



BOTTOM MAPPING

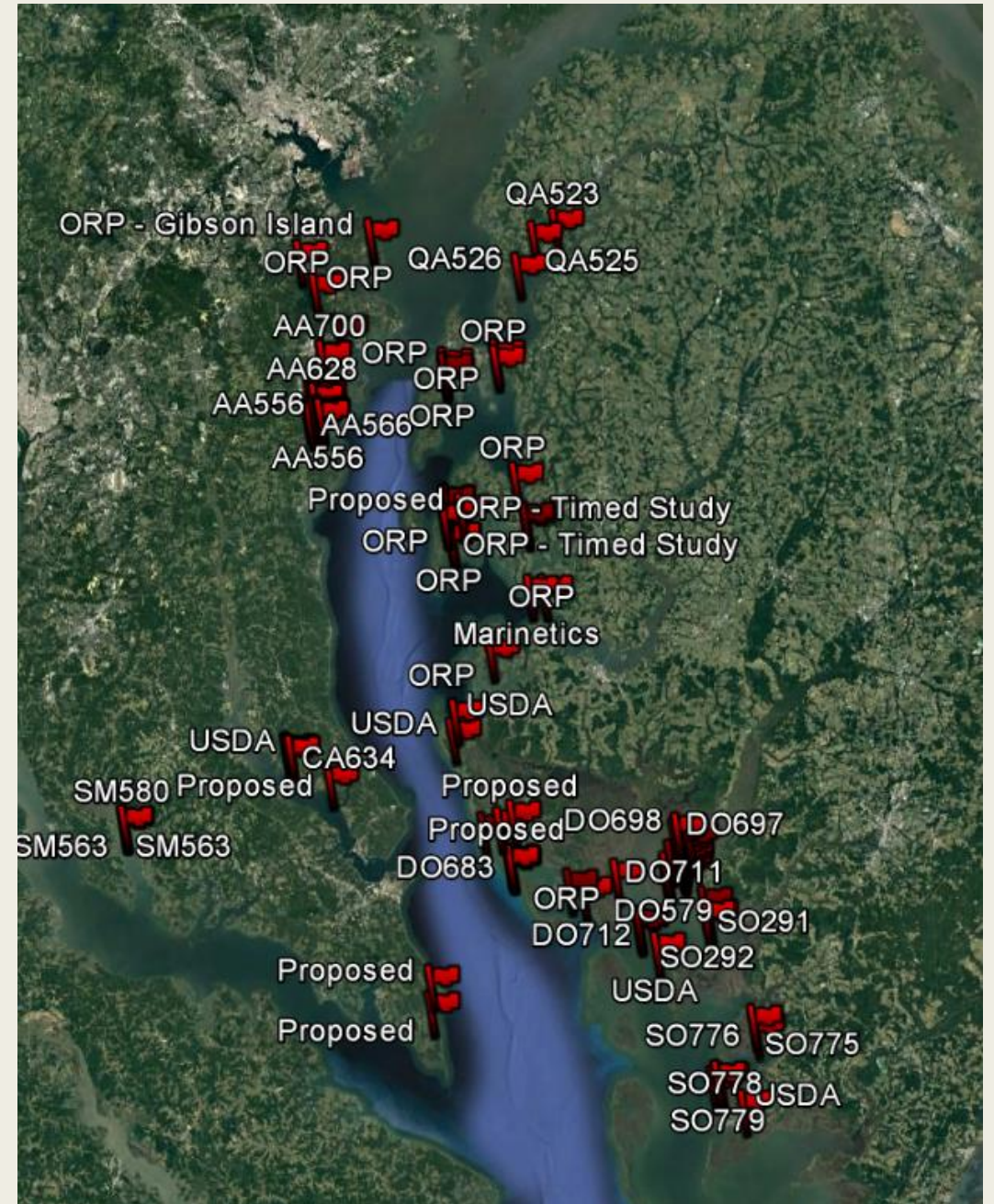
Randy Neilson (Neilson Enterprises)

September 14, 2016



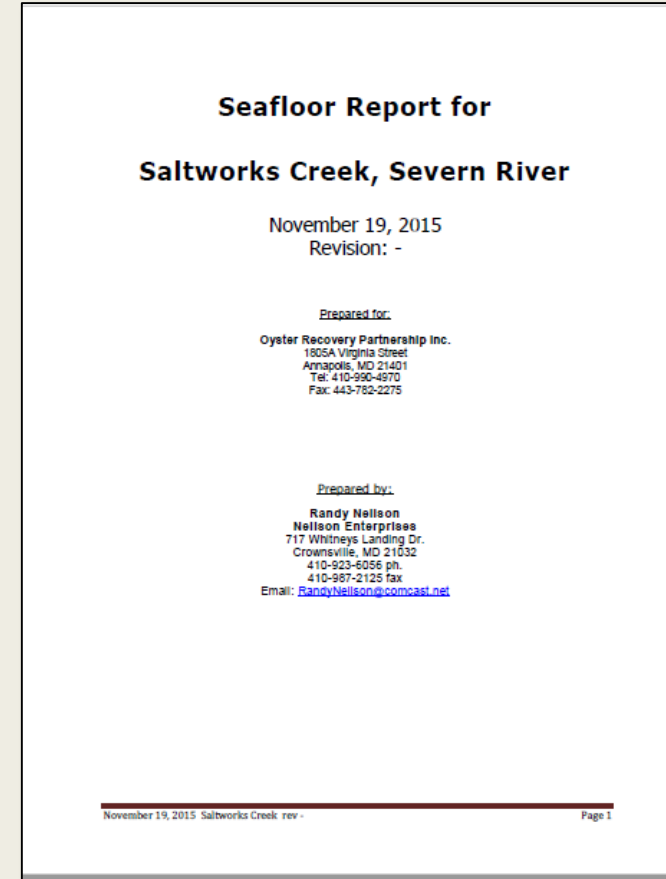
Background

- Retired System Engineer from Northrop Grumman (33 years)
- 2010 – began volunteering with ORP on various projects
- 2011 – 2012, Developed low cost approach to Seafloor Mapping using Commercially Available Equipment & Software which was aimed at supplementing Maryland Geological Survey services for ORP
- 2013 – Present, providing mapping services, brokered by ORP, to lease holders and other interested parties
 - *Have provided 64 surveys to date*
 - 27 to leaseholders
 - 37 to others



The Process

1. Mapping request
2. Information Gathering & Route Planning
3. Data Collection
4. Post Processing and Report Generation
5. Report Delivery



Examples shown in this presentation are taken from Saltworks Creek Survey Report

Mapping request

- Handled at Oyster Recovery Partnership by Kelly Barnes kbarnes@oysterrecovery.org
- Current rates are \$750 for the first 250 acres and \$100 for each additional 50 acres
- No charge for RST participants for initial mapping of 250 acres.

LEASE MAPPING

Any participant in the Remote Setting and Training Program can get their leases mapped for free. A seafloor survey report can help growers understand the condition of their lease. Three different types of data products are collected during the survey report. Maps indicating the measured depth of the area, relative hardness and imagery of the seafloor and any objects present are collected.

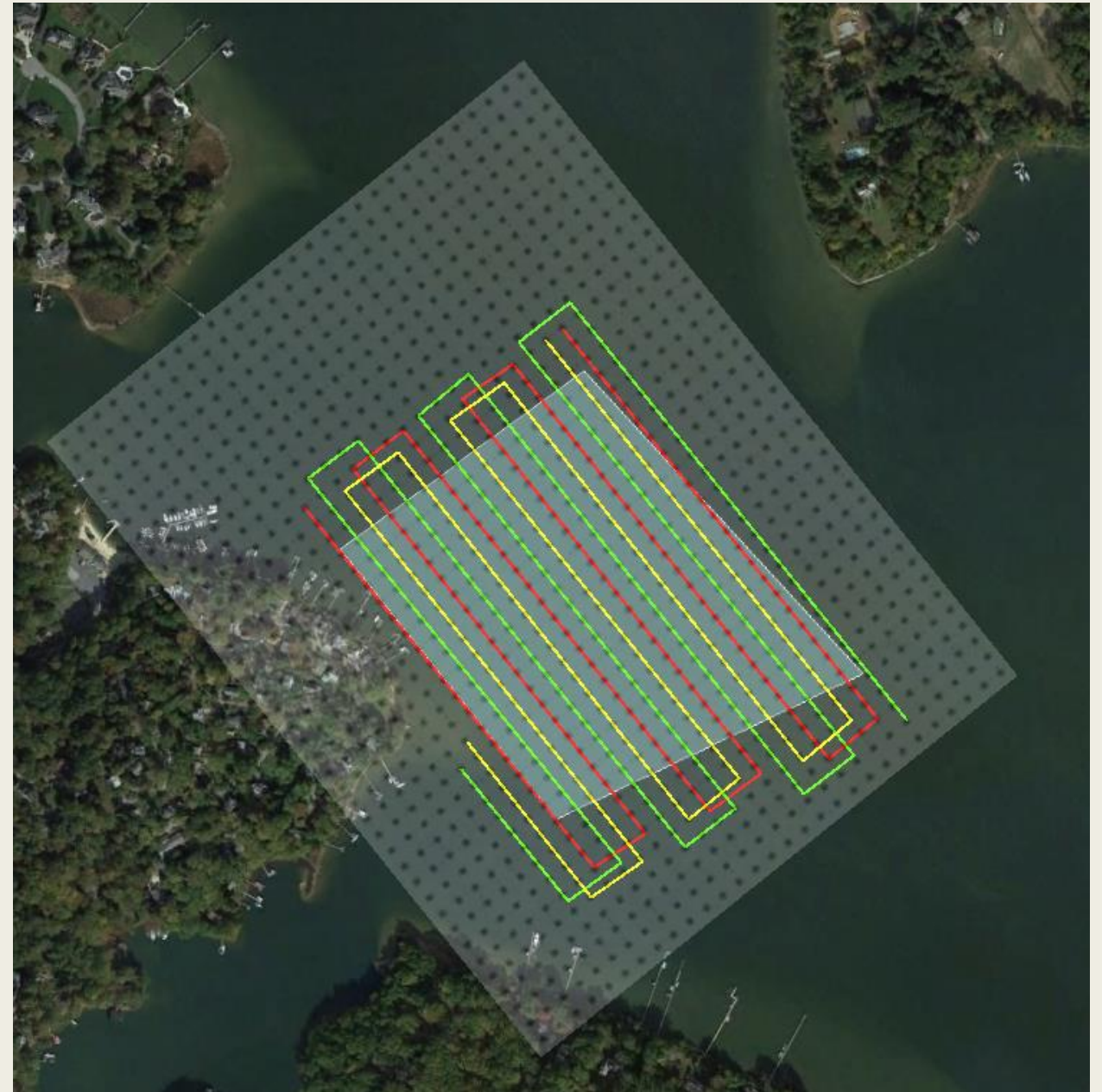
Interested in learning the bottom condition of your lease? Contact us at 410-990-4970.

Information Gathering

- Client contact info (name, mailing address, email, ph.)
- Lease(s) (or AOI) boundary coordinates (provided by client)
- Authorization to proceed (from ORP)
- Weather Prediction for scheduling

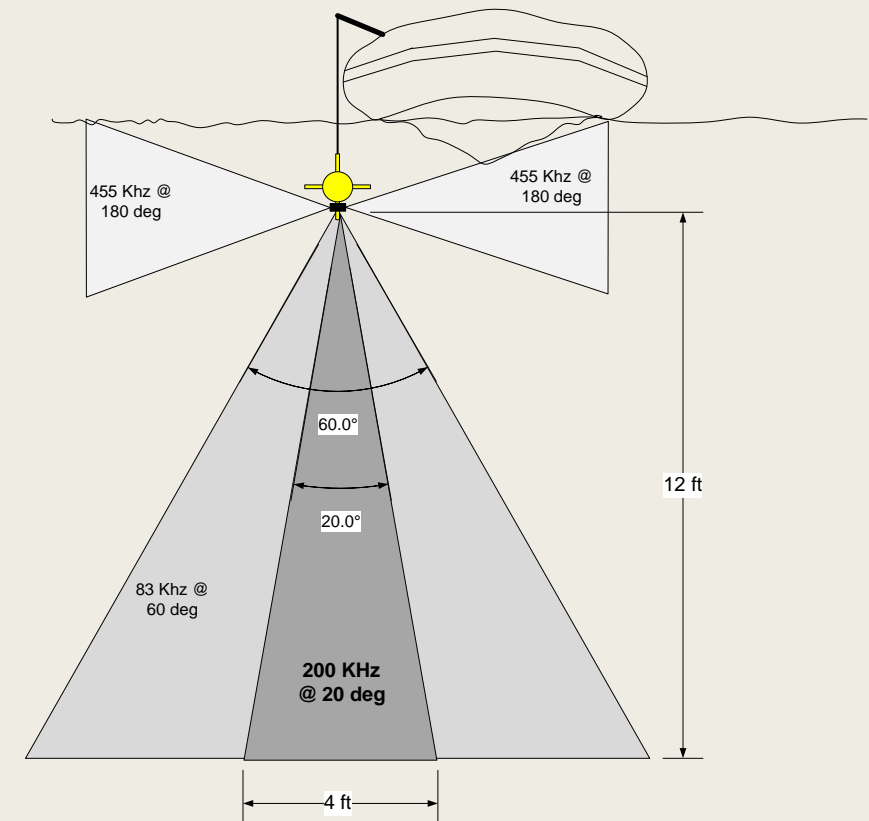
Route Planning

- Using a grid, 3 routes are created in Google Earth (~ 80 ft. apart)
- Routes & Waypoints loaded into the chartplotter
- Data Recordings are made for each route (A-red, B-yellow, & C-green) at approx. 3.5 knots



Data Collection

- Zodiac RIB provides for easy handling and shallow water access
- Sonar data collected with a commercial Humminbird chart plotter
- Custom made towfish (with transducer) suspended from downrigger

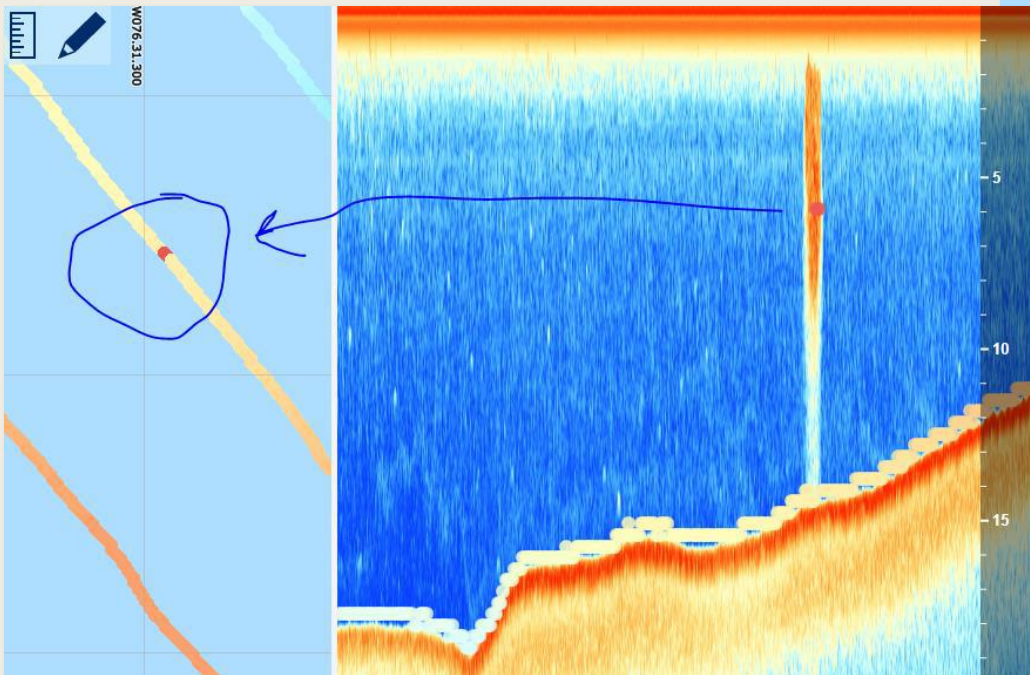
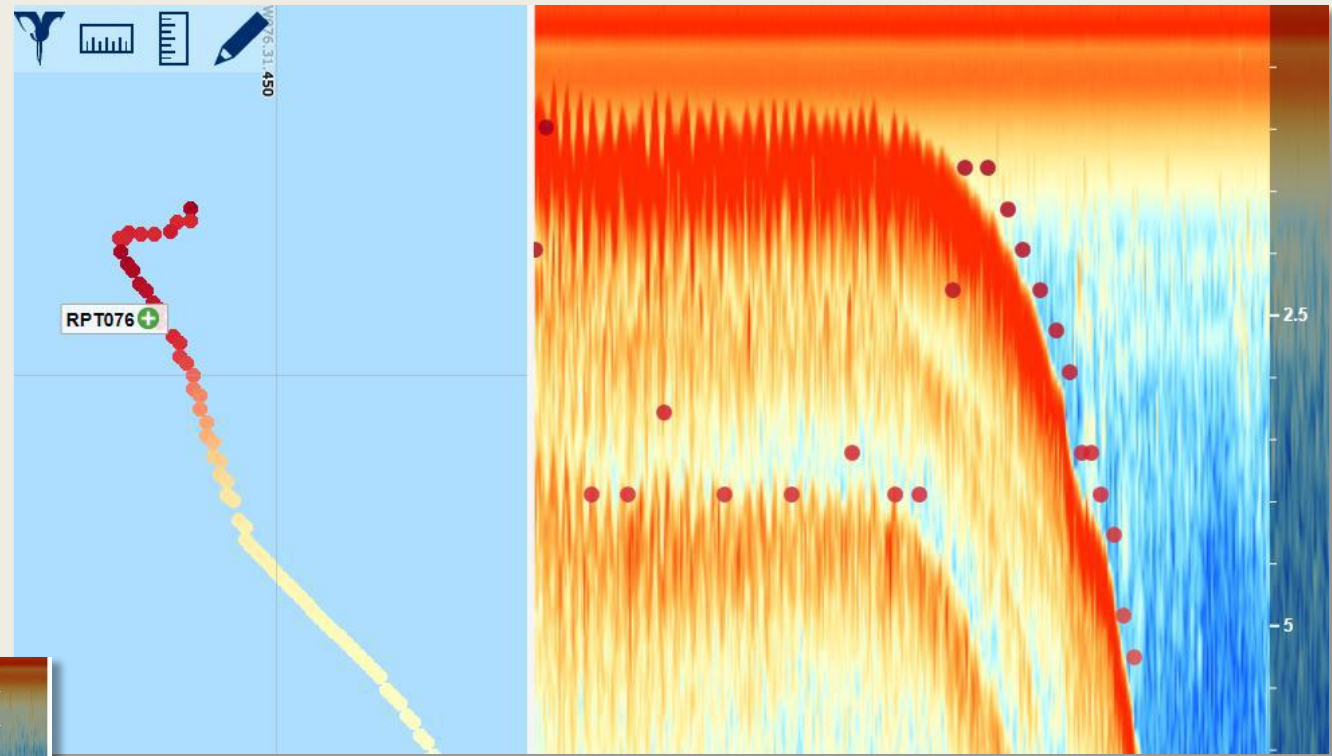


Post Processing

- Report and Data Products
 - *Bathymetry (depth)*
 - *Bottom Composition (Hardness)*
 - *Side Scan Imagery*
- Processing prior to 2014 utilized Dr. Depth software for map generation but was then superseded by Reef Master
 - *Dr. Depth was purchased by Johnson Outdoors and taken off the market*
 - *Reef Master is capable of handling larger areas of interest, provides more hardness evaluation options, facilitates data review and error correction of false returns in very shallow water.*

Soundings

- Necessity to review and correct false returns if found
- Esp. true for very shallow water when sonar unit may report the 2nd or 3rd echo as the bottom depth

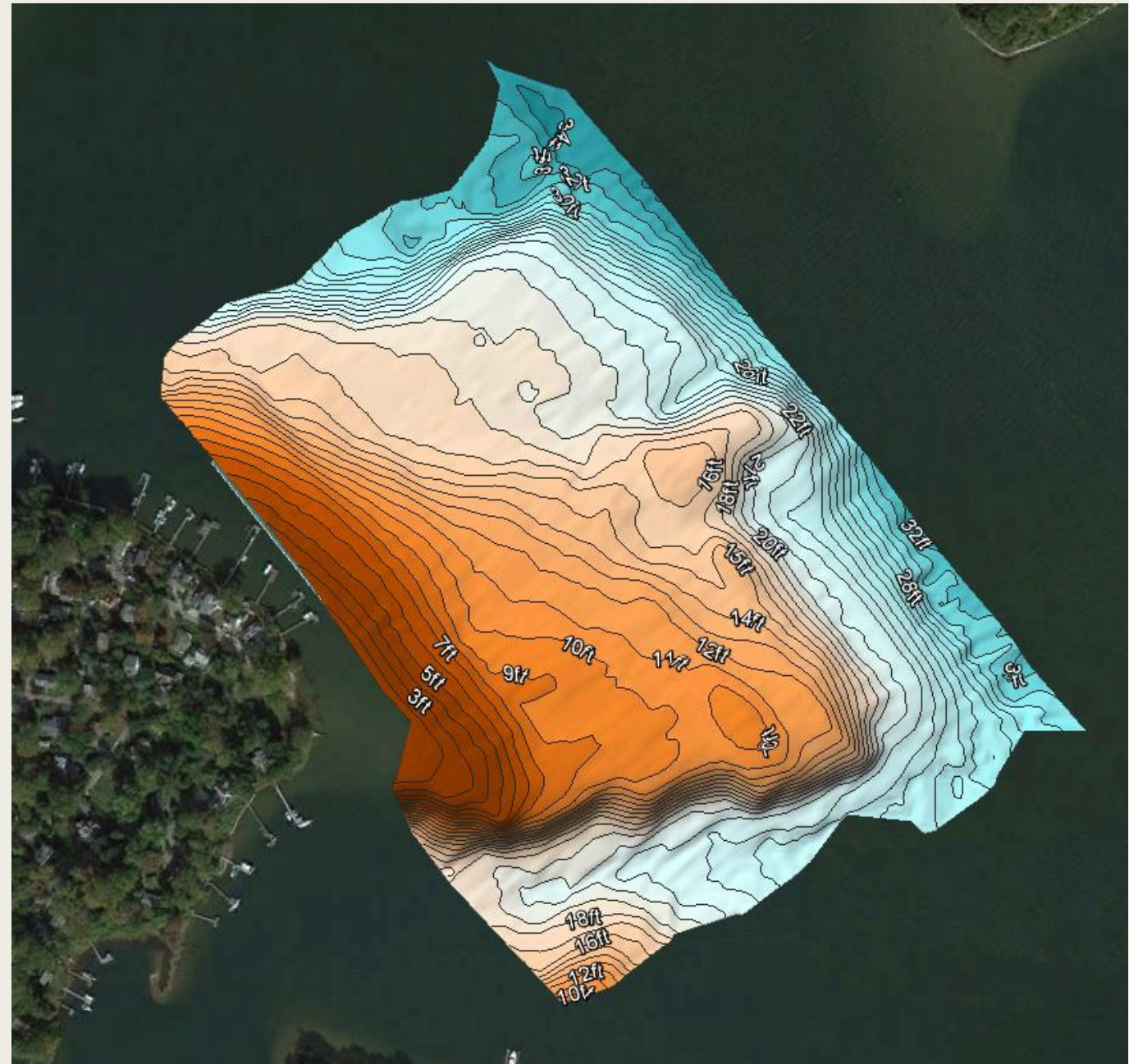
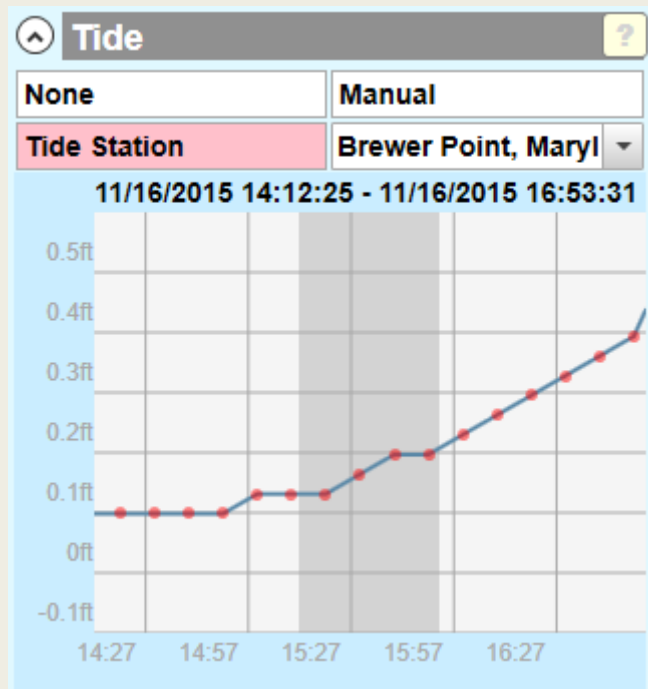


An area in a shallow section at the start of the run created false readings. These errors were manually corrected.

An area in middle of the run created false readings from a bait ball as shown. This depth error was manually corrected.

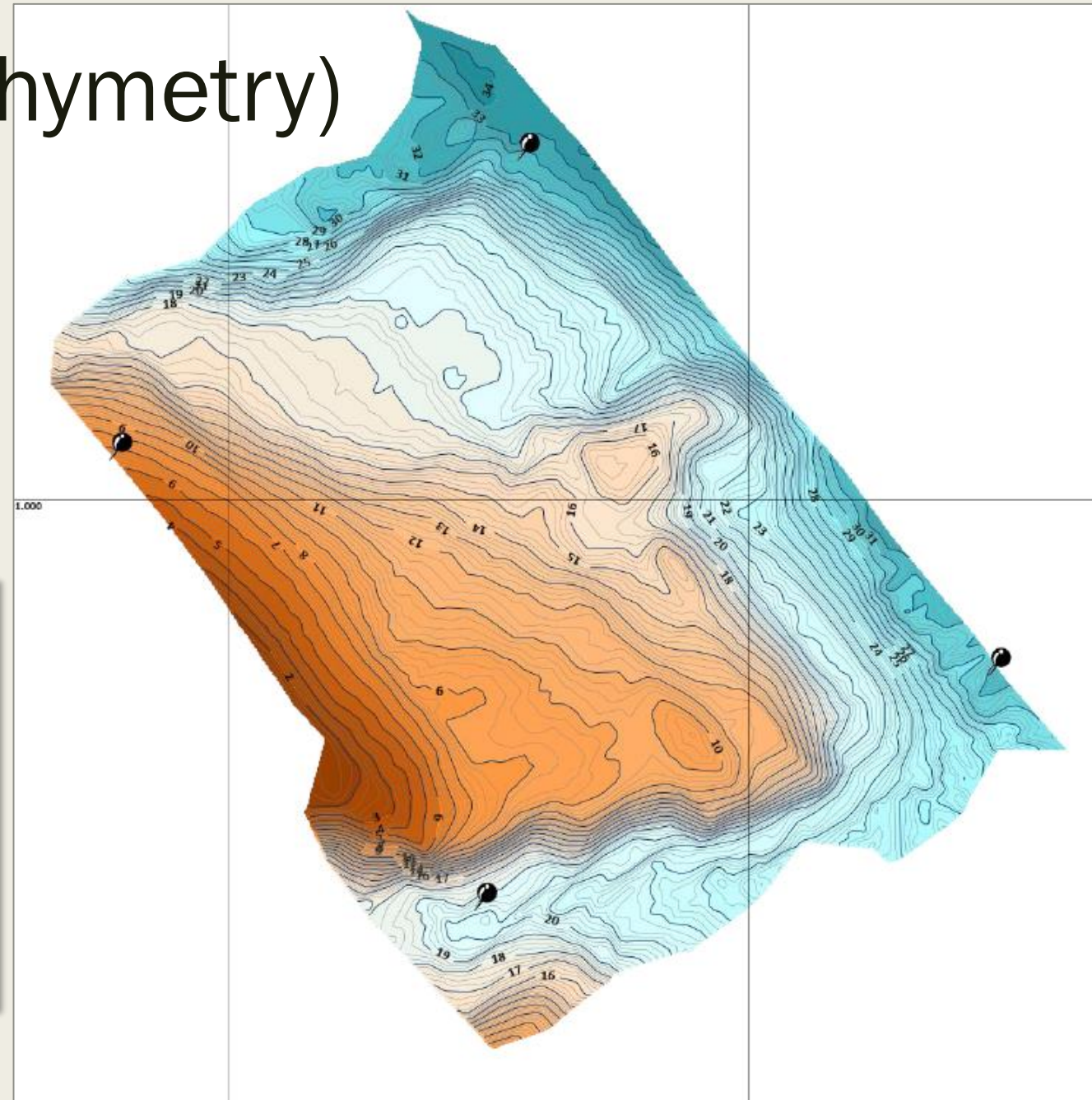
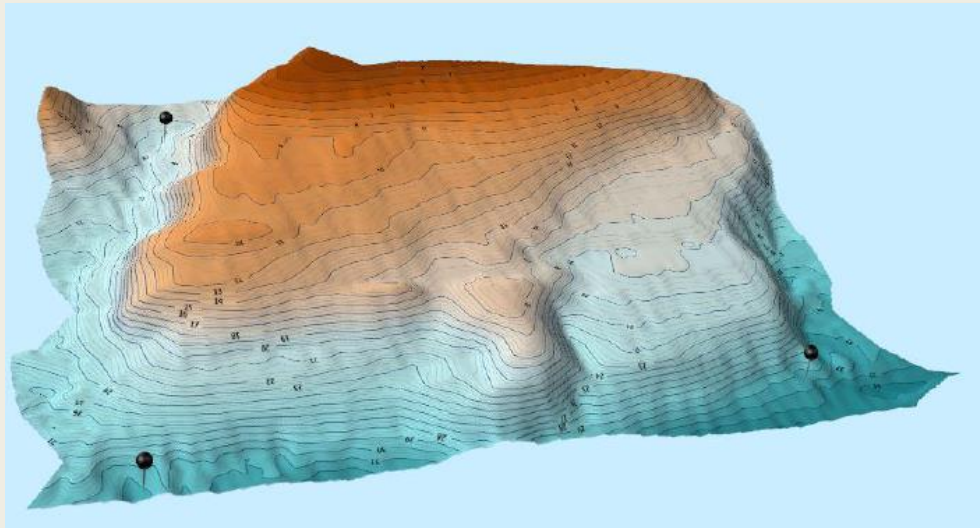
Bathymetry

- Derived from 200KHz down beam
- Tide Corrected
- Used as base map for 3D overlays



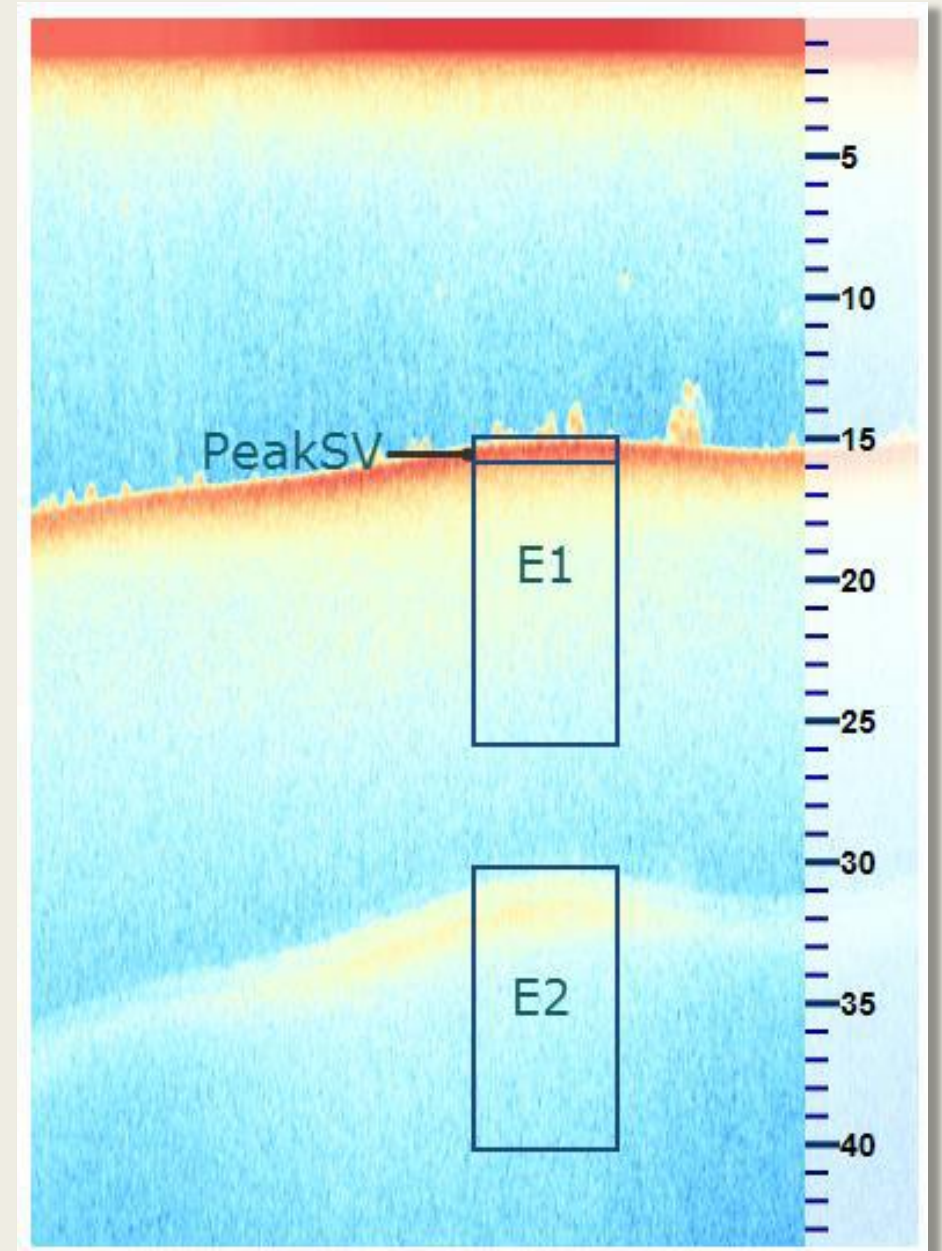
Sample Output (Bathymetry)

- 2D & 3D views in report
- 2D map viewed in detail with Google Earth



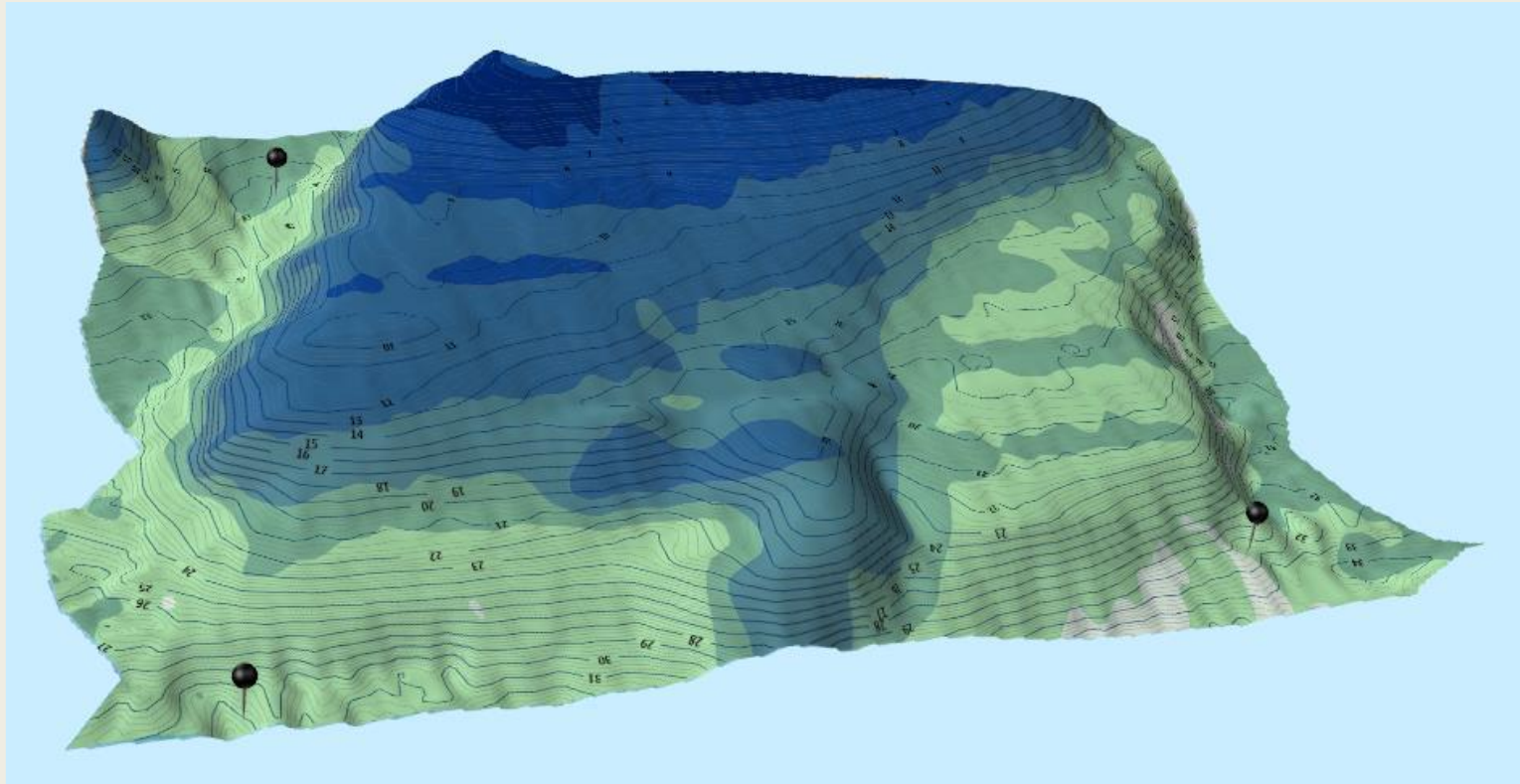
Bottom Composition

- **E1** - The E1 layer is derived from the sonar returns that immediately follow the peak return of the first echo return. This value is commonly referred to as roughness or rugosity and is a measure of the roughness of the bottom.
- **E2** - The E2 layer is derived from the full second echo return of the bottom and is commonly referred to as hardness. The second echo return is generated when the sonar echoes once again off the bottom, after having returned once to the surface and bounced off the underside of the boat. This second echo return is particularly useful for determining the relative hardness of the bottom.
- **Peak SV** - Peak SV simply measures the strength of the sonar return as it is reflected off the bottom, and is highly correlated to the hardness of the bottom.
- **Composite** - The composite layer is a blending or an averaging of all the hardness layers (PeakSV, E1, & E2).



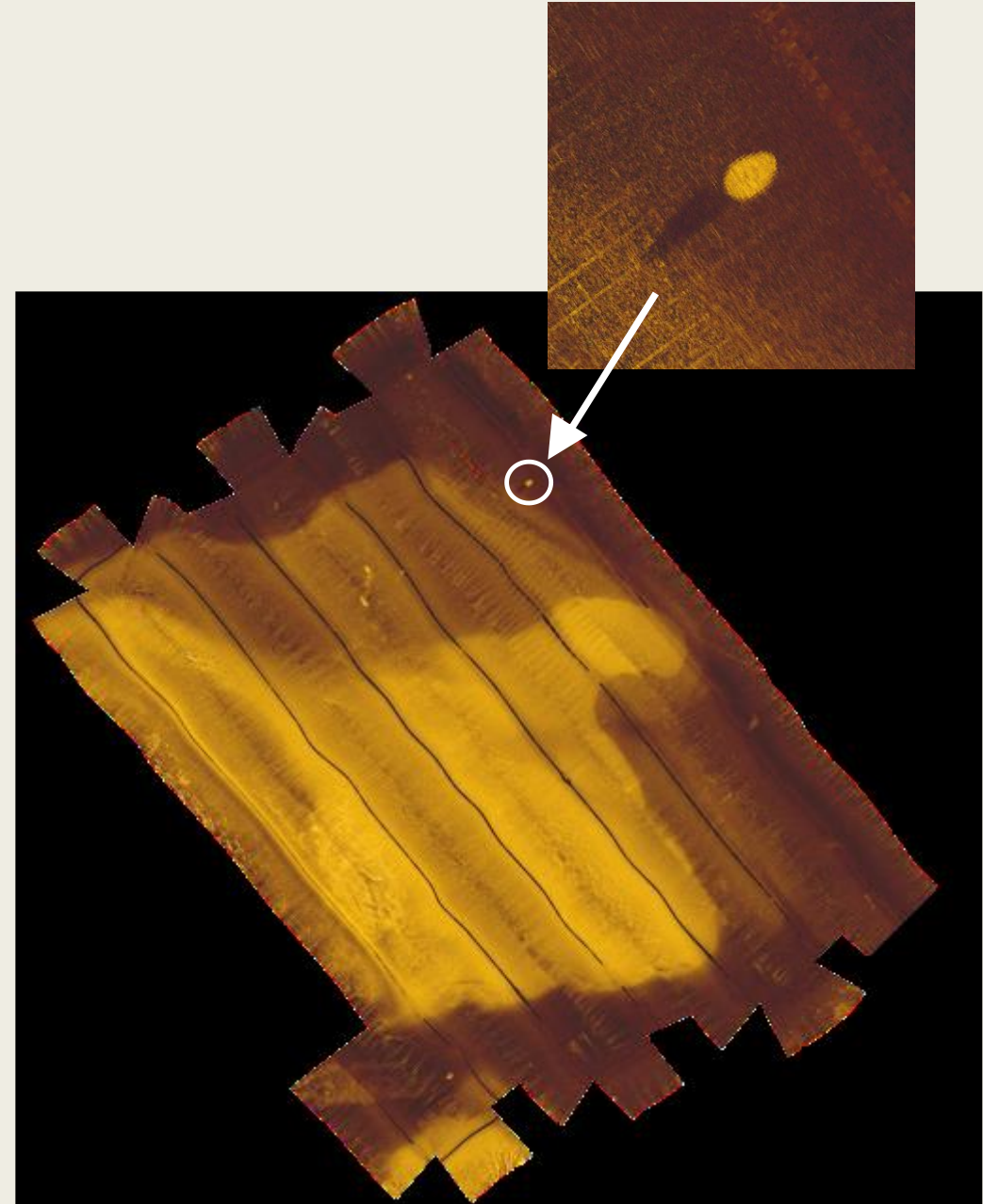
Sample Output (Hardness)

- 2D & 3D views in report
- 2D map viewed in detail with Google Earth



Side Scan Imagery

- Side scan mosaics are created from each planned route. This will yield three images (offset by 80 feet).
- Anomalies (typically caused by prop wash - either from other boats or from the survey boat, bait balls, and surface waves which result in a tugging action of the towfish tether) can be discovered from returns appearing in one of the images but not the other two.
- Features that appear in all three images will have a high probability of occurrence.
- This image comparison can be best made in Google Earth by turning off/on the respective layers or using transparency to correlate the image data.



Sample Output (Side Scan)



Underwater video (optional)

- Uses pole camera in select locations to correlate and verify mapping information
- Ability to monitor topside while recording (top camera only)
- Use depends on water clarity and available time
- Captured as video but reported as select still frames
- Lower camera is used to measure the slit depth (gold hook)
- Audio also used to evaluate bottom hardness



Report Generation

- Delivered (via email) as PDF document plus Google Earth overlays (.kmz)
- Hard copy mailed for those that don't have email
- Contains technical information for: the client, ORP, and the preparer (i.e. local observations, version numbers, etc.)
- Reported in standard format but tailored for each specific survey (i.e. baseline survey, timed studies, video collection, bottom samples, etc.)

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