



**The Port ENC –
a proposal for a new port related ENC standard**

Combined 20th TSMAD and 2nd DIPWG Meeting
3 to 7 May 2010 (Rostock, Germany)



Dieter Seefeldt



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**



Effective Operations in Ports

*Sub-Project 1
Navigation in Ports*

WP 1.1
TUG ASSISTANCE

WP 1.2
PRECISE NAVIGATION AND
MANOEUVRING IN PORTS

WP 1.3
PORT ECDIS

↓

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**.

WP 2.1
PORT AIR QUALITY

WP 2.2
WATER POLLUTION REL.
TO SHIP RECEPTION

WP 2.3
RISK MANAGEMENT
FRAMEWORK

WP 2.4
NOISE ANNOYANCE
OF PORTS




WP 3.1
EDUCATION
TRAINING AND
DEVELOPMENT

WP 3.2
EXPLOITATION
PROTECTION OF
KNOWLEDGE
DISSEMINATION

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Hamburg Port Authority

The Port ECDIS story starts with the question:

„Why a Port ECDIS?!“



Slide 5 features a header with a large container ship at sea, the EFFORTS logo (a ship with yellow stars), and the HPA Hamburg Port Authority logo. The main text is titled "Why a Port ECDIS – Port ENC?!" and lists three points with red anchor icons. The footer includes the name "Dieter Seefeldt", a small globe icon, and the number "5".

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 Harbor Masters, Pilots, Ship's Officers, Tug Operators, Port Maintenance Operators have, to organize and realize safe and ease vessel traffic for transport execution!
- Safe and efficient arrival/departure for ships and their cargo is most crucial for ports!**

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Slide 6 features a header with a large container ship at sea, the EFFORTS logo, and the HPA Hamburg Port Authority logo. The main text is titled "Why a Port ECDIS – Port ENC?!" and lists five points with red anchor icons. To the right, there are two images: a "Very Large Container Carrier (VLCCs)" and a "Very Large Cruise Liner". The footer includes the name "Dieter Seefeldt", a small globe icon, and the number "6".

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

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Why a Port ECDIS – Port ENC?!

less manoeuvre space

vessel berthing

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Slide 9: Why a Port ECDIS – Port ENC?!

less manoeuvre space

bulk vessel turning and docking

Hasenpusch / Hafen Hamburg

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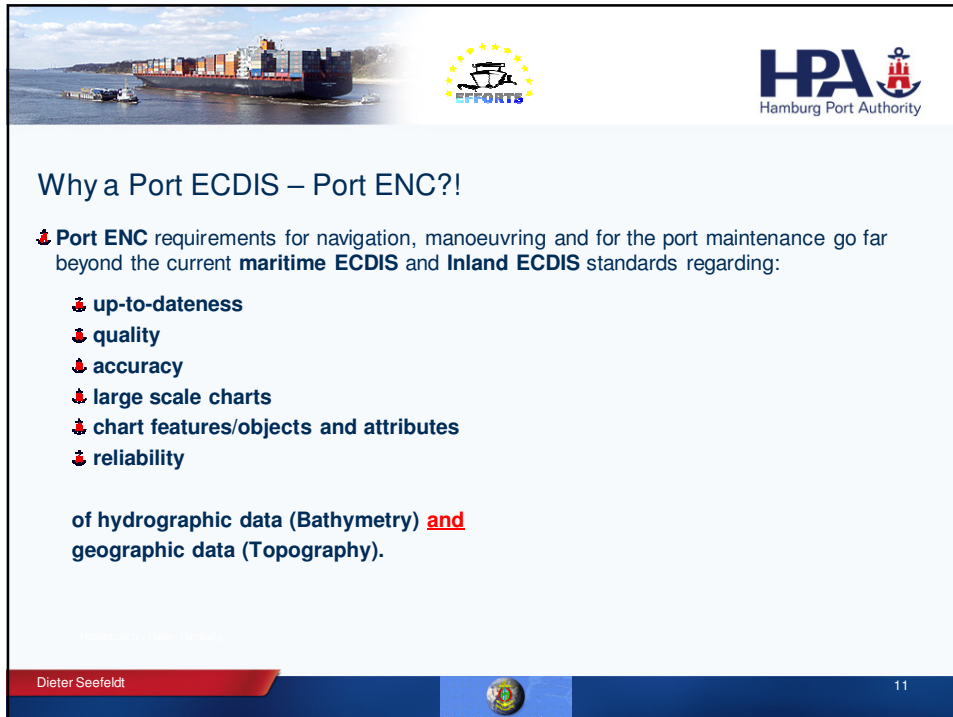


Slide 10: Why a Port ECDIS – Port ENC?!

- ⚓ 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-dateness, scale and accuracy aspects!

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Slide 11 features a header with a photograph of a large container ship at sea, the EFFORTS logo (a stylized ship with yellow stars), and the HPA Hamburg Port Authority logo. The main title is "Why a Port ECDIS – Port ENC?!" in blue. The text explains that Port ENC requirements go beyond maritime ECDIS and Inland ECDIS standards. A bulleted list with red anchor icons includes: up-to-dateness, quality, accuracy, large scale charts, chart features/objects and attributes, and reliability. It also mentions hydrographic data (Bathymetry) and geographic data (Topography). The footer contains the name "Dieter Seefeldt", a small globe icon, and the number "11".

Why a Port ECDIS – Port ENC?!

- Port ENC requirements for navigation, manoeuvring 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
 - reliability

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

Dieter Seefeldt 11



Slide 12 features the same header as slide 11. The main title is "Why a Port ECDIS – Port ENC?!" in blue. The text explains that for Port operations, special requirements must be fulfilled with respect to 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., topographic and hydrographic data) should be made available by the Port Authorities using a standardized data format → Port ENC standard. The footer contains the name "Dieter Seefeldt", a small globe icon, and the number "12".

Why a Port ECDIS – Port ENC?!

- For Port operations special requirements must be fulfilled with respect to
 - vertical and horizontal accuracy.
- This is normally achieved by
 - using modern sensor technology.
- The same accuracy must be inherent in the underlying electronic charts.
- This type of source data (e.g., topographic and hydrographic data) should be made available by the Port Authorities
 - using a standardized data format → **Port ENC standard**.

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Slide 13 features a header with a photograph of a large container ship at sea, the EFFORTS logo (a yellow star circle with a ship icon), and the HPA Hamburg Port Authority logo. The main text area is light blue and contains the title 'Why a Port ECDIS – Port ENC?!' followed by two bullet points. The first bullet point states that there is no standard or extensions for port operations. The second bullet point states that there is a call for a specific 'Port ECDIS' which leads to Port ENC. Below the text, a red line contains the statement 'A Port ENC is needed!!' followed by an arrow pointing to 'result of the Port ECDIS questionnaire'. The footer is dark blue and includes the name 'Dieter Seefeldt', a small globe icon, and the slide number '13'.

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

Dieter Seefeldt 13

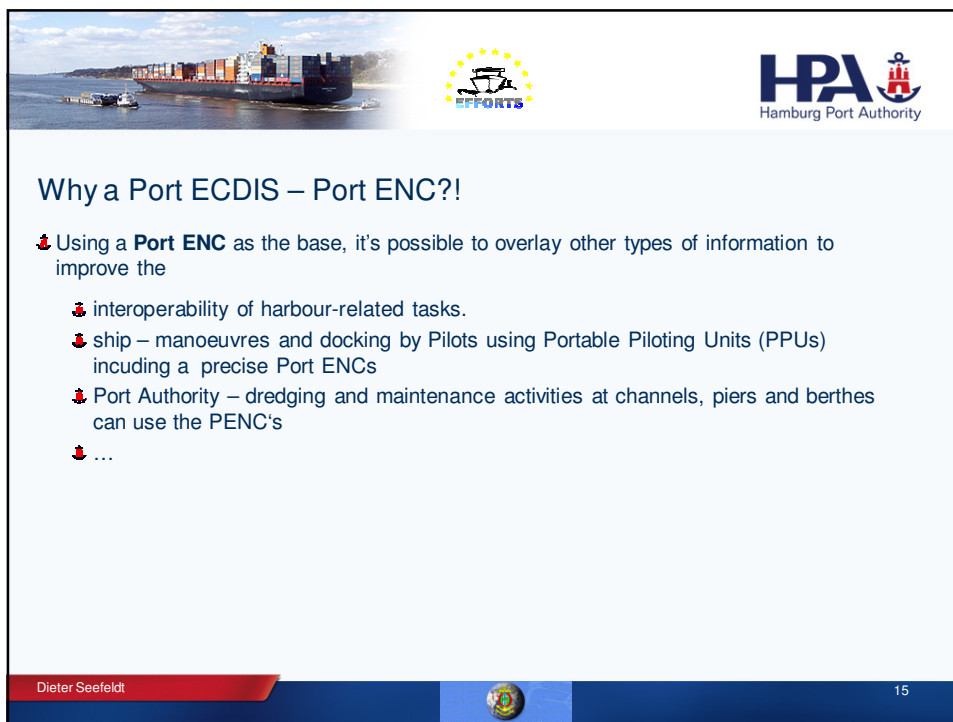


Slide 14 features the same header as slide 13. The main text area is light blue and contains the title 'Why a Port ECDIS – Port ENC?!' followed by four bullet points. The first bullet point states that the Port ENC Standard should be an independent but complementary standard to maritime ENC and Inland ENC. The second bullet point states that the development of a Port ENC standard focuses on high precision operations in ports. The third bullet point states that a Port ENC is intended to align with ongoing developments for maritime and Inland ENCs, specifically mentioning IHO S100 Standard and Maritime Spatial Data Infrastructure MSDI. The fourth bullet point states that Port ENC data should serve as the missing link between maritime and Inland ENCs. The footer is dark blue and includes the name 'Dieter Seefeldt', a small globe icon, and the slide number '14'.

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**. (→ IHO S100 Standard, Maritime Spatial Data Infrastructure MSDI....)
- Port ENC** data should serve as the missing link between maritime and Inland ENCs.

Dieter Seefeldt 14



Slide 15 features a header with a photograph of a large container ship at a port, the EFFORTS logo (a yellow star with a ship icon), and the HPA Hamburg Port Authority logo. The main title is "Why a Port ECDIS – Port ENC?!" in blue. The content consists of a bulleted list with red anchor icons, explaining the benefits of using a Port ENC as a base for overlaying other information. The footer includes the name "Dieter Seefeldt", a small globe icon, and the slide number "15".

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.
 - ship – manoeuvres and docking by Pilots using Portable Piloting Units (PPUs) including a precise Port ENCs
 - Port Authority – dredging and maintenance activities at channels, piers and berthes can use the PENC's
 - ...

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Slide 16 features the same header as slide 15. The main title is "Why a Port ECDIS – Port ENC?!" in blue. The content consists of a bulleted list with red anchor icons, detailing the various applications of ECDIS data beyond onboard use, including VTS, route planning, and marine simulators. It also mentions the use of ENC data as a backdrop and the potential for linking GIS technology to improve harbour interoperability. The footer includes the name "Dieter Seefeldt", a small globe icon, and the slide number "16".

Why a Port ECDIS – Port ENC?!

- ECDIS data are not only used onboard but also in:
 - Vessel Traffic Services (VTS) / Vessel Traffic Management and Information Systems (VTMIS)
 - Route planning application
 - Marine Simulators (ship handling, tug simulator...)
 - ...
 - ...
- 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.

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IHO Standards (S-57 & S-44)

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IHO Standards (S-57 & S-44)

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

⚓ but it 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 ⁵ 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	± 0.6		
		30	± 0.8		
A2	± 20 m	= 1.00 + 2% d		Full area search undertaken. All significant seafloor features detected ⁴ and depths measured.	Controlled, systematic survey ⁵ achieving position and depth accuracy less than ZOC A1 and using a modern survey echosounder ⁷ and a
		Depth (m)	Accuracy (m)		
		10	± 1.2		
		30	± 1.6		

highest level

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IHO 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-clearance is critical	Areas shallower than 100 metres where under-clearance is critical	Areas generally deeper than 100 metres where a general search 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 = 0.5 metre b = 0.013	a = 0.5 metre b = 0.013
Glossary and note 2	Full Sea floor Search	Required	Required	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	Cubic features > 2 metres, in depths up to 40 metres; 10% of depth beyond 40 metres	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	Not defined as full sea floor search is required	Not defined as full sea floor search is required
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	20 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. ?!



IHO Standards (S-57 & S-44)

- One example is the **official BSH - ENC of the Port of Hamburg**.
 - Produced and issued by BSH (Federal Maritime and Hydrographic Agency / Germany),
 - it meets all the relevant ENC related standards and **fulfils 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

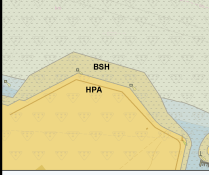
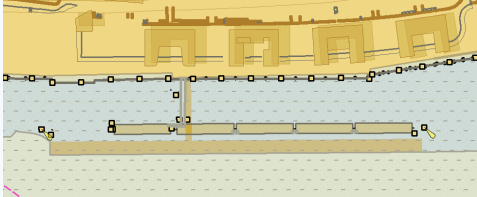
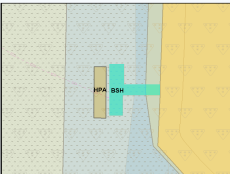
BSH ENC-cell Port of Hamburg
Federal Maritime and Hydrographic Agency
name: DE521500.000
date: 27.05.2005
scale: 1:15 000 → small scale!!
accuracy:
S-57 Object Class: M_QUAL
attribut: CATZOC = B (3) ±50m

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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	0,62
	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)!


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The EFFORTS Work Package 1.3 - Port ECDIS - tasks

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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**.

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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, VTMS, 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.

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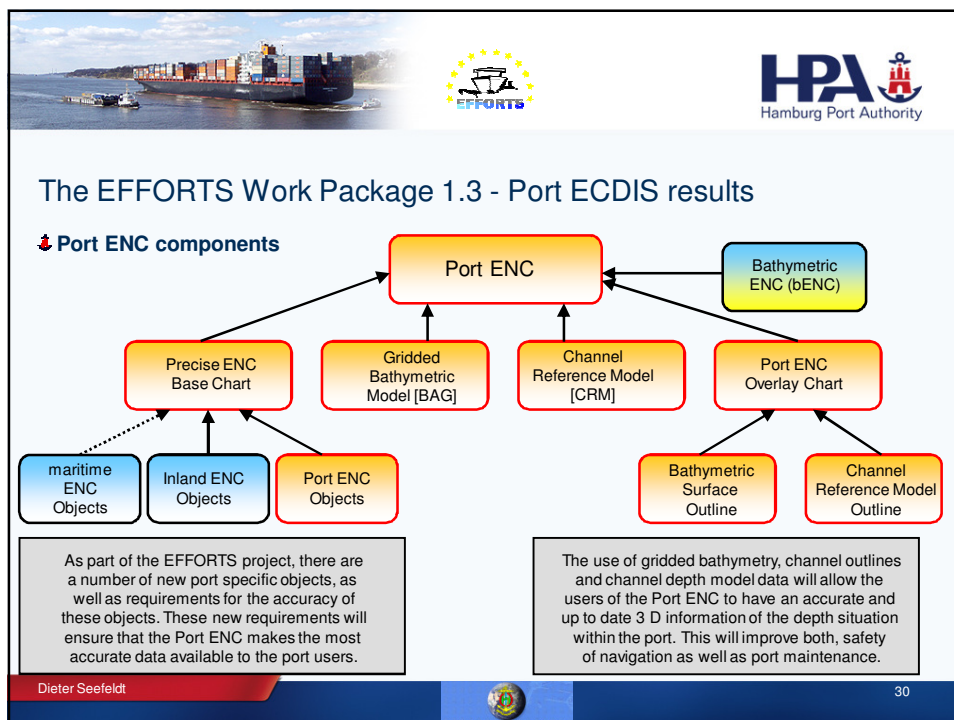
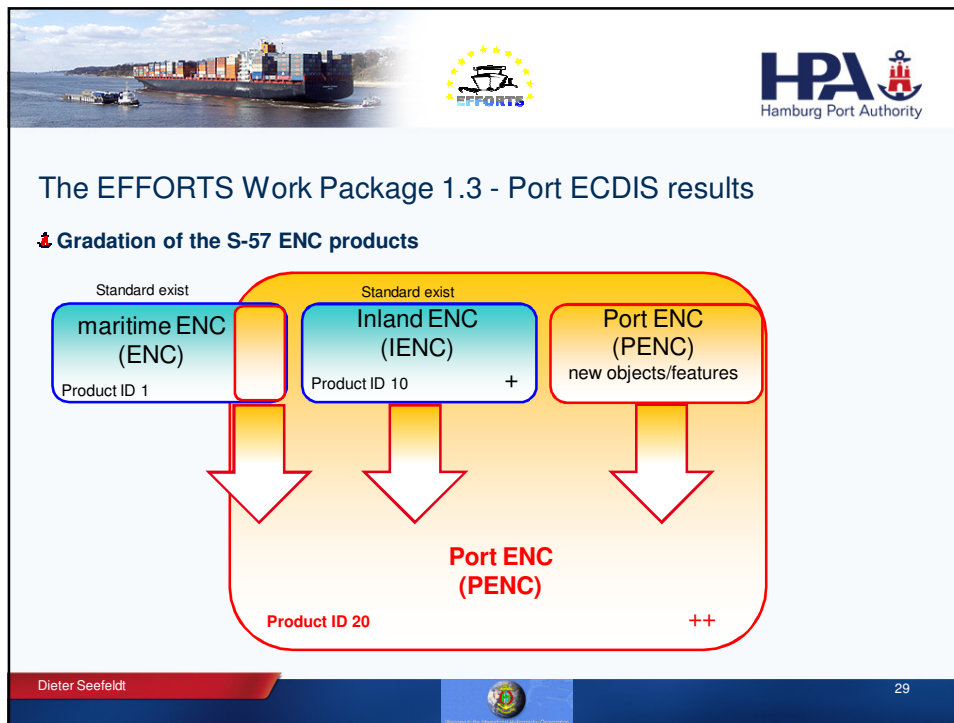







The EFFORTS Work Package 1.3 - Port ECDIS results

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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)

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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**).

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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.

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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

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The EFFORTS Work Package 1.3 - Port ECDIS results


- 📄 D 1.3.2 Port ECDIS (Port ENC) specification (documents)
 - 📄 Port ENC Feature Catalogue - description of the Port ENC features

Port ENC Feature Catalogue

Edition 1.0

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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; nbxtids; 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

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The EFFORTS Work Package 1.3 - Port ECDIS results




📍 Port ENC geographic 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 , clrsseg, DRYDOC, FLODOC, flodoc, GATCON, gatcon, HULKES, hulkes, lqkbsn, 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, NAVLINE, (RADLINE), RADSTA, RESARE, resare, (RSCSTA), RTPBCN, SILTNK, sistat, sistaw	± 0,5 m	± 0,5 m	Fixed object relevant for navigation (maneuvering, turning, towage)

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The EFFORTS Work Package 1.3 - Port ECDIS results

📍 Port ENC geographic data quality – suggestion → CATZOC → accuracy

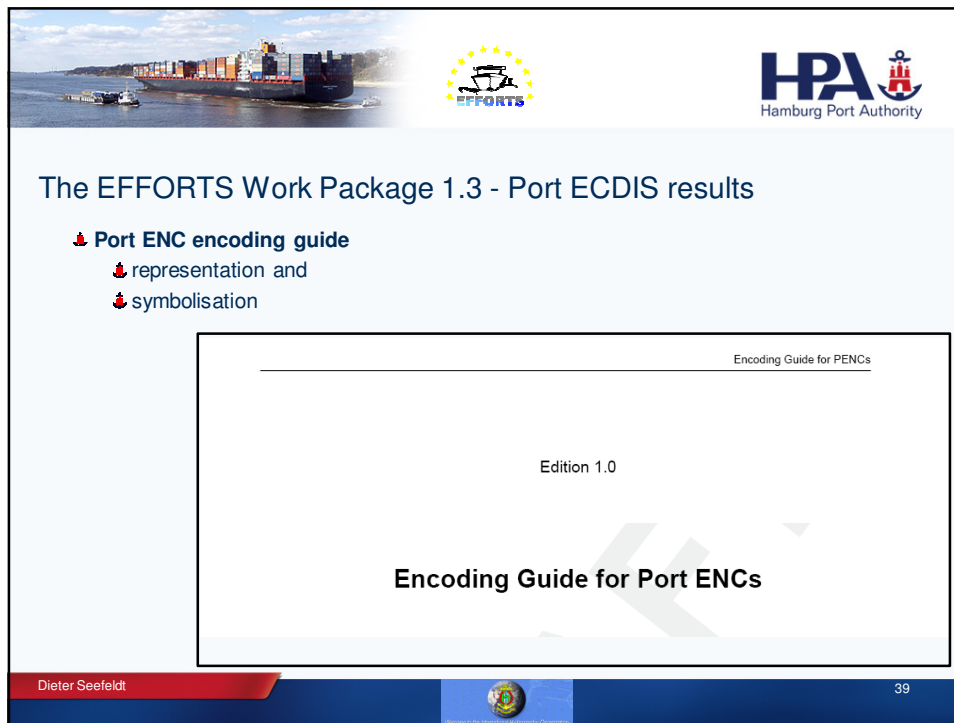
topacc Zone B

ID	Meaning	Object class	Positional accuracy	Vertical accuracy	Group
2	Zone B	(BCNCAR), (bcncar), (BCNISD), (bcnisd), (BCNLAT), (bcnlat), (BCNSAW), (bcnsaw), (BCNSPP), (bcnspp), bridge, cblohd , clrsseg, DRYDOC, FLODOC, flodoc, GATCON, gatcon, HULKES, hulkes, lqkbsn, 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, NAVLINE, (RADLINE), RADSTA, RESARE, resare, (RSCSTA), RTPBCN, SILTNK, sistat, sistaw	± 2,5 m	± 2,5 m	Fixed object relevant for navigation (maneuvering, turning, towage)

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

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The EFFORTS Work Package 1.3 - Port ECDIS results

🚢 **Port ENC encoding guide**

- 🚢 representation and
- 🚢 symbolisation

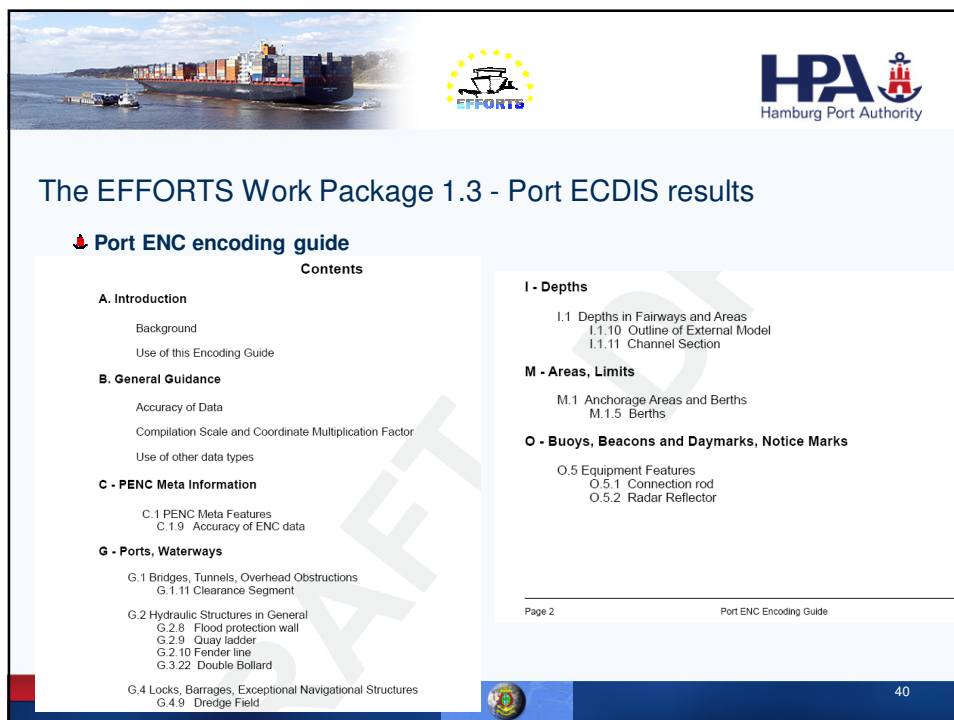
Encoding Guide for PENCs

Edition 1.0

Encoding Guide for Port ENC's

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The EFFORTS Work Package 1.3 - Port ECDIS results

🚢 **Port ENC encoding guide**

Contents

A. Introduction

- Background
- Use of this Encoding Guide

B. General Guidance

- Accuracy of Data
- Compilation Scale and Coordinate Multiplication Factor
- Use of other data types

C - PENC Meta Information

- C.1 PENC Meta Features
- C.1.9 Accuracy of ENC data

G - Ports, Waterways

- G.1 Bridges, Tunnels, Overhead Obstructions
- G.1.11 Clearance Segment
- G.2 Hydraulic Structures in General
- G.2.8 Flood protection wall
- G.2.9 Quay ladder
- G.2.10 Fender line
- G.3.22 Double Bollard
- G.4 Locks, Barrages, Exceptional Navigational Structures
- G.4.9 Dredge Field

I - Depths

- I.1 Depths in Fairways and Areas
- I.1.10 Outline of External Model
- I.1.11 Channel Section

M - Areas, Limits

- M.1 Anchorage Areas and Berths
- M.1.5 Berths




O - Buoys, Beacons and Daymarks, Notice Marks

- O.5 Equipment Features
- O.5.1 Connection rod
- O.5.2 Radar Reflector




Page 2

Port ENC Encoding Guide

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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	

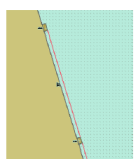
Tab.3: S-52 representation for the meta object "Accuracy of ENC data"


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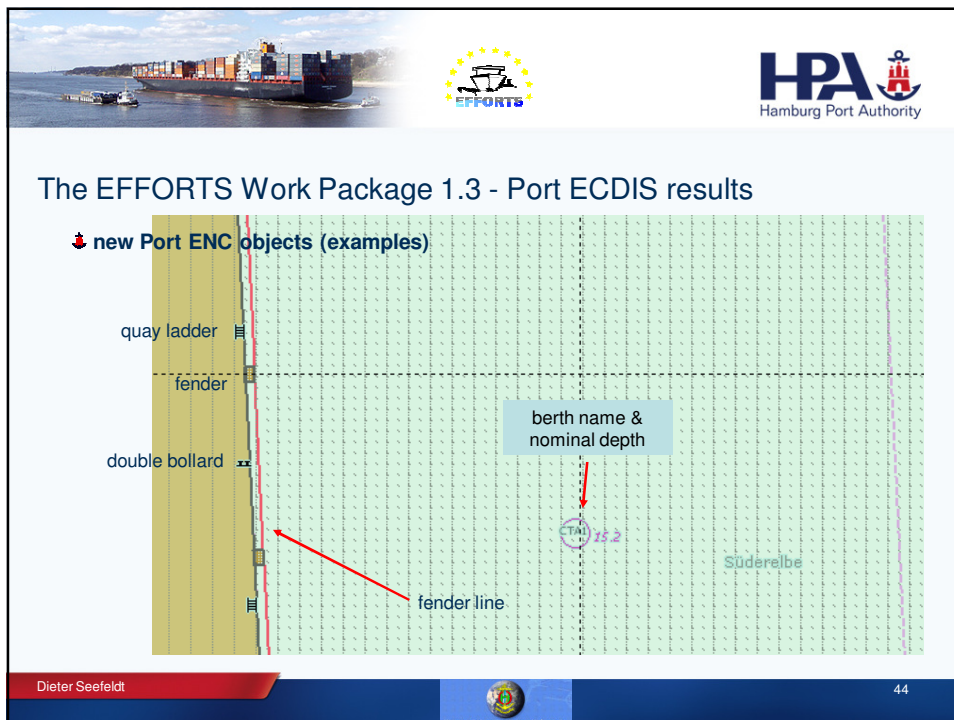
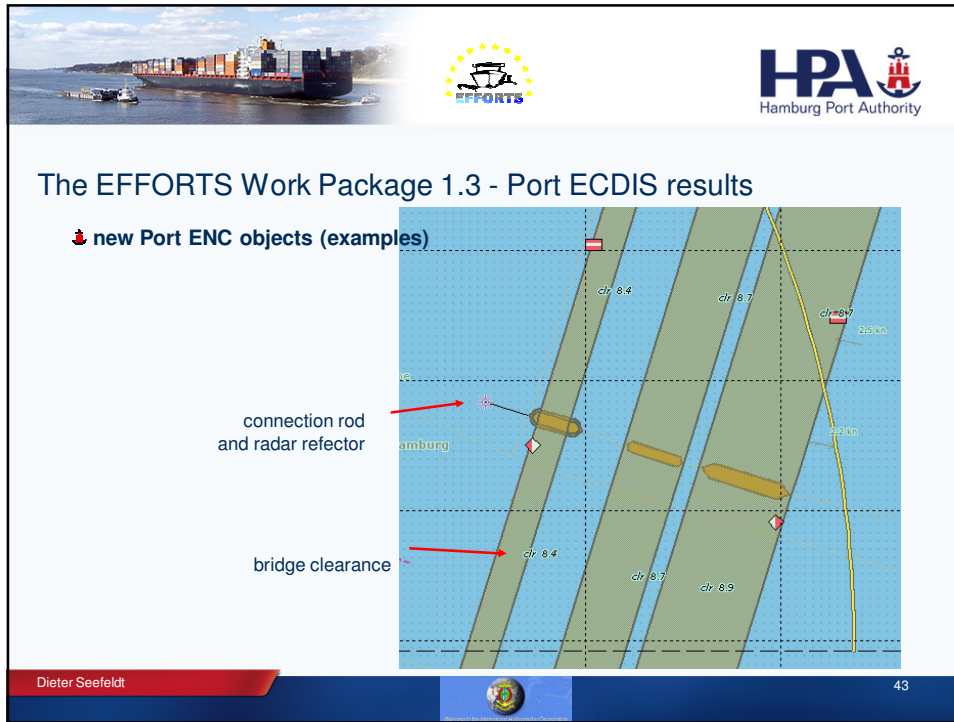







The EFFORTS Work Package 1.3 - Port ECDIS results

 **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

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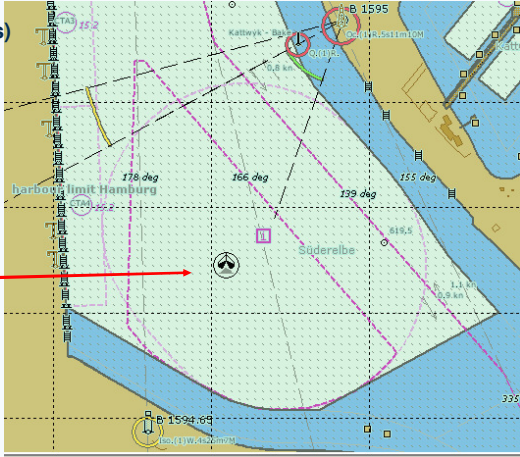



The EFFORTS Work Package 1.3 - Port ECDIS results

📍 new Port ENC objects (examples)

dredge field



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The EFFORTS Work Package 1.3 - Port ECDIS results

📍 Port ENC product specification


Product Specification for PENCs

Edition 1.0

Product Specification for Port ENCs

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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!!

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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


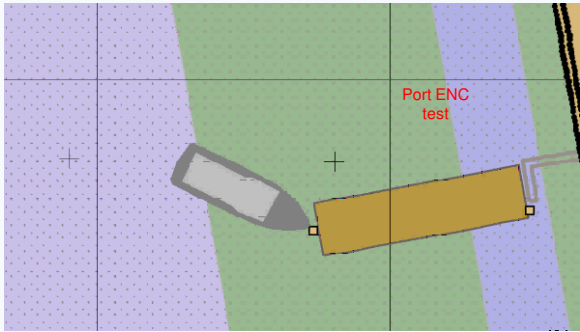



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The EFFORTS Work Package 1.3 - Port ECDIS results

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

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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"





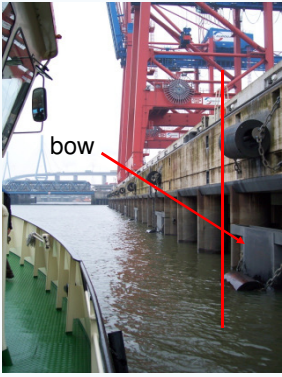
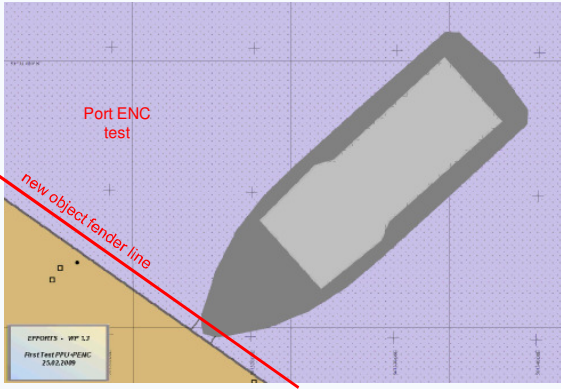
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The EFFORTS Work Package 1.3 - Port ECDIS results

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

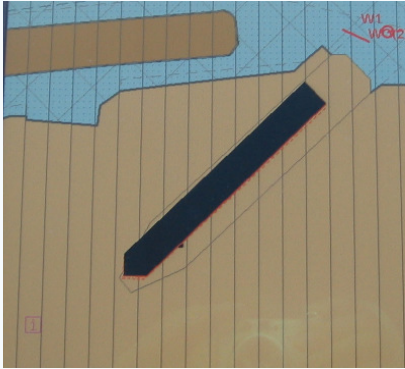
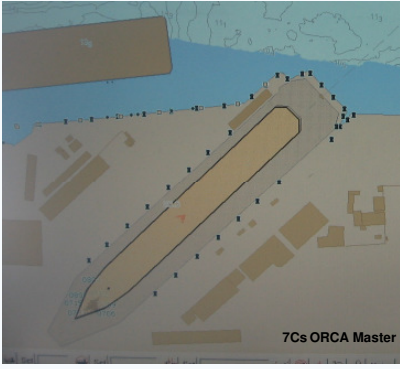



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The EFFORTS Work Package 1.3 - Port ECDIS results




D 1.3.4 Tests - functional test during docking manoeuvre

Onboard ENC – (inaccurate)

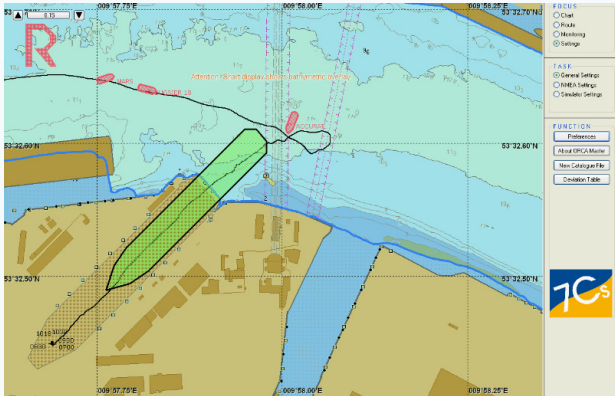
Port ENC – (precise)

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The EFFORTS Work Package 1.3 - Port ECDIS results

D 1.3.4 Tests - functional test during docking manoeuvre



7Cs ORCA Master

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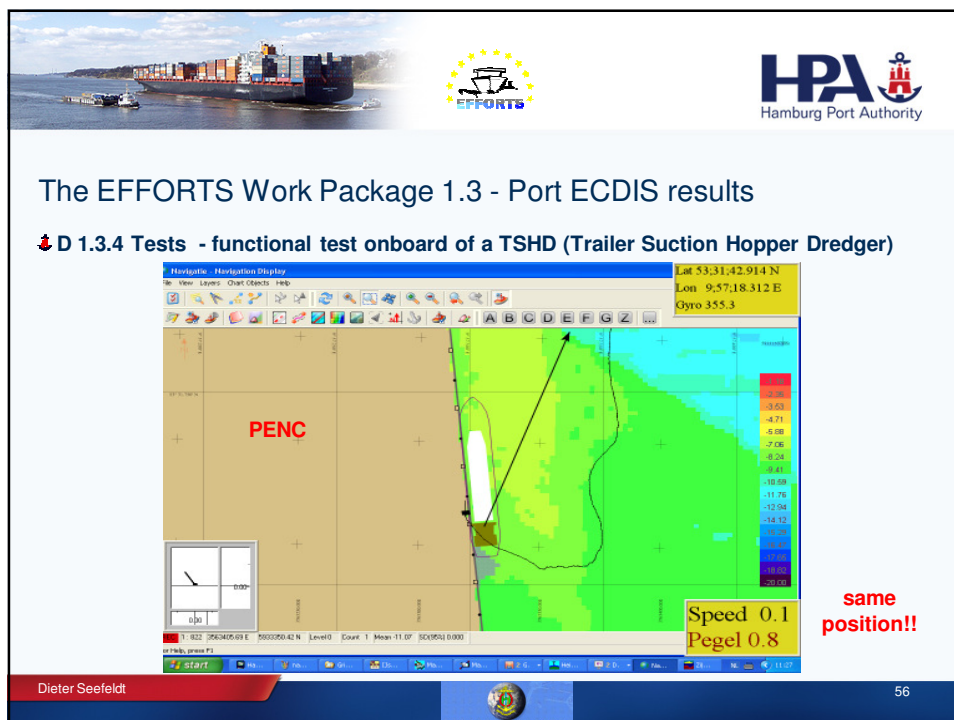
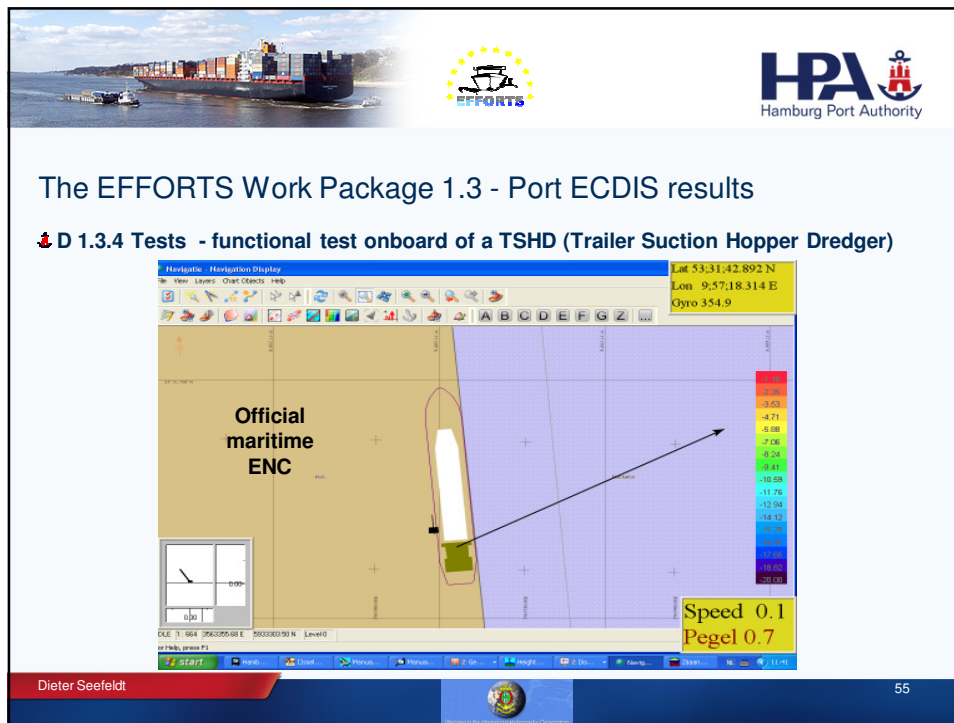

The EFFORTS Work Package 1.3 - Port ECDIS results

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



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 **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).




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





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




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





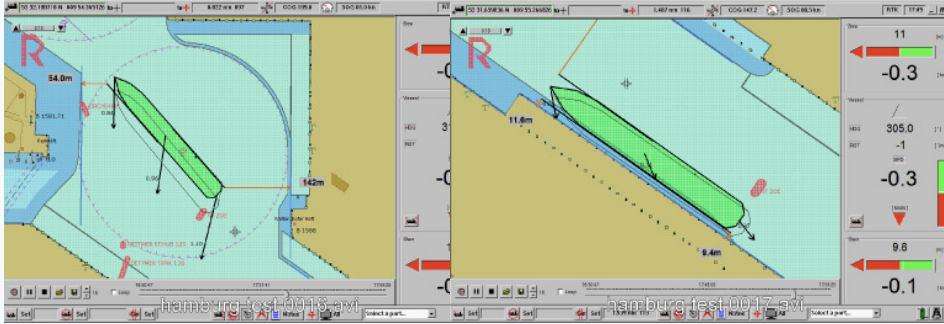
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The EFFORTS Work Package 1.3 - Port ECDIS results

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



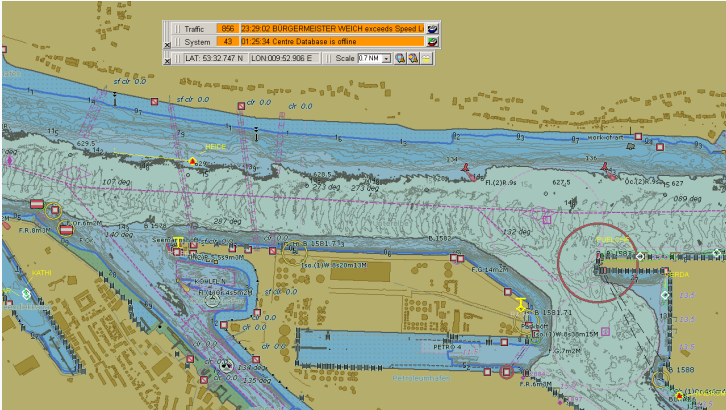
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The EFFORTS Work Package 1.3 - Port ECDIS results




D 1.3.4 Tests - functional test as base information in a VTMS



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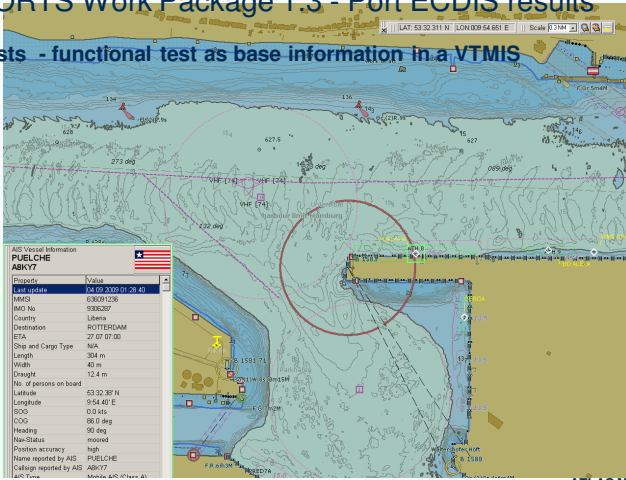
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The EFFORTS Work Package 1.3 - Port ECDIS results

D 1.3.4 Tests - functional test as base information in a VTMISS



AIS Vessel Information	
PUELICHE ABCV7	
Country	Liberia
Last update	04.09.2009 01:28:45
MMSI	630091236
IMO No.	5306327
Country	Liberia
Destination	POTTERSDAM
ETA	27.07.07 00:00
Ship and Cargo Type	N/A
Length	364 m
Width	40 m
Draught	12.4 m
No. of persons on board	
Latitude	53.22.89° N
Longitude	05.54.48° E
SOG	0.0 kts
COG	88.0 deg
Heading	90.8 deg
Rtt-Status	received
Position accuracy	high
Name reported by AIS	PUELICHE
Call sign reported by AIS	ABCV7

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The EFFORTS Work Package 1.3 - Port ECDIS results

Innovative aspects

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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 – IHO Standards for Hydrographic Surveys and defines a new Port ENC accuracy definition / class.
- Accuracy of ENC data – **m_aenc** and
- the characteristic of these object = 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"

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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.

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The EFFORTS Work Package 1.3 - Port ECDIS results

Innovative aspects

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




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.

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The EFFORTS Work Package 1.3 - Port ECDIS results

Implementation of results within the port industry and beyond


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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.

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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.)

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The EFFORTS Work Package 1.3 - Port ECDIS results

📌 the Port ENC & the Port ECDIS viewer - examples

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The EFFORTS Work Package 1.3 - Port ECDIS results

📌 the Port ENC & the Port ECDIS viewer - examples

Efforts Port ECDIS Viewer



This software must not be used as an aid to navigation.

The Efforts Port ECDIS Viewer was designed and developed exclusively as a demonstrator. The idea is to give an impression how Port ECDIS data can be visualized and how Port ECDIS data can help to make Operations in Ports more effective.

In no event shall the manufacturer be liable for any other damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or other pecuniary loss) arising out of inability to use, or the use, of the Software, even if the manufacturer has been advised of the possibility of such damages. In any case, the manufacturer's entire liability shall be limited to the amount actually paid by you for the software.

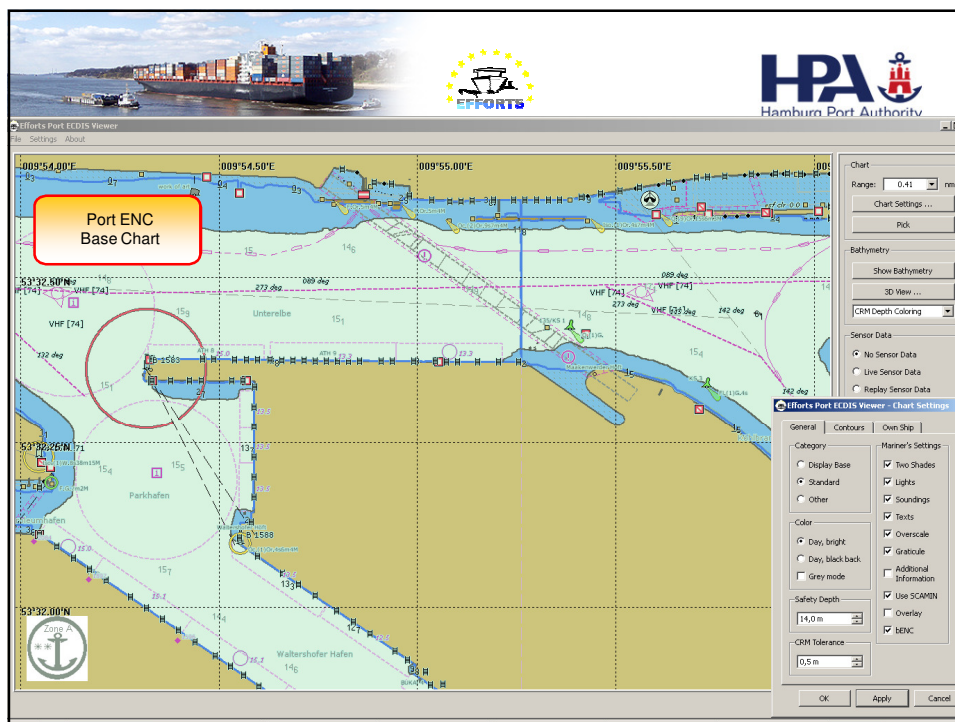
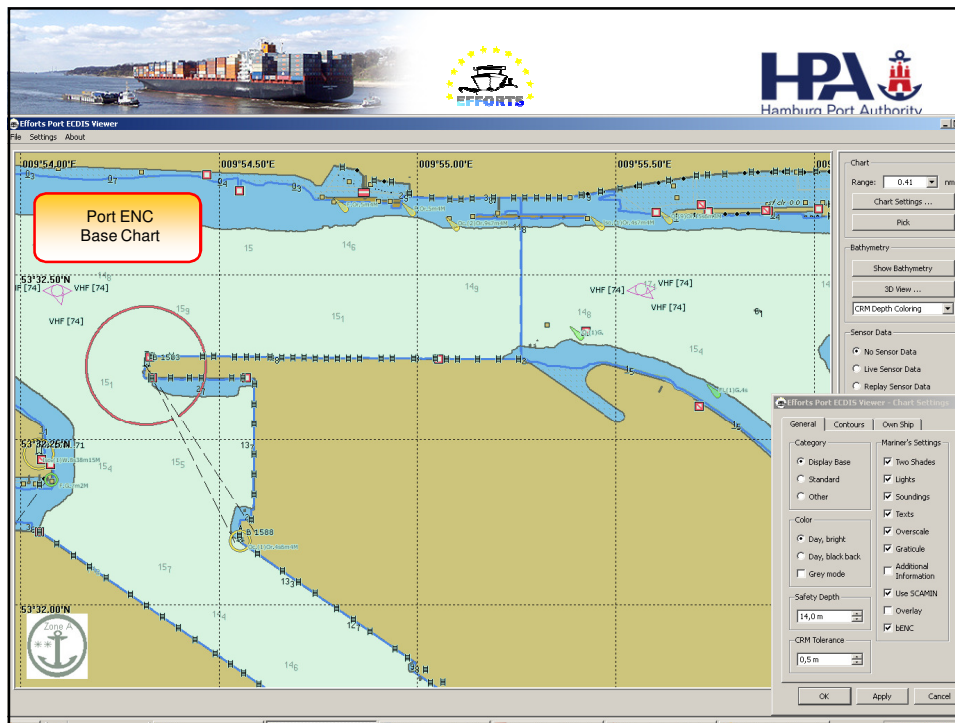
The manufacturer disclaims all warranties, either expressed or implied, including but not limited to implied warranties of fitness for a particular purpose, with respect to the Software, the accompanying manual(s) and written materials.

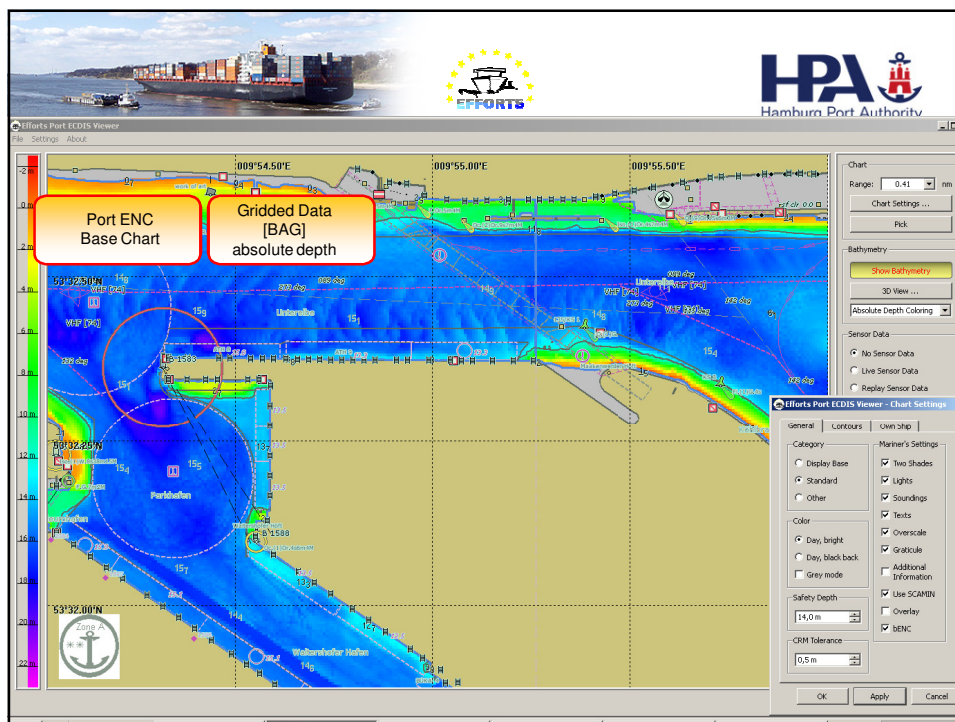
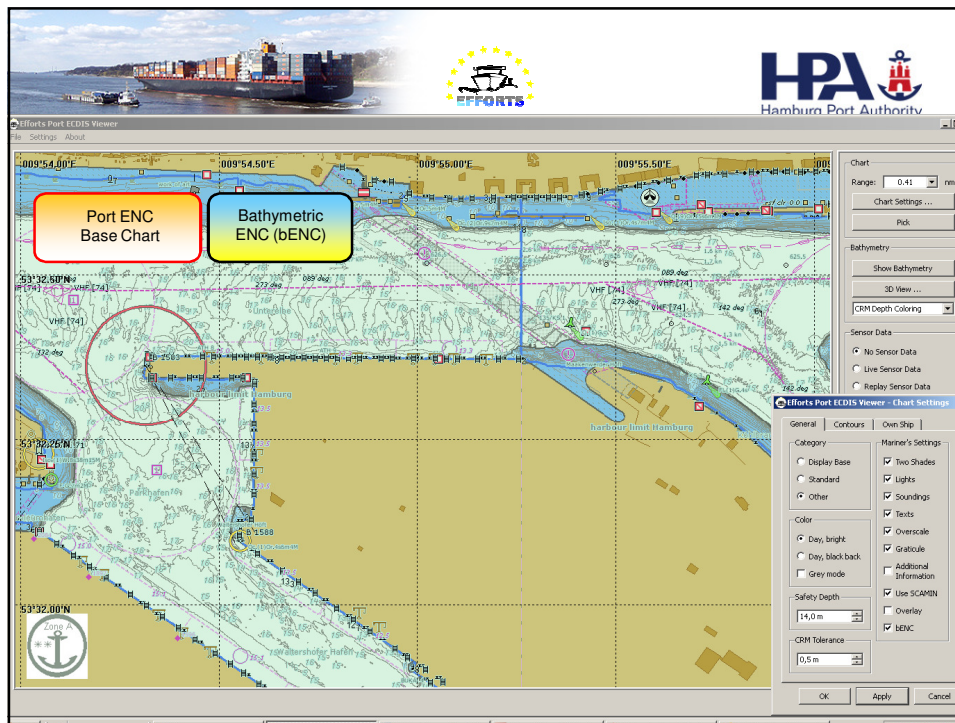
Moreover General Terms and Conditions of **SevenCs GmbH** (as of July 2009) must be accepted when using this software.

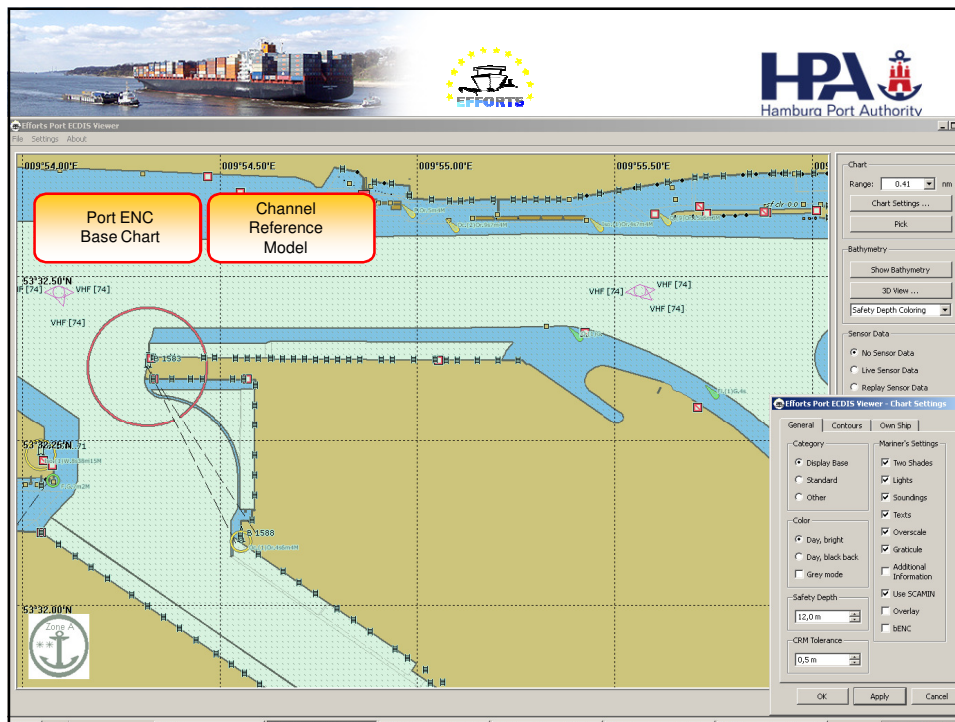
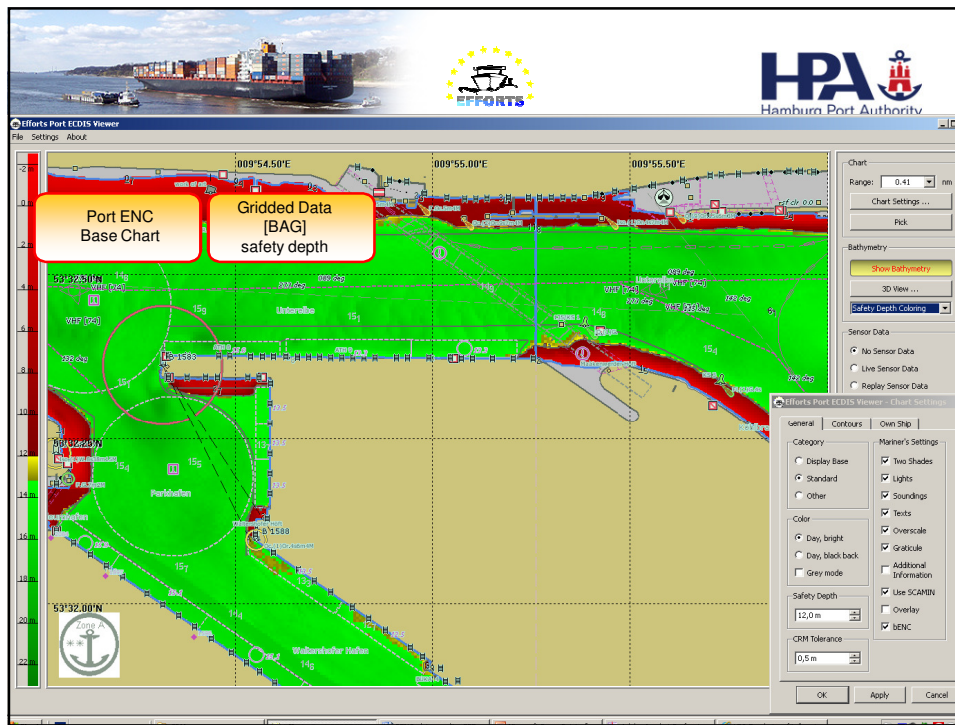
OK

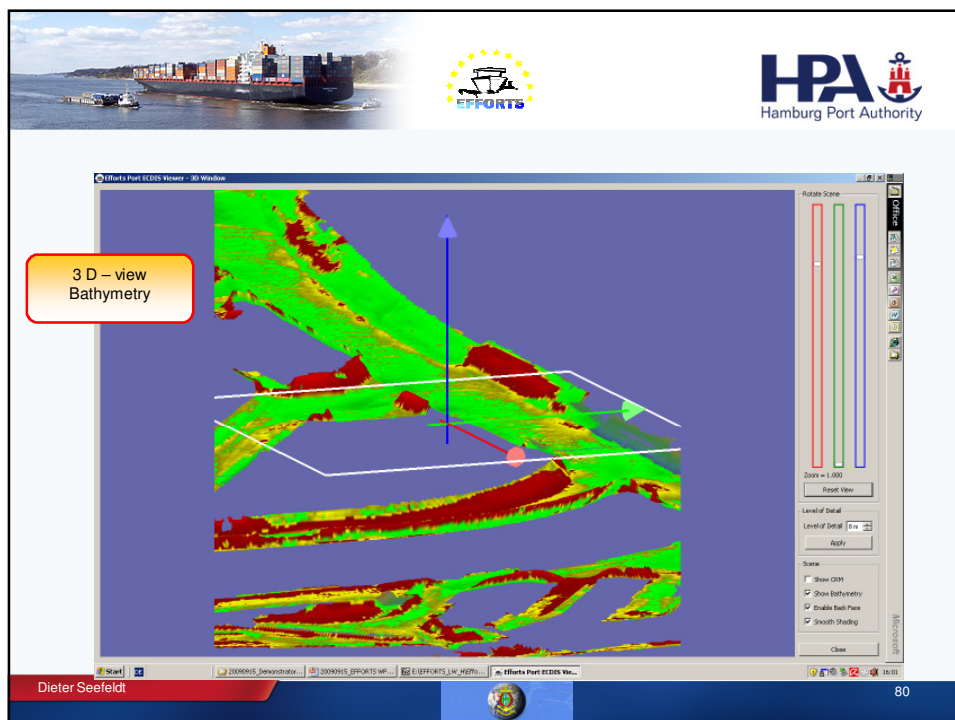
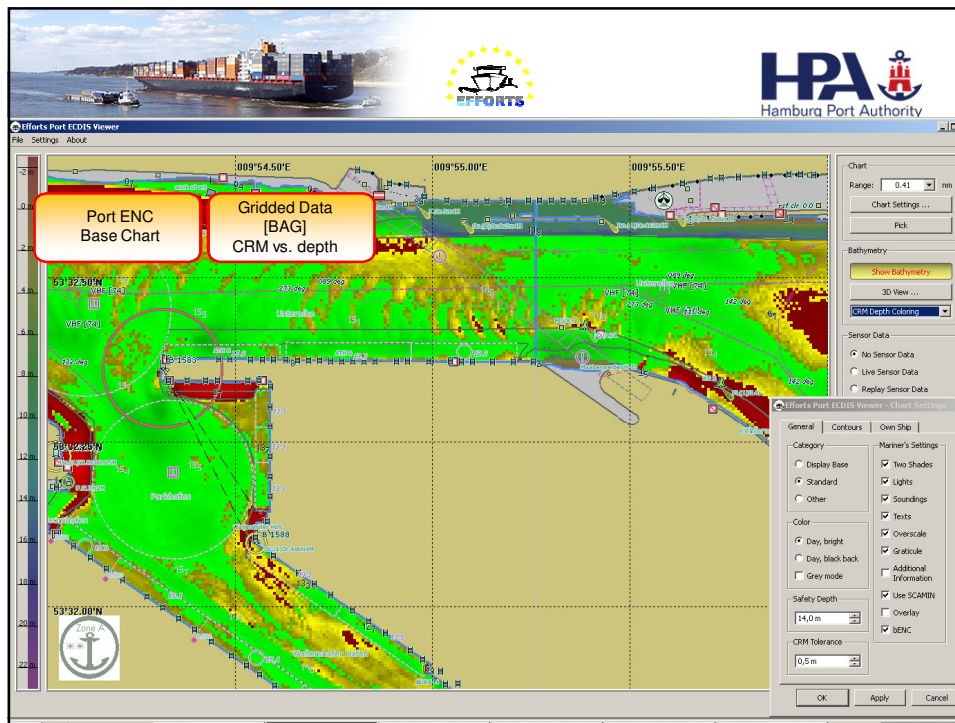
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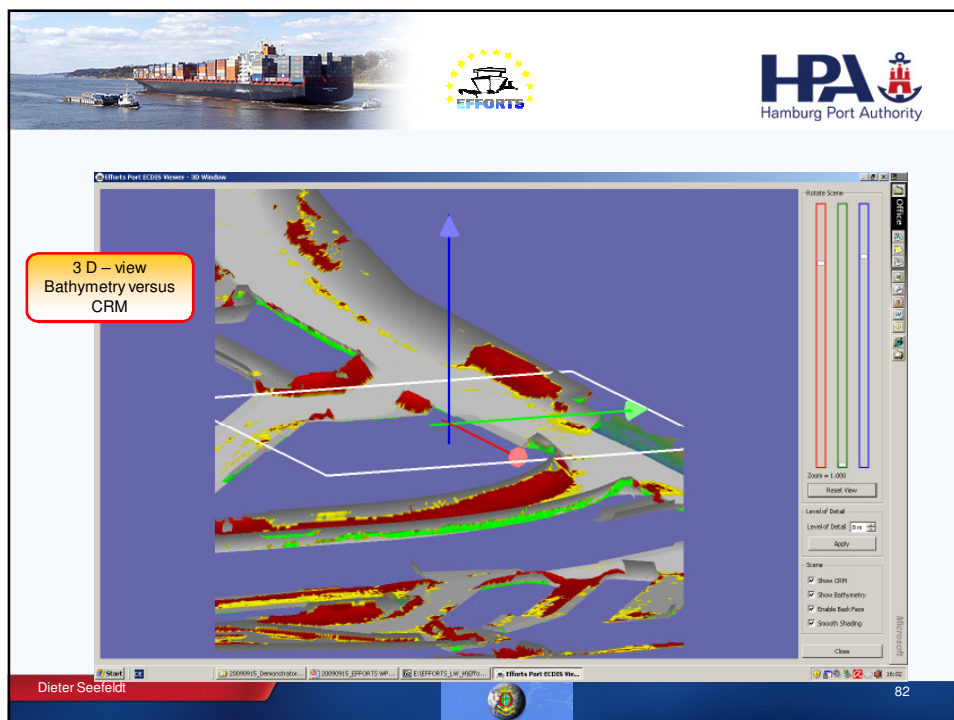
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The EFFORTS Work Package 1.3 - Port ECDIS results

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

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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]

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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
- UNECE - 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: FP6-03 1486
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 standards in scale, accuracy, chart objects and attributes ("object catalogue" in future "feature catalogue") and

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The Port ENC – proposal for a new standard

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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!**

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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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Slide 89 features a header with a photograph of a large container ship at sea, the EFFORTS logo (a yellow starburst with a ship icon), and the HPA Hamburg Port Authority logo. The main content area is light blue and contains the title "Developing a Port ECDIS - a challenge mastered" and a closing message "🚢 Thank you for your attention!!". The footer is dark blue with a red bar on the left containing the name "Dieter Seefeldt", a small globe icon in the center, and the number "89" on the right.

Developing a Port ECDIS - a challenge mastered

🚢 Thank you for your attention!!

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Slide 90 features a header with the same photograph of a large container ship and the HPA Hamburg Port Authority logo. The main content area is light blue and contains the title "Kontaktdaten" followed by contact information for the HPA Hamburg Port Authority AöR. The footer is dark blue with a red bar on the left containing the name "Dieter Seefeldt", a small globe icon in the center, and the number "90" on the right.

Kontaktdaten

on behalf of the
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 Neuer Wandrahm 4
 20457 Hamburg
 Germany
www.hamburg-port-authority.de

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 Mobile: +49 170 218 36 40
 E-Mail: Dieter.Seefeldt[at]DieSee.com

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