



SWEDISH MARITIME
ADMINISTRATION

28th BSHC Conference
19-21 September 2023
Helsinki, Finland

Agenda Item C.3
CDWG Report
Sweden

BSHC Chart Datum Working Group (CDWG)

CDWG Report to the BSHC 28th Conference

The CDWG Terms of Reference ([TOR](#)) requests the CDWG to report annually to the BSHC.

1. Status of Work of CDWG since BSHC 27th Conference

Since the BSHC 22nd Conference 2017, *Mr Thomas Hammarklint* has acted as a Chair.

CDWG has supported the implementation of the Baltic Sea Chart Datum 2000 (BSCD2000), reviewed the progress of implementation, continued to develop a common geoid model for the Baltic Sea and on behalf of the BSHC began planning for the coordination of the implementation of IHO products S-104 Water Level and S-111 Surface Currents. The working group has cooperated with several international bodies and the work has been presented at numerous national and international conferences and meetings.

In addition, a transition period road map and time line have been updated [[CDWG Roadmap](#)], BSHC CDWG – web pages ([CDWG Website](#)) were updated and maintained. The [TORs](#) and [Work Programme](#) (Annex 1 and 2) have been updated. A proposal from the BSHC Strategic Correspondence Group ([BS-SCG](#)) to change the name of the working group have been discussed and a proposal for a new name of the working group have been drafted [[CDWG14 Chair's Report](#)]: *Chart Datum, Water level and Currents Working Group (CDWCWG)*, with the important addition or subtitle: "To implement a common reference system, S-104 and S-111 in the Baltic Sea". A decision on the proposed name of the working group will be taken at the BSHC Conference ([BSHC28](#)), 19-21 September 2023 in Helsinki.

The communication within the CDWG has been done by e-mail correspondence. An online start-up meeting was held 12 October 2022. A physical Chart Datum Working Group meeting [[CDWG14 Minutes](#)] was held 28-29 March 2023 in Göteborg, Sweden. Russia has not been invited to any meetings and have not been involved in any actions within the working group since the Russian invasion of Ukraine 24th February 2022.

All the BSHC member states have nominated members to the working group, however not all have been active or participated at the meetings. Observers and experts are nominated from Swedish National Land Survey, Swedish Meteorological and Hydrological Institute, Finnish Geodetic Institute, Finnish Meteorological Institute, Tallinn University of Technology (Estonia), Institute of Geodesy and Cartography (Poland), Federal Agency for Cartography and Geodesy (Germany), and Norwegian Mapping Authority and contributes greatly to the activities within the CDWG's area of interest and responsibility.



Baltic Operational Oceanographic System ([BOOS](#)) has nominated a Point of Contact (CDWG Chair), mainly to cooperate on the transition to BSCD2000 for water level information (tide gauge observations and water level forecasts and warnings). Already in 2014, BSHC and BOOS signed a Memorandum of Understanding ([MoU](#)) to collaborate on this.

Members of CDWG:	Denmark	Mr Nikolaj Møller
	Estonia	Mrs Gabriela Kotsulim
	Finland	Mr Jarmo Mäkinen
	Germany	Dr Patrik Westfeld
	Latvia	Mr Bruno Špēls
	Lithuania	Mr Mindaugas Zakarauskas
	Poland	Mr Witold Stasiak
	Russia	Mr Leonid Shalnov
	Russia	Dr Sergey V. Reshetniak
	Sweden	Mr Thomas Hammarklint (Chair)
	Sweden	Mr Lars Jakobsson
	Sweden	Mr Henrik Tengbert
Observers and Experts:	Estonia	Prof. Artu Ellmann
	Estonia	Mr Sander Varbla
	Finland	Dr Mirjam Bilker-Koivula
	Finland	Mrs Anni Jokiniemi
	Germany	Dr Gunter Liebsch
	Germany	Dr Joachim Schwabe
	Norway	Mr Aksel Voldsund
	Poland	Mr Krzysztof Pyrchla
	Poland	Mrs Małgorzata Pająk
	Poland	Dr Monika Wilde-Piórko
	Poland	Dr Małgorzata Szelachowska
	Sweden	Prof. Anna Jensen
	Sweden	Dr Jonas Ågren
	Sweden	Dr Per-Anders Olsson
	Sweden	Mrs Johanna Linders
BOOS Representative:	Sweden	Mr Thomas Hammarklint (Chair)

The [List of Members](#) and other documents can be found at the [CDWG Website](#).



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2. CDWG Start-up meeting 12 October 2022, VTC

A virtual meeting [[Start-up meeting 2022 Minutes](#)], to start up the work in the working group after the suspension of all meetings and working groups under BSHC, due to the Russian invasion of Ukraine 24 February 2022.

Focus on the meeting was also to review national plans and status for the implementation of the Baltic Sea Chart Datum 2000 [[Summary of the Implementation Status 2022](#)] and follow up the FAMOS Continuation project; to finalize the BSCD2000 Geoid model in the Baltic Sea.

Several actions were added to the [CDWG13 Action list](#).

3. CDWG 14th meeting, 28-29 March 2023 in Göteborg, Sweden

An ordinary working group meeting (physical meeting only, first one after the pandemic). Focus on the meeting was to review national plans and status of implementation of the Baltic Sea Chart Datum 2000 [[Summary of the Implementation Status 2023](#)] and follow up the FAMOS Continuation project; to finalize the BSCD2000 Height Reference Grid for the whole Baltic [[CDWG14 Minutes](#)].

At the meeting, a new name of the working group was discussed and drafted, due to the fact that the working group have been tasked by BSHC to focus on and coordinate the implementation of IHO products S-104 Water Level and S-111 Surface Currents in the Baltic Sea [[BSHC27 Minutes](#)].

As a consequence, amendments in the [TORs](#) and [Work Programme](#) (Annex 1 and 2), have been drafted by the working group and needs to be approved by the members states at BSHC28. Several new actions to be handled within the working group have been listed in the [CDWG14 Action list](#).

4. The results of the CDWG during 2022-2023

CDWG has promoted studies and development of a common geoid model for the Baltic Sea by supporting the FAMOS-projects. Within FAMOS-project several gravity-surveying campaigns were executed in the Baltic Sea during 2015-2018 and interim geoid models have been calculated during 2018 and further computations have been executed since 2020 within the FAMOS Continuation project (as an activity within CDWG). An updated version of the BSCD20000 Geoid model will probably be released in the latter part of 2023.

A good geoid model or height correction grid for the whole Baltic Sea is an essential component for the Baltic Sea Chart Datum 2000. A release note will be published as an article in the International Hydrographic Review (IHR), submission until 31 August 2023.



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The [specification for the Baltic Sea Chart Datum 2000](#) have been updated. The specification is an essential document for applying and realizing the Baltic Sea Chart Datum 2000 in all BSHC member states. Baltic Sea Chart Datum 2000 has been registered in [IHO Geospatial Information Registry as chart datum number 44](#).

An [article](#) about the CDWG work and the implementation of the Baltic Sea Chart Datum 2000 has been published in the International Hydrographic Review (IHR) in May 2020.

In cooperation with members states and BOOS partners, the CDWG have compiled a [table](#) of the mean sea level in the Baltic Sea Chart Datum 2000 (BSCD2000), at sea level stations located in the Baltic Sea (see [map](#)).

The CDWG work have been or will be presented at the following conferences and meetings in 2022-2024:

- TWCWG6, 4-7 April 2022, VTC
- NKG, 5-8 September 2022, Copenhagen, Denmark [[Presentation](#)]
- BSHC27, 20-22 September 2022, Stockholm, Sweden [[Presentation](#)]
- NSHC TWG24, 27 September 2022, VTC [[Presentation](#)]
- BSHC CDWG Start-up meeting, 12 October 2022, VTC [[Minutes](#)]
- BOOS, 14 December 2022, VTC
- NSHC TWG25, 7 February 2023, VTC
- TWCWG7, 28 February - 2 March 2023, VTC
- BSHC CDWG14, 28-29 March 2023, Göteborg, Sweden [[Presentation](#), [Minutes](#)]
- BOOS, 9-11 May 2023, Helsinki, Finland [[Presentation](#)]
- EUREF Symposium, 23-26 May 2023, Göteborg, Sweden
- BSHC28, 19-21 September 2023, Helsinki, Finland [[Presentation](#)]
- NSHC TWG27, 6-7 February 2024, Göteborg, Sweden [[Presentation](#)]
- TWCWG8, 20-22 February 2024, VTC
- BSHC CDWCWG1, 26-27 March 2024, Helsinki, Finland [[Presentation](#), [Minutes](#)]
- BOOS, 7-9 May 2024, Copenhagen, Denmark
- BSHC29, 17-19 September 2024, Tallinn, Estonia
- TWCWG9, 19-22 November 2024, Monaco

5. Status August 2023

Until now, one of the most important tasks for the working group has been to review national plans and status of implementation of the BSCD2000. It can be concluded that most member states have made actions to implement the common vertical datum, see the [Summary of the Implementation Status 2023](#). The status of each member states can be found on the [CDWG Website](#).

The work to finalize the BSCD2000 Geoid model is ongoing and will probably be released in the latter part of 2023. The status of the actions are shown in the [CDWG14 Action list](#).



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6. Future work of the CDWG

At the [BSHC27 Conference](#), the working group was tasked to coordinate the implementation of the IHO products S-104 Water Level and S-111 Surface Currents in the Baltic Sea. This will be the major focus for the working group over the next years. This a long-term commitment and requires focus from the working group to successfully complete the task. Also, a closer cooperation with Baltic Sea Operational Oceanographic System ([BOOS](#)) are needed, to invite institutes and experts dealing with water level and current information, necessary to implement the products S-104 Water Level and S-111 Surface Currents (Annex 3 and 4).

However, CDWG will continue to guide and follow up the progress of the implementation of the harmonised vertical reference, following the [TORs](#) and [Work Programme](#) (Annex 1 and 2), even if the focus changes. These tasks will be coordinated by the CDWG, but will be carried out more in sub-groups of the CDWG with specially dedicated activity leaders. Such activities are for example to develop the "the specification for Baltic Sea Chart Datum 2000", finalize the BSCD2000 Geoid model for the whole Baltic Sea and promote studies and further development of dynamic topography of sea surface and promote improving precise real-time GNSS navigation.

The future work until 2027 of the CDWG [[RoadMap](#)] will be updated and expanded to include the implementation of IHO S-104 and S-111.

Continue cooperation with BOOS concerning water level information. Cooperation is important for the implementation and usage of the harmonised vertical reference. Continue communication with relevant organisations and inform users by giving presentations and participating in relevant conferences.

To activate all the member states to send representatives to the CDWG meetings. The CDWG plans to have its next meeting (CDWG15) 26-28 March 2024 in Helsinki, Finland.

7. Actions for the BSHC 28th Conference

The BSHC 28th Conference is requested to:

1. note this report
2. approve the proposed amendments to the TORs and Work Programme (Annex 1 and 2)
3. endorse the new name of the working group: *Chart Datum, Water level and Currents Working Group (CDWCWG)*
4. give further guidance to CDWG, as seen appropriate



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Annex 1. Terms of Reference (TOR)

BSHC Chart Datum Working Group Terms of Reference 8 August 2023

To be approved by the BSHC 28th Conference, 19-21 September 2023

Proposed amendments marked in red

The BSHC18 (September 2013) decided to continue CDWG work and wished the harmonized Baltic Sea vertical reference to be implemented.

The Working Group should

Report to the BSHC Conferences.

1. To continue implementation of the Baltic Sea Chart Datum 2000 (EVRS with land-uplift epoch 2000).
2. To prepare the road map for transition, including e.g.:
 - to establish a network of relevant bodies involved into the transition and efficiently communicate and give guidance within this network
 - to invite relevant bodies to inform the users
 - to review of progress of national plans and actions
 - to propose harmonization actions.
3. To cooperate with relevant bodies on water level related issues e.g.:
 - to promote studies on the validation, status and distribution of water level information, and to promote studies on interpolation and prediction of water levels
 - to promote studies on displaying schemes for joint Baltic Sea water level information
 - to promote studies on recommendations to IHO bodies how the sea level and its variations should be shown on nautical paper and ENC charts and publications, and conveying water level information to mariners [ref. IHO Technical Resolutions].



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4. To support development of a common harmonized height reference, including further development of a common geoid model for the whole Baltic Sea area:
 - to promote geoid computations and gravity measurements in the Baltic sea, as is needed to realize the Baltic Sea Chart Datum 2000
 - to coordinate the finalization of the **BSCD2000 height reference grid**
 - **to establish a continuity management (future updates) of the BSCD2000 height reference grid**
 - **to distribute BSCD2000 data products.**
 - to support geoid and oceanographic studies relevant to these purposes.
 5. To cooperate with relevant international bodies, for example organizations responsible for delivering water level **and currents** information (e.g. BOOS, NOOS) and geodetic infrastructure (e.g. EUREF and NKG).
 6. To liaise with relevant IHO bodies and study relevant IHO resolutions and specifications.
 7. **To coordinate the implementation of the IHO S-100 products S-104 Water Level Information and S-111 Surface Currents in the Baltic Sea:**
 - **to invite meteorological and oceanographic institutes to the working group to strengthen the implementation.**



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Annex 2. Work Programme

BSHC Chart Datum Working Group Work Programme 28 March 2023

To be approved by the BSHC 28th Conference, 19-21 September 2023
Proposed amendments marked in red

Note: This Work Programme includes those Tasks which were identified as the priority issues and which are expected to be fostered from 2021 and onwards bearing in mind the resources the BSHC members have.

Tasks:

1. Guide the implementation process of vertical reference within the Baltic Sea region.
 - a. To monitor and follow up the status of the relevant actions identified.
 - b. To ensure efficient communication with relevant bodies.
 - c. To propagate and explain the idea of harmonized chart datum.
 - d. To foster national efforts for realization **and coordinate the implementation** of S-104 and S-111 in the Baltic Sea.
2. Review of progress of national plans and actions.
3. Propose harmonization actions.
4. Promote studies and further development of a common geoid model and dynamic topography for the whole Baltic Sea, mainly by supporting and collaborating with relevant projects, e.g. organizing ship time for gravity measurements. Invite member states to consider gravity measurements and geoid computation and provide an overview where additional gravity measurements are needed.
5. Promote improvement of precise real-time GNSS navigation for the future.
6. Cooperate with BOOS and **invite** other relevant institutes and organizations **for the implementation of S-104 and S-111 in the Baltic Sea.**
7. Support other IHO working groups and European projects in issues concerning ~~vertical references~~ **water level, currents and reference systems.**

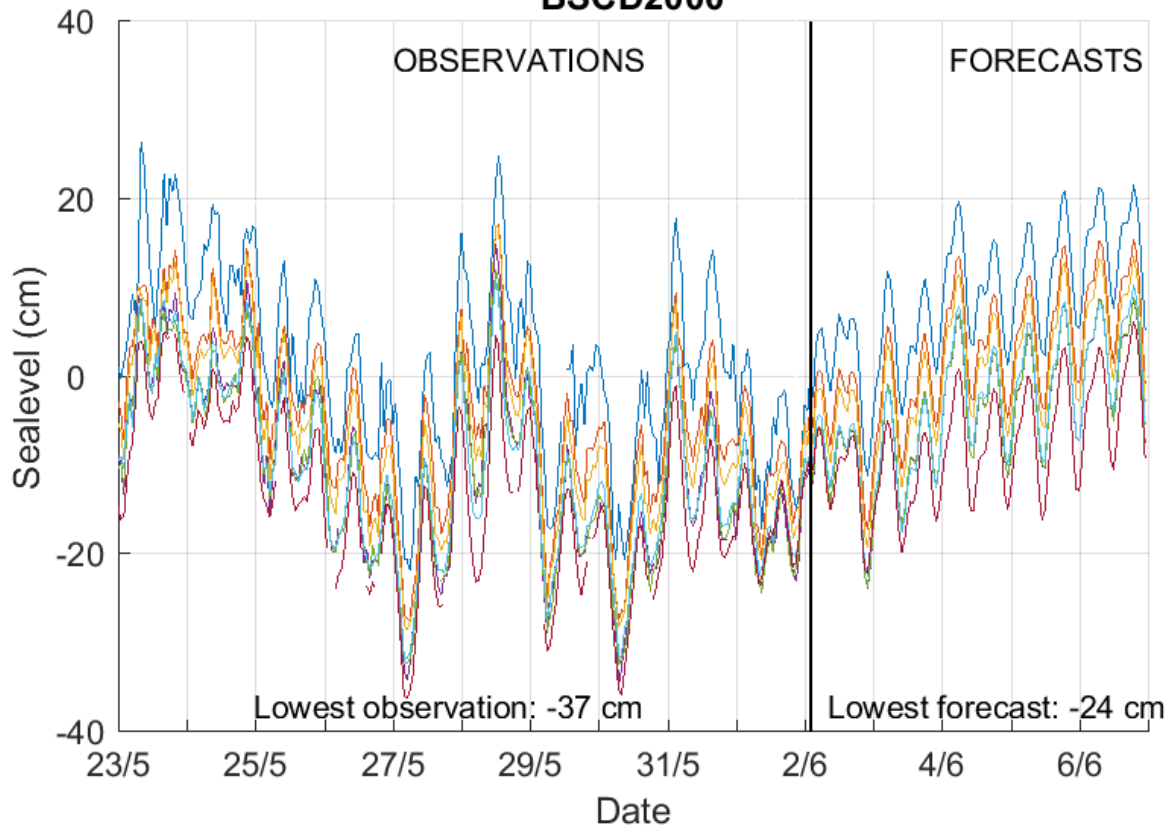


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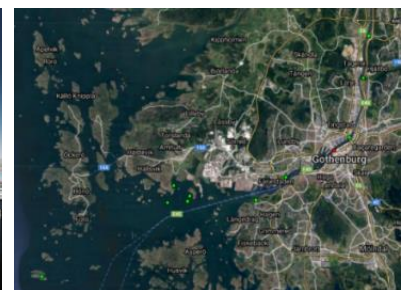
Annex 3. Example of a potential S-104 Water Level product (Port of Göteborg and upstream Göta River)



Sealevels Göteborg
2023-05-23 to 2023-06-06
Issued: 2023-06-02 02:00 UTC
BSCD2000



- Agnesberg
- Tingstad
- Hisingsbron
- Eriksberg
- Tångudden
- Krossholmen
- Vinga



Annex 4. Example of a potential S-111 Surface Current product (Trollhättan Locks Area, Göta River)

