S44 Survey Order Input to CATZOC

HSWG Presentation to DQWG

- **<u>David</u>**

1. Are HSWG content with the mapping in the look up table?

- **<u>Carlos</u>**

1. Temporal degradation

2. Usage bands of CATZOC

3. HO's are all taking different approaches – what is the DQWG plan?

- **<u>Megan</u>**
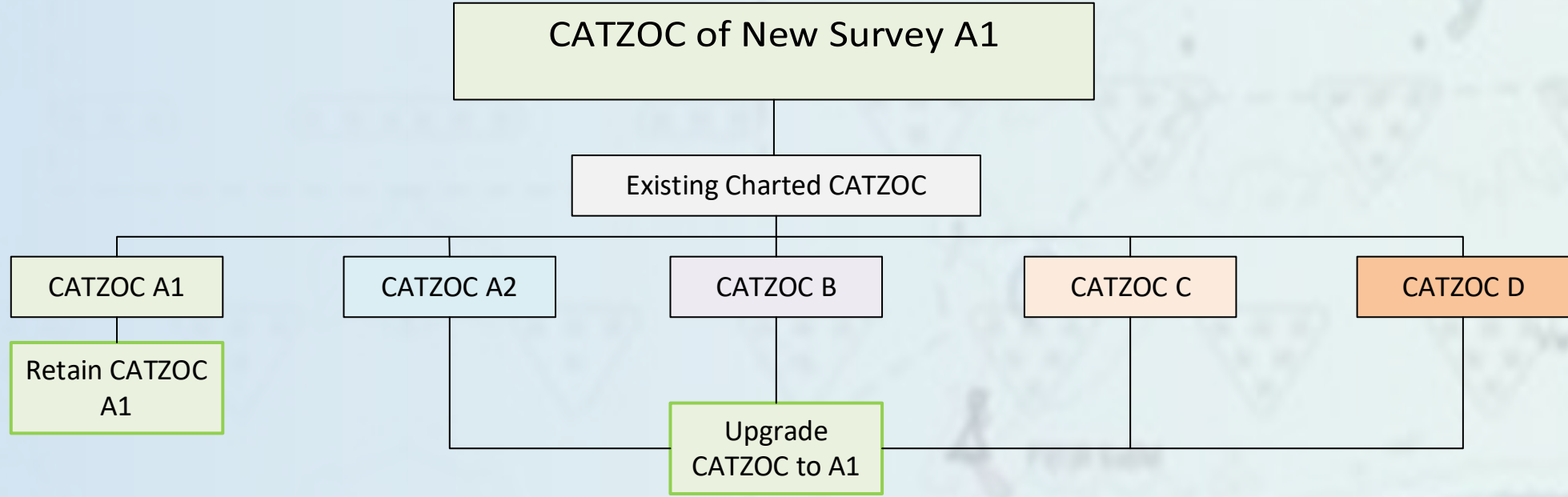
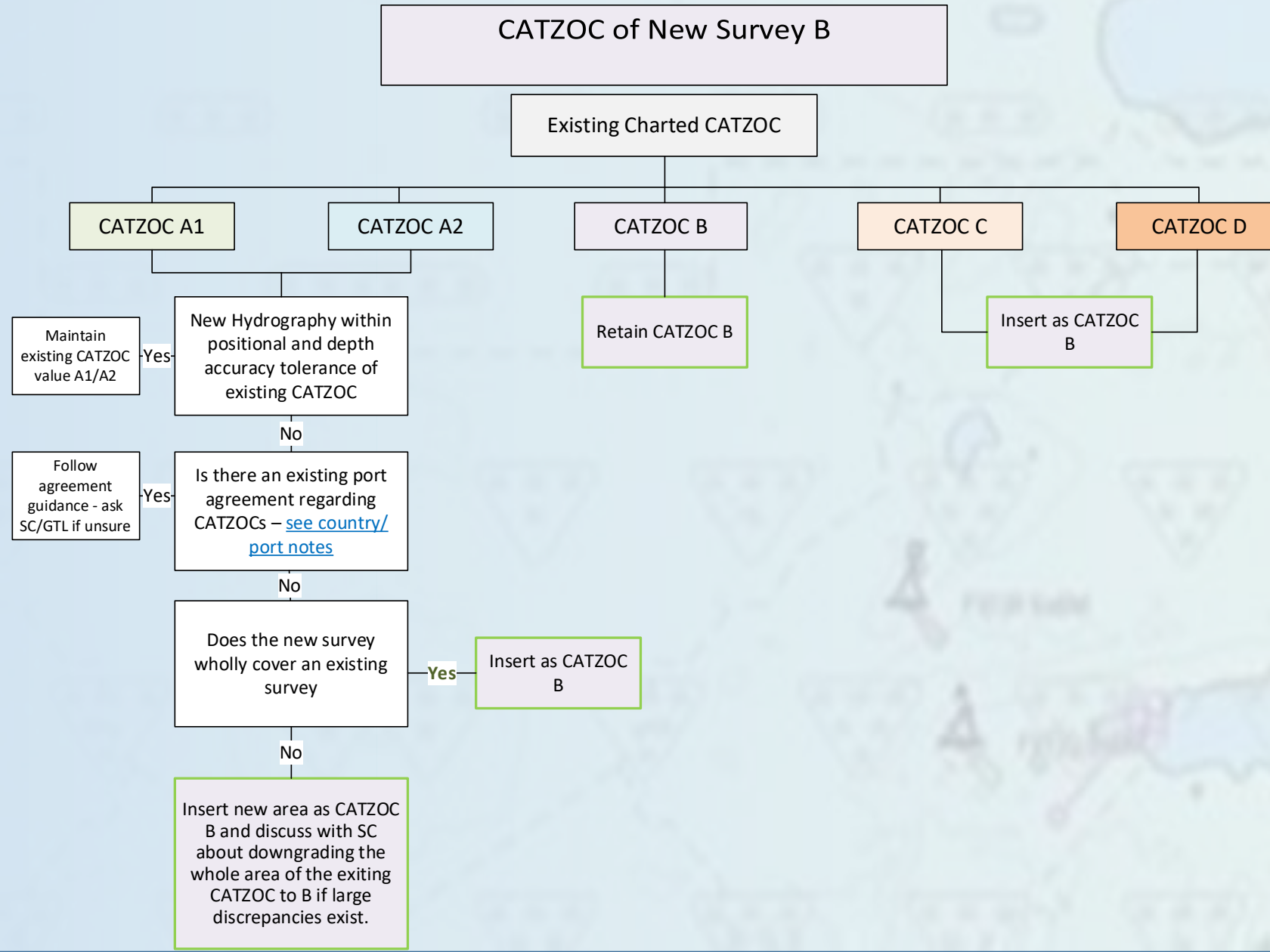1. Other issues with document raised.

- **<u>David</u>**

1. Are HSWG content with the mapping in the look up table?

   a. Broadly happy with the relationship made between S44 and CATZOC.

   b. S44 is only an input to CATZOC – so not possible to directly map.

   c. HSWG feel the look up table can never be used in isolation – a flowchart approach is required to potential downgrade CATZOC. Survey data – then other factors to consider.

   d. A number of terminology issues need resolving.

   e. Relationship with vertical and horizontal uncertainty and bathymetric coverage is clear, but less so for feature detection.

CATZOC of New Survey B

Existing Charted CATZOC

- **CATZOC A1**
- **CATZOC A2**
- **CATZOC B**
- **CATZOC C**
- **CATZOC D**

New Hydrography within positional and depth accuracy tolerance of existing CATZOC

—Yes→ Maintain existing CATZOC value A1/A2

No ↓

Is there an existing port agreement regarding CATZOCs – see country/ port notes

—Yes→ Follow agreement guidance - ask SC/GTL if unsure

No ↓

Does the new survey wholly cover an existing survey

Yes→ Insert as CATZOC B

No ↓

Insert new area as CATZOC B and discuss with SC about downgrading the whole area of the exiting CATZOC to B if large discrepancies exist.

Retain CATZOC B

Insert as CATZOC B

Check 3: Least depth of significant features known

Valid CATZOCs for the Survey Orders based on Least depth of significant features known

Least Depth Measured	Survey Order Requirement	cubic features > 1 meter	cubic features > 1 meter	>2m, or 0.1*d if d>40m	Not Specified	Not Specified
ZOC tolerance	Survey ZOC/QoBD	Exclusive	Special	1a	1b	2
Measured	A1 / 1	🟩	🟩	🟩	🟥	🟥
Measured	A2 / 2	🟩	🟩	🟩	🟥	🟥
Not required	B / 3	🟩	🟩	🟩	🟩	🟩
Not required	C / 4	🟩	🟩	🟩	🟩	🟩
Not required	D / 5	🟩	🟩	🟩	🟩	🟩
N/A	U / U					
N/A	- / Oceanic					

d = depth

Check 7: Least depth of significant features known

This is regardless of the S-44 classification of the survey and will be further explained in a different paper. In S-57 and when upgrading to S-101, the default value of this attribute is "unlikely to change" and thus not affecting the outcome of this checking process. HO's are however requested to assign the correct value to this attribute when making the upgrade to S-101.

Carlos

ZOC - sets the The degree of reliance which can be placed in the depth information within an ENC

Using CATZOC

- UNSARE (it is U)

- DEPARE

- DRGARE

- USAGE BAND (depends on the band, right?)
  - 1 (overview), scale is to big
  - 2 (general), still, same issue
  - 3 (coastal),
  - 4 (approach),
  - 5 (harbour),
  - 6 (berthing).

From S-67

One significant limitation of the ZOC system is that it <u>provides little information about when a survey was conducted</u>, or whether the seabed is stable.

While the date can be provided in another data field within an ENC, this is rarely done …

<u>In areas where the seabed is subject to change</u>, national **HOs should downgrade** the assigned ZOC category, restoring it only once a replacement survey is incorporated into a chart.
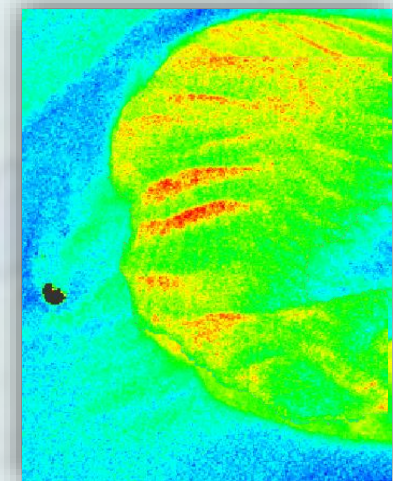
Assigning CATZOC (Seafloor Variability)
- Up-to-dateness (temporal degradation, Bathymetry Instability)
- CATZOC does not capture temporal changes
- CATZOC refers to ENC edition date
- Requires ENC producer evaluation (local Knowledge and local Dependency)

Temporal Degradation
- Changes that occur over time
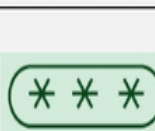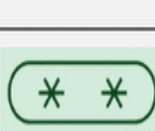 - Ex: sediment deposit
- Depth and Position changes

Bathymetry Instability
- Local repetitive changes that reshape the seafloor, maintaining control depth
  - Ex. Sand dunes that move over time
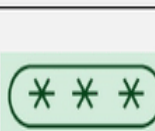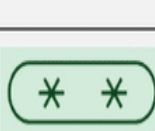- There is no significant depth change
- Position issue

Temporal Degradation

- Depth and Position changes
- CATZOC Degradation can be decided using Depth Accuracy and Position Accuracy
- Ex:
  - Seafloor Coverage review?
  - at the time of the new edition, is the expected change in depth more than current the allowed depth accuracy?
    YES – degrade one level & evaluate
    NO – maintain CATZOC
  - at the time of the new edition, is the expected change in position more than current the allowed position accuracy?
    YES – degrade one level & evaluate
    NO – maintain CATZOC

ZOC	Position Accuracy	Depth Accuracy		Seafloor Coverage	Typical Survey Characteristics	Symbol
A1	± 5m	=0.50 + 1%d		Full area search undertaken. Significant seafloor features detected and depths measured.	Controlled, systematic survey 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			
		100	± 1.5			
		1000	±10.5			
A2	± 20m	=1.0 + 2%d		Full area search undertaken. Significant seafloor features detected and depths measured.	Controlled, systematic survey achieving position and depth accuracy less than ZOC A1 and using a modern survey Echosounder and a sonar or mechanical sweep system.	
		Depth [m]	Accuracy [m]			
		10	±1.2			
		30	± 1.6			
		100	± 3.0			
		1000	± 21.0			
B	± 50m	=1.0 + 2%d		Full area search not achieved; uncharted features, hazardous to surface navigation are not expected but may exist.	Controlled, systematic survey achieving similar depth but lesser position accuracy less than ZOC A2 and using a modern survey echosounder, but no sonar or mechanical sweep system.	
		Depth [m]	Accuracy [m]			
		10	±1.2			
		30	± 1.6			
		100	± 3.0			
		1000	± 21.0			
C	± 500m	=2.0 + 5%d		Full area search not achieved, depth anomalies may be expected.	Low accuracy survey or data collected on an opportunity basis such as soundings on passage.	
		Depth [m]	Accuracy [m]			
		10	±2.5			
		30	± 3.5			
		100	± 7.0			
		1000	± 52.0			
D	Worse than ZOC 'C'	Worse Than ZOC 'C'		Full area search not achieved, large depth anomalies may be expected.	Poor quality data or data that cannot be quality assessed due to lack of information.	
U		Unassessed - The quality of the bathymetric data has yet to be assessed.				U

Bathymetry Instability

- No Depth change / Position issue
- CATZOC Degradation can be decided using <u>only Position Accuracy</u>
  - Ex: at the time of the new edition, is the expected change in position more than current the allowed position accuracy?
    YES – degrade one level & evaluate
    NO – maintain CATZOC
  - (ex: sand dunes move … no more than the distance from each other)

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Assigning CATZOC ….

1. Start with CATZOC value derived from Hydrographic Survey (S44 to CATZOC)
2. Degrade with ENC Production
3. Degrade with Local variability

   1. CATZOC refers to ENC edition date
      1. Review periodically ?
      2. Review at every new edition ? (new editions pop up when there are too many NM)
      3. ….
   2. Requires ENC producer evaluation (local dependency)
      1. Temporal Degradation
         1. Use CATZOC Vertical and Horizontal accuracy table
         2. …
      2. Bathymetry Instability
         1. Use CATZOC Horizontal accuracy table
         2. …

For 3 to occur there must be some knowledge of the area – allowing HO to improve the information to the mariners – otherwise
There is no possible improvement

Notice it is always a degradation

Megan

Parameters:

- Add Feature Detection to inputs (horizontal accuracy, depth accuracy, coverage, feature detection)

Terminology:

- Replace "accuracy" with "uncertainty"

- Use the phrase, "CATZOC Capability" to clarify S-44 is one input of CATZOC

- Seafloor Coverage vs Bathymetric Coverage - update Cross Reference Tables to ≤ 100% and ≥5%

Annex B:

- USA input needs to be updated

Hydrographic Input
- S-44 IHO Order
- CATZOC Capability (

Cartographic Input
- Datum **Transformations**
- Data Reduction
- Number Rounding
- Storage Resolution
- Generalization

CATZOC Assigned

CATZOC Reviewed
- Temporal Degradation
- Bathymetry instability

If there is some knowledge of the area Information to the Mariner can be improved