4th Crowd-Sourced Bathymetry Working Group (CSBWG4) Meeting

13-14 February 2017,
Center for Coastal and Ocean Mapping & NOAA/UNH Joint Hydrographic Center
University of New Hampshire, Durham, United States

(Paragraph numbering is the same as the Agenda Item numbering and does not necessarily reflect the order in which matters were discussed. When more than one participant attended from a State, each is identified by their initials after the three letter country code.)

1. Opening

The Chair, Ms Jennifer Jencks (NOAA/NCEI-USA), opened the meeting and welcomed all participants. She thanked those at the Center for Coastal and Ocean Mapping & NOAA/UNH Joint Hydrographic Center University of New Hampshire, for their assistance with the meeting arrangements. She highlighted the Crowd-Sourced Bathymetry Guidance Document (CSBGD) was the main output for the group with the target of producing a mature draft for circulation to stakeholders before submission of the draft to the 9th session of the Inter-Regional Coordination Committee (IRCC9) in Paramaribo, Suriname, in June 2017. The Chair explained how she intended to conduct the meeting, which was to include focused breakout sessions led by the various Correspondence Group (CG) leaders to progress the CSBGD towards the target timeline.

IHO Secretary General, Robert Ward, (SG) gave an introduction highlighting his engagement with UN SDG14 meeting in June, the preparatory meeting for which he would be attending later in the week. He noted that there was no comment on the need for bathymetry as a fundamental underpinning dataset; he indicated he would be raising the issue at the meeting in coordination with the World Meteorological Organization (WMO) and Intergovernmental Oceanographic Commission of UNESCO (IOC). He highlighted the proposed IHO resolution which would be discussed at the first session of the IHO Assembly by the IHO Member States (MS). He detailed the proposed timetable for publication of the document to meet the administrative and procedural processes of the IHO as well as providing sufficient time for stakeholder and MS comment, input and feedback. He explained that having the CSBGD in the public domain, even in a draft version, would enable prospective contributors to commence using the guidance and the mechanisms established. SG noted that a report to the Assembly was a significant milestone, which could include the further development of the IHO Data Center for Digital Bathymetry (DCDB). He highlighted that CSB was impacting a number of other areas, which need to be considered by MS and how it interacts with other initiatives, including MSDI and how the data can be used by the broad spectrum of potential data users.

The proposed timeline was discussed:

13-14 Feb	Generate mature draft
1 Mar	Circulate initial draft to MS and stakeholders for comment
14-30 Apr	Prepare draft GD for submission to IRCC9
1 Jul	IRCC formally circulate draft for MS comment
Late 2017/early 2018	CSBWG5 meeting, consider external input and comments
Apr/May	Prepare Edition 1.0.0 for submission to IRCC10
Sep	Formal submission to IHO Council2
Oct	IHO Council2 approval
1 Jan 2019	CSBGD Edition 1.0.0 released
Late 2018/early 2019	CSBWG6 meeting, commence work on Edition 2.0.0

The rationale behind the delay was detailed and the benefits were clarified. Evert Flier (EF) suggested not waiting a further year to expand the remit of the WG to discuss how national Hydrographic Offices could use the data. SG suggested looking at 'investigating the use of CSB' rather than develop guidelines for the use of CSB; this could help to avoid push back from HOs and progress towards gaining general acceptance of

the concept. Chukwuma Azuike (CA) considered there was a need to discuss how CSB could be used and displayed on a chart in the future; this was felt to be too early in the overall development of the concept, although it was acknowledged that this could be a discussion in the future.

2. Administrative Arrangements

Brian Calder (BC) provided domestic and administrative details for the meeting.

3. Introductions

All participants – representing Canada, Italy, Nigeria, Norway, Philippines and USA (NOAA-NECI, NOAA-OCS, NGA), UNH-JHC/CCOM, GMATEK, Inc./World Maritime University and Sea-ID – introduced themselves and gave a short description of their background and current role, see Annex A for list of participants. Raymond Sawyer (NavO) participated remotely. Apologies were received from Frederico Antonio Saraiva Nogueira (Brazil), Jens Peter Weiss Hartmann and Rune Andersen (Denmark), Thierry Schmitt (France), Leonor Veiga (Portugal), Seppo Mäkinen (Finland), Renny Thomas (India), Anthony Klemm (NOAA-OCS), James Miller (NOAA-OCS), Patrick Keown (NOAA-OCS), James Ford (NGA), Tim Thornton (TeamSurv), Ole Benjamin Hestvik (Olex), Steffe-Hinrich Boie (SevenCs) and Paul Cooper (Caris). The draft meeting agenda was reviewed and adopted.

The agenda was adopted, see Annex B, and Annex C for a list of meeting documents.

4. Previous Meeting report and Action List

The report of CSBWG3 was approved and actions were reviewed, it was noted that all the outstanding actions were included in the agenda for the meeting.

5. Updates on current projects

CSB data pipeline infrastructure update – Chair provided a short presentation on developments within the DCDB. Adam Reed (AR) highlighted the progression of contributors and addition of Trusted Nodes, he also noted a number of charting manufacturers were investigating the use of CSB data. This generated numerous questions and a wide ranging discussion on the focus for further development within the DCDB.

Crowd-Sourcing 3-dimensional Navigation Sonar Data – Glenn Wright (GW) provided a brief on WMU research foci on the use of 3D Navigation Sonar to increase safety of ship navigation. It was highlighted that there was no requirement for realtime download of data, which could circumnavigate the current bandwidth limitations. It was noted that the DCDB cannot accept gridded data at present, the SG highlighted that this needs to be a future development in a GEBCO plan. Numerous questions were presented on how data was processed and the available resolution; object detection capability was noted to be within S-44 standards, although further development was underway.

Sea-ID – Kenneth Himschoot (KH) and Andrew Schofield (AS) provided a brief on developments in association with a number of industry and academic partners.

6. Review of Progress

Whitney Andersen (WA), the coordinating editor, briefed the participants on the comments received with reference to the draft 3.5 version. She outlined what progress had been made and what she hoped to achieve by the end of the meeting. EF considered the document tries to address too many communities, and supported the suggestion to simplify the document before working on the sections to avoid working on parts that could be discarded. The Chair proposed the document could be divided into two parts – Part One a simple outline of CSB and Part Two containing more technical information. SG suggested amending the title to be ‘General Guidance on Crowdsourced Bathymetry’. The

participants had an extensive discussion on the basic concept and content of the document so as to be useable for the mariner, whilst providing information and background for deeper understanding and quality assessment by potential data users. WA highlighted the need to identify the target audience. EF outlined potential content for Part One – why it is important, how to become involved and what potential contributor needs to do; Part Two should provide technical detail and go into more depth on each subject area. CA urged to keep the document simple with clarity. WA noted that CSB will not happen without the Crowd. There was general agreement that the current document almost serves the purpose of the in-depth guidance, it was agreed that the policy and introduction document could be undertaken separately. This part of the document should contain considerations that the IHO desires to be taken into account when collecting CSB to allow the data to be available for the widest possible uses.

It was suggested the document should cover the following:

> IHO policy on CSB – Why CSB is important to the IHO, What is CSB to the IHO, Who can be involved in CSB.
>
> Guidance Document – How to undertake CSB.

It was noted the Mission of the IHO is:

> … to facilitate the provision of adequate and timely hydrographic information.
> … for world-wide marine navigation and other purposes
> … through the co-ordination of the endeavours of national hydrographic offices

And the Objectives of the IHO are:

> a) To promote the use of hydrography and to raise global awareness of its importance;
> b) To improve global coverage;
> c) To improve global hydrographic capability and capacity; and
> d) To establish international standards and to achieve uniformity in the use of these standards.

It was felt the CSBWG ToRs and the proposed IHO Assembly resolution could provide the basis from which the policy section could be developed.

AR suggested having a reading order to guide the reader through the contents to enable the potential contributor to understand what they needed to do to contribute either as data gatherer, data aggregator and data user. WA noted that majority of the content is already available; it just needs to be reordered and enhanced. AR explained a potential layout to maximise the e-document capabilities.

Chair summarised discussions and agreed the creation of the IHO policy document with a wider Guidance section. She noted that clarity was still required on the layout and contents of the document, the Chair further summarised the layout of sections previously agreed. BC noted that it was important to agree which sections were important for each audience.

SG confirmed IHO Secretariat will ask MS to confirm whether they will allow CSB collection in their area of maritime jurisdiction, he confirmed the IHO website would list only those MS who positively confirm they allow CSB data gathering to take place. The CSBGD would have a URL to this list. The SG suggested it was likely the IHO Secretariat would ask MS once the IHO had approved the CSBGD.

SG highlighted that in the future the upload capability should contain an ability to indicate if a particular dataset contained data of interest, which would be highlighted to the appropriate HO by IHO through a form of H Note. The participants had wide ranging discussions on the legal considerations and whether the document should contain such a section; SG noted that the IRCC required a section

on legal considerations. It was noted that if a Trusted Node undertook value added processes or data manipulation, it was recognised there could potentially be some liability for the Trusted Node.

7. Breakout Sessions

The participants reviewed the discussions and progress achieved during the breakout sessions. Each Chapter lead provided a short synopsis for inclusion in the meeting report.

Data Contribution (Chair/vice-Chair) – It was agreed that:

- This chapter will move from Chapter 6 to Chapter 1;
- All comments and edits were reviewed, discussed, and many were applied.
- Defined Trusted Node as a data aggregate facilitator;
- Deleted extraneous and redundant explanations and descriptions;
- Moved 6.2.3 to 4.3 – advice on data logging rates;
- Added a section on data contribution for The Individual Contributor Model; and
- Updated section on newly implemented data download options at the IHO DCDB.

Data Collection, Sensors and Metadata (AR) –

The metadata & data collection breakout group first addressed the comments provided with the review process. The group removed several redundant sections of metadata and data fields that discuss units, or dynamic fields of data (e.g., sound speed) represented as a static metadata field. The group also consolidated and rearranged the sections in Data Collection to better represent the best practices and the audience it addresses. Finally the group highlighted a number of items that were best discussed in the CSBWG at large. Decisions were:

Data fields:

- Add Course Over Ground; and
- The group would like to add heading, as this is the desired information for the offset calculation...but it was considered that this is not feasible at this time, as it is not provided by any of the data logger inputs.

Metadata fields:

- "sounder depth" field should be a single value;
- "sounder depth uncertainty" should be added;
- Offsets between GNSS and Sounder should be measured from the GNSS position, not GNSS antenna; and
- Add an "issue with uncertainty" metadata field.

Data Collection:

- Storing the raw NMEA strings is the 'best practice', but the DCDB needs the data fields as extracted, paired data points...it was agreed that it would not be desirable for the end users to do this;
- GPS, Real time Clock, and Time synchronization are best addressed separately in the document, as readers who are unfamiliar with any of them may better understand each piece; and
- Depth of transducer should be recorded as a single value, not a range. The addition of an uncertainty gives a pseudo range that the mariner may use to decide when the value should be updated.

Uncertainty (BC) –

- The uncertainty chapter comments from V3.6 of the guidance document were reviewed, and applied. Most of the comments were primarily informational, and these were included where possible;
- Sub-sections of the uncertainty chapter that were specific to all readers, data collectors, trusted nodes, and end users were identified in the document in order to assist when formatting the final product and/or providing a view tailored to particular readers of the document when in electronic form;
- General editorial corrections were made to the chapter, including the addition of some supporting text and figures to assist in highlighting the issues with potential outliers and blunders in the data being collected; and
- The uncertainty chapter appears now to be more or less complete with respect to the goals for the first circulated version of the document.

Liability (Chair/vice-Chair) –

- All comments and edits were reviewed and discussed, some suggestions were applied.
- Deleted extraneous and redundant explanations and descriptions; and
- Rearranged 7.3 – Rights and responsibilities so to improve flow.

Appendices (KH) –

It was initially agreed that the generic term for data contributors could be 'Voluntary Observers' to match the term in use with the WMO. After further discussion it was agreed the term 'mariner' should be used as being more widely understood and recognisable.

The Editor requested 'Track Change' versions be forwarded. It was agreed that Word versions should be circulated for comments rather than PDF.

8. CSBDG Development Roadmap and Milestones

It was established the following timeline and milestones would be agreed:

24 Feb – provide clean sections to Editor – Chapter leads
17 Mar – send out draft for review by WG – Editor/IHO
24 Mar – provide comments/feedback to Editor – All
31 Mar – review WG comments and feedback – Chair/vice-Chair/Editor/IHO
7 Apr – circulate initial draft to MS and stakeholders for first comment – Chair/Editor/IHO
5 May – submit draft with report to IRCC9 – Chair/IHO

9. Review of ToRs and RoPs

The ToRs and RoPs were reviewed and no changes were considered necessary, see Annex E for the current version. The amendments resulting from the coming into force of the Protocol of Amendments to the IHO Convention were highlighted.

10. Any other business

No items.

11. Venue and dates of the 5th CSBWG Meeting

It was agreed that a further meeting of the working group would be beneficial to review the results of the formal consultation with IHO Member States and Stakeholders prior to the IRRC10, when it was

anticipated the final version would be presented for endorsement and IRCC presentation to the IHO Council in 2018 for adoption. It is therefore planned to hold a fifth meeting of the CSBWG in Monaco in late November or early December 2017. **Action IHO**

12. Action Items

A draft list of Action Items from the meeting was generated. All Action Items are marked in this report and are collated together at Annex D. An updated list of the Action Items will be maintained on the CSBWG5 webpage and all those who have actions to complete should keep the Chair and the Secretary informed of any progress. **Action ALL**

It was agreed that the IHO would circulate a draft meeting report to all attendees by 24 February. **Action IHO**

Attendees were requested to provide any comments by 10 March. **Action ALL**

It was intended the final meeting report would be published by 24 March. **Action IHO**

The IHO and the Chair would prepare the final report to IRCC9 using the format required by IRCC. It was noted the report to IRCC9 needs to be submitted by 5 May 2017. **Action Chair**

The Chair requested IHO to generate a draft Agenda for CSBWG5 and include it as Annex F to the report. The draft Agenda may require further amendment following intersessional progress.

13. Closing remarks

The Chair thanked everyone for attending the meeting, particularly those who had battled through the snow to attend, and for their effort and enthusiasm towards the task. She particularly thanked the contributions of SeaID. She indicated the forthcoming events for which tasks need to be completed and at which the draft of the CSBGD will be presented. She encouraged all present to maintain their current level of engagement and urged them to progress the action items for which they had responsibility.

The Chair thanked the Center for Coastal and Ocean Mapping & NOAA/UNH Joint Hydrographic Center, University of New Hampshire, in particular Brian Calder, for the support, the arrangements for the meeting and the excellent facilities, despite the winter conditions which had made it even more challenging. She stressed the continued importance of liaison with other IHO bodies and the appropriate engagement with industry to progress the work items. She also noted the significant progress achieved, a result of the participants clearly taking ownership of the project and tasks.

The meeting closed at 1700.

The following Annexes are attached:

A. CSBWG4 – List of Participants.
B. CSBWG4 – Agenda
C. CSBWG4 – List of Documents
D. CSBWG4 – List of Actions
E. CSBWG4 – ToRs and RoPs
F. CSBWG4 – Draft Agenda for CSBWG5
G. CSBWG4 – List of Members

IHO Crowd-Sourced Bathymetry Working Group (CSBWG)
List of Participants CSBWG4

Member State	Organization	Name	E-mail
Canada	CHS	Serge Gosselin (vice-Chair)	Serge.Gosselin@dfo-mpo.gc.ca
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Nigeria	Nigerian Navy Hydrographic Office	Chukwuma Azuike	azuikeaps@yahoo.com
Norway	Norwegian Mapping Authority Hydrographic Service	Evert Flier	evert.flier@kartverket.no
Philippines	National Mapping and Resource Information Authority (NAMRIA)	Jaya Roperez	jayaroperez@gmail.com
USA	NOAA National Centers for Environmental Information (NCEI)	Jennifer Jencks (Chair)	jennifer.jencks@noaa.gov
USA	NGA Centre for Coastal and Ocean Mapping, University of New Hampshire	Brian Calder	brc@ccom.unh.edu
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USA	NGA CCOM, UNH	Lee Alexander	leealex@ccom.unh.edu
IHO	IHO Secretariat	Robert Ward	sg@iho.int
IHO	IHO Secretariat	David Wyatt (Secretary)	adso@iho.int
Expert Contributor	Sea-ID	Kenneth Himschoot	Kenneth@sea-id.org Kenneth.himschoot@sea-id.org
Expert Contributor	Sea-ID	Andrew Schofield	andrew.schofield@sea-id.org
Expert Contributor	GMATEK, Inc., World Maritime University	Glenn Wright	glenn@gmatek.com p1301@wmu.se
Remote Participants			
USA	NavO	Raymond Sawyer	Raymond.sawyer@navy.mil

4th Crowd-Source Bathymetry Working Group (CSBWG4) Meeting
UNH, Durham, New Hampshire, USA – 13-14 February 2017

1. Welcome and opening remarks by the Chair.

2. Domestic and administrative arrangements (*Host/Secretary*).

3. Introduction of participants, apologies and approval of agenda.

4. Approval CSBWG3 Report and Review of Actions.

5. Updates of Current Projects:

   .1 Introduction;
   .2 RosePoint;
   .3 DCDB development;
   .4 TeamSurv;
   .5 Sea ID;
   .6 EMODnet.

6. Overview review of the initial draft CSB Guidance Document (CSBGD) (*Editor*):

   .1 Introduction;
   .2 Overview of System and Sensor;
   .3 Metadata;
   .4 Data Collection;
   .5 Uncertainty;
   .6 Data Contribution;
   .7 DCDB;
   .8 Legal Considerations;
   .9 Annexes and Appendices;
   .10 Lists; and
   .11 Fact Sheet

7. Progress incorporation of feedback comments and input into each section, via breakout sessions, to develop final draft version:

   .12 Introduction;
   .13 Overview of System and Sensor;
   .14 Metadata;
   .15 Data Collection;
   .16 Uncertainty;
   .17 Data Contribution;
   .18 DCDB;
   .19 Legal Considerations;
   .20 Annexes and Appendices; and
   .21 Lists

8. Review of CSBGD development timeline and milestones – IRCC9, Assembly1.

9. Review of ToRs and RoPs.

10. Any other business.

11. Date and venue of next meeting – CSBWG5 – and intersessional activities.

12. Review of Action List and draft agenda for CSBWG5.

13. Closing remarks by Chair.

CSBWG4 - List of Documents

Document No	Document Title
CSBWG4-Invitation Letter	Letter of Invitation
CSBWG4Registration Form	Registration Form (Word Version)
CSBWG4-Logistic Information	Logistic Information
CSBWG4-Document Template	Document Template (Word version)
CSBWG4-3-Agenda	CSBWG4 Draft Agenda v3.0
CSBWG4-3-Agenda	CSBWG4 Draft Annotated Agenda v3.0
CSBWG4-4-Action List	List of Actions - CSBWG3 - updated 10 February 2017
CSBWG4-6	IHO CSB Guidance Document Draft v3.5
CSBWG4-9	ToRs and RoPs
CSBWG4-11	Proposed draft agenda for CSBWG5
CSBWG4-6.11	Draft Fact Sheet
CSBWG4-INF5.1.1	Bathymetry from space
CSBWG4-INF5.1.2	Satellite derived bathymetry migration
CSBWG4-INF5.1.3	Improving satellite derived bathymetry
CSBWG4-INF5.1.4	Effective surveying tool for shallow water zones
CSBWG4-INF5.1.5	Satellite derived bathymetry
CSBWG4-INF5.1.6	Reconnaissance surveying using satellite derived bathymetry
CSBWG4-Participants	CSBWG4 List of Participants

LIST OF ACTIONS – Updated 30 March 2017

Agenda Item	Subject	Status/Date	Comments	Action
CSBWG3				
4	IHO website	On going	Check IHO website for documents and information	All
~~8~~	~~CSBGD~~	~~24 Feb~~ Complete	~~Provide clean sections to Editor~~	~~Chapter leads~~
~~8~~	~~CSBGD~~	~~17 Mar~~ Complete	~~Circulate consolidated draft for review by WG~~	~~Editor/IHO~~
~~8~~	~~CSBGD~~	~~24 Mar~~ Complete	~~Provide comment and feedback to Editor~~	~~All~~
8	CSBGD	31 Mar	Review comments and feedback	Chair/vice-Chair/Editor/IHO
8	CSBGD	7 Apr	Circulate initial draft to IHO member states and stakeholders for initial impressions and comments	Chair/Editor/IHO
8	CSBGD	5 May	Submit draft with report to IRCC9	Chair/IHO
8	IRRC9	1 Jul	Formal circulation, under IHO CL, of draft CSBGD to IHO member states for comment	Chair/Editor/IHO
8	CSBGD	1 Sep	Consolidate comments and distribute to Chapter leads	Editor/IHO
8	CSBGD	7 Oct	Provide amended sections to Editor	Chapter leads
8	CSBGD	3 Nov	Circulate final draft version in preparation for CSBWG5	Editor
12	CSBWG5	2 Jun	Circulate an initial letter of invitation	IHO
13	Action List	CSBWG5	Keep chair and IHB informed of progress with allocated actions	All
~~13~~	~~CSBWG4 Draft Report~~	~~24 Feb~~ Complete	~~Draft to be circulated for comment~~	~~IHO~~
~~13~~	~~CSBWG4 Draft Report~~	~~10 Mar~~ Complete	~~All to provide comments on draft report to IHB~~	~~All~~
~~13~~	~~CSBWG4 Final Report~~	~~24 Mar~~ Complete	~~Publish final report~~	~~IHO~~
13	Report to IRCC9	31 Mar	Provide outline draft to Chair	IHO

13	Report to IRCC9	5 May	Submit report and draft CSBGD to IRCC9	Chair

CROWD-SOURCED BATHYMETRY WORKING GROUP (CSBWG)

Terms of Reference

(as adopted by IRCC-7, June 2015**)**

1. Preamble

The 5th Extraordinary International Hydrographic Conference (EIHC-5) considered Proposal 4 on Crowd Sourced Bathymetry (CSB) and decided by Decision 8 to task the IRCC to establish a Working Group (WG) to prepare a new IHO publication on policy for trusted crowd-sourced bathymetry, taking into account EIHC-5 Proposal 4 and the comments made during the Conference.

2. Objectives

a. Prepare a draft IHO publication on policy for trusted crowd-sourced bathymetry for consideration and endorsement by the 8th meeting of the IRCC in 2016.

b. The draft IHO publication on policy for trusted crowd-sourced bathymetry should provide guidelines on the collection and assessment of CSB data, not only for potential use for charting purposes but also for its wider use in non-navigational applications. The WG should:

(1) take into account EIHC-5 Proposal 4 and the comments made during the Conference;

(2) take into account the ongoing work to enhance the IHO Data Centre for Digital Bathymetry (DCDB) as a data discovery and upload/download portal for Crowd-Sourced Bathymetry;

(3) take into account the lessons learned and specifications created during the IHO CSB pilot project involving the Professional Yachting Association, Sea-ID and the DCDB, together with any other relevant CSB trials or operational services;

(4) actively seek input from other international organizations, industry and invited Expert Contributors on their methods and use of crowd-sourced information;

(5) seek advice and input from relevant HSSC Working Groups as required;

(6) identify the nature and minimum level of metadata required to accompany any crowd-sourced bathymetry data;

(7) identify methods for assessing and designating the uncertainty of crowd-sourced bathymetry, both as individual observations from a single observer and as repeat or duplicate observations from the same or different observers;

(8) identify preferred formats for the submission, exchange and preservation of crowd-sourced bathymetry data, taking into account the relevant international standards and existing industry or community practices; and

(9) base its recommendations, wherever possible, on established and accepted crowd-sourced data gathering principles.

c. The WG should identify potential legal and liability issues associated with the collection or use of crowd-sourced data and provide this information to IRCC for further consideration and guidance on how they should be addressed.

3. Authority

a. The WG is a subsidiary of the Inter Regional Coordination Committee (IRCC) and its work is subject to IRCC approval.

b. The need for the WG to continue shall be confirmed at each meeting of the IRCC.

4. Composition and Chairmanship

a. The WG shall comprise representatives of IHO Member States, invited Expert Contributors, including members of IHO-IOC Technical Sub Committee on Ocean mapping (TSCOM) and Observers from accredited NGIO, all of whom have expressed their willingness to participate, and a representative of the IHO Secretariat.

b. Member States, invited Expert Contributors and Observers may indicate their willingness to participate at any time. A membership list shall be maintained, posted on the IHO website and confirmed annually.

c. Invited Expert Contributor membership is open to entities and organizations that can provide a relevant and constructive contribution to the work of the WG.

d. The Chair and Vice Chair shall be a representative of a Member State. Unless already decided by the IRCC, the election of the Chair and Vice-Chair should be decided at the first meeting following each ordinary session of the Assembly and, in such case, shall be determined by vote of the Member States present and voting.

e. If a secretary is required it should normally be drawn from a member of the WG.

f. If the Chair is unable to carry out the duties of the office, the Vice-Chair shall assume the Chair with the same powers and duties.

g. Invited Expert Contributors shall seek approval of membership from the Chair.

h. Invited Expert Contributor membership may be withdrawn in the event that a majority of the MS represented in the WG agree that an Expert Contributor's continued participation is irrelevant or unconstructive to the work of the WG.

i. All members shall inform the Chair in advance of their intention to attend meetings of the WG.

j. In the event that a large number of Invited Expert Contributor members seek to attend a meeting, the Chair may restrict attendance by inviting the Invited Expert Contributors to act through one or more collective representatives.

5. Procedures

a. The WG should work primarily by correspondence.

b. The WG should attempt to meet annually, and wherever possible, with another convenient forum.

c. The WG should seek advice and input from relevant HSSC WGs as required.

d. Decisions should generally be made by consensus. If voting is required on issues or to endorse proposals presented to the WG, only IHO Member States may cast a vote. Votes at meetings shall be on the basis of one vote per MS represented at the meeting. Votes by correspondence shall be on the basis of one vote per MS represented in the WG. In all cases of voting, a majority shall be determined based on the number of Member States casting a vote.

5th Crowd-Source Bathymetry Working Group (CSBWG5) Meeting
(tbc) IHO HQ, Monaco – (tbc) November/December 2017

1. Welcome and opening remarks by the Chair.

2. Domestic and administrative arrangements (*Host/Secretary*).

3. Introduction of participants, apologies and approval of agenda.

4. Approval CSBWG4 Report and Review of Actions.

5. Updates of Current Projects:

   .1 Introduction;
   .2 RosePoint;
   .3 DCDB development;
   .4 TeamSurv;
   .5 Sea ID;
   .6 EMODnet.

6. Overview review of the draft CSB Guidance Document (CSBGD) (*Editor*):

   .1 Introduction;
   .2 Overview of System and Sensor;
   .3 Metadata;
   .4 Data Collection;
   .5 Uncertainty;
   .6 Data Contribution;
   .7 DCDB;
   .8 Legal Considerations;
   .9 Annexes and Appendices;
   .10 Lists; and
   .11 Fact Sheet

7. Progress incorporation of feedback comments and input into each section, via breakout sessions, to develop final draft version:

   .12 Introduction;
   .13 Overview of System and Sensor;
   .14 Metadata;
   .15 Data Collection;
   .16 Uncertainty;
   .17 Data Contribution;
   .18 DCDB;
   .19 Legal Considerations;
   .20 Annexes and Appendices; and
   .21 Lists

8. Review of CSBGD development timeline and milestones – IRCC10.

9. Review of ToRs and RoPs.

10. Any other business.

11. Date and venue of next meeting – CSBWG6 – and intersessional activities.

12. Review of Action List and draft agenda for CSBWG6.

13. Closing remarks by Chair.

IHO Crowd-Sourced Bathymetry Working Group (CSBWG)
List of Members

Member State	Organization	Name	E-mail (correspondence)	E-mail (Google Calendar, Drive, & Hangout access)
Argentina	Servicio de Hidrografia Naval	Fabián Alejandro Vetere	fvetere@hidro.gov.ar	
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Brazil	Diretoria de Hidrografia e Navegação	Frederico Antonio Saraiva Nogueira	frederico@marinha.mil.br	frederico.asn@gmail.com
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Canada	Canadian Hydrographic Service	Dana Gallant	Dana.Gallant@dfo-mpo.gc.ca	
Canada	Canadian Hydrographic Service	Peter Wills	Peter.Wills@ dfo-mpo.gc.ca	
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