015 questionnaire.
- B. Tabulated replies to IHO CL 25/2015.

**IHO CL25/2015 questionnaire**

**QUESTIONNAIRE ON THE POSSIBLE ESTABLISHMENT OF  
A HYDROGRAPHIC SURVEYS WORKING GROUP**

(to be returned to the IHB **no later than 31 May 2015**)

E-mail: info@iho.int - Fax: +377 93 10 81 40)

**Date:**

**Member State:**

**Contact:**

**E-mail:**


1. Does the 5<sup>th</sup> Edition of S-44 - *IHO Standards for Hydrographic Surveys* meet your current and foreseeable requirements?

YES  NO

If you answer 'NO', please explain what additional requirements should be considered:

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2. Have you identified any additional topics to be addressed by the establishment of a Hydrographic Surveys Working Group?

YES  NO

If you answer 'YES', please describe and provide justification for the additional topics to be considered and their priority (high, medium, low).

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3. If a working group was established, please indicate what would be your contribution to the working group:

- Active member:	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>
- Correspondence member:	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>
- Nomination for office bearers:				
Chair:	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>
Vice-Chair:	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>
Secretary:	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>

4. Additional comments, if any:



**Tabulated replies to IHO CL 25/2015**

Member State	a	b	c	Remarks
Algeria	Y	N	Correspondence	a – no comment; b – no comment
Australia	N	Y	Active if take over role of DQWG, correspondence if separate from DQWG	<p>a – If hydrographic surveys are to be considered as being done for many purposes, then the focus of the existing S-44 is too limited as it is only suitable for collection of bathymetry for charting and related purposes.</p> <p>The requirements table is focussed on the technology available (or perceived to be available) at the time of drafting the existing edition, rather than simply setting a tiered structure of standards for different circumstances and depth bands. For example, it is clearly written around the feature detection capabilities of a side scan sonar, and fails to recognise that other systems such as Lidar might achieve similar outcomes in suitable areas, or that the results of satellite derived bathymetry will need to be categorised. The publication should therefore be clearly broken into a standards (requirements) section early in the publication, perhaps supported by a more descriptive series of following sections on how those standards might or might not be achieved/achievable using different technologies (guidance).</p> <p>b – There is a breakdown in the relationship between surveying and charting, with cartographers familiar with ZOC defending the separation between S-44 orders and ZOC categories. However, the fundamental intent of chart reliability indicators is to indicate how well an area is surveyed, so there should actually be a strong link between the two – with modern cartographic systems using digital data handling there is no longer degradation of position (in particular) when transferring from fair sheets to charts at any scale. The weakest areas of correlation between surveying and charting standards occur at the ‘Special Order’ level, for which there is absolutely ZOC category which adequately represents areas where minimum under-keel clearance is reasonable, the different combinations of horizontal and vertical accuracies used between Orders and ZOCs even for modern surveys, as well as significant misalignment in quantifying feature detection/seafloor coverage object sizes.</p> <p>Finally, in making the connection between the quality of a survey and the quality indication</p>

				<p>on an ENC (where ZOCs are mandated) there is absolutely no guidance on “how” for use by hydrographic offices. The only mention of ZOCs exists as a small table within S-57, leaving most hydrographic offices with whom AU have spoken either quite intimidated by the process, or sometimes confused. For example, there have been recent instances noted of cartographers unfamiliar with ZOCs assigning ZOC categories considering seafloor coverage as an outcome of line spacing, when it is actually a separate criterion within the overall assessment. Guidance (such as has been used by AU for over a decade) needs to be published as either an IHO publication, or incorporated in an existing one already focussed on data quality. So far, S-44 is the only publication focussed on data quality, as all others are focussed on products.</p> <p>d – Regrettably, AU considers the existing Data Quality Working Group to be too narrowly focussed and without a sufficient breadth of experiences within its membership to adequately address the existing tasks given it. Adding an AU member with combined experience in hydrographic surveying, navigation, and being responsible for considering whether data is suitable for planning a ship’s passage across differing levels of hydrographic survey data quality, has not yet adequately influenced the prevailing ‘scientific/programmer’ (and liability) view of depicting data quality. AU would much prefer the Data Quality Working Group’s current focus to be reduced to a project (possibly under S-100), with the determination of what is genuinely adequate, good, etc. left to people with a collectively more rounded combination of hydrographic knowledge and mariner skills. There must be a link between how good a survey was/is, and how mariners are told this – the two cannot be treated in isolation. If a new working group is to be created AU therefore recommends its scope cover “Survey data quality categorisation”, not just “S-44”.</p>
Bangladesh	Y	N	N	<p>a – no comment; b – no comment</p> <p>d – Considering the future expansion plan of Hydrographic Department, in near future we may contribute as “Active Member”.</p>
Belgium	N	Y	N	<p>a – Guidelines on the processing of multi-beam data (out of the huge number of values/square meter) to define the most shallow bottom depth that will be used for mapping a nautical chart.</p> <p>b – A more detailed guideline to fill in the C-55 values for the Status of Surveys. Priority –</p>

				medium.
Brazil	N	Y	Active/correspondence & secretary	<p>a – The S-44 does not cover the following issues:</p> <ul style="list-style-type: none"> <li>- Standards for backscatter survey: as shown in the U.S. Hydro Conference 2015 there are groups, such as the University of New Hampshire (UNH) and the international association Marine Geological and Biological Habitat Mapping (GeoHAB), working in order to establish minimum standards to backscatter survey and to create guidelines on the acquisition, processing and interpretation of backscatter data recorded with seafloor mapping sonars, as mentioned before;</li> <li>- Standards for tidal modelling in RTK surveys: S-44 does not cover limits for Separation Models for Ellipsoidally Referenced Hydrographic Surveys. However, the hydrographic surveys using such technologies are growing strongly;</li> <li>- Standards for Autonomous Underwater Vehicle (AUV): in order to follow the development of this new technology, it is important that S-44 establishes AUV standards for hydrographic surveys; and</li> <li>- Standards for Hydrographic Survey in Rivers: there is no mention in publication S-44 about Standards for Hydrographic Survey in Rivers. That subject is extremely important for Brazil, because in most of our rivers, such as Amazonia, Parana-Tiete, Paraguay and so on, there is huge movement of small, medium and large vessels. It would be of high interest for Hydrographic Offices that need guidance for this kind of activity.</li> </ul> <p>b – The IHO Manual on Hydrography describes superficially some important topics on Hydrography, as for example multibeam sonars, backscatter, side scan sonar and satellite-derived bathymetry. As a manual, it really does not need to be so deep on those issues. However, Hydrographic Surveys Working Group could advise IHO to create manuals for some important topics, in order to establish guidelines on those matters, giving more details about such issues.</p>
Canada	N	Y	Active	<p>a – The Canadian Hydrographic Service (CHS) has defined its own standards to add specific content essential for our hydrographic survey requirement. The CHS ‘Standards for Hydrographic Surveys’ was written based on the IHO S-44 standard. CHS Standards is not very far from the S-44 international standards, but some adjustments were made. CHS</p>

				<p>has also defined 'Management Guidelines for Hydrographic Surveys' to explain how to reach Orders defined in the CHS Standards. The main additions we made to the CHS Standards was to add a more precise order (called 'Exclusive Order') and we separated the attribution of the order for each component. For example, an area may not be fully covered, but the positioning might be very precise in all axes.</p> <p>A copy of the CHS 'Standards for Hydrographic Surveys' and 'Management Guidelines for Hydrographic Surveys' are available here:  <a href="http://www.chs-shc.gc.ca/data-gestion/hydrographic/hydrographic-eng.asp">http://www.chs-shc.gc.ca/data-gestion/hydrographic/hydrographic-eng.asp</a></p> <p>b – Establishment of standards for engineering hydrographic survey.</p> <p>Establishment of International Guidelines for Hydrographic Survey (see note in answer for question No. 1). It would be beneficial for the Hydrographic community (and for CHS) to see how things are done in other countries and share best practices.</p> <p>Establishment of rules or guidelines for the codification of features collected in the field and data conditioning to ease the inclusion in Electronic Navigational Charts.</p> <p>Establishment of standards and best practices for the use of Ellipsoidally Referenced Survey, separation model creation and GNSS surveys (links with work done in other working groups).</p> <p>Establishment of standards and best practices to optimize the data acquisition for the forthcoming S-102 standards requirements.</p> <p>Establishment of guidelines and best practices for the optimization of LiDAR surveys (ex: ground-truthing, best air/water/weather conditions, calibration, positioning, etc.)</p>
Chile	N	Y	Active & vice-chair	a – Standards for hydrographic surveys' data exchange, for their use in the joint charts

				<p>production, for example the INT Charts;</p> <ul style="list-style-type: none"> <li>- Standards for the establishment of the vertical datum in adjacent or face-to-face coasts of two Member States and the corresponding depth sounders reduction for joint charts, for example the INT charts;</li> <li>- Standards for the approval of satellite bathymetry or other airborne means for cartographic purposes;</li> <li>- Standards for the validation of the hydrographic data processing programmes, ensuring the QC and QA fulfilment;</li> <li>- Standards for surveys in navigable rivers and maybe even in navigable international lakes;</li> <li>- The IHO, by means of its S-100, is promoting the use of the universal hydrographic data model and, for that purpose, the S-44 has to think also of minimal standards to meet other demands, not necessarily those related to the safety of navigation, if the IHO wants to actively participate in other applications of Hydrography. If this is not done by IHO, another organization will do it and then IHO will lose the position of technical authority.</li> </ul> <p>b – Hydrographic surveys following natural disasters (high);</p> <ul style="list-style-type: none"> <li>- Support to countries that have to present maritime traffic separation scheme initiatives and that do not have the capacity to conduct hydrographic surveys (support to IMO) (medium);</li> <li>- Design of minimum structure required to meet Phase 2 of the Capacity Building Strategy (medium);</li> <li>- Ensure the dissemination to MS of the state-of-the-art knowledge concerning methodologies and procedures used in the conducting of hydrographic surveys and its variations depending on available technology (high);</li> <li>- Investigation into the applicability of emerging technologies in the processes linked to hydrographic surveying (medium);</li> <li>- Propose standards for hydrographic surveys conducted for purposes other than the production of nautical charts (Example : search for damaged objects) (high);</li> <li>- Standards for hydrographic surveying in rivers and lakes where there is</li> </ul>
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				<p>international navigation (medium).</p> <p>d – We believe that, if a working group is established, an initial meeting should be held in order to:</p> <ul style="list-style-type: none"> <li>- Establish a prioritized work programme and timetable;</li> <li>- Identify the responsibilities of the working group members in accordance with the approved work programme;</li> <li>- Establish a working procedure and communications between the working group members;</li> <li>- Identify and approve potential external experts who could contribute to the aims of the working group.</li> </ul> <p>Then the work would be conducted mainly by correspondence, until there was justification to hold a second “face to face” meeting.</p>
Croatia	N	Y	Correspondence	<p>a – Similarly to some other national hydrographic offices, the Croatian Hydrographic Institute (CHI) is faced with pressure to use hydrographic data from private companies or other data providers (CSB, SDB, ...).</p> <p>As is known, S-44 does not deal with specifications for the use of new systems or new procedures, particularly those related to data collected by private companies or from CSB.</p> <p>b – It is well known that the responsibility for the official chart (hydrographic) data rests on NHOs. If there are justified reasons for including other data than those collected by NHOs, it is reasonable to have proper mechanisms and procedures in place in order to ensure the quality of private data is as good as of those collected by NHOs.</p> <p>CHI considers that certain proper mechanisms and procedures should be unique and developed at the IHO level. Hydrographic Surveys Working Group can be the appropriate body to deal with the above mentioned topic. Therefore, CHI strongly supports the establishment of a Hydrographic Surveys Working Group.</p>

Cuba	Y	N	Correspondence	a – no comment; b – no comment;
Ecuador	N	Y	Correspondence	a – The purpose must not only be safety of navigation and protection of the marine environment, we think that maritime boundaries must also be included.  b – The CLSC11 stated that, for the works concerning the extension of the shelf, they should follow the standard S-44, Version 4; Version 5 is currently in force, which is only for safety of navigation; we consider that the subject UNCLOS must be included.
Egypt	N	N	Correspondence	a – A guideline to reach any desired criteria should be included in the new edition; b – no comment
Estonia	Y	N	Correspondence	a – no comment; b – no comment
Finland	Y	N	N	a – no comment; b – no comment  d – Finland sees that it is not possible at this stage to indicate its contribution level to the working group.
France	Y	Y	Active/correspondence	a – S-44 meets the requirements for the hydrographic surveys carried out by SHOM for the safety of surface navigation.  b – The inclusion of recommendations for the implementation of satellite bathymetry techniques might be considered in order to make the best use of it (no urgency).  d – Participation in such an HSSC Working Group is not included in SHOM's Work Programme for 2015. If necessary the number of participants in such a group will be fixed for? by? HSSC7.
Germany	N	Y	Active	a – General review of current S-44, Ed.5. b – TPU/TVU for model depths - Alternative survey methods (LIDAR, SDB, ROV...)

				<ul style="list-style-type: none"> <li>- CSB handling and perspectives</li> <li>- User spectrum and range of uses</li> <li>- Modern products and its dissemination</li> </ul> <p>d – Active member of the working group could be Mr. Bernd Vahrenkamp (BSH).</p>
Greece	Y	N	Active/correspondence	a – no comment; b – no comment
Iceland	Y	N	N	a – no comment; b – no comment
India	Y	N	N	a – no comment; b – no comment
Ireland	Y	N	N	a – no comment; b – no comment
Italy	N	Y	Correspondence	<p>a – S-44 was thought for surface navigation purpose. Today hydrography is not only for that purpose, as stated in its S-32 definition. The main strategic item is to adapt the IHO standards to what hydrography is today, and not only for the safety of navigation.</p> <p>At a lower level, there are some marginal changes to S-44 highlighted in Annex 1, mostly connected with reference frames, systems and datum.</p> <p>b – High. Collecting data with a modern instrument (e.g. beam forming multibeam) is a comprehensive assessment of the environment. It includes bathymetry, backscatter, water column and sometimes sub-bottom profiles. All these data are hydrography and no-one is standardizing these activities at a global level today. The document provided by GGeoHab starts taking into account this approach.</p> <p>Medium. The Hydrographic Manual (C-13) is not kept updated, and it is an integration to the standard (S-44).</p> <p>d – (detailed proposed changes to S-44)</p>



Japan	Y	N	Correspondence	a – no comment; b – no comment
Netherlands	Y	Y	N	<p>a – Yes, but the comments that the Netherlands made during the approval of the 5<sup>th</sup> edition (ref. CL22/2008) are still valid;</p> <p>b – The question if and how Satellite Derived Bathymetry Data can fulfil the S-44 Orders is open and needs to be investigated. This is the most important point towards getting SDB operational for nautical charting purposes.</p> <p>On a national level, S-44 was used as the basis for Guidelines for survey work done under the responsibility of the Dutch government. This includes two additional orders for hydrographic work related to construction and maintenance dredging, which are stricter. The Netherlands are not unique in this sense. It would be useful to standardize these requirements on an international level.</p> <p>d – NLHO does not have any additional capacity to share for this working group. NL recommends that the tasks identified under questions 1 and 2 are given to the Data Quality Working Group, of which NL is an active member. Such an approach reflects the aim to limit the number of groups under HSSC, as decided upon during the past HSSC meeting.</p>
Nigeria	N	Y	Active/correspondence & vice-chair	<p>a – Technical specifications for port and harbour surveys, environmental/dredging surveys and Aids to Navigation Surveys etc.</p> <p>b – Offshore overflight surveys, ROV surveys and geotechnical surveys. Coastal engineering surveys and construction (under water) surveys- Requirements/Technical guidelines, Provision of broad technical guidelines in special surveys.</p> <p>d – There is a lot of survey operations to be examined, reviewed and streamlined with respect to the HSWG which will add value to the practice of Hydro Survey and IHO as a regulator. I support the creation of HSWG.</p>

Norway	Y	Y	Active/correspondence	<p>a – no comment</p> <p>b – Procedures for qualification or approval of third parties surveying. The Norwegian Hydrographic Service has developed such procedures (in Norwegian).</p> <p>d – At least in the first phase of the work we would like to participate as “active member” and might change to “correspondence member” later on.</p>
Peru	Y	Y	Active	<p>a – no comment;</p> <p>b – Presently, the hydrographic surveys cover 100% of the sea bottom in port approaches, channels and critical areas and, with the new multibeam technology for shallow and deep waters, it will be possible to cover the whole area of the bathymetric survey of the nautical chart.</p>
Poland	Y	N	Correspondence	a – no comment; b – no comment
Portugal	Y	N	Correspondence	a – no comment; b – no comment
Republic of Korea	N	Y	Active/correspondence	<p>a – Hydrographic surveys are currently conducted not only using multi-beam but also other various methods such as bathymetric LiDAR, thus there is a need for establishing detailed and categorized standards;</p> <p>b – New survey technology using bathymetric LiDAR</p>
Romania	Y	N	Correspondence	a – no comment; b – no comment
Russian Federation	Y	N	Correspondence	a – no comment; b – no comment
Singapore	Y	N	Correspondence	a – no comment; b – no comment

Slovenia	Y	N	N	a – no comment; b – no comment
South Africa	Y	N	Correspondence	a – no comment; b – no comment
Spain	Y	Y	Active/correspondence & vice-chair/secretary	<p>a – no comment;</p> <p>b – Nowadays, technology progresses very rapidly. The study for the possible inclusion of new technologies in hydrographic tasks must be ongoing. The lack of a specific technical forum can delay the continuous vision of the technologies applied to Hydrography.</p> <p>The current level of the various Hydrographic Offices is quite mixed. The existence of a Working Group on Hydrographic Surveying would offer the possibility of a technical forum to exchange experience, knowledge and opportunities.</p> <p>d – If necessary, we could assume the office of Vice-Chair or Secretary (not both).</p>
Suriname	Y	N	Correspondence	a – no comment; b – no comment
Sweden	N	Y	Active	<p>a – S-44 and our Finnish-Swedish joint implementation FSIS-44 serve well at the moment. We do see motives for a revision with target date 2020-2022:</p> <ul style="list-style-type: none"> <li>- improve the balance between requirements for full bottom coverage, object detection and positional accuracy;</li> <li>- change focus for the standard from the individual point measurements to an overall surface assessment.</li> </ul> <p>b – High: Revision of S-44 as indicated in previous question;</p> <p>Medium: Develop “Technical aspects and guidelines for satellite-derived and crowd-sourced bathymetry”. Reference to point 6 in CL25 document;</p> <p>Medium: Develop “Backscatter guidelines”. Reference to point 7 in CL25 document;</p>

				<p>Medium: Work in collaboration with DGWG and other relevant WGs to align principles for presenting data quality in S-10X products (e.g. the CATZOC issue);</p> <p>Low: Support the surveyors to implement tools for error budgets and total propagated errors;</p> <p>Low: Support FIG-IHO-ICA IBSC and the individual organisations to manage relevant publications (e.g. FIG Commission IV documents).</p> <p>d – We consider C-13 to be obsolete in its present status and it should be withdrawn as official IHO document. The future needs of a totally new edition may be discussed or taken care of when developing the other documents above.</p>
Turkey	Y	N	Correspondence	a – no comment; b – no comment
Ukraine	Y	N	Correspondence	a – no comment; b – no comment
UK	Y	N	Active	<p>a – no comment; b – no comment</p> <p>d – Although a principle of S-44 is that it is independent of survey method, there may be a future need to include references to crowd sourced bathymetry (CSB) and satellite derived bathymetry (SDB), as these become more widely accepted forms of hydrographic data collection. At present UK supports the outcome of discussions at EIHC-5, which no revision of S-44 is required, and also accepts that it would be premature to establish a CSB need for revision in advance of agreement of a CSB policy, as an output from the CSBWG within IRCC.</p> <p>UK does not support the formation of a new WG simply to revise a publication, but proposes that if and when revisions of S-44 are identified, a project team is established with that specific intent.</p>
USA	N	Y	Active	a – Hydrographic Offices seeking to improve their nautical charts are beginning to explore remote-sensing technologies and alternate data collection methods (i.e. crowd sourcing). And traditional acoustic-based hydrographic technologies have advanced to enable the

				<p>concurrent acquisition of new data types (i.e. backscatter).</p> <p>These non-traditional technologies and methods were not envisioned in the current version of the IHO hydrographic standard S-44.</p> <p>b – A “Hydrographic Standards and Technologies Working Group” may be a more appropriate title for a working group through which Hydrographic Offices can evaluate these technologies and methods, exchange best practices, and consider revisions to S-44.</p> <p>These new and emerging technologies include:</p> <ul style="list-style-type: none"> <li>- Derived bathymetry (i.e. satellite, radar): high priority</li> <li>- Volumetric and seafloor backscatter: medium priority</li> <li>- Integrated positioning: medium priority</li> <li>- Remotely operated vehicles: medium priority</li> </ul> <p>d – Please see comment in paragraph 2 to question 1 above referring to a suggestion to consider amending the name of a potential new working group from “hydrographic surveys” to “hydrographic standards and technologies”.</p>
Uruguay	Y	N	Correspondence	a – no comment; b – no comment

Total replies: 41

a: Yes – 27 (comments: 2), No – 14 (comments: 14)

b: Yes – 18 (comments: 18), No – 23 (comments: none)

d: comments: 14

Stakeholder	a	b	c	Remarks
Australia AQUAMAP Pty Ltd	N	Y	Active/correspondence	<p>a – IHO should think about adopting the SSSI Australia and Marine Safety Queensland Hydrographic Standards on Competencies because there are too many professions who claim to be “Experts” in Hydrography these days.</p> <p>It should be promoting these to Port Authorities and the big insurance companies like Lloyds etc. wherever UKC or dredging for navigation is involved.</p> <p>b – Shouldn’t the different type of survey orders in the S-44 coincide with “Zones of Confidence” on nautical charts. This would avoid confusion between the two sets.</p>
Australia 3D at Depth Pty Ltd	N	Y	Active/correspondence	<p>a – We have developed a Subsea LiDAR Laser scanner capable of operating in water depths of 0 to 3000m. S-44 tends to cover acoustic technology with accuracies of - 0.25m. The Subsea LiDAR has a resolution of 1 mm and an accuracy of +/- 4mm at a range of -25m. Maximum Range is approx 45m.</p> <p>We kindly request the addition of a Subsea Laser category or perhaps the addition of S-44 orders which are of higher accuracy than the current special order.</p> <p>b – High – Discussion on Subsea LiDAR and laser mapping technology.</p> <p>d – Would need to review the level of commitment required to be a full active member before accepting the role.</p>
Australia Pilbara Ports Authority	N	Y	Active/correspondence	<p>a – The current standards are open to interpretation by individual hydrographic surveyors. This results in hydrographic survey applied methodology, data, and reports that are inconsistent with each other and varies in consistency, quality and therefore reliability.</p>

				<p>b – Priority: High</p> <p>Rewrite the Hydrographic Standards so they will lead to the production of uniform and consistent hydrographic survey data for end users.</p> <p>Priority: High</p> <p>The importance of the report that has to accompany any hydrographic survey data is underestimated. This report has to explain in detail how the survey was conducted, what checks were carried out, what deliverables resulted, etc. etc.. This is important considering that without this detail, future users of the survey data lack the background to be confident of relying on the data and the data therefore has become “worthless”.</p> <p>Priority: High</p> <p>Too often a methodology is nowadays applied by CPHS Level1 Surveyors where any unqualified person or organisation writes a ‘Hydrographic Survey Method Statement’ and the CPHS Level 1 Surveyor simply makes a statement that his or her hydrographic survey was carried out “...per the Hydrographic Survey Method Statement.....” Under the current Standards this is perfectly acceptable. In reality, this methodology leads to inaccuracies, omission of critical data and loss of faith in ‘CPHS Level 1 surveyors’ in general.</p> <p>A Hydrographic Survey Report accompanying any Hydrographic Survey Deliverable has to address how the survey <u>was</u> actually carried out, <u>not</u> how the survey was <u>planned</u> to be carried out.</p> <p>d – The problems with the Standards as they are experienced by our organisation as an ‘end user’ has prompted our organisation, the Pilbara Ports Authority managing a stretch of some 1000 kilometres of coastline critical to our national economy, to determine our own Hydrographic Survey Standards and Deliverables. See attached.</p>
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