5th Tidal, Water Level and Currents Working Group Meeting

Remote Meeting
16 - 18 March 2021

(*Paragraph numbering is the same as the Agenda Item numbering and does not necessarily reflect the order in which matters were discussed. ISO three letter country codes have been used to identify individual participants*)

1. Opening

1.1 Welcome/Chair opening Remarks

The Chair, Dr Gwenaële Jan (France), welcomed all to the meeting. She thanked NHS for being ready to host the meeting last year and she thanked all the participants, in particular those attending outside their normal working hours. She thanked IHO for allowing technically the holding of the meeting. She mentioned that several colleagues have moved on to new careers or activities and thanked them warmly whilst welcoming the new representatives who joined the working group. She welcomed all participants and she noted that much time will be focused on the further development of the S-100 based PSs and the tidal prediction and analysis work. She thanked the members of the group who are present in spite of the time difference which requires their presence on a time very early for some, very late for others. She highlighted that this time again we're adapting to the health context and we find in this symposium a way to gather our work and expertise on the actions of our working group on the tide, water levels and marine currents.
She highlighted the increased amount of intersessional work that had been conducted via numerous e-mails and short virtual meetings amongst small sub-groups of the TWCWG. Her thought is that it is an efficient way to conduct work in this context, specifically during the cancellation period of face-to-face meetings.
By the programming of the agenda of the meeting, one measures always and still the diversity of the activities of our group as well as the multidisciplinary expertise.
The 2020 review has been more active than previous years in comparisons of tidal predictions and S-104 specifications. Simultaneously to this progress, it appears essential to reinforce the effort on test cases for these 2 products. This is the direction she would like to take in 2021 and share with the team. She noted that many work items are progressing well. Large scale vertical referencing, in 3D, could progress more (cf; 2012, 2014 introduced in TWCWG with geoid, GRS80, WGS84, ellipsoid). Progress on predictions, building capacity and S-104, S-111, have been brought to a point where it is possible and probable that their concretization will succeed.
On behalf the working group, she highlighted the work undertaken by Dr Kurt Hess, who sadly died last year, she noted the large hole that had been created with his passing. She noted her intention to pass the baton for the function of Chair at the end of the meeting after seven years as she felt it is good to rotate the role amongst the members.

1.2 Introductions

Participants briefly introduced themselves, see Annex A for list of participants.

2. Administrative Arrangements

2.1 Approval of agenda and TWCWG4 Report

The Secretary introduced the Agenda which was adopted without amendment, Annex B. The report of the TWCWG4 meeting was approved.

Decisions:
1. Draft agenda adopted without amendments.
2. Report of TWCWG4 was approved.

2.2 Programme and session timetable

The draft timetable was introduced, it was explained that this was intended for guidance only and was not intended to be a rigid structure. Where necessary time spent on individual topics would be amended to allow an appropriate discussion; see list of documents at Annex C.

2.3 Report on intersessional activities

The Chair provided details of the interaction with other IHO subordinate bodies. She highlighted 2019-2020 exchanges with NIPWG, DQWG, HDWG and the S-100WG as well as with IOC of UNESCO (T. Aarup) on GLOSS items. The Chair provided an update on the reports to HSSC11 and HSSC12 and highlighted the outcomes of the meetings relevant to the TWCWG. She highlighted the outstanding issues which need to be addressed, the main focus being the ongoing development of the S-104 and S-111 PS and the provision of compatible datasets by various TWCWG members.

2.4 Review of TWCWG4 Actions

The Action List from TWCWG4 was reviewed, it was noted that the majority outstanding items were covered in the agenda for the meeting and it was agreed these should be taken under their appropriate agenda item. The Secretary reiterated the need for all those leading on actions to keep the Chair, vice-Chair and IHO informed of progress and completions, so that the Action List can be kept up-dated intersessionally. A new list of Action Items would be prepared for the meeting, Annex D.

The Secretary encouraged all to contribute to the progress of agenda item actions and to regularly check the website for new items and information.

Decision:
3. It was agreed to take the outstanding actions under the relevant agenda items.

3. Programme Matters

3.1 Tidal predictions

Hilde Sande Borck (**HSB**) (NOR) provided an update presentation on the work undertaken on the comparison of tidal predictions and the results generated from the analysis of common datasets using national analysis software. She highlighted the results which had been received from Germany, Spain, New Zealand, Argentina and

Norway. She noted considerable detailed analysis and reports had been received which was impressive.

She provided examples of the analysis results from different datasets, which displayed the constituents generated by the different national software. She noted the similarities in the results as well as some of the major differences. She displayed the number of significant constituents generated and the variations noted from the different datasets. She noted the commonalities between the different countries as well as the main variations. She provided her initial impressions from the results. She highlighted some results from Vardø achieved by Norway, Argentina, Spain and Germany.

She provided some ideas for future work and the areas on which focus should be directed, which included analysis of currents that should be undertaken by those with more knowledge in this area.

It was agreed that a method needed to be investigated for storing data on the internet and subsequent accessibility to all TWCWG members. In addition it was agreed that a plan should be developed for further analysis of tidal harmonics and that it would be helpful to have a breakout group at TWCWG6.

Actions:

1. **Chair/All**: initiate investigation for storing data and making it available for use by all TWCWG members.
2. **Chair/All**: develop a plan for further analysis of tidal harmonics.

3.2 Exchange of Harmonic constants/predictions

The Vice-Chair, Peter Stone (NOAA-USA), introduced Anthony Arguez, who provided a presentation on the in-depth analysis undertaken by NOAA looking at six different datasets – Vardø, Oslo, Egersund, Boston, Panama City and Seattle. He described the methodology used for the harmonic analysis and the intercomparison of constituents. He provided some summary comments and recommendations for consideration by the TWCWG, including working towards utilising a standard set of constituents and additional analysis and collaboration along with modernisation of the tidal prediction systems.

The presentations generated a number of questions and discussion. The Chair proposed that it might be an advantage for the provider of the dataset to indicate how many constituents should be used for this specific exercise and mentioned that the common data files shared have been set to constitute a common database to be used by TWCWG Members for prediction. Ruth Farre (**RF**) (ZAF) noted that the original project was focused on analysis of datasets using own national software with local constituents to gain a comparison against the results achieved by the provider. Chris Jones (**CJ**) (GBR) noted that the project had evolved from the original concept. He suggested that all should use the same dataset and undertake analysis using their own software and constituents to highlight the differences and the impact of additional or different constituents used.

It was noted that the TWCWG needed to decide how to organize the Harmonic Analysis results and what the next steps should be. It was proposed that a project should be

established to undertake some in depth data analysis, although it was recognised that this might be too large task for the group. It was noted that all the national organizations were analysing accurately the tidal information recorded, however it was recognised that each organization was undertaking the work slightly differently and that there would be benefit in investigating how these different approaches influenced the results generated. It was noted that this task was already covered by the ToRs and the tasks in the Work Plan, it was more a case of directing the necessary resources to the task. The Chair highlighted the importance of knowledge exchange between TWCWG members and national organizations. She also noted the importance of making the survey results available for all to review and provide feedback.

The Chair introduced the second session, which she noted was focused on the S-100 based Product Specifications under the responsibility of TWCWG.

4. Product Specification Presentations

4.1 S-104 Update

Greg Seroka (**GS**) (NOAA-USA) provided a progress update presentation on the S-104 PS. He provided the recent progress achieved since TWCWG4 in April 2019, highlighting the main updates t achieve edition 0.0.8. He noted that the Features and Attributes had been registered in the IHO GI Registry in coordination with Nautical Information and Publications Working Group (NIPWG) for trend definition. The question on real-time data exchange was raised and how this was being approached across the S-100 based PS, it was noted that there needed to be a consistent approach across all PS and clarity on how the data is processed on receipt by the ECDIS.

He highlighted the items for discussion and decision by TWCWG, these included datum separation (difference) product ('hydroid'). It was proposed to remove this item to expedite the release of Edition 1.0.0 with the objective of including in the future.

He asked whether uncertainty should be a new optional Feature Attribute or whether it should be an item for future editions. He noted that there were a number of different methods for calculating uncertainty and therefore it might be prudent to wait. It was noted that the calculation of uncertainty could be a task for the TWCWG to investigate. Chair recalled the discussions during 2020 on this topic, the fact that TWCWG received feedback from member states and reached agreement on TWCWGs' consensus. Chair provided her view on the importance of uncertainty and its inclusion as a variable in the future versions of PSs, even if this value could be set to "undefined", for example. TWCWG consensus was to not include uncertainty in S-111 and S-104, however the Chair understood that it could be included in a later version (i.e. Version 2.0). Regarding the method of calculation, she agreed with Vice-Chair that different methods will be used by different hydrographic offices to compute uncertainty. A first agreement within TWCWG was not to provide a specific method of calculation for it. But, she agreed with the idea that the TWCWG could propose some calculation methods on this specific point, since during the meeting TCWG5, the request seems to be expressly made and is a kind of extension of the solutions found in 2020.
Chair requested that member states share any proposals on the calculation of uncertainty within TWCWG as this will initiate the process.

GS noted the 8th Technical Specification Meeting (TSM8) question on whether additional vertical datums were required, which was a S-100 change proposal. It was questioned what chart datums need to be added and which datums will not be used and can be removed. It was noted that new datums were likely to be developed, therefore there needed to be clarity on the process for adding new datums. A more flexible process was described with three different options, he noted that the proposed 'option two' was the preferred option at the S-100WG.

At TSM8 the handling of real-time data handling was discussed and proposals were reviewed. It was questioned whether it was possible to provide S-104 AIS use cases.

It was questioned whether portrayal information was needed in Edition 1.0.0 and whether it could wait for the development work towards Edition 2.0.0. It was suggested that it should remain as useful guidance for use cases. The TWCWG agreed that it should remain

It was suggested that S-104 Edition 1.0.0 should be released in compliance with S-100 Edition 5.0.0 rather than Edition 4.0.0, despite Edition 5.0.0 being released in 2022. It was noted that there was no guidance, which needed to be discussed with the Chair of S-100WG. It was agreed that Edition 1.0.0 should be published in compliance with S-100 Edition 5.0.0, even though it would be in draft version at the time.

It was suggested that the file naming convention of 4-character producer code should be followed in the same manner as S-111.

It was agreed that the same *fillValue* requirements for S-111 should be followed in S-104.

He highlighted the next steps, which were to publish S-104 Edition 1.0.0, remove all remaining real-time/AIS items and finishing updating UML, ensuring all S-100WG review comments are addressed, updating the S-100 discovery metadata is based on upcoming S-100 updates and incorporating the points raised and agreed at TWCWG5.

Decisions:

4. **Datum separation**: don't include in S-104 Ed 1.0.0, include in Ed 2.0.0.
5. **Uncertainty**: defer the methods for calculating uncertainty and also the possible inclusion of uncertainty as a Feature Attribute until Ed 2.0.0; this should be progressed and resolved well before Ed 2.0.0 is submitted.
6. **Additional Datums**: the WG should define particular additions to the list of datums, but the encoding will be determined by the discussion in the S-100 WG.
7. **Real-time AIS use case**: provided a use case to be sent to S-100/IIC for their S-100 real-time data development.
8. **Portrayal**: leave in PS with note that no XML portrayal catalogue is provided in Ed 1.0.0 and implementation not expected for Ed 1.0.0.
9. **Compliance**: have S-104 compliant with S-100 Ed 4.0.0, but note that efforts were made to accommodate known Ed 5.0.0 draft at time of publication.
10. **File name 4-character producer code**: same as for S-111 above.
11. **Group_F (including fillValue)**: same as for S-111 above.

12. **Water level trend threshold:** more discussion needed offline to determine optimal place for this metadata variable in HDF5 file.

Actions:

3. **Zarina Jayaswal (ZJ) (AUS)**: provide some visual diagrams to explain concept of datum separation.
4. **Chair/Vice-Chair**: TWCWG to provide a list of vertical datums to be used (must be chart datum) by July 2021 with the list finalised and submitted to S-100 WG by October 2021 (e.g hydrographic zero (ZH (cf; 2017-2020 information TWCWG), Geoids, Ellipsoid. (TWCWG 2013-2018).
5. **ZJ**: provided use case to S-100WG/IIC. Four other use cases from TWCWG members have been provided (2020) to TWCWG and shared using the cloud dedicated to documentation exchange.
6. **Chair/Vice-Chair**: initiate discussion on water level trend threshold.
7. **All**: send the TWCWG/Chair your proposal for a method of calculating.

4.2 S-111 Update

Greg Seroka (**GS**) (NOAA-USA) provided a progress update presentation on the S-111 PS. He highlighted the contribution made by Dr Kurt Hess in the initial development work for both the S-111 and the S-104 PSs, he noted that without his efforts and dedication, neither would have advanced as far as they had.

He highlighted the main updates from Edition 1.0.2 to Edition 1.1.0, which included editorial comments by Japan, uncertainty name change, conversion of some data types from integer to enumeration and the addition of a section on Validation checks. The extent of the circulation of the current version was clarified and what were the proposed next steps after TWCWG approval of a number of issues, that needed to be addressed by TWCWG and which were highlighted in the presentation.

The WG was asked whether non-uniform time intervals should be included in S-111 as had been requested for S-104. The Chair noted that this issue needed to be resolved as a number of national HOs were generating compatible datasets. It was suggested that this feature may have a use in the future and it was noted that it was not a major impact on the PS or users.

He described the changes since TSM7 from Edition 1.1.0 to Edition 1.1.1, which included an expanded vertical coordinate system, added *dataCodingFormat* = 8: 'Stationwise time series', portrayal catalogue: dusk/night colours corrected, and use h5dump in addition to HDFView. He highlighted the main issues to be addressed, that included the file naming convention and whether S-111 should use 4-character producer code; it was agreed that the general S-100 convention should be followed and S-111 should use the 4-character producer code format. He asked whether the *fillValue* should be changed from the suggested '-1.0' to be required '-9999' for speed and direction. It was noted that there would be a discussion on units of measurement at the next S-100WG, which may impact on the names of units, after which S-111 and S-104 should conform.

He closed with the next actions to be taken to work towards Edition 2.0.0. He highlighted the required components that need to be completed to progress to Edition

2.0.0, these included data quality checks, data validation, and exchange catalogue datasets. He noted that it was necessary to continue to respond to requests arising from implementation test bed creators and OEMs, Nautical Chart Working Group (NCWG) portrayal review for conflicts with S-101, improvement of portrayal and ensure compliance with S-100 Edition 5.0.0.

The presentation generated numerous comments and questions amongst the participants. He explained the timeframe for the submission of proposals to S-100WG for inclusion in S-100 Edition 5.0.0. The IHO highlighted that the original concept was for a PS on 'navigationally significant surface currents', although the name has changed, the original concept has remained unaltered. The Chair emphasised this point and provided reference information about validation: There is a reference document at HSSC>DQWG>Reference Documents>Data Validation ISO principles. That may be of use to the TWCWG when starting validating S-104 and S-111 datasets.

Decisions:

13. **Non-uniform time interval data**: include support in S-111 as in S-104.
14. **Compliance**: have S-111 Ed 2.0.0 be compliant with S-100 Edition 5.0.0, not Ed 4.0.0.
15. **File name 4-character producer code**: use 4-character instead of 2-character codes, but need to coordinate when S-100 allows for 4-character codes in Producer Code Register (in S-100 Ed 5.0.0?).
16. **Group_F (including *fillValue*)**: after S-100 WG discussion of UoM is concluded, S-111 and S-104 should conform. Require *fillValue*, code, uom.name, etc. to be certain values in Group_F for consistency across all S-111 products.

4.3 Use Cases

The Chair introduced the use cases discussion, she displayed the S-100 product development and testbed timeline included in the S-100 Roadmap. She highlighted a number of issues which need to be addressed before TWCWG6, noting the other Working Groups with which TWCWG needed to engage.

She provided details on the use cases developed by and shared within TWCWG and were available on the TWCWG web page. She proposed that one document should be developed, which included all submitted use cases. She noted that the Spanish submission needed to be translated for wider use amongst the TWCWG. She requested additional use cases or reviews on current uses cases, be provided by TWCWG members. She highlighted the information received from KHOA on the development of the S-100 Testbed.

She thanked German, USA and Spain for the provision of use cases and she encouraged other members to develop new use cases. She indicated that time would be made available for participants describe the tests and use cases on which they were working.

Action:

8. **All**: provide additional use cases for discussion by TWCWG.

5. Product Specification Work Packages

5.1 Progress report of S-104/S-111 Developments

Chris Jones (**CJ**) (GBR) provided a presentation covering the UKHO developments with respect to S-104 and S-111 as it develops compliant datasets. He provided details on the overall aims of the UKHO activities for both PSs, he described the discovery work being undertaken, particularly for provision of Real Time tide data, forecast data in association with the UK Met Office and predicted (astronomical tide) data. He noted the storage challenge which has needed to be addressed and the validation process that is being developed. He displayed some forecast prototypes of portrayal which demonstrated the visualisation of the data, although it was recognised that portrayal had not been decided. He highlighted the items that needed further development and work.

He provided details on the surface current PS development work, he noted that the PS was more mature and that a number of other national organizations were further advanced in the generation of compliant datasets, modelling and potential portrayal visualisations. He highlighted the progress achieved thus far and the work which had been completed. He noted the areas in which external assistance may be required and the next steps to be addressed.

He provided a summary of the items for both PSs which the UKHO needed to address and consider.

5.2 Progress report on encoding datasets

Erin Nagel (**EN**) (NOAA-USA) provided a presentation covering the progress on the encoding datasets for S-104 and S-111. She provided a background overview followed by an update on encoding developments. She provided details of the S-111 encoding operations and the current precision navigation system cloud-based data processing, ingest and dissemination. She provided details on the discovery, visualisation and accessing of the data. She highlighted the challenges and next steps to be addressed.

5.3 Progress report on current datasets encoding

Stephan Dick (**SD**) (DEU) provided a presentation update on the activities and developments by BSH for both S-104 and S-111. He noted that the data provided was compliant with the S-100 standards. He displayed a number of forecast model outputs; he noted the data validation methods and results. He noted the use cases and test data sets which had been generated. He highlighted the feedback received and the areas which needed to be considered to address the comments. He summarised the conclusions resulting from the experienced gained from the project.

5.4 S-111 HDF5 Validation Checks

Raphael Malyankar (**RM**) (Portolan Sciences) provided a brief on the S-111 HDF5 validation checks. He provided a short background brief and then highlighted the required checks, which needed to be completed prior to publication of Edition 2.0.0. He provided comprehensive details of the dataset validation processing flow and for feature information and instance groups.

5.5 Engagement with S-100WG and other relevant bodies

The Chair provided a brief presentation on the engagement with other IHO subordinate bodies, in particular DQWG, NIPWG, HDWG and S-100WG. She highlighted the main activities of this engagement and the outcomes. She noted the interaction with GLOSS, particularly the Data Archaeology Workshop (2020).

Rogier Broekman (**RB**) (Chair DQWG-NLD) provided a short brief on data quality issues which needed to be addressed by TWCWG. He focused on the need to provide guidance to HOs on data quality aspects. He described the flow from data gathering to presentation to the user and the challenges involved and the question resulting from the request from the Crowd Sourced Bathymetry Working Group (CSBWG) for guidance on how HOs can use CSB data. He noted that if the CD - MSL separation was less than half the vertical uncertainty at a certain depth, the CSB data could be used, however this needed to be validated by the TWCWG. The Chair asked for a date for when the DQWG needed input, it was proposed that comments should be received by late September to allow completion of the work for submission to HSSC14.

The presentations generated a number of comments and questions and discussion in the Chat.

Actions:

9. **Chair/Vice-Chair**: initiate discussion on how to determine the separation vertical uncertainty ratio to allow use of CSB data.
10. **All**: provide feedback to Chair on data quality issues documentation for submission to DQWG Chair for July 2021.

6. IHO Resolutions and Charting Specifications

6.1 Review of IHO Resolutions

Ruth Farre (**RF**) (ZAF) provided a presentation on the results of the review of the IHO resolutions and the proposed draft amendments. She also noted that two new resolutions had been proposed. She noted that no comments had been received on the proposals and that it was assumed that these were approved by TWCWG.

She then displayed the text of the two new resolutions, which had not received any comments, and thus it was assumed the TWCWG approved them for submission to HSSC. She highlighted two questions which needed to be addressed and the actions requested of the TWCWG. The wording of A6.1 needed clarification and what constituted “negligible” tidal current/stream to reflect the similarly-defined “negligible” tidal range being less than 30cm as defined in A2.5. **RF** agreed to make the proposed amendments to A6.1 and circulate to the TWCWG for final approval. It was noted that there were various values used by different national organizations, **SD** questioned the need for articulating a value. It was noted that defining these values had both practical implications as well as for harmonization with the development of the S-100 PS. It was suggested that the value should be provided and the user can decide its usefulness. It was noted that the question was directed towards locations where the tidal stream never exceeds a value, not for locations where the value drops below a threshold at a discrete time. It was proposed that the same approach could be taken as used in A2.5, in that a figure was provided as an illustrative example not as a set definition. It was agreed that **RF** would provide final versions for submission to HSSC. It was agreed the Chair would discuss with the Secretary of the HSSC on the appropriate timeframe for

submission. During the meeting, Chair received an answer from HSSC suggesting to submit versions as it is now. Additional information could be done in the future for new review of the amendments.

Actions:

11. **RF**: make the proposed amendments to A6.1 and circulate to the TWCWG for final approval.
12. **RF**: provide final versions for submission to HSSC.

6.2 Review of IHO Charting Specifications

The Secretary highlight the need to review and propose revisions to the IHO Chart Specifications relevant to the TWCWG. ZAF volunteered to lead the review and revision process using the relevant Chart Specifications provided in the meeting documents.

Actions:

13. **RF**: lead the review and revision process using the relevant Chart Specifications provided in the meeting documents.
14. **Secretary**: provide relevant specifications for review to RF.

7. Capacity Building

7.1 CB Course Update

Ruth Farre (**RF**) (SANHO) provided a presentation on the development and progress with Tides, Water Level and Currents Capacity Building course material. She highlighted the progress on the translation of the material and from where in the IHO website it could be downloaded. She noted that a proposal had been received for a translation into Chinese. She highlighted the actions required of the TWCWG. She noted the development of an advanced course as an online preparation for an IHO Cat A and Cat B course and demonstrated the first module that had been created, which included an interactive test. She noted that each module would be made available for TWCWG review, input and amendment. She also provided details of a new compact tide gauge under test by SANHO for use in developing coastal states, which included a network viewing portal. This presentation generated a number of questions and comments. It was asked whether there was a library of course supporting documentation or manuals in different languages for provision at the end of the course. It was noted that the IOC GLOSS had produced a number of publications and that the translations of the course material had included additional information on available national publications and manuals.

Decision:

17. It was agreed that a Chinese translation was of benefit and MSA were invited to progress the task.

Actions:

15. **RF**: to provide relevant presentations and documents for translation to MSA.
16. **BRA**: Portuguese translation of supplementary documentation to be completed and 1 slide still to be translated – all to be sent to RF.

Gary Mitchum, the Chair of the IOC GLOSS Group of Experts, provided a short update on GLOSS activities. He hoped that there would be an opportunity for a joint meeting in 2023 when the GLOSS next meets after the late 2021 meeting at the IOC in Paris. The data quality control manual was noted as being published by the IOC.

8. TWCWG Work Plan and ToRs

8.1. Work Plan

The Secretary noted the draft work programme for 2021-2022, which had been prepared in advance of the meeting, had been available for on the TWCWG5 document page and that no amendments had been submitted. Any proposed amendments needed to reflect discussion and progress during this meeting should be highlighted to the Secretary. It was noted that the updated version would be included in the meeting report, Annex F, and that it would submitted to HSSC13 for approval.

Action:
17. **Chair/Secretary**: include updated WP in final meeting report and submit to HSSC13.

8.2. Review of ToRs

The ToRs and RoPs for TWCWG were displayed, Annex E. No revisions were deemed necessary.

9. Venue and dates of the 6th TWCWG Meeting

9.1 Next meeting

The Chair asked if any MS would volunteer to host TWCWG6. **RF** confirmed that the invitation made at TWCWG4 to hold TWCWG6 in South Africa remained and SAHHO would welcome the opportunity to host the meeting. It was agreed that **RF**, Chair and Secretary would agree on suitable dates to be notified to the TWCWG.

Action:
18. **Chair/Secretary/RF**: identify dates for TWCWG6 and inform TWCWG.
19. **Secretary/RF**: circulate initial letter of invitation to TWCWG6 no later than 6 month before meeting.

10. Elections for Chair and Vice-Chair

10.1 Elections

In accordance with the ToRs and as the current Chair, M. Gwenaële Jan (France), and Vice-Chair, Mr Peter Stone (USA), had indicated they would not make themselves available for re-election, therefore elections were held for both positions. Chair noted her intention to pass the baton for the function of Chair at the end of the meeting after several years as she felt it important to rotate the role amongst the members.

Christopher Jones (GBR) and Ruth Farre (ZAF) were unanimously elected as Chair and Vice-Chair respectively for the next triennium.

The Secretary, David Wyatt, informed the participants after the Elections that he would be leaving the Secretariat at the end of September on completion of his handover.

11. Closure of meeting

11.1 Review of list of Actions and Decisions

A draft list of Actions and Decisions from the meeting would be generated and circulated with the draft meeting report. All Actions and Decisions are marked in this report and are collated in Annex D. An updated list of the Actions and Decisions will be maintained on the TWCWG6 document page and all those who have actions to complete should keep the Chair, Vice-Chair and Secretary informed of progress.

Action:

20. **All**: all those who have actions to complete should keep the Chair, Vice-Chair and Secretary informed of progress.

11.2 Chair closing remarks

The Chair (**GJ**) summarized the TWCWG5 outcomes, highlighting the activities on which participants should focus during the intersessional period before the next meeting, TWCWG6. She thanked her Vice-Chair, Peter Stone (**PS**), and Secretary, David Wyatt (**DW**), for their support over the past years. The new Chair provided some closing comments. The Chair (GJ) was keen to express that she really appreciates the TWCWG working group: it's a great group. It has been a great pleasure to chair the working group in cooperation with IHO-Secretary (DW) and Vice-Chair (PS). She thanked IHO for providing a working matrix in this international context of knowledge sharing and prefiguring some possible fields for the future of hydrography. It is a great house that inspires respect. Bathing in this spirit is an opportunity that we all maintain by our actions. She said that it was an honour for her to Chair the group for almost 7 years of cooperation, after having taken the function in the continuity of Dr. Stephan Gill, her predecessor. She addressed her congratulations to new Chair and Vice-Chair and said that they will bring their expertise in these two functions.

Annexes:

A. TWCWG5 – List of Participants.
B. TWCWG5 – Agenda
C. TWCWG5 – List of Documents
D. TWCWG5 – List of Actions and Decisions
E. TWCWG5 – TWCWG ToRs and RoPs
F. TWCWG5 – TWCWG draft Work Programme 2021-2022
G. TWCWG5 – TWCWG6 Draft Agenda
H. TWCWG5 – ChatLog Day 1
I. TWCWG5 – ChatLog Day 2
J. TWCWG5 – ChatLog Day 3

LIST OF PARTICIPANTS

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Apologies:

IHO Tides, Water Level and Currents Working Group 5 Meeting

Virtual Meeting

16-18 March 2021

1. Instructions

Please join the TWCWG meeting from your computer, tablet or smartphone using the link provided in the covering email.

Country or Region	Start Time (Local Time)	GMT (+/-)
United Kingdom (GMT)	11:00	-
Europe (CET)	12:00	+1
South Africa (SAST	13:00	+2
China (CST)	19:00	+8
Japan (JST) & S. Korea (KST)	20:00	+9
Australia (AEDT)	22:00	+12
New Zealand (NZDT)	00:00	+13
Brazil (BRT)/Chile (CLST)	08:00	-3
USA (EST)	06:00	-5
USA/Canada (PST)	03:00	-8

2. Read-ahead Materials

See TWCWG5 Document list for download of all documents (https://iho.int/en/twcwg5-2021). For efficiency purposes, participants are invited to read the documents listed below beforehand. Superscript letters on agenda items indicate the relevant Read-ahead documents:

Day 1:

a. TWCWG4 Report
b. TWCWG4 Actions Chair Comments
c. Programme Matters reports and updates:
    - Compare Tidal Analysis and Predictions
    - xx
d. Draft revisions to resolutions

Day 2:

e. S-111 current Edition 1.1.1
f. S-104 current draft Edition 0.0.8

IHO Tides, Water Level and Currents Working Group 5 Meeting

Virtual Meeting

16-18 March 2021

Day 3:

g. Tides course material
h. TWCWG documents
   - Draft Work Plan 2021-2022
   - ToRs

3. Draft Agenda

Day 1: 16 March 2021
All times in Monaco

Day 1: Programme matters

12:00 – 13:00 – ***Welcome and Administration***

1.1 Welcome, Opening Remarks and Meeting Expectations - Chair
1.2 Introductions - All
2.1 Approval of agenda and TWCWG4 Report[a] - Secretary
2.2 Programme and timetable of the sessions - Chair
2.3 Report on intersessional activities (HSC11 and HSSC12) - Chair
2.4 Review of Actions[b] (Read ahead) - Details saved for Agenda items - Chair/Secretary

13:00 – 14:00 – ***Update on Programme matters***[c]

3.1 Compare Tidal Predictions generated as a result of analysis of a common data set by different analysis software - USA/NOR
3.2 Exchange of Harmonic constants/predictions, feedback on comparison of tidal constituents - USA/GBR

14:00 – 14:45 – ***IHO Resolutions and Charting Specifications***[d]

6.1 Review of relevant IHO Resolutions - ZAF
6.2 Review of relevant IHO Charting Specifications - IHO

14:45 – 15:00 – ***Wrap-up***

IHO Tides, Water Level and Currents Working Group 5 Meeting

Virtual Meeting

16-18 March 2021

Day 2: 17 March 2021
All times in Monaco

Day 2: Progressing S-100 based Product Specifications

12:00 – 12:15 – ***Welcome and Plan for session***

12:15 – 13:00 – ***S-111 Update and Progress report***[e]

4.2 Surface Current Product Specification (S-111) - USA

13:00 – 14:30 – ***S-104 Update, Progress report and review***[f]

4.1 Water Level Information for Surface Navigation (S-104) - AUS/USA

14:30 – 14:45 – ***S-104 and S-111 Use cases***

4.3 Use case documents - Chair

14:45 – 15:00 – ***Wrap-up***

Day 3: 18 March 2021
All times in Monaco

Day 3: Capacity Building, Work Plans and Elections

12:00 – 12:15 – ***Welcome and Plan for session***

12:15 – 13:15 – ***Product Specification Work Packages***

5.1 Progress report on S104/S111 developments - GBR
5.2 Progress report on encoding datasets - USA
5.3 Progress report on current datasets, encoding, and additional datasets - DEU
5.4 S-111 HDF5 Validation Checks - USA
5.5 Engagement with S-100WG and other relevant subordinate bodies - Chair

13:15 – 14:00 – ***Capacity Building***[g]

8.1 Tides and Water Levels Workshop training material - ZAF

14:00 – 14:20 – ***Work Plan and ToRs***[h]

10.1. TWCWG Work Plan up-dates - Secretary
10.2. Review TWCWG ToRs and RoPs - Secretary

14:20 – 14:30 – ***Next meeting (TWCWG6)***

IHO Tides, Water Level and Currents Working Group 5 Meeting

Virtual Meeting

16-18 March 2021

11.1 Venue and dates of the 6th TWCWG Meeting - Chair/Secretary

14:30 – 14:40 – ***Elections***

12.1 Election of the Chair and Vice-Chair in accordance with ToRs article 3c - Secretary

14:40 – 15:00 – ***Close***

13.1 Review of List of Actions and Decisions for CSBWG10 and draft agenda for CSBWG11 - Secretary

13.2 Discussion on outstanding issues and post-meeting expectations/focus - Chair

TWCWG5 Attendees

See List of Participants document

TWCWG5 - List of Documents

Document No	Document Title
TWCWG5 Letter 1	Letter of Invitation
TWCWG5 Annex A	TWCWG5 Registration (Word version)
TWCWG5 Annex A	TWCWG5 Registration (pdf version)
TWCWG5 Annex B	Logistic Information
TWCWG5-2.1	Agenda v3.0
TWCWG5-2.2	Programme v1.0
TWCWG5-2.3.1	TWCWG Report to HSSC11
TWCWG5-2.3.2	TWCWG Presentation to HSSC11
TWCWG5-2.3.3	Actions from HSSC11
TWCWG5-2.3.4	TWCWG report to HSSC12
TWCWG5-2.3.5	TWCWG short report to HSSC12
TWCWG5-2.3.6	TWCWG presentation to HSSC12
TWCWG5-2.3.7	Outcomes from HSSC12
TWCWG5-2.4	TWCWG4-List of Actions updated 10 February 2021
TWCWG5-3.2.1	Reslution1/2019 - Digital Tide and Tidal Current Tables
TWCWG5-3.2.2	Reslution1/2019 - Member State comments
TWCWG5-4.1	S-104 Edition 0.0.8 - Track Change version
TWCWG5-4.1	S-104 Edition 0.0.8 - Clean version
TWCWG5-4.2	S-111 Edition 1.1.1 - Track Change version
TWCWG5-6.1	IHO Resolutions - Proposed revisions
TWCWG5-6.1	IHO Resolutions - Draft Amendments (Track Change)
TWCWG5-6.2	Relevant IHO Charting Specifications
TWCWG5-6.2 Annex B	S4 B-131
TWCWG5-6.2 Annex C	S4 B-302
TWCWG5-6.2 Annex D	S4 B-380
TWCWG5-6.2 Annexes E-H	S4 B-405 to B-408
TWCWG5-6.2 Annex I	S-4 B-496
TWCWG5-8.1	Proposal on the development of Chinese version of CB course
TWCWG5-10.1	TWCWG Work Plan 2021-2022

TWCWG5-10.2	TWCWG ToR
TWCWG5-11.1	TWCWG6 - Draft Agenda
TWCWG5-11.2	Outcomes Chair meeting presentation
TWCWG5-Presentations	Presentations.zip
TWCWG5-Participants	List of Participants

LIST OF ACTIONS AND DECISIONS – Updated 13 April 2021

No	Agenda Item	Subject	Status/Date	Comments	Action
	Continuous				
-	-	Standard Constituent List	On going	Add additional data and upload to website for further comment.	All
-	-	Study of long term data sets	On going	Circulate to TWCWG national reports on studies into sea level rise and trends	All
-	-	Compare tidal and current predictions	On-going	Provide additional datasets for analysis, with constituents used, to IHO for uploading to web page	All
-	-	Compare tidal and current predictions	On-going	Provide reports of analysis NOR and IHO for wider discussion and comments	All
-	-	Inventory of tide gauges	On going	Contact national representative attending RHC meetings to raise awareness of inventory and encourage input and updating of information	All
-	-	Inventory of tide gauges	On going	Regularly check entries and provide up-dates and amendments to IHO as necessary	All
-	-	Actual Tides On-line Link	On going	Check and provide up-dates and amendments to the information provided to ensure content is current and all links work	All
-	-	Capacity Building	On going	Through their appropriate representatives, highlight to RHC meetings the course availability and the intended target audiences	All
-	-	Any other business	On going	Investigate what historical data is held and to consider preserving it as digital data for future use	All
	TWCWG4				
18	5.3	Compare Tidal Predictions	TWCWG5	Comparison of the results provided	NHS
19	5.3	Compare Tidal Predictions	TWCWG5	Outline topics and challenges that should be resolved or covered in the guidelines	BOM/NHS
20	5.3	Compare Tidal Predictions	TWCWG5	Generate first draft for recommendations concerning uncertainty	BOM/NHS
21	5.6	Status of vertical datum change	TWCWG5	Prepare a synopsis on the existing surfaces of references and compare it to CD	Chair (volunteers required - see report)

	TWCWG5				
1	3.1	Tidal predictions	TWCWG6	Initiate investigation for storing data and making it available for use by all TWCWG members	Chair/All
2	3.1	Tidal predictions	TWCWG6	Develop a plan for further analysis of tidal harmonics	Chair/All
3	4.1	S-104 Update	28 May	Provide some visual diagrams to explain concept of datum separation	ZJ
4	4.1	S-104 Update	1 Oct	TWCWG to provide a list of datums to be used (must be chart datum) by July 2021 with the list finalized and submitted to S-100 WG by October 2021	Chair/Vice-Chair
5	4.1	S-104 Update	25 Jun	Provided use case to S-100WG/IIC	ZJ
6	4.1	S-104 Update	25 Jun	Initiate discussion on water level trend threshold	Chair/Vice-Chair
7	$.1	S-104 Update	25 Jun	Provide proposed method of calculation water level trend threshold to Chair	All
8	4.3	Use Cases	1 Oct	Provide additional use cases for discussion by TWCWG	All
9	5.5	Engagement with S-100WG and other relevant bodies	25 Jun	Initiate discussion on how to determine the separation vertical uncertainty ratio to allow use of CSB data	Chair/Vice-Chair
10	5.5	Engagement with S-100WG and other relevant bodies	2 Jul	Provide feedback to Chair on data quality issues documentation for submission to DQWG Chair	All
11	6.1	Review of IHO Resolutions	2 Apr	Make the proposed amendments to A6.1 and circulate to the TWCWG for final approval	RF
12	6.1	Review of IHO Resolutions	2 Apr	Provide final versions for submission to HSSC	RF
13	6.2	Review of IHO Charting Specifications	TWCWG6	Lead the review and revision process of the relevant Chart Specifications	RF
~~14~~	~~6.2~~	~~Review of IHO Charting Specifications~~	~~26 Mar~~ Complete	~~Provide relevant specifications for review~~	~~IHO~~
15	7.1	CB Course Update	23 Apr	Provide relevant presentations and documents for translation to MSA	RF
16	7.1	CB Course Update	28 May	Provide to RF completed Portuguese translation of supplementary documentation and 1 slide	BRA

17	8.1	Work Plan	HSSC13	Included revised version of Work Plan 2021-2022 in report to HSSC13	Chair/IHO
18	9.1	TWCWG6	25 Jun	Identify suitable dates for meeting	Chair/IHO/RF
19	9.1	TWCWG6	1 Oct	Circulate an initial letter of invitation and post on the website.	RF/IHO
20	11.1	Review of list of Actions and Decisions	TWCWG6	All those who have actions to complete should keep the Chair, Vice-Chair and Secretary informed of progress	All
~~21~~	~~11.1~~	~~TWCWG5 Draft Report~~	~~26 Mar~~ Complete	~~Draft to be circulated for comment~~	~~IHO~~
~~22~~	~~11.1~~	~~TWCWG5 Draft Report~~	~~9 Apr~~ Complete	~~All to provide comments on draft report~~	~~All~~
~~23~~	~~11.1~~	~~TWCWG5 Final Report~~	~~23 Apr~~ Complete	~~Publish final report~~	~~IHO~~
~~24~~	~~11.1~~	~~Report to HSSC13~~	~~15 Mar~~ Complete	~~Final report for submission~~	~~Chair/vice-Chair/IHO~~

LIST OF DECISIONS

No	Decision
1	Draft agenda adopted without amendments
2	Report of TWCWG4 was approved
3	It was agreed to take the outstanding actions under the relevant agenda items
4	Datum separation: don't include in S-104 Ed 1.0.0, include in Ed 2.0.0
5	Uncertainty: defer the methods for calculating uncertainty and also the possible inclusion of uncertainty as a Feature Attribute until Ed 2.0.0; this should be progressed and resolved well before Ed 2.0.0 is submitted
6	Additional Datums: the WG should define particular additions to the list of datums, but the encoding will be determined by the discussion in the S-100 WG
7	Real-time AIS use case: provided a use case to be sent to S-100/IIC for their S-100 real-time data development
8	Portrayal: leave in PS with note that no XML portrayal catalogue is provided in Ed 1.0.0 and implementation not expected for Ed 1.0.0
9	Compliance: have S-104 compliant with S-100 Ed 4.0.0, but note that efforts were made to accommodate known Ed 5.0.0 draft at time of publication
10	File name 4-character producer code: same as for S-111 above

11	Group_F (including fillValue): same as for S-111 above
12	Water level trend threshold: more discussion needed offline to determine optimal place for this metadata variable in HDF5 file
13	Non-uniform time interval data: include support in S-111 as in S-104
14	Compliance: have S-111 Ed 2.0.0 be compliant with S-100 Edition 5.0.0, not Ed 4.0.0
15	File name 4-character producer code: use 4-character instead of 2-character codes, but need to coordinate when S-100 allows for 4-character codes in Producer Code Register (in S-100 Ed 5.0.0?)
16	Group_F (including fillValue): after S-100 WG discussion of UoM is concluded, S-111 and S-104 should conform. Require fillValue, code, uom.name, etc. to be certain values in Group_F for consistency across all S-111 products
17	It was agreed that a Chinese translation was of benefit and MSA were invited to progress the task.

Tides, Water Level and Currents Working Group (TWCWG)

Terms of Reference and Rules of Procedure

References: *6th HSSC Meeting (Viña del Mar, Chile, November 2014)*
7th HSSC Meeting (Busan, Republic of Korea, November 2015)

1. Objective

a) To provide technical advice and coordination on matters related to tides, water levels, currents, relevant oceanographic data and vertical datum, including integrated water level/current data models.

b) To support the development and maintenance of related specifications in liaison with the relevant IHO bodies and non-IHO entities;

c) To develop and maintain the IHO publications for which the WG is responsible.

2. Authority

This WG is a subsidiary of the Hydrographic Services and Standards Committee (HSSC). Its work is subject to HSSC approval.

3. Composition and Chairmanship

a) The WG shall comprise representatives of IHO Member States (MS), Expert Contributors (EC), observers from accredited NGIO, and a representative of the IHO Secretariat. A membership list shall be maintained and posted on the IHO website.

b) EC membership is open to entities and organizations that can provide a relevant and constructive contribution to the work of the WG.

c) The Chair and Vice-Chair shall be a representative of a MS. The election of the Chair and Vice-Chair shall be decided at the first meeting after each ordinary session of the Assembly and shall be determined by vote of the MS present and voting.

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

e) If the Chair is unable to carry out the duties of the office, the Vice-Chair shall act as the Chair with the same powers and duties.

f) ECs shall seek approval of membership from the Chair.

g) EC membership may be withdrawn in the event that a majority of the MS represented in the WG agrees that an EC's continued participation is irrelevant or unconstructive to the work of the WG.

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

i) In the event that a large number of EC members seek to attend a meeting, the Chair may restrict attendance by inviting ECs to act through one or more collective representatives.

4. Procedures

a) The WG should:

(i) monitor and develop the use of tidal, water level, current information and relevant oceanographic data including integrated water level/current data models;

(ii) advise on the use of vertical datums;

(iii) advise on tidal, water level and current observation, analysis and prediction;

(iv) advise on matters concerning exchange, distribution and use of tidal, water level, current information and relevant oceanographic data related data/information;

(v) study principles and contribute to the development of improved methods for conveying tidal, water level, current information and relevant oceanographic data to mariners and other users;

(vi) keep under review the relevant IHO publications and resolutions in order to advise HSSC on their updating;

(vii) draft or revise guidance document(s), resolutions and specifications as appropriate and as instructed by HSSC; and

(viii) consider new related topics as instructed by HSSC and advise HSSC accordingly.

b) The WG should work by correspondence, teleconferences, group meetings, workshops or symposia. The WG should meet about once a year. When meetings are scheduled, and in order to allow any WG submissions and reports to be submitted to HSSC on time, WG meetings should not normally occur later than nine weeks before a meeting of the HSSC.

c) Decisions should generally be made by consensus. If votes are required on issues or to endorse proposals presented to the WG, only MS 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.

d) The date and venue of group meetings shall normally be announced by the Chair at least six months in advance.

e) The draft record of meetings shall be distributed by the Chair (or the secretary) within six weeks of the end of meetings and participants' comments should be returned within three weeks of the date of despatch. Final minutes of meetings should be posted on the IHO website within three months after a meeting.

f) Sub-working groups and project teams may be created by the WG or proposed to HSSC to undertake detailed work on specific topics. The terms of reference and rules of procedure of the sub-working groups and project teams are determined or proposed by the WG as appropriate.

g) The WG should liaise with other IHO bodies, international organizations and industry to ensure the relevance of its work.

h) The WG should prepare annually a report on its activities and a rolling two-year work plan, including expected time frame.

TWCWG WORK PLAN 2021-22

Objective

a) To monitor developments related to tidal and water level observation, analysis and prediction and other related information including vertical and horizontal datums;

b) To develop and maintain the relevant IHO standards, specifications and publications for which it is responsible in liaison with the relevant IHO bodies and non-IHO entities;

c) To develop standards for the delivery and presentation of navigationally relevant current information; and

d) To provide technical advice and coordination on matters related to tides, water levels, currents and vertical datum.

Tasks

A	Maintain the list of standard tidal constituents (IHO Task 2.8.4)
B	Compare the tidal predictions generated as a result of analysis of a common data set using different analysis software
D	Develop, maintain and extend a Product Specification for dynamic surface currents in ECDIS (S-111) (IHO Task 2.3.4)
E	Develop, maintain and extend a Product specification for dynamic water level in ECDIS (S-104) (IHO Task 2.3.4)
F	Liaise with S-100WG on water level and current matters relevant to ECDIS applications (IHO Task 2.3.5)
G	Liaise with industry experts on the development of product specifications for water level and currents (IHO Task 2.5.1)
H	Prepare and maintain an inventory of water level gauges and current meters used by Member States and publish it on the IHO/TWCWG web site (IHO Task 2.8.5)
I	Review and maintain the Actual Tides and Currents On-Line links as published on the IHO TWCWG website (IHO Task 2.8.5)
J	Maintain and extend the relevant IHO standards, specifications and publications as required (IHO Tasks 2.8.4 and 2.1.8)
K	Conduct at least annual meetings of TWCWG and its sub-group(s) and project team(s) (IHO Tasks 2.1.2.7)
L	Develop and maintain material for course on Tides, Water Levels and Currents (IHO Task 3.3.9)

Work item	Title	Priority H-high M-medium L-low	Next milestone	Start Date	End Date	Status P-planned O-ongoing C-completed S-Superseded	Contact Person(s)	Related Pubs / Standard	Remarks
A.1	Maintain the list of standard tidal constituents	M		-	Permanent	O	Chris Jones* All		Review current list of published tidal constituents
B.1	Compare the tidal predictions generated as a result of analysis of a common data set using different analysis software.	M		-	Permanent	O	Hilde Sande Borck * All		Select Common data set Analyse using different software Predict common set of tides Compare results
D.1	Develop and maintain a product specification for dynamic application of surface currents in ECDIS (S-111)	H H	Issue Edition 1.0.0 Issue Edition 2.0.0	2013 2019	~~2017~~ ~~2018~~ 2019 2022	~~O~~C O	See report TWCWG4: List of involved and active members: Neil Weston* Erin Nagel, Stephan Dick, Luis Becker, Gwenaële Jan, Japan, Ronald Kuilman, Raphael Malyankar		Joint project team is established as required. Liaise with S-100WG (see F.1) Liaise with industry experts (see G.1)
E.1	Develop and maintain a product specification for dynamic application of water levels in ECDIS	H H H	Develop draft Product Specifications (S-104) for water level information for surface navigation in S-100 Issue Edition 1.0.0 Issue Edition 2.0.0	2009 2019 2021	~~2017~~ ~~2018~~ ~~2019~~ 2020 2021 2024	O P P	Zarina Jayaswal* Glen Rowe, Jimin Ko, Raphael Malyankar See TWCWG4 report list of MS involved		Joint project team is established as required. Liaise with S-100WG (see F.1) Liaise with industry experts (see G.1)

Work item	Title	Priority H-high M-medium L-low	Next milestone	Start Date	End Date	Status P-planned O-ongoing C-completed S-Superseded	Contact Person(s)	Related Pubs / Standard	Remarks
F.1	Liaise with S-100WG on water level and current matters relevant to ECDIS applications	H		-	Permanent	O	Gwenaële Jan Neil Weston Zarina Jayaswal		Joint project team is established as required.
G.1	Liaise with industry experts on the development of product specifications for water levels and currents	H		-	Permanent	O	All		
H.1	Maintain an inventory of water level gauges and current meters used by Member States and publish it on the IHO/TWCWG web site.	H		-	Permanent	O	David Wyatt* All		Initial inventory from TWCWG members available on IHO web site.
I.1	Review and maintain the Actual Tides and Currents On-Line links as published on the IHO/TWCWG website	L		-	Permanent	O	David Wyatt* All		
J.1	Maintain and extend the relevant IHO standards, specifications and publications	M		-	Permanent	O	Gwenaële Jan* Peter Stone All	S-60 User's Handbook on Datum Transformations involving WGS 84	See IHO CL10/2017 dated 1/02/2017
J.2	Maintain IHO resolutions	H		2019	~~2020~~ 2021	O	Ruth Farre*All	IHO Resolutions in M-3	
L.1	Develop and maintain material for CB course on Tides and Tide gauges	H	Complete translate of course material into Spanish and Portuguese by 2018 in liaison with Regional CB Coordinator requirements	-	Permanent	O	Ruth Farre* Peter Stone Zarina Jayaswal Gwenaële Jan Cesar Borba José Ramón Torres García China (MSA)		Adapt currently available course material to create a course suitable for delivery in support of CBSC requests

Meetings (Task K)

Date	Location	Activity
25-29 April 2016	Niterói, Brazil	TWCWG-1
8-12 May 2017	Victoria, Canada	TWCWG-2
16-20 April 2018	Viña del Mar, Chile	TWCWG-3
8-12 April 2019	Busan, Republic of Korea	TWCWG-4
16-18 March 2021	Remote VTC	TWCWG-5
tbc 2022	Cape Town, South Africa	TWCWG-6

Chair: Christopher Jones (UK) Email: christopher.jones@ukho.gov.uk
Vice Chair: Ruth Farre (South Africa) Email: ruth.farre@sanavy.co.za
Secretary: David Wyatt (IHO) Email: adso@iho.int

Tides, Water Level and Currents Working Group
Cape Town, South Africa – ??-?? April/May 2022
Draft Agenda – (TWCWG6)

1. Opening

.1 Opening address – Chair
.2 Address by host nation – ???
.3 IHO comments – IHO

2. Administrative Arrangements

.1 Adoption of the Agenda and Apologies – Chair/Secretary
.2 Programme and timetable of the Sessions – Chair/Secretary
.3 Meeting administration, including H&S – ???
.4 Report on Intercessional Activities including HSSC13 – Chair
.5 Matters arising from TWCWG5/Review of Action Items – Secretary

3. Programme Matters

.1 Standard Constituent List – GBR
.2 Standard for digital Tide Tables – USA
.3 The study of long term data sets for the determination of global sea level rise. – NOR/USA
.4 Compare Tidal Predictions generated as a result of analysis of a common data set by different analysis software – USA/NOR
.5 Feedback on long term sea level variation – NOR
.6 Exchange of Harmonic constants/predictions, feedback on comparison of tidal constituents – GBR/USA
.7 Establishment and Maintenance of VRF for High Resolution Bathymetric Surfaces – GBR & NLD
.8 Determining ellipsoidal height of MSL at the coast – NLD
.9 Inventory of Tide gauges used by IHO Member States – IHO
.10 Actual Tides On-line Link status – IHO

4. Product Specification Presentations

.1 Water Level Information for Surface Navigation (S-104) – AUS
.2 Surface Current Product Specification (S-111) – USA

5. Product Specifications Work Packages

.1 Progress report on current datasets – USA
.2 Feedback on results from encoding tests – USA
.3 Application of encoding tool(s) to additional datasets – USA
.4 Encoding datasets in HDF5 S-111 format – USA
.5 Engagement with S-100WG and other relevant subordinate bodies – FRA

6. IHO Resolutions and Charting Specifications

.1 Review of relevant IHO Resolutions – ZAF
.2 Review of relevant IHO Charting Specifications – IHO

7. IOC Programmes

.1 Update on IOC GLOSS Programme items and events – USA
.2 Update on IOC TOWS Programme items and events – CHL

DRAFT

8. Capacity Building

.1 Tides and Water Levels Workshop training material – ZAF/AUS

9. Any Other Business

.1 Development of report to HSSC14 – Chair
.2 Historical data recovery/data archaeology – Chair
.3

10. Work Plan and ToRs

.1 TWCWG Work Plan 2022-2023 up-dates – IHO
.2 Review TWCWG ToRs and RoPs – IHO

11. Venue and dates of the 7th TWCWG Meeting (TWCWG7) – Chair/Secretary

12. Review of Action Items from TWCWG6 – Secretary

13. Draft Agenda for TWCWG7 – Chair/Secretary

14. Closing remarks – Chair

DRAFT

Chat Log C:\Users\ADSO\Desktop\TWCWG5\ChatLog 2021_03_16 14_56.rtf

David Wyatt - IHO Secretariat (to Everyone): 12:02: Please can India and KHOA give me names and email addresses of participants, so I can add you to the list of attendees?
KHOA, Republic of Korea (to Everyone): 12:03: wonjin choi, ch8331@korea.kr
KHOA, Republic of Korea (to Everyone): 12:03: aram kim, 1124kar@korea.kr
Chris Jones (UKHO) (Private): 12:05: Hi David - from UKHO we also have Colin Shepherd (colin.shepherd@ukho.gov.uk).
Chris Jones (UKHO) (Private): 12:23: Also we will be joined at some stage by Michael Davies (michael.davies@ukho.gov.uk) and Dave Chapman (dave.chapman@ukho.gov.uk): Both UKHO.
KHOA Jay Kim (to Everyone): 12:25: Sorry, I am having trouble with my mic so I will introduce myself via chat. I am Jay Kim of GeoSystem Research Corp. and I am with the KHOA. Thank you.
David Wyatt - IHO Secretariat (to Everyone): 12:29: Jay Kim do you have an email address?
KHOA Jay Kim (to Everyone): 12:29: It is jhkim@geosr.com
Francisca Contreras (to Everyone): 12:42:
I am Francisca from Chile
David Wyatt - IHO Secretariat (to Francisca Contreras): 12:42: Not a problem for today, if you have a question use the ChatLog and Peter or I will pick it up.
David Wyatt - IHO Secretariat (to Mauricio Venegas): 12:48: Can I have your details, as I do not yet have you on the participants list?
Mauricio Venegas (Private): 12:52: hi David, sorry or not introduce me. I'm from Chile, SHOA. We are invited by oceanographic department from the service.
David Wyatt - IHO Secretariat (to Mauricio Venegas): 12:53: That's fine, can you give me an email address or is it the department one you use?
Mauricio Venegas (Private): 12:54: hidrografia@shoa.cl
David Wyatt - IHO Secretariat (to Everyone): 13:19: Can people please turn off their mics if not talking. If you want to make an intervention or ask a question turn on your camera and indicate.
Bernardo Aliaga (Private): 13:58: Dear David, I will leave in a couple of minutes for a Hotwash on the NZ tsunami event of 4th March with Central America MS. I will join again tomorrow. Thank you. Bernardo
Hilde Sande Borck - NHS (to Everyone): 13:59: I forgot to mention that there are also some other results than those I mentioned, such as those by South Africa. In the overview (which will be online in a while) these are noted, but not yet included
Carl Kammerer USA NOAA (to Everyone): 14:14: maybe it was just information regarding datum changes?
Peter Stone - NOAA (to Everyone): 14:15: NOAA uses a maximum of 0.25kts as a weak and variable tidal stream
Peter Stone - NOAA (to Everyone): 14:15: weak
Colin Shepherd (to Everyone): 14:16: Difficult to define negligible as it will be affected by the overall tidal range for a particular location
AUS - Zarina Jayaswal (to Everyone): 14:16: Location Identification Number - may not be unique will this be an issue? eg - ISO standards Suggest Country be per IHO convention and be noted as such.

Eugenio San Martin (to Everyone): 14:16: Chile SHOA use less than 0.3 kn as a weak and variable tidal current
Eugenio San Martin (to Everyone): 14:18: and we identified with the symbol "*'
Eugenio San Martin (to Everyone): 14:18: in the tidal current table
Phil MacAulay, CHS Canada (to Everyone): 14:20: I agree with both Chris and Zarina on intent of comment and support Gwen's suggestion
Chris Jones (UKHO) (Private): 14:21: Yes I agree - the new metadata resolution will cover that.
Chris Jones (UKHO) (to Everyone): 14:21: Yes I agree - the new meta data resolution will cover that.
AUS - Zarina Jayaswal (to Everyone): 14:24: note that on a chart flood/ebb arrows and tidal diamonds are to the nearest 0.1kts
Phil MacAulay, CHS Canada (to Everyone): 14:26: What Is the criteria for negligible? Too small to be of navigational import?
Phil MacAulay, CHS Canada (to Everyone): 14:29: May cause trouble in S111 as at various phases of flow through cycle, currents will be small, but may this will quickly change, so the temporal nature of the results makes application of a set minimum to be null could be problematic to display of the forecast data
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 14:30: Sorry but since there's no limitations for storing or computing tide and/or currents nowadays, which is the advantage of defining negligible values? We can retain all of them leaving the user to decide to consider them or not.
Sadid Latandret (Colombia) (to Everyone): 14:33: I agree with you, because all the data is important and the information can be consulted by anyone who can use it for another purpose.
Carl Kammerer USA NOAA (to Everyone): 14:33: this question deals with locations where the maximum currents are not in excess of a given value (.12 cm/s for the US) throughout the entirety of predictions not at a given discrete time
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 14:34: I see your point but I don't see the advantage in neglecting information
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 14:35: The S-101 draft specification allows encoding of speeds down to 0.1 kt in its relevant features; it also allows omission of the minimum speed.
Phil MacAulay, CHS Canada (to Everyone): 14:37: So negligible when are we referring to values determined for tidal predictions based on constituent analysis?
Greg Seroka (US NOAA/OCS) (to Everyone): 14:41: S-111 Data Classification and Encoding Guide has minimum resolution of at least 0.01 knot for surface current speed
Greg Seroka (US NOAA/OCS) (to Everyone): 14:42: With null value (for land mask or missing value) being a negative number
Ruth FARRE - South African (SANHO) (Private): 14:45: we appear to have missed point 6.2 of the agenda
Chris Jones (UKHO) (to Everyone): 14:47: Thanks Ruth!
Stephan Dick, BSH (to Everyone): 14:47: Thank you Ruth
AUS - Zarina Jayaswal (to Everyone): 14:47: thank you Ruth for taking lead on that action.
Briana (UNH) (to Everyone): 14:47: thanks Ruth!
Thomas Hammarklint, Sweden (to Everyone): 14:50: Thank you Ruth!
Briana (UNH) (to Everyone): 14:55: thank you too David for keeping things tight!

Greg Seroka (US NOAA/OCS) (to Everyone): 14:56: Thank you all! Look forward to the discussion tomorrow!
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 14:56: bye until tomorrow
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 14:56: see you tomorrow !
Kurtis Redding (US Naval Oceanographic Office) (to Everyone): 14:56: bye!
Luis Becker (to Everyone): 14:56: Thank you! Bye!

Chat Log C:\Users\ADSO\Desktop\TWCWG5\ChatLog 2021_03_17 14_51.rtf

Carol Estrada Directorate of Hydrography and Navigation of Peru (to Everyone): 11:55: Good morning everyone, please, I would like to notify that I will not be able to join the meeting today, because I need to attend to a medical appointment.
I'm very sorry. I also would like to take this opportunity to inform that the Directorate has sent a letter on February 17th, requesting the updating of the names of our representatives, in order to keep in touch with this work team.
Thankyou
Ruth FARRE - South African (SANHO) (to Organizer(s) Only): 11:58: Hi, would it be possible to record this session today and make it available to members? the SANHO charting and ENC Heads are not available to listen in and I think it would be beneficial for them to be able to hear and see what is taking place with the S100 and S104. This might be beneficial to other member states as well.
Chris Jones (UKHO) (Private): 11:59: Morning David. Hope you are well. Just to note that today I am joined by UKHO colleagues Edward Collins (edward.collins@ukho.gov.uk) and Colin Shepherd (colin.shepherd@ukho.gov.uk) and hopefully Michael Davies (michael.davies@ukho.gov.uk) and Dave Chapman (dave.chapman@ukho.gov.uk)
Greg Seroka - NOAA/OCS (US) (to Everyone): 12:04: Recording is good with me
Eugenio San Martin (to Everyone): 12:05: It's ok for me, excellent idea
Peter Stone - NOAA (to Everyone): 12:05: I am fine with recording
Paola Picco Italian Hydrographic Institute (to Everyone): 12:05: ok for me
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 12:05: ok for me
Leigha Peterson-NGA,USA (to Everyone): 12:05: good with me
Chris Jones (UKHO) (Private): 12:05: Yes
AUS - Zarina Jayaswal (to Everyone): 12:05: No objection to recording.
Stephan Dick, BSH (to Everyone): 12:05: ok
Wonjin and Aram, KHOA (to Everyone): 12:05: ok
Marcos - IHM, SPAIN (to Everyone): 12:05: OK
Yulei Dong(China MSA) (to Everyone): 12:05: ok
Ruth FARRE - South African (SANHO) (to Everyone): 12:05: good with me. Thank you
Phil MacAulay, CHS Canada (to Everyone): 12:05: fine with me
Liana (to Everyone): 12:05: ok
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 12:05: No objection to recording
Hélène TONCHIA ECA GROUP (to Everyone): 12:06: ok
Do-Seong Byun (Korea KHOA) (to Everyone): 12:05: That's good idea!
Phil MacAulay, CHS Canada (to Everyone): 12:10: at least one new person from the CHS (Canada) too
Peter Stone - NOAA (to Everyone): 12:16: Hey Greg, Were these reviews coming from the distribution of ver. 1.0.0 through the HSSC or from the TWCWG?
Chris Jones (UKHO) (to Everyone): 12:28: Would it be wise to include this feature in S-111 anyway? As it might be useful / required by some users at some stage?
Carl Kammerer USA NOAA (to Everyone): 12:28: What impact would changing or allowing time to be non-uniform have on the specs and users? is it trivial or substantial?
Phil MacAulay, CHS Canada (to Everyone): 12:30: After some discussion, the CHS suggests that allowing for non-uniform time interval in S111 might be useful

Luca Repetti (Italian Hydrographic Institute) (to Everyone): 12:30: Forgive me but I honestly can't imagine a need for non-uniform time intervals.
Chris Jones (UKHO) (to Everyone): 12:31: Real-time current sensor data may be delivered in non-uniform time intervals?
AUS - Zarina Jayaswal (to Everyone): 12:32: the only example I can think of are the use of real-time current/wave buoys changing sampling interval for response to tsunami event.
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 12:32: At least not a situation in which they suit better than uniform ones
Phil MacAulay, CHS Canada (to Everyone): 12:32: That is same use case the CHS was discussing, thanks Chris
Paola Picco Italian Hydrographic Institute (to Everyone): 12:32: lagrangian may be
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 12:33: Thanks Zarina, a good example, but, hopefully, an extreme one
AUS - Zarina Jayaswal (to Everyone): 12:39: Suggest file naming use of producer code be consistent across S-100 products specs.
Carl Kammerer USA NOAA (to Everyone): 12:39: Agree with Zarina
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 12:40: The initiative for 4-character codes was after S-100 4.0.0 was published
Peter Stone - NOAA (to Everyone): 12:40: I am fine with change but do have a question which I will hold for tomorrow's discussion
Chris Jones (UKHO) (to Everyone): 12:40: Agreed - keep the naming consistent.
Gwenaele Jan, Shom (to Everyone): 12:40: Agreed
Ruth FARRE - South African (SANHO) (to Everyone): 12:40: Agree, naming consistency is important
Phil MacAulay, CHS Canada (to Everyone): 12:41: The CHS agrees
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 12:43: There will be a discussion of UoM in the S-100 WG which may affect the names of units. After that discussion is concluded, S-111 and S-104 should conform.
Gwenaele Jan, Shom (to Everyone): 12:44: Agreed with Raphael comment.
Dr. Edward Weaver - WRSystems (to Everyone): 12:45: So by adding in Upper and Lower, this will increase dataset size. Has a study been done to see the impact of the additional size of the datasets?
AUS - Zarina Jayaswal (to Everyone): 12:46: Fill value should be a large value that is not close to a realistic value. So support -9999.
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 12:46: As I understand NIWC, the important thing is that the fill values be standardized in the product specification
Hélène TONCHIA ECA GROUP (to Everyone): 12:47: What about sea current at another depth than surface?
Chris Jones (UKHO) (to Everyone): 12:47: Yes UKHO agrees that the use of -9999 should be required (mandatory) not 'suggested'.
Paola Picco Italian Hydrographic Institute (to Everyone): 12:48: -9999 is also a commonly used FillValue
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 12:48: lower and upper are for the "actual" values, they should not include the fill values
Neil Weston - NOAA (to Everyone): 12:48: Using a consistent fill value (-9999) removes ambiguity for developers/programmers

Hélène TONCHIA ECA GROUP (to Everyone): 12:48: Why calling them surfaceCurrentSpeed ?
Do-Seong Byun (Korea KHOA) (to Everyone): 12:47: Is it impossible to use "NaN" rather than "-9999." for fillValue?
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 12:49: Helene - denoting the fill value for each attribute
AUS - Zarina Jayaswal (to Everyone): 12:52: Rather not use 'NaN' cause the variable is then mixing numerical and character values.
Do-Seong Byun (Korea KHOA) (to Everyone): 12:52: Thanks - Zarina.
Phil MacAulay, CHS Canada (to Everyone): 12:55: Question: Assume that Vertical datum is applicable for representing data from a moored current device, surface current is with respect to the present sea surface level, bottom is obvious, Have we considered different depths from the surface, 10 m depth, or 20 m, so time changing vertical reference as with surface current? These could be natural model data references
Erin Nagel (USA/NOAA/OCS) (to Everyone): 12:57: Correct, we are providing S-111 files at -4.5 m
briana sullivan (to Everyone): 12:58: great job Greg....thanks
AUS - Zarina Jayaswal (to Everyone): 13:01: From memory - per the title were concerned only with currents at surface that affect shipping, so alternative depths were not initially considered.
Phil MacAulay, CHS Canada (to Everyone): 13:02: Reason I asked is that we have considered providing data at a few depths, deeper draft ships, not just 'surface current' ref, ours is also about 5 m (or 4.5 if that is spec).
Carl Kammerer USA NOAA (to Everyone): 13:02: Zarina is correct
Do-Seong Byun (Korea KHOA) (to Everyone): 13:03: We also use 5 m for surface current.
Phil MacAulay, CHS Canada (to Everyone): 13:03: Perfect, as long as we can consider expansion to sub-surface in future if needed.
AUS - Zarina Jayaswal (to Everyone): 13:04: we use 5-7m for surface current, as currents at that depths is where SOLAS class vessels are significant effected by these affects.
AUS - Zarina Jayaswal (to Everyone): 13:04: Note "surface current" was never defined in depth from the water level, just that it is navigationally significant.
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 13:05: We should keep in mind that the effects of current on a ship is the contribution of all the currents inside the depth interval from 0 to draft
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 13:05: giving only a surface current value isn't sufficient IMHO
Ruth FARRE - South African (SANHO) (to Everyone): 13:07: Good Point Luca.
AUS - Zarina Jayaswal (to Everyone): 13:09: Good Point - just need to then considered data package sizes, how often updated - especially for gridded data.
Peter Stone - NOAA (to Everyone): 13:09: I think the HOs have the option to provide an integrated current value over multiple depths. They just have to attach a depth to that value
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 13:09: Agreed
Ruth FARRE - South African (SANHO) (to Everyone): 13:09: Agreed
Dr. Edward Weaver - WRSystems (to Everyone): 13:10: Are you working with Eivind Mong and S-124 team because they are working on real-time data exchange
Gwenaele Jan, Shom (to Everyone): 13:12: The logic is that the structure of the metadata and

the structure of the S111's allows for the encoding of future sub-surface prod. The S-111 current specification defined on the surface is/should be / derivable at depth.
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 13:16: @Dr. Weaver, Sorry no we are not.
Chris Jones (UKHO) (to Everyone): 13:20: Greg: quick question: waterLevelTrendThreshold is captured at the entire HDF5 file level..... how do we deal with big variations of threshold within the same dataset, or even small geographic areas?
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:20: Yes, S-100 WG are working on real-time data in general
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:30: Next few slides elaborate on the issues
AUS - Zarina Jayaswal (to Everyone): 13:32: I will look at making some visual diagrams that will help explain the vertical datum separation (ellipsoid - cd separation) - Pictures can make explaining easier.
Chris Jones (UKHO) (to Everyone): 13:34: Thanks Greg - we can discuss further offline on the waterLevelTrendThreshold question.
AUS - Zarina Jayaswal (to Everyone): 13:37: Note there was a suggested rule for implementation in S-104 that where S-129 product existed it took precedence.
Peter Stone - NOAA (to Everyone): 13:39: It think the method to calc. WL uncertainty would be a good TWCWG project in the future
AUS - Zarina Jayaswal (to Everyone): 13:40: Agree delay uncertainty to next edition.
Chris Jones (UKHO) (to Everyone): 13:41: Yes I agree that Uncertainty can be dealt with for v2.
Paola Picco Italian Hydrographic Institute (to Everyone): 13:42: agree with Peter
David Wyatt - IHO Secretariat (to Everyone): 13:43: This should be progressed during the progress from Edition 1.0.0 to Edition 2.0.0 and should be completely resolved well before Edition 2.0.0 is submitted.
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:46: no correction
Ruth FARRE - South African (SANHO) (to Everyone): 13:46: WRT the uncertainty there is information on it in the Manual of Hydrography Chapter 5: section 2.2.1 Error Budget Considerations page 275, which deals with uncertainties
Neil Weston - NOAA (to Everyone): 13:46: ITRF20XX are 3-D reference frames and some of the others are 1-D datums. Seems we are mixing datum types
Peter Stone - NOAA (to Everyone): 13:47: what is the process to add new datums in the future? New datums will always be developed.
Kurtis Redding (US Naval Oceanographic Office) (to Everyone): 13:47: What about WGS-84 ellipsoid?
AUS - Zarina Jayaswal (to Everyone): 13:47: ITRF2014 and ITRF2020 are based on GRS80 GEOID as is Balti Sea Chart Datum.
AUS - Zarina Jayaswal (to Everyone): 13:47: As is WGS84
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:47: Process is an update proposal to the IHO registry, accompanied or followed by an S-100 maintenance proposal
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:48: Code will be determined when datum is added to GI registry
Luca Repetti (Italian Hydrographic Institute) (to Everyone): 13:48: In the sea surface definitions atmospheric contribution is missing. It is quite difficult to get rid with, and it is the

most important factor in water level long term fluctuations, much more than water level trend itself
AUS - Zarina Jayaswal (to Everyone): 13:50: Note ITRF2014/ ITRF2020/WGS84 height values - linked to real-time navigation. IF EPSG code can be used rather than S-100 vert datum list. It would cover these.
Kurtis Redding (US Naval Oceanographic Office) (to Everyone): 13:51: WGS 84 ellipsoid is very close to GRS 80, but the WGS has its own ellipsoid
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:52: We'll have to wait and see what the S-100 WG finally decides
Lars Jakobsson, Swedish Maritime Adm. HO (to Everyone): 13:55: Baltic Sea Chart Datum 2000 is a geoid corresponding to EVRS, European Vertical Reference System, and are connected to Amsterdam Pier. Relations between EVRS (vertical)/ETRS89 (European Terrestrial Reference System 1989 3-dim) to ITRF2014 are known.
Thomas Hammarklint, Sweden (to Everyone): 13:55: Nice to see that the registration of Baltic Sea Chart Datum 2000 into the IHO-GI Registry (http://registry.iho.int) has been successful - the process works :-)
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:56: Datums - this group should define particular additions to the list of datums, but the encoding will be determined by the discussion in the S-100 WG
Stephan Dick, BSH (to Everyone): 13:57: I think it can be a useful guidance
Dave (UKHO) (to Everyone): 13:57: Agreed. Leave it in for use cases and await for the portrayal catalogue
Peter Stone - NOAA (to Everyone): 13:57: I agree with Stephan
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:57: Support leaving it in with a note saying that no portrayal catalogue is provided in 1.0.0 and implementation not expected for 1.0.0
AUS - Zarina Jayaswal (to Everyone): 13:57: Leave for guidance - deals with the traditional planning//view mariners are used to.
Phil MacAulay, CHS Canada (to Everyone): 13:57: yes please leave in
Chris Jones (UKHO) (to Everyone): 13:57: Agreed it is useful to have examples for use cases.
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:58: "XML portrayal catalogue"
Peter Stone - NOAA (to Everyone): 14:00: compliant with Ed 4.0.0 Coordination is important. You can say that efforts were made to accommodate known 5.0.0 draft at time of publication
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 14:01: I think the key may be using the technical readiness levels in S-97 - 1.0.0 needs only TRL1
Michael Davies (UKHO GIS Developer) (to Everyone): 14:07: Thank you Greg and everyone. A really useful session!
Greg Seroka - NOAA/OCS (US) (to Everyone): 14:18: Good point, moving platform (included in S-111 as dataCodingFormat=4) could have non-uniform time intervals. Good use case
Peter Stone - NOAA (to Everyone): 14:23: Would the moving platform data be considered real time observations? If so, S-100 would have to include irregular time steps.
Greg Seroka - NOAA/OCS (US) (to Everyone): 14:24: Yes, S-100 Ed 5.0.0 includes support for irregular time steps
Paola Picco Italian Hydrographic Institute (to Everyone): 14:24: why not? If they send data in real time
Phil MacAulay, CHS Canada (to Everyone): 14:38: For individual gauge locations?

AUS - Zarina Jayaswal (to Everyone): 14:40: Could this be related to uncertainty?
Ruth FARRE - South African (SANHO) (to Everyone): 14:41: Greg, Once this is in the implementation stage, how will it be applied? For example a single layer for the entire country or specific regions or areas?
AUS - Zarina Jayaswal (to Everyone): 14:44: Water level trend - is calculated at each point, the trend threshold was initially thought to be for the area released - initially ENC Nav 5 and 6 scale. If looking at whole charting area - would need to look at breaking down just for sheer size?
Phil MacAulay, CHS Canada (to Everyone): 14:46: trend threshold could be defined as some % of typical range of water level change. Thus dependent on specific behaviours in area
Dave (UKHO) (to Everyone): 14:46: That's really interesting Zarina! Very helpful to understand the thinking behind it
Hilde Sande Borck - NHS (to Everyone): 14:46: Ruth, we are asking the same questions within the NHS, but have no answers yet, so this is a very interesting question.
Greg Seroka - NOAA/OCS (US) (Private): 14:47: Hi David, yes, I will reach out to Carl and get his notes, review, and then email straight to you. Thanks
Ruth FARRE - South African (SANHO) (to Everyone): 14:48: Thank you for your comments Zarina, Phil and Hilde.
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 14:48: One factor should be, what do the navigators and bridge officers want to see or know?
AUS - Zarina Jayaswal (to Everyone): 14:49: Mariners currently just see water level trend, no threshold or threshold hold limit in EC Displays. If they want to know more details they look at graphic plot.
AUS - Zarina Jayaswal (to Everyone): 14:50: Hence the portrayal section looks at providing a similar display to what they currently see on existing products.
Greg Seroka - NOAA/OCS (US) (to Everyone): 14:51: Agreed with Zarina on trend/threshold limit

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Peter Stone - NOAA (Private): 12:22: Hello David, Is there time today to raise a possible future project to examine how to calculate water level uncertainty with an aim of supporting S-104.
Ruth FARRE - South African (SANHO) (to Everyone): 12:28: What is instanceChunking?
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 12:28: Yes, offline discussions for further explanations of metadata - they should be added to the product specification
Michael Davies - UK Hydrographic Office (to Everyone): 12:30: Hi Ruth, section 10.2.2 says it "a string containing the HDF5 chunking values used in creating the values arrays". I think it has to do with splitting a geographic area up, however, I could be wrong and definitely welcome some guidance
Hélène TONCHIA ECA GROUP (to Everyone): 12:30: Can we get the forecast 1 month from now?
AUS - Zarina Jayaswal (to Everyone): 12:31: The cutting up of data into areas should match S-102 data sets. To ensure smoothing mapping layering in the visualisation tool.
AUS - Zarina Jayaswal (to Everyone): 12:31: and S-101 ENC's as well
Michael Davies - UK Hydrographic Office (to Everyone): 12:31: NOAA's GitHub repository has been invaluable in my development work - Many thanks to our American colleagues!
Do-Seong Byun (Korea KHOA) (to Everyone): 12:33: Is there any solution to unify data format in order to remove data conversion process from NetCDF to HDF5?
Greg Seroka - NOAA/OCS (US) (to Everyone): 12:36: instanceChunking is more how the HDF5 internally stores the data; re: Zarina's comment, that is more what the entire HDF5 file covers--for this, S-104/S-111 should be tiled out according to ENC chart scheme (for interoperability with S-101 ENC and S-102 bathymetry)
Michael Davies - UK Hydrographic Office (to Everyone): 12:41: thank you Greg. That's what I thought, but then I ran into issues chunking my HDF5 outputs with values lower than the size of the X & Y axis. I appreciate my struggle is my being new to working with S-100 and indeed NetCDF/HDF5
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 12:44: @Michael - we would be interested in more details, to see if it requires modification or removal of the chunking attribute concept from S-100
Greg Seroka - NOAA/OCS (US) (to Everyone): 12:45: Michael: sure, chunking is also an ongoing item, how to optimally and correctly do it, so you're not alone!
Michael Davies - UK Hydrographic Office (to Everyone): 12:45: sounds good @Raphael. I'll get in touch offline. Thank you!
Greg Seroka - NOAA/OCS (US) (to Everyone): 12:48: Do-Seong Byun: any changes between HDF5 and NetCDF would have to go through S-100 first
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 12:49: Agreed, NetCDF/HDF5 is an "S-100 level" question. At this point I don't recall the details of the reasons for the differences...
Greg Seroka - NOAA/OCS (US) (to Everyone): 12:51: I wasn't involved in those S-100 discussions, but I would imagine it's because HDF5 is more generic, and NetCDF "uses" the HDF5 format
AUS - Zarina Jayaswal (to Everyone): 12:53: Yes 'NetCDF' is a subset of HDF5 encoding.
Dave Chapman(UKHO) (to Everyone): 12:55: Depending on what version of NetCDF you

have access too...3 and below is not directly transformable to HDF5 from my understanding.
Phil MacAulay, CHS Canada (to Everyone): 13:05: Can you comment on how important including wet-drying in your model solutions is in terms of the final accuracy?
Thomas Hammarklint, Sweden (to Everyone): 13:05: An important and relevant aspect is the limitations of the models we will use to produce S-104 and S-111. Often the operational models found in for example CMEMS (free of charge), are not high resolution enough to be able to resolve the dynamics, for example in sound and ports, where the limitations for the vessels are often greater. In addition, the produced forecasts are only 5-6 days ahead, often also with bad accuracy. How should we prepare and drive the oceanographic operational community to produce the models we would need to produce reliable S-104 and S-111, that will be useful for the mariners?
Do-Seong Byun (Korea KHOA) (to Everyone): 13:08: Stephan, can you explain a little bit more 'optimized method for water level'?
Stephan Dick, BSH (to Everyone): 13:10: Thomas, the resolution of models is an important topic. I would not provide results of a coarse model for harbour areas.
Greg Seroka - NOAA/OCS (US) (to Everyone): 13:13: Thomas: agreed, need person(s) at HO that understand both models and S-100 to be involved to produce S-100 navigation-ready models
Gwenaele Jan, Shom (to Everyone): 13:20: How do we prepare and encourage the operational oceanographic community to produce the models we would need to produce reliable S-104s and S-111s that will be useful to mariners?
The question is about preparing and encouraging the operational community.
Compared to what is used today for navigation in route planning mode or approaching a port, the addition of temporal information should be of interest to users (for the tide).
Having a consistent interoperable information by opening on this temporal dimension should also be of interest.
The point raised about the quality (heterogeneity) of the different bathy navigation products, water level, current, beacons, nautical information, go no go areas, and the natural link with the associated uncertainty is so important that it is one of the reasons to move forward with the S-100 WGs. We can continue to exchange outside the meeting or at the end of the conference on this uncertainty point and the portrayal aspects as well.
Greg Seroka - NOAA/OCS (US) (to Everyone): 13:21: Phil: we are also looking into how to encode wetting/drying from our models in S-104 and S-111. Ongoing work and we are interested in the answer to your question too
Stephan Dick, BSH (to Everyone): 13:24: Including wetting and drying is very important for the dynamics in German coastal waters.

AUS - Zarina Jayaswal (to Everyone): 13:25: In Australia we are looking at variable sized grid models. Some areas we need to have wet/dry model included due to gently sloping bottom topography with large tidal ranges (9+m). EG Broome has a 10 km wharf and 90% of it dries at low tide. We have strong support for including wet/dry model because it also useful for other sectors-> coastal erosion/management purposes/ Risk assessment for flooding.
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:29: The draft S-111 1.0.0 validation checks (both Word introduction and spreadsheet) are on the S-100 WG5 page https://iho.int/en/s-100wg5-2020 documents S-100WG5-04.15B and S-100WG5-04.15C.
Gwenaele Jan, Shom (to Everyone): 13:32: Thank you very much Raphael.
Gwenaele Jan, Shom (to Everyone): 13:34: We also deal with wetting and drying in numerical

model.
AUS - Zarina Jayaswal (to Everyone): 13:43: In Australia CATZOC uses total Hor/Vert uncertainty. So is a sum of all uncertainty of instruments used to determine that sounding value from hydrographic surveys?
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 13:48: About metadata and exchange catalogues, mentioned earlier today: The exchange catalogue schemas are at the S-100 GitHub site, https://github.com/IHO-S100WG/S100-Schemas in the form of a zip file. This zip also contains an examples of XML exchange catalogues for some data products. There is currently an S-100 WG team discussing updates to the S-100 metadata and exchange catalogue model(s), so there may be changes to the schemas in S-100 5.0.0.
AUS - Zarina Jayaswal (to Everyone): 13:49: GNSS receivers are only accurate to 10cm in the vertical at best using Satellite-Based Augmentation Systems at sea.
AUS - Zarina Jayaswal (to Everyone): 13:50: That is using surveying grade receivers.
Mr M P Gupta, India (to Everyone): 13:55: could you please indicate the webpage address of the online module of tide CB. Regards
Leigha Peterson-NGA,USA (to Everyone): 14:05: Ruth, we are very excited by your update regarding capacity building and leveraging the e-learning environment. Thank you!
Peter Stone - NOAA (to Everyone): 14:07: How do you handle vertical control with this system. That is a big impediment for us.
Mr M P Gupta, India (to Everyone): 14:18: could you please indicate the webpage address of the online module of tide CB. Regards
Ruth FARRE - South African (SANHO) (to Everyone): 14:21: https://cb.iho.int/
Peter Stone - NOAA (to Everyone): 14:21: Yes, it's a good idea
Phil MacAulay, CHS Canada (to Everyone): 14:25: where will fall meeting be, or will be virtual?
Dr. Edward Weaver - WRSystems (to Everyone): 14:38: Congratulations Chris!
Eugenio San Martin (to Everyone): 14:38: congrats Chris!!
Thomas Hammarklint, Sweden (to Everyone): 14:39: Congratulations Chris!
Ronald Kuilman (RNLN) (to Everyone): 14:39: Congratulations Chris!
Ruth FARRE - South African (SANHO) (to Everyone): 14:39: Congrats Chris!
Do-Seong Byun (Korea KHOA) (to Everyone): 14:39: Congratulations, Chris!
AUS - Zarina Jayaswal (to Everyone): 14:39: Thank you Gwen for your leadership!
Carol Estrada Directorate of Hydrography and Navigation of Peru (to Everyone): 14:39: Congratulations, Chris!
Ruth FARRE - South African (SANHO) (to Everyone): 14:39: Thank you for all your hard work and support Gwen!
Leigha Peterson-NGA,USA (to Everyone): 14:40: Thank you Gwenaele and congratulations, Chris
Greg Seroka - NOAA/OCS (US) (to Everyone): 14:40: Thank you Gwen!! Congrats Chris!!
Hilde Sande Borck - NHS (to Everyone): 14:40: Thank you Gwen and good luck to Chris!
Erin Nagel (USA/NOAA/OCS) (to Everyone): 14:40: Congratulations Chris and thank you Gwen for all of your hard work!
Mr M P Gupta, India (to Everyone): 14:41: congrats to Mr Chris
Yulei Dong(China MSA) (to Everyone): 14:41: Thank you Gwenaele and congratulations, Chris
AUS - Zarina Jayaswal (to Everyone): 14:42: Thank you Peter for your efforts and welcome

Ruth :)
Do-Seong Byun (Korea KHOA) (to Everyone): 14:42: Gwenaele, thank you!
Phil MacAulay, CHS Canada (to Everyone): 14:42: Congrats Ruth
Dr. Edward Weaver - WRSystems (to Everyone): 14:42: Congratulations Ruth and thank you Peter!
Peter Stone - NOAA (to Everyone): 14:42: Congratulations Chris and Ruth
Greg Seroka - NOAA/OCS (US) (to Everyone): 14:42: Thank you Peter, and congrats Ruth!!
Ronald Kuilman (RNLN) (to Everyone): 14:42: Congratulations Ruth!
Yulei Dong(China MSA) (to Everyone): 14:42: Congratulations Ruth
Leigha Peterson-NGA,USA (to Everyone): 14:42: Excellent, Ruth and thank you, Peter.
Paola Picco Italian Hydrographic Institute (to Everyone): 14:42: congratulations to Chris and Ruth
Mr M P Gupta, India (to Everyone): 14:42: Congrats to Ms Ruth.
JHOD and JHA, Japan (to Everyone): 14:42: Congrats Chris and Ruth!
Erin Nagel (USA/NOAA/OCS) (to Everyone): 14:43: Congratulations Ruth!
Ruth FARRE - South African (SANHO) (Private): 14:43: Thank you Peter for everything you have done for this working group.
Do-Seong Byun (Korea KHOA) (to Everyone): 14:43: Congratulations Ruth!
Carol Estrada Directorate of Hydrography and Navigation of Peru (to Everyone): 14:43: Gwenaele, thank you! Congratulations Ruth and Chris
Repetti Luca - Italian Hydrographic Institute (to Everyone): 14:43: Congratulations Chris and Ruth !
Yupeng Zhao（China MSA） (to Everyone): 14:44: Congrats Chris and Ruth! Thank you Gwenaele and Gwen **!**
AUS - Zarina Jayaswal (to Everyone): 14:44: Thank you David for your wonderful support and keeping us honest.
Phil MacAulay, CHS Canada (to Everyone): 14:44: thank you David, you have been an amazing IHO Sec. Very sorry to see you leaving.
Ruth FARRE - South African (SANHO) (to Everyone): 14:45: David, your contributions and guidance has been invaluable. You will be very missed.
Peter Stone - NOAA (to Everyone): 14:45: Thank you David and Bon Voyage
Greg Seroka - NOAA/OCS (US) (to Everyone): 14:45: Thank you for keeping us organized and on target, David! Sad to see you go, and best of luck!
Stephan Dick, BSH (to Everyone): 14:45: Thank you David for the great job you did.
Dr. Edward Weaver - WRSystems (to Everyone): 14:45: Thank you David for all of the hard work and memories. You will be sorely missed and we hope you will keep in touch. I personally thank you for all of your input and direction.
Do-Seong Byun (Korea KHOA) (to Everyone): 14:45: David, thank you for your contributions.
Paola Picco Italian Hydrographic Institute (to Everyone): 14:46: thank you Gwenaele and David !
Ruth FARRE - South African (SANHO) (Private): 14:46: my heart is breaking that you are not going to be with us anymore, but you and the family will always be a part of my life... you are stuck with me!
Erin Nagel (USA/NOAA/OCS) (to Everyone): 14:46: Thank you David for all of your contributions!

Ronald Kuilman (RNLN) (to Everyone): 14:46: Thank you David for the great job you did
Chris Jones (UKHO) (to Everyone): 14:47: Thank you David - an excellent Secretary and great support over so many years.
Hilde Sande Borck - NHS (to Everyone): 14:47: Thank you David for your contributions!
Leigha Peterson-NGA,USA (to Everyone): 14:48: As a new WG member, your impact on this group is obvious. Thank you for shaping the present state, David.

Stephan Dick, BSH (to Everyone): 14:48: Thank you also to you, Gwen and David!
Stephan Dick, BSH (to Everyone): 14:48: Sorry, Peter!
Erin Nagel (USA/NOAA/OCS) (to Everyone): 14:49: Thank you Peter for all of your hard work!
Phil MacAulay, CHS Canada (to Everyone): 14:49: Thank you Peter for your work as Vice-Chair
Do-Seong Byun (Korea KHOA) (to Everyone): 14:50: Peter, thanks a lot!
JHOD and JHA, Japan (to Everyone): 14:50: Thank you David. I'm very sad to see you to leave...
Ronald Kuilman (RNLN) (to Everyone): 14:50: Thank you Gwen and Peter for your work!
Chris Jones (UKHO) (to Everyone): 14:52: Peter you have undertaken an excellent job as Vice Chair - thank you.
Chris Jones (UKHO) (to Everyone): 14:54: Gwen - thank you for your excellent Chairing of this group over the past years. I will be stepping into some very impressive shoes!
Wonjin and Aram, KHOA (to Everyone): 14:54: Thank you David, Gwen, Peter for your all kinds!
Raphael Malyankar (US/NOAA affiliated) (to Everyone): 14:55: Thank you Gwen, David, and Peter. And thanks to all who participated. Bye...