2nd Crowd-Sourced Bathymetry Working Group (CSBWG2) Meeting

10-11 February 2016, Boulder, Colorado, USA

(Paragraph numbering is the same as the Agenda Item numbering and does not necessarily reflect the order in which matters were discussed.)

1. Opening

The Chair, Ms Lisa Taylor (NOAA/NCEI-USA), opened the meeting at 0848. She thanked those at NOAA-NCEI for their assistance with the meeting arrangements. She thanked all participants for coming and gave a brief update on the work undertaken since the first meeting in Kuala Lumpur and described the background to the project. She explained also how she intended to manage the meeting.

2. Administrative Arrangements

Domestic and administrative arrangements were confirmed, including lunch and evening events.

3. Introductions

All participants – representing Italy, Japan and USA (NOAA-NECI, NOAA-OCS, NGA), UNH-JHC/CCOM, Olex AS and Sea-ID – introduced themselves and gave a short description on their background and current role. Apologies were received from Paul Cooper (Caris). The draft meeting agenda was reviewed and adopted.

4. Previous Meeting report and Action List

The report of the previous meeting, CSBWG1, was approved and it was noted there were no outstanding Actions from the previous meeting.

5. Background and Review of Progress

The meeting received reports from the coordinators of the three Correspondence Groups describing what progress had been achieved intersessionally since the CSBWG1 meeting.

Uncertainty Correspondence Group (UCG): Brian Calder (BC) described the four key areas that require focus - establish minimum requirements for metadata, identify types of data uncertainty, determine how best to attribute uncertainty to help users determine how the data can be used, and give suggestions for combinations of uncertainties when products are constructed.

Data Format and Metadata Correspondence Group (DFMCG): Anthony Klemm (AK) reported on progress – they had investigated the need for alternative data formats, evaluated the current format used in the IHO CSB pilot project (GeoJSON), discussed distinguishing between metadata that should be required and metadata that should be encouraged, considered a unique ID for vessels, investigated download/exact data format from DCDB, noting that it was considered that an ASCII format ultimately would be preferred. They had considered a special features file – basically a tag for specific important events in the data and how this could be captured. They identified a number of questions to be addressed regarding ship ID, unique ID structure, how to include new technology, how trusted nodes can provide data other than raw point data if preferred. Chair explained the Trusted Node concept.

Systems and Hardware Correspondence Group (SHCG): Kenneth Himschoot (KH) reported that the CG is investigating current initiatives using diverse hardware and how they are storing data and in what format. A number of organizations have been contacted in preparation for providing an overview of the very diverse mariner groups to discover what hardware is in use and how it is used.

Chair noted progress will be uneven across the various sections due to external commitments and relative complexities of the subject matter; however it was anticipated long term the progress would even out.

6. Guidance Document Structure

Chair explained the CSB Guidance Document (CSBGD) development requirements and how she intended to progress. She then gave a brief on the current outline and what needed to be added to create the draft document in preparation for presentation to IRCC8. The main sections were highlighted; SeaID asked where the potential legal issues on collecting data in certain countries would be addressed. Chair noted the need to identify issues covering legality and liability related to both collection and use. Chair suggested there may be a need to amend the ToRs 2.c to reflect the expertise and scope of the WG. France expressed concern that if the CSBGD is too detailed it could put off potential users/contributors from becoming involved. Chair noted it was anticipated to use external links to allow deeper research into the subjects as desired whilst keeping the basic document simple for more general use.

Chair asked the working group (WG) members to each consider taking on the role of coordinating editor to manage the document.

The Chair opened a discussion on the requirements and attributes necessary to fulfil the role as coordinating editor. All participants were asked to identify what skills and attributes they could provide. Karen Marks (KM) provided advice and guidance on the role from her experience with editing the GEBCO Cookbook and described the PDF format used in the Cookbook and why it was decided to use that particular format. James Ford (JF), Anthony Klemm (AK) and Adam Reed (AR) agreed to investigate an appropriate person to take on the role of Coordinating Editor and provide feedback to the Chair by 19 February. **Action JF, AK and AR**

Chair asked the participants to consider who the CSBGD users were likely to be; IHB noted the need to keep in mind lowest knowledge level of these potential contributors and users. TeamSurv highlighted the wide diversity of potential users may need multiple documents; AR suggested multiple documents would be harder to use and a single document also allows people to increase knowledge through further reading and the gaining of a deeper understanding of subjects. AK suggested the use of links and careful consideration of the structure would make document user friendly and allow easier navigation to relevant topics. BC noted it was unlikely to have a single audience and there remained a need to address wider requirements of potential uses. BC suggested the need to consider groups of boat operators as well as single vessels. Evan Robertson (ER) suggested the use of the collection models as way to section the document. Marta Pratellesi (MP) encouraged the use of links to navigate deeper into subjects away from initial area of interest. Summing up, the Chair decided to create one document in a digital format; she highlighted the need to investigate the most appropriate digital formats, such as SGML and XML. IHB cautioned on straying into creating standards in the CSBGD as this could involve following the processes articulated in Resolution 2/2007, which would not be appropriate.

Chair asked the participants to consider and identify what the CSBGD should not be. AK highlighted the need to avoid misuse and misinterpretation of data and understanding of Uncertainty. IHB suggested a precautionary note as a way to ensure data was not given an unwarranted level of authority or confidence by potential users. TeamSurv highlighted the issues of data protection and data ownership. BC noted the need to ensure CSBGD does not become too large. Chair anticipated CSBGD would evolve and improve with experience and use; she considered future versions/editions would reflect user input and feedback. Olex questioned the need for the document, why it was being created and what restrictions could be placed on the data and its quality. IHB highlighted that the data has multiple uses and it is for the product creator/user to assess its quality to meet their particular needs. TeamSurv agreed to let the user make the quality assessment with the opportunity to provide feedback identifying particularly poor data, a process which may be of assistance to other data contributors, Trusted Nodes and users. It was agreed there was a need to keep potential users in mind

when drafting CSBGD. AR agreed to investigate potential CSBDG reviewers from the wider community. **Action AR**

6.1 Metadata Section: The participants reviewed the outline of the CSBGD adding comments and additional inputs. The participants then worked through the comments and inputs, which initiated a wide ranging discussion on the document contents and the order in which the various sections should appear. It was agreed that the type of units (metric or imperial) to be used needed to be considered and guidance on how and where any transformation should be undertaken. It was felt that careful wording could be found to articulate the preferred data format for uploading into the DCDB without making it a data standard. It was agreed that the metadata should contain an Uncertainty field. It was agreed that data should be uncorrected when submitted to the DCDB; the raw data should include the necessary detail to allow contact to be made with the provider either to obtain more information/data or to obtain higher resolution raw data from a submitted lower resolution subset. The participants agreed on what should be in the metadata, whilst the description on what additional vessel metadata should be captured should be addressed by the DFMCG. **Action DFMCG**

Positional accuracy was agreed to be to 6 decimals of degrees and to be kept compatible with S-100 formats to allow future development of a transfer standard for CSB data. It was agreed a ship draft data field should be available and user should be encouraged in its completion. Data contributors should be encouraged to pass over selected known survey data areas to conduct a system confidence check. The need to check the feasibility and use of confidence check areas for groundtruthing sensors and systems against known data was agreed. **Action ER** It was agreed the vessel sensor information needed to be recorded. ER to investigate creation and maintenance of list of echo sounders and navigation receiver look-up tables. **Action ER**

GPS latency was identified as a potent source of error; it was felt this could be significantly large up to 2.5 seconds.

A number of additional metadata fields were identified as being required and would be considered by DFMCG. **Action DFMCG**

6.2 Uncertainty Section: The Meeting participants discussed the best way to generate this section without making the contents too complex. It was suggested detailed explanations and examples could be included in annexes. The main section should contain elementary level information and explanations, sufficient for basic understanding with links to more detailed information. Where should Uncertainty be calculated – in metadata as submitted or post-processed as required by the user? It was suggested data could have a qualitative Uncertainty value. IHB cautioned against giving any assessment which could generate a false sense of data suitability for the end users. It was agreed there was a need to identify what Uncertainty should be measured and how it could be displayed to potential users. **Action UCCG** AR suggested users could provide feedback on data quality and uncertainty of processed data sets. It was agreed this could be investigated in the future. Users could undertake system confidence checks by passing over previously surveyed areas for comparison of data collected against known data. Uncertainty estimate of data could be fed back to contributors as a scorecard to allow them to improve data quality.

AR suggested reorganizing the section to include the introduction, how contributors can improve data quality, how Trusted Nodes can assess data, how Users can assess data against potential uses and how feedback can be provided back to contributors. BC asked for more comments on how the section is laid out and what level of detail should be included.

BC led the discussion on motion sensor data and whether it would be available and how it should be handled. He suggested there be a recommendation to have it as a capability and therefore accurate time stamp data would be a requirement and be logged. It was agreed there was a need to have clarity on whether the draft was directly applied to the logged depth or whether it would be added later; also there is a need to know whether the echo sounder was set to read from the waterline or transducer and which transducer was in use if multiple ones were fitted.

BC asked if there was or likely to be created a true crowd, such that multiple measurements from a crowd are self-correcting due to the volume of repeat measurements; it was noted that it was unlikely to achieve this in the near future except in narrow channels and harbour approaches and possibly some bays.

It was questioned whether some of this section related to the use of data should be included in a new chapter on CSB in the GEBCO Cookbook rather than the GD. It was agreed to discuss this with the GEBCO Cookbook editor, Dr Karen Marks, at a later stage.

The ability to detect change from published information was important as well as identifying new data and additional environmental observations; how this can be recorded and used needs to be investigated further. It was agreed there remains a need to encourage collection and submission of data to improve information available to the mariner and other data uses. Olex cautioned against including non-automatic collected data which requires significant human interaction. It was noted that vessel motion data was useful for assessing the uncertainty and thus data quality.

6.3 Metadata and Data Formats: AK led the discussion on data formats and how the data can be provided to the DCDB. The chair highlighted the current DCDB supported formats. It was agreed to change the section title to 'Contributing Data to the DCDB' and that a description of the DCDB should be included in the section introduction. Chair suggested including comments on the ability to contribute lower resolution datasets or subsets from organizations with information on where to obtain the full dataset. There should be an ability to assess the data uncertainty/quality by the user. It was agreed to follow Method 2 as describe in document CSBWG2/5/2/1 to create a unique key to ID each vessel and data row entry.

It was agreed to develop a ship type classification based on the AIS classifications with the flexibility to add additional types if needed. ER agreed to coordinate the development of a look-up table of vessel types with DFMCG as highlighted in document CSBWG2/5/2/2. **Action ER**

6.4 DCDB Section: The meeting received a brief on the software development being undertaken to enhance the DCDB and how this would impact the development of the CSBGD. This generated numerous questions and wide ranging discussions, particularly focusing on metadata content and data formats with respect to data flow from Trusted Nodes. Data discovery issues were discussed, particularly viewing data for a bounded area or specified epoch. The developments for data assessments and filters were described. The development team requested that the spatial and non-spatial search attributes be defined by the WG to allow this development to progress and enhance the data discovery/viewing ability. The WG needs to consider which minimum search attributes are needed, with the understanding that additional attributes can be added to the interface at a later time as long as they are captured in the metadata. The best way to address issues created by data lines separated by gaps in the same file were discussed. It was preferred that new files were created rather than have gaps in individual lines which then need to be filtered. Chair request that the feasibility of generating separate files rather than part lines in files when system is interrupted be investigated. **Action ER**

6.5 Legal Section: Kevin Baumert (KB), legal counsel for the US Extended Continental Shelf project office at NOAA, offered his perspective on possible legal and liability issues associated with the collection and use of CSB data. The question of who owns the data and where the liability rests clearly requires the need to include some kind of cautionary statement. Potential issues with data collection in the waters of coastal states include the interpretation of rules related to innocent passage, including what constitutes "research or survey activities" (within the Territorial Sea), and the meaning of "Marine Scientific Research" (within the EEZ and on the Continental Shelf). Chair asked that a draft section be developed to articulate the potential legal and liability issues. **Action JJ**

6.6 Systems and Hardware: Kenneth Himschoot (KH) briefed the WG on the investigation into the wide range of sensors and systems in use at sea. It was agreed there was a clear need for some

basic explanation on these sensors and systems as well as how they fit into CSB data gathering. It was agreed that recording and storing the raw NMEA data string was of benefit. It was agreed there may be a need to highlight sections of the NMEA specifications. The SHCG was tasked to investigate whether a link could be included in the CSBGD. **Action SHCG** Chair asked all to consider suggesting or developing diagrams and graphics to explain concepts within the CSBGD; NOAA can formalize rough versions if necessary. **Action All**

7. Other Key Topics and Areas for Discussion

Included under agenda item 6.

8. CSBDG Development Roadmap and Milestones

IHB briefed on future events for which progress on development of the CSBGD will need to be reported and from which comment and input may be received. The current draft CSBGD developed during the meeting was more than sufficient to present to IRCC8 in Abu Dhabi in late May. The next significant events would be IHC19/Assembly1 in Monaco in late April 2017 and IRCC9 shortly after; it was agreed a meeting later in the year would allow further progress to be achieved and preparation of a mature draft for presentation at these events.

9. External Review Process

Included under agenda item 6.

10. Review of ToRs and RoPs

It was agreed a proposed amendment to ToRs paragraph 2.c should be included in the CSBWG report to IRCC8. See Annex E for the proposed amendment. **Action Chair/IHB**

11. Any other business

An email from Paul Cooper was highlighted in which details of other organizations engaged in crowdsourcing was given. It was agreed further investigation of these organizations was desirable and the WG should consider inviting some additional members associated with these organizations to the next meeting. **Action Caris**

The meeting received a brief on the Olex AS developments, which included how the system worked, areas covered, data obtained and some products derived. Comparison of MBES and Olex datasets were displayed, which highlighted the potential of CSB in areas where large quantities of repeat observations are available. Olex indicated provision of data to the DCDB was being considered either directly from individual vessels, which would require a software modification, or from the Olex database. Further discussion with the vessels delivering to Olex was required.

12. Venue and dates of the 3rd CSBWG Meeting

It was agreed there was a need for a further meeting of the WG post IRCC8 and prior to the IHC19/Assembly1 in Monaco in late April 2017 and IRCC9 in May. The IHB offered to host the meeting in Monaco on 7-8 November 2016 and noted it was proposed to host a meeting of the Galway Statement Tri-Partite Implementation Committee and the Atlantic Seabed Mapping International Working Group during the same week. **Action IHB**

13. Action Items

It was agreed that there was a need to identify actions and deliverables to move the development process forward. 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 CSBWG3 web page and all those who have actions to complete should keep the Chair and the IHB informed of any progress. **Action ALL**

It was agreed that the IHB would circulate a draft meeting report to all attendees by 19 February. **Action IHB** Attendees were requested to provide any comments by 4 March. **Action ALL** It was intended the final meeting report would be published by 18 March. **Action IHB**

The IHB and the Chair would prepare the final report to IRCC8 using the format required by IRCC. It was noted the report to IRCC8 needs to be submitted by 10 April 2016. **Action Chair**

The Chair requested IHB to generate a draft Agenda for CSBWG3 and include as Annex F to the report. The draft Agenda may require further amendment following intersessional progress.

14. Closing remarks

The Chair thanked everyone for coming to the meeting and for the effort and enthusiasm towards the task. She particularly thanked the contributions of TeamSurv, Olex and SeaID. She noted the up-coming 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 the current level of engagement and urged them to progress the action items for which they had responsibility.

David Wyatt (IHB), on behalf of the Directing Committee thanked the NOAA-NCEI for hosting the meeting and providing a high level of support and excellent facilities. He stressed the continued importance of liaison with other IHO bodies and the appropriate engagement with industry to progress the work items. He also noted the significant progress achieved, a result of the participants clearly taking ownership of the project and tasks.

The Chair endorsed these sentiments and she highlighted the continuing need for active engagement by the CSBWG members during and between meetings to progress action and work items.

The meeting closed at 1635.

The following Annexes are attached:

A. CSBWG2 – List of Participants.
B. CSBWG2 – Agenda
C. CSBWG2 – List of Documents
D. CSBWG2 – List of Actions
E. CSBWG2 – ToRs and RoPs
F. CSBWG2 – Draft Agenda for CSBWG3
G. CSBWG2 – List of Members

IHO Crowd-Sourced Bathymetry Working Group (CSBWG)
List of Participants CSBWG2

Member State	Organization	Name	E-mail
Italy	Istituto Idrografico della Marina	Marta Pratellesi	marta.pratellesi@marina.difesa.it
Japan	Hydrographic and Oceanographic Department, Japan Coast Guard (JHOD)	Daishi Horiuchi	ico@jodc.go.jp
USA	NOAA-National Centers for Environmental Information (NCEI)	Lisa Taylor (Chair)	Lisa.A.Taylor@noaa.gov
USA	NOAA-NCEI	Jennifer Jencks	jennifer.jencks@noaa.gov
USA	NOAA Office of Coast Survey (OCS)	Anthony Klemm	anthony.r.klemm@noaa.gov
USA	NOAA OCS	Percy Pacheco	percy.pacheco@noaa.gov
USA	NOAA-Centre for Coastal and Ocean Mapping, University of New Hampshire	Brian Calder	brc@ccom.unh.edu
USA	NOAA-NCEI	Evan Robertson	evan.robertson@noaa.gov
USA	NGA	James Ford	james.d.ford@nga.mil
USA	NOAA OCS	Adam Reed	adam.reed@noaa.gov
IHB	IHB	David Wyatt (Secretary)	adso@iho.int
Expert Contributor	Sea-ID	Kenneth Himschoot	Kenneth@sea-id.org Kenneth.himschoot@sea-id.org
Expert Contributor	Managing Director, Olex AS	Ole Benjamin Hestvik	oleb@olex.no
Selected Remote Contributors			
France	SHOM	Thierry Schmitt	thierry.schmitt@shom.fr
USA	NOAA-NCEI	Karen Marks	Karen.marks@noaa.gov
Expert Contributor	TeamSurv	Tim Thornton	Tim.Thornton@teamsurv.eu

2nd Crowd-Source Bathymetry Working Group (CSBWG2) Meeting
Boulder, Colorado, USA – 10-11 February 2016

1. Welcome and opening remarks by the Chair
2. Domestic and administrative arrangements (Secretary)
3. Introduction of participants, apologies and approval of agenda
4. Approval CSBWG1 Report and Review of Actions
5. Brief reports from correspondence groups on progress, including principal achievements as well as problems and outstanding issues
6. CSB Guidance Document (CSBGD):
    - Review of initial outline
    - Select a coordinating editor to put pieces together and ensure consistent format and voice
    - Identify audience
        - Hydrographic Offices that will use the database?
        - Academia?
        - Joe Boater, the potential CSB contributor and data user?
        - Prospective Trusted Nodes?
    - How can we make the GD easy to navigate (e.g., use of hyperlinks to jump to specific topics and link to more specific reference materials)?
    - Introduction/High level summary:
        - Describe the context with vision and mission, what is it, and what it isn't.
        - General description with diagrams to tie all focus areas together with examples of how the systems would work (data flow, metadata lists, data formats, how the unique ID works)
    - What can we include from the pilot project lessons learned?
    - Include sections to address each user type, with a specific details?
    - Need for technical and formatting graphics?
    - Include directions on how to use the data?

7. Other key topics/ areas for discussion:
    - State of IHO DCDB development (rate of data coming in, timeline for development), pilot project lessons learned to inform GD
    - How much metadata can we reliably generate? How much can we ask the users to provide?
    - Do we need to limit, or just assess, uncertainty?
    - Questions and feedback from software developers and GIS team
    - Do we need to address the incorporation of data into products, or just the creation of data and its archival?
    - Is there such a thing as a hydrographic crowd? That is, can CSB behave with the self-correction implicit in the wisdom of crowds?
    - Should we address legal framework issues/questions regarding data collection and data use implications for liability? *(invite Kevin B. to discuss)*
    - Need consensus on technical aspects (e.g., output data format, etc.)
8. CSBGD development roadmap: timeline, milestones and point people
    a. IRCC8, CSBWG3, IRCC9/19th IHC
9. External interim review by potential users? By whom?
10. Review of ToRs and RoPs.
11. Any other business.
12. Date and venue of next meeting – CSBWG3 – and intersessional activities.
13. Review of Action List and draft agenda for CSBWG3.
14. Retrospective of meeting
15. Closing remarks by Chair

CSBWG2 - List of Documents

Document No	Document Title
CSBWG2-Invitation Letter	Letter of Invitation
CSBWG2-Registration Form	Registration Form - Word Version
CSBWG2-Foreign Visitor Form	Foreign Visitor Form
CSBWG2-Logistic Information	Logistic Information
CSBWG2-Document Template	Document Template (Word version)
CSBWG2-1-CGs Guidance	Chair D&G email
CSBWG2-3-Agenda	CSBWG2 Draft Agenda v6.0
CSBWG2-4-Action List	List of Actions - CSBWG1 - updated 14 January 2016
CSBWG2-5.2.1-Unique IDs	Reasoning of unique IDs
CSBWG2-5.2.2-Ship Type IDs	Ship Type Identification Recommendations
CSBWG2-6	IHO CSB Guidance Document Outline
CSBWG2-9-Tors_RoPs	ToRs and RoPs
CSBWG2-10.1-OpenSeaMap	OpenSeaMap Information Paper
CSBWG2-10.2-Olex	Olex Observations and Experiences with CSB
CSBWG2-10.3-TeamSurv	TeamSurv Overview
CSBWG2-12	Proposed draft agenda for CSBWG3
CSBWG2-Participants	CSBWG2 List of Participants

LIST OF ACTIONS – Updated 4 April 2016

Agenda Item	Subject	Status/Date	Comments	Action
CSBWG2				
4	IHO website	On going	Check IHO website for documents and information	All
6	Guidance Document	CSBWG3	Investigate potential DG reviewers from wider community	Adam Reed
6	Guidance Document	IRCC8	Draft introductions for each section	All CGs
6.1	Guidance Document - Metadata	CSBWG3	Recommend what should be in the data metadata and what additional vessel data should be captured in the vessel metadata	DFMCG
6.1	Guidance Document - Metadata	CSBWG3	Investigate requirements and best recording method for vessel sensor type in look-up table	Evan Robertson
6.1	Guidance Document - Metadata	CSBWG3	Check the feasibility and use of confidence check areas for groundtruthing sensors and systems against known data	Evan Robertson
6.1	Guidance Document - Metadata	CSBWG3	Consider additional metadata fields identified as being required and how to include them	DFMCG
6.2	Guidance Document - Uncertainty	CSBWG3	Identify what Uncertainty to be measured and how it could be displayed to potential users	UCCG
6.3	Guidance Document – Data Formats	CSBWG3	Coordinate table of vessel types with DFMCG	Evan Robertson
6.4	Guidance Document - DCDB	CSBWG3	Investigate creation and maintenance of list of echo sounders and navigation receivers look-up tables	Evan Robertson
6.4	Guidance Document - DCDB	CSBWG3	Investigate the feasibility of generating separate files rather than part lines in files when system is interrupted	Evan Robertson
6.4	Guidance Document - DCDB	CSBWG3	Check with other plotter software on what data formats can be imported as guidance to what other format the DCDB could provide	Evan Robertson
6.5	Guidance Document - Legal	CSBWG3	Develop draft section to articulate the legal and liability issues which need to be considered by IRCC and IHO Member States	Jennifer Jencks
6.6	Guidance Document – Systems and Hardware	CSBWG3	Investigate link to NMEA specifications within Guidance Document	SHCG
6.6	Guidance Document	CSBWG3	Develop or suggest diagrams and graphics to explain concepts and email via group email address	All

10	ToRs and RoPs	IRCC8	Submit proposed ToRs revision to IRCC8	Chair/IHB
11	Any other business	CSBWG3	Investigate other organizations involved in crowd-sourcing, liaise with identified organizations and identify any lessons to be learnt	Caris
11	Any other business	CSBWG3	Consider inviting participation of GO-SHIP at next meeting	Caris
~~11~~	~~Any other business~~	~~19 Feb~~ Completed	~~Investigate appropriate person to take on the role of Coordinating Editor~~ – Chair informed Whitney Anderson (NGA) and Kirsten Crossett (NOAA) have agreed jointly to take this role	~~James Ford, Adam Reed, Anthony Klemm~~
11	Any other business	19 Feb	Check consistency of CG names in webpage	IHB
12	CSBWG3	27 May	Circulate an initial letter of invitation	IHB
13	Action List	CSBWG2	Keep chair and IHB informed of progress with allocated actions	All
~~13~~	~~CSBWG2 Draft Report~~	~~19 Feb~~ Completed	~~Draft to be circulated for comment~~	~~IHB~~
~~13~~	~~CSBWG2 Draft Report~~	~~4 Mar~~ Completed	~~All to provide comments on draft report to IHB~~	~~All~~
~~13~~	~~CSBWG2 Final Report~~	~~18 Mar~~ Completed	~~Publish final report~~	~~IHB~~
~~13~~	~~Report to IRCC8~~	~~18 Mar~~ Completed	~~Provide outline draft to Chair~~	~~IHB~~
~~13~~	~~Report to IRCC8~~	~~10 Apr~~ Completed	~~Submit report to IRCC8~~	~~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. ~~with general advice on any relevant liability or legal issues associated with the collection or use of crowd-sourced data.~~

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 IHB ("IHB" to be replaced by "IHO Secretariat" when the IHO Secretariat is established).

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 Conference ("Conference" to be replaced by "Assembly" when the revised IHO Convention enters into force) 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.

3rd Crowd-Source Bathymetry Working Group (CSBWG3) Meeting
IHB, Monaco – 7-8 November 2016

1. Welcome and opening remarks by the Chair.

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

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

4. Approval CSBWG2 Report and Review of Actions.

5. Review progress on development of draft CSB Guidance Document (CSBGD):

   .1 Introduction;
   .2 Basic system/sensor descriptions;
   .3 Metadata;
   .4 Data formats;
   .5 DCDB development;
   .6 Progress against agreed milestones.

6. Review of CSBGD development timeline and milestones – IRCC9, 19th IHC/Assembly1.

7. Review of ToRs and RoPs.

8. Any other business.

9. Date and venue of next meeting – CSBWG4 – and intersessional activities.

10. Review of Action List and draft agenda for CSBWG4.

11. 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	
Australia	Australian Hydrographic Office	Andrew Coulls	Andrew.coulls@defence.gov.au	
Brazil	Diretoria de Hidrografia e Navegação	Frederico Antonio Saraiva Nogueira	frederico@dhn.mar.mil.br	frederico.asn@gmail.com
China	National Marine Data Information & Service	Fan Miao	fm_nmdis@163.com	
France	SHOM	Thierry Schmitt	thierry.schmitt@shom.fr	thierry_schmitt@yahoo.com
India*	Indian Navy Hydrographic Office	RM Thomas	inho@navy.gov.in	
Italy	Istituto Idrografico della Marina	Marta Pratellesi	marta.pratellesi@marina.difesa.it	
Japan	Hydrographic and Oceanographic Department, Japan Coast Guard (JHOD)	Daishi Horiuchi	ico@jodc.go.jp	
Nigeria	Nigerian Navy Hydrographic Office	C Azuike	info@nnho.org.ng	
Portugal	Portuguese Hydrographic Institute	Ricardo Cordeiro de Almeida	cordeiro.almeida@hidrografico.pt	
Turkey*	Turkish Hydrographic Office	Bülent Gürses	bgurses@shodb.gov.tr	
UK*	UKHO	Edward Hosken	Edward.Hosken@UKHO.gov.uk	
USA	NOAA National Centers for Environmental Information (NCEI)	Lisa Taylor (Chair)	Lisa.A.Taylor@noaa.gov	Lisa.A.Taylor@noaa.gov
USA	NOAA NCEI	Jennifer Jencks	jennifer.jencks@noaa.gov	jennifer.jencks@noaa.gov
USA	NOAA Office of Coast Survey (OCS)	Anthony Klemm	anthony.r.klemm@noaa.gov	anthony.r.klemm@noaa.gov
USA	NOAA OCS	James Miller	james.j.miller@noaa.gov	james.j.miller@noaa.gov
USA	NOAA OCS	Patrick Keown	patrick.keown@noaa.gov	patrick.keown@noaa.gov

Up-dated: 04 March 2016

USA	NOAA OCS	Percy Pacheco	percy.pacheco@noaa.gov	percy.pacheco@noaa.gov
USA	NOAA NCEI	Evan Robertson	evan.robertson@noaa.gov	evan.robertson@noaa.gov
USA	NAVO	Raymond Sawyer	raymond.sawyer@navy.mil	
USA	NGA	John Lowell	John.E.Lowell@nga.mil	
USA	NGA	James Ford	James.D.Ford@nga.mil	
USA	NGA	Whitney Anderson (Editor)	Whitney.E.Anderson@nga.mil	
USA	NOAA National Ocean Service (NOS)	Kirsten Crossett (Editor)	kirsten.crossett@noaa.gov	
USA	NOAA OCS	Adam Reed	adam.reed@noaa.gov	
USA	NOAA NCEI	Karen Marks	Karen.marks@noaa.gov	Karen.marks@noaa.gov
USA	NGA Centre for Coastal and Ocean Mapping, University of New Hampshire	Brian Calder	brc@ccom.unh.edu	brian.r.calder@gmail.com
IHB	IHB	David Wyatt (Secretary)	adso@iho.int	djw9581@gmail.com
IHB	IHB	Anthony Pharaoh	addt@iho.int	
Expert Contributor	Caris, Pan American Institute of Geography and Histroy	Paul Cooper	pcooper@caris.us	prcooper10@gmail.com
Expert Contributor	Managing Director, Olex AS	Ole Benjamin Hestvik	oleb@olex.no	olebenjamin@gmail.com
Expert Contributor	Sea-ID	Kenneth Himschoot	Kenneth@sea-id.org Kenneth.himschoot@sea-id.org	Kenneth@sea-id.org Kenneth.himschoot@sea-id.org
Expert Contributor	PYA/Sea-ID	Andrew Schofield	Andrew.schofield@sea-id.org	Andrew.schofield@sea-id.org
Expert Contributor	TeamSurv	Tim Thornton	Tim.Thornton@teamsurv.com	tt@smartcomsoftware.com
Expert Contributor	GEBCO/Stockholm University	Martin Jakobsson	martin.jakobsson@geosu.se	
Expert Contributor	GEBCO/JHA	Shin Tani	soarhigh@mac.com	201libelle@gmail.com
Expert Contributor	GEBCO/Namria-Philippiness	Jaya Roperez	jayaroperez@gmail.com	jayaroperez@gmail.com

Expert Contributor	Ztin Consulting-Korea	Eunmi Chang	emchang21@gmail.com	emchang21@gmail.com
Expert Contributor	Marine Science Technology Sdn Bh-Malaysia	Zainul Ghazali	zainul.ghazali@mast.com.my	
Expert Contributor	AimsGlobal-Malaysia	M Termizi	mtermizi@aimsglobal.com.my	
Expert Contributor*	SevenCs/Chartworld	Emma Fowler	emma.fowler@chartworld.com	
Expert Contributor	GEBCO	Vicki Ferrini	ferrini@ldeo.columbia.edu	

* denotes correspondence member