

S-100 Data as a Service

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INTRODUCTION



- Forward thinking hydrographic offices are moving from product centric to data centric workflows and services
- **CHS, Teledyne CARIS, and PRIMAR** have launched a project to implement an innovative bathymetric data service that will demonstrate the value of the evolving IHO S-100 data standards
- The project focuses on the latest technological approaches to leverage some key opportunities for tomorrow's hydrographic industry
- The Project involves all parties of the distribution chain from **Hydrographic Organizations** to the **end-users**



PILOT PROJECT OBJECTIVES

- Garner support from potential stakeholder groups e.g. hydrographic offices, ports, pilots, other government agencies, global mapping initiatives (Seabed 2030) **for the refinement of the S-100 standard**
- Show the hydrographic community the potential benefits of S-102 and bathymetry web services
- Explore potential for use of S-104 and S-111 standard for supplementary services
- Refine the cloud and service technology to work towards a robust and production ready service
- Develop innovative business models to ensure customer adoption by providing value added benefits for stakeholders



PILOT PROJECT OVERVIEW

- This pilot will allow CHS, Teledyne CARIS and PRIMAR to demonstrate its ability to provide a service that consumers of bathymetric data can subscribe to

- The bathymetric data will be available as S-102 products at **3 different resolutions** and also OGC Web services

| Usages (S-57) | Resolution | Cell coverage | Best suited for |
|-----------------------------|----------------------|-------------------------------|--|
| 1 (Overview) 2 (General) | 0.001° ≈ 100m | 1° X 1° ≈ 100x100 km | Overview (Offshore – All Canada) |
| 3 (Coastal) 4 (Approach) | 0.0001° ≈ 10m | 0.1° X 0.1° ≈ 10x10 km | Transit (Near Shore – Less than 50m deep) |
| 5 (General) 6 (Overview) | 0.00002° ≈ 2m | 0.02° X 0.02° ≈ 2x2 km | Ports (Critical areas, Channels and Approaches) |

- Teledyne CARIS has developed cloud data store and cloud processing tools
- Teledyne CARIS has developed a rich API providing 3rd party access to the datastore
- PRIMAR has expanded its existing store front to allow users to subscribe to their area of interest as S-102 bathymetry products and OGC web services



PILOT PROJECT OVERVIEW

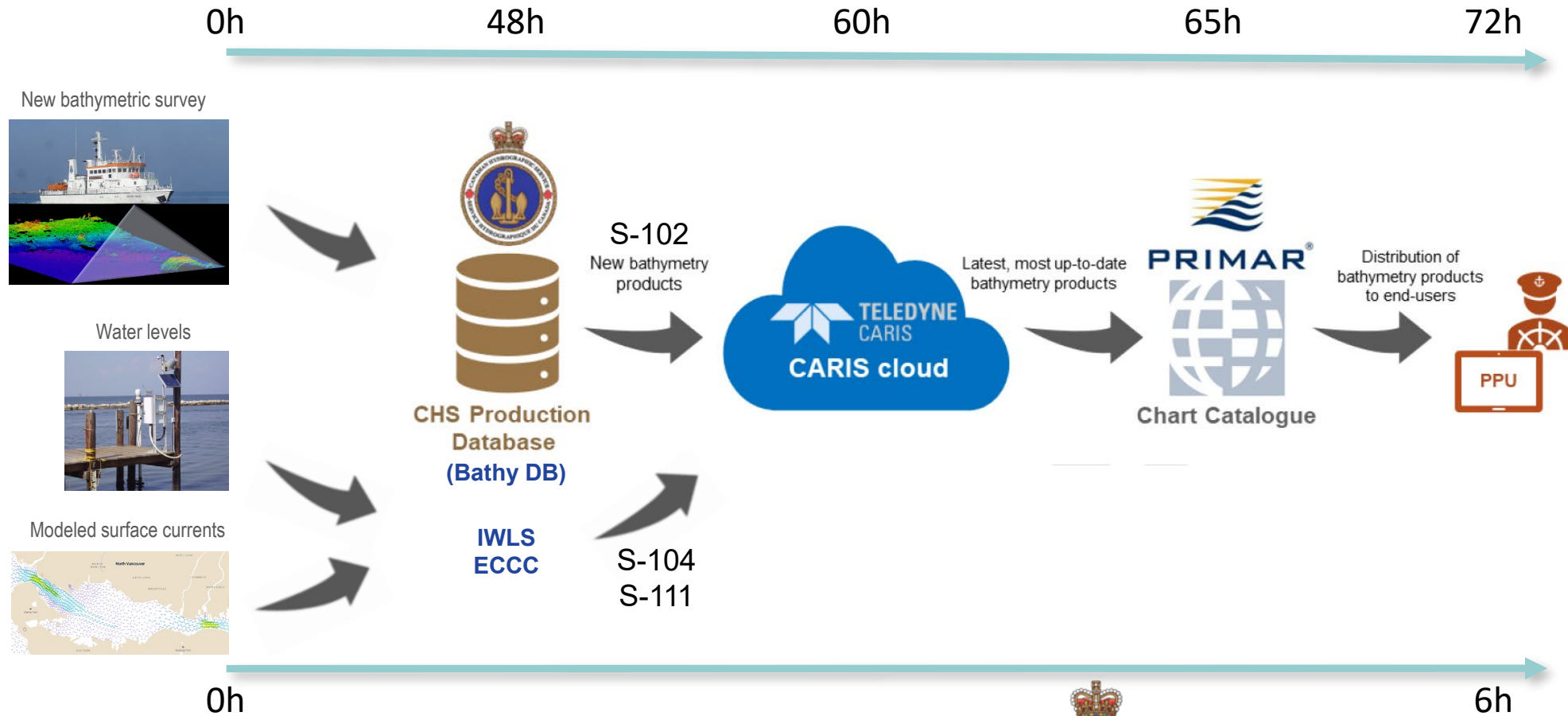
- For the Phase 1 of this pilot project, S-102 data is available in the **5 Key Areas** defined in the Ocean Protection Plan (OPP).
- For the phase 2 of the pilot project, trials will be conducted in the **St-Lawrence River** and the **Vancouver Harbour** area (around April).



1. Kitimat
2. Vancouver / Fraser river
3. St Lawrence River (Quebec-Montreal)
4. St John, NB
5. Canso Strait



THE HIGH LEVEL CONCEPT OF THE PILOT PROJECT



0h

6h

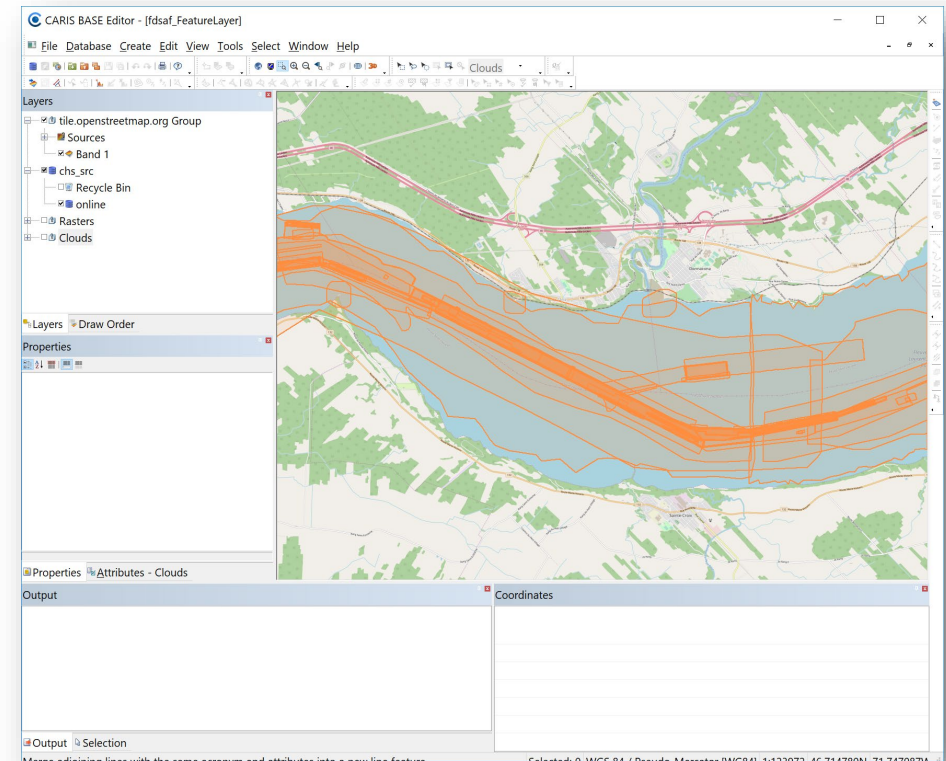


Bathymetric data validation at the CHS

- Implemented Teledyne CARIS BDB
- Established Data Integration (DI) process:
 - Data standardization (digitizing, georeferencing, etc.)
 - Vertical referencing (PACD)
 - Quality assessment
 - Comparative validation process **
 - ‘Combine’ – Deconfliction rule
 - DB loading



Production BDB Server



- Developed tiling script to generate S-102 products



PROJECT DELIVERABLES

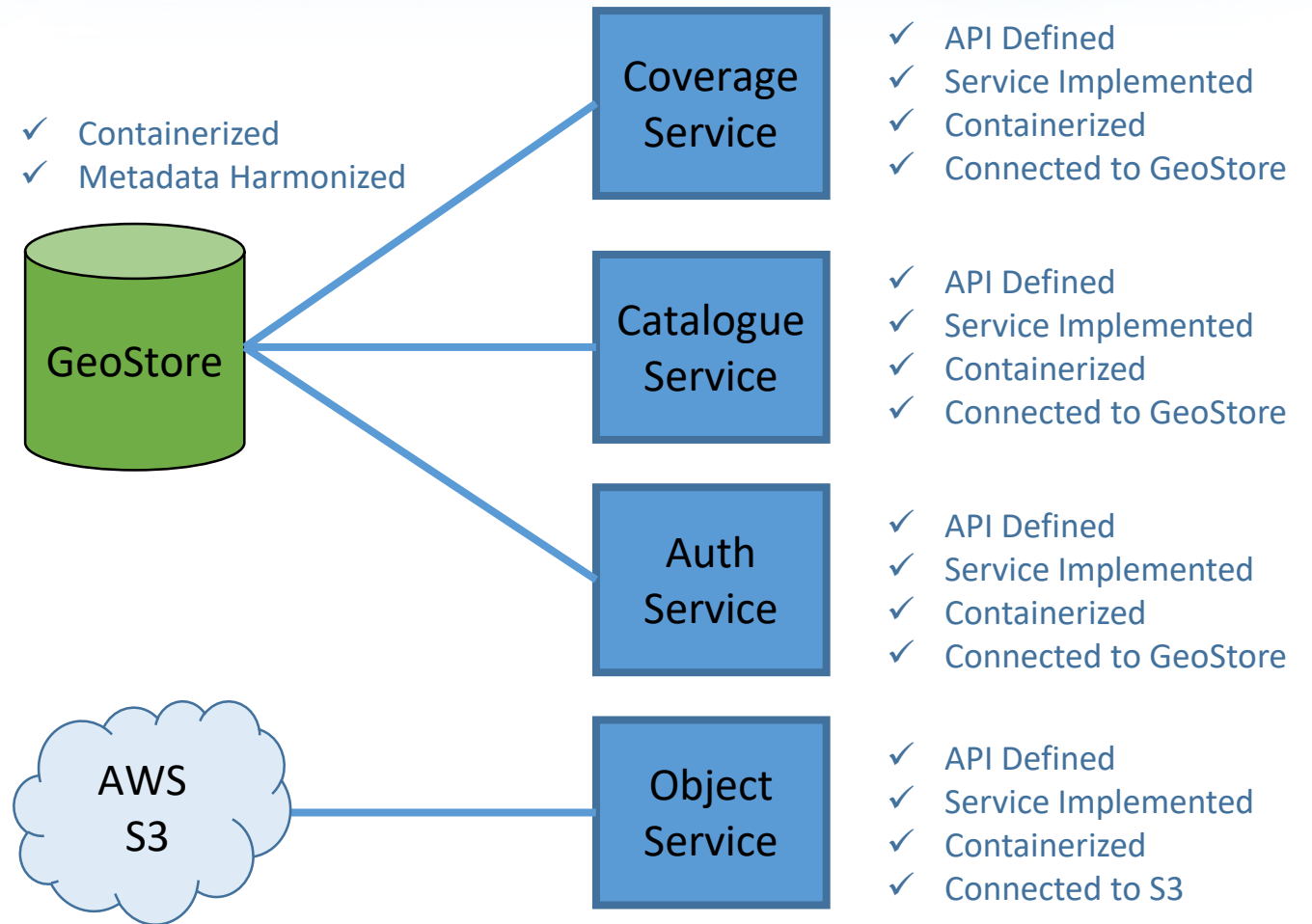
- **Phase 1 – June 2018 – March 2019** - Three milestones to implement Pilot System
 - Publication of bathymetry data from CHS' production database to CARIS Cloud
 - Demonstration of CHS S-102 datasets in PRIMAR system, available to users who have subscribed to that area
 - Demonstration of potential use of S-102 datasets for e-Navigation, in collaboration with Kongsberg
- **Phase 2 – June 2019 – March 2020** - Test the Pilot System in real-world scenarios
 - Plan for testing the bathymetry data service
 - System trial period with users in Canada and Norway
 - Analysis of the test results and entry into commercial service



Phase 1 Summary

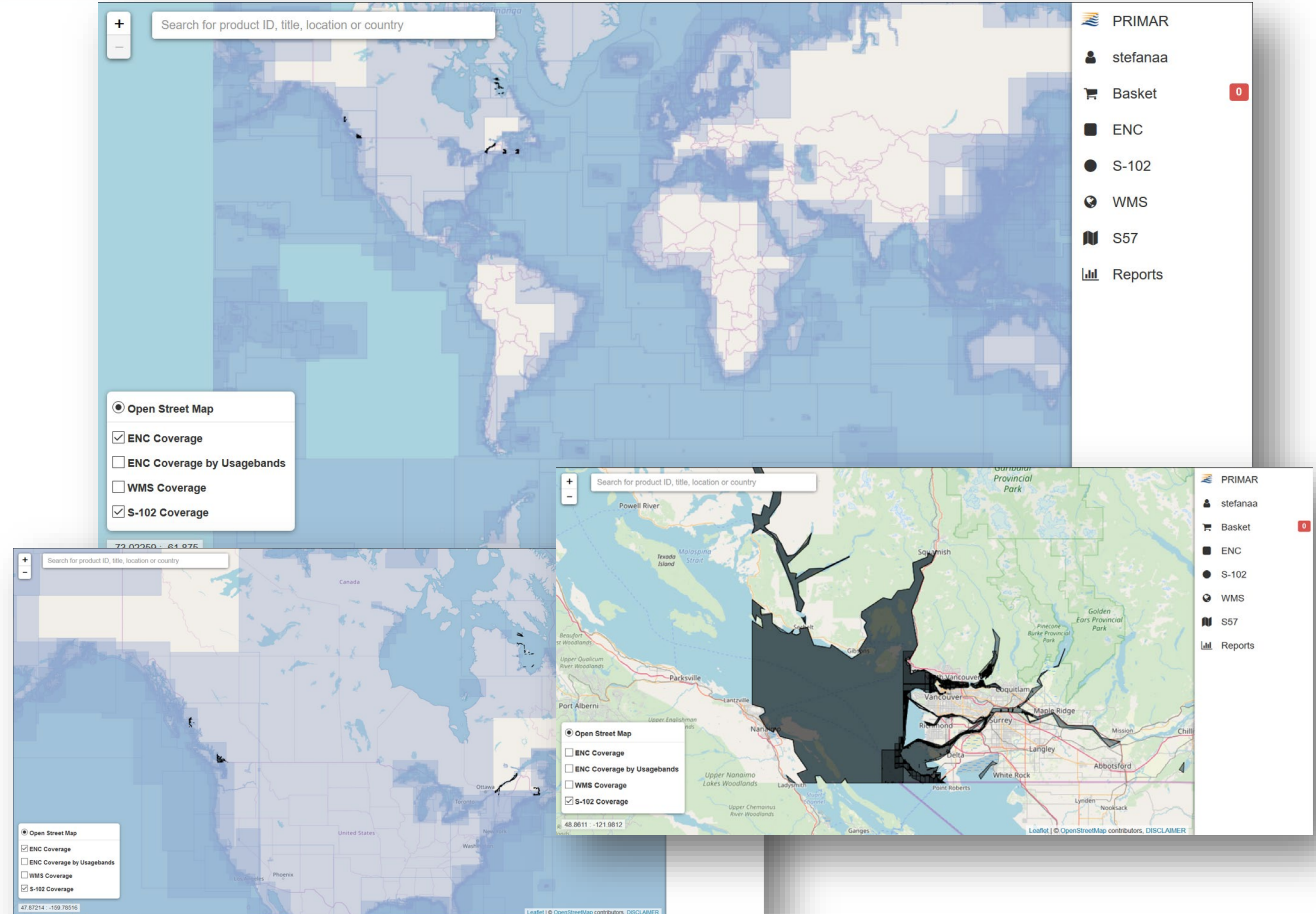
Completed!

- Pilot System implemented and capability demonstrated
- Pilot dataset loaded to CARIS cloud (900+ S-102 cells)
- Coverage, Catalogue, Authentication and Object services complete
- GeoServer implemented as a container for OGC service end points
- Demonstration scenario of Vancouver Harbour S-102 data in 3D
- Ordering and downloading data through PRIMAR's S-102 service



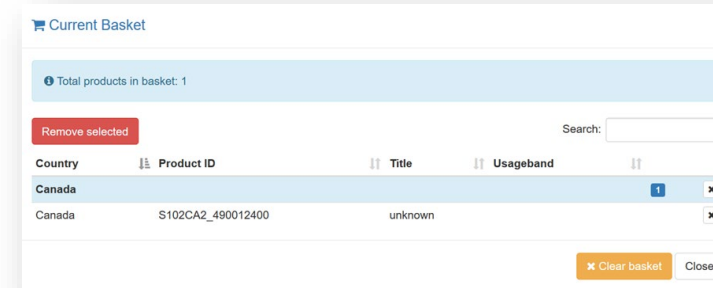
ORDERING BATHYMETRY DATA IN PRIMAR

- PRIMAR CHART Catalogue:
 - Visualization of the current S-102 and ENC coverage available
 - Product discovery, ordering and download
 - Management of product subscriptions
 - Management of end-user permits for PRIMAR distributors

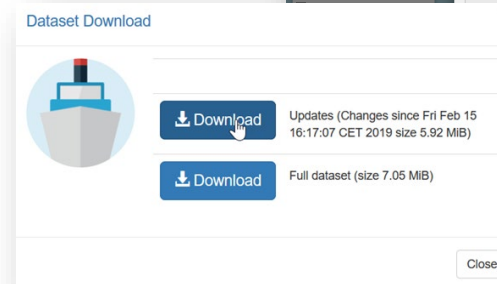


ORDERING BATHYMETRY DATA IN PRIMAR - SUBSCRIPTION & DOWNLOAD

- Management of product subscriptions:
 - Ordering/subscribing to new S-102 products
 - Summary of current product subscriptions, including subscription period and auto-renewal option
- Download products:
 - Full set of subscribed S-102 products
 - Recently updated products



| Product | Title | Permit End Date | Subscription Type | Usageband | Auto Renewal |
|-------------------|--|-----------------|-------------------|-----------------|--------------|
| S102CA2_490012400 | unknown | 2020.02.29 | 12 months | | Off |
| US1WC01M | North Pacific Ocean West Coast of North America Mexican Border to Dixon Entrance | 2020.02.29 | 11 months | Overview | Off |
| CA3512 | Strait of Georgia, Central Portion/Partie Centrale | 2020.02.29 | 11 months | Coastal Coastal | Off |
| CA3001 | Vancouver Island / Ile de Vancouver, Juan de Fuca Strait to la Queen Charlotte Sound | 2020.02.29 | 11 months | General | Off |
| US1WC07M | San Diego to Aleutian Islands and Hawaiian Islands | 2020.02.29 | 12 months | Overview | Off |



DEMONSTRATION SCENARIO – INTEROPERABILITY WITH 3rd PARTY APPLICATIONS

Vancouver Harbour S-102 Datasets from CARIS cloud to QGIS via OGC Web Services

Display S-102 bathymetry in QGIS via

Web Feature Service (WFS)

- 1.0.0, 1.1.0, 2.0.0

Web Map Service (WMS)

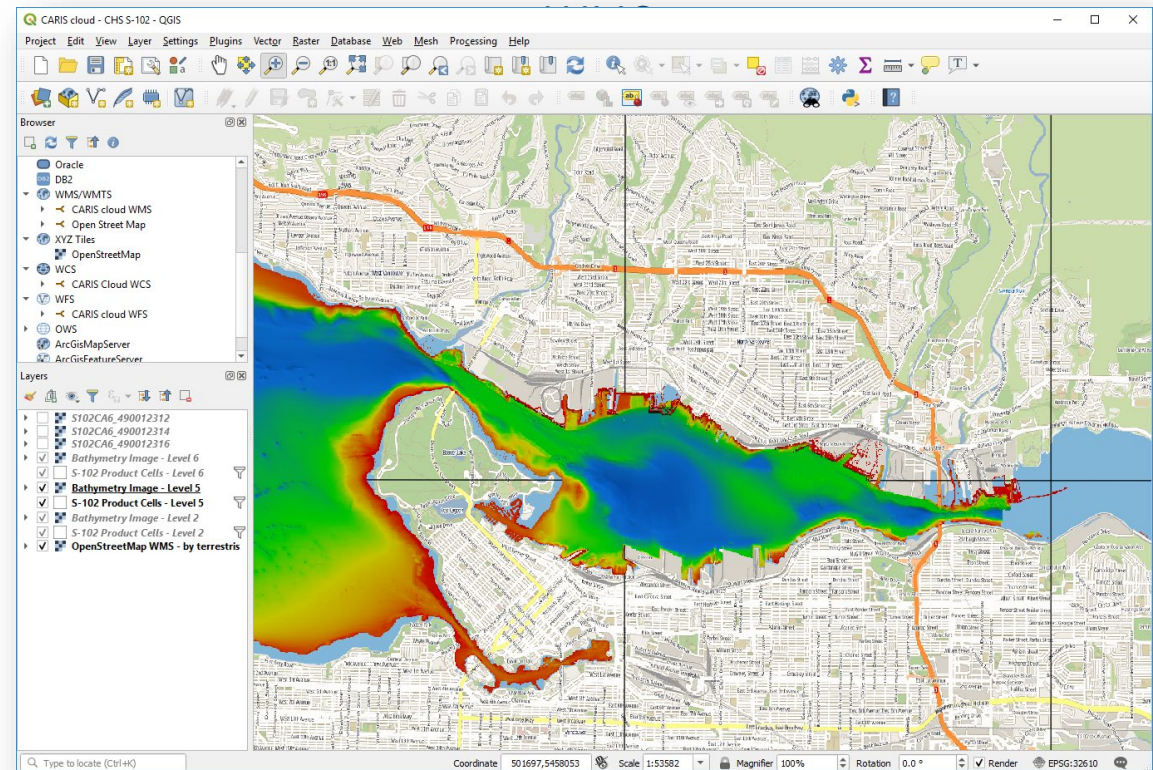
- 1.1.1, 1.3.0

Web Coverage Service (WCS)

- 1.0, 1.1, 2.0

Catalog Service for the Web (CSW)

- 2.0.2



Phase 2 in Progress

- Plan for the system trials completed
- CHS datasets published to CARIS cloud and available in PRIMAR
- User accounts and instructions provided to participants in the trials
- System trials underway

The top screenshot shows a map of Quebec with a red polygon and a color-coded bathymetry overlay. The middle screenshot shows a map with a search bar and a 'Basket' panel. The bottom screenshot shows a 'Current Basket' table with 31 products.

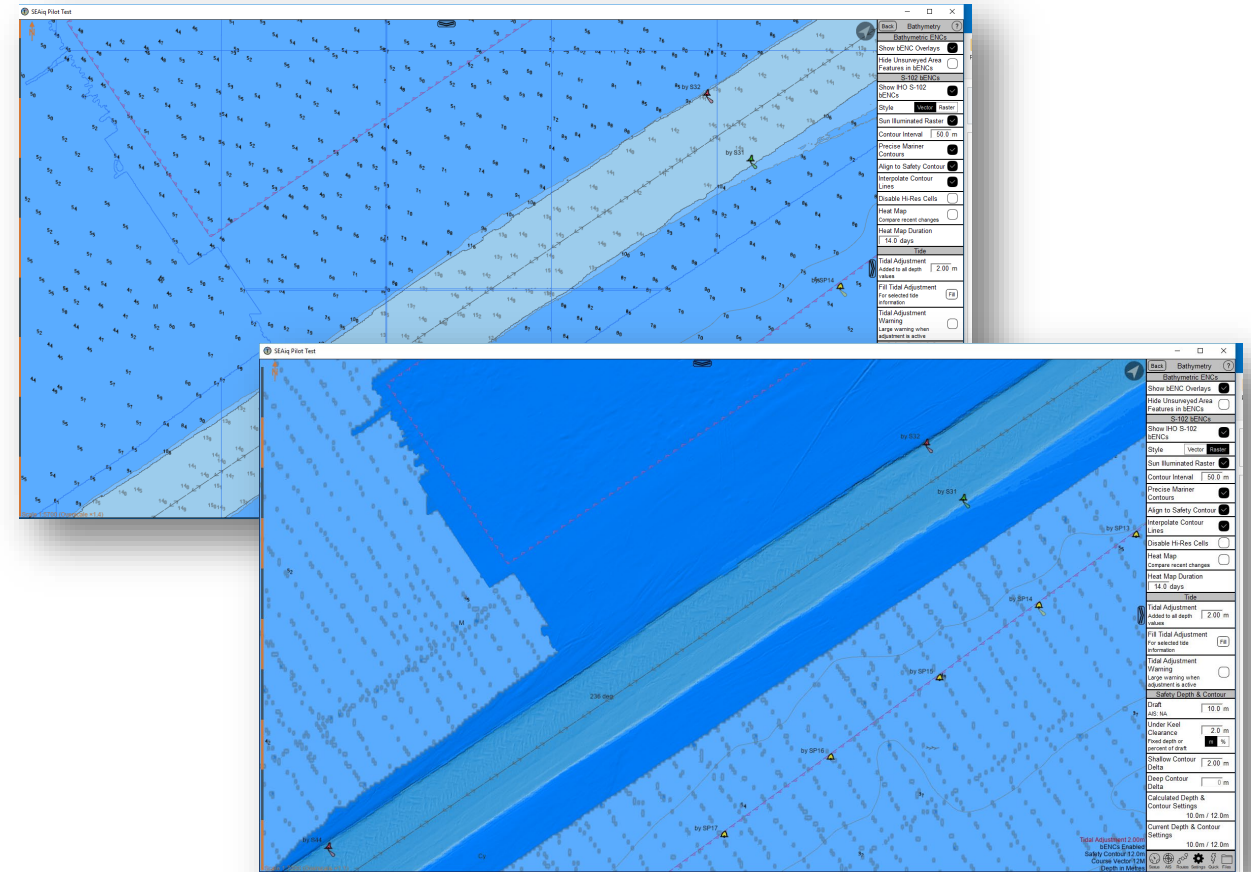
| Country | Product ID | Title | Usageband |
|---------|-------------------|---------|-----------|
| Canada | S102CA2_450007400 | unknown | |
| Canada | S102CA2_460007400 | unknown | |
| Canada | S102CA5_460007310 | unknown | |
| Canada | S102CA5_460007320 | unknown | |
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| Canada | S102CA6_460607310 | unknown | |
| Canada | S102CA6_460407310 | unknown | |
| Canada | S102CA6_460607308 | unknown | |
| Canada | S102CA6_460407316 | unknown | |
| Canada | S102CA6_460607306 | unknown | |



System Trials

- Canadian and Norwegian users
- Industry participation
- Real-world navigation scenarios
 - Canada (East and West coast)
 - Norway
- Gather feedback from users and industry
 - Feedback about S-102 data
 - Feedback about Data Service
- Prepare the service for commercial roll-out
- Share results with hydrographic community

CHS S-102 datasets in SEAiq Pilot PPU (vector and raster views)



System Trials - Participants



KYSTVERKET
NORWEGIAN COASTAL ADMINISTRATION



IMAGINE 4D



CANADIAN COAST GUARD



CLOSING SUMMARY

- *The combination of CHS, the project proponent, CARIS the principle supplier of hydrographic software and PRIMAR an internationally recognized and utilized RENC, represents a great team with the necessary skill to achieve the goals of this pilot*
- *Together we want to help define the model for the future hydrographic products and services*



TELEDYNE
CARIS

