

Full Scale Testing of Rock Bag Filter Units

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Outline

- Purpose
- Background
- Experiment Setup
- Results
- Conclusions and Further Work



Purpose

To determine the following water velocity limitations of the AquaRockBags® exposed to wash from a tug for the following conditions:

- Stability for the 4 t and 8 t rock bags on a 1V:2H slope
- Potential for uplift of the 4 t and 8 t rock bags on a flat surface when
 - Stability for the 8 t rock bags when stacked as in an unsupported vertical wall
 - The tug is located seaward of the bags
 - The tug is located above the bags

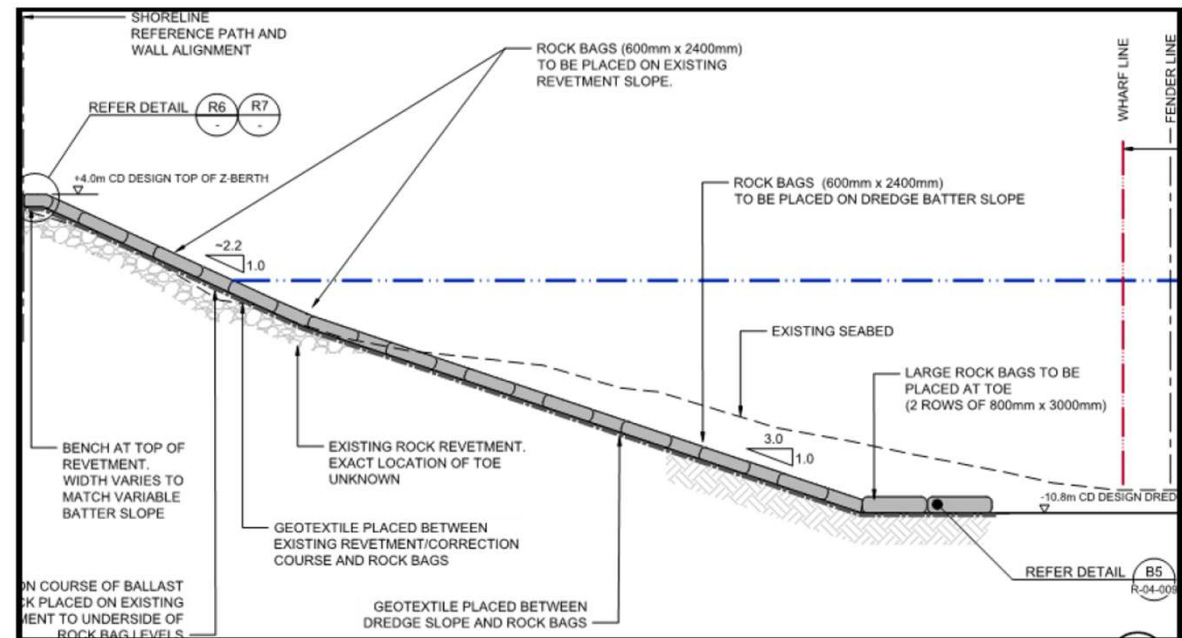


Figure 1 : Revetment Cross Section

Background

D. Messiter, B. Miller, J. H. Simpson and G. Lumiatti, "Super Cruise Vessel vs Rock Bags," in Australasian Coasts and Ports 2019 Conference, Hobart, 2019.



Figure 3 WRL basin showing bow thruster tube, motor (propeller inside tube) movable bed and Rock Bags

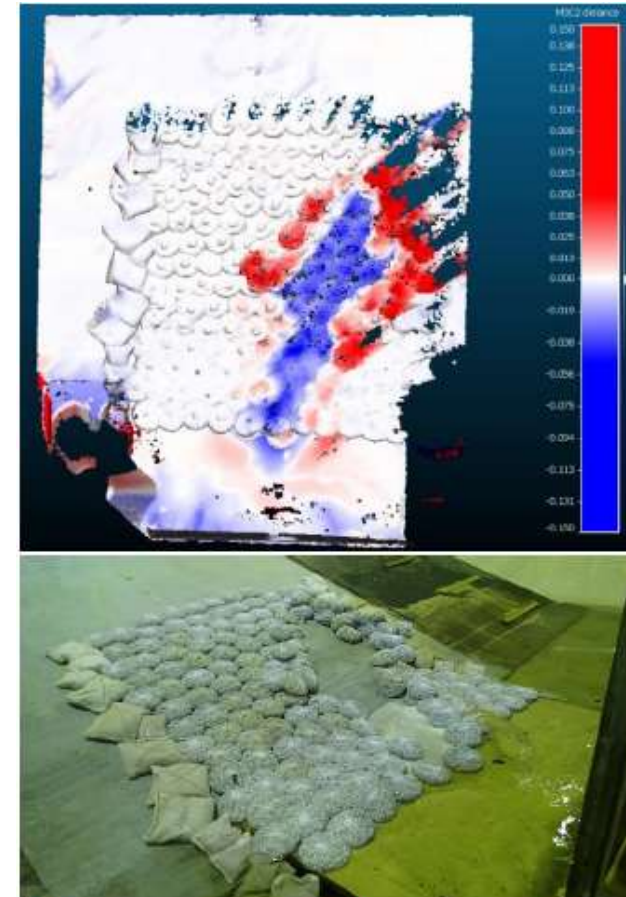
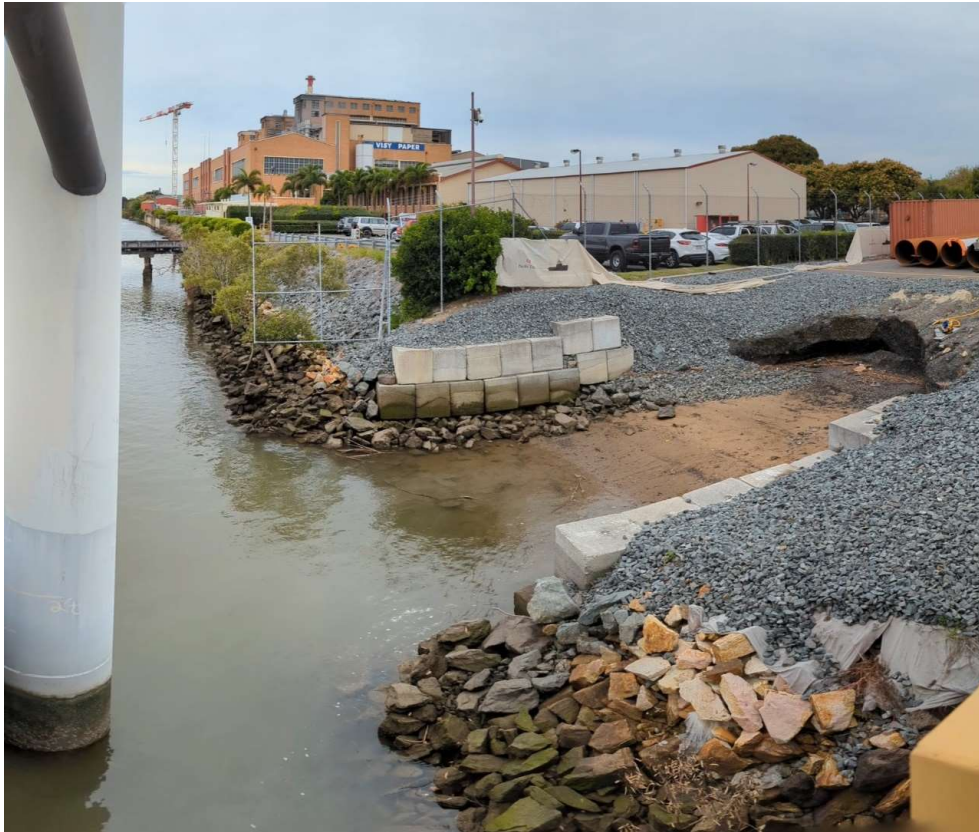


Figure 8 Comparison of pre and post faro scans of Test 6 (top); accompanied by the post-test image

Experiment Setup

Site Overview



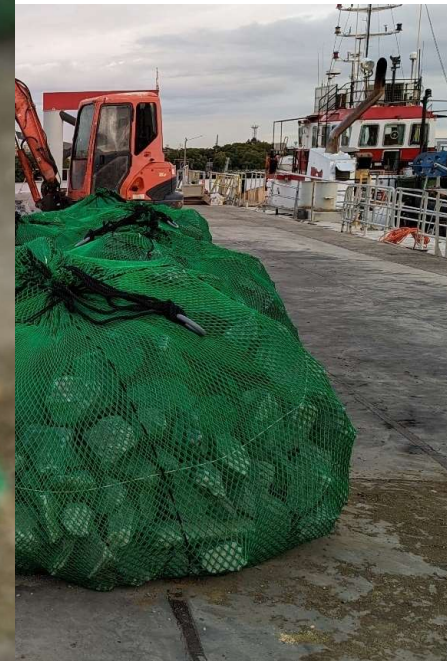
Experiment Setup

Small Rock Bags



Experiment Setup

Medium Rock Bags



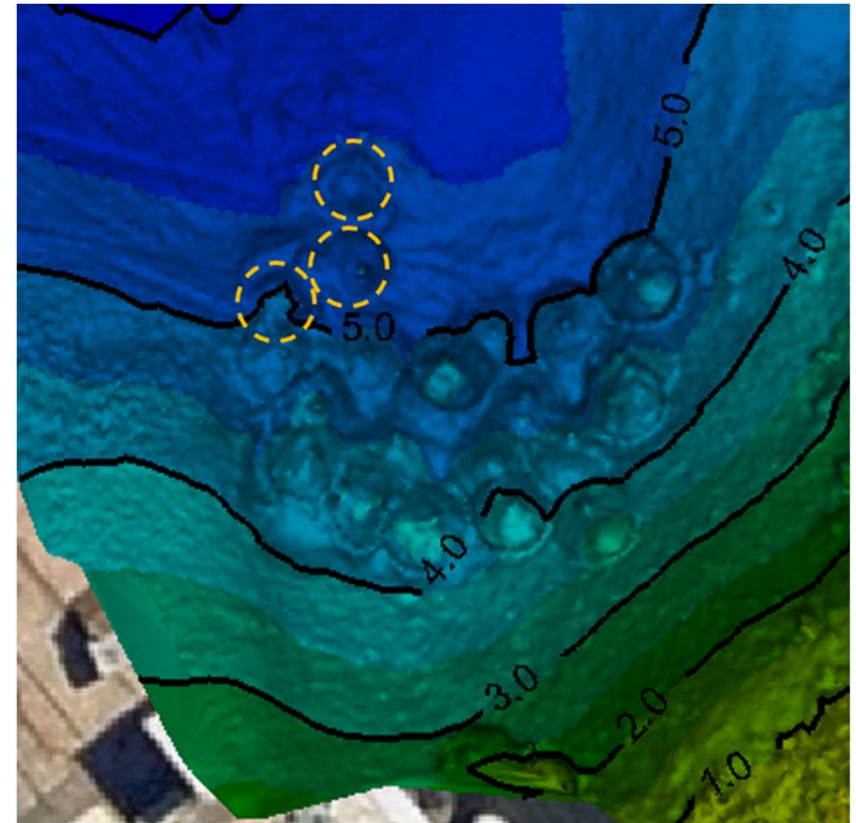
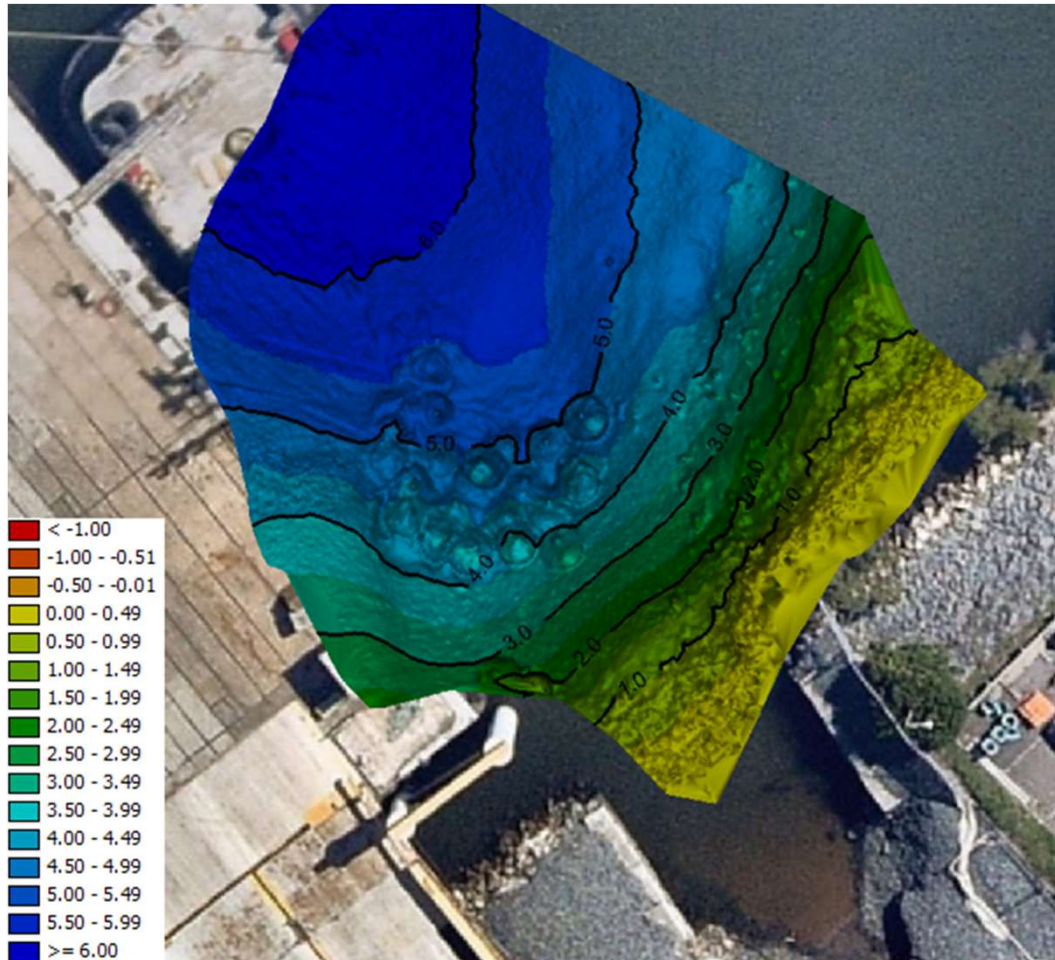
Experiment Setup

Large Rock Bags



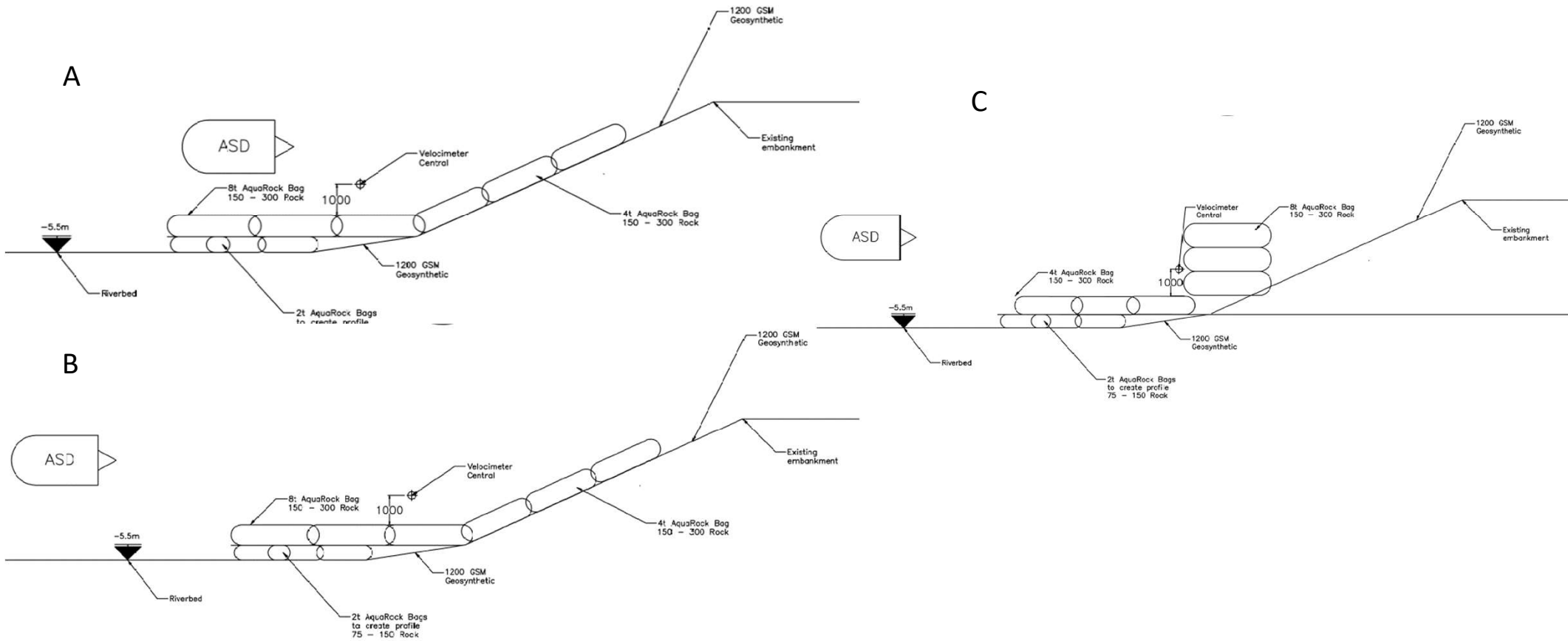
Experiment Setup

Site Preparation



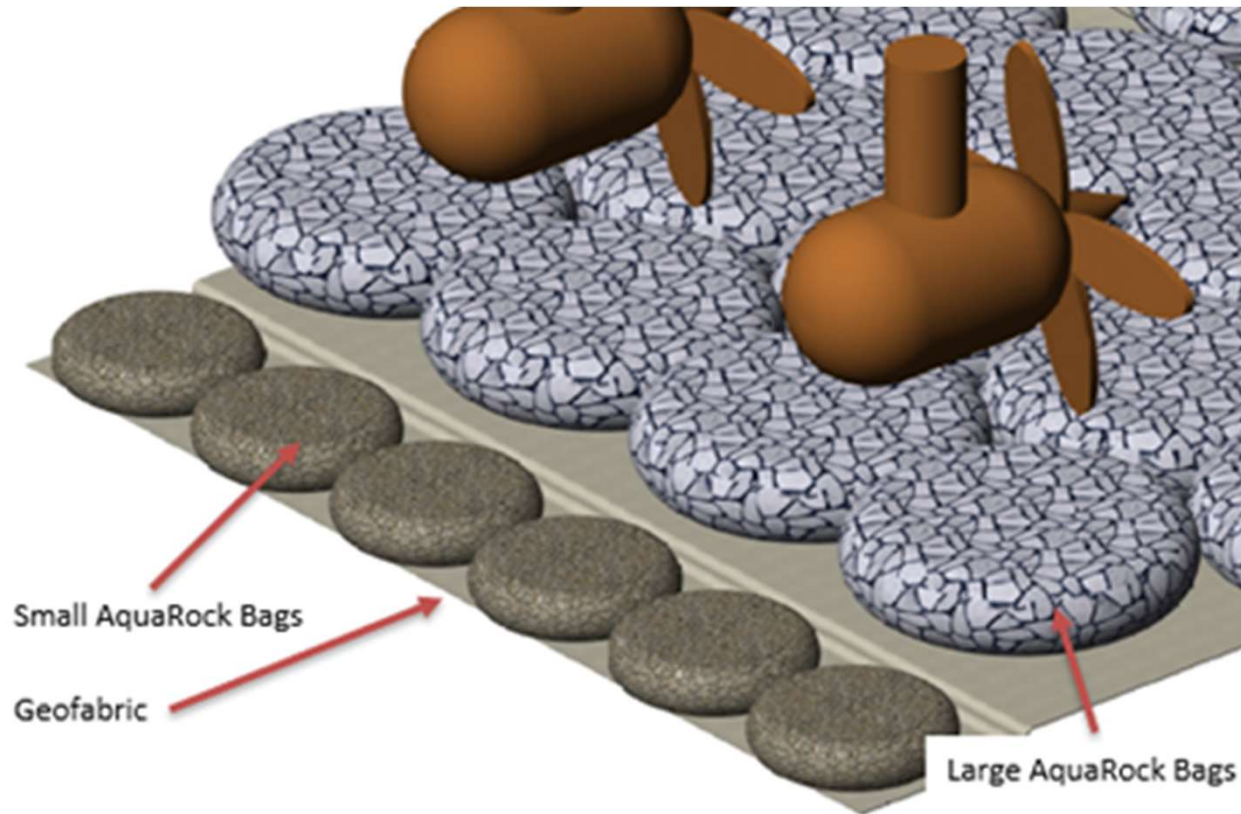
Experiment Setup

Three design cases



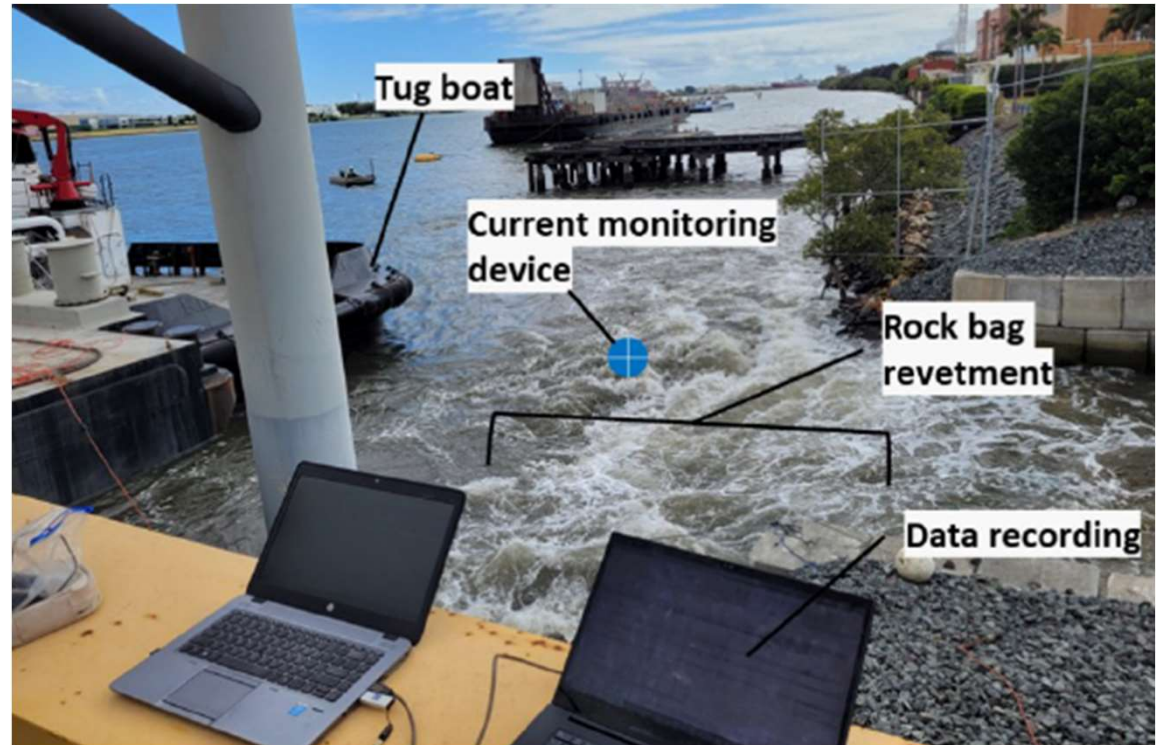
Experiment Setup

Case A Drawing



Experiment Setup

Water Velocity Measurement



Experiment Setup

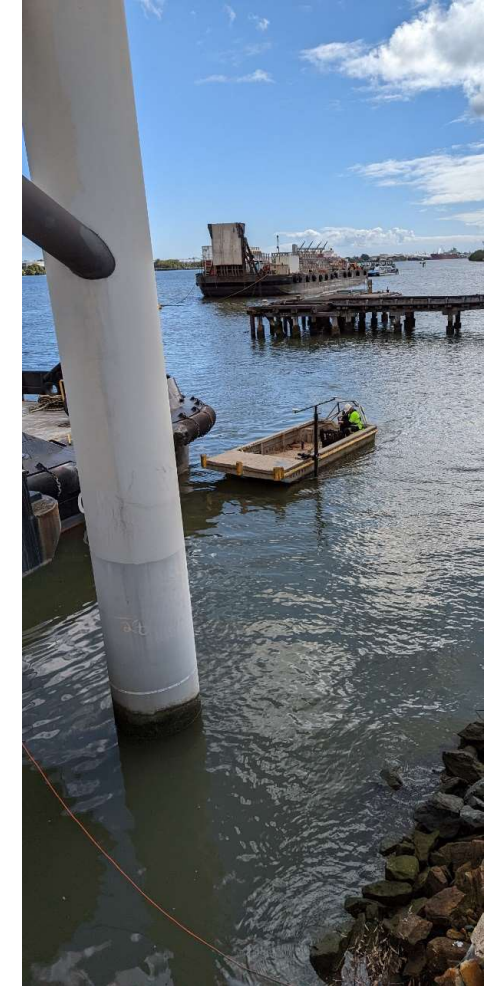
Cape Mac Tug Details

Tug Engine RPM	Estimated Engine Throttle	Tug	Estimated Equivalent BP [t]
400	Idle	11	
600	50%	21	
650	63%	26	
675	69%	29	
700	75%	32	
800	+100%	42	
900	Maximum Engine Capacity		



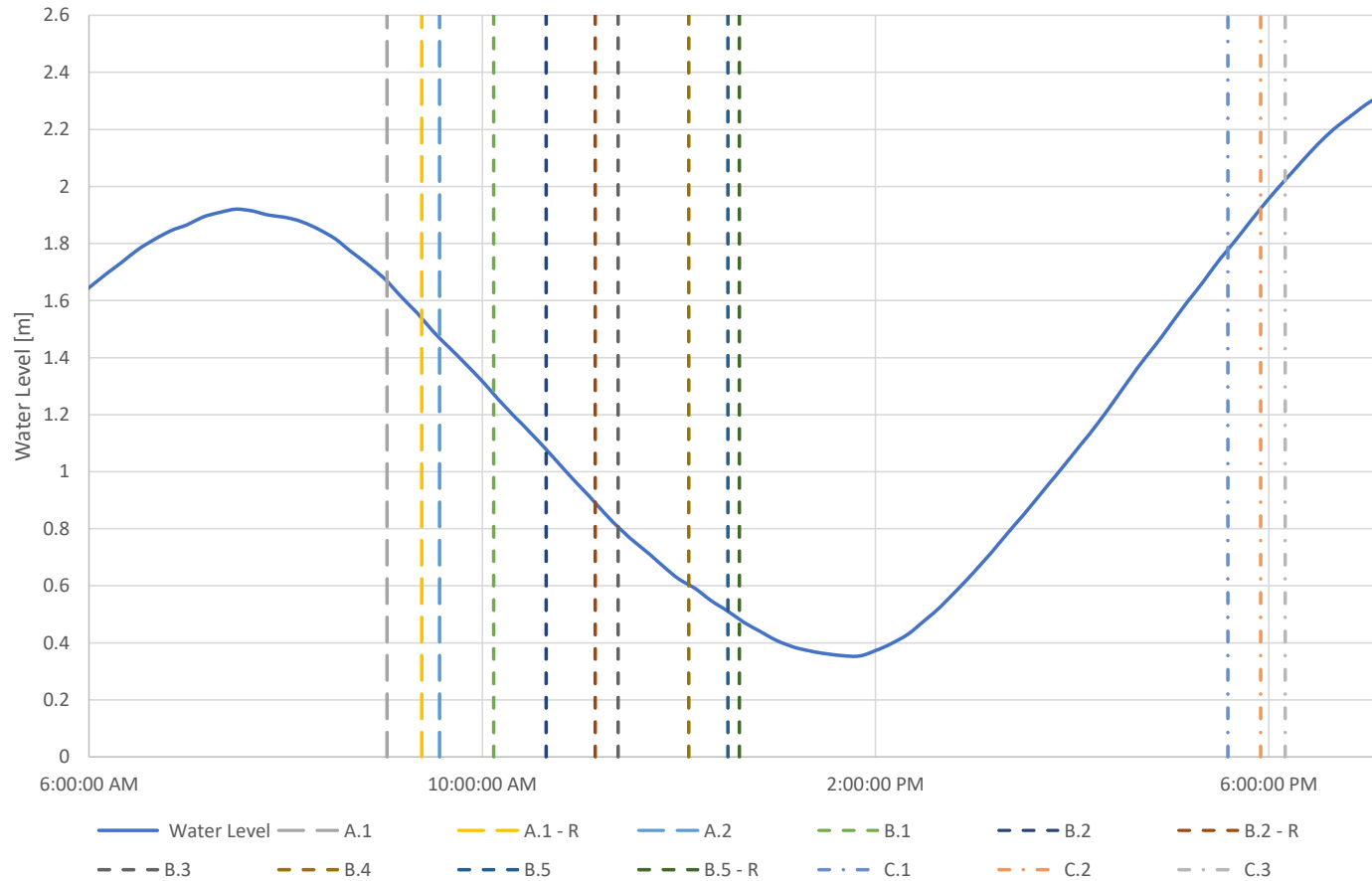
Experiment Setup

Bag Installation



Experiment Results

Tide Levels



Experiment Results

Case C



Experiment Results

Water Velocities

Case	Configuration	Engine RPM	Run Time [min]	Estimated Peak Water Velocity [m/s]	End Time	Water Level [m]
A.1	4t Revetment - tug over 8t	400 RPM	5	2.8	0902	1.68
A.1 - Repeat		400 RPM	5	2.8	0923	1.56
A.2		600 RPM	10	2.8	0934	1.49
Tug moved 8 m from revetment						
B.1	Bottom unit lift - 8t	400 RPM	10	4.4	1007	1.25
B.2		600 RPM	10	4.4	1039	1.07
B.2 - Repeat		600 RPM	10	4.8*	1109	0.88
B.3		650 RPM	10	5.1*	1123	0.82
B.4		675 RPM	10	5.2*	1206	0.59
B.5		700 RPM	5	5.3*	1230	0.51
B.5 - Repeat		700 RPM	5	5.1*	1237	0.47
4 t bags moved to bed and 8 t bags stacked into a wall behind the 4 t bags						
C.1	8t wall and 4t uplift	600 RPM	5	4.6**	1735	1.81
C.2		650 RPM	5	5.1**	1755	1.96
C.3		700 RPM	5	5.2**	1810	2.02

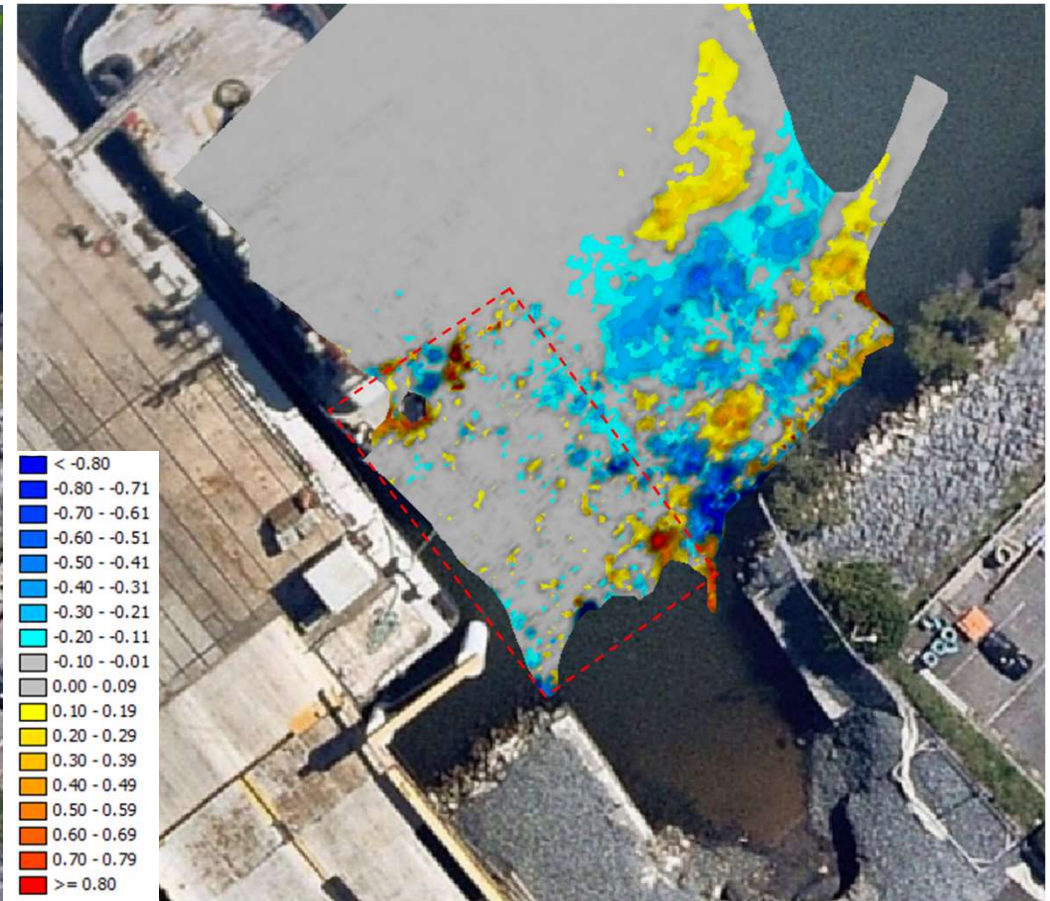
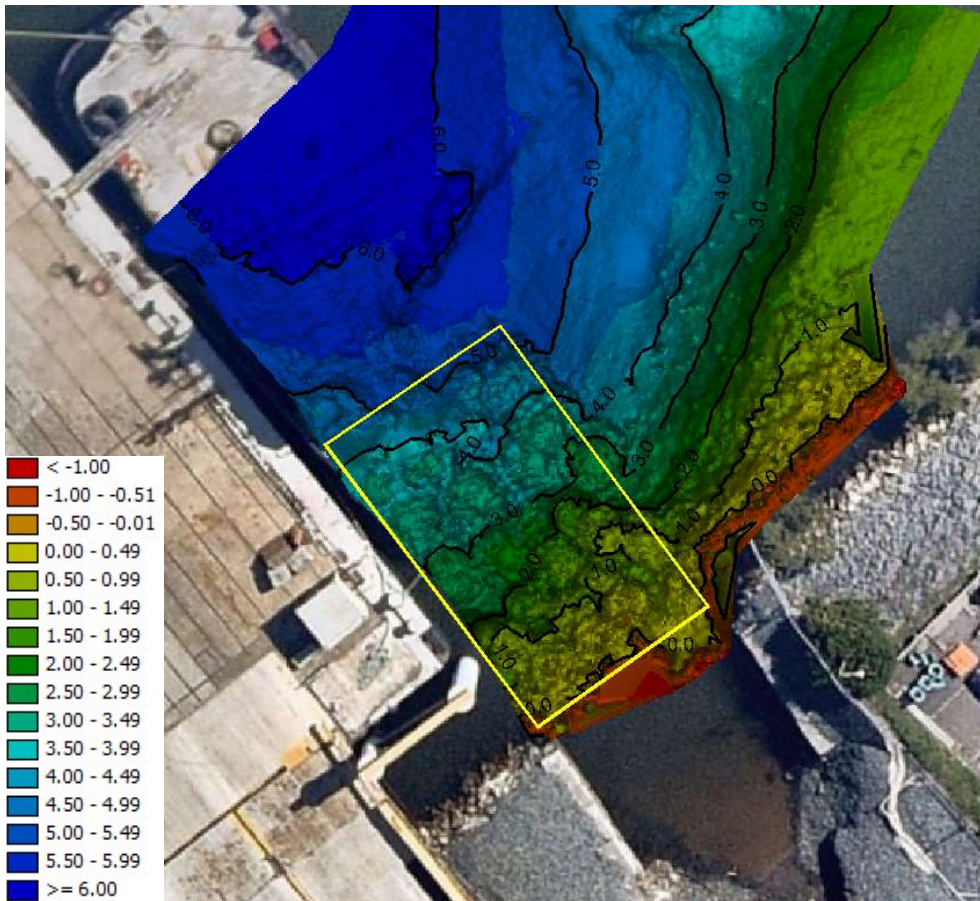
Experiment Results

Water Velocities



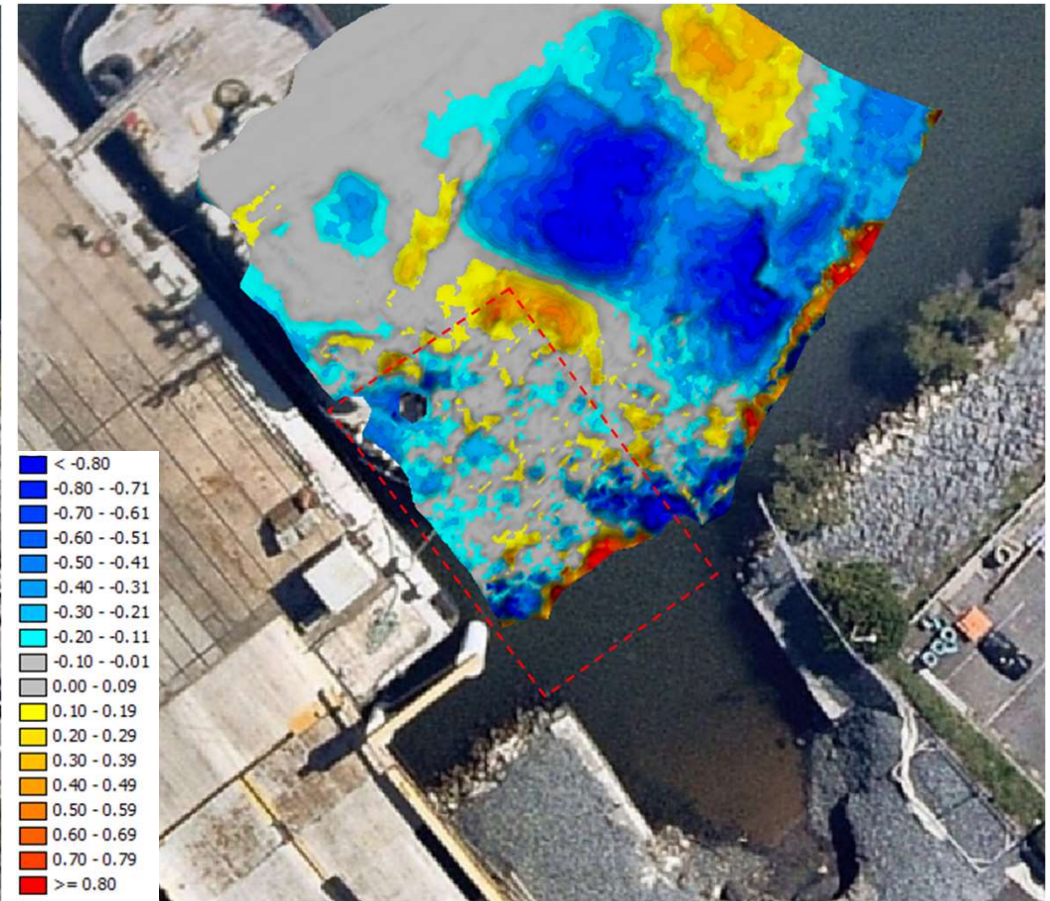
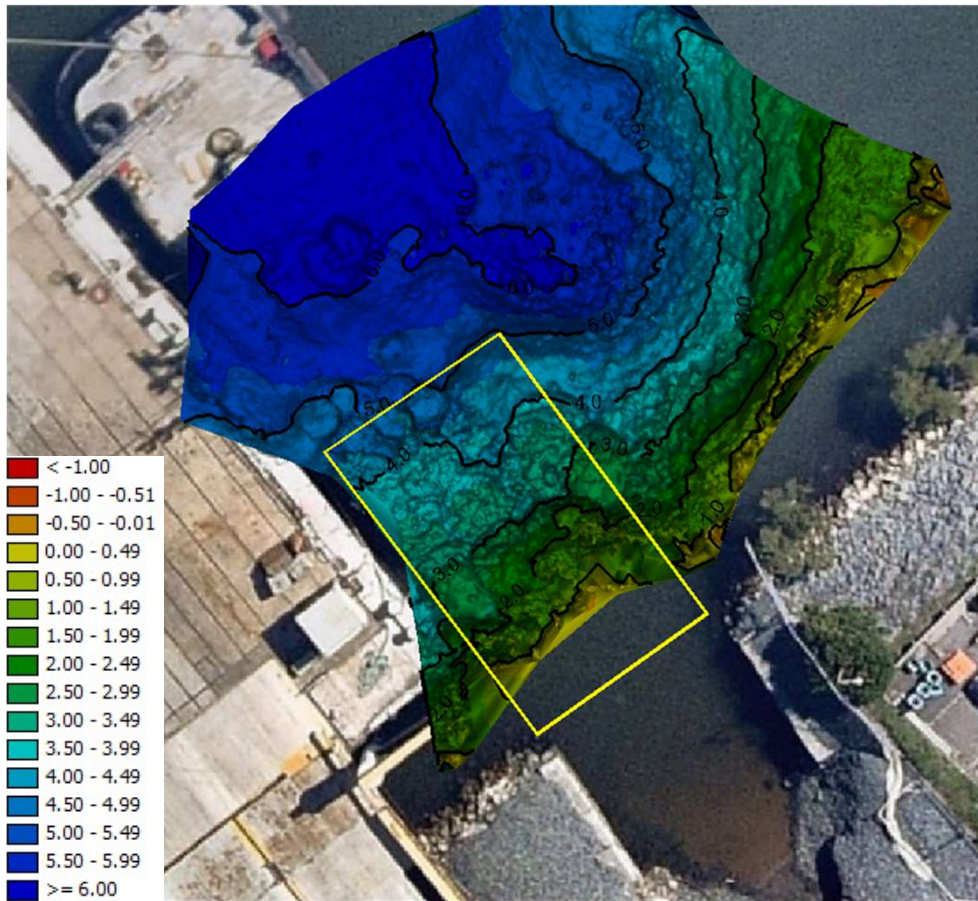
Experiment Results

Case A



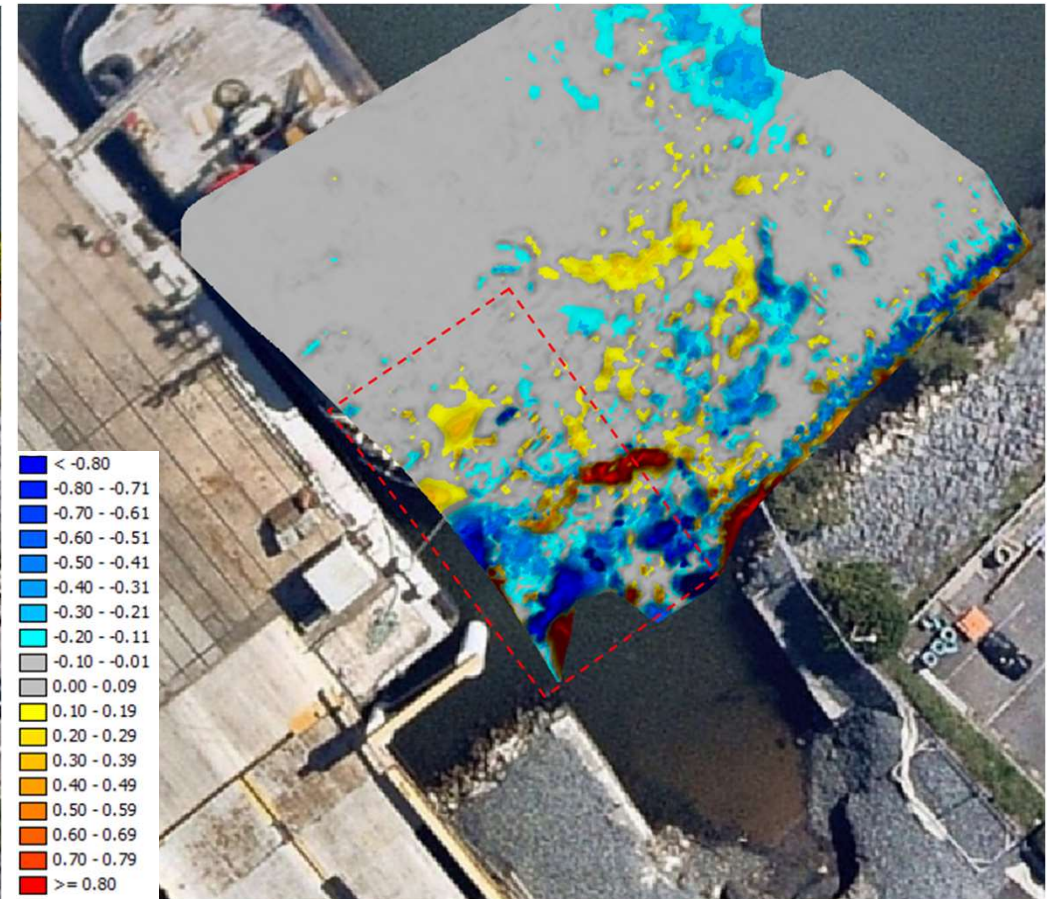
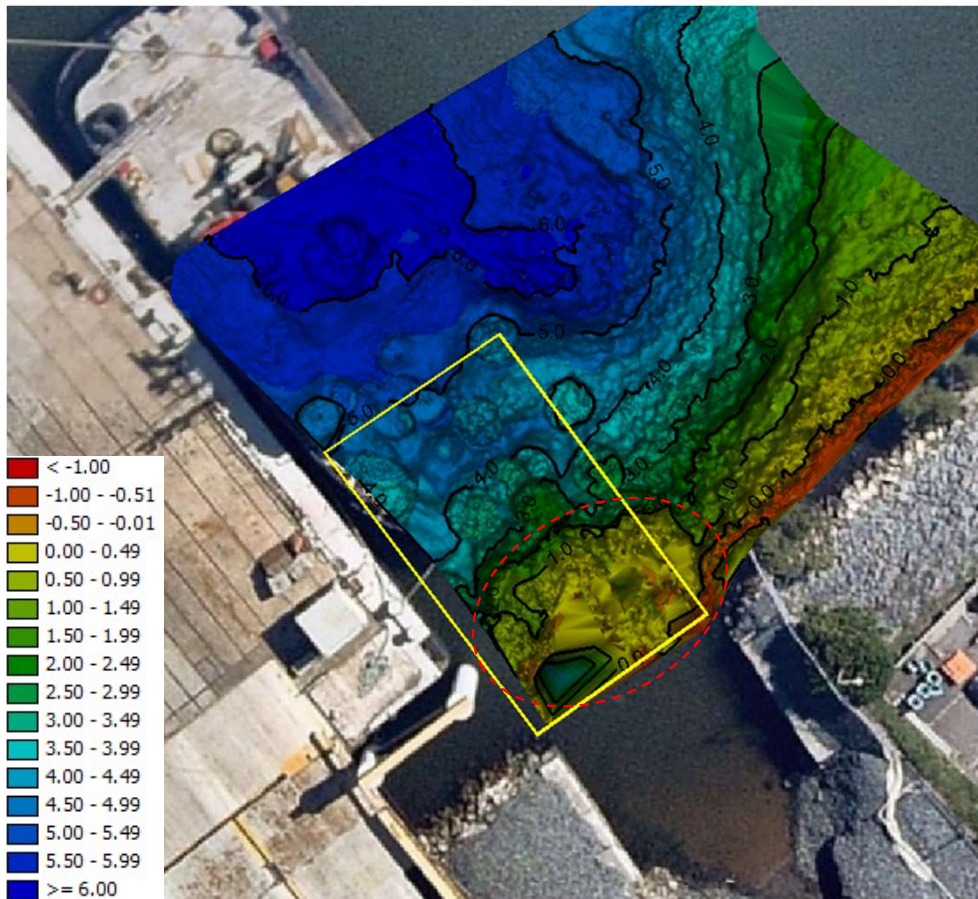
Experiment Results

Case B



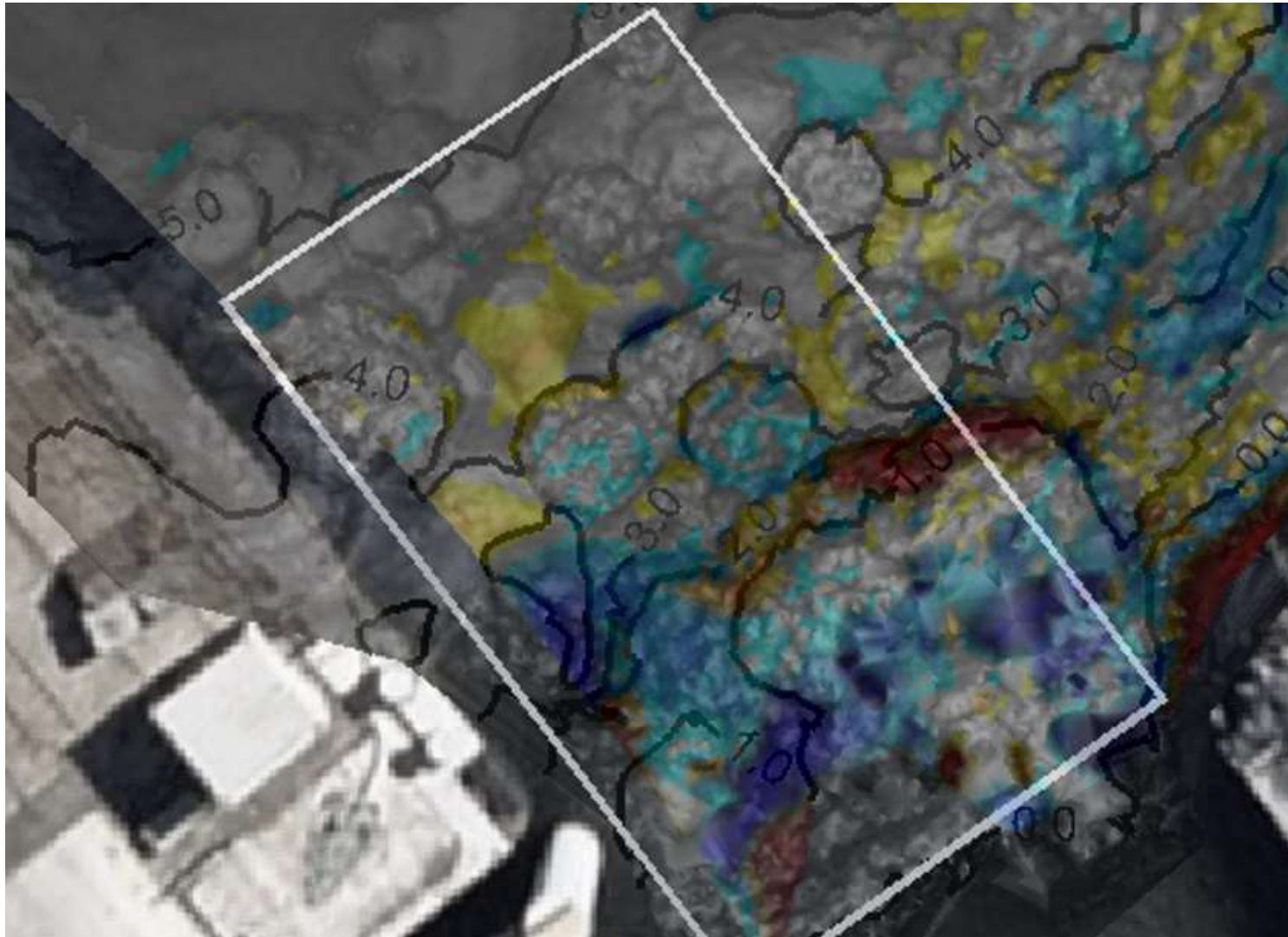
Experiment Results

Case C



Experiment Results

Case C



Conclusions and Further Work

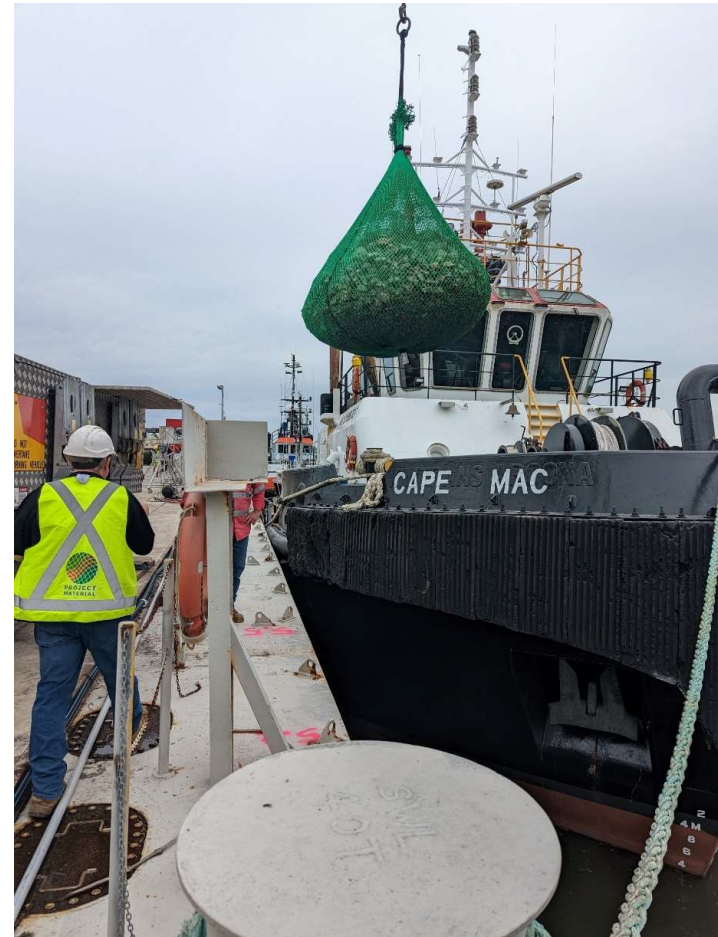
Test showed that the AquaRockBag® units are suitable to be installed in water velocities up to an estimated 5.3 m/s with minimal movement as

- scour protection in
 - a berth pocket
 - around piles
 - on revetments
- revetment armour units



Conclusions and Further Work

- Use smaller rock in the medium rock bag
- Conduct the test in a less tidally impacted area
- Test for more ASD offset distances to the rock bags
- Place additional water velocity sensors to the sides of the revetment to measure the flow parallel to the shoreline
- Utilise a larger vessel to provide greater water velocities and test to failure



Thank you
Questions?