



Australian Government

Australian Maritime Safety Authority



Forum for Operational
Oceanography

Australian Forum for Operational Oceanography

FOO 2017

25-27 July 2017

Esplanade Hotel, Fremantle

AMSA's application of metocean models and awareness to support strategic and operational decision-making.

“All models are wrong – some models are useful”

George Box (1978)



Overview

- AMSA evolution
- Everyday operations
- Someone had a vision
- DHI Metocean modelling
- Can we do that now? (strategic questions)
- Operational spin-offs

Evolution of AMSA

- AMSA is transforming
 - modernising service delivery
 - capitalising on existing skills
 - working more collaboratively
 - leading in our region
 - global influence
 - service delivery for domestic commercial vessel sector

Three lines of defence
Standards – Operations – Response

Three lines of defence

Standards

- vessel safety
- marine environment
- maritime regulation
- system safety
- navigation and routeing
- communications
- International

Operations

- seaworthiness and safety
- inspection
- registration
- safety management
- seafarer welfare
- regulation of Australian vessels
- qualifications

Response

- search and rescue
- emergency towage capability
- crisis and response planning
- JRCC - joint rescue coordination centre
- marine environment
- maritime emergencies
- pollution response



Efficient processes

- designed and tested with users
- streamlining of regulations

Customer-centric approach

- AMSA Connect
- AMSA Website
- face to face
- regional presence

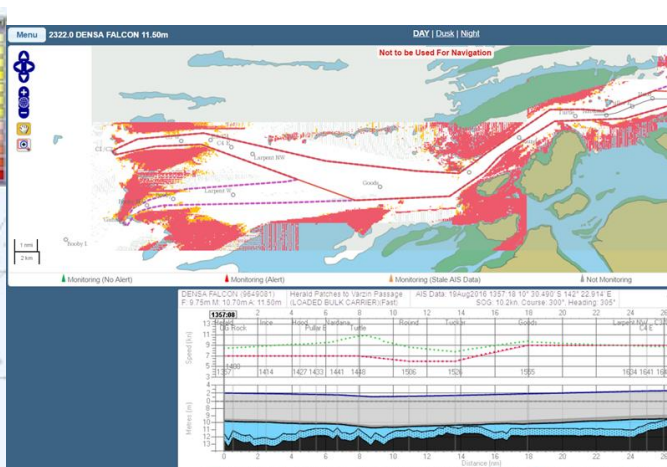
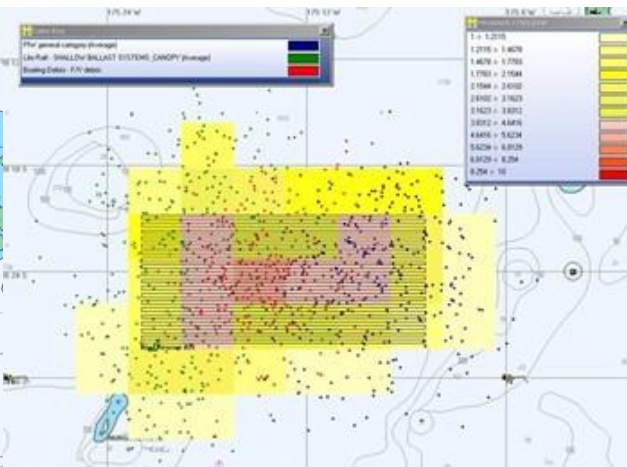
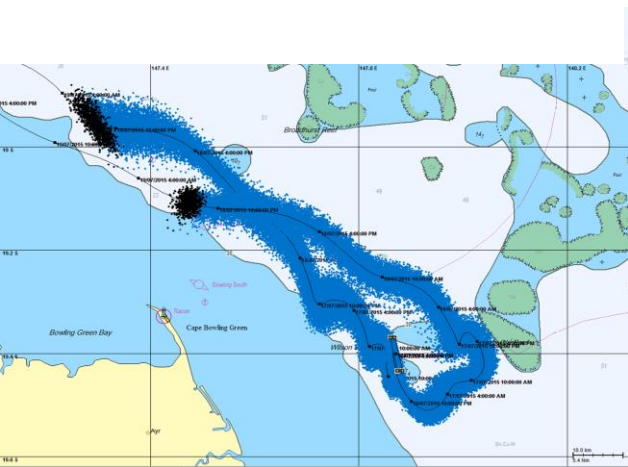
Technology

- revamping IT
- single customer database



Models aren't new to AMSA

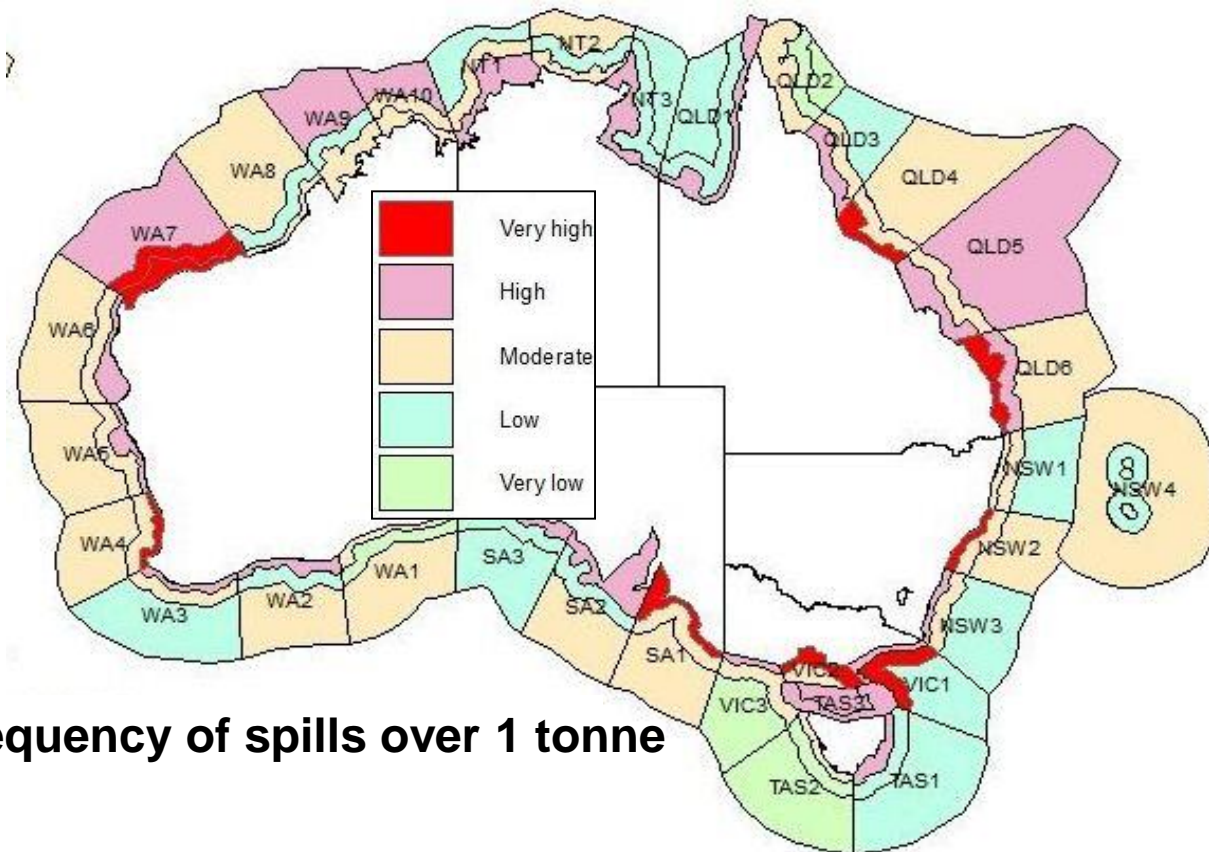
- Oil behaviour and fate
- Search & rescue planning
- Under keel clearance management





Models aren't new to AMSA

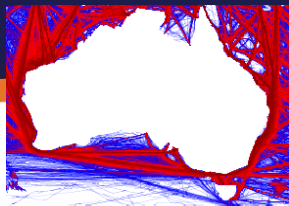
Australian 2009 oil spill risk assessment



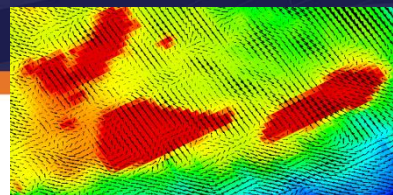
Visionary - Multi-layered Risk Estimation



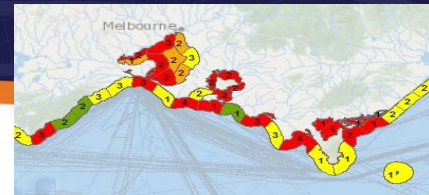
Layer 1 (2011 - on)
Ship specific risk
(proxy for safety quality)



Layer 2 (2013/14/15 - on)
Eg. Nm travelled, days in area,
(proxy for vessel traffic
densities and/or exposure)



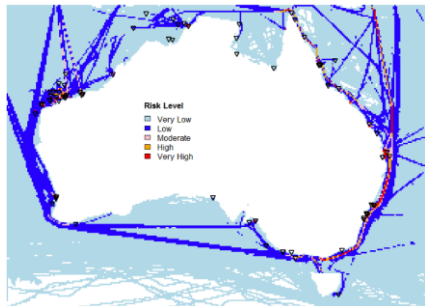
Layer 3 (2014/15 - on)
Physical environmental
layer (wind, waves,
currents, bathymetry)



Layer 4 (2013 - on)
Sensitivities (economic,
cultural/social, ecological)

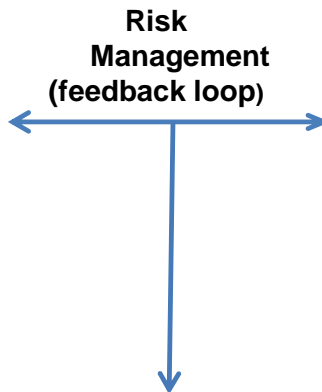
Total Risk Exposure:

Protect: property, life and marine environment



Expressed as:

- probabilities
- expected numbers
- monetary value at risk (proxy to consequences)
- oil on water
- oil on coast



Layer 5 (2014/15 - on): Effects of risk control options (RCOs):

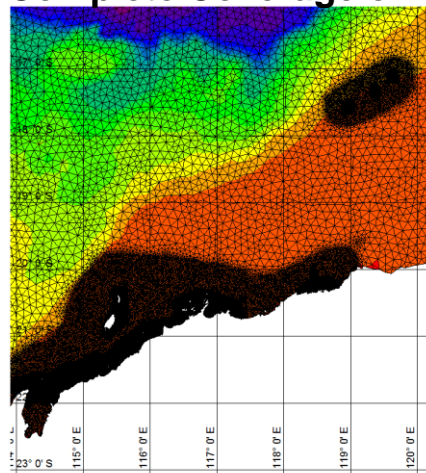
- navigational aids
- aids to navigation
- vessel traffic services
- under keel clearance
- emergency response
- inspections and audits
- pollution preparedness
- general surveillance
- others as appropriate

(Acceptable) residual risk

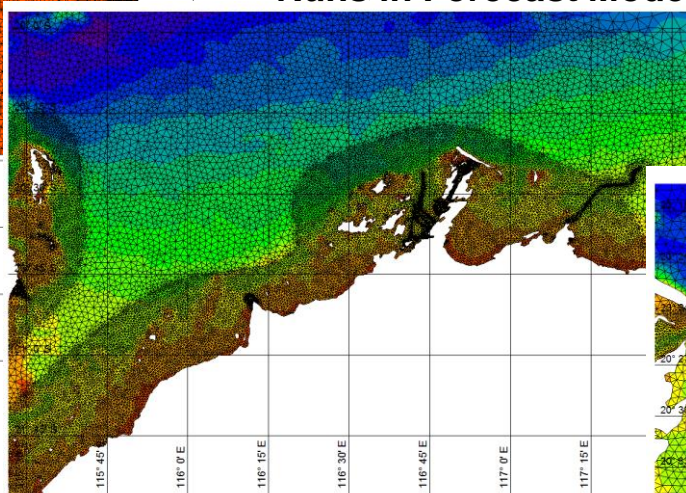


The Strengths of Flexible Mesh

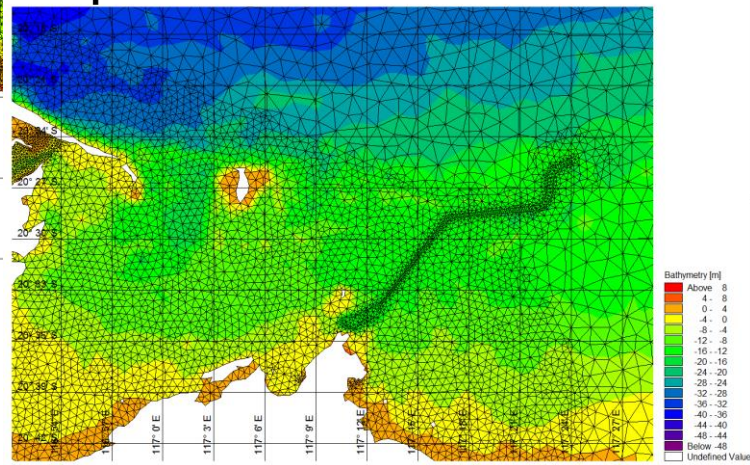
Complete Coverage of Australian Waters



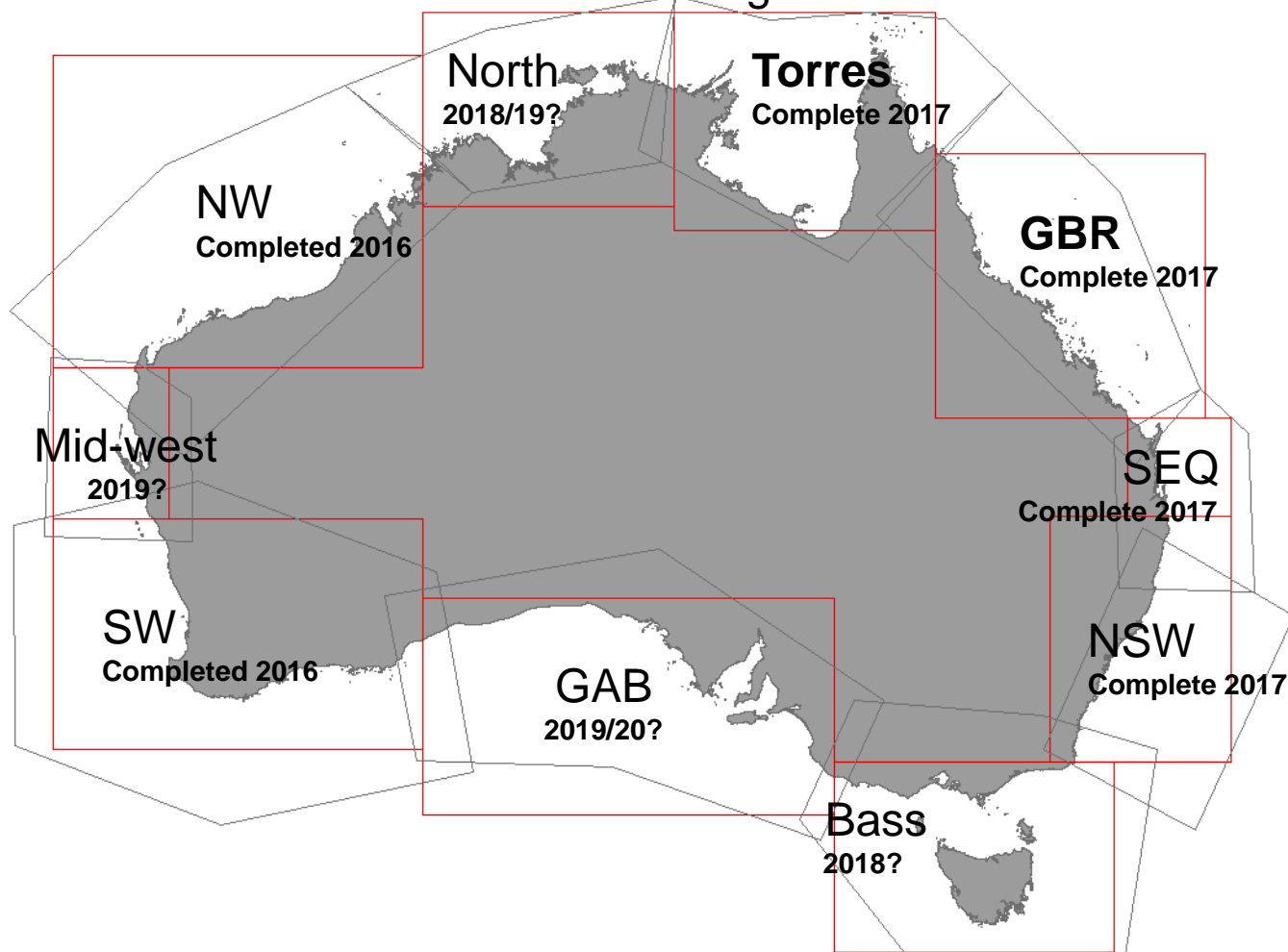
Runs in Forecast Mode



Spatial Resolution <150 m



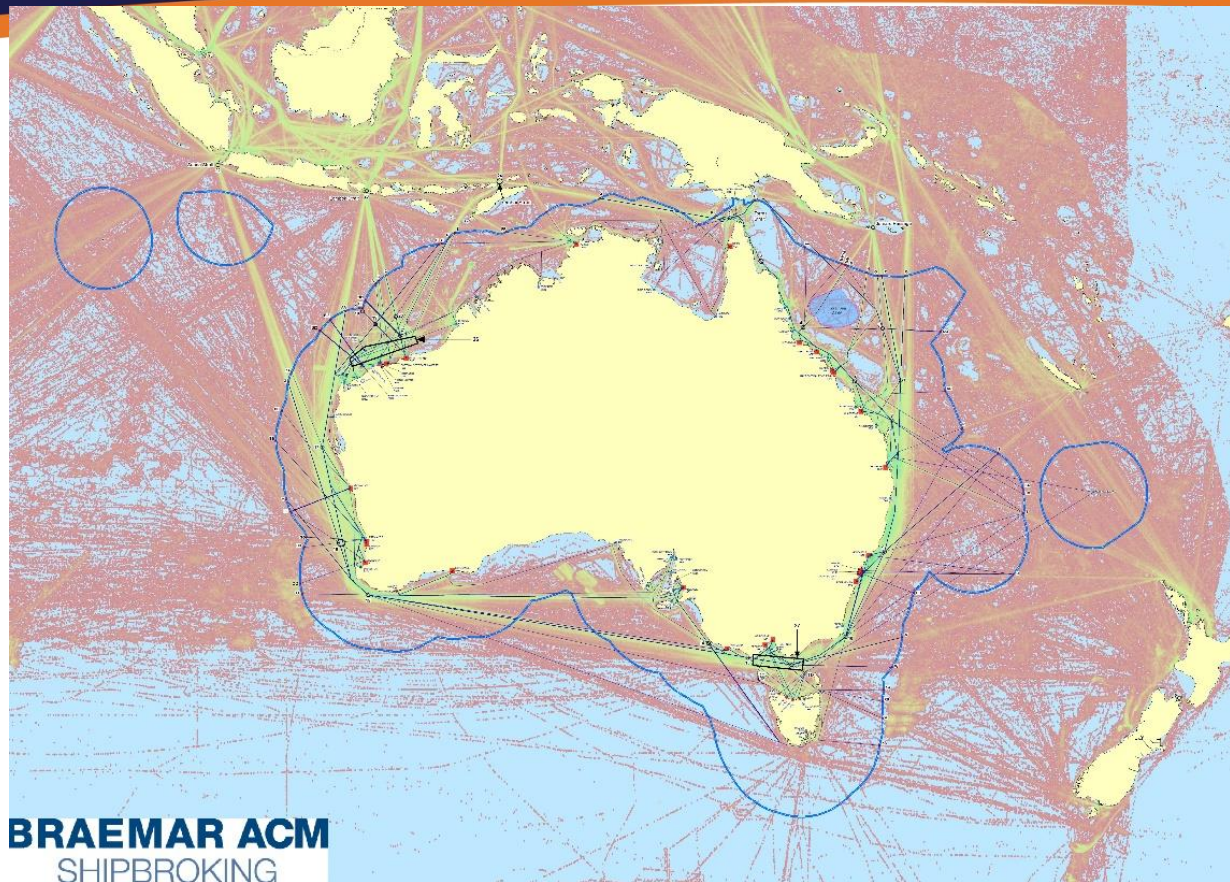
DHI Met Ocean Hindcast Modelling Domains

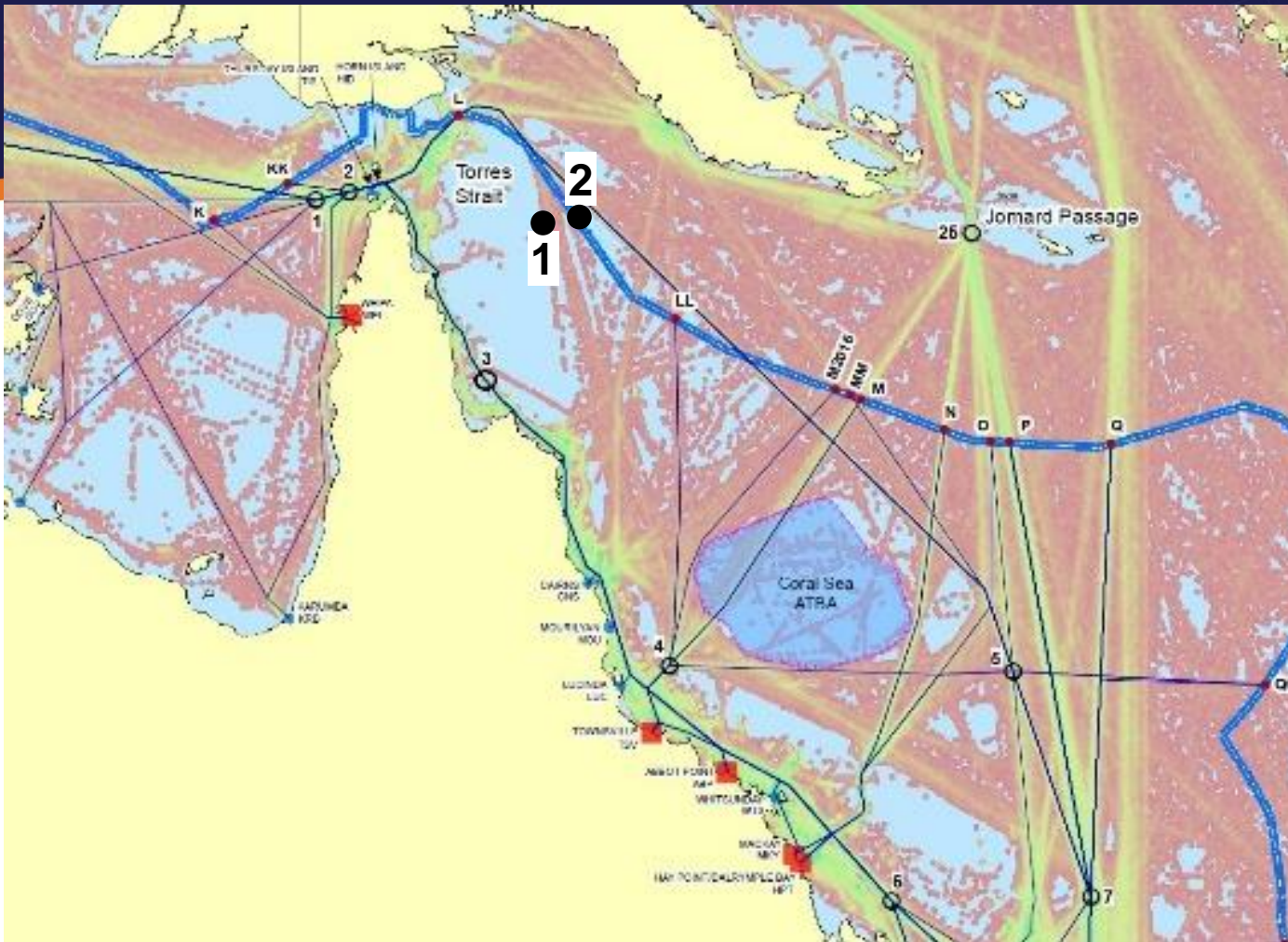




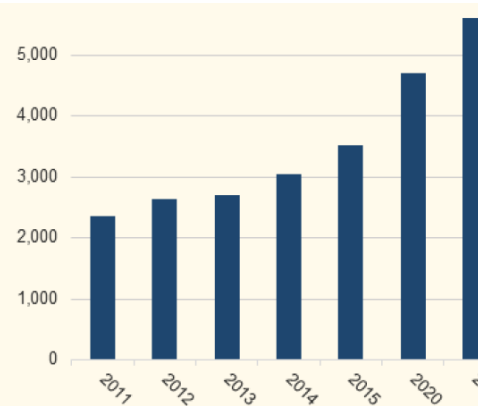
Australian Government
Australian Maritime Safety Authority

Maritime traffic projections – 2015-2025

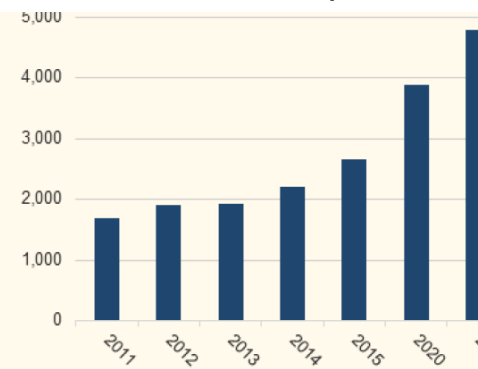




Waypoint 2 Traffic (incl Weipa)
(no. of movements inbound & outbound)



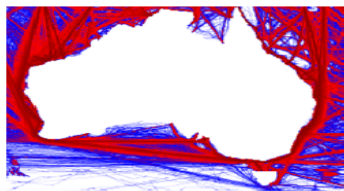
Waypoint 1 Traffic
(no. of movements inbound & outbound)



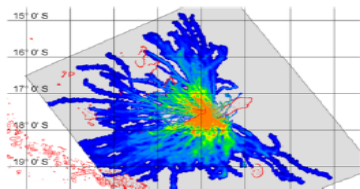
Factors



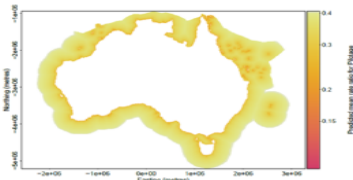
Ship specific risk (safety quality)



Vessel traffic



Met-ocean conditions



Effect of risk control options

System predicts risk exposure given changes in factors

Ship sizes?

Changes in economy?

Changes in port arrivals?

Changes in traffic composition?

Location specific components

- *Effect of wind, waves and currents on risk exposure*
- *Available sea-room based on distance to baseline, bathymetry (LAT for tides) and marine hazards*

Effect of Risk Control Options (RCO's) on decreasing risk endpoint

User runs prediction scenarios

Chose area (EEZ, specific area of interest)

Chose specific scenario or all such as for instance: business as usual, good, economy bad economy

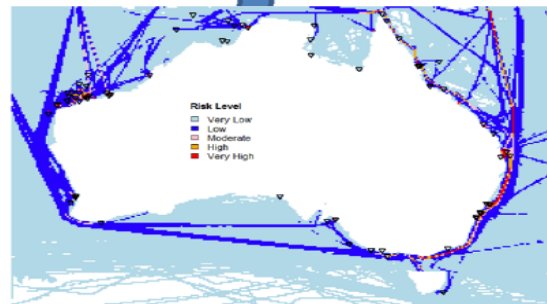
Chose time frame (next year, 2020, 2025)

Add other factors (expected increase in ship sizes?)

System predicts risk exposure: change to baseline

User can perform sensitivity analysis (effect of RCO's)

User can overlay coastal sensitivities (if available)



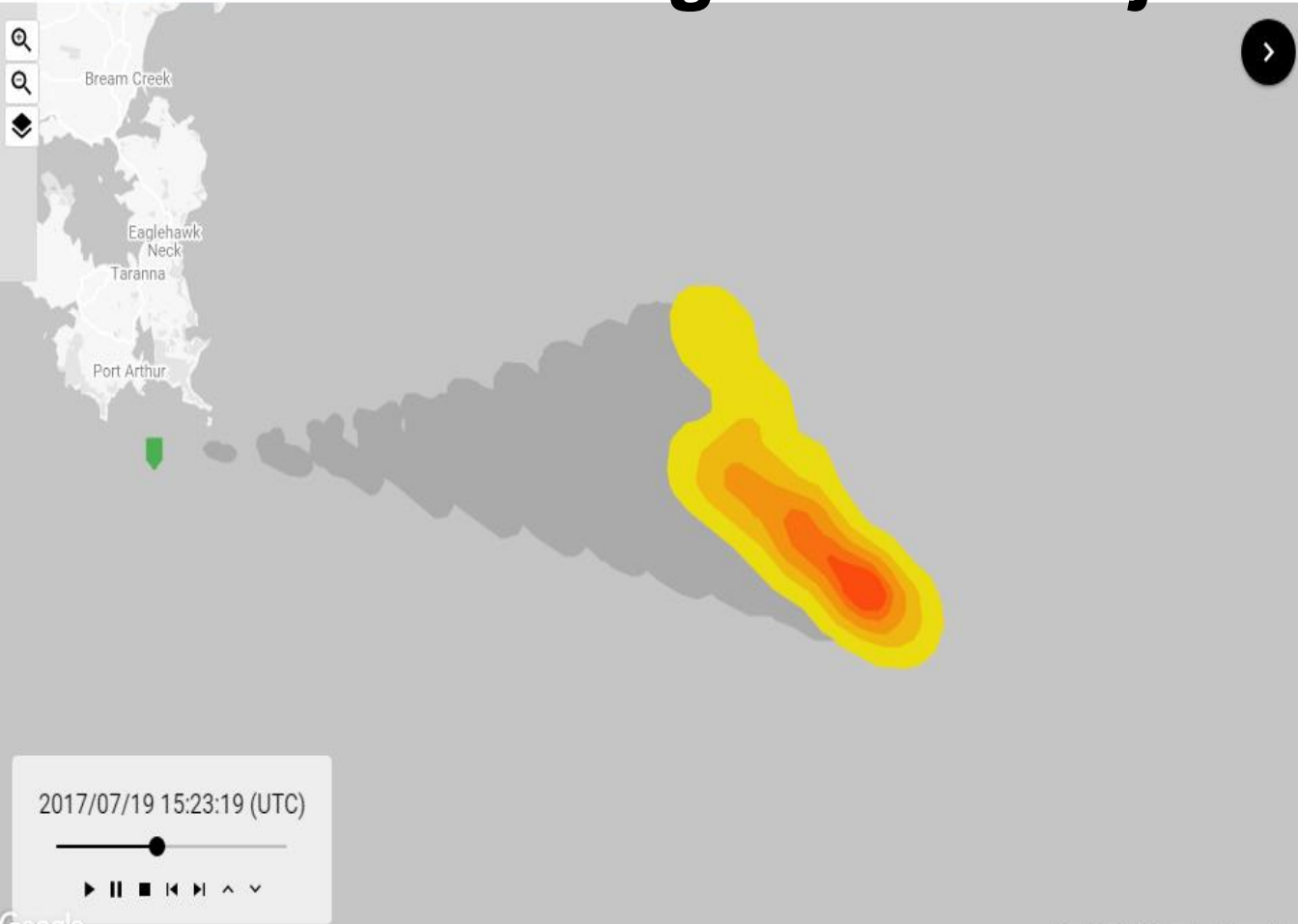
Risk exposure measured as:

- expected Nr. of collisions, powered groundings, drift groundings (risk end points) - TLVSS
- Oil on water? Oil on coast? (not included at this stage)
- monetary value at risk \$\$\$
- Change of risk exposure (location and magnitude)



New Dynamic Risk Assessment

- Allows national dynamic real-time risk assessment (NCI gives us the capability)
- Improves AMSA's Domain Awareness and Situational Awareness
- Points in the direction of critical AMSA infrastructure investment assessment
- Encourages bottom-up risk and resources assessment from jurisdictions for spill response



Lodged Events

Kiwi Ship (test)

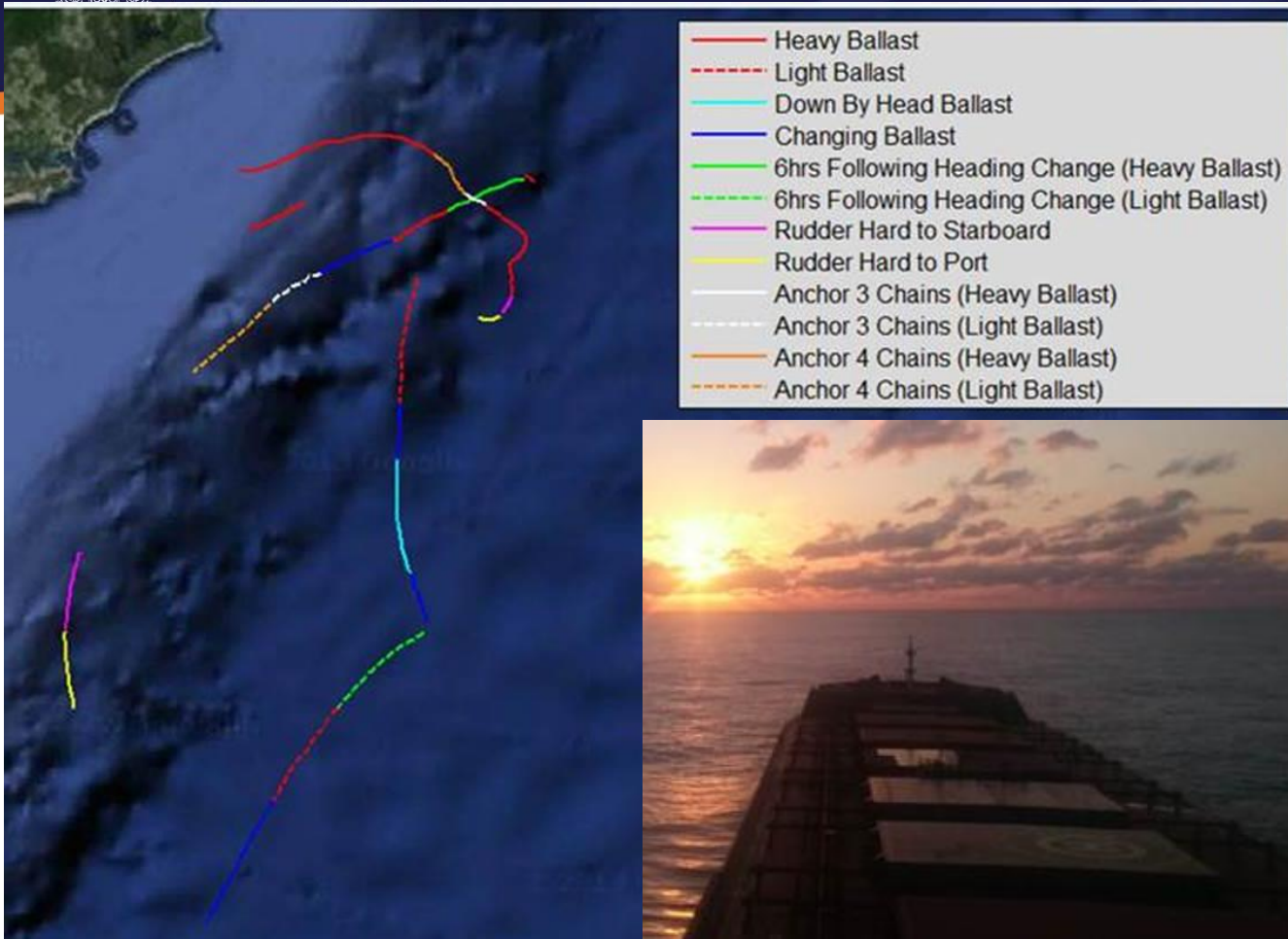
19/07/2017 04:23:19, PaulAMSA

PI Test

09/12/2016 03:42:58, PaulAMSA

2017/07/19 15:23:19 (UTC)



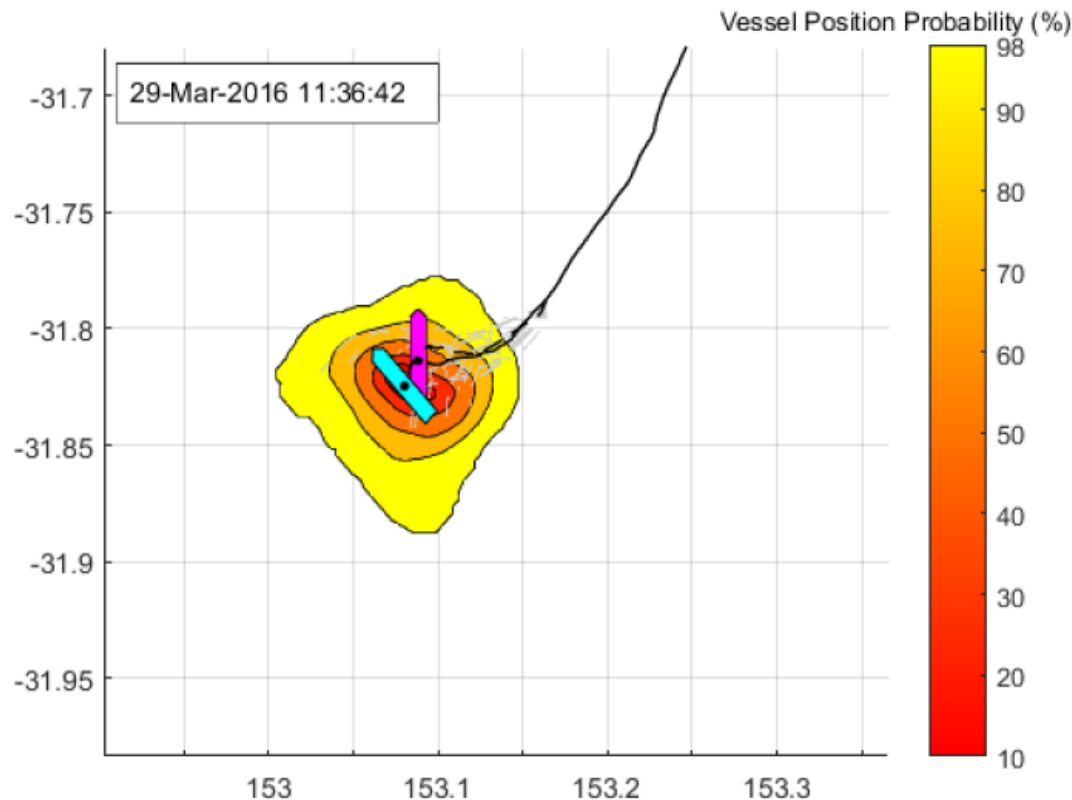


Tested in August 2015 with:

- DHI
- Rio Tinto Marine
- OceanWaves



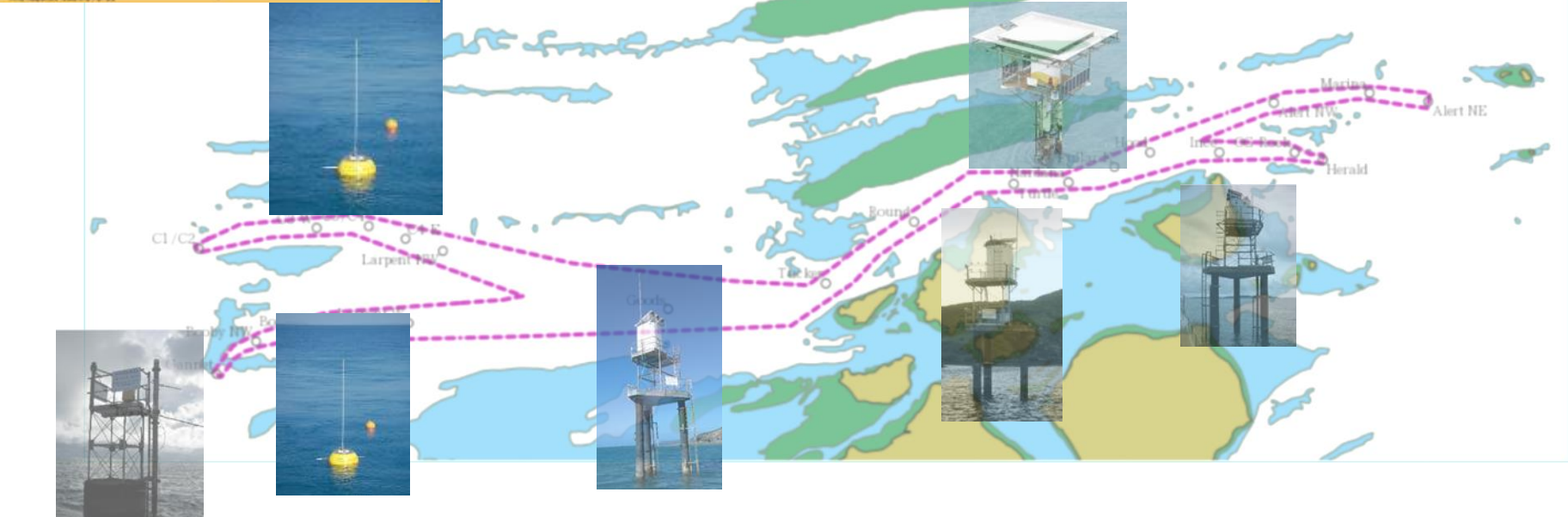
Drift vessel prediction



Incident - Equator Peace
off NSW
Predictions over 24-26 hrs
were within decision
acceptable tolerance
levels for response options
for AMSA.

Figure 4-7 Equator Peace drift event, Method 2 update: Probability density plot at +34 hours

A map of Australasia and adjacent waters, including the Philippines, Indonesia, Malaysia, and parts of Australia and New Guinea. A black rectangular box highlights the study area in the Philippines, specifically around the Luzon Strait and the Philippine Sea. The map shows various islands, sea areas, and maritime boundaries. The title 'AUSTRALASIA AND ADJACENT WATERS' is prominently displayed at the bottom left, along with the publisher's logo and name, 'OFFICE OF THE SECRETARY OF DEFENSE'.





Lessons still to be learned!

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Australian Maritime Safety Authority

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Met Ocean Data Service

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Summary Tide Wave Tidal Stream Wind Meteorological

Tide

Booby Island	Goods Island	Turtle Head	Nardana Patches	Ince Point	Twin Island
01Dec2015 1042	01Dec2015 1042	01Dec2015 1042	01Dec2015 1042	01Dec2015 1042	01Dec2015 1042
3.60 m Tide	3.21 m Tide	2.47 m Tide	2.33 m Tide	2.22 m Tide	1.90 m Tide
-0.07 m Residual	-0.08 m Residual	+0.02 m Residual	-0.04 m Residual	+0.05 m Residual	

Wave

Varzin Passage
01Dec2015 0950
Sea Swell
0.17 m 0.03 m
Height Height
3.4 s 9.2 s
Period Period
123 ° 246 °
Direction Direction
0.48 m Maximum Height

Tidal Stream

Gannet Passage
01Dec2015 0948
Sea Swell
0.24 m 0.02 m
Height Height
3.3 s 10.1 s
Period Period
111 ° 240 °
Direction Direction
0.53 m Maximum Height

Wind

Nardana Patches
01Dec2015 1042
1.8 kn Rate
091 ° Direction

Meteorological

Booby Island
01Dec2015 1042
6.0 kn Speed
6.9 kn Gust
075 ° Direction

Booby Island
01Dec2015 1042
1009.6 hPa Pressure
29.0 °C Temperature
69 % Humidity

All times are in Torres Strait local time (AEST) (UTC+10). All tides are given in metres above LAT.

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AMSA is learning and changing and evolving.

So, how do we engage with the oceanographic community so that our developments and needs are better aligned?