NEW BRIDGEWATER BRIDGE – AUSTRALIAN GRAYLING SIGNIFICANT IMPACT ASSESSMENT

Report to

Department of State Growth

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Marine SOLUTIONS TASMANIA PTY LTD

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Note: Location maps throughout this report are representative only.

Cover photo: aerial photo of the existing Bridgewater Bridge (photo Marine Solutions, 2021).

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2 INTRODUCTION

2.1 PROPOSAL BRIEF

Marine Solutions were engaged by Burbury Consulting on behalf of the Department of State Growth to conduct a Significant Impact Assessment of a proposed new river crossing near Bridgewater, Southern Tasmania, on populations of Australian grayling (*Prototroctes maraena*). The Australian grayling is listed as vulnerable under both the *Threatened Species Protection Act 1995* (*TSPA*; Tasmania) and the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*; National). Any species listed under the *EPBC Act* is considered a Matter of National Environmental Significance (MNES) and is protected.

The *Matters of National Environmental Significance – Significant Impact Guidelines 1.1* (Department of Environment 2013) provide guidance on determining whether an action is likely to have a significant impact on a matter protected under national environment law. If a significant impact is likely to occur, under the *EPBC Act,* the action will require approval from the Australian Government Environment Minister.

2.2 STUDY AREA

The New Bridgewater Bridge Project (hereafter "the Project") involves construction of a new bridge, crossing of the River Derwent between Granton and Bridgewater, approximately 18 km north-west of the city centre of Hobart, Tasmania (Figure 1). The new bridge will replace use of the existing causeway and vertical lift bridge, and forms part of the National Highway Network between Burnie, Launceston and Hobart. The Project involves the eventual removal of the existing bridge, while the existing causeway will remain in place.

Figure 1. Location of the existing Bridgewater Bridge and causeway in Southern Tasmania. The new bridge will run roughly parallel to the existing crossing.

3 BACKGROUND

3.1 AUSTRALIAN GRAYLING

The Australian grayling (*Prototroctes maraena*) is a native fish which migrates between fresh and marine water. The species is found in coastal rivers and streams across Victoria, New South Wales and Tasmania (Backhouse et al 2008) and can grow up to 300 mm in length. Adult grayling live and breed in freshwater rivers. The larvae are swept downstream to the coast, where they grow into juveniles. Juveniles spend approximately six months in the marine environment before returning to freshwater habitats.

The major threat to the Australian grayling is the introduction of barriers to fish movement, which prevent the larvae reaching marine environments and the juveniles travelling back to fresh water. The national recovery plan for Australian grayling (Backhouse et al 2008) describes the threatening processes for the species as follows:

- Barriers to movement: construction of dams and weirs restricting migration to and from the sea.
- River regulation: reducing the frequency and extent of natural flooding.

- Poor water quality: altered temperature regime (thermal pollution), reduced dissolved oxygen and toxins. The IUCN RedList entry for Australian grayling provides more detail on the threat of pollution, citing agricultural and forestry effluents as the main contributors (Koster and Gilligan 2019).
- Siltation: smothering of river gravel substrate used by grayling for feeding and spawning.
- Impact of introduced fish: predation (particularly trout), competition, disease transmission and physical habitat degradation (common carp).
- Climate change: decreased rainfall resulting in reduced river flows.
- Disease: particularly diseases associated with introduced fish species.
- Fishing (angling and whitebaiting): accidental catches by anglers and whitebaiters.

Australian grayling have been shown to typically occupy restricted reaches of stream in moderate to fast flowing habitats (Dawson and Koster 2018) and to breed on loose rocky substrate in freshwater habitats. Spawning is thought to be triggered by an increase in river flow (Koster et al 2013), or changes in temperature and lunar phase (Hall and Harrington 1989). Spawning generally occurs between February and May, with timing varying across its range. Larvae are believe to move downstream to the ocean, rather than remaining in estuaries, with very few specimens recorded from estuarine environments (Schmidt et al 2010, Crook et al 2006). Examination of elemental signatures of grayling otoliths from the different rivers similarly suggested that the juvenile phase of fish is spent in a chemically homogenous environment, such as the sea, rather than in chemically variable environments such as an estuary (Crook et al 2006).

In Tasmania, the known range of Australian grayling includes northern (including King Island), eastern and some western rivers (Threatened Species Section, 2021). The species has been recorded in the River Derwent (Backhouse et al 2008), however little is known about the population. The Tasmanian Natural Values Atlas reports three individuals of Australian grayling recorded within 500 m of the existing Bridgewater Bridge on the 28th October 1987. Available information indicates that this record was on the northern shore of the river channel, around 400 m upriver of the bridge. It is unclear whether the specimens were juveniles or adults.

Tasmania's threatened fauna handbook (Bryant and Jackson 1999) lists a sighting of Australian grayling in the River Derwent at Green Island, around 6 km upriver from the existing Bridgewater Bridge. It is unclear whether the specimen was a juvenile or adult. Aquenal (2006) comments on this observation that the wetlands in this area are unlikely to represent optimal habitat for this species.

Older references to Australian grayling (then known as "cucumber mullet") in Tasmanian Parliamentary Papers mention the dramatic decline of grayling from the River Derwent in the years prior to 1885 and insinuated the role of introduced trout and a "wide-spread plague" in the decline (Saville-Kent 1885, 1886a, 1886b). These documents also mentioned that, prior to the decline, grayling were known to spawn in the Derwent close to the falls above New Norfolk (Saville-Kent 1886a). The Superintendent and Inspector of Fisheries at the time (W. Saville-Kent) was planning to re-stock grayling in the Derwent with grayling ova collected from the Mersey (Saville-Kent 1885).

Communication with the Tasmanian Inland Fisheries Service (IFS; *pers. comm.* Rob Freeman) indicated that there has not been any recent specific surveys/work on Australian grayling in the River Derwent. There are however reports of grayling being incidentally caught by anglers.

Targeted surveys for Australian grayling were not undertaken as part of this Project for several reasons. Fish survey methods, other than underwater visual census, involve a degree of risk of injury or mortality to the fish. Visual census would not be effective in the shallow water around Bridgewater, which often has low visibility. Adult grayling occupy riverine habitats and are therefore not expected to occur in this area, and juvenile grayling are unlikely to be distinguishable from other species using underwater visual methods. Use of beach seine nets would damage habitat (e.g. *Ruppia megacarpa*) in the conservation area and suspend significant quantities of sediment and sediment-associated metals. Whitebait and fyke nets are suited for use in rivers and are unlikely to be effective in the broad expanse of the estuary. Electrofishing also cannot be used in saline water. The assessment of Australian grayling was therefore based on available information from IFS, Derwent Estuary Program and published sources.

Juvenile Australian grayling are expected to pass through the Project land as they transition downstream between freshwater and marine habitats as larvae, and upstream between marine and freshwater habitats as juveniles. The upstream migration is believed to occur between late winter to spring, along with juveniles of multiple other amphidromous fishes, collectively known as whitebait. Given that adults

of Australian grayling live and breed in rivers, and available evidence suggests juveniles occupy marine habitats, grayling are expected to occur in the project area and surrounding estuarine waters only during their passage to other habitats.

3.2 New Bridgewater Bridge

The New Bridgewater Bridge Project has potential to influence the aquatic environment of the Derwent Estuary through activities occurring during construction, as well as through the permanent structures of the bridge.

Design of the bridge and construction methods had not been finalised at the time of writing, so environmental assessments were required to consider a range of plausible scenarios.

The bridge will be constructed on piles driven into the sediment. Piling will be conducted from a combination of temporary platforms over the water in the main river channel and potentially via barges embedded into the sediment of the shallow macrophyte beds adjacent to the existing causeway. In the main river channel, any temporary platforms will be supported by piles spaced sufficiently to allow passage of migrating fishes beneath.

Construction activities occurring in the water and involving sediment disturbance, including pile driving among others, will be conducted during daylight hours. Drilling at the socket of the pile deep in the sediment may be conducted at night, however this is not expected to generate any significant underwater noise nor disturb surface sediments.

Underwater noise from piling is not expected to significantly impact the Australian grayling, with physiological damage to fishes unlikely. Potential impacts will be further mitigated by slow starts, where the intensity of the underwater noise and impact is slowly increased over a period of time, allowing animals to move out of the area. Marine Solutions have video record of multiple fish species displaying normal behaviour around active piling.

The temporary structures used for piling will not block upstream or downstream passage of migrating fishes. In the event of linked barges used as temporary access for construction in the shallows, this may inhibit free access to a small area of macrophyte habitat adjacent to the causeway (approx. 5% of

comparable habitat in the local area). Upstream-migrating juveniles will be directed along the wall of barges into the main river channel and upriver around the northern tip of the existing causeway. In the event temporary platforms are used for construction in the shallows, these will be constructed on piles with sufficient spacing to allow movement of fishes beneath. The temporary structures will not block upstream or downstream passage of migrating fishes.

Sediment disturbance is expect to be the primary source of risk to the aquatic environment from the Project. Suspended sediment concentrations are not expected to reach levels that would be problematic for fishes. This statement is based on the expected low intensity, extent and frequency of sediment disturbance in the Project, as well as the suspension of construction activities during night hours, the large width of the river at this point, and the high water depth and flow in the main river channel. These factors mean that sediment disturbance is expected to be low, with temporal (night) and spatial (main river channel) windows always remaining open for migrating fishes.

The sediment of the Derwent Estuary is contaminated with metals from historic pollution from the downstream zinc smelter and upstream paper mill. A laboratory experiment also indicated that reactive substances in the sediment of the area can consume oxygen from the water column upon disturbance. Despite these results, only minor changes in dissolved oxygen concentrations have been generally reported in field studies that involved sediment disturbance at levels far greater than expected for this project (Simpson et al 2018).

Based on these potential risks, as well as the close proximity of a TSPA-listed threatened aquatic macrophyte (*Ruppia megacarpa*), methods for constructing the bridge have been selected with the intention of minimising sediment disturbance. No dredging will take place. A small amount of sediment disturbance may be unavoidable however through vessel movements, piling works and scour around temporary structures. Hydrodynamic modelling, using input/source concentrations based on the results of extensive sediment sampling and elutriate testing across the project area indicated that elevations of released metals, should they occur, will be limited to a narrow band of water for a short distance downstream of the causeway on the southern shore of the river.

An intensive monitoring program during construction involving water sampling and telemetered water quality meters, with comparison against trigger values. This information will guide adaptive

management of in-water activities to ensure that metal and oxygen concentrations do not reach harmful levels. The monitoring program and trigger levels will be formalised through the state Major Project approval process.

The permanent structures of the bridge will include the bridge piers and two areas of land reclamation. Minimum spacing between the piers will be 30 m, but is more likely to be greater. Pile caps or pier groups will be aligned with the river flow in the main river channel, meaning negligible obstruction to river flow and fish passage. The southern reclamation is proposed for the shallow macrophyte bed towards the southern corner of the existing causeway (Figure 2). This may extend up to 100 m out from the existing shoreline, representing just over 10% of the narrowest width of the river in this area. The shape of the reclamation will avoid sharp angles and will rather guide any upstream-migrating fishes following the shore out and around the structure. The northern reclamation occupies a small area of the shore on the northern side of the main river channel, with the deeper extent of the reclamation running parallel with the channel (Figure 2). One scenario involves removal of this northern reclamation upon completion of the project. Installation and removal of the reclamations will be conducted behind barriers to isolate them from the waterway.

Overall, the permanent structures are therefore not expected to have any measurable impact on the movement on the Australian grayling.

Figure 2. Potential zones within which land reclamation may occur.

4 SIGNIFICANT IMPACT ASSESSMENT

The significant impact criteria are a tool to assist organisations in assessing whether a proposed action will have a significant impact on a matter of national environmental significance. Under the significant impact criteria, an action is likely to have a significant impact on a *vulnerable* species if there is a real chance or possibility that it will:

- Lead to a long term decrease in the size of an important population of a species.
- Reduce the area of occupancy of an important population.
- Fragment an existing important population into two or more populations.
- Adversely affect habitat critical to the survival of the species.
- Disrupt the breeding cycle of an important population.
- Modify, destroy, remove, isolate or decrease the availability of quality of habitat to the extent that the species is likely to decline.
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat.
- Introduce disease that may cause the species to decline.
- Interfere substantially with the recovery of a species.

An important population of a species is a population that is necessary for the species long term survival and recovery. This includes populations that are key sources of breeding or dispersal, populations important for maintaining genetic diversity and populations that are near the limits of the species ranges.

4.1 ASSESSMENT

A specific assessment of the impacts of the New Bridgewater Bridge against each significant impact criteria outlined in *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (Department of Environment 2013) is provided in the following section.

As one of the major rivers in southern Tasmania, and one of the major river systems at the southern extent of the Australian grayling's range, the River Derwent can be considered to contain an *important*

population of Australian grayling. This said, it is expected that the species only briefly passes through the estuarine portion of the River Derwent as larvae moving down into the marine environment, and as part of their upstream migration into freshwater as juveniles.

4.1.1 Specific Impact Criteria

Lead to a long-term decrease in the size of an important population of a species.

The Project is not expected to lead to a long-term decrease in the size of the Australian grayling population in the River Derwent.

The primary risk of the Project to the aquatic environment is the potential release of high concentrations of metals into the water column by construction activities that disturb the sediment.

Disturbance of anoxic sediment layers in the project area also has some potential to result in locally reduced dissolved oxygen concentrations.

Construction activities will be managed to avoid and minimise sediment disturbance, and with mitigation measures to isolate significant sediment disturbance from the ambient environment, metal concentrations and oxygen levels in the water column are expected to be maintained at levels that do not cause mortality in fish.

Hydrodynamic modelling, using input/source concentrations based on the results of extensive sediment sampling and elutriate testing across the project area, indicated that elevations of metals, should they occur will be limited to a narrow band of water for a short distance downstream of the causeway on the southern shore of the river.

The potential for creation of widespread hypoxic conditions will be similarly avoided through careful management and mitigation. This will be reinforced through water quality monitoring, evaluation of the results and adaptive management of construction activities. If elevated concentrations of metals or reduced dissolved oxygen concentrations occur, they will be rapidly recognised in the water quality monitoring, with construction methods adapted to promptly return these to safe levels.

Fish and other highly mobile organisms can also avoid areas of high metal concentrations, should they occur (e.g. Sprague 1968). Suspended sediment concentrations are also not expected to reach levels

that could be problematic for fishes. The Project is therefore not expected to result in any loss of important habitat, loss of spawning grounds, blockage of migratory pathways, reduction of reproductive output, nor lead to levels of fish mortality that could result in a long-term decrease of the population.

A significant impact is therefore unlikely with respect to this criterion.

Reduce the area of occupancy of an important population.

The area of occupancy of the population refers to the extent of the River Derwent and tributaries occupied by the Australian grayling. Given that the Project occurs in a transitory habitat for the Australian grayling and that the potential construction impacts and permanent structures of the bridge, including the land reclamations and bridge pylons, are not expected to inhibit upstream or downstream migration of the species, the Project is not expected to reduce the area of occupancy of the population.

A significant impact is therefore unlikely with respect to this criterion.

Fragment an existing important population into two or more populations.

Fragmentation occurs when some form of barrier causes a population to be broken into two or more sub-populations. Given that the Project occurs in a transitory habitat for the Australian grayling and that the potential construction impacts and permanent structures of the bridge, including the land reclamations and bridge pylons, are not expected to inhibit upstream or downstream migration of the species, there is no foreseeable mechanism by which the Project could fragment the population.

A significant impact is therefore unlikely with respect to this criterion.

Adversely affect habitat critical to the survival of the species.

Available evidence suggests that the estuarine environment of the Project Land extent serves as a transitory habitat for the Australian grayling. Critical habitats include the upriver freshwater river areas for adults and spawning, while larvae and juveniles are considered to spend most of their time in the marine environment.

Hydrodynamic modelling of potential impacts resulting from construction works indicate that the Project cannot plausibly affect the freshwater habitats of the River Derwent upstream of New Norfolk.

The marine environments of the lower River Derwent and Storm Bay are also not expected to be impacted by the Project.

A significant impact is therefore unlikely with respect to this criterion.

Disrupt the breeding cycle of an important population.

The Project will not impose barriers to migration, nor is it plausible that impacts from the Project such as mobilized contaminants, hypoxic water or suspended sediment could reach the freshwater spawning areas. Studies have found the eggs of the Australian grayling to be intolerant of salinities greater than 5 ppt (Hall and Harrington 1989). The salinity in the Project area mostly ranges between 2 and 15 ppt (Marine Solutions 2021), with freshwater only observed during high river flow. The aquatic habitats in the Project area are predominantly soft silt, dominated by seagrass (*Zostera* sp.) and the aquatic macrophyte *Ruppia megacarpa*. The Project is also not expected to impose any barriers to upstream migration of juveniles, with suspended sediment and metals in the water maintained below harmful levels, and minor elevations, should they occur, shown by hydrodynamic modelling to be limited to a small portion of the width of the estuary and occurring only during daylight hours. The Project is not expected to impact spawning habitats, nor influence upstream or downstream migration, meaning that it is not expected to disrupt the breeding cycle of the population.

A significant impact is therefore unlikely with respect to this criterion.

Modify, destroy, remove, isolate, or decrease the availability of quality of habitat to the extent that the species is likely to decline.

Available evidence suggests that the estuarine environment of the Project Land extent serves as a transitory habitat for the Australian grayling. The Project is not expected to significantly degrade habitat quality, with minimal and short-term impacts to water quality and the condition of aquatic macrophytes in the estuary.

Access to a small portion of macrophyte habitat may be reduced during construction under a scenario involving a chain of linked barges, however a large area of comparable habitat remains (over 95% in the immediate area) and no structures that could form barriers to upstream/downstream migration are proposed.

A significant impact is therefore unlikely with respect to this criterion.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat.

The Project does not pose a significant risk of introducing new species to the area, with the requirement to develop a Construction Environment Management Plan (to be approved by the Tasmanian regulator) expected to include appropriate biosecurity measures.

A number of introduced species are already present in the estuarine section of the River Derwent, notably the North Pacific sea star (*Asterias amurensis*), Japanese seaweed (*Undaria pinnatifida*), New Zealand screw shell (*Maoriculpus roseus*). Invasive freshwater species, including European carp (*Cyprinus carpio*) and eastern gambusia (*Gambusia holbrooki*), have previously been recorded in Tasmania.

A significant impact is unlikely with respect to this criterion.

Introduce disease that may cause the species to decline.

The proposed development is not expected to introduce any diseases to the Australian grayling population, with the requirement to develop a Construction Environment Management Plan (to be approved by the Tasmanian regulator) expected to include appropriate biosecurity measures.

A significant impact is therefore unlikely with respect to this criterion.

Interfere substantially with the recovery of a species.

The proposed development will not impose any barriers to migration or reduce the quality of critical Australian grayling habitat in the River Derwent.

The Project is also not expected to result in significant or prolonged fish mortality. As such, the proposed development is not expected to interfere with the recovery of Australian grayling populations.

A significant impact is therefore unlikely with respect to this criterion.

5 CONCLUSION

An assessment of the impacts of the New Bridgewater Bridge Project on the Australian grayling against the Significant Impact Criteria found that significant impacts are not likely.

Available evidence suggests that the estuarine environment of the Project Land extent serves only as a transitory habitat for the Australian grayling. The Project will not involve the formation of any barriers to migration, nor will it impact on spawning or key habitats. Impacts on water quality in the transitional habitat are expected to be minimal, with potential elevations expected to be brief and localised, resulting in negligible effects on upstream or downstream migration.

With appropriate environmental impact mitigation, biosecurity measures, monitoring and evaluation, the development is not expected to have a significant impact on Australian grayling as a Matter of National Environmental Significance and referral to the minister is not required.

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