RBR

Welcome, the RBR Webinar will begin shortly…

RBR

rbr-global.com

Product Overview:
RBR Options for Hydrography

Stef Stimson

Business Development Manager (Asia-Pacific)

Loggers

OEM

Sensors

Systems

RBR

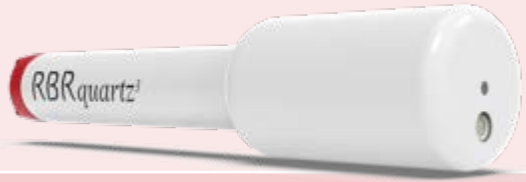

RBRmaestro³
RBRconcerto³
RBRconcerto³
RBRbrevio³
RBRsolo³
RBRcoda³

RBR


RBRcervello
RBRsolo
RBRduet
RBRvirtuoso
RBRduo
RBRconc
RBRfermata
RBRfermette
RBRssm
RBRquartz
RBRconcerto
RBRmaestro
RBR

Water Level / Tides / Waves : Loggers

Compact	Standard	Quartz
Ideal when instrument size is critical Lowest running costs	Ideal for very long deployments	Ideal for high resolution Ideal for wave deployments beyond 50m
RBR*solo*³ D RBR*solo*³ D|tide16 RBR*solo*³ D|wave16	RBR*virtuoso*³ D RBR*virtuoso*³ D|tide16 RBR*virtuoso*³ D|wave16	RBR*quartz*³ Q
RBR*duet*³ T.D RBR*duet*³ T.D|tide16 RBR*duet*³ T.D|wave16	RBR*duo*³ T.D RBR*duo*³ T.D|tide16 RBR*duo*³ T.D|wave16	RBR*quartz*³ BPR RBR*quartz*³ BPR|zero



Options : Titanium (1,000 to 10,000m range)

8, 16 and 32Hz sampling

standard (~1s) or fast (~0.1s) thermistor

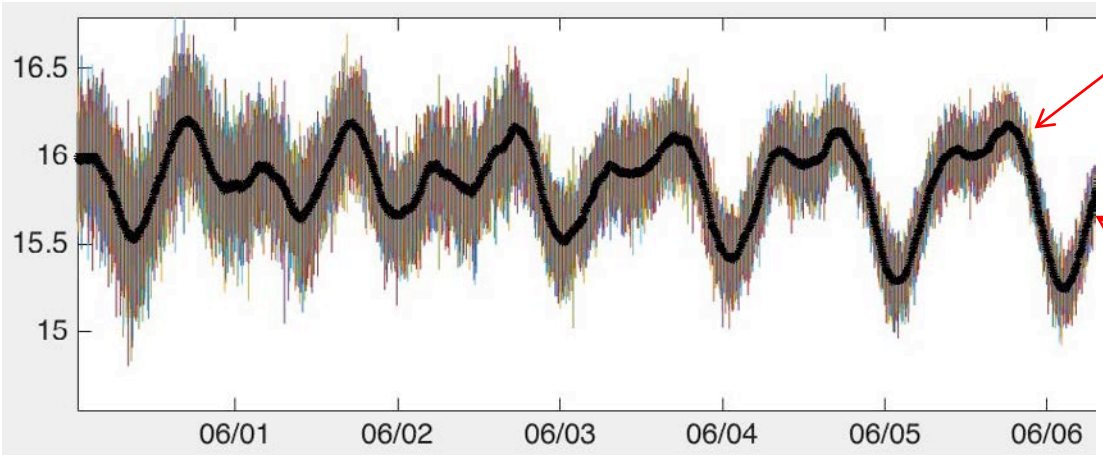
RBR

Water Level / Tides / Waves : Specs

Compact 	Standard 	Quartz 
1 x AA Battery	8 x AA Battery	8 x AA Battery (BPR req. Ext Pwr)
~60M Readings	~240M Readings	~240M Readings
0 to 20 / 50 / 100 / 200 / 500 / 750m 0 to 1,000 / 2,000 / 4,000 / 6,000 / 10,000m		Q: 0 to 10 / 20 / 55 / 125 / 190 / 260 / 330m BPR: 0 to 1,350 / 2,000 / 4,000 / 7,000m
-	Twist Activation	Twist Activation (Q only)
-	External Connectivity Available	External Connectivity Available
-	Wi-Fi Available	
±0.05% Accuracy / ±0.001% FS		±0.01% Accuracy / 10ppb @ 1Hz
Example 1: Continuous @ 1Hz = > 1 year		~1 month*
Example 2: Tide: 1min samples @ 1Hz every 5mins = ~5 years		~5.5 months*
Example 3: Waves (4096 burst @ 4Hz /hr) = >6 months (solo) / ~2.5 years (virtuoso)		~3 months*

* Ext. power recommended for most deployments

D



All data is saved

Post processed for averaging

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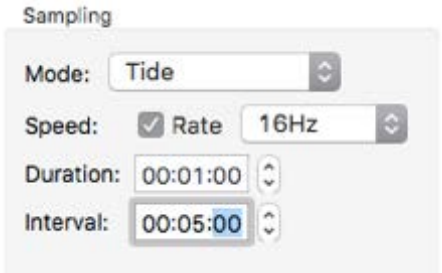
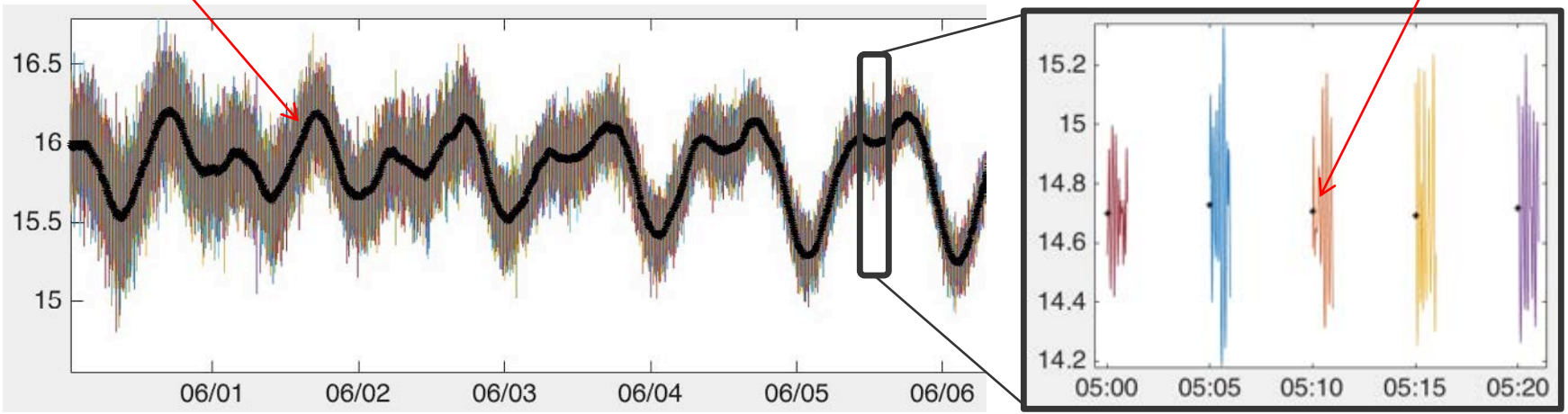
D|tide16



Filter out higher frequency variation

Only averaged data is saved



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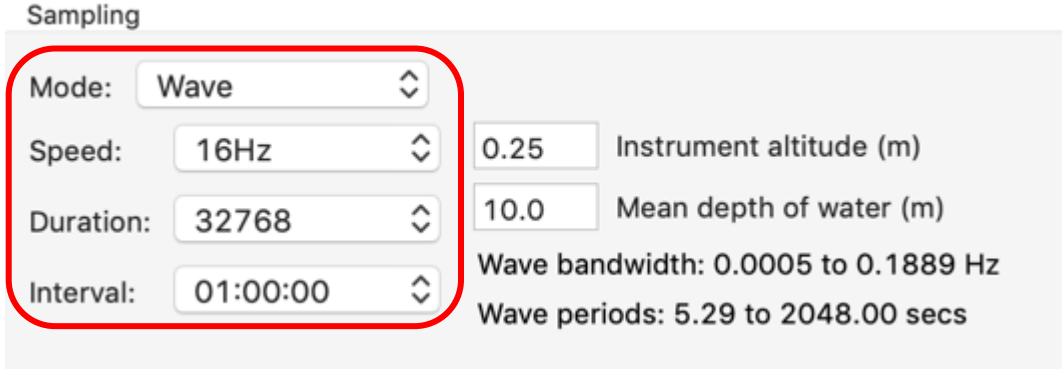
D|wave16

Wave
“Burst”
Sampling

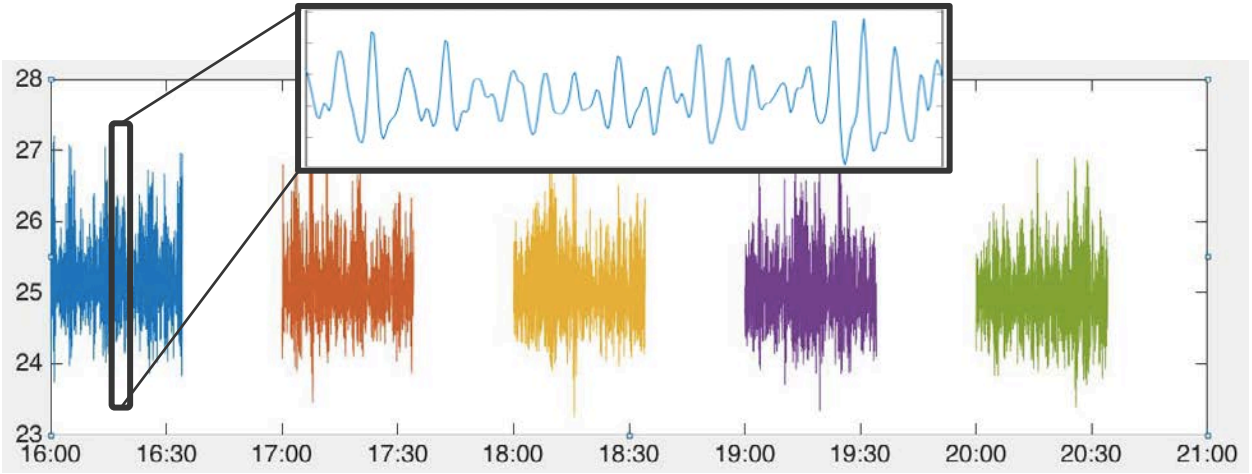


~34 min

Every

1 hour

(32768 ÷ 16 ÷ 60)



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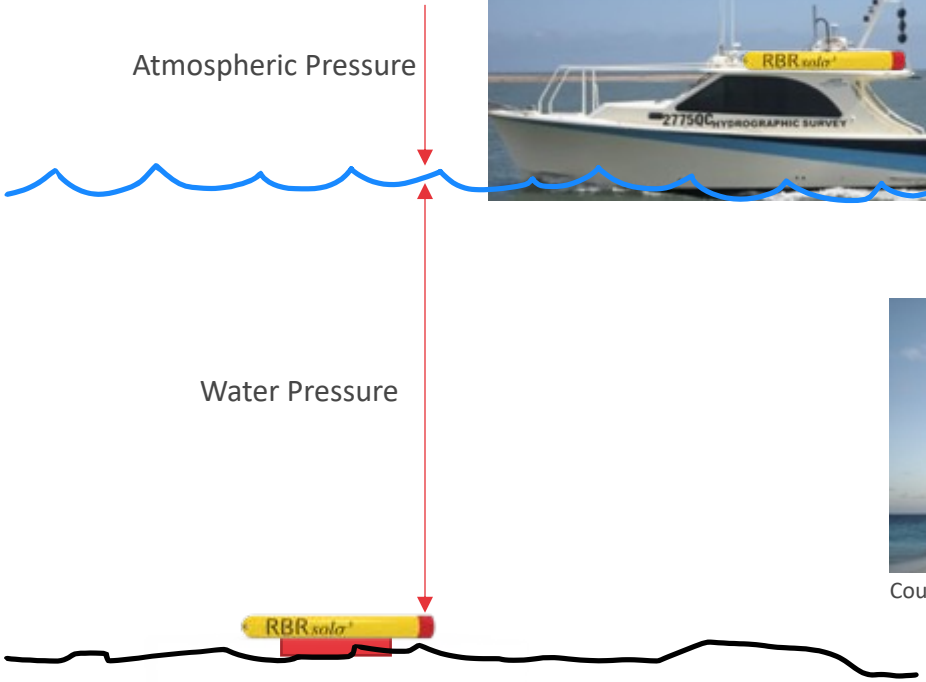
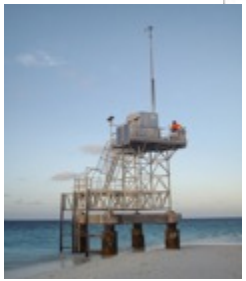
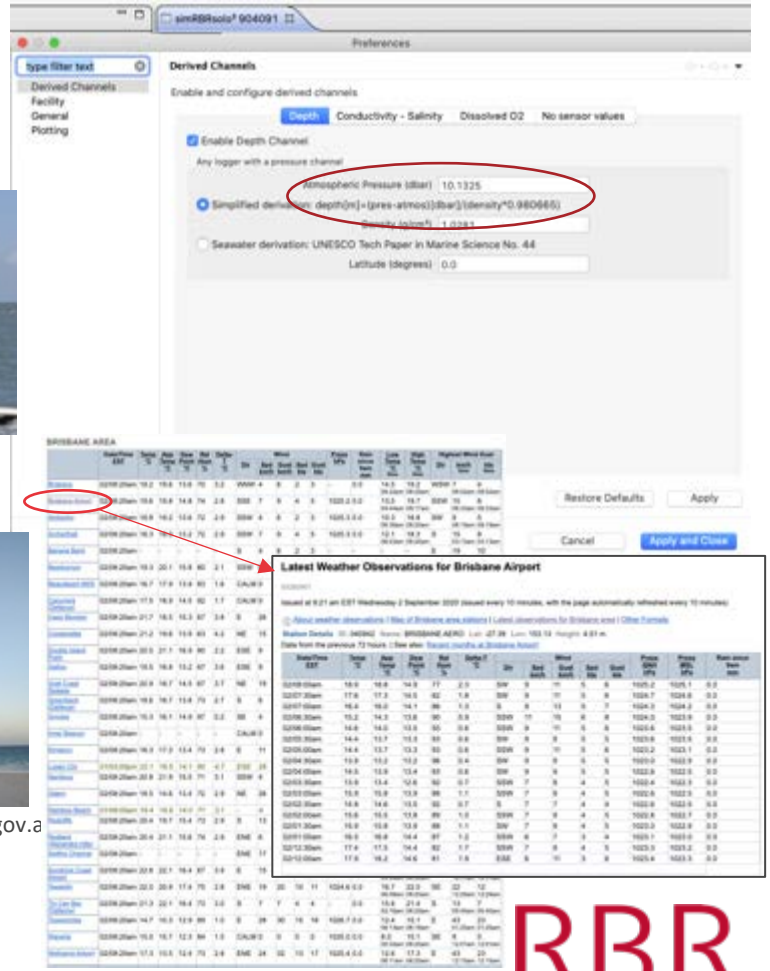
Pressure Based Tides

Water Level = Pressure Recorded – Atmospheric Pressure





Courtesy www.bom.gov.a



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TGR-1050P…….Purchased in 2008!!

Logger 21097 data:

<5mm since cal 2+ yrs

and 12 years old!!

RBR

Speed of Sound: CTD

Sensor	Accuracy
Conductivity	±0.003 mS/cm
Temperature	±0.002°C
Depth	±0.05% FS

RBR*concerto*³ C.T.D

240 million readings, up to 32Hz sampling

Available configurations: RBR*concerto*³ C.T.D|fast8, RBR*concerto*³ C.T.D|fast16, RBR*concerto*³ C.T.D|fast32

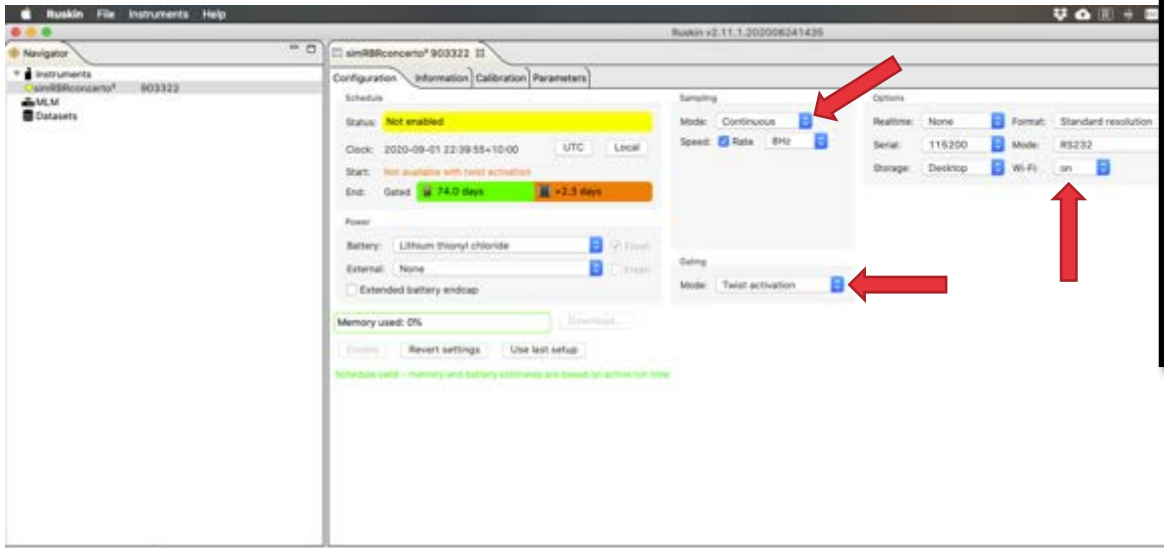
750m, 2000m, and 6000m ratings

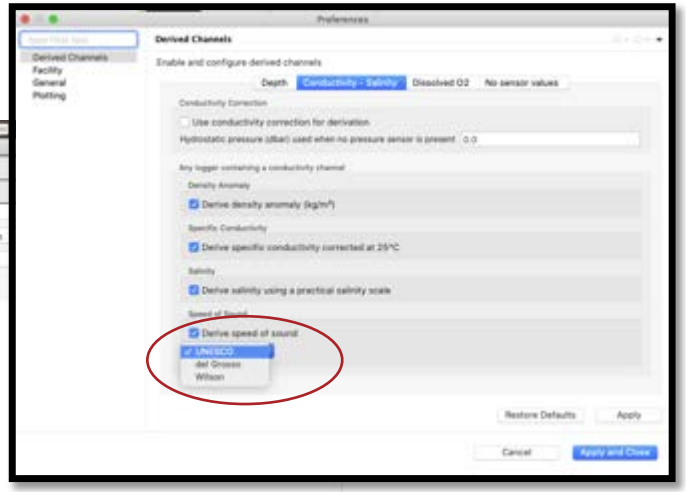
USB-C download

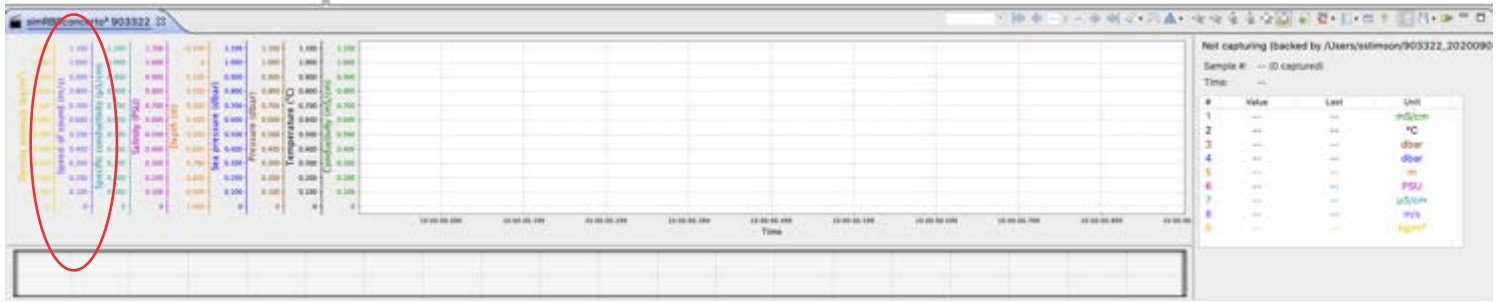
Twist Activation and Wi-Fi

RBR

Speed of Sound: CTD







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RBR*concerto*³ C.T.D+

240 million readings

Up to 5 channels combinations: T.ODO, Fl, Tu, pH, PAR, ORP, etc…

750m, 2000m, and 6000m ratings

USB-C download

Twist Activation and Wi-Fi

RBR

RBR*maestro*³

240 million readings

Up to 10 channels combinations: T.ODO, Fl, Tu, pH, PAR, ORP, etc…

Bulkhead-mounted and cable-connected sensors

USB-C download

Twist Activation and Wi-Fi

RBR

RBR*brevio*^{3} C.T.D

Shorter housing with 4 AA batteries

Internal logging, Wi-Fi enabled, or integrated with vehicle control system

Available configurations: RBR*brevio*^{3} C.T.D|fast16, RBR*brevio*^{3} C.T.D|fast32, RBR*brevio*^{3} C.T.D|deep

750m, 2000m, and 6000m ratings

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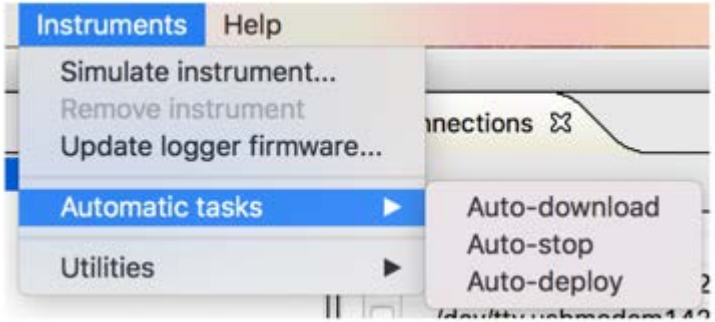
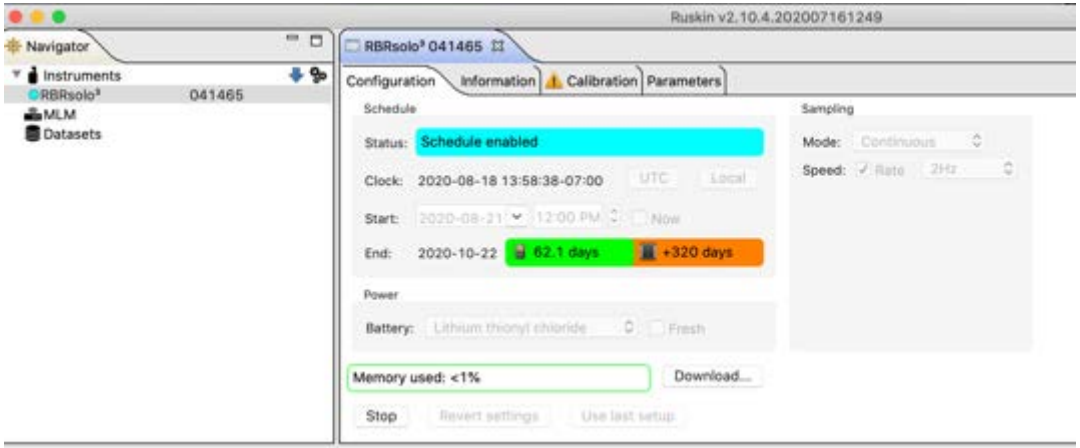
Top Tip#1 : Auto Deploy and Auto Download





Past Webinars - https://rbr-global.com/about-rbr/webinars

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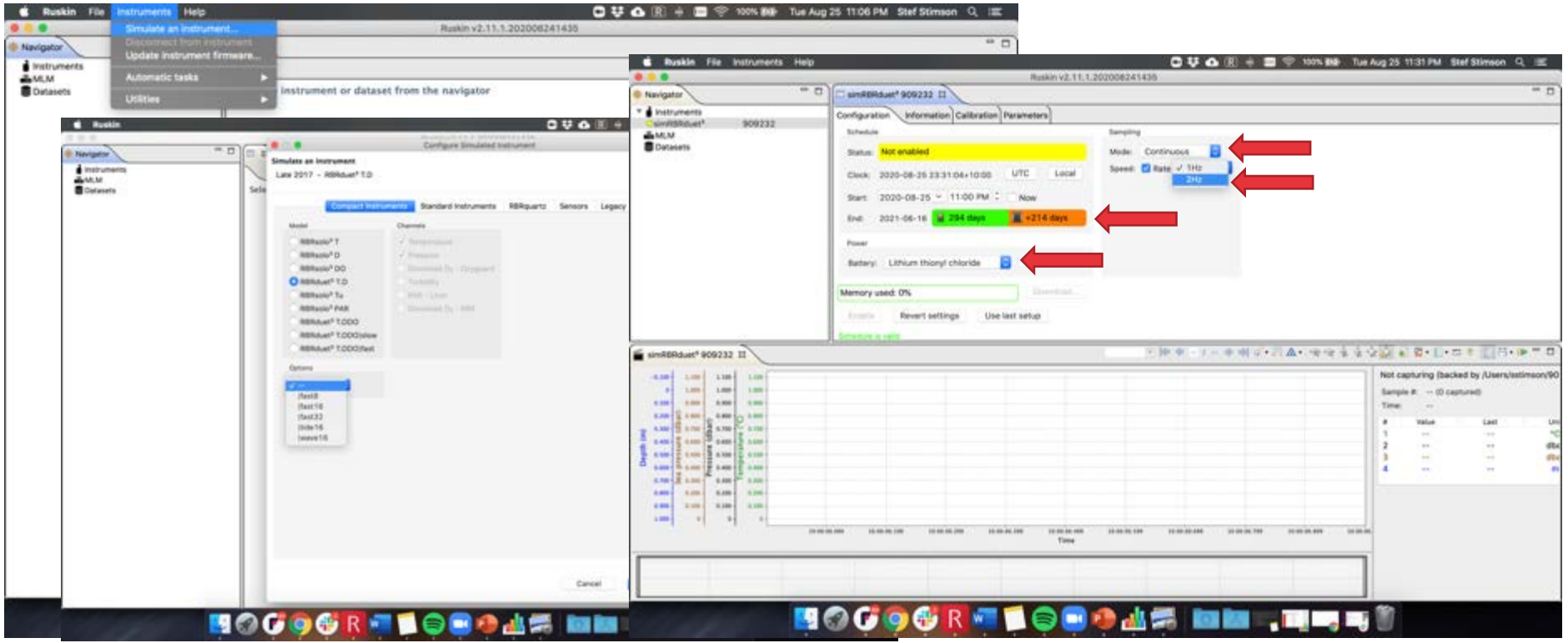
Top Tip#2 : Using Ruskin As A Planning Tool



Surf zone monitoring at the Palm Beach artificial reef using nine RBRduet T.Ds

Evan Watterson (Bluecoast Consulting Engineers)

[Past Webinars - https://rbr-global.com/about-rbr/webinars](https://rbr-global.com/about-rbr/webinars)

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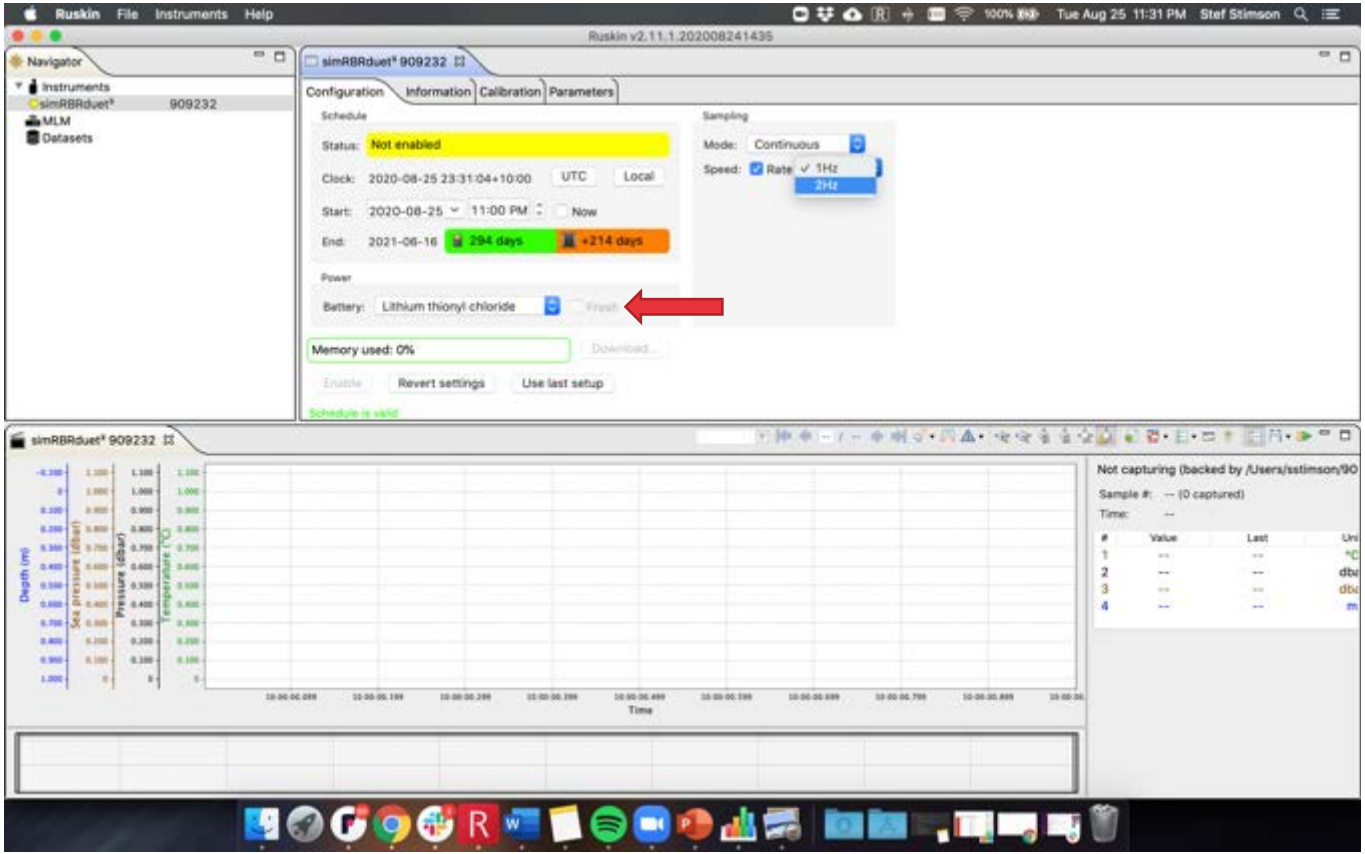
Top Tip#3 : Fresh Battery



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Upcoming Webinars

Future Webinars

Chronicling seasonality in Beaufort Sea Lagoons

Christina Bonsell (University of Texas)

September 9, 2020 at 12PM EST (GMT-4)

Wave processes on coral reefs and the impact of sea level rise on atoll islands

Eddie Beetham (Tonkin + Taylor)

September 10, 2020 at 11AM AEST (GMT+10)

[Past & Future Webinars - https://rbr-global.com/about-rbr/webinars](https://rbr-global.com/about-rbr/webinars)

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Thank You

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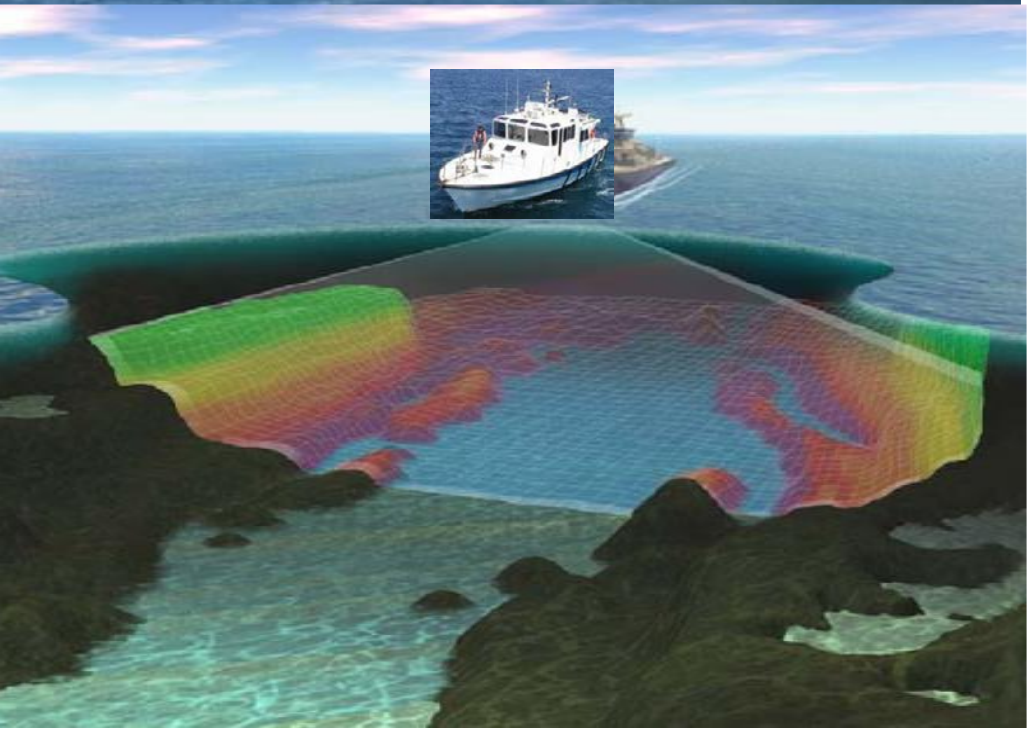


PORT of BRISBANE
Here for the future

RBR Webinair

Tidal Measurements to Support Hydrographic Surveys within the Port of Brisbane and throughout Queensland Waters.

3rd September 2020

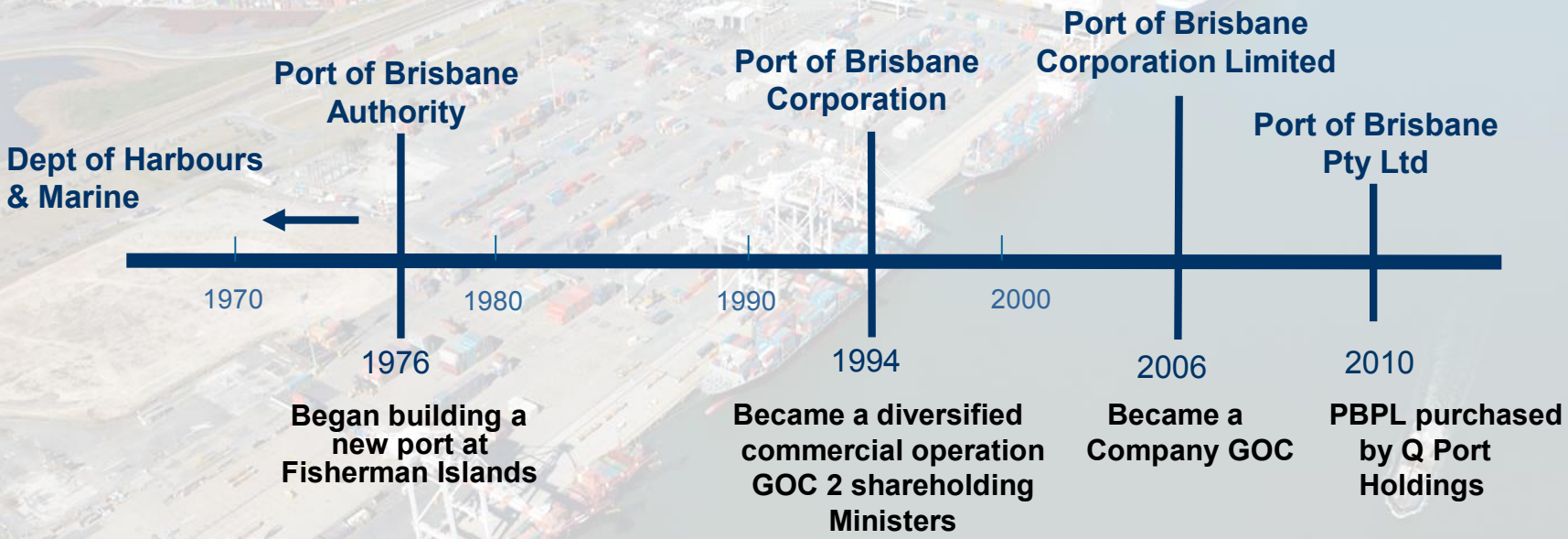
Presented by Giles Stimson
Manager Hydrographic Surveys

Something you didn't know about me??

- I attended the most expensive birthday party to date!

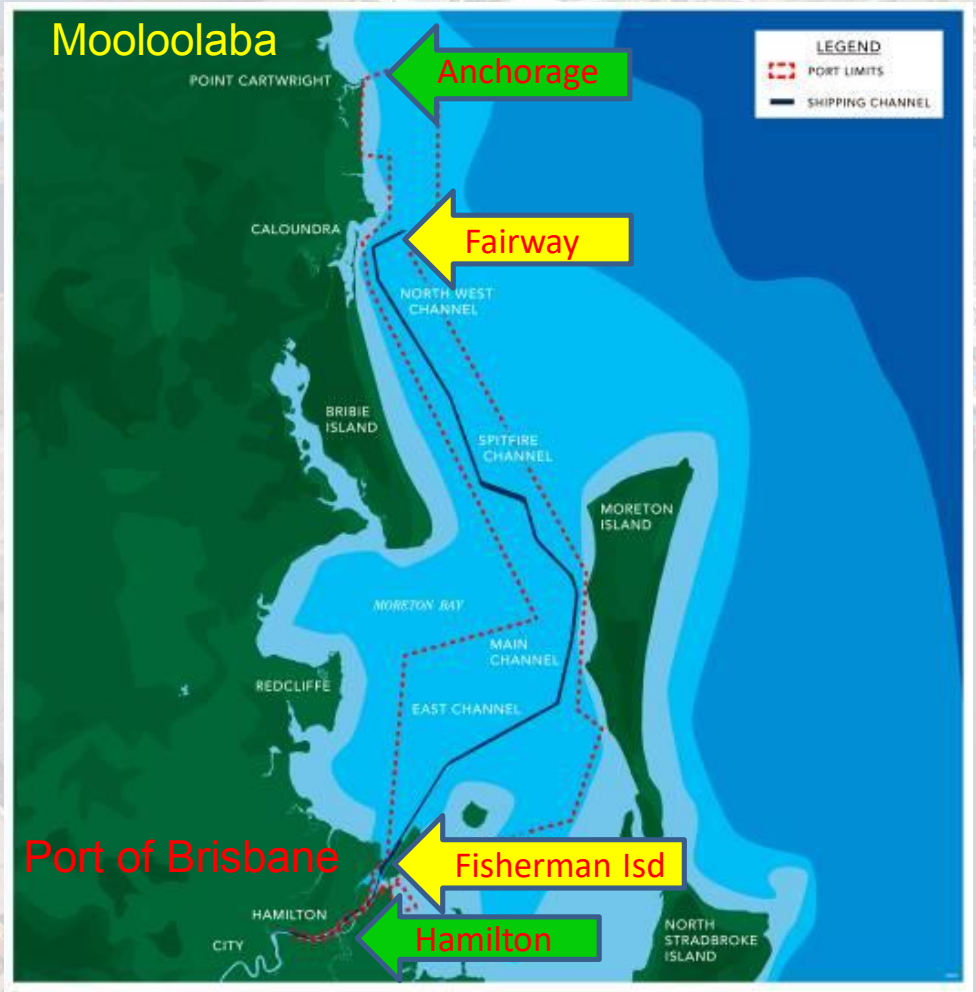
- In 1996, whilst working as the Principal Land and Hydrographic Surveyor during the construction of Sultan of Brunei's Marina complex, to berth the royal family's fleet of Mega Yachts, my family and I were invited to several functions, over a 2 week period, to celebrate the Sultan's 50th birthday.

The Port of Brisbane Pty Ltd - Our History



PORT of BRISBANE
Here for the future

Our Boundaries



- 96km shipping channels
- 16km up Brisbane River to Breakfast Ck
- 30km Pilot Boarding Area & Anchorage
- 2,000ha of core port land > 500ha spare
- 7.5km of berths plus >2.5km spare
- Area of land at Fisherman Islands 700ha
- Future Port Expansion area 230ha

PORT of BRISBANE
Here for the future

Imports and Exports

- **Over 6,000 shipping movement per year**
  - Tankers (oil) 43% of the Ports trade is oil
  - Import crude and export refined product
  - Containers (1,000,000 Teus)
  - Dry bulk (grain, coal)

Total international trade worth over $48.4 billion per year.

PORT of BRISBANE
Here for the future

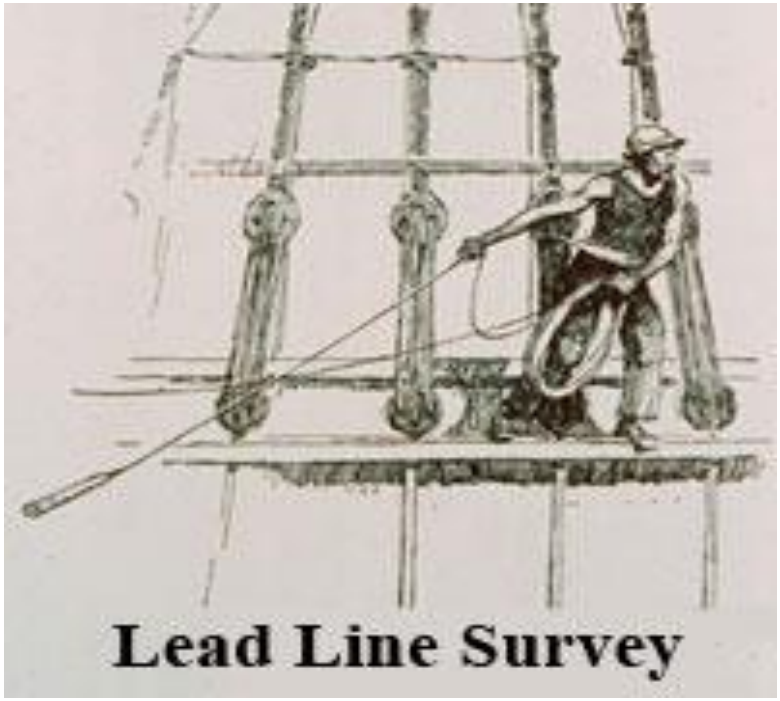
Port Surveys - Responsibility

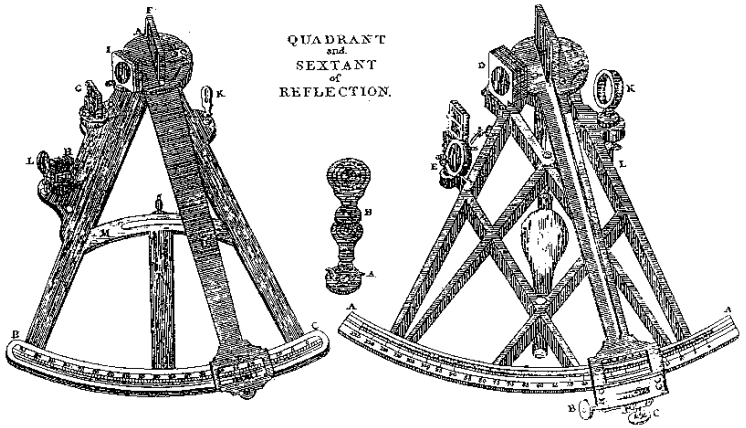
•Team of 8 Qualified Hydrographic Surveyors

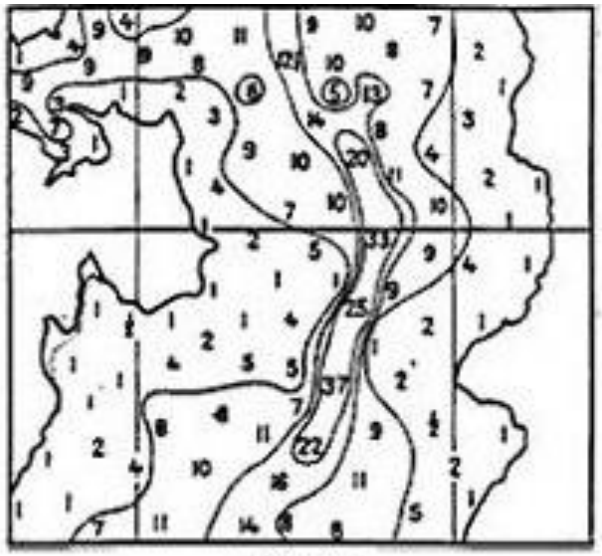
- Safety of Navigation – All vessels-large and small
- Port Maintenance - 38 deep water berths -15m+
- 96kms Channels operating UKC.

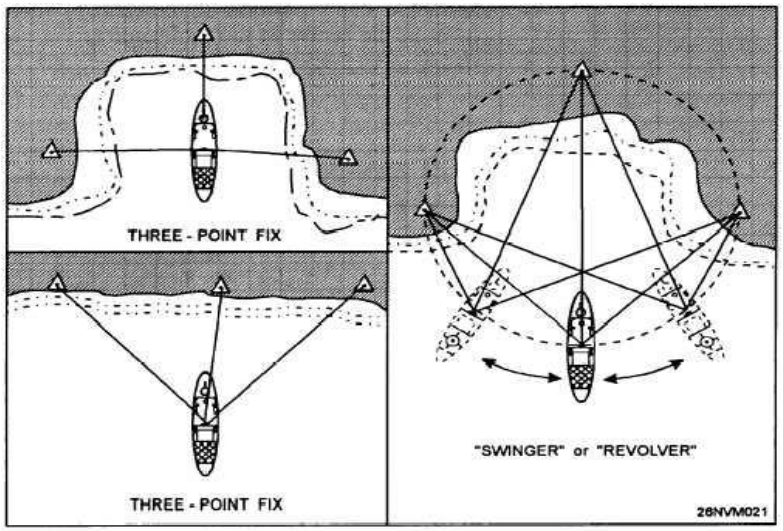
•16kms Tidal River Reaches.
•Berth & Channel Maintenance & Development.
•Major Port Infrastructure Projects – Expansion.
•Monitoring and Technical Support – Dredge Fleet.
•Liaise and advise Harbour Masters, Pilots, Consultants, Premier's Office, Government Agencies & Port Stakeholders.
•External Clients – Revenue.
•Assist with the Dredge Maintenance and surveys of Queensland's Major Ports.
•All surveys carried out in accordance with Maritime Safety Queensland (MSQ) Standards for Hydrographic Surveys within Queensland Waters and in accordance with the International Hydrographic Organisation's (IHO) Standards - Special Publication SP44

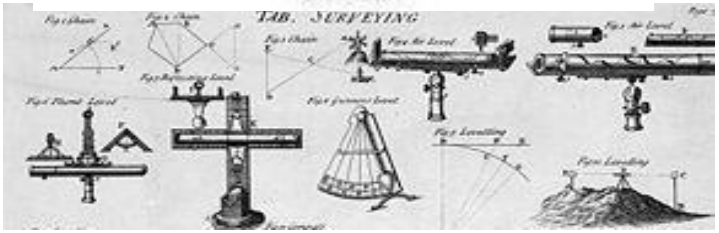
Foundations of Hydrography



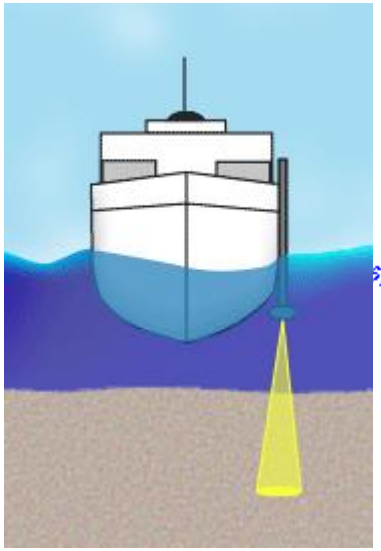


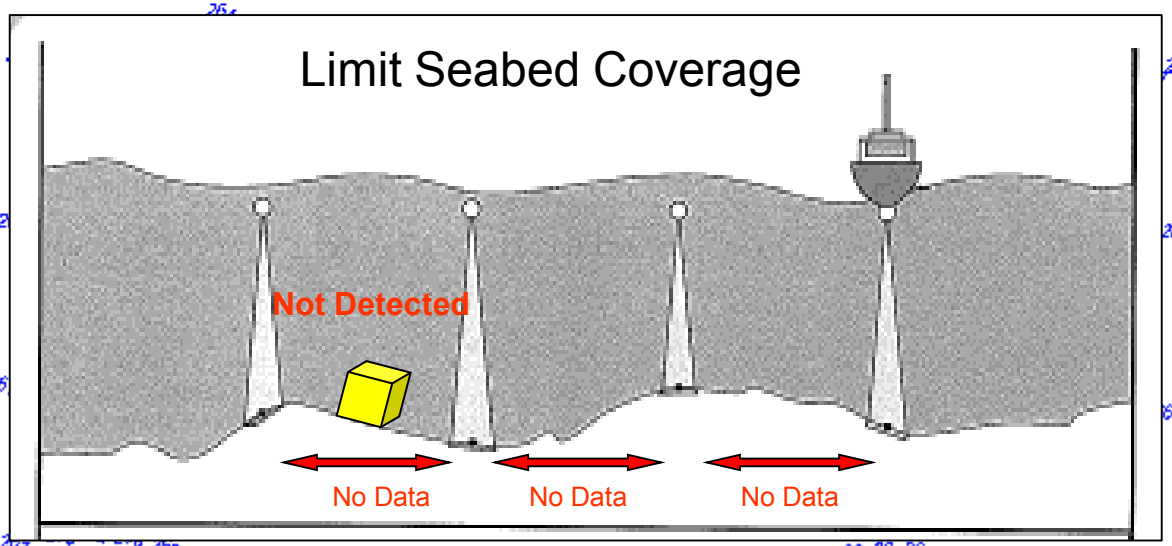




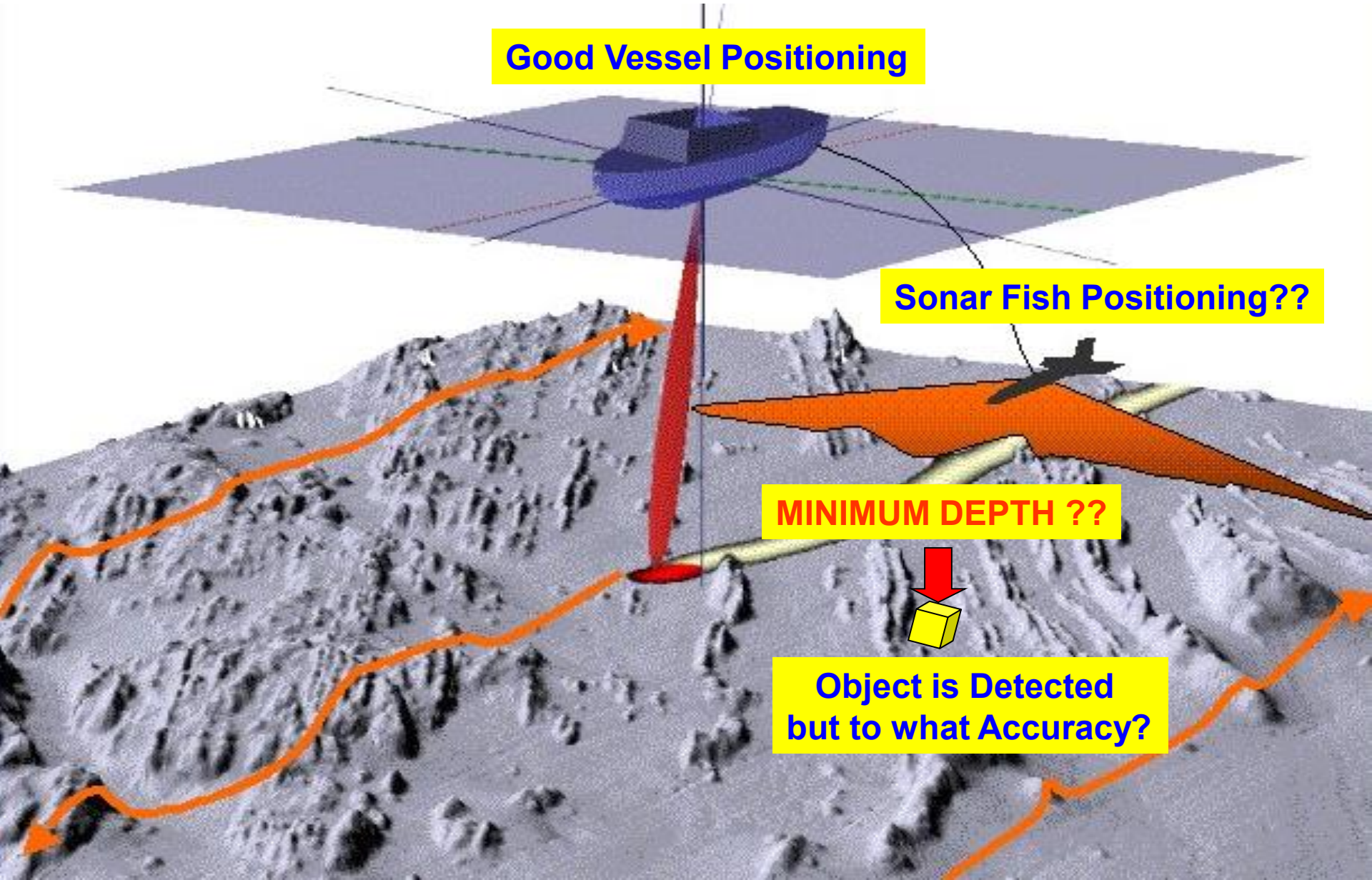


Progression - Single Beam Echo Sounding



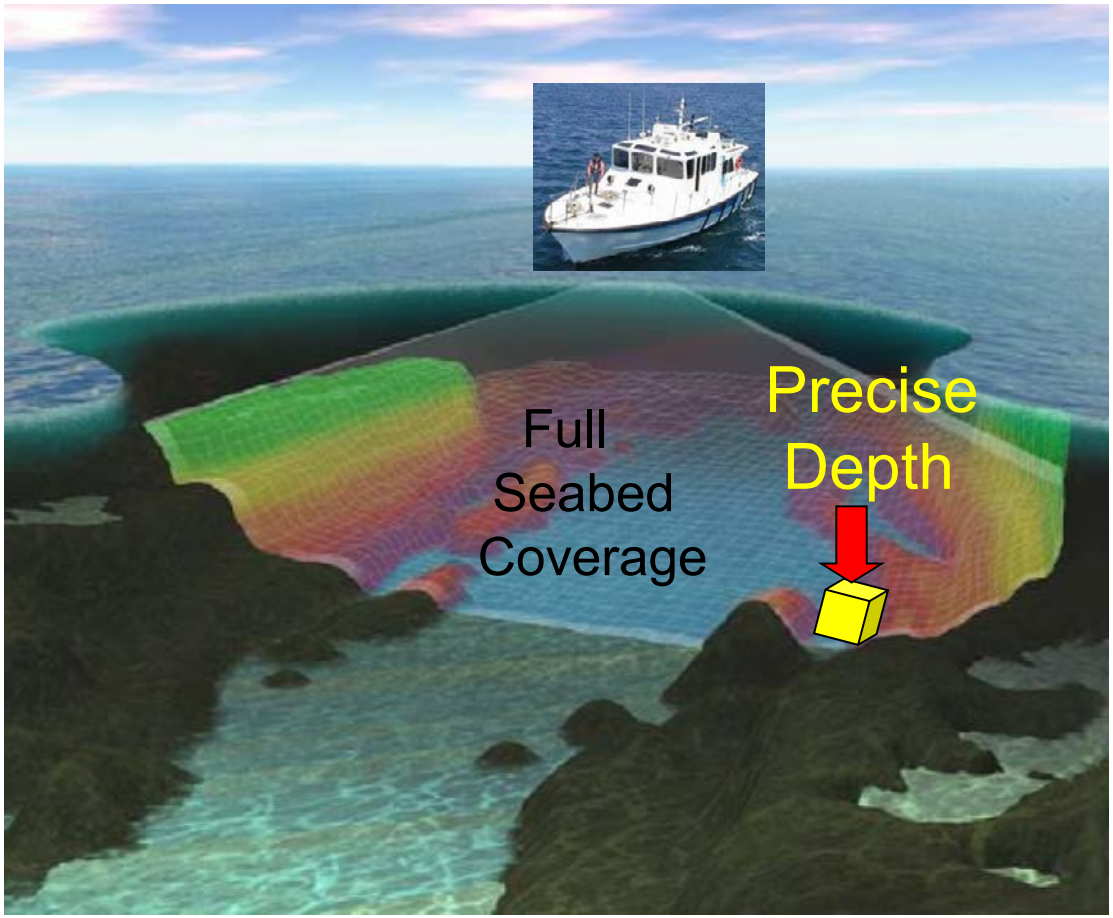


Progression
Single Beam With Towed Side Scan Sonar



Solution?

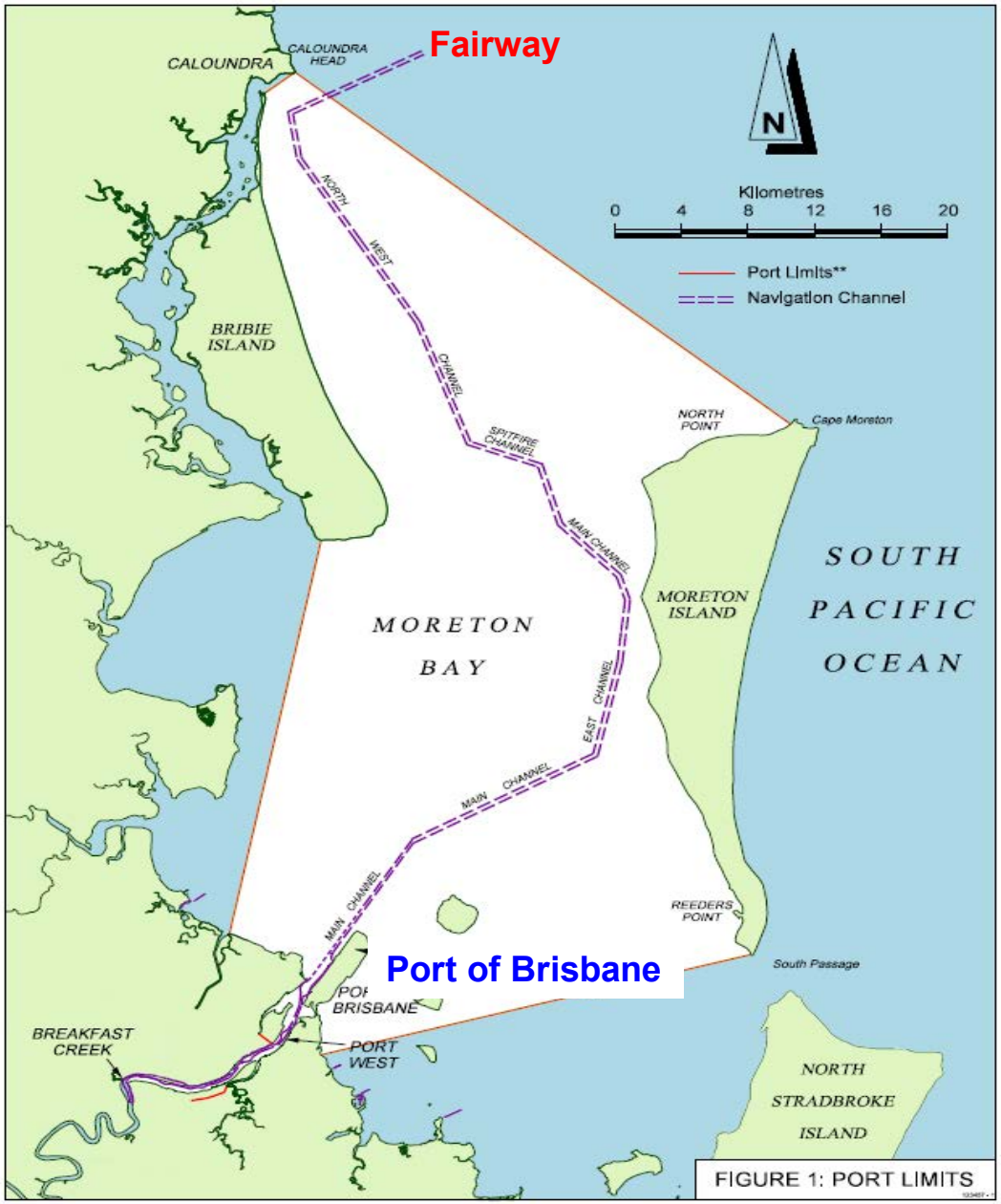
Multibeam Technology



What is Needed to be Measured?

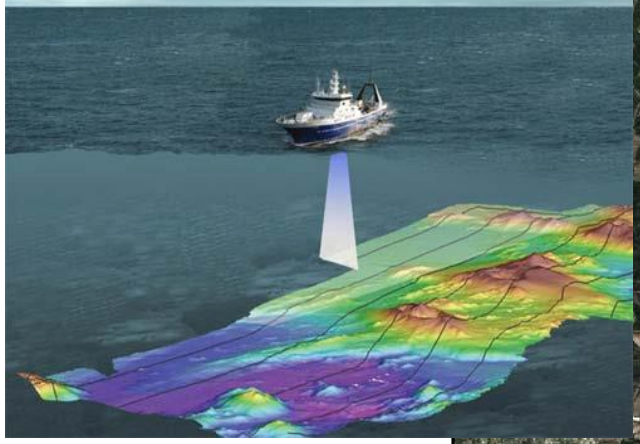
- Precise Vessel's Position
- Precise Vessel's Dynamics (Attitude)
- Factors Affecting the Sonar Acoustics
- Vertical Datum (Changing Tides)

Moreton Bay - Fairway to Port of Brisbane
Approx. 2,400 Sq kms



Main Deepwater Channel & Bay Tide Gauge Network

Hydrographic Surveys



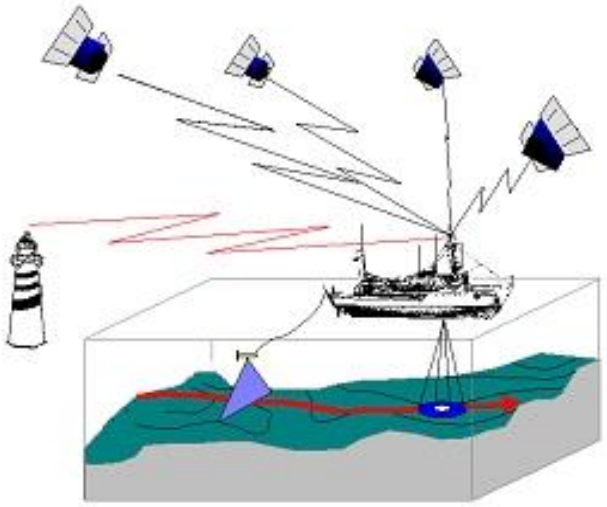
Navigation

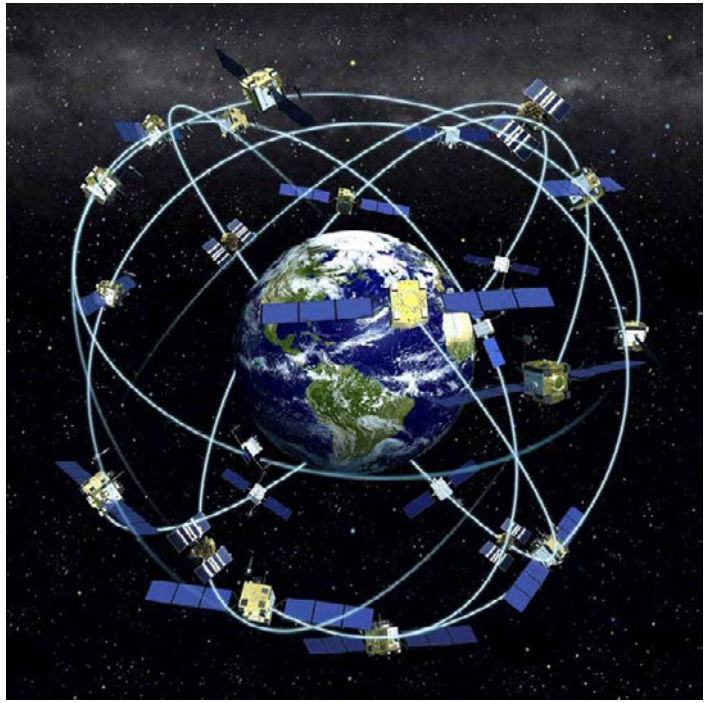
UKC Support

Dredge Support

Precise Positioning Global Navigation Satellite System - GNSS

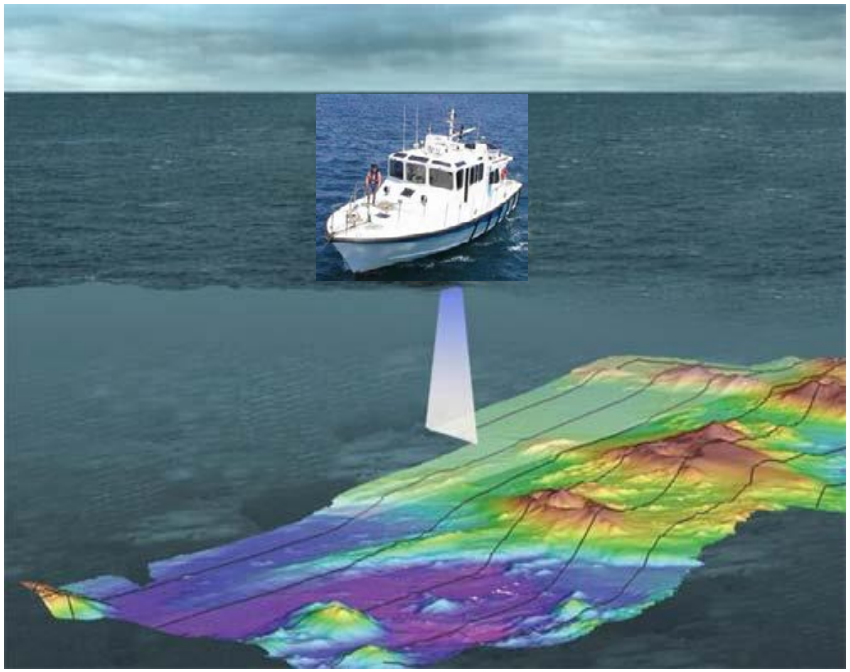
- NAVSTAR Global Positioning System 30+ Satellites
- Galileo, GLONASS, Augmentation System
- Full Real Time Kinematic (RTK GPS)
- Centimetre accuracies essential (X,Y,Z)
- Close Coupled Positioning using Attitude Sensors

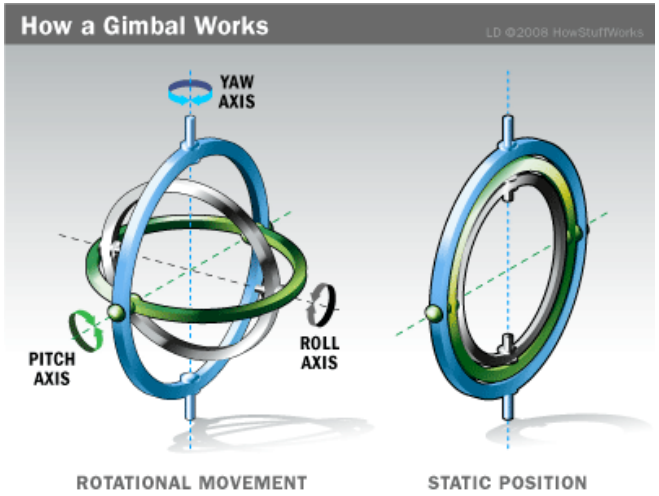


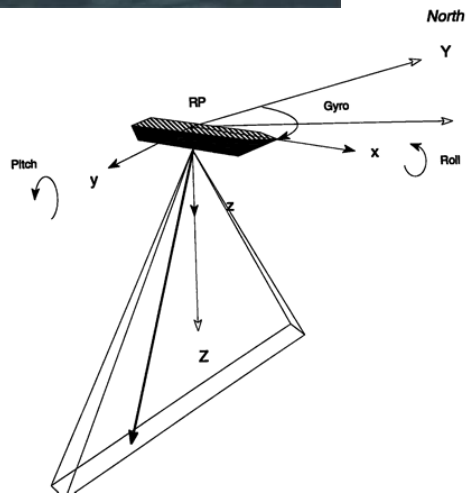


Precise Vessel Dynamics

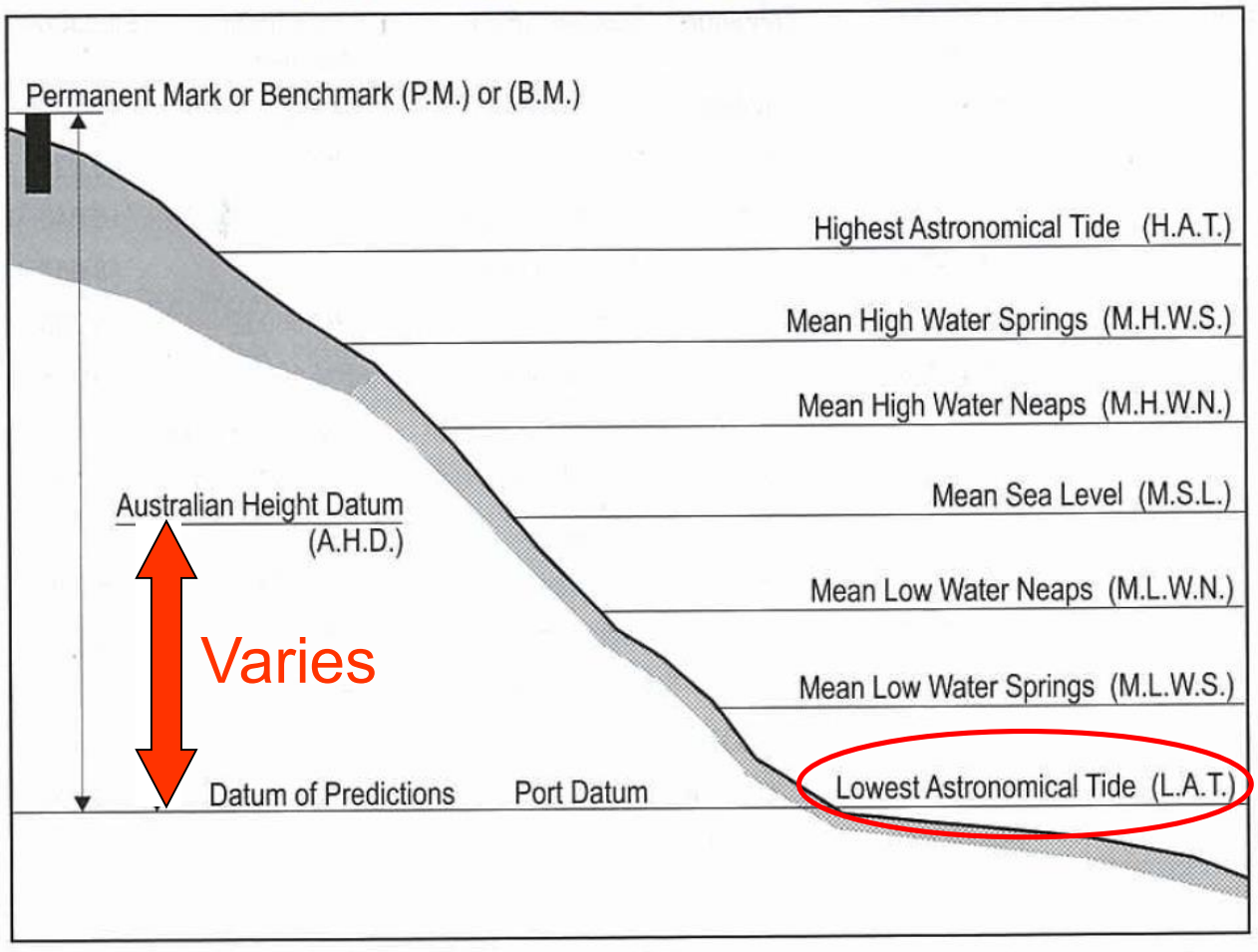
Motion Sensors







Which Vertical Datum?? Area Specific Tidal Reduction



Typical Fixed Tide Station Setup

Portable RBR Tide Gauges

RBR

Portable RBR Tide Gauges – Rapid Response & External Surveys

Portable RBR Tide Gauges – Rapid Response & External Surveys

PBPL Multibeam Systems

3 Ultra High Resolution Beam Focused Sonars

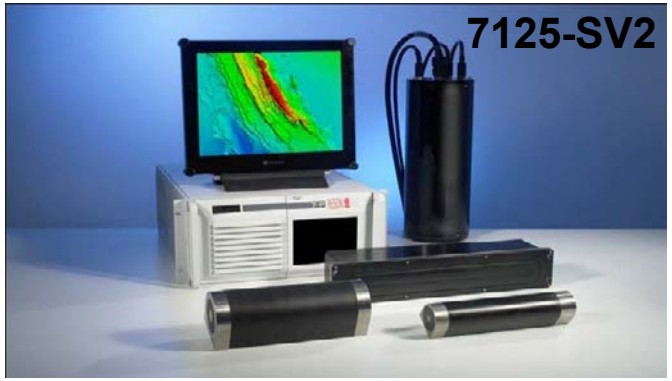
- Reson SeaBat 8125-Hybrid – ‘Navigator’

  - Wide Sector and Wide Band.
  - 455kHz High Frequency System.
  - 256/512 Beams (0.5°) covering a 120° Angle.
  - Pings at 40 Hz = 10,240 Data Point/Second.
  - Sophisticated Motion Sensors
  - Depth Resolution 6mm

- Reson SeaBat T-50P – ‘Jim Peel’

T-50P

  - Latest Sonar/Ceramics Technology.
  - 400kHz High Frequency System.
  - 512 Beams (0.25°) covering a 128° Angle.
  - Pings at 50 Hz = 25,600 Data Point/Second.
  - Equi-distance or Equi-Angle Beam Formations.
  - Sophisticated Motion Sensors
  - Advanced Diagnostic



- Reson SeaBat 7125 SV2

  Dual Frequency sonar on the ‘Investigator’

PBPL Survey Vessels with Multibeam Capabilities

Jim Peel 16m
Reson Seabat T-50P

PBPL Survey Vessels with Multibeam Capabilities

Navigator 7m
Reson Seabat 8125-Hybrid

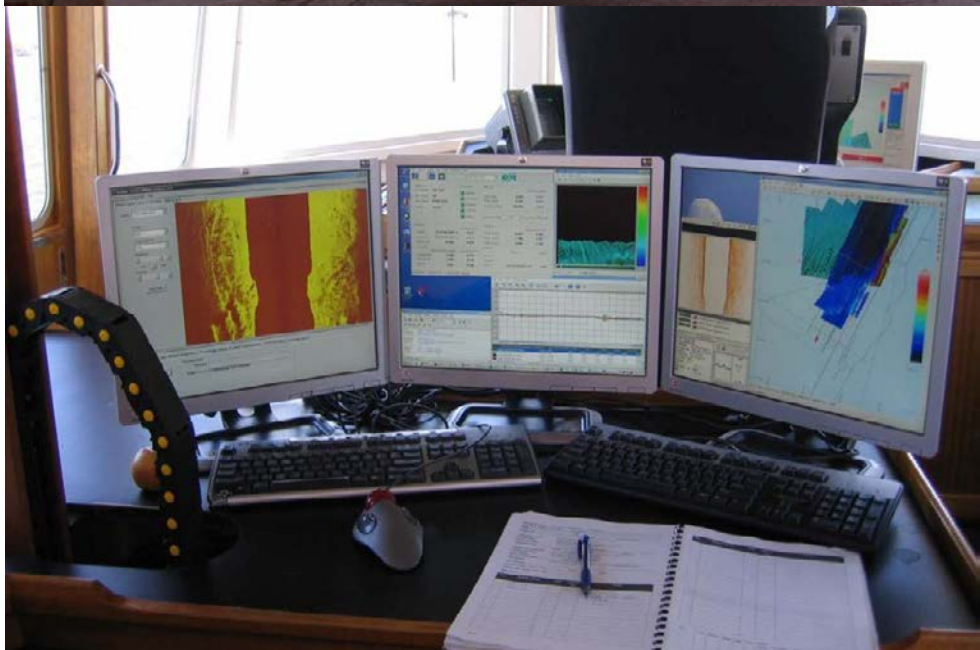
Investigator 10m
Reson Seabat 7125-SV2

Jim Peel - Multibeam System

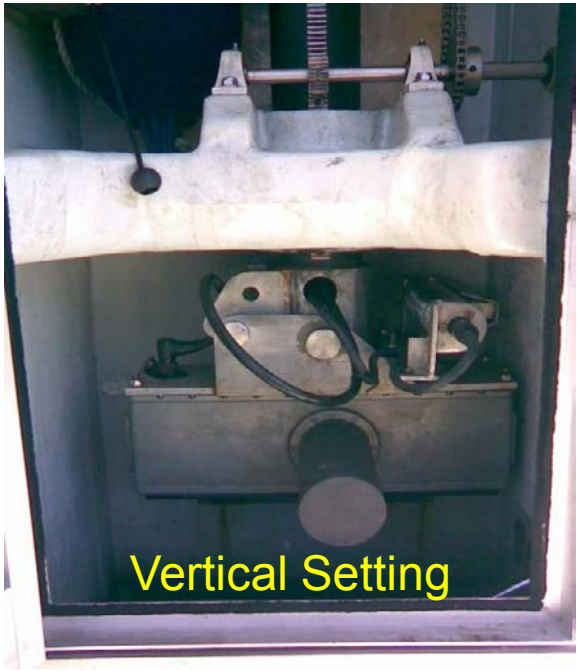
Hull/Moonpool Mounted Transducers

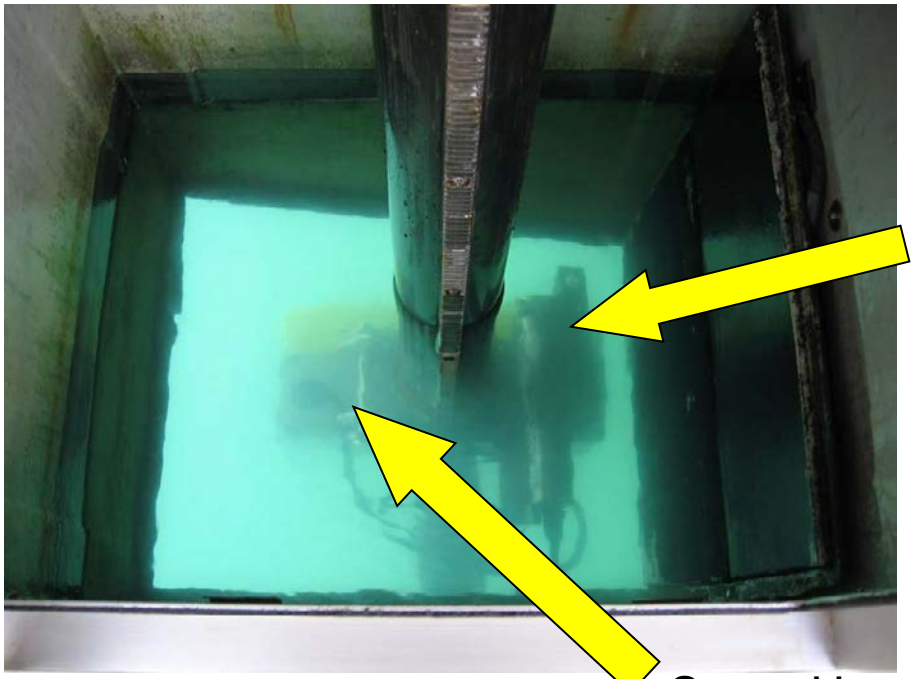
Moonpool Mount

Looking up Moonpool

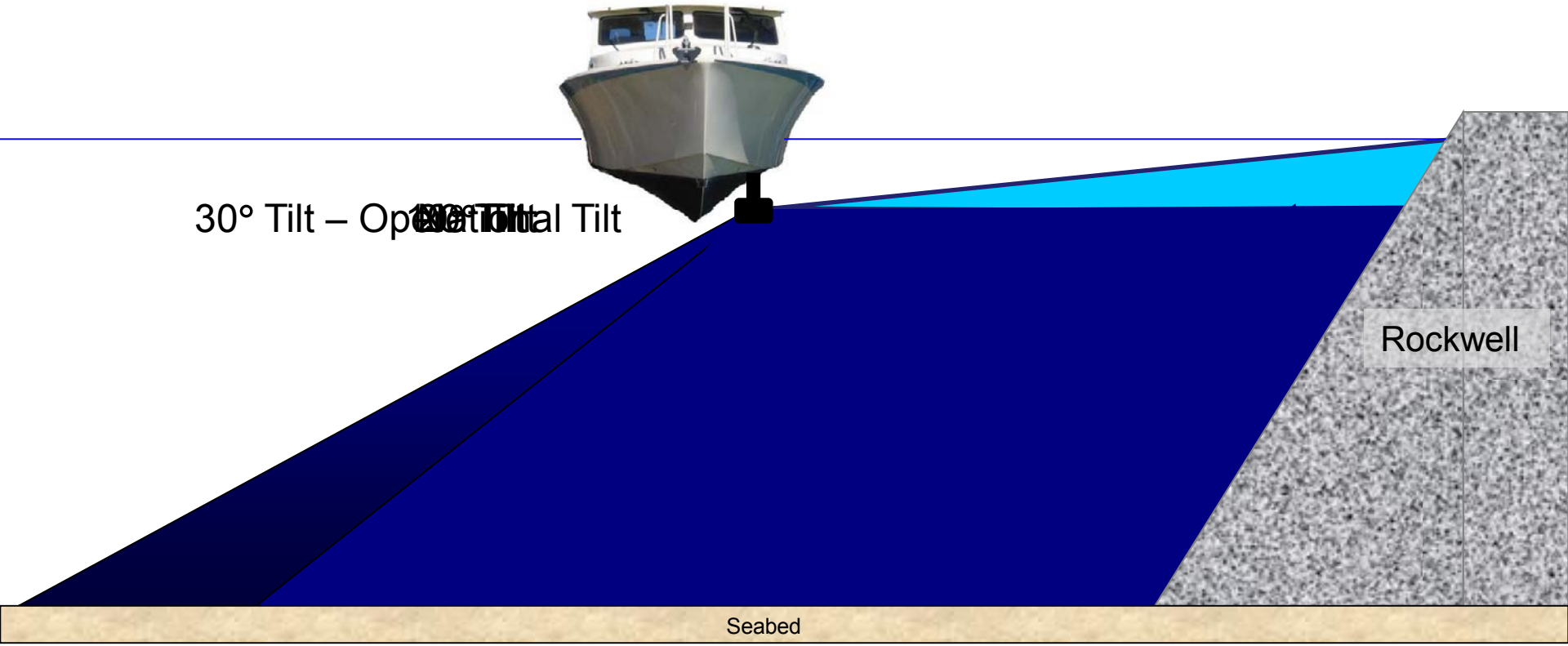


Investigator's 8125 Angled Head Capability





Investigator's Tilted Sonar Coverage



- Operations in Shallow Water (Vessel stays in Deeper Water)
- Reconnaissance in Uncharted Waters (working from Deep to Shallow)
- Charting known Wrecks, Obstructions etc (Charted Positions not Reliable)
- Surveying around Structures (Rock walls, Jetties, Piers etc)

Speed of Sound in Water Variations

C

Sound Speed Profile

Depth

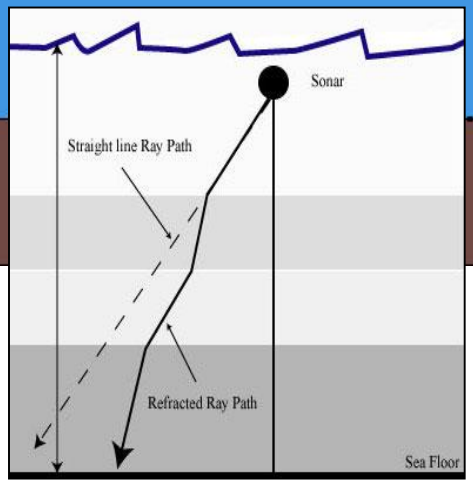
Speed of Sound Dependant on Change in Salinity, Temperature and Pressure

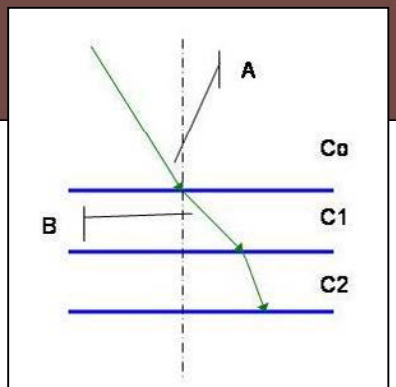
Change in Water Density Refracts the Acoustic Path

Actual acoustic path

Apparent acoustic path

Apparent bottom

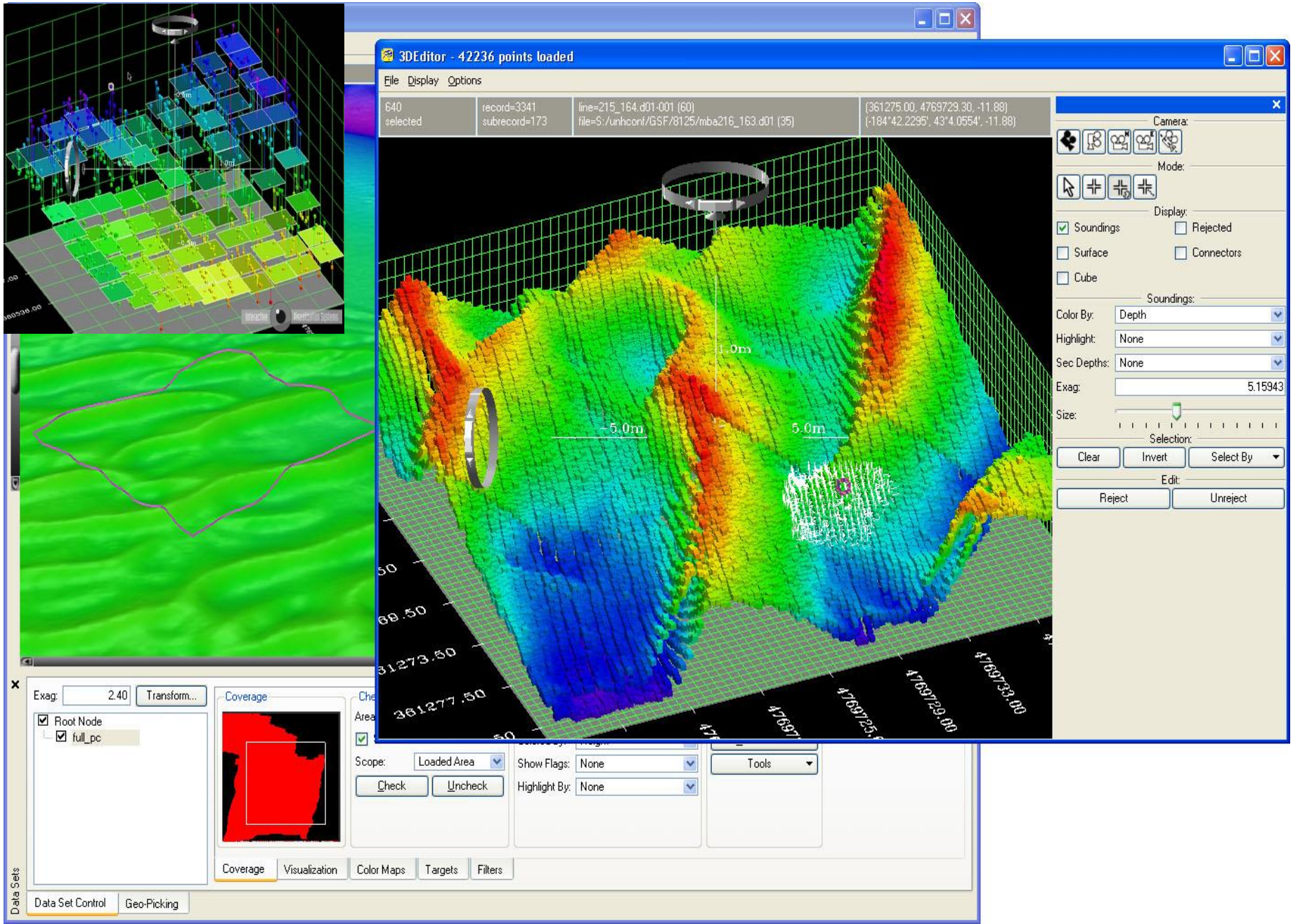




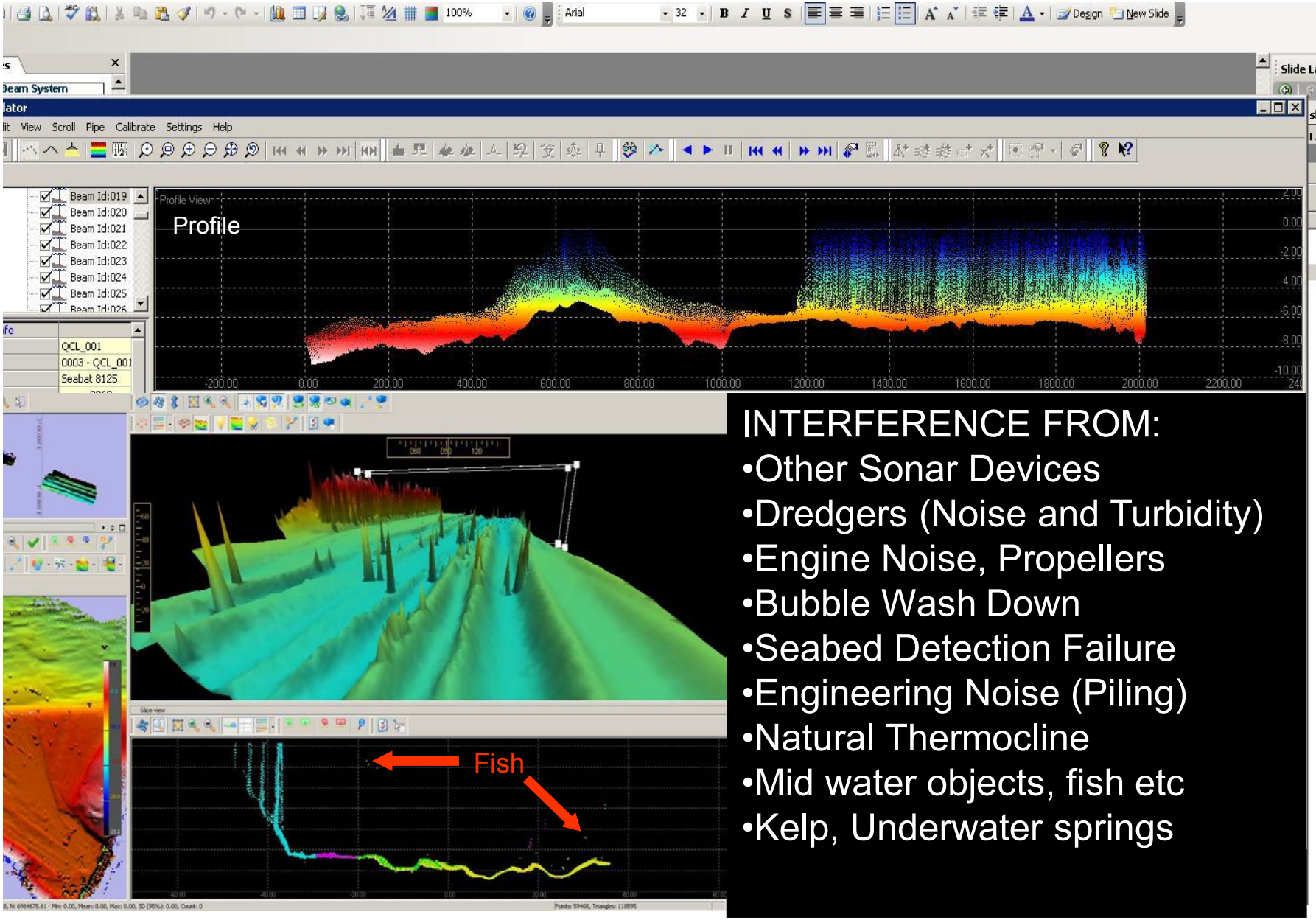
Bathymetric Data Collection

- Up to 2007, POB used Single Beam technology for surveys collecting approx. 100,000 Data Points per year
- 2007 onwards Multibeam Surveys were utilised, enabling100,000 Data Points to be collected every 5 Seconds!
- The survey PCs with all hydrographic equipment interfaced now has to carry out in excess of 12 Billion Computations a Second!!!

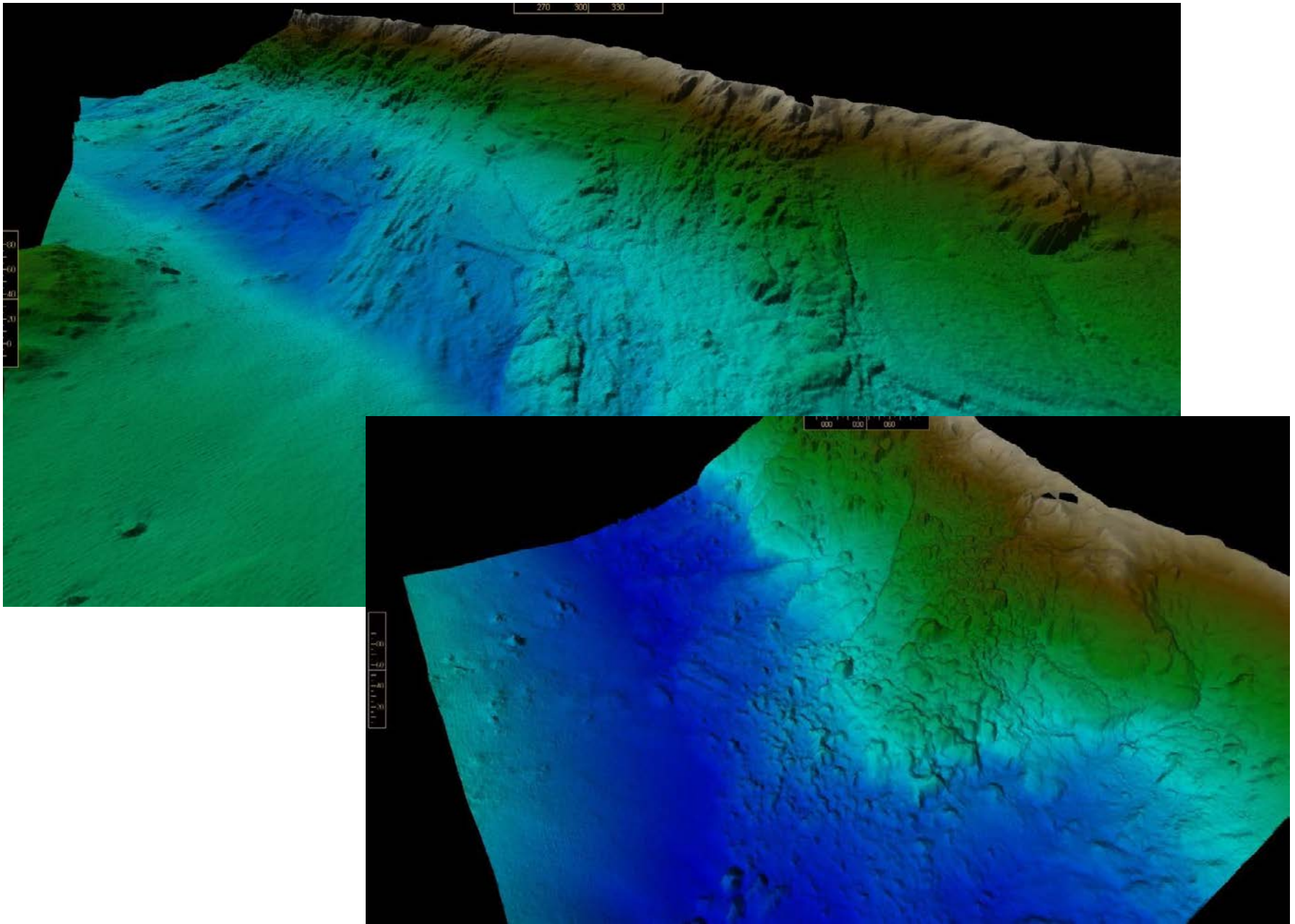
Massive Datasets – Data Cleaning – Intelligent Filtering



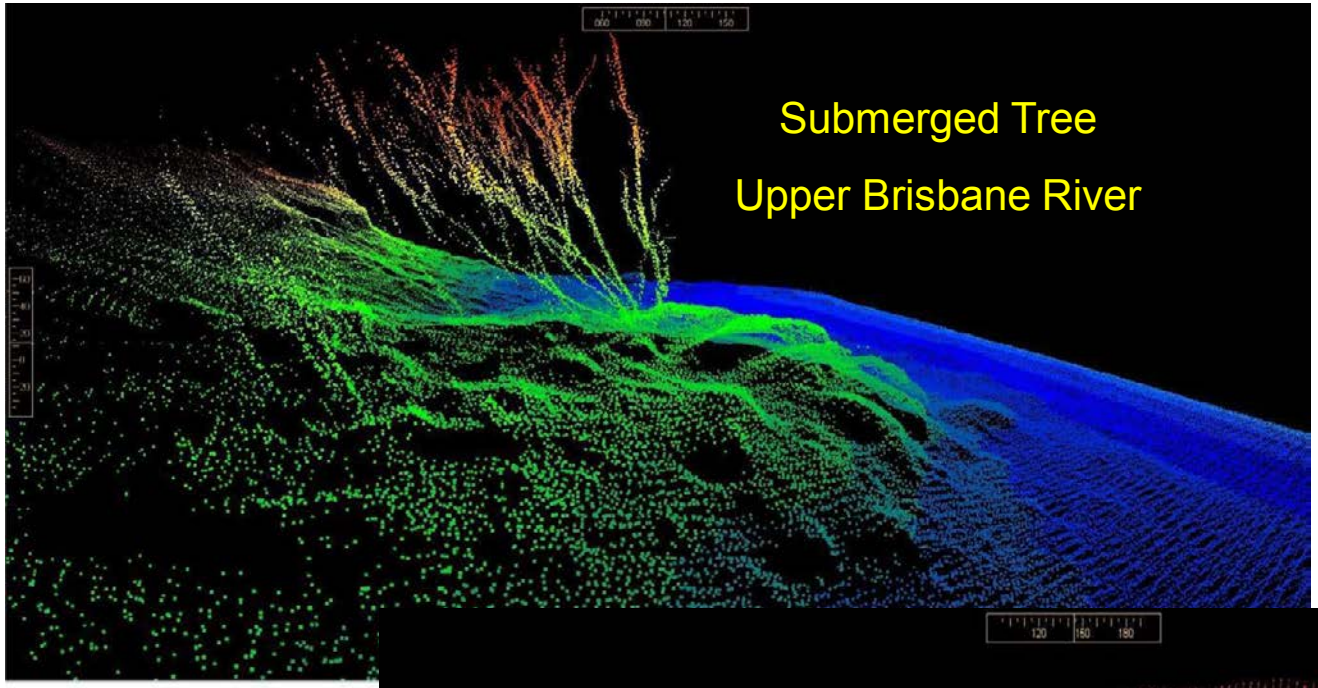
Data Cleaning – Interference –Area Based Editting

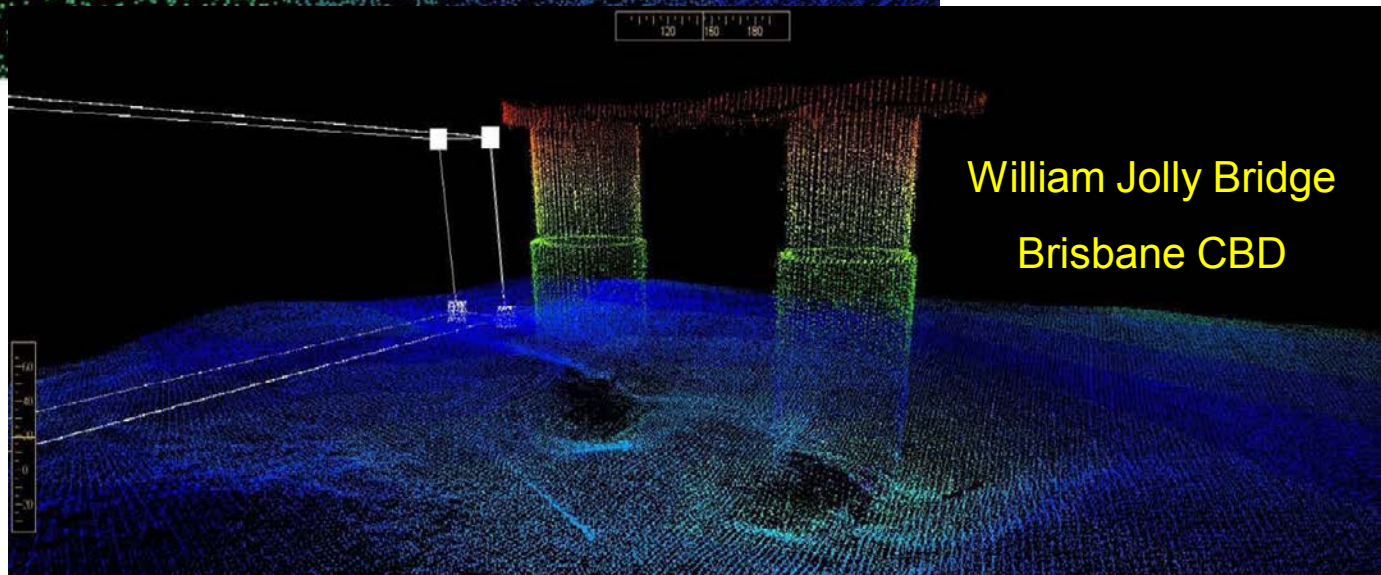


Brisbane River Survey –Bank Slumping

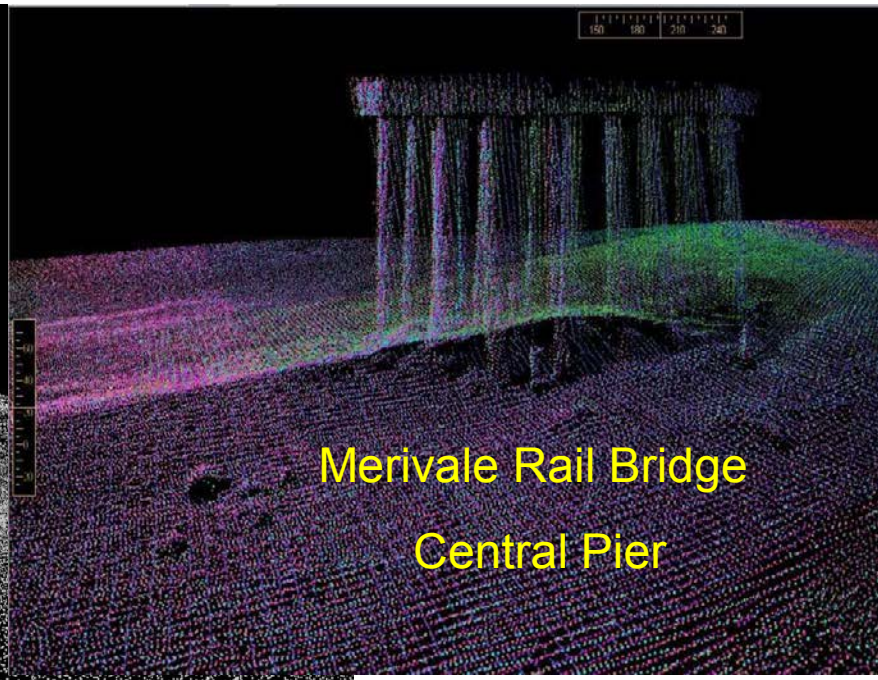


3D Visualization – Point Cloud Format

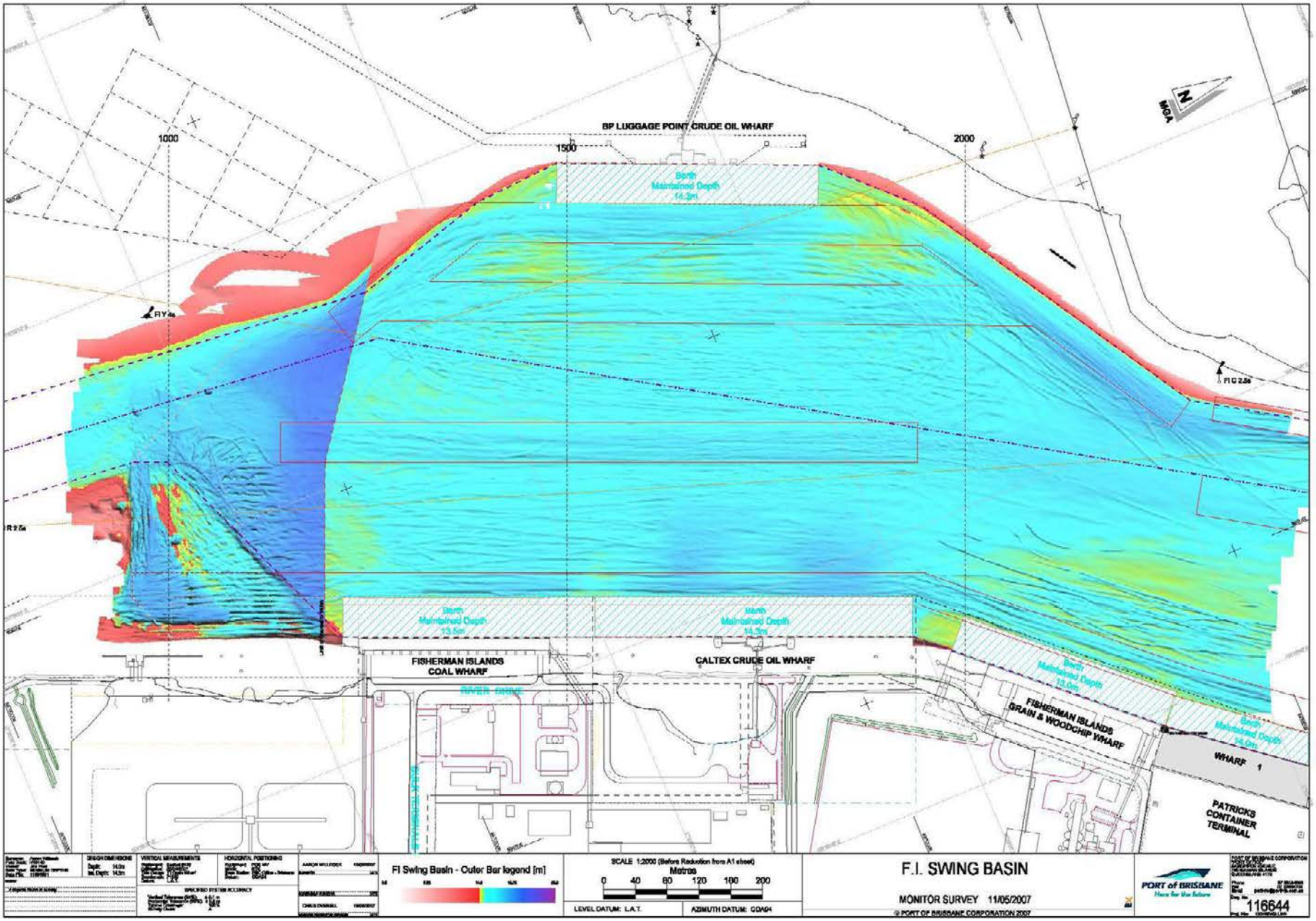




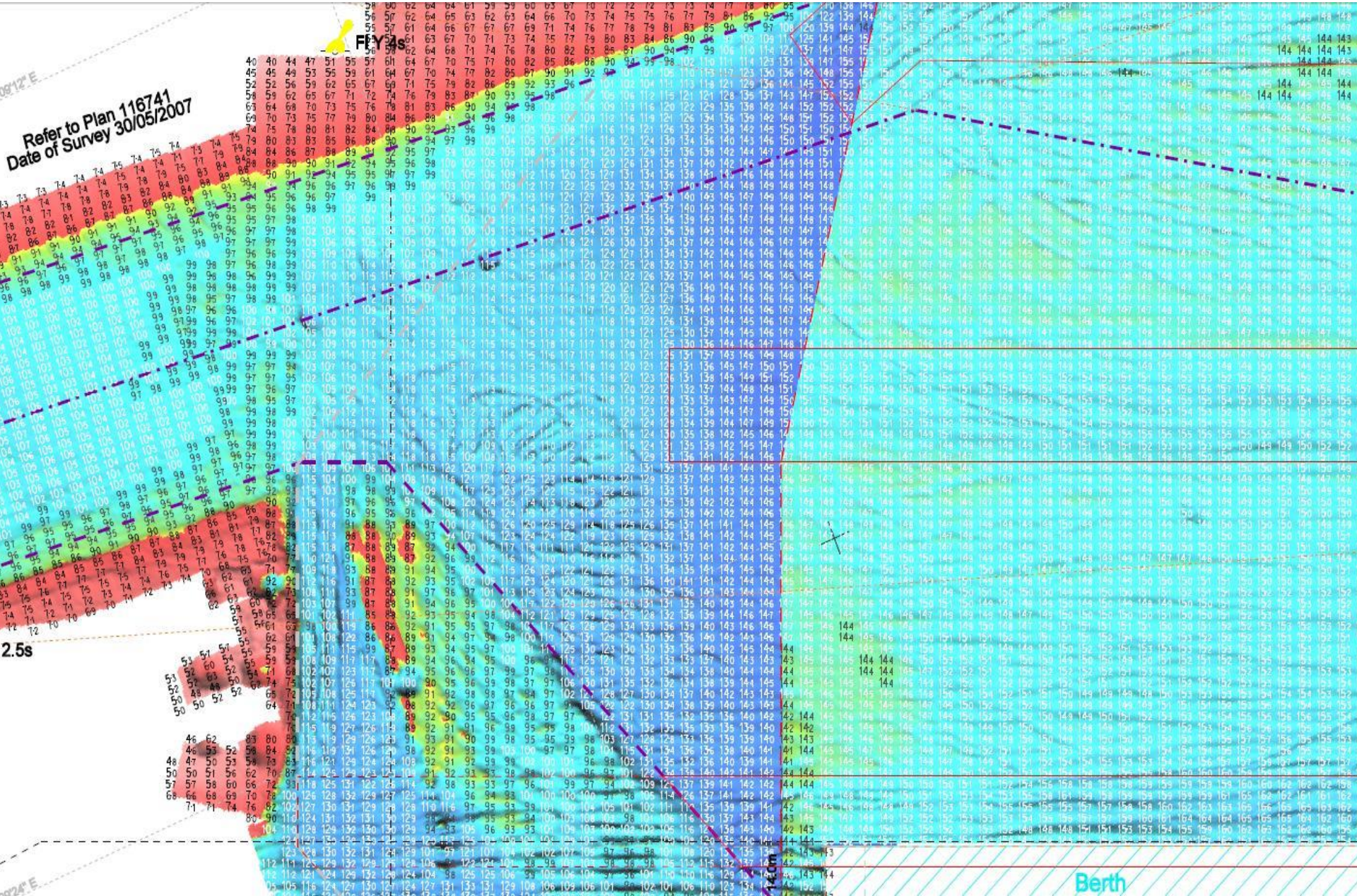
3D Visualization of Structures – Point Cloud Format



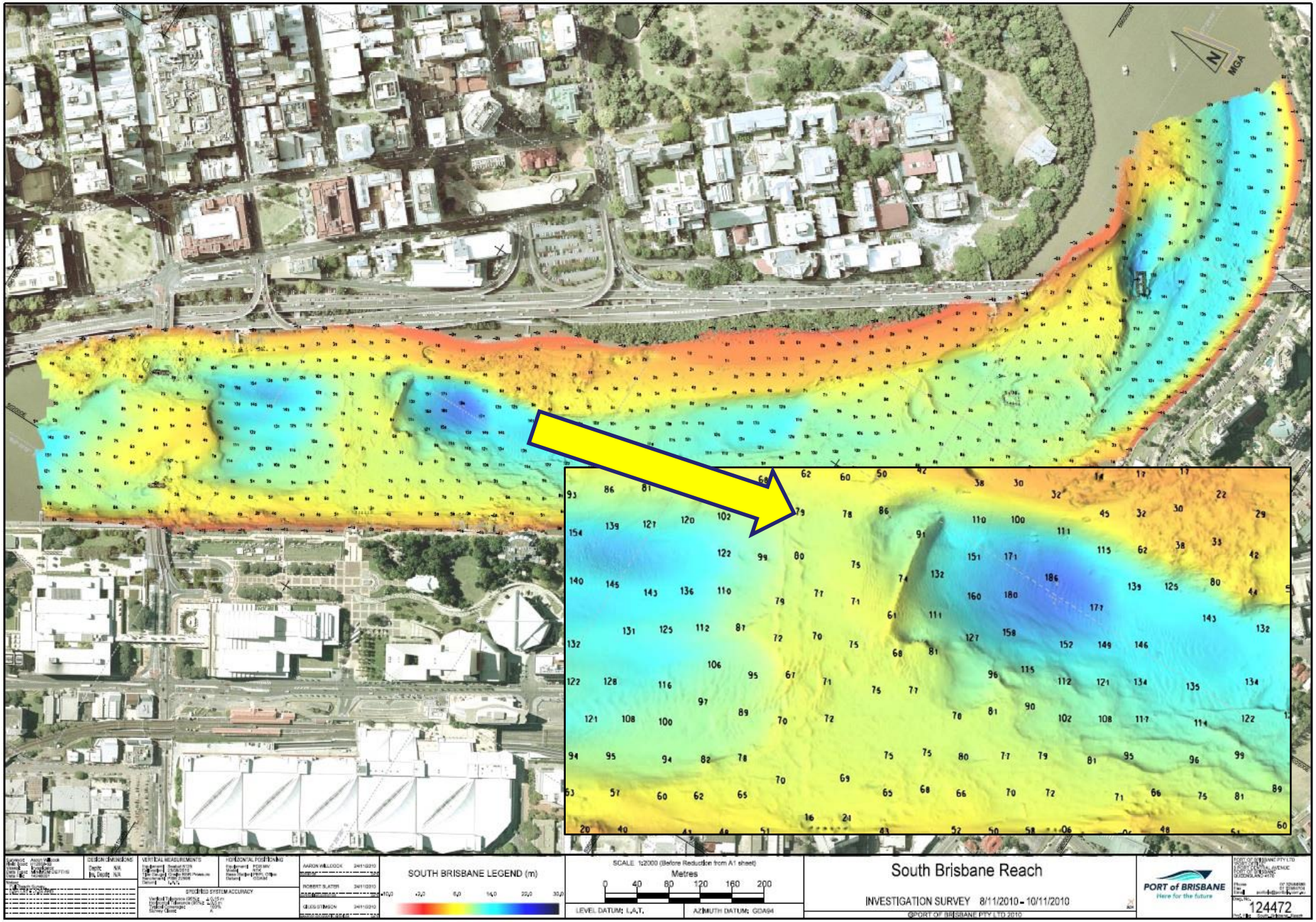
Multibeam Presentation – Sounding Models



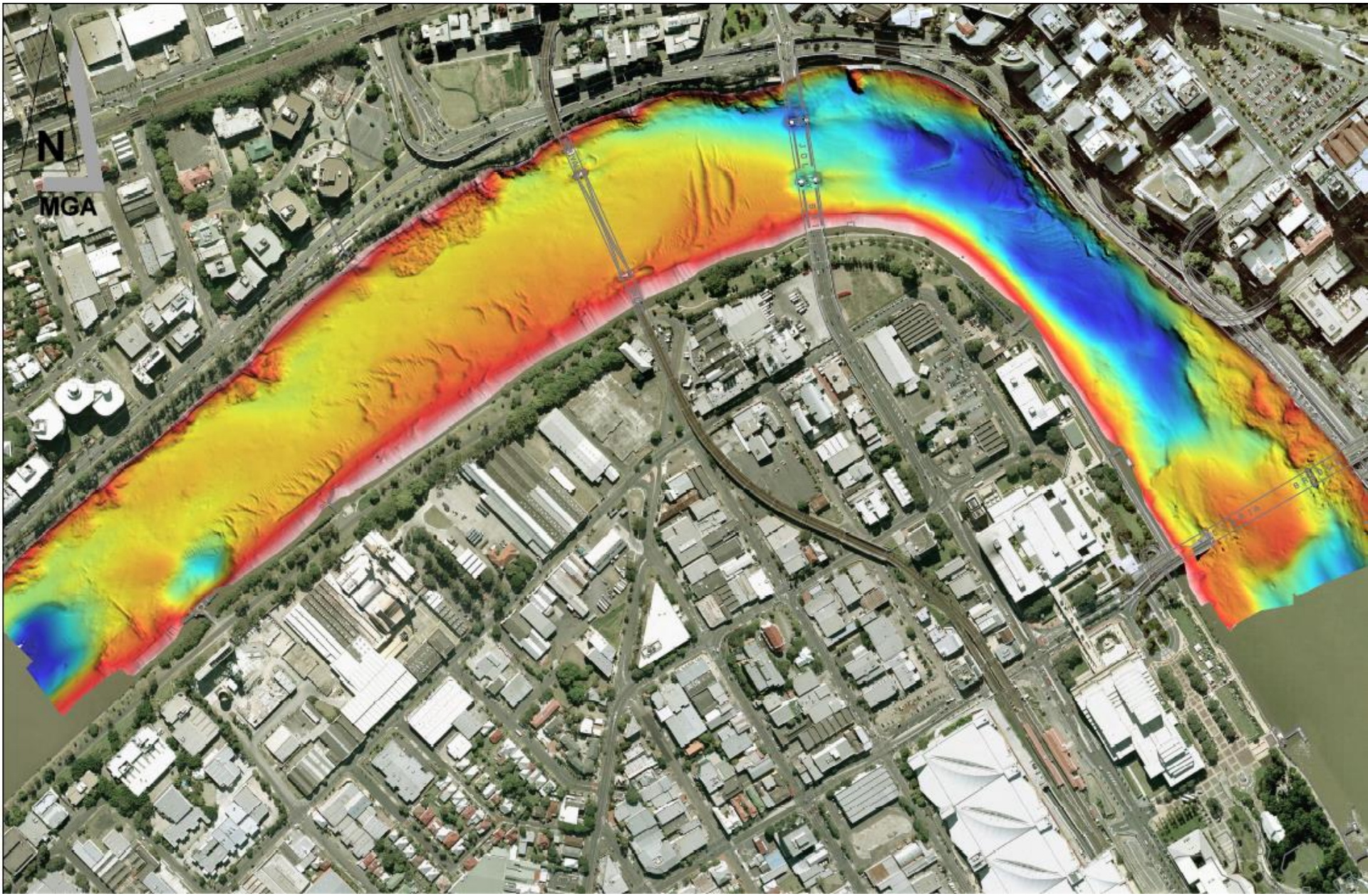
Multibeam Presentation – Models and Grid Soundings



Multibeam Presentation – Model and Shoal-Biased

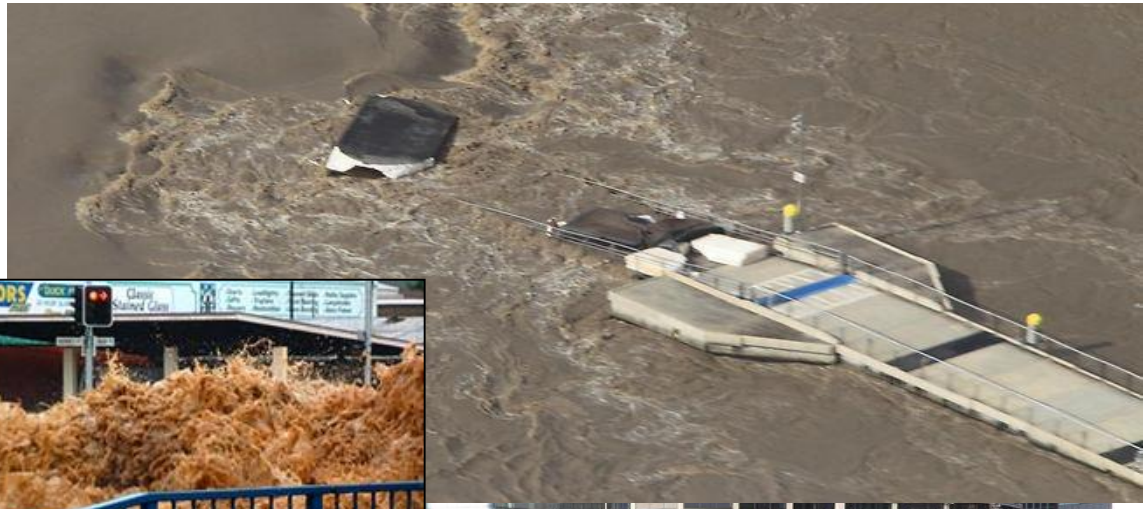


Bathymetry Presentation – Draped Mapping



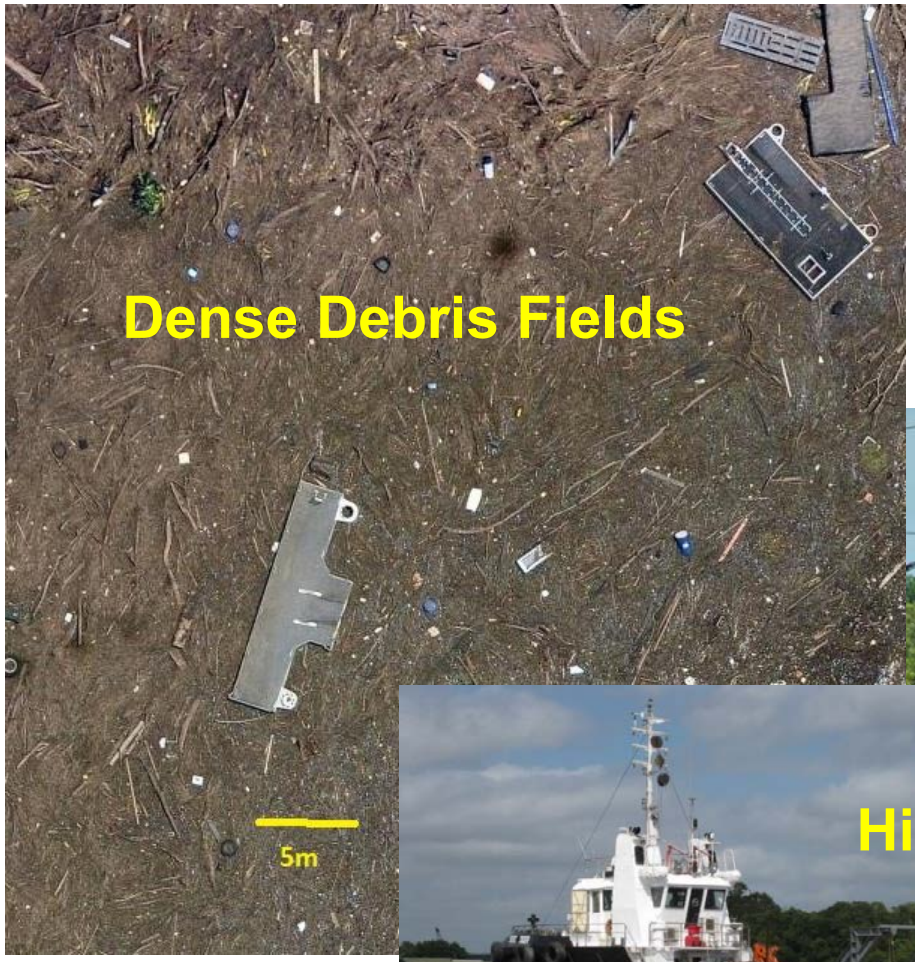
QLD Storm Event Conditions

Brisbane River Conditions 12th Jan 2011
10 knots+ Upstream 6-8+ knots Downstream

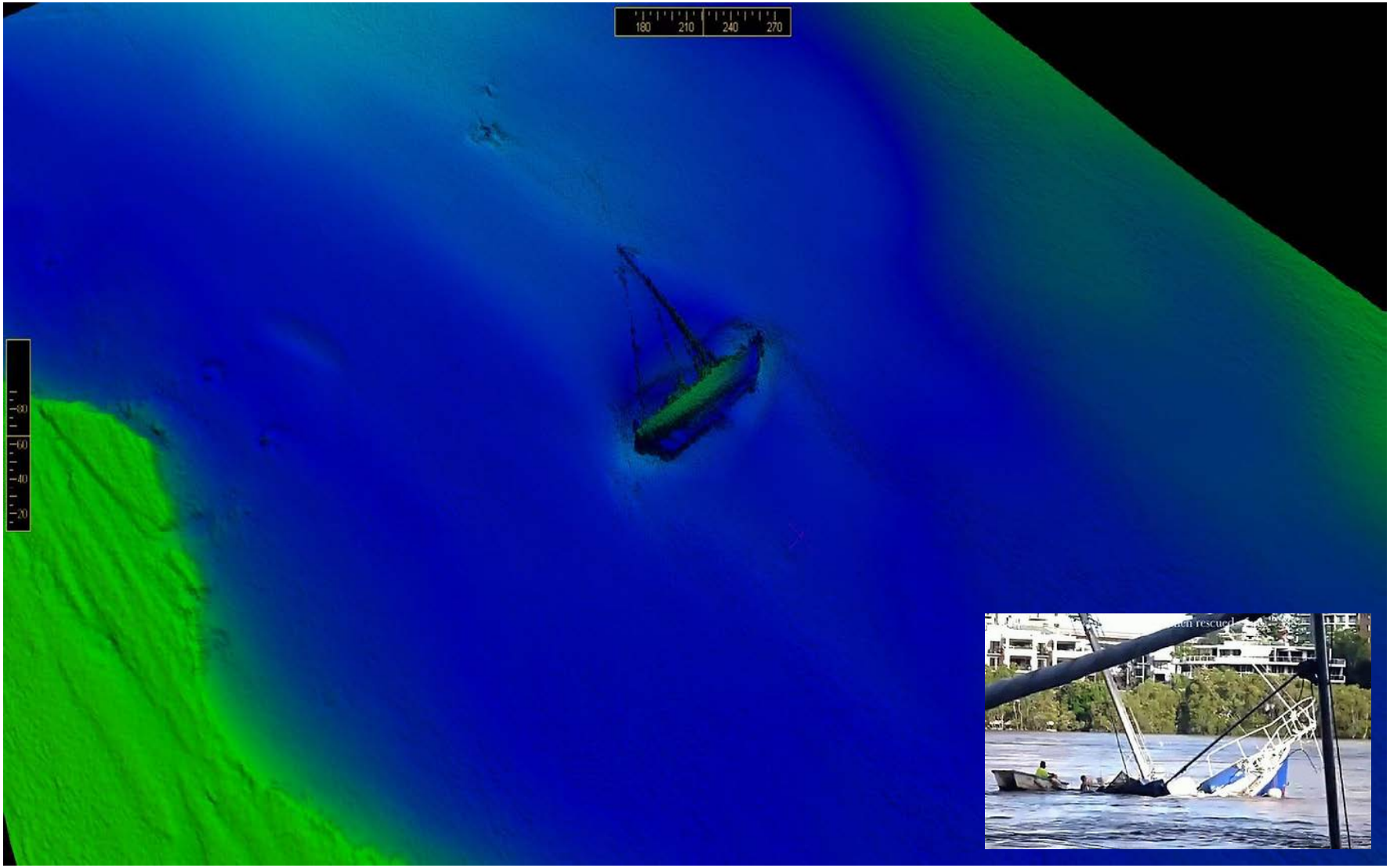


Brisbane 2011 Floods

Start of Hydrographic Surveys 13th Jan 2011
Challanges – Floating Debris Fields - Gathering

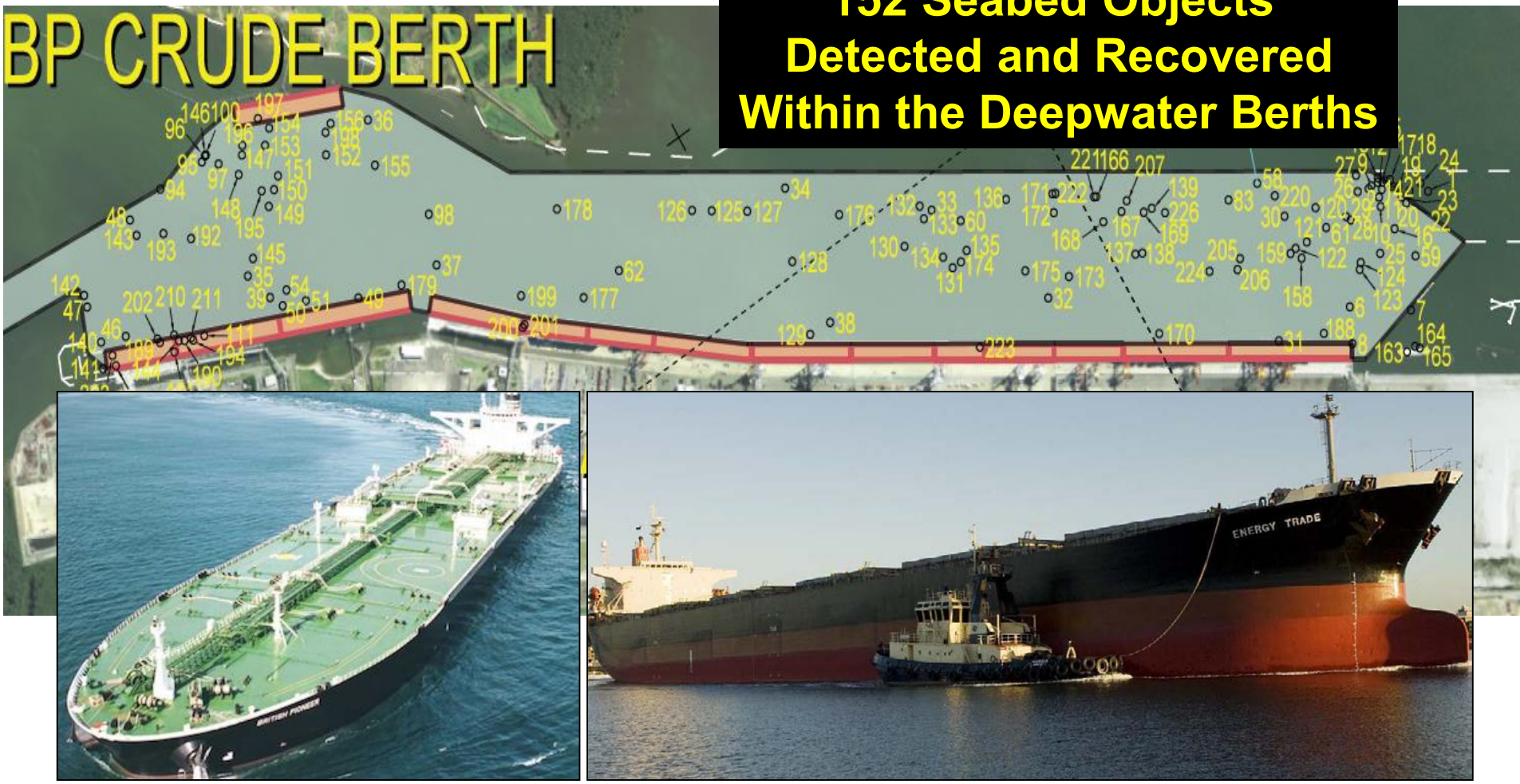


High Resolution Multibeam – Object Detection

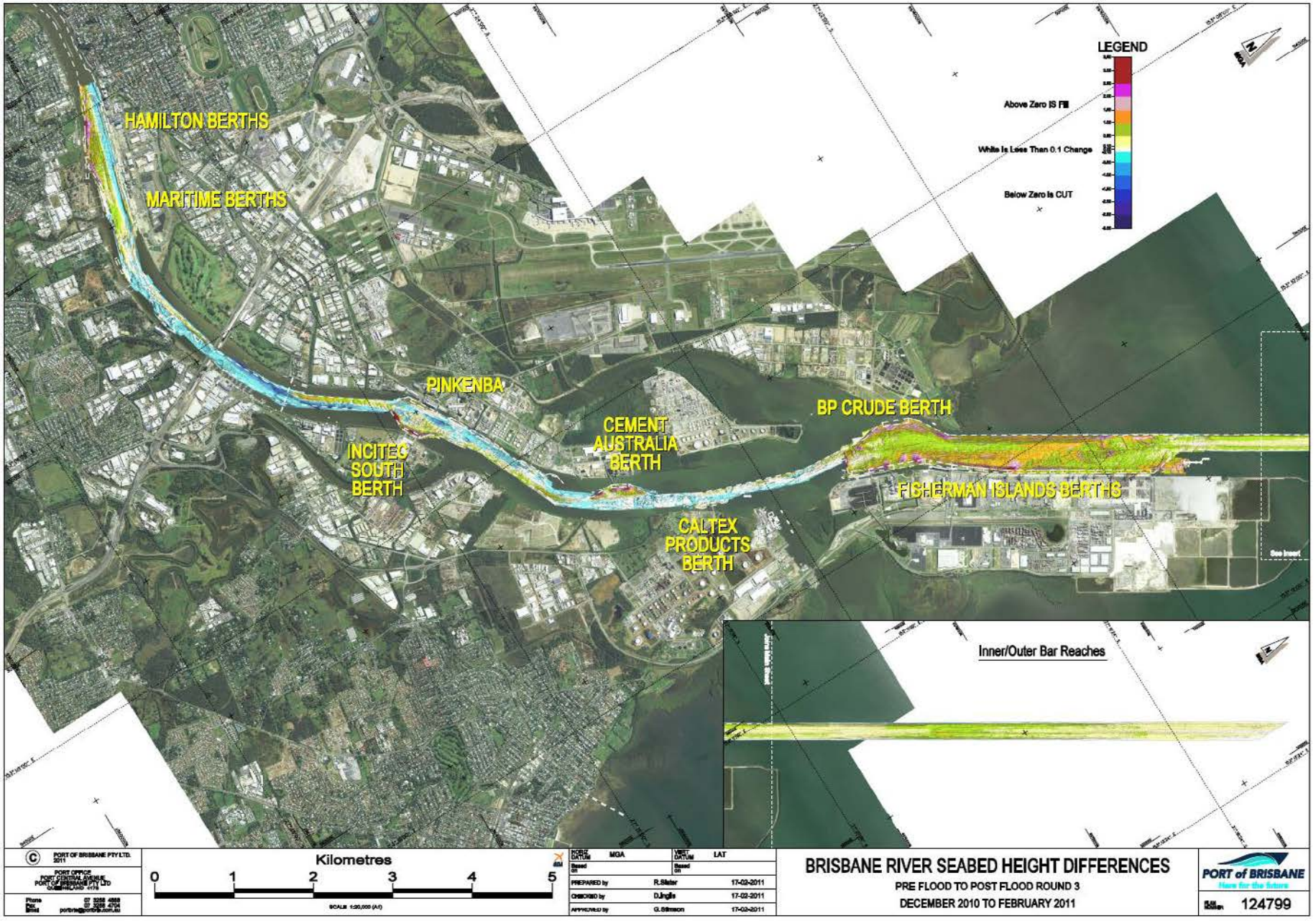


Object Detection – Deep Draught Berths – FI 2011 Floods

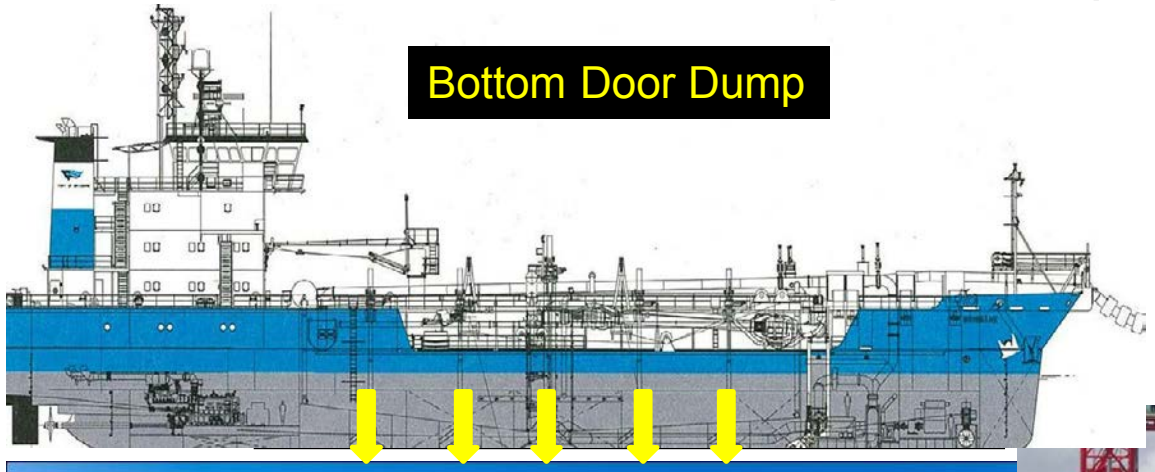
152 Seabed Objects Detected and Recovered Within the Deepwater Berths

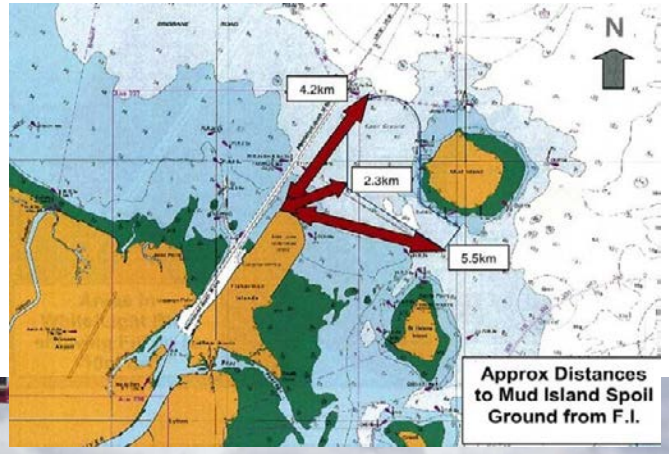


Deposition of Silt - 2011 Floods

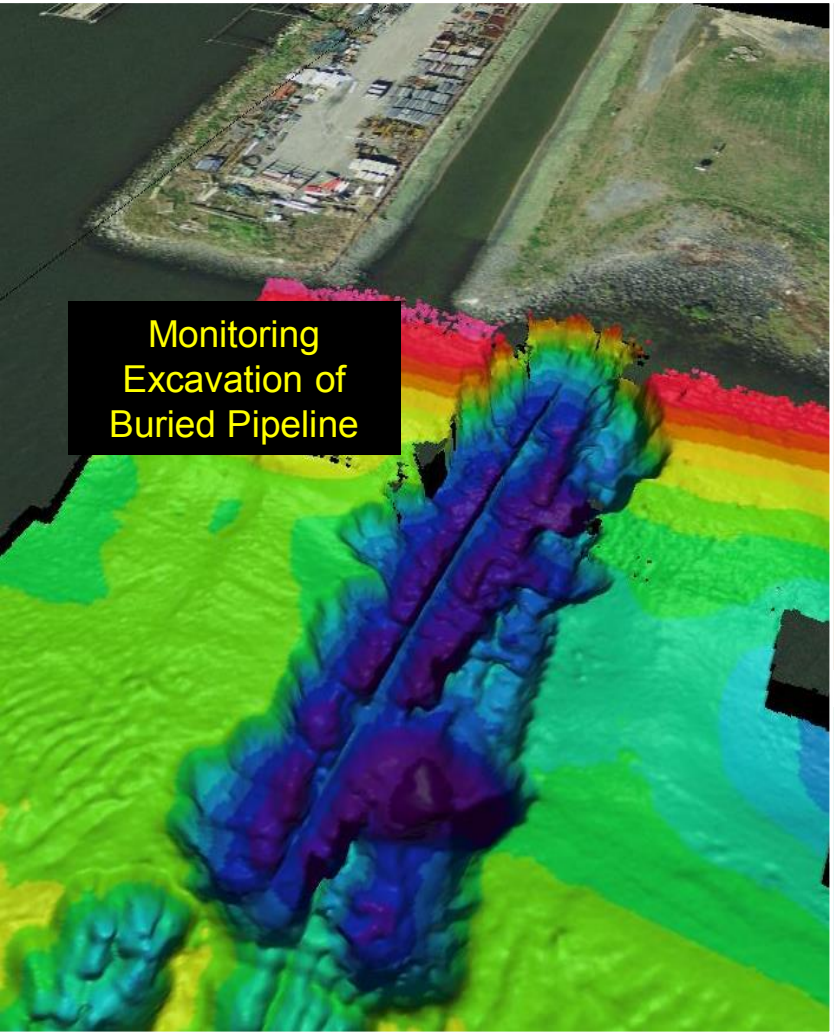


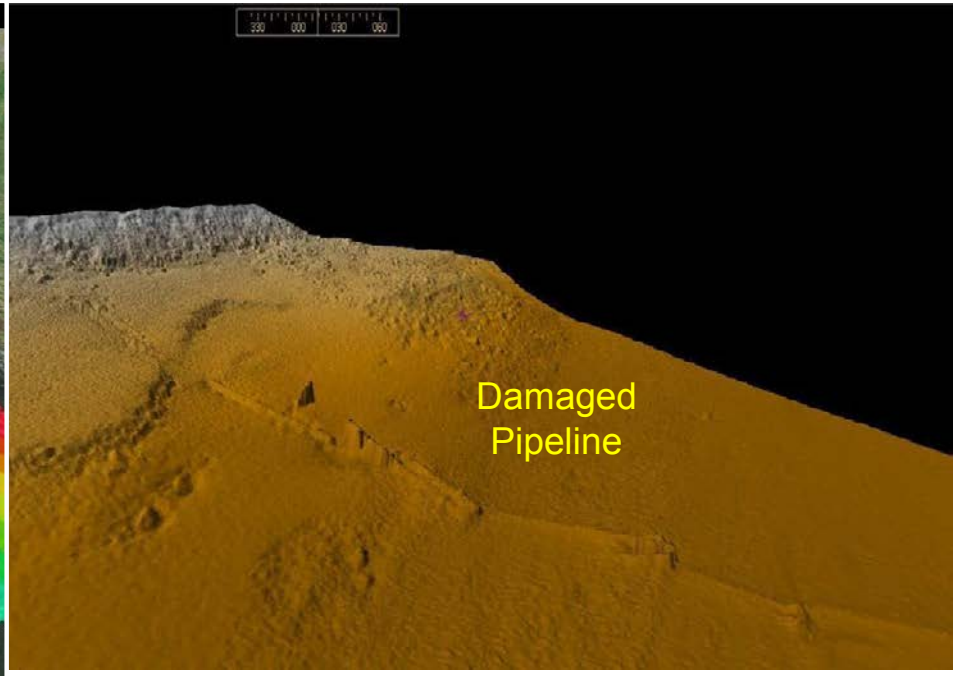
Maintenance of Port Depths – Disposal of Flood Material



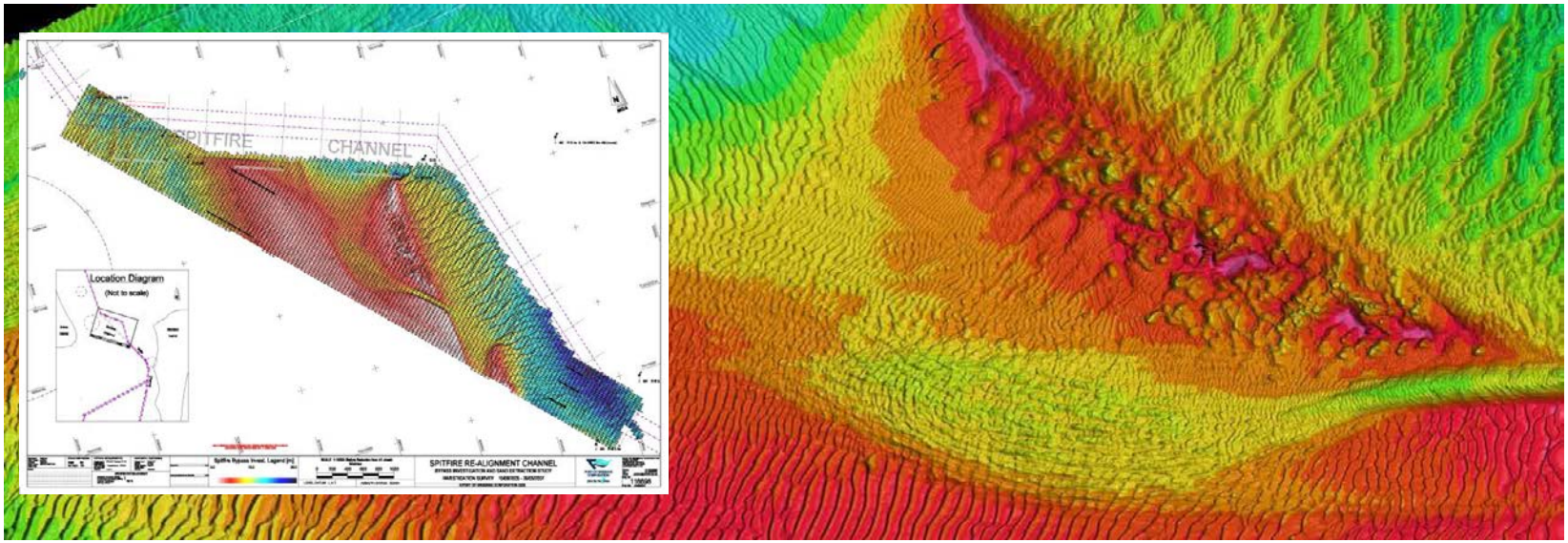


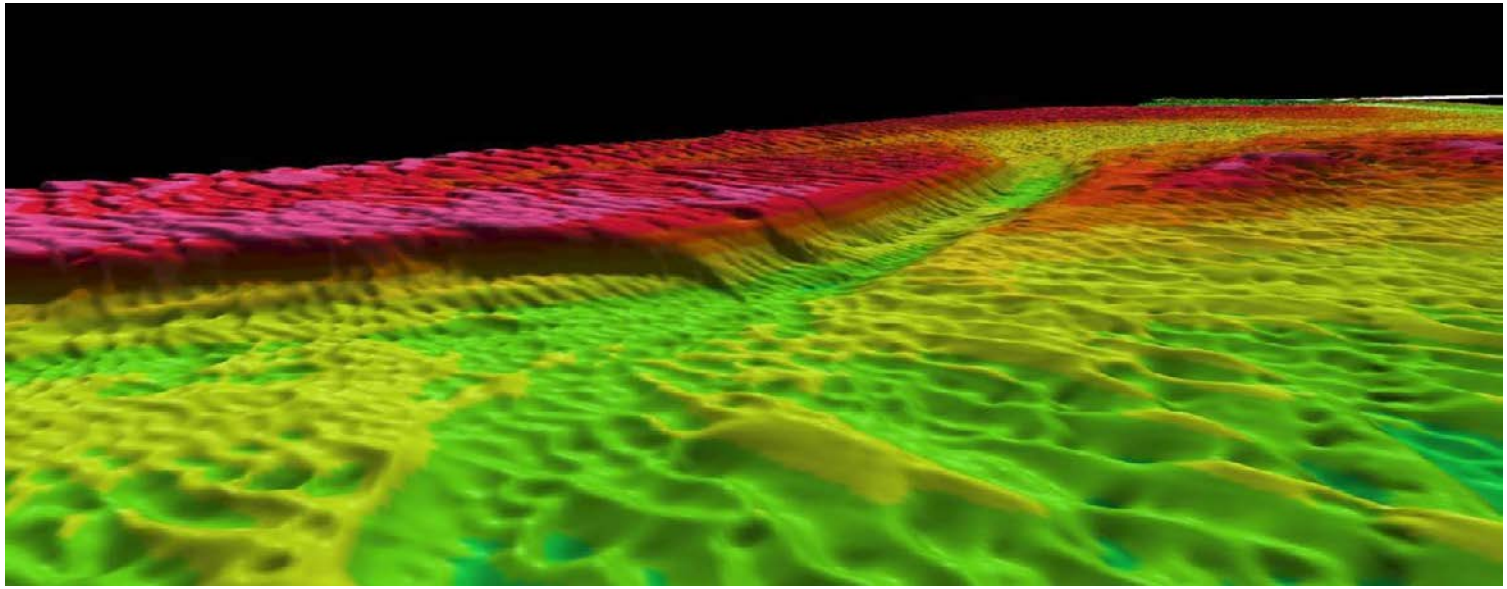
3D Visualisation – Engineering Projects
Pipeline Monitoring & Surveys





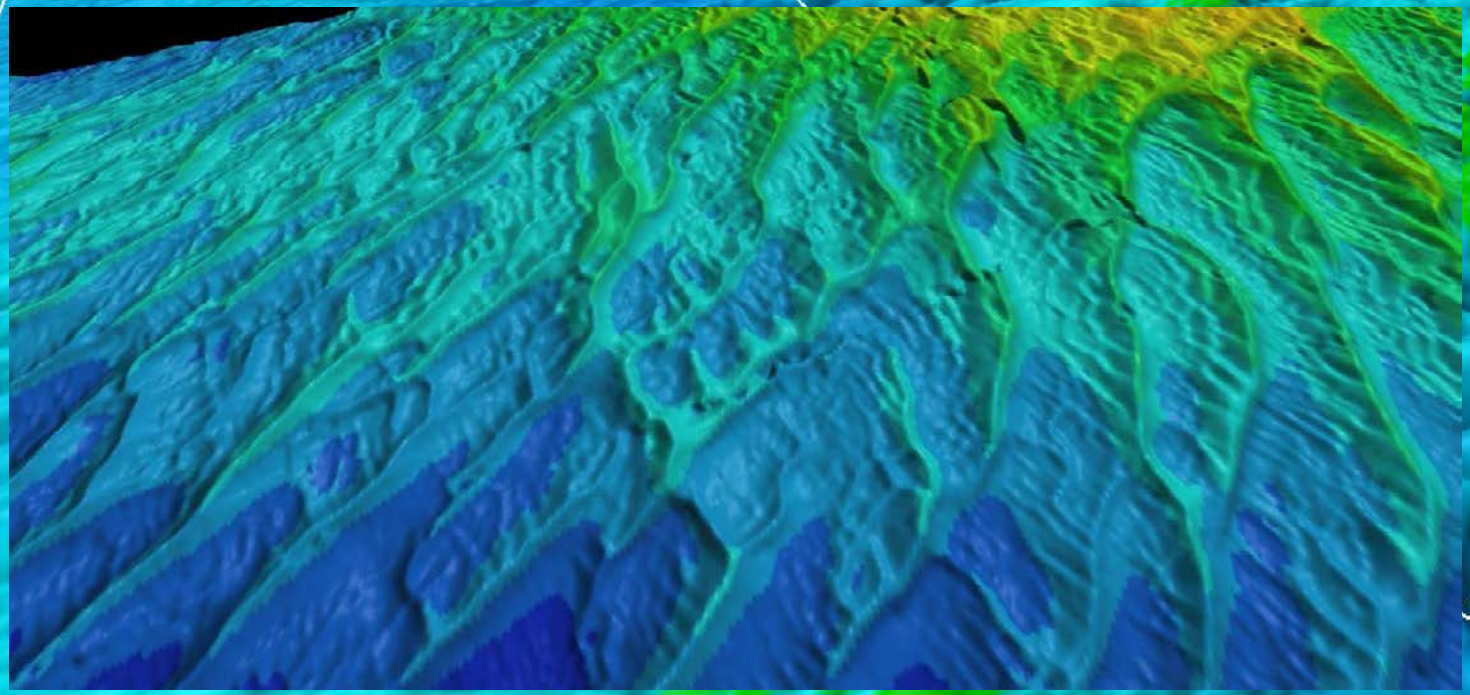
Multibeam Presentation - 2D & 3D Views





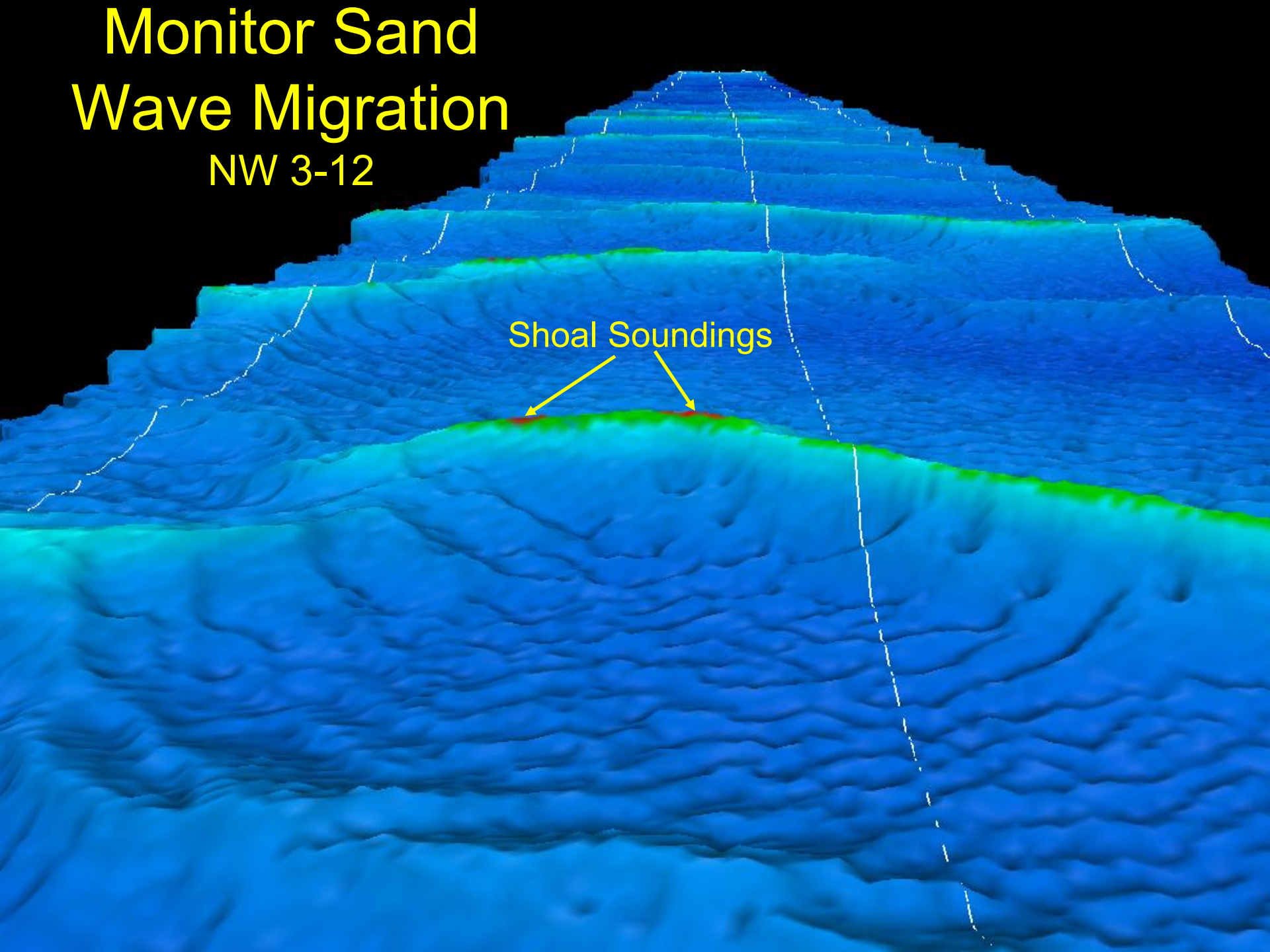
Sand Ripples Movement

NW 2-4

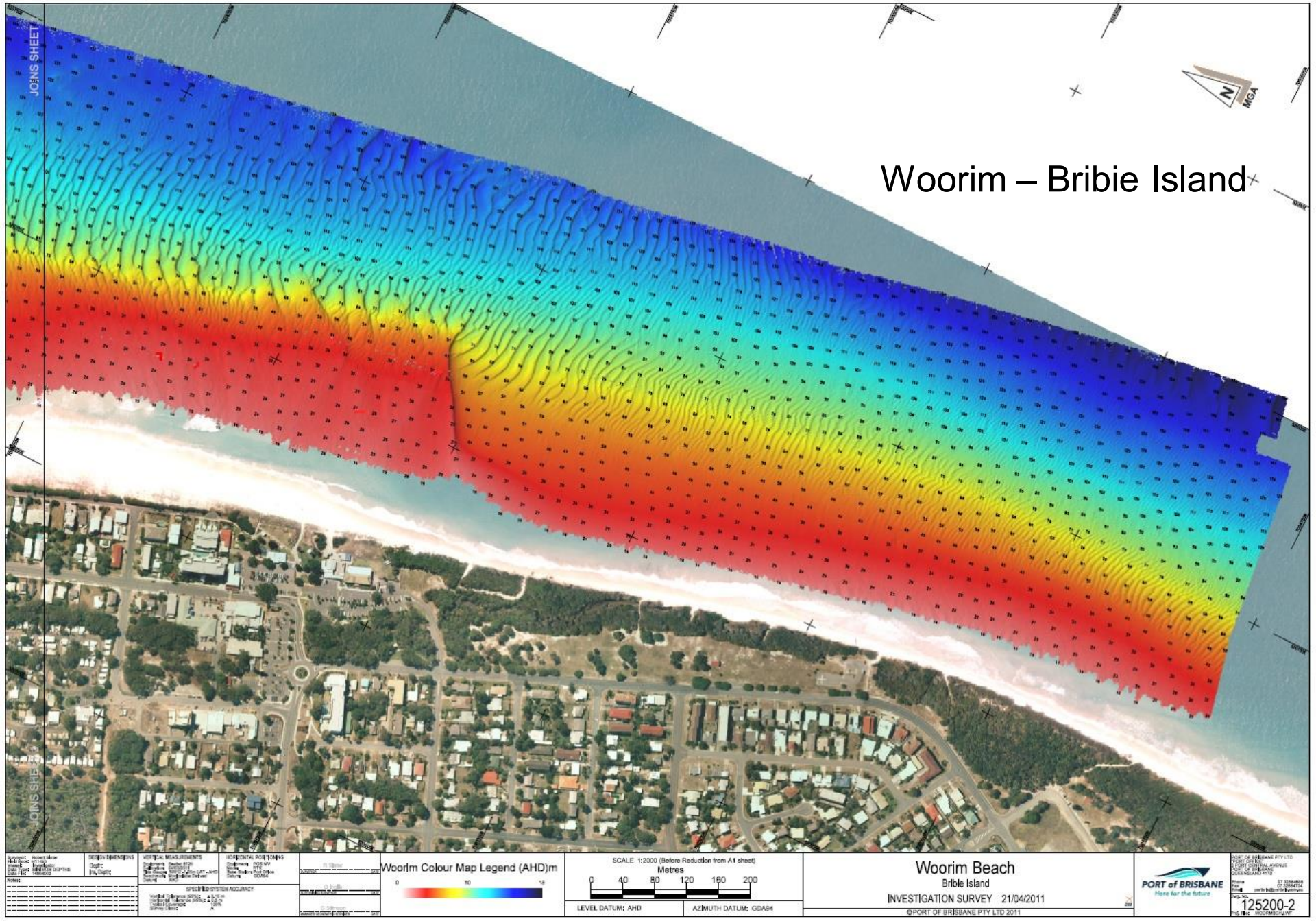


Monitor Sand Wave Migration

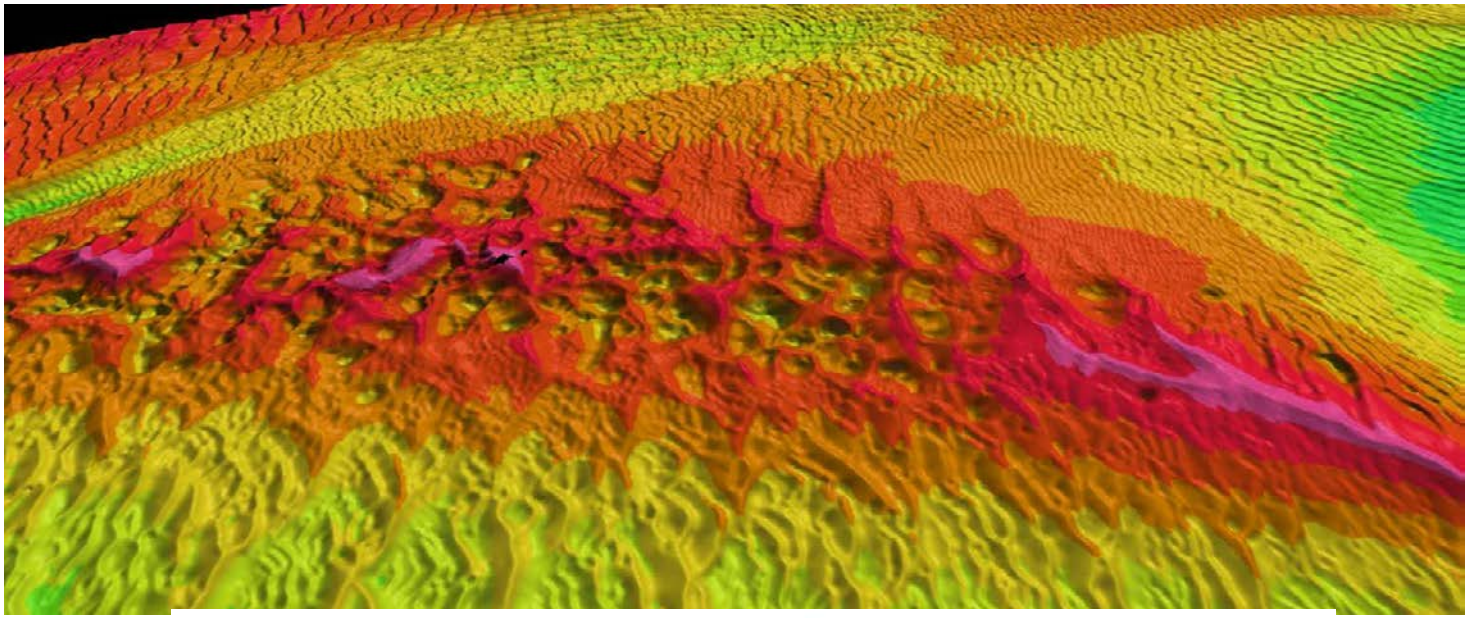
NW 3-12

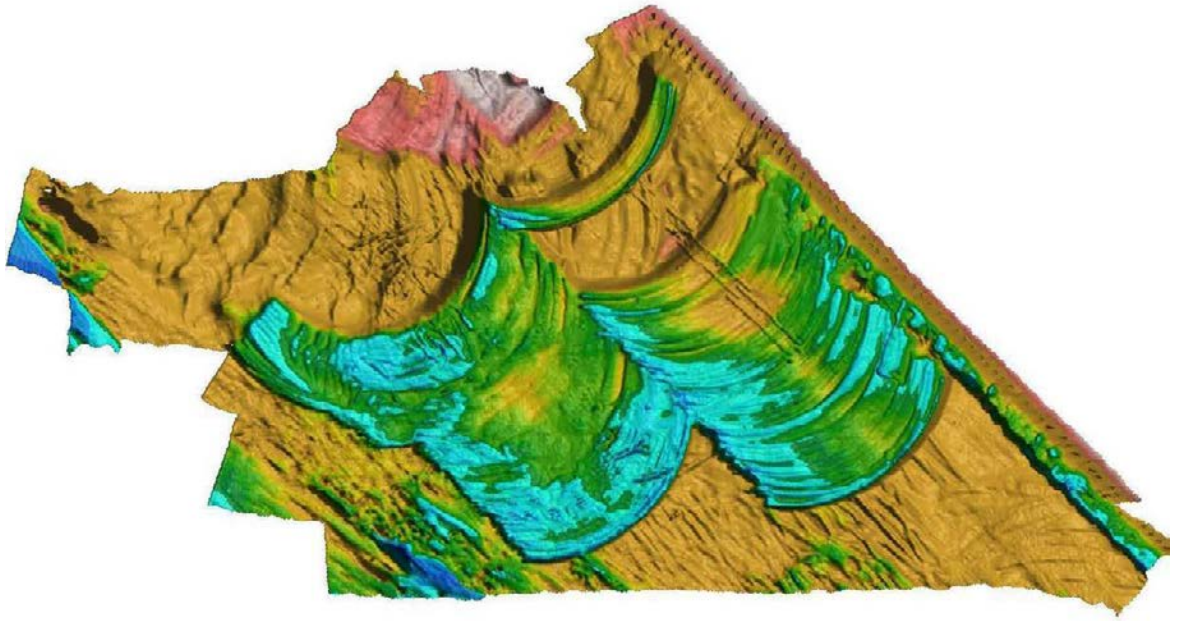


Beach Surveys/Profiles

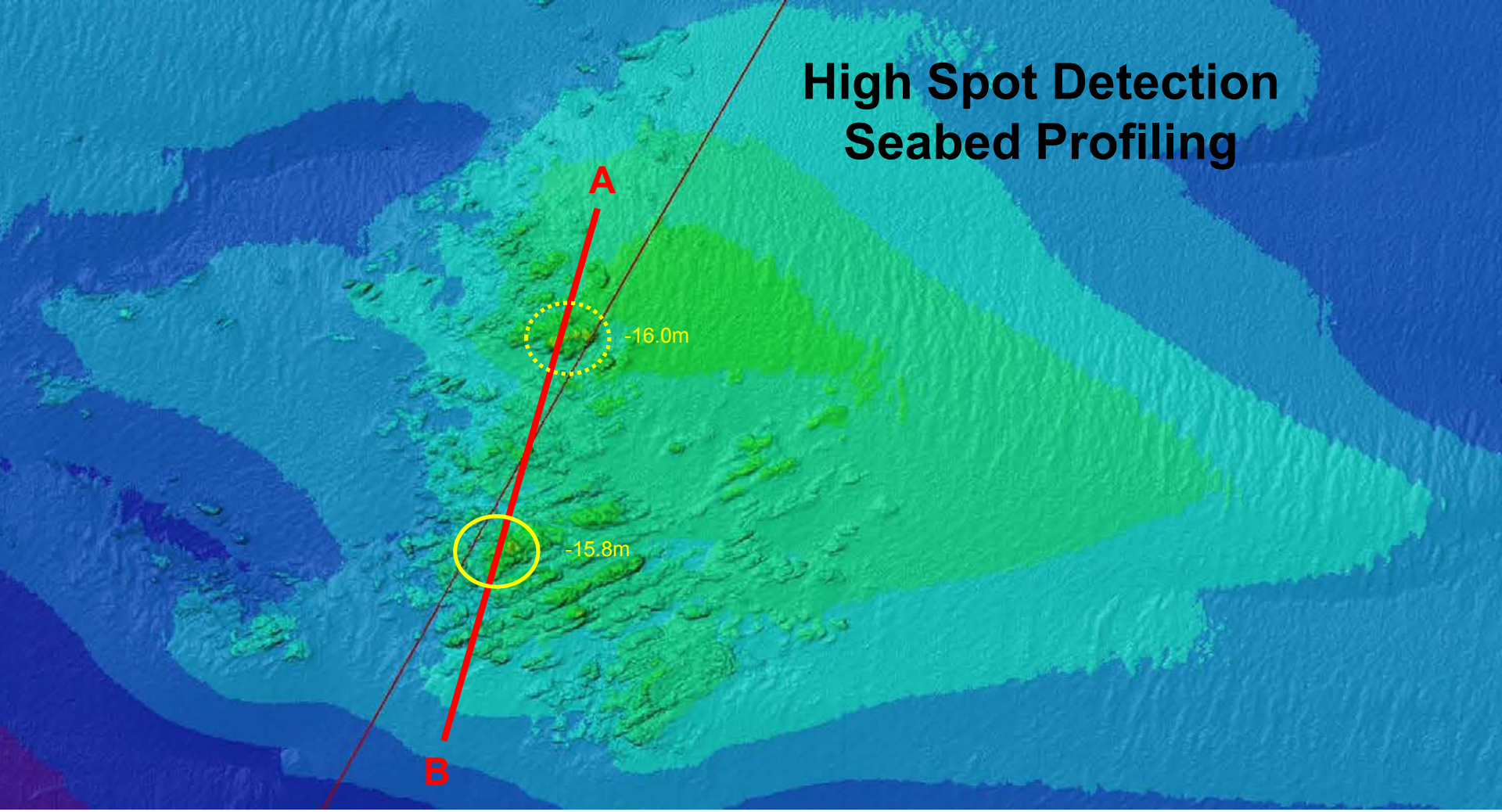


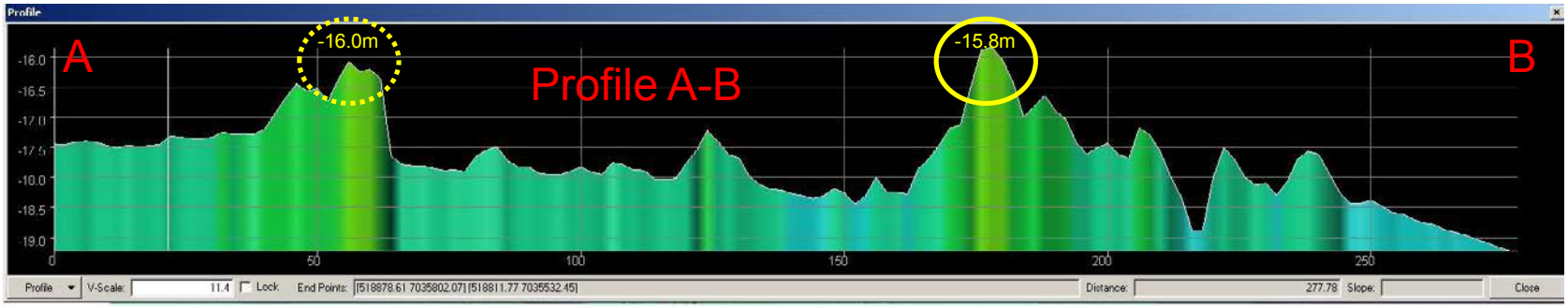
3D Visualisation – Engineering Projects
Cutter Suction and Grab Dredging





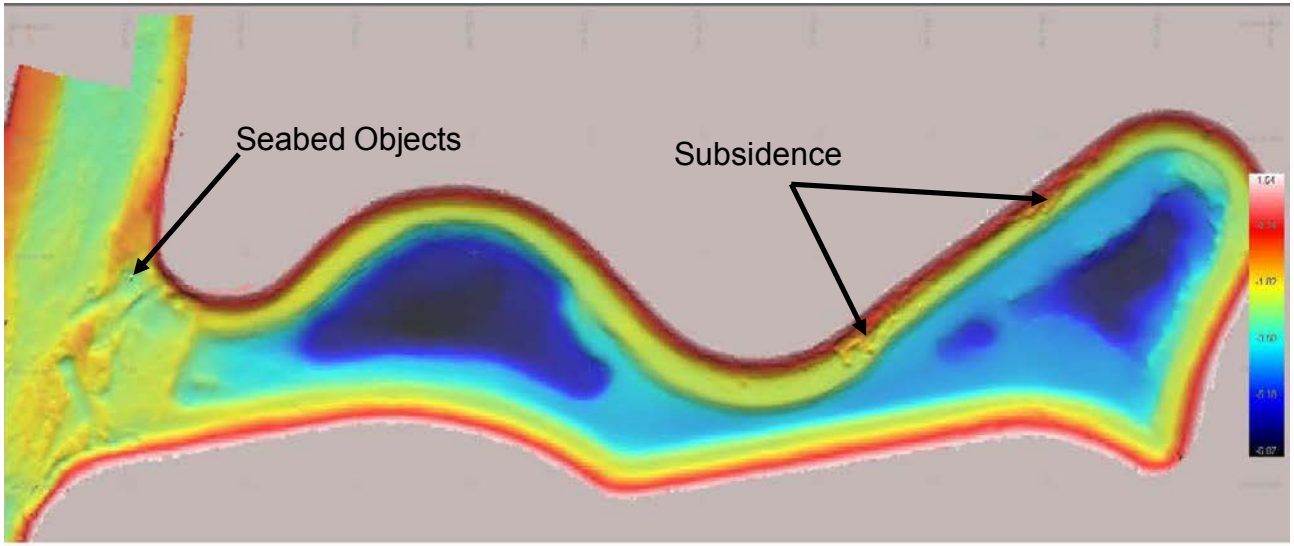
High Spot Detection
Seabed Profiling

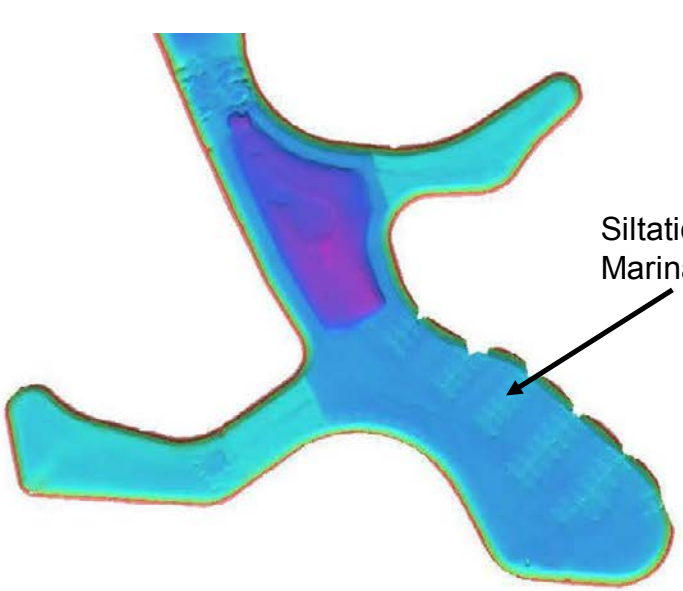


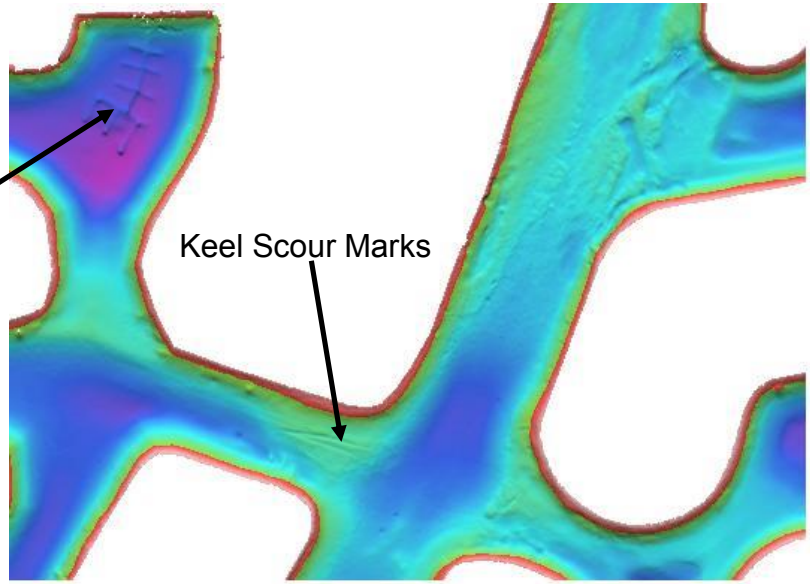


3D Visualisation – Engineering Projects
Canal Surveys – Subsidence Monitoring

3D Visualisation – Engineering Projects
Canal Surveys – Subsidence/Siltation Monitoring







Aquatic Paradise

Raby Bay Canal Survey

Survey Residuals 2008 to 2010

1st to 5th February 2010

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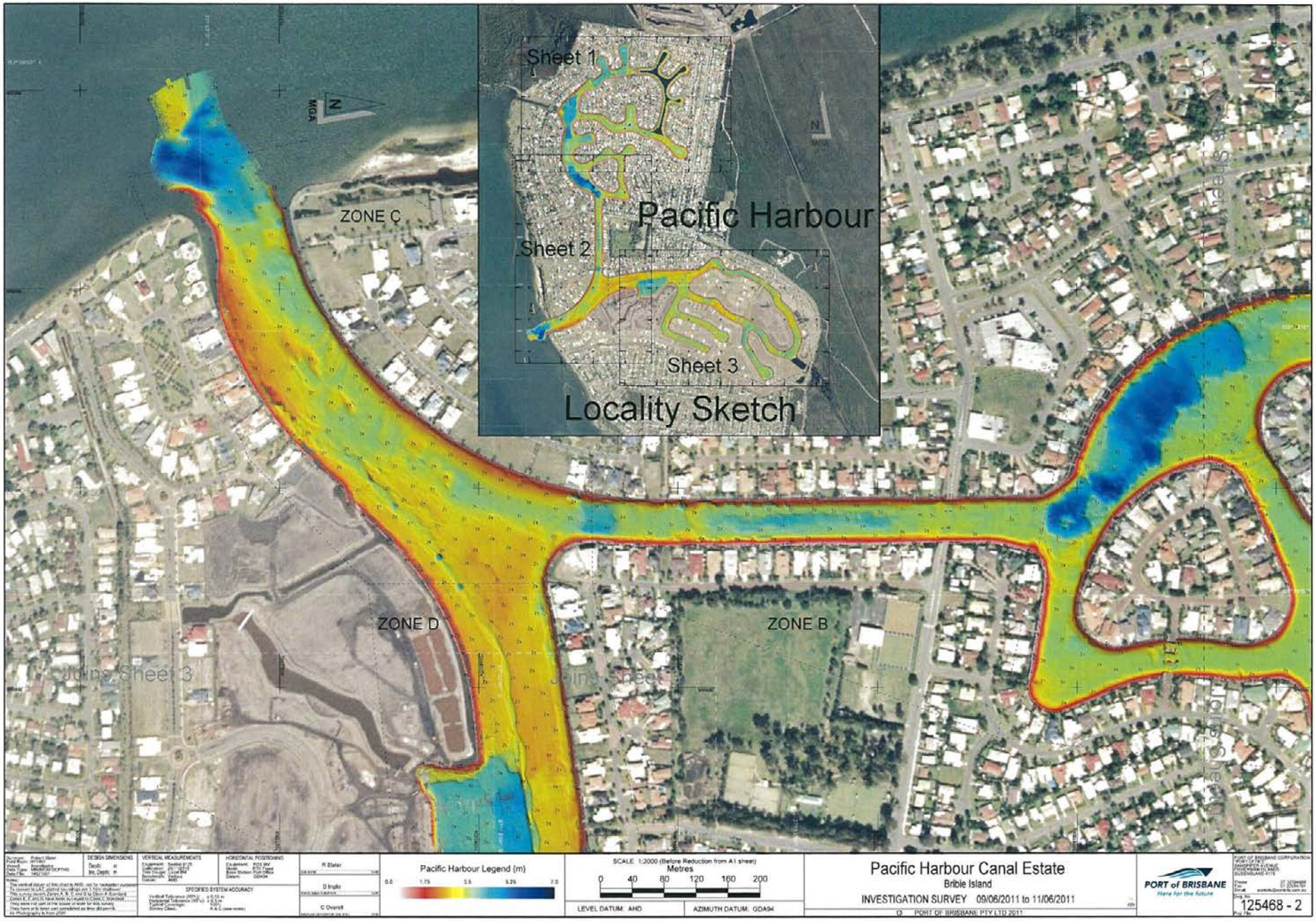
Here for the future

120720


Sheet 1
Sheet 2
Sheet 3
Pacific Harbour
Locality Sketch
ZONE C
ZONE D
ZONE B
Joins Sheet 3
Joins Sheet 2
Pacific Harbour Legend (m)
0.0
1.75
3.5
5.25
7.0
SCALE 1:2000 (Before Reduction from A1 sheet)
Metres
0
40
80
120
160
200
LEVEL DATUM: AHD
AZIMUTH DATUM: GDA94
Pacific Harbour Canal Estate
Bribie Island
INVESTIGATION SURVEY 09/06/2011 to 11/06/2011
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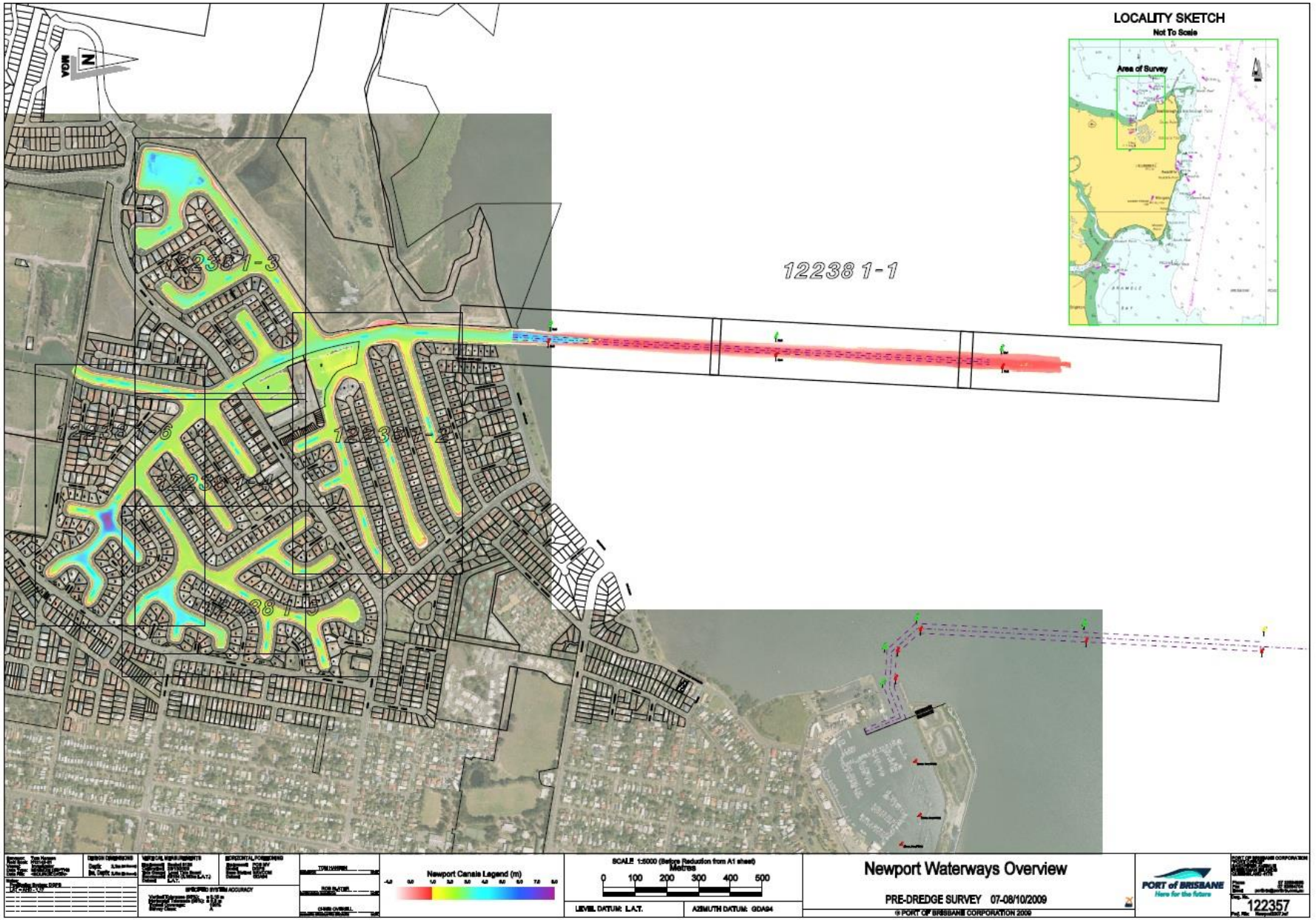
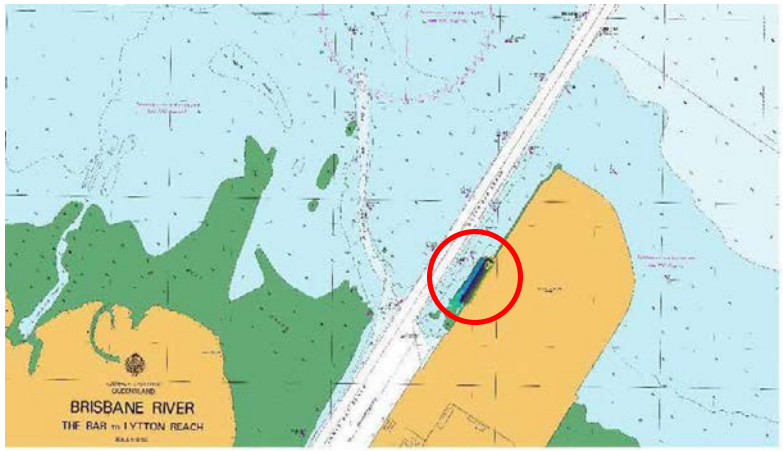
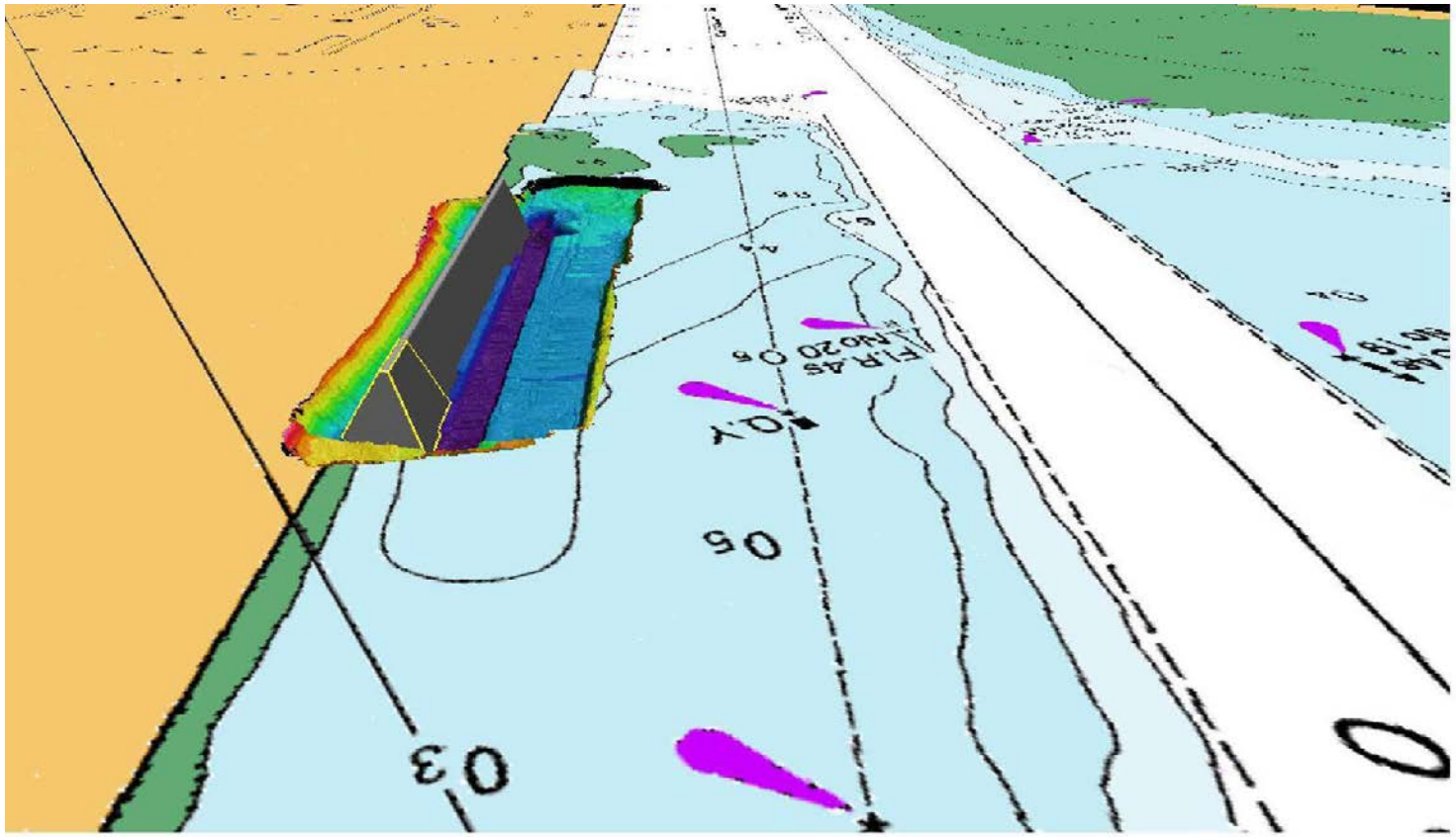
125468 - 2

Dredge Support - Newport Channel Widening

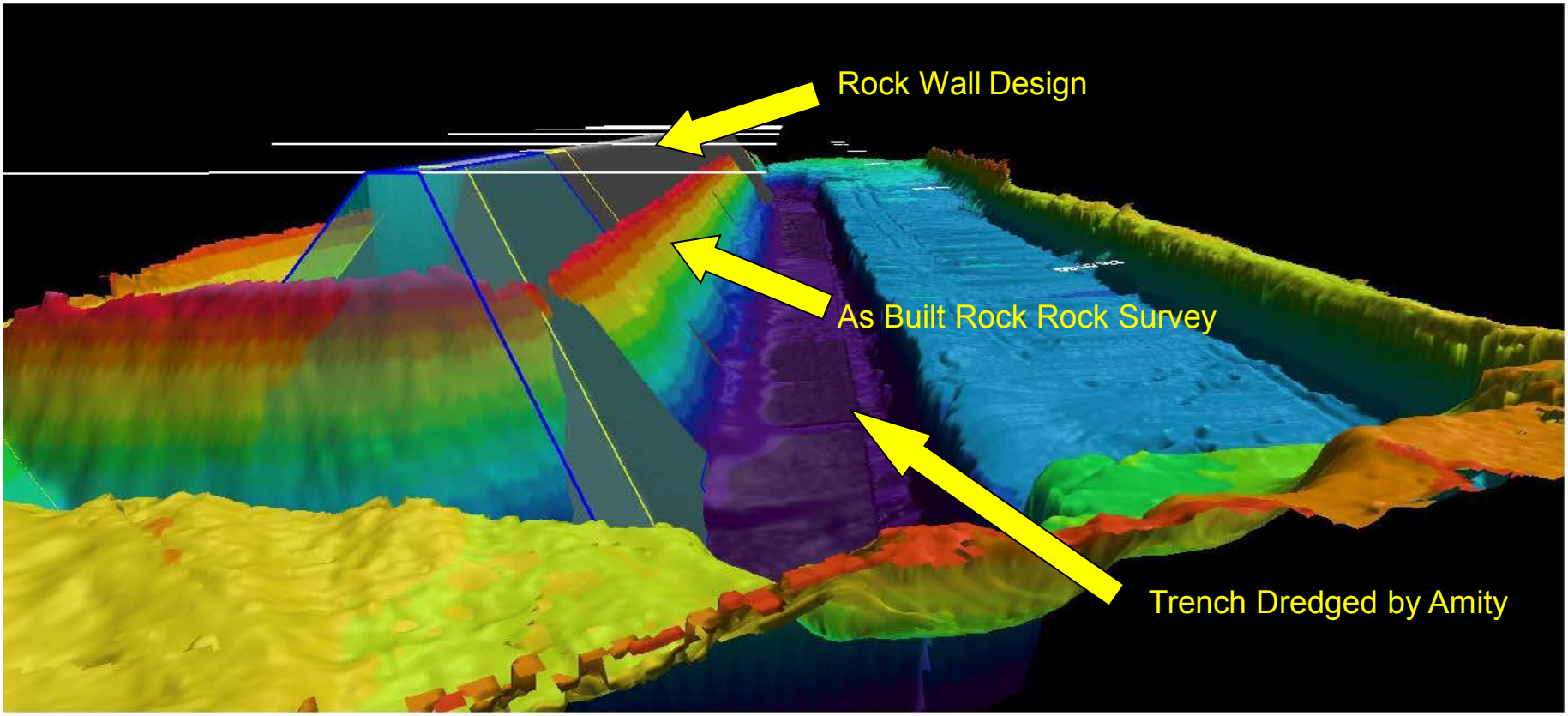




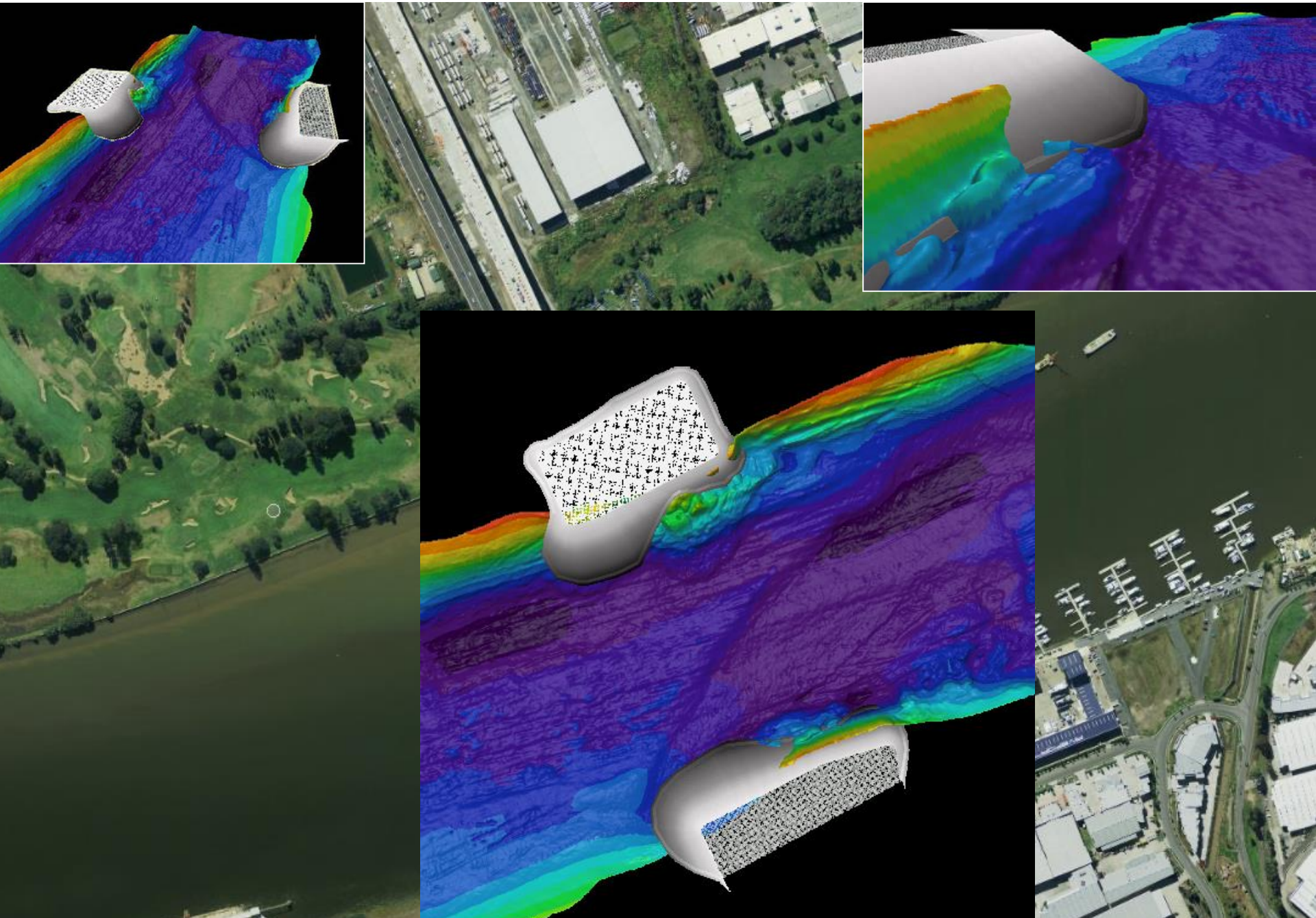
Engineering Projects
Rock Wall Construction
Berth 12



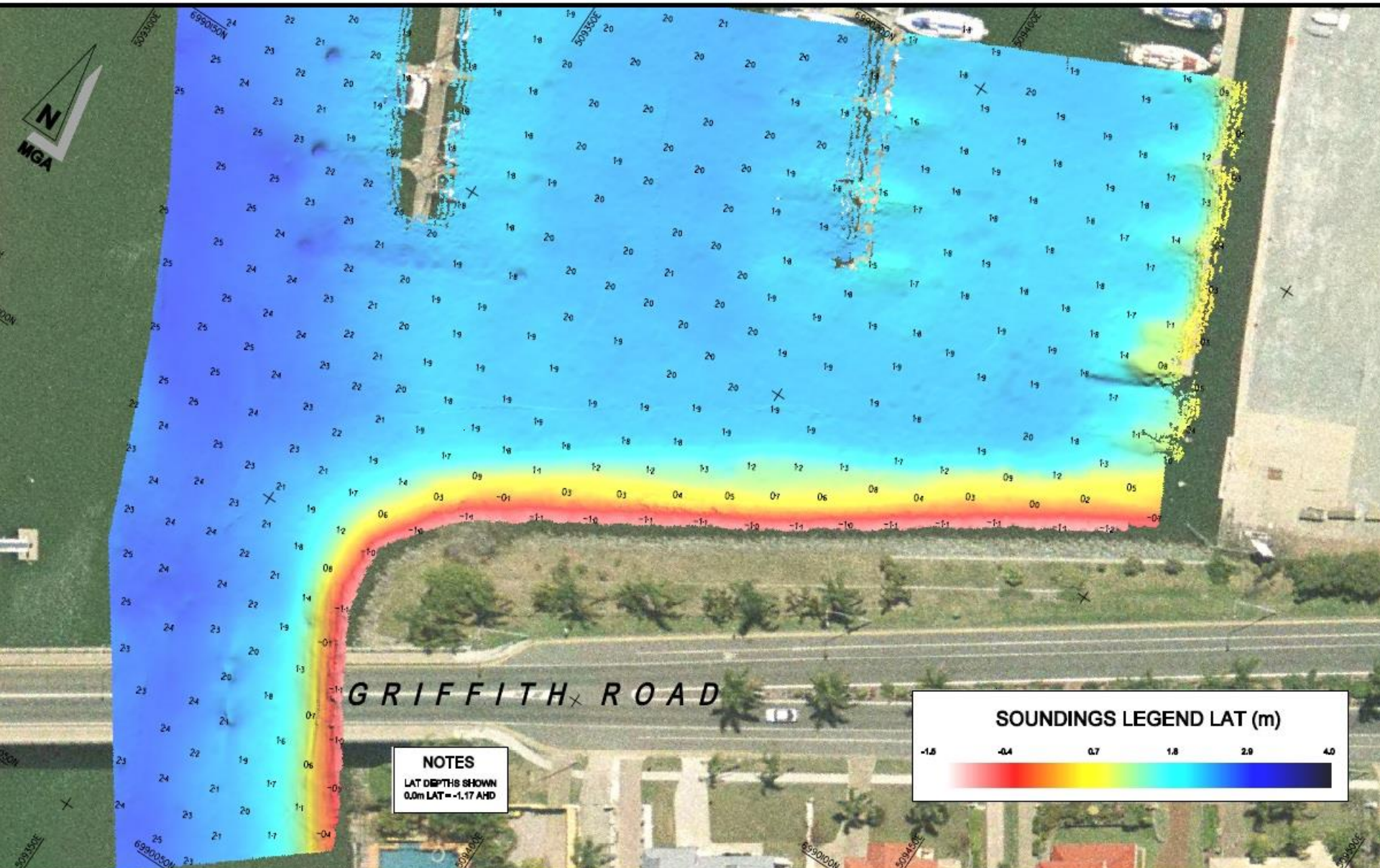
3D Visualisation – Engineering Projects
Rock Wall Construction – Berth 12



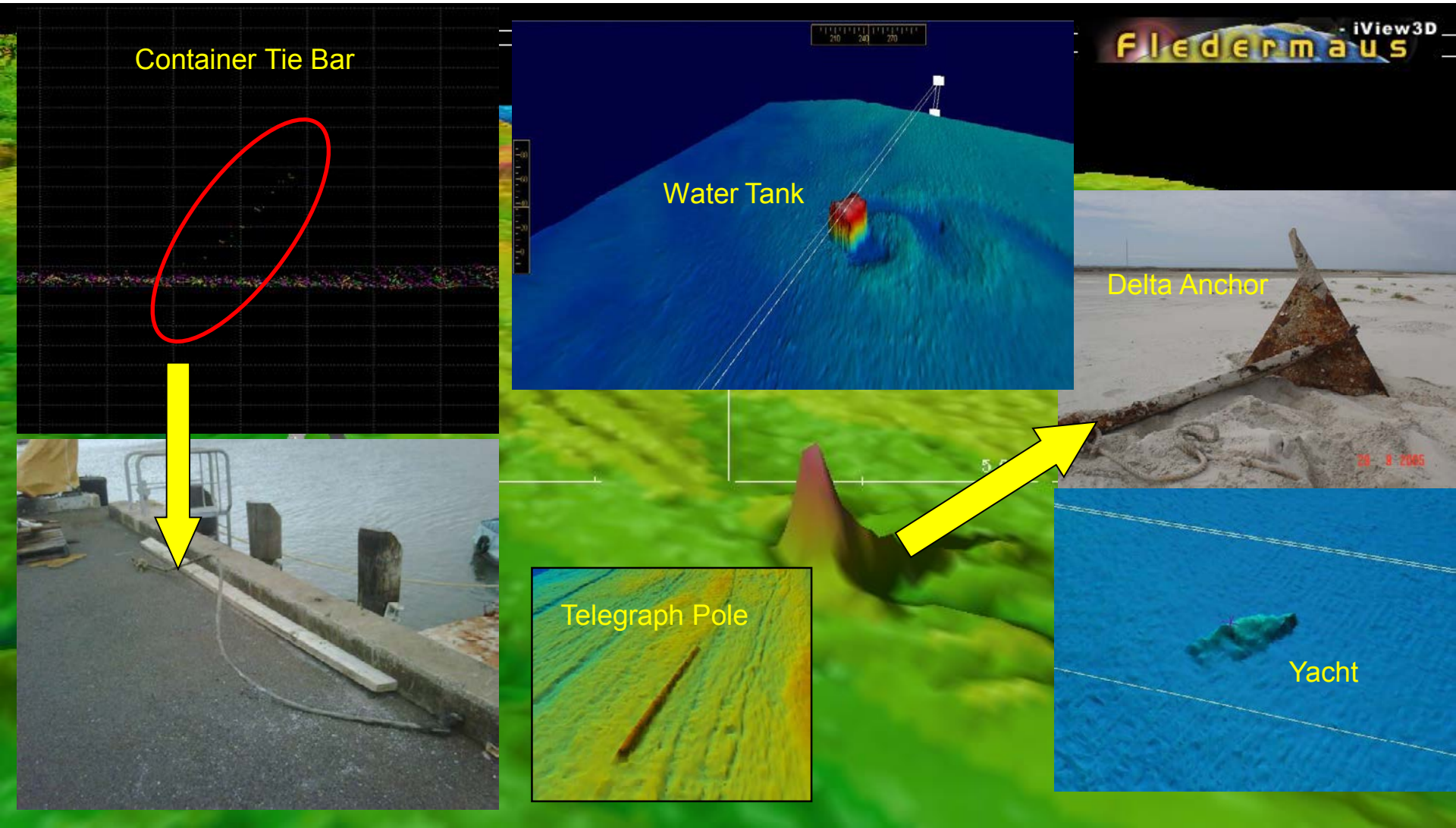
Post Flood Surveys – Monitoring Gateway Bridge Arrestors



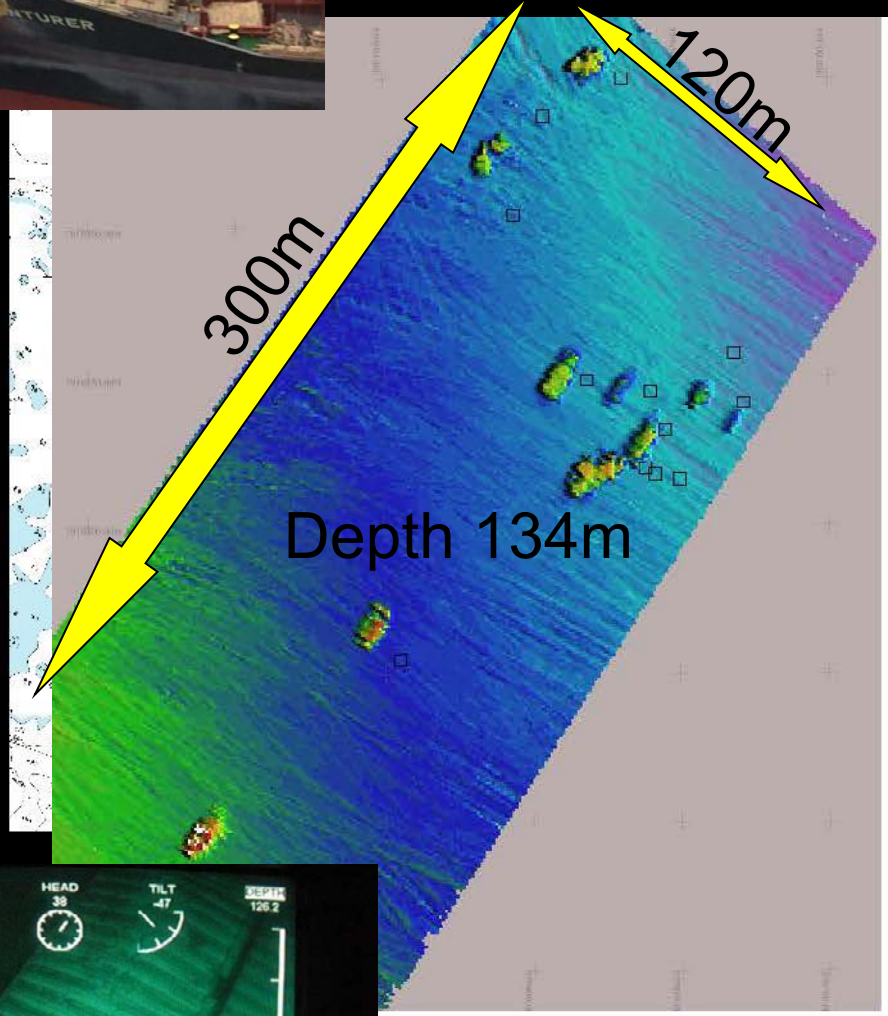
Bridge Embankment Surveys
Slumping/Subsidence

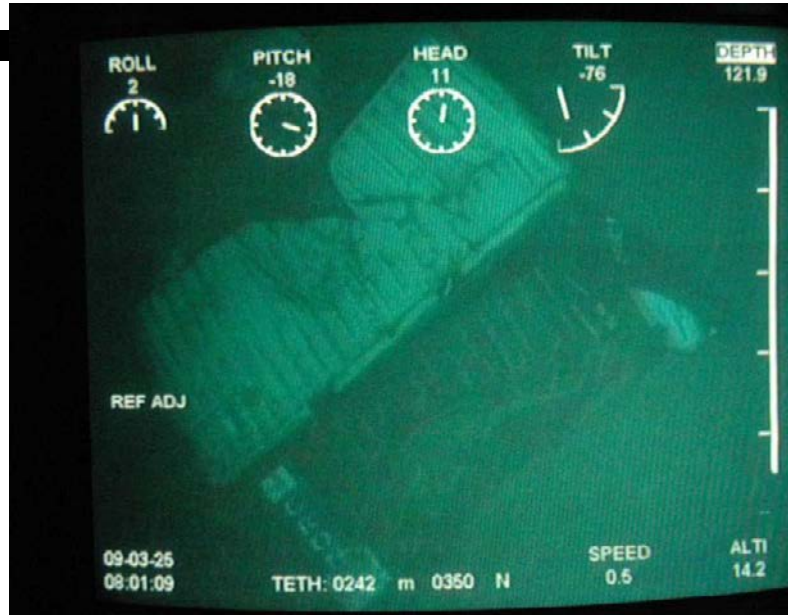


Seabed Object Detection
Delta Anchor, Water Tank, Yacht, Telegraph Pole and Container Tie Bar

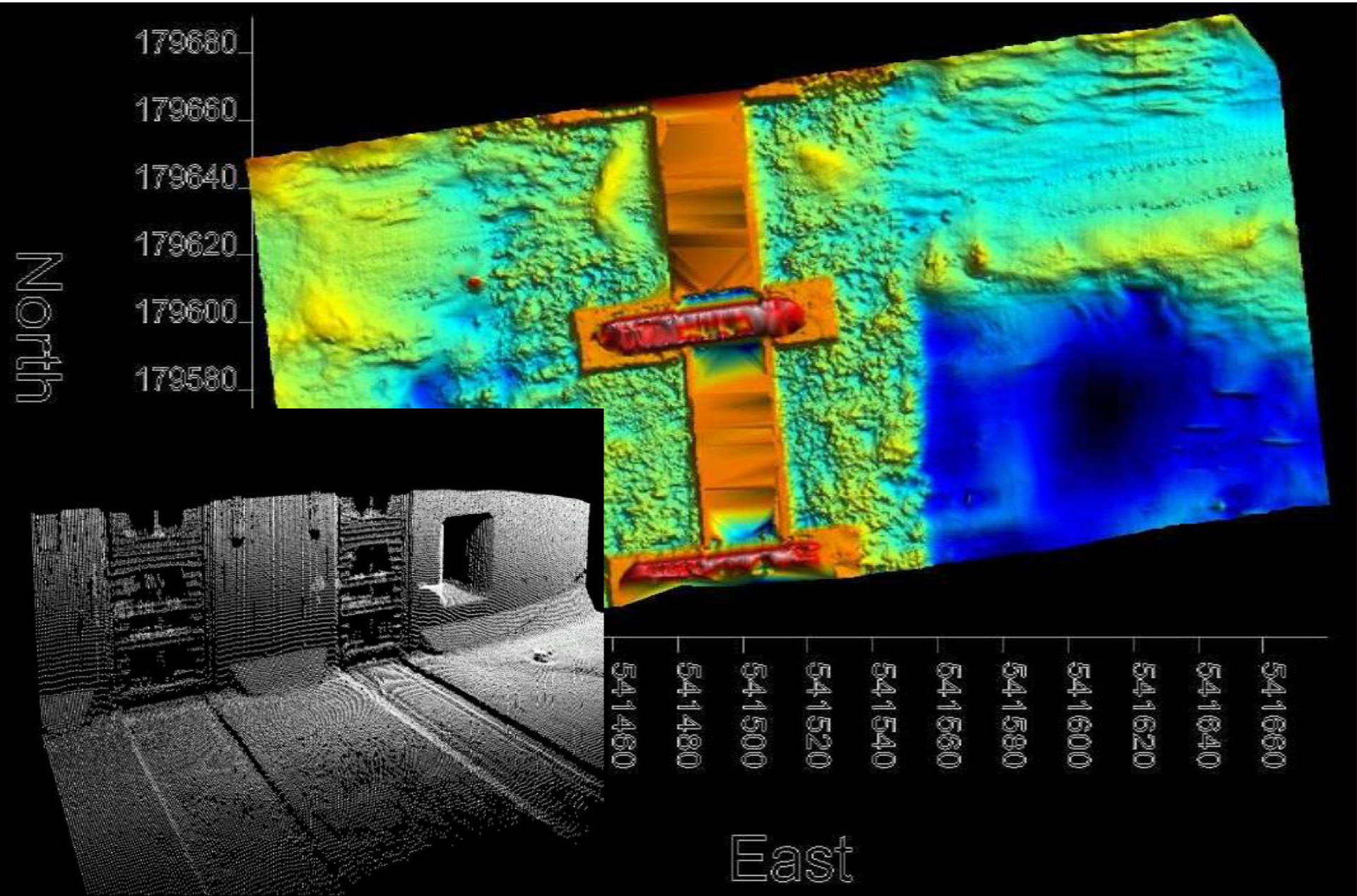


Lost Containers
Pacific Adventurer March 2009

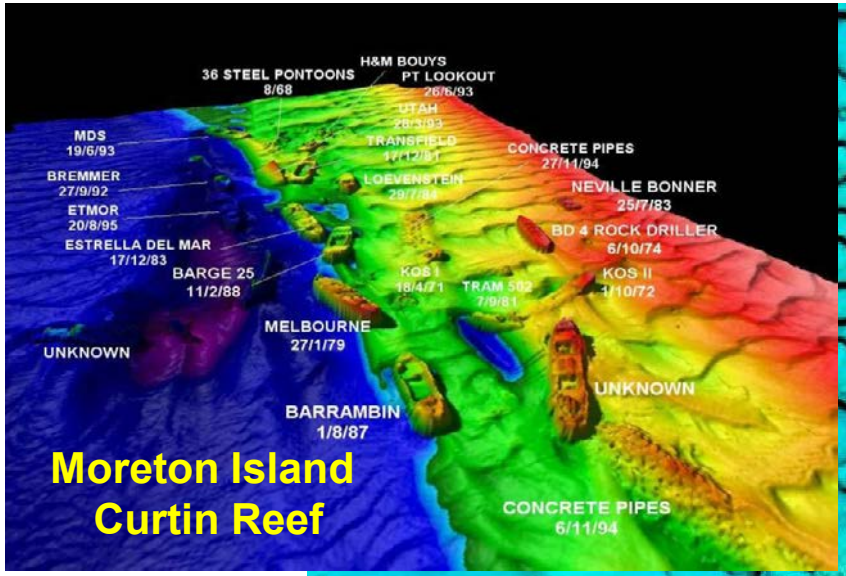




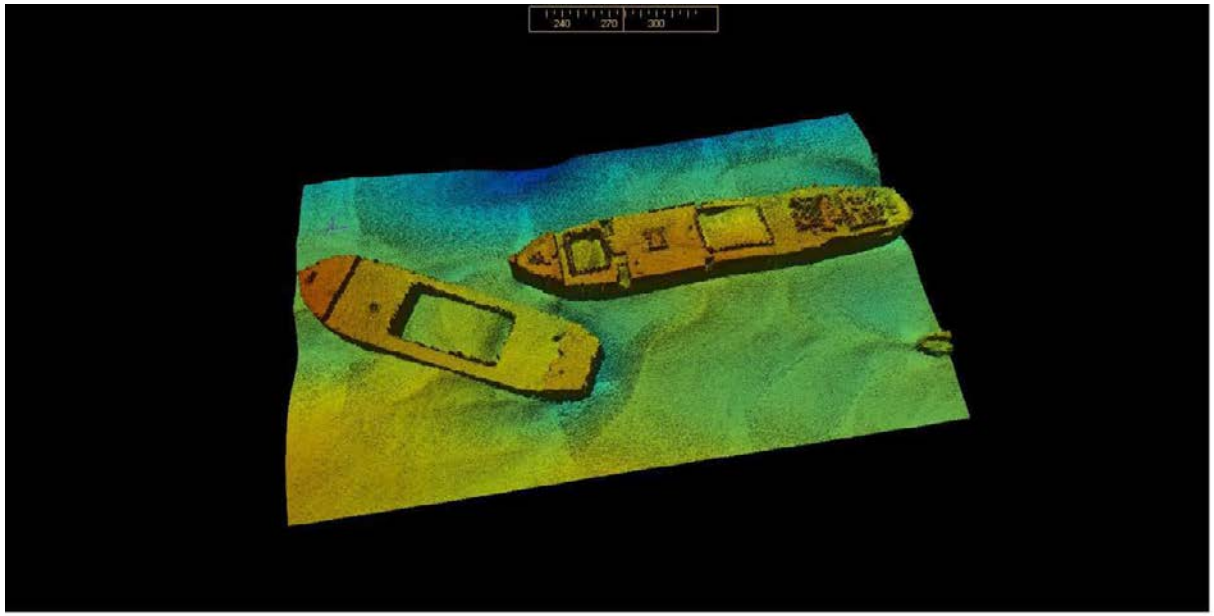
Multibeam of Structures – Engineering Projects -Structures

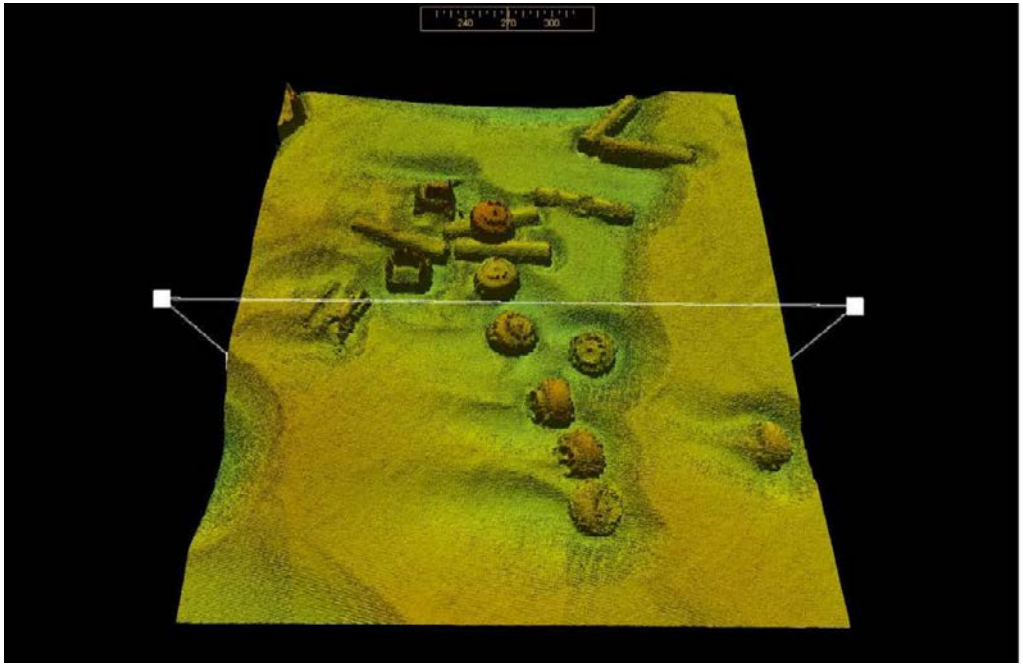


3D Visualisation - Safety of Navigation - Wrecks

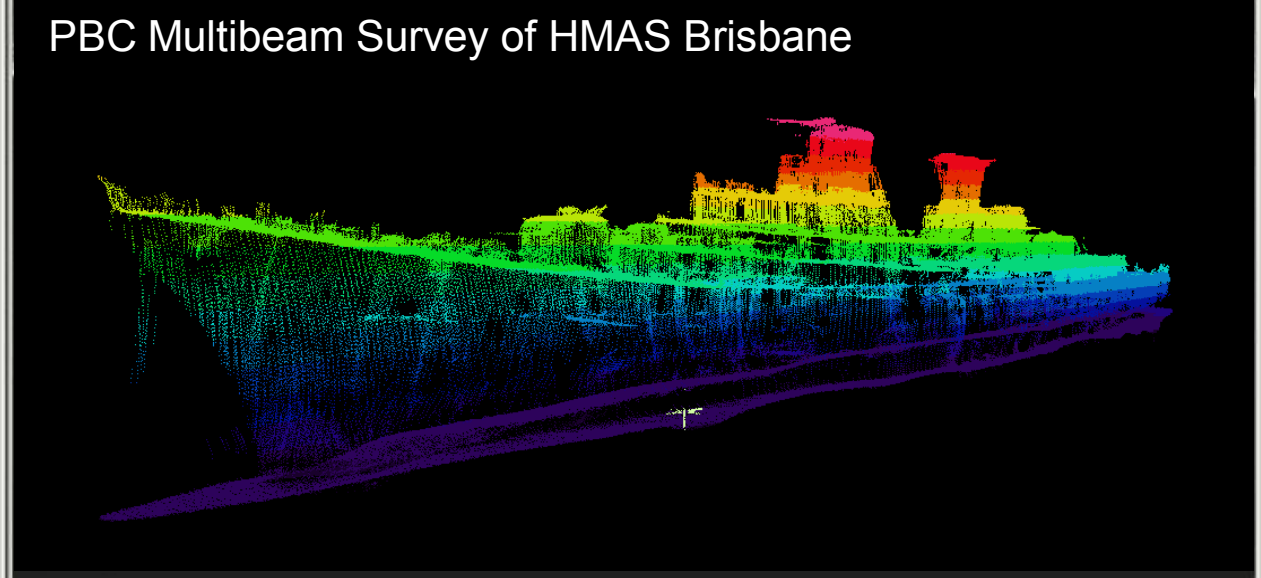


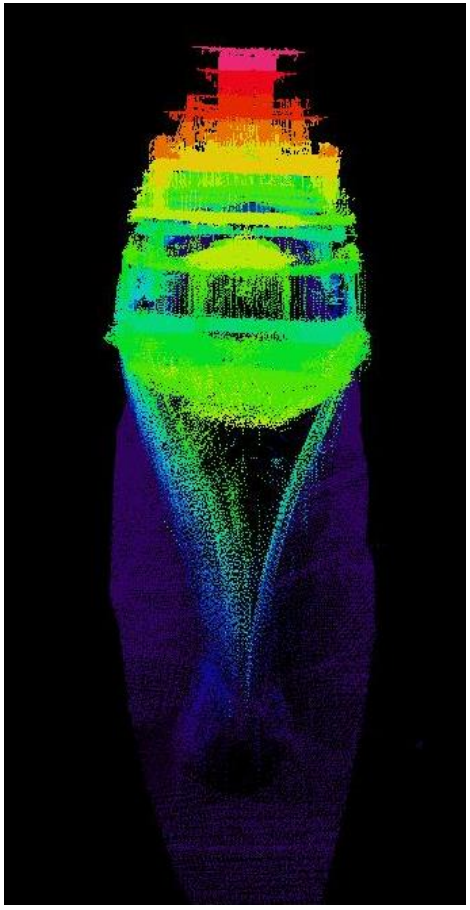
3D Visualisation – Curtin Reef - Wrecks

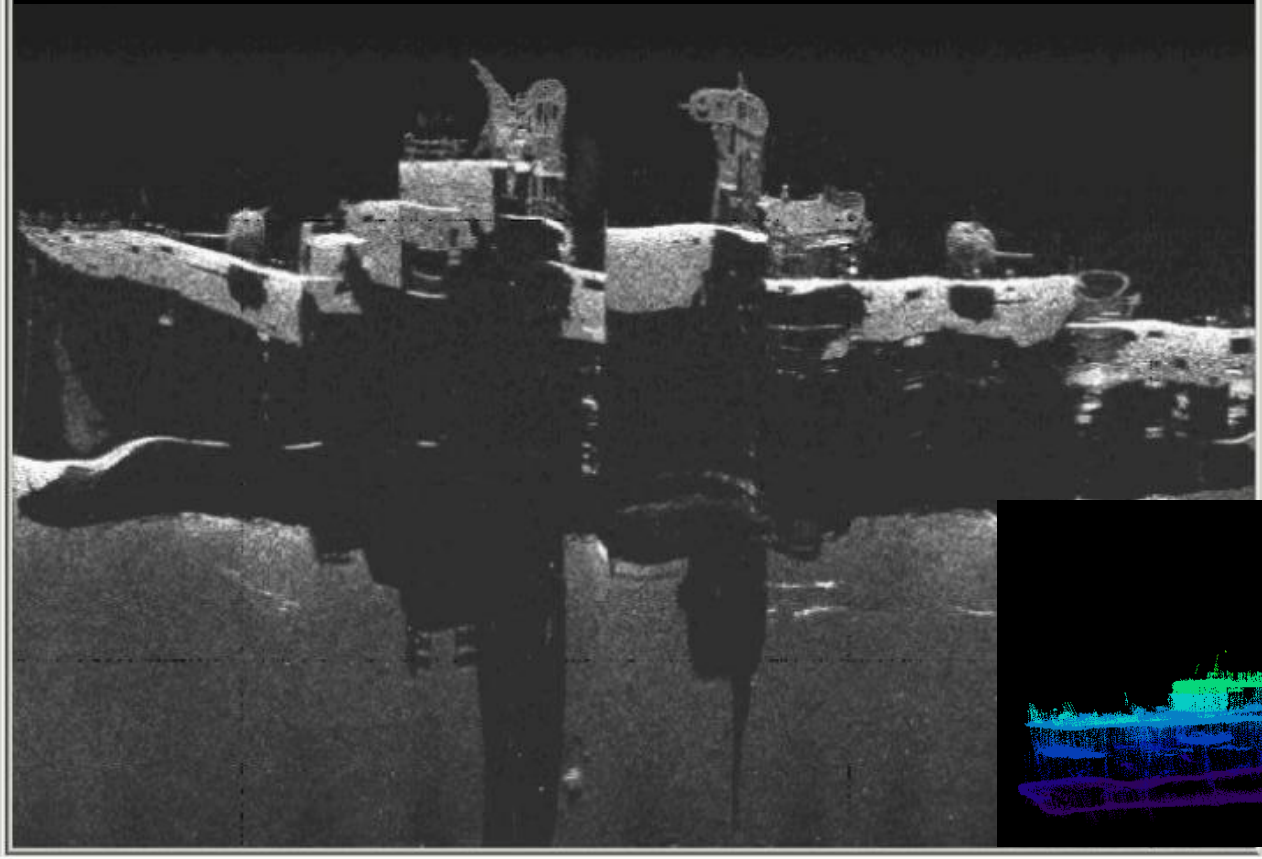


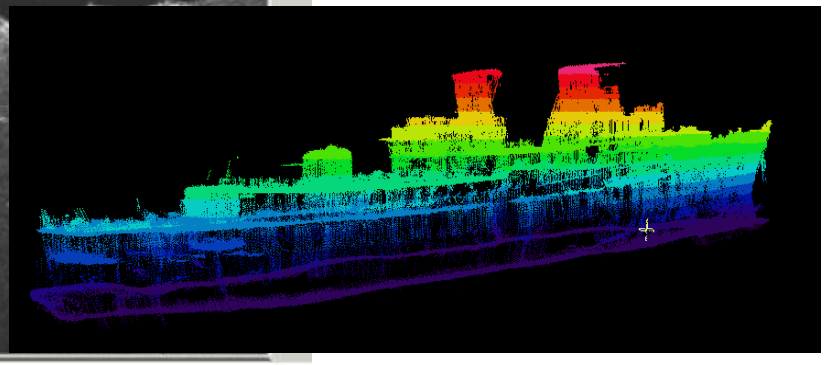


PBC Multibeam Survey of HMAS Brisbane

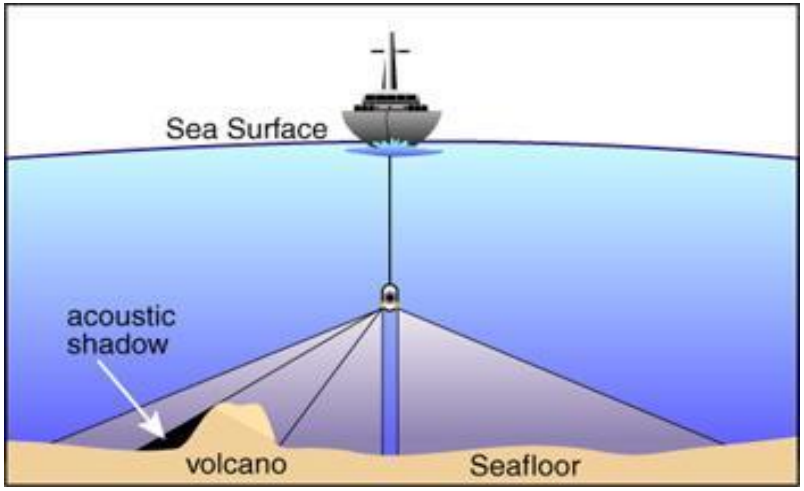


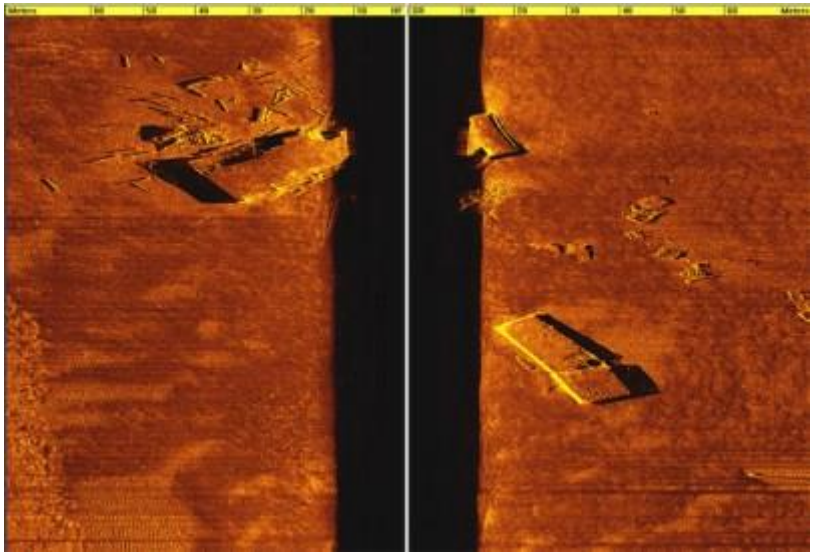


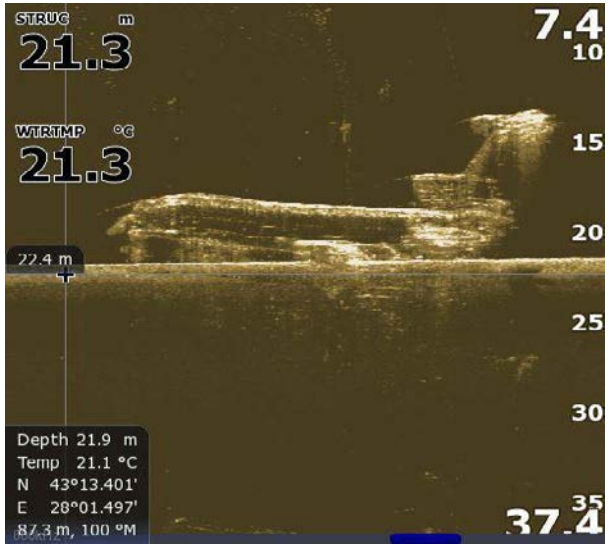




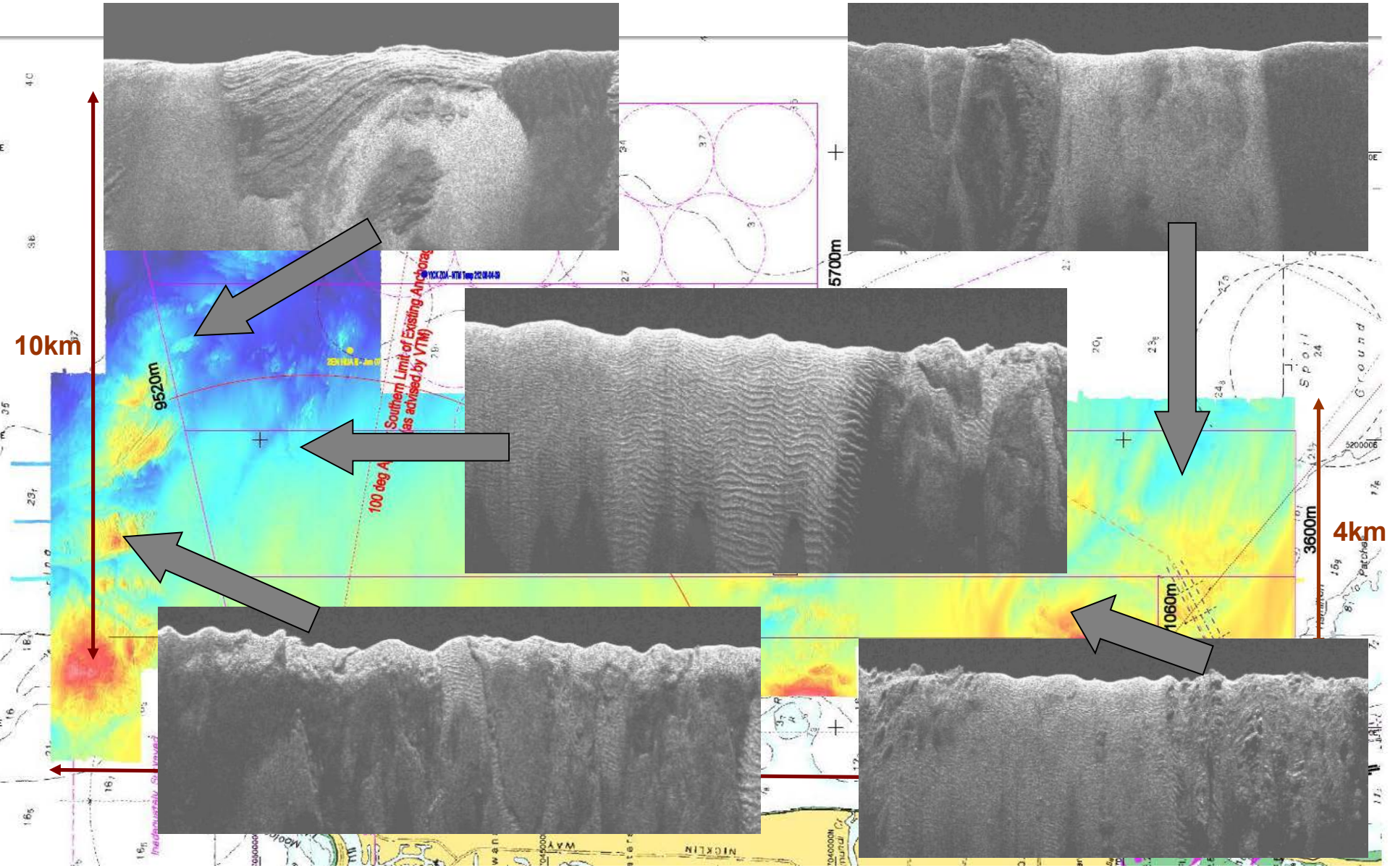
Side Scan Sonar



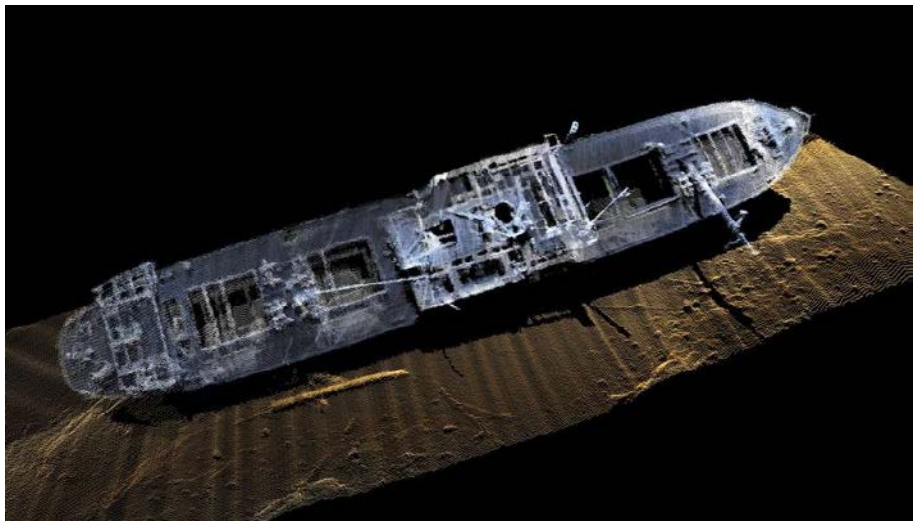


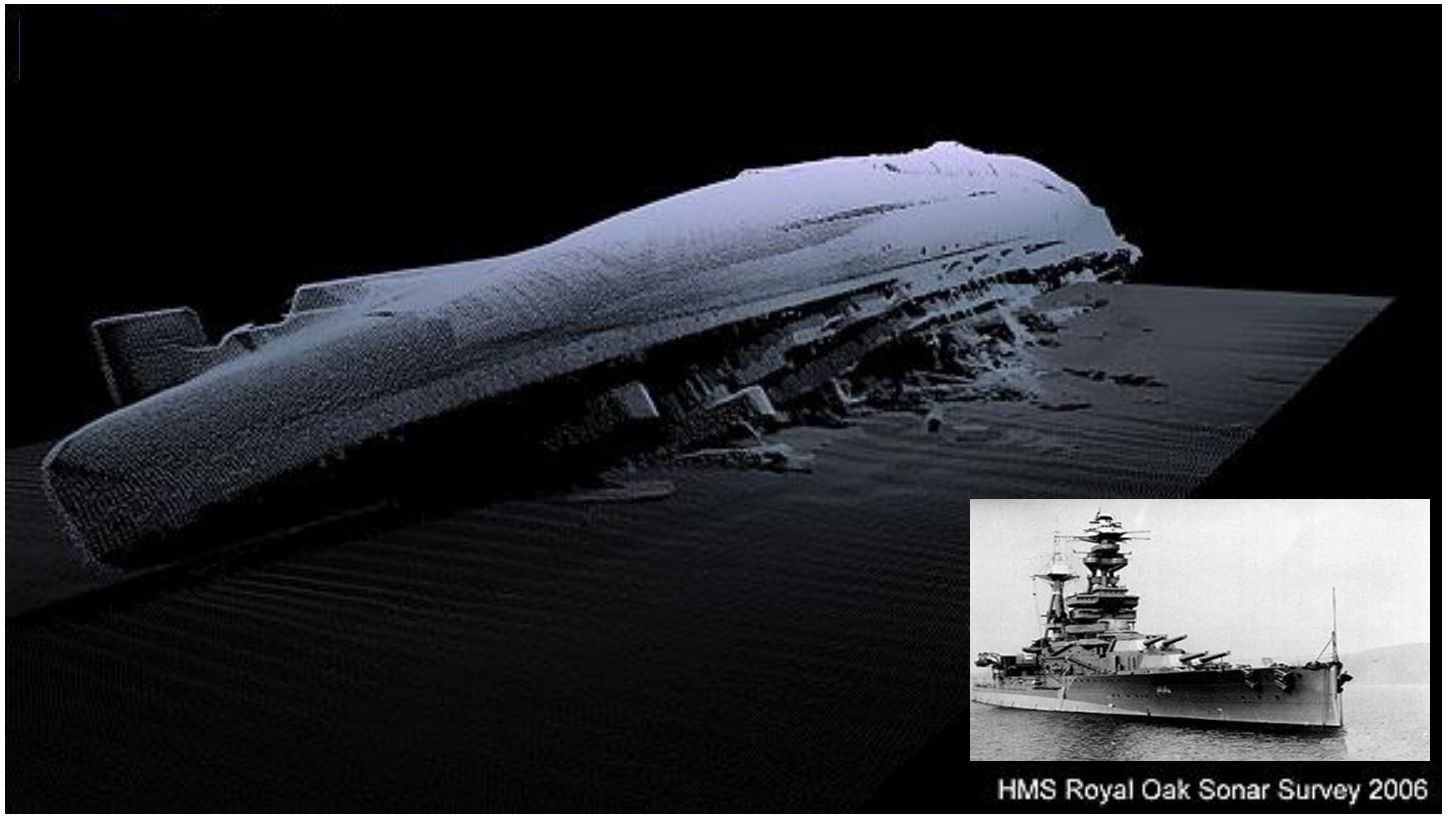


Point Cartwright / Anchorage Survey Side Scan Enhancement

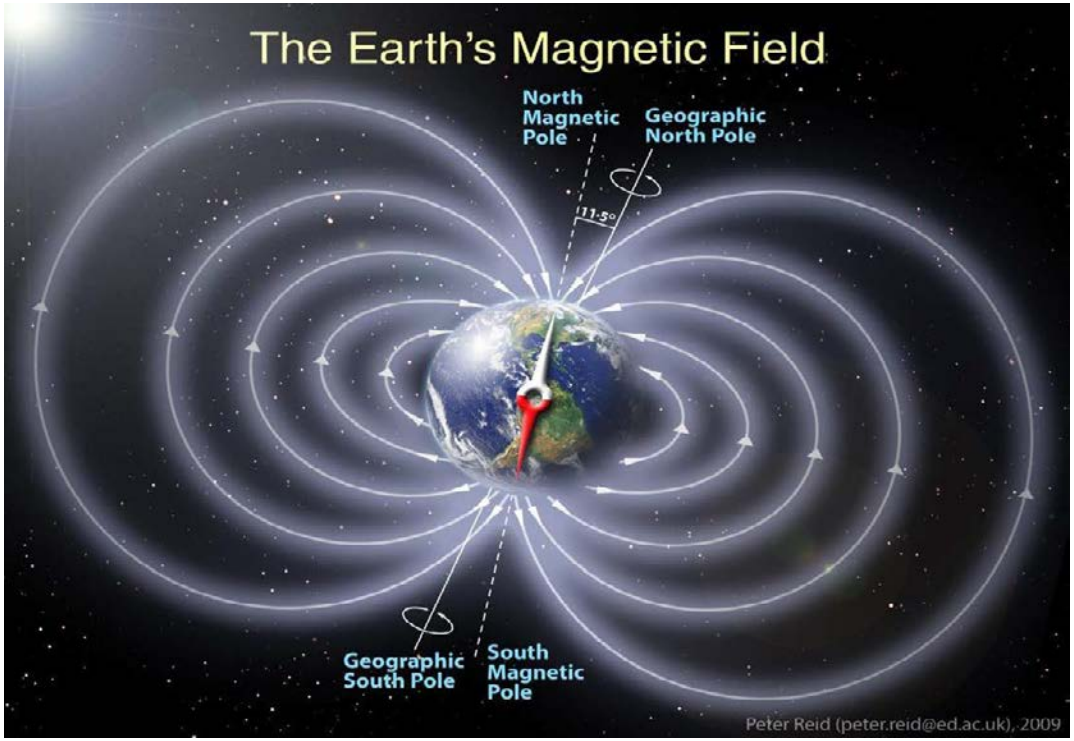


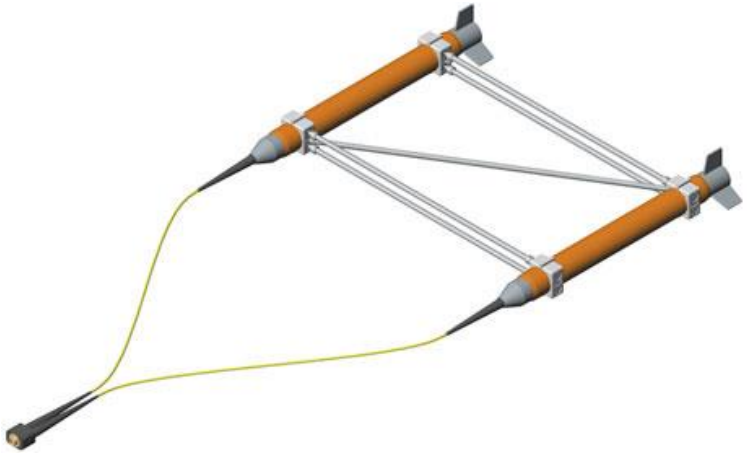
3D Visualisation – Multibeam & Side Scan with Software Enhancement





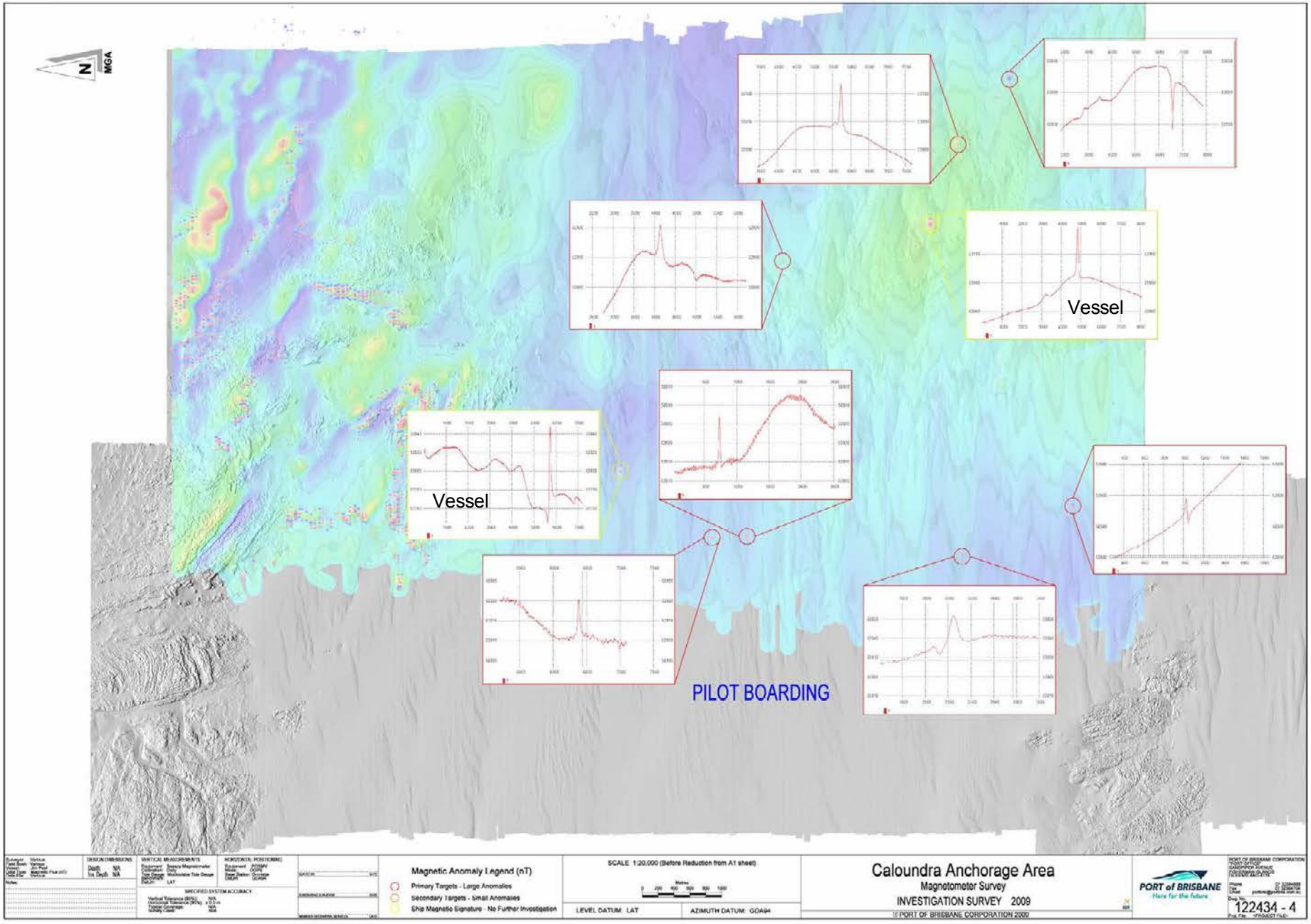
Magnetic Surveys





Magnetometer Capabilities

Resolution: 0.001 nT
Sensitivity: 0.015 nT
Dead Zone: NONE
Heading Error: NONE
Temperature Drift: NONE
Time-based Stability: 1ppm
Absolute Accuracy: 0.2 nT
Range: 18,000 to 120,000 nT
Gradient Tolerance: Over 10,000 nT/m
Sampling Rates: 0.1Hz to 4Hz
External Trigger: by RS-232
Communications: RS-232, 9600bps



Magnetic Anomaly Legend (nT)

- Primary Targets - Large Anomalies
- Secondary Targets - Small Anomalies
- Ship Magnetic Signature - No Further Investigation

SCALE 1:20,000 (Before Reduction from A1 sheet)

LEVEL DATUM: LAT

AZIMUTH DATUM: GDA94

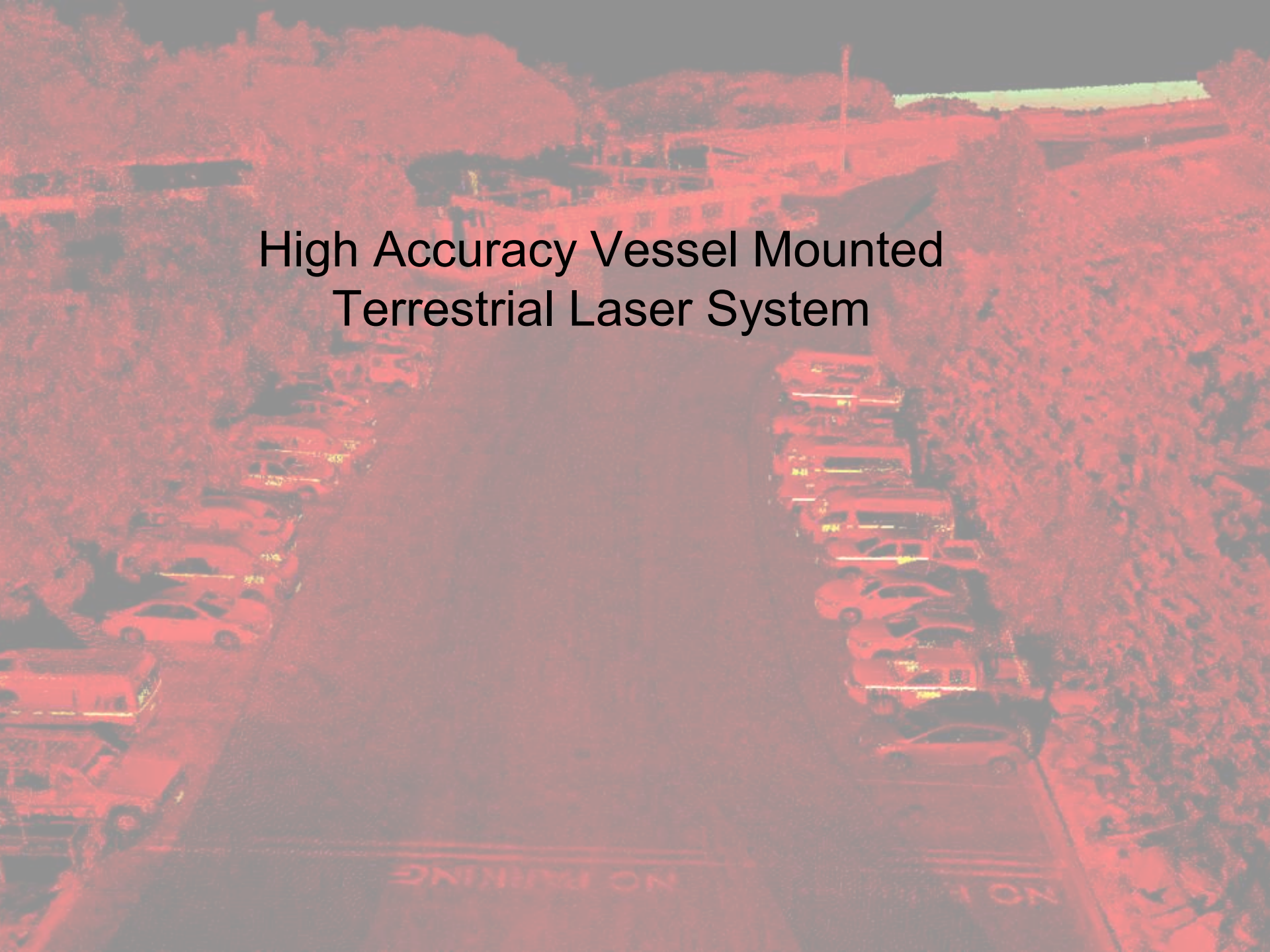
Caloundra Anchorage Area

Magnetometer Survey

INVESTIGATION SURVEY 2009

PORT of BRISBANE
Here for the future

Drg. No. 122434 - 4

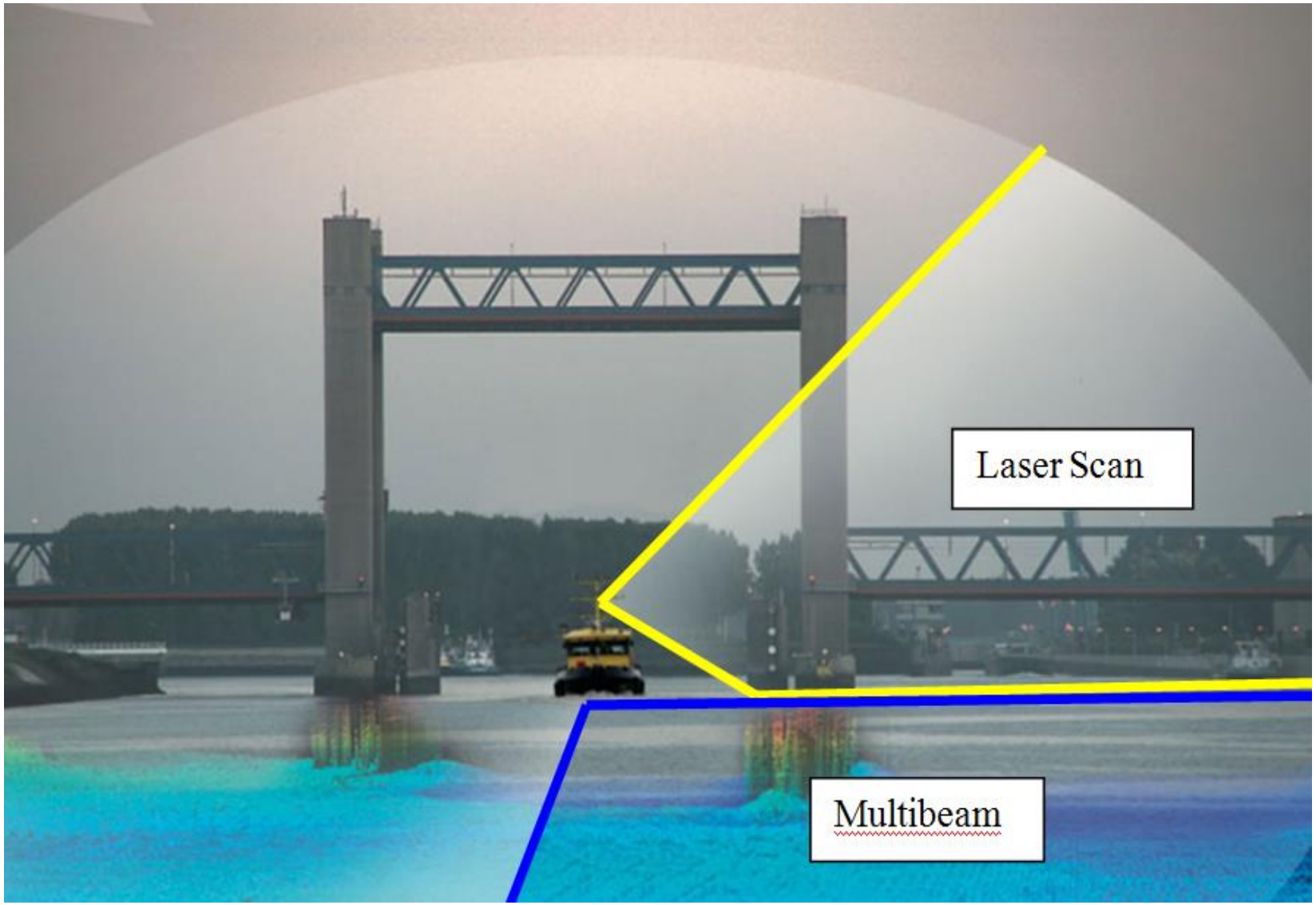


High Accuracy Vessel Mounted Terrestrial Laser System

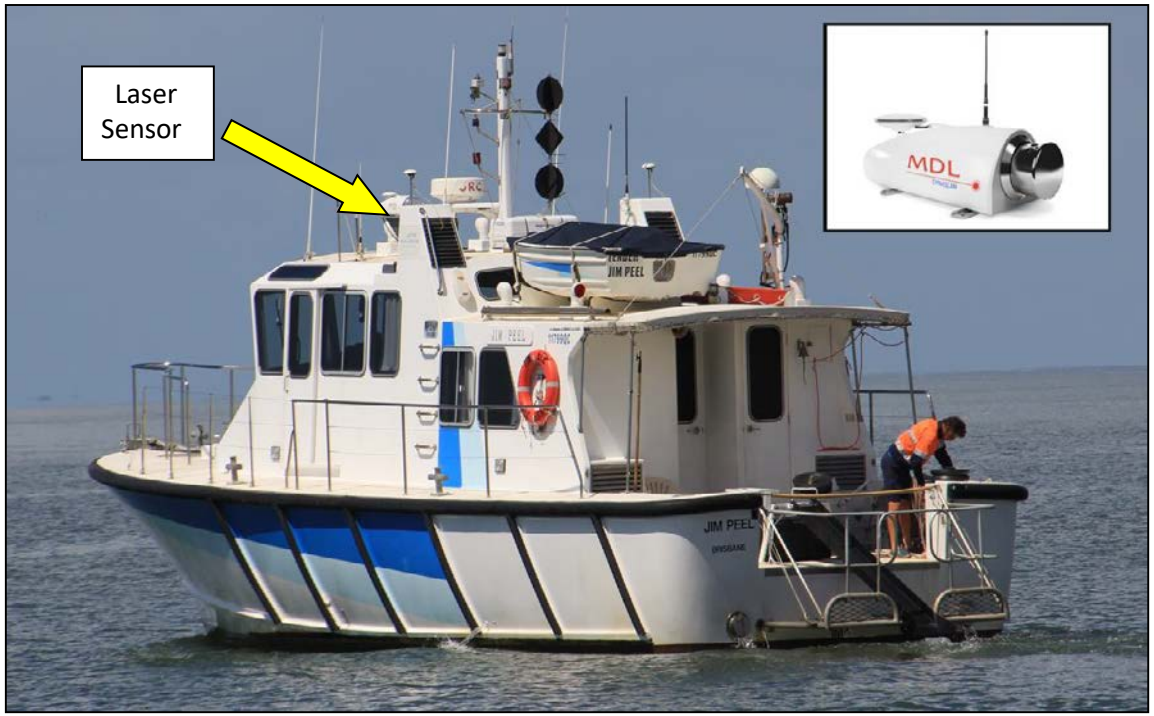
Breakwater Damage – Cyclone Oswald 2013

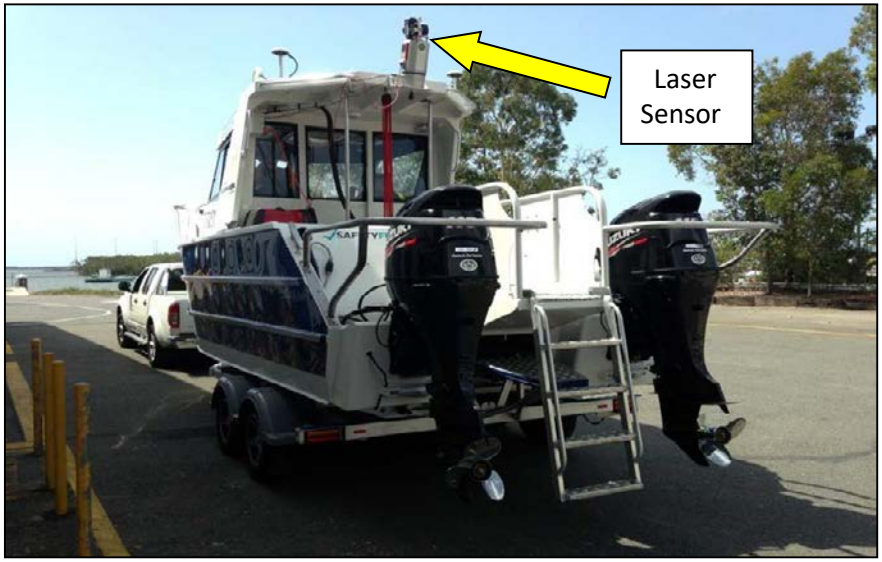
PBPL High Resolution Terrestrial Laser Riegl VZ-2000

Simultaneous Multibeam and Vessel Mounted Terrestrial Laser Survey

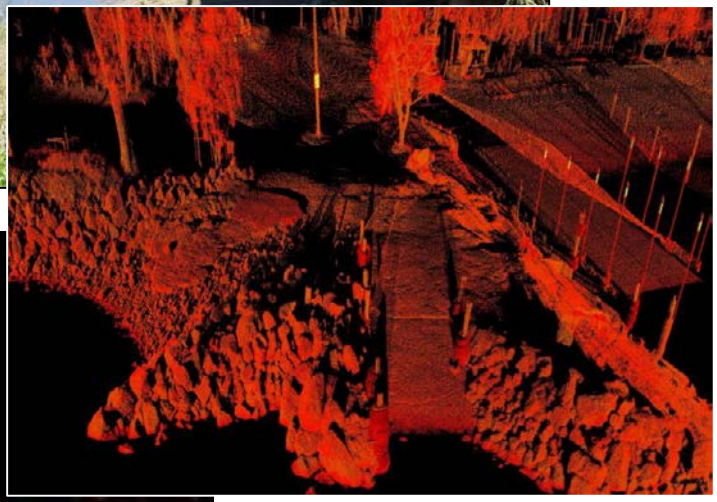


Vessel Mounted Terrestrial Laser Surveys

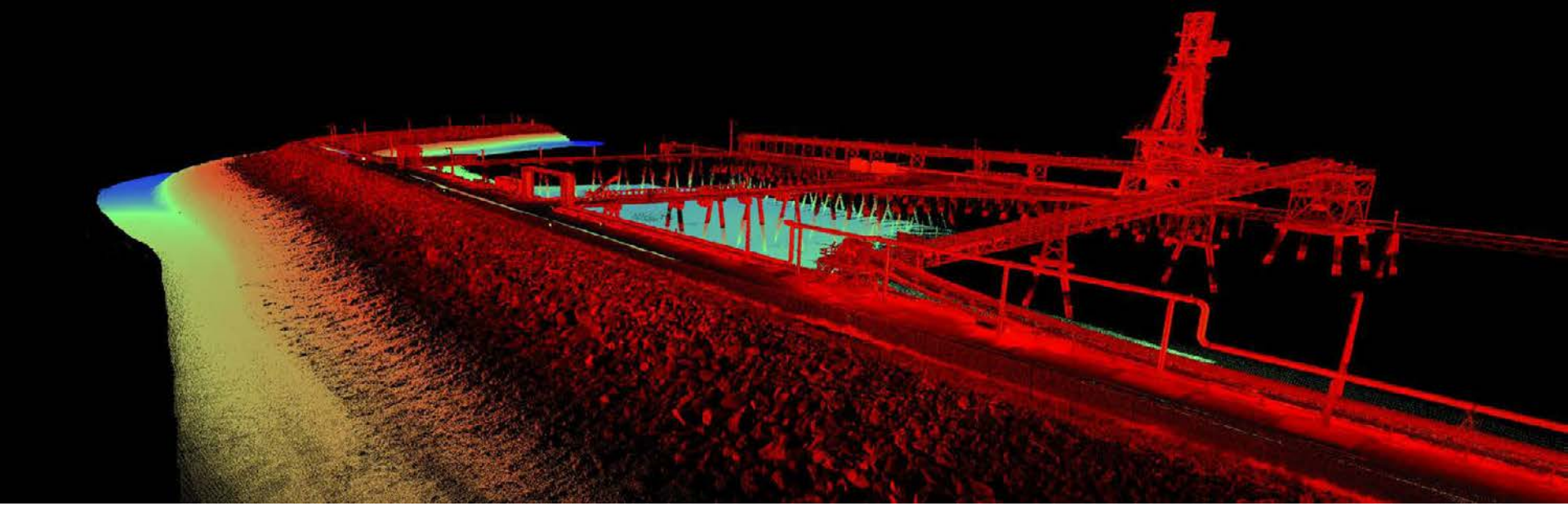


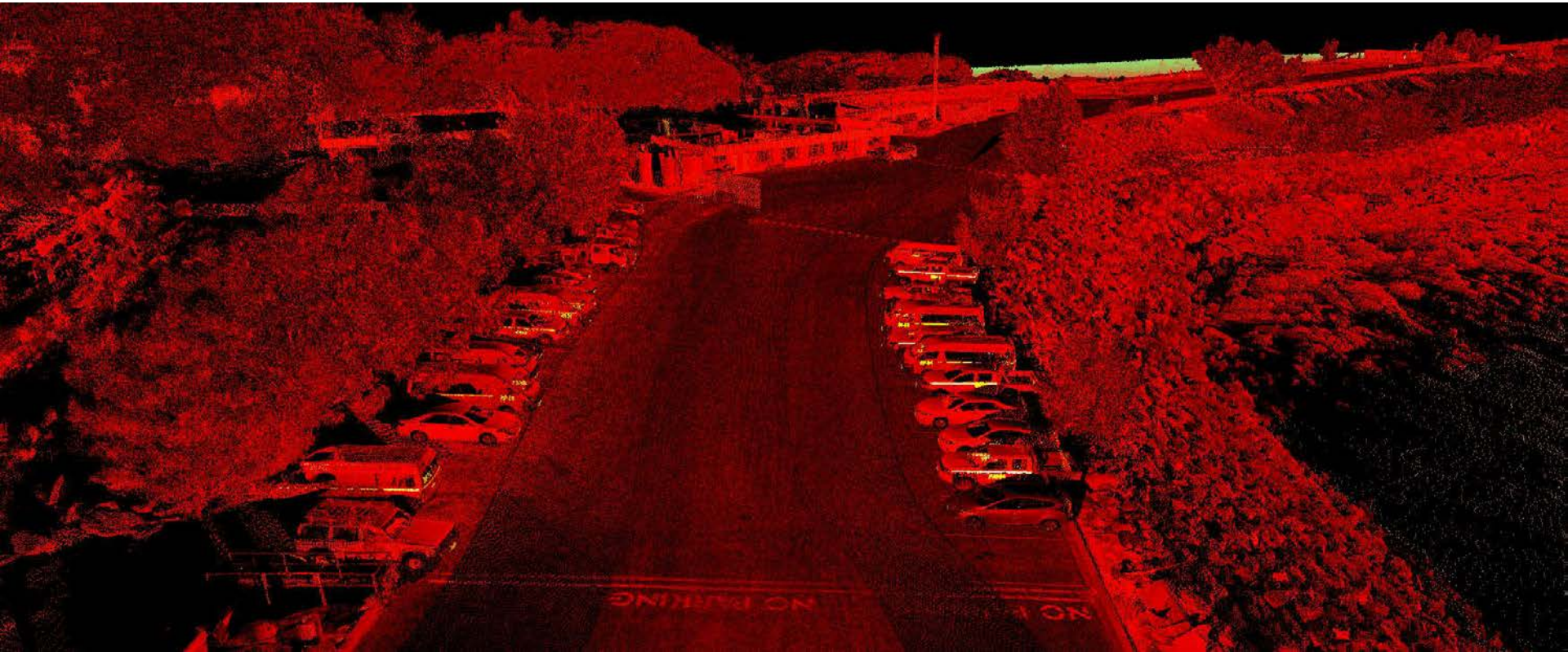


Vessel Mounted Terrestrial Laser Survey

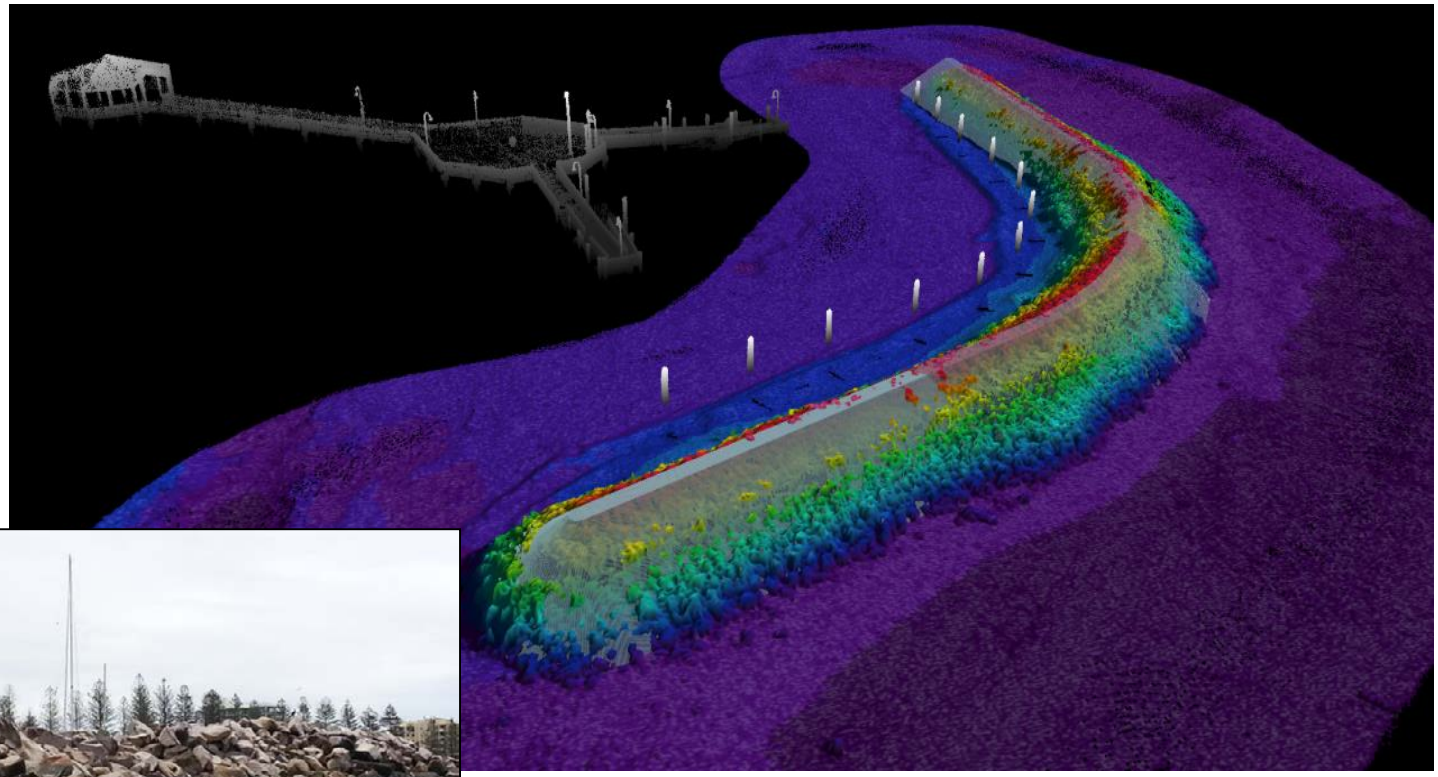


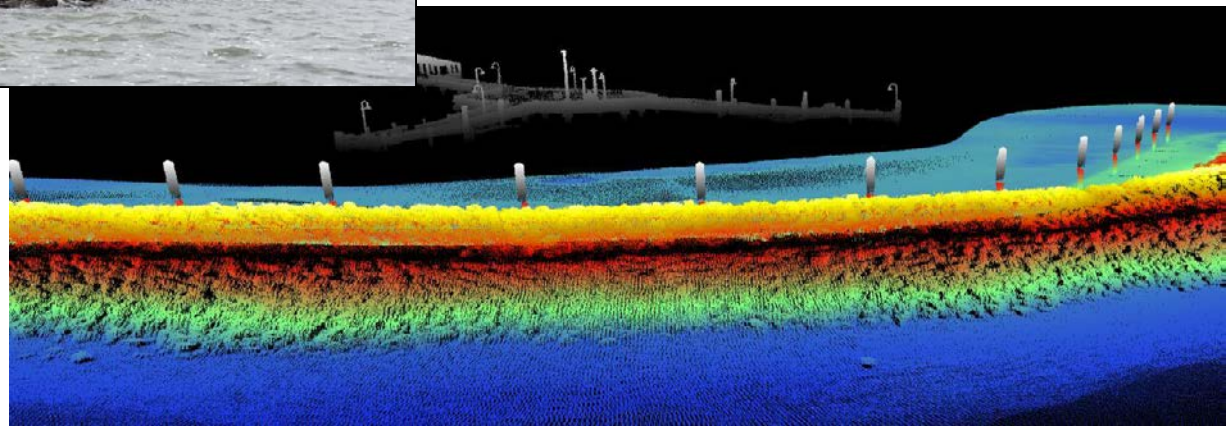

KARLOO




NO PARKING

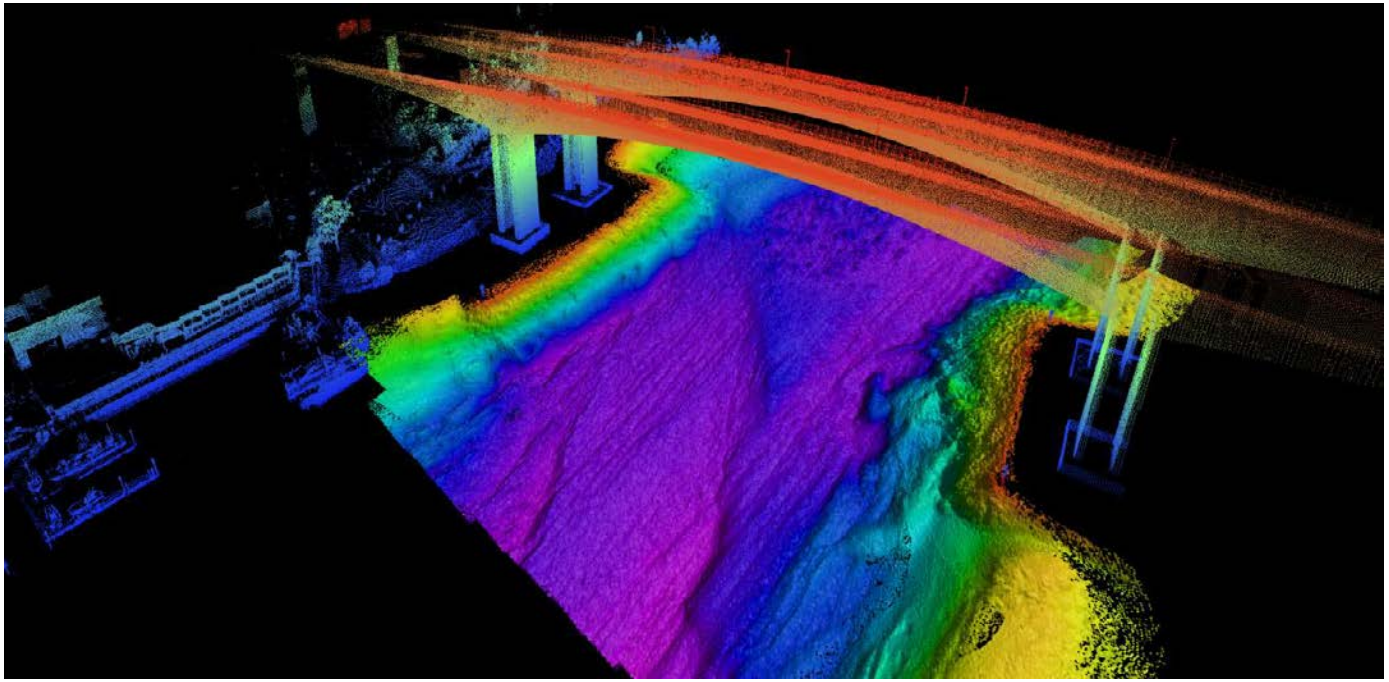
Breakwater Survey Combined Multibeam & Laser Survey

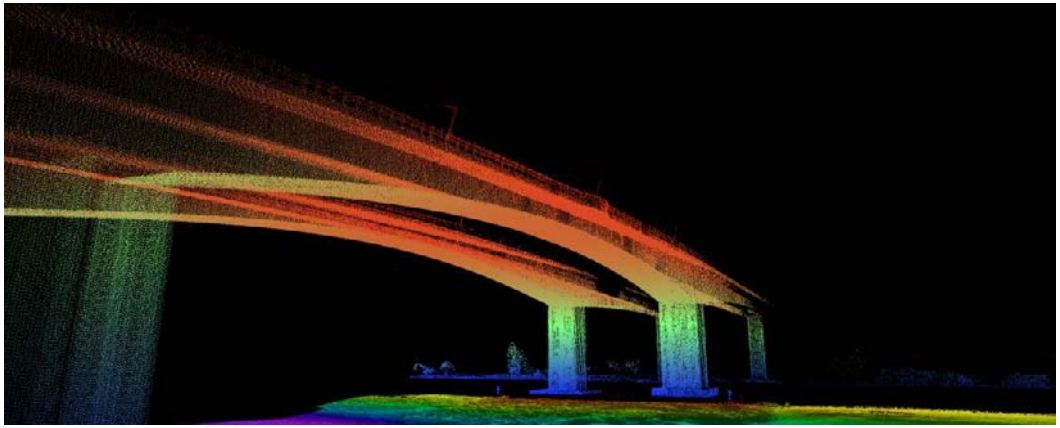




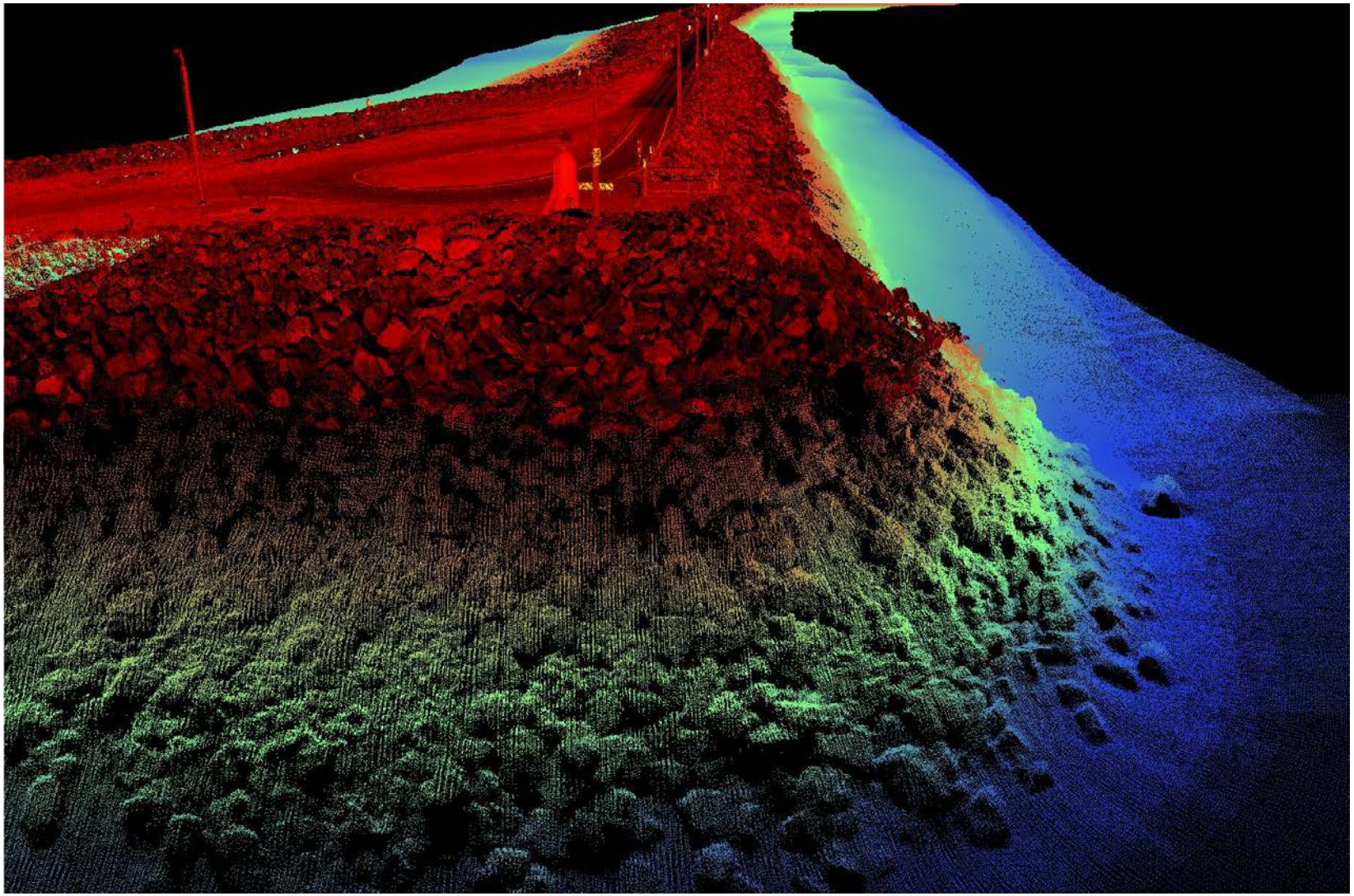
Combined Vessel Mounted Terrestrial Laser Survey and High Resolution Multibeam Surveys

Brisbane River – Gateway Bridge Multibeam & Laser Survey

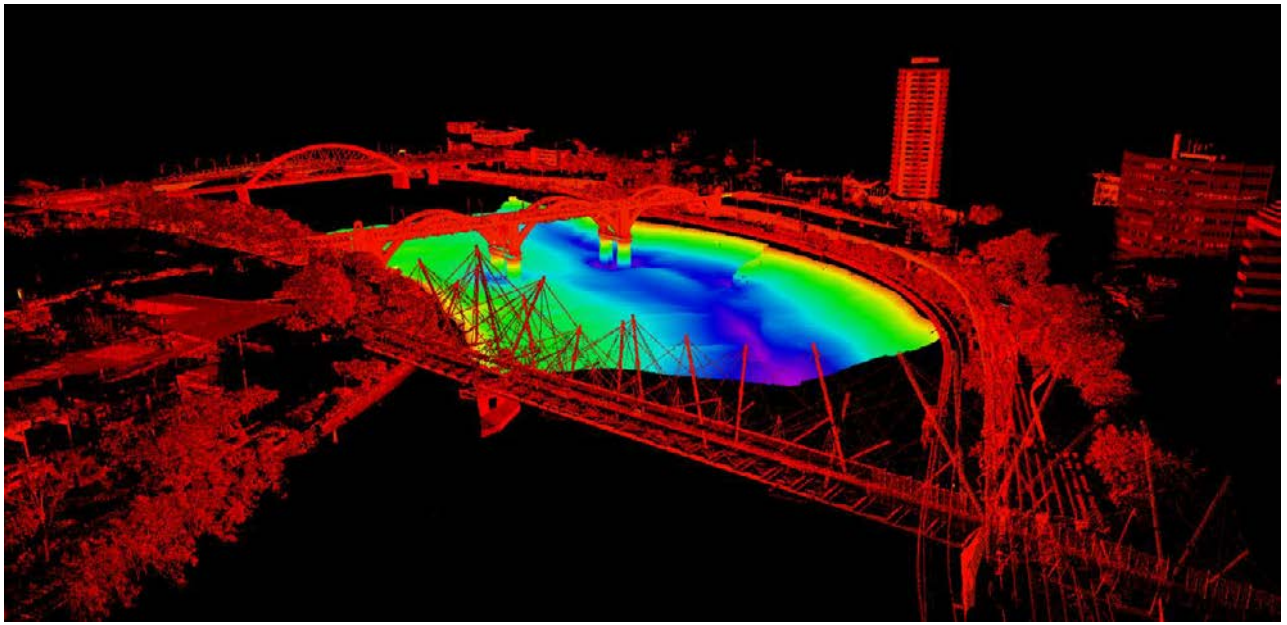


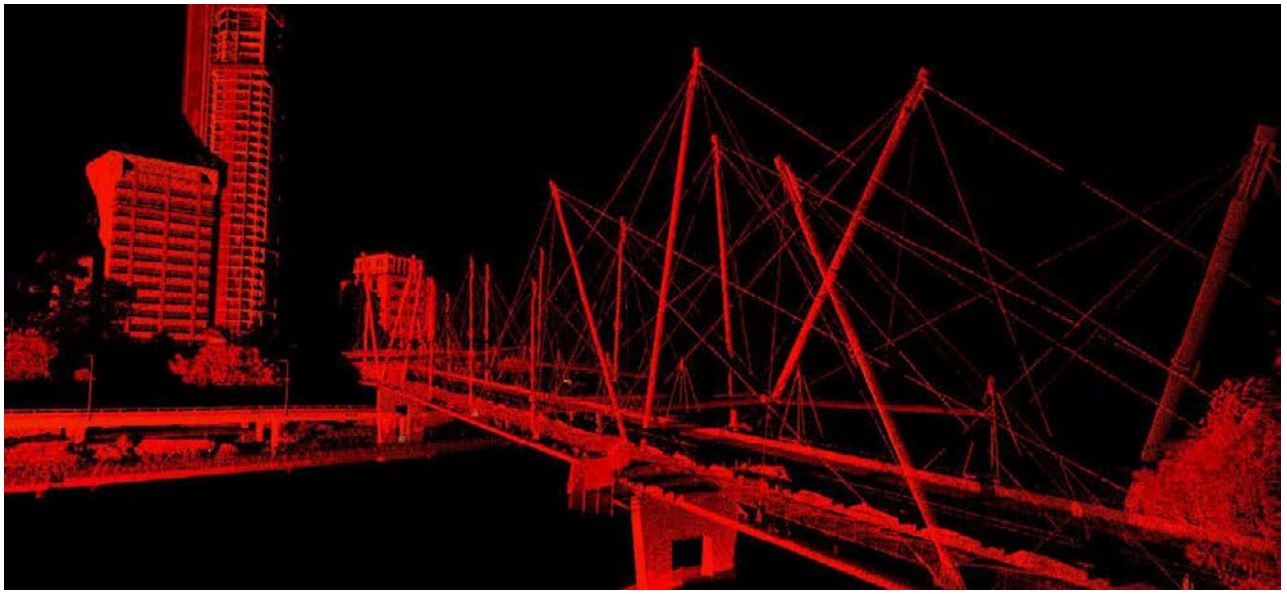


Combined Vessel Mounted Terrestrial Laser Survey and High Resolution Multibeam Surveys

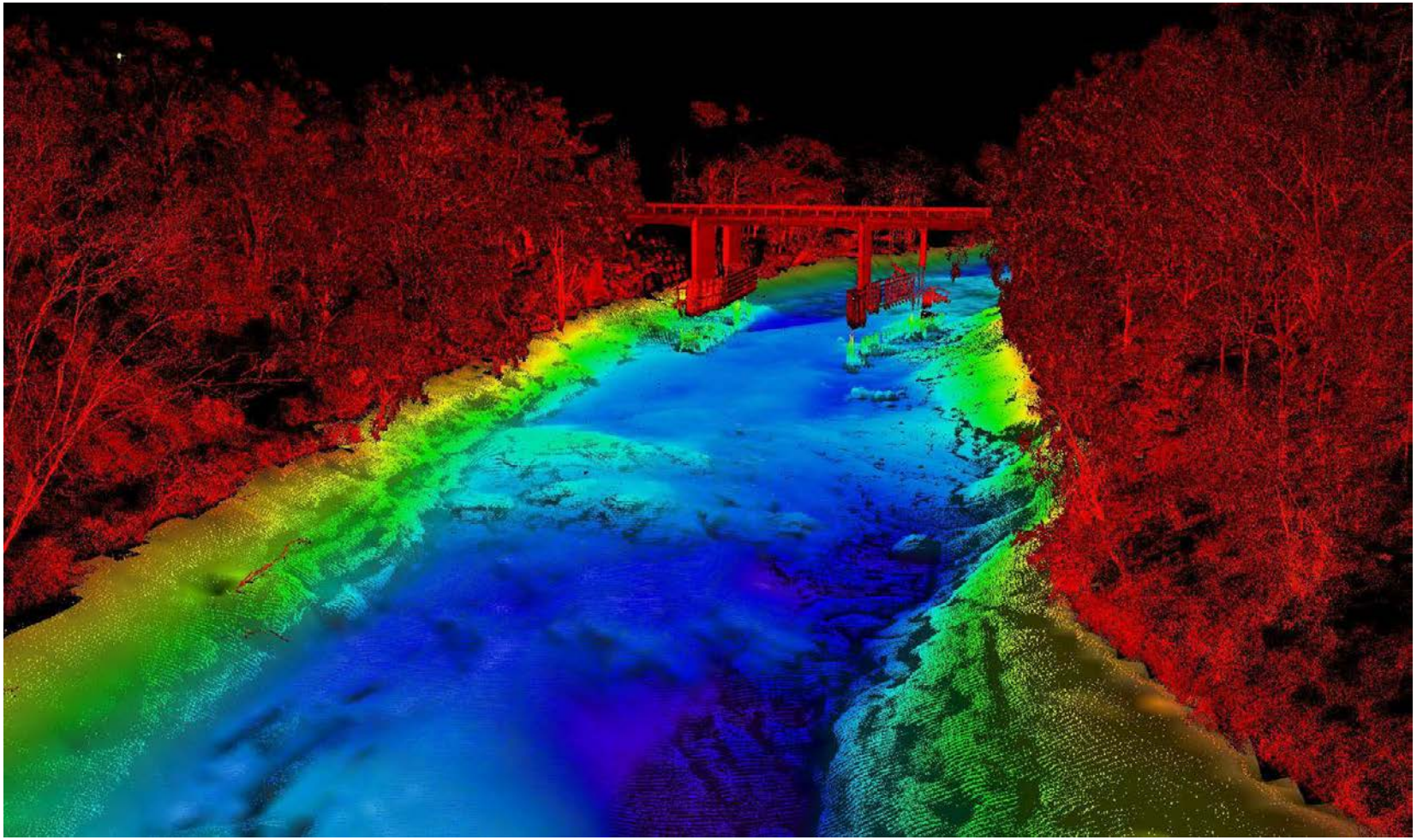


PBPL - Combined Vessel Mounted Terrestrial Laser and High Resolution Multibeam Surveys

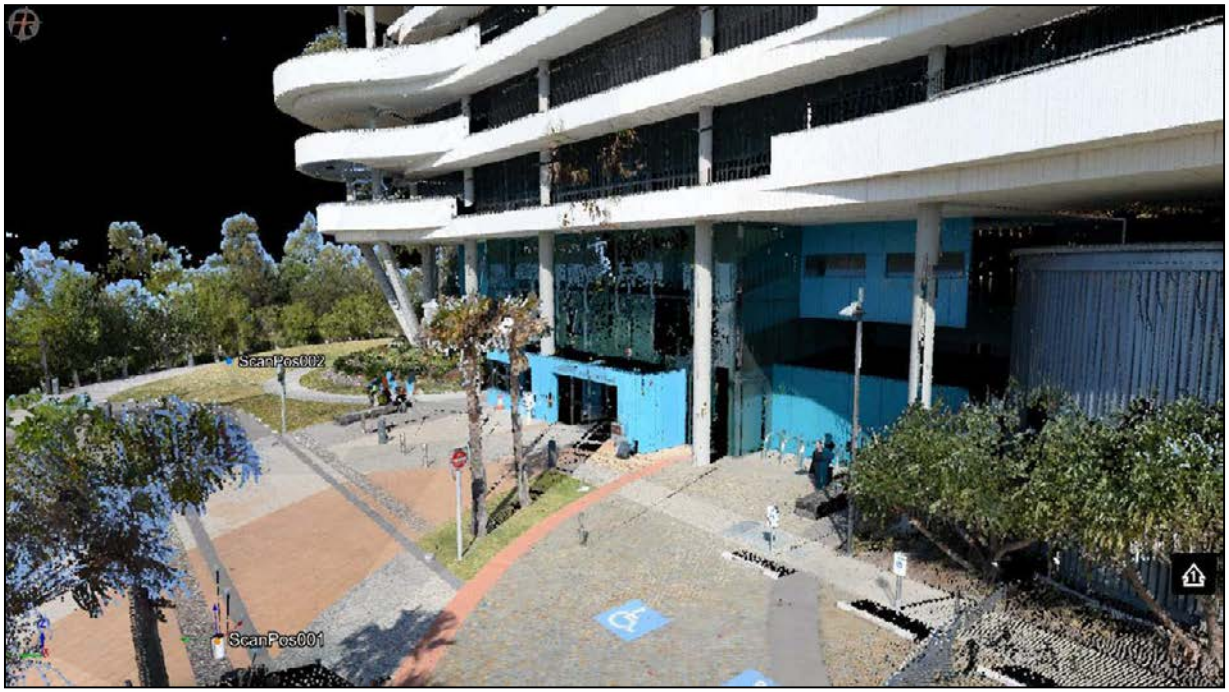


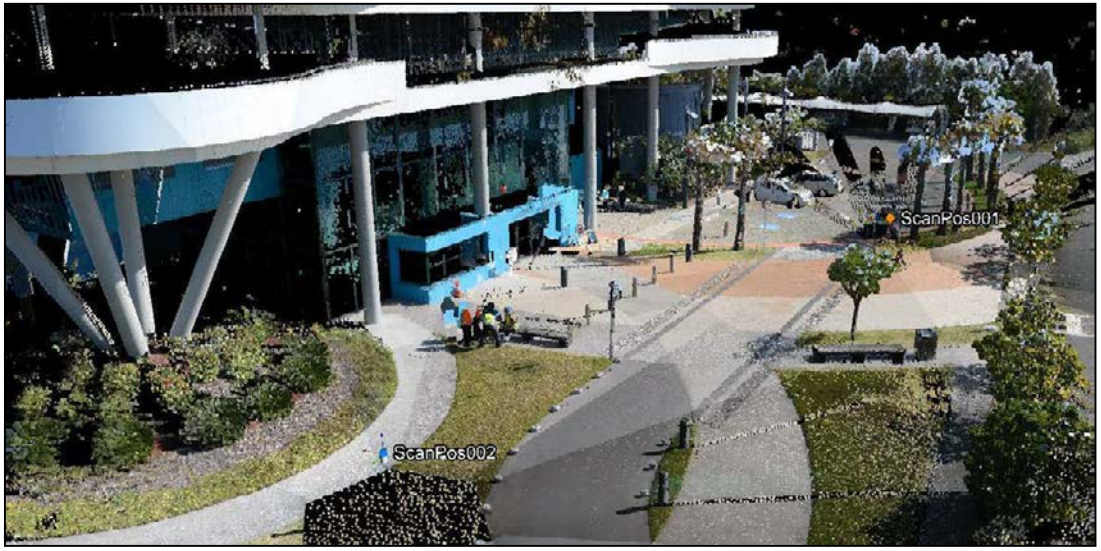


Combined Vessel Mounted Terrestrial Laser Survey and High Resolution Multibeam Surveys



Combined Terrestrial Laser Survey and Geo-Referenced Photography



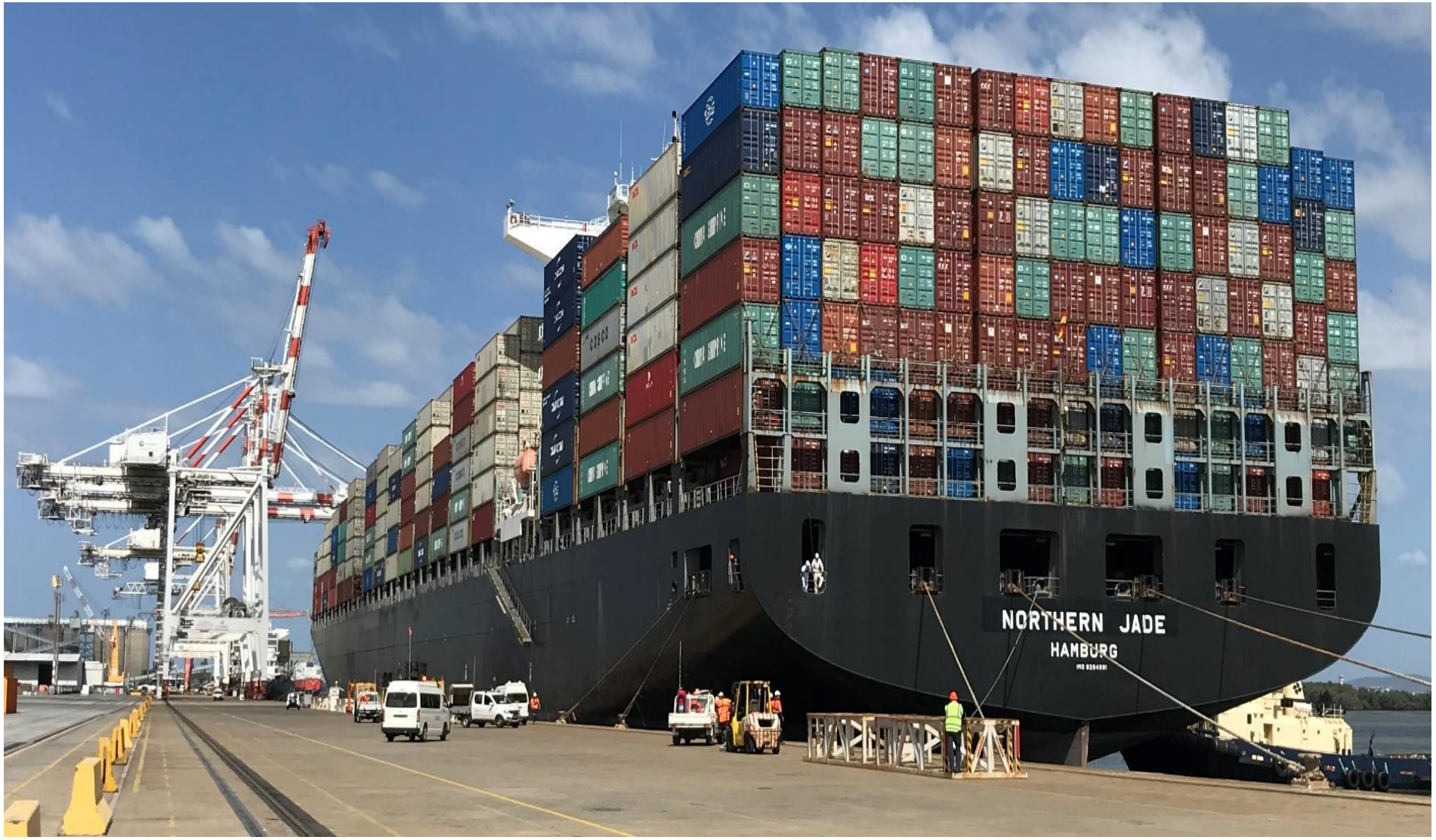


Combined Terrestrial Laser Survey and Geo-Referenced Photography

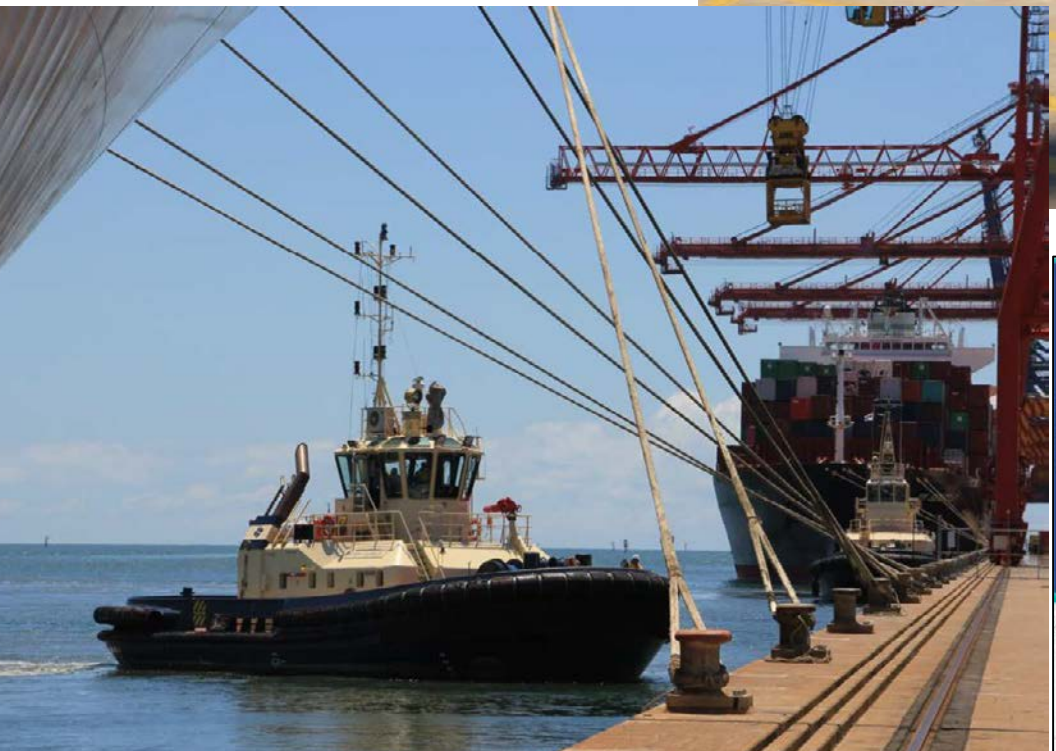
Port of Brisbane – Advanced Systems/Developments

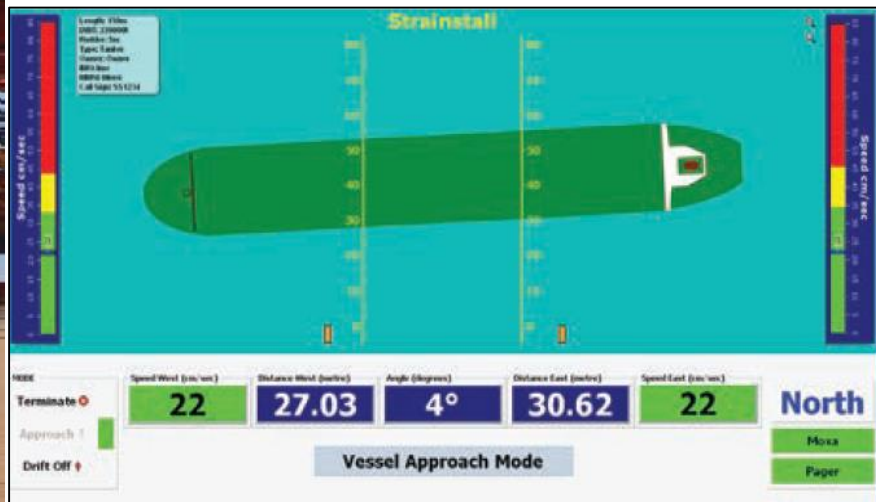
Fisherman Islands- Growing Development

Fisherman Islands - Protect & Enhance Port Assets
Vessel Speed of Approach Monitoring



Speed of Approach and Mooring Arrangements of 8500 TEU Vessels





Shipping Optimisation – NCOS Online

- NCOS Online is world-leading software that provides a seven-day detailed forecast of a vessel's under keel clearances (UKC) and environmental conditions with a web interface, allowing for dynamic vessel scheduling.

- Its introduction means PBPL and key stakeholders including the Harbour Master can more safely and accurately determine the UKC required to cater for larger vessels, providing safety and flexibility benefits for customers.

- NCOS Online is the only vessel UKC forecast system in the world to have the same high level of accuracy as a Full Mission Bridge Ship Simulator.

Shipping Optimisation – NCOS Online

- It combines state-of-the-art technology with decades of operational port experience, and leverages the ability to do quick field trials to ensure an accurate and reliable operational solution.

- By incorporating forecast and real time environmental data, vessel specifications and transit information, NCOS Online allows vessels of all classes to maximise its cargo and sailing windows while maintaining optimal safety. It is compatible with any vessel design and size.

- The software has an easy-to-use interface, tailored to accommodate the specific requirements of the multiple user groups including the Harbour Master, VTS, pilots and port operations.

- Developed with DHI, The Port of Brisbane and other organisations and agencies since 2005, using detailed and extensive Brisbane River, Moreton Bay and other data, including both historic and current Port met ocean and Hydrographic survey data

- Strong relationships between organisations lead to NCOS Online which developed into a new DHI company ‘Seaport OPX’ which now selling NCOS around the world (now in 18+ ports)

Shipping Optimisation – NCOS Online

- Since NCOS went 'live' at the Port of Brisbane in August 2017, the number of deep drafted bulk carriers above 14.0m calling at the Port draft has tripled
- Deep drafted containers above 13.0m has more than doubled (as at May 2018)
- Seaport OPX is the point of contact for PBPL

Multiple Awards including:

•Smart Infrastructure Award – Infrastructure Partnerships Australia 2018

•Innovative Support Services Awarded – Dredging and Port Construction Innovation Awards 2017 (London)

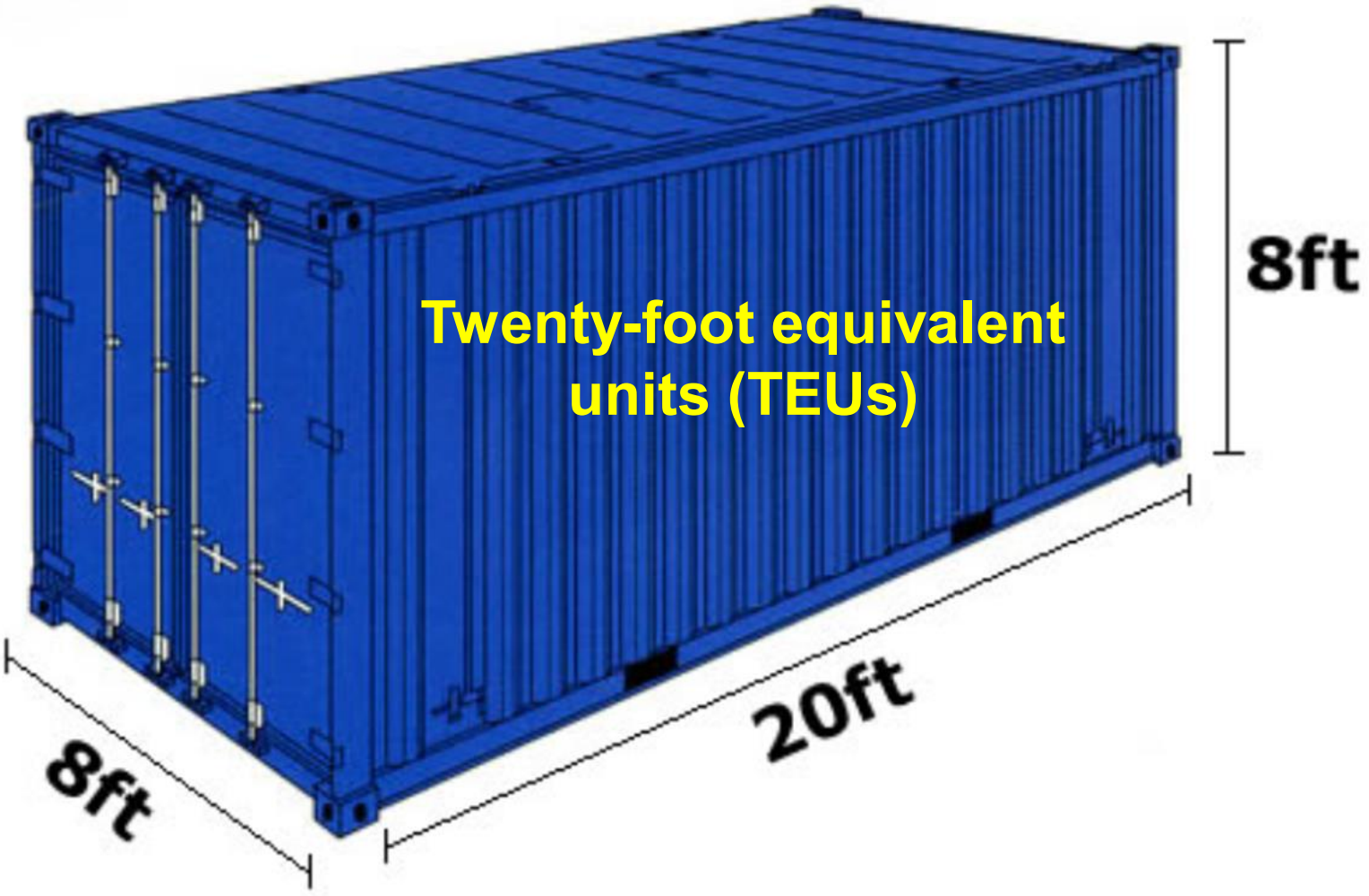
NCOS – Contributing to Containerised Vessel Efficiencies

- In ocean shipping, the time that is taken between the arrival of a vessel and its departure is referred to as the turnaround time.
- The vessel turnaround time is used to measure the efficiency of port operations and, as a consequence the drive is to get the vessel into and out of the Port as quick but as safe as possible.
- This can be optimised using a Dynamic Under Keel Clearance (UKC) system such as DHI's Nonlinear Channel Optimisation System or **NCOS-Online**
- NCOS is an innovative 'live' and forecasting physics based model.

NCOS Online – Channel Optimisation and Safety of Navigation

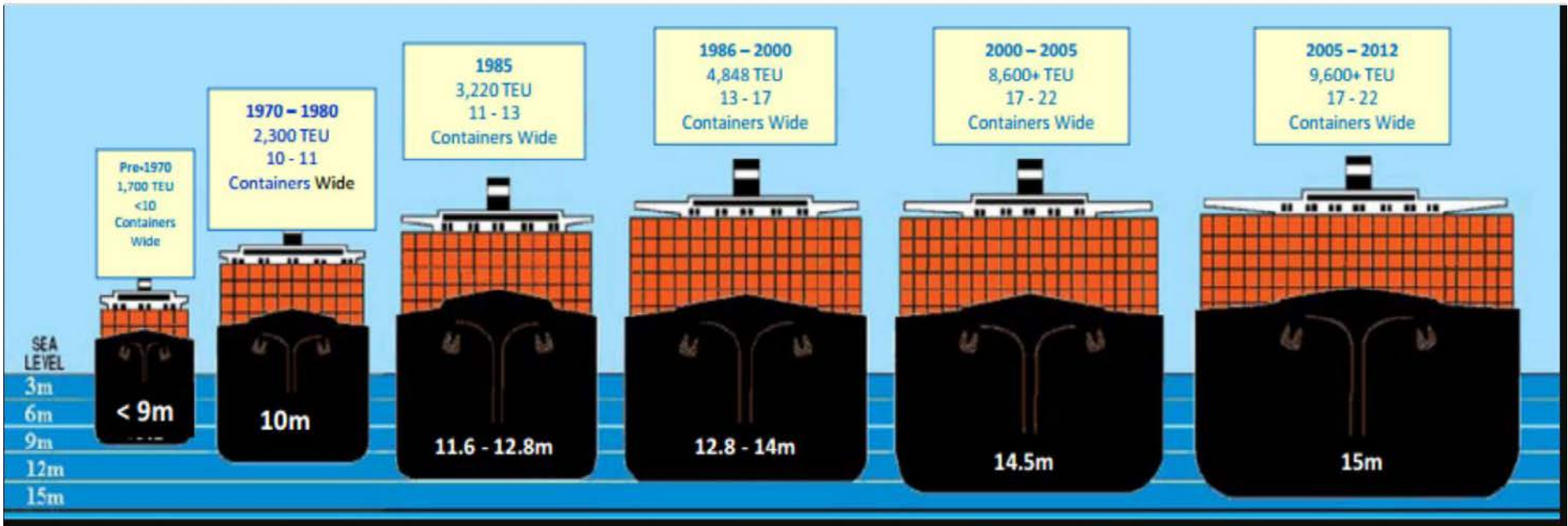
The Increase in Shipping Demand - Containerisation

The Increase in Shipping Demand - Containerisation

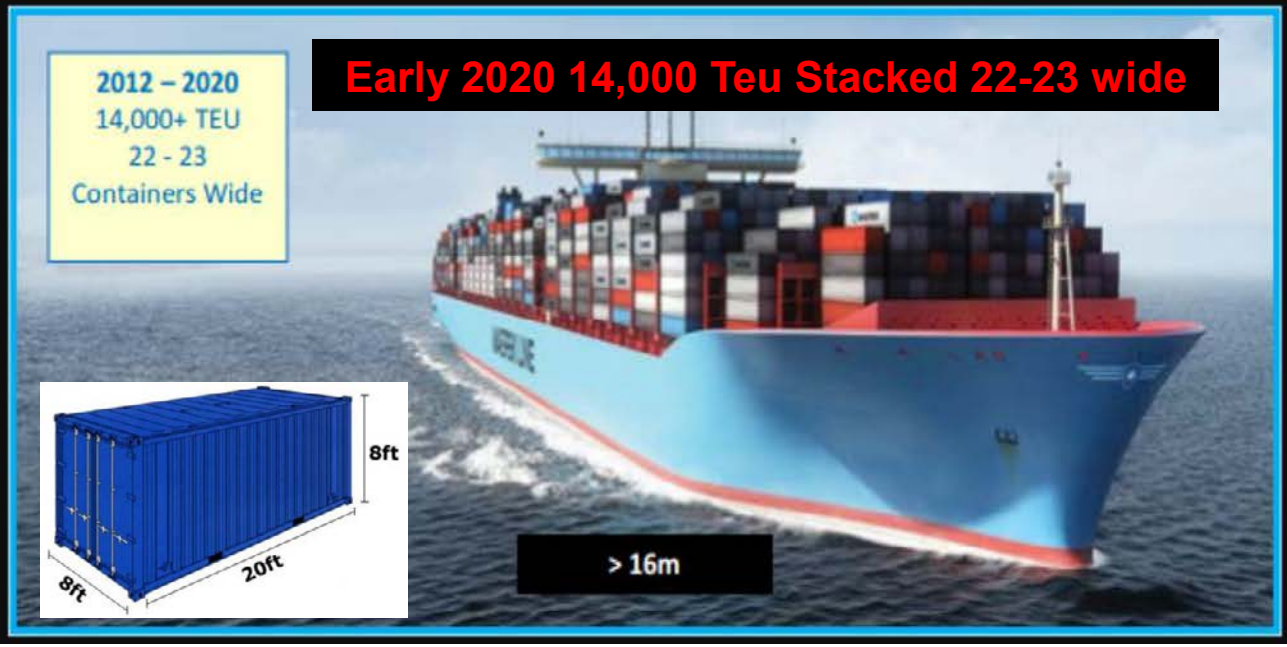


In **2019**, global **container** throughput reached approx 802 million twenty-foot equivalent units (TEUs), with 17 Million in circulation

Example of why we need UKC – Increase in Container Vessel size - 1979 to 2020



1970 1,700Teu Container Stack <10 wide

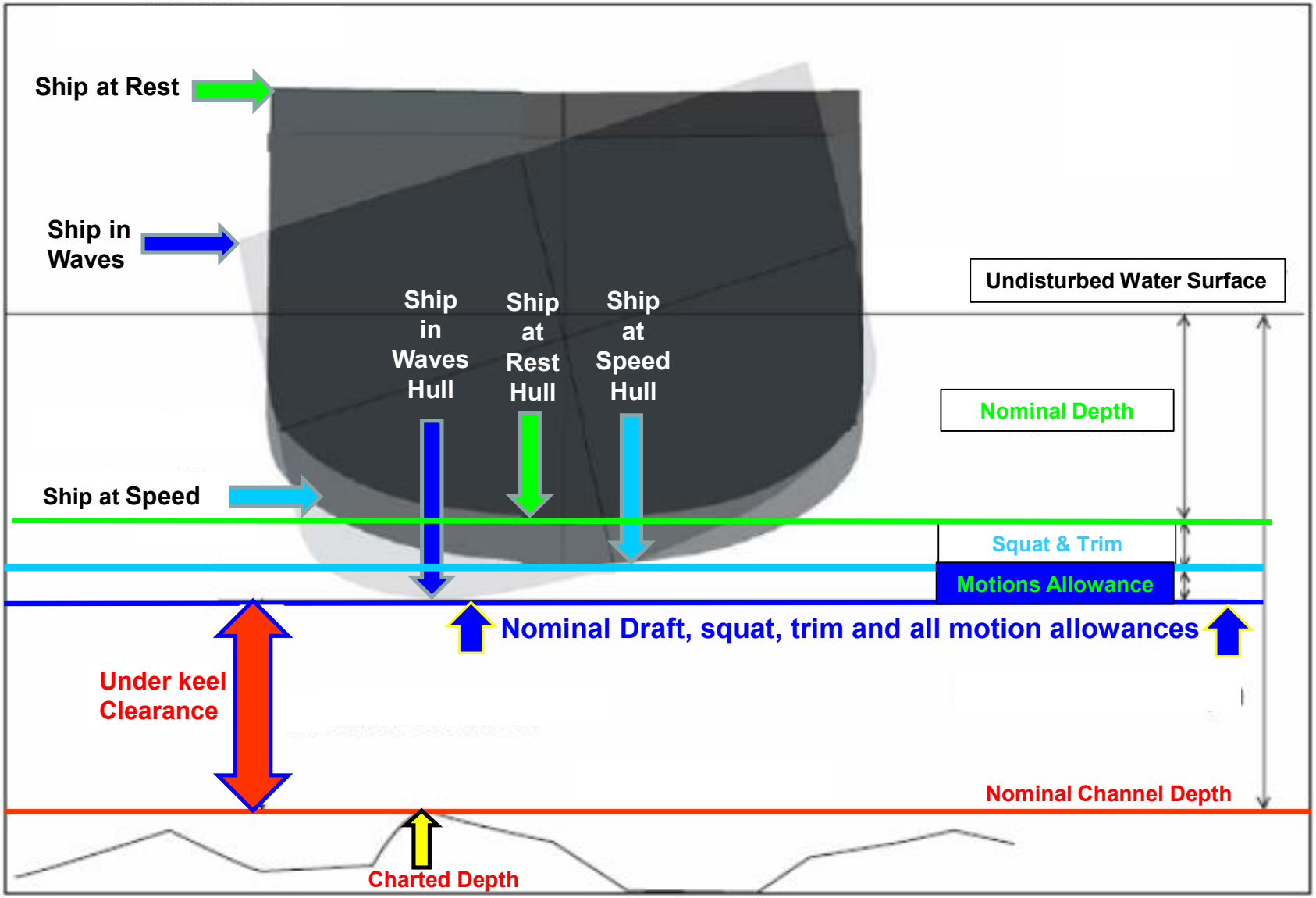


2012 9,600 Teu Container Stack 17-22 wide

The Latest & Largest Container Vessel - Q2 2020

- Daewoo Shipbuilding & Marine Engineering's (DSME), Samsung Heavy Industries (SHI) & Hyundai Heavy Industries (HHI) 12 x **24,000-TEU** vessels started delivery Q2 2020.

Dynamic Under Keel Clearance (UKC) Computations

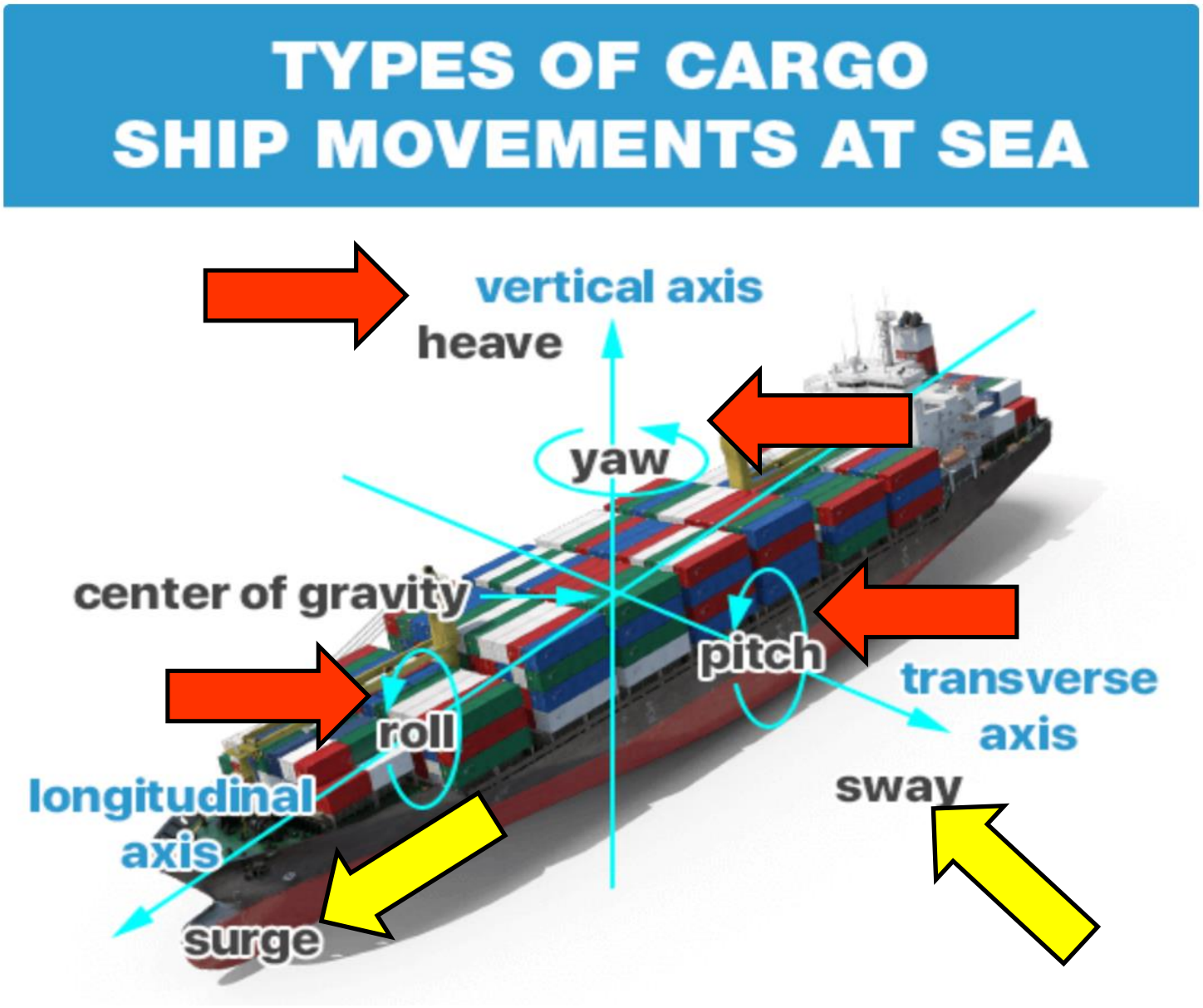


Dynamic Under Clearance Computations

When cargo ships travel across the sea they are subjected to six types of ship motions due to wave action which consist of three lateral movements and three rotations movements which are:

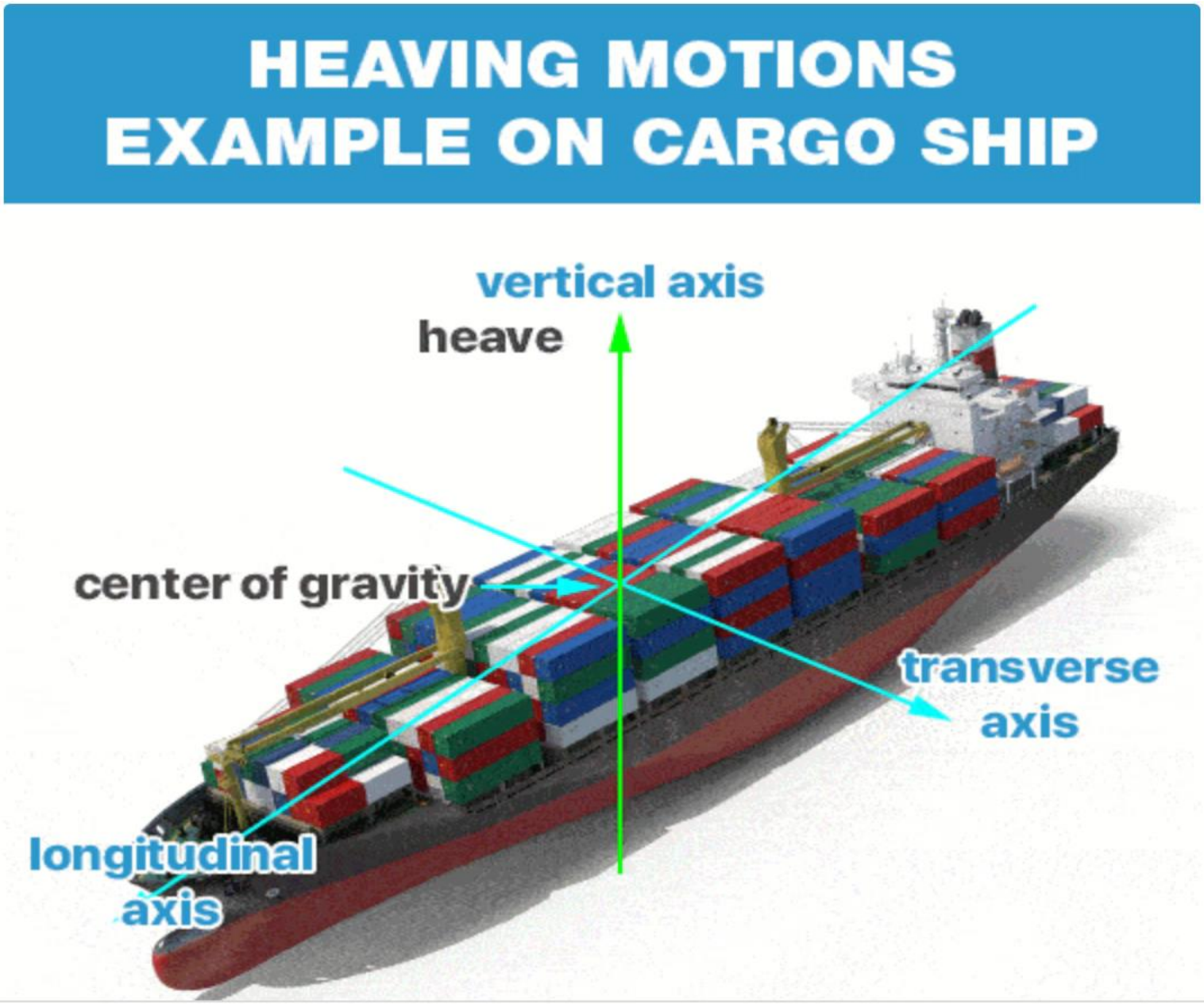
- Heaving: vertical movement
- Swaying: transverse movement
- Surging: longitudinal movement
- Rolling: longitudinal rotation
- Pitching: transverse rotation
- Yawing: vertical rotation

Under Clearance Computations



Ref: https://www.freightforwarderquoteonline.com/news/six-types-of-cargo-ship-motions-at-sea-and-their-effects/

Under Clearance Computations



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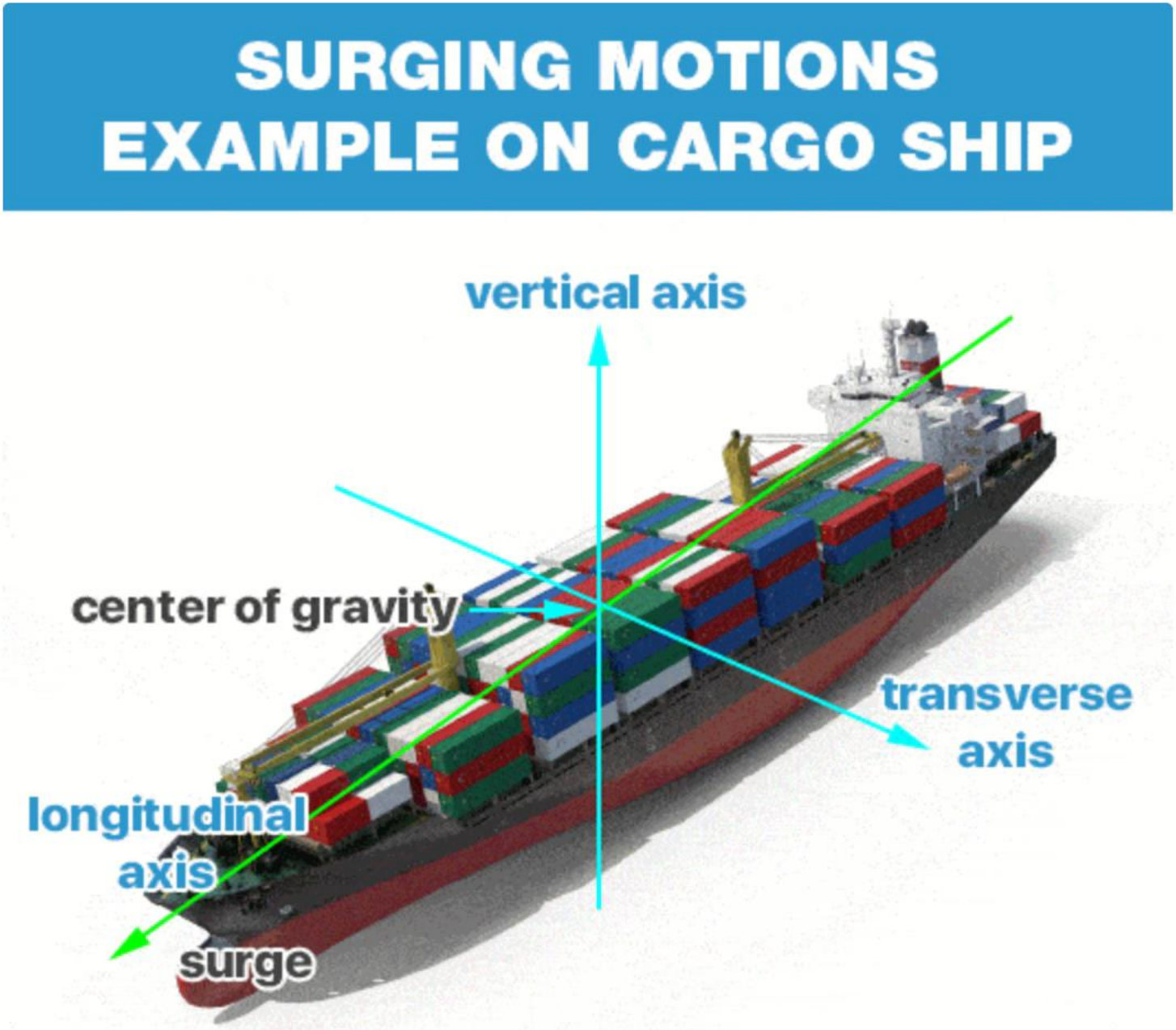
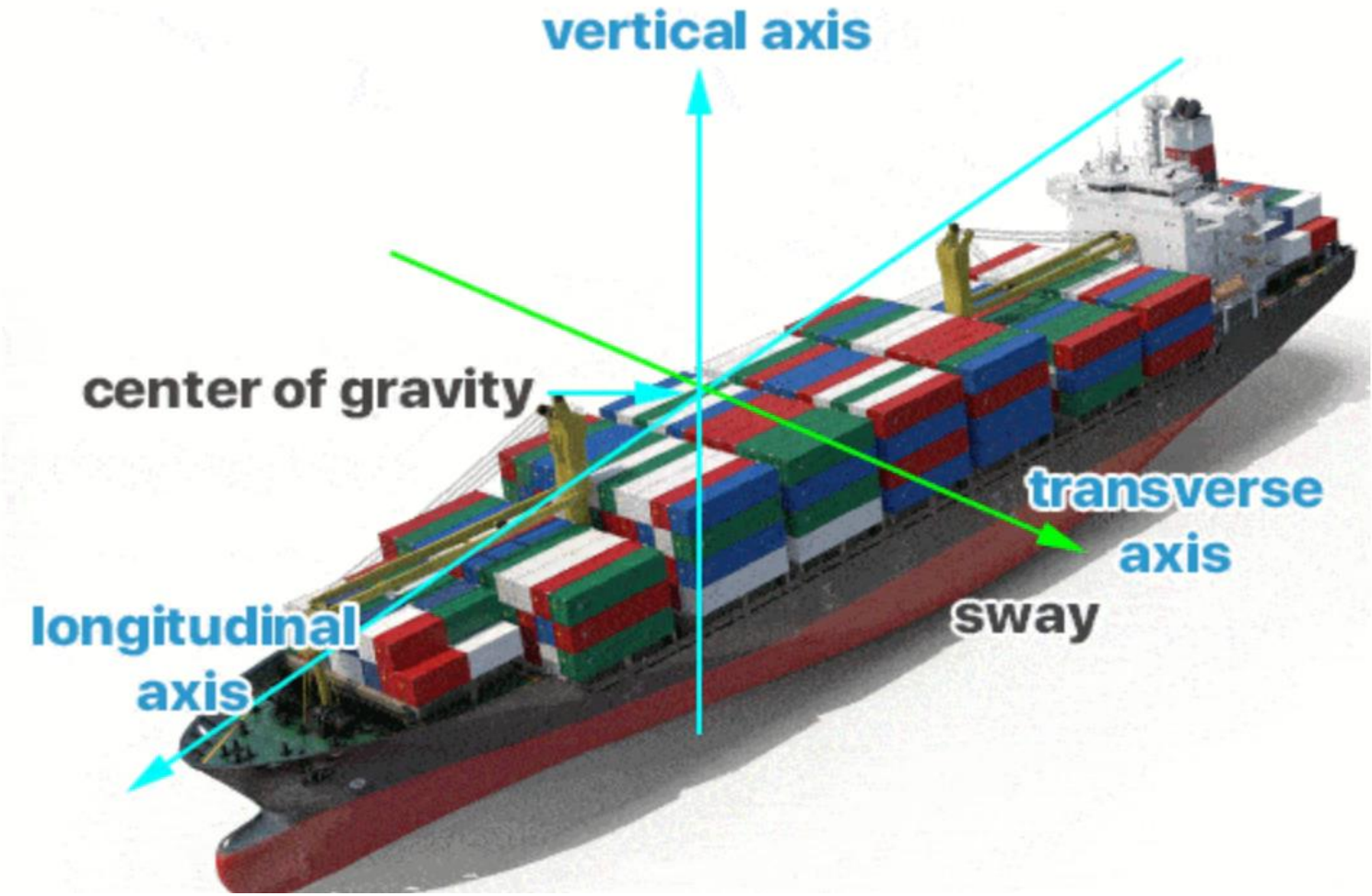
Under Clearance Computations



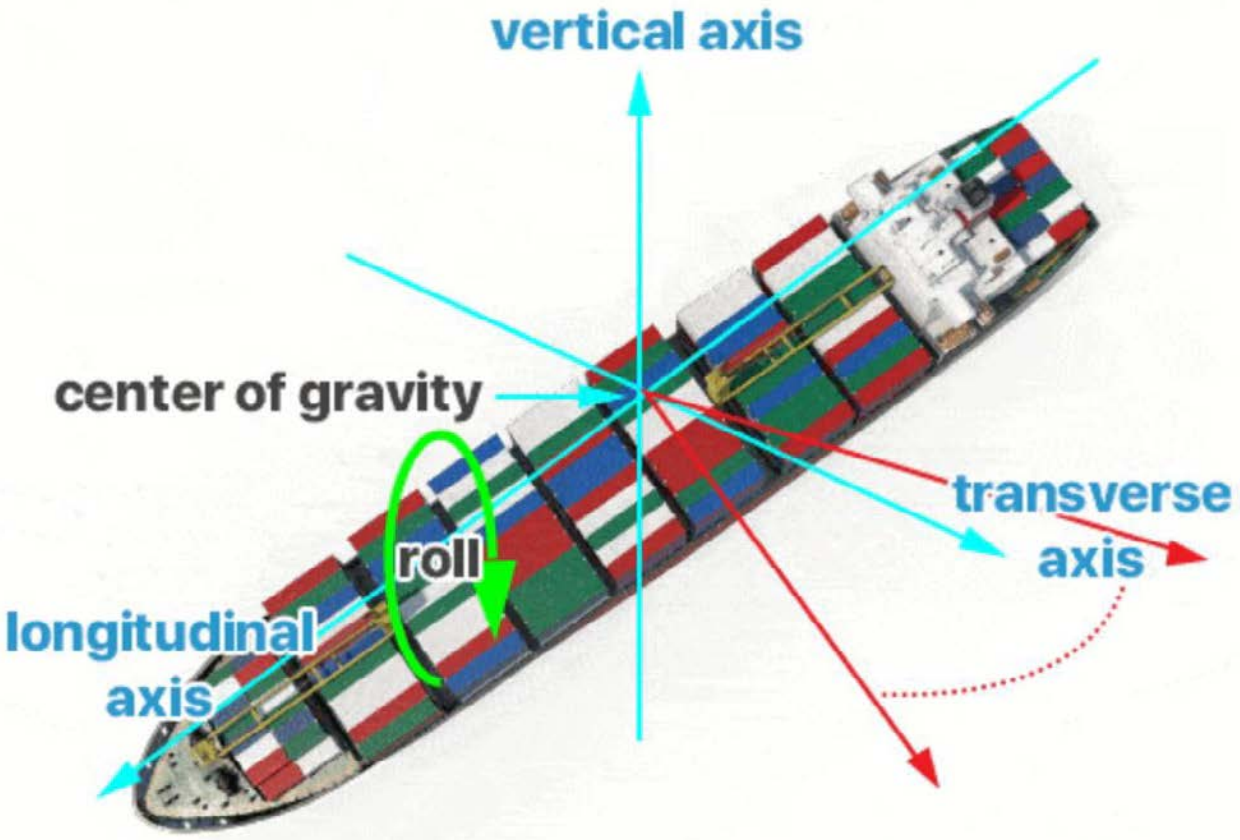
Ref: https://www.freightforwarderquoteonline.com/news/six-types-of-cargo-ship-motions-at-sea-and-their-effects

SWAYING MOTIONS EXAMPLE ON CARGO SHIP



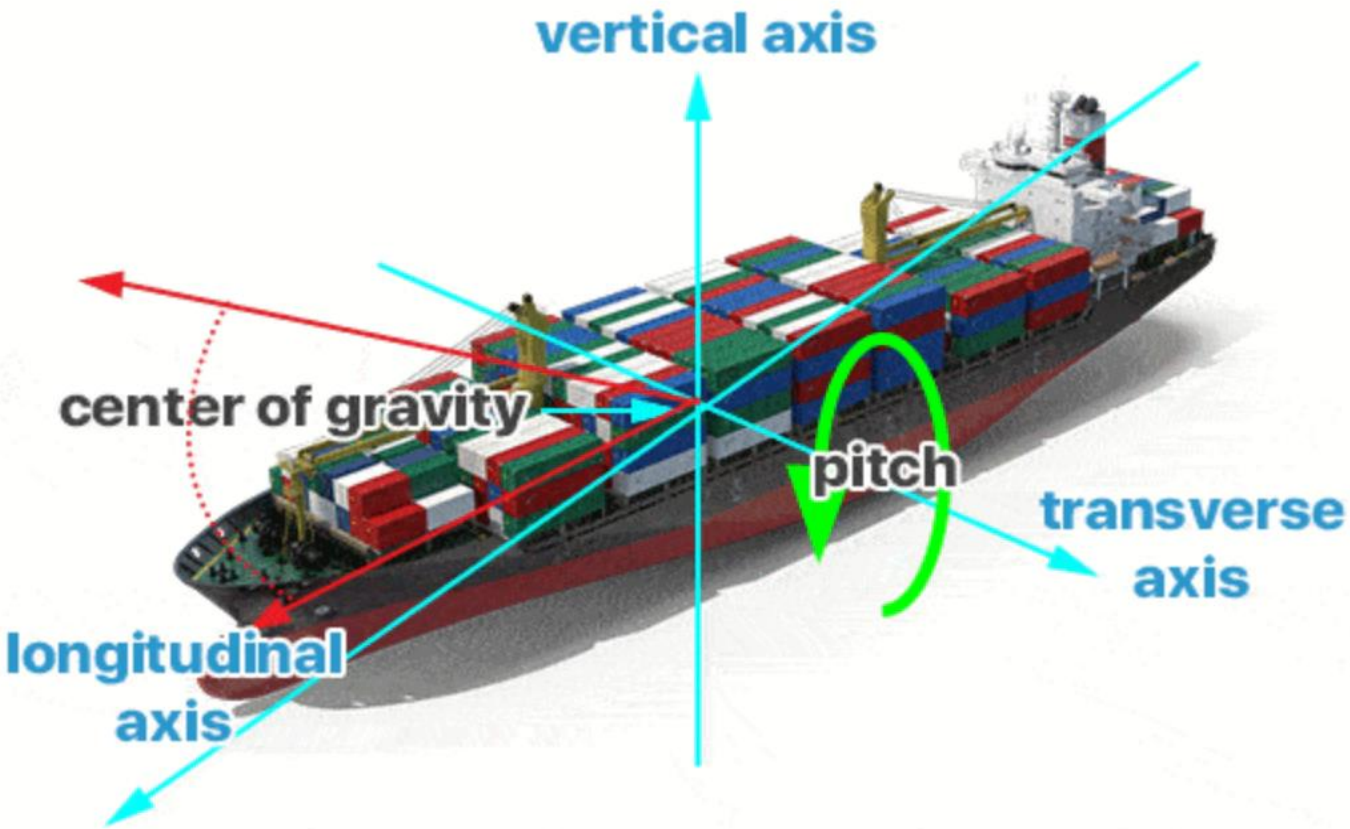
Ref: https://www.freightforwarderquoteonline.com/news/six-types-of-cargo-ship-motions-at-sea-and-their-effects

ROLLING MOTIONS EXAMPLE ON CARGO SHIP



Ref: https://www.freightforwarderquoteonline.com/news/six-types-of-cargo-ship-motions-at-sea-and-their-effects

PITCHING MOTIONS EXAMPLE ON CARGO SHIP



Ref: https://www.freightforwarderquoteonline.com/news/six-types-of-cargo-ship-motions-at-sea-and-their-effects

NCOS Online

An innovative 'live' and forecasting physics based model

DEVELOPED WITH DHI

- Working together since 2005 modelling Brisbane River and Moreton Bay
- Relies on Port hydrographic survey and metocean data, historic and current.
- Strong relationships between organisations lead to NCOS Online
- This Lead to a new DHI company 'Seaport OPX' selling NCOS around the world (now in 18+ ports)
  - Seaport OPX – point of contact for PBPL

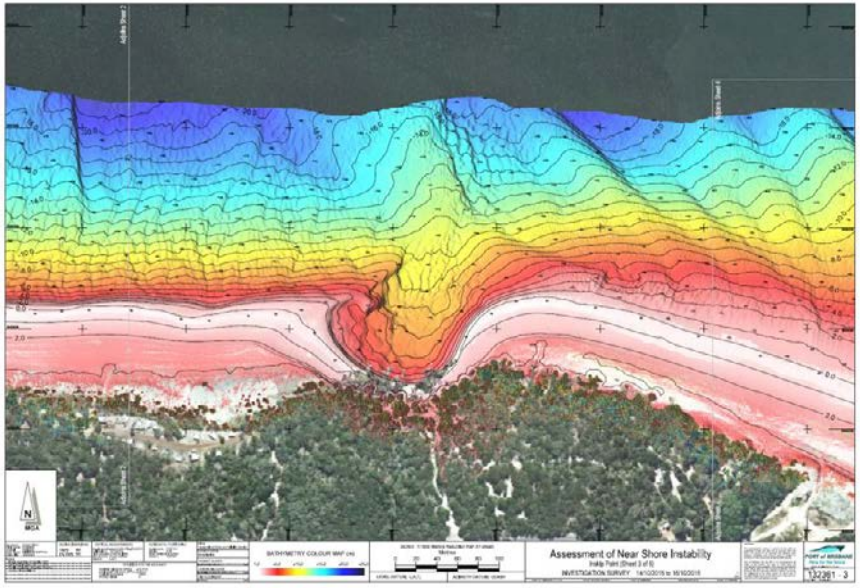
- WHAT IS NCOS ONLINE (NON-LINEAR CHANNEL OPTIMISATION SYSTEM)
- Models environmental conditions in Brisbane River and Moreton Bay 7 days in advance (wind, wave, hydrodynamics)
- Updates 4 times a days
- Monitors and compares forecast to actual

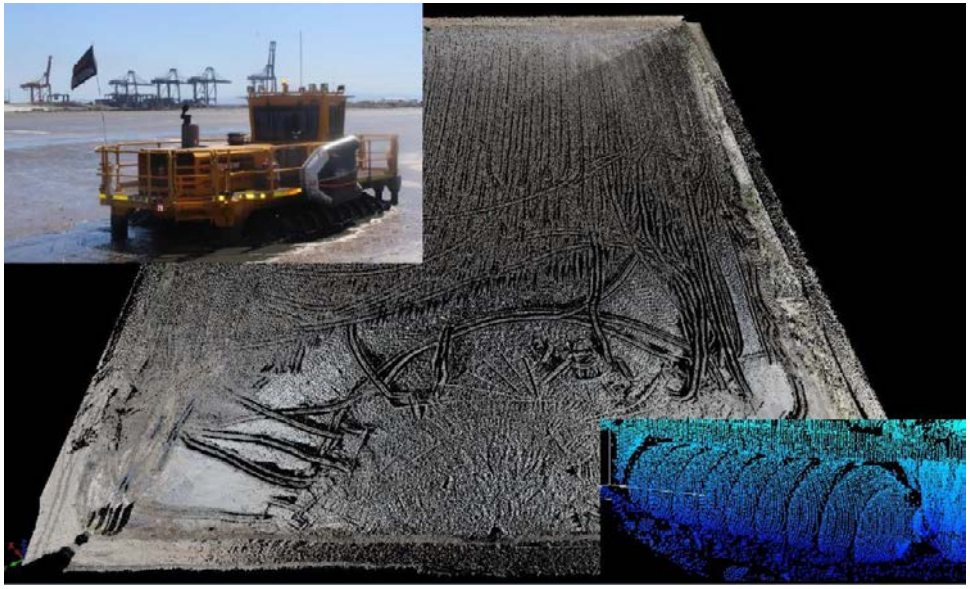
NCOS Computational Power for PBPL UKC

- The computations for NCOS-Online take place on the National Super Computer based in Canberra of which DHI/PBPL has a slot
- This allows computations previously unimaginable for Under Keel Clearance (UKC) computations.
- For each vessel's transit within NCOS-Online, a response matrix calculation is carried out which uses 37.2TFlops (teraflops)
- A teraflop is a trillion (which is a million million) floating point operations per second.
- A single vessel transit take 15 minutes to compute which would equate to 37.2 trillion x 15 minutes = 37.2 trillion x 900 seconds = close to Million Billion or 10 to the power of 15 (10^15) which look like this:
- **1,000,000,000,000,000** calculations for each 15 minute vessel transit calculation or close to 1 Quadrillion computations

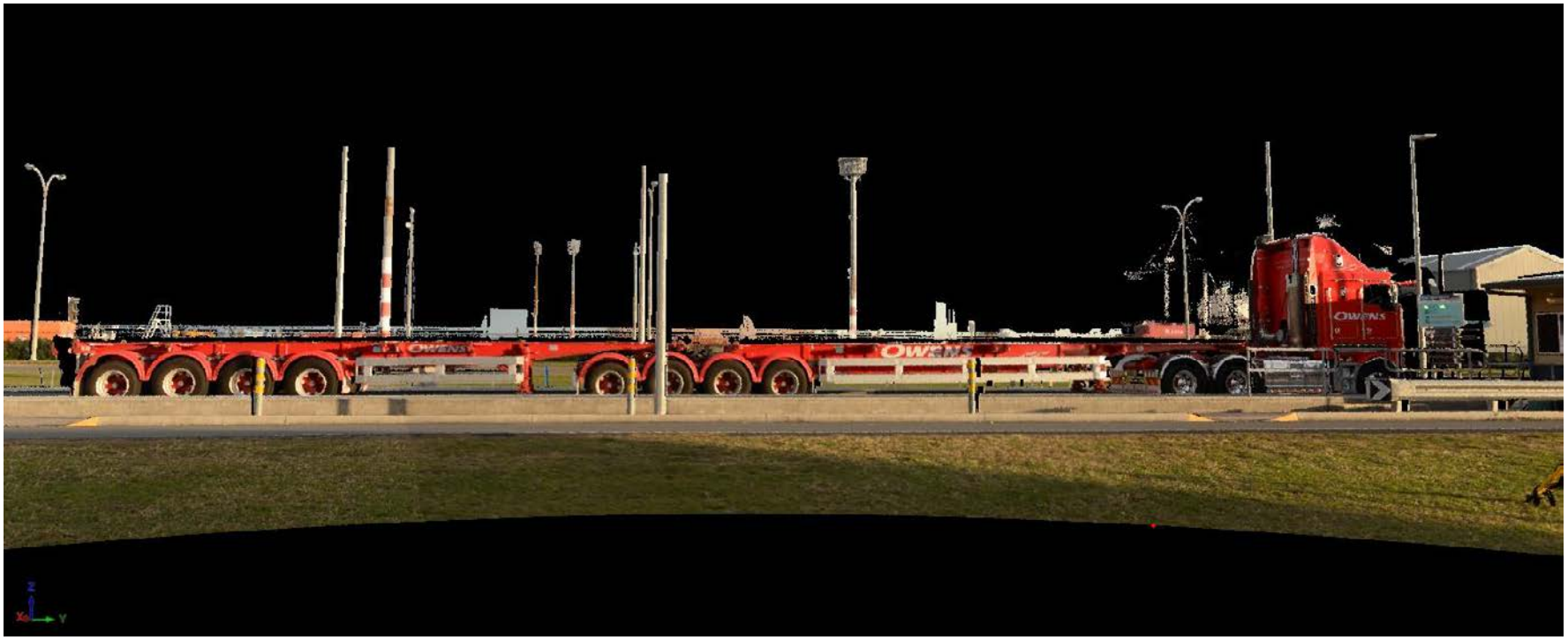
Port of Brisbane – Hydrographic Solutions
Current & Future Developments

Mobile Mapping Terrestrial Laser Survey and Geo-Referenced Photography

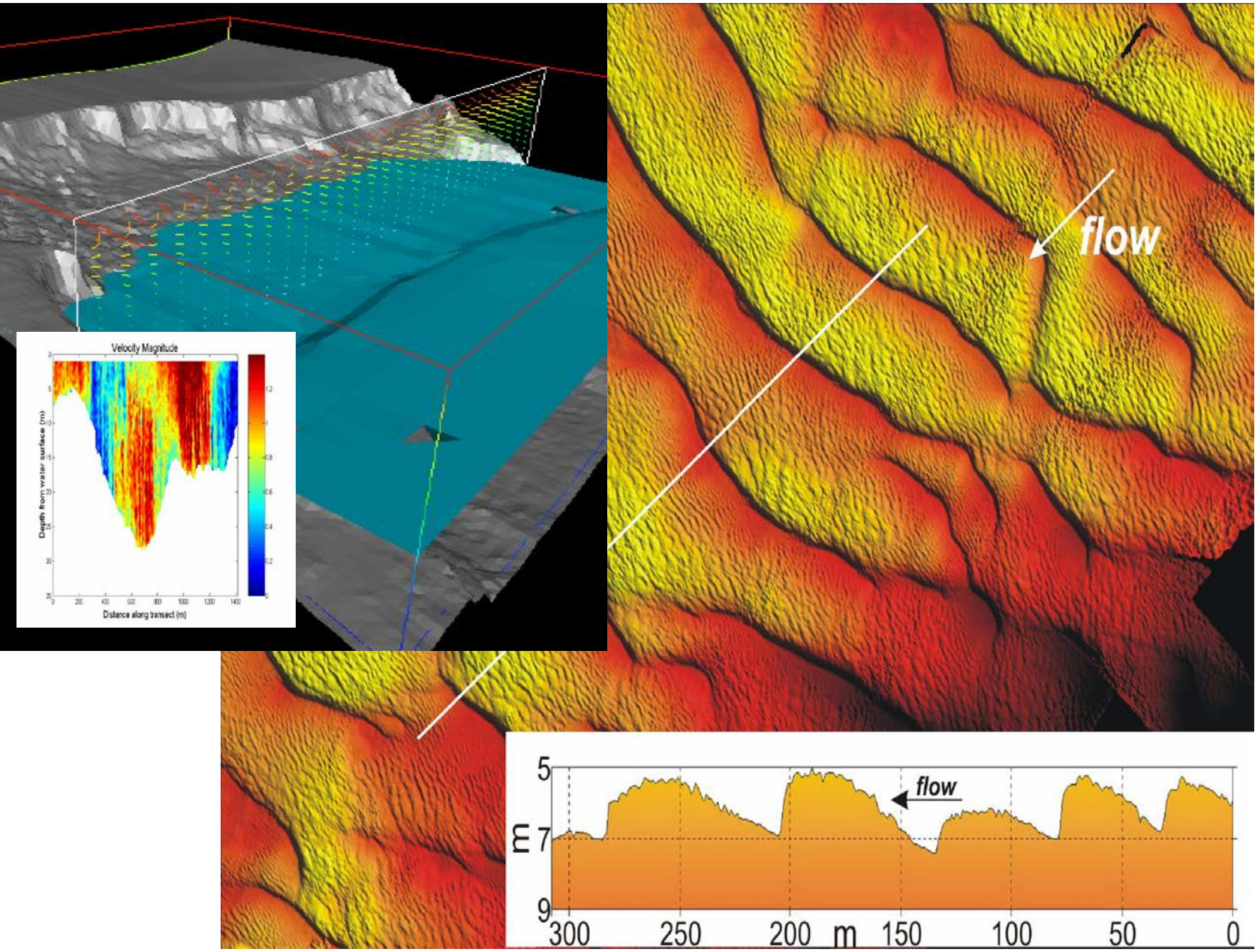




Terrestrial Laser Scan with Photography of B-Doubles



Seabed Visualisation – Current Tracking

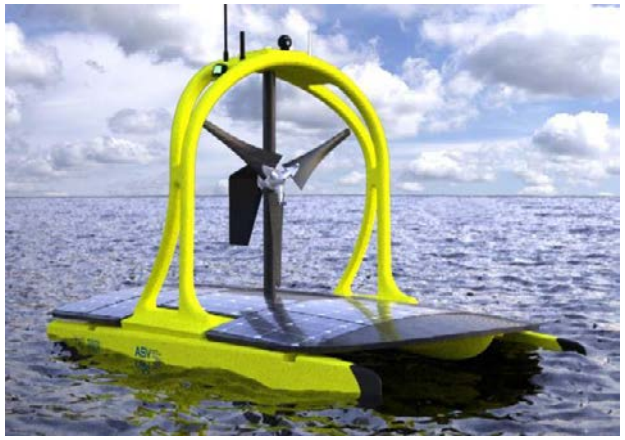


Autonomous or Remote Controlled Hydrographic Vessels

Twin Thrusters with Weed Guards

Carbon Fibre Tri-Hul

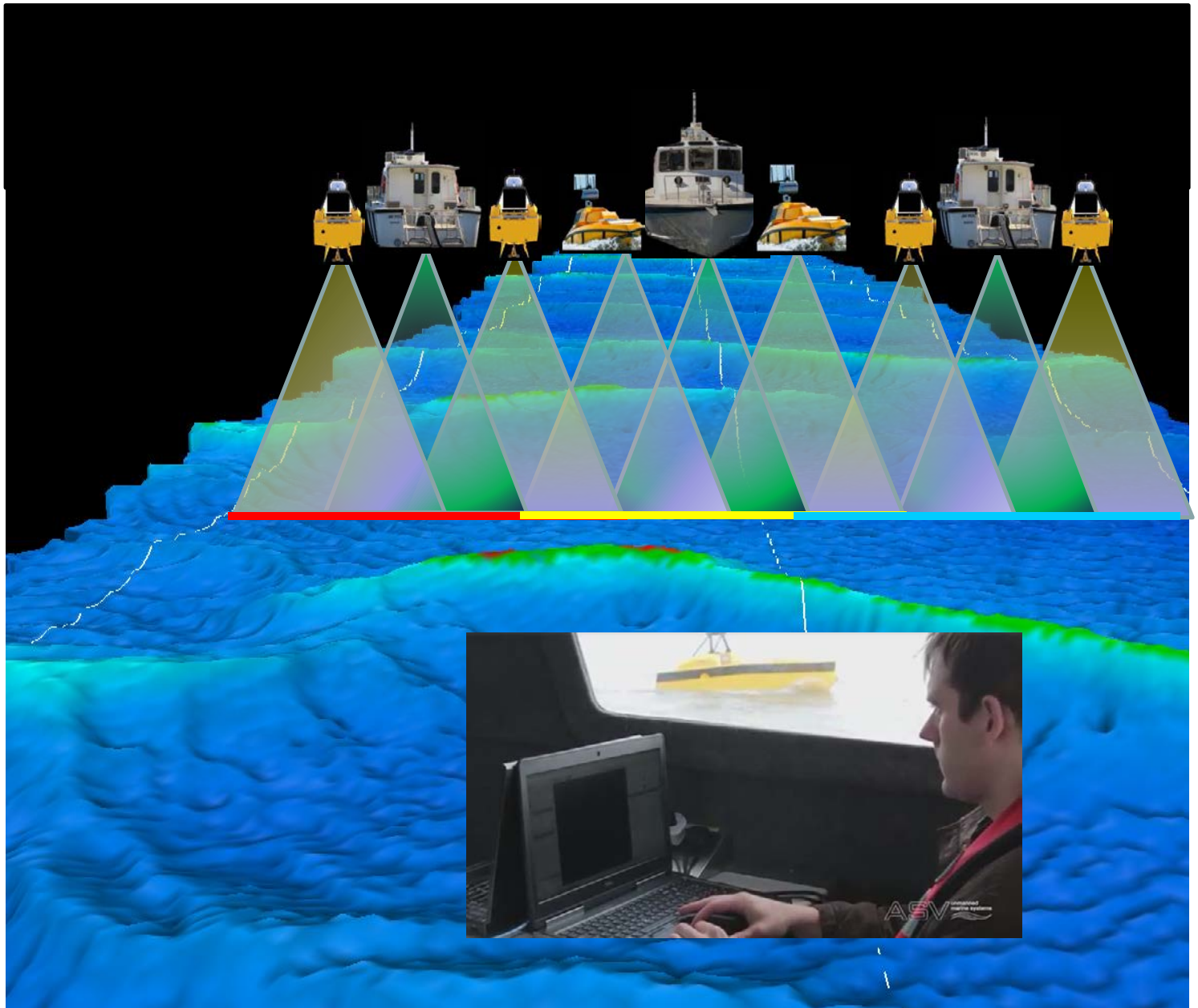
Remote Controlled or Autonomous Surveys



Deeper Water Autonomous Hydrographic Vessels

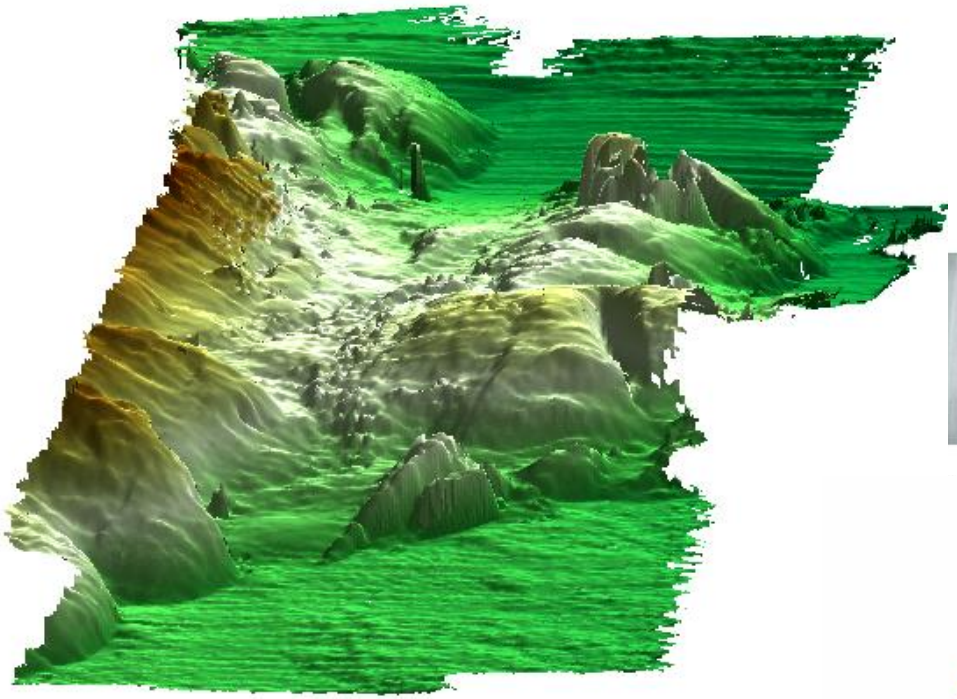
C-Worker 5	
Length	5.5m
Beam	1.7m
Draft	0.9m
Weight	1900kg
Propulsion	Direct driver fixed propeller 1 x Yanmar 57hp diesel engine
Speed	Up to 10 knots
Endurance	Up to 7 days at 7 knots
Payload power	1kW
Control	ASView for direct, semi-autonomous or autonomous control
Communications	IP Radio

Monitor Sand Wave Migratigation

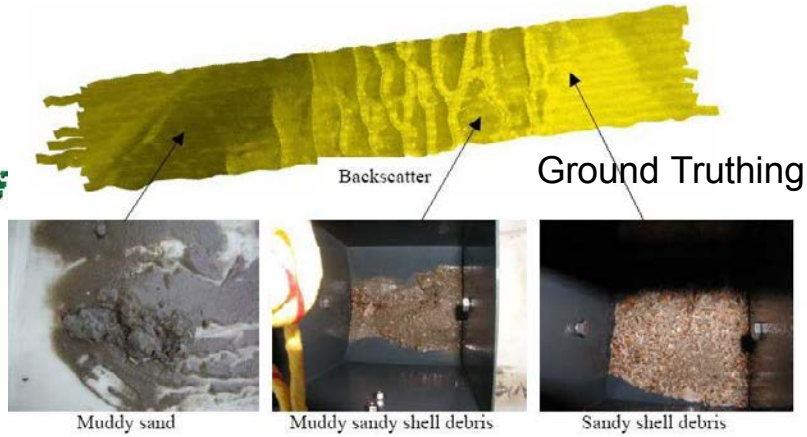


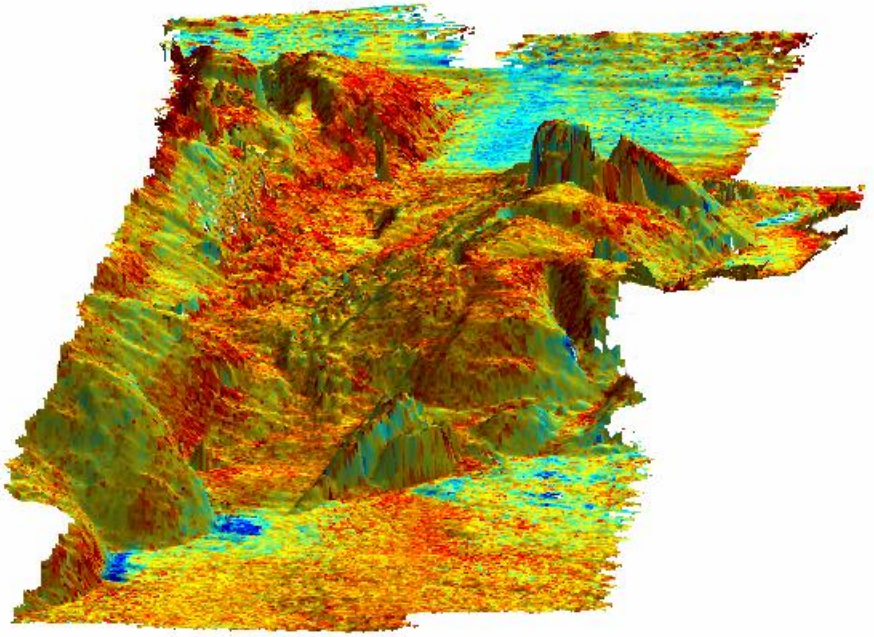
Future Applications - Seabed Classification

Analysis of sonar amplitudes resulting from varying scattering Processes from the seabed

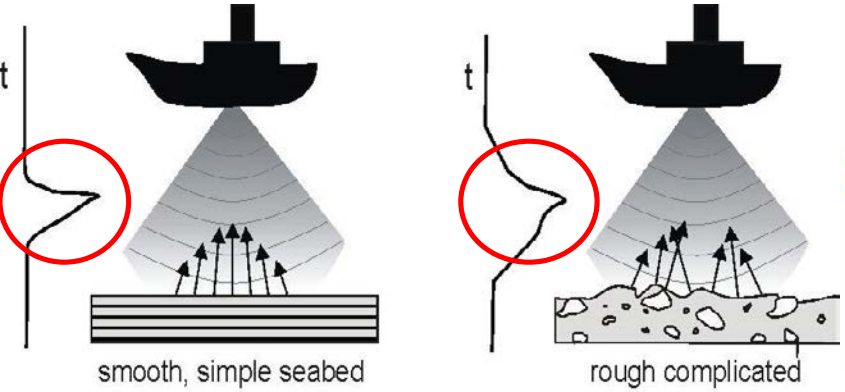


Bathymetry

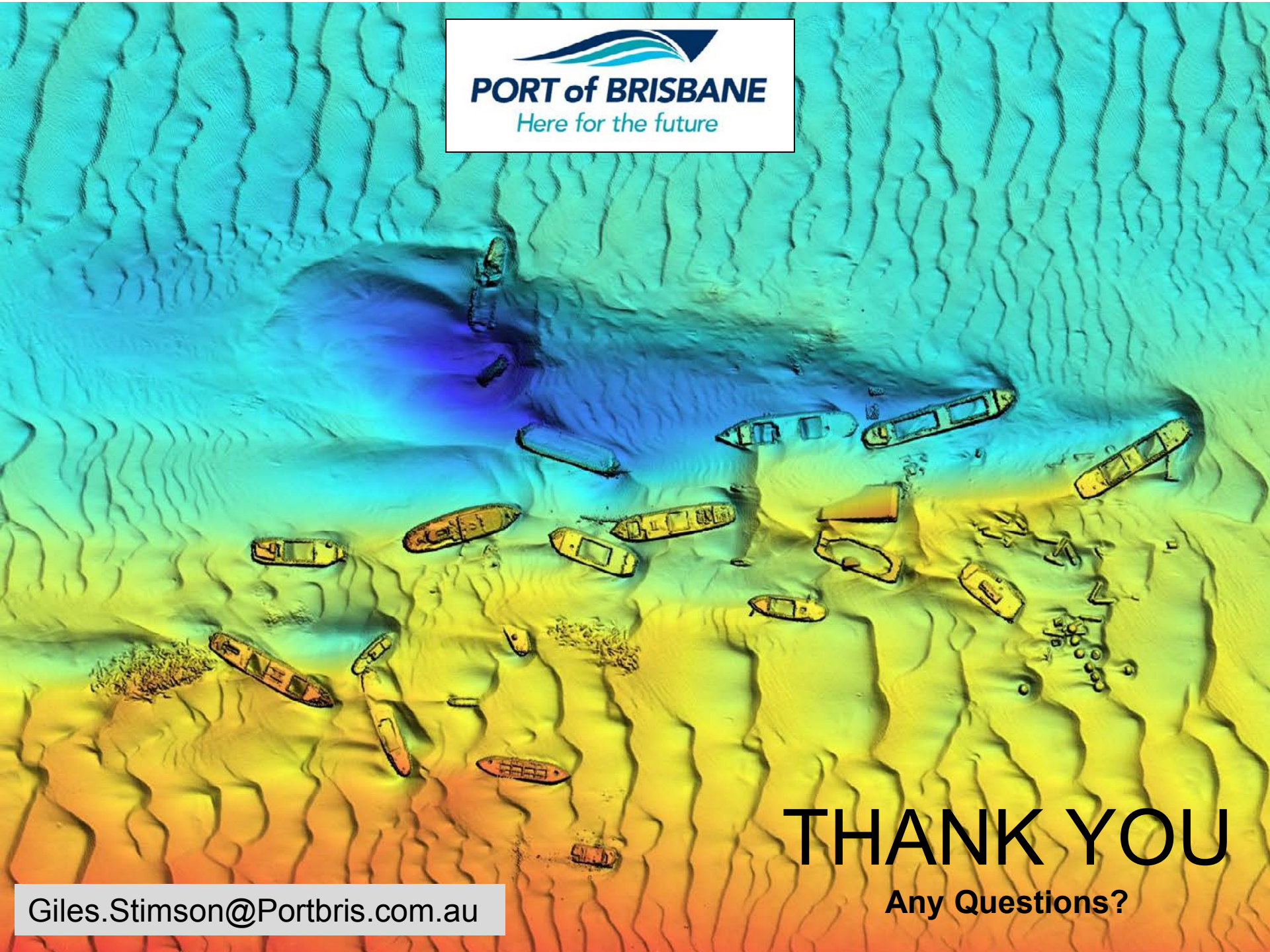


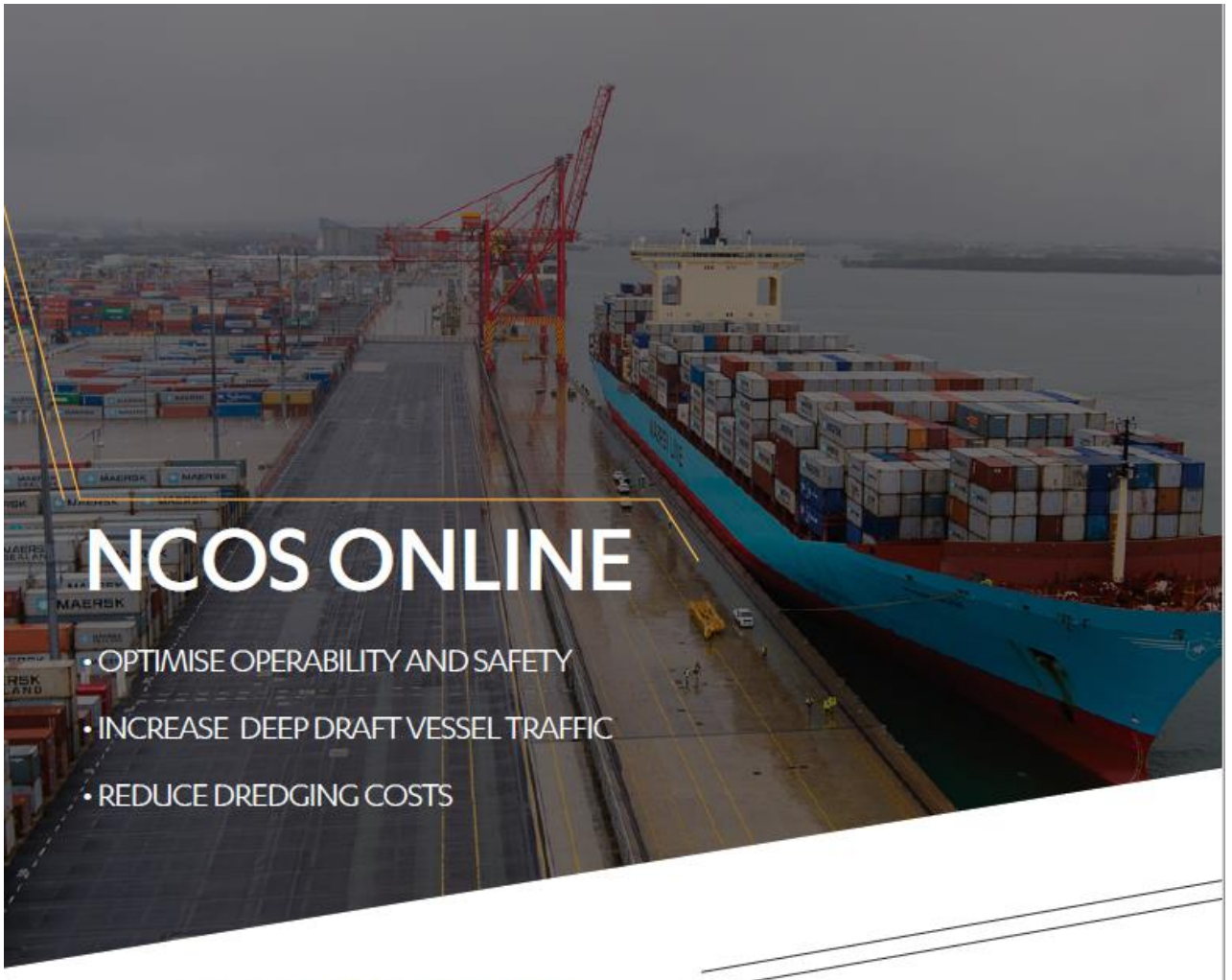


Acoustic Backscatter



Backscatter Amplitudes


PORT of BRISBANE
Here for the future
THANK YOU
Any Questions?
Giles.Stimson@Portbris.com.au



NCOS ONLINE

- OPTIMISE OPERABILITY AND SAFETY
- INCREASE DEEP DRAFT VESSEL TRAFFIC
- REDUCE DREDGING COSTS

WHAT IS **NCOS ONLINE?**

NCOS ONLINE, is an integrated next generation traffic management system that allows Ports to safely cater for larger cargo ships and avoid environmentally sensitive dredging programs.

Many Ports use older generation under keel clearance (UKC) systems that do not incorporate the full 3D characteristics of modern larger vessels to allocate sailing windows. Therefore, they are not able to maximise the capacity of existing shipping channels resulting in regular larger-scale dredging programs.

NCOS ONLINE is the world's first vessel UKC forecast management system with the same high level of accuracy as a Full Mission Bridge Ship Simulator SIMPLEX by FORCE Technology, utilised to train pilots and mariners.

The cloud based system makes millions of calculations a second based on channel depth, weather conditions, and vessel configurations to more accurately produce optimal sailing windows for larger ships.

This dramatically increases operational flexibility and safety for shipping customers, and reduces dredging requirements.

In the first eight months of NCOS ONLINE operation at The Port of Brisbane, the Port has tripled the number of bulk carriers departing with a draft greater than 14 metres, and achieved a 233% increase in container ships with a draft greater than 13 metres compared to the year prior dynamic under keel clearance system.

FIND OUT HOW WE CAN HELP YOU?

Simon Brandi Mortensen | Group Executive, Ports and Navigation
Tel: +61 7 5564 0916 Email: sbm@dhigroup.com

Port of Brisbane Chief Executive Officer, Roy Cummins, said the Port of Brisbane was determined to ensure its capacity for catering for larger vessels continues to grow.

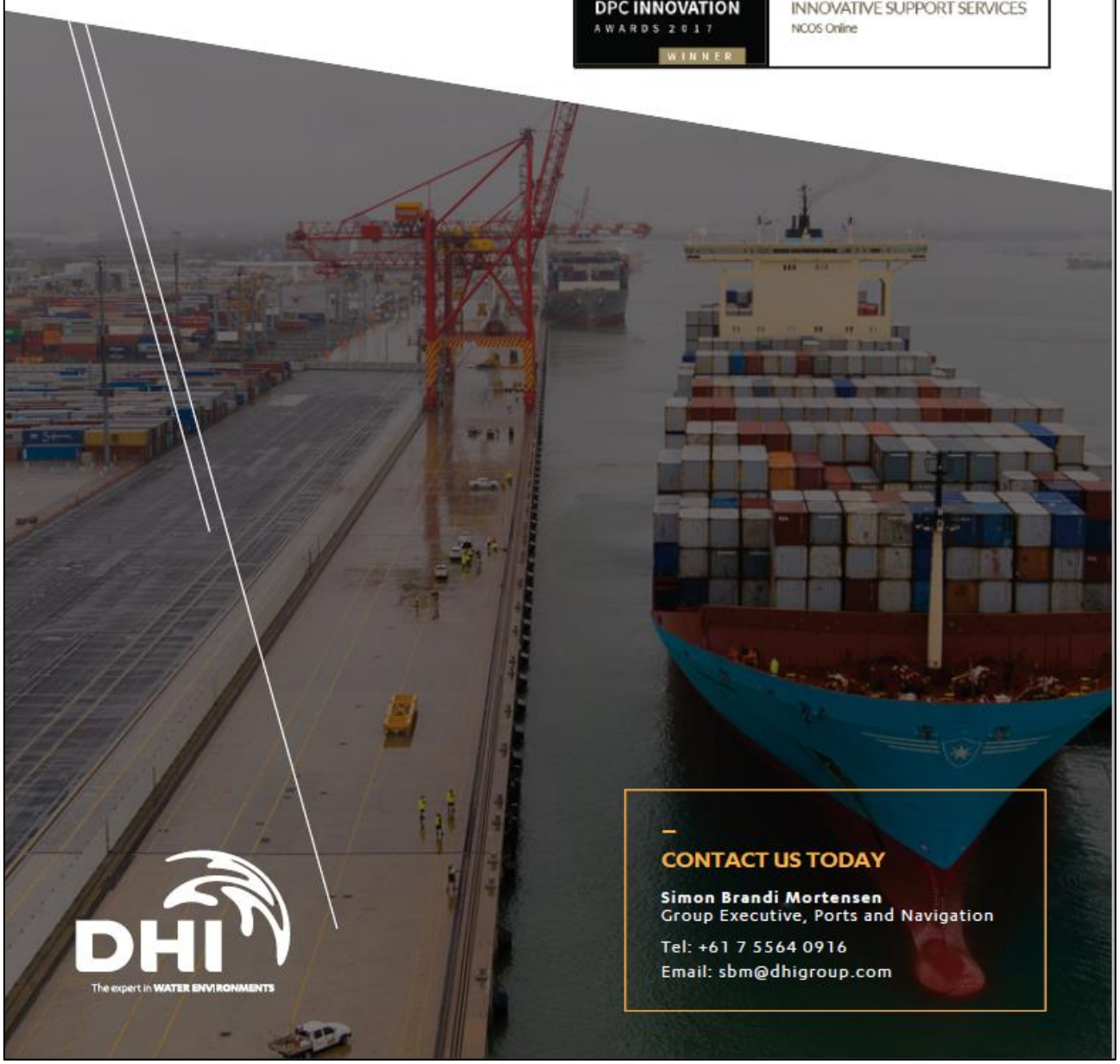
"Our new channel clearance system (NCOS ONLINE) has been in place since August (2017), and the recent record-breaking visit by the first 9500 TEU vessel to visit the port, the Susan Maersk, is a testament to its capability,"

Mr Cummins

"It means that we can more safely and accurately determine the under-keel clearance needed to cater for larger vessels, providing safety and flexibility benefits for customers and reducing the need for additional, expensive dredging. "By implementing NCOS and working with our partners, we are delivering on our commitment to never be the limiting factor for shipping on the east coast of Australia."

DPC INNOVATION
AWARDS 2017
WINNER

INNOVATIVE SUPPORT SERVICES
NCOS Online



DHI
The expert in WATER ENVIRONMENTS

CONTACT US TODAY

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Group Executive, Ports and Navigation

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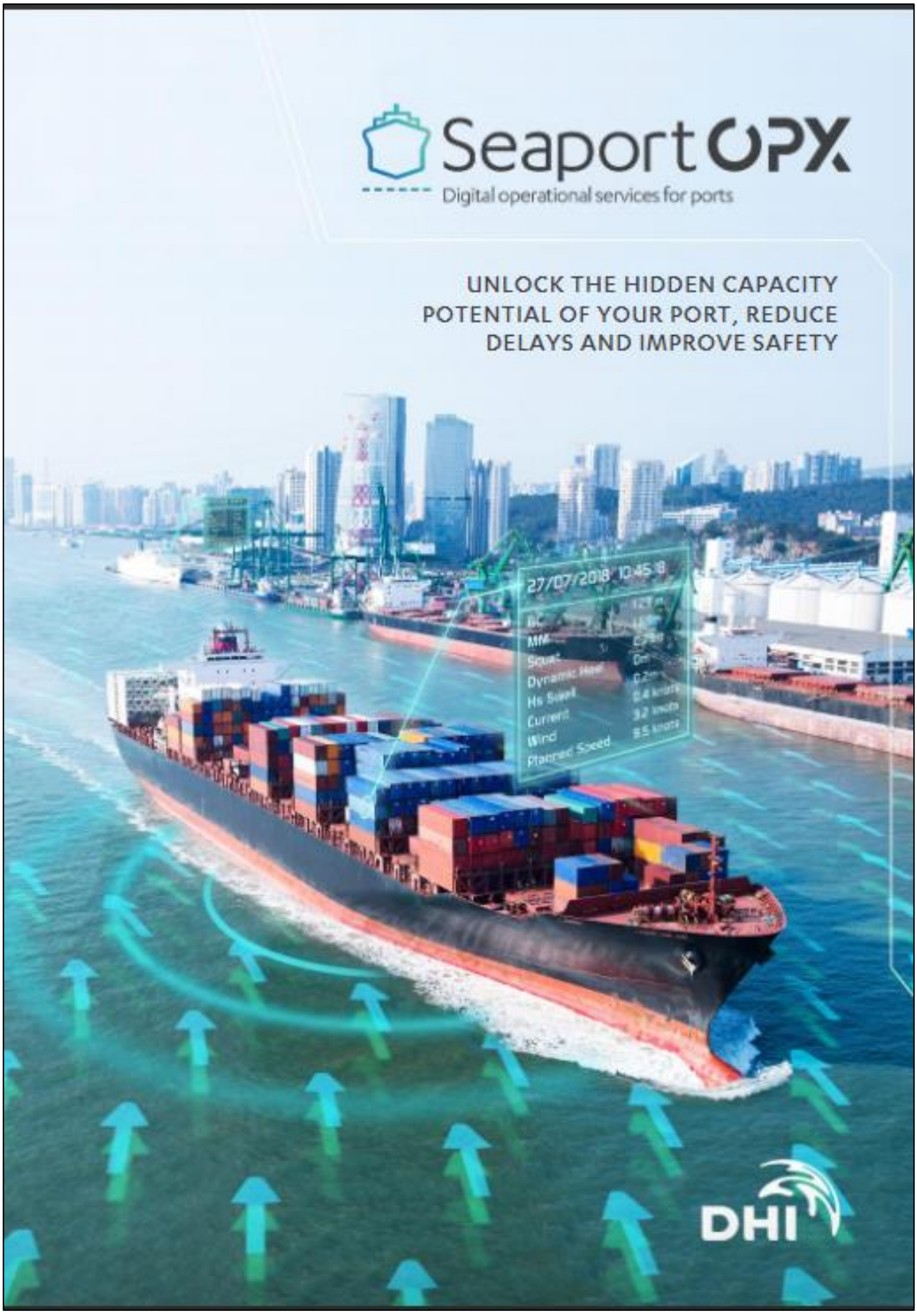
Seaport OPX

Digital operational services for ports

UNLOCK THE HIDDEN CAPACITY POTENTIAL OF YOUR PORT, REDUCE DELAYS AND IMPROVE SAFETY



NCOS ONLINE:
The next generation of physics-based vessel traffic management systems

ACCURACY

THE ACCURACY OF A FULL MISSION BRIDGE SIMULATOR

NCOS ONLINE is a multi-award winning, physics-based vessel traffic management system that incorporates the accuracy of high-end Full Mission Bridge Simulator SIMFLEX4 with regards to ship response under power and at berth.
The underlying numerical engine uses a powerful 3D panel method for vessel response calculations in combination with highly detailed global forecasts of winds, waves and hydrodynamics resolved at port scale, offering unsurpassed resolution through the shipping channel and at berth.
Accuracy of the vessel response forecast is assured through numerous full-scale validation campaigns on a range of vessel types and classes.

INFORMED PLANNING & EFFICIENT OPERATION

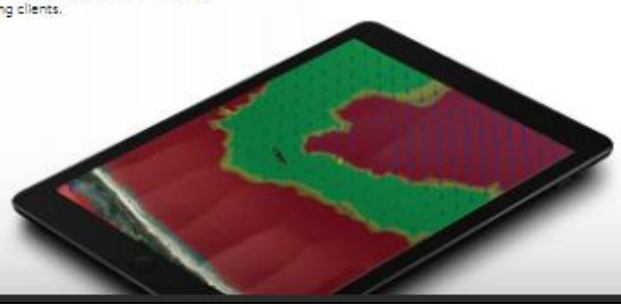
SUPPORTS YOUR STRATEGIC PLANNING AND OPERATIONAL NEEDS

NCOS ONLINE is implicitly capable of taking into account any relevant vessel constraint such as Under Keel Clearance (UKC), maneuverability or berth configuration that may constrict the movement of vessels through the channel or operability at berth, facilitating scenario planning and capacity assessments of unparalleled accuracy. Detailed environmental scenarios for existing or concept port arrangements can be directly exported for use in full mission bridge simulators for a rapid hands-on maneuverability assessment of any potentially challenging situation in advance. The system supports optimization of both maintenance and capital dredging, reducing costs, environmental impacts and potentially expediting approvals.

MODULAR FRAMEWORK – CUSTOMIZED SOLUTIONS, EMPOWERED USERS

A FLEXIBLE SYSTEM TO SUPPORT THE NEEDS OF EACH PORT

NCOS ONLINE is built on a modular framework, enabling us to provide a custom integrated solution for each of our clients. As a global not-for-profit which invests 20% of annual revenue in Research and Development (R&D), we are always looking for new ways to add value for new and existing clients.



QUANTIFICATION, ACCURACY, CERTAINTY

CERTAINTY AND USER-CONTROLLED CONSERVATISM

QUANTIFICATION CONSIDERING LATEST INFORMATION

Experience and local knowledge are paramount to the safe operation of a port or channel. Harbour Masters oversee all planned transits in real-time through their own dashboards and have exclusive access rights to increase the level of conservatism of various safety parameters in the system if unusual circumstances dictate this type of action.
Port users are able to upload and approve hydrographic surveys which are then immediately accounted for in NCOS ONLINE transit calculations, ensuring pilotage plans adopt the latest seabed profile.

INTEGRATED BY DESIGN

COMMUNICATE EFFICIENTLY. ENSURE AVAILABILITY

Communication between stakeholders is critical to effective marine operations. In many cases, the tools stakeholders use to inform their actions are unique, limiting their ability to communicate efficiently. The NCOS ONLINE system has been developed in close collaboration with port and waterway operators and provides a suite of tailored dashboards that accommodates the needs of Pilots, Harbourmasters and VTS traffic controllers. In addition, the system offers seamless integration with 3rd party systems such as VTS systems, PPUs and Onboard System displays using a secure cloud-based web API. This integration allows scheduled transits and pilotage plans to be instantaneously shared with pilots and tug operators, ensuring availability and reducing costs.

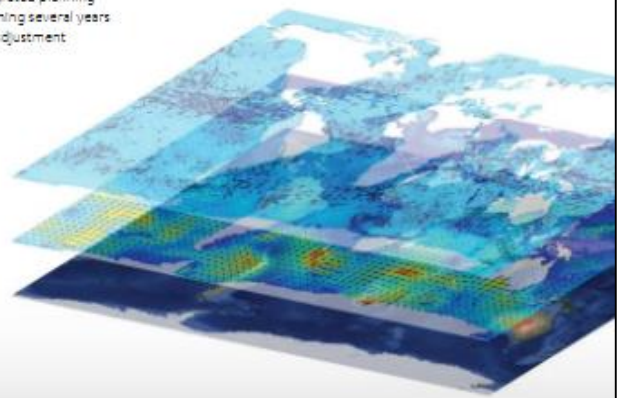
IMPROVED SCHEDULING

SUPPORTS SHORT AND LONG-TERM SCHEDULING OF ALL PORT CALLS

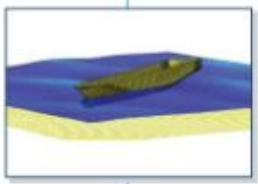
Managing a port efficiently requires careful long-term planning and flexible scheduling for vessels in transit and at berth. NCOS ONLINE provides an integrated planning module that incorporates long term planning several years into the future with dynamic scheduling adjustment based on running 7-day forecasts.

TAKE ADVANTAGE OF THE ENVIRONMENTAL CONDITIONS AT YOUR PORT

- Maximize Operability
- Minimize Delays
- Assure Safety
- Improve Sustainability



MAXIMUM SAFETY AND EFFICIENCY

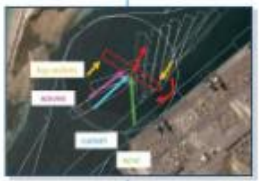


UNPARALLELED ACCURACY

Comprehensive 3D physics-based vessel response calculation with the Accuracy of Full Mission Bridge Simulators.

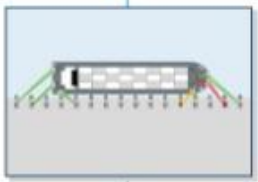
IN CHANNEL

UKC windows for all vessels calling at the port displayed on one user friendly cloud-based interface.



MANEUVERING

Direct evaluation of maneuvering forces and towage requirements through full force balance assessment.



AT BERTH

Dynamic moored vessel response forecasting including passing vessels and integrated berth planning.

UNLOCK THE HIDDEN CAPACITY POTENTIAL OF YOUR PORT

EFFICIENT COMMUNICATION

Automatic generation of pilotage plans and mooring plans. Integrated berth planning and pilot rostering. Instantaneous distribution of information to stakeholders to ensure availability of pilots and tug operators.

SEAMLESS INTEGRATION

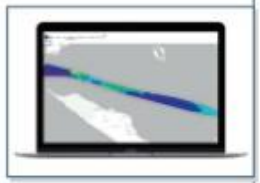
Seamless integration to 3rd party VTS, PPUs, port and onboard systems through secure and standardized API.

LESS DREDGING & MORE SUSTAINABILITY

Optimize capital and maintenance dredging campaigns.

EMPOWERED DECISION MAKING

User-controlled conservatism and client-side bathymetry updates to reduce uncertainty of safe transit calculations.



24/7 SUPPORT

Training at 24/7 international support.

CALL BY CALL
VESSEL BY VESSEL

FORESIGHT
User friendly interfaces for scheduling vessels in transit and at berth.

OVERSIGHT
Full oversight of weather and AIS data within port domain powered by accurate 7-day forecasts of water level, currents, winds and waves improved with machine learning.

OUR GLOBAL NETWORK OF OFFICES

With offices in more than 30 countries across the globe, we deliver locally relevant solutions tailored to meet your specific needs.

OUR PEOPLE ADVANCE OUR GLOBAL KNOWLEDGE AND DELIVER IT LOCALLY

Our highly qualified staff (80% hold an MSc or a PhD) constantly advance our knowledge in water environments. They make this knowledge accessible to our clients and partners.

OUR CLIENTS, OUR PARTNERS

To drive successful projects, we work closely with our clients. We are committed to addressing their specific challenges. We become their trusted advisors because professional integrity is fundamental to us. The clients we work with range from decision makers to water professionals:

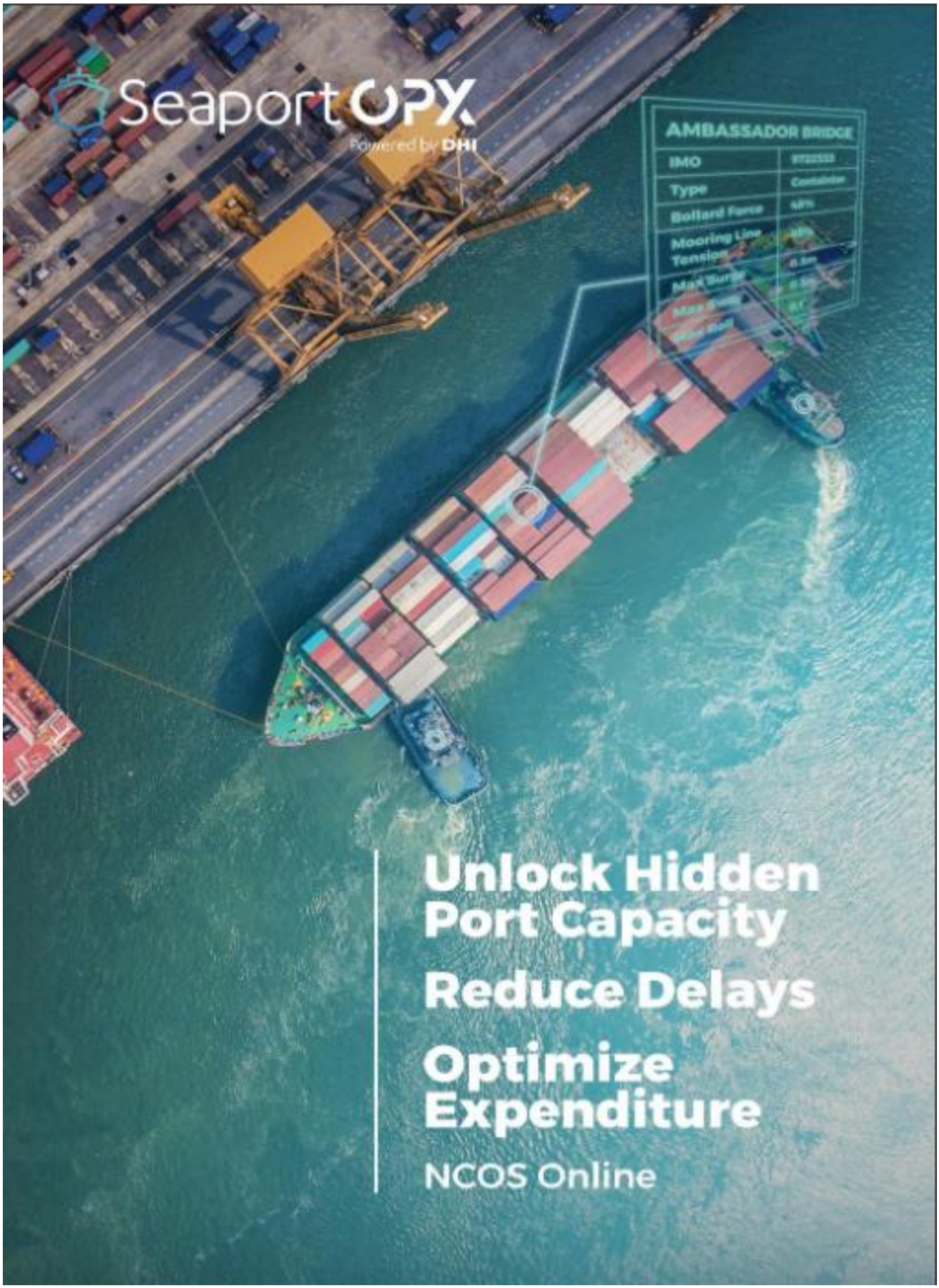
- Public authorities and government organisations
- Industry sectors such as ports, water utilities, energy, infrastructure and transportation companies
- Consulting engineers and contractors

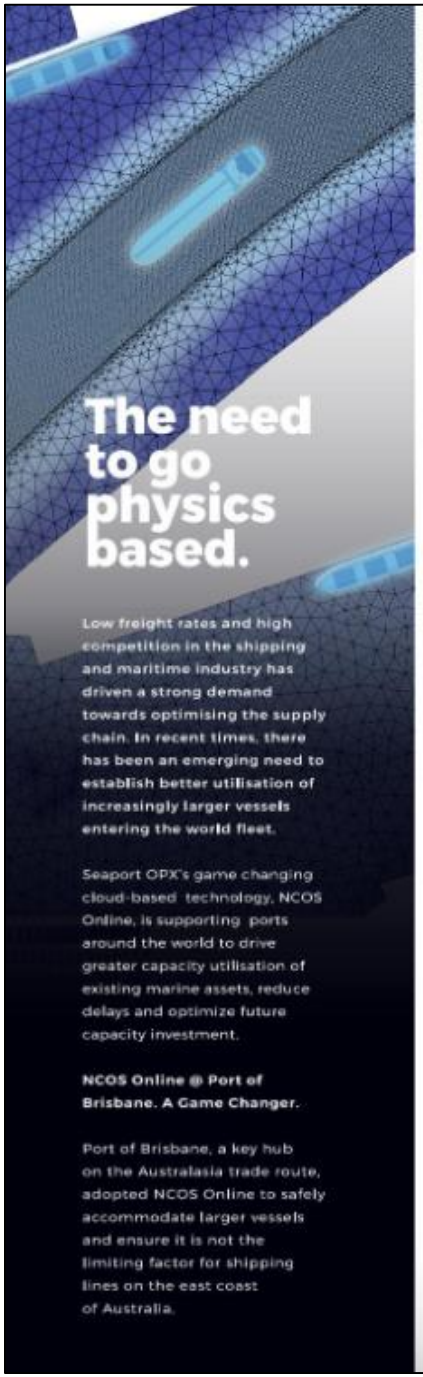
QUALITY ENSURES BUSINESS EXCELLENCE

To make sure that we meet our customer's needs, we develop and deliver our products and services under our advanced business management system. This system is certified to be in accordance with the international standard.

WE ASSOCIATE WITH GLOBAL LEADERS IN MARINE ENVIRONMENTS

The industry recognises our expertise, knowledge and credibility. We are proud to be associated with names that make a difference to the world of water.


Seaport OPX
Powered by DHI
AMBASSADOR BRIDGE
IMO
Type
Bollard Force
Mooring Line Tension
Unlock Hidden Port Capacity
Reduce Delays
Optimize Expenditure
NCOS Online



The need to go physics based.

Low freight rates and high competition in the shipping and maritime industry has driven a strong demand towards optimising the supply chain. In recent times, there has been an emerging need to establish better utilisation of increasingly larger vessels entering the world fleet.

Seaport OPX's game changing cloud-based technology, NCOS Online, is supporting ports around the world to drive greater capacity utilisation of existing marine assets, reduce delays and optimize future capacity investment.

NCOS Online @ Port of Brisbane. A Game Changer.

Port of Brisbane, a key hub on the Australasia trade route, adopted NCOS Online to safely accommodate larger vessels and ensure it is not the limiting factor for shipping lines on the east coast of Australia.

Boost Capacity

Previously limited to 6000 TEU Container vessels, NCOS Online has enabled the Port of Brisbane to call vessels up to 9500 TEU vessels.

In addition, NCOS Online has enabled the port to increase maximum allowable container vessel draft by 0.5m.

Reduce Expenditure

NCOS Online enables larger vessels to safely navigate the Port's 90km shipping channel, increasing utilisation of the shipping channel.

NCOS Online has enabled CAPEX savings to Port of Brisbane, with the NPV of cash flow impact associated with 10 year deferred dredging estimated at $52,000,000 AUD in PV terms.

Sustainable Growth

The Port of Brisbane is Australia's largest capital city port and operates in an area of high environmental significance, at the mouth of the Brisbane River. NCOS Online provides a physics-based virtual environment of the entire port that supports more efficient decision support for improved odour control, sustainable port growth and climate change adaptation.

*Department of Infrastructure, Regional Development & Cities, Australian Government, 2019.

What we can do for you.

REDUCE DELAYS

Reduces arrival delays at berth, improve traffic efficiency and reduce emissions

REDUCE RISK

Ensure the safety of all vessel transits and moorings with best-practise tools which are robust and defensible

CAPEX SAVINGS

Defer capital dredging works and enable larger and deeper drafted vessel calls. Optimise berthing schedules, extend quay life & improve safety

SUSTAINABILITY

Manage data-driven Port sustainability indicators more effectively and carry out faster and more accurate environmental impact assessments

CLIMATE CHANGE

Support port infrastructure resilience and smarter climate change adaptation strategies through agile and robust physics-based scenario assessment

OPEX SAVINGS

Extend transit windows for deep drafted vessels, reduce arrival delays and improve efficiency of maintenance dredging operations

Testimonials.

"NCOS has been a game-changer for the Port of Brisbane. By boosting the Port's capacity to handle larger vessels without compromising safety, we have added value to our customers and maximised efficiency for all Port users."

Roy Cummins
CEO Port of Brisbane

"NCOS ONLINE has given us a better physics based understanding of the unlocked potential of our Port and has been a valuable tool for improving our environmental management. The NCOS ONLINE system has the potential for significantly reducing opex and capex expenditure."

Keith Gordon
Executive General Manager, Port of Melbourne
