Hobbs Bay Marina

FEASIBILITY

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DEVELOPMENT FEASIBILITY ASSESSMENT

Hobbs Bay Estate Marina

1 INTRODUCTION

Hopper Developments Limited intends to utilise the 'fast-track' process (Fast Track Approvals Act 2024) for a proposed marina (comprising approximately 300 berths). If accepted, formal reporting on the above matters would accompany the "substantive application". This letter provides a high-level consideration of the anticipated and potential effects arising from the proposed marina development at Hobbs Bay in respect of the following matters:

- Land Modification, Geotechnical Engineering and Dredging;
- Three Waters (Stormwater, Wastewater and Potable water); and,
- Coastal Processes

2 GEOTECHNICAL/EARTHWORKS

2.1 General Land Modification

In respect of any potential earthworks to be undertaken on the landward side of the marina, we anticipate that adherence to the Auckland Council Guidance Document 005 ("GD05") which provides guidance on erosion and sediment control for all land disturbing activities, will provide for effective mitigation for erosion and sediment control potential effects.

2.2 Preliminary Ground Model

Our high-level preliminary ground model is based on the geotechnical information contained within the CMW geotechnical report and associated documents.

2.2.1 Sea Cliff

The sea cliff height varies between approximately 5.5m (eastern end) and 17m (western end). Machine boreholes investigated close to the coastal margin of the Hobbs Bay Estate subdivision found East Coast Bays Formation (ECBF) bedrock at depths ranging between 4.8m to 10m, with residual ECBF overlying the bedrock (sandstone/siltstone), and a 'Transition Zone' comprising soils derived from near- complete weathering of the ECBF 'bedrock'.

In general, it was found that 'bedrock' makes up the lower exposures of the cliff face, some 50% to 70%, with some areas of locally higher or lower depths.

There is a rock platform fronting the cliff which varies in width, with sand covering the eastern end.

It should be noted that the CMW report found potential bedding-parallel shear zone along the base of the northern sea cliff projection (towards the central to eastern end) which appeared to undergo or be more susceptible to more rapid weathering and erosion.

While consideration will need to be given to debris/rock fall protection for any structures and or public space proposed within close proximity to the coastal cliffs, we do not consider this to be a significant risk to the project and could be readily mitigated with scaling of any loose material from the face or the installation of debris walls and/or rock netting etc. The most appropriate methodology will be confirmed during detailed design.

2.2.2 Marine Area

The proposed marina area is expected to have an average water depth of approximately 2 metres, with shallower depths near the coastline and deeper water extending towards the harbour or the southern extent of the marina. These depths would fluctuate with tidal variations.

Online resources provide information on water depths at the neighbouring Gulf Harbour Marina[1], indicating that the main access channel and superyacht berths have depths of around 4 metres. Berths for recreational yachts and boats are typically in depths of approximately 2 metres or less.

It is understood that no existing testing data is available within the marine project area. Geotechnical data from outside the dredge area is likely to be unreliable, particularly as the available data is limited to the onshore area of Hobbs Bay Estate. However, the MAF (2006) report noted that capital dredging for Gulf Harbour Marina in 2000 involved the removal of 52,000 cubic metres of sandstone from the interior channel, 40,000 cubic metres of silt and sand from the entrance channel, and 30,000 cubic metres from the East Marina Extension basin.

The marine area is likely to consist of a variable mixture of weathered bedrock, intact bedrock, and marine sediments. Most bed material within waterbodies results from sedimentation, a natural process where material is eroded by water and transported from inland waterways and coastlines towards the ocean. In general, coarser sands and silts are more common along the coast, while finer muds accumulate in lower-energy environments.

Aerial photograph observations suggest that the proposed Hobbs Bay Marina is likely underlain by a combination of bedrock-like materials with a layer of overlying sediment. Sediment thickness is expected to increase where geological structures such as faults, folds, or bedding planes are present, as these features can intensify weathering, erosion, and sediment deposition. The CMW geotechnical report also indicates the presence of a bedding-parallel shear zone near the base of the eastern cliff, with sand covering the embayment to the immediate east of this zone.

While no site-specific testing is available and we anticipate a variable sea bed profile, from our desktop study and local knowledge of the geology within the area we do not consider there to be any substantive geotechnical concerns or issues regarding the practicality of dredging and forming the marina.

2.3 Dredging

Dredging involves the removal of bank or bed material from water bodies such as harbours, lakes, or rivers. It is typically carried out using large excavators from the bank or in the water from a barge, while larger-scale dredging operations utilise specialist equipment such as hydraulic suction systems. As sedimentation is a continuous natural process, ongoing sediment removal is often necessary following initial dredging works. Although periodic maintenance dredging of the marina and deep-water entrance channel can be expected, no significant sediment accretion is anticipated, owing to both the shelter provided by the embayment with further shelter from the proposed breakwater/groyne to the south; and the lack of any significant volume of sediment laden run-off into the marina from the north or east from any water courses.

As a preliminary estimate, and assuming ground conditions are similar to those encountered during dredging for the adjacent Gulf Harbour Marina, anticipated dredging volumes and techniques are summarised in the following table.

Given the uncertainty in the in situ ground conditions, we have adopted an estimation-based approach, presenting a range to reflect the expected variability in both ground conditions and dredged volumes. We assume that marine sediments (or soils) will comprise the majority of encountered materials. For the purpose of this estimation, we assume 80% of the total area will comprise marine sediments. The remaining 20% could potentially encounter bedrock sequences.

Area	Approximate Area of Dredging m^2	Assumed Depth of Dredging M into the ground	Anticipated Geology	Dredge Method	Dredge Volume m^3
General Berth Areas	~100,000	1 – 2	Marine Sediments (Likely based on CMW indicative ground models)	Cutter Suction Dredge or Barge Mounted Excavator	100,000-200,000
	~30,000	1 – 2	Bedrock of Sandstone/Siltstone Sequences (Possible but Less Likely based on CMW indicative ground models)	Barge-mounted excavators (Backhoe Barge)	30,000-60,000

Note: each dredge method assumes that an accompanying hopper barge is used for transportation.

Total dredge volume is anticipated to be in the order of 200,000 to 300,000 m^3.

[1] Gulf Harbour Marina | NZ Marina of the Year 2020-21 | Navigating the Marina

2.4 Disposal Options

At the present time, the options for dredge materials are:

1. **Dry and Reuse Option:** Sediment is dredged from the source location, dried on the adjacent land, or nearby, and either reused for on-site reclamation filling or transported to another location for use.

2. **Dry and Landfill Option:** Sediment is dredged from the source location, dried on adjoining land or nearby, and then transported by truck for disposal at a landfill. It is understood that the dredged material from Gulf Harbour was managed using this method.

3. **Cement (or Lime) Mixing and Landfill Option:** Sediment is dredged from the source location and transported by barge to a storage site. It is then mixed with cement or lime to achieve a shovel-able consistency, followed by transportation by truck for disposal at a landfill. This method facilitates faster drying of water-laden materials.

4. **Cement (or Lime) Mixing for Reuse Option:** Sediment is dredged from the source location, transported by barge to a storage site, and mixed with cement or lime. It is then either reused for on-site reclamation filling or transported to another location for use.

5. **Offshore Disposal:** Sediment is dredged from the source location and transported by barge to an offshore disposal site, typically using a bottom dump barge.

For any reclamation fill, placement and compaction would adhere to the Code of Practice for Land Development in Auckland and meet the general compaction standards set out in NZS4431:2022. Specific compaction control criteria will need to be developed once site-specific material properties are known, upon completion of site-specific geotechnical testing. This criteria will also need to account for any cement or lime treatment, considering the intended maritime use.

For all options above, consideration will need to be given to possible ecological and environmental impacts, however with suitable sediment control(s) etc, any impact will be adequately mitigated to be non-substantive. Exact methodology will be identified during detailed design when the chosen disposal option is selected.

2.5 Structures

2.5.1 Hardstand/Carpark

The proposed Marina will comprise approximately 300 berths therefore, there will be a corresponding large impervious area required for parking and vehicle movements. The hardstand surface will likely be reclaimed land with a sealed surface. Due to the size of the proposed hardstand, a piled structure would be cumbersome to install and maintain.

Material for the reclamation could likely be sourced from the dredged sediment, after conditioning with cement, lime or a combination of both depending on the soil properties. During the detailed investigation, a design will be prepared to re-use the dredged materials. The testing will include machine sediment auger sampling and laboratory soil testing. Gulf Harbour Marina hard stand was likely constructed using this process therefore, it is likely that Hobbs Bay Marina can adopt a similar methodology.

Conditioning and reuse of the dredge material on adjoining land is the most efficient and sustainable methodology to construct the hardstand area(s) and is geotechnically feasible provided adequate dewatering of the material. Once conditioned, we consider that compaction criteria will be readily met.

2.5.2 Breakwater Rockwall

A new Breakwater Rockwall will be proposed in the east-to-west direction along the southern boundary of the Marina. There is suitable material and rock available in Whangarei that could be barged down for construction.

2.6 Detailed Investigation at Substantive Application Stage

Overall, our high-level feasibility assessment suggests the marina is viable with relatively limited geotechnical constraints, considering both local and surrounding effects.

At the substantive application stage, additional detailed physical Investigation will be required. Soil investigations and testing techniques are similar to terrestrial procedures. The likely required minimum investigations would be the following:

- Marine Boreholes
- Laboratory Soil testing
- Coastal Survey

3 STORMWATER

All stormwater generated by the Marina development will be disposed of into Hobbs Bay, therefore, significant consideration needs to be given to the treatment and resulting water quality of stormwater runoff. The areas subject to the marina works would fall outside the Regionwide Stormwater Network Discharge Consent (RNDC) held by Healthy Waters (Auckland Council), and as such, a private stormwater discharge consent would be required.

Stormwater can be managed in the following ways:

- All stormwater run-off originating from docks, impervious areas that are not subject to vehicular traffic and any run-off from inert roof surfaces would be captured and discharged directly into Hobbs Bay, without any treatment as ‘clean’ water. Roof areas would likely be directed into rain tanks for non-potable re-use.
- Any stormwater run-off generated from impervious areas that are trafficked by vehicles (carparks, trailer parks, loading bays and the actual access into the marina will be directed to a treatment system/s before

being discharged to Hobbs Bay. It is anticipated that a treatment device such as a Hynds 'Up Flo Filter' or a 'Jellyfish Filter' from Stormwater360 will be utilised to treat run-off and capture gross pollutants, oil, debris, metals and hydrocarbons etc.

- Given the proximity to the coastal environment, no attenuation of stormwater will be required. However, any outlets would need to be designed to manage scour and erosion.

While there is no risk of flooding, there will be overland flow from the Hobbs Bay Estate subdivision above the marina which will need to be considered and controlled. As shown in Figure 1 below, four overland flow paths will discharge to the marina, these could either be directed through the marina carparks or directed around the marina to the east then south via drainage channels. Alternatively, these could be captured within a separate piped network.

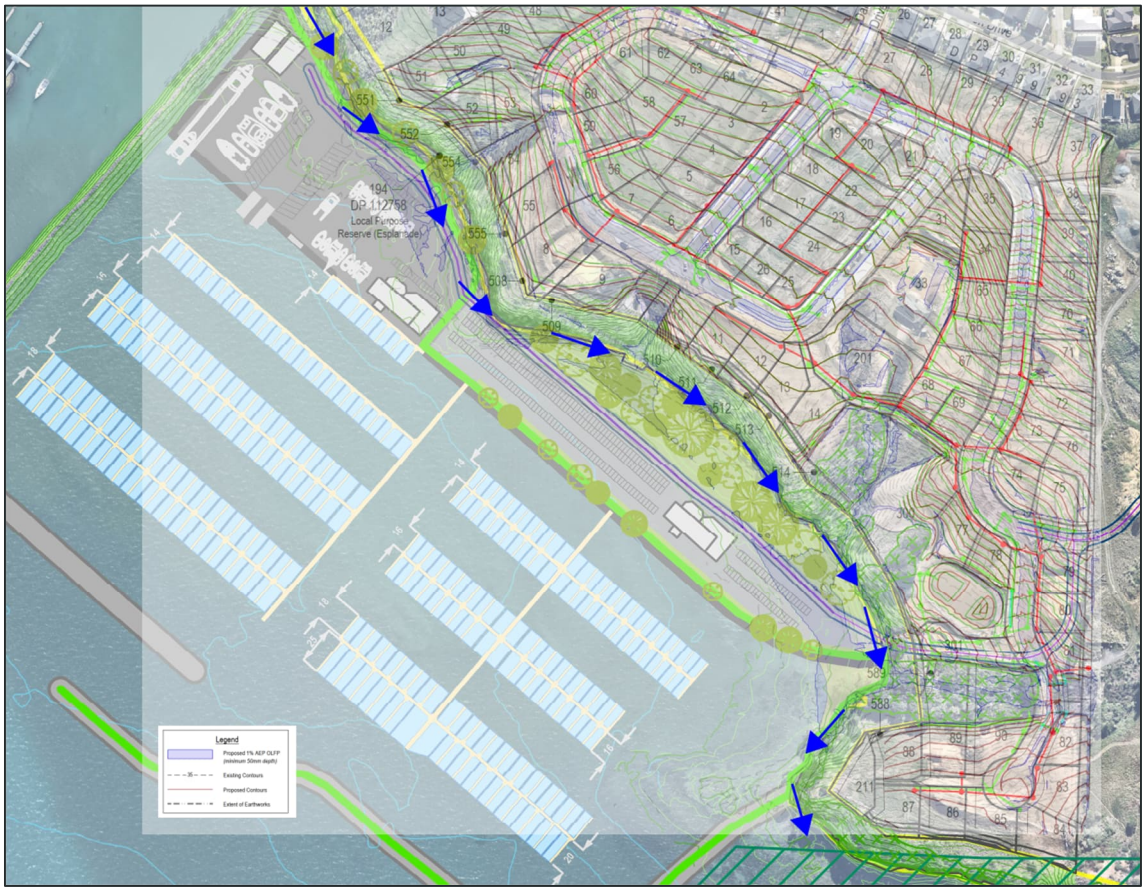

Figure 1: Proposed 1%AEP Overland Flow Path Layout from Subdivision

The design of all stormwater systems will address the climate change provisions contained in the Auckland Council Stormwater Code of Practice.

The stormwater system will be designed in accordance with Auckland Council's Stormwater Code of Practice and will be built to industry best practice.

4 WASTEWATER

We understand that there is currently limited capacity available in the Hibiscus Coast wastewater network, however an upgrade of Watercare's Army Bay wastewater treatment plant is scheduled for completion in 2031. Depending on the timing of the marina development a connection into the adjacent Hobbs Bay Estate wastewater network could be available. During the consenting process for the Hobbs Bay Estate Development consultation with Watercare was conducted and the understanding is that the existing wastewater pump station (GIS ID 961546) is undersized.

To enable the connection, wastewater from the proposed marina development (including berths, buildings and any public amenities) will be collected within a proposed public pump station located toward the southeastern extent of the marina and be pumped, via a proposed public rising main to a new wastewater manhole within the Hobbs Bay Estate, adjacent 'Road 4'. Wastewater would then gravity flow from this proposed manhole to the existing public wastewater pump station GIS ID 961546. Please refer to Figure 2 below for a schematic of the proposed wastewater reticulation.

The existing wastewater pump station GIS ID 961546 currently serves 58 lots. The Hobbs Bay Estate Development will increase the catchment of the pump station to 148 lots. In regard, to the Hobbs Bay Estate Development there was a consultation with development engineer Lars Fog from Watercare Services Ltd (on 28th July 2021), which confirmed the proposed upgrade of the existing wastewater pump station is the logical option and would be acceptable with a detailed design to follow.

This previous correspondence with Watercare Services Ltd provides strong assumption that with upgrades to the existing pumpstation connection would be acceptable.

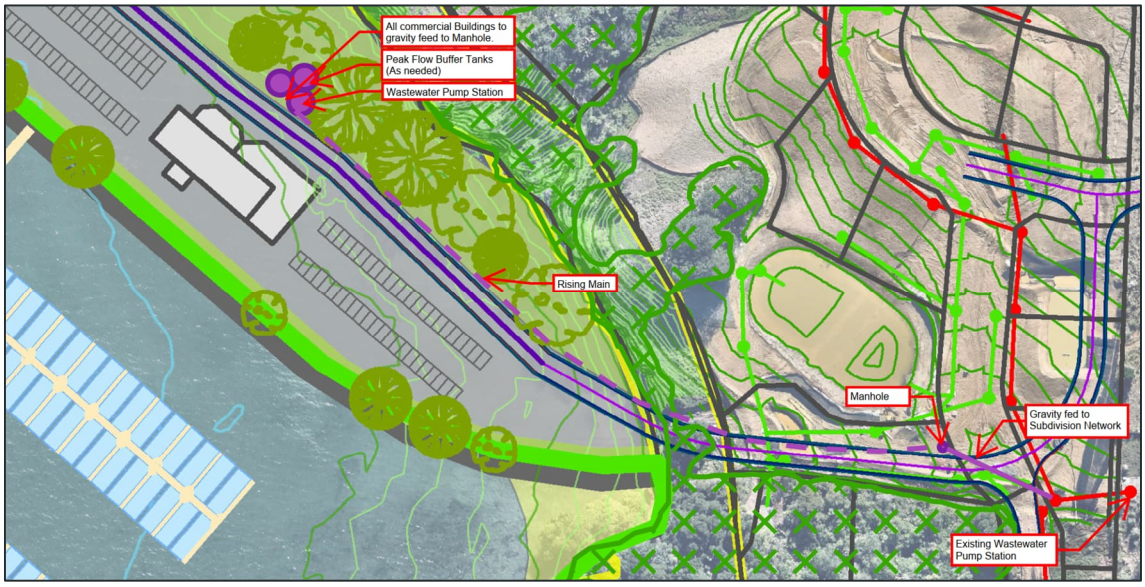

Figure 2: Proposed Wastewater connection to the Public Network

In the unlikely event that the council network was not upgraded in time to service the marina, it would be possible to install a series of wastewater storage tanks to service the marina, with the waste being transported via trucks

when necessary to parts of the network that do have capacity. This is currently how some marinas, like Kennedy Point Marina on Waiheke deal with wastewater disposal due to limited network capacity on the island, and is possible because marinas generally are not high-volume wastewater generating activities.

5 POTABLE WATER

The water supply network in the proposed Hobbs Bay Estate development includes a 63Ø rider and a 125Ø main supply within the western and eastern berm of Road 4 respectively. It is proposed to connect into the development's network near Lot 80, adjacent to the stormwater reserve to provide potable water to the Marina as shown in Figure 3 on the following page.

The Hobbs Bay Estate water main network is proposed to connect to the existing water mains located along Resolution Drive. The hydrants on Resolution Drive and Pinecrest Drive were tested in January 2022 by Nova Flowtec Services Ltd and found to have adequate flow for the Development. Watercare also completed a hydraulic model from the proposed connection point and suggested that there is enough capacity for the domestic demand of the proposed subdivision. Once the exact type and number of commercial activities and serviced berths are known, a detailed serviceability assessment of the water network will be completed.

There are eleven proposed fire hydrants to be constructed during the development of Hobbs Bay Estate. These hydrants will be inadequate to supply the proposed Marina for firefighting as are not located within 135m of the whole site. It is proposed to extend the water supply into the Marina, If capacity is inadequate, dedicated storage tanks for firefighting supply will be required, or a saltwater intake from within the marina could be investigated. Any hydrant connections will need to be located near the entry to the Marina and near the boat trailer park within easy access for first responders.

If the public water supply cannot support the entire marina development, a series of rainwater storage tanks could be designed. The tanks would be designed with sufficient buffer to ensure peak flows are always available. Any available supply from the Watercare mains would supply the tanks, and the remaining supply would be from roof collection systems on all proposed buildings.

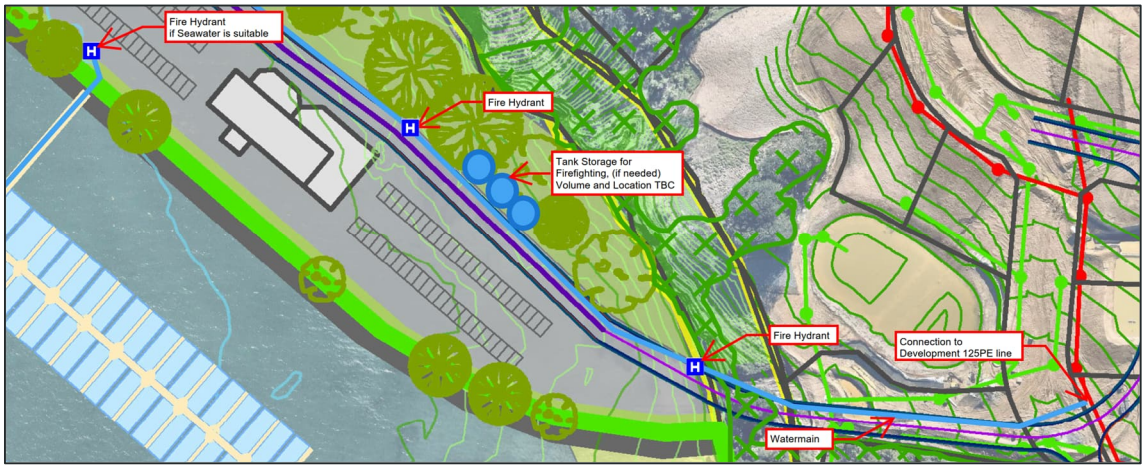

Figure 3: Proposed Water supply connection to 125PE in Subdivision Network

6 ACCESSWAY AND ROADING

Access to the proposed marina will be via the roading network constructed as part of the adjacent Hobbs Bay Estate subdivision as per figure 4 below. Two options exist to access the marina, either via connection to 'Road 2' or 'Road 4'.

Connection to 'Road 4' via 'Carpark 2' is the most direct route, however consideration needs to be given to the significant elevation difference between proposed ground level of 'Carpark 2' of around RL8.0 to the proposed marina carpark level of around RL2.0-3.0. There is also a significant elevation difference between 'Road 2' and the marina carpark level, however the longer route provides more opportunity to address grading issues.

Figure 4: Proposed access to Subdivision roading system

7 COASTAL PROCESSES

7.1 Sea Level Rise

Climate change is expected to accelerate sea level rise (SLR) into the future. The New Zealand Coastal Policy Statement (NZCPS) requires that identification of coastal hazards includes consideration of sea level rise over at least a 100-year planning period. Although coastal consents are generally granted for a term of 35 years, it's unlikely that the marina would be disestablished after a single consent period so consideration of the longer term effects and maintenance/renewals would be considered in any marina and infrastructure design.

To predict SLR the Ministry for the Environment (Mfe, 2024) recommends that four scenarios are considered. These are essentially emissions-based scenarios and denoted Representative Concentration Pathways (RCPS). These scenarios are based on the latest IPCC guidance and are outlined below and presented in Figure 5 below.

- RCP2.6 - Low to eventual net-zero emission scenario
- RCP4.5 - Intermediate-low scenario
- RCP8.5 - High-emissions scenario
- RCP8.5 H+ - Extreme H+ scenario

Figure 24: Range of projections of global mean sea level rise to 2200 for three representative concentration pathways, relative to 2000 from Kopp et al (2014)

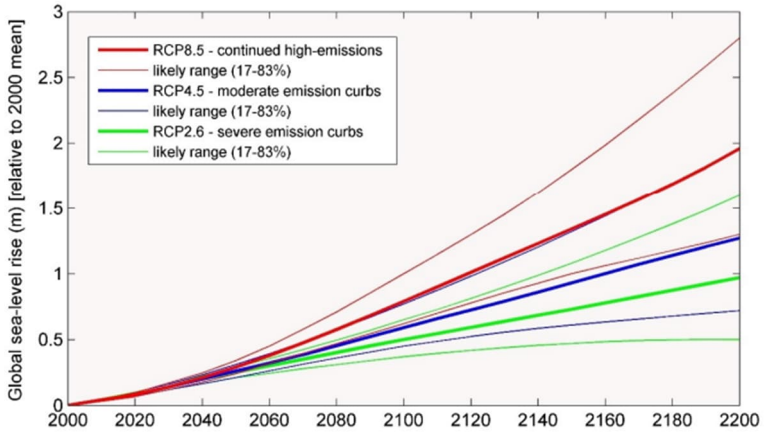

Figure 5: Sea Level Rise Predictions presented within Mfe (2024)

We consider that a future sea level rise of 1.0m should be considered for the proposed marina site. Marinas are mostly constructed of adaptive systems of pontoons and piles, however carparks and land-based parts require a more conservative approach, as they are more difficult to adjust as the sea level rises.

The potential for future sea level rise will be accounted for during detailed design with minimum finished levels adopted for all structure(s), carpark(s) and hardstand(s) ensuring mitigation of any adverse effects.

7.2 Wave Action

Given the relatively sheltered position of the proposed marina on the southern side of the Whangaparaoa Peninsula and the proposed breakwater/groyne south of the proposed berths to protect the marina from prevailing wind and wave action, we consider that any wave action within the marina will be minimal.

From NIWA 2013, the expected ‘storm-tide elevations on the eastern open-coast’ and ‘maximum storm-tide plus wave setup elevations’ within the proximity of the proposed Hobbs Bay marina are around RL2.01 and RL2.52 respectively (relative to AVD-46) for a 0.01AEP event. Consideration should be given to these levels plus climate change during design of the sea wall/groyne.

The proposed marina entrance location and arrangement protects the berths from any adverse effects of nuisance wave action and will be further refined during detailed design.

7.3 Coastal Inundation

The proposed marina site is currently subject to 1%AEP inundation (refer to Figure 6 below), however we consider that once future sea level rise is considered during the design and other controls (breakwater/groyne) are in place, the potential for any future inundation of the site will be mitigated.

Minimum finished floor levels can be set as part of the more detailed design as part of the substantive application to adequately mitigate potential effects.

Figure 6: Auckland Council GeoMaps 1% ARI Inundation Data

7.4 Coastal Erosion/Accretion

As outlined in Section 2.3, periodic maintenance dredging of the marina and deep-water entrance channel can be expected, however no significant sediment accretion is anticipated, owing to both the shelter provided by the proposed breakwater/groyne to the south and the lack of any significant volume of sediment laden run-off into the marina from the north or east from any water courses.

We consider coastal erosion within or surrounding the marina to be minor issue, with the breakwater/groyne expected to mitigate the potential foreshore/cliff erosion mentioned in the geotechnical section.

8 CONCLUSIONS

In summary, we consider that dredging of the existing seabed to form the Hobbs Bay Marina should not present any significant engineering challenges and can be undertaken in a manner that controls sediment discharges to water during dredging.

It is important to note that material types and physical properties can vary significantly within the project area (e.g., the proposed marina area) and even within a single layer or formation. Therefore, a sufficient number of borings, including in-situ and laboratory tests, should be conducted to accurately represent the materials to be dredged across the project area and at the specified dredging depth.

Several options for the disposal of dredge material exist; the potential effects of these options vary but in all cases there are options to avoid or mitigate any adverse effects. We also consider that the development can be serviced by the existing and proposed public three waters reticulation networks within the vicinity of the site. Any impacts/effects of coastal processes are relatively insignificant and will be subject to detailed design as part of the substantive application.

9 LIMITATIONS

This report should be read and reproduced in its entirety, including the limitations to understand the context of the opinions and recommendations given.

This report has been prepared exclusively for Hopper Developments Ltd in accordance with the brief given to us or the agreed scope and they will be deemed the exclusive owner on full and final payment of the invoice. Information, opinions, and recommendations contained within this report can only be used for the purposes with which it was intended. LDE accepts no liability or responsibility whatsoever for any use or reliance on the report by any party other than the owner or parties working for or on behalf of the owner, such as local authorities, and for purposes beyond those for which it was intended.

This report was prepared in general accordance with current standards, codes and best practice at the time of this report. These may be subject to change.

For and on Behalf of LDE Ltd

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10 APPENDIX – REFERENCE MATERIALS

Drawings

- Davis Coastal Consultants Limited – P01 Proposed Layout, Hobbs Marina, Rev. A, dated 01 May 2024.

Geotechnical documents provided for our study include:

- CMW (NZ) Limited – Geotechnical Investigation Report for Resource Consent; 5 Daisy Burrell Drive, Whangaparaoa, dated 6 July 2022, Revision 2.
- 4Sight Consulting Limited (Now part of SLR) – Site Specific Coastal Hazard Assessment, dated 5 May 2023, version 3.0
- CMW (NZ) Limited – s92 Response Letter, dated 27 April 2023
- CMW (NZ) Limited – s92 Response Letter, dated 19 June 2023
- CMW (NZ) Limited – Revised Geotechnical Design Memo for Design Change at Lots 9 and 10, dated 22 August 2023.

Other documents reviewed as reference literature:

- Ministry of Agriculture and Forestry (MAF) Biosecurity New Zealand Technical Paper No: 2019/05, June 2006