18th NSHC Tidal Working Group meeting, Brest 7-8 February 2012

Contents:

Minutes of the meeting

Meeting Location: Service Hydrographique et Océanographique de la marine (SHOM: French Navy Hydrographic and Oceanographic Service**) – Brest – France**.

Participants

Jean-Claude Le Gac, SHOM, France – **Chairman**
Tor Tørresen, Statens Kartverk, Norway
Palle Bo Nielsen, Danish Meteorological Institute, Denmark
Chris Jones, UKHO, United Kingdom
Hans Poppe, Flemish Hydrography, Belgium
Ronald Kuilman, NLHO, Netherlands
Leendert Dorst, NLHO, Netherlands
Roland Klees, TU Delft, Netherlands
Patrick Goffinet, BSH, Germany
Gwénaële Jan, SHOM, France
Gaël Andre, SHOM, France
Nicolas Weber, SHOM, France
Yves-Marie Tanguy, SHOM, France
Guillaume Voineson, SHOM, France

1. Opening remarks :

Welcome by the chairman to the working group and visitors of the BLAST (Bringing Land and Sea Together) project. He introduced the new French members of SHOM's tide department. G. Jan and/or G. André become the new French point of contacts for the NSHC TWG.

The meeting started with a round table so that the experts could outline their expectations.

The chairman ended the opening remarks by providing a general overview of SHOM activities (National Hydrographic Office, Defense support and support to any public policies related to the competencies of the organisation like coastal management, risk management …). A focus was made on subjects of interest for the meeting, namely tide activities, reference surfaces, project Litto3D® (a French national version of the "bringing land and sea together" concept).

2. Adoption of the agenda :

The agenda was adopted with a modification of the planning for the presentation of R. Klees due to agenda incompatibilities (ANNEX A).

3. Minutes of the 29th NSHC Conference :

The chairman reminded to the NSHC members the conclusions of the 29th NSHC conference

"NSHC tasked the NSHCTWG with the formulation of recommendations on the ways forward, to create common and unique reference surface for the full North Sea area relative to the ellipsoid, based on the information presented in the annex D to the report of the 17th TWG meeting in Copenhagen in May 2010.
NSHC approved the NSHCTWG Terms Of Reference and Work Plan according to the recommendations.
TWG are to act as an important stake holder in BLAST WP3.
TWG are to anticipate on BLAST WP3 results and implement outcome in TWG workplan".

Leendert Dorst, NLHO, Netherlands emphasized the collaboration efforts needed to fulfill the NSHC TWG workplan as approved by the NSHC Conference and mentioned starting initiatives in order to prepare the second step of the BLAST project by 2014.

Further discussions on BLAST were delayed to items 10 to 14.

4. Minutes of the 17th meeting :

The minutes of the 17th NSHC-TWG were adopted.

5. Status of Action Items from 17th meeting :

Item 16/02: C. Jones (UK) proposed to the Member States to use a standard XML scheme for exchange of tidal constituents within the IHO community. The data format can be achieved from the UKHO Web site
http://www.ukho.gov.uk/AdmiraltyPartners/FGHO/Pages/TidalHarmonics.aspx

N. Weber (FR) presented the French approach and mentioned that the XML format was already under investigation at SHOM both for harmonic constituents but also for tide predictions. The French analysis was then presented. C. Jones agreed that it should be taken into account, and that XML format should be a common language both for tide constituents and tide predictions.

The NSHC members agreed that some efforts should be dedicated to the development of an IHO XML format for tide exchanges (constituents and prediction). C. Jones agreed to submit that principle to the TWLWG.

The members agreed that the development of an XML format is to be considered as a mean that facilitates exchanges of tide information between HO's. It does not imply changes in exchange policies between HO's. However, it was mentioned that EU directives (INSPIRE, PSI), IOC initiatives for free data dissemination or national policies about open data were important facts to be kept in mind.

P. Goffinet (DE) indicated that BSH use a non-harmonic analysis for prediction due to the complex tide propagation along the German coasts (shallow water and estuaries).

Other discussions about item 6 were delayed to item 7.

6. Developments in modern tide gauges :

Items 6 and 7 were mixed together.

7. Talk "French tide gauge network RONIM and sea level data distribution facility REFMAR" :

G. Voineson (FR) presented the "French tide gauge network RONIM and sea level data distribution facility REFMAR". French tide gauge network is mainly composed by real-time radar gauges. Installation of tide gauge in open-seas is considered (offshore wind farms).

French real-time sea level height data can be downloaded via REFMAR (http://refmar.shom.fr) web portal whereas Mean Sea Level (MSL) and GPS data are collected by SONEL web portal (http://www.sonel.org).

For satellite transmissions of sea level data through the Global Telecommunication System (GTS), France uses Meteosat9 satellite operated by Eumetsat, and the WMO (World

Meteorological Organization) format called CREX also used by Australia. CREX is an ASCII easy readable standard format which allows coding a great amount of information. UKHO may also use this format in the future.

The Flemish tidal network is mainly composed of stilling well gauges.

For UK, the UKHO is not responsible of all tide-gauges and it is not plan to develop a web portal for real-time data.

The CREX format was mentioned to be of interest within the TWLWG already involved on the subject of real-time tide data transmission. C. Jones agreed to submit that format to the TWLWG.

8. Talk: Developments in digital tide tables and website predictions:

The NLHO website provides seven days of tidal predictions free of charge together with water level from Dutch, Belgium and German predictions. The standalone tide predictions software NLTide is based on Total Tide core and is distributed free of charge on the NLHO website.

France informed the NSHC TWG members about the main changes of SHOM's offer about tide data products for the last few years (semi-automation of numerical tide data tables, tide prediction on its website, standalone tide prediction software SHOMAR, smartphone application being developed, …). It was also mentioned that for a few months, SHOM now displays a 7 days window of tidal prediction whenever in the present year on SHOM website, charge free. SHOMAR software offers worldwide tidal predictions in harbours: High and Low Water predictions, hourly predicted heights, graphical plots, heights for a given time, times for a given height and tidal coefficients in France. SHOMAR is equivalent to paper tide tables for all regions. A professional version is to be developed.

All meeting attendees confirmed that they provide paper books and/or digital tide tables (pdf format). Such pdf tide tables are often distributed free charge. Ex: The website www.getij.nl of Rijkswaterstaat (Dutch Directorate-General for Public Works and Water Management) provides seven days of tidal predictions free of charge. The NLTides digital tide tables contains Dutch, Belgian and German tides and stream predictions. It is based on the TotalTide core, and a free trial is available on the NLHO website.

The tide tables for Danish Faroese and Greenlandic waters are distributed as pdf-files on the InterNet (download free of charge) and as pdf-files on a memorystick.

Paper books are cost charged and still necessary, though the demand is diminishing. UK also underlined that stopping the edition of tide table paper books may impact the budget of retailing shops.

Automation of tide table production: this point was raised and discussed. SHOM informed that the generation process for its numerical tide tables is fully automated. A human supervision is still necessary to control and check the quality of the products.

9. Tidal reduction methods :

Item 9 was postponed to discussions within items 10 to 14 and item 17 .

10. Talk: "UK VORF Model software: status update":

Chris Jones **(**UKHO) put the method to create the VORF to the present committee over UK and Irish continental shelves. The talk focused on the validation methodology.

VORF chart datum (CD) derived from new versus classical methods. The talk focused on difference between previous (based on LAT) chart datum (CD) and recent method using GPS.

Discussion brought to mind that offshore, the CD surface is equivalent to LAT (using altimetry for mean Sea level, and then deducing the LAT).

To fill the gap between tide gauge and altimetry, when it occurs, the VORF method interpolates the geoïd information and MSL measurement before and after gap. Then, model is used to compute the Highest astronomical tide (HAT) and the lowest one (LAT).

- VORF output: ellipsoidal MSL

- VORF validation: The exercise consists in the computation of vertical reference surface derived from 2 months of the tide gauge data (pressure sensor synchronised on GPS time) and GPS data of a ship in the vicinity.

- Tests and validation of the reference surface are in process and preliminary results seem to be quite good (10cm inshore, 15cm offshore).

- Current status: it can not yet be used operationally. Civil programs can test VORF. Defence still uses classical tide reduction.

- Objective: Ultimately it will enable hydrographic surveyors to conduct their operations without the need to measure tides.

Difference highlighted in the minutes of the 29th NSHC conference between French and UK Lowest Astronomical Tide (LAT) reference surfaces can't be removed and is strongly dependant of the tidal model used. Hence, a way to remove at least a part of the discrepancy is to use the same model, the same bathymetry and the same inputs. Developing a common tide model would be a way to eliminate the differences. The action could be covered with help of BLAST-WP3 project.
Suggested idea derived from the commitee discussion: to establish a table of the number of the harmonic constants to be taken into account.
The main objective discussed during meeting: to get a common agreement and share international method.

11. Talk: "French vertical reference surfaces – Advances in the project Bathyelli":

Y.M. Tanguy (FR) introduced several results of the French BATHYELLI project where Mean Sea Level was re-computed using data from permanent tide gauges, spatial altimetry offshore, and GPS surveys in-between. Data were interpolated into a resulting grid referring the Mean Sea Surface and the LAT to the GRS80 ellipsoid.

A new realisation reference surfaces is expected to be produced soon all along the French metropolitan coast, by introducing new GPS surveys conducted in 2009 and 2010.

For the North Sea and the English channel 4 GPS surveys are already available and exploitable. However, the GPS survey in Calais area (the most useful for the North Sea) has to be re-planned (March 2012). New GPS surveys are already planned for next 2 years.

In parallel to the improvement of the reference surfaces, the major step for Bathyelli will now to proceed to the validation of the reference surfaces and to develop the operational chain allowing the hydrographers at SHOM to conduct GPS surveys. The efforts are divided into 2 axes:

- Validation of the reference surfaces: Some preliminary results were shown about the validation tide measured by GPS during a survey and employing high level geodetic software

(GAMIT) versus measured / model predicted tides offshore. The results are encouraging showing that high level validation processes can be investigated, rather than simply comparing the results of classical hydrographical surveys versus GPS surveys which only allow a global estimation of the quality of the processes without any insight about the origin of the differences. It thus turns out that the French approach for reference surfaces validation be a mix of high level validation processes and the classical and robust final comparison of hydrographic surveys.

- Develop the processing chain: the aim is to develop a "routine" chain based on standard industrial soft and hardware manageable within a production environment. Applanix PosmV and POSPAC are considered to be potential candidates. Some technological developments were also shown in order to develop GPS buoys.

Open points**:**

(1) NL stays in contact with Ole Andersen (DTU -- Danish Space) to share vertical reference data and other deliverables of the BLAST project. (BATHYELLI, etc.)

(2) SHOM (FR) during this meeting clearly let know that participating to BLAST-2 would be of interest.

12. Talk: "Results from BLAST WP3 – Lowest Astronomical Tide in the North Sea derived from a vertically referenced shallow water model and an assessment of its suggested sense of safety":

R. Klees (NL, Delft University) gave a talk on the progress of the BLAST WP3.11. (blast-project.eu).

Main R. Klees highlights were:

- to show how LAT can be computed relative to geoid (instead of MSL), including monthly and long term mean meteorological conditions;

- to obtain insight into the probability that water levels are below LAT .

The conclusions were that:

- The error introduced when using MSL rather than the geoid (geoid source data: EGG08) to compute ellipsoidal heights of LAT is max 5 cm.
- Interaction of tide with the average wind, air pressure and density forcing is less than the accuracy of current MSL realizations (Atmospheric forcing fields source: ERA-interim).
- Including monthly mean variations in wind, air pressure and density fields into the definition of "average meteorological conditions" changes LAT by max 15 cm in the North Sea.
- In the eastern part of the North Sea, minimum instantaneous water levels in periods of tidal minima are below LAT once per month to once per week.
- Probabilities are largest in winter, followed by spring, fall and summer.
- Probabilistic approach to CD definition offers an opportunity to realize CD unambiguously and is much easier to validate.

  The presentation was considered to be an interesting approach and sparked quite a lot of debates.

  Moreover, the approach proposed by R. Klees consists of considering that the LAT is not statistically as safe as some could think, and therefore that CD could be considered in a probabilistic way.

13. Discussion: Status update on cooperation with BLAST-WP3:

BLAST project is to finish in 2012. It is considered important that a feedback be provided by the BLAST team about the inputs from the NSHC TWG (the concatenated surface references computed by BE, NL, FR, UK and DE were provided to the BLAST project). L. Dorst agreed to get in touch with the BLAST project team to get such a feedback.

A new BLAST proposal is under preparation. R. Klees mentioned that there is neither any guarantee that any WP related to surface references would be part of next proposal, nor that a BLAST follow up be accepted by EU. It was mentioned that some contacts would be established with the BLAST team in order to investigate that point. L. Dorst agreed to coordinate with the BLAST team on behalf of the NSHC TWG.

14. Discussion on spatially consistent reference surfaces for the North Sea (Open discussion):

Tidal signal is never zero in offshore area. Applied to North Sea, R. Klees cited one result of their application: -1 to +8 cm for M2 wave tide.

Neglecting the tide is neglecting the non linearity tidal waves.

P. Goffinet (DE) remembered the definition of Chart Datum and the difference with LAT (not systematically merged). It was also mentioned that CD/ LAT were related to a predictive level using only tide predictions. A more global insight on the results of the BLAST-WP3 project was considered to be necessary to pursue the analysis of the presented results (see item 13).

Round table:

- There has not been any further progress for the task devoted to the NSHC TWG about a single set of spatially consistent reference surfaces for North Sea, since the work performed in 2010 under the coordination of NLHO (presented at last 29th NSHC). The discrepancies that could be observed at the boundaries between the reference surfaces computed by each HO still exist. It was mentioned that one potential way to get rid of such "non natural" steps at the boundaries would be to compute a single LAT surface at the basin scale. This would imply to set up a single hydrodynamics model (see also item 10). This is an important work and currently, no HO members offer to lead this task. Furthermore, a similar work may have been done within the BLAST project. It was thus considered important that the BLAST project results be further exploited by the group in order to examine the ways forward to pursue such a goal (see item 13 and the asked feedback from the BLAST project team) first.

- All HO's were invited to pursue investigations about the observed discrepancies and to work at bilateral level between interested HO's to investigate the origin of the discrepancies.

- About BLAST, it was also mentioned that there was a risk that many "reference surfaces" (the "official" ones computed by the HO's, those computed by BLAST …) be disseminated at the EU level or within the technical community. The feedback from the BLAST project team is considered as very important from that point of view. A comparison between the LAT of North Sea generated by BLAST project and the concatenated LAT of each individual HO must be done.

- Open points derived from this keynote:

- The question of the Chart Datum computation near the coast could be a tricky question. There is a need for TWLWG to set up an agreement on methodology or/and a state of art of distinct methodologies from the different countries involved in TWLWG.

- This point implies pre-eminently to reach the quality data crucial points. Then a common protocol to compute or / and to validate outputs used to compute Chart Datum.
Note: The single LAT common surface from merging will have to meet the accuracy requirement of 20cm.

Solution 1/ Merging of national realizations of LAT and CD, with or without smoothing.
Solution 2 / Use a common numerical tide model and forcing fields to run the LAT.
Solution 3/ Postpone the item in order to find an agreement to achieve this important consideration of common or comparable surface references (among them LAT).

3 LAT exist. Solution 1 suggests that tests and comparison between these 3 LAT would be run. Solution 2 appeared for the present time not to be in the objective of BLAST project.

3 first points have been identified as to be carefully studied:
- ⇨ Impact of a compiled vertical surface?
- ⇨ Practical realisation of the LAT merging for each national LAT and chart datum realisation.
- ⇨ Think to the future and develop a future common model.

This discussion brought to the item focusing on the BLAST project framework (item 13).

15. Talk: "Portrayal of data quality in digital and paper tidal publications":

L. Dorst (NLD) led the discussion and presented the work of DQWG on request of TSMAD about the S-101 data quality model. This has an important impact on tide data quality management since it shall imply that tide data qualities be provided to feed the S101- data quality model.

The group considers that it is an important task to be done, but it is also quite complex and not straightforward since data qualities are dependent on tide-gauge observations and processing methodologies. Moreover, tide predictions offshore may depend on hydrodynamics models performances and qualities.

G. André presented some misfits between up-to-date tide predictions and observations, in order to illustrate some difficulties. T. Torrensen (NOR) replied that such misfits may be observed elsewhere and required careful and long analysis to identify the origin of the misfits.

There was a general consensus that tide data quality should be a matter of concern within that perspective, but no ways forward was drawn to address the issue.

16. Talk: "An update of tide activities at the Norwegian HO":

T. Tørresen (Norwegian Hydrographic Service) gave a general view of the activities at the Norwegian HO.

Sea level of the North Sea, the Norwegian Sea and Barents Sea. Modelled areas are based on ROMS numerical model and global tidal model TPXO to consider the tidal forcing.

- 6 years of harmonic analysis run for tide waves with M4, MS4, MN4, Mf, Mm, M2, S2, N2, K2, K1, O1, P1, Q1.

Inshore mean sea surface: the need is related to soundings reduction inshore by GPS positioning rather than traditional tide gauges reduction. There is thus a need to have a good knowledge of MSL relative to the ellipsoid. The methodology is set (measurement with tides gauges and GPS in a very dense network). The method to determine the MSL versus the ellipsoid is in progress.

Some information provided:

- the new web pages of the Norwegian mapping authority ;
- the Utide analysis program for matlab software that is being used in Norway (available at http://www.po.gso.uri.edu/~codiga/utide.utide.htm);
- LAT computation highlighted a jump between LAT Norway and LAT UK.
- Considering a "bathyelli like" exercise (see talk Y-M Tanguy) is, today, a problem due to the tide because of Fjords geography and dynamics environment (GPS mask point and fresh water flux to manage);

17. Talk: "Progress report on the introduction of Premo version 3 water level reduction software":

R. Kuilman (NLHO) gave a presentation of the development of Premo software for water level reduction, Version 3 now combines short-term (6-hours) Meteo-Ocean forecast and tide gauges data assimilation using Kalman filtering. Validation of the results was presented. PREMO V3 presents several advances, relative to previous version (accuracy, geographical extension of the model, etc.)

Premo V3 should be operational per April 2012 and is available upon request for other organizations.

BE member wish that a comparison between NL and BE methods be performed.

Members say to be interested in having documentation about Premo software.

Premo v3 is a software used MATROOS database, which contains a surge data base.

Slides of the R. Kuilman talk, displays vertical reference level results better than 20 cm error. Budget error is better than 20cm.

18. Report of activities of the IHO TWLWG:

On request of NLHO (not member of the IHO TWLWG) and of SHOM (new specialists in the tide team), C. Jones provided a general overview of TWLWG activities. This was very useful for new IHO TWLWG members.

It was agreed that for next NSHC TWG meeting a report on important matters discussed within TWLWG would systematically be presented.

FR is tasked to communicate known errors in B. Simon book to C. Jones, so that the English version still under revision be corrected.

C. Jones indicated the e-mail contact info@ihb.mc to share news and informations on tide gauges instrumentation.

19. Draft report of NSHC-TWG for the 30th NSCH conference:

A Draft report will be prepared by FR and sent to all NSHC-TWG members for approval. Then it will be sent to IHB in preparation of next NSHC.

20. Any other business:

INSPIRE EU directive was mentioned to be an important matter. The group convened about that fact (see also other items in the present minutes).

It is recognized that a recognized web portal on the IHO web site would be convenient. C. Jones agreed to get in touch with IHB in order to study the feasibility of such an initiative.

21. Review of Action Items:

See annex D.

22. Date and venue of the 19th NSHC TWG Meeting:

T. Torresen offered that NO host the next TWG meeting. The next NSCH meeting will be held in Norway in May-June 2013 in Stavenger under Norwegian chairmanship.

23. Closing remarks:

The presentations given at the 18th NSHC TWG meeting are made available to all participants at FTP link that has been also sent to all TWLWG attendees by e-mail.

ftp://ohitwlwg:ohg2Ohcu@ftp.shom.fr/

See : OHI_TWLWG_201202_Brest_talks

ANNEX A: Agenda 18th TWG meeting

1. Opening remarks……...…….....Chairman
2. Adoption of the agenda……..Chairman
3. Minutes of the 29th NSHC Conference……All
4. Minutes of the 17th Meeting…… .....All
5. Status of Action Items from 17th Meeting..…….….... All
6. Developments in modern tide gauges..……..…… ……All
7. Presentation "'French Tide Gauge network RONIM and sea level data distribution facility REFMAR".....FR
8. Developments in digital tide tables and website predictions…… .…….All
9. Tidal reduction methods……..…….All
10. Presentation UK VORF Model: status update.....UK
11. Presentation "French vertical reference surfaces – Advancees in the project Bathyelli" .FR
12. Presentation - "Results from BLAST WP3 - Lowest Astronomical Tide in the North Sea derived from a vertically referenced shallow water model, and an assessment of its suggested sense of safety" …….....TU Delft, NL
13. Status update on cooperation with BLAST Work Package 3.....NL, BE, DK, All
14. Discussion on spatially consistent reference surfaces for the North Sea …… ……All
15. Discussion : Portrayal of data quality in digital and paper tidal publications.....NL
16. Presentation "An update of tidal activities at the Norwegian HO" ……...NOR
17. Presentation - "Progress report on the introduction of Premo version 3 water level reduction software" …….....NL
18. Report of activities of the IHO TWLWG …….....UK
19. Draft report of the NSHC-TWG for the 30th NSHC conference……...…FR
20. Any other business…….……....All
21. Review of Action Items…….....Chairman
22. Date and venue of the 19th NSHC TWG Meeting……...……..All
23. Closing remarks…….....Chairman

ANNEX B: Terms of Reference for the North Sea Hydrographic Commission Tidal Working Group

As amended by NSHC 28th conference and commented on by TWG 18th

1. Objective
Provide technical advice and promote co-ordination on tidal issues especially within the North Sea Hydrographic Commission (NSHC).

2. Authority
The Tidal Working Group (TWG) is a subsidiary of the NSHC and its work plan is subject to NSHC approval. The TWG acknowledges the IHO Tidal and Sea Level Working Group (TSLWG) as a subsidiary of the Data Acquisition and Transfer Standards Subcommittee (DATS) of the Hydrographic Services and Standards Committee (HSCC). Subject to approval by NSHC the TWG is especially involved with the regional interpretation and implementation of tidal issues as identified by DATS/TSLWG. If applicable the TWG can also give advice to DATS and NSHC for further consideration.

3. Procedures
a. The TWG should:

1. work according to the agreed NSHC work plan;
2. monitor and report the progress of the work plan;
3. propose new work plan items for consideration by the NSHC.

To support the identification of new work plan items deemed relevant for the NSHC, the TWG should:

4. liaise with especially DATS/TSLWG for any emerging development;
5. exchange views and experiences concerning tidal issues like unifying vertical datums, analysis, modelling and related issues like sea level rise and surge.

b. The TWG will conduct its business mainly by correspondence. Meetings and workshops should be scheduled as deemed necessary for the accomplishment of the work plan.

4. Composition and Chairmanship

1. The TWG shall comprise representatives of the NSHC Member State and expert contributors if applicable.
2. Decisions should generally be made by consensus, if a majority is required each Member State has one vote.
3. External contributors can contribute to the work plan but are not entitled to vote.
4. The Chair and secretarial support will be from the Member State hosting the meeting.
5. The Chair should monitor and report on the work plan to the NSHC.

ANNEX C: WORK PLAN

Workplan NSHC Tidal Working Group: ([Feb 2012] - to be confirmed by NSHC)				
Item number (TWG/item)	**objective (WHY/priority)**	**task description (WHAT/HOW)**	**HO involved**	**Status**
WP 16 / 01	Better accommodate the different needs of both navigational purpose and coastal management	Common MSL in reference to the GRS80 ellipsoid	All, coordination NLHO	Closed, see WP18/01
WP 16 / 02		Common LAT in reference to the GRS80 ellipsoid	All, coordination NLHO	Closed, see WP18/01
WP 16 / 03		Common chart datum in reference to the GRS80 ellipsoid	All, coordination NLHO	Closed, see WP18/01
WP18/01	Improve North Sea wide realization of reference surfaces; task: Explain and reduce differences in reference surfaces at the international boundaries; HO involved: all, on a bilateral basis; status: permanent"	Investigate the ways further to explain and smooth common MSL and LAT at the boundaries between national reference surfaces (See See A18/01, A18/02 & A18/03)	All, Coordination NLHO	Permanent
WP 16 / 04	Enable GNSS-based tidal reduction and the connection with the vertical datum on land	Follow developments on geoid, MSL and LAT computations for the North Sea area	All	Permanent, see also WP18/01
WP 18/02		Exchange between HO's on operational methodologies for GNSS based surveys	All	Permanent

ANNEX D: Actions for internal coordination

Table 1 Action items NSHC Tidal Working Group

Item number (TWG/item)	objective (WHY/priority)	task description (WHAT/HOW)	HO involved	status
A18/01	Explain differences in realizations of LAT	Exchange on bilateral basis between involved HO's to investigate further the origin of observed differences at the boundaries between national reference surfaces	All	Permanent
A18/02	Be a stakeholder of the BLAST WP3 project	Get feedback from BLAST project team and study the outputs of BLAST WP3	All, Coordination NLHO	Summer 2012
A18/03	Be a stakeholder of the BLAST WP3 project	Examine the feasibility for MS of the NSHC to join the BLAST follow up	All, Coordination NLH0	Summer 2012
A18/03	Better capitalize the work done by the NSHC TWG	Study the feasibility for setting up a web portal for NSHC TWG on the IHO website	UKHO	Summer 2012
A18/04	Facilitate exchanges of tide data by developing a standard XML format for tide data exchanges	Publish harmonic constituents and tide prediction for use within IHO community; UKHO acts as coordinator and links with TWLWG	All, UKHO	Permanent
Action 18/05	Towards a common language both for tide constituents and tide predictions.	Automation of tide table production	All TWLWG	2012-Dec.
A 17 / 01	Explain differences in realizations of LAT	Exchange used harmonic constituents and hydrodynamic models	All, coordination NLHO	Closed
A 17 / 02	Explain differences in realizations of CD	Exchange used methods and concepts for CD	All, coordination NLHO	Closed
A 17 / 03		Circulate draft report on the creation of common reference surfaces among TWG members	NLHO	Closed
A 17 / 04		Submit final report on the creation of common reference surfaces to NSHC	NLHO	Closed
A 16 / 02		Publish harmonic constituents for use within IHO community; UKHO acts as coordinator and translation to XML	All and TSMAD	Closed, see A18/04