

REPORT ON TWO POTENTIAL OUTLET OPTIONS FOR STORMWATER MANAGEMENT AT BLUE LAGOON, DODGES FERRY, SOUTHEAST TASMANIA



Report to
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¹ Cover photo, aerial image of Blue Lagoon, Dodges Ferry, Tasmania

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1 EXECUTIVE SUMMARY

Sorell Council engaged Marine Solutions to identify the potential environmental impacts in the marine environment of discharging stormwater from Blue Lagoon to the adjacent marine environment. Two discharge options have been proposed. Option 1 discharges above the mean high water mark on Blue Lagoon Beach via a concrete headwall and pipeline. Option 2 proposes to discharge stormwater from Blue Lagoon to Tiger Head Bay via a combination of open grass swale and pipeline. The option of doing nothing has been considered, but due to a range of risks, this has been discounted. In periods of low rainfall the lagoon levels fall as water is evaporated and trickles slowly through the sand base of the lagoon, however during periods of higher rainfall a threshold is reached whereby the lagoon fills, and its upper level must be managed by a stormwater discharge.

There is expected to be negligible differences in stormwater quality between the two options. The relatively fresh stormwater discharge will be buoyant in the saline receiving environment, and is likely to persist in surface waters for a relatively short period before rapidly mixing. Compared with no action, installation of either option may foreseeably improve stormwater quality, due to alleviation of risk of residential wastewater system inundation, as well as the potential absorption/filtration effects of sand contact (Option 1) and grass swale contact (Option 2). Both options have the potential for a litter trap also, likely minimizing plastic and other waste being swept into the marine environment.

Amenity effects are not considered to be an important factor when evaluating the suitability of the two options; Option 1 may create a temporary scour zone on Blue Lagoon Beach that will form after heavy rain events, but be replenished by natural coastal processes which will redistribute marine sediments across the beach. The amenity impact (i.e. to beach-walkers) from this is likely to be temporally and spatially contained. Option 2 will create loss of access to a narrow corridor accommodating a grass swale which will be fenced. Both are expected to have very minimal impact on user amenity.

Potential impacts to a nearby threatened handfish population are expected to be negligible for both options. This is because intermittent discharge will only occur during heavy rainfall events, volumes will be comparable to no-action scenarios, and under either scenario, stormwater plumes will be buoyant and fast-mixing, and therefore unlikely to pose a risk to a benthic species. Further, for both options, the

contribution of stormwater discharging from Blue Lagoon to the marine environment during high rainfall events is small when compared to broader-scale catchment inputs, including stormwater from all the surrounding roads and properties which represents a much larger catchment than Blue Lagoon.

The main difference between the two options is discharge environment. Option 1 discharges into Blue Lagoon Beach to the immediate south of Tiger Head. The outlet discharges onto sand above high-water mark and drains to the water over the beach. The marine environment is variable in its energy at this location, and may have complex and variable current patterns depending on the state of the tide, swell size and wind strength and direction. Option 2 discharges to the base of the Tiger Head Boat Ramp, where tidal movement creates high flow from Pittwater via a deeper channel around Tiger Head into Frederik Henry Bay.

In conclusion, there are no marine ecological contraventions to either of the proposed options. From a marine environmental perspective, either of the proposed options are assessed as better than no action, and either option is deemed an adequate solution for stormwater management. Option 1 will periodically create a sand scour creek across the beach – which will resolve naturally with time, while Option 2 discharges onto an existing boat ramp and will not therefore create any scour.

2 INTRODUCTION

Blue Lagoon is a natural area forming part of the broader Bally Park in Dodges Ferry, which is used as a public open space between Kannah Street, Tiger Head Road and Carlton Beach Road. During heavy rainfall, Blue Lagoon periodically fills over its capacity, resulting in localised flooding. Historically the lagoon system would have drained to the foreshore at Red Ochre Beach, however, vegetation regrowth has banded these drainage pathways (ERA, 2022), causing pooling and flooding in the lagoon area.

The area around Blue Lagoon is primarily residential and recreational use. There are no known industrial inputs in the vicinity, and it is therefore unlikely that stormwater contains significant chemical pollution as can occur in industrial stormwater. However, it is likely that stormwater will exhibit elevated nutrients on occasion, as residences in close proximity to the lagoon have on-site wastewater treatment systems that have historically been inundated during flooding.

Sorell Council is investigating options for stormwater infrastructure to assist in storm water management during localized flooding events of Blue Lagoon.

2.1 PURPOSE AND SCOPE

The purpose of this report is to provide Sorell Council with an independent assessment and comparison of two proposed options for stormwater management around Blue Lagoon, Dodges Ferry. Specifically, comment is provided on the likely marine environmental impacts, including impacts to threatened species, of the two proposed options.

The scope of this report extends to a brief summary of each proposed option, summarization of available information regarding marine threatened species in the area, and an assessment and comparison of the likely impacts of the two options, using available information.

2.2 PROPOSAL BRIEF

Sorell Council are investigating two options for management of stormwater around Blue Lagoon (see Figure 1):

Option 1. Blue Lagoon Beach outfall

Option 2. Tiger Head Boat Ramp outfall

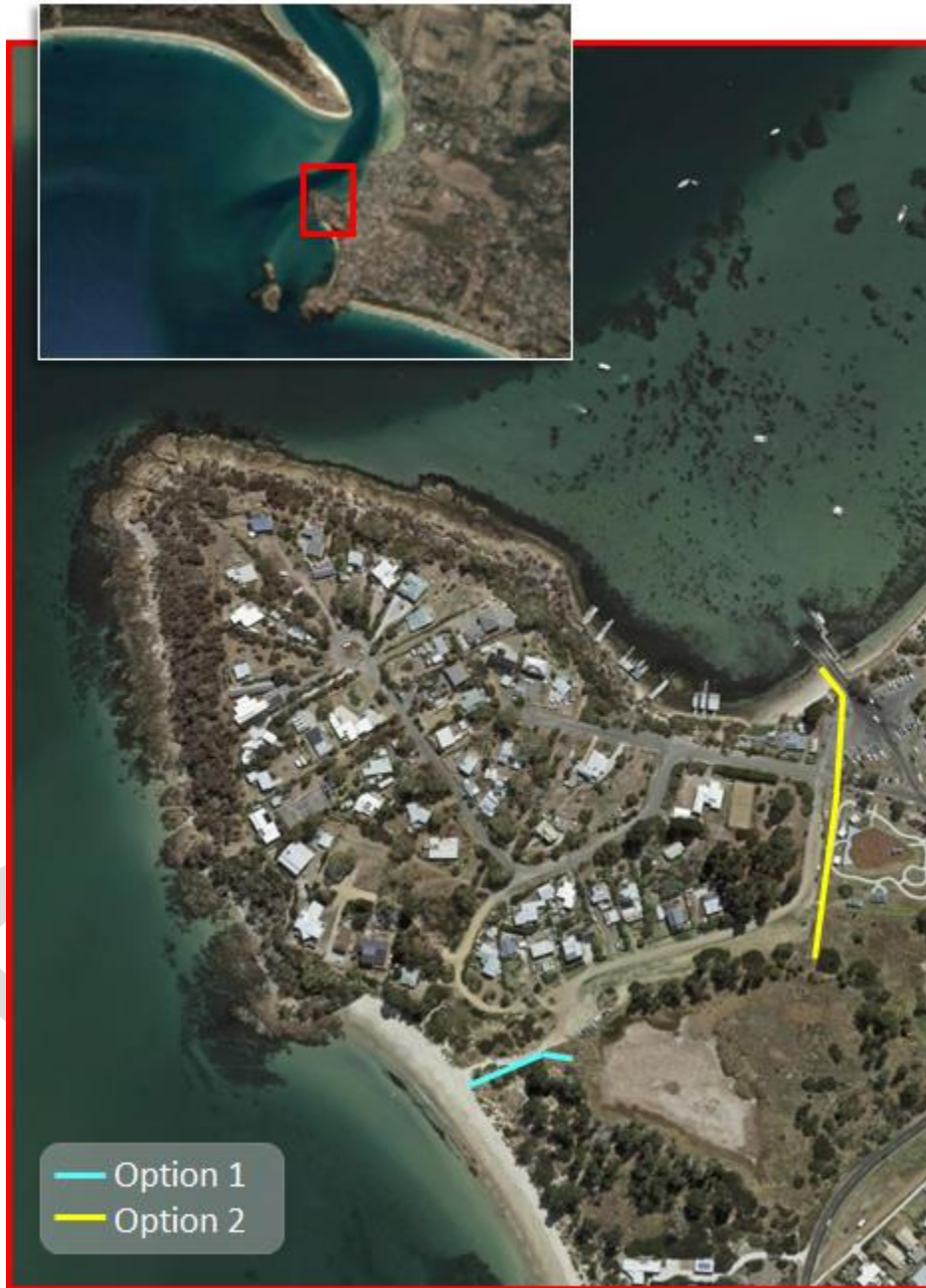


Figure 1 Map showing approximate alignments and discharge locations of Option 1 (Blue Lagoon Beach outfall) and Option 2 (Tiger Head Boat Ramp outfall).

Option 1 – Blue Lagoon Beach outfall

This option proposes to discharge stormwater from Blue Lagoon to Blue Lagoon Beach (beach to the immediate north of Red Ochre Beach; Figure 2, Figure 3). The proposal includes the construction of a 1m high x 1.7m wide concrete headwall to accommodate a 600mm diameter outlet pipe. The pipe will be trenched to potentially sensitive vegetation, then directionally drilled under the vegetated dune, discharging above mean high tide level. An inlet grill will be installed to reduce the amount of litter escaping the beach marine environment and blockage of the pipe. The discharge point will be disguised with rock pitching and endemic plantings. It is expected that a temporary scour zone will form after heavy rain events and be replenished by natural tidal deposition.

Option 2 – Tiger Head Boat Ramp outfall

This option proposes to discharge stormwater from Blue Lagoon to Tiger Head Bay via a combination of open grass swale and pipeline (Figure 4, Figure 5). An open grass swale to the immediate west of the playground will feed a 300mm pipeline. The pipeline will be directionally drilled from the northwest corner of the playground, under Tiger Head Road to emerge at the base of the boat ramp. The pipe is to discharge into shallow water immediately alongside the jetty and disperse on a concrete base underneath the jetty, with a proposed footing approx. 1m wide and 2 m long. Near the base of the boat ramp, an overflow tee junction with flap is proposed to allow the system to function during king tides and/or storm surges. It is the understanding of the author that this option is also to include a litter trap.

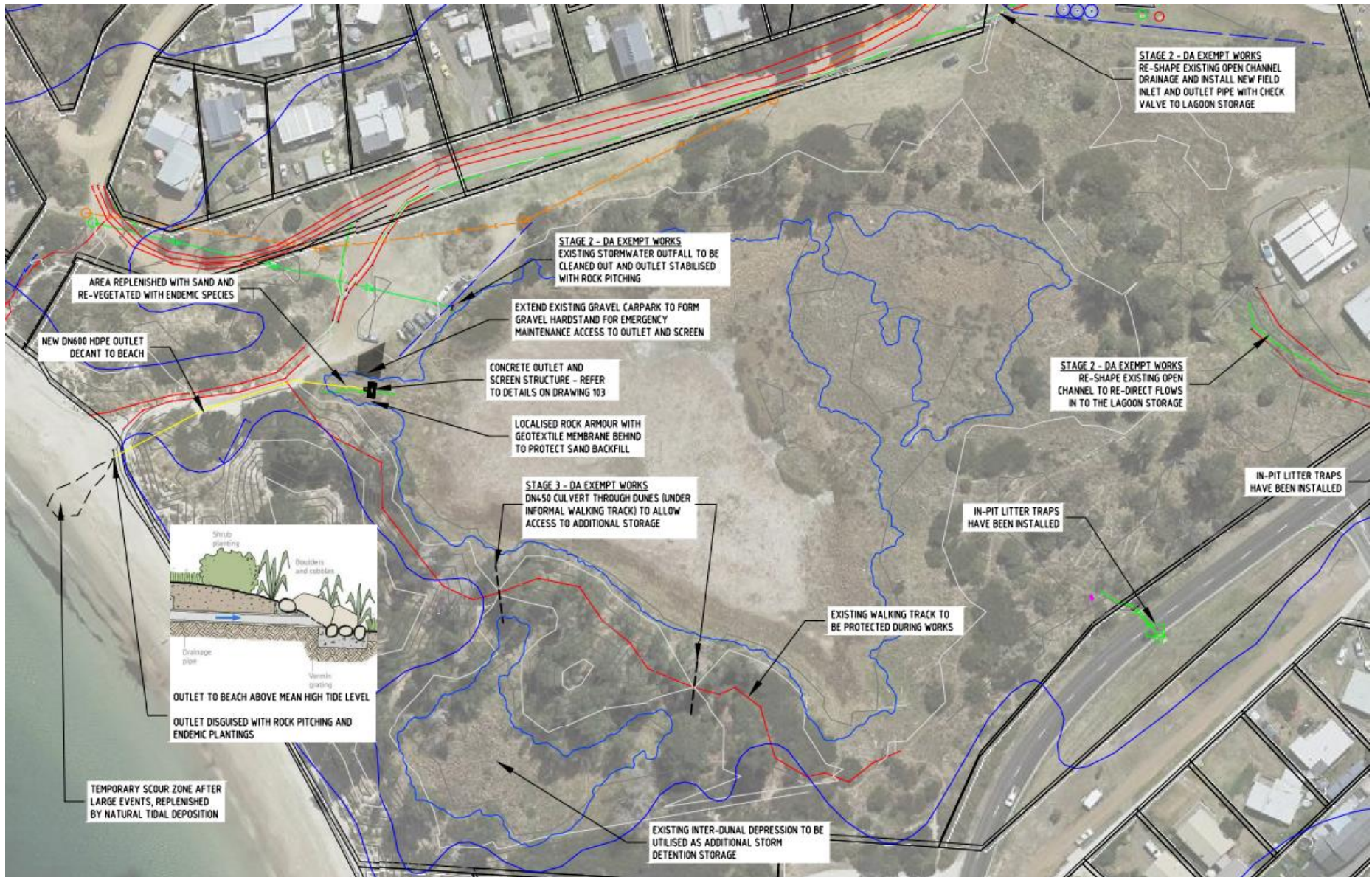


Figure 2 Concept arrangement drawing of proposed discharge to Blue Lagoon Beach (image source: ERA (2022), provided by Sorell Council).

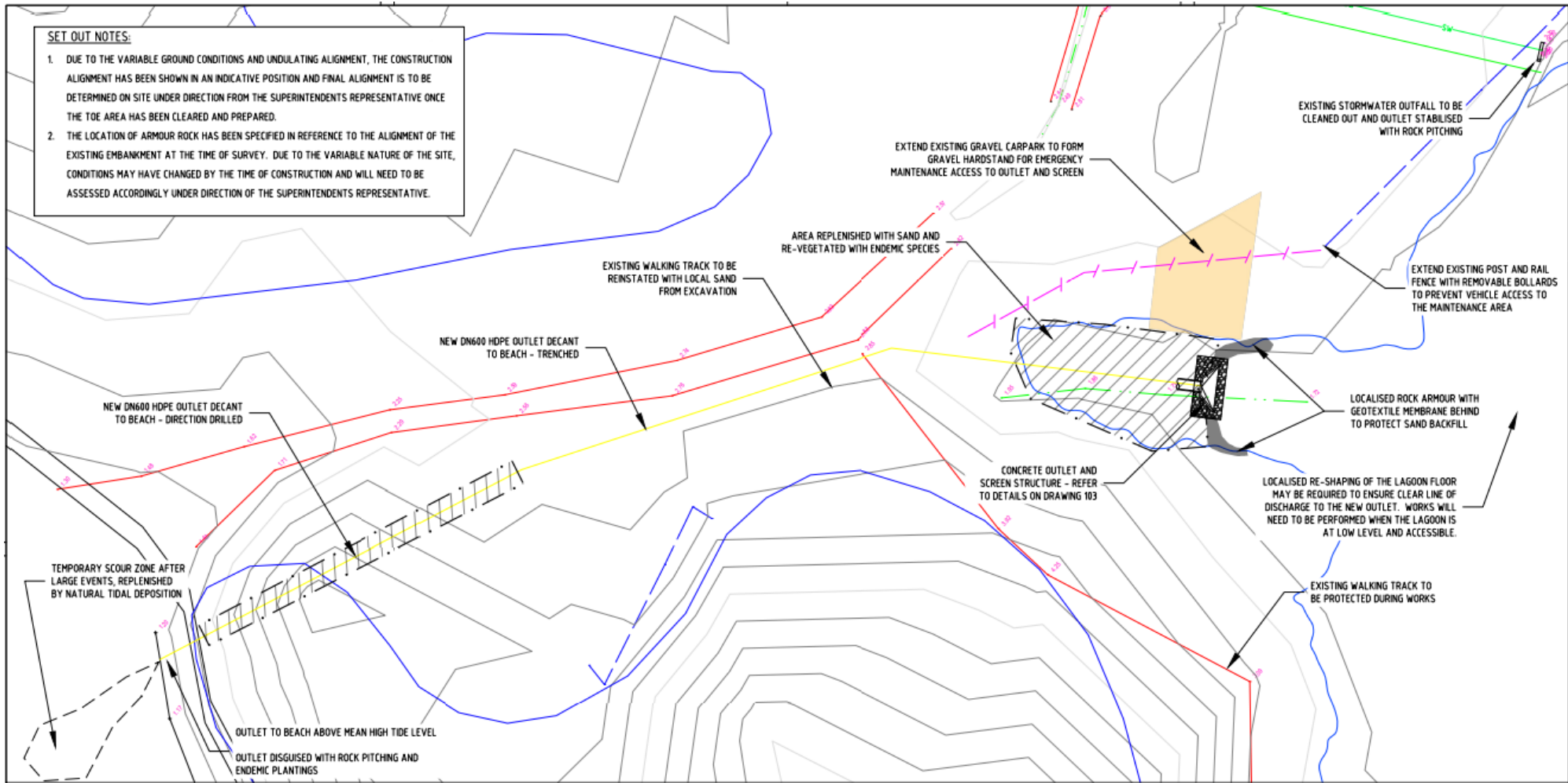


Figure 3 Concept arrangement drawing of proposed discharge to Blue Lagoon Beach (image source: ERA (2022), provided by Sorell Council).

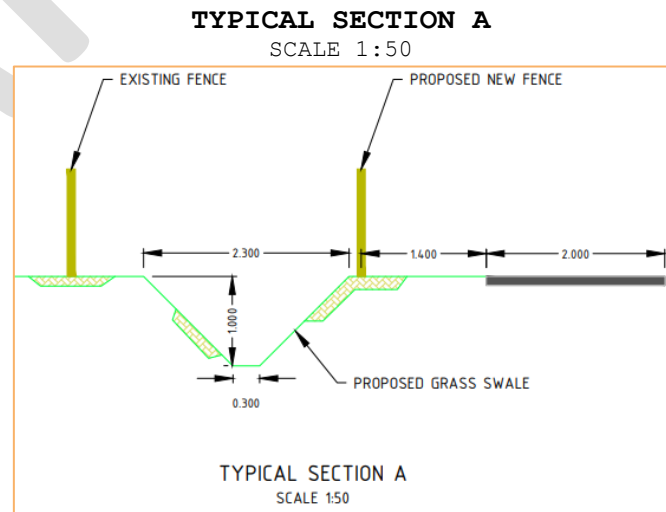


Figure 4 Location Plan showing proposed stormwater route north from Blue Lagoon to discharge alongside the Tiger Head Boat Ramp and Jetty (image source: Sorell Council).

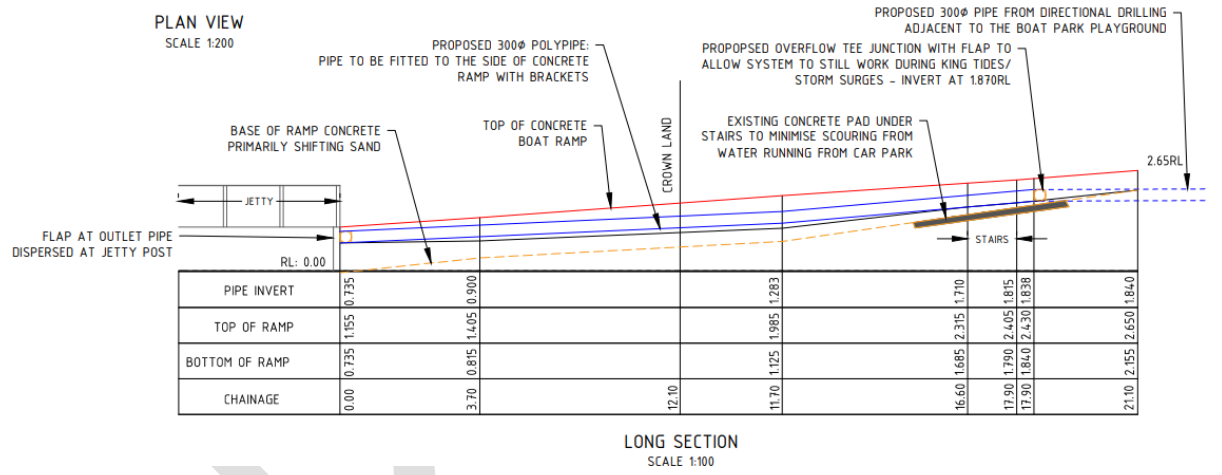
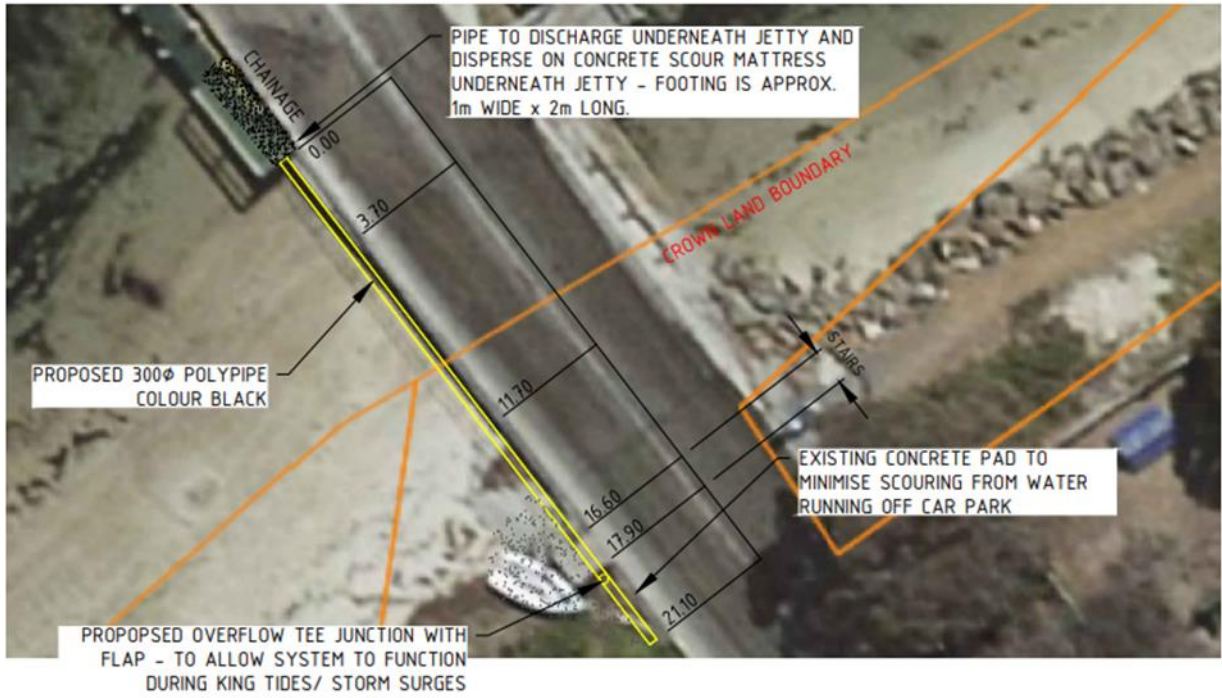


Figure 5 Plan view of proposed stormwater discharge location at the boat ramp (Scale 1:200. Image source: Sorell Council).

3 THREATENED AND PROTECTED SPECIES/ECOLOGICAL COMMUNITIES

In a search of the Natural Values Atlas (DPIPWE, 2022) and EPBC PMST (Commonwealth of Australia 2022), 15 threatened marine species and 1 threatened marine ecological community were identified as possibly occurring in the area or known to occur in the area (Appendix 1). Verified records of 2 threatened species within a 500 m radius of the study area were found (DPIPWE, 2022) (Table 2): the Red Handfish and the New Zealand Fur Seal. The New Zealand Fur Seal is a highly mobile species and therefore any potential impact to this species negligible. The red handfish is discussed in further detail below.

3.1 RED HANDFISH

The Red Handfish (*Thymichthys politus*) is a Critically Endangered benthic fish endemic to southeast Tasmania. Its distribution is currently understood to be restricted to a few small patches of reef in Fredrick Henry Bay, and the population is estimated to be only ~100 individuals total (Handfish Conservation Project 2022). Given the low number of mature individuals and the extremely limited distribution of the species, areas supporting known populations represent critical habitat to the survival of the species (DEE, 2015). The most significant threat to the red handfish include an increase in the population of sea urchin, which graze on essential handfish habitat, pollution and siltation, marine developments, physical damage to their habitat and Illegal collection (DPIPWE 2020). The species is protected under both state and federal legislation.

The presence of red handfish is confirmed on the shallow rocky reef fringing Tiger Head, within 500 m of both outfall options.

4 COMPARISON OF TWO STORMWATER MANAGEMENT OPTIONS

This section compares in detail the two proposed stormwater management options for Blue Lagoon, Dodges Ferry, in relation to their potential implications to the marine environment. In particular, the comparison focuses on the discharge environment, stormwater quality, impacts to amenity and impacts to threatened species (Table 1).

Table 1 A comparison of two proposed stormwater management options for Blue Lagoon, Dodges Ferry.

	Option 1 Blue Lagoon Beach outfall	Option 2 Tiger Head Boat Ramp outfall
Receiving environment	<p>Discharges into Blue Lagoon Beach to the immediate south of Tiger Head. Variable energy beach environment. Counter-clockwise eddies may form on outgoing tides due to waters discharging out of Pittwater and eddying on contact with Spectacle Islands. Storm events often correspond to higher energy environment at Blue Lagoon Beach.</p> <p>Scour of the beach due to the discharge may wash increased material into the marine environment increasing turbidity, along with the stormwater discharge which may have increased turbidity.</p> <p>Increased turbidity in the stormwater should not be confused with tannins which can make the water look dark, especially if it has been sitting in a hind dune lagoon for a time prior to discharging.</p> <p>Water quality will be impacted by a stratified layer of fresh, which will be mixed into the receiving environment by a combination of waves and current action, and the overall change to water quality is expected to be localized and short lived.</p>	<p>Discharges to the base of the Tiger Head Boat Ramp. The discharge environment is characterized by strong bimodal (tidal) currents.</p> <p>As the discharge is occurring onto a concrete pad there will be no scour or additional turbidity / increase in total suspended solids from the discharge. As with Option 1, the stormwater may have increased turbidity, and this should not be confused with elevated tannins.</p> <p>At this location, impacts to water quality will be low due to the high levels of initial dilution caused by strong tidal current flows which occur within the moorings and into the bay.</p>

	Option 1 Blue Lagoon Beach outfall	Option 2 Tiger Head Boat Ramp outfall
Stormwater quality	<p>Some filtration of stormwater will occur via contact with sand across Blue Lagoon Beach, before stormwater enters marine environment.</p> <p>The stormwater inlet will be grated acting as a litter trap and reducing the amount of litter that flows from the Lagoon into the marine environment.</p>	<p>Some filtration of stormwater will occur via contact with grass and soil in swale, before stormwater enters marine environment.</p> <p>It is assumed the stormwater inlet will be grated acting as a litter trap and reducing the amount of litter that flows from the Lagoon into the marine environment.</p>
Amenity impacts	<p>Likely beach scouring after high rain event on Blue Lagoon Beach. This scouring will likely diminish as the beach sand is replenished with tidal movement.</p> <p>Discoloured surface plume will likely be visible following rain.</p>	<p>Loss of access to small corridor of fenced area to accommodate grass swale between Blue Lagoon and Tiger Head Road.</p> <p>Discoloured surface plume will likely be visible following rain however it may be less obvious as it combines with the flows from Pittwater which include numerous inputs.</p>
Impacts to threatened species	<p>Critically Endangered red handfish population is known within 500 m around Tiger Head.</p> <p>Intermittent discharge will only occur during/after heavy rainfall events. Catchment runoff during these rainfall events into the nearby marine environment will impact water quality on a broader scale than this proposal (e.g. Coal River, Craigbourne Dam). Therefore, the stormwater discharging from Blue Lagoon will have negligible contribution to the potential impacts to threatened species during rainfall events.</p> <p>The stormwater plume will be buoyant in the marine environment, and therefore likely to mix in surface layers. Therefore, impacts to benthic habitats and species are</p>	<p>As for Option 1.</p>

	Option 1 Blue Lagoon Beach outfall	Option 2 Tiger Head Boat Ramp outfall
	expected to be less than for a saline or brine plume.	

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5 CONCLUSIONS

Due to the density of seawater being higher than stormwater, any stormwater plume discharged from Blue Lagoon will be buoyant in the marine environment, and likely stay in the surface layers until it mixes sufficiently with the receiving environment for the density to increase and assimilation to occur. Given the relatively high current flows in the area we expect initial dilution to be high, and the stratification to break down rapidly, thus even in high rainfall scenarios, the impact of stormwater from Blue Lagoon will be minimal. The potential impacts of stormwater discharge from Blue Lagoon could have on the marine environment is negligible when considered in the scheme of catchment runoff and nearby river inputs. Therefore, stormwater is deemed unlikely to pose detrimental effects to the nearby red handfish population.

Discharging stormwater on Blue Lagoon Beach will create scouring, likely only temporary until sand is replenished from natural coastal processes. The amenity impact from this is likely to be temporally and spatially contained, however in periods of ongoing rainfall, the impacts could include a deeper scour which takes longer to resolve. Discharging via Tiger Head boat ramp will restrict access to a narrow corridor accommodating a grass swale which will be fenced.

From a marine environmental perspective, either of the proposed options are deemed an adequate solution for stormwater management, with a slight preference for Option 2 due to the minimization of sediment mobilization directly into the marine environment.

6 REFERENCES

Department of the Environment and Energy (DEE) (2015) Recovery Plan for Three Handfish Species, Commonwealth of Australia.

Department of Primary Industries, Parks, Water, and the Environment (DPIPWE) (2020), Listing Statement for *Thymichthys politus* (Red Handfish), available at <<https://dipwe.tas.gov.au/Documents/Red%20Handfish%20Listing%20Statement.pdf>>, accessed on 12th November 2020.

Handfish Conservation Project (2022) Red Handfish, available at <<https://handfish.org.au/species-overview/>>, accessed on 30/7/2022.

7 APPENDICES

Appendix 1. Threatened Marine Species Summary

There are a number of marine species listed as threatened that may occur in the vicinity of the proposed development. Threatened species are protected under the *Threatened Species Protection (TSP) Act 1995* (Tasmanian state legislation) and/or the *EPBC Act* (Australian Government legislation).

Under the *TSP Act*, no listed species is allowed to be collected, disturbed, damaged or destroyed without a permit. Under the *EPBC Act*, any action with significant impact on a listed threatened species and/or community is prohibited without approval (Section 18 and 18A).

In addition to threatened species legislation, the *Fisheries (General and Fees) Regulations 2006* under the *Living Marine Resources Management Act 1995* (LMRMA) prohibits the taking/possession of a number of marine species, including Syngnathids (seahorses, seadragons and pipehorses), handfish, threespin blennies, limpets/false limpets of three superfamilies, and five species of shark. Additional species are protected by the schedules of the *Wildlife (General) Regulations 2010* (Regulations under the *Nature Conservation Act 2002*), under which a person must not take, buy, sell or have possession of any protected wildlife or any product of any protected wildlife without a permit. Threatened species that could potentially occur within the vicinity of the study area are discussed in greater detail in this section.

Table 2 Summary of threatened marine species identified in a search of the Natural Values Atlas and the EPBC PMST. Note that the scope does not extend to terrestrial or avian biota.

Species		Type	Listing (EPBC Act)	Listing (TSP Act)	EPBC PMST findings*	NVA findings
<i>Serirolella brama</i>	Blue Warehou	Fish	Conservation Dependent	n/a	Known	-
<i>Thunnus maccoyii</i>	Southern Bluefin Tuna	Fish	Conservation Dependent	n/a	Likely	-
<i>Brachionichthys hirsutus</i>	Spotted Handfish	Fish	Critically Endangered	Endangered	May	Verified within 5000m
<i>Thymichthys politus</i>	Red Handfish	Fish	Critically Endangered	Endangered	Likely	Verified within 500m
<i>Prototroctes maraena</i>	Australian Grayling	Fish	Vulnerable	Vulnerable	Likely	Within 500m, based on range boundaries
<i>Balaenoptera musculus</i>	Blue Whale	Mammal	Endangered	n/a	Likely	-
<i>Eubalaena australis</i>	Southern Right Whale	Mammal	Endangered	Endangered	Known	Verified within 5000m
<i>Megaptera novaeangliae</i>	Humpback whale	Mammal	n/a	Endangered	-	Verified within 5000m
<i>Arctocephalus forsteri</i>	New Zealand fur seal	Mammal	n/a	Rare	-	Verified within 500m
<i>Arctocephalus tropicalis</i>	Sub-Antarctic fur seal	Mammal	Vulnerable	Endangered	-	Verified within 5000m
<i>Carcharodon carcharias</i>	White Shark, Great White Shark	Shark	Vulnerable	-	Known	-
<i>Parvulastra vivipara</i>	Tasmanian Live-bearing Seastar	Invert.	Vulnerable	Vulnerable	May	Verified within 5000m
<i>Gazameda gunnii</i>	Gunn's screw shell	Invert.	n/a	Vulnerable	-	Verified within 5000m
<i>n/a</i>	Giant Kelp Marine Forests of South East Australia	Community	Vulnerable	n/a	May	-
<i>Ruppia megacarpa</i>	Largefruit seatassel	Plant	n/a	Rare	-	Verified within 5000m
<i>Ruppia tuberosa</i>	Tuberous seatassel	Plant	n/a	Rare	-	Verified within 5000m

* Community or species or species habitat [known to; likely to; or may] occur within area.