Paper for consideration by ENC Working Group

Use of AU6 ENC cells as an option for Bathymetric ENCs (bENC)

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Executive Summary: Compilation of high density bathymetric ENCs (bENC) by Hydrographic Offices using current standards.
Related Documents: S-65, S-57
Related Projects:

Introduction / Background

Last year the AHS determined to send all our cartographers to an IMO approved generic "ECDIS" training course as part of our "ENC first" approach. Our staff share the simulator with a range of mariners who perform very different jobs (pilots, masters, tug operators, etc). The cartographers are exposed to seeing how our ENC products are understood and used "in the real world".

As the majority of the simulations are conducted in the approaches to commercial ports it didn't take too long to realise how the lack of more detailed bathymetry was a major concern for mariners (especially once ships entered dredged areas).

This paper shares the AHS experience so far and promotes the concept and production of high bENCs using current standards to other IHO member states as well as provide "fuel" for future S-100 initiatives.

Analysis / Discussion

The AHS sees three main avenues to produce bENCs.

1. Port authorities can use their own GIS department or external contractors to compile non-official S-57 cells and distribute them to their pilots.
2. Official S-57 data (ENCs) can be produced (maybe co-financed by all stakeholders) by contractors but quality controlled and published by HO's.
3. Compiled, quality controlled and maintained by HOs.

The AHS has always been supportive of depicting one metre contours in complex areas. In fact, in the early 2000's the AHS published a series of 12 large scale ENCs to cover the navigation through the Torres Strait. Back then all contours where hand drawn and it took a long time to complete. More importantly the contours were very difficult to maintain without the support of the right tools (automation). The AHS is now intends to publish bENCs, this time, supported by a methodology able to repeat itself making it possible to update the products efficiently using CARIS Bathy Database.

The second key aspect is that the AHS is supportive of bENC that are equally available to all key members of a ship's bridge team, particularly the Pilot, Master

and other ship's navigation staff. This position has resulted from discussions with the Australian Maritime Safety Authority (SOLAS requires the Master to plan berth to berth, not just to the pilot boarding point), the Australian Marine Pilots Institute, and a study of a number of ship accident reports discussing breakdowns in Bridge Resource Management. These all lead to a view that all involved in this critical phase of navigation should have access to the same data irrespective of whether they are using a Portable Pilotage unit (PPU) or ECDIS. Bathymetric overlays created for and usable only within closed PPU systems do not meet this requirement.

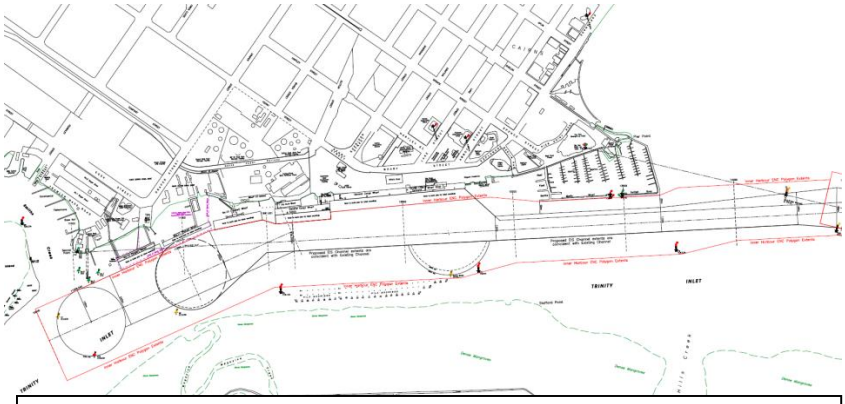
The final key aspect is customer engagement - face to face meetings with port authorities, pilots and port surveyors.

These meetings create a partnership where the Ports identify what they need in an ENC and the AHS identifies what they need in terms of a hydrographic survey AHS's key points to produce bENC (using current standards) are;

- Discuss the need of such a product, on a port by port basis. The meeting must include, at least the Harbourmaster, a senior pilot and port surveyors.
- The area covered MUST be as small as possible in order to safely operate the largest ship calling the port. It must focus on restricted waters (very narrow passages, strong currents, sharp turns, etc). The size of the area directly affects production times and ENC file size.
- One metre contours are AHS' preferred option. It was selected as the most realistic contour spacing to be offered to mariners based on the uncertainty of all the different measurements involved in the determination of the final depth figures (tidal models, depth (e.g. +/- 0.5m + 1%d for an A1 survey). We also consider uncertainties coming from the measurement of the draught of the ship itself (especially when it is also affected by squatting).
- For bENCs covering dredged channels, the use of an "intermediate contour" equal to the design depth of the channel (e.g. 11.7m) is strongly recommended as it normally reflects the maximum draught (plus tide, less port's UKC requirements) of vessels able to enter the port.
- Soundings, spaced at 50/100m depending on the width of the channel, were also requested by mariners. They are considered important to support the one metre contours utilising the "safety depth" setting in ECDIS.
- The port survey areas must "overshoot" the bENC extents and must be supplied to the HO in full (there's no such a thing as merging "old" and "new" one metre contours). Harbourmasters and port surveyors must commit to this process in order to maintain consistency on their deliverable, making the HO's internal processes repeatable.
- Let the Harbourmaster, local pilots and port surveyors come up with the extents of the bENC cells. By doing that they are committing to the project. Port stakeholders are quick to ask HO's for more contours over large areas

but they seem not to be aware of the fact that those areas must be re surveyed periodically and that in the end it will affect their resources. From our experience, making them accountable for one of the key moving parts of the project ends up resulting on very “sensible” product extents. We intend to produce our AU6 ENC based on survey extents created by the Ports.

- Surveys must provide full sea bottom coverage and be within ZOC A1 horizontal and vertical accuracy.
- Port surveyors and HO’s tides and bathymetric data validation representatives must agree, beforehand, on file formats, metadata and LAT adjustment values in order to speed up as much as possible the registration, processing and validation of the incoming data. We would like to aim for new surveys to be passed on to the chart production team within 48 hrs. Ideally, the updated ENC cell must be released to the RENC in not more than 7 working days since the receipt of the new bathy by the HO.
- Bathymetric ENCs (bENCs) will be published as standalone AU6 cells, each covering an individual dredged channel, segment or manoeuvring area, as defined by the port’s various survey / re-survey areas.
- Maximum ENC cell size is still 5MB so if an area becomes too large it must be split in more than one product.
- The survey must be processed by BDB as one entity. A surface will be created and the depth contours (DEPCNT) and depth areas (DEPARE) will be auto generated. The result file will be cropped using the “official ENC extents”; all the previous contours and areas will be deleted from the AU6 cell and replaced with the new ones.
- Soundings will be also auto generated by the software.
- Any other non-bathymetric data overlapping the area will be included in the AU6 (e.g. navaids, wrecks, etc, to ensure correct layering when displayed in ECDIS). High resolution coastline will be retained at the AU5 level and the AU6 will run very close to it without duplicating the data. This will avoid topology issues while trying to join auto generated contours and depth areas against other non-bathymetric features. On the AU5, a M_CSCL object with the same scale than the AU6 (extending up to 100m from the seawall) can be added to avoid the over scale warning pattern display on ECDIS. This provides a seamless display.



Port of Cairns - Proposed AU6 limits

On the eastern side the limits of a different polygon can be seen. It corresponds to a different AU6 as the re-surveying (dredging) frequency is different in both areas (6 months vs 3 months).

AU5 ENC showing DRGARE and no bathy	AU5 ENC with overlapping AU6 (bENC)

Conclusions

The automated production of high density bathymetric ENCs (at one metre interval), using existing standards (S-57 and ECDIS PS) and with maintenance regimes related to survey programmes is expected to be feasible when the Ports are able to provide timely data to the necessary specifications.

Justification and Impacts

The production of bENCs as official ENC products mean that they will be equally accessible to ship masters and pilots and they will be able to have the same view (ECDIS vs PPU) improving communication and therefore Bridge Resource Management (BRM) principles.

Recommendations

Promulgate the production of bENC test cells by HOs and the discussion of its benefits as an official product with port authorities, pilots, navigation safety agencies and mariners in general.

Actions required of ENCWG

a. Note this paper

b. Discuss the pros and cons of officially produced bENCs

c. Agree and support the implementation of the recommendations