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Best standardized nautical information for safe navigation in ports - the Port ENC!

Results of the integrated EU research project EFFORTS - work package 1.3 - Port ECDIS.

EFFORTS

June 21th - 23th 2010, Quebec – Canada

Dieter Seefeldt (Ret.)

Canadian Hydrographic Conference 2010 June 21-23 City of Québec, Quebec, CANADA

The EFFORTS project

A general remark:

- **Port ECDIS** was the EFFORTS work package synonym → we defined a proposal for new **Port ENC (PENC)** standard and data set!!

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The EFFORTS project

Project acronym: **EFFORTS**
Project title: **Effective Operation in Ports**

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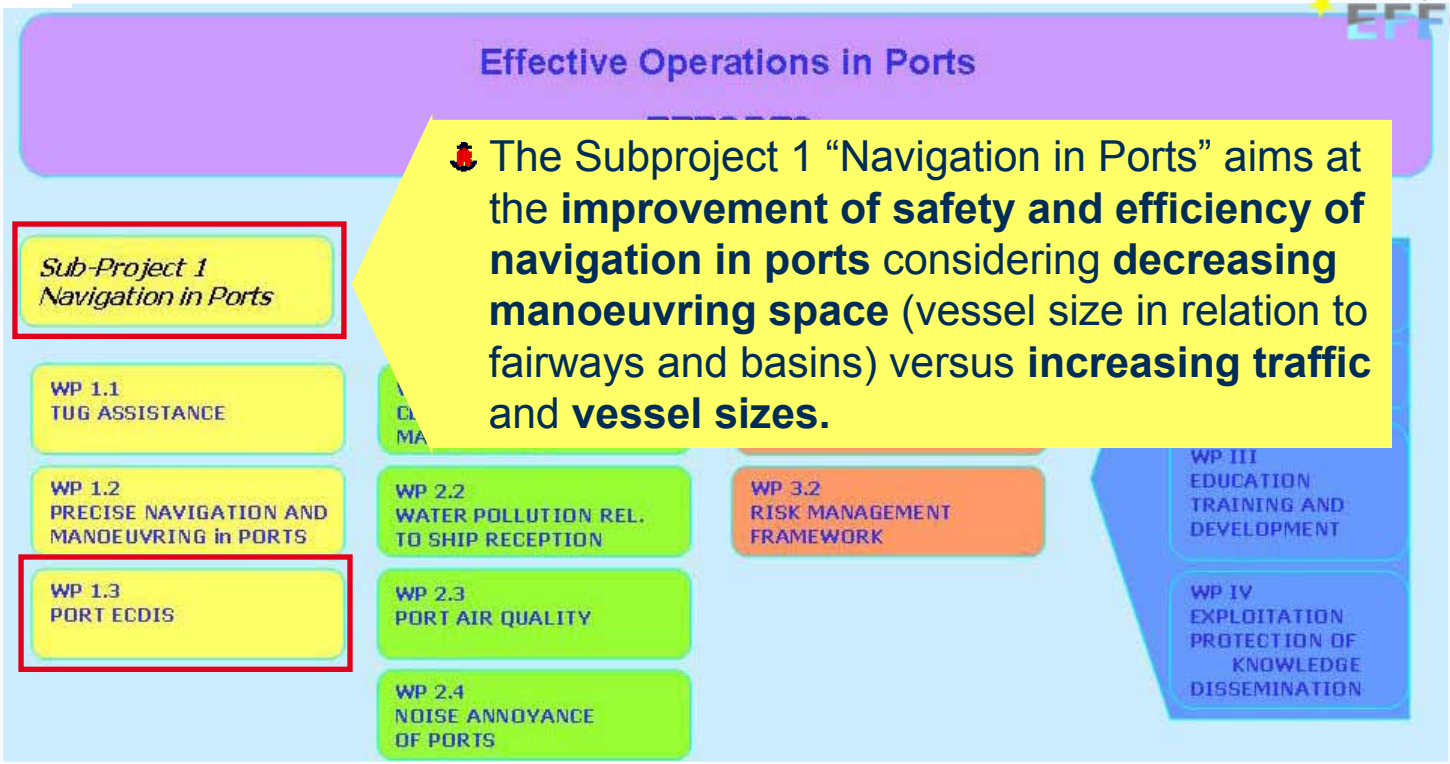

- The Subproject 1 “Navigation in Ports” aims at the **improvement of safety and efficiency of navigation in ports** considering **decreasing manoeuvring space** (vessel size in relation to fairways and basins) versus **increasing traffic** and **vessel sizes.**

The Port ECDIS story starts with the question:

„Why a Port ECDIS?!“

Why a Port ECDIS – Port ENC?!

- Ports are the hubs of global trade
- and the most challenging areas with the highest level of special requirements regarding safe and ease of navigation, manoeuvring, berthing etc.
- including the highest level of special requirements of Harbour Masters, pilots, ship's officers, transport execution and port maintenance have,
- that should be fulfilled by the **Port Hydrographer**!! That‘s a real challenge!
- **Because safe and efficient arrival/departure for ships and their cargo is most crucial for ports!**

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Why a Port ECDIS – Port ENC?!

- Increase of vessel sizes,
- less harbour and manoeuvre space,
- Minimum Under Keel Clearance and
- special requirements for minimum dredging
- call for the highest level of accuracy and reliability of digital chart information for navigation in fairways and ports currently not being met by equipment according to **SOLAS V Carriage requirements!**

Very Large Container Carrier (VLCCs)

Very Large Cruise Liner

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Why a Port ECDIS – Port ENC?!

ship operations in ports

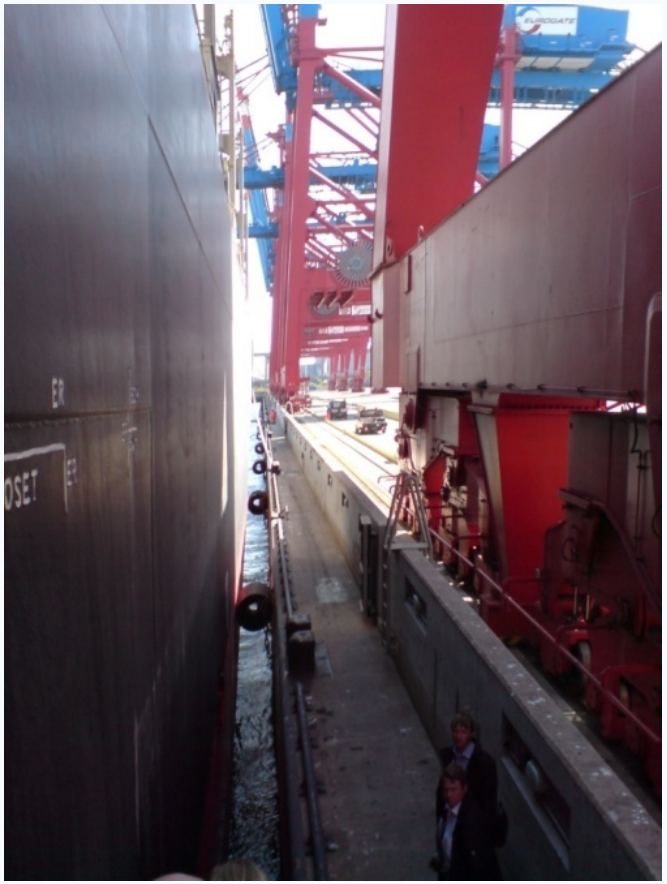
docking

Why a Port ECDIS – Port ENC?!

less manoeuvre space

bulk vessel berthing

Hasenpusch / Hafen Hamburg



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Why a Port ECDIS – Port ENC?!

less manoeuvre space

bulk vessel
turning and docking

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Why a Port ECDIS – Port ENC?!

- Masters and pilots approaching a seaport use an **Electronic Chart Display and Information System (ECDIS)**, which **meets IMO/SOLAS V carriage requirements** by using official **maritime ENC's** to obtain the required navigational information they need.
- The common **IHO ECDIS standard for maritime ENC's** supports navigation in the open sea, coastal areas and in seaports (like the Port of Hamburg)
- The **Inland ECDIS standard** for **Inland ENC's (IENCs)** was developed for navigation on inland waterways and uses the same accuracy and quality definitions like the **maritime ECDIS standard**

- but **without meeting the requirements ports have** regarding precise navigational, manoeuvring, berthing, turning, docking, maintenance, up to-date-ness, scale and accuracy aspects!

Why a Port ECDIS – Port ENC?!

- **Port ENC** requirements for navigation, maneuvering and for the port maintenance go far beyond the current **maritime ECDIS** and **Inland ECDIS** standards regarding:
  - **up-to-dateness**
  - **quality**
  - **accuracy**
  - **large scale charts**
  - **chart features/objects and attributes**
  - **and reliability**

  of hydrographic data (Bathymetry) and geographic data (Topography).

Hasenpusch / Hafen Hamburg

Why a Port ECDIS – Port ENC?!

- For Port operations, there are special requirements for
  - **vertical and horizontal accuracy**.
- This is achieved by
  - **using modern sensor technology**.

- The **same accuracy must be inherent in the underlying electronic charts.**
- This type of source data (e.g., topography and hydrographic data) should be made available by the Port Authorities
  - using a standardized data format → **Port ENC standard**.

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Why a Port ECDIS – Port ENC?!

- At present, there is **no standard or extensions** considering the special requirements of port operations!
- That **call for a specific "Port ECDIS" → Port ENC.**

A Port ENC is needed!! **→ result of the Port ECDIS questionnaire**

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Why a Port ECDIS – Port ENC?!

- The **Port ENC standard** should be an
  - independent but complementary standard to **maritime ENC and Inland ENC.**
- The development of a **Port ENC standard** focuses on high precision operations in ports.
- A **Port ENC** intended to align with the ongoing developments for **maritime** and **Inland ENCs**.
- **Port ENC** data should serve as the missing link between **maritime** and **Inland ENCs**.

Why a Port ECDIS – Port ENC?!

- Using a **Port ENC** as the base, it's possible to overlay other types of information to improve the
  - interoperability of harbour-related tasks.
  - Ships – maneuvering and docking by Pilots using Portable Piloting Units (PPUs) including the Port ENCs
  - Port Authority – dredging and maintenance activities at channels, piers and terminal facilities can use the PENC
  - …

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Why a Port ECDIS – Port ENC?!

- **Port ENC** data are not only used onboard but also in:
  - Vessel Traffic Management and Information Systems (VTMIS)
  - Route planning application
  - Marine Simulators (ship handling, tug simulator…), Training
  - Port Planning…
  - …
- Besides ECDIS more and more applications have been developed, they are use ENCs (Electronic Navigational Chart) as backdrop information
- And on base of ECDIS technology (→GIS) it will be possible to link, combine or overlay other information to improve the interoperability of harbour related tasks.

IHO Standards (S-57 & S-44)

IHO Standards (S-57 & S-44)

- **IHO Standards do not provide significant topographic source data for integration in ENCs.**
- **No dedicated accuracy requirements are defined that apply for different navigational purposes / categories (e.g., port operations)**
- Within **ENCs** and **Inland ENC's**, the IHO S-57 **Zone of Confidence (ZOC) assessment is used to describe the quality of bathymetric data,**
- **but is not used for topographic data!**

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IHO Standards (S-57 & S-44)

1.Co.34 Replace the existing ZOC table and the associated comments with the following:

"ZOC Table:

S57 ECDIS definitions (Zone of Confidence - bathymetry)

1	2	3		4	5
ZOC [1]	Position Accuracy [2]	Depth Accuracy [3]		Seafloor Coverage	Typical Survey Characteristics [5]
A1	± 5 m	=0.50 + 1%d		Full area search undertaken. All significant seafloor features detected [4] and depths measured.	Controlled, systematic survey [6] high position and depth accuracy achieved using DGPS or a minimum three high quality lines of position (LOP) and a multibeam, channel or mechanical sweep system.
		Depth (m)	Accuracy (m)		
		10 30 100 1000	± 0.6 ± 0.8 ± 1.5 ± 10.5		
A2	± 20 m	= 1.00 + 2%d		Full area search undertaken. All significant seafloor features detected [4] and depths measured.	Controlled, systematic survey [6] achieving position and depth accuracy less than ZOC A1 and using a modern survey echosounder [7] and a
		Depth (m)	Accuracy (m)		
		10 30	± 1.2 ± 1.6		

highest level

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S44 Ed. 5 new - Minimum Standards for Hydrographic Surveys - February 2008

Minimum Standards for Hydrographic Surveys

(To be read in conjunction with the full text set out in this document.)

Reference	Order	Special	1a	1b	2
Chapter 1	**Description of areas.**	Areas where under-keel clearance is critical	Areas shallower than 100 metres where under[illegible] is less crit[illegible] *features* of concern to surface shipping may exist.	Areas shallower than 100 [illegible]s where a general [illegible]n of the sea floor is be an issue for the type of surface shipping expected to transit the area.	Areas generally deeper than [illegible]s where a general [illegible]n of the sea floor is considered adequate.
Chapter 2	**Maximum allowable THU 95% *Confidence level***	2 metres	5 metres + 5% of depth	5 metres + 5% of depth	20 metres + 10% of depth
Para 3.2 and note 1	**Maximum allowable TVU 95% *Confidence level***	a = 0.25 metre b = 0.0075	a = 0.5 metre b = 0.013	a b	
Glossary and note 2	***Full Sea floor Search***	Required	Required		
Para 2.1 Para 3.4 Para 3.5 and note 3	***Feature Detection***	Cubic *features* > 1 metre	Cubic *features* > 2 metres, in depths up to 40 metres; 10% of depth beyond 40 metres		
Para 3.6 and note 4	**Recommended maximum Line Spacing**	Not defined as *full sea floor search* is required	Not defined as *full sea floor search* is required	3 m F sp	
Chapter 2 and note 5	**Positioning of fixed aids to navigation and topography significant to navigation. (95% *Confidence level*)**	2 metres	2 metres	2 metres	5 metres
Chapter 2 and note 5	**Positioning of the Coastline and topography less significant to navigation (95% *Confidence level*)**	10 metres	20 metres		
Chapter 2 and note 5	**Mean position of floating aids to navigation (95% *Confidence level*)**	10 metres	10 metres	10 metres	20 metres

used for the Port of Hamburg

S57 ECDIS ZOC +/- 5m
versus
IHO S44 Special Order
+/- 2m

Mismatch between IHO S57 ECDIS Requirements and S44 Special Order!

quay walls, bridges, locks etc. ?!

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IHO Standards (S-57 & S-44)

- One example is the **official ENC of Hamburg.**
  - Produced and issued by BSH (Federal Maritime and Hydrographic Agency / Germany),
  - it meets all the relevant ENC related standards and **fulfills the requirements for maritime navigation,**
    - but the ENC is too small in scale,
    - does not have any bathymetric detail,
    - not showing up-to-date information
    - and poorly defined horizontal accuracy for topographic features such as quay walls, piers, pontoons, etc.

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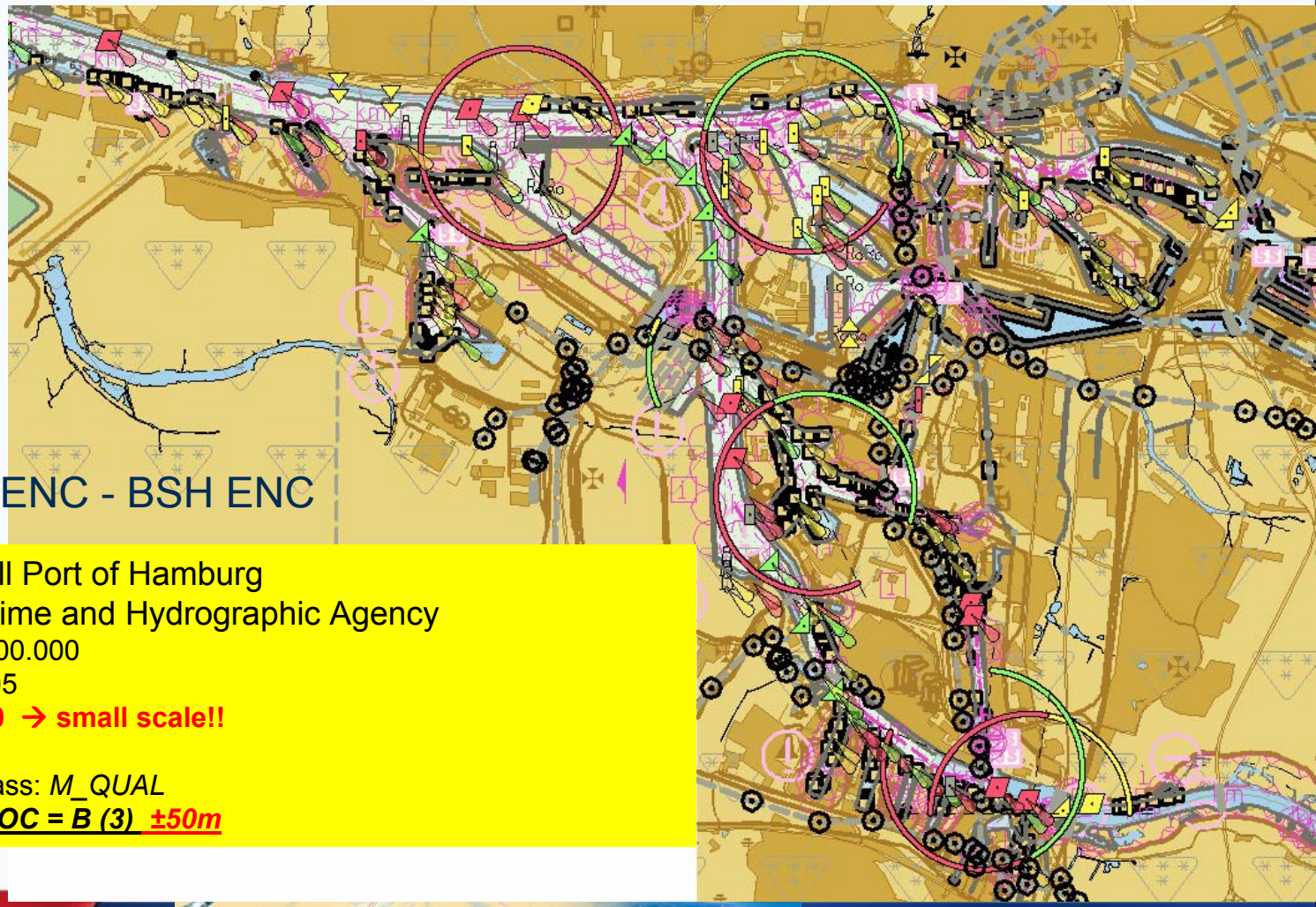
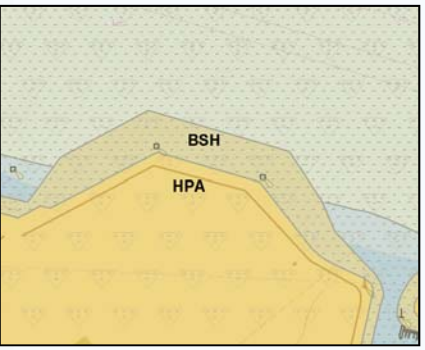
Comparison
HPA Basis Port ENC - BSH ENC

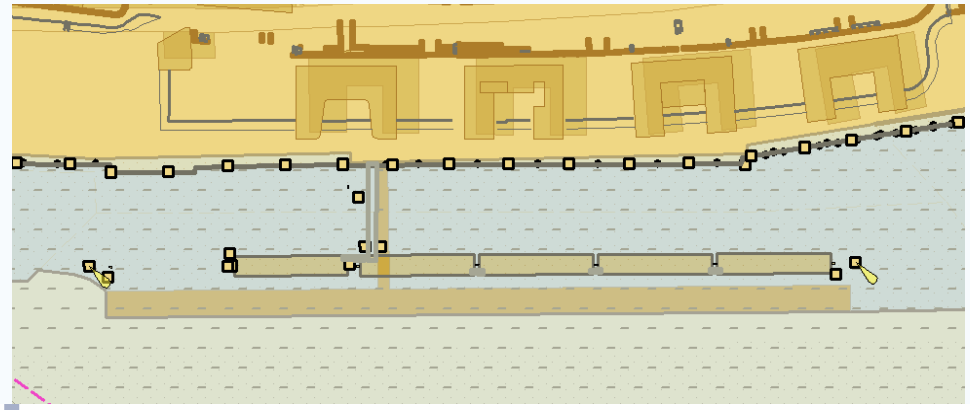


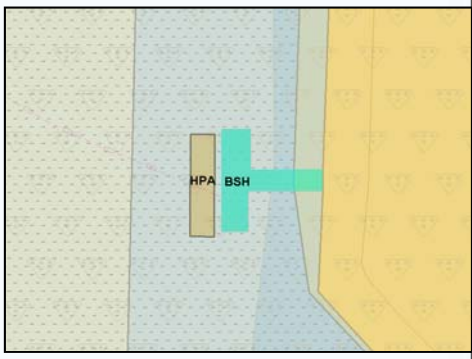
BSH ENC-cell Port of Hamburg
Federal Maritime and Hydrographic Agency
name: DE521500.000
date: 27.05.2005
scale: 1:15 000 → small scale!!
accuracy:
S-57 Object Class: *M_QUAL*
attribut: *CATZOC = B (3)* *±50m*

IHO Standards (S-57 & S-44)

- Comparison the official maritime ENC and the Port ENC







		Differences HPA - BSH		
		East (m)	North (m)	Distance (m)
Fixed marks / navigational aids	Average	-0,01	0,01	0,01
	MIN	-0,19	-0,62	0,02
	MAX	0,15	0,56	0,62
Quay wall corner	Average	-4,75	-3,65	7,79
	MIN	-13,93	-17,15	2,42
	MAX	6,84	4,35	17,67
Pontoon corner	Average	1,60	-2,89	8,05
	MIN	-11,00	-11,69	3,84
	MAX	10,42	19,74	22,30

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IHO Standards (S-57 & S-44)

- Comparison the official maritime ENC and the Port ENC

- **Result:**

- **the official maritime ENC is not suitable for special operations within the port area**
- **the official BSH - ENC has a different purpose to meet (usage band 5 - harbour)!**

The EFFORTS Work Package 1.3 - Port ECDIS - tasks

The EFFORTS Work Package 1.3 - Port ECDIS - tasks

- **Task 1 – Potential user requirements → structured questionnaire**
- **Task 2 - Port ENC - Technical specification**
  - accuracy; precision of topography and aids of navigation; special new Port ENC objects (features and attributes); precise 3D depth information using Digital Terrain Models (DTM) technologies; 3D reference DTM (the Channel Reference Model CRM)
- **Task 3 – Prototype of a Port ENC**
  - **Port ENC dataset of the Port of Hamburg,** including precise **Port ENC chart data**, so named **gridded bathymetry** (in BAG format), **bathymetric ENC's** (bENC) and a **3D channel reference model** (CRM).
- **Task 4 – Testing of prototype(s)**
  - Tests on board of a **HPA survey vessel;** test using a **PPU on board of a container vessel,** functional tests **onboard of a Trailer Suction Hopper Dredger (TSHD)** and during **docking process of a cruise liner .**

The EFFORTS Work Package 1.3 - Port ECDIS - tasks

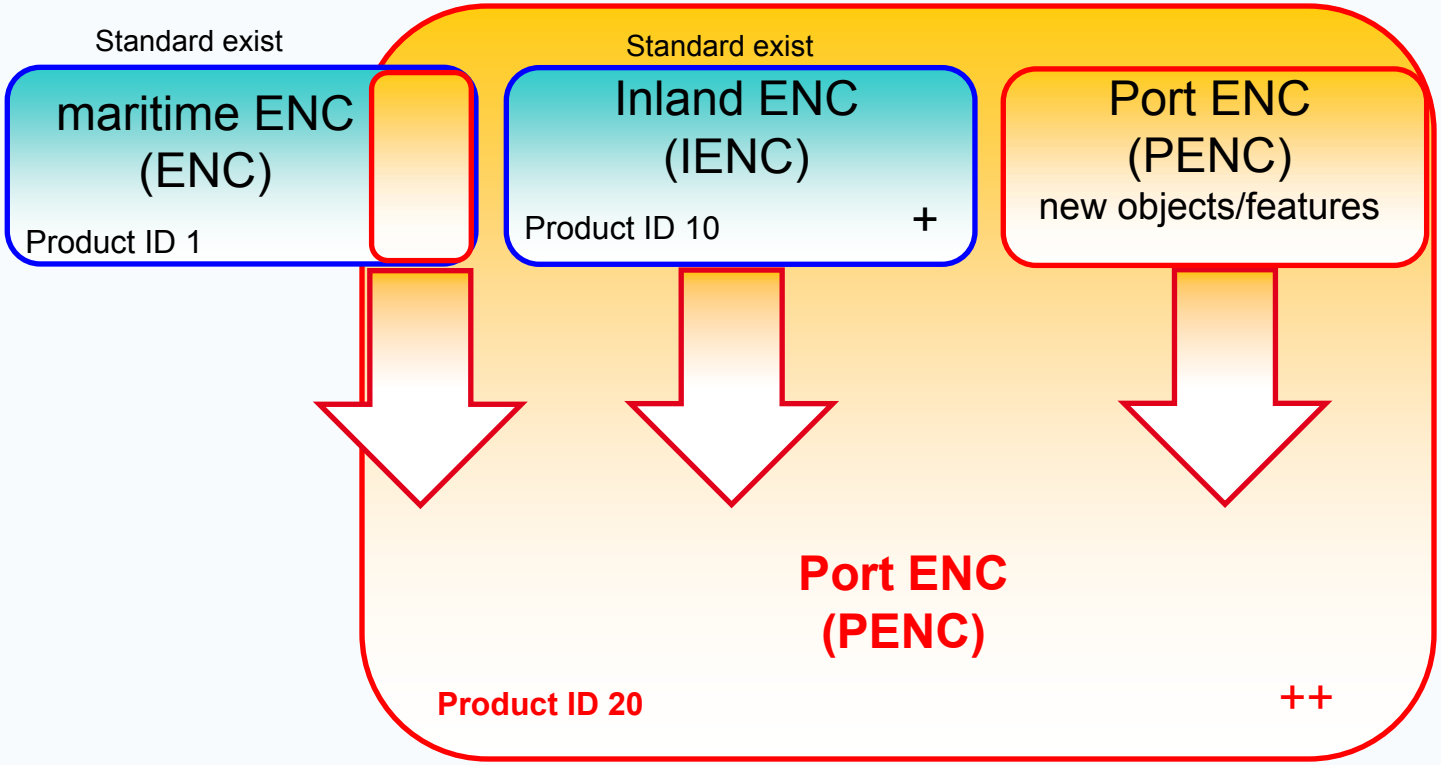
- **Task 5 – Defining requirements for follow-up developments and standardization (Port ENC - Roadmap).**
  - The Port ENC can be used as base information within a PORTIS (Port Information System) which also includes AIS, Radar, VTMIS, Route Planning, dredging information, river and port basin maintenance information, current and velocity, tidal information etc. Follow-up work to enhance the prototype, widen its application and organise standardisation was described.
  - Port ENC can also be used in Marine Simulators (ship handling, tug simulator…)

- **The outcome should be a proposal and comprehensive concept as basis and input for European / international standardization proved by validation and functional tests in the Port of Hamburg.**

The EFFORTS Work Package 1.3 - Port ECDIS results

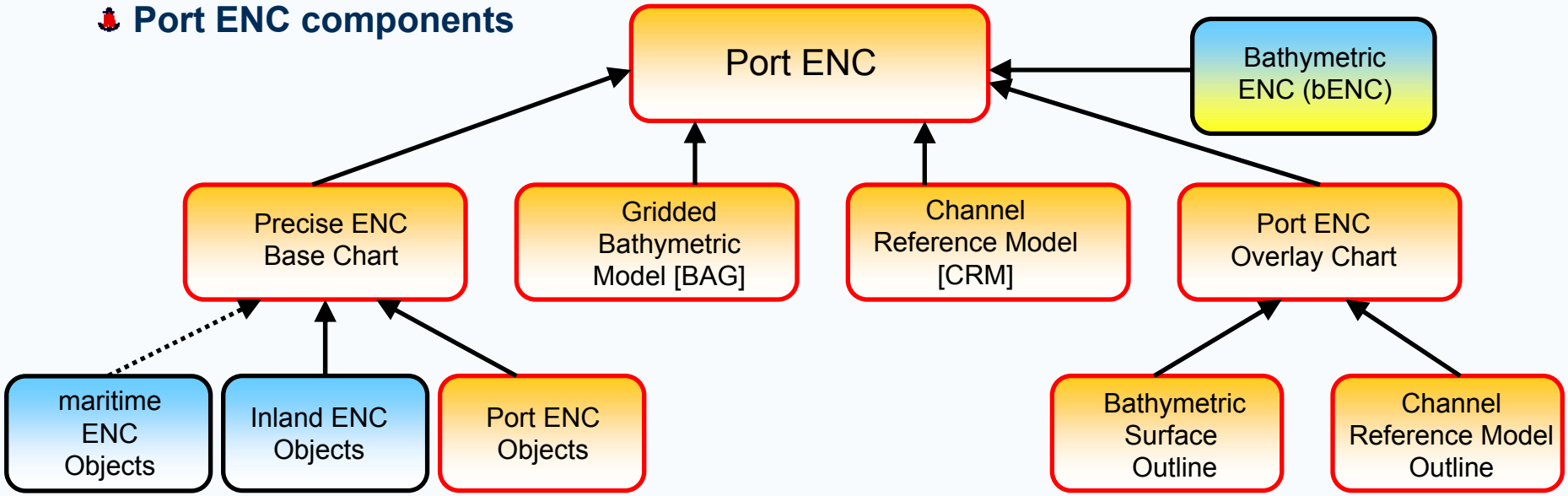
The EFFORTS Work Package 1.3 - Port ECDIS results

- **Gradation of the S-57 ENC products**



The EFFORTS Work Package 1.3 - Port ECDIS results

Port ENC components



As part of the EFFORTS project, there are a number of new port specific objects, as well as requirements for the accuracy of these objects. These new requirements will ensure that the Port ENC makes the most accurate data available to the port users.

The use of gridded bathymetry, channel outlines and channel depth model data will allow the users of the Port ENC to have an accurate and up to date 3 D information of the depth situation within the port. This will improve both, safety of navigation as well as port maintenance.

The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.1 Potential users and requirements (structured questionnaire, study)**
- **D 1.3.2 Port ENC specification (documents)**
- **D 1.3.3 Port ENC prototype (software and dataset)**
  - **including a Port ENC viewer**
- **D 1.3.4 Tests with Port ENC prototype (based on basic dataset) and evaluation of tests (report)**
- **D 1.3.5 Port ENC follow-up requirements (document)**

The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.1 Potential users and requirements (structured questionnaire, study)**
- **Result:**
  - All the answers are reflecting exact the impression we had and why we are thinking, a **precise Port ENC is necessary and a benefit** for port navigation, manoeuvring and maintenance work!
  - For Port operations a new port related dataset, a **Port ENC,** is needed and required (known request and the result of the **Port ECDIS questionnaire**).

The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.1 Potential users and requirements (structured questionnaire, study)**
- **What is left uncovered?**
  - **high accuracy charts** (for using RTK-DGPS, local RTK - DGPS services deliver cm accuracy, position must fulfil or be better than IHO - S44 Special Order)
  - **large scale information** (1:500 up to 1:5000) with up to date information including special objects / features for port navigation and operation such as e.g. fenders etc.
  - **3 D possibilities** (Grid / Raster / TIN)
  - a designed / constructed channel **reference model (CRM)** e.g. for dredged areas.

The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.2 Port ECDIS (Port ENC) specification (documents)**
  - **Definition of present Data Quality in Standards used for ENC data (S57 versus S44 standard)**

Study about data quality in the following standards:

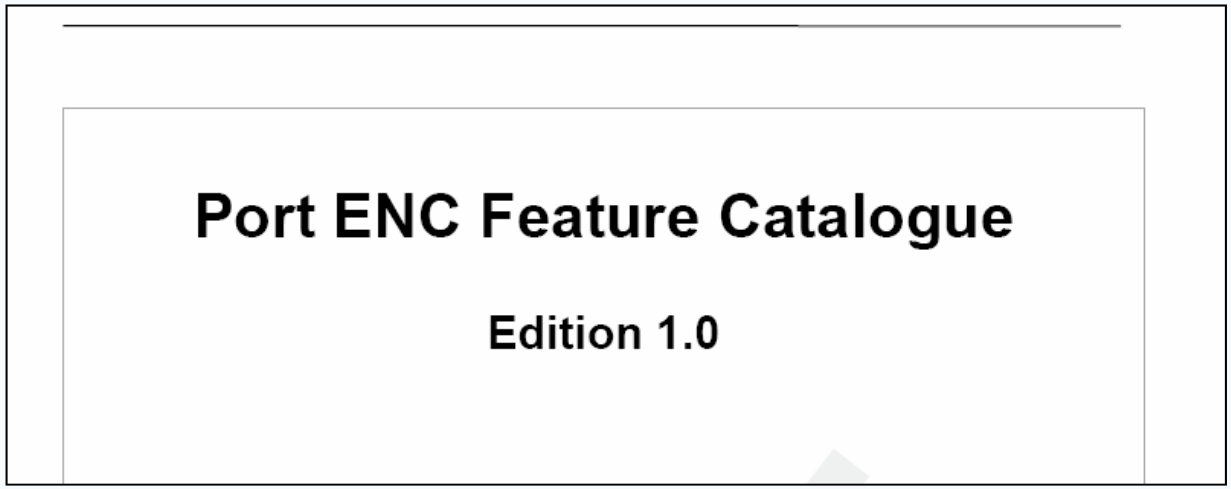
- IHO maritime ECDIS
- Inland ECDIS
- IHO S44 - Standards for Hydrographic Surveys

Definition of Data Quality in Standards used for ENC Data

EC FP6 project Efforts WP 1.3 Port ECDIS

The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.2 Port ECDIS (Port ENC) specification (documents)**
  - **Port ENC Feature Cataloque - description of the Port ENC features**



The EFFORTS Work Package 1.3 - Port ECDIS results

- **Port ENC bathymetric data quality – suggestion → CATZOC → accuracy**

Object Class: **Accuracy of ENC data**

Acronym: **m_aenc**

Set Attribute_A: **batacc**; **topacc**;
Set Attribute_B: INFORM; NINFOM; **ntxtds**; **txtdsc**;
Set Attribute_C: RECDAT; RECIND; SORDAT; SORIND;

The attribute batacc is from the type "enumerated". There is one attribute value, this value is based on the IHO Standards for Hydrographic Surveys (Special Publication N° 44 Ed.5) and be called Special.

S44 Ed. 5 (new)

Minimum Standards for Hydrographic Surveys

February 2008

Hydrographic survey

batacc

ID	Meaning	Max. allowable THU	Max. allowable TVU
1	Special	±2 m	a = 0.25 m b = 0.0075

Tab.1: allowable uncertainty for bathymetric data

represents the IHO S44 SO

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Port ENC geo-/topographic data quality – suggestion → CATZOC → accuracy**

topacc Zone A

ID	Meaning	Object class	Positional accuracy	Vertical accuracy	Group
1	Zone A	(BCNCAR), (bcncar), (BCNISD), (bcnisd), BCNLAT, bcnlat, (BCNSAW), (bcnsaw), (BCNSPP), (bcnspp), **bridge**, **cblohd**, clrseg, DRYDOC, FLODOC, flodoc, GATCON, gatcon, HULKES, hulkes, lokbsn, MORFAC, PILPNT, **pipohd**, PONTON, ponton, PYLONS, SLCONS, slcons	± 0,1 m	**± 0,1 m**	Fixed object relevant for berthing, docking and lock passage
		berths, BUISGL, HRBFAC, hrbfac, LNDMRK, NAVLNE, (RADLNE), RADSTA, RESARE, resare, (RSCSTA), RTPBCN, SILTNK, sistat, sistaw	± 0,5 m	**± 0,5 m**	Fixed object relevant for navigation (maneuver-ing, turning, towage)

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Port ENC geo-/topographic data quality – suggestion → CATZOC → accuracy**

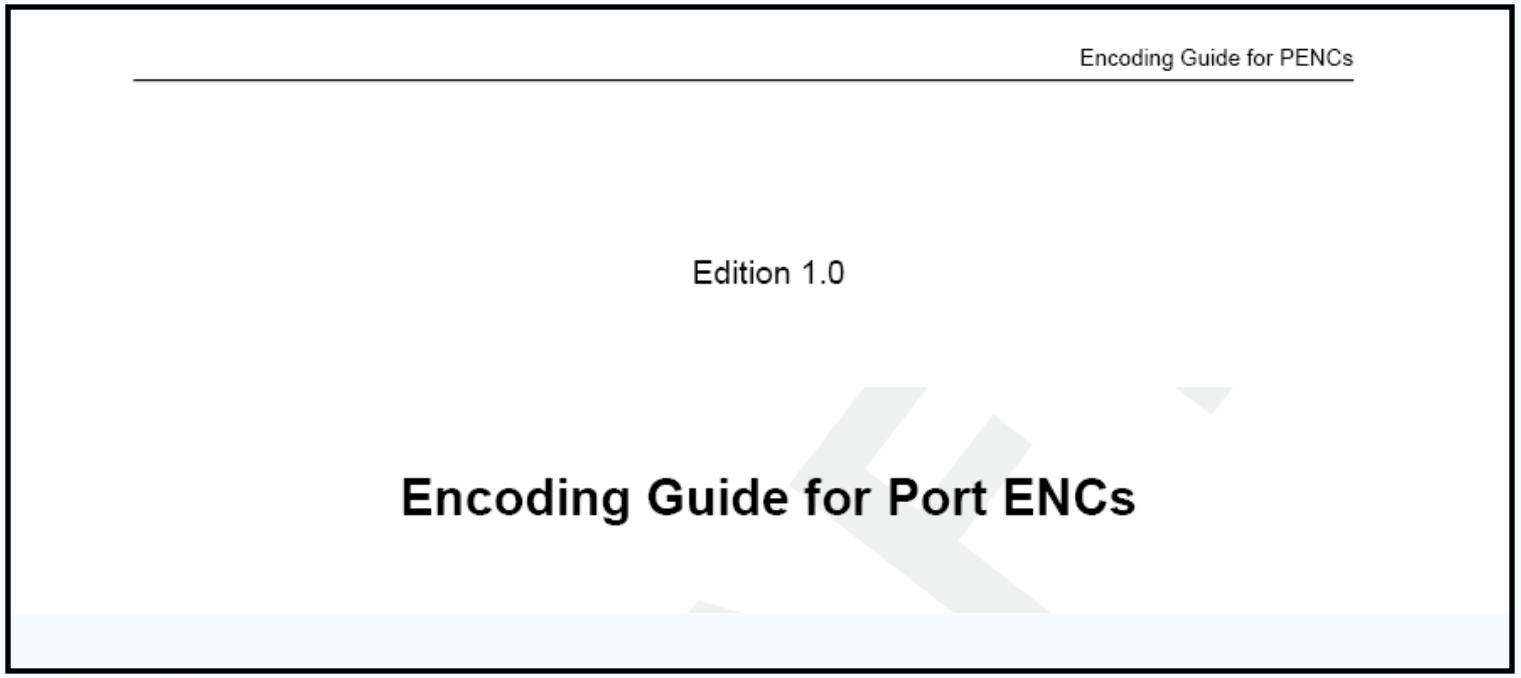
topacc Zone B

ID	Meaning	Object class	Positional accuracy	Vertical accuracy	Group
2	Zone B	(BCNCAR), (bcncar), (BCNISD), (bcnisd), BCNLAT, bcnlat, (BCNSAW), (bcnsaw), (BCNSPP), (bcnspp), **bridge**, **cblohd**, clrseg, DRYDOC, FLODOC, flodoc, GATCON, gatcon, HULKES, hulkes, lokbsn, MORFAC, PILPNT, **pipohd**, PONTON, ponton, PYLONS, SLCONS, slcons	± 0,5 m	**± 0,5 m**	Fixed object relevant for berthing, docking and lock passage
		berths, BUISGL, HRBFAC, hrbfac, LNDMRK, NAVLNE, (RADLNE), RADSTA, RESARE, resare, (RSCSTA), RTPBCN, SILTNK, sistat, sistaw	± 2,5 m	**± 2,5 m**	Fixed object relevant for navigation (maneuver-ing, turning, towage)

Tab.2: The characteristic of the attribute "Accuracy of topographic data"

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Port ENC encoding guide**
  - representation and
  - symbolisation



The EFFORTS Work Package 1.3 - Port ECDIS results

Port ENC encoding guide

Contents

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Port ENC encoding guide → CATZOC → accuracy**
  - representation and
  - symbolisation

Port ENC highest quality level →

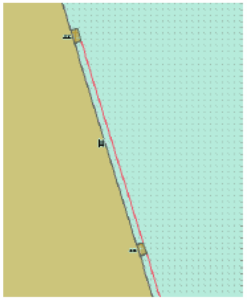
Port ENC second highest quality level →

ID		S-52 representation
bathymetric	topographic	
1	1	
1	2	

Tab.3: S-52 representation for the meta object "Accuracy of ENC data"

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Port ENC encoding guide**
  - representation and
  - symbolisation

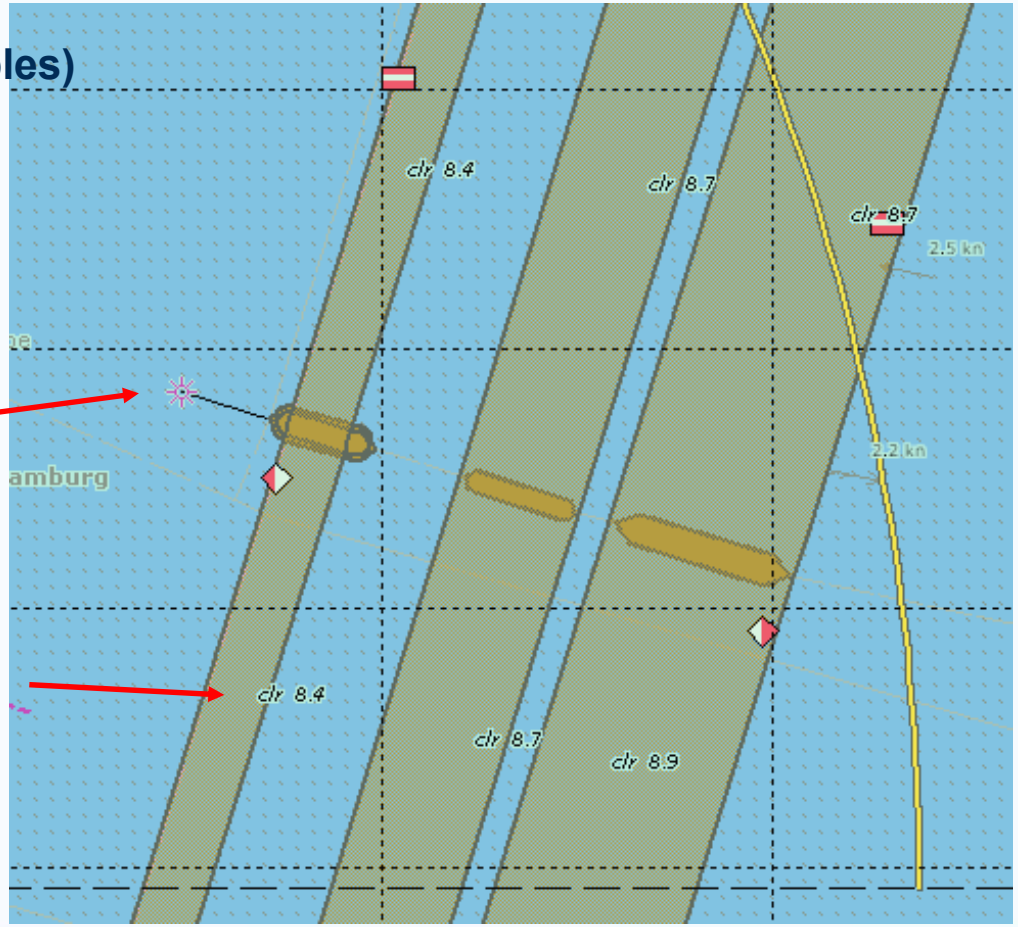
G - Ports, Waterways		
G.2 Hydraulic Structures in General		
G.2.10 Fender line (O) A theoretical line that shows the pilot the connection between the leading edges of the fenders for mooring and berthing manoeuvres. (HPA, Port ECDIS Requirements 1.3).		
Graphics	Encoding Instructions	Object Encoding
PENC Symbolisation 	A) The fender line and fenders should be associated using a C_ASSO collection object (refer to "The Use of the Object Catalogue for ENC" 15. Collection objects).	**Object Encoding** **Object Class =** slcons (L) (M) catslc = [21 (fender line)] (O) SCAMIN = [12000] (C) SORDAT = [YYYYMMDD] (C) SORIND = (Refer to IEHG EG 1.3.1, Section B, General Guidance) (C) verdat = [3 Mean Sea Level), 5

The EFFORTS Work Package 1.3 - Port ECDIS results

- **new Port ENC objects (examples)**

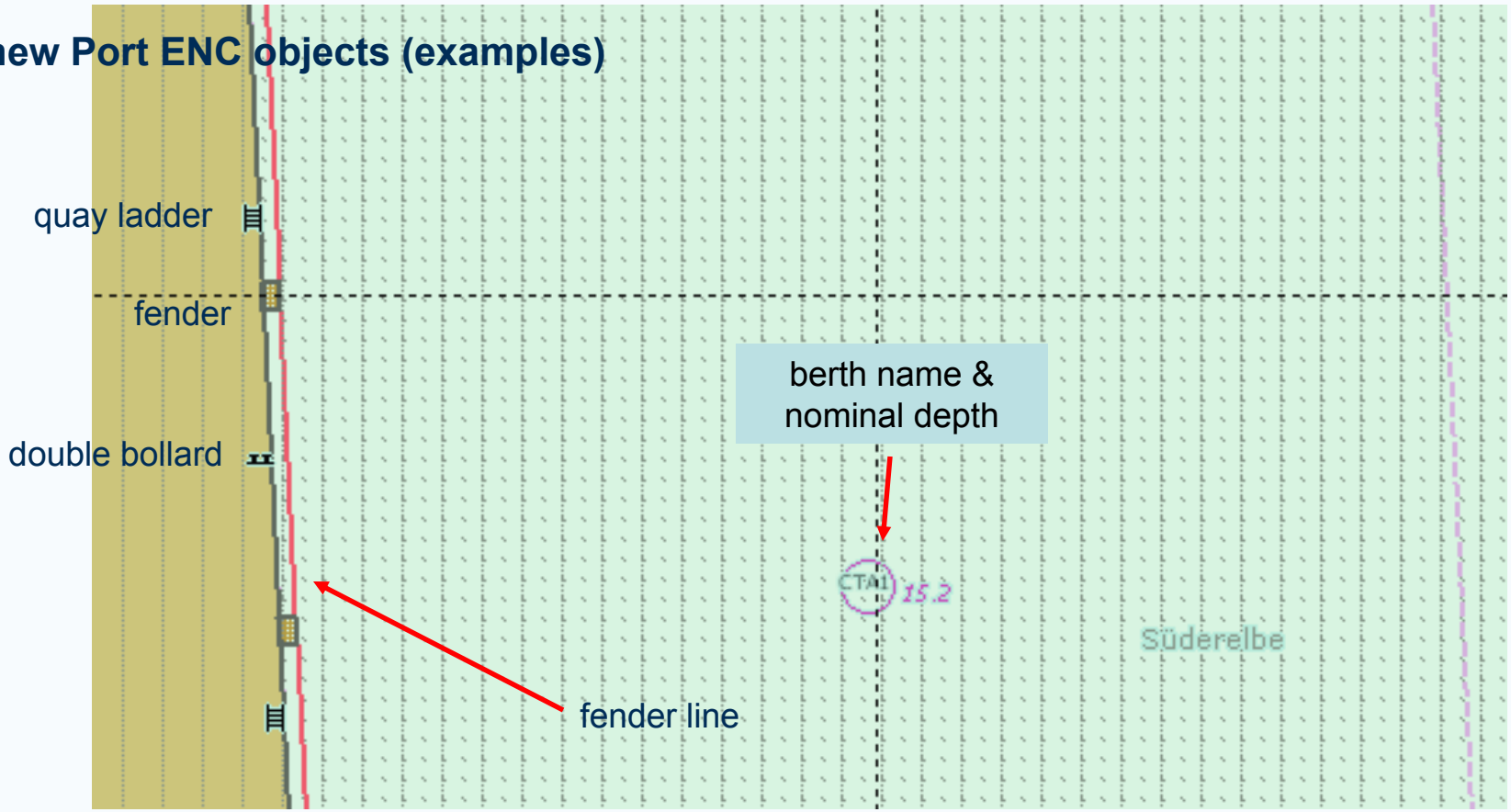
connection rod
and radar refector

bridge clearance



The EFFORTS Work Package 1.3 - Port ECDIS results

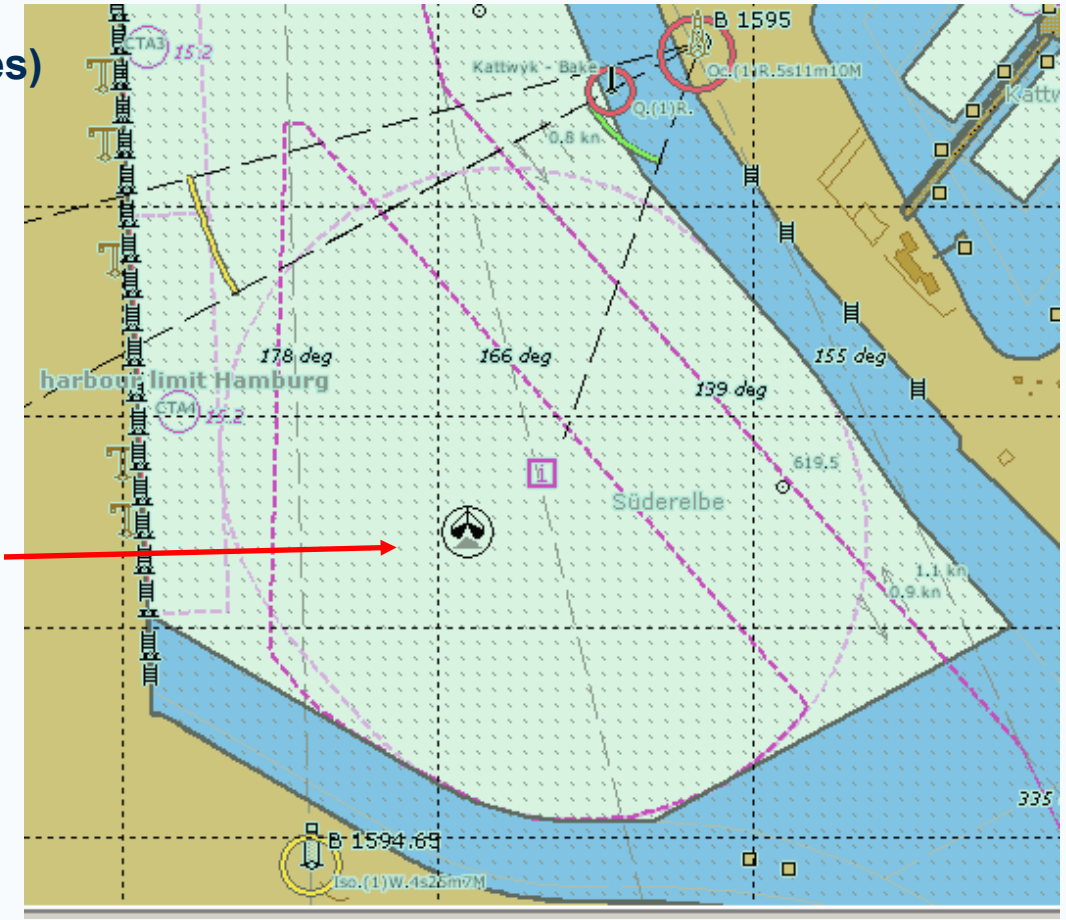
- **new Port ENC objects (examples)**



The EFFORTS Work Package 1.3 - Port ECDIS results

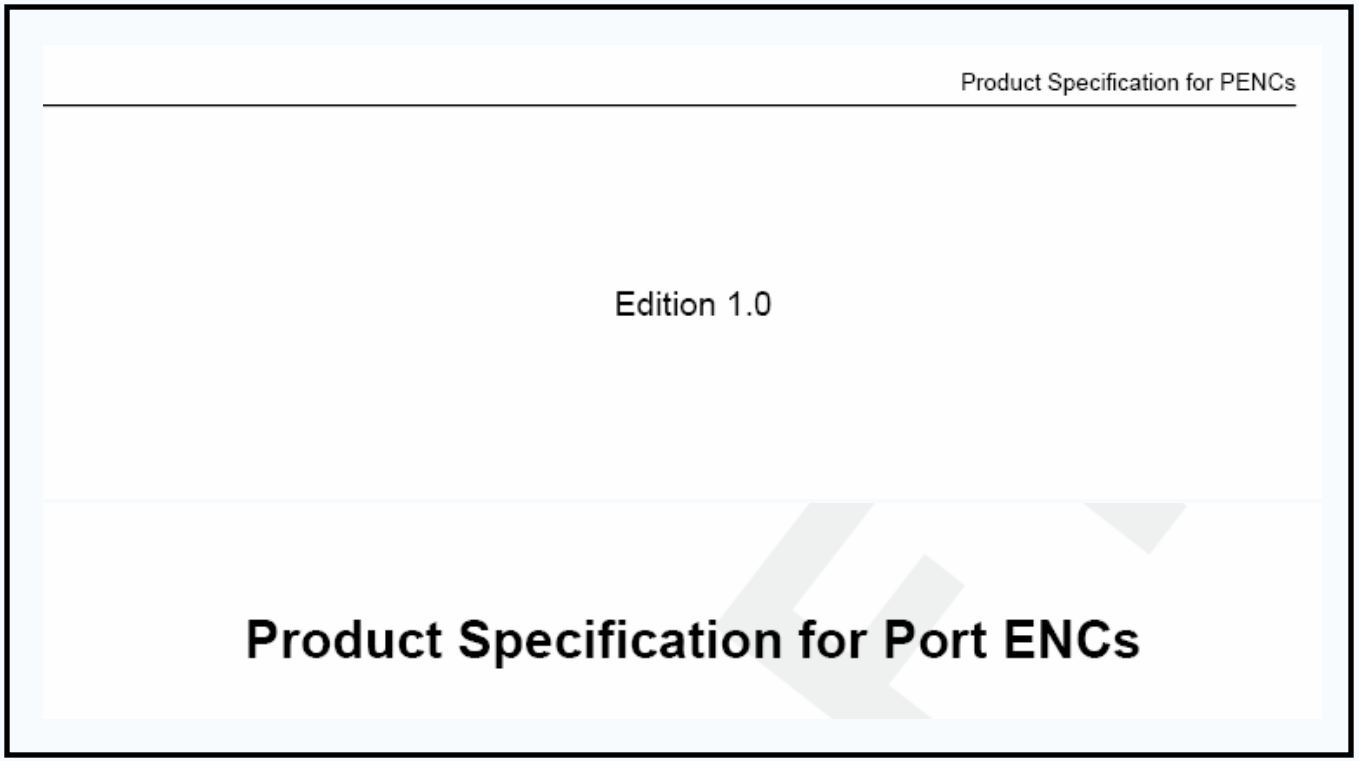
- **new Port ENC objects (examples)**

dredge field



The EFFORTS Work Package 1.3 - Port ECDIS results

- **Port ENC product specification**



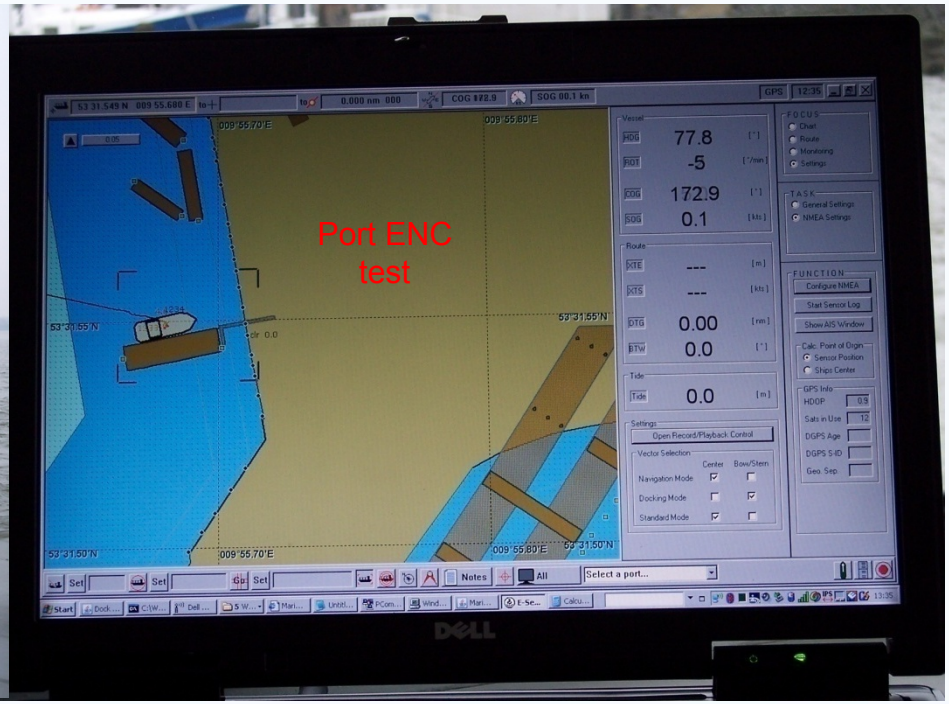
The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests with Port ECDIS (Port ENC) prototype (based on basic dataset) and evaluation of tests (report)**

  - Remark:
    - All the tests running very successful
    - Delivering very promising results
    - Demonstrating the outstanding quality and accuracy of the developed Port ENC!!

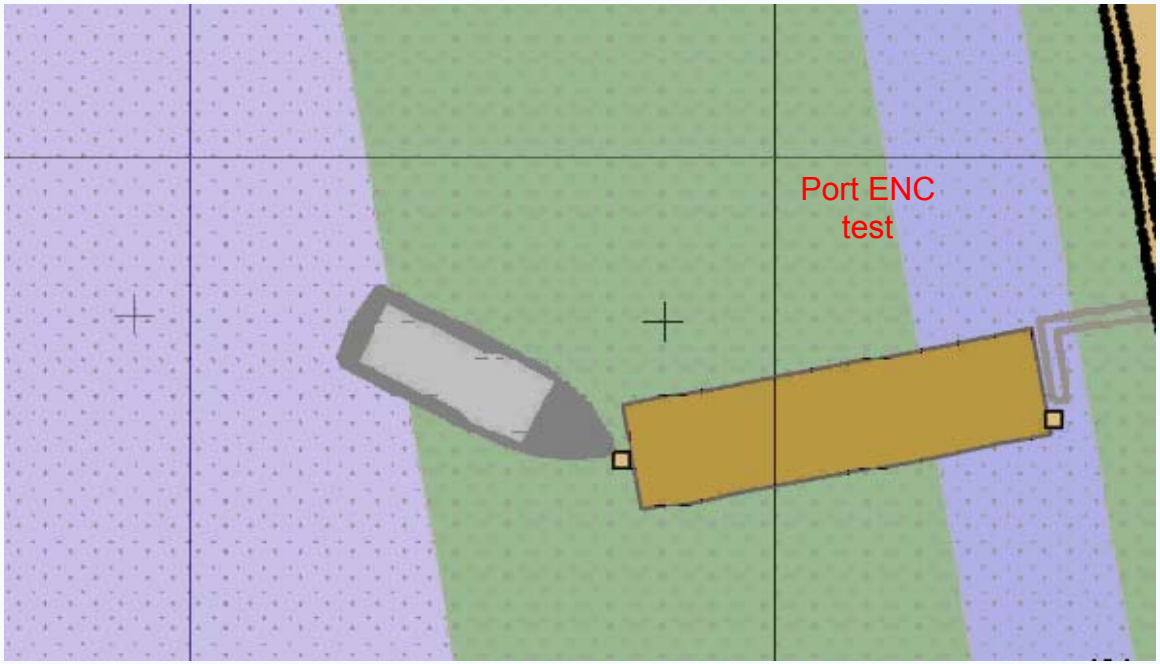
The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - PPU and accuracy test on board of survey vessel Deepenschriewer II**



The EFFORTS Work Package 1.3 - Port ECDIS results

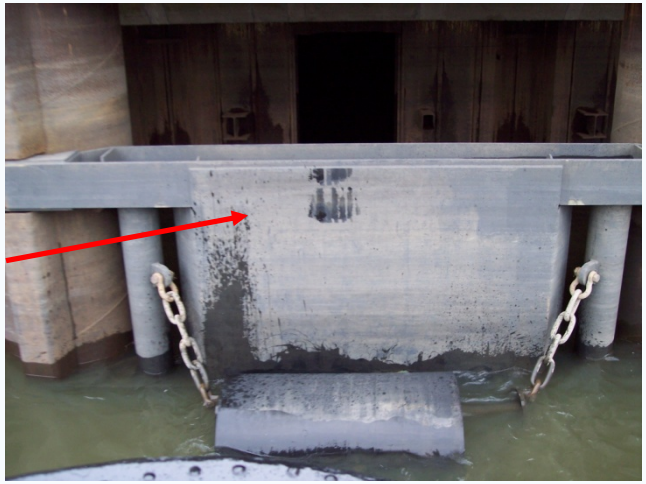
- **D 1.3.4 Tests - PPU and accuracy test on board of survey vessel Deepenschriewer II**



The EFFORTS Work Package 1.3 - Port ECDIS results

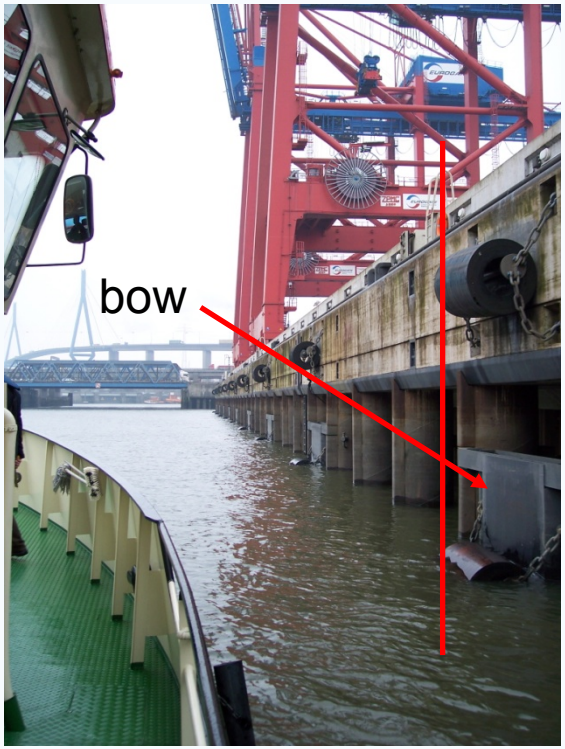
- **D 1.3.4 Tests - PPU and accuracy test on board of survey vessel Deepenschriewer II**

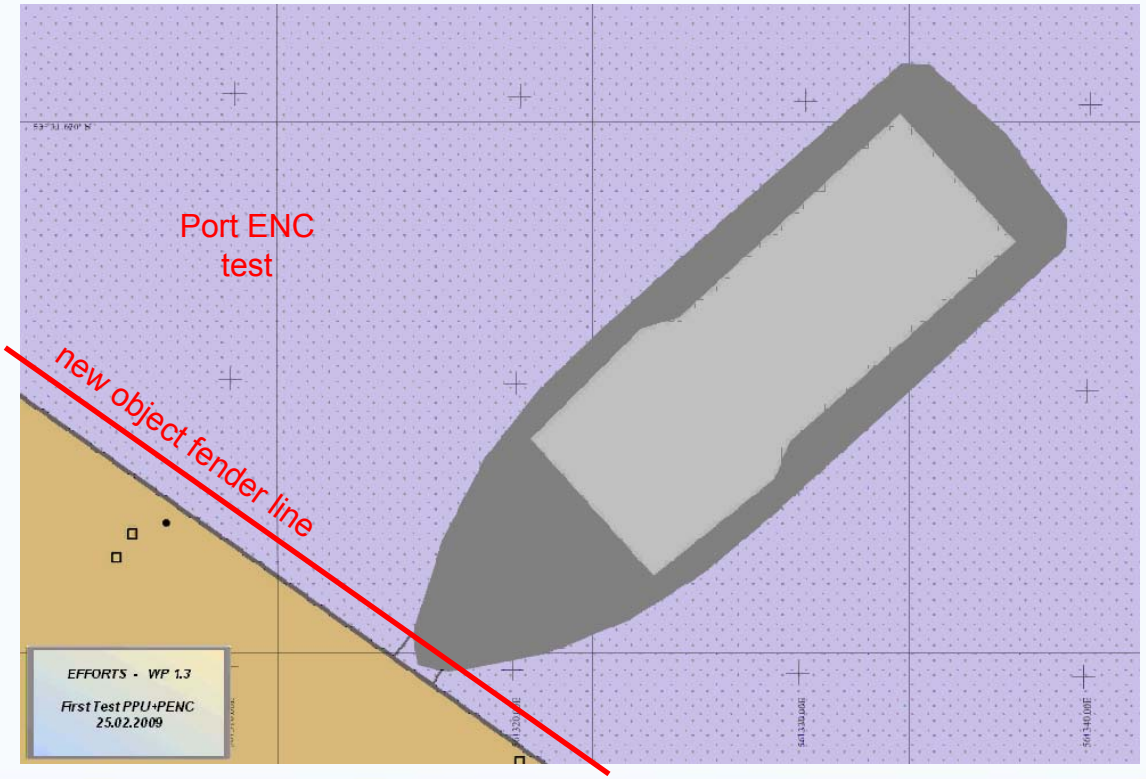
"bow – print"



The EFFORTS Work Package 1.3 - Port ECDIS results

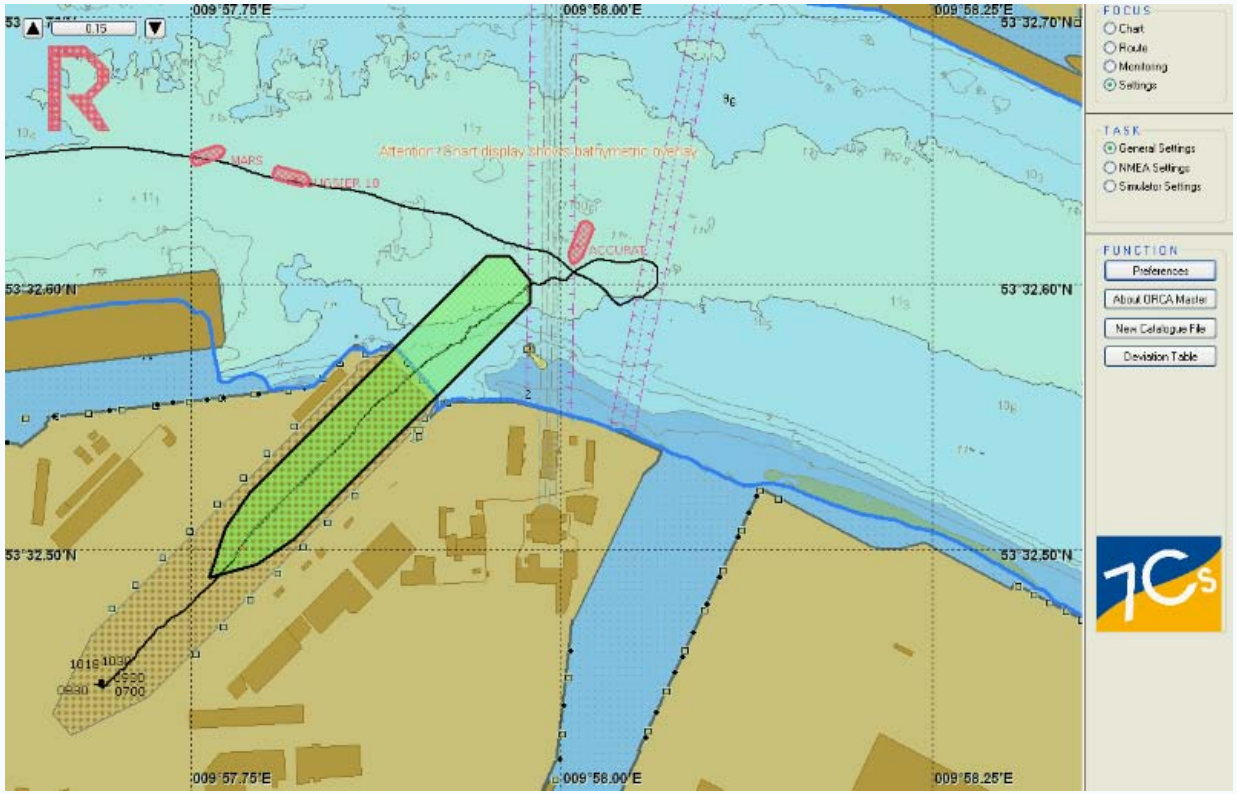
- **D 1.3.4 Tests - PPU and accuracy test on board of survey vessel Deepenschriewer II**





The EFFORTS Work Package 1.3 - Port ECDIS results

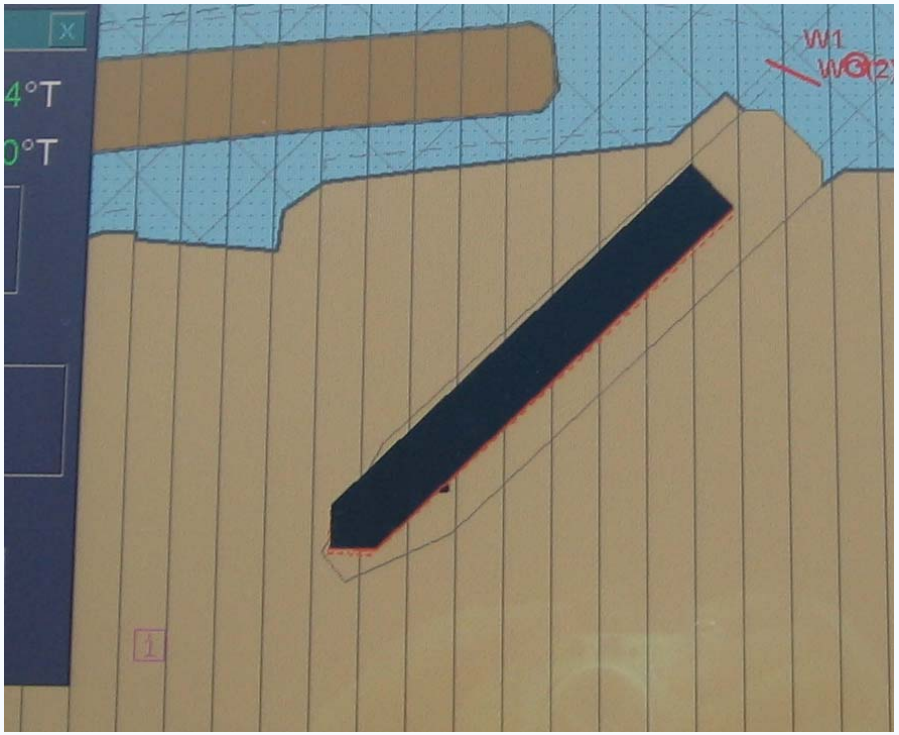
- **D 1.3.4 Tests - functional test during docking manoeuvre**



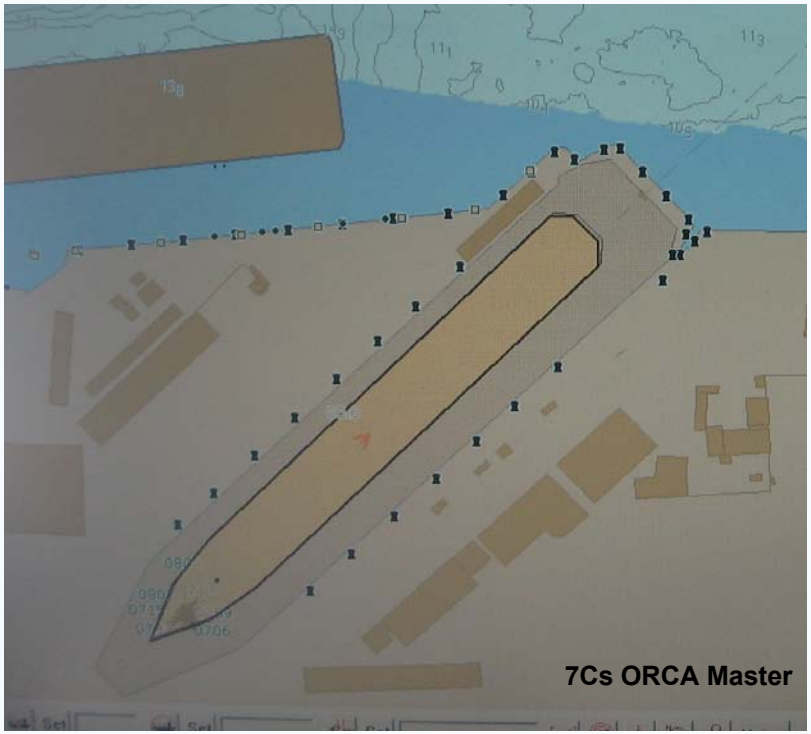
7Cs ORCA Master

The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - functional test during docking manoeuvre**



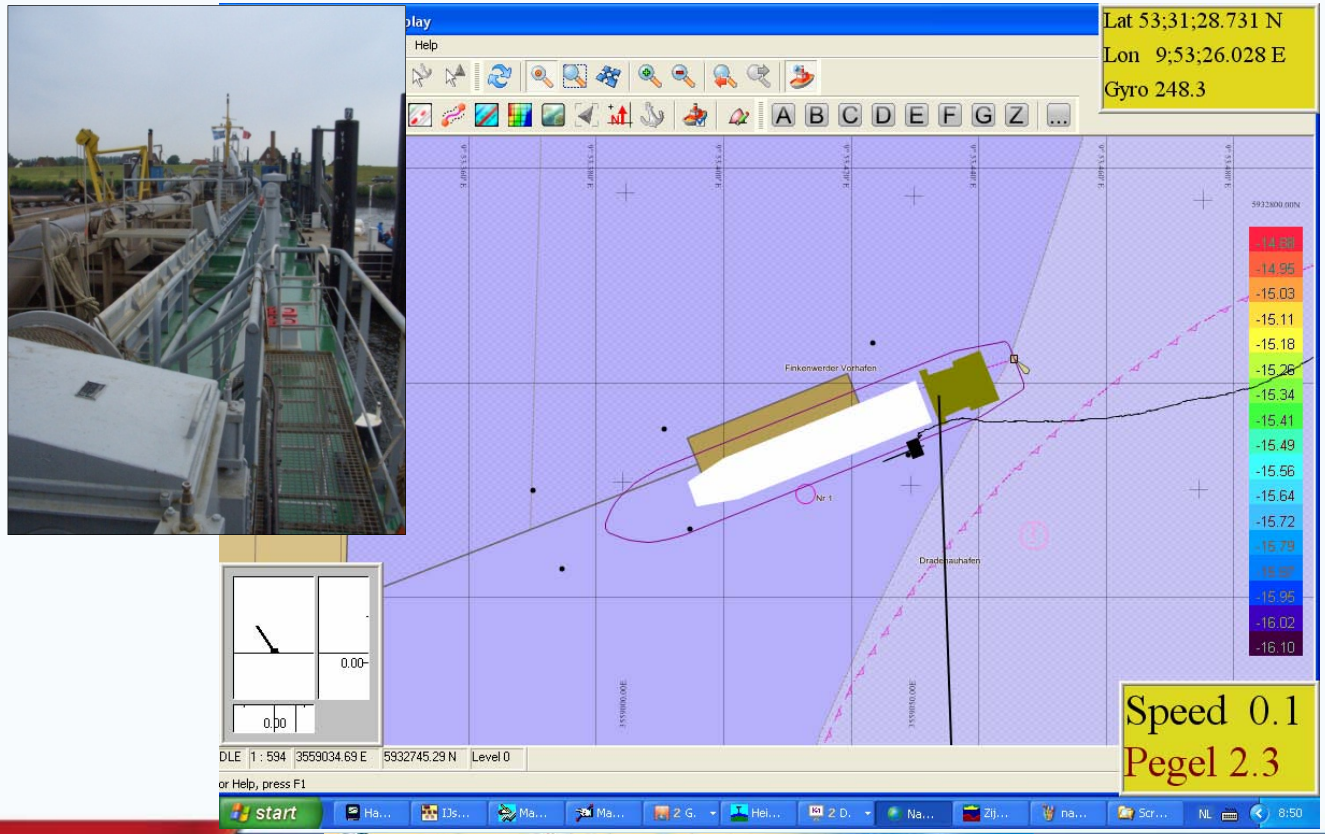
Onboard ENC – (inaccurate)



Port ENC – (precise)

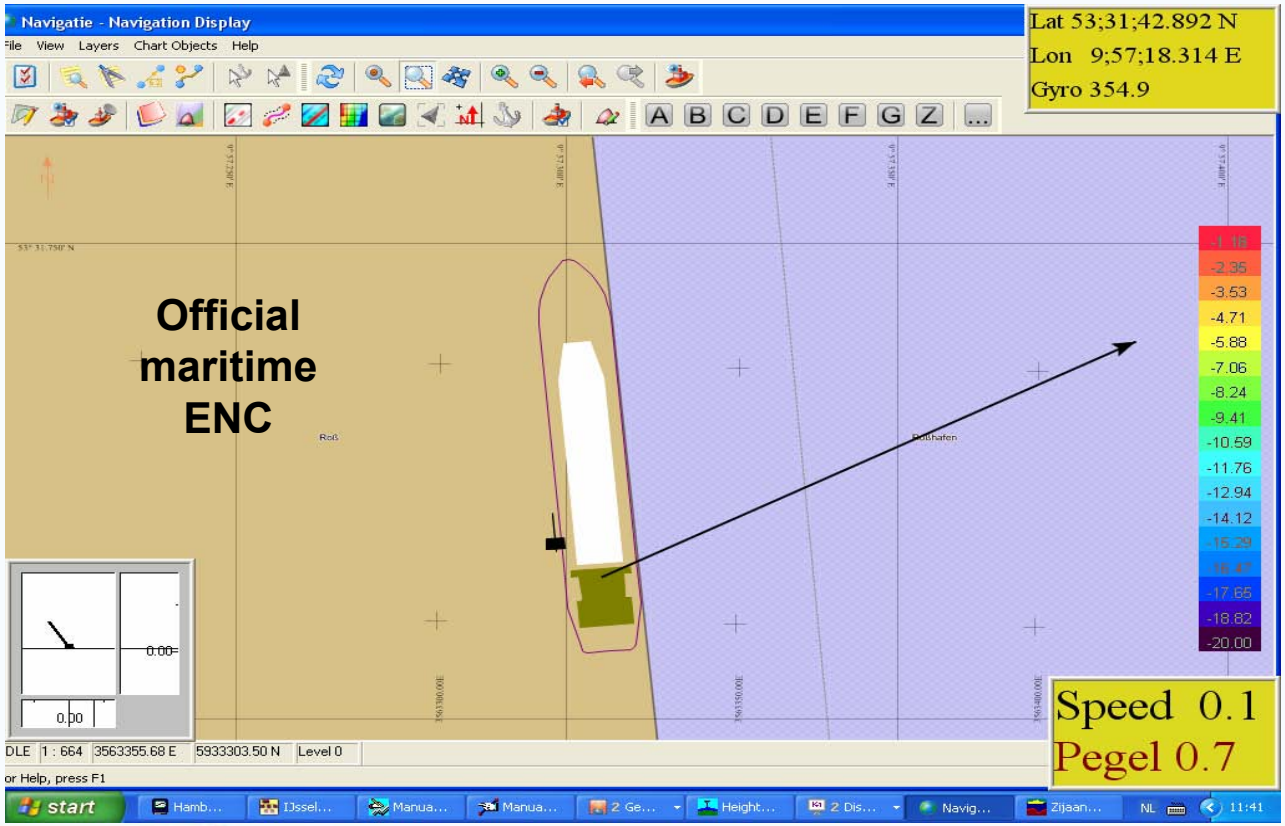
The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - functional test onboard of a TSHD (Trailer Suction Hopper Dredger)**



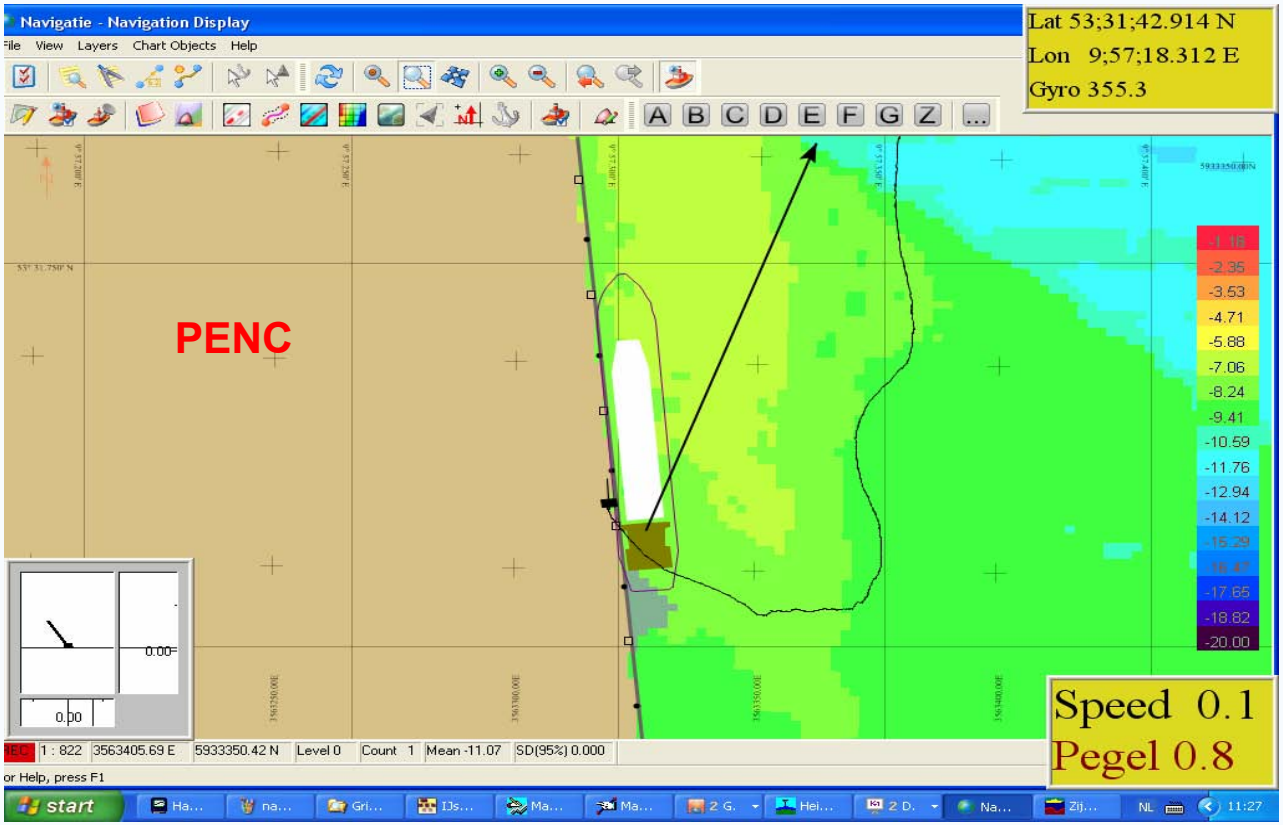
The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - functional test onboard of a TSHD (Trailer Suction Hopper Dredger)**



The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - functional test onboard of a TSHD (Trailer Suction Hopper Dredger)**



same position!!

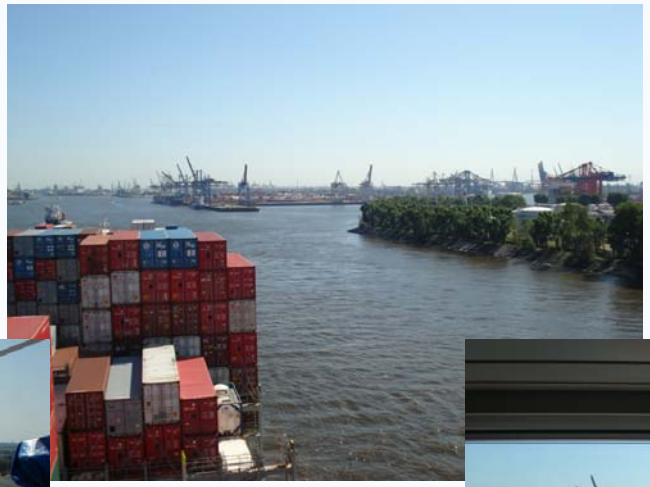
The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - PPU (Marimatech) test onboard of a Container vessel (VLCC)**

Container Vessel → Yang Ming Uberty (Lenght 333.5m - Breadth 42.8m - Draught: 11.0m).

The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - PPU test onboard of a Container vessel (VLCC)**



The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - PPU (Marimatech) test onboard of a Container vessel (VLCC)**

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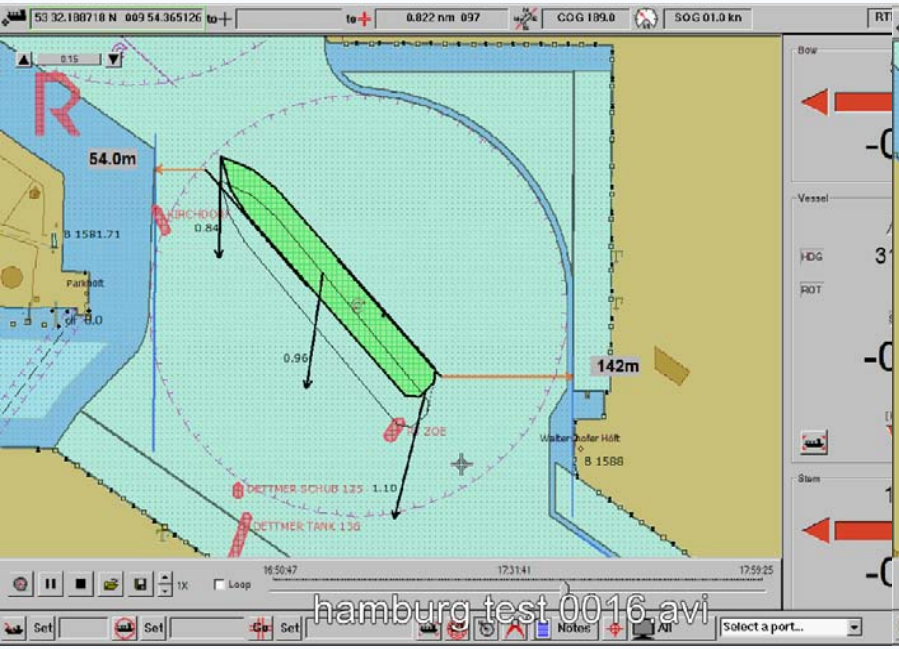
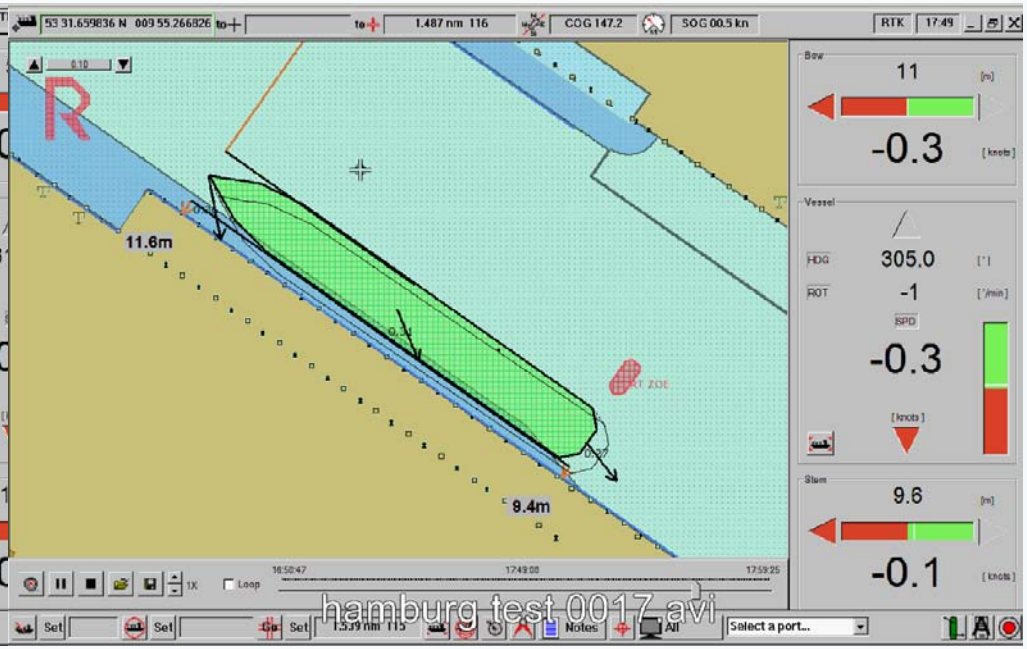
The EFFORTS Work Package 1.3 - Port ECDIS results

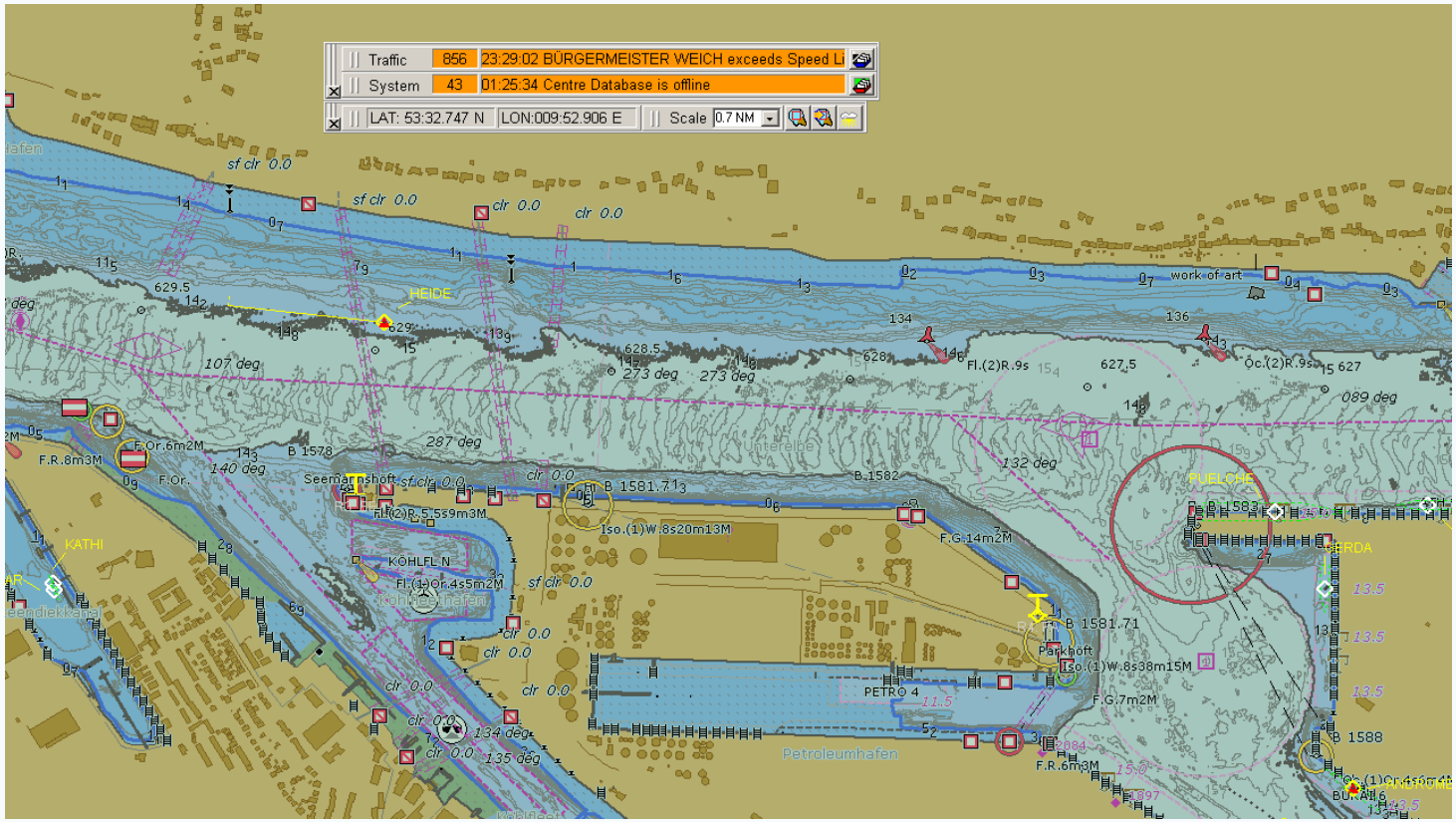
- **D 1.3.4 Tests - PPU (Marimatech) test onboard of a Container vessel (VLCC)**





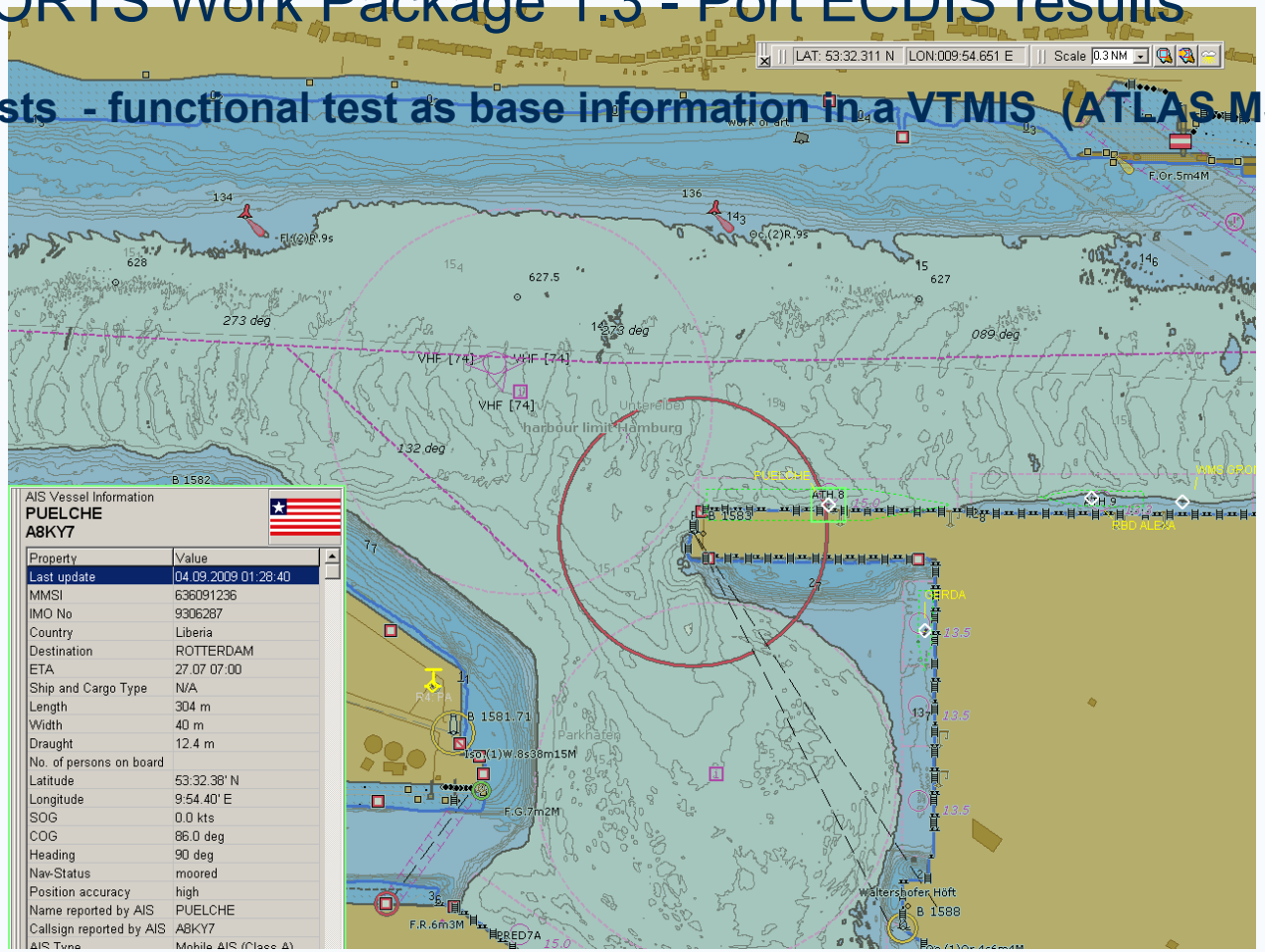
The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - functional test as base information in a VTMIS (ATLAS MS)**



The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.4 Tests - functional test as base information in a VTMIS (ATLAS MS)**



The EFFORTS Work Package 1.3 - Port ECDIS results

- **Innovative aspects**

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Innovative aspects**
  - The new standard takes into account the different accuracy definitions of S57- ECDIS / Inland ECDIS and also of IHO S44 – Standards for Hydrographic Surveys and **defines a new Port ENC accuracy definition / class**.
  - Metaobject Accuracy of ENC data – m_aenc and
  - the characteristic of these Metaobject = combined bathymetric and topographic accuracy meta objects –> batacc and topacc)

ID		S-52 representation
bathymetric	topographic	
1	1	
1	2	

Tab.3: S-52 representation for the meta object "Accuracy of ENC data"

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Innovative aspects**
- The proposed **Port ENC standard** has a far **higher density of information**, allowing more precise navigation / manoeuvring et cetera.
- The proposed Port ENC standard introduces additional data models and includes information not available in current standards,
  - like **3D - gridded bathymetry (in BAG format)** and
  - **3D - channel reference model (CRM)** and supports the
  - **bENC (bathymetric ENC)**
- allowing new usages. New data representations allow for new visualization methods (3D) and new functionality for better data analysis.

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Innovative aspects**
  - The Port ENC – could be a core component for **e-Navigation**

IMO

DRAFT STRATEGY FOR THE DEVELOPMENT AND IMPLEMENTATION OF E-NAVIGATION

1 DEFINITION AND SCOPE

1.1 E-navigation is the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment.

1.2 E-navigation is intended to meet present and future user needs through harmonization of marine navigation systems and supporting shore services.

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Implementation of results within the port industry and beyond**

The EFFORTS Work Package 1.3 - Port ECDIS results

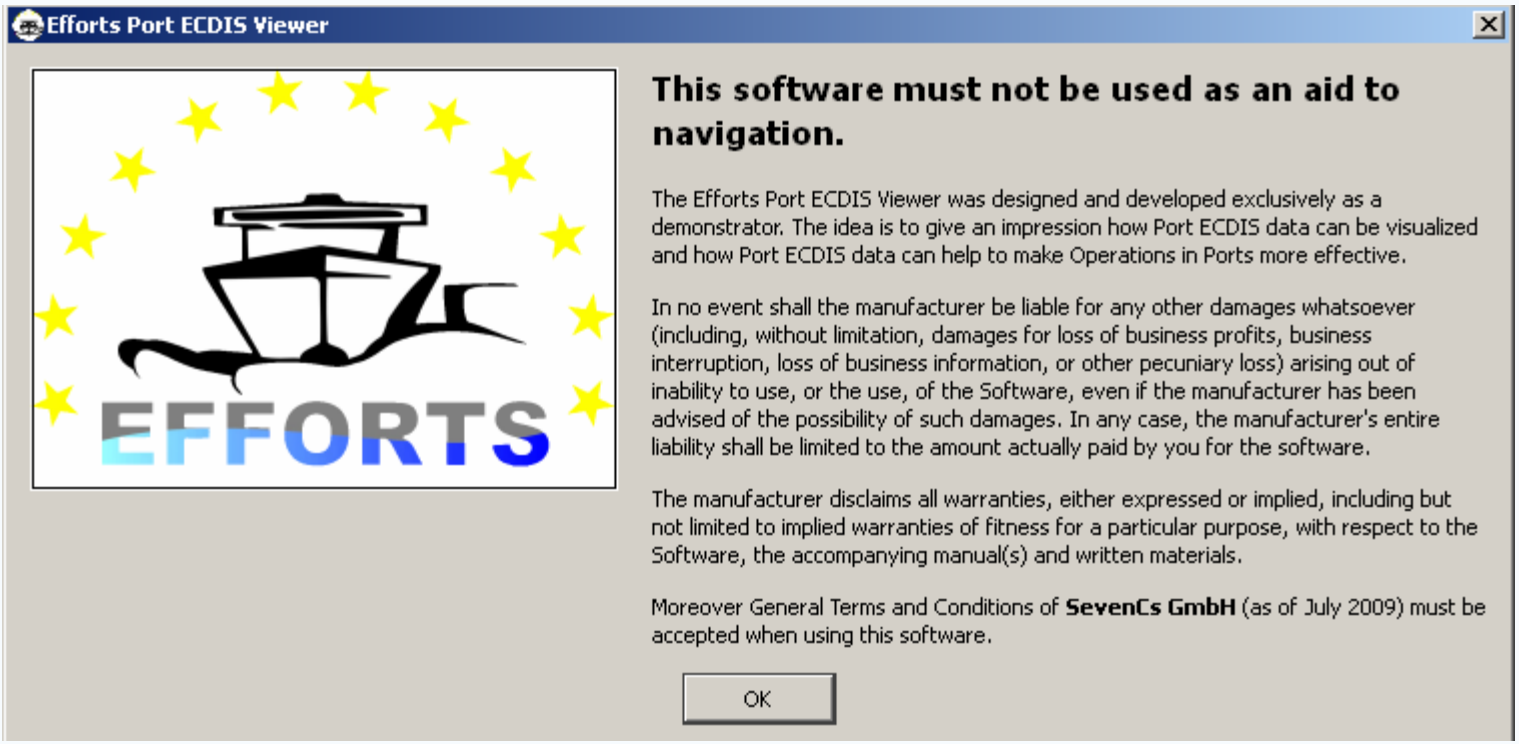
- **Implementation of results within the port industry and beyond**
- Harbour Masters, Pilots and Captains of the arriving and departing vessels, Port Authorities, TUG operators and other organisations, they work on port water area related maintenance tasks (e.g. dredging…), they all need and can use the higher accuracy and additional information of the Port ENC.
- They can navigate and work more easily, safely and precise within the PENC covered area (river, access channel, port basin, turning basin…).
- The new within the Port ENC presented information fills the current ECDIS - Inland ECDIS data lack.

The EFFORTS Work Package 1.3 - Port ECDIS results

- **Implementation of results within the port industry and beyond**
  - If more and more data becomes available in the proposed PENC standard, the data can be used for numerous other GIS driven approaches like:
  - Vessel Traffic Service (VTS), Vessel Traffic Management and Information System (VTMIS)
  - IALA - PAWSA (Port and Waterways Safety Assessment)
  - Integrated Navigation Systems (INS) – Portable Pilot Units (PPU's)
  - Risk Management – Accident Analysis
  - Port planning / strategy
  - Port Maintenance (dredging, embankment monitoring ….)
  - Tug and maritime simulation
  - Route planning
  - Harbour Rescue Coordination
  - Port services (stowage, logistics, public transport management etc.)
  - ……

The EFFORTS Work Package 1.3 - Port ECDIS results

- **the Port ENC & the Port ECDIS viewer - examples**



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HPA Hamburg Port Authority

Efforts Port ECDIS Viewer

File Settings About

Port ENC
Base Chart

009°54.00'E 009°54.50'E 009°55.00'E 009°55.50'E

53°32.50'N

53°32.25'N

53°32.00'N

VHF [74]

B 1583

B 1588

Zone A

Chart
Range: 0.41 nm
Chart Settings ...
Pick

Bathymetry
Show Bathymetry
3D View ...
CRM Depth Coloring

Sensor Data
No Sensor Data
Live Sensor Data
Replay Sensor Data

Efforts Port ECDIS Viewer - Chart Settings

General | Contours | Own Ship

Category
Display Base
Standard
Other

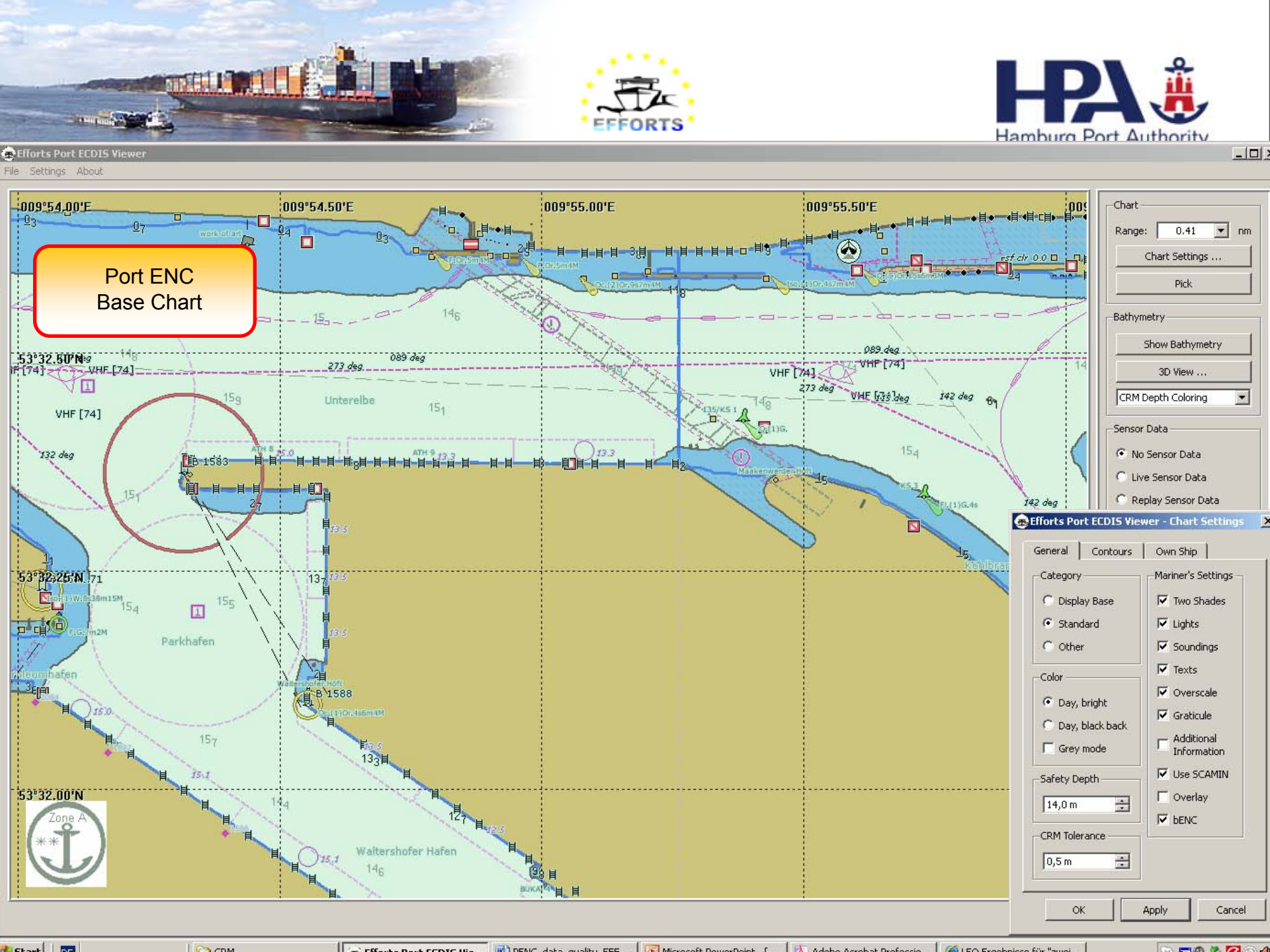
Color
Day, bright
Day, black back
Grey mode

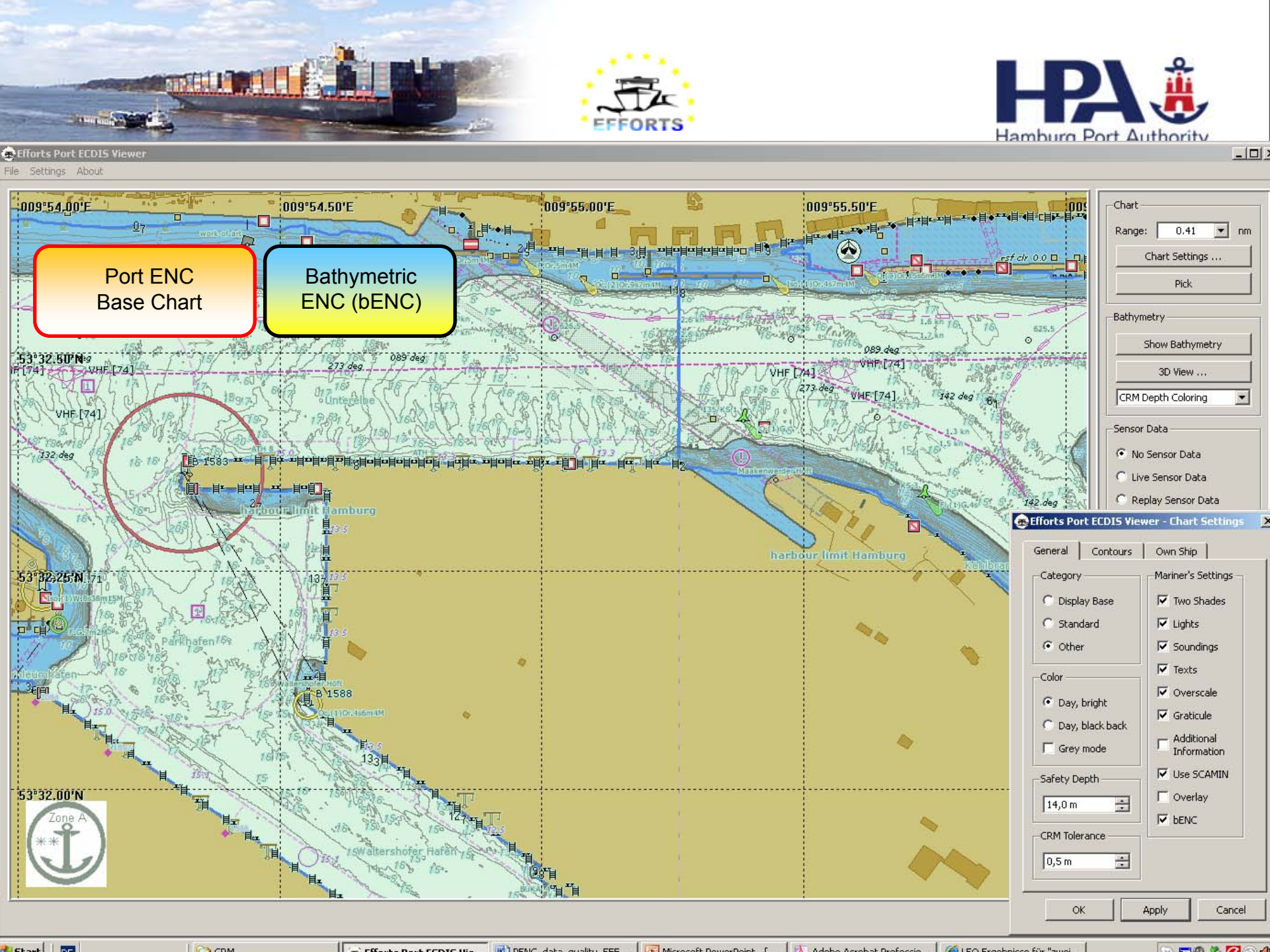
Safety Depth
14,0 m

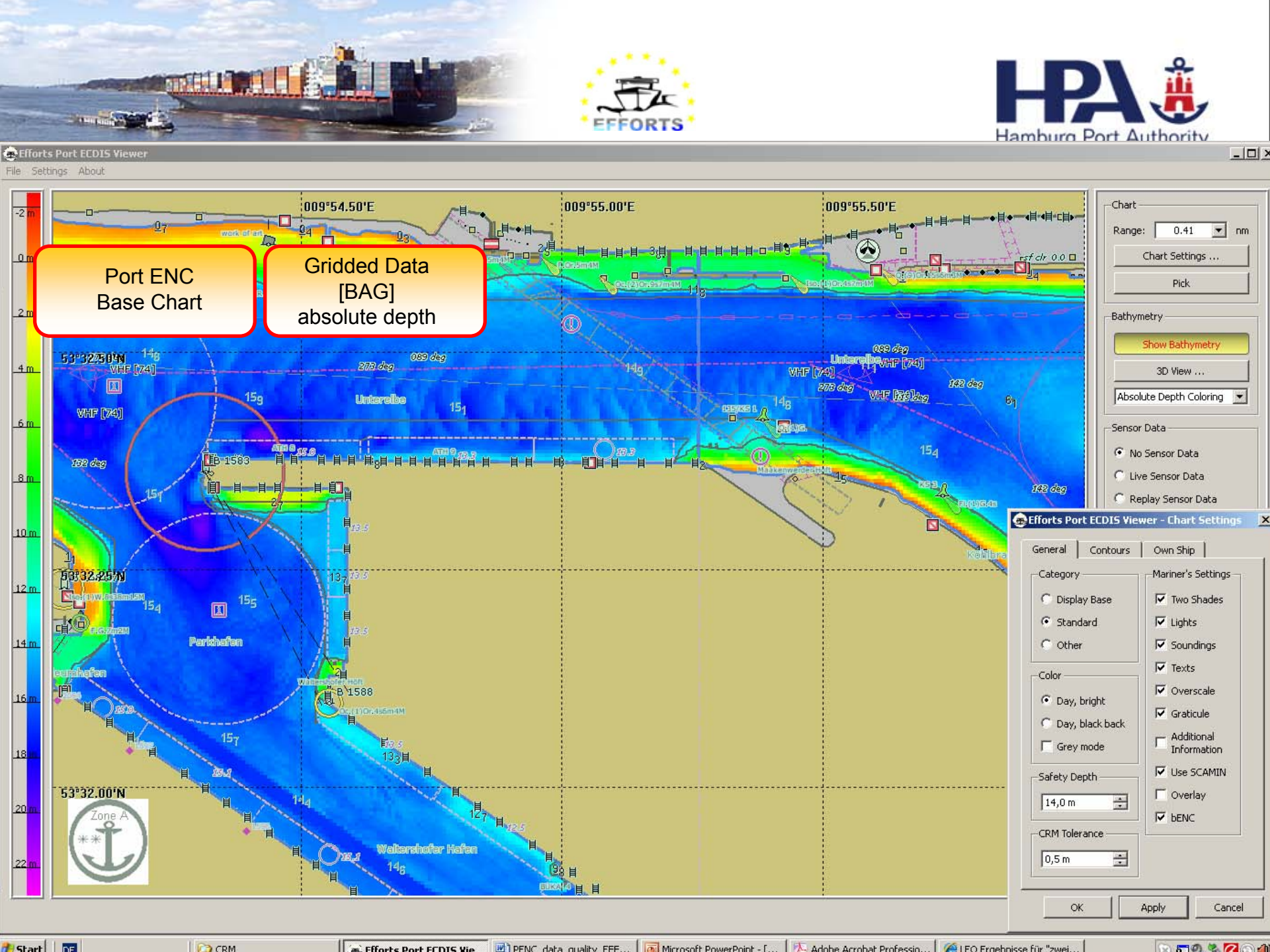
CRM Tolerance
0,5 m

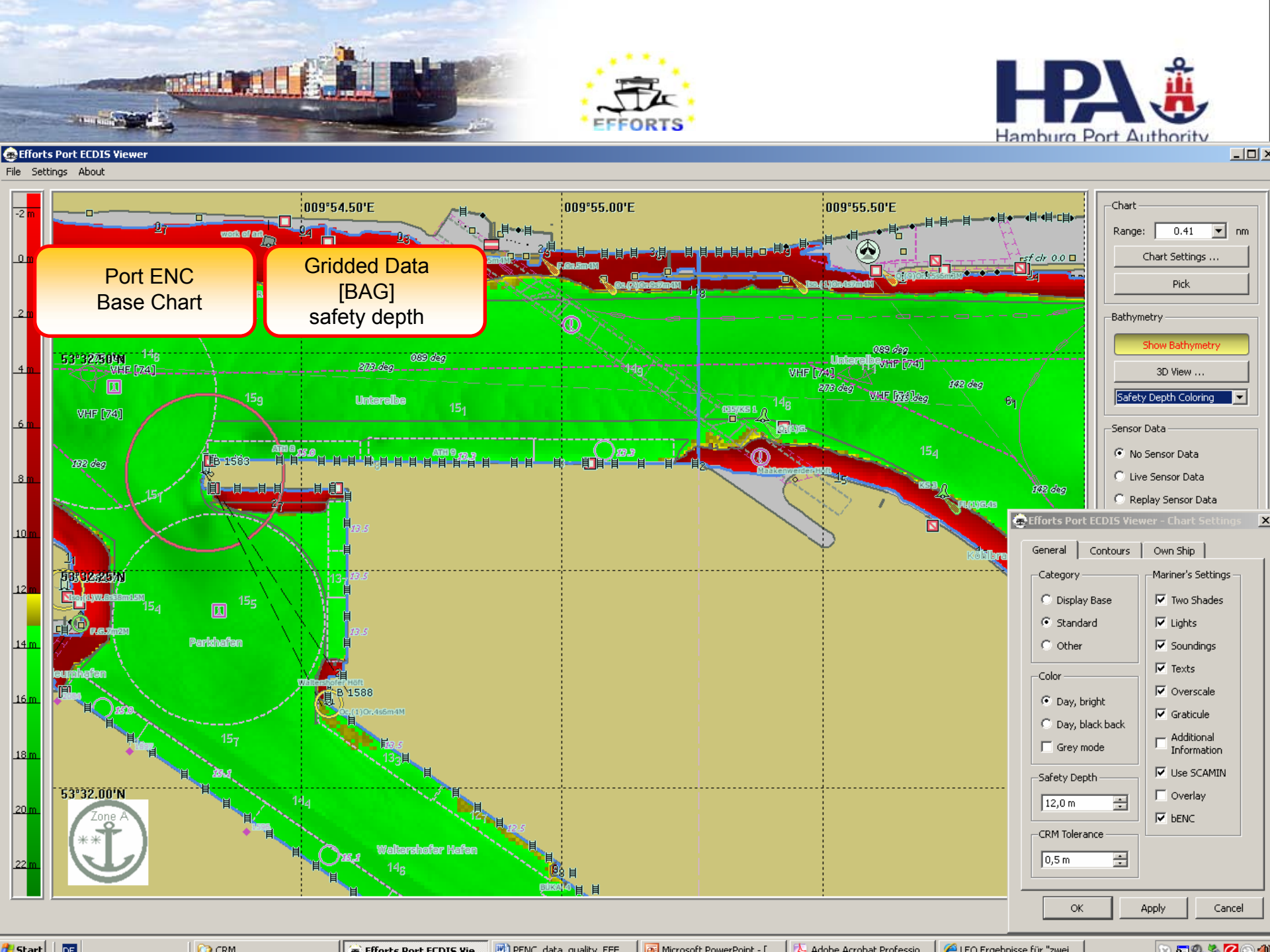
Mariner's Settings
Two Shades
Lights
Soundings
Texts
Overscale
Graticule
Additional Information
Use SCAMIN
Overlay
bENC

OK Apply Cancel


EFFORTS
HPA
Hamburg Port Authority
Efforts Port ECDIS Viewer
File Settings About
Port ENC
Base Chart
009°54.00'E
009°54.50'E
009°55.00'E
009°55.50'E
53°32.50'N
53°32.25'N
53°32.00'N
VHF [74]
Unterelbe
Parkhafen
Waltershofer Hafen
Zone A
Chart
Range: 0.41 nm
Chart Settings ...
Pick
Bathymetry
Show Bathymetry
3D View ...
CRM Depth Coloring
Sensor Data
No Sensor Data
Live Sensor Data
Replay Sensor Data
Efforts Port ECDIS Viewer - Chart Settings
General
Contours
Own Ship
Category
Display Base
Standard
Other
Color
Day, bright
Day, black back
Grey mode
Safety Depth
14,0 m
CRM Tolerance
0,5 m
Mariner's Settings
Two Shades
Lights
Soundings
Texts
Overscale
Graticule
Additional Information
Use SCAMIN
Overlay
bENC
OK
Apply
Cancel


EFFORTS
HPA
Hamburg Port Authority
Efforts Port ECDIS Viewer
File Settings About
Port ENC Base Chart
Bathymetric ENC (bENC)
009°54.00'E
009°54.50'E
009°55.00'E
009°55.50'E
53°32.50'N
53°32.25'N
53°32.00'N
harbour limit Hamburg
Parkhafen
Waltershofer Hafen
Zone A
Chart
Range: 0.41 nm
Chart Settings ...
Pick
Bathymetry
Show Bathymetry
3D View ...
CRM Depth Coloring
Sensor Data
No Sensor Data
Live Sensor Data
Replay Sensor Data
Efforts Port ECDIS Viewer - Chart Settings
General
Contours
Own Ship
Category
Display Base
Standard
Other
Color
Day, bright
Day, black back
Grey mode
Safety Depth
14,0 m
CRM Tolerance
0,5 m
Mariner's Settings
Two Shades
Lights
Soundings
Texts
Overscale
Graticule
Additional Information
Use SCAMIN
Overlay
bENC
OK
Apply
Cancel


EFFORTS
HPA
Hamburg Port Authority
Efforts Port ECDIS Viewer
File Settings About
Port ENC
Base Chart
Gridded Data
[BAG]
absolute depth
009°54.50'E
009°55.00'E
009°55.50'E
53°32.75'N
53°32.25'N
53°32.00'N
Unterelbe
Parkhafen
Waltershofer Hafen
VHF [74]
B 1583
B 1588
Zone A
Chart
Range: 0.41 nm
Chart Settings ...
Pick
Bathymetry
Show Bathymetry
3D View ...
Absolute Depth Coloring
Sensor Data
No Sensor Data
Live Sensor Data
Replay Sensor Data
Efforts Port ECDIS Viewer - Chart Settings
General
Contours
Own Ship
Category
Display Base
Standard
Other
Color
Day, bright
Day, black back
Grey mode
Safety Depth
14,0 m
CRM Tolerance
0,5 m
Mariner's Settings
Two Shades
Lights
Soundings
Texts
Overscale
Graticule
Additional Information
Use SCAMIN
Overlay
bENC
OK
Apply
Cancel


EFFORTS
HPA
Hamburg Port Authority
Efforts Port ECDIS Viewer
File Settings About
Port ENC
Base Chart
Gridded Data
[BAG]
safety depth
009°54.50'E
009°55.00'E
009°55.50'E
53°32.50'N
53°32.25'N
53°32.00'N
Unterelbe
Parkhafen
Waltershofer Hafen
Zone A
Chart
Range: 0.41 nm
Chart Settings ...
Pick
Bathymetry
Show Bathymetry
3D View ...
Safety Depth Coloring
Sensor Data
No Sensor Data
Live Sensor Data
Replay Sensor Data
Efforts Port ECDIS Viewer - Chart Settings
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Own Ship
Category
Display Base
Standard
Other
Color
Day, bright
Day, black back
Grey mode
Safety Depth
12,0 m
CRM Tolerance
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Mariner's Settings
Two Shades
Lights
Soundings
Texts
Overscale
Graticule
Additional Information
Use SCAMIN
Overlay
bENC
OK
Apply
Cancel

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Efforts Port ECDIS Viewer

File Settings About

Port ENC Base Chart

Channel Reference Model

009°54.00'E 009°54.50'E 009°55.00'E 009°55.50'E

53°32.50'N

53°32.25'N

53°32.00'N

VHF [74]

B 1583

B 1588

Zone A

Chart

Range: 0.41 nm

Chart Settings ...

Pick

Bathymetry

Show Bathymetry

3D View ...

Safety Depth Coloring

Sensor Data

No Sensor Data

Live Sensor Data

Replay Sensor Data

Efforts Port ECDIS Viewer - Chart Settings

General Contours Own Ship

Category

Display Base

Standard

Other

Color

Day, bright

Day, black back

Grey mode

Safety Depth

12,0 m

CRM Tolerance

0,5 m

Mariner's Settings

Two Shades

Lights

Soundings

Texts

Overscale

Graticule

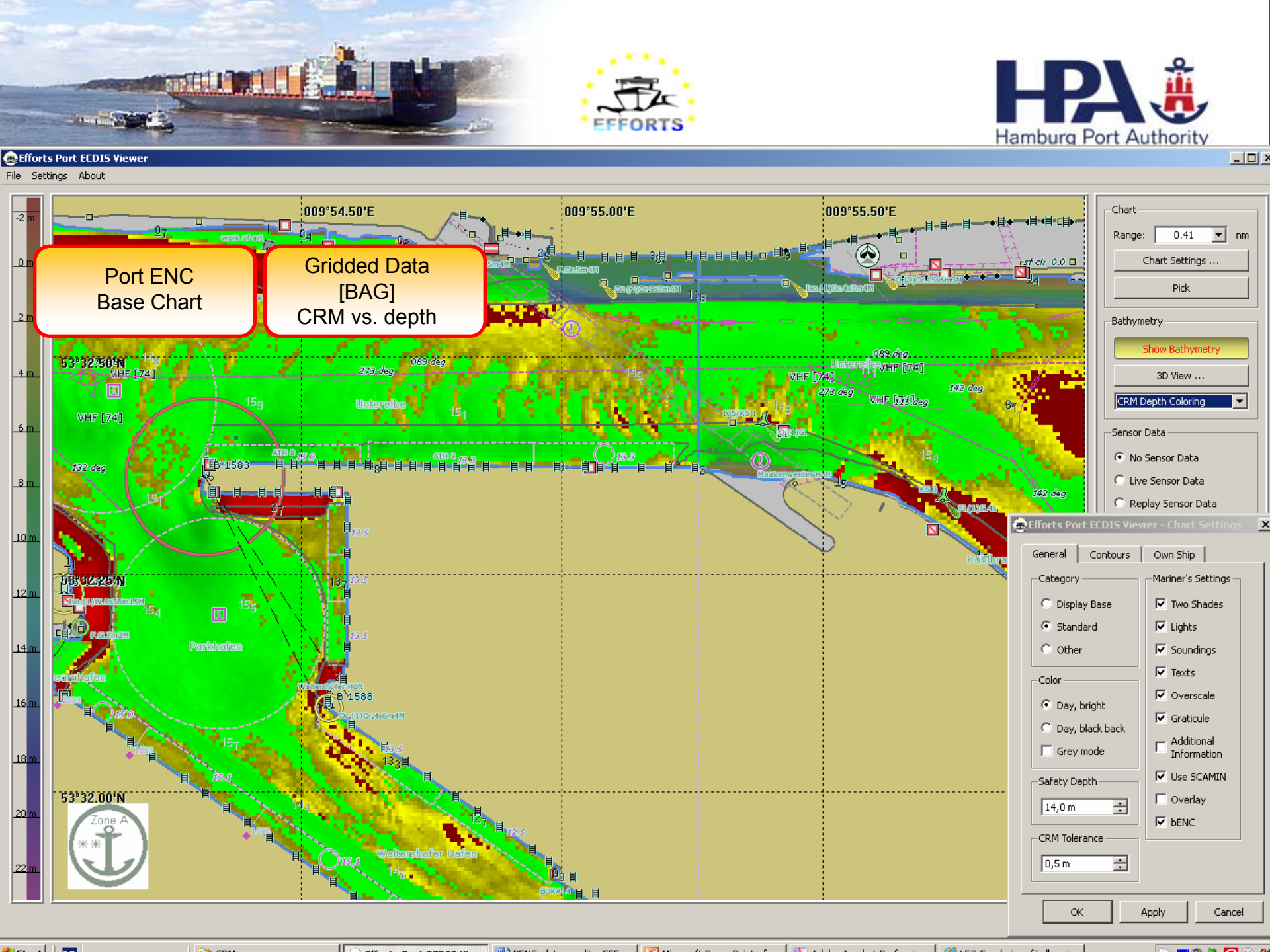
Additional Information

Use SCAMIN

Overlay

bENC

OK Apply Cancel


EFFORTS
HPA
Hamburg Port Authority
Efforts Port ECDIS Viewer
File
Settings
About
Port ENC
Base Chart
Gridded Data
[BAG]
CRM vs. depth
009°54.50'E
009°55.00'E
009°55.50'E
53°32.50'N
53°32.25'N
53°32.00'N
Chart
Range:
0.41
nm
Chart Settings ...
Pick
Bathymetry
Show Bathymetry
3D View ...
CRM Depth Coloring
Sensor Data
No Sensor Data
Live Sensor Data
Replay Sensor Data
Efforts Port ECDIS Viewer - Chart Settings
General
Contours
Own Ship
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Grey mode
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14,0 m
CRM Tolerance
0,5 m
Mariner's Settings
Two Shades
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Soundings
Texts
Overscale
Graticule
Additional Information
Use SCAMIN
Overlay
bENC
OK
Apply
Cancel
Zone A
Unterelbe
Parkhafen
Waltershofer Hafen

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3 D – view
Bathymetry

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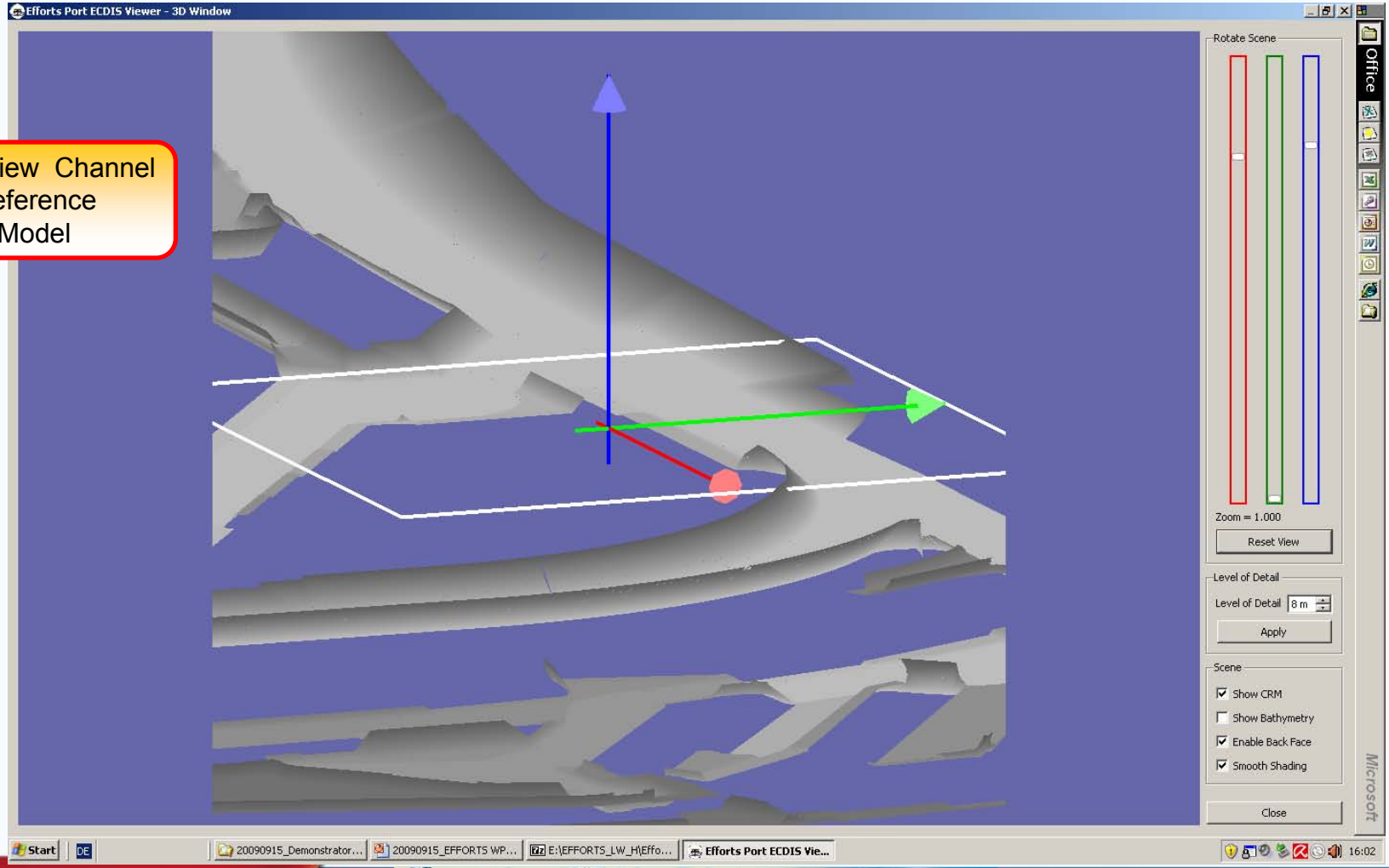
3 D – view Channel Reference Model



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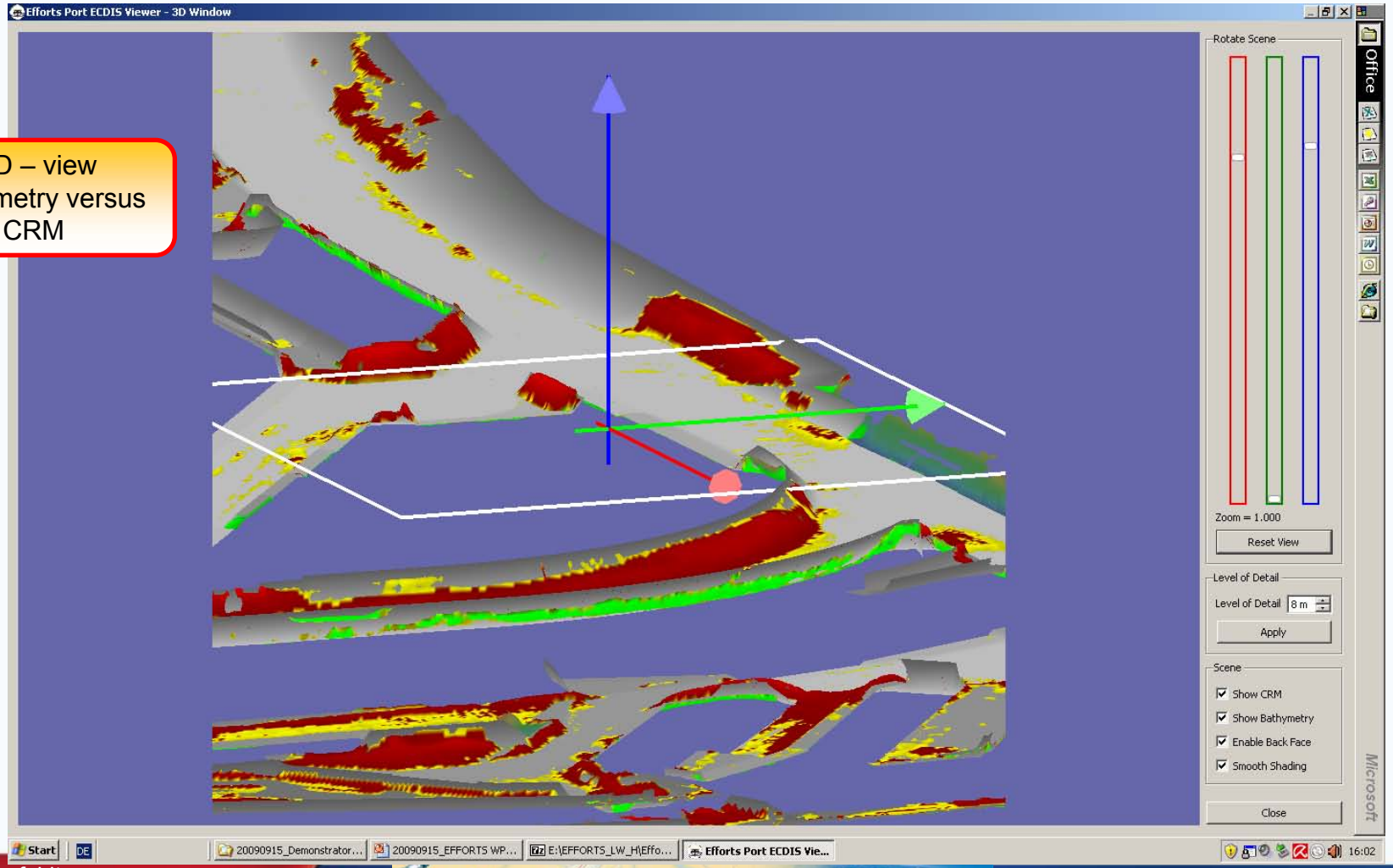
3 D – view
Bathymetry versus
CRM



The EFFORTS Work Package 1.3 - Port ECDIS results

- **D 1.3.5 Port ECDIS (Port ENC) follow-up requirements (document)**

The EFFORTS Work Package 1

- **D 1.3.5 Port ECDIS (Port ENC) follow-up requirements (document)**

If you have some additional requirements or new ideas, please let us know!!

Project no: FP6-031486

Project acronym: EFFORTS

Project title: Effective Operations in Ports

Instrument: Integrated Project

Thematic Priority: Integrating and Strengthening the European Research Area

[D1.3.5 PortECDIS follow-up requirements (document)]

Due date of deliverable: [31/10/2009]
Actual submission date: [03/10/2009]

Start date of project: 01/05/2006 Duration: 42 months

Organisation name of lead contractor for this deliverable: [Hamburg Port Authority]

Revision: [final, 1]

The EFFORTS Work Package 1.3 - Port ECDIS results

We informed about the project:

- IHO - International Hydrographic Organisation
- IMO - International Maritime Organization
- Open ECDIS Organisation
- Inland ENC Harmonization Group
- EC - European Commission - Directorate-General Energy and Transport
- UN/ECE - Economic Commission for Europe of the United Nations
- CCNR - Central Commission for Navigation on the Rhine
- DC - Danube Commission
- IAPH - Head Office (Tokyo) - International Association of Ports and Harbors
- IAPH - Europe Office (Rotterdam)
- IHMA - International Harbour Masters' Association
- EHMC - European Harbour Masters' Committee
- PIANC - International Navigation Association
- BMVBS - Federal Ministry of Transport, Building and Urban Affairs, Germany
- IALA - International Association of Marine Aids to Navigation and Lighthouse Authorities
- IMPA - International Maritime Pilots Association
- EMPA - European Maritime Pilot's Association
- EMSA - European Maritime Safety Agency

Project no: FP6-031486
Project acronym: EFFORTS
Project title: Effective Operation in Ports

WP 1.3 PortECDIS
Port ECDIS information paper

The EU Project - Port ECDIS -
Development of a new enhanced ENC standard for use in ports and harbours.

Why a Port ECDIS?!
Masters and pilots approaching a seaport usually use an Electronic Chart Display and Information System (ECDIS) to obtain the required navigational information they need. The common ECDIS standard supports navigation in the open sea and coastal areas; the Inland ECDIS standard was developed for navigation on inland waterways. The chart requirements for manoeuvring big ships in narrow fairways (harbour access channels) and harbours and for the port maintenance go far beyond the current ECDIS standard in scale, accuracy, chart objects and attributes ("object catalogue", in future "feature catalogue") and

The Port ENC – proposal for a new standard

The Port ENC – proposal for a new standard

- The successful result of the EFFORTS work package 1.3 - Port ECDIS could be only a
  - **proposal and comprehensive concept for a new Port ENC standard!!**
  - It can be currently **only a first step**!

EFFORTS

Hamburg Port Authority

Developing a Port ECDIS - a challenge mastered!!

Final statement

It must be reliable and clear, that the harbour master, the pilot, the captain and all other user can trust the topographic and bathymetric information within the Port ENC!

So the Port ENC can be used as reference system for navigation!

**"If the vessel sails on land
the positioning of the vessel is inaccurate,
not the Port ENC!"**

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- Thank you for your attention!!

Kontaktdaten

on behalf of the

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