

Statement of Reasons for TPDNO Determination and Apportionment in Macquarie Harbour, 31 August 2022

I, Wes Ford, Director, Environment Protection Authority, provide this statement of reasons in support of my determination of Total Permissible Dissolved Nitrogen Output (TPDNO) for Macquarie Harbour under Management Control 3.2 of *Amendment No. 2 of the Macquarie Harbour Marine Farming Development Plan October 2005* (the 'Plan').

This determination is valid from 1 September 2022 to 31 August 2027

The purpose of this statement is to provide the basis for my decisions regarding the setting of TPDNO for the Plan area (in accordance with Management Control 3.2.1) and for the apportionment of TPDNO to individual lessees or sub-lessees licensed for marine farming operations within the Plan area (in accordance with Management Control 3.2.4). I also explain the method which was used to determine the TPDNO.

Determination under Management Control 3.2.1

- I. The Total Permissible Dissolved Nitrogen Output attributable to finfish farming activity within the Plan area for any 12-month period from 1 September 2022 is 500.1 tonnes.

Basis for Decision

- I.1. Expansion of finfish farming in Macquarie Harbour occurred from 2005, with a peak in standing biomass in 2014-15 at over 20,000 tonnes. To reduce pressure on the harbour and allow for environmental recovery, the maximum permissible biomass to be held in the Plan area has progressively been lowered by the Director, EPA since early 2017. In 2018, the limit was reduced to 9,500 tonnes and has remained at this level.
- I.2. However, data submitted to the Department of Natural Resources and Environment Tasmania (NRE Tas) indicates that since 2018, annual feed inputs have gradually been increasing. This has occurred while complying with the peak standing biomass limit of 9,500 tonnes and appears to be due to a change in harvesting strategies and an increase in total annual production.
- I.3. Standing biomass limits are derived from daily calculations of estimated growth, mortality and harvesting of finfish. Biomass limits provide a helpful cap on the total amount of fish being farmed at any point in time, however, biomass limits allow considerable flexibility in relation to feed inputs. As such, the Director, EPA has identified that limits on dissolved nitrogen outputs are a better regulatory mechanism than biomass limits to restrict production.
- I.4. The setting of a TPDNO for a defined area over a specified period provides a better regulatory mechanism to cap production because it limits the amount of nitrogen which can be released to the environment via feed inputs. Nitrogen output is considered a more helpful constraint on production because it is more closely related to overall environmental impact. Dissolved nitrogen output is a calculated value, using standardised methods to reflect nitrogen content in feed and science-based assumptions on the fate of nitrogen.

- I.5. The aim of this TPDNO determination is to build upon improvements in ecosystem function and dissolved oxygen levels that have been observed in Macquarie Harbour since 2017.
- I.6. In setting TPDNO I have given particular consideration to the following factors:
 - I.6.1. Dissolved oxygen (DO) levels in mid-water layers remain concerningly low and there is insufficient evidence at present to conclude that the minor recovery in DO levels is a sustained long-term trend;
 - I.6.2. Increases in finfish production since 2018 have occurred through production and harvesting strategies within an unchanged biomass cap; and
 - I.6.3. Ongoing concerns regarding the status of the Maugean Skate and written recommendation from the Secretary of NRE Tas to adopt a precautionary approach in setting aquaculture stocking limits.
- I.7. I have also considered a range of monitoring results and scientific reports (Attachment I) to assess environmental impacts that finfish farming activities may have on the harbour.
- I.8. On balance, therefore, I believe that the implementation of a TPDNO that results in a modest reduction in harbour-wide production is warranted and that this level should be maintained for a period of time to allow further analysis and evaluation of ongoing monitoring and research efforts.
- I.9. As a starting point for the determination, the 2019 calendar year was selected as the most relevant reference year. During this period, feed inputs were relatively low (approximately 10% lower than 2021) and key environmental performance indicators were showing positive trends.
- I.10. Monthly recorded feed inputs for the 2019 period were combined with long-term information on feed composition (e.g. protein content) to calculate representative dissolved nitrogen outputs for that year.
- I.11. An average dissolved nitrogen output as a percentage of feed input of 3.40% across 14,709 tonnes of feed was adopted. This nitrogen output percentage is an average calculated from reported data over a three-year period as follows: Huon Aquaculture (three years from January 2017), Tassal (three years from July 2017) and Petuna (18 months from July 2020).
- I.12. The resulting TPDNO for the Plan area is 500.1 tonnes.

Determination under Management Control 3.2.4

2. The apportionment of the TPDNO between lessees or sub-lessees operating in the area covered by the *Macquarie Harbour Marine Farming Development Plan October 2005* for any 12-month period from 1 September 2022 until 31 August 2027 is shown in the table below:

Operating Company	Total Lease Area (Ha)	Total Lease Area (%)	TPDNO Allocation (Tonnes)
Huon Aquaculture	229.96	24.84	124.2
Petuna	415.95	44.92	224.7
Tassal	279.97	30.24	151.2
Total	925.88		500.1

Attachment I: Information Considered in Making this Determination

I have considered the following lines of evidence to support the determination.

IMAS Technical Reports:

The March 2022 IMAS report to EPA [Assessment of the Macquarie Harbour Broadscale Monitoring Program \(BEMP\) data from 2011-2020](#) outlines the ecological condition of the harbour during that period. This report shows that there has been an improvement in some key environmental parameters both on and off lease since the maximum permissible biomass was reduced from early 2017.

It is noted that the dissolved oxygen (DO) levels in Macquarie Harbour fluctuate considerably as they are influenced by complex riverine and oceanic inputs and other environmental conditions. The mid-water depth DO levels, which continue to remain lower than those observed historically, remain of concern.

DO levels in bottom waters affect benthic ecology, which explains the reduction in species diversity and faunal abundance observed during low oxygen events in 2016 and 2017. By 2020, populations of macrofauna showed some recovery but the length of time varied and appeared directly related to the magnitude and spatial extent of oxygen recharge.

The temperature in bottom waters is showing an increasing trend which may have future implications for the entire system.

Between 2018 and 2021, nutrient concentrations across the harbour declined somewhat from previous elevated levels. Monitoring of various forms of nitrogen, including the observed trends in Kjeldahl nitrogen in bottom waters, suggests that there had been an increase in the organic nitrogen pool within the system that is now beginning to decline.

IMAS January 2022 Follow-up Survey:

IMAS was engaged by the EPA to undertake an additional benthic survey in January 2022 and to consider the more recent ecological data and trends in the harbour. Benthic surveys were undertaken at established sites within the harbour and at a finer scale in gradational transects at some key leases. Findings indicate overall improved sediment conditions, including an increase in the diversity and abundance of benthic species. Given the unique nature of Macquarie Harbour, it is likely that benthic fauna is a less reliable indicator of broader system health than elsewhere and would not necessarily reflect the state of dissolved oxygen in the mid-water and its associated effects on ecologies there (e.g. Skate). A review of updated physico-chemical water quality results highlights a trend of increasing water temperature in bottom waters.

Beggiatoa spp. - Compliance Site Surveys:

Observations of *Beggiatoa* spp. at 35 metre compliance sites have reduced significantly over time, with 46 non-compliances recorded across the Plan area over three survey rounds in 2017, 28 during 2018, 17 during 2019, 19 during 2020 and 6 during 2021.

EPA's review of January 2022 compliance surveys found three non-compliant survey points for *Beggiatoa* spp. detected at one lease, MF266, which was stocked at the time of survey. May 2022 surveys did not find any non-compliances at 35 metre compliance sites.

Beggiatoa spp. – Control Site Surveys in World Heritage Area (WHA):

Beggiatoa spp. was present at five of the nine 'control' sites located in the WHA in January 2022, and three of the nine in May 2022. Since 2015, monitoring of these nine sites, as well as an additional 19 'control' sites in the Harbour, *Beggiatoa* spp. has been observed in patchy to thin mat extent at up to six locations. There has been a fluctuation in *Beggiatoa* spp. presence over time with an increased number of *Beggiatoa* observations in 2016-17, 2019-20 and more recently in September 2021 and January 2022. There does not appear to be a direct link between the observation of *Beggiatoa* spp. at these sites and feed inputs into the Macquarie Harbour.

Environmental Licence Water Quality Limits:

Monthly ammonia, nitrate and dissolved oxygen data collected for sites located across Macquarie Harbour demonstrate compliance with the rolling annual median indicator limits outlined in Environmental Licences (ELs). Median values for ammonia and nitrate at 20 metres depth in recent years show improvement since 2016-17. In 2020 and 2021, dissolved oxygen concentrations at 20 metres depth increased to the highest levels monitored since 2012, however, this was followed by a gradual declining trend from the end of 2021 to date, with median DO levels now equal to March 2020 values. Nitrate and DO concentrations at 20 metres depth are tracked but do not have an associated EL compliance limit.

Long-term EPA Monitoring of Dissolved Oxygen in Macquarie Harbour:

Review of long-term monitoring data indicates that the dissolved oxygen (DO) in most of the harbour continues to be significantly below pre-2010 levels.

In surface waters, the equilibrium state has shifted from a normoxic range of 5-8 mg/L to the median more frequently occupying a level around the long-term 20th percentile or below.

In deeper waters, median observed DO levels have moved from the historic 20th-80th percentile range of 3-5 mg/L to the hypoxic to severely hypoxic range of 2-3 mg/L. While an

upward trend in mid and bottom waters is evident in 2020-22 compared to previous years, levels generally remained below the long-term 20th percentile, except for two spikes associated with marine recharge events during this period. DO reduction is most significant in the mid harbour. Mid (25 m) and bottom (35 m) waters on the World Heritage Area boundary, approximately 1 km from MFL 266, exhibit recurring severe hypoxia. Although 2020-22 observations showed a slight improvement against previous DO levels (e.g. compared to anoxic conditions observed in 2016), levels remained significantly below the long-term 20th percentile.

While DO levels in the harbour vary due to the circulation pattern hydrodynamics, which are influenced by riverine and marine inputs, the DO drawdown due to finfish aquaculture in the middle and bottom water is significant.

This ecosystem stressor Line of Evidence supports a Weight of Evidence case for a declined ecosystem health status compared to pre-2010.

Status of Maugean Skate (*Zearaja maugeana*):

The Maugean Skate is endemic to Tasmania. This species is only known from the estuaries of Macquarie Harbour and to a lesser extent Bathurst Harbour, demonstrating its restricted distribution and specific habitat requirements. It is currently listed as endangered under the *Threatened Species Protection Act 1995*, the *Environment Protection and Biodiversity Conservation Act 1999* and the IUCN Red List. It has also been selected as one of 100 priority species in the Action Plan for the National Threatened Species Strategy 2021-2031 which helps focus the efforts of the Australian Government and partners on threatened species recovery actions.

An expert working group has been convened by NRE Tas to inform the development of options to remediate environmental conditions (for the Maugean Skate) in Macquarie Harbour. The EPA is participating in and supporting this process. The EPA understands that a number of options to support Skate recovery will be considered by this working group.