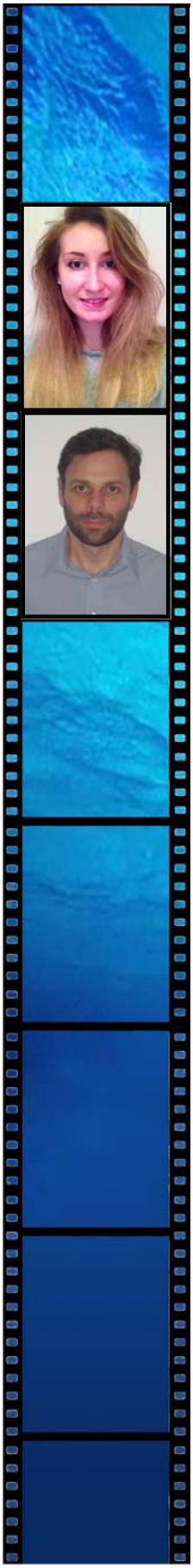


Notes

IC-ENC ENC VALIDATION TRAINING COURSE

By Laura TYZACK (IC-ENC)
& Panagiotis GKIONIS (Hellenic Navy Hydrographic Service)

Abstract

The International Centre for ENCs (IC-ENC) was set up in 2002 with a remit to harmonise the production and distribution of high quality ENCs. This Note provides an insight into IC-ENC, its validation processes, and the new ENC Validation Training Course. It is jointly authored by Lt.Cdr. Panagiotis Gkionis (Hellenic Navy Hydrographic Service, ENC Validation Training Course delegate) and Miss Laura Tyzack (IC-ENC Data Validator).

Introduction to IC-ENC

IC-ENC is a Regional ENC Coordinating Centre (RENC), established to support the achievement of the IHO's Worldwide Electronic Navigational Chart Database (WEND) Principles.

IC-ENC is a low cost, not for profit RENC which was set up in 2002. IC-ENC's role, as an international centre of ENC excellence, is to assist Hydrographic Offices (HOs) to harmonise their production and distribution of ENCs. IC-ENC does this by providing four main services to HOs:

- ENC Production Support
- Independent ENC Validation
- ENC Distribution
- ENC Revenue Management

IC-ENC has 12 members of staff across two offices - the headquarters in the United Kingdom and a regional office in Australia. It has 29 member HOs at present, with new nations joining on a regular basis. IC-ENC now has a folio of over 5000 ENCs which are validated on a regular basis. ***Figure 1*** shows the current IC-ENC membership.

Figure 1 *– Current IC-ENC membership*

IC-ENC is controlled by its members. The members meet annually through a Steering Committee meeting to discuss strategic issues, agree on policies and set the budget. There are also Technical and Commercial Working Groups held each year, attended by both IC-ENC staff and member HOs, which recommend policies to the Steering Committee.

IC-ENC Validation

IC-ENC's approach to validation is to consider the impact of any issues, identified during the validation process, on the end user of the ENC product, the mariner. This is achieved through the use of policies, IHO documentation, and working practices to assist the IC-ENC Validator in the quality assurance of each ENC that is produced by the member HOs. The working practices set out the validation procedures, which include conformance to S-57 and S-58 IHO standards, vertical and horizontal consistency, and assessment of ENC display on ECDIS. IC-ENC members then receive a comprehensive feedback report for each processed ENC. These reports highlight any data issues including recommendations for improvement. IC-ENC members have access to the *IC-ENC Errors Database*, a database of validation tool errors, which explains each error's meaning, significance and action to take. This helps the HO to interpret the error and to assist with their own production and internal validation.

IC-ENC checks an ENC's data structure against both S-57 and S-58 standards, and also its data content by making a visual assessment. IC-ENC uses several validation software tools to assist in the validation of each ENC, including 7Cs Analyzer and Designer, dKart Inspector, and two ECDIS systems. Each validation software tool generates log files of error messages, which are then inspected and classified according to IC-ENCs policy regarding the impact to the user. The *IC-ENC Errors Database* is used by the IC-ENC Validator to assist the validation process. A sample page is shown in ***Figure 2.***

DETAILED ERROR INFORMATION	
Source:	dKart Inspector (V6.0.0.6)
Error Name:	LG0151: (T0061)
Explanation:	An object captured within an intertidal (-h to 0) or land area has been attributed with WATLEV = 3 (always underwater/submerged).
User Impact:	It is illogical to have a submerged object shown within an intertidal area or on land, but the impact on the user is minimal because the shoaler object will take precedence when setting safety margins in the ECDIS. However, this error message may be categorised as 'HO to correct' rather than 'Accept' because, should the mariner interrogate the object, there may be confusion and/or a loss of confidence in the product if this issue is seen. This error may also be reported erroneously for an object which has been captured entirely within a depth area attributed with DRVAL1 > 0, but which is adjacent to intertidal or land area.
Description:	HO TO CORRECT: If an object attributed with WATLEV = 3 overlaps an intertidal area or LNDARE and EXPSOU is incorrectly encoded. ACCEPT: If the object in question is a linear SLCONS object which shares the same geometry as a LNDARE object. (This object class is included with the software test). ERRONEOUS: If it is a linear LNDARE object. (The test was amended in SP1 of dKart Inspector 5.0 so that it no longer reports point LNDAREs, but linear LNDAREs are still reported erroneously). Or The object is located entirely within a depth area attributed with DRVAL1 > 0. Or The object is attributed with EXPSOU = 3 (Deeper than...).
Required Action:	In order to provide the mariner with the best possible product please correct the WATLEV attribute of the object in question. If, on review, it is found that the object genuinely is submerged on an intertidal or land area, then the attribute EXPSOU should be attributed with "3 - Deeper than..." to confirm this situation to the mariner.
References:	Logical consistency S58 Check 61
Cross Reference:	VS57_UOC_126

***Figure 2** – Sample page from IC-ENC Errors Database*

Further assessment is made to identify any gaps or overlaps between adjoining cells, and a visual assessment is made of the vertical and horizontal consistency of the ENCs in the area. This is done by accounting for the purpose of the ENC, voyage routes, prominent navigation features and so on, always with the navigator in mind. Several examples of these visual assessments are shown in Figures 3-4***. Figure 3*** shows an example of where a single HO has produced two adjoining cells of the same usage band which overlap one another. Overlaps or gaps in data can cause serious problems for ECDIS users, so IC-ENC would ask for immediate action to remove the overlap before it is released for use. ***Figure 4*** shows the two cells after the overlap has been removed.

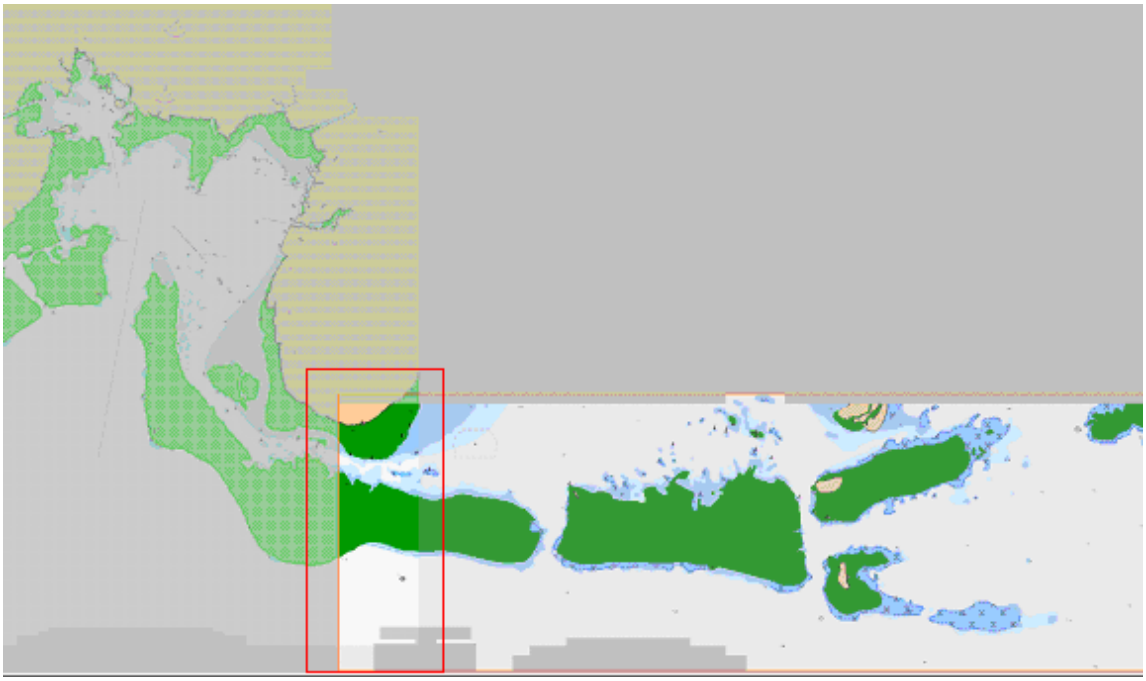


Figure 3 – Overlap in data identified using dKart Inspector 6.0

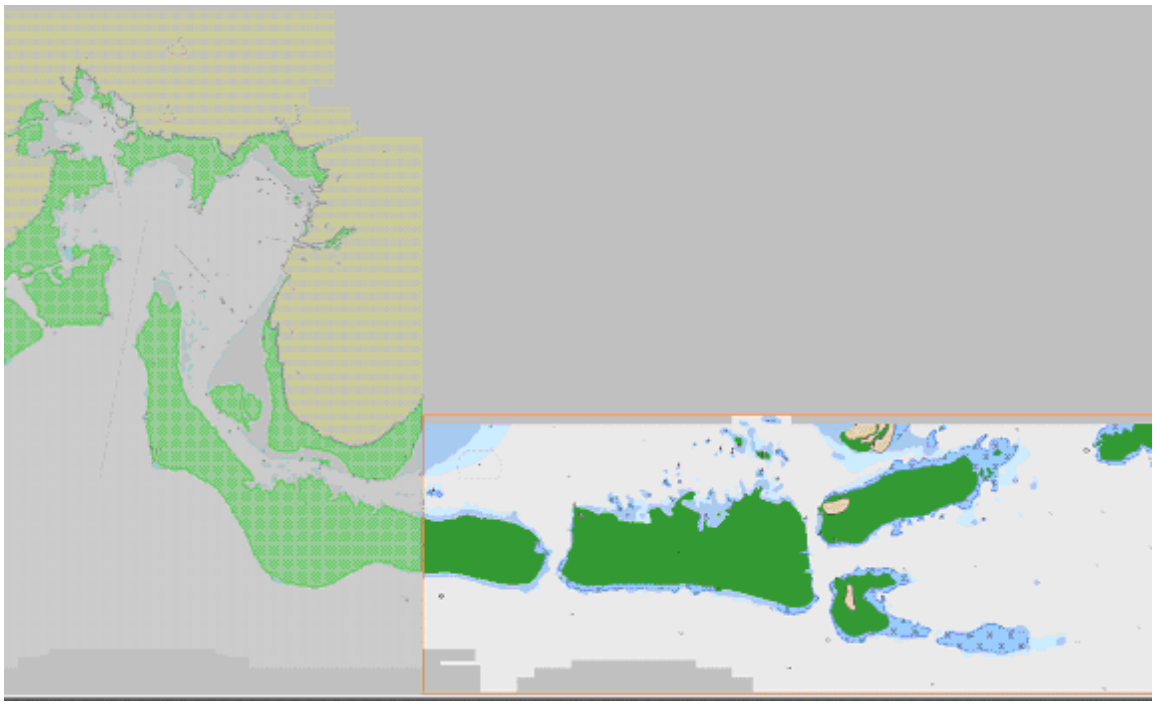


Figure 4 – *Resolved overlap*

Figure 5 shows an example of where a single HO has produced two adjacent usage band ENCs, but one of them is less up-to-date than the other, resulting in misaligned TSS objects. This is a good example of a problem for which IC-ENC would have asked for an immediate corrective action, given the importance of TSS objects.

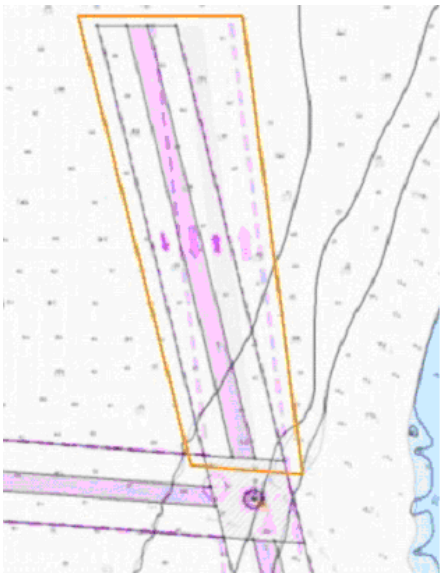


Figure 5 – *Misalignment of two Traffic Separation Scheme (TSS) objects*

Each ENC is then visually assessed using two widely used ECDIS. The assessment includes checking the clarity, consistency, application of SCAMIN (density of features when zooming in and out), and general usability of the ENC. ***Figure 6*** shows an example of where two different HOs have produced neighbouring ENCs, but the different policies on the use of SCAMIN has resulted in a dataset which is not consistent. The ENC to the west does not have SCAMIN attributed to the soundings, resulting in a cluttered display in the shoaler areas, whereas the ENC to the east has a SCAMIN value attributed that is too large, resulting in the soundings being entirely removed from the display. This is a good example of an issue where IC-ENC would liaise with the HOs in order to achieve a more consistent display for the mariner, with each HO receiving individual advice about their implementation of SCAMIN.

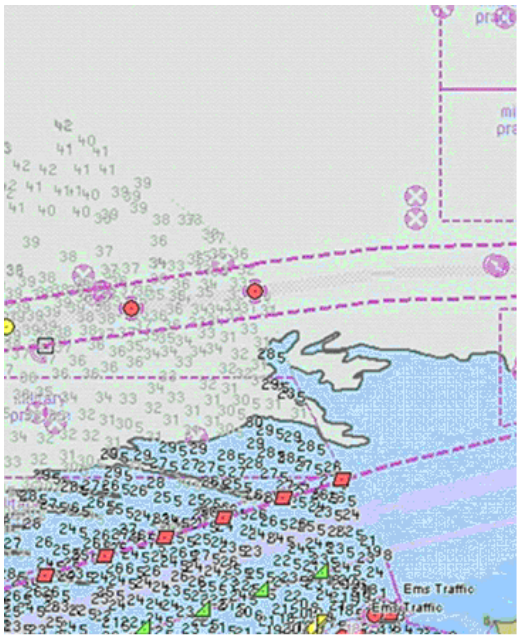


Figure 6 – *Different implementations of SCAMIN*

Additional checks include the assessment of datums, compilation scales, additional word (.txt) and picture files (.tif), and CATZOC suitability. If there are any issues for which improvements are possible, the validator will make an assessment of the impact to the mariner and classify findings accordingly in the Validation Report. An example of a Validation Report is shown in ***Figure 7***.

IC-ENC form P007: Validation Report

Cell Information:
Cell Name – XY457683.000
Edition Number - 1
CRC - 527E4E99

Validated by:
Name - Laura Tyzack
Phone - (+44) (0) 1823 723389
E-Mail - therenc@ic-enc.org
Validation Date - 07/03/2014

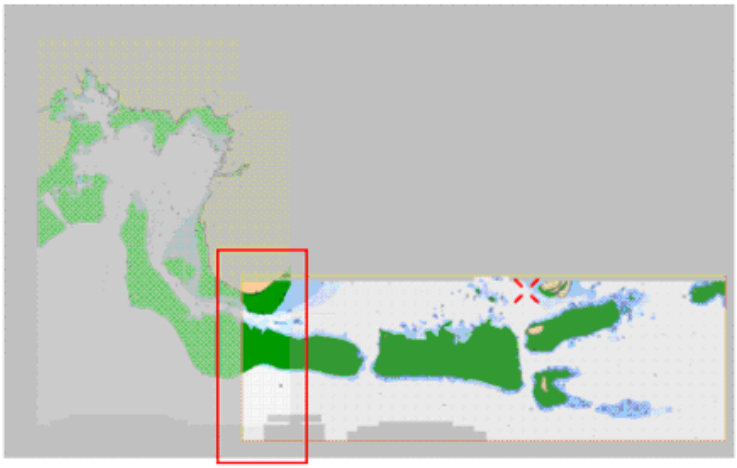
VALIDATION CONCLUSION:

NOT ACCEPTED FOR DISTRIBUTION due to the presence of data issues which you have agreed under the partnership programme to correct before release

CORRECTION REQUIRED BEFORE RELEASE:

The following data issues are considered to be safety critical and so must be corrected before the ENC is released:

Data overlap



We have identified a data overlap between XY457683 and XY457684. Please clip GB501660 to resolve this overlap.

Figure 7 – *Example P007 Validation Report*

Once an ENC has been accepted for release by the producing nation and IC-ENC, IC-ENC makes it available to its Value Added Resellers (VARs). These VAR companies bring together ENCs from a variety of sources, and have developed commercial services that supply ENCs to users. The VARs therefore manage this element of the distribution chain, ensuring IC-ENC remains focused on data quality. Eight VARs are currently appointed (IC-ENC welcomes new applicants), and the variety of competing VAR services

ensures a high level of customer service. This approach means IC-ENC remains as cost effective as possible. An HO sets its own price for its ENCs, and IC-ENC retains just $1 per annual subscription sold to cover its operating costs, with the remainder being returned to the HO as part of IC-ENC's Revenue Management Service.

IC-ENC ENC Validation Course

The decision was made at the IC-ENC Steering Committee 14 (September 2013), as a capacity building initiative, to develop an ENC Validation Training Course. This would be available to IC-ENC member HOs in order to further increase the level of quality amongst members' ENC production teams. For IC-ENC, this would involve developing its already present internal training package for new staff members, as the essential components and knowledge base were already in place. It was agreed that the costs of attendance by the delegates would be met from the central IC-ENC budget. The target date for the pilot course was set for the first half of 2014. IC-ENC has now completed the pilot training course, which ran from 3rd – 14th March 2014 for three delegates. Figure 8 shows the Course Instructor, IC-ENC Data Manager Mr Mike Hawes, and the three course delegates.

Figure 8 – *Mr Mike Hawes (Course Instructor) with the three course delegates (from left to right): Mr Hans Wytema, P.Officer Nikoletta Paspaltzi, Lt. Cdr. Panagiotis Gkionis.*

The aim of the IC-ENC Validation Training Course is to introduce the delegates to the roles and responsibilities of IC-ENC, with the focus being on the ENC validation process, and to provide them with the knowledge and skills required to carry out internal validations at their home ENC production offices. The objective of the training course, then, is for each delegate to show the ability to demonstrate an understanding of ENC validation, including the relevant international standards, content and creation of ENCs, and ENC validation principles and ECDIS performance issues. The training course consists of 10 modules, involving a variety of both theory and practical based learning exercises, which aim to provide the delegates with the knowledge and skills required to assess and validate ENC data.

Lt. Cdr. Panagiotis Gkionis, one of the course delegates from the Hellenic Navy Hydrographic Service, has provided the following review of the IC-ENC Validation Training course:

"An excellent course, suits from novice to confident validator level. It definitely improved my knowledge of how IC-ENC deals with ENC data, as well as my ability to use validation tools and better understand IC-ENC recommended actions for ENC improvement. Instruction was excellent and gave a lot of time to personal tuition and hands-on training. I would recommend this course to all HOs in need of ENC validation training for their staff.

During the pilot course, the trainees were introduced to the IC-ENC status, governance and financial framework, its roles and responsibilities, as well as its current and future technology. Basic background information and IHO documentation (including S-57 component documents – ENC Product Specification, Use of the Object Catalogue for ENC, Object/Attribute Catalogue) related to data validation were presented, before the whole IC-ENC validation process (IC-ENC, 2013) was theoretically and practically demonstrated. Initially, the methodology and tools for uploading/downloading of datasets exchanged between IC-ENC and HOs (Exchange Sets) was described, together with an overview of the applicable data flow/management scheme.

Then, the trainees were demonstrated the ENC registration procedure and basic checks for data corruption and non-sequential updates through the IC-ENC in-house developed database and software. A series of checks according to the S-57 and S-58 (IHO, 2011) standards and specifications were exercised both in the classroom using dedicated software suites (dKart Inspector, Editor and SevenCs' Analyzer, Designer, Optimiser, Manager) as well as at the IC-ENC facilities with cells being actually validated. Variations from the S-57 and S-58 Standards (errors/warnings) are identified through the IC-ENC Errors Database/Lists and classified according to the impact to the mariner. Consistency checks of data between ENCs within a given region were also widely demonstrated. The trainees learnt how to assess data at the boundaries of adjoining ENCs that have identical compilation scales and to assess data against larger and smaller-scaled ENCs which overlap it.

The validation procedure continues with the utilisation of two widely used ECDIS to ensure a safe representation of the chart data for the mariner through a clear, consistent and seamless ENC display. ECDIS are also used for identification of issues related with the application of the SCAMIN attribute.

Finally, issues related with ENC data gaps/holes, overlapping data, generalisation, vertex reduction, text files and .tif files' display were discussed through case studies. All error/warning messages (per processed ENC file) produced by the validation software together with any identified issues from the validator's visual assessment, consistency and ECDIS checks are compiled in a comprehensive Validation Report which is sent to each IC-ENC member."

Future of IC-ENC

IC-ENC will continue to provide a valuable service to its members. IC-ENC is actively seeking to increase its membership, and thus its ENC coverage, which will bring greater economies of scale to its operations, and further financial efficiencies. Additionally, following the recent success of the pilot IC-ENC Validation Training Course, IC-ENC aims to continue to provide further training opportunities to its members, aimed at improving the understanding of ENC validation.

For more information, please visit the IC-ENC website at www.ic-enc.org.

References

IC-ENC (2013). **Explanation of IC-ENC Validation Processes**, viewed 24 March 2014, http://www.ic-enc.org/validation.

International Hydrographic Organisation (2000). **Transfer Standard for Digital Hydrographic Data**, viewed 25 March 2014, http://www.iho.int/iho_pubs /IHO_Download.htm.

International Hydrographic Organisation (2011). **Recommended ENC Validation Checks**, viewed 25 March 2014, http://www.iho.int/iho_pubs/IHO_Download.htm.

International Hydrographic Organisation (2012). **Data Protection Scheme**, viewed 25 March 2014, http://www.iho.int/iho_pubs/IHO_Download.htm.

Biographies of the Authors

Laura TYZACK is a Data Validator for IC-ENC. She joined IC-ENC in July 2013, previously working in a datafill team within the UKHO since August 2012. She achieved a BSc (Hons) degree in Geography in July 2012 at Bath Spa University. This formed her interest in cartography and the decision to join the UKHO, as well as become a member of the British Cartographic Society. Aside from cartography, she also has a strong interest in cultural geography.
Email: laura.tyzack@ic-enc.org.

Panagiotis GKIONIS has been working for the Hellenic Navy since 1994. Following training at the Hellenic Naval Academy, he embarked on his seagoing career in 1998. For the next 14 years he found himself within warfare appointments onboard frigates and gunboats, qualifying primarily as a Navigating Officer. He took up his current appointment as an Assistant Head of the Research and Planning Department onboard the Hellenic Navy Hydrographic Service (HNHS), following the completion of an 'MSc Hydrography' programme in 2012. Following his training at the IC-ENC Validation Training Course, he is a member of the HNHS data validation team.
Email: tragion@gmail.com