

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

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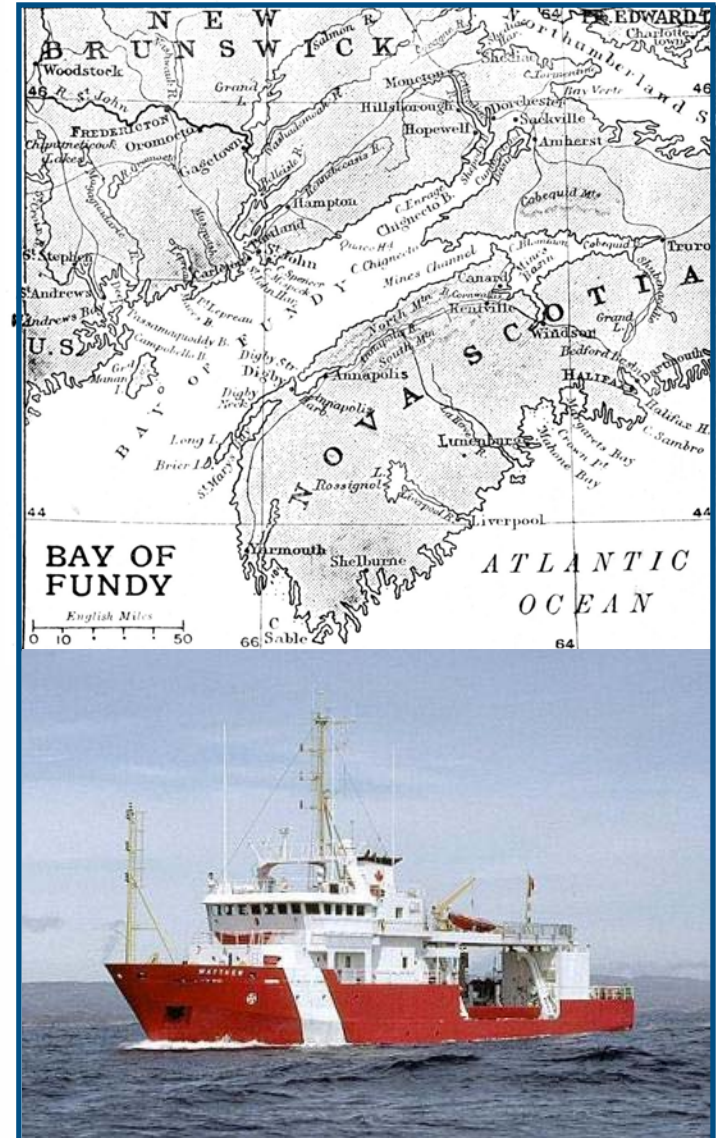
# Introduction

- 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

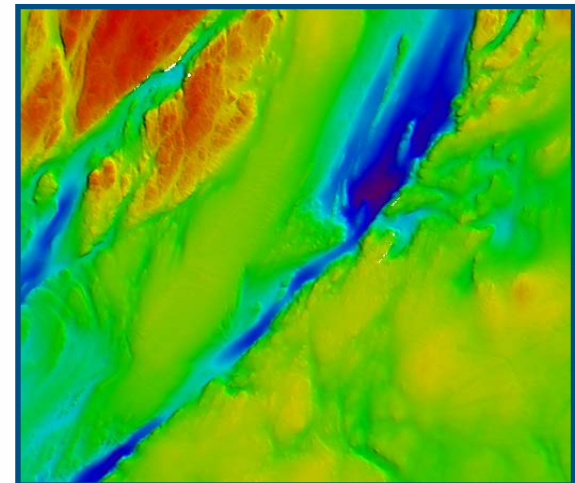
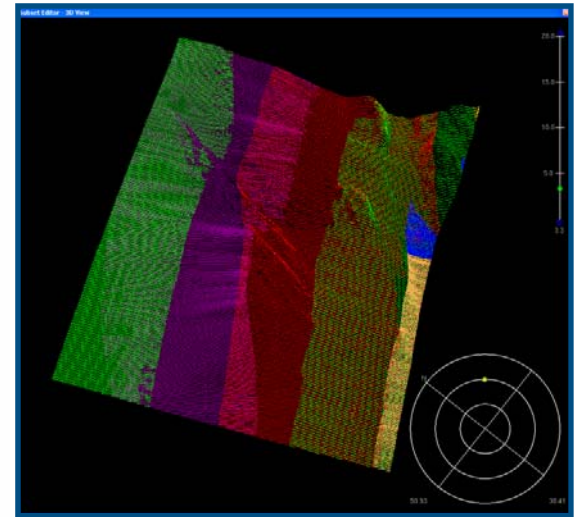
- To build a regional database using the CARIS Bathy DataBase v3.0 product
- Must be easy to manage and maintain
- Meet client data requests efficiently





# Workflow – Data Sources 1.

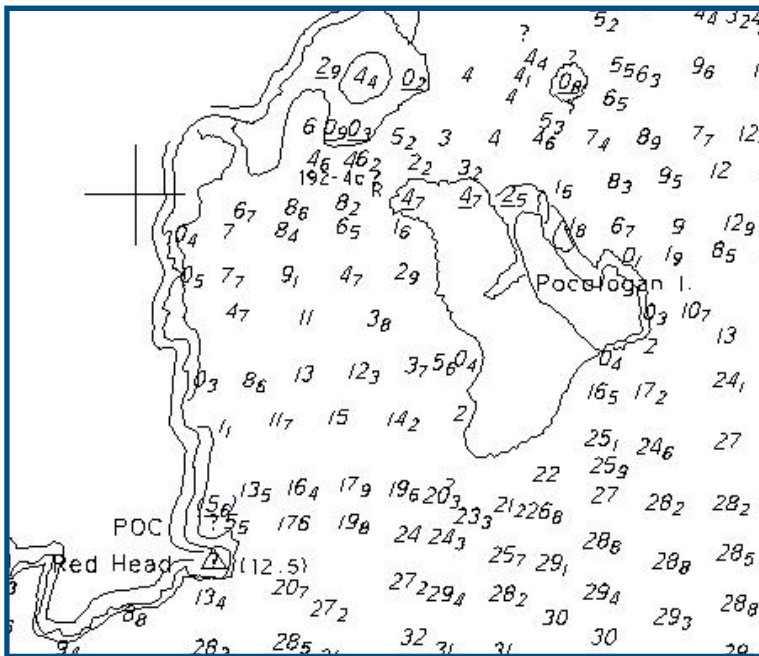
- Multibeam Data from 1994, 1999, 2006, 2007, 2008, 2009 in CARIS HIPS / SIPS Format
  - Bathy DataBase has native support for HIPS BASE surfaces
    - \*.csar, \*.hns, \*.hcs, \*.bag
  - Data was collected with various CHS Vessels and Launches
    - Matthew, Creed, Pipit, Plover
  - Data collected using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



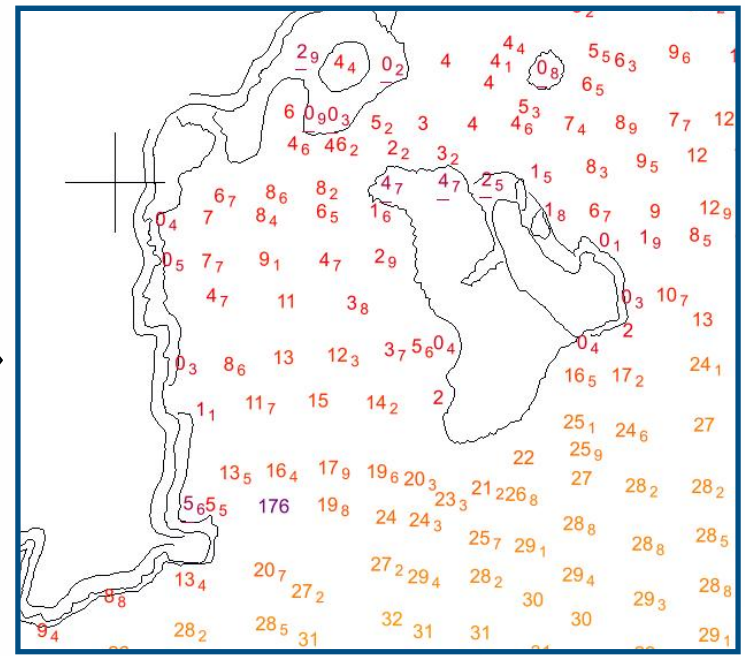


## Workflow – Data Sources 2.

- 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**



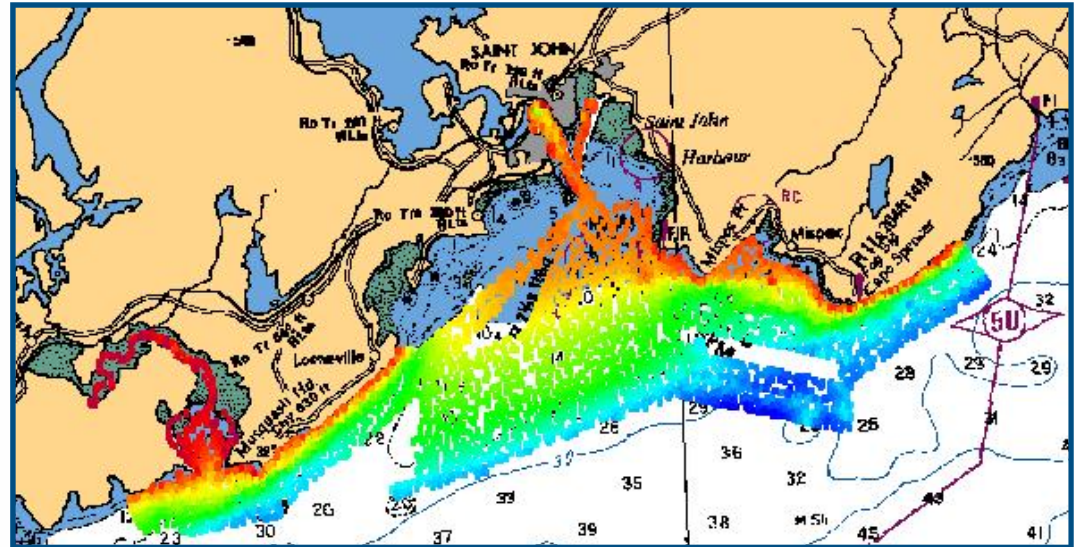
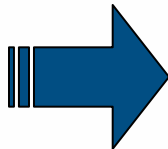
**CARIS Bathy DataBASE**



# 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
-66.0669749139	45.2731532272	4.45
-66.0682470422	45.2730634052	9.93

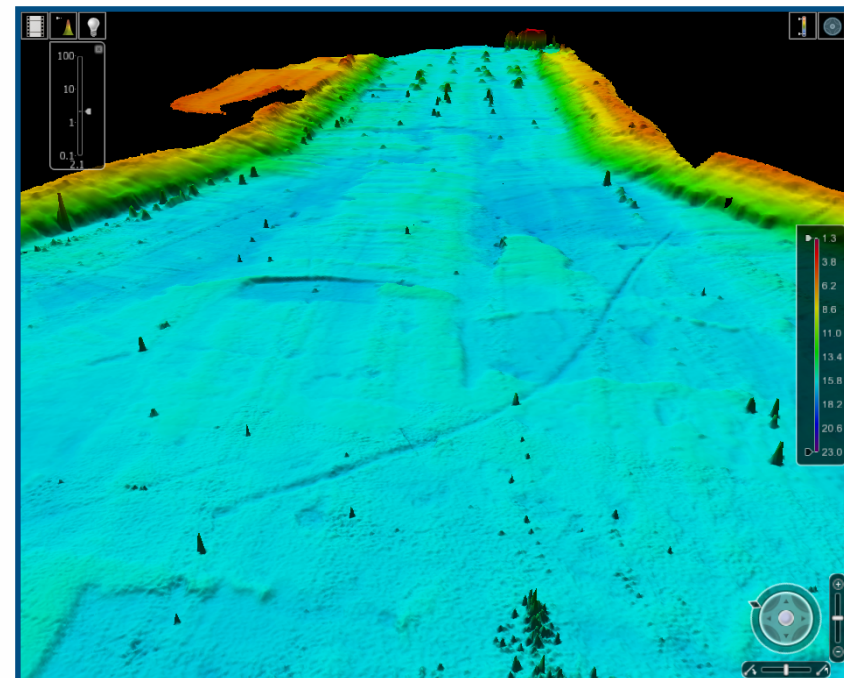
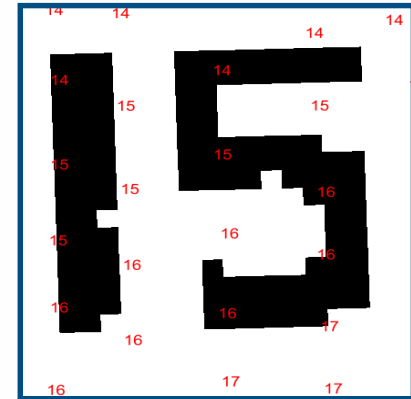
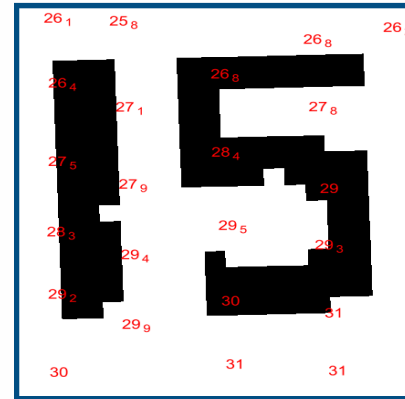






# Data Validation

- 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

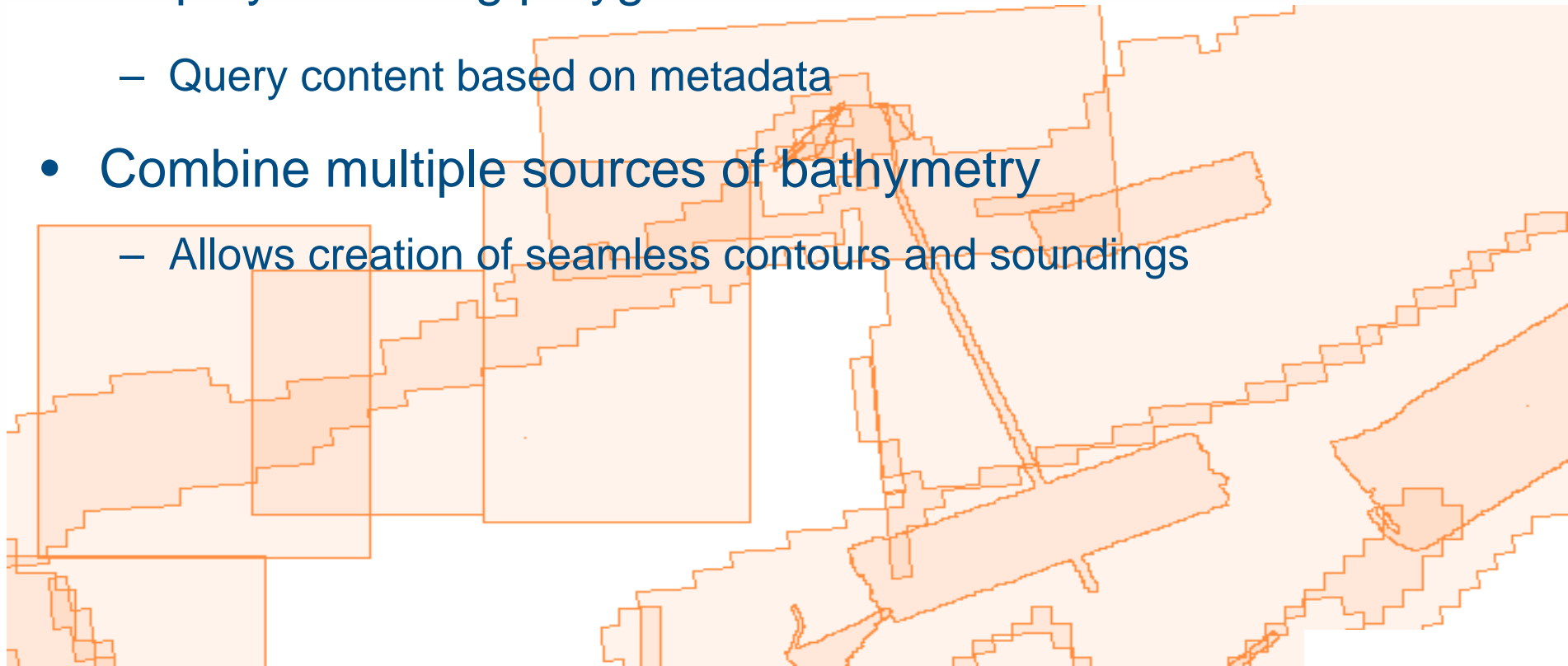






# Committing to Database

- 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

Sources	
Operation	SwathAngle
MaxFootPrint	22.500
Weight_Table	0.0,0.0;15.0,0.01;75.0,1.0;90.0,1.0;
Filter/Accepted	true
Filter/Examined	true
Filter/Outstanding	true
Track_Source_Data	1
SurveyLine	\\csprocxp\CHS_DATA\BOF2007\Matthew_EM710\2007-
SurveyLine	\\csprocxp\CHS_DATA\BOF2007\Matthew_EM710\2007-

Attributes		
Acronym	Name	Value
OBJNAM	Object name	9270
uidcre	User id of the object's creator	08000001
srftyp	Storage Type	CSAR Point Cloud (.csar)
srfrs	Gridded surface resolution	
srfcst	Category of bathymetric surface	Standard
objst8	Object state	Offline
modtim	Last modified time	20100617 032816.656
idprnt	Unique identifier of parent object	7000000
cretr		

Source Notice To Mariners Maintenance Products Database Admin Tools Action Edit Block Field Record Que

DOCUMENTS

1001623 1

Main Page 1274 Report Documents Projection File Contents Actions Relationships Coordinates Maintenance

Document Description

Fileno 1001623 Count Ret'd's 1

Region CHSATL CHS Atlantic Region

Document Category SDSREC Source Information

Document Format FLDSHT Field sheet

Agency

Contact Name

Agency Numbers

Agency Number Code Agency Code CHSATL CHS Atlantic Region

HIC Hydrographer in Charge CHRISTIAN SOLOMON

HIC Hydrographer in Charge HEATHER JOYCE

Agency Contact

Non Digital Storage

Region CHSATL Storage (code) DIGITL Digital Data Only

Storage (no code) Copy Type

ORG Original document/ first part

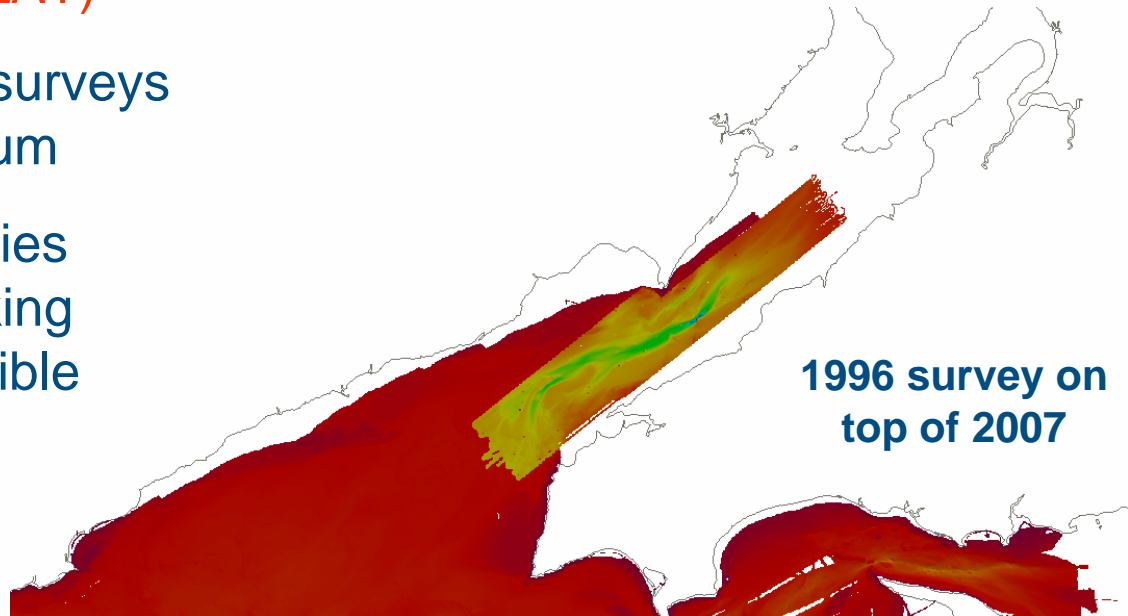
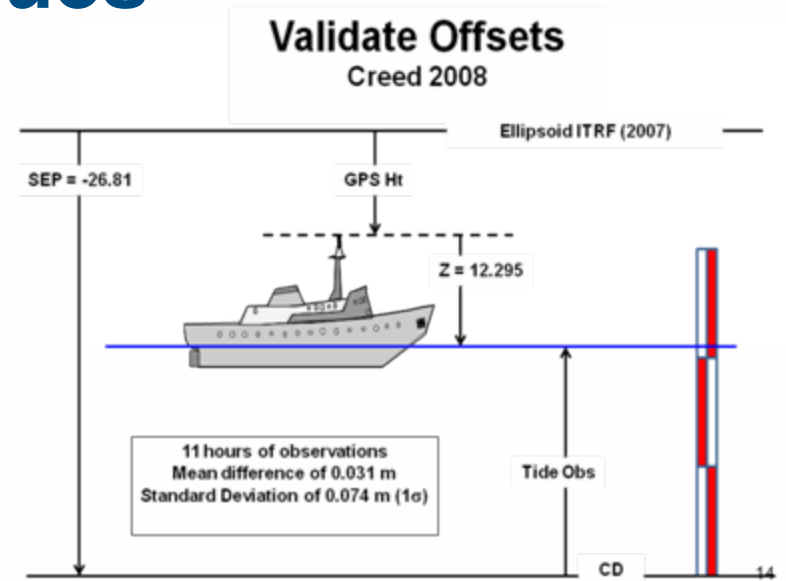
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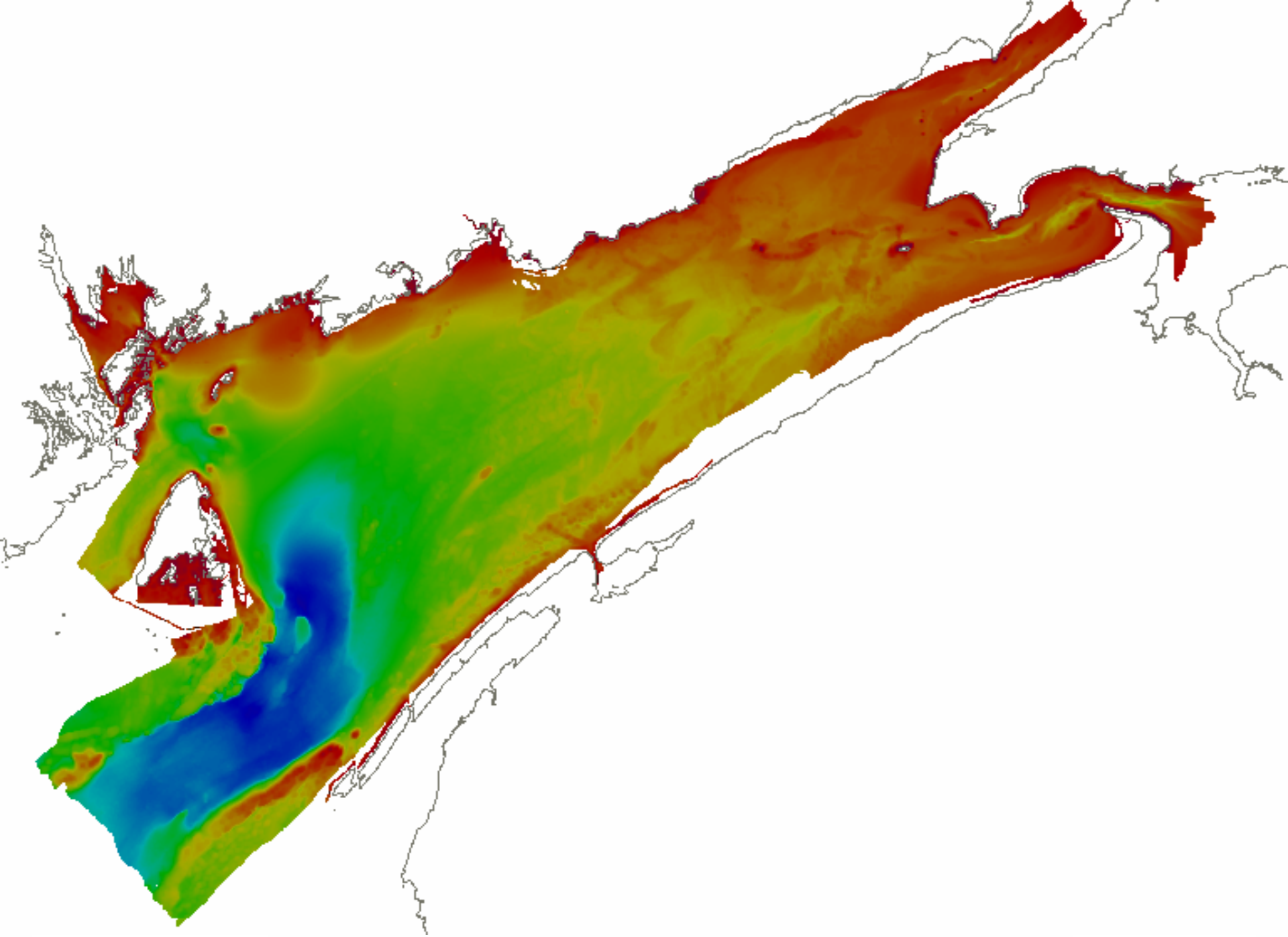


# Tidal Issues

- 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



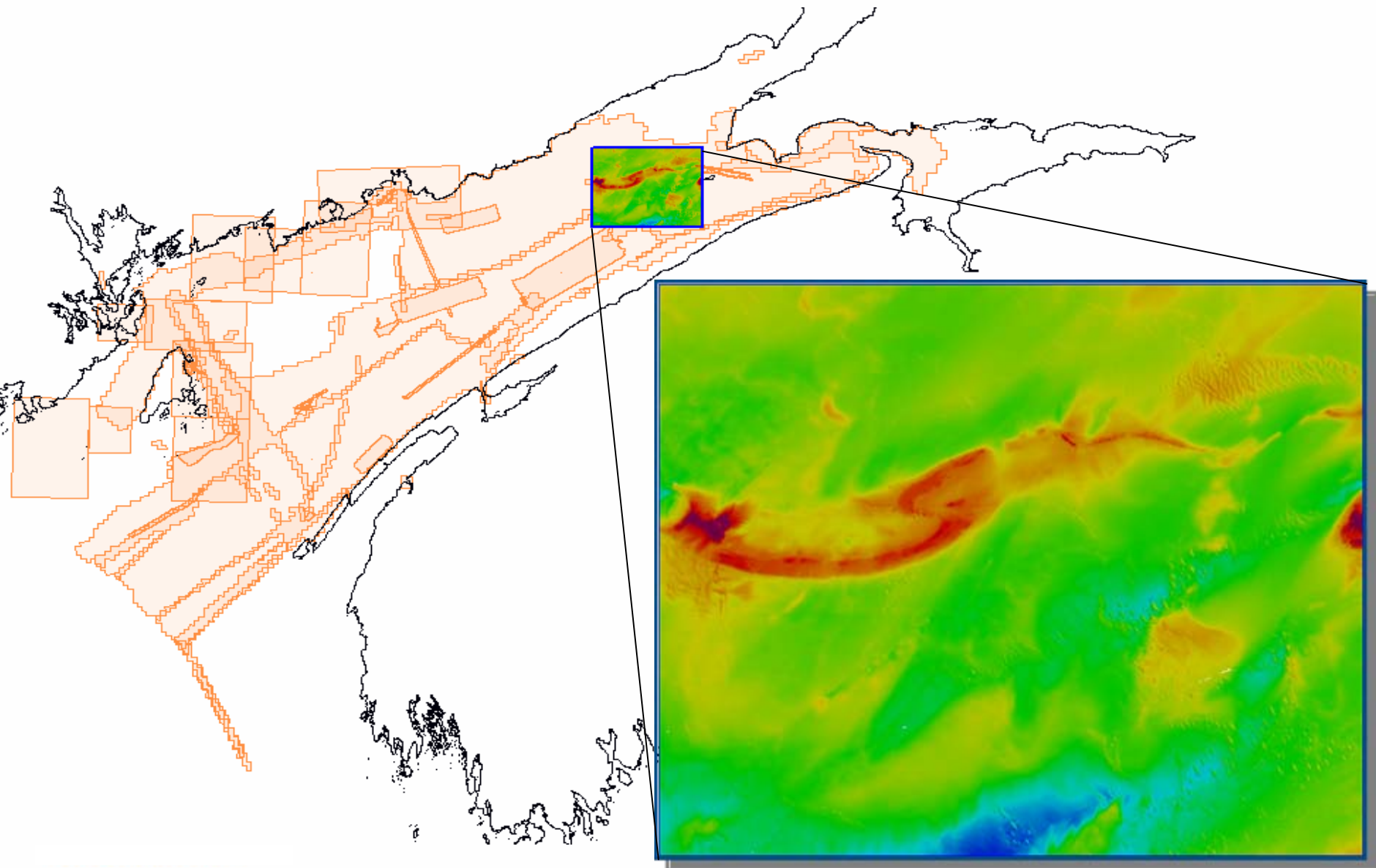


# Conclusions

- 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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