



# Overview

Completed questionnaires from:

- Netherlands
- Sweden
- Germany
- UK
- Norway
- Denmark
- France
- Belgium

- This presentation does not include some of the more administrative questions
- All completed questionnaires can be found in the shared workspace:  
<https://social.bscw.bund.de/sec/bscw.cgi/49544985>
- More completed questionnaires and updates are welcome.

# S-104

# Actions: Accomplished

## 3. What actions have already been done to implement S-104 products?

- NL: We have created several S-104 HDF5 (DCF2) testdatasets.
- SE: S-104 has been produced, validated and tested in the Baltic Sea e-Nav project
- DE: Automated production of HDF5-datasets is possible in a test area.
- UK: UKHO has conducted sea trials with industry partners.
- NO: NHS has decided to use the existing data products to produce a national product with water level forecast. Developing an automatic pipeline for this production is on-going.
- DK: Ongoing communication between The Danish Meteorological Institute and the Danish Geodata Agency to establish and determine collaboration and responsibilities for S-104.
- FR: Research and development have been made on and datasets for sea trials with UKHO have been created.
- BE: Initial preparations

# Actions: Planned

## 4. What actions have been planned to be executed and what is the schedule?

- NL: The plan is to continue testing and share this knowledge with other parties.
- SE: Produce S-104 test data in the Baltic Sea e-Nav project until 2026. Then to be in production in specified areas by 2028.
- DE: Full production is planned for the start of 2026.
- UK: Trials will take place throughout 2026 with different locations being considered.
- NO: By the end of 2025: To have an automatic production of S-104 for the entire country according to version 2.0.0.
- DK: None at the moment.
- FR: We're still amending and correcting the first developments; we plan to start the production of S-104 (astronomic predictions) mid 2026 on Channel and Atlantic Coastlines.
- FR: Evaluation of results of hydrodynamic model that recalculated the Belgian LAT surface: intended results are grid-based-coverage & timeseries

# Type of Data

## 5. Which type of water level data do you plan to produce?

(see Section 7.1 of product specification)

	NL	SE	DE	UK	NO	DK	FR	BE
<b>Real-time observation</b>	In the far future	No	No	No	No	Undecided	around tide gauge sites	Maybe
<b>Astronomical prediction</b>	Maybe	No	Maybe	Maybe	Yes (12/2025)	Undecided	Yes (Mid 2026)	Yes (Q4 2026)
<b>Analysis method</b> (statistical or other indirect methods)	Maybe	No	No	No	No	Undecided	No	No
<b>Hybrid method</b> (combination of methods)	Maybe	No	Yes (2026)	Yes (unknown)	Yes (12/2025)	Undecided	No	No
<b>Forecast</b> (Hydrodynamic models)	Yes (2026)	Yes (01/2028)	See hybrid method	Yes (unknown)	See hybrid method	Undecided	Yes (2027)	Maybe

# Regions

## 6. Which type of water level data will be provided first? For which region? (Data with highest priority)

Data type	Region	Remarks
Forecast	NL: North sea SE: Öresund DE: Weser Estuary + parts of the Elbe Estuary  UK: UK EEZ NO: Norwegian coastline	DE: Approx. 5-day forecasts; Combination of statistical and hydrodynamic model forecasts
Astronomical prediction	DE: Weser Estuary + parts of the Elbe Estuary  NO: Norwegian coastline FR: French Atlantic and Channel coastlines BE: Belgian Sea area (First), River Scheldt area (Later)	DE: In order to provide data further out than 5 days (up to a year available).
Hybrid method	UK: UK Ports	UK: Port-scale only, hybrid = astronomic grid as the base with (scaled) forecast from model added on

# Distribution

## 7. If S-104 data is to be produced, how will the data be made available to users?

- NL, DE: via RENC IC-ENC
- SE, NO, FR: via RENC PRIMAR
- UK: Via UKHO's ADMIRALTY distribution network.
- BE: Most likely through IC-ENC, similar to other S-100 data products

# Horizontal Reference System

## 8. Which horizontal reference system do you use for S-104?

(see Section 5.1 of product specification)

EPSG: 4326	[WGS 84]	NL, SE, DE, UK, FR
EPSG: 9057	[WGS 84(G1762) Valid epoch 2005.0]	<del>UK</del>
EPSG: 4258	[ETRS89]	NO
EPSG: 32631	[WGS 84 / UTM zone 31N]	BE

# Vertical Reference System

## 9. Which vertical reference system do you use for S-104?

(see Section 5.2 of product specification)

<b>Vertical Coordinate System</b> EPSG code; Allowed values: <ul style="list-style-type: none"><li>• 6498 (Depth – Metres – Orientation Down)</li><li>• 6499 (Height – Metres – Orientation Up)</li></ul>	NL: no EPSG code available SE: 1390 DE, UK, NO: 6499
<b>Vertical Datum Reference</b> 1 – S-100 vertical datum 2 – EPSG	NL: Approximate Lowest Astronomical Tide (ALAT) SE: 1390 DE, NO: 2 - EPSG UK, FR: 1 – S-100 vertical datum BE: EPSG 5861
<b>Vertical Datum</b> If verticalDatumReference = 1 this is a value from S100_VerticalAndSoundingDatum If verticalDatumReference = 2 this is an EPSG code for vertical datum	NL, DE, FR: ALAT SE: Baltic Sea Chart Datum 2000 (BSCD2000) UK: 10 (approximateLowestAstronomicalTide) NO: 1301 (Norwegian Chart Datum) BE: LAT
Is this vertical reference system the same as for your S-102 products?	NL, SE, DE, UK, NO, FR, BE: Yes



# Spatial and Temporal Resolutions

## 10. What is the spatial resolution of the regular grid in your S-104 data?

- NL: On this moment the spatial resolution is variable depending on the resolution of the source file (with is an irregular grid). Before we generate a S-104 file we convert an irregular grid into a regular grid.
- SE: 0.3 to 1.85 km
- DE: Around 900 meters.
- UK: Approximately 70 – 100 m for high-resolution port-scale models. ~1.5 km for oceanic S-111
- NO: Not yet finalized. Currently testing with 0.01/0.005 degrees, but will probably increase the resolution.
- FR: About 0.016°x0.016° lon/lat.
- BE: To be determined: larger than 1km or 1' seem to make sense for the sea area and the port areas.

## 11. What is the temporal resolution of your S-104 data?

- NL: In our testdata we have a 10 minutes resolution for the harbours/approaches and 60 minutes for the North Sea.
- SE: 15 minutes
- DE: 15-minute timesteps.
- UK: 15-30 minutes
- NO: Most likely 10 minutes.
- FR: 15 minutes
- BE: To be decided.



# Uncertainties

## 12. Do you plan to provide information on uncertainties? If yes, how do you calculate them?

- NL: No.
- SE: Only on an overall level
- DE: We do intend to provide uncertainties. There currently no concrete plans on the method of area-wide calculation.
- UK: Yes. We haven't established the exact method yet but as a first go, I would imagine we will take (minimum) 1 years' worth of the forecast data, compare it against every available observation station within the model domain, determine the uncertainty to the maximum value allowed in S-104 (3.5 sigma) or match the uncertainty for S-102 (assumed 2-sigma but depends if present in S-102). Initially to create a single, static uncertainty layer, the point values of uncertainty can be interpolated to a grid which is used in the .hdf5 files.
- NO: No.
- FR: No.

# Test Data

## 13. If you already have test data, where can it be found (e.g. website)?

- NL: We will share our testdata on <https://iho-ohi.github.io/S100Resources>.
- SE: Animation, testbed Öresund, combined S-102, S-104 and S-111: [https://www.bshc.pro/wp-content/uploads/102\\_104\\_111SE00\\_ORESUND\\_24H\\_202409300100.mp4](https://www.bshc.pro/wp-content/uploads/102_104_111SE00_ORESUND_24H_202409300100.mp4)
- UK: We will put updated data on the [UKHO Marine Data Portal](#) but at the time of writing (10<sup>th</sup> October 2025) the latest S-104/S-111 V2.0 files are not available.
- NO: No files available online. Examples may be shared upon request.
- DE: <https://linchart60.bsh.de/chartserver/S-100/index.html>
- FR: <https://diffusion.shom.fr/expertises-formation/jeux-de-donnees-test-s-100.html>

# S-111



# Actions: Accomplished

## 3. What actions have already been done to implement S-111 products?

- NL: We have created several S-111 HDF5 (DCF2) testdatasets.
- SE: S-111 has been produced, validated and tested in the Baltic Sea e-Nav project
- DE: From an organisational point of view, all decisions necessary for the implementation of S-111 have been taken.
- UK: UKHO has conducted sea trials with industry partners.
- NO: NHS has decided to produce S-111 for the entire coastline based on the operational ocean model run by MET Norway. Developing an automatic pipeline for this production is on-going.
- DK: Ongoing communication between The Danish Meteorological Institute and the Danish Geodata Agency to establish and determine collaboration and responsibilities for S-111.
- FR: Research and development have been made on and datasets for sea trials with UKHO have been created.
- BE: examining usability of existing datasets

# Actions: Planned

## 4. What actions have been planned to be executed and what is the schedule?

- NL: The plan is to continue testing and share this knowledge with other parties.
- SE: Produce S-111 test data in the Baltic Sea e-Nav project until 2026. Then to be in production in specified areas by 2029.
- DE: Full production is planned for the start of 2026.
- UK: Trials will take place throughout 2026 with different locations being considered.
- NO: By the end of 2025: To have an automatic production of S-111 for the entire country according to version 2.0.0.
- DK: None at the moment.
- FR: We're still amending and correcting the first developments; we plan to start the production of S-111 (astronomic predictions) mid 2026 on Channel and Brittany coastlines.
- BE: S-104/S-111 data project with UGent is starting on 1 December 2025. Preliminary results may be expected by middle of 2026. Final products should be ready by middle of 2027.

# Type of Data

## 5. Which type of surface current data to you plan to produce?

(see Section 7.1 of product specification)

	NL	SE	DE	UK	NO	DK	FR	BE
<b>Historical observation</b>	No	No	No	No	No	Undecided	No	No
<b>Real-time observation</b>	Maybe	No	No	No	No	Undecided	No	Maybe
<b>Astronomical prediction</b>	Maybe	No	No	Yes	No	Undecided	Yes (Mid 2026)	No
<b>Analysis method</b> (statistical or other indirect methods)	No	No	No	No	No	Undecided	No	No
<b>Hybrid method</b> (combination of methods)	No	No	No	No	No	Undecided	No	Yes
<b>Forecast</b> (Hydrodynamic models)	Yes (2026)	Yes (2029)	Yes (2026)	Yes	Yes (12/2025)	Undecided	Yes (2028)	No

# Regions

## 6. Which type of surface current data will be provided first? For which region? (Data with highest priority)

Data type	Region	Remarks
Forecast	NL: North sea SE: Öresund DE: Weser Estuary + parts of the Elbe Estuary UK: UK EEZ NO: Norwegian coastline	DE: 120 h model forecast
Astronomical prediction	UK: Port-Scale FR: Channel Coastlines and Brittany	
	BE: Sea area (offshore/nearshore), Port area, River Area	

# Distribution

## 7. If S-104 data is to be produced, how will the data be made available to users?

- NL, DE: via RENC IC-ENC
- SE, NO, FR: via RENC PRIMAR

# Horizontal Reference System

## 8. Which horizontal reference system do you use for S-111?

(see Section 5.1 of product specification)

EPSG: 4326	[WGS 84]	NL, DE, UK, FR
EPSG: 9057	[WGS 84(G1762) Valid epoch 2005.0]	<del>UK</del>
EPSG: 1390	[Baltic Sea Chart Datum 2000]	SE
EPSG: 4258	[ETRS89]	NO
EPSG 32631	[WGS 84 / UTM zone 31N]	BE

# Vertical Reference System

## 9. Which vertical reference system do you use for S-111 and/or which layer thickness do you use ?

(see Section 5.2 and E-6.1 and Table 12-1 of product specification)

<b>Vertical Coordinate System</b> EPSG code; Allowed values: <ul style="list-style-type: none"> <li>• 6498 (Depth – Metres – Orientation Down)</li> <li>• 6499 (Height – Metres – Orientation Up)</li> </ul>	NL: EPSG code not available UK: 9499 FR: 6498
<b>Vertical Datum Reference</b> 1 – S-100 vertical datum 2 – EPSG	NL: Approximate Lowest Astronomical Tide (ALAT) → no EPSG code available UK, FR: 1 – S-100 vertical datum
<b>Vertical Datum</b> If verticalDatumReference = 1 this is a value from S100_VerticalAndSoundingDatum If verticalDatumReference = 2 this is an EPSG code for vertical datum	NL: ALAT UK: 10 FR: 48 (Sea Surface)
<b>and/or</b>	
<b>Depth/height value or layer thickness (m)</b>	NL: not yet determined SE: Depth DE: 20 meters, The base of the vertical coordinate system is the sea surface (verticalCoordinateBase = 1) NO: 5



# Spatial and Temporal Resolutions

## 10. What is the spatial resolution of the regular grid in your S-111 data?

- NL: On this moment the spatial resolution is variable depending on the resolution of the source file (with is an irregular grid). Before we generate a S-111 file we convert an irregular grid into a regular grid.
- SE: 0.3 to 1.85 km
- DE: Around 900 meters.
- UK: Approximately 70 – 100 m for high-resolution port-scale models. ~1.5 km for oceanic S-111
- NO: 800 m
- FR: Depending on the model used for the production ranging from 250 m – 2 km.
- BE: Different grid sizes (Offshore sea area, Near shore sea area (near ports), port area , river area) depending on the spatial variation of tidal currents.

## 11. What is the temporal resolution of your S-111 data?

- NL: In our testdata we have a 10 minutes resolution for the harbours/approaches and 60 minutes for the North Sea.
- SE: 15 minutes
- DE: 15-minute timesteps
- UK: 15-30 minutes
- NO: 1 hour
- FR: Depending on the model used for the production ranging from 15 min to 1 hour.
- BE: 1 hour

# Uncertainties

## 12. Do you plan to provide information on uncertainties? If yes, how do you calculate them?

- NL: No.
- SE: Only on an overall level
- DE: There currently no concrete plans on the method of calculation.
- UK: For S-111, no plans at all, we don't see the benefit.
- NO: No.
- FR: No.
- BE: No

# Test Data

## 13. If you already have test data, where can it be found (e.g. website)?

- NL: We will share our testdata on <https://iho-ohi.github.io/S100Resources>.
- SE: Animation, testbed Öresund, combined S-102, S-104 and S-111: [https://www.bshc.pro/wp-content/uploads/102\\_104\\_111SE00\\_ORESUND\\_24H\\_202409300100.mp4](https://www.bshc.pro/wp-content/uploads/102_104_111SE00_ORESUND_24H_202409300100.mp4)
- UK: We will put updated data on the [UKHO Marine Data Portal](#) but at the time of writing (10<sup>th</sup> October 2025) the latest S-104/S-111 V2.0 files are not available.
- NO: No files available online. Examples may be shared upon request.
- DE: <https://linchart60.bsh.de/chartserver/S-100/index.html>
- FR: <https://diffusion.shom.fr/expertises-formation/jeux-de-donnees-test-s-100.html>

# General issues / Discussion points

# Discussion Points

## NL:

- Our S-104 testdataset of the harbour of Rotterdam has a filesize of 1,5 GB, this will be an issue with the maximum filesize of 10MB. Do other countries also facing this problem.
- What is for S-104 a relevant minimum spatial resolution for an approach or harbour also thinking about the communicating vessels principle.

## SE:

- Coordinate and monitor the progress
- Share the status of implementation, have one point; “Status of S-104 and S-111 implementation” for each Member State at the TWG-meetings (similar as the S-100 implementation status presented at the NSHC meetings), could also be included in the national report presented at our meetings

## UK:

- Comparison of methods on S-104 uncertainty
- S-104 accuracy + comparison to astronomic predictions
- Distribution of data
- Use cases and trial-feedback with ports/pilots
- S-104/S-111 validation/checking the files work in S-100 ECDIS

## DK:

- Collaboration between TWG and NOOS about production and distribution of oceanographic navigation data

## BE:

- “Surface currents” are defined as occurring in the top 2-3m from the water level according to IHO S-32 publication -) Hydrographic dictionary (at least since Ed. 3 – 1974). BEHO analog surface current products have been produced using the top 10m from the water level already for many decades. Large ships, especially container ships, may require a product that extends that top layer to 15-20m.

