# The Creation of a Bathy Database for the Bay of Fundy, Canada

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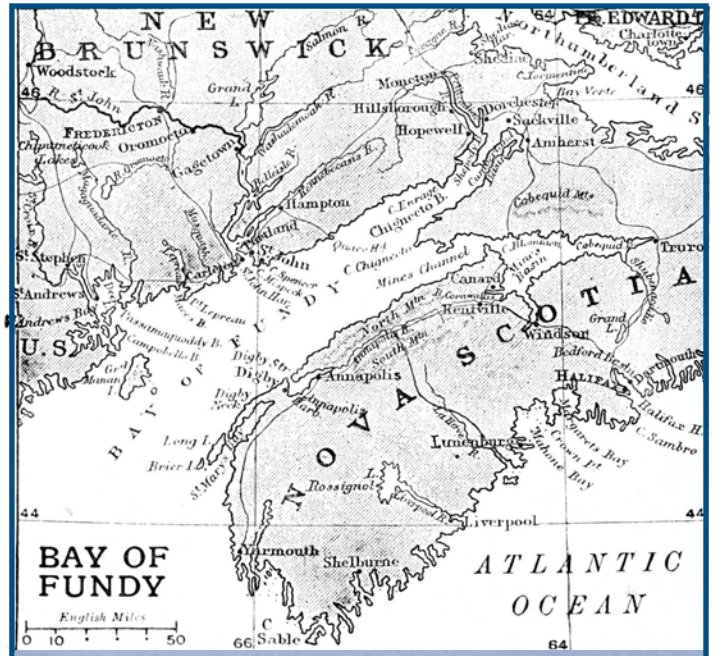
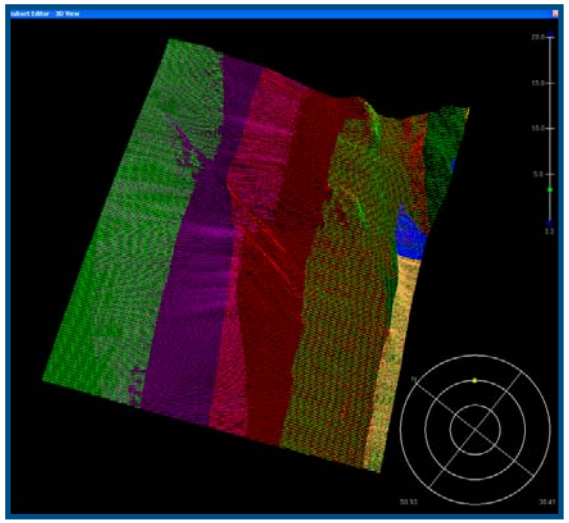
# Introduction

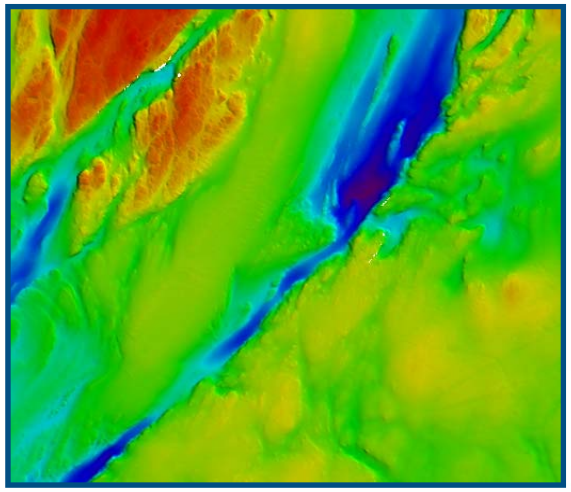
- Background
  - CHS Atlantic get's many requests for bathy data for the Bay of Fundy Area
  - Surveys since early 1900's
  - Multibeam Surveys taking place since early 1990's, lots of data available!
  - Fundy has the highest tides in the world = data processing challenge
- Objective
  - To build a regional database using the CARIS Bathy DataBASE v3.0 product
  - Must be easy to manage and maintain
  - Meet client data requests efficiently




# Workflow – Data Sources 1.

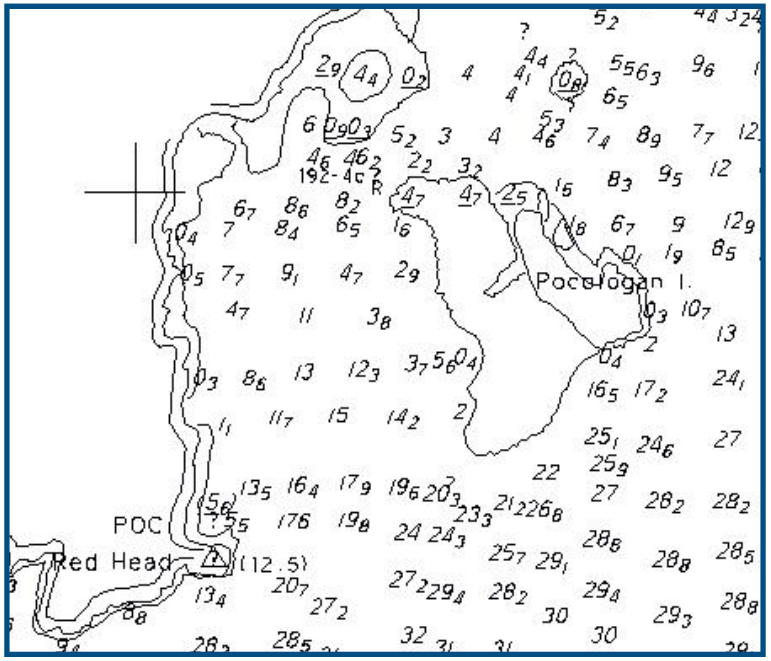
- Multibeam Data from 1994, 1999, 2006, 2007, 2008, 2009 in CARIS HIPS / SIPS Format
  - Bathy DataBASE has native support for HIPS BASE surfaces
    - *.csar, *.hns, *.hcs, *.bag
  - Data was collected with various CHS Vessels and Launches
    - Matthew, Creed, Pipit, Plover
  - Data collected using different sensors
    - em710, em1000, em3002
  - Data resolution = 5m (10m for 1990's)



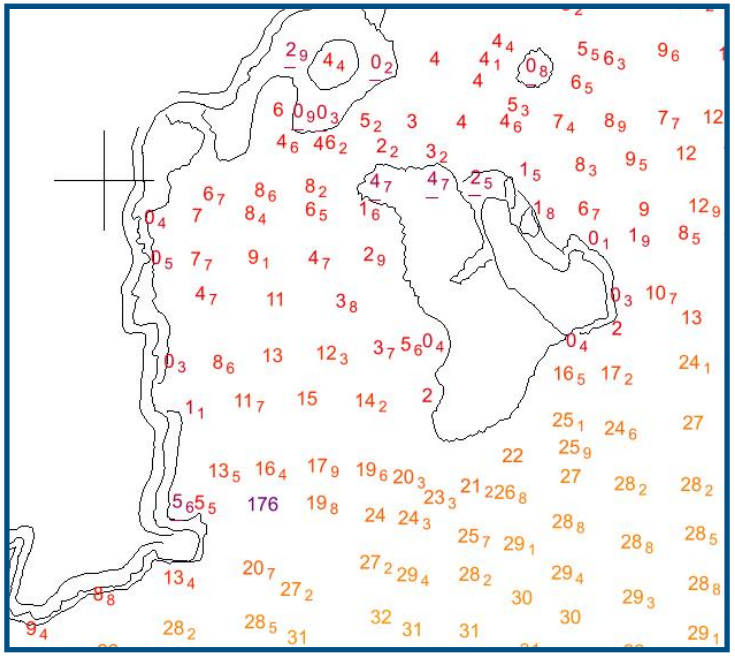


# Workflow – Data Sources 2.

- Charted sounding data from 1960's, 70's, 80's and 90's in NTX format for areas without Multibeam coverage
  - Bathy DataBASE allows import of NTX soundings and metadata
  - Data collected using a variety of techniques, Singlebeam, Lead Line
  - Resolution = Chart density




CARIS GIS



CARIS Bathy DataBASE

# Workflow – Data Sources 3.

- XYZ datasets of processed multibeam downloaded from the UNB Ocean Mapping Groups website,
  - Bathy DataBASE allows import of XYZ data in ASCII format
  - Data collected over UNB GGE Survey Camps with the Heron
  - Numerous Multibeam systems used
  - Resolution = 10m

| | | |
|---|---|---|
| -66.0679926166 | 45.2732430491 | 9.11 |
| -66.0678654037 | 45.2732430491 | 8.42 |
| -66.0677381909 | 45.2732430491 | 8.00 |
| -66.0676109781 | 45.2732430491 | 6.62 |
| -66.0673565524 | 45.2732430491 | 4.07 |
| -66.0682470422 | 45.2731532272 | 9.07 |
| -66.0681198294 | 45.2731532272 | 10.02 |
| -66.0679926166 | 45.2731532272 | 10.58 |
| -66.0678654037 | 45.2731532272 | 10.16 |
| -66.0677381909 | 45.2731532272 | 9.07 |
| -66.0676109781 | 45.2731532272 | 7.32 |
| -66.0674837653 | 45.2731532272 | 5.34 |
| -66.0673565524 | 45.2731532272 | 4.13 |
| -66.0672293396 | 45.2731532272 | 4.63 |
| -66.0671021268 | 45.2731532272 | 4.75 |
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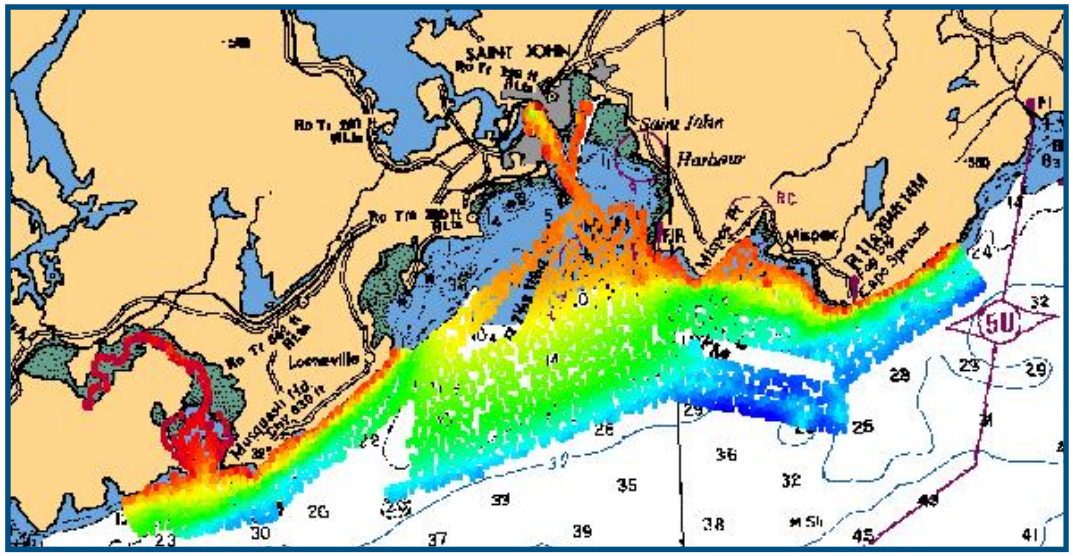
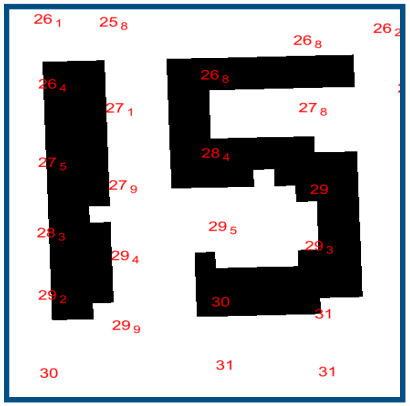
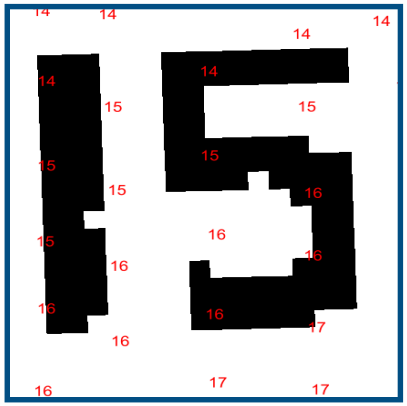
| -66.0682470422 | 45.2730634052 | 9.93 |

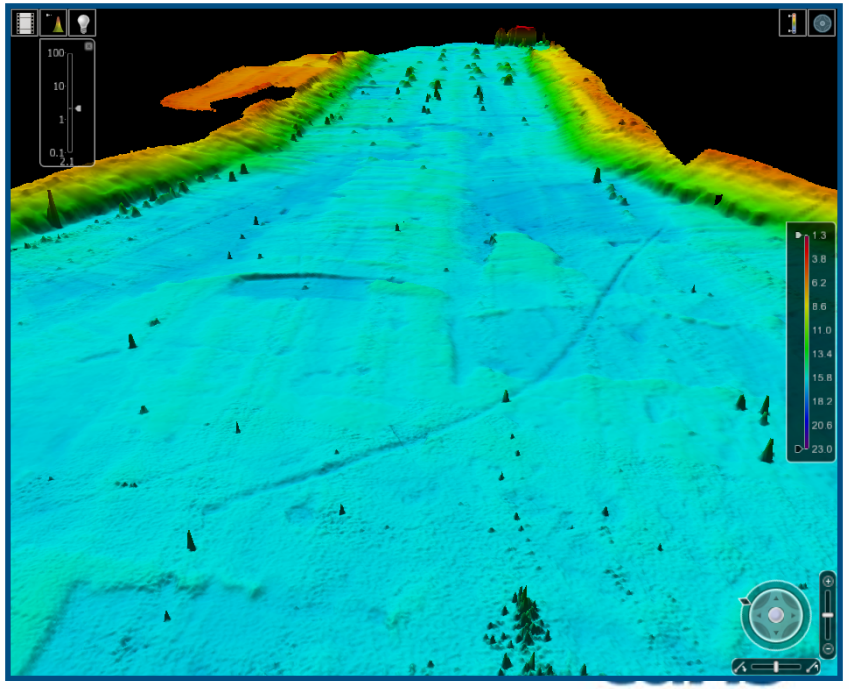


# Data Validation

- Before new source is committed to the database, data needs to be validated against existing datasets
  - Soundings can be compared to existing chart information, e.g. CHS charts (BSB's, ENC's)
    - Charts could be in different depth units e.g. fathoms
    - Bathy DataBASE display units can be changed to aid validation
  - Surface Differencing
  - Data Interrogation in 3-D

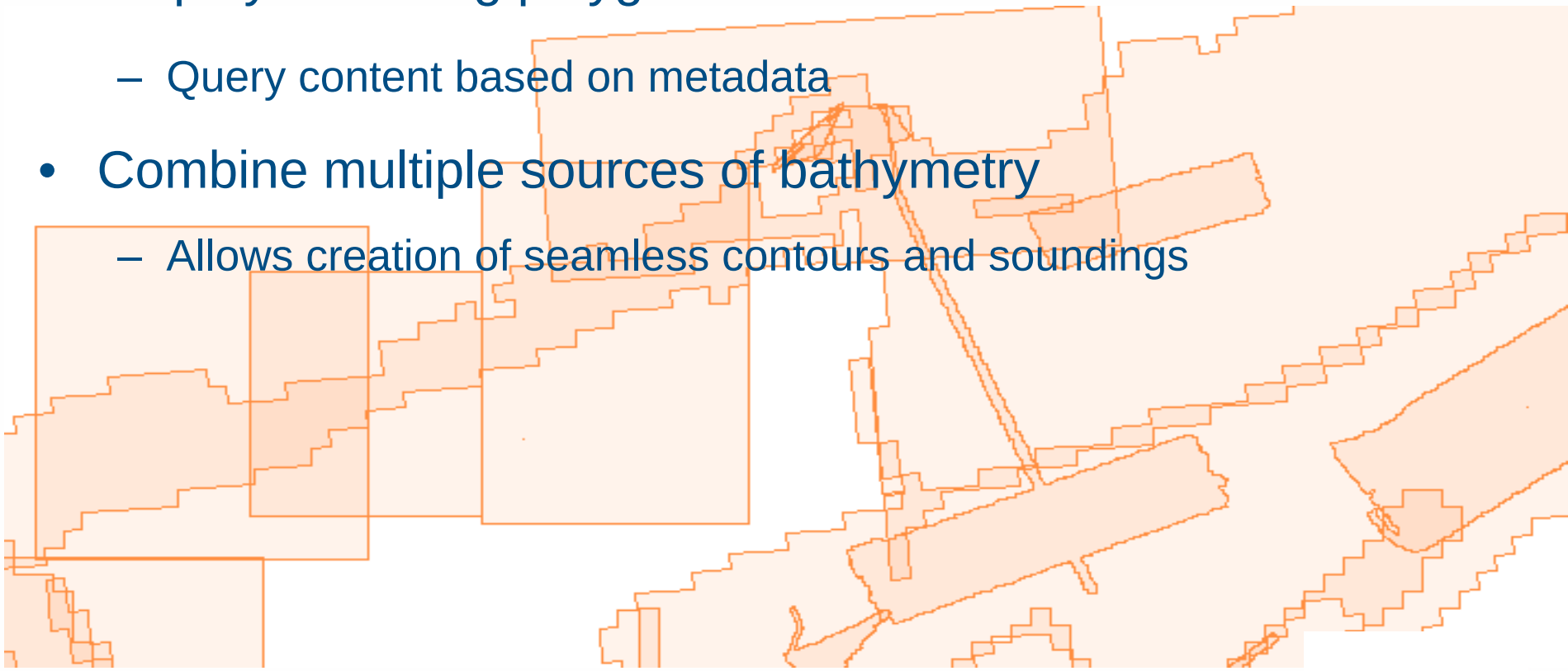






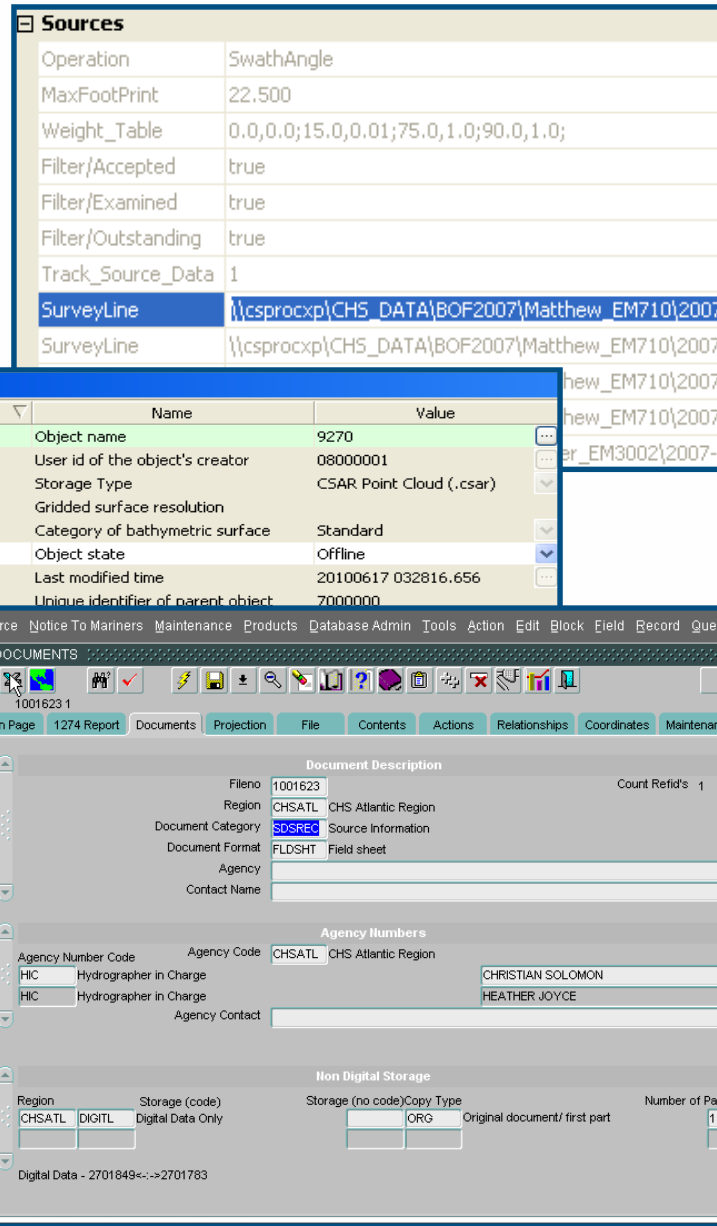
# Committing to Database

- Load sounding sets and surfaces as objects
  - Individually or grouped by field season
- Display bounding polygons and attributes
  - Query content based on metadata
- Combine multiple sources of bathymetry
  - Allows creation of seamless contours and soundings



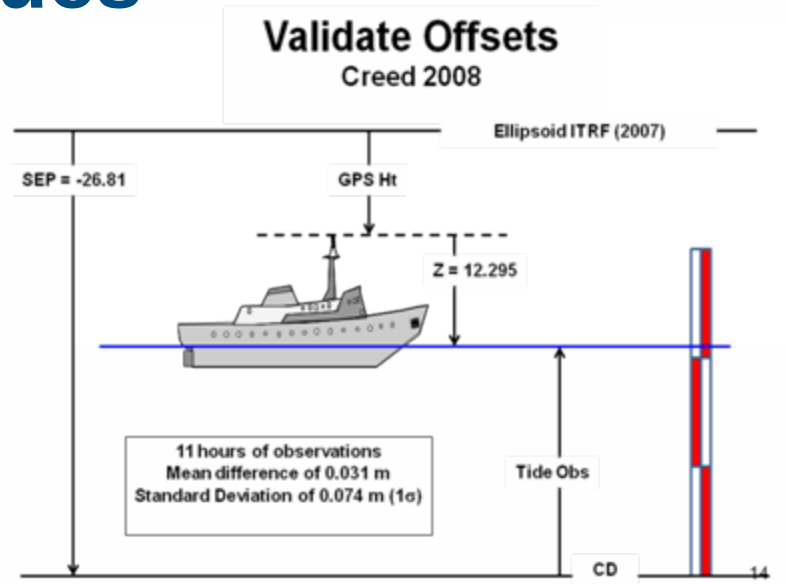
# Metadata

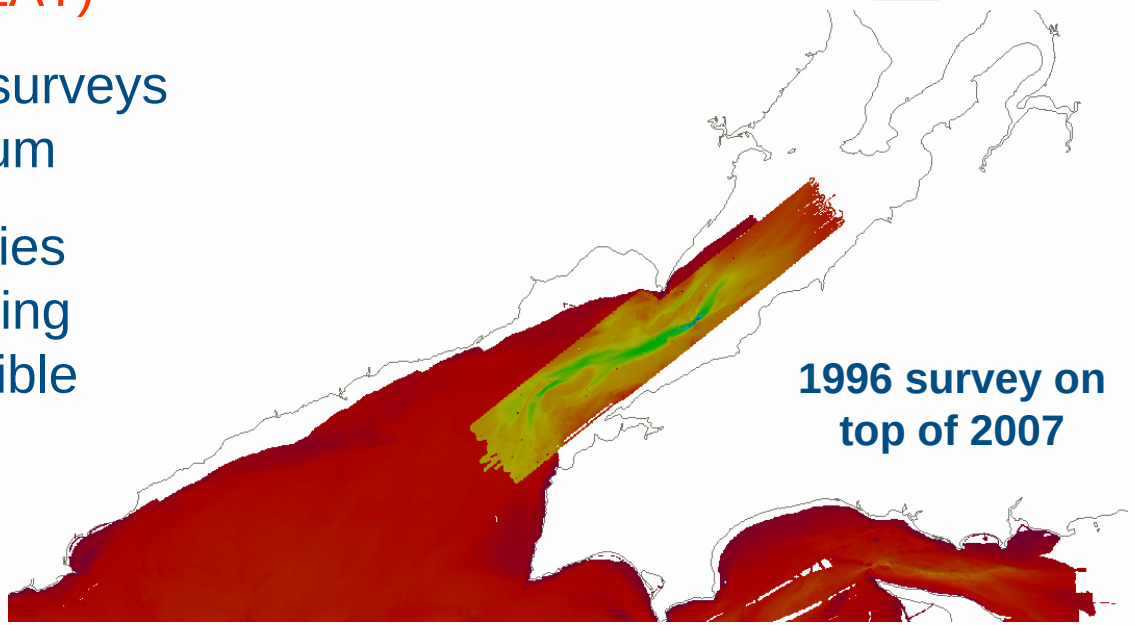
- Appropriate Metadata needs to be available to describe data source
  - HIPS BASE surfaces contain metadata that is available in Bathy DataBASE
  - NTX file header information can be retained and used as a metadata
  - XYZ files may contain metadata that can be carried across on import
- Bathy DataBASE also allows additional Metadata to be added when committing new source
  - Customizable attribute model
  - Can link to external metadata
    - CHSDir

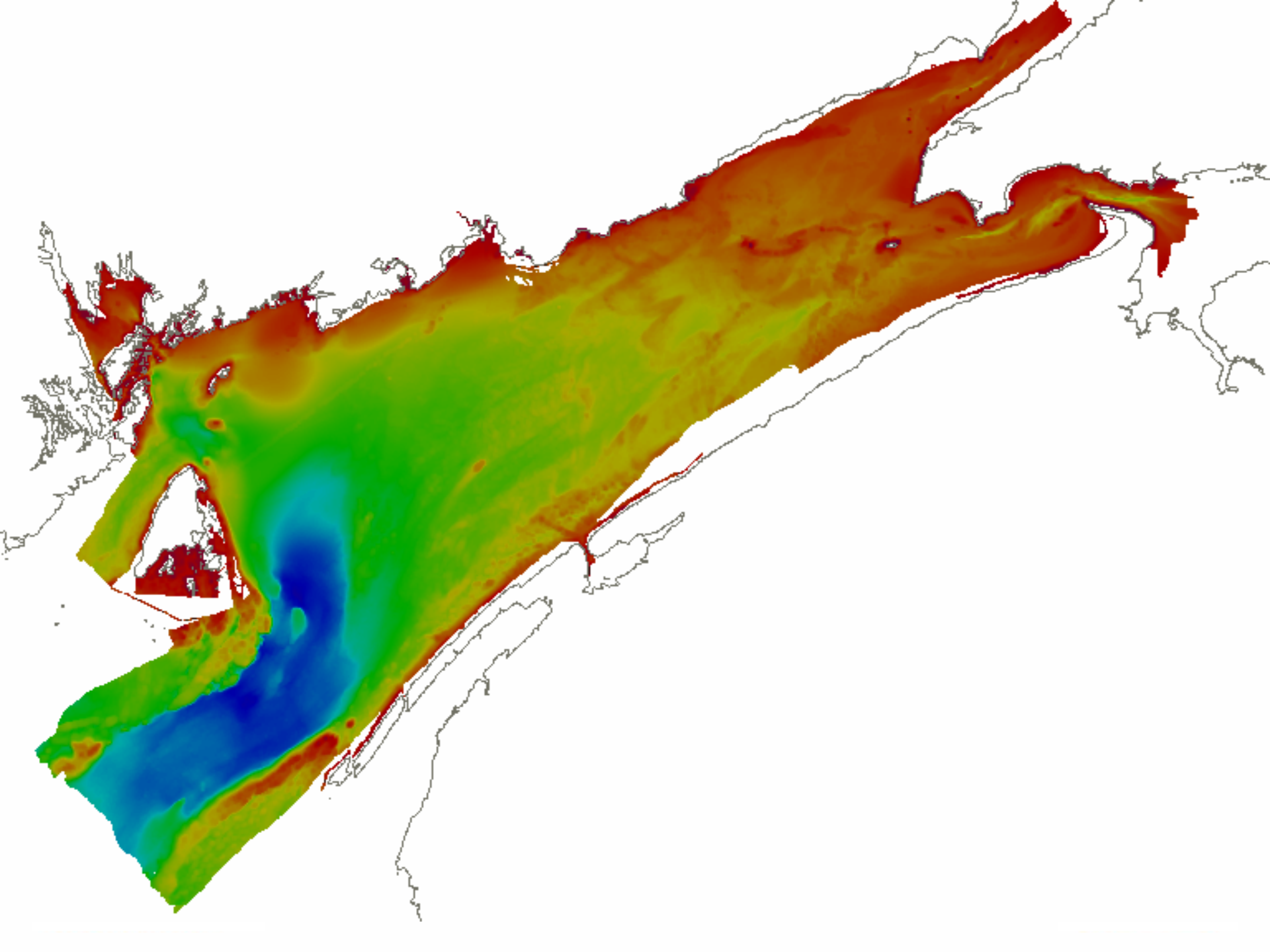


# Tidal Issues

- HIPS data from 1994, 1999 and 2006 used a combination of predicted and observed tides
- HIPS data from 2007 onwards used GPS heights
- NTX soundings were already reduced to Chart Datum (LAT)
- XYZ data from the Heron surveys was reduced to Chart Datum
- The result was discrepancies between the datasets making seamless analysis impossible





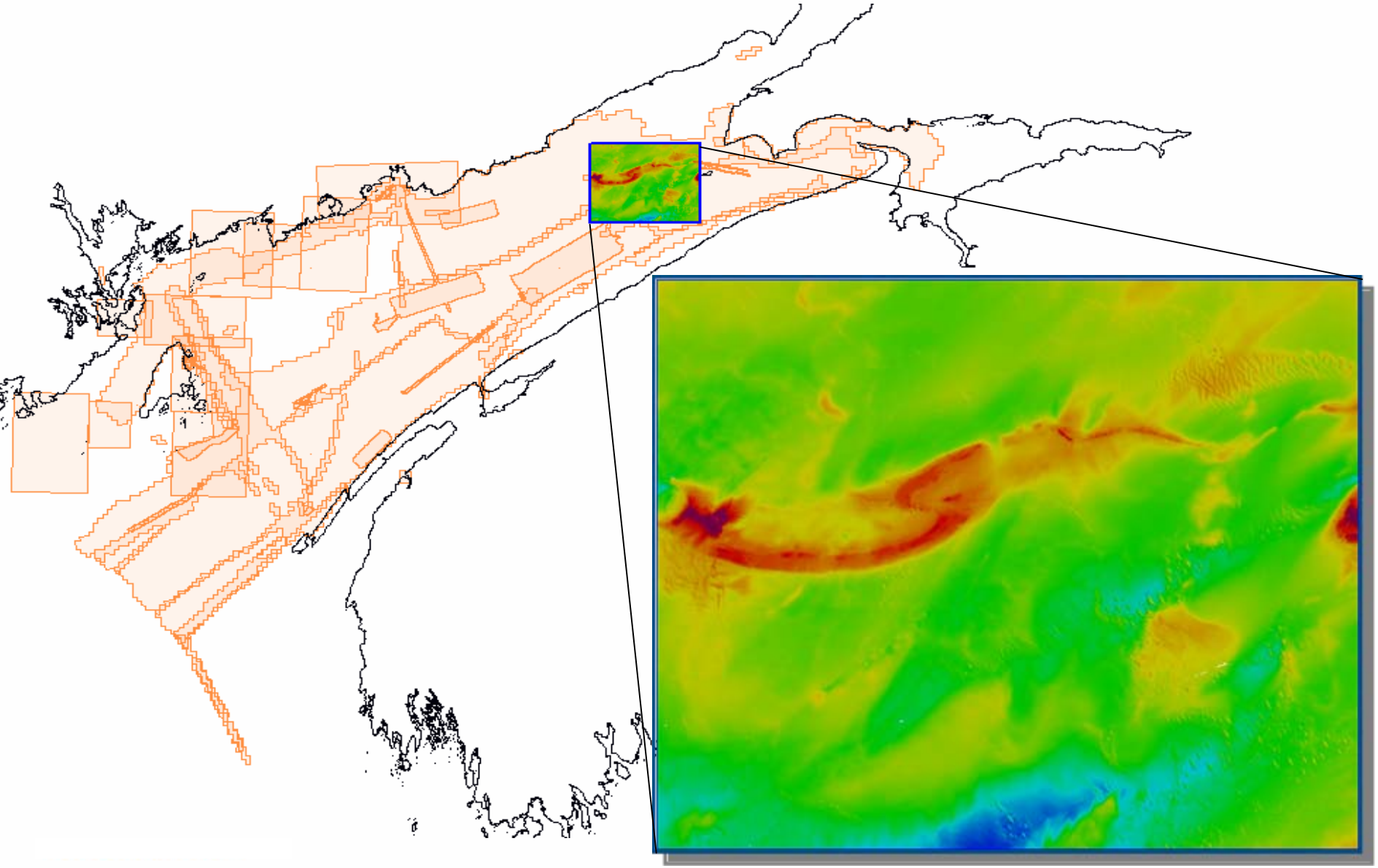
# Recent Client Requests

- **Parks Canada**
  - Request for highest resolution possible for all the Bay of Fundy Data.
  - Combined 10m grid exported as GeoTIFF image
- **National Research Council (NRC) Canadian Hydraulics Centre**
  - Request for gridded data for Bay of Fundy including Minas Passage
  - Combined 10m grid as points
- **Other frequent request include Contours or Soundings of an area in Shape file format**

# Conclusions

- Ironed out the workflow for the ingestion of CHS bathymetric data sources
- Created a Bathymetric database for the Bay of Fundy with links to CHSDir for source metadata
  - However tidal discrepancies downgrade it's usability
  - HIPS BASE surfaces still awaiting validation by CHS
- Client requests can be quickly and easily met
  - Combining datasets to cover required extents
  - Extracts of surfaces (grids or points)
  - Images GeoTIFF's, KMZ
  - Vector information in common GIS formats e.g. Shape, GML etc.

# Bathy Database for the Bay of Fundy



# Recommendations

- Revise expected deliverables from future survey missions to aid smooth ingestion into Bathy DataBASE including use of GPS height information
  - Consider breaking down surfaces by vessel and / or region
- Consider using Dave Dodd's ITRF 5m surface as starting point for Bay of Fundy Database and append as new survey data becomes available
  - This could require a transformation to LAT (currently MSL)
  - Alternatively store surfaces referenced to ITRF Ellipsoid
    + **PRO** = Perform transformation to client required datum on export
    – **CON** = The z-values in the map window won't be logical which may make validation difficult

# Acknowledgments


- Dr. David Dodd, University of New Brunswick (now at CHS Central)

- Ron Macnab, Geological Survey of Canada (Retired)

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