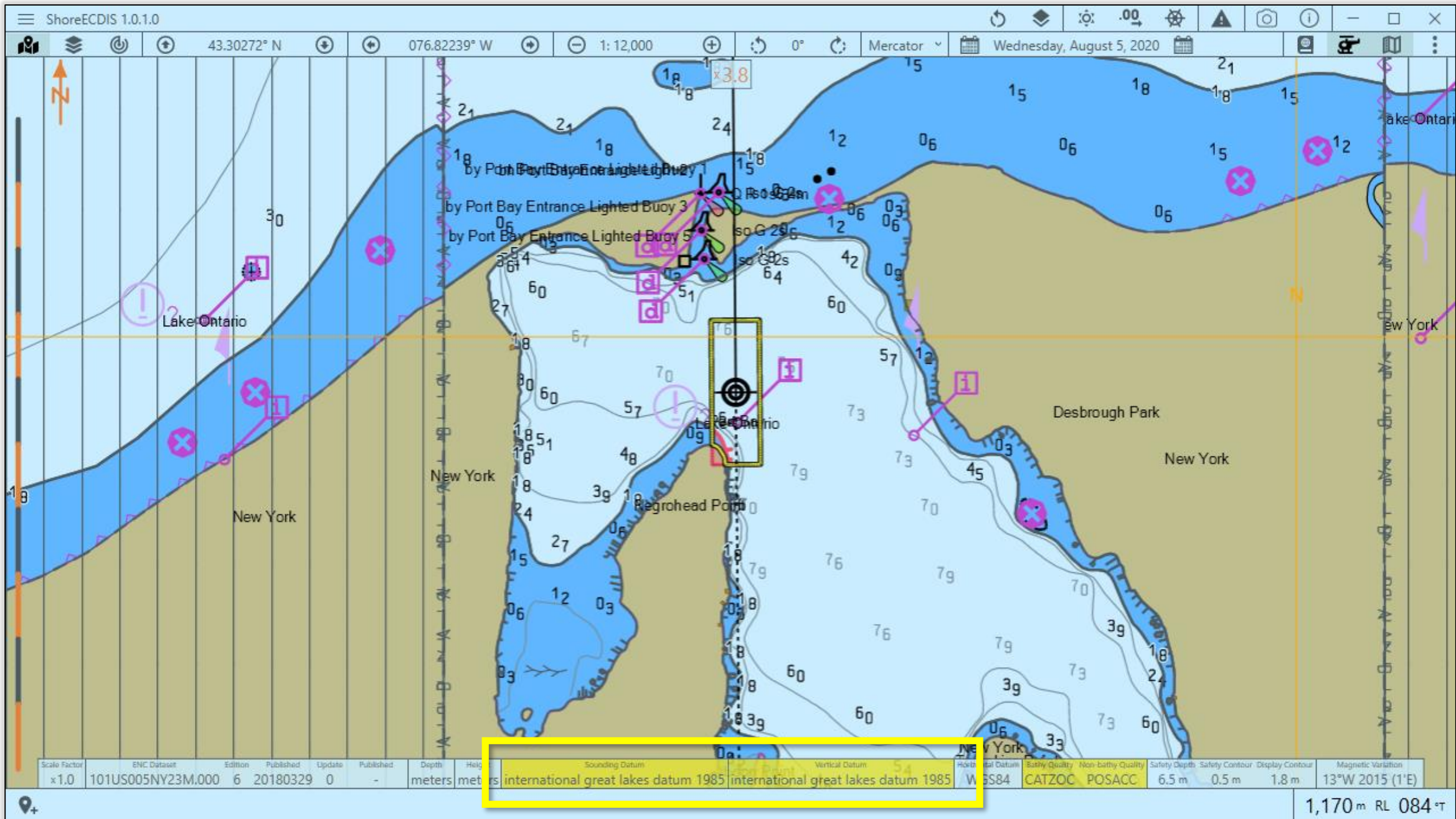# Issues Regarding Vertical Datum

NIWC LANT

For

S-101PT5

Issues

How to distinguish sounding datum (feature type *SoundingDatum*) from vertical datum (feature type *VerticalDatumOfData*)

- How to identify a datasets default sounding and vertical datum?
- For feature types with bindings to a *verticalDatum* attribute, which of the *SoundingDatum* and/or *VerticalDatumOfData* apply
  - To which of the features other attributes is the datum applicable?

Default sounding and vertical datum

- *S101_DatasetDiscoveryMetadata* provides *verticalDatum* and *soundingDatum*
  - Describes vertical reference (e.g. lowest low water springs)
  - Does not describe CRS axes or units
    - S-101 units are always meters
    - S-101 vertical datum always oriented up
    - S-101 sounding datum always oriented down
  - Currently unavailable – no metadata available for converted datasets
- ISO-8211 VDAT fields within the CSID record

S-100 part 10a: AXTY

Axis Type	Axis direction	AXTY value	
Geodetic Latitude	North	1	
Geodetic Longitude	East	2	
Ellipsoidal Height	Up	3	
Easting	East	4	
Northing	North	5	
Westing	West	6	
Southing	South	7	
Geocentric X	Geocentric X	8	
Geocentric Y	Geocentric Y	9	
Geocentric Z	Geocentric Z	10	
Gravity Related Height	Up	11	
Gravity Related Depth	Down	12	

ISO-8211 CSID

CSID (Coordinate Reference System Record Identifier)
    RCNM = 15
    RCID = 1
    NCRC = 3
  CRSH (Coordinate Reference System Header)
  [... horizontal CRS omitted ...]
  CRSH (Coordinate Reference System Header)
    CRIX = 2
    CRST = 5
    CSTY = 3
    CRNM = Depth - mean lower low water
    CRSI =
    CRSS = 255
    SCRI =
  CSAX (Coordinate System Axes)
    AXTY = [12]
    AXUM = [4]

VDAT (Vertical Datum)
    DTNM = mean lower low water
    DTID = 12
    DTSR = 2
    SCRI =
  CRSH (Coordinate Reference System Header)
    CRIX = 3
    CRST = 5
    CSTY = 3
    CRNM = Depth - mean high water
    CRSI =
    CRSS = 255
    SCRI =
  CSAX (Coordinate System Axes)
    AXTY = [12]
    AXUM = [4]
  VDAT (Vertical Datum)
    DTNM = mean high water
    DTID = 16
    DTSR = 2
    SCRI =

S-101 ISO-8211 encoding

- Which of the VDAT fields is a vertical datum and which is a sounding datum?
  - No ordering required
  - AXTY are the same
- Which are the default datum and which are referenced by dataset features?
  - Need to examine the entire dataset
- Dataset converter outputs 12 (gravity related depth) for the AXTY of the vertical datum
  - Unclear if S-101 allows values other than 12

Datum attribute on a feature

- Overriding default sounding datum or default vertical datum?
  - *verticalDatum* serves a dual purpose
    - Used to override sounding and / or vertical datum
    - Which is being overridden?
    - Not machine readable – must code to a specific feature catalogue version
  - Recommend renaming *SoundingDatum* to *SoundingDatumOfData*, and adding a new attribute *soundingDatum*
    - *soundingDatum* overrides *SoundingDatumOfData*
    - *verticalDatum* overrides *VerticalDatumOfData*

Datum attribute on a feature

- How to algorithmically determine the datum associated with relevant attribute values of a feature?
  - *LightAllAround* has seventeen attributes, including *verticalDatum*
    - Which attributes are referenced to the *verticalDatum*?
      - Which are depths?
      - Which are heights?
      - Which are neither?
    - Not machine readable
  - Recommend using *soundingDatum / verticalDatum* as part of one or more complex attributes
    - depth / height
    - datum

Recommendations

1. Require the CRSH / VDAT fields in the encoding to be ordered such that:
    a) The default sounding datum is the first VDAT field
    b) The default vertical datum is the second VDAT field

2. Require encoding:
    a) Vertical datum using AXTY of 11
    b) Sounding datum using AXTY of 12
    c) Specify if other values of AXTY are allowed

3. Change name / code of *SoundingDatum* feature to *SoundingDatumOfData*

Recommendations

4. Add new attribute *soundingDatum*

5. Modify the registry / feature catalogue / DCEG so that *soundingDatum* / *verticalDatum* are part of one or more complex attributes

    a) Similar to use of *verticalClearanceValue* / *verticalUncertainty*

6. Update the dataset converter to support these changes