



15th meeting of the DQWG

Using data quality for safe navigation

DQWG-15.??

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



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INTRODUCTION

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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)



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TASK HSSC11/50

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- 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



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THE PRINCIPLE

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- 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 ENC



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THE CONDITIONS

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- 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



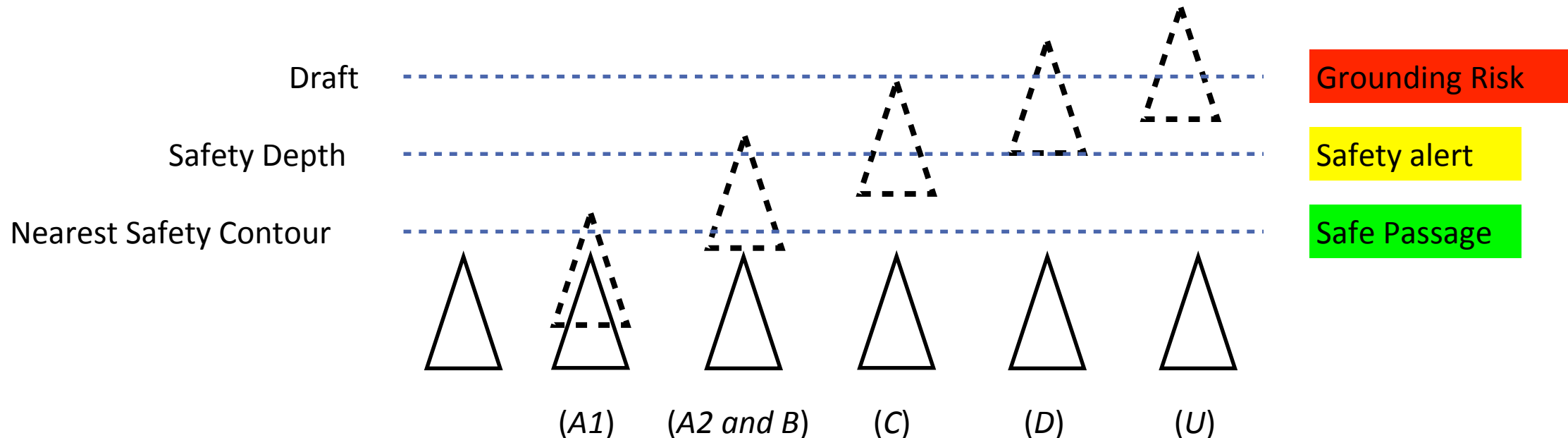
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THE METHODOLOGY (VERTICALLY)

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Applies to:

- obstructions
- under water rocks
- wrecks
- soundings





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THE METHODOLOGY (HORIZONTALLY)

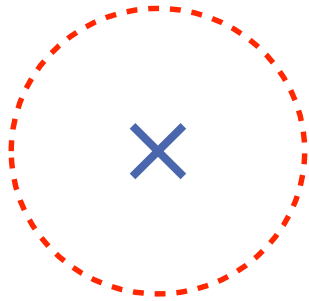
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Circle showing the area of the
possible position of the isolated feature

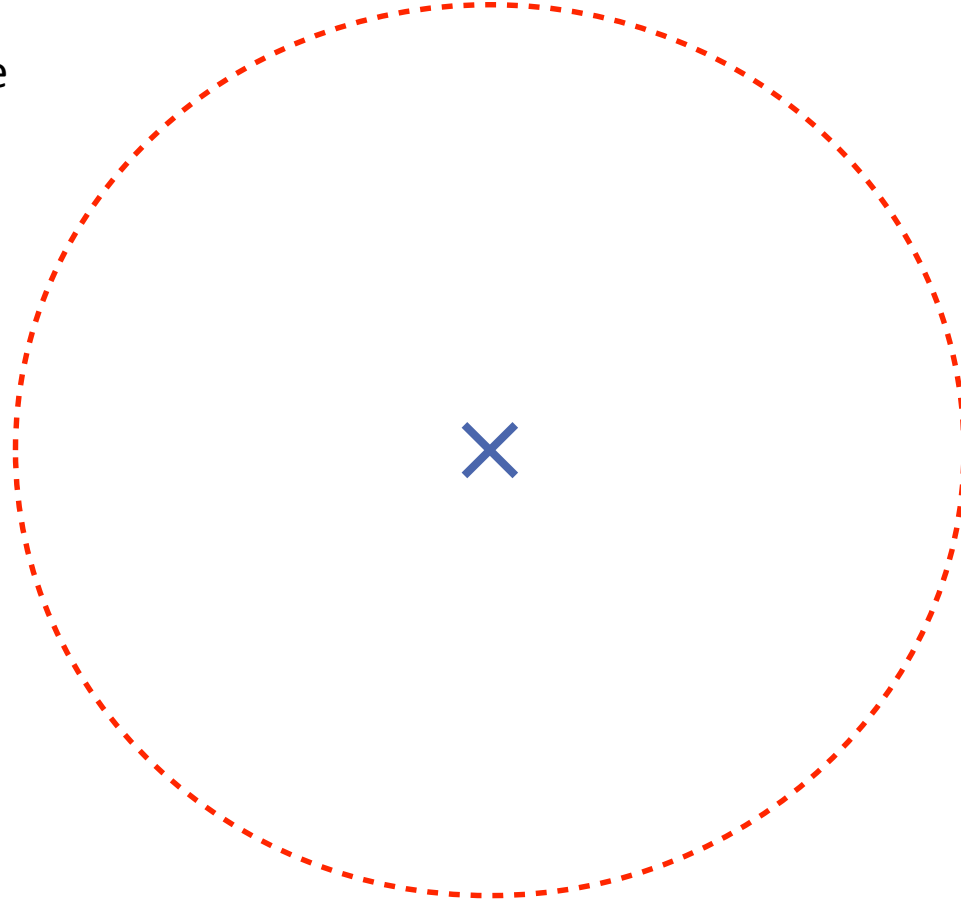
- CATZOC A2 = 20 meter
- CATZOC B = 50 meter
- CATZOC C and D = 500 meter



(A2)



(B)



(C and D)



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OPERATIONAL TEST

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- 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)



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HOW TO ESTABLISH THE CORRECT FEATURES?

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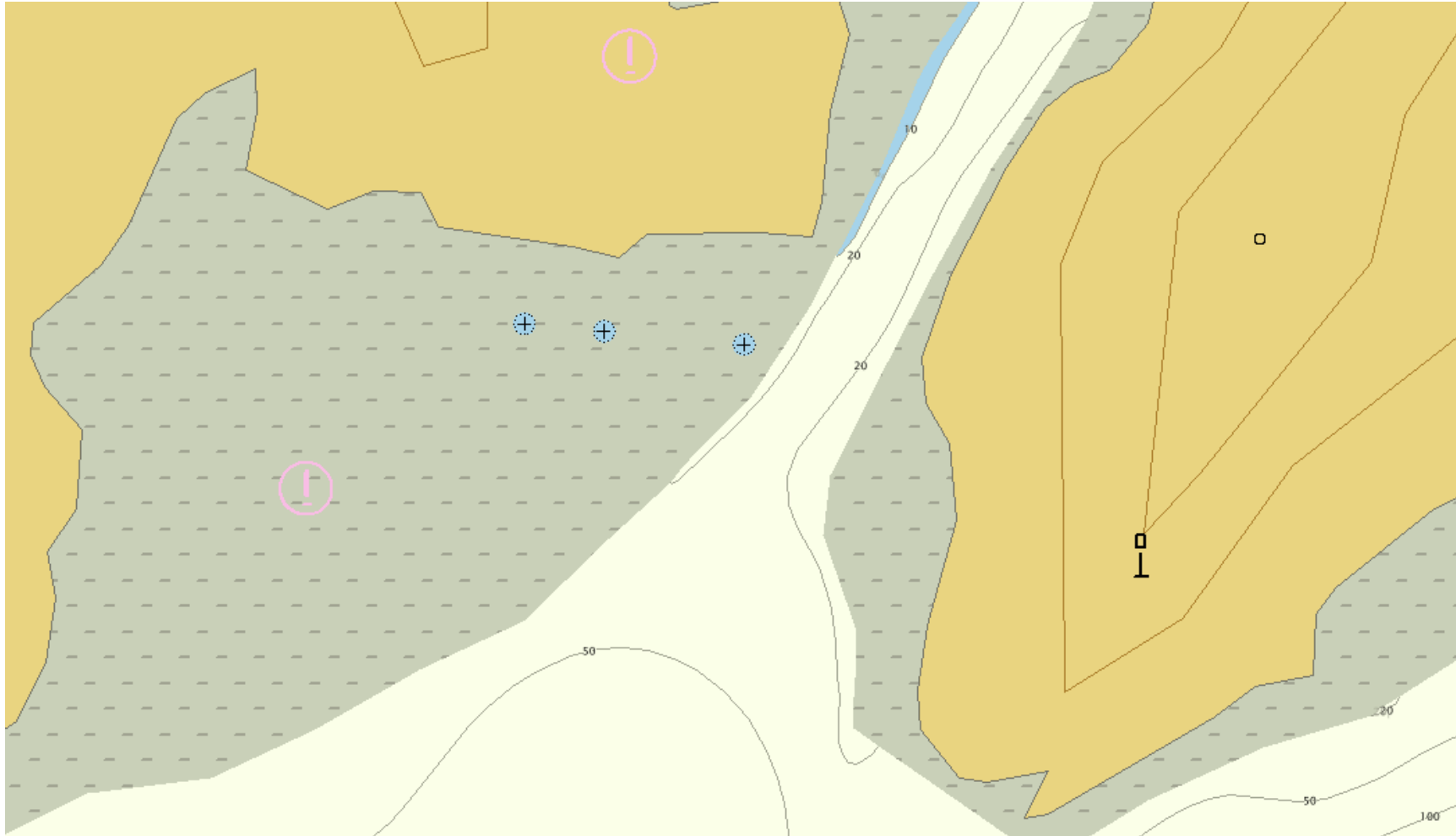
- Filter the areas of a specific CATZOC value (e.g. D)
- Select all UWTRC point objects inside the CATZOC D areas
- Copy these to a scratch layer
- Create Restricted Areas (*SAA in S-101*) around each single UWTRC
- Draw a circle until the edge of the CATZOC D area OR until the circle is 500m wide
-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



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CURRENT MARINERS VIEW

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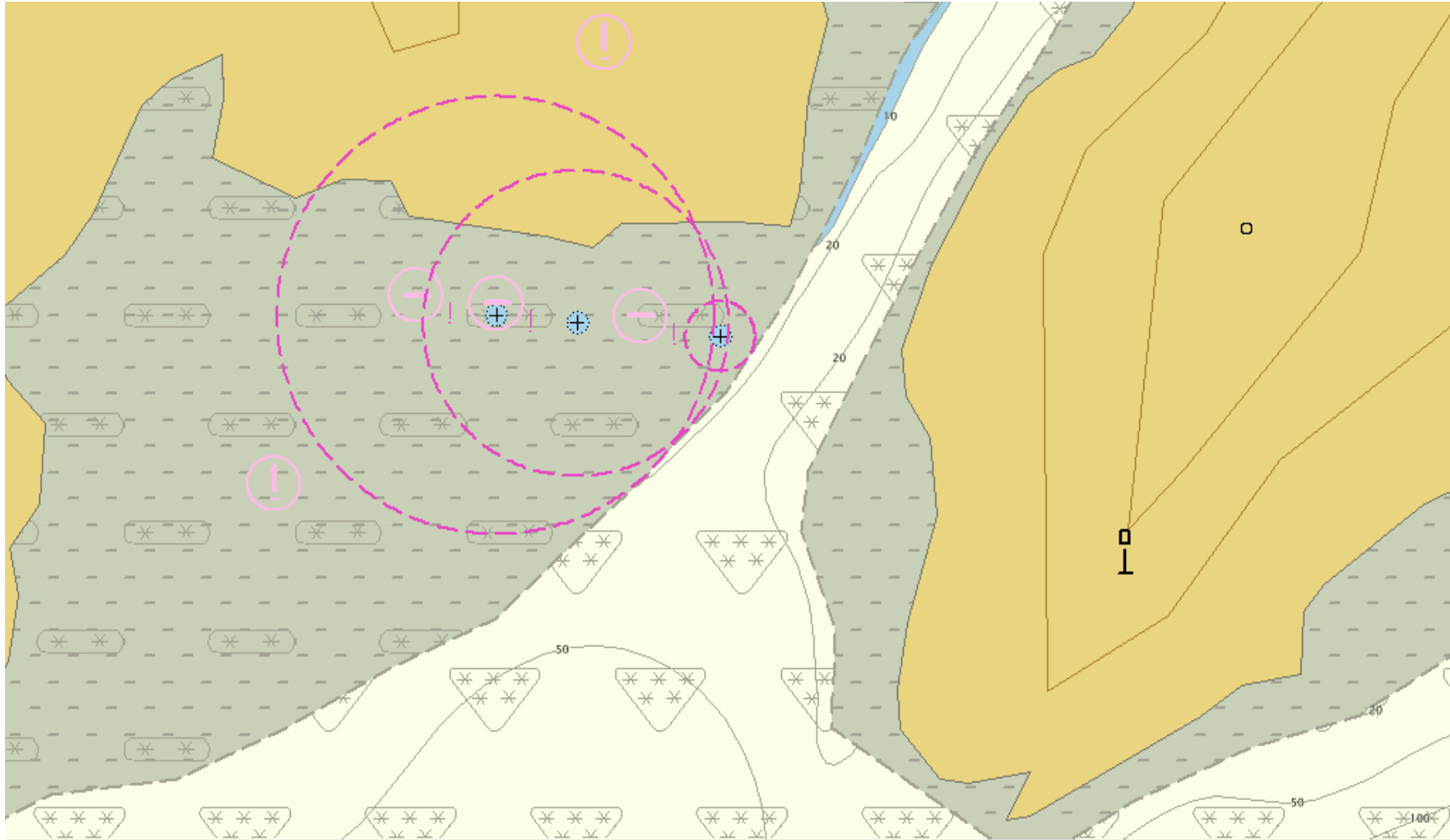
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S-101 ENC WITH ADDITIONAL SAFETY ALERT AREAS

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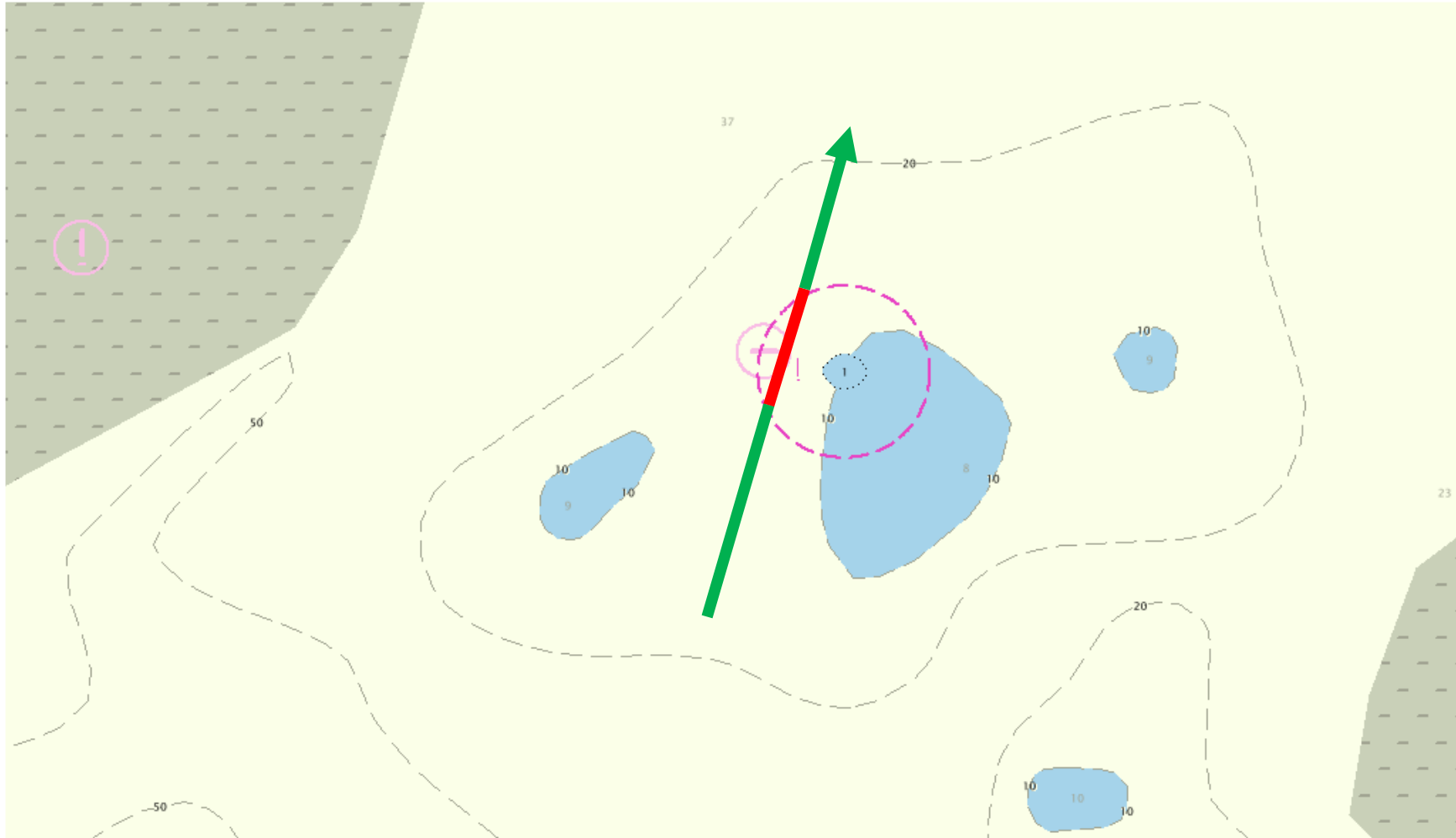
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VESSEL PASSING TOO CLOSE TO UNDERWATER ROCK

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SUCCESSFULLY LOADED INTO ECDIS

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Item	Value
<input checked="" type="checkbox"/> Geo Objects	
<input checked="" type="checkbox"/> Point	
<input checked="" type="checkbox"/> Underwater rock / awash rock	
Source date	20070901
Source indication	DK,DK,graph,M60707
Value of sounding	
Water level effect	covers and uncovers
Line	
<input checked="" type="checkbox"/> Area	
+ Administration area (Named)	
+ Depth area	
<input checked="" type="checkbox"/> 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



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ECDIS SAFETY ALERT FEATURES @ 1.5 NM

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CONSIDERATIONS FOR S-101

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- 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



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MAN-MACHINE INTERFACE

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- 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



- 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



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REQUIREMENTS

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- 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 Symbolology Procedure (activate SAA)
- Include tidal information and its accuracy to improve safety



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WAY FORWARD

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- Concept proven for Denmark 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**

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- Feedback on this concept is welcome
- IHO Data Quality Working Group
- Send email to: [R.Broekman.01 @mindef.nl](mailto:R.Broekman.01@mindef.nl)