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Managing Safe Navigation and Asset Protection in Areas Exposed to Strong Propeller and Thruster Currents

Andrew Bradford - PIANC APAC 2022

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Case studies involving management of thruster currents at the Overseas Passenger Terminal, Sydney Cove

- Two field data collection projects:

1. Navigation risks for ferries operating in Sydney Cove
2. Asset protection of OPT wharf and berth pocket

Acknowledgements to Port Authority of New South Wales and Cardno, now Stantec

Cardno now Stantec

PORT AUTHORITY OF NEW SOUTH WALES

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Sydney Cove and the Overseas Passenger Terminal (OPT)

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Overseas Passenger Terminal, Sydney Cove

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Overseas Passenger Terminal upgrades

- Current terminal built 1960s
- Upgrades in 1980s
- Temporary mooring installation 2013 (drag anchor mooring) for a large vessel arrival
- Northern 60 metre extension
- Fender upgrades
- Additional southern mooring point
- Maximum vessel length now 350 metres
- Terminal passenger processing capacity ~5000

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Project 1 – Ferry navigation impacts

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Ferry navigation impacts

Cardno approached by Harbour City Ferries to investigate current measurements

Incidents reported by ferries, particularly Freshwater class on approach to Wharf 3

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Horizontal ADCP

Mounted on Wharf 3

Possible range up to 150 metres

Assumes homogenous flow

Depth limitations

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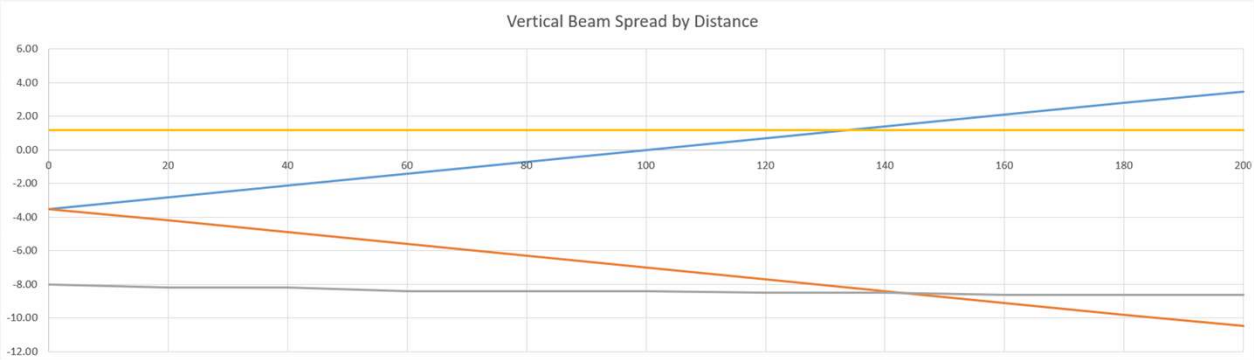
Vertical spread of H-ADCP acoustic beam



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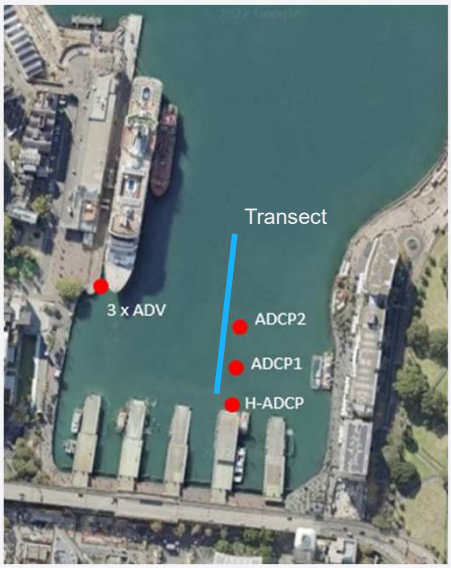
Field trial of ADCP performance



- Teledyne RDI 300kHz ChannelMaster H-ADCP
  - North facing on Wharf 3
- 2 x bed-mounted Teledyne RDI 1200kHz ADCPs
  - 40 and 80 metres north of Wharf 3
- Vessel-mounted Teledyne RDI 1200kHz to conduct North-South transects

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Field trial of ADCP performance

- Port Authority coordinated for a cruise ship to run its thrusters following arrival to allow measurements of a known output
- Vessel used 3 thrusters during arrival at 80% for ~1 minute
- Single thruster then run at 30% for ~25 minutes

- Temporary installation of H-ADCP, 2 bed mounted ADCPs and a port survey vessel used for transects

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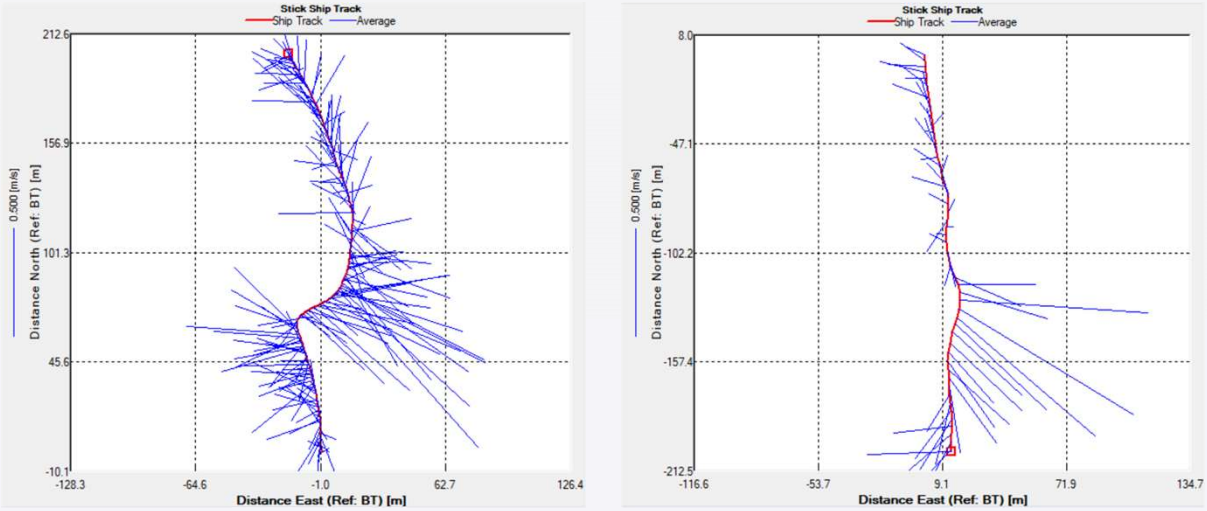
Vessel transect measurements



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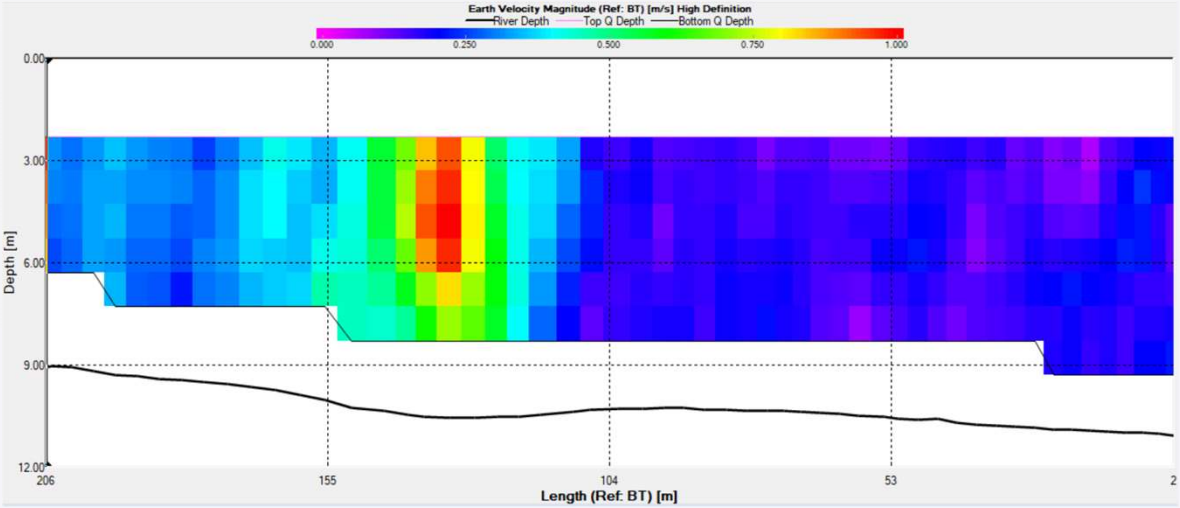
Vessel transect measurements



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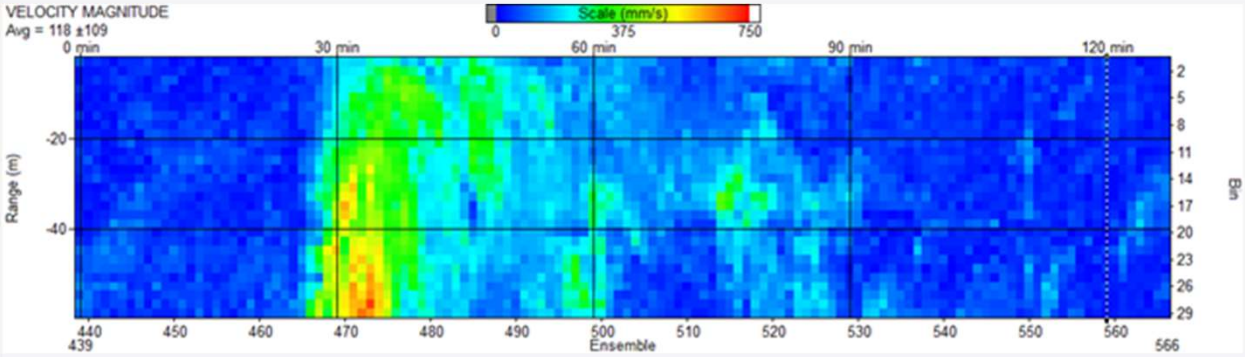
H-ADCP Current Magnitudes

South (Ferry Wharf)



North

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Comparison of measurements

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Project 2 – Asset Remediation and Protection Works

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Asset remediation and protection works

A number of observations from both landside and from hydro survey indicated bed scour and wall impacts were occurring.

Port Authority hydrographic survey increased frequency of OPT surveys to investigate

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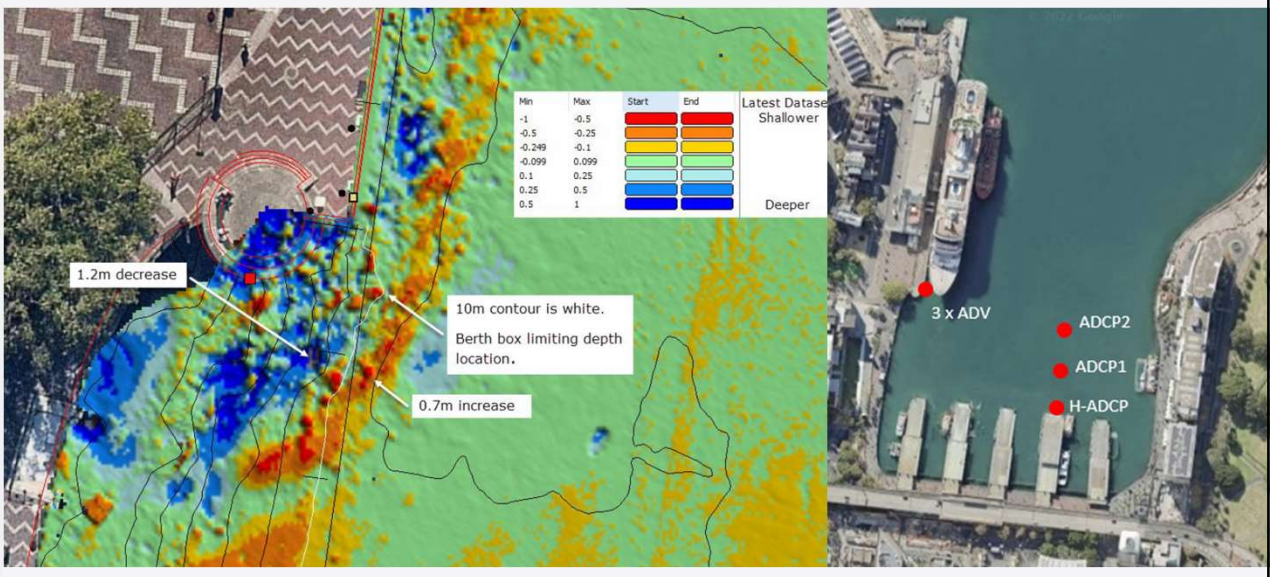
Depth change 2014 - 2018



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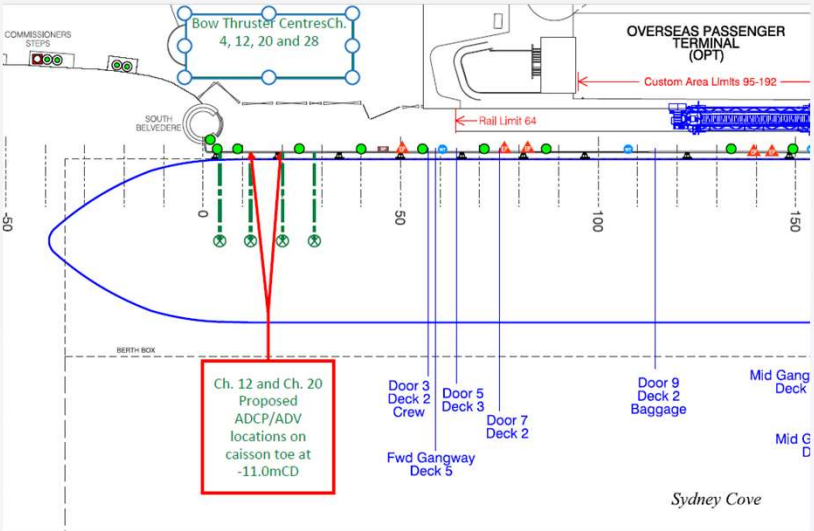
Installation of Vector ADV instruments

- 3 instruments to be installed
- Placed at base of wall aligned with thruster positions



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Nortek Vector ADV

Single point current measurements from small volume of water

Allows measurements of turbulent currents

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Installation

Diver installation

Bolted to caisson

January 2020 – April 2020

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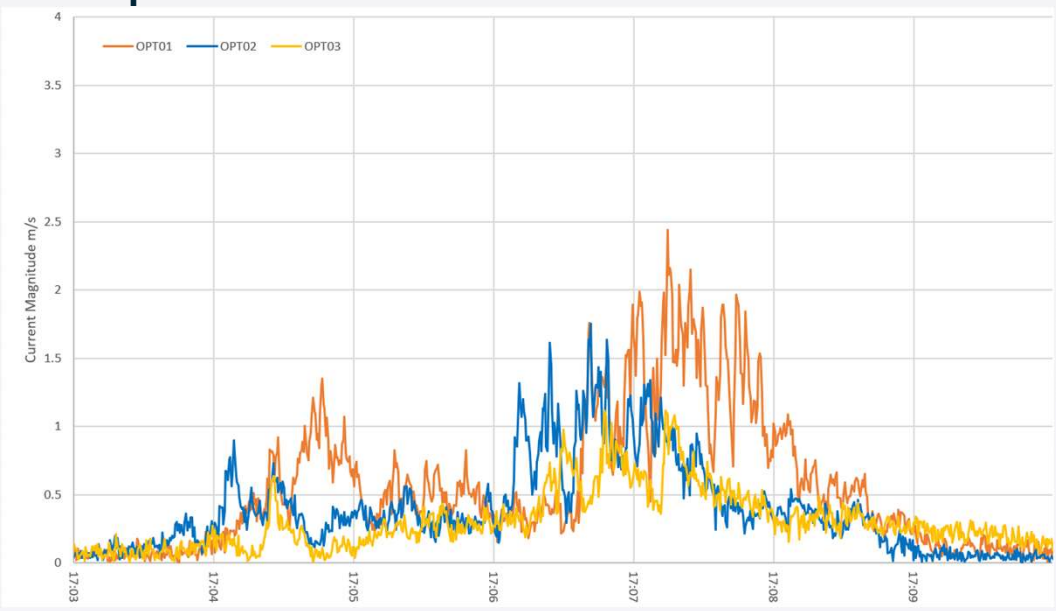
Typical departure currents



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Summary

- Field measurements provided valuable inputs to the management of the effects of bow thruster currents in Sydney Cove
- Real-time H-ADCP allowing safe navigation of ferries
- Continuing detailed design of asset protection works for wharf and berth pocket to ensure the future safety of the berth
- Physical modelling of designs
- Opportunity for further data analysis and comparisons

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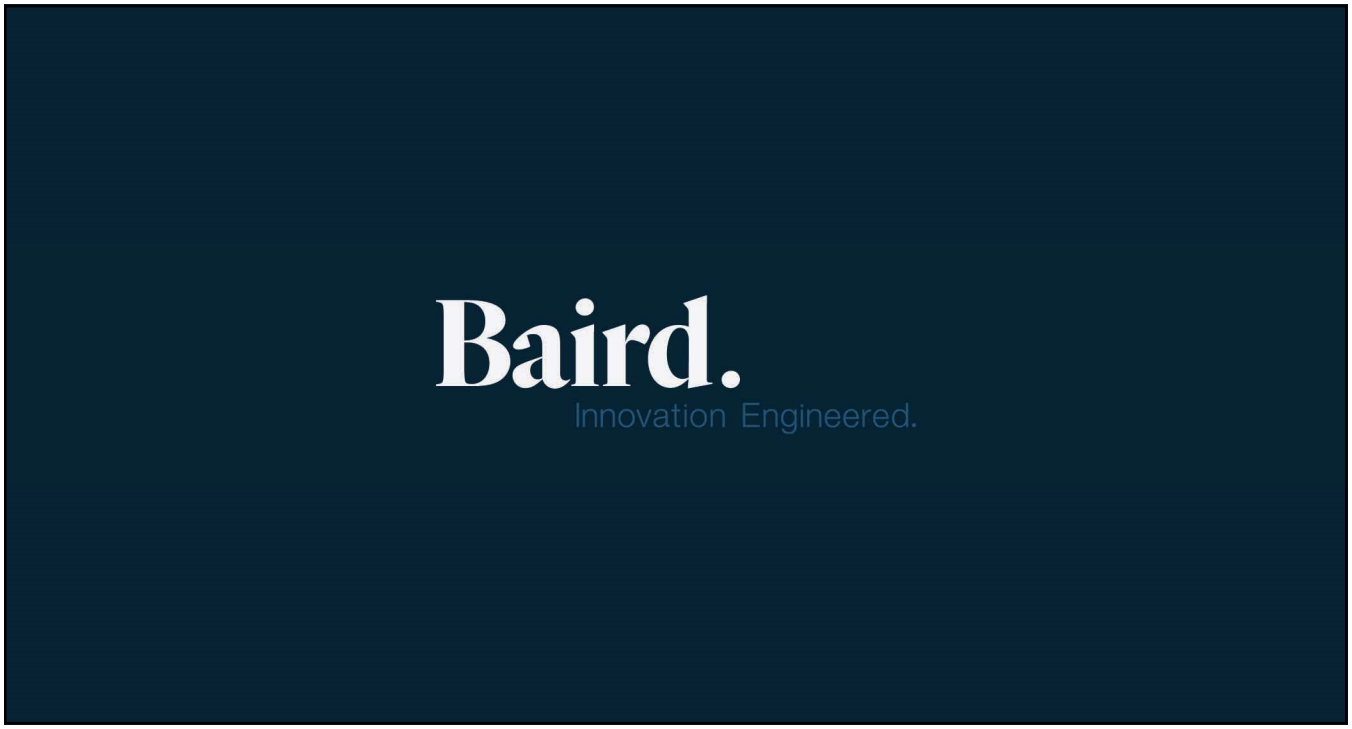

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