

WENDWG6-04.1A2 - Testing overlapping ENC's in ECDIS

ic-enc

International Centre for Electronic Navigational Charts

Agenda

- The Standards
- The Research:
 - The IC-ENC testing process
 - Limiting factors
 - Results (summary)
- ‘Research’ compared to ‘Reality’
- What is the real size of the problem?
- Do we need an Action Plan?
- Summary
- Discussion questions

The Standards

- “**there must be no overlapping data between cells of the same Navigational Purpose**, except at the agreed adjoining national data limits, where, if it is difficult to achieve a perfect join, a 5 meter overlapping buffer zone may be used.”

IHO S-57 Appendix B.1, Annex A – Use of the Object Catalogue for ENC (Edition 4.0.0)

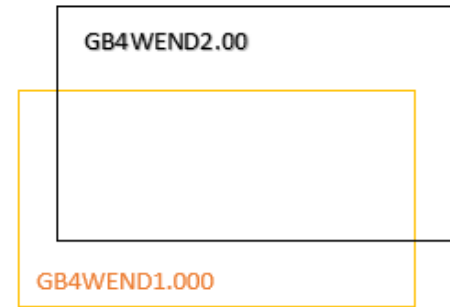
- “**ECDIS systems will operate unpredictably** in areas where significant overlapping ENC coverage is present, raising a potential navigational risk to end users. Where overlapping coverage exists **the Producer Member States should recognize their responsibility** and take the necessary steps to resolve the situation”.

Guidelines for the Implementation of the WEND Principles states in section 1.7

Manually altered IEC test cells (GB4X0000.000), with 3 overlapping scenarios

Tested on 5 different ECDIS

- Range of kernels
- 30% of ECDIS market share (2010)
- 2 of the systems different versions
- Additional 3 ECDIS were attempted but cells wouldn't investigated)

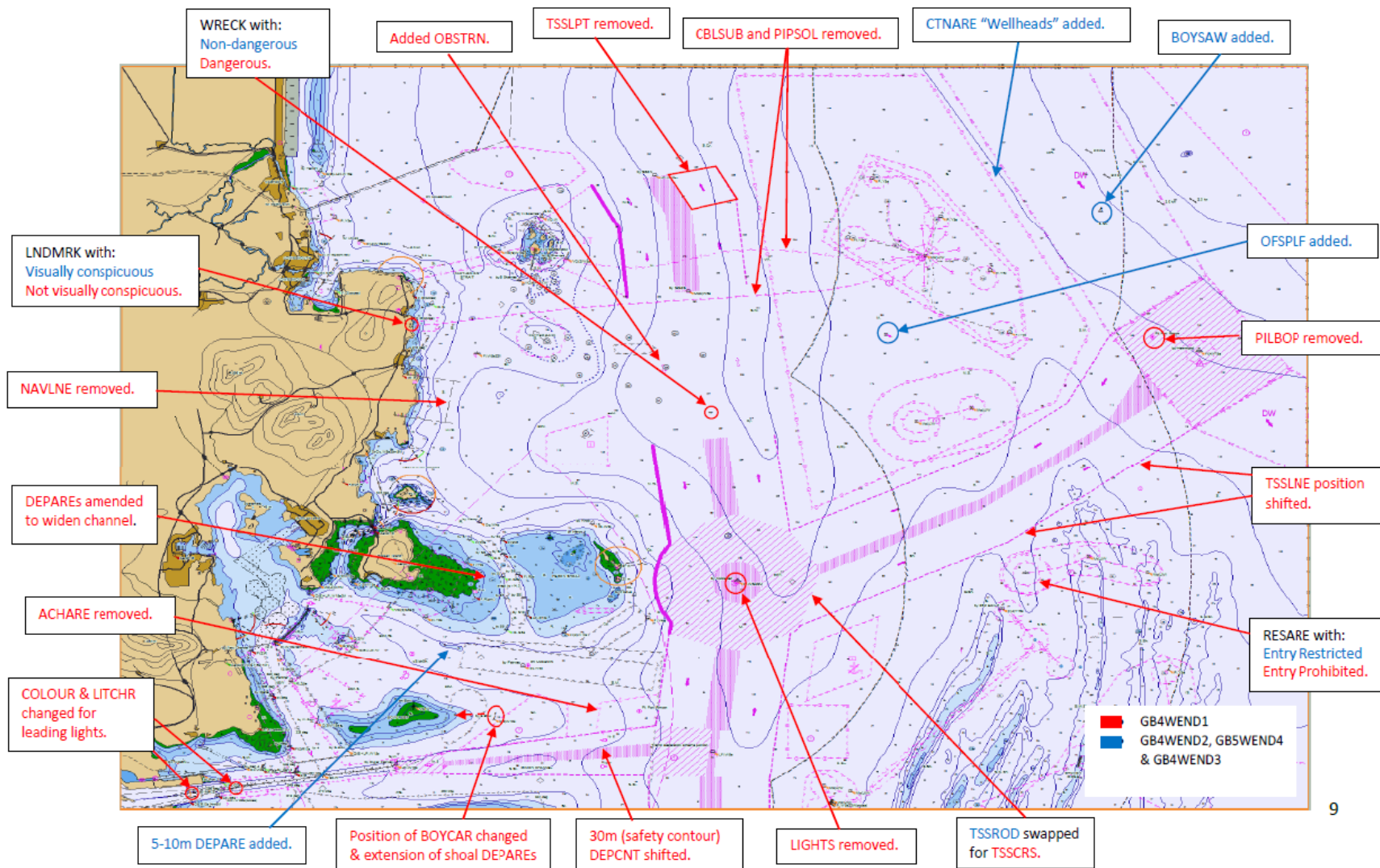


Tests consisted of:

- Panning
- Zooming
- Pick report
- Display of designated features
- Passage plan (partially complete)

Test Scenarios

1. The same scale and same usage band
2. The same scale and a different usage band –
not an 'overlap' in the Standards / previous
WEND analysis
3. A different scale but the same usage band



Limiting factors

- Test cells reflect a hypothetical worst case scenario (Band 5 cells, most overlapping cells Band 1 or 2)
- Tested in an office environment (but same software, some stand alone ECDIS units)
- ECDIS display settings
 - limited our ability to compare exactly 'like-for-like', but this was accounted for in assessment
- ECDIS scale settings
 - limited our ability to compare exactly 'like-for-like', but this was accounted for in assessment

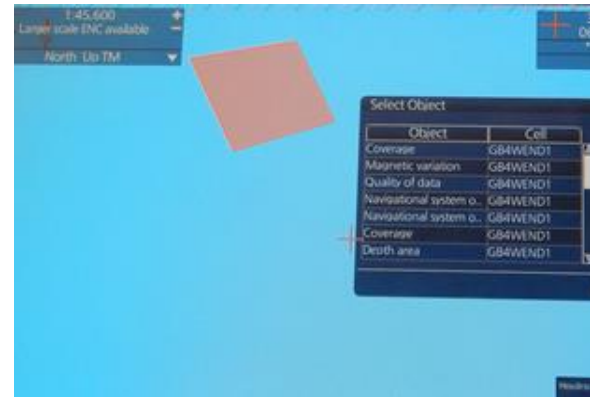
Results Summary Table

ECDIS	Scenario	Pan	Zoom	Pick Report
A	1	See Annex B Figure 2 & 9	See Annex B Figure 17	
	2	See Annex B Figure 9		
	3	See Annex B Figure 9		
	Comments	Generally pans ok but inconsistent as to which cell is displaying at the edges and at what point it changes. Both cells listed in Pick report at edge.	Display of cells change as zoom in and out of cell at the edges for scenario 1 & 2. More stable in the centre of the cell. Scenario 3 zoomed as expected.	Reports items from display cell except at the edge. The cell varies due to panning and zooming issues but pick report is accurate. Where duplicated reports in full.
B	1	See Annex B Figure 3		
	2			
	3			
	Comments	Pan relatively stable in scenarios 1 & 3 but keeps a stored memory of cell with both cells reporting in the Pick report at limits. Pan in scenario 2 consistent.	Scenario 1 zoom in and out not the same at the centre and edge. Scenario 2 & 3 stable zooming.	Scenario 1 & 3 occasionally report both cells and 2 nd cell doesn't list full capture. Potentially only listing safest option. Scenario 2 consistent and only lists one cell.
C	1	See Annex B Figures 2, 5, 6 & 9		
	2	See Annex B Figures 5, 6 & 9		
	3	See Annex B Figures 5, 6 & 9		
	Comments	Generally pans ok but inconsistent as to which cell is displaying at the edges and at what point it changes. Both cells listed in Pick report at edge.	Display of cells change as zoom in and out of cell at the edges for scenario 1 & 2. More stable in the centre of the cell. Scenario 3 zoomed as expected.	Reports items from displayed cell except in edge of cell. The cell varies due to panning and zooming issues but pick report is accurate. Where duplicated reports in full.
D	1	See Annex B Figures 4, 7, 8, 10 & 11	See Annex B Figures 7, 8, 17 & 18	See Annex B Figures 10, 11, 13, 14, 15 & 16
	2	See Annex B Figures 7 & 8	See Annex B Figures 7 & 8	
	3	See Annex B Figures 7 & 8	See Annex B Figures 7, 8, 19 & 20	
	Comments	Screen routinely 'blues out' whilst panning.	Screen routinely 'blues out' whilst zooming.	Scenario 1 & 3 occasionally report both cells and 2 nd cell doesn't list full capture. Potentially only listing safest option. Scenario 2 consistent and only lists one cell.
E	1	See Annex B Figure 3		See Annex B Figure 12
	2			
	3			
	Comments	Pan more stable but at cell limits multiple cells in Pick report. Pan in scenario 2 consistent.	Both cells regularly report in the pick, except in scenario 2 which only displays the dominant cell.	Example in scenario 1 where Pick report was empty. Scenario 2 stable and consistent. Scenario 3 regularly reports both cells in Pick report.
		Significant display issues	Some unexpected display or reporting issues but usable	Operating as generally expected – only minor issues

Results Summary (full results^{ic-enc} provide in documents)

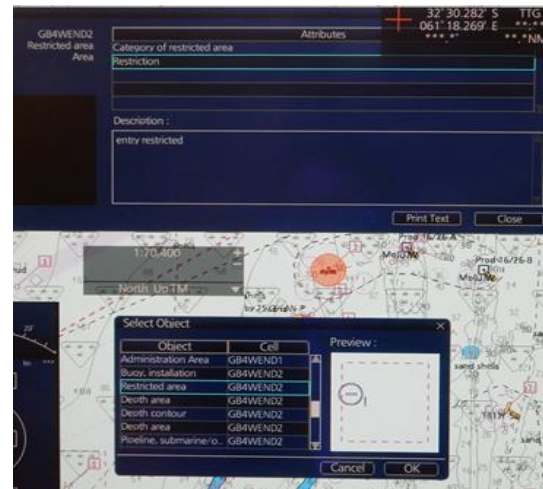
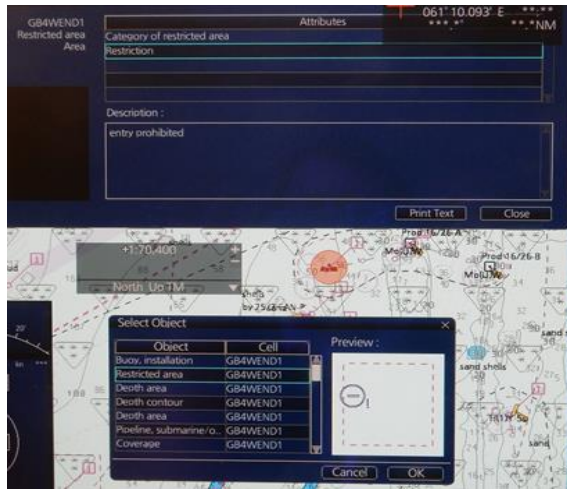
- Overlapping data has **erratic effects** on the display of the ENC's.
- There is **huge inconsistency between results** in different ECDIS,
- **Only one cell displayed on the screen** but often multiple cells could be viewed and interrogated in the Pick report.
- The main issues: **panning** across the screen and the **Pick report** details.
 - Panning across cells appears to work on complex algorithms ranging from percentage of cell covered, largest scale and even down to alphanumerical order.
- Overlapping Scenario 1 (**same scale, same usage band**) causes the most severe display problems.

Results (cont.)

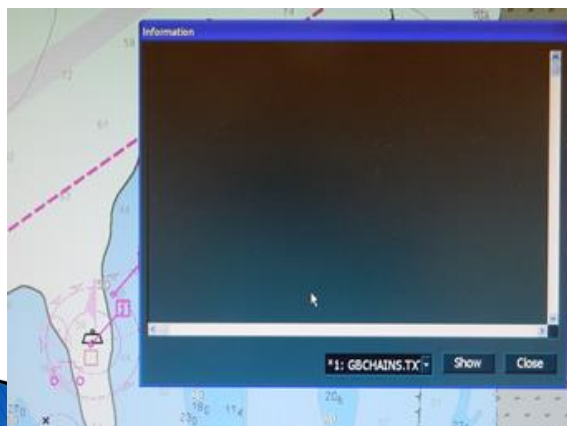


TSSLPT highlighted at 45k which remains highlighted but the screen turns blue when pan slightly to the south.

Results (cont.)



From the same Pick report - GB4WEND1 (left) displays RESARE with entry prohibited. GB4WEND2 (right) displays entry restricted.



A different ECDIS system shows a blank Pick report for the RESAREs.

Results (cont.)



ECDIS display differing depending on scale (56k, 59k, 62k & 68k)

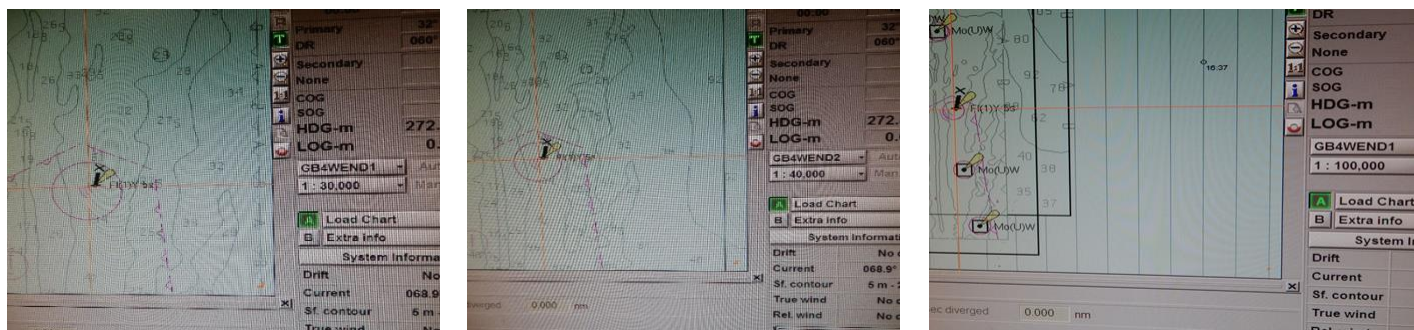


Chart displayed changing depending on viewing scale (30k GB4WEND1, 40k GB4WEND2, 100k GB4WEND1), both of the cells have the same compilation scale

‘Research’ to ‘Reality...’

- ▶ Impacts on ECDIS are clearly significant
- ▶ User feedback to problems encountered on overlapping data...

IC-ENC Senior Data Validator (customer feedback manager):

- ▶ “We have **no record** of any user feedback from users regarding problems with their ECDIS in areas of data overlap”

PRIMAR Director:

“In PRIMAR we have **no records of complaints from end users based on ENC overlaps.**”

Our network of distributors might have some more detailed feed-back, but that would take some time to collect.”

Jason Scholey, UKHO AVCS Product Manager: ic-enc

- ▶ “We have many thousands of users of AVCS - our ENC service. **Prior to around 2010, customer enquiries about ENC overlaps were relatively regular.** The vast majority were about the display of 2 ENC's at the same time, which resulted in an often unusable chart display with coastline and contours crossing in multiple locations. This caused particular problems with the display of the safety contour, which would be taken from both ENC's at once.
- ▶ **In more recent years, these enquiries have almost completely disappeared.** The most recent issues that we've seen with overlapping ENC's are when there is inconsistent content in the 2 cells, such as a different depiction of a TSS. In this case the screen shots supplied have shown a single ENC on the display. I have been responsible for AVCS throughout this period and I now can't remember the last time I saw a customer enquiry solely relating to overlapping ENC's.
- ▶ Having said that, overlaps are not good for customers. ECDIS adopt a range of strategies for choosing which ENC to present to the user, often driven by scale. **In the worst cases where the scales are the same there is often no way to predict which ENC will be shown and the user may not be able to choose.** Finally, any differences between the content of the overlapping ENC's can lead to **confusion**, which is never good on the bridge of a ship.”

What is the size of the problem?

- ▶ Is it nil? (based on lack of customer feedback)
- ▶ Is it huge? (based on the research)
- ▶ Is it somewhere in the middle?
- ▶ ...What does WENDWG deem an 'acceptable size of problem' / 'acceptable risk' ?

Action to take?

- ▶ WENDWG view of 'chance of success'
- ▶ Amount of effort, its importance, its urgency
- ▶ An action plan Or not

Summary

- The only way to **eliminate the potential for a problem completely** is for producing nations to work together to remove all overlaps.
- Hydrographic Offices should not expect, nor rely, on the ECDIS OEM's to solve the problem...
 - But, technical solutions will help.
 - New guidance/rules to OEMs (Pres Library v4) is to inform user of an overlap (but open to each OEM how to encode) and to just display one ENC...but which one? Are HOs content to let a machine decide?
 - This is a topic where Political and Technical aspects must be considered together

Summary (cont)

- RENCs (and others) can actively assist in preventing ‘accidental’ overlapping data (and this is happening effectively).
- RENCs (and others) can actively assist in reducing the risk where overlaps continue to exist (alignment of content etc)
- It is beyond the remit of RENCs to legislate/act/resolve/arbitrate in areas where overlapping data is the result of politics

IC-ENC requests WENDWG:

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1. Considers the implications of this paper at WENDWG6 (March 2016).
2. If WENDWG6 discussion supports it, widen the audience of this paper:
 - a) The WENDWG submits, with any additional commentary, to ENCWG for their comment.
3. Agree any other next steps for this investigation.
4. Circulate the paper to the ECDIS OEMs that have been tested, for direct comment.
 - a) Other OEMs too?
5. Extend the definition of an ENC 'overlap', to include Scenario 2 (Same Scale, Different Usage Band).

Extension to definition – 28

CELLNAME	SCALE	USAGE BAND	overlaps	CELLNAME	SCALE	USAGE BAND
C1515374	22000		5	CN483102	22000	4
CA370368	40000		3	US5WA45M	40000	5
CA370518	40000		3	US5AK4NM	40000	5
MY4C5123	22000		4	SG5C4038	22000	5
MY4C5403	22000		4	MY5C5403	22000	5
MY4C6130	22000		4	SG5C4038	22000	5
MY4C6130	22000		4	SG5C4044	22000	5
CA473439	15000		4	CA573412	15000	5
GB200707	700000		2	IN121MTB	700000	1
GB200707	700000		2	IN122MCC	700000	1
GB202738	700000		2	IN122MCC	700000	1
GB202851	700000		2	IN121MTB	700000	1
GB241250	700000		2	IN121MTB	700000	1
GB241400	700000		2	IN121MTB	700000	1
IN141ANI	700000		1	TH200362	700000	2
AU409127	180000		4	ID300329	180000	3
DK2FO80A	180000		2	GB301234	180000	3
DK2SKARK	180000		2	NO3B0416	180000	3
FR372550	180000		3	GB233200	180000	2
GB232600	180000		2	GB302634	180000	3
GB233200	180000		2	GB302633	180000	3
GB403313	90000		4	TR300143	90000	3
GB203552	1500000		2	JP13UV10	1500000	1
GB203552	1500000		2	JP13UV20	1500000	1
GB203552	1500000		2	JP13UV30	1500000	1
GB203552	1500000		2	JP148NH0	1500000	1
GB203552	1500000		2	JP148NI0	1500000	1
GB203552	1500000		2	JP148NJ0	1500000	1

Discussion questions

- ▶ What is the size of problem now (to the user)?
 - Nil? Huge? Somewhere inbetween?
- ▶ What size does WENDWG consider 'acceptable'?
- ▶ What is WENDWG view of 'Chance of success'?
- ▶ Do we do anything? If so, what is the Action Plan?

- ▶ Do we extend the definition? (28 'new cases')
- ▶ Do we widen the audience?
 - ENCWG first (next week)
 - Do we include others?: e.g. OEMs

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