15th meeting of the DQWG

Using data quality for safe navigation

DQWG-15.6B

DQWG15, IHO Secretariat, Monaco, 4 – 7 February 2020

INTRODUCTION

The primary objective of the IHO Data Quality Working Group is to develop appropriate methods of classifying and depicting the quality of digital hydrographic information (www.iho.int)

- **Data Quality Working Group existence:**
  - Data Quality Working Group was re-activated at 18th CHRIS meeting (2006)
  - CHRIS-19 Committee agreed to add “presentation of data quality” to the DQWG work plan and the ToR to be amended accordingly (2007)
  - HSSC-9 agreed on the continuity of the activities of the DQWG and approved the new ToRs (2017)

TASK HSSC11/50

- HSSC11 tasked DQWG to continue the development of the conditional visualization methodology of quality of bathymetric data (**May 2019**)
- Quality of Bathymetric Data = M_QUAL/CATZOC (in S-57)
- S-57 ENC cells were provided by several DQWG members for testing
- Testdata was made available to S-100WG Vice-Chair
- First results were discussed at S-100 Test Strategy Meeting (**Sept 2019**)
- Portrayal is still the biggest issue
- This presentation is a **proof of concept** using existing software
- For symbology reason only, S-57 object RESARE is used
- Implementation to be decided by HSSC

IHO

International Hydrographic Organization

THE PRINCIPLE

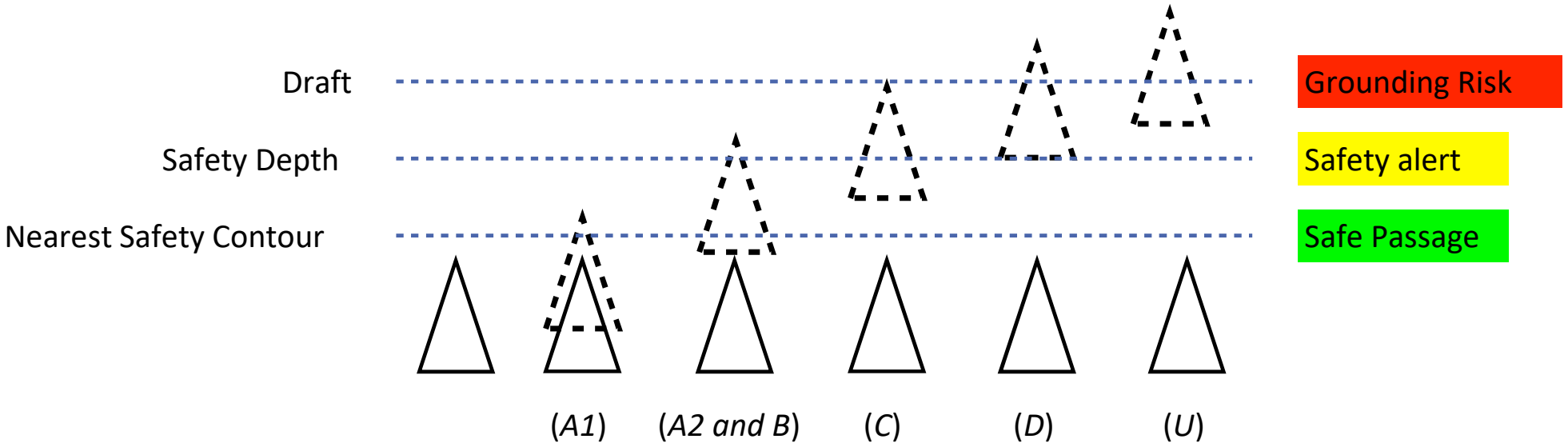
- Conditional visualization is based on the principle that isolated features hazardous to navigation need to be **highlighted** on need-to-have basis
- The horizontal and vertical accuracy of these isolated features is taken into account
- If no horizontal accuracy *(HORACC)* of a single feature is available, it will assume to have the accuracy associated with the quality indicator of the area. Same for vertical accuracy *(VERACC)*
- The area quality indicator - *Category Zone of Confidence (CATZOC)* - has been in use for more than 20 years
- *CATZOC* is mandatory in existing S-57 ENCs

THE CONDITIONS

- New methodology should:
  - Be intuitive to the Mariner
  - Not create confusion or distraction to the Mariner
  - Only be shown when the Mariner needs it for decision making
  - Make use of existing symbology in ECDIS
  - Be easy to supply the underlying data by the Hydrographic Office
  - Be easy to understand by the Hydrographic Office
  - Be supportive to facilitate autonomous shipping
  - Also work if no portrayal at all is needed

THE METHODOLOGY (VERTICALLY)

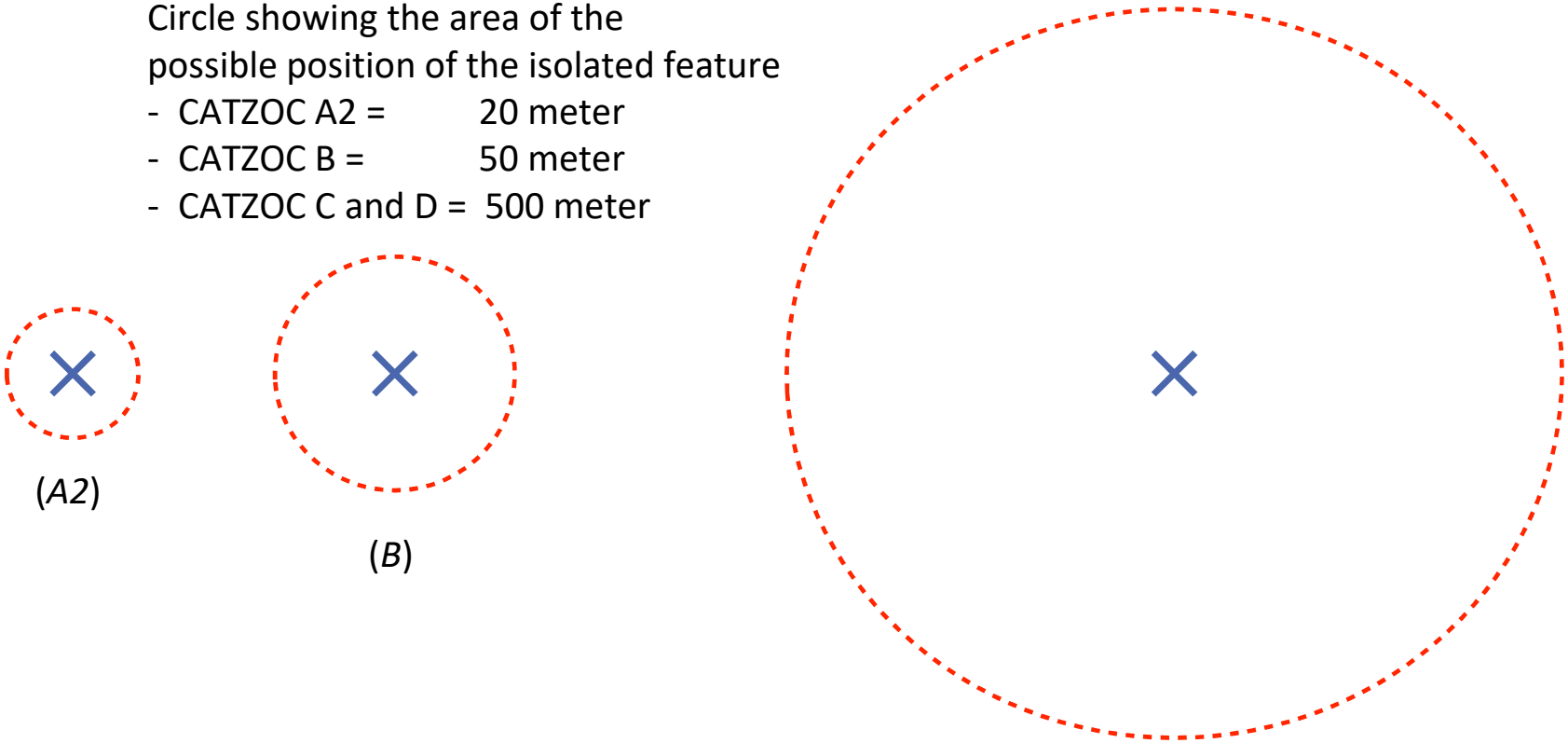
Applies to:
- obstructions
- under water rocks
- wrecks
- soundings



THE METHODOLOGY (HORIZONTALLY)

Circle showing the area of the possible position of the isolated feature

- CATZOC A2 = 20 meter
- CATZOC B = 50 meter
- CATZOC C and D = 500 meter



(*A2*)

(*B*)

(*C and D*)

OPERATIONAL TEST

- Testcase using ENC data from Denmark
- Greenland area (60-30N, 46-30W)
- Intended Usage = 4
- Polar region
- Source data: old paper charts, recent Satellite Imagery
- Difficult to confirm or disprove historic data without sufficient recent surveys
- Cell contains areas of CATZOC = D, B and A2
- Cell contains 116 UWTROCs (107 unknown depth)

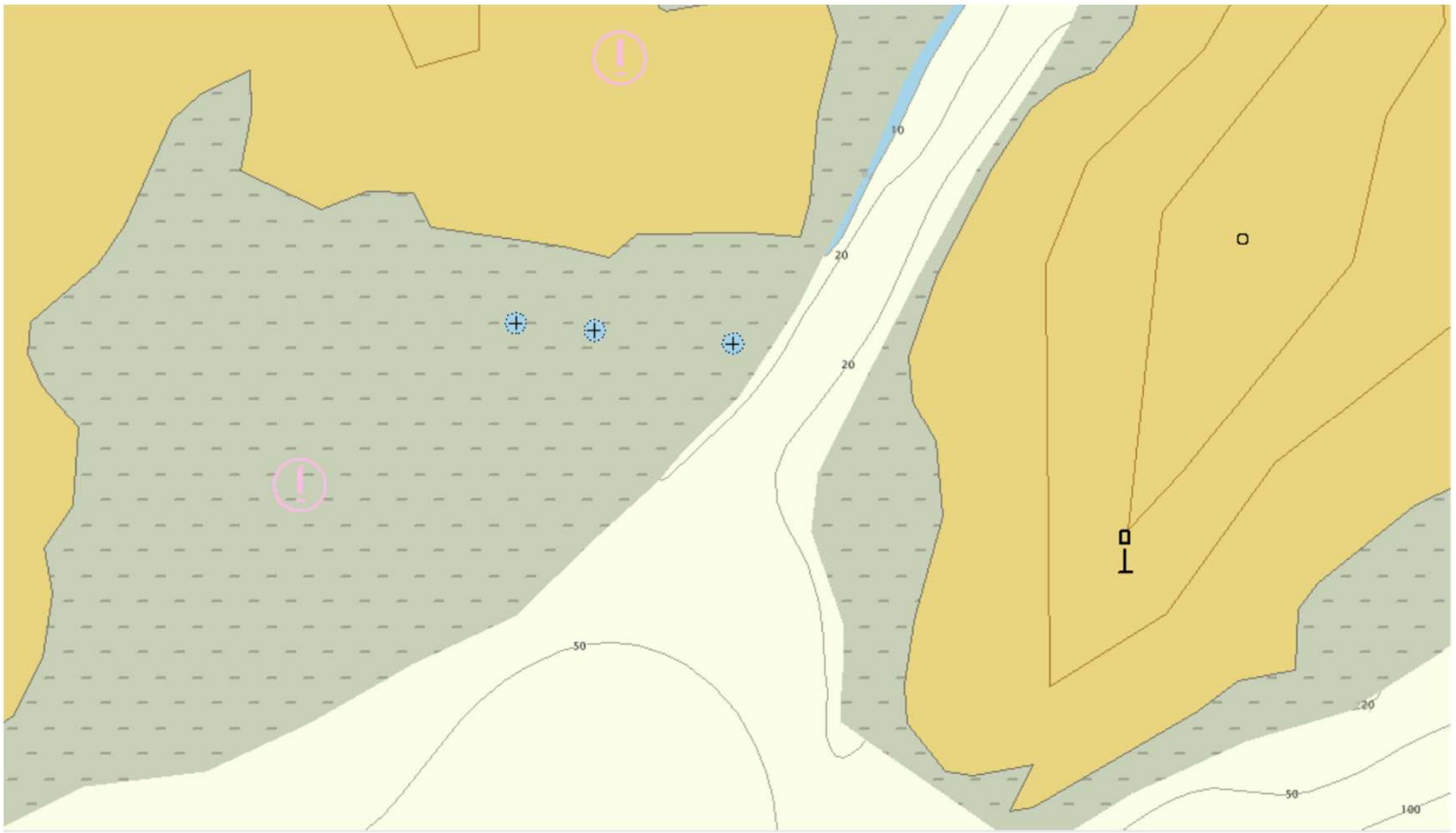
HOW TO ESTABLISH THE CORRECT FEATURES?

- Filter the areas of a specific CATZOC value (e.g. D)
- Select all UWTROC point objects inside the CATZOC D areas
- Copy these to a scratch layer
- Create Restricted Areas *(SAA in S-101)* around each single UWTROC
- Draw a circle until the edge of the CATZOC D area OR until the circle is 500m wide
- Assign attributes:
  - Category of restricted area = Offshore safety zone (**not in S-101**)
  - Restriction = Area to be avoided (**not in S-101**)

IHO

International Hydrographic Organization

CURRENT MARINERS VIEW

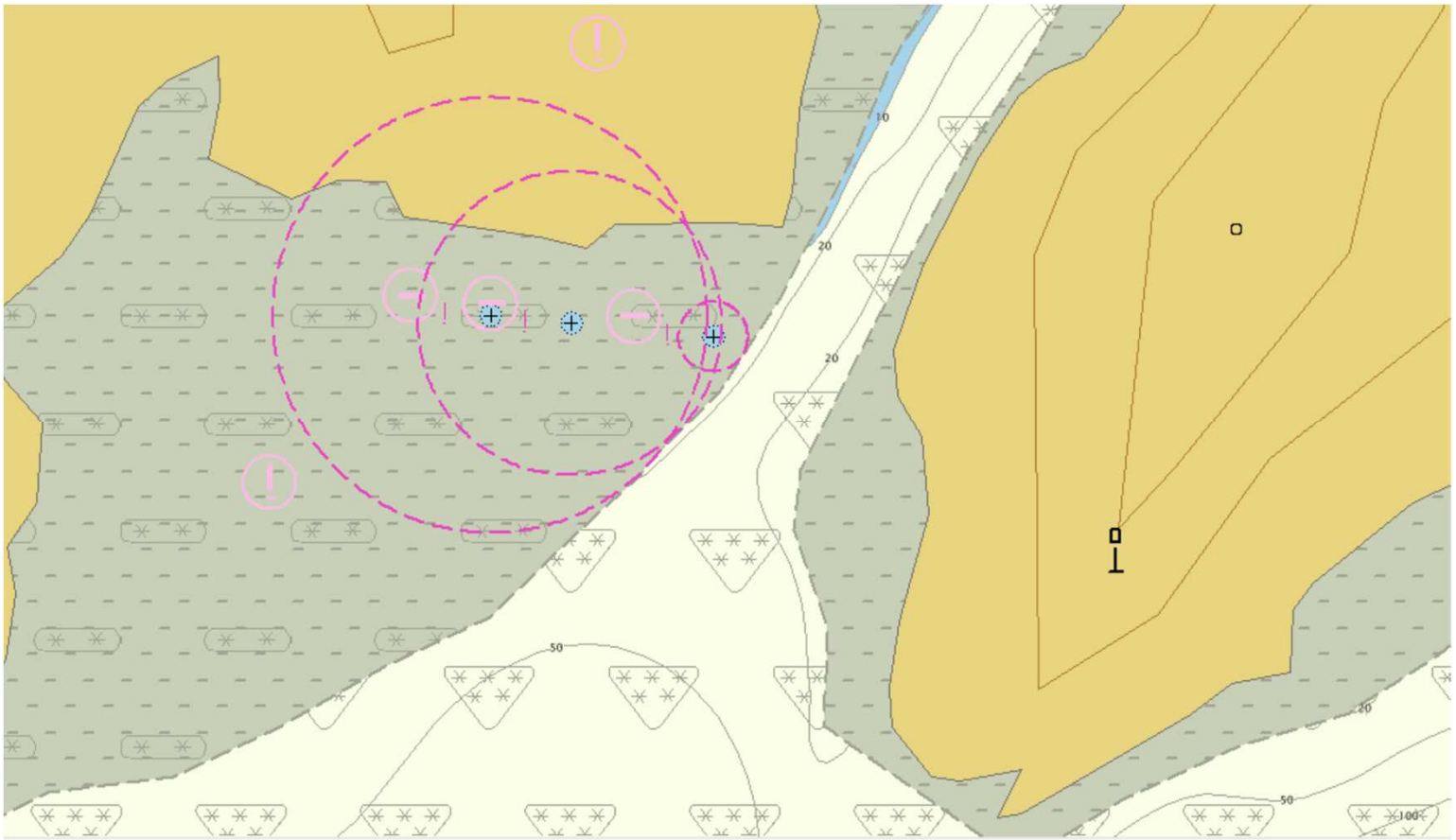


DQWG-15, IHO Secretariat, Monaco, 4 - 7 February 2020

IHO

International Hydrographic Organization

S-101 ENC WITH ADDITIONAL SAFETY ALERT AREAS

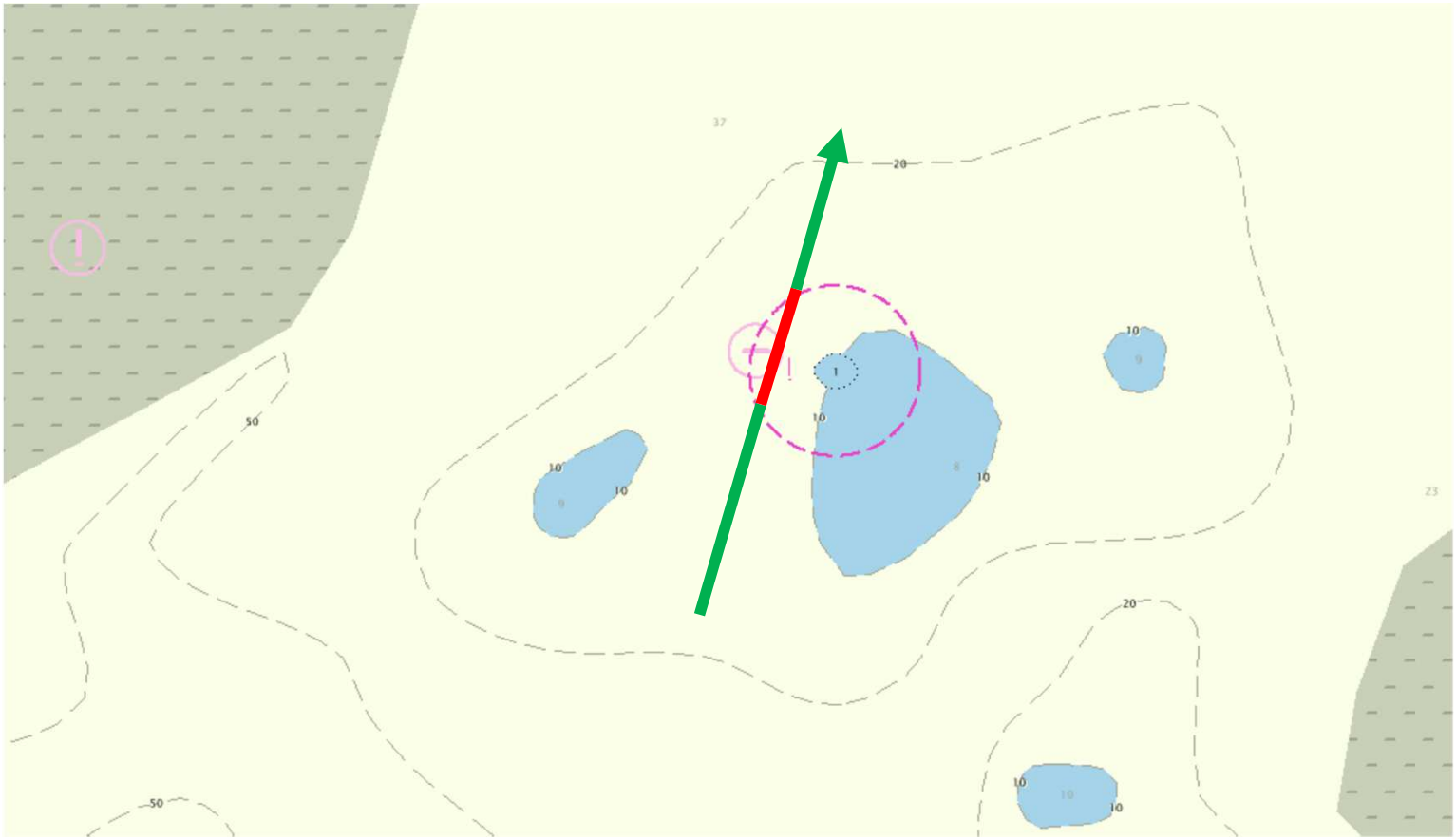


DQWG-15, IHO Secretariat, Monaco, 4 - 7 February 2020

IHO

International Hydrographic Organization

VESSEL PASSING TOO CLOSE TO UNDERWATER ROCK



DQWG-15, IHO Secretariat, Monaco, 4 - 7 February 2020

SUCCESSFULLY LOADED INTO ECDIS

International Hydrographic Organization

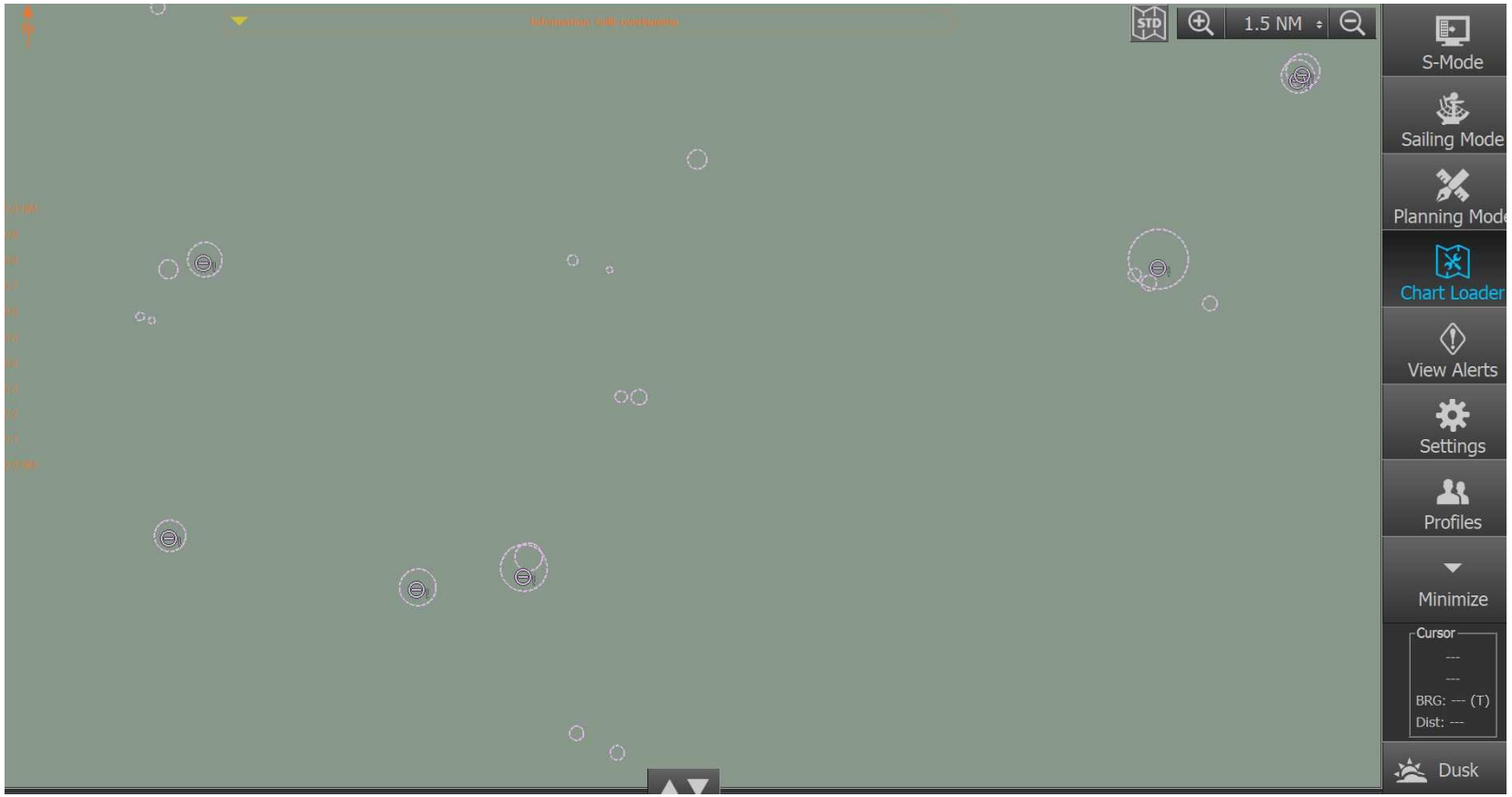
Item	Value
− Geo Objects	
− Point	
− Underwater rock / awash rock	
Source date	20070901
Source indication	DK,DK,graph,M60707
Value of sounding	
Water level effect	covers and uncovers
Line	
− Area	
+ Administration area (Named)	
+ Depth area	
− Restricted area	
Category of restricted area	offshore safety zone
Restriction	area to be avoided
+ Territorial sea area	
Track	

- Pick Report
- Shows the UWTROC
- Shows the RESARE

IHO

International Hydrographic Organization

ECDIS SAFETY ALERT FEATURES @ 1.5 NM



DQWG-15, IHO Secretariat, Monaco, 4 - 7 February 2020

CONSIDERATIONS FOR S-101

- In S-101 the feature Safety Alert Area (SAA) is suggested
- Attribute depth value is needed to check against the safety depth of the Mariner
- The HO can decide which Safety Alert Area's should be included into the S-101 ENC
- Mariner enters a Safety Depth and minimal XTD into ECDIS
- When dangerous isolated objects (including their accuracy) are within the ships boundaries of Safety Depth and minimal XTD, alerts are triggered.
- ECDIS issues an alarm to attend the Mariner of the risk ahead
- More autonomous vessel may deviate to avoid the risk

MAN-MACHINE INTERFACE

- Mariner is at all times in charge of the vessel
- Mariner requires to be in charge of the information presented to him for decision making
- Mariner requires an ON/OFF switch to manually activate and de-activate the Safety Alert Area features (**voyage planning**)
- Mariner can be supported in decision making by automatically activating the Safety Alert Area features when vessel comes too close to isolated hazardous objects dangerous to navigation (**voyage monitoring**)
- System is automatically de-activated when risk is no longer present
- Mariner has the ability to de-activate the Safety Alert Area Features

IHO BENEFITS

International Hydrographic Organization

- The HO decides which Areas need to be created to alert the Mariner
- In **S-57**:
  - Portrayal of object RESARE is already implemented into S-57 and S-52
  - Usage of RESARE already triggers an alarm in ECDIS to the Mariner
  - S-52 Ed 4.0:
    - 10.5.10 Detection of Areas, for which Special Conditions Exist
- In **S-101**:
  - A similar mechanism can be created for Safety Alert Area's
  - Add **Tidal** information => Under Keel Clearance / risk avoidance system
    - long term tidal prediction + accuracy
    - short term tidal prediction + accuracy
    - current tidal observation + accuracy
    - tidal forecast + accuracy

IHO

International Hydrographic Organization

REQUIREMENTS

- S-101 model needs an update: Safety Alert Area features
- ECDIS needs a user input: show Safety Alert Area (ON/OFF)
- ECDIS needs new Conditional Symbology Procedure (activate SAA)
- Include tidal information and its accuracy to improve safety

IHO

International Hydrographic Organization

WAY FORWARD

- Concept proven for Greenland situation, other Test Data to be tested
- Concept to be shared with other HSSC WGs/PTs
- Serious testing: showcase along US East coast (New York - Miami)
- Test results to be discussed at next DQWG meeting (**Feb 2020**)
- If approved, paper to be delivered at HSSC12 (**May 2020**)

IHO END

International Hydrographic Organization

- Feedback on this concept is welcome

- IHO Data Quality Working Group
- Send email to: R.Broekman.01@mindef.nl