Acquisition Directorate

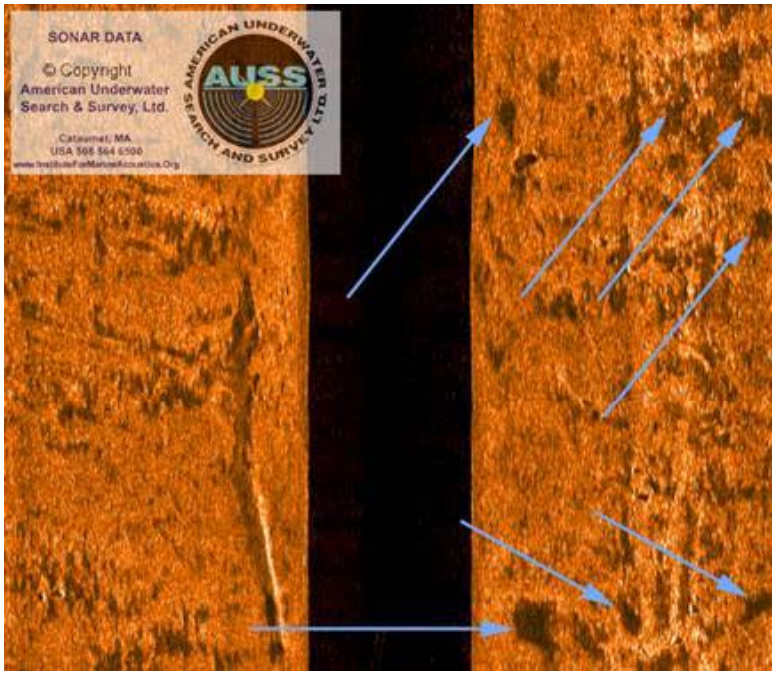
Research & Development Center

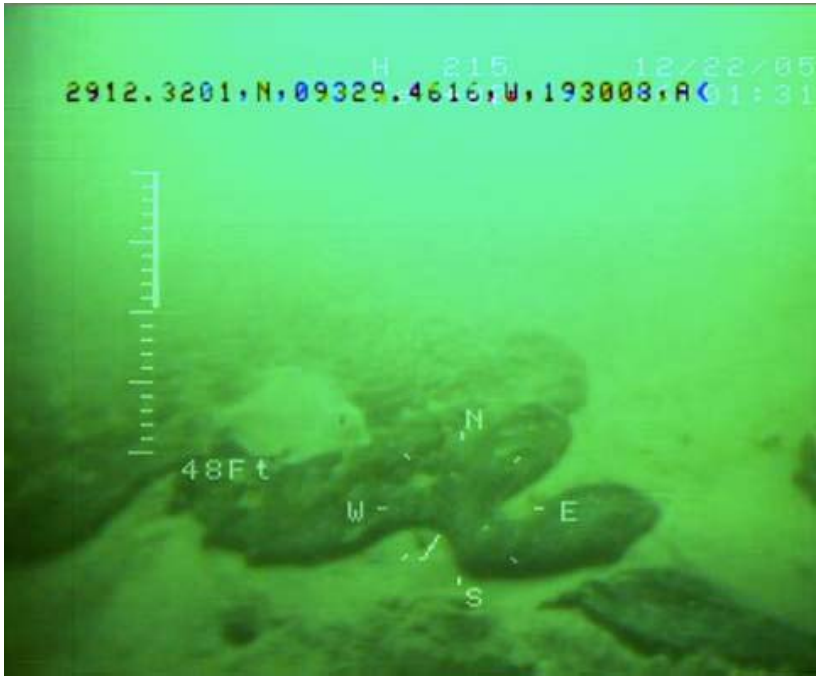
Response to Liquid Asphalt Releases in Aquatic Environments: Detection

RDC | Kurt Hansen

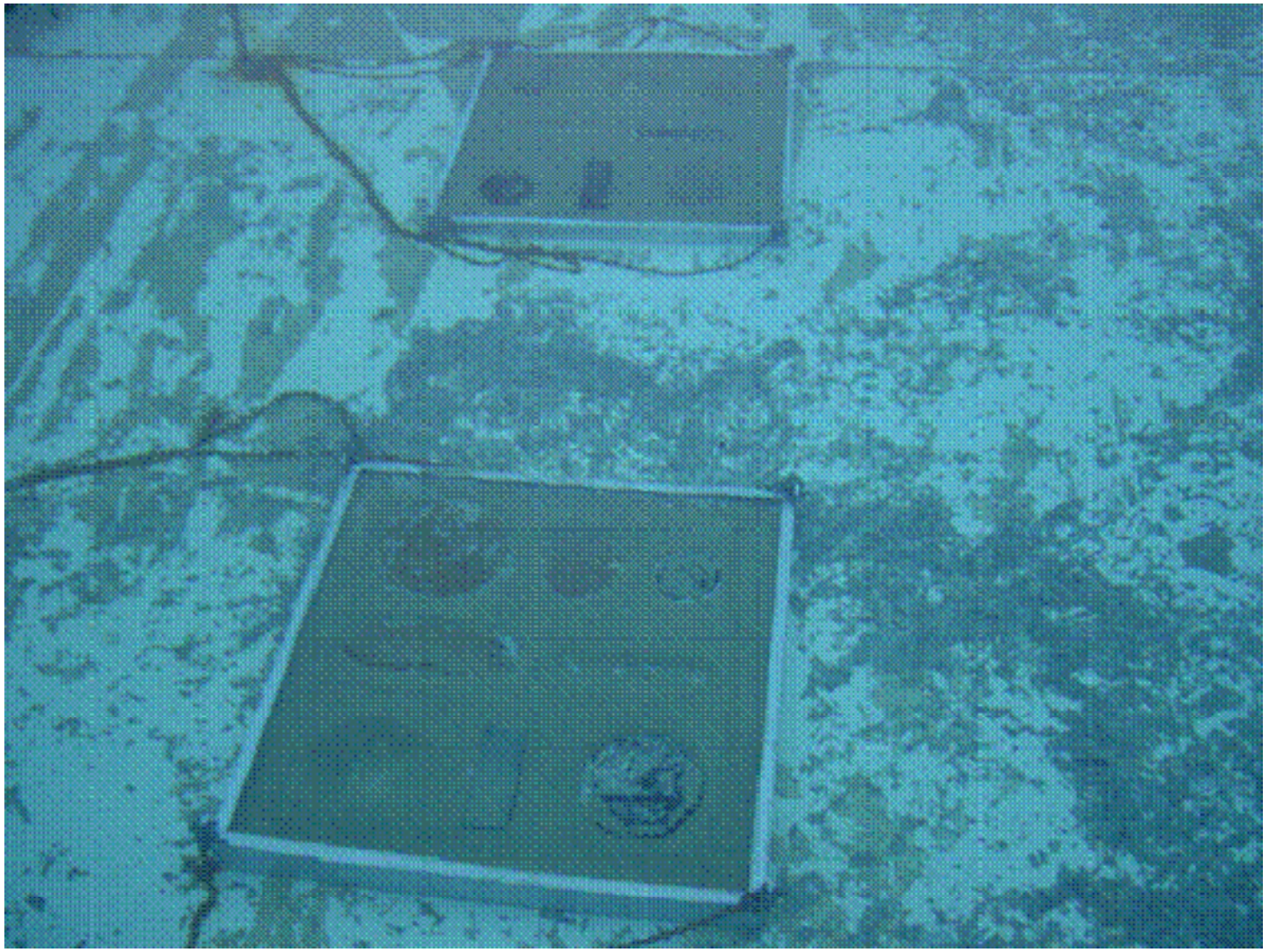
21 October 2009

Submerged Oil Spills Technology

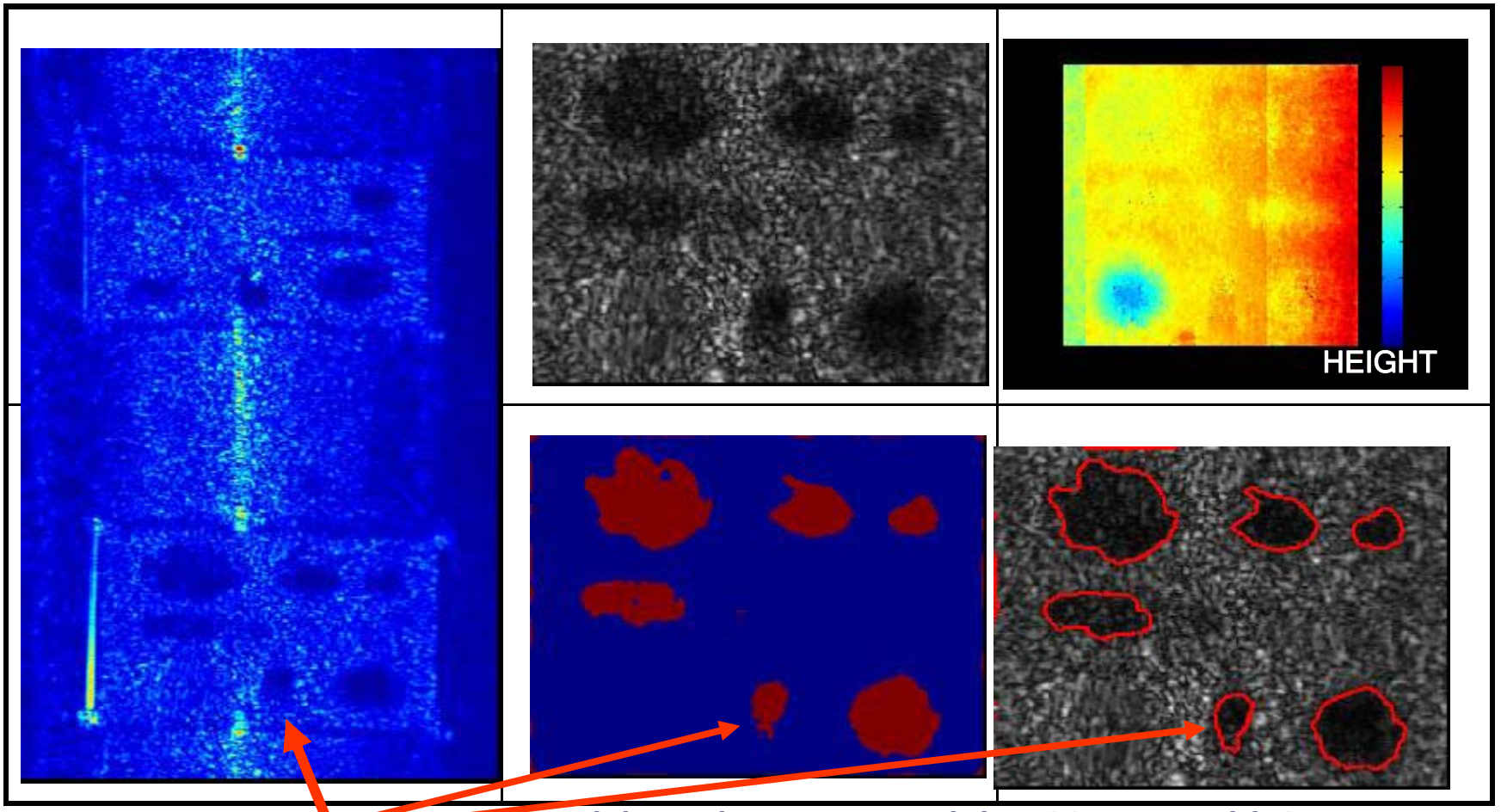




Target Trays – Ohmsett 2008

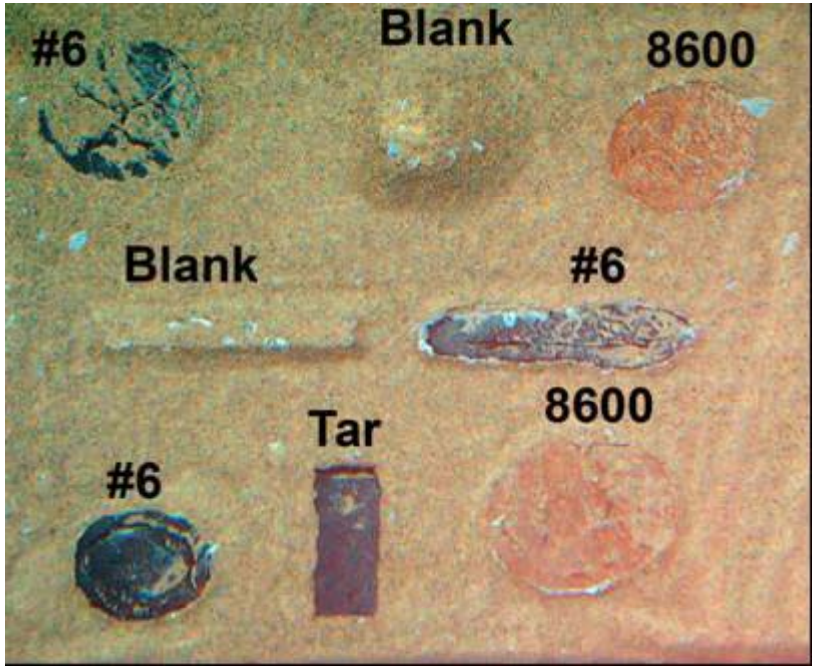


Tray B using RESON Multi-Beam Sonar



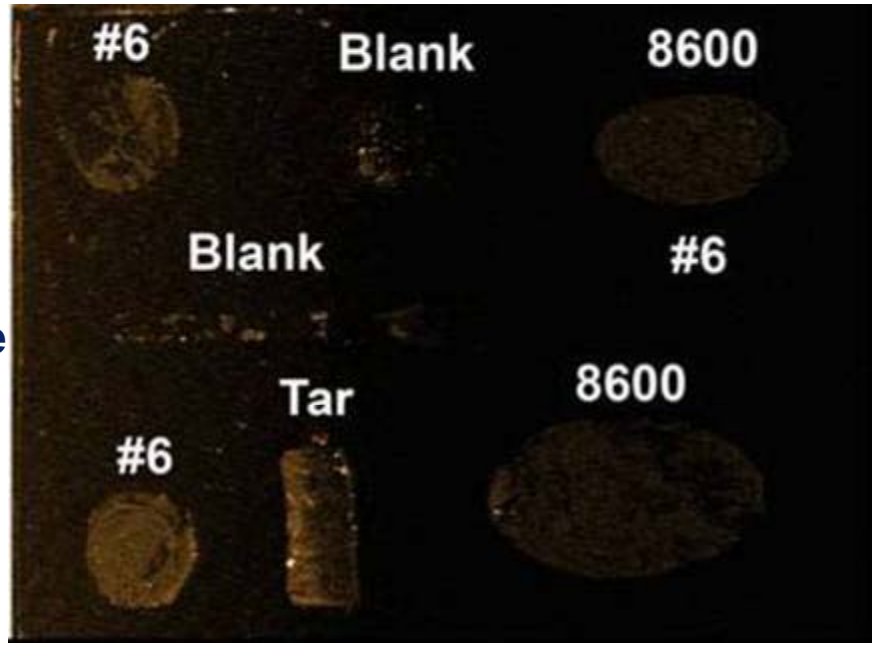
Eight-Inch Target Tray (B) RESON Data with Sonar on Top of Tray Left Figure: raw data, Top Center: zoomed raw data for bottom tray, Top Right: echo sounder data on same area, Bottom Center: automated detections results, Bottom Right: automated detection overlaid on raw data)

SAIC Laser Fluorometer Results
(Tar is asphalt)

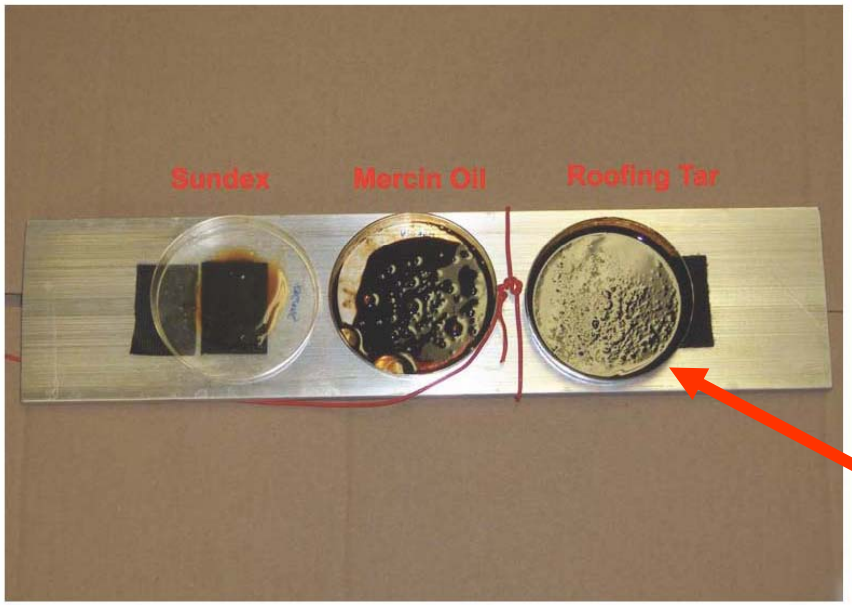


Visual

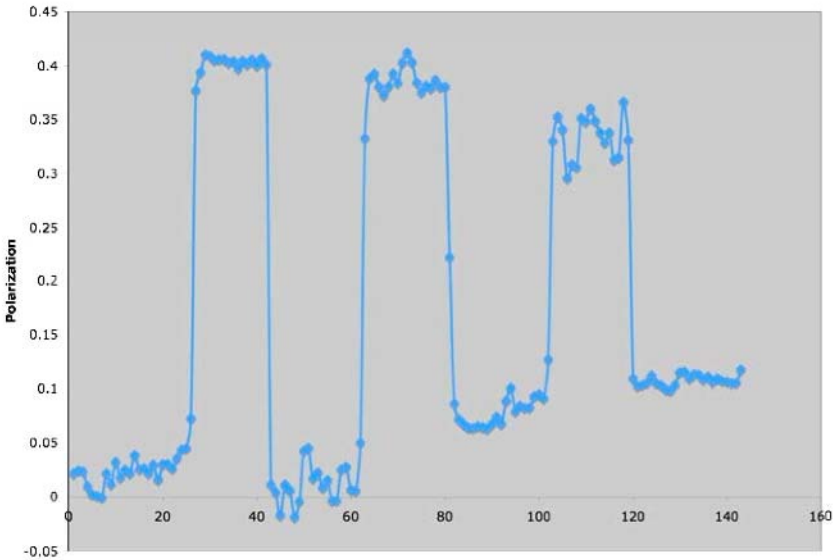
Fluorescence



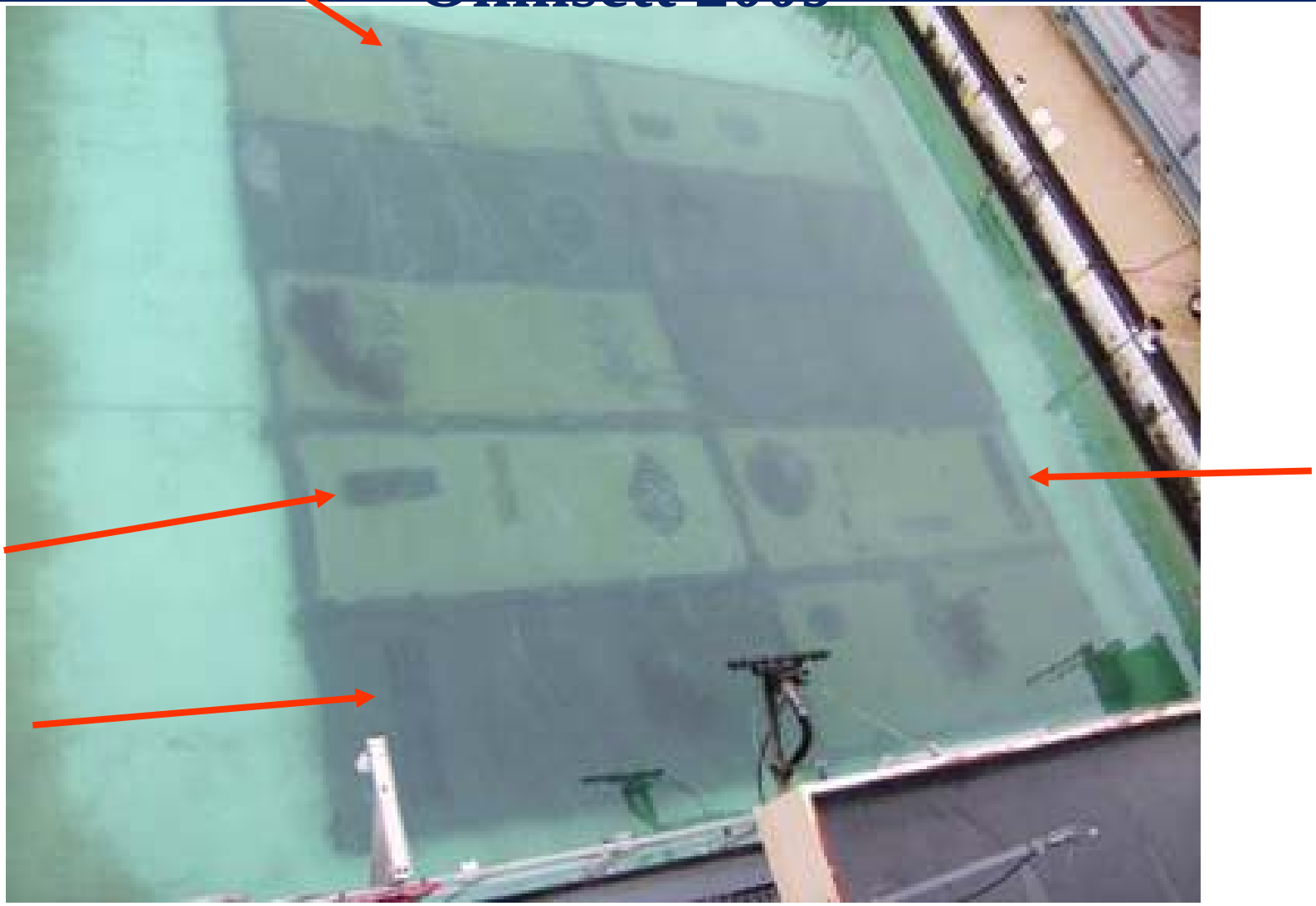
EIC Laser Fluorometer Polarization Samples



Asphalt



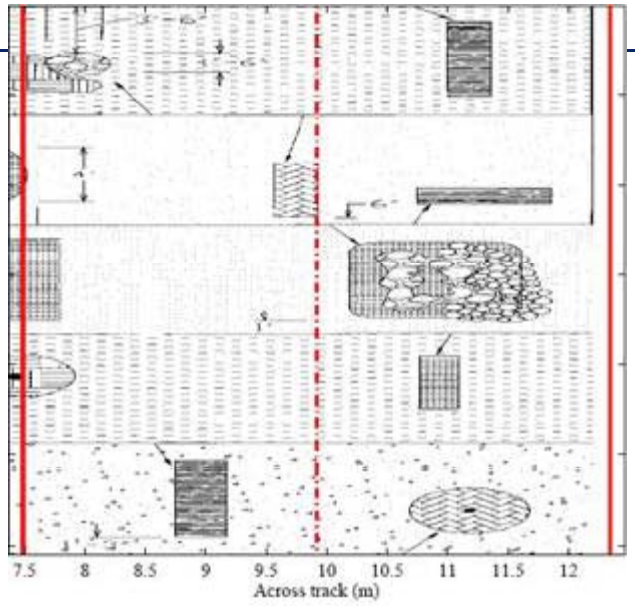
Tray Details Showing Asphalt for Test 2 Ohmsett 2009



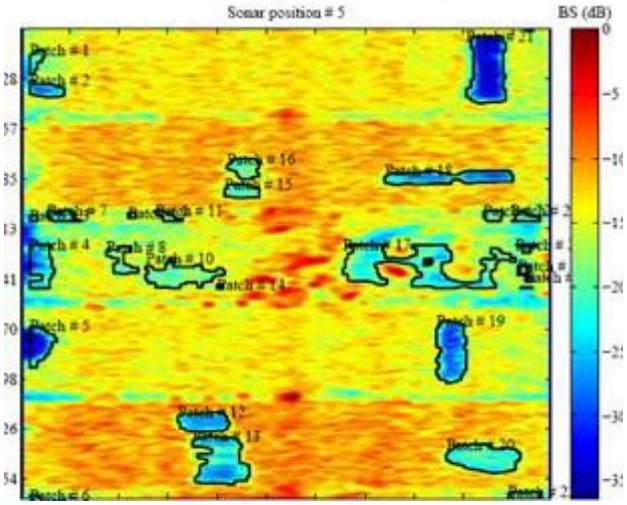
Asphalt Samples

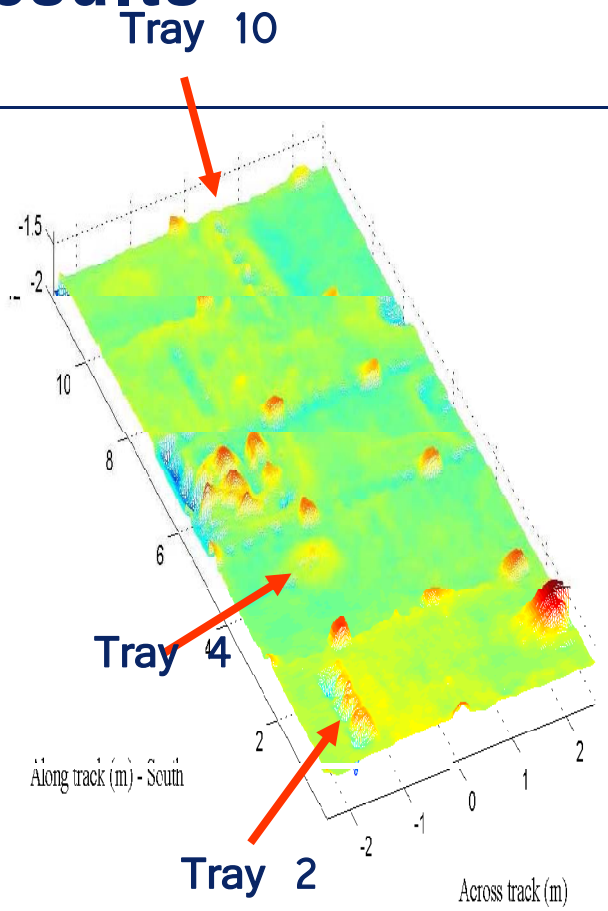
RESON Multi Bean Sonar Results

Position 5



(a) Sketch of the survey area.





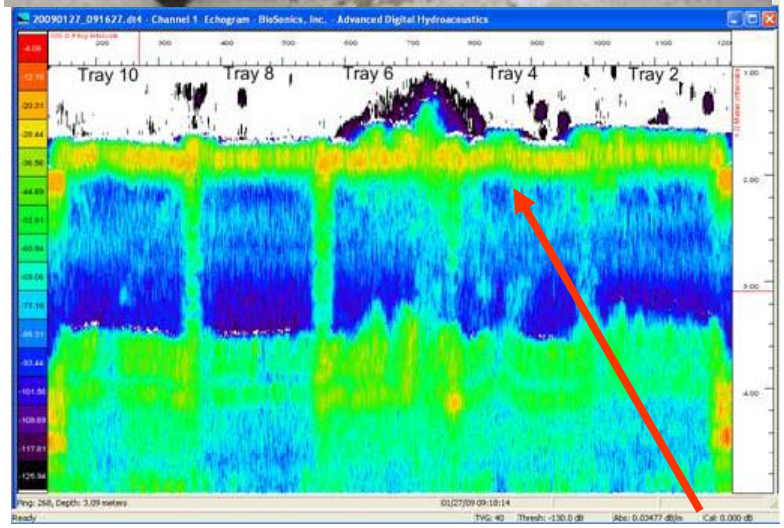
Using Area Detected as Measure

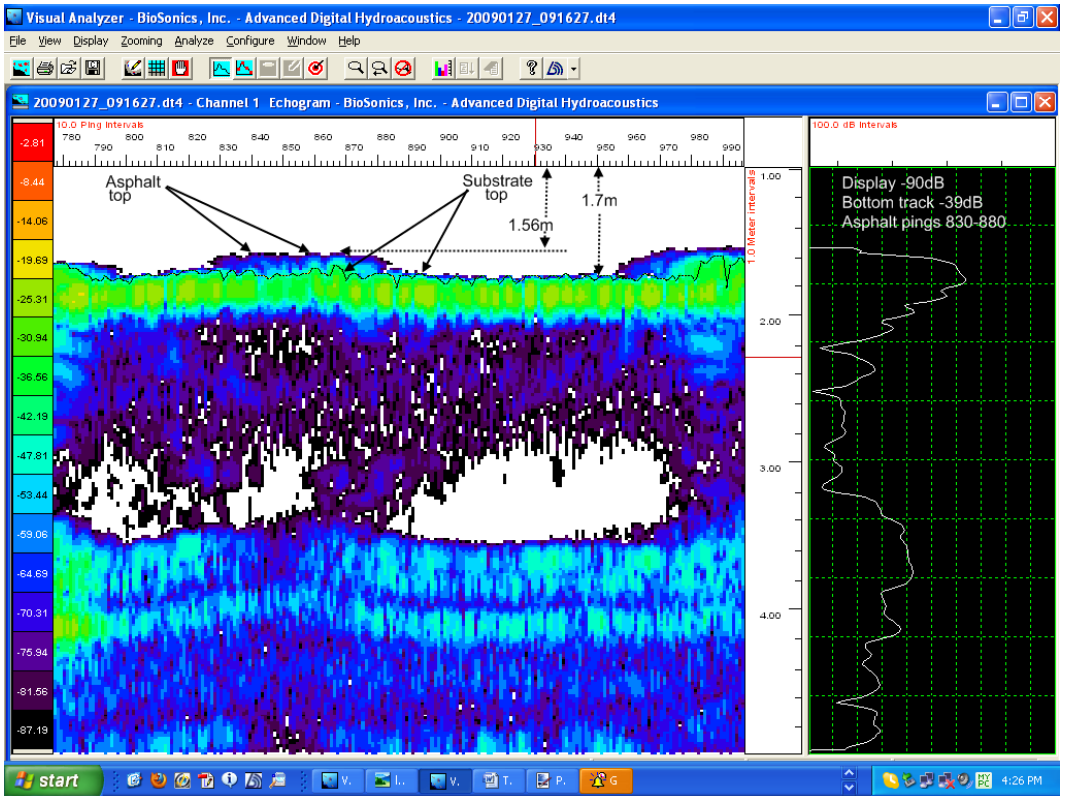
For Asphalt (4 targets)

True Asphalt Area = 2 meters^2

Detected Area = 2.26 meters^2

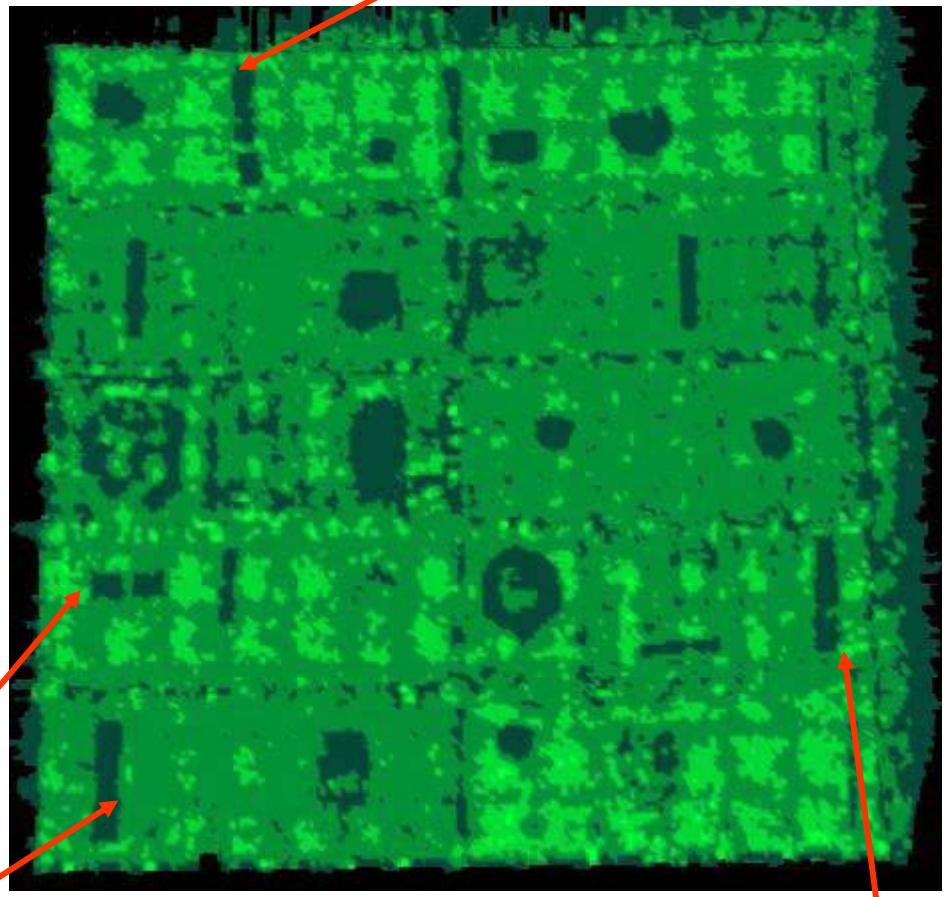
Biosonics Sonar Results
Asphalt Thickness 14 cm (5.5 inches)



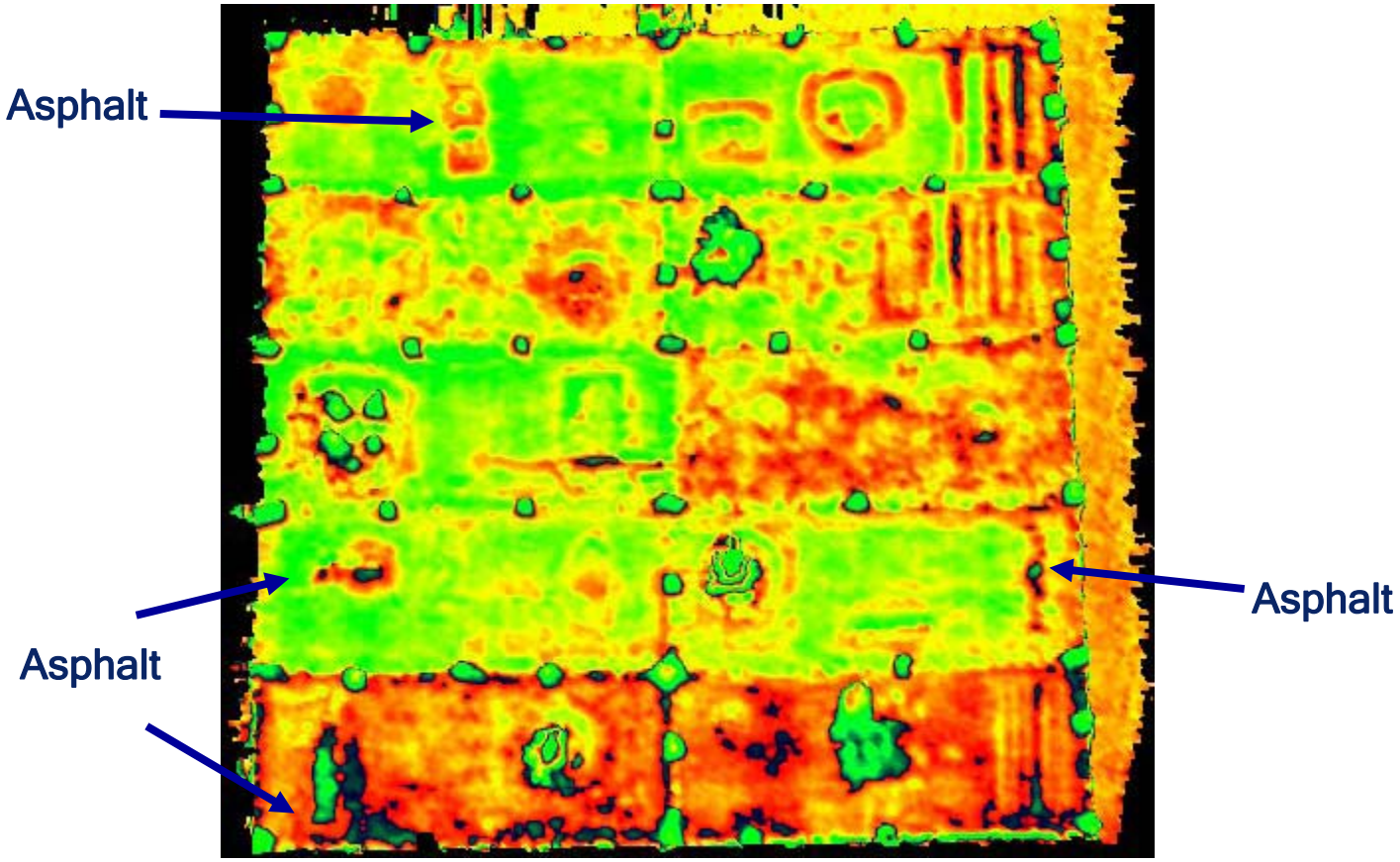


Asphalt

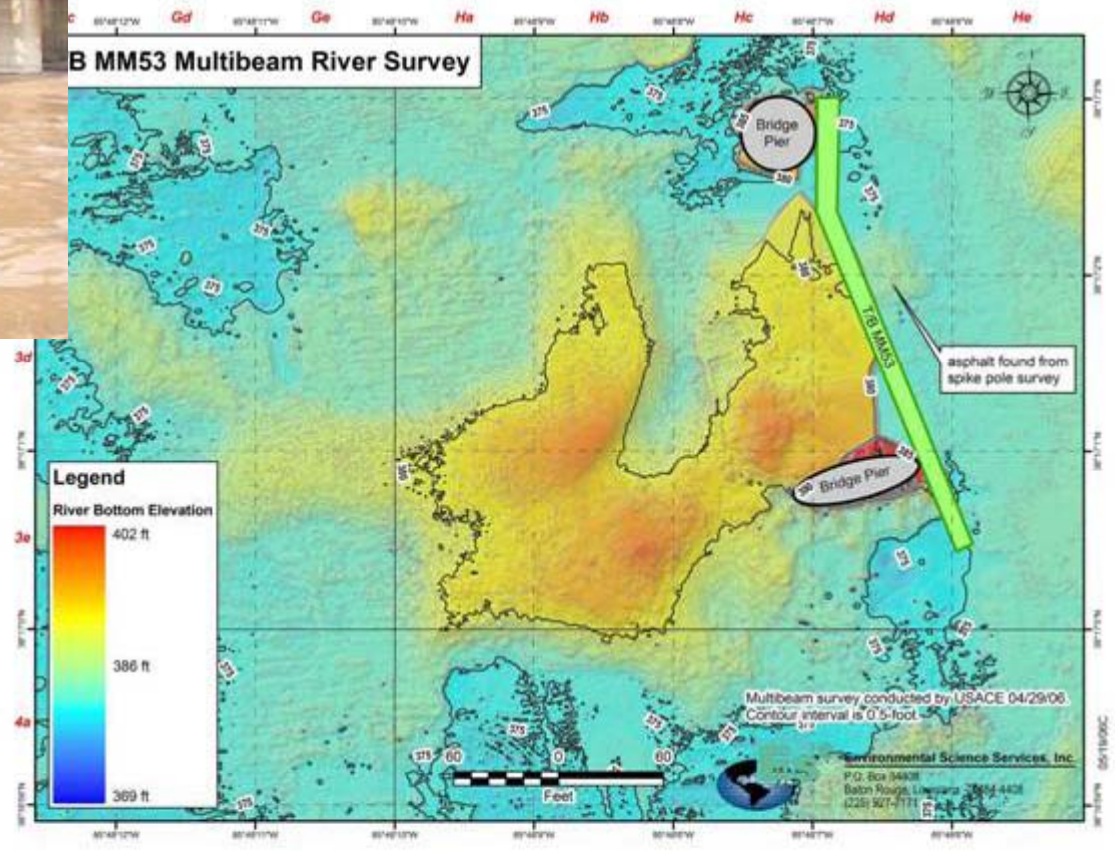
CodaOctopus Imaging Sonar Results (Intensity)



CodaOctopus Imaging Sonar Results (Height)

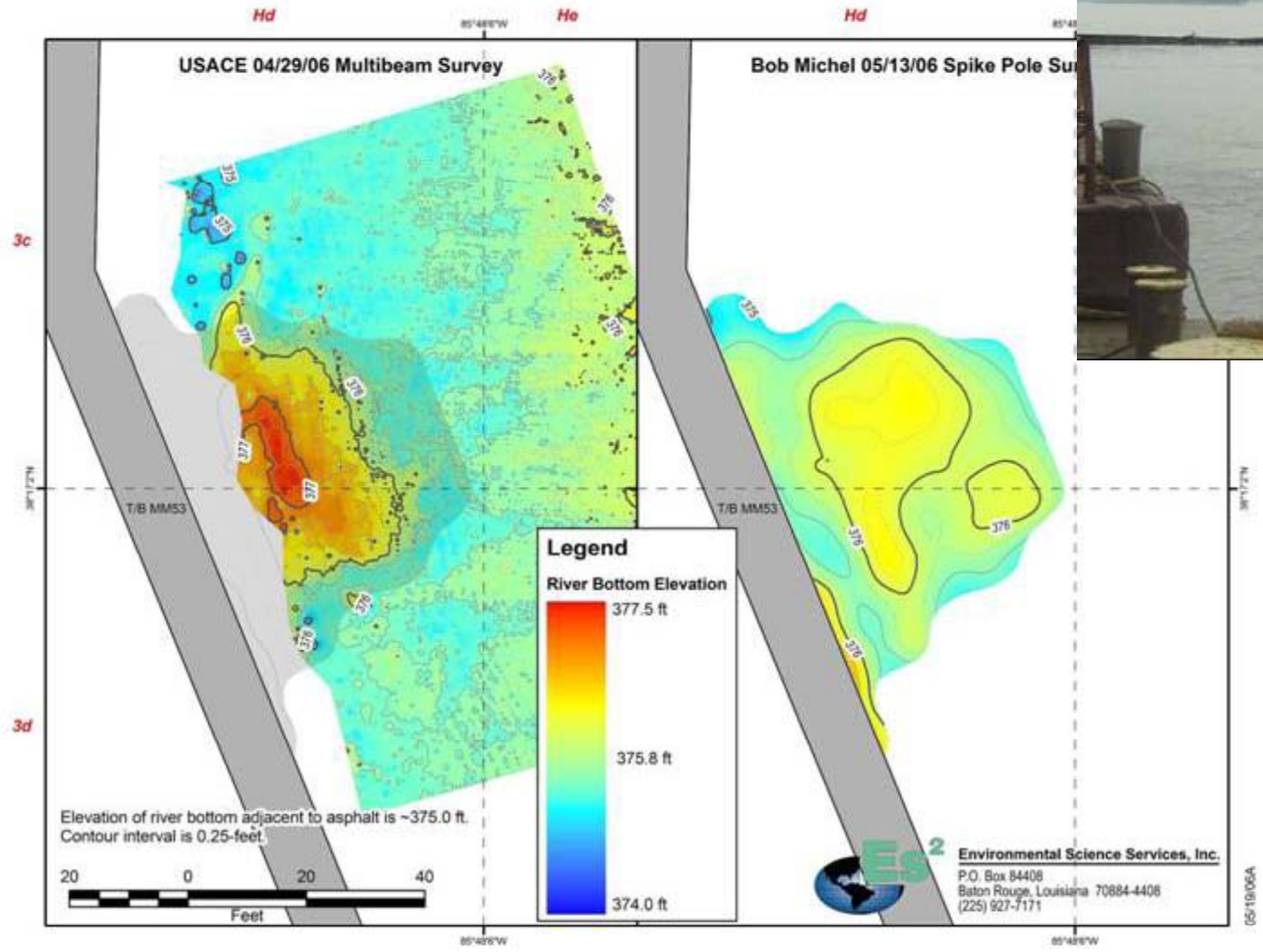


Barge MM53


B MM53 Multibeam River Survey
Bridge Pier
TB MM53
asphalt found from spike pole survey
Bridge Pier
Legend
River Bottom Elevation
402 ft
386 ft
369 ft
Multibeam survey conducted by USACE 04/29/06
Contour interval is 0.5-foot
Feet
Environmental Science Services, Inc.

Barge MM53


31 10:13AM


Hd
Ho
Hd
USACE 04/29/06 Multibeam Survey
Bob Michel 05/13/06 Spike Pole Su
3c
3d
T/B MM53
T/B MM53
Legend
River Bottom Elevation
377.5 ft
375.8 ft
374.0 ft
Elevation of river bottom adjacent to asphalt is ~375.0 ft.
Contour interval is 0.25-feet
20
0
20
40
Feet
Environmental Science Services, Inc.
P.O. Box 84408
Baton Rouge, Louisiana 70884-4408
(225) 927-7171
05/19/06A

Conclusions for Asphalt Detection

Still Need behavior Information

- Identify transition from liquid to solid

Laser Fluorometer (LF) –

- In early stages of spill when asphalt may be more liquid, fluorescence may be brighter
- LF may still have applications in later stages

SONAR

- SONAR successful in water column if air or bitumen (Orimulsion) embedded with oil/asphalt
- Recommend using both target strength and bathymetry data if searching for unknown
- Multi-beam or single-beam with enhanced processing/graphics appears best options
- Stay with frequencies about 400 kHz.

Visual

- Need good visibility

Pike Poling

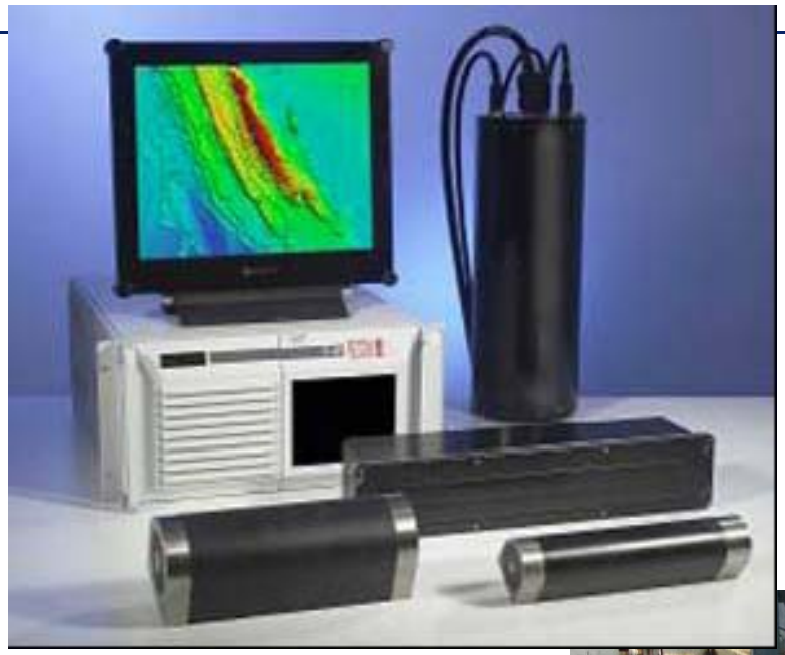
- Limited by depth

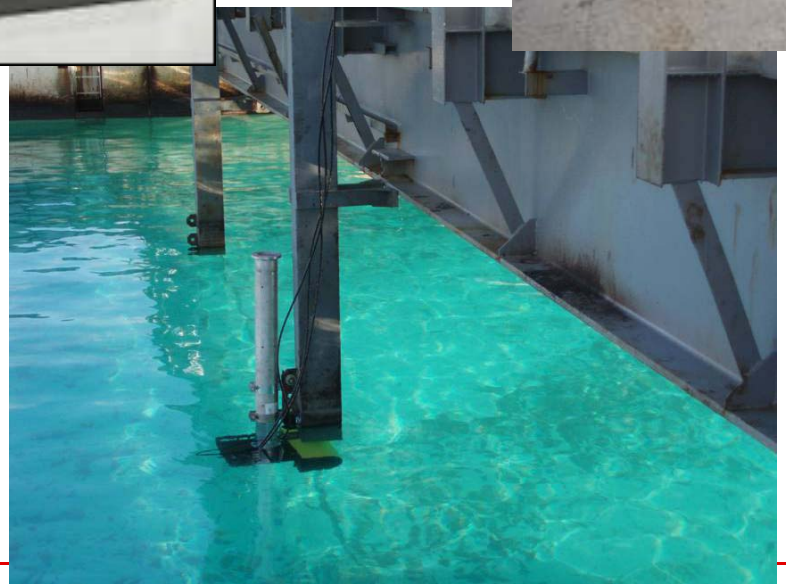
Questions

Non-Attribution Policy

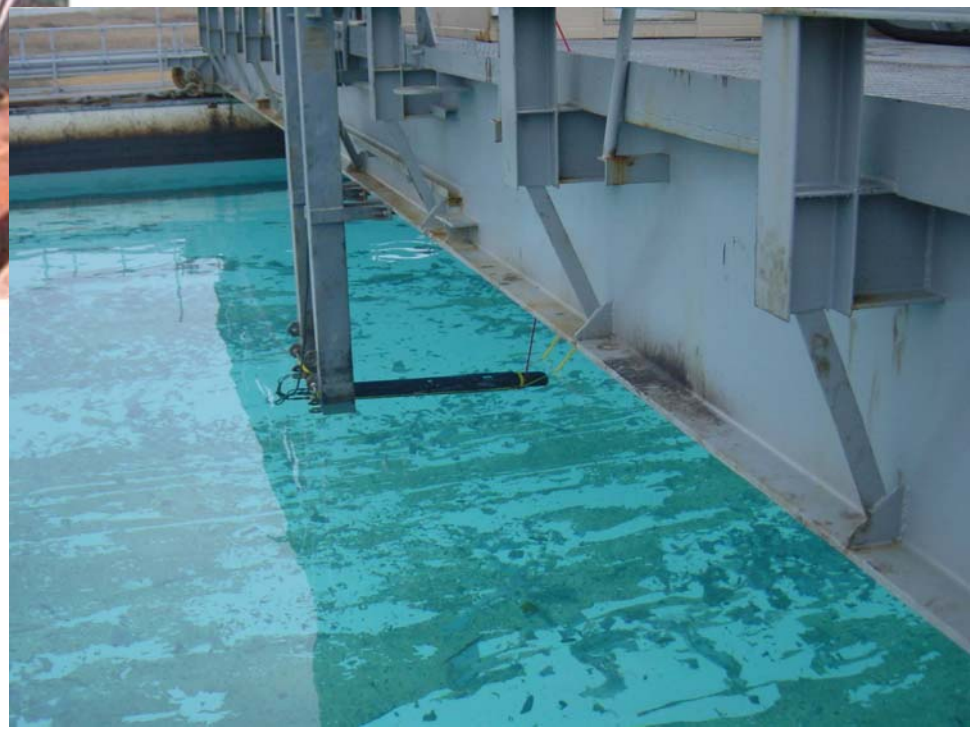
Opinions or assertions expressed in this paper are solely those of the author and do not necessarily represent the views of the U.S. Government. The use of manufacturer names and product names are included for descriptive purposes only and do not reflect endorsement by the author or the U. S. Coast Guard of any manufacturer or product.

RESON – Multibeam sonar

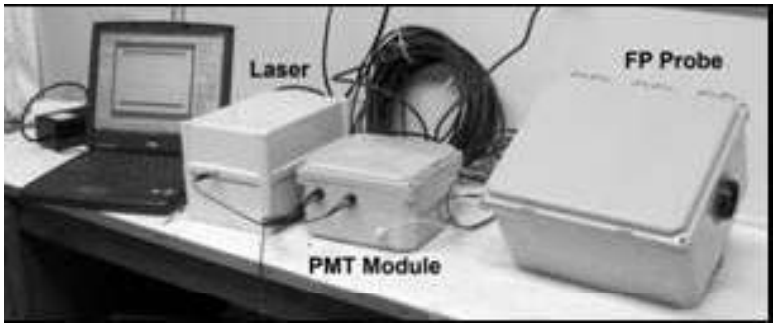


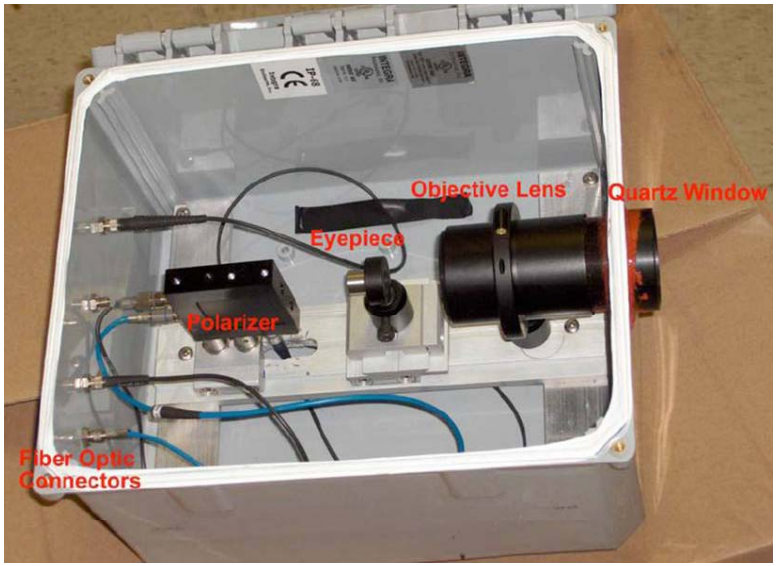


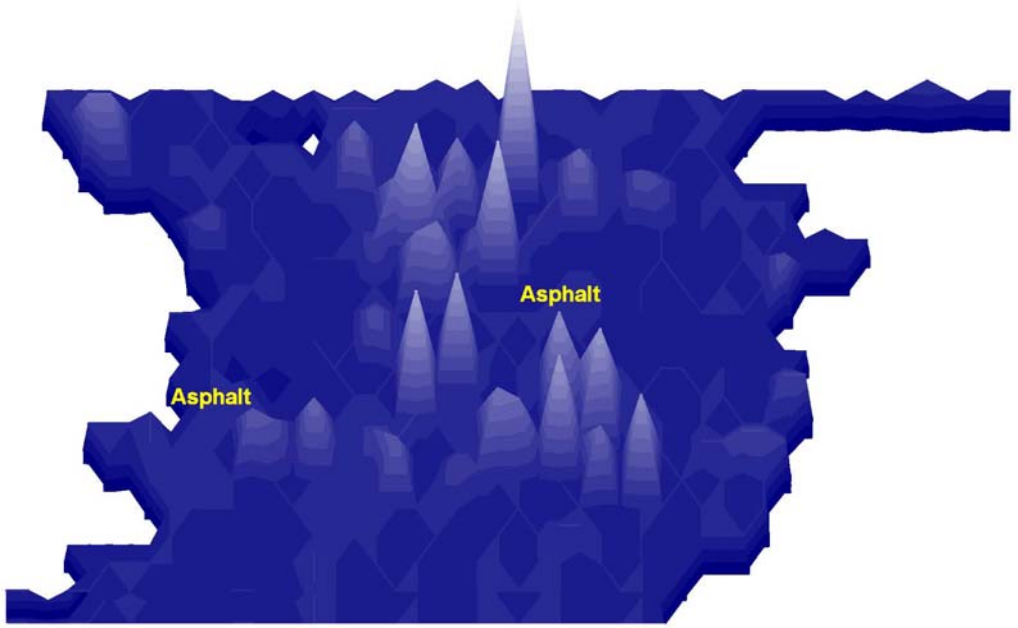
SAIC System

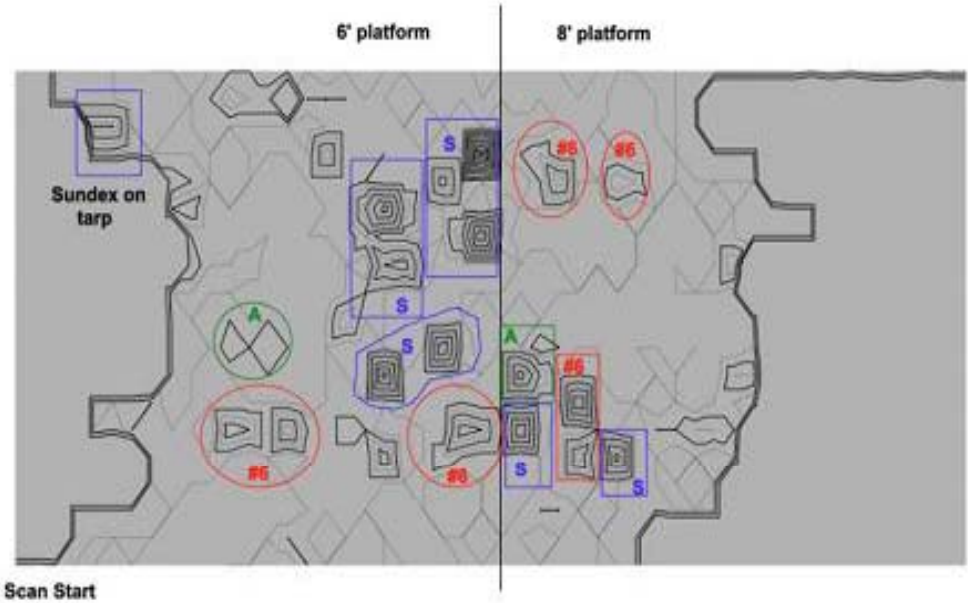


EIC Fluorescence Polarization






Asphalt
Asphalt
Scan Start


6' platform
8' platform
Sundex on tarp
Scan Start

EIC LF Results –
GPS readings caused results to scatter.