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BRIEF FOR AAPA
FACILITIES ENGINEERING COMMITTEE

Maritime Civil Engineering Applications and Solutions

13/06/2022

Konrad Mech





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Developing Advanced Technologies Enabling Extreme Performance for Extreme Conditions





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Kongsberg Maritime

The broadest
portfolio of products
for the maritime
industry

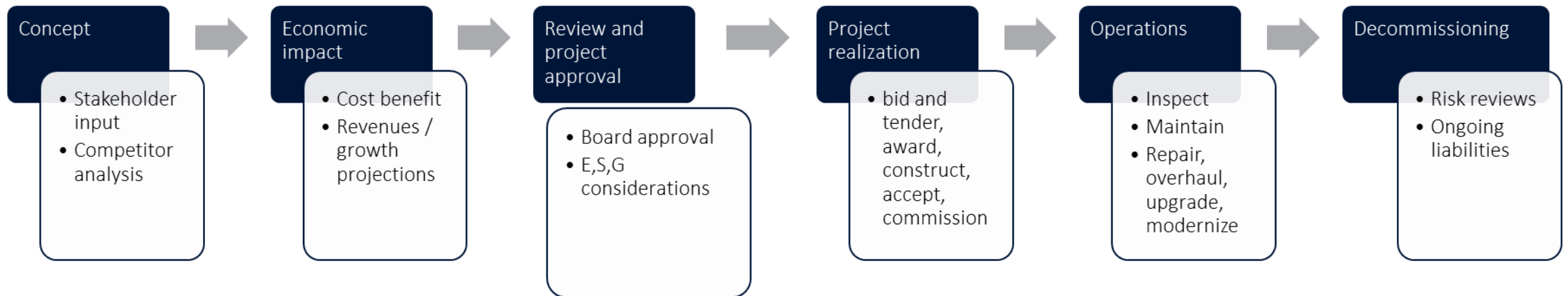




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Marine Civil Engineering Activities

- Construction and maintenance projects
- Scheduled and unscheduled infrastructure inspection
- Scheduled and unscheduled hydrographic / bathymetric survey
- Navigation channel and berth maintenance
- Dredging





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We have market tenure...

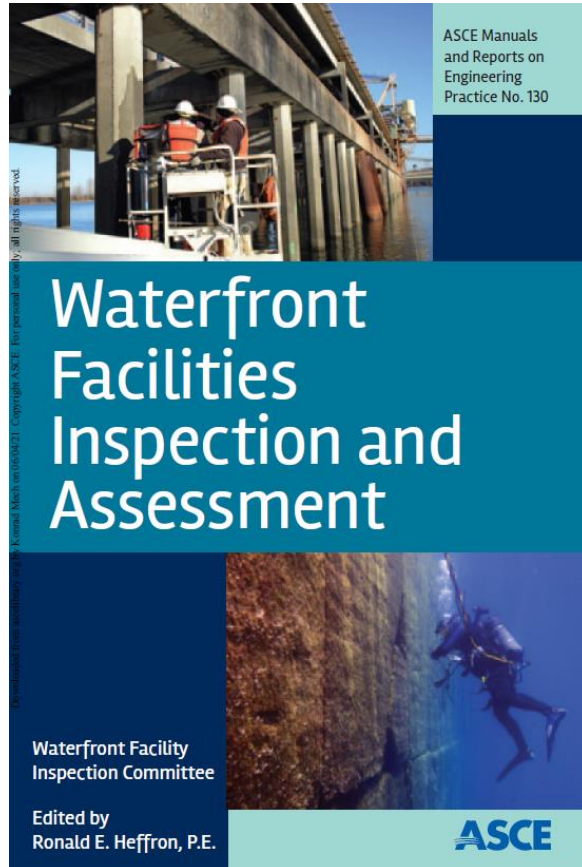


Fig. C-25. Sector scanning sonar image of steel bulkhead with typical defects circled
Source: Courtesy of Collins Engineers, Inc., reproduced with permission.

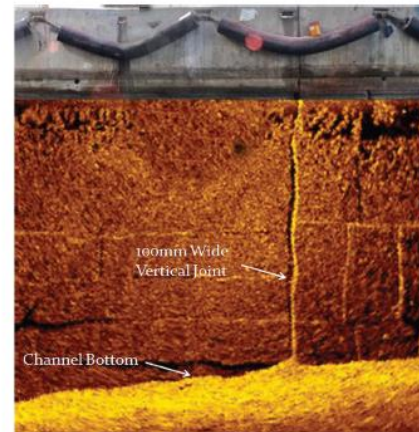


Fig. C-26. Sector scanning sonar image of quay wall with offset blocks and noted vertical joint
Source: Courtesy of Collins Engineers, Inc., reproduced with permission.

Depending on the complexity of the sonar device, single-beam technology is limited by its inability to detect refilled scour holes, false readings from heavy drift or heavy turbulence, distorted scale on the readout due to varying boat speed, and inability to provide information about the

geophysical sub-bottom. Furthermore, the technology must compensate for any water surface elevation changes during tidal swings while taking channel bottom to waterline measurements.

All these methods are limited by the softness of the channel bottom. The swiftness of the current also can affect lead line and sounding pole measurements because the water velocity can introduce horizontal drift into the line or cause a lightly weighted tape to drift downstream. This method also may be more prone to inaccuracies resulting from the experience of the inspector.

C.17.2 Underwater Acoustic Imaging Data

Some sonar devices produce high-resolution images to enable documentation and evaluation of underwater conditions such as structure material surface condition, channel bottom elevation location, and presence of debris or underwater objects that represent a security concern. These sonar devices can obtain photograph-like quality images of bulkheads, piles, and armored slopes under wharves. See Figs. C-25 and C-26.

Underwater acoustic imaging provides photograph-like documentation of a structure element surface, but it is limited in its ability to penetrate beyond line of sight. Also, the images may not accurately represent the structural element material if heavy marine growth is present. Sonar imaging can also be used for diver tracking in real time, which can be a valuable safety consideration. Depending on the type of sonar device used, acoustic images may be displayed in two-dimensional (2D) exhibits or three-dimensional (3D) point-cloud data sets or models.

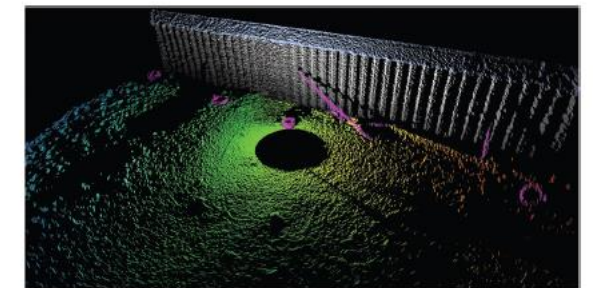


Fig. C-27. Multibeam sonar image of steel sheeting bulkhead with debris on channel bottom
Source: Courtesy of Collins Engineers, Inc., reproduced with permission.



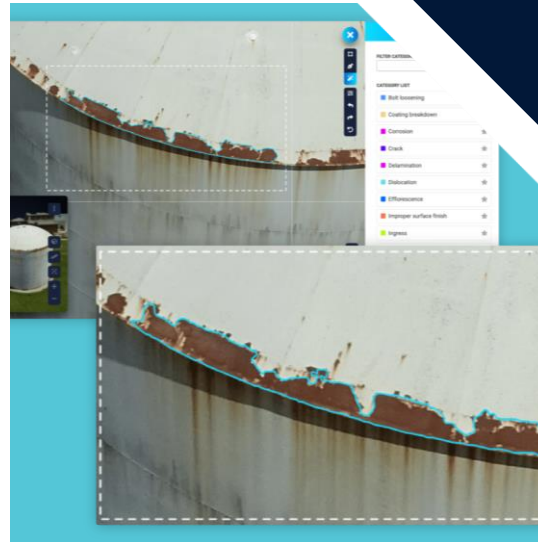
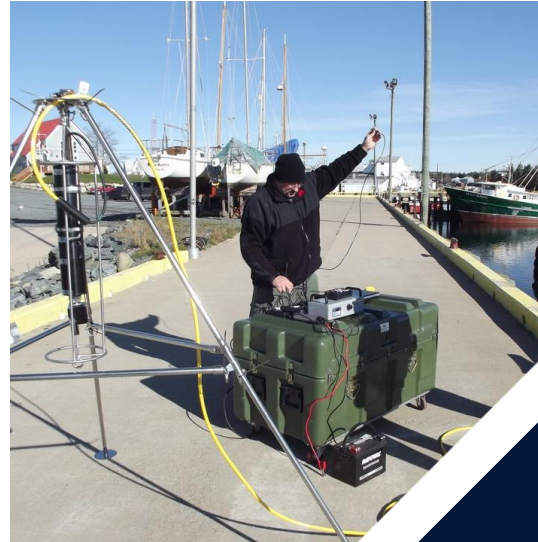
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1171 Sonar with MS1000 Software: Real-Time Mosaicking

Customer Focus: Civil
Engineers

Customer Benefits:

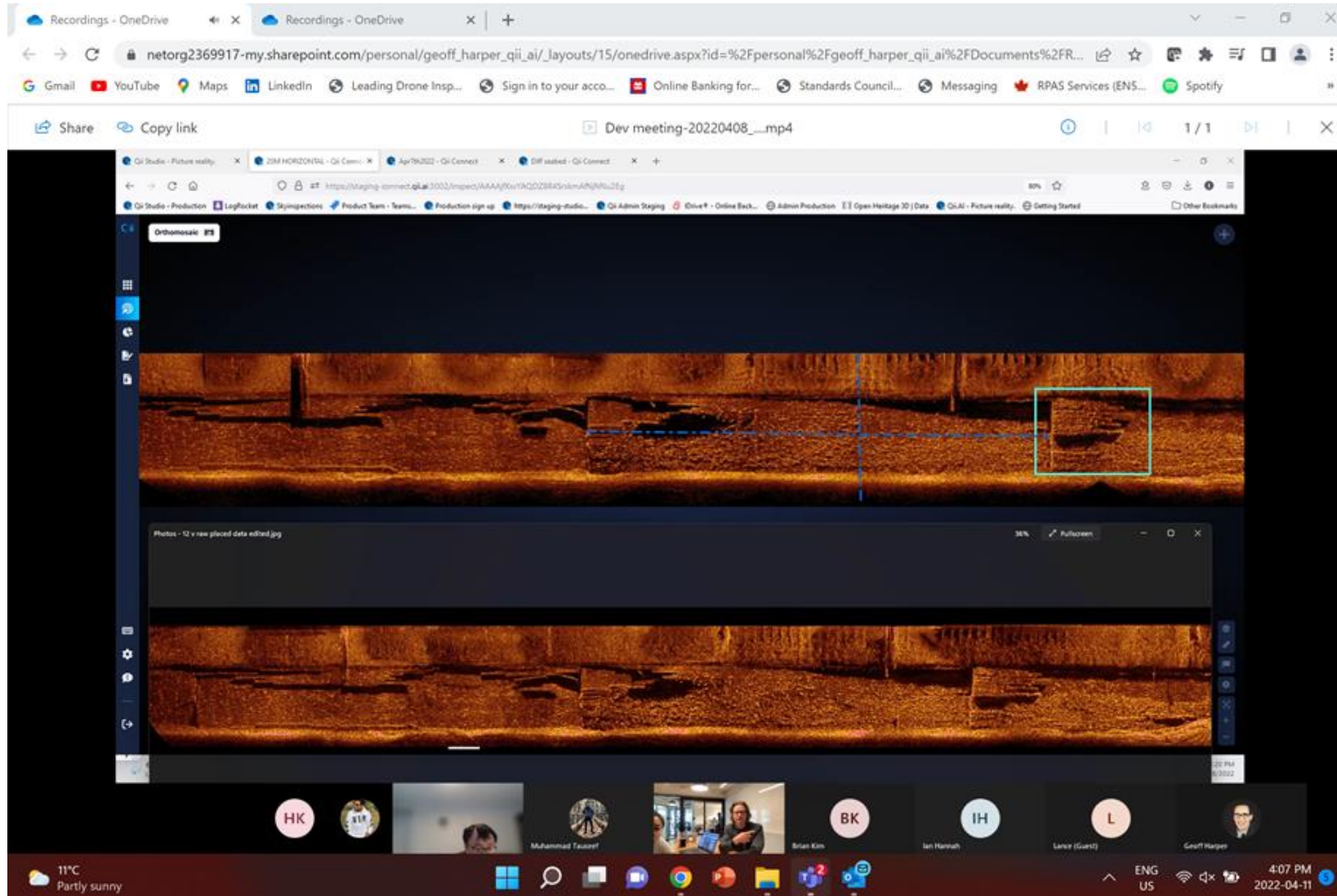
- Faster image processing
- Better mosaics
- Feature I.D.





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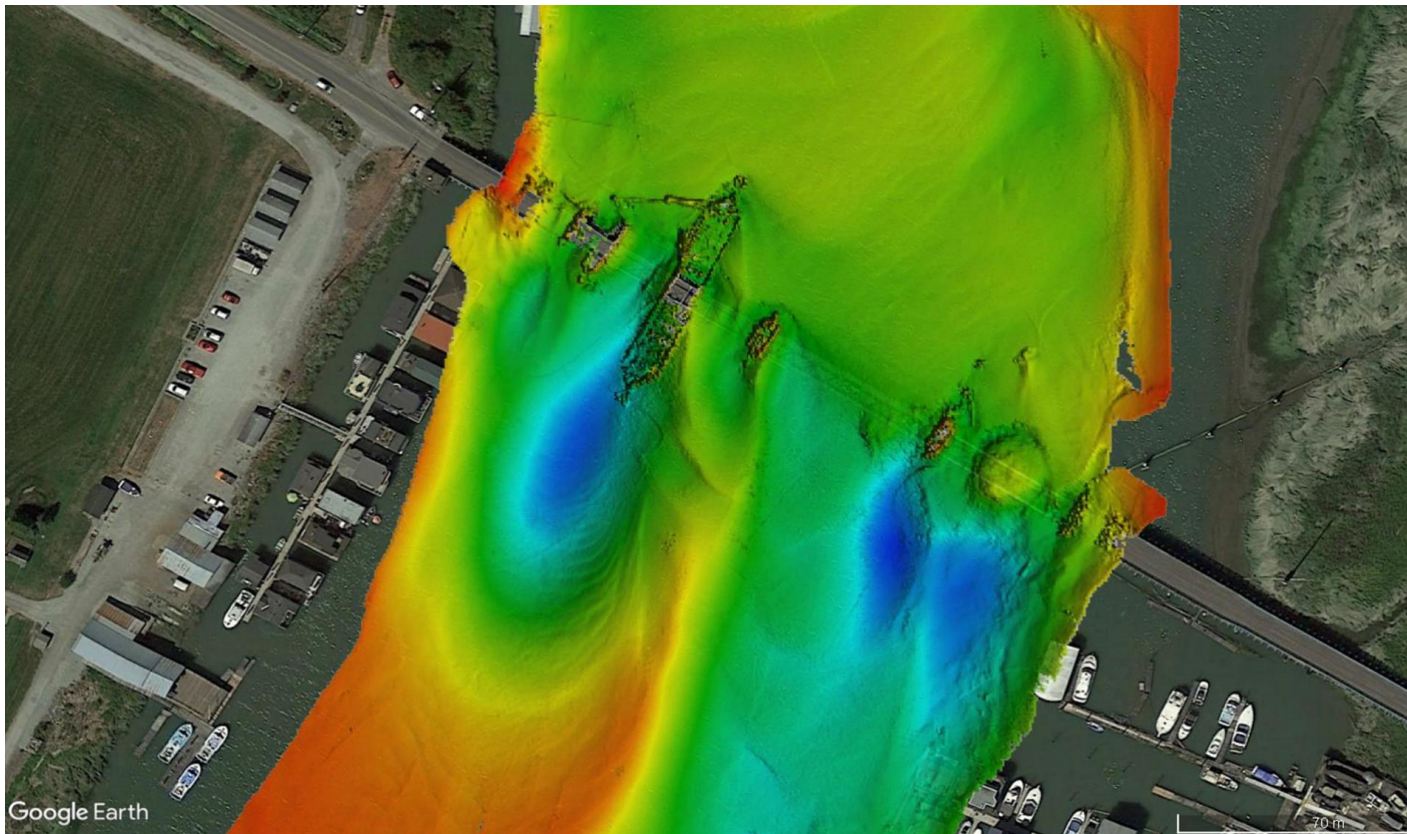
Top Slide: AI. Bottom slide: manual splicing





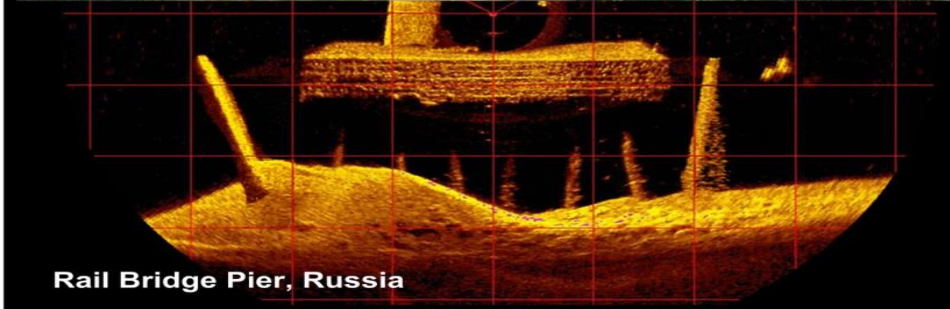
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Bridges



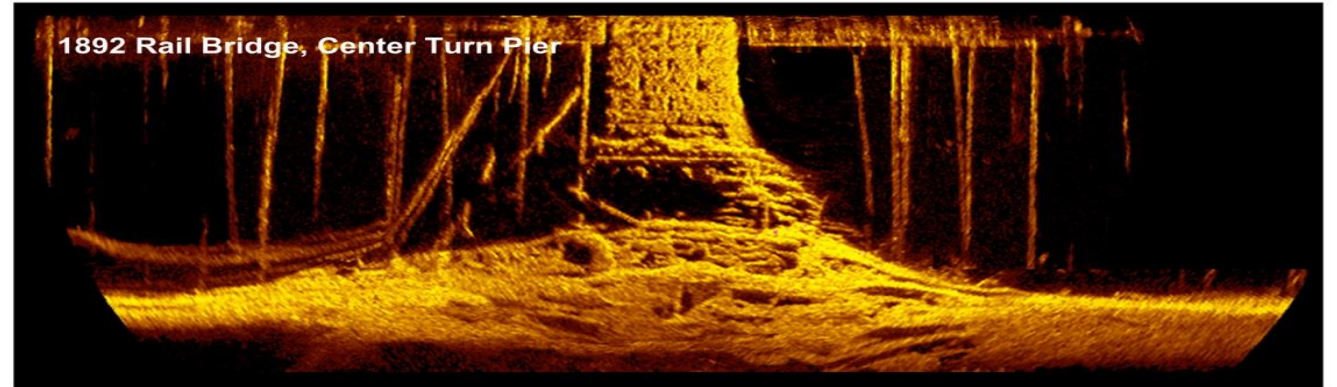
- Bridge Pier scour
 - Real-time monitoring with DAS with K-Observer
 - Periodic inspection with Hi-res sonar
- Bridge structural inspection
 - High Res Sonar; Multibeam sonar
 - ScanFuse powered by Qii.AI

Scanning Sonar Used to Identify Scour, and Structural Deterioration of Bridge Piers and Docks



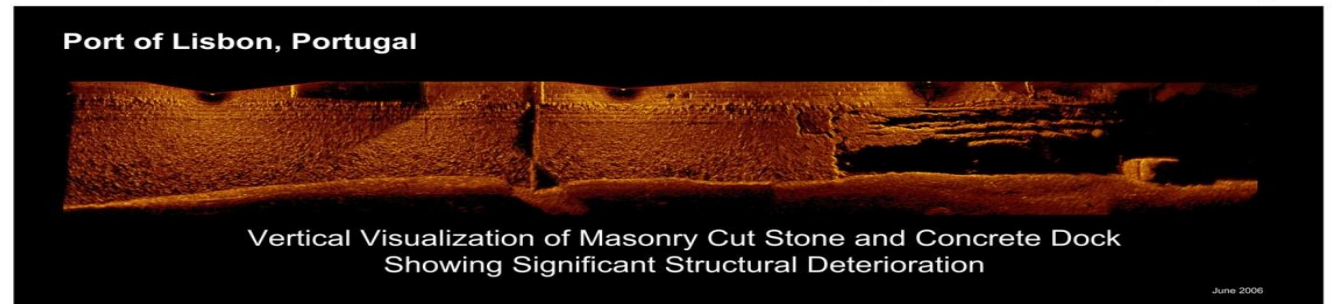
Rail Bridge Pier, Russia

Courtesy *Peter Diving*, Russia



1892 Rail Bridge, Center Turn Pier

Courtesy *Nautilus Marine Group*, Lansing, MI

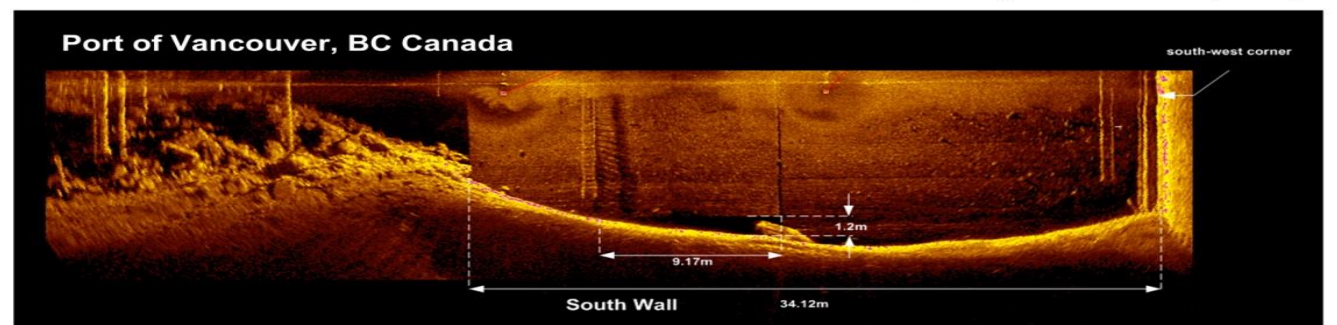


Port of Lisbon, Portugal

Vertical Visualization of Masonry Cut Stone and Concrete Dock
Showing Significant Structural Deterioration

June 2006

Courtesy *3P-Consultores*, Portugal



Port of Vancouver, BC Canada

Data Collection by *Kongsberg Mesotech Ltd.*, Port Coquitlam, BC, Canada

Data Collected Using MS 1000 and 675 kHz High Resolution Scanning Sonar Head with 30 Degree Fan Beam Transducer

Kongsberg Mesotech Ltd.



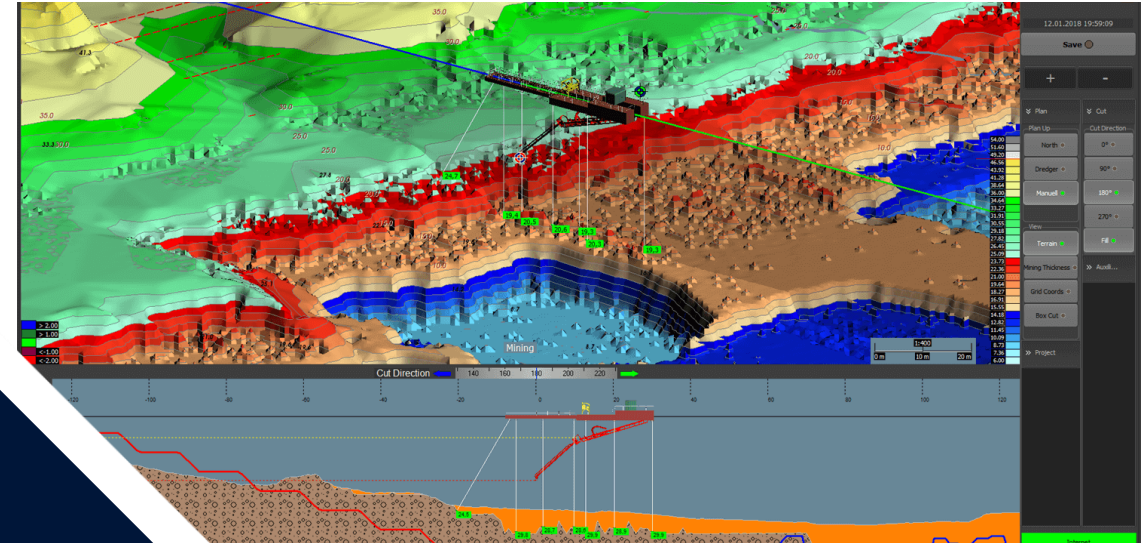
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Real-Time Dredge Monitoring

Customer Focus: Dredge
Operators

Customer Benefits:

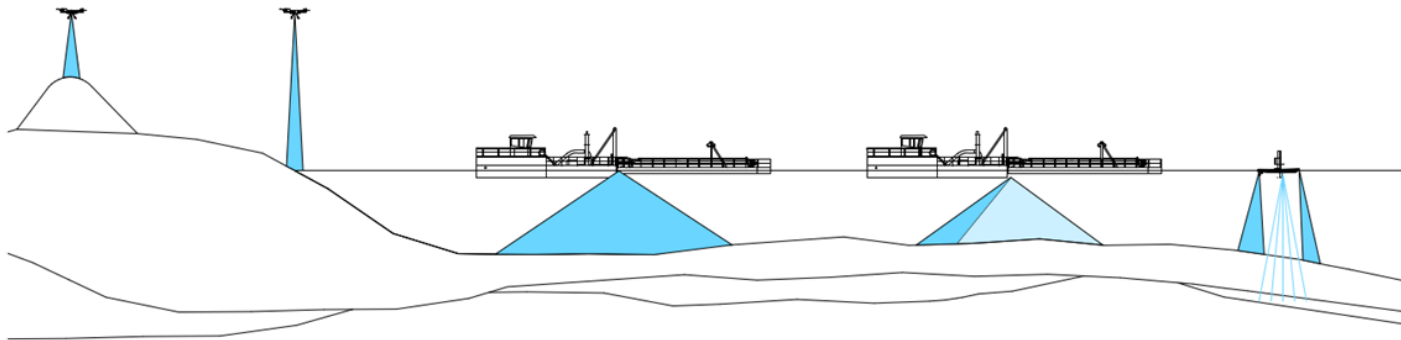
- Contract Compliance
- Time Savings
- Eliminate Excess
Dredging





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Total Awareness during Dredging Ops



- Pre- and Post-Dredge QA Survey
 - Manned or unmanned bathymetric survey
 - Sub-bottom profilers
- Real-time dredge monitoring
 - DAS sonar with MARPO-Dredger software
 - M3 sonar on rotator with MARPO-Dredger software
 - EK80 real-time turbidity monitoring with MARPO-Dredger software
- Dredging mission asset assessment and planning
 - MARPO Dredger software



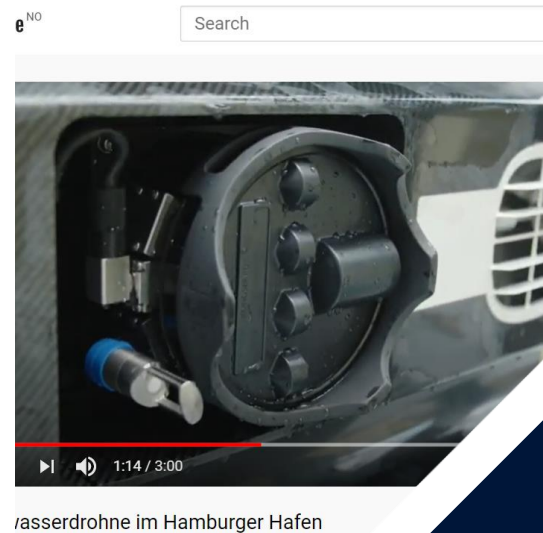
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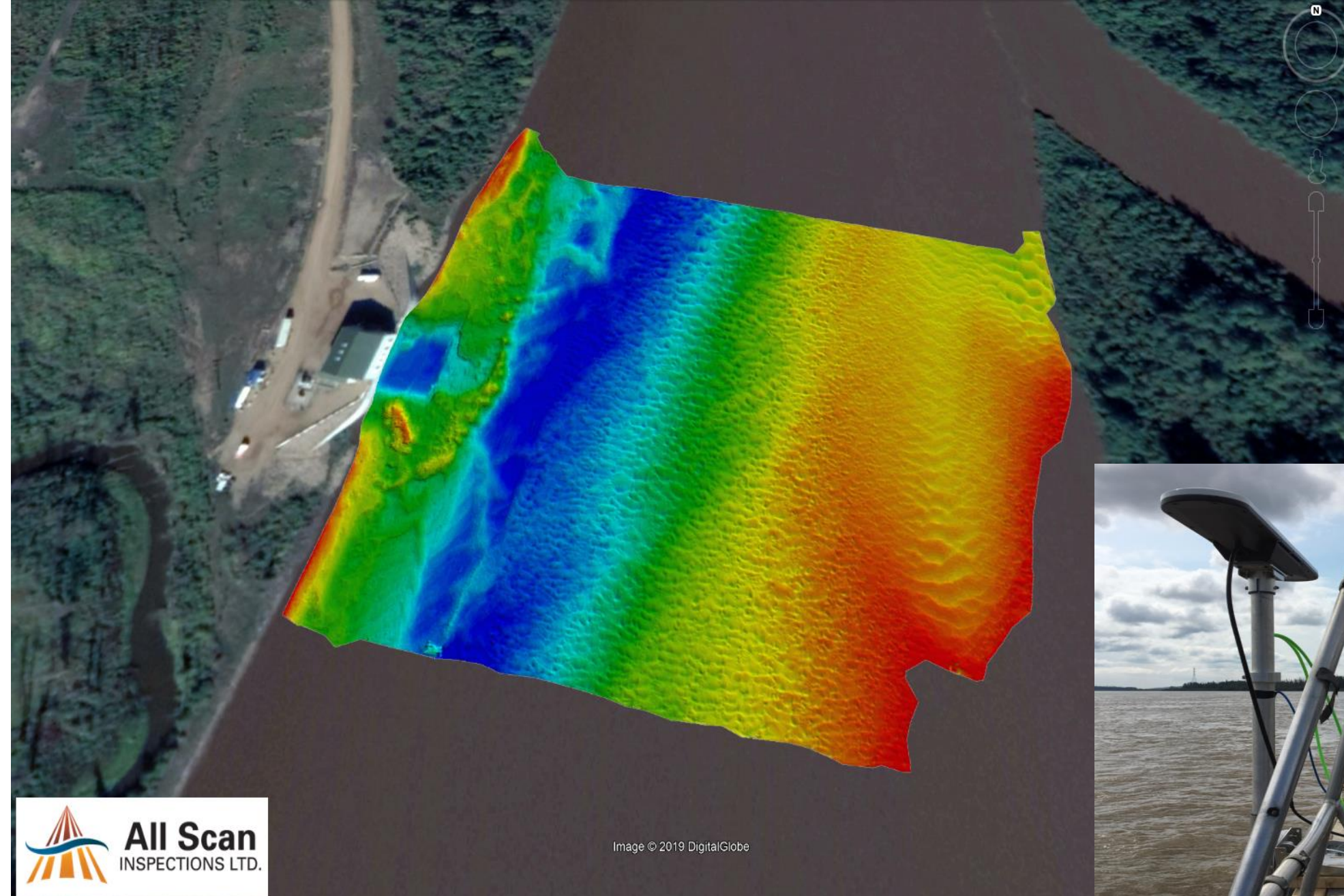
Shallow Survey

Customer Focus: Shallow
Survey and Inspection

Customer Benefits:

- Small form factor
- High performance for Low Price
- Integrated with Hypack, EIVA, Qinsy, Sonarwiz







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USV/ASVs already integrated with the M3 Sonar

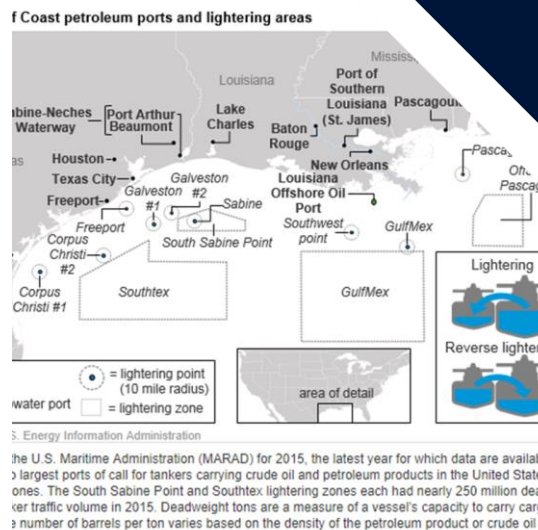
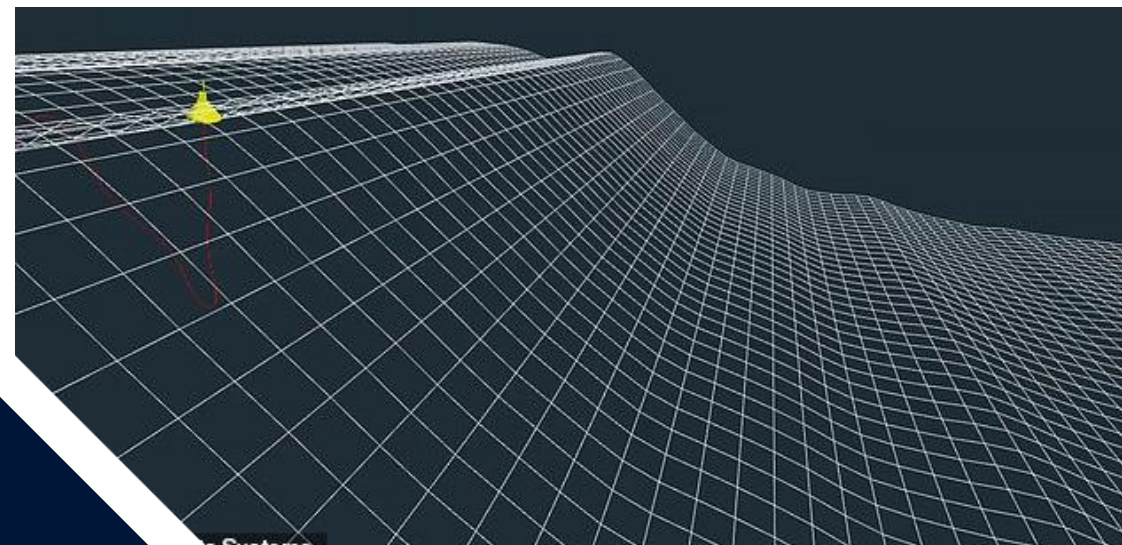


WORLD CLASS – Through people, technology and dedication

KONGSBERG PROPRIETARY – See Statement of Proprietary information

Real-Time Berth Depth Monitoring: MarineLabs

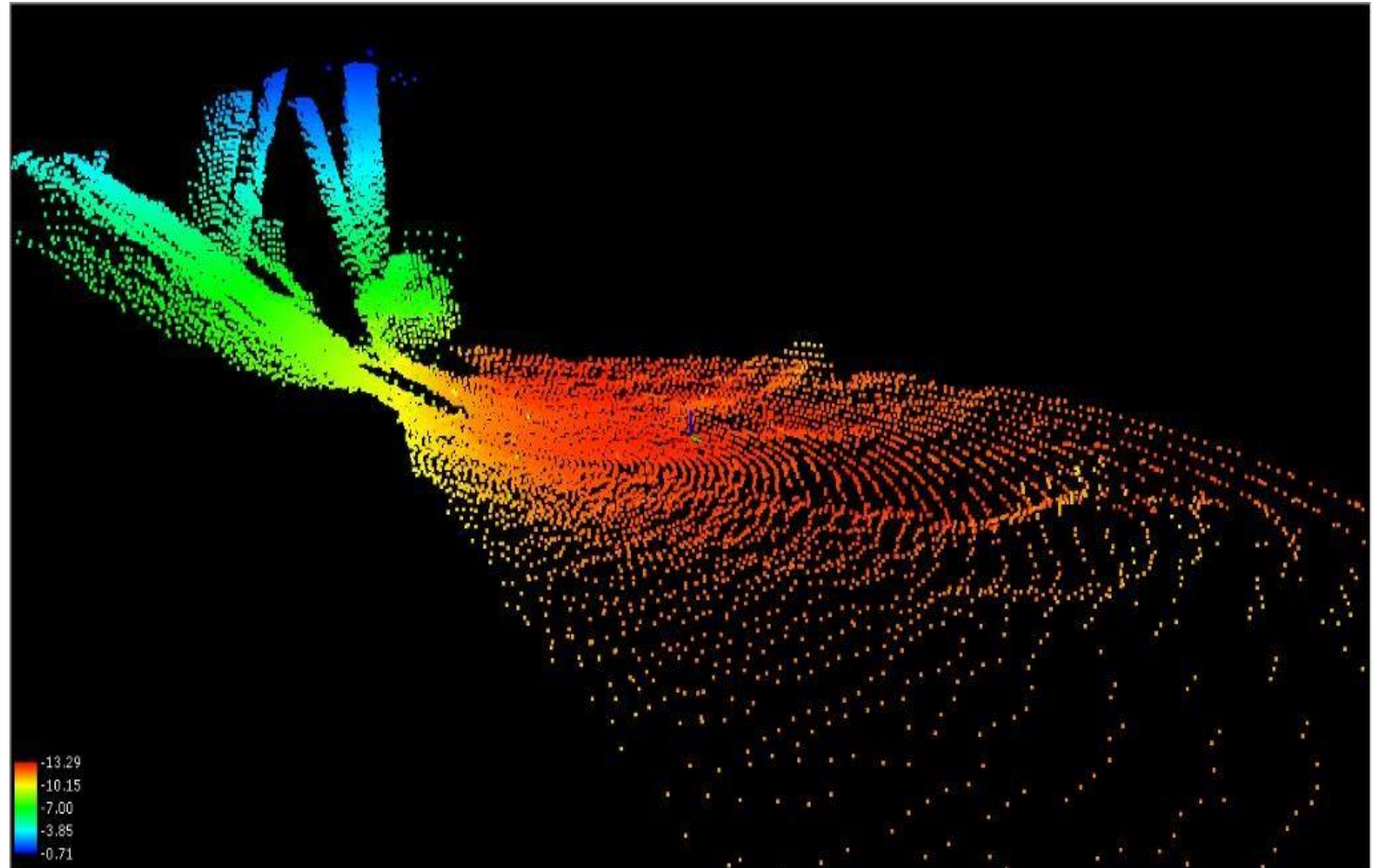
Customer Focus: Pilots
and Bulk Cargo Carriers



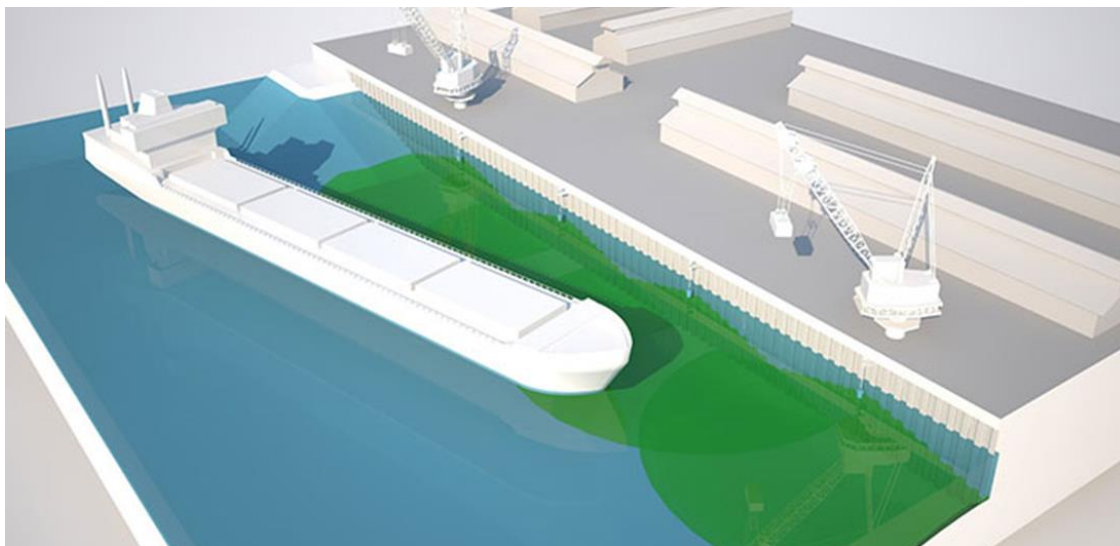


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Dual Axis Scanning Sonar



BerthWatch



Plus Vicente C – Parana!
Plus Seatex AIS Base Stations!

- Value Proposition
 - Maximize cargo based on true depth under keel
 - Minimize lightering / reverse lightering
 - Mitigate allision risk with sunken objects
 - Recover from storm events faster
 - Trigger dredging operations when needed
- Why BerthWatch?
 - Real depth under keel
 - Real time data adjusted for SV, wave and tide data
 - Easy user and desk-top interfaces for pilots and vessel masters

BerthWatch – Desktop view



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MarineLabs

- Check beside the berth data you want



- Click on a berth pocket

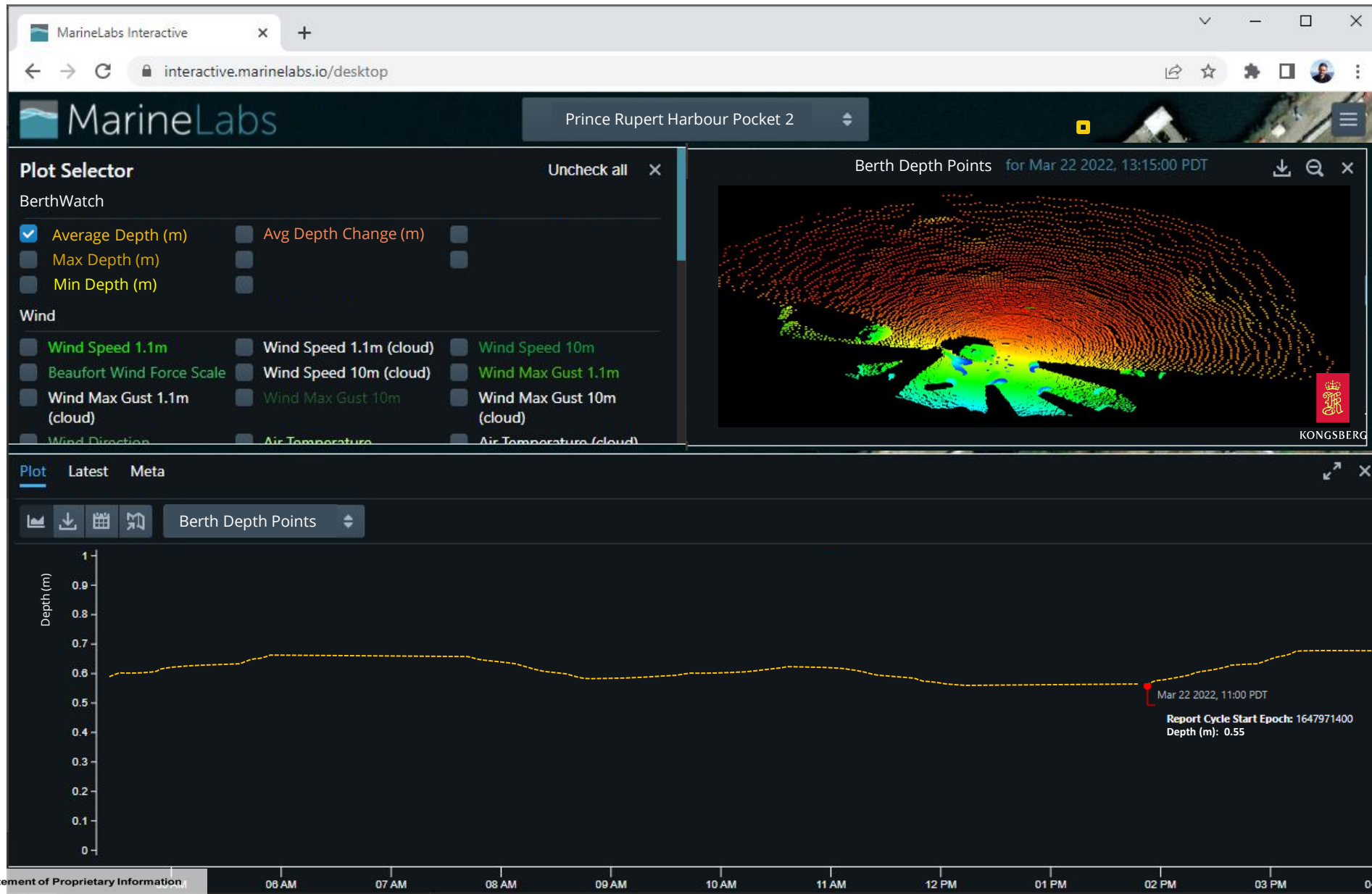
- Mouse over the report you want

BerthWatch – High-res panel



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MarineLabs



- 3D pan and zoom depth points, coloured as a function of depth or Δ^*

- Select 'Berth depth points'

BerthWatch – Dashboard

- Select berth pocket
- Check for Δ warnings
- View latest pocket depth summary
- 3d pan rotate point cloud
- Check another berth pocket

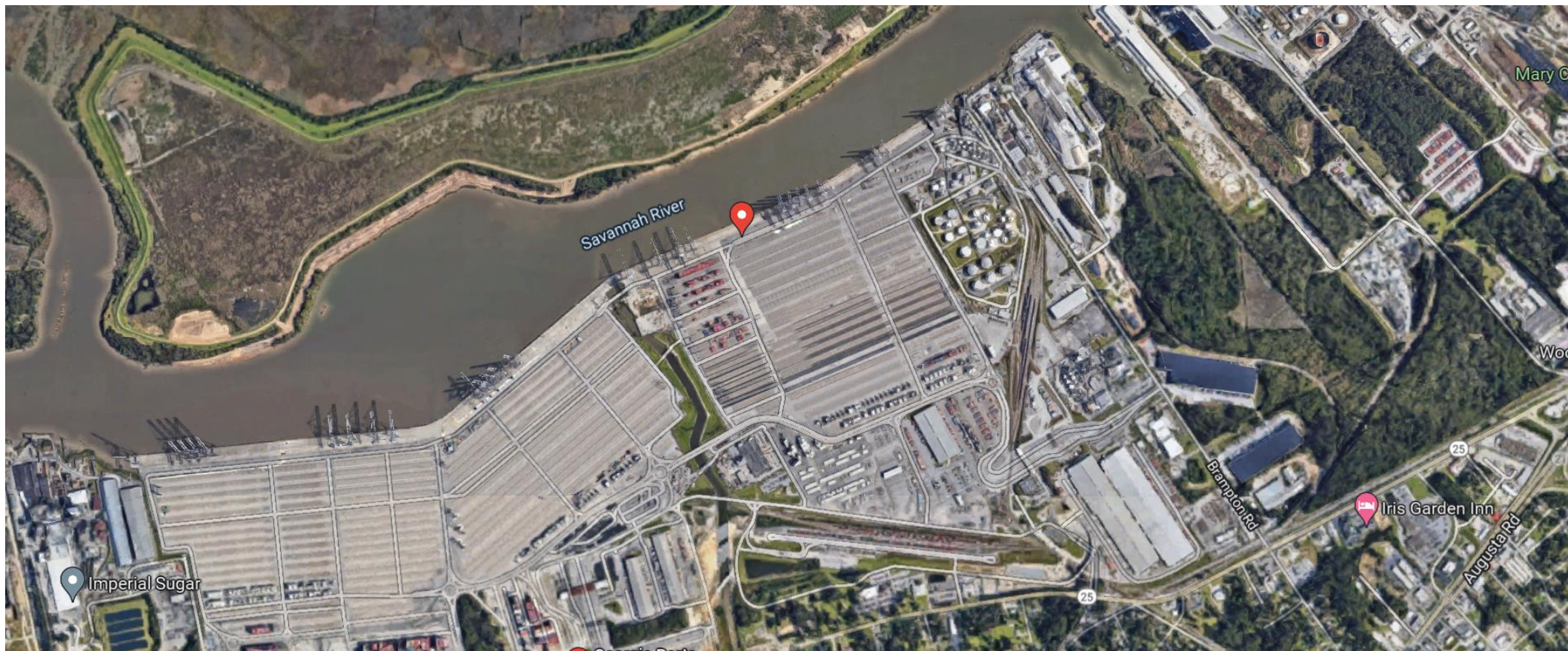


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MarineLabs

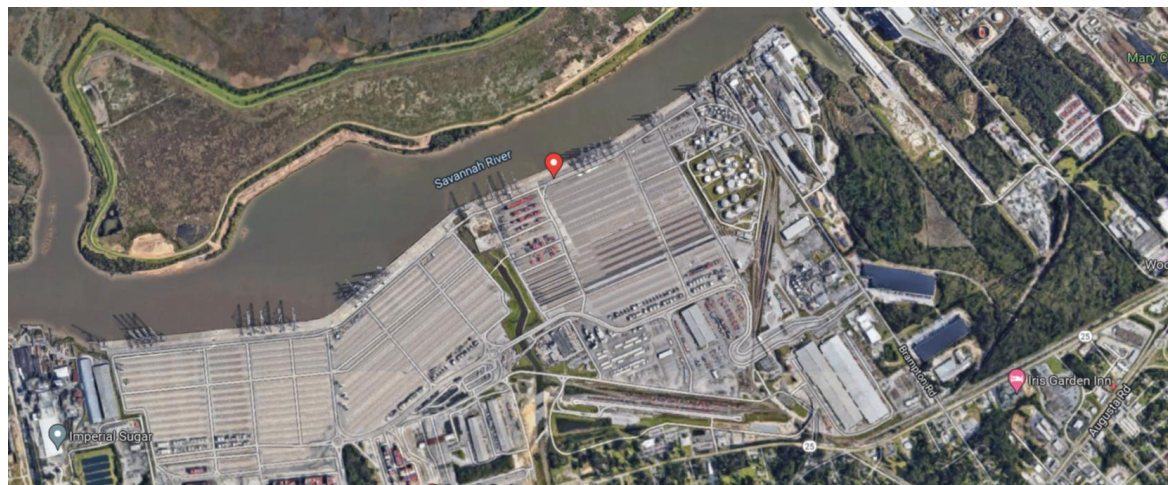
Georgia Port Authority Garden City Terminal

\$600,000,000 per year through 9 berths



BerthWatch

Bulk Terminal or Container Terminal – Values and Benefits



BerthWatch Installation: 4 DAS heads + 1 Power/Telemetry Box

- \$22,000 USD per month, minimum 1 year installation

- Case study: Panamax Bulker

- 1 cm of additional draft = 80 metric tonnes of added cargo
- 15 cm additional sulphur @ \$426 USD/tonne = \$511,000USD additional cargo. Per vessel.

- Case study: Container Vessel Terminal

- Georgia Port Authority tariff per TEU = \$100 USD
- Garden City Terminal = 9 berths (90% of total traffic)
- Over 2,000 vessel calls / year
- TEUs handled = 5,400,000 TEUs
- Revenue per Berth = $\$540,000,000 / 9 = \$60,000,000$ USD/berth
- Berthwatch investment as % of revenue = 0.0044%

World class instruction for the application of marine technologies needed for ports, dams, waterways, locks, and marine transportation infrastructure.

The Marine Center

Professional training and micro credentials for the marine industry



Marine Bridge & Infrastructure Inspection Certification:
A Marine Bridge & Infrastructure Inspection certificate will be issued upon the completion of the three course series.

Marine Bridge & Infrastructure Inspection Certification Courses	Duration	Delivery / Location
Fundamentals of SONAR systems & acoustics	16 hours	Online
Inspection technologies & application	8 hours	Online
Underwater Bridge & Infrastructure inspection	4 days	Traverse City, MI



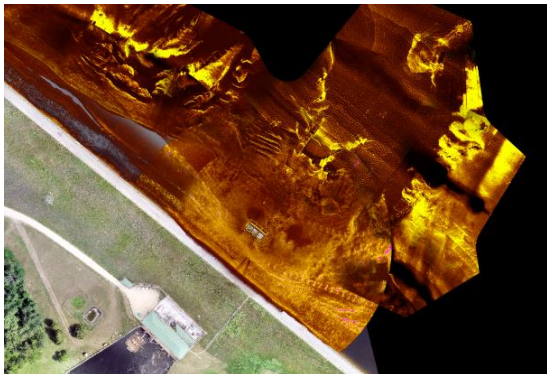


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Contact Information

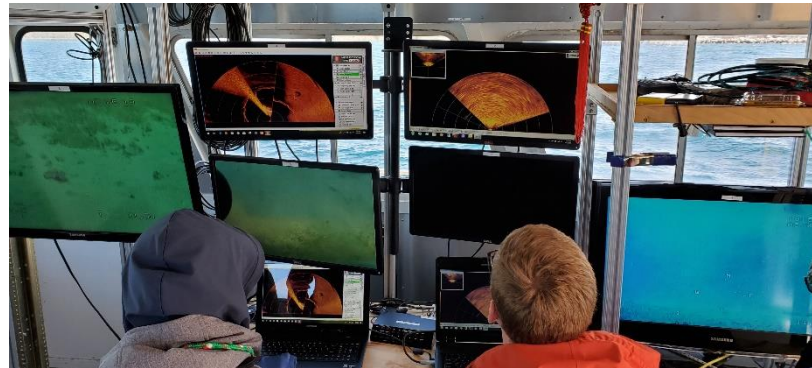


SCAN FOR PROGRAM BROCHURE



Names & Contact Information - Kongsberg

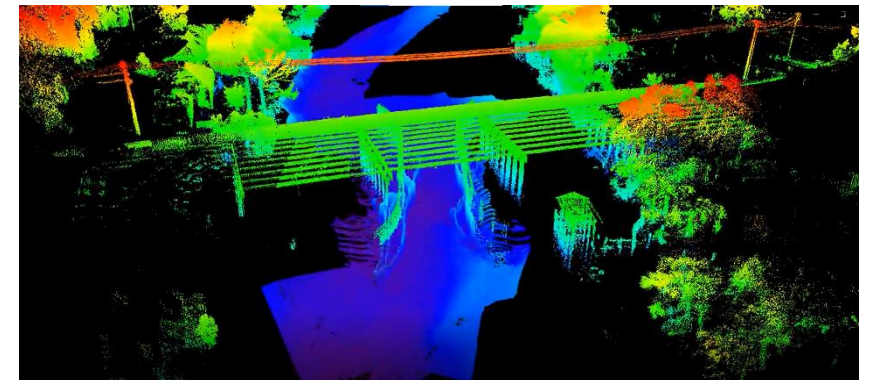
Konrad Mech, P.Eng.
Sales Director, Coasts, Ports and Inland Waterways
778.995.6912
Konrad.Mech@km.kongsberg.com
www.linkedin.com/in/konradmech



Names & Contact Information - NMC

Hans Van Sumeren, CMarTech
hvansumeren@nmc.edu
231.995.1793
nmc.edu/water

Ed Bailey, CMarTech
ebailey@nmc.edu
231.995.1215
nmc.edu/marine-center





**Thank you for your
attention!**

konrad.mech@km.kongsberg.com



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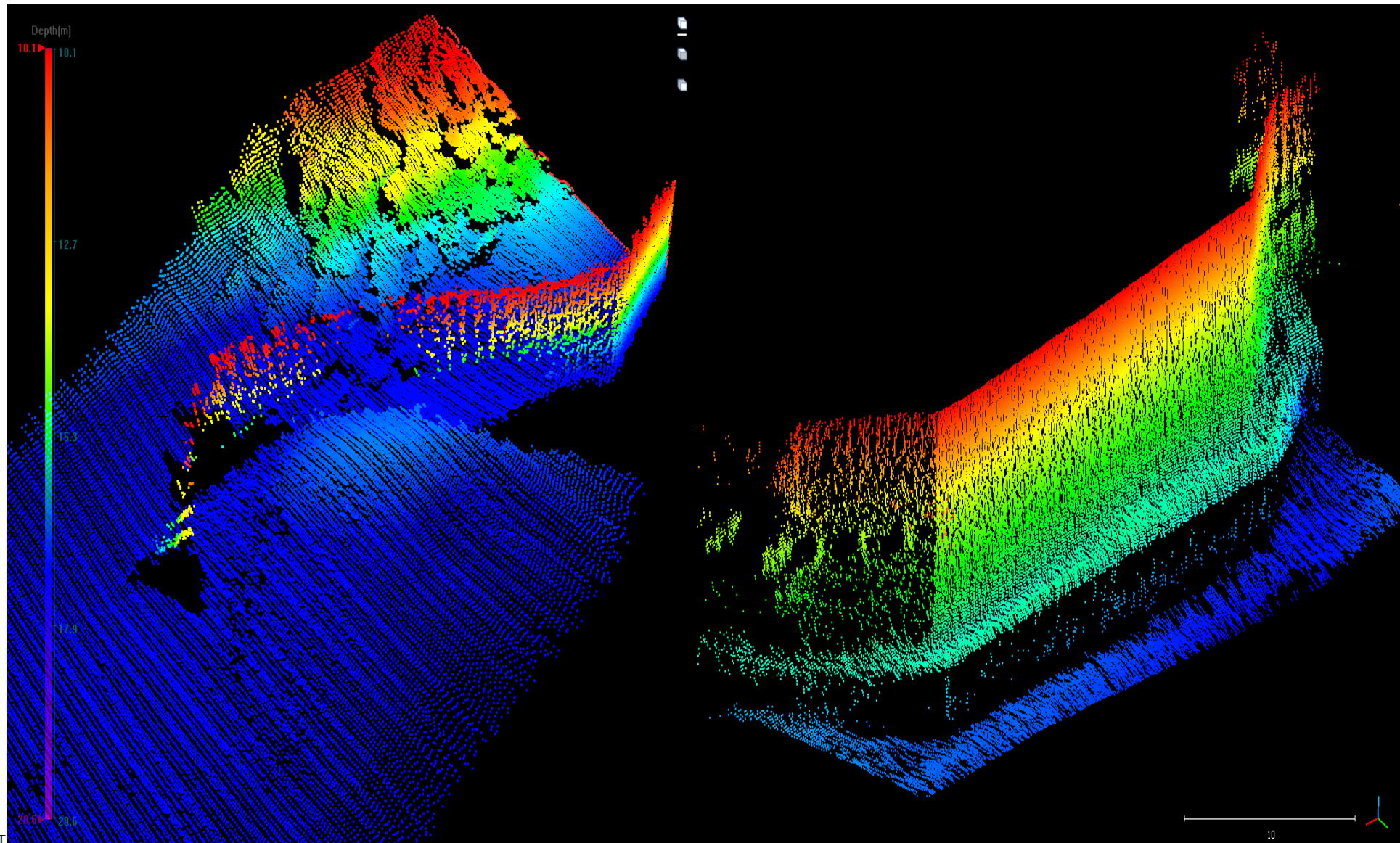
Inland Waterways

- Lock and canal bathymetric survey
 - Manned or unmanned bathymetric survey
- Lock and canal infrastructure inspection
 - Hi-res and multibeam sonar with USM pole mount
- Environmental monitoring of at-risk species
 - EK80 real-time turbidity monitoring with MARPO-Dredger software
- Real-time monitoring of lock doors
 - DAS with K-Observer
- Hull inspection for maritime security of critical commerce routes



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REAL – TIME 3D POINT CLOUD



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13.06.2022

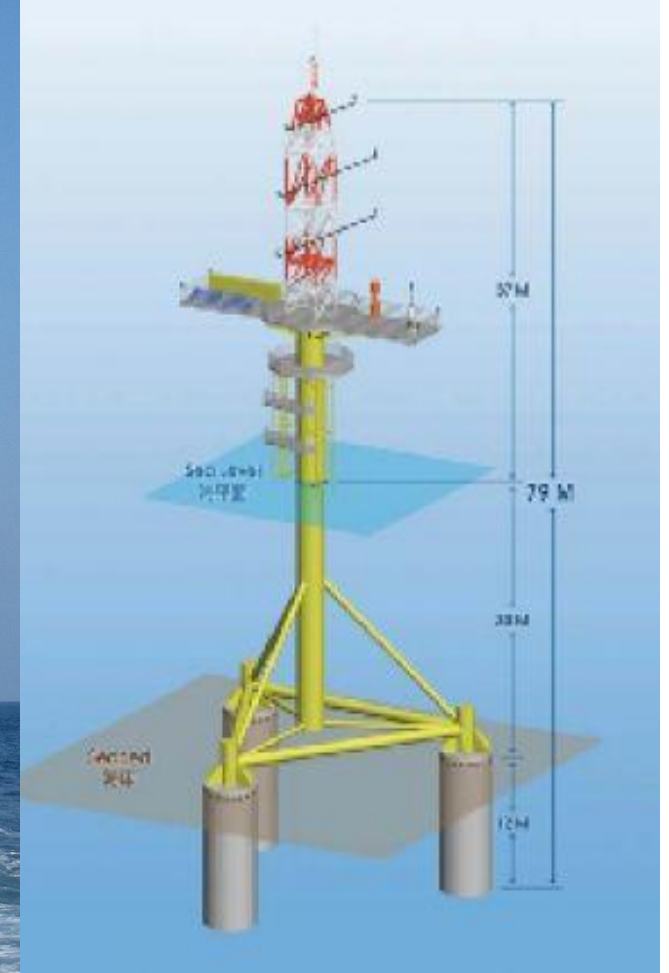
WORLD CLASS – through people, technology and dedication

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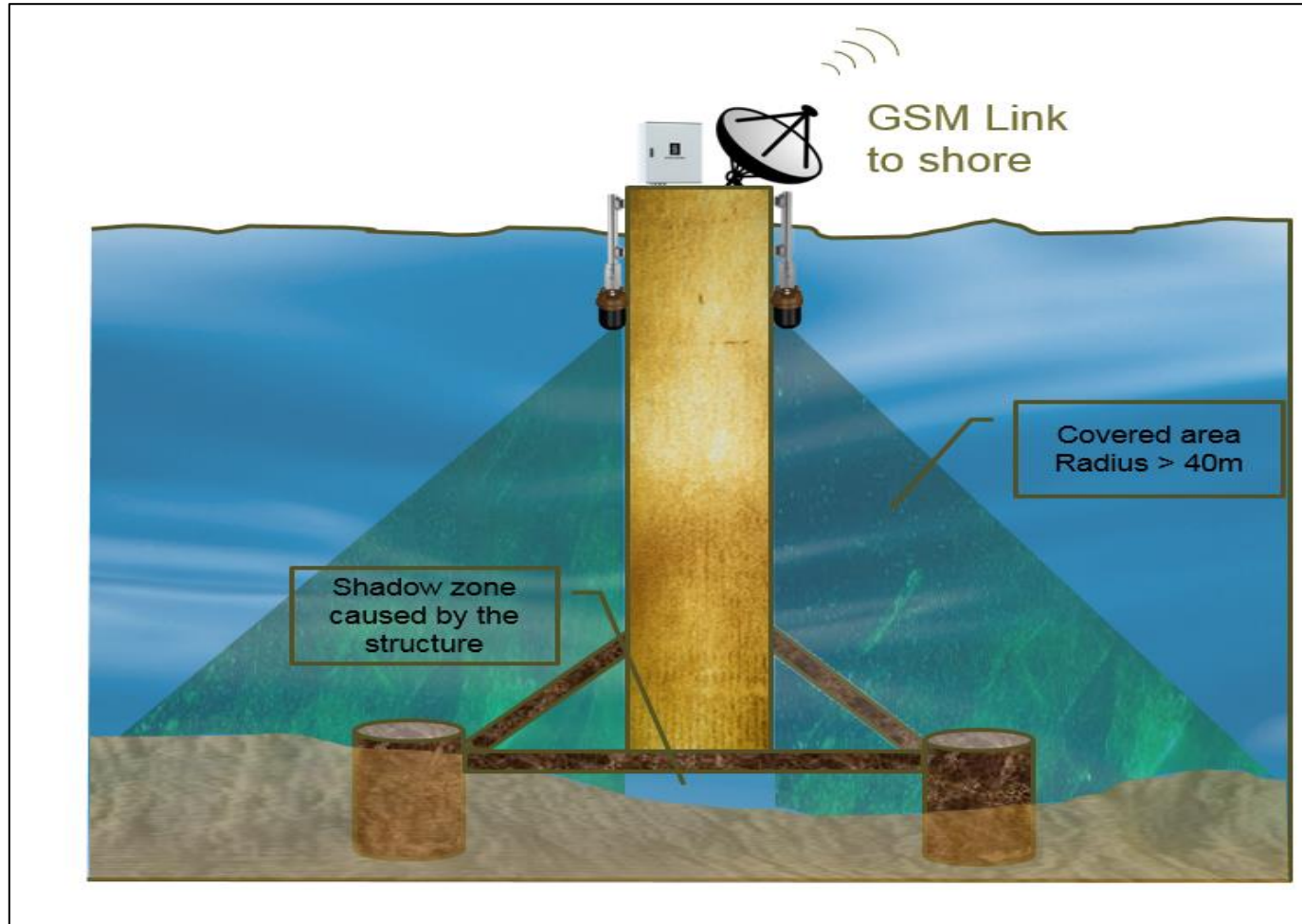
Scour Monitoring System





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Set-up with 2 Dual Axis Scanning Sonars





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