DATE: 8th August 2023.

SUBJECT: Non-Standard Vessel Assessment – Final Report - Tasman Bridge Transit - *RSV Nuyina*.

PURPOSE:

To note the outcomes of the final assessment of the above vessel and the requested transit of the Tasman Bridge (**the Bridge**) to undertake refuelling operations at the Self s Point berth.

BACKGROUND TO BRIDGE TRANSITS

TasPorts Ports Procedure Manual describes the parameters and procedures that apply to vessels using the Tasmanian ports listed below and defined in the Marine and Safety (Pilotage and Navigation) Regulations 2017:

- Primary Ports: Hobart, Bell Bay – Zone E, Devonport, Burnie and Port Latta
- Secondary Ports: Launceston – Zone D, Hobart – Zone C, Coles Bay, Naracoopa, Port Arthur, Port Davey. Stanley, Strahan, Grassy, Spring Bay, Lady Barron.

Arrangements for the Port of Hobart are spelled out in the TasPorts Procedure Manual and include limitations on vessels that can safely transit the Tasman Bridge.

Requests can be made for Non-Standard Vessel Assessments (NSVAs) to be undertaken when it's clear the size or configuration of a vessel set to transit the Tasman Bridge does not automatically meet predetermined specifications.

In this instance, the Non-Standard Vessel Assessment (NSVA) undertaken by the Office of the Harbour Master at the request of the Australian Antarctic Division was done so because the vessel didn't immediately meet the requirements of the TasPorts Ports Procedure Manual.

BACKGROUND TO THIS REQUEST

Following the delivery of *RSV Nuyina* to the Australian Antarctic Division (**AAD**) (**the Division**) in October 2021, the vessel was found to have been built with a wider than planned hull extension making it technically over width for the Tasman Bridge Transit parameters.

On 28 February 2022, following the completion of extensive and diligent risk assessments, including complex simulation exercises conducted in July 2021 and a Peer Review by a leading international maritime consultant, TasPorts provided the *RSV Nuyina* with conditional approval to transit the Tasman Bridge.

That approval was subject to the ongoing successful completion of a comprehensive Marine Pilot Familiarisation Program, including on water and practical harbour trials within the Port of Hobart, followed by further simulation exercises at the Australian Maritime College.

On water harbour trials were initially undertaken on 1 April 2022 where the windage (the area of the ship exposed to the wind) was raised as a concern for the vessel and the way in which she could be safely handled. These concerns were to be tested in the simulation trials at the Australian Maritime College (AMC) on 12 May 2022. The trials confirmed that at a minimum, a bespoke set of environmental parameters would be required to be further tested for transiting the Tasman Bridge (for example low wind thresholds) due to the observed concerns.

Shortly after this, the vessel departed for Singapore for scheduled maintenance and remained overseas for an extended period.

During this time, the ship model at AMC was further developed and discussions had within TasPorts around the associated risk of the windage now being the primary factor to the safe transit of the Tasman Bridge.

To this end, in order to carry out further due diligence as required, TasPorts engaged an external consultant to facilitate the second phase on water harbour trials and also the second phase AMC simulations.

Vessel handling data and current drift data gathered during these trials was used by AMC to make changes to their ship model so as to attempt to best replicate those conditions found during the on-water harbour trials.

During the conduct of the on-water trials in April in Hobart the following observations were noted by the members of the Office of the Harbour Master (OHM) and the attending team of Marine Pilots.

The vessel was well found and in good working order with all shipboard and external systems available to conduct the trials as part of the assessment noting the professionalism exercised by the vessels Master and crew was of the highest standard.

As previously noted in the maritime simulator assessments and previous on water trials, the vessel did and does carry a significant amount of swept path drift when turning and altering course. This side slip or dynamic transverse velocity presented itself again in April during the on-water trials.

The observed contributing factors to this effect are apparent with the prevailing wind and currents on the starboard quarter and abaft the beam respectively. In the on-water assessments, the vessel was observed to quickly build up a Rate of Turn (ROT) to such an extent that the corresponding transverse track of both the stern and bow were exhibiting different resultant vectors over the ground due to the prevailing ROT.

In countering this increasing and adverse ROT, counter (or opposite) rudder angles which were needed to be applied to reduce the ROT to a safe level of control, then had the subsequent effect of contributing to the vessels continued side slip or transverse track/swept path.

The vessel exhibited a very dynamic transverse velocity of both the stern and the bow vectors when measured on the Portable Pilot Unit (PPU).

The resulting swept path saw the vessel requiring to be steered on a heading which exceeded the normal standard allowable limit for the difference between the ships head and the resultant course over the ground.

This phenomenon was tested a number of times and the same resultant effects and behaviour of the vessel was observed.

The Cross Track Error (XTE) is the transverse distance from the safe navigation course or track, which is required to be maintained in order to navigate within a minimum level of safety. This track can best be described as train tracks in which a vessel needs to navigate in with a degree of confidence to the point where the vessel then reaches the imaginary (but real) Point of No Return (PNR) and can then safely continue.

This resultant control measure of the application of counter helm to reduce the ROT to a safe level is such that the minimum safe Cross Track Error (XTE) is unable to be achieved when applying to the physical limitations of the Tasman Bridge pillars which make up the main Navigational Span.

The inability to successfully maintain the minimum safe XTE in the available sea room would then present a further reduction in the minimum safe passing distance between the Main Navigational Span pylons on the Tasman Bridge aperture.

Windage and Hydrodynamic Pivot Point Considerations.

It is recognised that where vessels with accommodation blocks and superstructures extending aft over two thirds of the vessel's length from the navigational Bridge, will see a resultant windage vector act in such a way that the centre of wind pressure of the hull and accommodation is not too distant from the vessels underwater hydrodynamic Pivot Point.

When these two factors combine, the resultant course to steer in order to maintain the required course over the ground to safely transit the Bridge will be such that it will exceed the safe minimum distances from the Bridge pylons.

This was evident in both the 2021 and 2023 on-water trial results.

If a Bridge transit was attempted, the resulting course required on an outbound passage would see the vessels starboard bow pass within an unsafe distance of the western Bridge pylon and then require a correction to be made to the vessels heading at an unsafe time in order to maintain the same safe passing distance from the eastern pylon to the vessels port quarter.

On all but 3 occasions in the simulator trials, the vessel has handled in such a fashion that the helm required to be applied was excessive and having to be applied to extents that in order to have the vessel avoid contacting the Bridge pylons, hard over or maximum rudder angles were having to be used. Therefore, there are no inbuilt or redundant risk treatments available with which to apply safely at that critical transit time.

Having participated in a number of project and ship handling simulations at a number of providers, participants at the first and second simulator sessions can attest to the ability of any simulator provider to build a model which is the best estimate for the hydrodynamic performance of each vessel and the resultant effects of the differing static and variable inputs which are then applied to the water based hydrodynamic model. In saying this the work done to date has been exemplary on both fronts by all service providers involved in the project and NSVA.

However, this does not and cannot replace the real and apparent effects observed on the water to date of how the vessel will handle in the varying current and wind conditions found north of the Tasman Bridge.

As the vessels non-linear and rounded hull form designed for ice operations does not have a standard parallel body under water area and as shown in the on-water trails, does not possess the same level of directional stability found in other standard hull form designs. This is also a contributing factor to way the vessel would handle given the variable water flow under and down each side of the hull when the vessel turns.

The utilisation of towage assets to reduce the resultant course over the ground would be such that the forces required could not be affected safely enough in the confined waters immediately north of the Bridge and past the Point of No return, to a level of realistic and safe expectation.

Exposing a tug to the side of vessel where the safe passing distance was diminishing would not only have an expectation of push at all costs but in reality, very quickly escalate to both dire and fatal consequences if exercised in reality.

Likewise, some discussion previously has been undertaken around the vessels ability to transit the Bridge utilising Dynamic Position Systems, but these systems cannot be used as risk treatments for Bridge transits.

As the Tasmanian Harbour Master, I fully understand the commercial implications of any decisions made around Tasman Bridge transits and the effect on the operation of the vessel and the Division. As Harbour Master tasked with providing advice on making such maritime based safety decisions on behalf of the Tasmanian Government, based on all the available information at this time, I regret to advise that I will be recommending that the Nuyina does not meet the minimum safe criteria for safely passing through the Tasman Bridge.

This information was passed onto the Division in correspondence in August 2023.

In completing this NSVA, it is of note that TasPorts and the Division has at all times conducted the NSVA in a manner which has seen the consideration of safety of the personnel onboard the *RSV Nuyina* being the foremost consideration in this NSVA. Those representatives of the Division and its agents have also acted with the upmost paramount professionalism and courtesy to all involved.

Noteworthy comments are to be made of the various third-party external contractors who have assisted in the conduct of both the two on water trials, simulator trials and liaison between all parties during the phase of the ongoing assessment.

The associated documentation used in the finalisation of this NSVA includes but is not limited to:

1) Initial TasPorts *RSV Nuyina* Wharf Requirements Brief – 2018.
2) February 2021 – Correspondence to AAD from TasPorts.
3) August 2021 – Correspondence to AAD from TasPorts.
4) November 2021 – TasPorts [redacted] Maritime Risk Assessment Report Transit of the Tasman Bridge.
5) February 2022 – TasPorts / OMC Initial Risk Assessment Report Tasman Bridge Transit
6) February 2022 – Correspondence to AAD from TasPorts.
7) May 2022 – Initial on water sea trials – Port of Hobart.
8) May 2022 – Initial AMC Simulation Assessment Reports.
9) April 2023 – Second on water sea trials – Port of Hobart.
10) June 2023 – Second AMC Simulator Assessment Reports.
11) August 2023 - Final NSVA Report Summary (This document).
12) August 2023 - Letter to AAD from TasPorts.
13) Figure 1) Portable Pilot Unit Screen Shots – Sea trails - Southbound Turn in open water.

14) Figure 2) Portable Pilot Unit Screen Shots – Sea trails - Southbound Turn in open water.
15) Figure 3) - AMC Simulator Screen Shot showing Drift Angle at Point of No Return (PNR).
16) Figure 4) - AMC Simulator Screen Shot showing Drift Angle of 7.2 degrees at 467m from Tasman Bridge.
17) Figure 5) – AMC Simulator Screen Shot showing Drift Angle of 7.1 degrees.
18) Figure 6) – AMC Simulator Screen Shot showing Drift Angle of 6.7 degrees with Drift velocity exceeding 1.0 knots and diminishing clearance to the Bridge pylons
19) Figure 7) - AMC Simulator Screen Shot showing Drift Angle at 138m from Tasman Bridge.
20) Figure 8) - AMC Simulator Screen Shot showing excessive Rate of Turn (ROT) of 18.4 degrees required to centre the vessel passing through the Main Navigational Span – noting rudder angles of Port and Starboard 20 to Hard Over Rudder required to achieve this.
21) Figure 9) – AMC Simulator Screen Shot showing “Swept Path” characteristics of the vessel.
22) Figure 10) – AMC Simulator Screen Shot showing resultant Tasman Bridge Allision with vessel still tracking to the East.
23) Figure 11) – AMC Simulator Screen Shot showing Loss of Control of Bow / Starboard Bridgewing position and resultant Tasman Bridge Allision.

Where necessary, the documentation noted above and that gathered during the assessment is strictly privileged as it references those activities and assessments carried out by TasPorts in the normal course of its business as Port Operator.

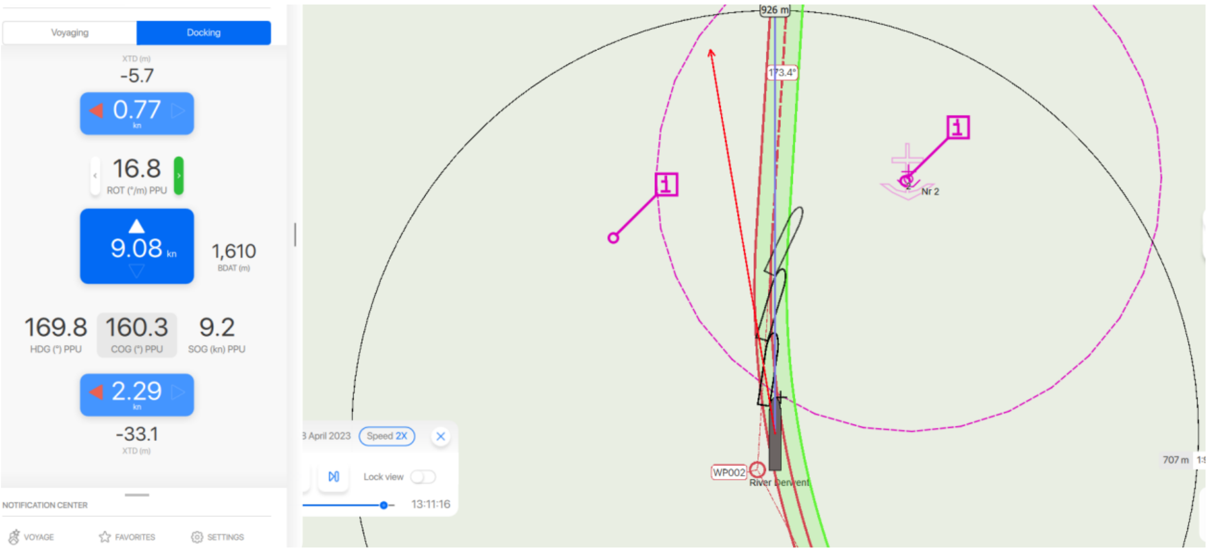

Figure 1) Portable Pilot Unit Screen Shots – Sea trials - Southbound Turn in open water.

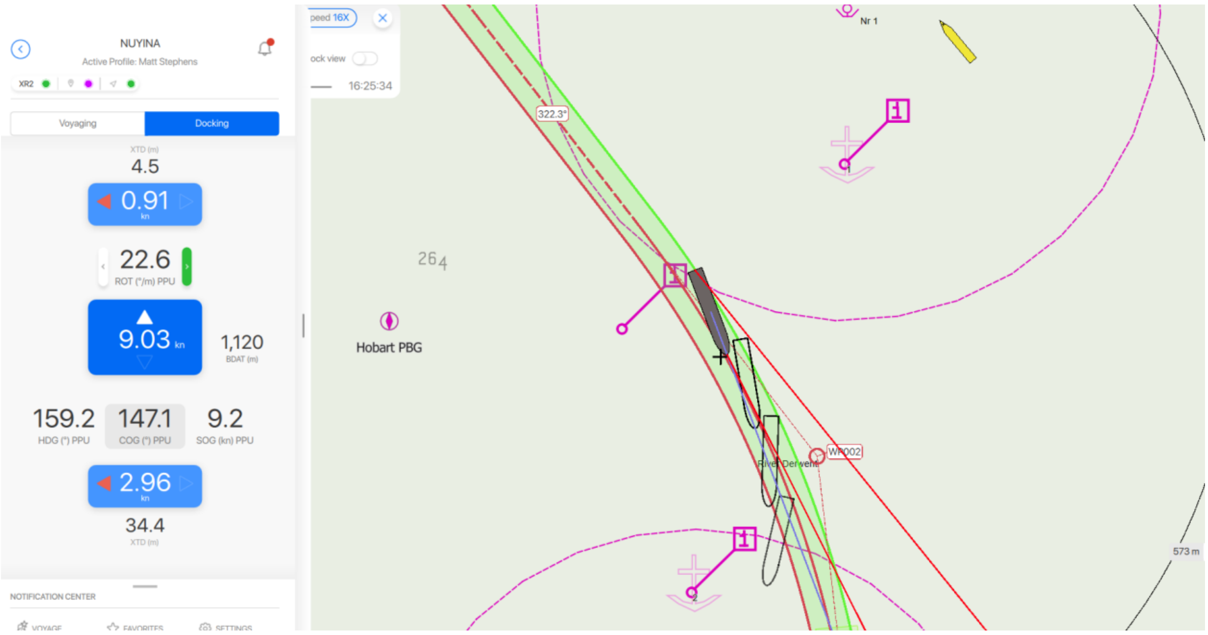

Figure 2) Portable Pilot Unit Screen Shots – Sea Trials - Southbound Turn in open water.

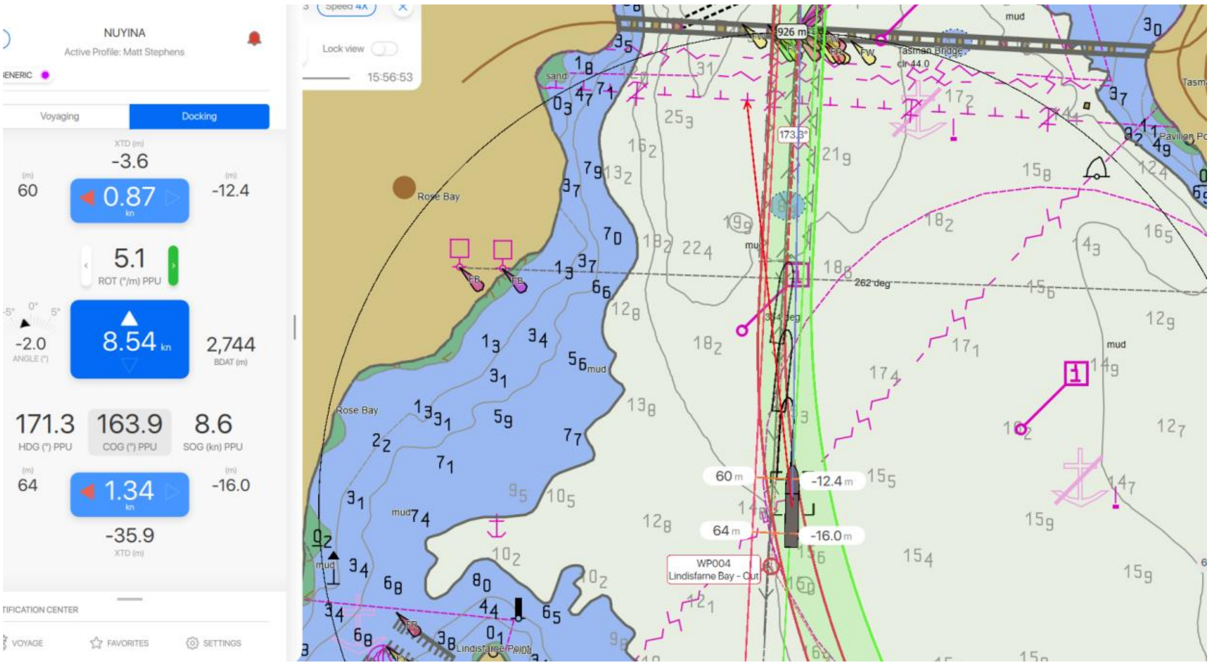

Figure 3) - AMC Simulator Screen Shot showing Drift Angle at Point of No Return (PNR)

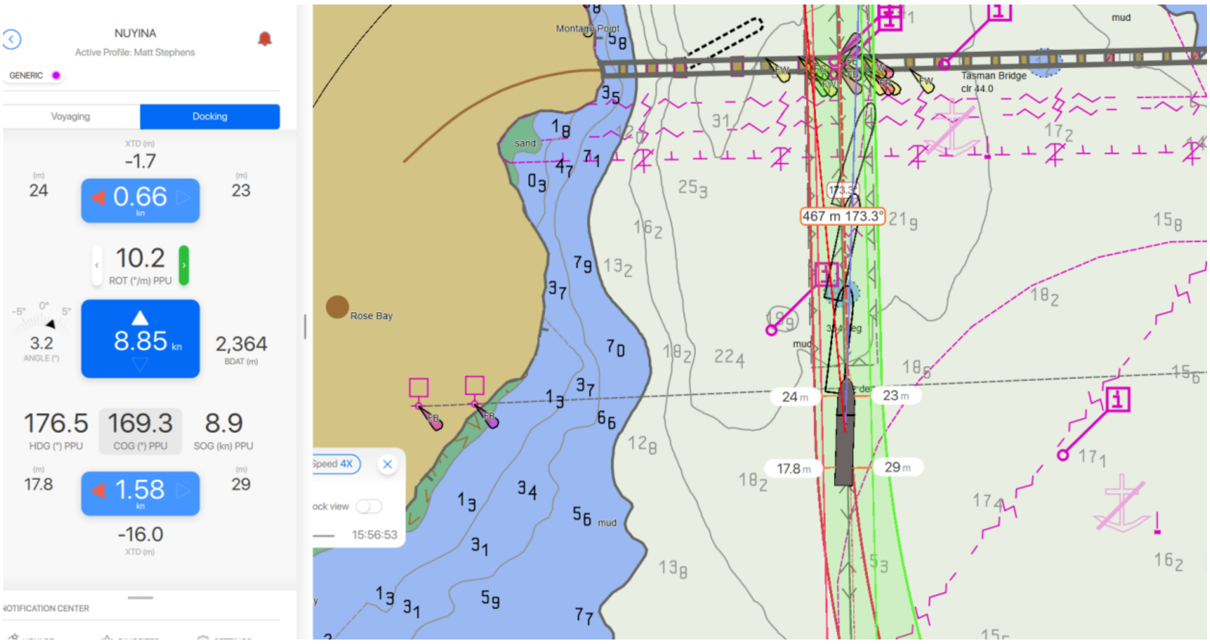

Figure 4) - AMC Simulator Screen Shot showing Drift Angle of 7.2 degrees at 467m from Tasman Bridge.

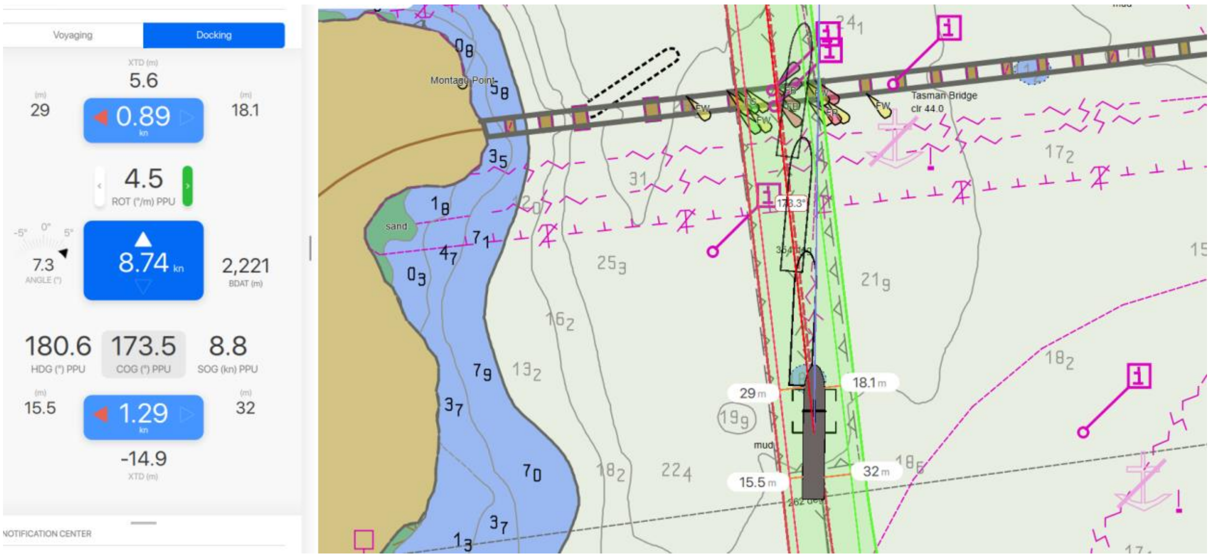

Figure 5) – AMC Simulator Screen Shot showing Drift Angle of 7.1 degrees with Drift velocity exceeding 1.0 knots.

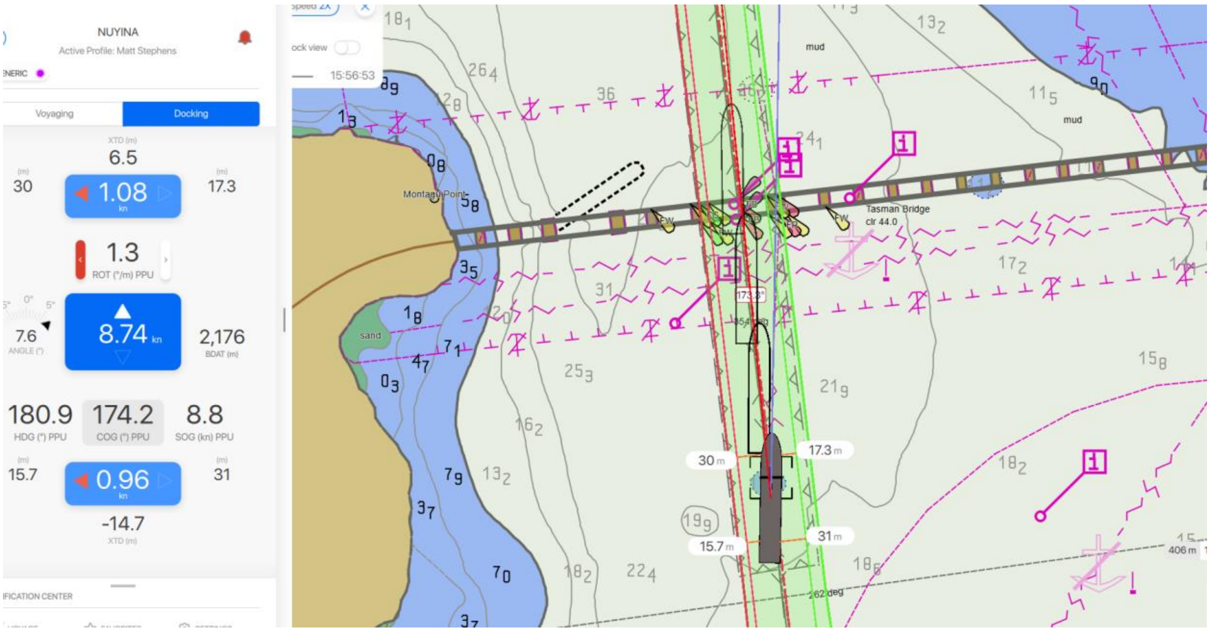

Figure 6) – AMC Simulator Screen Shot showing Drift Angle of 6.7 degrees with Drift velocity exceeding 1.0 knots and diminishing clearance to the Bridge pylons.

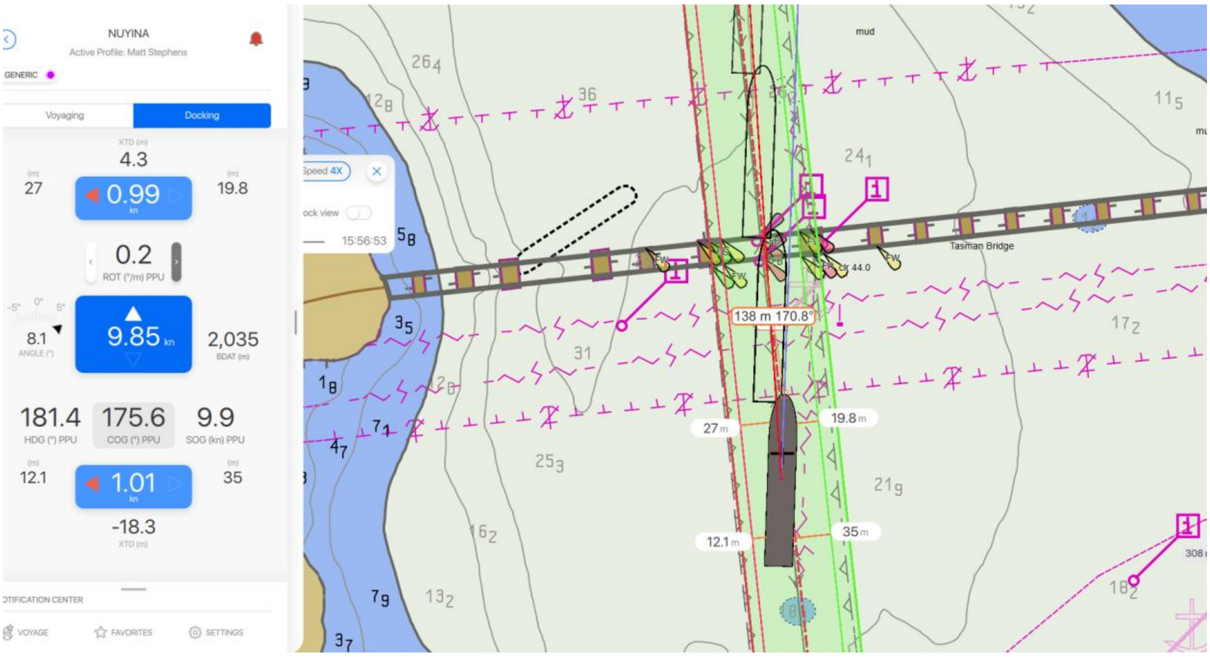

Figure 7) - AMC Simulator Screen Shot showing Drift Angle at 138m from Tasman Bridge.

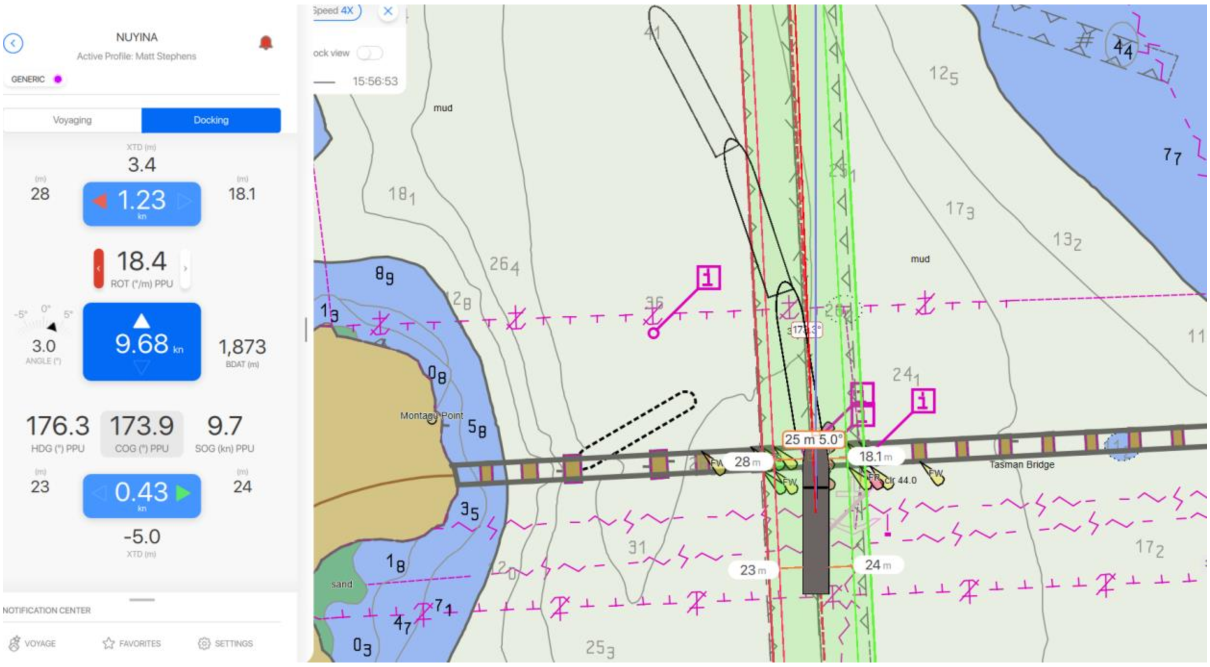

Figure 8) - AMC Simulator Screen Shot showing excessive Rate of Turn (ROT) of 18.4 degrees required to centre the vessel passing through the Main Navigational Span – noting rudder angles of Port and Starboard 20 to Hard Over Rudder required to achieve this.

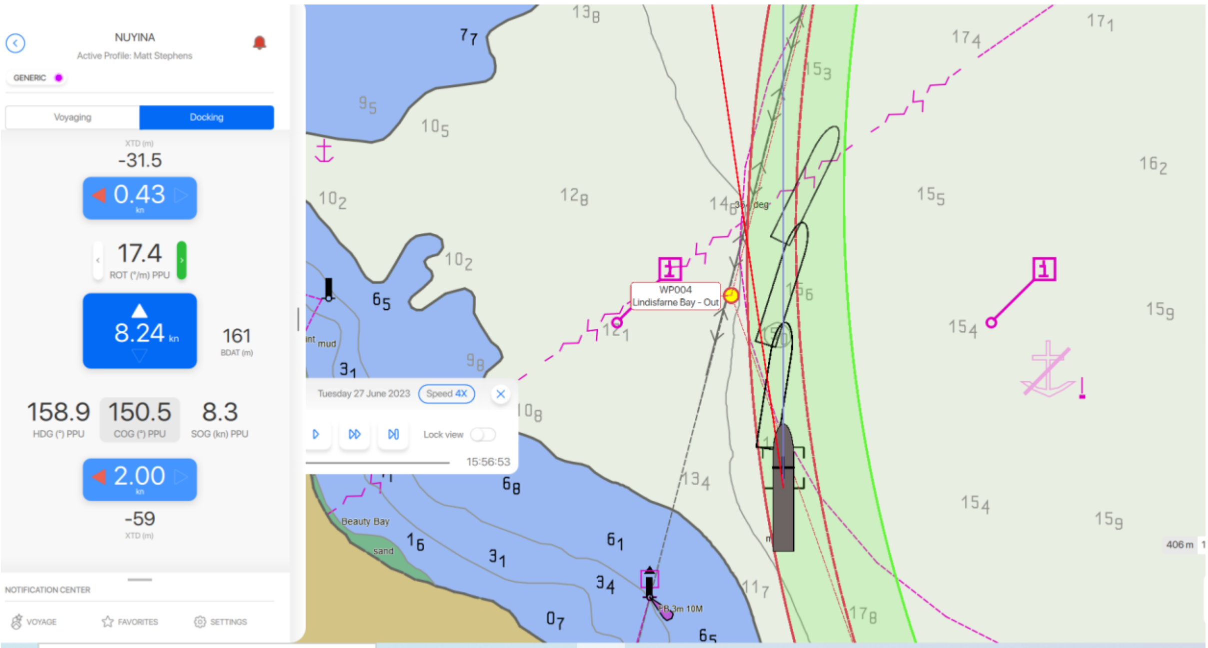

Figure 9) – AMC Simulator Screen Shot showing "Swept Path" characteristics of the vessel.

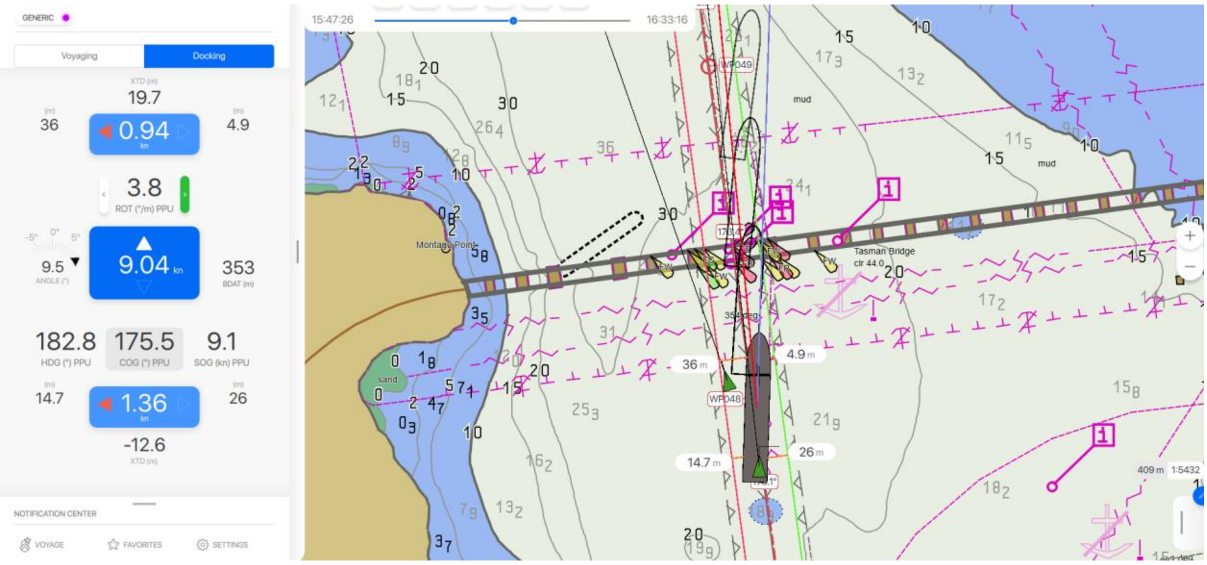

Figure 10) – AMC Simulator Screen Shot showing predicted resultant Tasman Bridge Allision with vessel still tracking to the East.

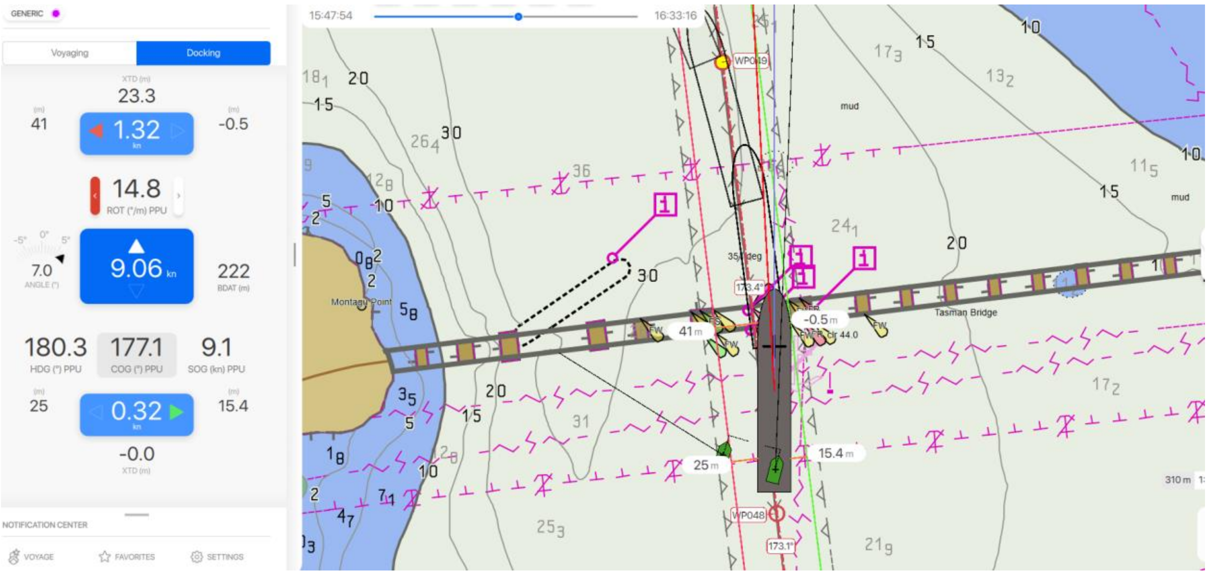

Figure 11) – AMC Simulator Screen Shot showing Loss of Control of Bow / Starboard Bridgewing position and resultant Tasman Bridge Allision.

For and on behalf of TasPorts.

Captain A.Michael Wall.

Harbour Master.

Report Ends.