

An aerial photograph of a coastal landscape. In the center, a white lighthouse stands on a grassy cliffside. To its left are several white buildings with red roofs. The cliffside descends to a rocky coastline where waves are crashing. In the background, there are rolling green hills and a body of water under a cloudy sky.

MSDI: Workflows, Software and Related Data Standards

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Content

- Introduction
- Leveraging SDI principles for hydrographic operational efficiency
 - French INFRAGEOS example (SHOM - Service Hydrographique et Océanographique de la Marine)
- Delivering seamless land and sea elevation datasets through Canada's NSDI (CGDI)
 - Canadian example (CHS - Canadian Hydrographic Service and NRCAN – Natural Resources Canada)
- Requirements for GIS Software
- Related Data Standards
- CARIS Company Overview



Introduction

- **Why is CARIS at this Symposium?**

- The Marine environment is important to us.
- Marine geospatial sector is under represented in GSDI
 - GSDI10 conference only 3% of papers related to marine data
 - 65% of the earth is covered by water
- Encourage producers and owners of Marine data to support their NSDI or get involved in MSDI projects
- Want to show that today's marine geospatial software can technically support your NSDI
- Enable good decision making in the coastal and marine environments by providing software that agencies and service providers can use and / or interface to!
- As a software manufacturer we can't solve the organisational **caris** aspects although we understand the challenges and importance!



Hydrographic Operational Efficiency

- SHOM has been using an assortment of heterogeneous systems to store, manage and exploit hydrographic data
- The INFRAGEOS-H project aims to solve this by providing an interoperable RDBMS core with software clients delivering data processing, visualisation and access efficiencies
- Features of the SDI include
 - Control and transfer of hydrographic information
 - Encapsulation of Metadata
 - Web based data discovery and access
- INFRAGEOS-H enables SHOM to conform to international and INSPIRE standards for data normalisation and dissemination



CARIS is delivering this solution

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Stakeholders

- Survey Platforms
 - Ships, Aircraft, AUV's
- Regional Offices / Branches
 - Responsible for the quality of data in their region
- Hydrographic Office Headquarters
 - Responsible for the quality of all hydrographic data
 - Supplier of data to military
 - Supplier of charts to shipping
- Other Agencies
 - National Mapping Agency, Cadastre, Science, Other HO's
- Public
 - Awareness / general interest
 - Accountability

Data types in INFRAGEOS

- **Types of Marine Data in this MSDI**

- Bathymetry

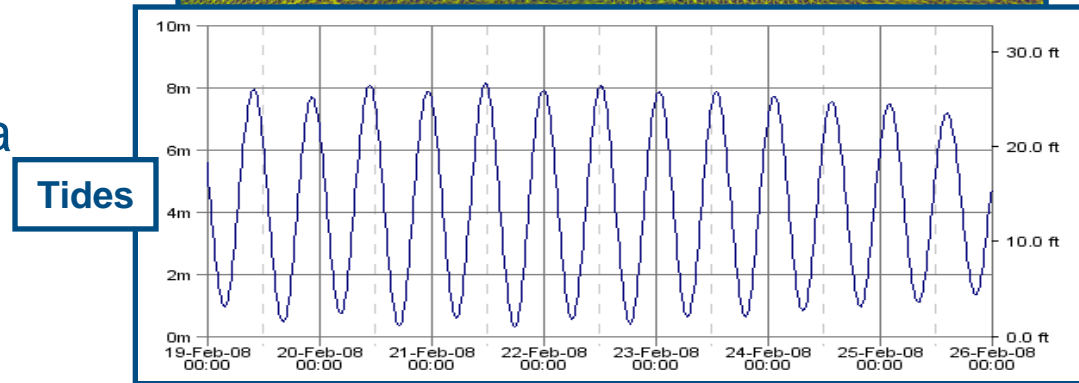
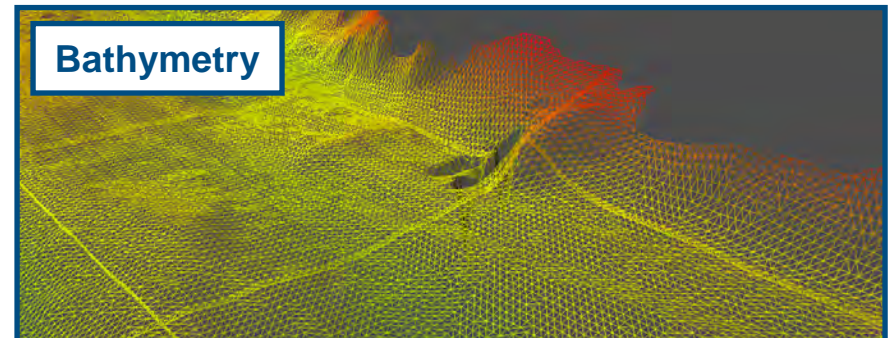
- Multibeam Sonar
- Single Beam Sonar
- LiDAR
- Legacy sounding data

- Navigational Aids

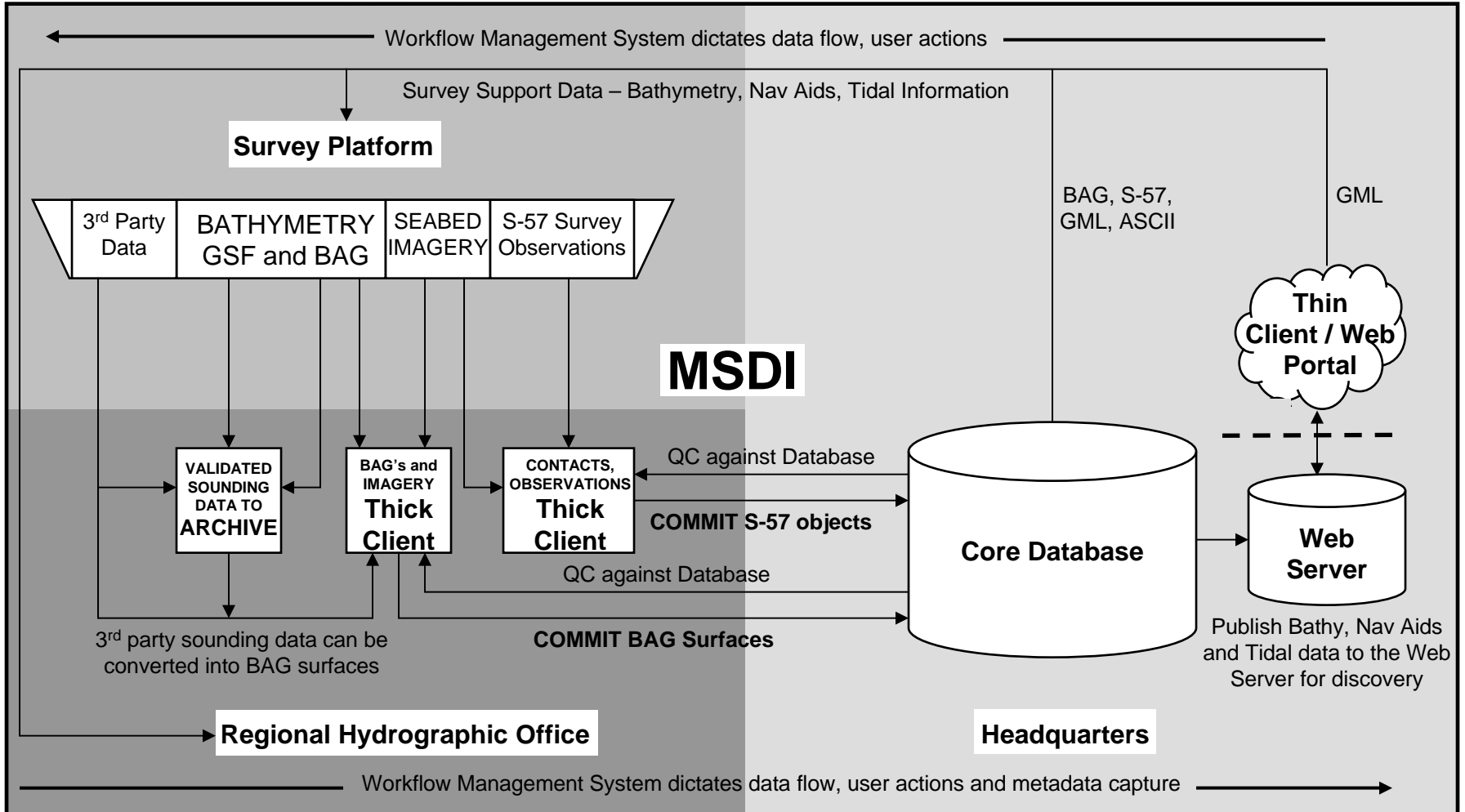
- Bouys
- Lights
- Beacons

- Tides

- Stations
- Observations



Workflow





Bathymetric Metadata

Project Level

- **Project name**
- Vertical datum
- Projection
- Time frame
- Authority
- Agencies
- Sensors used

Survey Level

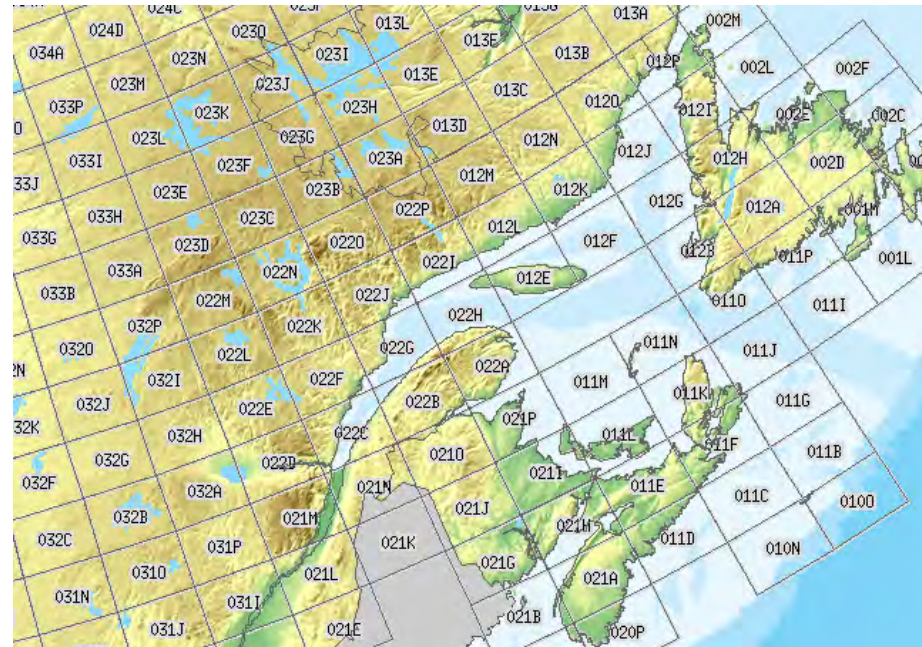
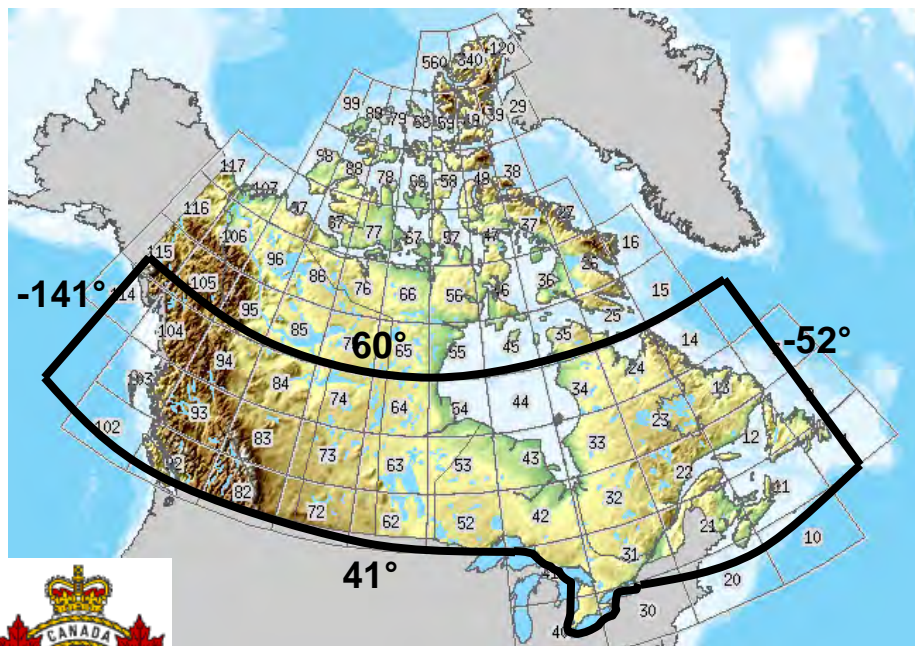
- **Project name**
- Vertical error
- Horizontal error
- Ship / Surveyor
- Type of Sensor
- Resolution

Feature Level

- **Project name**
- Designated
- VERDAT
- SOUACC
- POSACC

Delivering Topobathy DEM's

- CHS (hydrographic office) and NRCAN (national mapping agency) are collaborating to deliver TopoBathy DEM's through the CGDI
- Coverage is Canada wide below 60°N with cells at 1:250,000
- For the purpose of coastal management, analysis and decision making



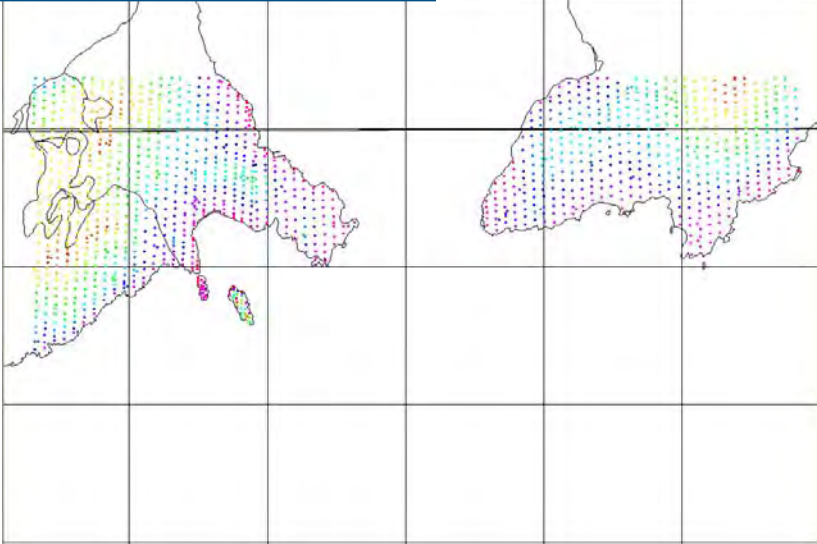
Topobathy DEM characteristics

- **DEM characteristics**
 - Geographic coordinates (ϕ, λ)
 - NAD83 horizontal datum
 - CVGD28 vertical datum
 - Elevations in metres, positive above MSL
 - 20 arcsecond resolution (c500m)
 - Available as USGS ASCII grid
 - With FGDC metadata
- **CARIS BDB software is used**
 - Resolve coordinate reference differences
 - Combine DEM's,
 - Extrapolate data from sea to shore
 - Calculate uncertainty models
 - Export the final DEM's for inclusion in portal

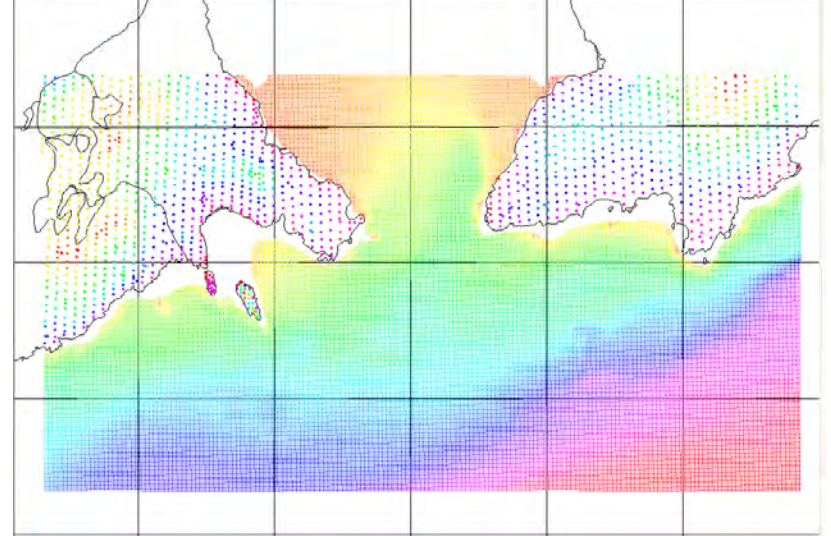


TopoBathy DEM Workflow

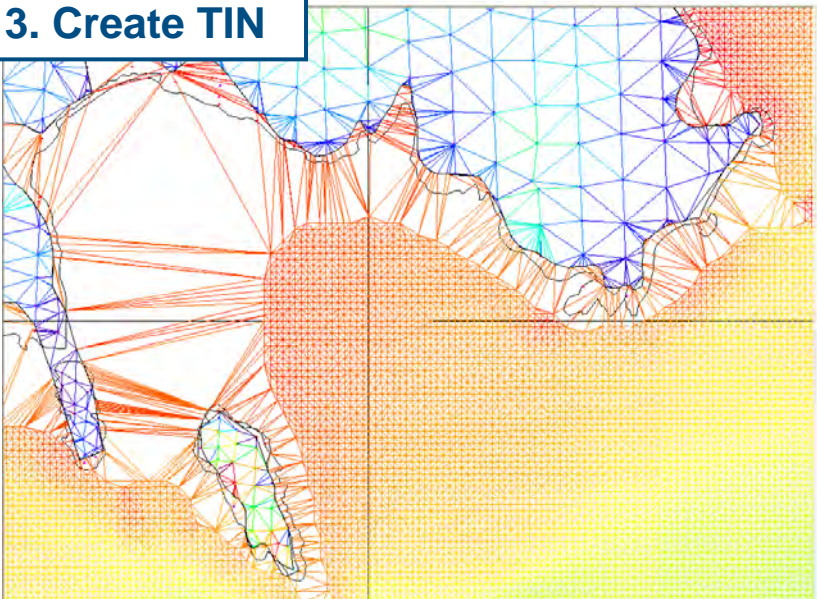
1. Import Land Data



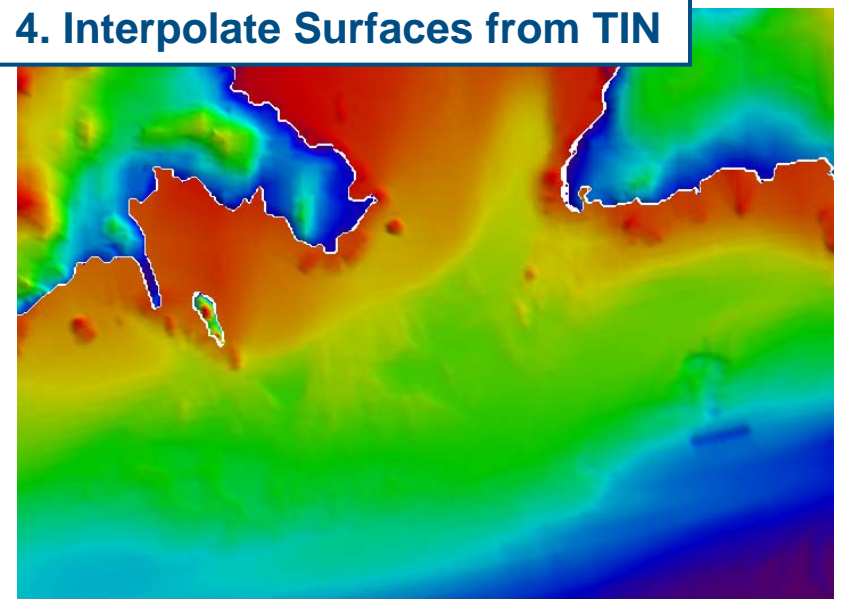
2. Import Sea Data



3. Create TIN

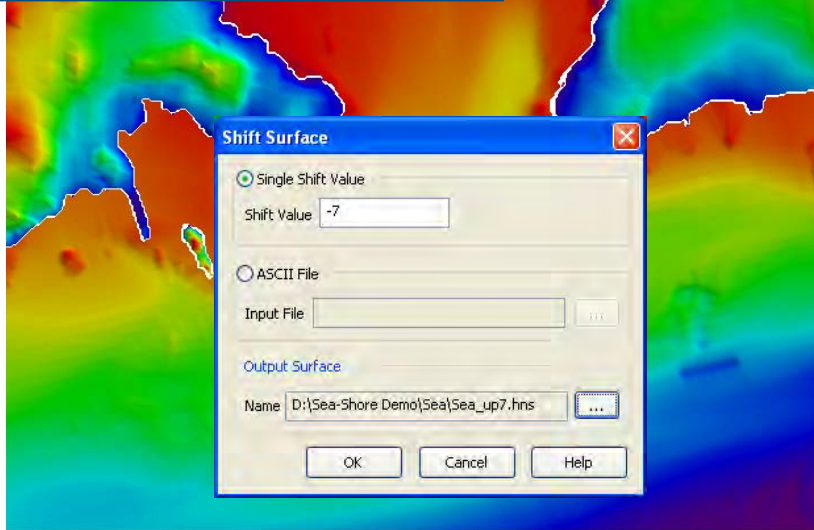


4. Interpolate Surfaces from TIN

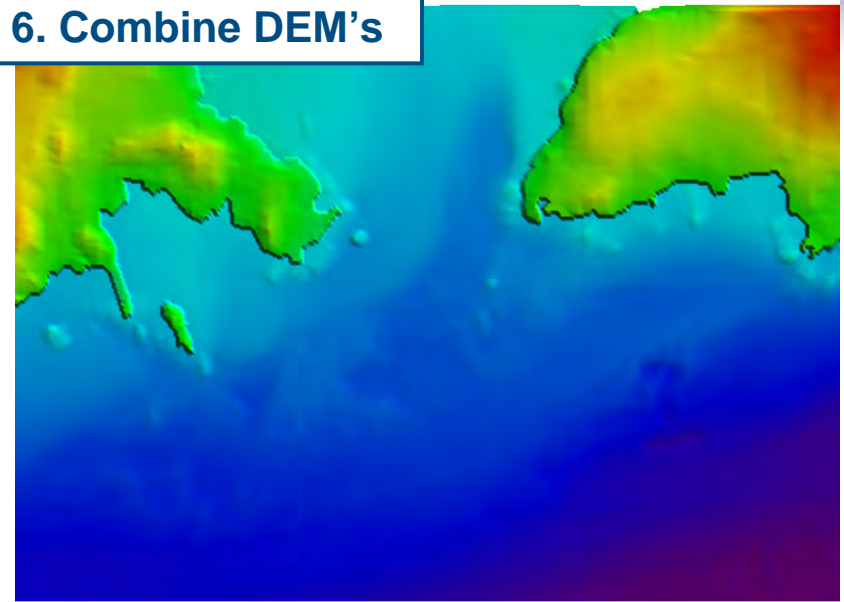


TopoBathy DEM Workflow

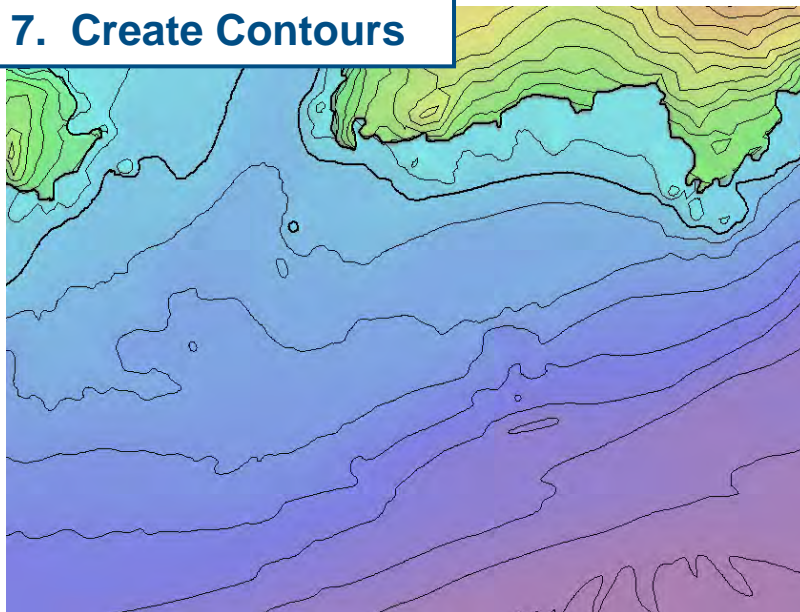
5. Perform Datum Shift



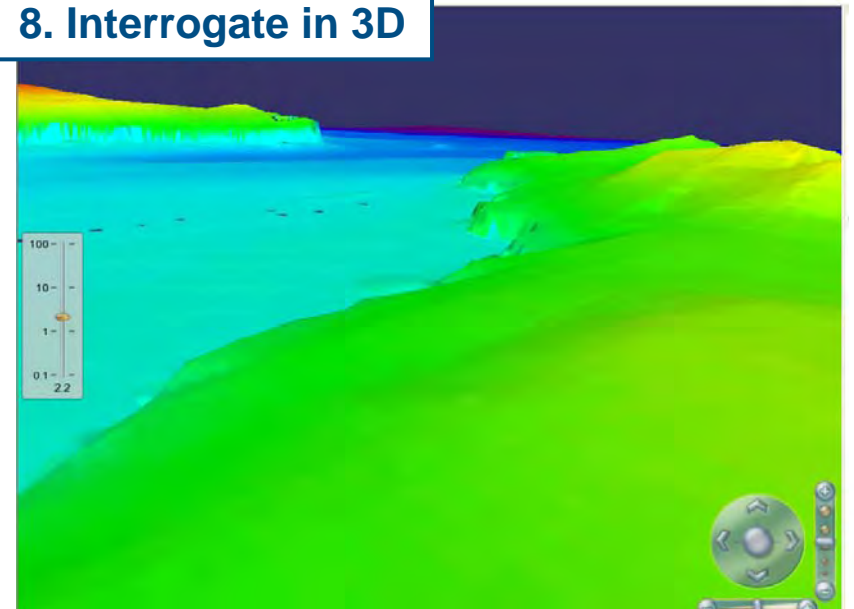
6. Combine DEM's



7. Create Contours



8. Interrogate in 3D





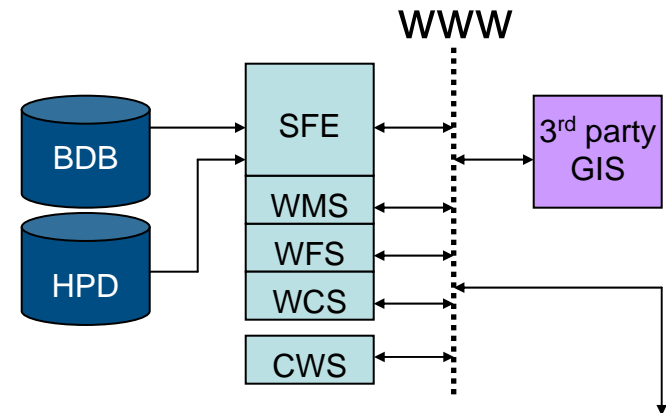
Software requirements for bringing land and sea data together

- **Hydro data is +ve down, Topo data is +ve up**
 - Software needs to be able to handle this
- **Land and Sea data often referenced to different coordinate systems**
 - Vertical = MSL for Land, LAT for Sea
 - DEM's therefore need to be shifted (VORF, VDATUM, ASCII)
 - Or stored in reference to the Ellipsoid
- **Sea to Shore models need to be created to resolve data gaps in the surf zone**
- **DEM's need to be combined**
 - For seamless examination and analysis
 - To derive continuous vector features e.g. contours

Software for integrating Marine datasets in SDI Projects

- **CARIS Spatial Fusion Enterprise (SFE) for web enabling Marine data**

- Chart data - ENC's, RNC's, CARIS HPD content via HPD web service
- High resolution bathymetry from CARIS BDB via bathy web service

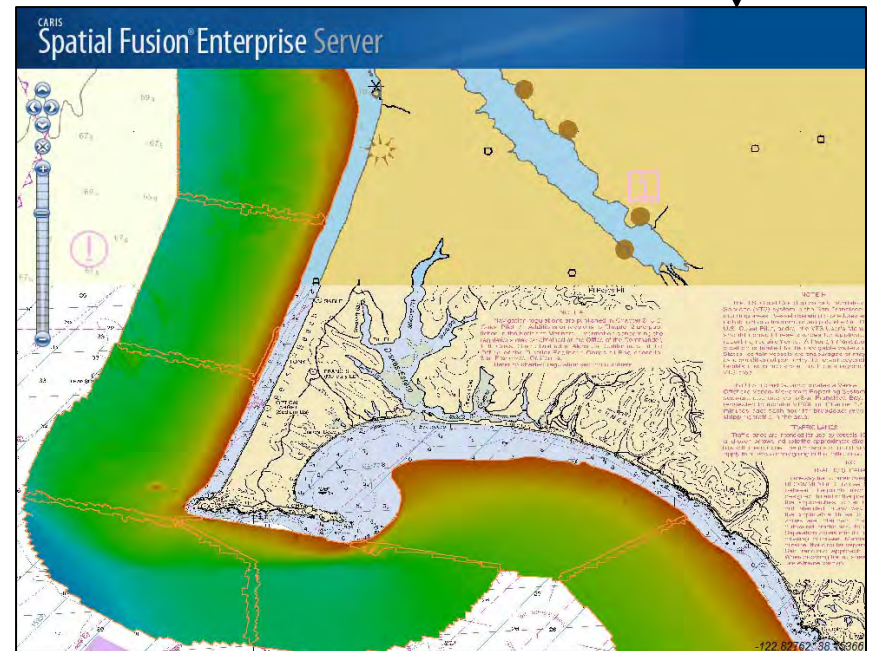


- **Alongside common GIS data types shp, dxf, dgn, mif, GeoTiff, MrSid**

- **Available through the CARIS web client or any OGC compliant GIS**

- **SFE is standards based**

- INSPIRE compliant
 - OGC services
 - ISO Metadata
- Google base map / API





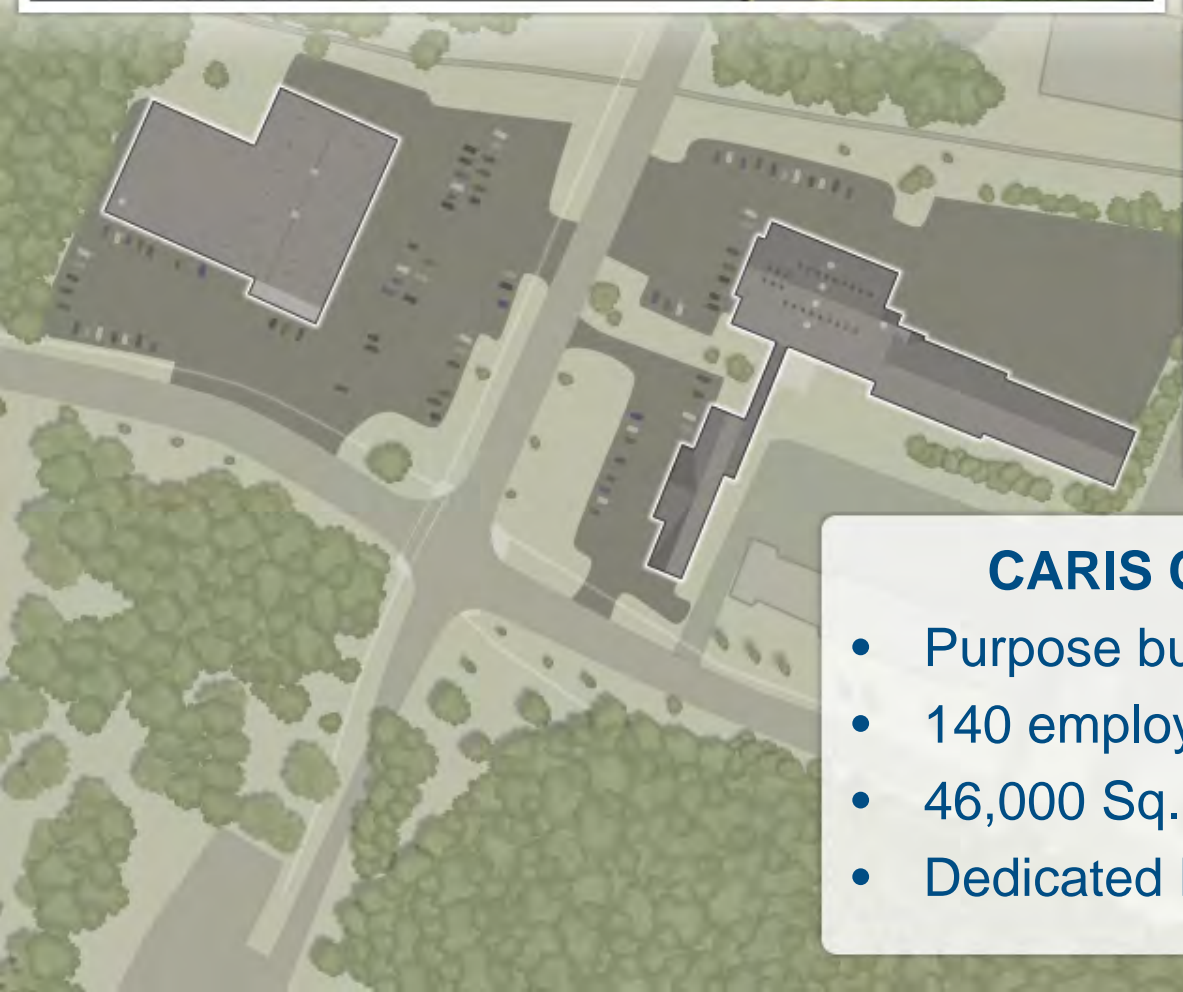
Related Data Standards

- BAG, 32 bit GeoTIFF, HDF5 for bathy DEM
- GSF for bathymetric soundings
- IHO S-57/S-100 for hydrographic observations
- ISO 19115 Metadata for SHOM
- FGDC Metadata for CHS
- WFS / GML for exchange of chart features
- WMS for map browsing
- WCS for bathy extracts and download
- CWS for data discovery
- ***All these are open formats and standards***



CARIS Company Overview

- 30 Years in Business
- Successful CARIS installations in over 85 countries
- 180 employees divided between Canada, Netherlands, USA, Australia and the UK
 - Developers, Project Management, Sales, Marketing, Tech Support
- International team of Technical Support professionals with industry experience and academic backing
- ISO 9001:2000 certified
- Involved in development of standards - OGC, ISO, IHO, ONSWG
- *“Our mission is to be world leader in the development and marketing of spatial information solutions within our focus markets while growing new markets that build upon our core competencies”.*



CARIS Campus in Fredericton

- Purpose built facility with IT in mind
- 140 employees
- 46,000 Sq. Ft.
- Dedicated Fiber optic link 12 - 100 MB



Thank You

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