

Applications Ready for Bathymetric ENC

The bathymetric ENC (bENC) concept was developed by SevenCs several years ago and was presented in the September 2005 issue of Hydro International, "Ports and Harbours Special". The approach aims to integrate the latest hydrographic survey data into ENC-based navigation software. According to this concept, high-density bathymetric data are kept in separate S-57 data sets. bENCs are considered a bathymetric complement. The idea is to use bENCs in conjunction with regular ENCs (official or non-official) rather than to replace them. Meanwhile, the concept has matured, a proposal for a Product Specification (Edition 1) has been finished and first applications are ready to handle bENCs.

The integration of high-density bathymetry into electronic navigational charts (ENCs) has become a major issue. For this purpose, after acquiring, cleaning and modelling the hydrographic survey data, contours at metre (or sub-metre) intervals are generated. The contouring results are then converted into S-57 (the IHO exchange format for ENCs) and encoded accordingly. The next step is the definition and attribution of depth areas, i.e. areas enclosed by adjacent contour lines. The result is a sort of electronic fair-sheet containing bathymetric data in S-57 format.

This fair-sheet could be used to update the bathymetry of the official ENCs covering the relevant area. However, for various reasons (for example, compliance with paper charts), most Hydrographic Offices – the producers of official ENCs – do not integrate high-density bathymetry into the ENCs they distribute for the use in Electronic Chart Display and Information Systems (ECDIS).

New User Groups and Requirements for S-57 Data

Official ENCs are not only used in ECDIS systems. Electronic chart systems (ECS) and portable pilot units (PPUs) also make use of official ENC data. They are not bound to the strict regulations of ECDIS type approval. This allows for the flexibility to use 'non-official' data that have been produced by other authorities (for example port authorities or waterway authorities) or private producers. Many ECS and PPU users have a strong interest in using accurate and actual bathymetric information in addition to ENCs (official or non-official). The integration of high-density bathymetry helps to make such applications even more useful when navigating through waters with limited under-keel clearance.

Data suitable for the production of high-density bathymetry ENCs (bENCs) are collected by port and waterway authorities on a regular basis. However, the data are usually not made available in S-57 format. There are only a few port authorities (for example Rotterdam and Hamburg) that produce ENC data sets for their area of responsibility. Their ENCs contain high-density bathymetry.

A Flexible Approach

The SevenCs bENC concept aims to produce dedicated S-57 layers for bathymetric data. This approach allows for more flexibility when it comes to the use of high-density bathymetry in ENCs. The new bathymetric data are often available on short notice. It does not involve any changes in topography or in the existing chart information, only in bathymetry. The bENC concept allows the updating of the bathymetric information separately without modifying the regular ENCs. This is much faster because the regular ENCs remain unchanged and the old bENCs are replaced by a new Edition.

The bENC concept allows focusing on bathymetry only. Producers of bENCs do not necessarily have to become involved in full-blown ENC production. Basically, the electronic fair-sheet holds all the information that is required to produce a bENC. Provided the end applications support handling of bENCs, they can be shown in the chart display together with the regular ENC data from Hydrographic Offices or non-official producers.

Production Guide for bENCs

Due to its limited content, the production of bENCs is rather straightforward and can be automated to a great extent. There was no need to introduce new S-57 object classes when the bENC concept was developed. bENCs make use of the same topology model as standard ENCs. New product code and file naming conventions were introduced.

bENCs are produced for pre-defined scale ranges. These scale ranges are assigned during the production process and should be in line with the compilation scale of the data set. The scale ranges are associated with the ENC categories of navigational purposes (usages). As opposed to standard ENCs, more than one usage can be assigned to a bENC. That is why one bENC can serve as a bathymetric complement for different usage bands.

Based on the existing Product Specification for ENCs, a proposal for a bENC Product Specification (Edition 1.0) has been developed. It describes in detail the bENC content, allowed object classes and updating methods. The document serves as a guideline for data producers and application builders who want to integrate the bENC concept.

For the production of bENCs in compliance with the bENC Product Specification (Edition 1.0), ENC production tools should be extended accordingly.

How bENCs Integrate into the Chart Display

Lately, the bENC concept has not only been integrated into the ENC production workflow, but also into ECS and PPU software products. Different applications may have different requirements with respect to the presentation of bathymetric data. For this reason, and to avoid the introduction of unnecessary constraints, the presentation of bENCs has not been specified. However, what needs to be considered is the proper drawing order to avoid relevant information being obscured by bENCs.

The navigation software used should ensure that the bENCs are shown only in combination with a regular ENC of the same scale band. If, for example, a bENC has been given the navigational purpose category 'Berthing', it is only displayed in case a regular Berthing ENC is also shown. This is because the bENC is regarded as a bathymetric complement.

To enable the distinction between features originating from bENC layers and those from regular ENCs, the following measures should be taken. ECS software should indicate whenever bENCs are used to complement the chart display. It must be possible to switch them on and off without changing the display scale. Moreover, the pick report should state whether bENC data have been considered for data query. Alarm functions should take the depth information of bENCs into account.

The ECS software can use the same symbol instructions for both bENC and ENC object classes. To visualise the coverage of a bENC, highlighting its outline (for example, in orange) has been proposed. This also helps to better distinguish bENC information from the information of the standard chart display.

Feedback and Conclusions

During the last few months, interest in the SevenCs bENC concept has been growing. E-Sea Fix PPU by Marimatech Denmark integrates this technology and is the first PPU that supports the handling of bENCs.

Only recently has the bENC concept been drawn to the attention of various port and waterway authorities, pilot organisations and Hydrographic Offices. So far, the message has been well received and the first data sets have been produced and successfully tested. The bENC concept has proven to be a flexible and straightforward approach to complement official ENC data with the latest bathymetric survey data. Moreover, the approach allows the realisation of a mixed chart display consisting of official ENC data and complementary high-density bathymetry from non-official sources (i.e. other authorities, private data) in S-57 format.

<https://www.hydro-international.com/content/article/applications-ready-for-bathymetric-encs>
