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Port of Tauranga reconsent of dredging activities: assessment of environmental effects – marine pest risks

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Port of Tauranga reconsent of dredging activities: assessment of environmental effects – marine pest risks

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The authors have read and agree to comply with the Code of Conduct for Expert Witnesses as set out in the Environment Court Consolidated Practice Note 2023 where it is relevant to this report, acknowledging that this is a technical report rather than expert evidence.

Prepared for Port of Tauranga Limited

This report was revised on 17 August 2026 and supersedes previous versions released on 18 March 2026, 6 March 2026 and 11 February 2026.

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Glossary

Term	Definition
AEE	Assessment of environmental effects
BFMP	Biofouling management plan
BHD	Backhoe dredger
BOPRC	Bay of Plenty Regional Council
BWM Convention	Ballast Water Management Convention
CMA	Coastal marine area
CRMS	Craft Risk Management Standard
DMP	Dredge management plan
HAB	Harmful algal bloom
MGPS	Marine growth prevention system
MITS	Marine Invasives Taxonomic Service
MPI	Ministry for Primary Industries
NIS	Non-indigenous species
NMHRSS	National Marine High Risk Site Surveillance
NZCPS	New Zealand Coastal Policy Statement 2010
POTL	Port of Tauranga Limited
RCEP	Regional coastal environment plan
RPMP	Regional pest management plan
TONMBP	Top of the North Marine Biosecurity Partnership
TSHD	Trailing suction hopper dredger

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Executive summary

Port of Tauranga Limited (POTL) is applying to renew resource consents related to capital and maintenance dredging in Tauranga Harbour and deposition of the associated material. The proposed capital dredging is to deepen the approach to Berth 1, an area of the Passing Lane in No. 1 Reach and the sitting basins, totalling 800,00 m^3. POTL is seeking approval for the deposition of 2,900,000 m^3 of capital dredgings, which includes 1,500,000 m^3 associated with its Stella Passage Extension (subject to a separate resource consent). The maintenance dredging will be limited to 250,000 m^3 annually (averaged over 10 years, with an annual cap of 350,000 m^3). The existing consents authorise disposal of dredged material at several areas within and outside the harbour; however, it is expected that the bulk of the material will be deposited at the nearshore and main offshore sites, the latter of which is located approximately 10 km from the port. Dredging activities present vector risks that can lead to marine non-indigenous species (NIS) being translocated within or between regions. Consequently, as part of the reconsent application Cawthron Institute has undertaken an assessment of biosecurity risks to the marine environment related to the proposed activities, including the potential for NIS to be introduced to, and / or spread within, the wider Bay of Plenty Region.

Dredge vessels arriving from outside the Bay of Plenty Region constitute the largest relative biosecurity risk associated with the proposed activities. Elevated risk occurs if the vessels' region of origin has marine NIS of concern not currently present within the Bay of Plenty, and if risk mitigation measures have not been implemented for these vessels prior to their passage to the port. Dredge spoil disposal could also act as a pathway for the inadvertent transfer of marine NIS from the dredge location to the spoil disposal grounds. The majority of NIS established within Tauranga Harbour are sessile filter-feeding invertebrates (e.g. sponges, hydroids, bryozoans, ascidians) and seaweed species that primarily colonise hard substrates. There is likely to be a lack of suitable habitats for these taxa at the disposal grounds. However, the Mediterranean fanworm (*Sabella spallanzanii*) and Asian paddle crab (*Charybdis japonica*) present specific risks that may warrant careful consideration. While there are several detection records of three additional non-indigenous soft sediment–dwelling species (including a bivalve, a crab and a whelk) in the proposed dredge area, none of these species are recognised as specific biosecurity threats, nor are they subject to management controls in the Bay of Plenty or other areas of Aotearoa New Zealand. New NIS may establish in Tauranga Harbour in the future that could pose a higher risk of establishment at the spoil disposal grounds, warranting an adaptive approach that can account for future changes in risk.

Biosecurity risks from any vessels arriving from overseas are expected to be minimised by the Craft Risk Management Standard's long-stay requirements that dictate vessels must be ostensibly free of biofouling. For any vessels arriving from other locations within Aotearoa New Zealand, the Bay of Plenty Regional Council's (BOPRC's) regional pest management plan requires that they have no more than a slime layer and / or barnacles on their hull, and compliance can be enabled via vessel-specific biofouling management plans (BFMPs) in accordance with Ministry for Primary Industries guidance. These BFMPs should be provided to BOPRC for assessment prior to any vessel arriving, and they should also include information to enable any risk from ballast water or entrained sediment to be assessed and

appropriately mitigated. The biosecurity risks associated with the dredge spoil disposal are expected to be largely mitigated by the close proximity and environmental similarity of the dredge and disposal sites. A mechanism should exist to adaptively manage any future changes in biosecurity risk. For example, if the 6-monthly National Marine High Risk Site Surveillance data for Tauranga Harbour and any additional ad hoc surveying by BOPRC detect new pests in the area, then a reassessment of risk and mitigation options should be allowed for. If BOPRC reasonably considers that the risk profile has changed, it should be able to require a new risk assessment by a suitably qualified person.

The proposed dredging activities within Tauranga Harbour are likely to present an incremental change in marine biosecurity risk over the existing situation, primarily associated with vessel movements and dredge spoil disposal. POTL proposes to manage all risks in an integrated way through the development of a dredge management plan (DMP) that is in line with current requirements and provides scope to adapt as required. The DMP will include specific biosecurity measures for vessels (via BFMPs that cover risks from biofouling, ballast and sediment), and consent conditions are proposed to enable adaptive management of future changes in biosecurity risk (e.g. if new pest incursions occur, or if existing pests proliferate). If the proposed mitigation measures are implemented appropriately, the residual marine biosecurity risk is expected to be minor or less than minor.

1. Background and scope

1.1 Proposal description

Port of Tauranga Limited (POTL) is preparing an application for renewal of resource consents related to maintenance dredging in Tauranga Harbour and to enable some additional capital dredging (Figure 1). The existing resource consents (RC65806 and RC65807) were granted in 2013 and authorise four activities within the coastal marine area (CMA):

1. the disturbance of the seabed by capital dredging
2. the disturbance of the seabed by maintenance dredging
3. the deposition of the dredged material to areas of the CMA
4. the removal of some of the dredged material from the CMA.

The existing consents will expire in December 2027, and POTL wishes to reconsent all four activities. Specifically, POTL wishes to retain the ability to undertake maintenance dredging, typically annually, to maintain the depth and area of shipping channels and basins. It is proposed that additional capital dredging will be undertaken, limited to deepening the approach to Berth 1 at the southern end of Pilot Bay (including in the existing resource consent), deepening an area of the Passing Lane to smooth the entrance corner beyond the Harbour Entrance (2,786 m^2, to 17.4 m deep) (not included in the existing resource consents), and extending the width of the Mount Maunganui Sitting Basin (a strip 28,000 m long by 50 m wide) and Sulphur Point Sitting Basin (a strip 1,222 m long by 50 m wide) (included in the existing resource consents). The existing consents authorise disposal of dredged material at several areas within the harbour and outside the harbour entrance, and the same disposal grounds are proposed for the reconsent (Figure 1).

1.2 Scope of assessment

POTL have requested an assessment of the potential marine biosecurity effects arising from the proposed dredging activities, including the potential for non-indigenous species (NIS) to be introduced to, and / or spread within, the wider Bay of Plenty Region. This includes transfer of NIS via associated vessel movements, dredge spoil disposal and, in the case of some capital dredging projects, altered shipping patterns. It is noted that the existing resource consents (granted in 2013) have no specific conditions related to marine biosecurity.

The report is structured into four main sections:

- overview of marine pest risks associated with dredging activities in Aotearoa New Zealand
- identification of existing marine pest risks within the Bay of Plenty Region
- identification of marine pest risks associated with the proposed dredging activities

- recommendations for mitigating marine pest risks associated with the proposed dredging activities based on accepted best practice.

This report forms part of the overall assessment of environmental effects (AEE) to support the application. The focus of the marine pest assessment is on risks from macroscopic species (i.e. marine animals and plants with adult life stages that are usually visible to the eye). Microscopic organisms such as biotoxin-producing microalgae associated with harmful algal blooms (HABs) and pathogens and parasites are outside the scope of the current assessment. The identification of marine pest risks and appropriate mitigation approaches in this report are based on the information made available to Cawthron Institute (Cawthron) by POTL. Because information about the specific dredge vessel(s) to be used for capital works is unknown at this time, the assessment focuses on generic dredging vessel operations and the associated sources of biosecurity risk.

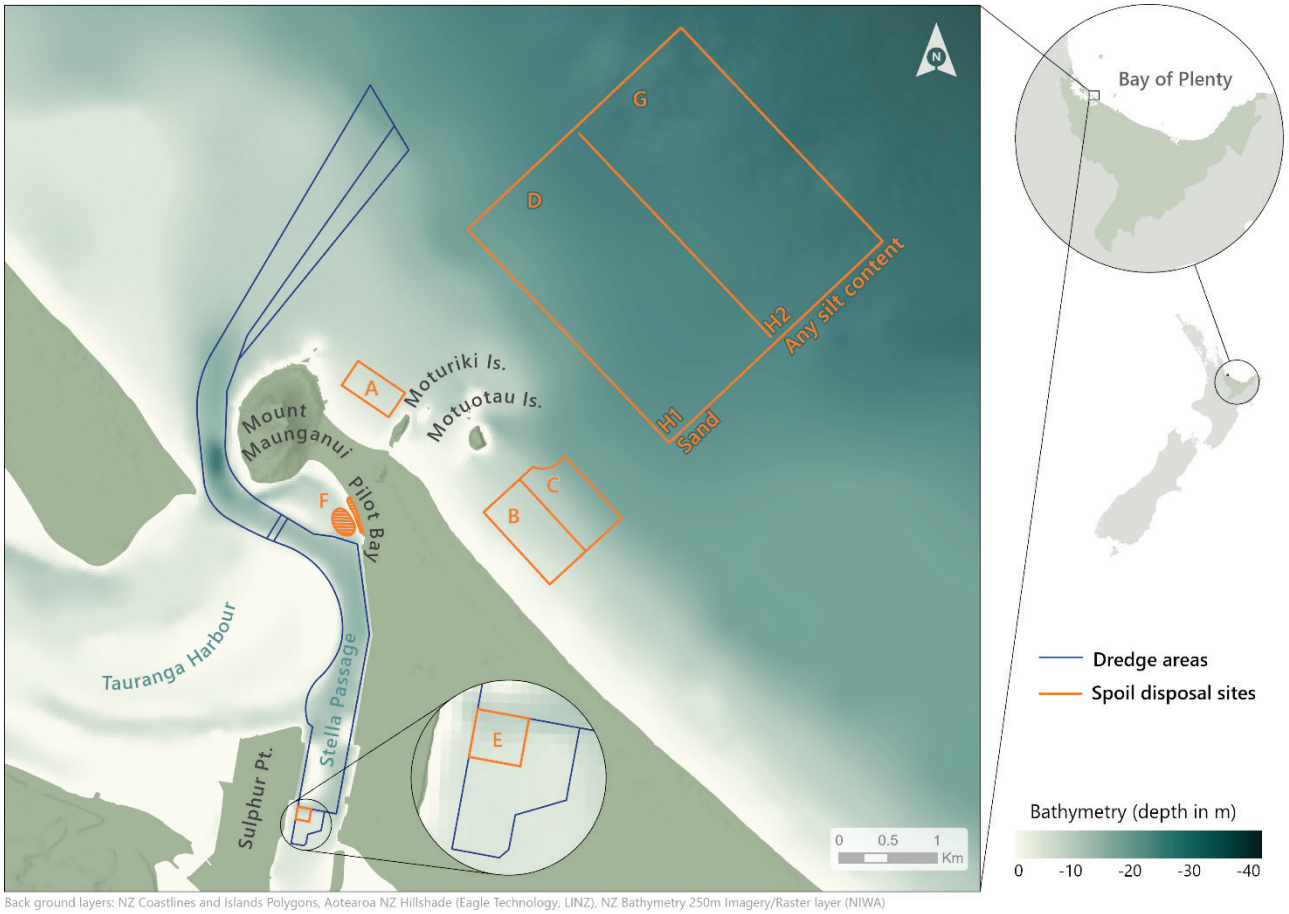


Figure 1. Locations of proposed dredge areas and spoil disposal sites for maintenance and capital dredging by Port of Tauranga Limited at the Tauranga Harbour site. Data supplied by Port of Tauranga Limited. For more detailed maps of proposed dredging and disposal sites, see Appendix 1.

2. Biosecurity risks and dredging activities

2.1 Background

The introduction and spread of marine NIS presents a considerable threat to environmental, economic, social and cultural values (Hewitt et al. 2004; Georgiades et al. 2016). At least 429 NIS have been introduced to Aotearoa New Zealand's marine environment, with 266 of these species considered to have established self-sustaining populations (Seaward and Inglis 2023). Although recorded marine NIS in Aotearoa New Zealand are numerous, only a few receive public attention – typically those that have been demonstrated to cause economic or ecological harm. Such species are recognised as marine 'pests' (Falk-Petersen et al. 2006). Impacts of marine NIS are dependent on context and can vary considerably based on species attributes, as well as resource levels, abiotic environmental conditions and the community structure of invaded habitats (Thomsen et al. 2014). Consequently, it is very difficult to accurately predict the effects of a given NIS in a particular environment. However, generalised information on the key types and attributes of marine pests, including a description of susceptible habitats and potential impacts to core values, can be useful for predicting the potential consequences of their incursion in a new area (Table 1).

Management of marine pests after they have become established in a location is often challenging and expensive (Cahill et al. 2021). As such, a key priority for successful marine biosecurity is to prevent the initial introduction and spread of these organisms in the first instance. Previously, the focus of marine biosecurity management has been largely species-specific. However, given the difficulty predicting which species will be 'pests' in which locations, a pathway-based[1] approach is now generally considered to best address marine biosecurity incursion and spread risks to a region or to Aotearoa New Zealand as a whole. Rather than focus on certain species, pathway-based management measures are inclusive of all associated species, irrespective of their status as pests. This approach recognises that the impacts of known NIS may vary considerably over time and among locations, and that NIS with no designated or recognised status may emerge as problem organisms in future years. In addition, the risk profile for a region is likely to change over time as species distributions change within Aotearoa New Zealand, or as new risk species from overseas source regions arrive and establish (Forrest et al. 2015). Managing human-mediated vectors[2] and associated risk mechanisms is recognised as the most effective strategy to reduce incursion and spread likelihoods. A thorough understanding of all transport pathways and mechanisms of NIS spread in a given area is therefore critical to achieving effective management, as unmanaged vectors have the potential to compromise the overall success of biosecurity initiatives (Sinner et al. 2013).

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1 There are a number of human activities in the marine space that may, intentionally or unintentionally, move organisms from one place in Aotearoa New Zealand to another. These activities are generally called 'pathways' and include a range of industries operating within the marine environment (e.g. shipping, aquaculture, etc.).

2 Associated with pathways are the physical means by which the organism is transported, referred to as 'vectors'. Vectors can include vessels and moveable structures (e.g. finfish farm pen structures, oil rigs), equipment (e.g. ropes, anchors) and aquaculture livestock (e.g. shellfish spat) that move among different geographic locations (within and outside a region).

Table 1. Generalised information on the key types of marine pests, including examples of high-profile species, a description of susceptible habitats and potential impacts to core values. *Indicates species not currently present in Aotearoa New Zealand. Modified from Fletcher and Johnston (2019).

Type of pest	Description	Example species	Susceptible habitats	Potential impacts
Filter-feeding invertebrates	Often occur in very high densities and can modify natural ecosystems through the possible exclusion of indigenous species. High biomass of problematic fouling organisms increases the time and costs of harvesting and factory processing of cultured shellfish species. They can remove potential food sources from the water column and impact nutrient availability. They may compete for food and space with cultured species such as oysters and mussels.	• *Sabella spallanzanii* • *Styela clava* • *Didemnum vexillum*	• Submerged artificial structures (e.g. wharf pilings, docks) • Cultured shellfish stock • Soft sediment	• Ecological • Economic • Social / cultural • Amenity
Mobile predators	Mobile predators directly prey upon and compete with indigenous species. They feed on a wide variety of prey, including species of commercial importance. Invasive mobile predators such as sea stars and crabs can establish large populations and can feed voraciously on shellfish species, including mussels, scallops, oysters and clams, directly impacting on social / cultural and commercial values.	• *Charybdis japonica* • *Eriocheir sinensis** • *Carcinus maenas** • *Asterias amurensis**	• Rocky reef • Soft sediment • Submerged artificial structures • Cultured shellfish stock	• Ecological • Economic • Social / cultural • Amenity
Infauna	Infauna species live in the sediments of the seafloor and include crabs, tubeworms and shellfish. They can reach high densities and can cause dramatic changes to soft sediment communities. They can outcompete indigenous species for available food and space. Burrowing infauna have been documented to cause weakening and collapse of river and estuary banks (e.g. Chinese mitten crab, *Eriocheir sinensis*).	• *Eriocheir sinensis** • *Potamocorbula amurensis**	• Soft sediment	• Ecological • Economic • Social / cultural • Amenity
Macroalgae	Macroalgae can form dense populations due to their rapid growth rates and high reproductive output. They can colonise a variety of substrata and can tolerate wide-ranging temperatures and depths. They can compete with indigenous canopy-forming species, and their establishment can alter light availability and flow regimes, change the presence of understorey and epibiotic assemblages, and alter macrofauna abundance and diversity.	• *Undaria pinnatifida* • *Sargassum horneri** • Exotic *Caulerpa*	• Rocky reef • Submerged artificial structures • Cultured shellfish stock	• Ecological • Economic • Social / cultural • Amenity

2.2 Biosecurity management in Aotearoa New Zealand

In Aotearoa New Zealand, biosecurity management is predominantly administered by the Ministry for Primary Industries (MPI), which implements the Biosecurity Act 1993, and regional authorities. MPI is primarily concerned with preventing NIS incursion and establishment in Aotearoa New Zealand to manage risks to national and regional values. Regional authorities are primarily concerned with the within-country management of established pests. MPI and regional authorities often work in partnership, and fulfilment of their shared responsibilities includes:

- managing risk vectors pre-border, border and post-border
- carrying out surveillance at high-risk points of entry (shipping ports) to facilitate early detection of high-risk species
- responding to new-to-country and new-to-region incursions
- managing associated inter-regional vector movements
- implementing control programmes for priority pests
- managing related communications (e.g. awareness and education) (Sinner et al. 2013).

The New Zealand Coastal Policy Statement 2010 (NZCPS)[3] provides guidance on biological risk management in the marine environment. Under Policy 12 of the NZCPS,[4] regional authorities are required to 'provide in regional policy statements and in plans, as far as practicable, for the control of activities in or near the CMA that could have adverse effects on the coastal environment by causing harmful aquatic organisms to be released or otherwise spread'.[5] In accordance with this, amendments to the Biosecurity Act in 2012 allowed for the creation of regional pest management plans (RPMPs) to reduce the spread of pests and diseases that are already present in Aotearoa New Zealand but not yet widespread. In the Bay of Plenty Region, a RPMP has been produced and is administered by the Bay of Plenty Regional Council (BOPRC), providing the framework for management of specified organisms, including marine pests, in the region. Policy 12 also specifies the inclusion of 'conditions in resource consents, where relevant, to assist with managing the risk of such effects occurring'. The Bay of Plenty Regional Coastal Environment Plan (RCEP)[6] contains rules relevant to the proposed activities. Specifically, Objective 44 of the RCEP states that 'exotic or introduced plants and harmful aquatic organisms are prevented from establishing in the CMA and the adverse effects of existing infestations of exotic plants and harmful aquatic organisms in the coastal environment are remedied or mitigated'.

BOPRC is also involved in the Top of the North Marine Biosecurity Partnership (TONMBP), which coordinates efforts to prevent and manage marine biosecurity incursions across four regional jurisdictions. The partnership also includes Auckland Council, Northland and Waikato Regional Councils, MPI, the Department of Conservation, the aquaculture industry, port companies, local tangata whenua

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3 New Zealand Coastal Policy Statement 2010 (NZCPS): Marine and coastal publications (doc.govt.nz)

4 The proposal will involve activities listed in the New Zealand Coastal Policy Statement (NZCPS) Policy 12(2). Specifically, subclause (b) as it relates to the discharge or disposal of organic material from dredging.

5 Harmful aquatic organisms are aquatic organisms that, if introduced into coastal water, may adversely affect the environment or biological diversity, pose a threat to human health, or interfere with the legitimate use or protection of natural and physical resources in the coastal environment (NZCPS 2010, glossary).

6 The Bay of Plenty Regional Coastal Environment Plan (boprc.govt.nz)

and other stakeholders. These regional authorities, and others around the country, have now developed or are developing plans that include practical measures to reduce the risks of transport of marine pests and disease agents. With reference to the current application, BOPRC and the other three councils in the TONMBP are working towards a common set of rules relating to hull fouling on vessels (referred to as the Clean Hull Plan) that seeks to prevent marine pests being spread by moving boats.[7]

2.3 Recognised high-risk marine non-indigenous species

A number of marine NIS have been identified as high risk and subsequently classified as 'unwanted organisms' under the Biosecurity Act 2013. There are currently 12 marine invertebrate or algae species listed (Table 2), eight of which are also listed as 'notifiable organisms' under the Biosecurity (Notifiable Organisms) Order 2016. Each species has a prior history of invasion outside Aotearoa New Zealand, is known to have significant impacts on indigenous ecosystems or economic values in the regions it has invaded, and is deemed capable of surviving in Aotearoa New Zealand coastal waters (Wotton and Hewitt 2004). Five of these species are already established in Aotearoa New Zealand: Asian kelp (*Undaria pinnatifida*), clubbed tunicate (*Styela clava*), Mediterranean fanworm (*Sabella spallanzanii*), and two 'exotic caulerpa' species, *Caulerpa brachypus* and *C. parvifolia*. Of these, *U. pinnatifida*, *S. clava* and *S. spallanzanii* have been previously recorded within the Port of Tauranga.[8] In addition to those listed as unwanted organisms, two further marine species are specified on Biosecurity New Zealand's list of priority pest and diseases of biosecurity concern to plant and aquatic health (Table 2).[9] These are the Asian brown mussel (*Perna perna*) and Asian shore crab (*Hemigrapsus sanguineus*).

There are several other high-profile marine pest species currently present in Aotearoa New Zealand that have, for various reasons, not been formally designated as unwanted or notifiable organisms. Some of the higher-profile species in this category include the Asian paddle crab (*Charybdis japonica*), droplet tunicate (*Eudistoma elongatum*), Asian date mussel (*Arcuatula senhousia*), Australian 'cunjevoi' tunicate (*Pyura doppelgangera*), vase tunicate (*Ciona* spp.) and carpet tunicate (*Didemnum vexillum*). These species are often managed by regional jurisdictions through associated RPMPs. For the Bay of Plenty specifically, the RPMP (released in 2020) includes five marine species that have been classified as pests within the region. At the time of writing, *E. elongatum* and the solitary sea squirt (*Pyura praeputialis*) are listed as exclusion pests,[10] and *C. japonica*, *S. clava* and *S. spallanzanii* are listed as progressive containment pests[11] under the RPMP.

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7 Further information is available at https://www.marinepests.nz/clean-hull-plan

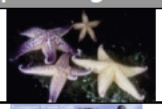
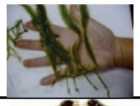
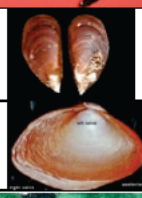
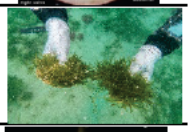
8 Both *Styela clava* and *Sabella spallanzanii* are still at very low population levels.

9 These species do not have any legal designation as pests but have been identified as potential threats. For more information, see https://www.mpi.govt.nz/biosecurity/pests-and-diseases-not-in-new-zealand/ocean-pests-and-diseases-not-in-nz/

10 Exclusion pests are not known to be present in the region and it is a key regional priority that they do not become established here.

11 The progressive containment programme covers species that are established to the point that eradication is not feasible, but it is feasible to prevent the pest from spreading to other parts of the region, to reduce the distribution within the region or to eradicate the pest from parts of the region.

Table 2. Marine non-indigenous species (NIS) designated as 'unwanted organisms', 'notifiable organisms' or priority pests and their distribution in Aotearoa New Zealand. Locations with significance to the proposed dredging activities are noted in bold.

Scientific and common name	Aotearoa New Zealand distribution	Example image
Asterias amurensis * † ‡ **Northern Pacific sea star**	Not recorded	
Carcinus maenas * † ‡ **European shore crab**	Not recorded	
Caulerpa taxifolia * † ‡ **Green aquarium weed**	Not recorded	
Eriocheir sinensis * † ‡ **Chinese mitten crab**	Not recorded	
Haliotis rufescens * † **Red abalone**	Not recorded	
Hemigrapsus sanguineus ‡ **Asian shore crab**	Not recorded	
Penaeus chinensis * † **Chinese prawn**	Not recorded	
Perna perna ‡ **Asian brown mussel**	Not recorded	
Potamocorbula amurensis * † **Asian clam**	Not recorded	
Caulerpa brachypus * **Caulerpa parvifolia *** **Exotic caulerpa**	Hauraki Gulf / Tīkapa Moana and Bay of Islands	
Sabella spallanzanii * † **Mediterranean fanworm**	Northland, Hauraki Gulf / Tīkapa Moana and Firth of Thames, **Tauranga**, Gisborne, Wellington, Picton, Nelson, Tarakohe, Lyttelton, Dunedin, Bluff	
Styela clava * **Clubbed tunicate**	Northland, Hauraki Gulf / Tīkapa Moana and Firth of Thames, **Tauranga**, Wellington, Picton, Nelson, Golden Bay / Mohua, Lyttelton, Dunedin	
Undaria pinnatifida * **Asian kelp**	Widespread in harbours throughout New Zealand (excluding the west coast of the South Island), including **Tauranga**	

* Unwanted organism under the Biosecurity Act 1993.

† Notifiable organism under the Biosecurity (Notifiable Organisms) Order 2016.

‡ Specified on Biosecurity New Zealand's list of priority pest and diseases of concern to plant and aquatic health.

2.4 Transport vectors associated with dredging activities

Dredging involves the removal of sediments and debris from the seabed, often for the purpose of maintaining or increasing the depth of navigation channels, anchorages or berthing areas to ensure the safe passage of vessels. Several smaller cutter-suction, backhoe, clamshell and bucket dredges, and hopper barges and tugs, are based around Aotearoa New Zealand and are used for domestic dredging and construction projects (Floerl et al. 2015). However, capital dredging for Aotearoa New Zealand ports requires the extraction of larger quantities of seabed compared to maintenance dredging, and thus is usually carried out by larger dredges contracted from overseas (Inglis et al. 2013). Dredging activities present vector risks that can lead to marine pests being translocated within or between regions. These activities include vessel movements, dredge spoil disposal and, in the case of some capital dredging projects, increased shipping activities as a result of increased accessibility. Controlling these vector risks, which are discussed in detail below, is a critical step in effective biosecurity management for this sector.

Movement of vessels

Vessel movements are generally considered the most important anthropogenic pathway for marine NIS spread (Molnar et al. 2008; Ruiz et al. 1997; Seebens et al. 2013). Vessels can transport marine organisms as part of biofouling[12] communities, within ballast water used to maintain vessel stability, or within entrained water or debris.

The role of vessel biofouling in transferring marine NIS is recognised as a particularly important biosecurity risk mechanism in Aotearoa New Zealand. Biofouling communities accumulate on vessel hulls, within internal seawater systems, and on 'niche' areas (e.g. bow thrusters, rudders, sea chests,[13] gratings) that are recessed or protected from water drag, or are not adequately protected by antifouling coatings (Bell et al. 2011). The volume and complexity of biofouling communities on or in a vessel is influenced by the time since the vessel was last dry-docked, the age of any applied antifouling coatings and the type (if any) of marine growth prevention systems (MGPS)[14] installed within internal seawater systems. For vessels arriving from overseas, voyage history is important as it can help identify whether the vessel operated in locations known to harbour species of potential concern to Aotearoa New Zealand, as well as influence the survival in Aotearoa New Zealand waters of any biofouling organisms present on the vessel. For example, if the vessel's most recent deployment was in a temperate location that is 'climatically' similar to Aotearoa New Zealand, there is likely to be an increased risk that the recipient region will provide a suitable recipient environment for any 'hitchhiking' marine organisms.

Ballast water is used to aid the stability of vessels and is often carried on larger dredges. Depending on the source, this water may contain potentially harmful species as adults or as their dispersive life stages (e.g. invertebrate larvae or seaweed spores). If this water is subsequently discharged at another location, any associated organisms may be transferred. Sediment may also be associated with equipment or deck

[12] Biofouling refers to the gradual accumulation of organisms and biogenic structures on artificial surfaces submerged in marine or freshwater environments. These assemblages can vary greatly in complexity and composition, but typically include microbial organisms, sessile algae and invertebrates (e.g. mussels, bryozoans, sponges, etc.).

[13] Sea chests are water-intake chambers that are recessed into the side of the hull of large vessels.

[14] Marine growth prevention systems (MGPS) deliver antifouling agents (generally biocides) to prevent settlement and growth of marine organisms within internal seawater systems of vessels.

spaces used to acquire (e.g. dredge head, suction pipes) and hold (e.g. dredge hopper) dredged material, and in addition may occur in ballast tanks. The movement of entrained sediments therefore presents a biosecurity risk if there are any associated marine organisms.

Dredge spoil disposal

Dredge spoil has been recognised as a potential vector for the translocation of marine NIS during its transfer from the dredge location to disposal grounds (Sinner et al. 2012). The biosecurity risk will largely depend on whether the dredging location has marine NIS present that do not occur in the spoil disposal ground. Short-distance (i.e. < 1 km) translocation of NIS during dredge spoil disposal is probably of little consequence considering the natural dispersal ability of most marine species.[15] For spoil locations that are more widely separated, including those outside of the 12 nautical mile limit, there are a range of other considerations. In addition to the risk of species translocation, physical disturbance and alteration of the seabed because of spoil disposal may increase the susceptibility of seabed habitats to colonisation by marine pests.

Subtidal soft sediment–dwelling species are most likely to be successfully spread via dredge spoil disposal. For example, the small bivalve *Theora lubrica* is widespread in the Hauraki Gulf / Tīkapa Moana (hereafter Hauraki Gulf), but can be particularly abundant in disturbed areas, including spoil disposal grounds (Roberts 1990). Species listed as unwanted organisms by MPI that have not been recorded in Aotearoa New Zealand, but can live in subtidal soft sediment marine habitats, are the Asian clam (*Potamocorbula amurensis*), European green crab (*Carcinus maenas*) and Northern Pacific sea star (*Asterias amurensis*). It should also be noted that there are a range of other potentially high-risk marine species that meet these habitat requirements but have not been deemed unwanted organisms – for example, *C. japonica* and *A. senhousia*. Furthermore, several high-risk species can colonise small areas of hard substrate within predominantly soft sediment habitats – for example, both *S. spallanzanii* and *S. clava* have been shown to establish on pieces of shell or rock material within the Hauraki Gulf and Firth of Thames regions. These species could theoretically colonise dredge spoil disposal areas if suitable habitat is available.

Increased shipping activities

Capital dredging projects associated with commercial ports are often related to widening and deepening of shipping channels to enable larger ships to enter the port. Resulting changes in the size or type of ships visiting the port, possible increases in vessel traffic (due to increased accessibility by larger ships) and altered patterns of trade (e.g. ship arrivals from new global source regions) are all factors that have the potential to increase marine biosecurity risk for the recipient region (Kolar and Lodge 2001; Perrings et al. 2005). In particular, increased vessel traffic potentially leads to a greater risk of marine NIS spreading from the port to other domestic destinations, as well as a greater risk that the port receives potentially harmful species from elsewhere.

[15] The duration of planktonic larval stages of some high-risk marine species can range from days to months. Depending on local hydrodynamics, these species may be capable of dispersing considerable distances through natural mechanisms alone.

3. Existing regional biosecurity risks

Tauranga Harbour is a large tidal estuary (approximately 218 km^2) comprising two harbour basins that are separated by large intertidal flats (Clark et al. 2018). The harbour comprises numerous bays, estuaries, wetlands and saltmarshes, and it contains the largest remaining seagrass beds in the Bay of Plenty. Most of the coastline is made of up of soft sandy shores and dune systems, aside from the eastern end of the harbour, where the city of Tauranga is located. Nearly the entire harbour (aside from the port area) has been identified as an outstanding natural feature and landscape, and as an area of significant conservation value under the Bay of Plenty RCEP (Lawton and Conroy 2019).

Introductions of marine pest species to the harbour may have irreversible effects, including biodiversity loss and alteration of ecosystem function (e.g. Tait et al. 2023). Most of the current marine pest species in Aotearoa New Zealand are fouling organisms that predominantly colonise hard substrates. However, several invasive crustaceans and bivalves that are on the national watch list or are present in nearby regions would affect soft sediment habitats if they were introduced to the harbour. In addition, introductions affecting marine industries within the Bay of Plenty CMA may result in considerable direct economic costs, particularly with reference to high-value industries such as shellfish aquaculture and fisheries (see Soliman and Inglis 2018). Negative impacts to key social / cultural, amenity and public health values are also possible (i.e. impacts on food harvesting, tourism and recreational fishing).

Marine biosecurity effects arising from the proposed dredging activities should be considered from a regional perspective, including in the context of other controlled and uncontrolled activities. A summary of existing biosecurity risks within the Bay of Plenty Region are therefore provided below.

3.1 Existing populations of non-indigenous marine species

Commercial shipping ports and larger marinas are recognised as high-risk areas for the introduction of marine NIS, with species distribution data for these sites generally more comprehensive than for other coastal areas. A baseline biological survey of the Port of Tauranga undertaken in April 2005 recorded a total of 264 taxa, including 177 indigenous species, 9 NIS, 43 cryptogenic species[16] and 35 organisms that could not be identified to species level (Inglis et al. 2008). The nine NIS comprised six species of bryozoan (*Bugulina flabellata*, *Bugula neritina*, *Arbopercula angulata*, *Watersipora subtatra*, *Amathia distans* and *Amathia verticillata*), two hydroids (*Monotheca pulchella* and *Tridentata marginata*) and one sponge (*Cliona celata*). The hydroid *T. marginata* and the sponge *C. celata* have subsequently been reclassified as indigenous and cryptogenic, respectively. Eight additional NIS were described in an earlier baseline survey of the same sampling locations (Inglis et al. 2006); they included two annelid worms (*Dipolydora flava* and *Polydora hoplura*), two hydroids (*Clytia ?linearis* and *Eudendrium capillare*), two amphipods (*Apocorophium acutum* and *Monocorophium acherusicum*), one solitary ascidian (*Cnemidocarpa* sp.) and one seaweed (*Codium fragile* subsp. *fragile*). The annelid worm *D. flava* and the solitary ascidian *Cnemidocarpa* sp. have subsequently been reclassified as indigenous species. Most of the NIS recorded are likely to have been introduced to Aotearoa New Zealand accidentally by

[16] Organisms whose geographic origins (i.e. whether they are indigenous or non-indigenous) are uncertain.

international shipping. Introductions to Port of Tauranga itself are likely to have occurred directly through international vessel arrivals or as secondary spread from other regions through domestic vector movements.

Since 2002, Tauranga Harbour has been included in the government-funded National Marine High Risk Site Surveillance (NMHRSS) programme. This programme implements surveys every 6 months at high-risk sites around the country and is designed to detect the presence of primary[17] and secondary target species.[18] The NMHRSS programme uses a variety of methods designed to sample a range of soft and hard habitat types. Methods include benthic sled tows, crab condos, baited crab traps, and diver and shore searches. Since the more intensive baseline surveys were completed in 2002 and 2005, four secondary target species (*A. senhousia, D. vexillum*, *S. clava* and *S. spallanzanii*) have been documented through NMHRSS surveys within Tauranga Harbour. In addition, a further 35 non-target NIS have previously been detected in Tauranga Harbour based on a combination of the NMHRSS programme and other surveys (see Appendix 2; Marine Biosecurity Porthole 2025). This includes several recognised pest species such as *U. pinnatifida*, *C. japonica*, the Japanese mantis shrimp (*Oratosquilla oratoria*) and the light-bulb ascidian (*Clavelina lepadiformis*) (MPI 2022). When collated, these sources indicate that marine NIS are relatively widespread within the southern basin of the harbour (Figure 2).

A survey of wharf piles on the west and east sides of Stella Passage was carried out as part of an earlier resource consent application to develop the wharf facilities (Leonard et al. 2020). Scrapings (0.5 m^2) were taken from four piles, with two depths sampled per pile (5 m and 10 m). In total, 88 taxa were identified from the wharf pile collections, with a particularly high diversity of sponge and ascidian taxa. The authors state that only one 'recently introduced organism' was recorded (a single *Styela clava*)..[19] The port is subsequently described as relatively uninvaded based on this data; however, the area surveyed was very small in the context of the wider port (four of about 4,340 wharf piles). In addition to the hard substrate assessment, the channel floor adjacent to the existing wharf area was surveyed using benthic sled / dredge tows (Leonard et al. 2020). Eighty-seven taxa were identified during this assessment, and no introduced species were recorded. These findings were similar to an earlier survey in the same area, which recorded 85 taxa (Healy et al. 2009).

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17 Currently, there are five primary target species, all listed on MPI's Unwanted Organisms Register (Table 2), which have been identified by MPI as presenting a significant risk of arriving and establishing in Aotearoa New Zealand waters.

18 Includes non-indigenous or cryptogenic organisms that are known to be established in Aotearoa New Zealand coastal waters to enable detection of range extensions. The list of secondary target species has changed over the course of the NMHRSS programme, as certain species become recognised threats or no longer warrant specific monitoring.

19 Several other non-indigenous and cryptogenic taxa were recorded, although they are recognised as having been present in Aotearoa New Zealand for a considerable time period. In addition, some groups of organisms were grouped together for identification purposes (e.g. bushy bryozoans, encrusting bryozoans), so it is unclear if non-indigenous species are present.

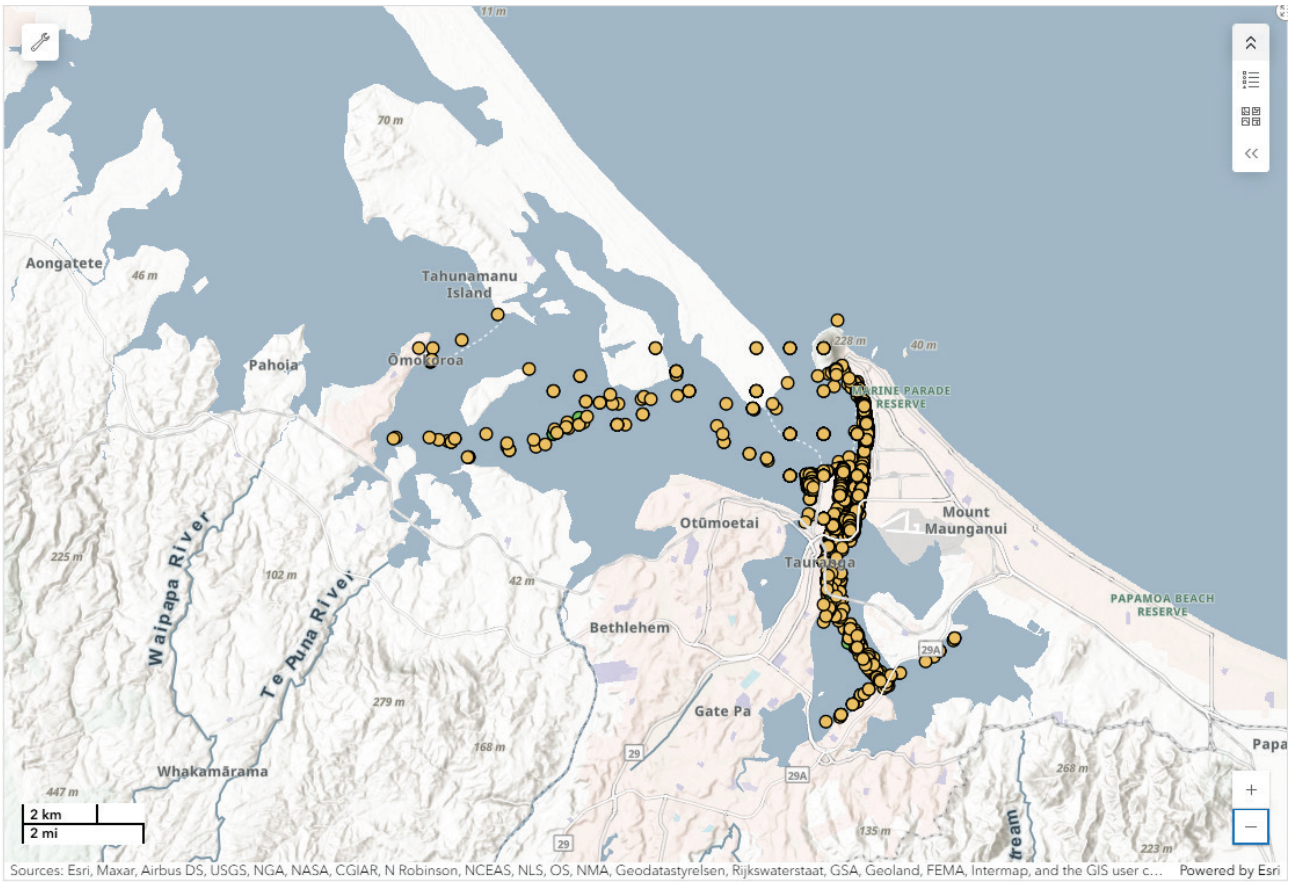


Figure 2. Distribution of marine non-indigenous species (NIS) that have previously been detected within the southern basin of Tauranga Harbour, as reported in the Marine Biosecurity Porthole (2025). Records are for species listed as established in Aotearoa New Zealand but may represent one-off detections in Tauranga Harbour. Dot colour indicates the source of the record: National Marine High Risk Site Surveillance (NMHRSS) programme (yellow), or samples submitted directly to the Marine Invasives Taxonomic Service (MITS; green).

Of note, there have been ongoing sporadic detections of the fanworm *S. spallanzanii* within the harbour since the species was first discovered there in 2013. This has included more than 10,700 individual worms found on vessels, the majority of which have come into Tauranga Harbour from other regions (unpublished data, supplied by BOPRC). There have also been semi-regular detections of *S. spallanzanii* on submerged infrastructure and benthic habitats within the harbour over the previous 12 years. Presently, all detections of established populations on artificial structures (e.g. wharves, jetties, pontoons) have been restricted to within the two marinas. However, since mid-2019 there have also been semi-regular detections of worms on benthic habitats in Pilot Bay near Mount Maunganui, as well as adjacent to three commercial wharves (Demolition Wharf, Sanford Wharf and Moana Wharf) immediately south of the Sulphur Point wharves. This includes 81 worms found on the seafloor in Pilot Bay in late 2023, with the discovery attributed to in-water cleaning of a boat hull.[20] There are ongoing delimitation and removal efforts for *S. spallanzanii* within the harbour by BOPRC.

[20] https://www.sunlive.co.nz/news/331750-fanworm-infestation-found-in-pilot-bay.html

There has also been a recent increase in the distribution and abundance of the Asian paddle crab (*Charybdis japonica*) within Tauranga Harbour. This species was found during both the winter 2023 and summer 2023/24 rounds of the NMHRSS programme, including in several areas near the port (including both marinas) and south of the Tauranga Harbour bridge towards Maungatapu (Woods et al. 2024). Of particular note, during the December 2023 survey two crabs were found immediately adjacent to the proposed dredge areas near the Sulphur Point wharves (Woods et al. 2024). Prior to these detections, *C. japonica* had been detected only south of the Tauranga Harbour bridge and not within the immediate port area. This species is widely established within several harbours and estuaries in the upper North Island (Hilliam and Tuck 2022). It has been subject to control programmes by BOPRC and Manaaki Te Awanui[21] since its detection in Tauranga Harbour in 2018 (Woods et al. 2024).

Lastly, a single Japanese mantis shrimp (*Oratosquilla oratoria*) was captured in a trap near Ōmokoroa on 28 November 2024 as part of BOPRC's Asian paddle crab trapping programme, which is being carried out by Manaaki Te Awanui.[22] A second individual was then found in Ōhope, roughly 100 km from Tauranga Harbour, on 12 December 2024.[23] Japanese mantis shrimp were first reported in Aotearoa New Zealand in Kaipara Harbour, Northland, in 2010 and since then have been spreading around the upper North Island. The closest known location to the Bay of Plenty where they have been identified prior to the 2024 individual is Thames Harbour. These findings illustrate the challenges in preventing the establishment of pest species that are present in neighbouring regions, particularly those that are highly connected through anthropogenic vectors such as vessel traffic.

When compared to other major shipping ports in Aotearoa New Zealand, Port of Tauranga appears to have had similar rates of marine NIS introduction. Based on a high-level assessment of detection records extracted from the Marine Biosecurity Porthole database – which includes the results of all the NMHRSS surveys (carried out twice per year in each port across a range of habitats) – the Port of Tauranga has similar numbers of NIS as other key shipping ports in New Zealand. Forty-six NIS have been detected within the port and its immediate vicinity, which is comparable to the ports of Wellington, Nelson and Lyttelton (49, 42 and 41 NIS, respectively; Marine Biosecurity Porthole 2025).

3.2 Existing activities contributing to regional biosecurity risk

Commercial shipping

The Bay of Plenty Region contains several sites that are significant nodes for international and domestic vessel traffic. This includes the Port of Tauranga itself, as well as two marinas (which have 1,061 berths between them) and roughly 500 consented vessel moorings. Port of Tauranga is the largest commercial port in Aotearoa New Zealand, with more than 2,000 ship movements in and out of the harbour every year. Vessels entering Aotearoa New Zealand waters from overseas are required by national and international regulations to manage the risk of introducing NIS via hull fouling (through MPI's Craft Risk Management Standard for Vessels; CRMS) and ballast water (under the International Convention for the

[21] Manaaki Te Awanui is a Māori environmental research group based in Tauranga, Bay of Plenty.

[22] https://www.sunlive.co.nz/news/356404-invasive-shrimp-found-in-tauranga-harbour.html

[23] https://sunlive.co.nz/news/357175-thumb-splitting-shrimp-spotted-again-in-tauranga.html

Control and Management of Ships' Ballast Water and Sediments; BWM Convention). If implemented correctly by incoming vessels, the combined requirements minimise the risk of introductions of NIS from international vessels.

Currently, there is no established system to manage biosecurity risks posed by domestic vessel traffic in Aotearoa New Zealand, although MPI is considering a coordinated approach to managing biofouling risks posed by domestic vessels. Small commercial vessels pose a significant biosecurity risk as they often operate at a range of geographical scales (i.e. local, region and nationwide) and their movement is largely unregulated. While domestic commercial vessels are generally geographically constrained (e.g. vessels servicing aquaculture facilities), their consistent high-frequency movement patterns may also lead to increased risk with regard to the transport of marine pests. These vessel risks include ballast water, for which there are currently no domestic (within Aotearoa New Zealand) exchange or treatment requirements.

Recreational boating

The two marinas located in Tauranga Harbour, Tauranga Bridge Marina and Tauranga Marina, have 500 and 561 berths, respectively. The marinas themselves do not have customs clearance, but recreational craft visiting from overseas can clear customs in the nearby port area. The exact number of recreational vessels based in the Bay of Plenty Region is not known because there is no requirement for registration of non-commercial craft. Most recreational marine traffic entering the Bay of Plenty is believed to originate from Auckland or Northland, posing a risk to the region as both of these areas host populations of marine pest species (such as *S. spallanzanii* and *S. clava*) that are not widely established in the Bay of Plenty. For recreational vessels in particular, risk factors include being slow moving and idle for long periods, and frequenting transport hubs (e.g. marinas).

Aquaculture activities

Marine farming activities within the wider Bay of Plenty Region also present several potential sources of biosecurity risk. There are currently several shellfish aquaculture operations in the eastern Bay of Plenty, including the country's largest consented marine farm, which is offshore from Ōpōtiki. Existing aquaculture activities in the region have associated vessel, equipment and stock movements, which can pose biosecurity risks. From a biosecurity perspective, transfers of juvenile mussels and oysters between spat collection and on-growing areas are reasonably significant and occur between regions (Lovett et al. 2024). At present, the Bay of Plenty mussel industry uses both locally caught spat and spat sourced from Kaitaia (harvested attached to beach-cast seaweed along Te Oneroa-a-Tōhē / Ninety Mile Beach in Northland). The two intertidal oyster leases within Ōhiwa Harbour (approximately 60 km east of Tauranga Harbour) are farmed by Tio Ōhiwa, with Pacific oysters (*Crassostrea gigas*) grown and sold at the site since 1968. To our knowledge, no wild-caught Pacific oyster spat are produced locally. Instead, seed oysters are sourced from Kaipara and Mahurangi Harbours (in the upper North Island) and transferred to the Bay of Plenty site on wooden sticks year round (Heath 2014).

4. Risks from the proposed dredging activities

A wide range of activities occur within the CMA, all of which have unique risks and implications with regard to marine biosecurity. To implement appropriate management, the context and magnitude of these risks need to be understood. For all human activities that affect the CMA, biosecurity risk can be broadly summarised as involving:

- international source regions, or domestic source regions known to have marine NIS, especially those that do not already occur in the recipient region
- methods of transfer that do not already occur as a result of other human activities in region (e.g. aquaculture development in a region where the industry did not previously operate)
- methods of transfer that have considerably higher capacity or frequency of transferring biological material than other human-mediated pathways in the region
- methods of transfer that lead to establishment risk that is considerably greater than that posed by natural dispersal from existing source populations (e.g. in adjacent natural or artificial habitats).

Biosecurity risks from the proposed dredging activities are discussed in the sections below, with effects structured into those associated with vessel movements, dredge spoil disposal and changes in shipping activity. Likely effects, and proposed mitigation measures, are summarised in Table 3 (end of Section 5).

4.1 Transfer of marine pests via vessel movements

While specific details are not known at the time of writing, it is expected that the majority of the dredging will be carried out by a trailing suction hopper dredger (TSHD), which 'vacuums' material from the seabed and stores it in a hold (hopper) for transportation to the disposal ground. In addition, a backhoe dredger (BHD) is likely to be used for some localised dredging throughout the channel. A range of support vessels will also be required during the proposed dredging activities, including survey vessels and crew boats. Due to the restricted scope of the activities, the proposed capital dredging will be undertaken with smaller maintenance-sized vessels. However, due to the specialised nature of these activities, it is likely that POTL will need to contract a TSHD dredge vessel (and potentially also a BHD dredge vessel) from outside the region.[24] Other associated vessels (e.g. survey vessel) are also likely to be domestic vessels but not necessarily based in the Bay of Plenty Region.

Dredge vessels have a number of generic attributes that make them potentially high risk as vectors for marine NIS transfer (Bridgwood and McDonald 2014). They are likely to have several risk mechanisms, including ballast water, entrained sediments and hull biofouling (Section 2.4). These types of specialised vessels also tend to have a large number of 'niche areas',[25] which may pose a higher level of biosecurity

[24] Use of an overseas-based vessel is considered very unlikely, as there are dredges currently operating in Aotearoa New Zealand that are capable of carrying out the required work, and the mobilisation and demobilisation costs for a dredge from overseas would exceed the cost of undertaking the dredging itself (R. Johnstone, POTL, pers. comm., 28 October 2025).

[25] Niche areas on a TSHD are likely to include internal seawater systems, gratings, areas around cathodic protection anodes, the propeller and shaft, anchor chain lockers and dry-docking support strips, among others.

risk than vessels with a more basic hull design due to their increased surface area and complexity. Some niche areas do not receive antifouling treatments during dry-docking and consequently accumulate large amounts of biofouling growth. In addition, niche areas may provide sheltered environments for marine growth (e.g. sea chests, internal pipework) and thus can harbour diverse biofouling communities, as well as mobile organisms such as crabs, fish and sea stars (Coutts and Dodgshun 2007; Frey et al. 2014).

Biosecurity risks posed will be specific to the vessel(s) contracted for the activity and will largely depend upon their voyage and maintenance history. In particular, elevated risk occurs if the contracted vessel's region of origin has marine NIS of concern not currently present within the Bay of Plenty Region, and if risk mitigation measures have not been implemented prior to the vessel's passage to the port. Vessels associated with dredging activities are typically slow moving (travelling at speeds of 5–10 knots), and their voyage history is characterised by long residency periods at previous destination ports. Assuming that the risk of organism release increases over time, vessels that typically operate for a long duration (e.g. a few months) in any one location tend to have a greater biosecurity risk than short-stay vessels (e.g. a merchant ship with a turnaround time of 2–3 days) (Coutts et al. 2010; Hopkins and Forrest 2010).

The proposed dredging activities will be in close vicinity to domestic and international shipping routes, as well as existing established populations of marine pests. Existing sources of biosecurity risk include international vessel arrivals into the region, and domestic vessel movements into the more immediate vicinity (e.g. recreational vessels, fishing boats, tourism operators, barges, merchant ships). The movement of a single dredge vessel into the region may, at face value, appear to be of limited concern given the high volume of existing vessel traffic. However, there are a number of instances where similar one-off events have been implicated in the introduction of NIS to Aotearoa New Zealand – for example, the international movements of barges (Coutts and Forrest 2005; Hopkins and Forrest 2010). As such, vessel movements associated with the proposed dredging activities are expected to present a minor incremental increase in marine biosecurity risk. These risks can be appropriately mitigated through adhering to current national and regional guidelines regarding vessel maintenance, in particular acceptable levels of hull fouling and ballast water management (Section 5.1).

4.2 Transfer of marine pests via dredge spoil disposal

The proposed dredging activities will require the disposal of spoil material, which may act as a vector for the inadvertent transfer of marine NIS from the dredge location to the spoil disposal grounds. As well as the risk from translocation, physical disturbance and alteration of the seabed by dredging and spoil disposal may also increase the susceptibility of seabed habitats to colonisation by marine NIS. Currently, there are multiple authorised areas within the CMA where the dredged material can be deposited. These include two nearshore sites and one offshore site outside the harbour entrance, as well as three sites within Tauranga Harbour (Figure 1, Appendix 1). The proposed reconsent of dredging activities will authorise dredge spoil deposition at the same disposal sites. The proposed capital dredging will involve staged removal and deposition of 2.9M m^3 at the main offshore deposition site (Deposition Site 'H'). In addition, the current application proposes an annual limit of 250,000 m^3 (averaged over 10 years, with a cap of 350,000 m^3 in any one year) for maintenance dredging activities, which will also be disposed of at the nearshore and main offshore deposition sites.

Subtidal soft sediment–dwelling species are most likely to be successfully spread via dredge spoil disposal. The majority of NIS established within Tauranga Harbour are sessile filter-feeding invertebrates (e.g. sponges, hydroids, bryozoans, ascidians) and seaweed species that primarily colonise hard substrates (Appendix 2). However, several species of soft sediment–dwelling bivalves, gastropods, polychaetes and crabs are present in the harbour and could theoretically be translocated via this mechanism. This includes the recent detections of the Asian paddle crab (*C. japonica*) immediately adjacent to the proposed dredging area, as well as several records of the small bivalve *Theora lubrica*, the crab *Pyromaia tuberculata* and the whelk *Tritia burchardi* within the proposed dredging area (Figure 3). The presence of *C. japonica* immediately adjacent to the dredge area presents a tangible risk of translocation to the spoil disposal sites that warrants consideration by decision-makers, especially when considering the active trapping programme within the harbour that is ongoing for this species. The three other species are also non-native and may pose threats to indigenous assemblages. However, it is noted that they are not listed as specific biosecurity threats (i.e. they are not classified as 'unwanted organisms', 'notifiable organisms' or pests of concern), nor are they subject to management controls in the Bay of Plenty or other areas of Aotearoa New Zealand (i.e. they are not included in any regional pest management plans). These four soft sediment–dwelling NIS are relatively common throughout the upper North Island, and all have larval durations of 2 weeks or longer, so could potentially spread to the offshore disposal site via natural dispersal mechanisms alone.

In addition to the listed species, there have been ongoing sporadic detections of the Mediterranean fanworm (*S. spallanzanii*) in the harbour since it was first detected in 2013, including a relatively large population near Pilot Bay in late 2023 and sporadic occurrences adjacent to commercial wharves south of the Sulphur Point area of the port since mid-2019 (see Section 3.1). Detections in the region have often been associated with moored vessels.[26] The presence of this species near the dredge area presents a tangible risk of translocation to the spoil disposal sites that will need to be appropriately mitigated. Lastly, there was a single detection of *A. senhousia* closer to the shoreline in Pilot Bay during the NMHRSS survey in February 2021. This detection was through diver searches. This species is well established in the lower basin of the harbour, south of the harbour bridge, and there have also been some isolated detections in the northern harbour basin, between Ōmokoroa and Motuhoa Island (Marine Biosecurity Porthole 2025). The larvae of *A. senhousia* remain free-swimming for 2–6 weeks and can disperse over large distances during this planktonic stage (Kimura and Sekiguchi 1996; Mistri 2002).

[26] https://tmbiosecurity.co.nz/mediterranean-fanworm-discovered-in-bay-of-plenty/; https://www.sunlive.co.nz/news/110567-councils-marine-pest-plea.html

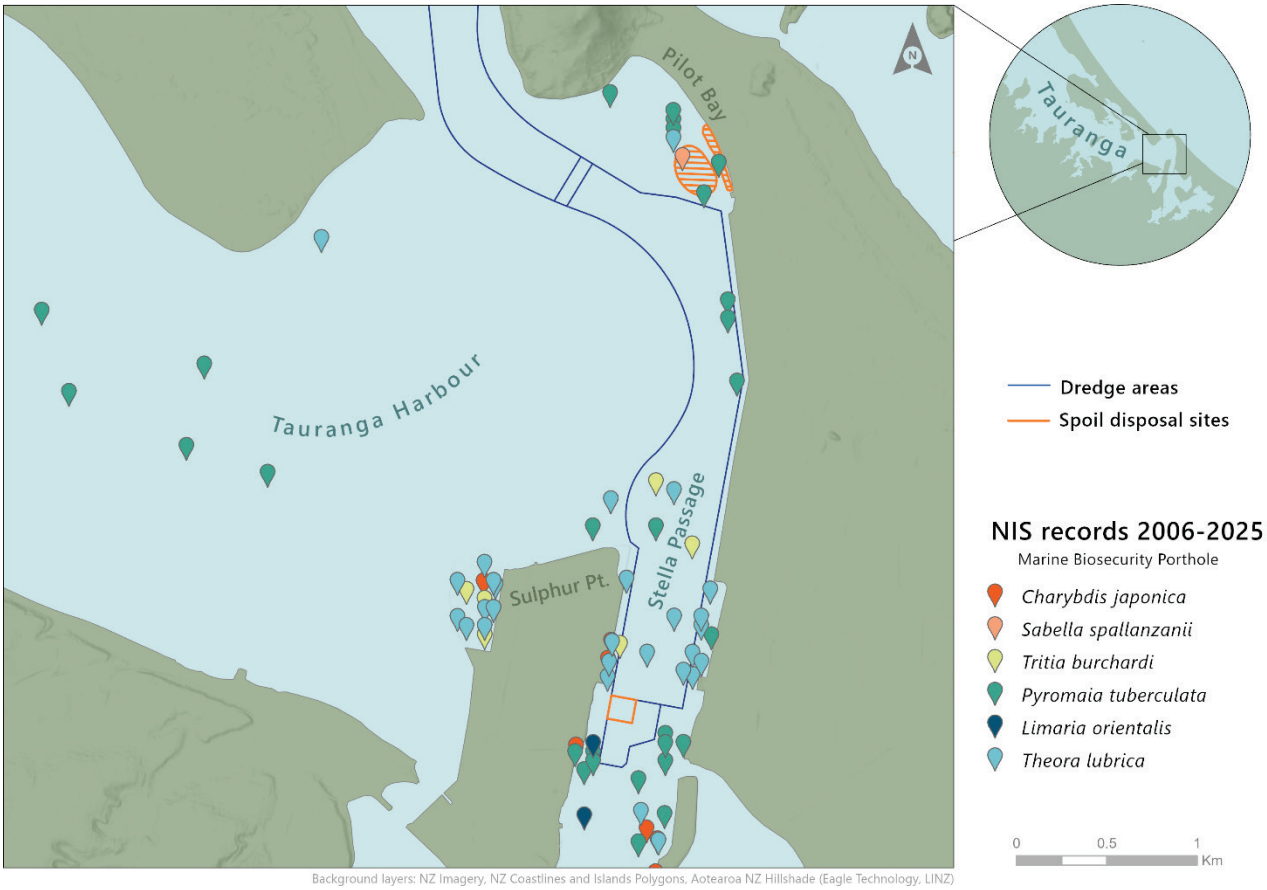


Figure 3. Soft sediment–dwelling non-indigenous species (NIS) that have previously been detected within or near the shipping channel to be dredged, as reported in the Marine Biosecurity Porthole (2025). All records are detections during the National Marine High Risk Site Surveillance (NMHRSS) programme, filtered to include soft sediment species detected using benthic sled tows, crab (box) traps, crab condos and diver searches (see Woods et. al [2024] for a description of sampling methods). Records are for species listed as established in Aotearoa New Zealand but may represent one-off detections in Tauranga Harbour.

The potential survival of organisms that end up in the dredge spoil material is unknown but will likely depend on several factors. During dredge operations, the surface sediment (containing much of the biota) becomes progressively buried by subsurface sediment (see Golder 2018). As this burial within the barge will occur for the period of dredging and transport (i.e. 2–3 hours for one dredging cycle), it will likely result in mortality for most organisms through crushing, smothering, suffocation and / or toxicity (e.g. exposure to ammonia). However, it should be noted that no specific information is available about survivability of biota within dredged sediment. As a degree of mixing occurs within the barge during operations, it is possible organisms could remain near the surface and avoid burial within the dredge material. Should any organisms survive the transport process, establishment at the disposal site will be further dependent on favourable environmental factors (e.g. substrate characteristics, temperature, light, etc.).

The biosecurity risks associated with the dredge spoil disposal are at least partly mitigated by the close proximity of the dredge and disposal sites. Relative to the life history and reproductive characteristics of

many marine species, the distance from the dredged channel to the spoil grounds is short. The planktonic durations of the dispersive stages (e.g. larvae, spores) of benthic marine species can range from a few seconds to many weeks. Excluding species with very short durations, these dispersive stages typically enable spread across scales of hundreds of metres to tens of kilometres or greater in a given reproductive season, unless oceanographic processes or habitat conditions act as dispersal barriers (Forrest et al. 2009). Given the relatively short distance between the dredging and disposal sites, dispersive stages may be able to travel these distances by natural dispersal mechanisms alone depending on prevailing hydrodynamics in the region. The transfer of dredge spoil from the dredge area to the disposal grounds also represents a continuation of an activity that has occurred since the late 1960s, as the same offshore disposal grounds are proposed. As such, the marine biosecurity risks from dredge spoil disposal are expected to be minor and incremental increases.

4.3 Transfer of marine pests through altered shipping patterns

The initial stage of the capital dredging programme (completed in 2015/16) enabled the port to accommodate larger vessels, with the design vessel modelled off the Maersk 'S-Class' container vessel (347 m length, 43 m beam and 14.5 m draught). These vessels can currently enter or depart the harbour during a tidal window centred around slack high water (Bermingham et al. 2024), and more recent capital dredging during late 2025 and early 2026 (to create a swinging basin) allows the same size of vessel to enter or depart during a wider tidal window. The more recent dredging may also allow larger vessels to call at the port in future following the appropriate safety assessments. Any ability for larger vessels to visit the Port of Tauranga will not necessarily translate into an increase in vessel arrivals. Instead, it may mean that more domestic transhipments[27] are carried out through the port, with a concurrent potential reduction in vessel arrivals from overseas (because fewer large ships would be required to transport the same amount of cargo). Other restrictions, such as berth space within the Port of Tauranga (which often operates with fully booked berth slots), may also influence the likelihood of potential vessel traffic changes in the future. The ability for larger vessels to visit the port may lead to international ship arrivals from new global source regions (i.e. port-to-port connections not currently in place) with a different biosecurity risk profile. However, the risk from these vessels is expected to be mitigated by legislation governing levels of acceptable hull biofouling and discharge of ballast water for international arrivals. As such, the incremental biosecurity risk from altered shipping patterns associated with the proposed dredging activities is likely to be negligible in the context of other risk vectors.

Regardless of potential future changes in the type and volume of ship traffic associated with the Port of Tauranga, the additional capital dredging requested in the current proposal is unlikely to materially affect shipping traffic volumes. To the best of the authors' knowledge, the capital dredging to widen the outside bend of Cutter Channel and extend the sitting basins is aimed at improving operational efficiencies within the port rather than enabling more or larger ships to visit.

[27] Transhipment is the transportation of cargo moved from one vessel to another while in transit to the final destination.

5. Recommended mitigation measures

Due to the difficulties in managing marine pests, preventing incursions through the management of high-risk vectors is a critical aspect of marine biosecurity in Aotearoa New Zealand. There are potential biosecurity risks associated with the proposed dredging activities, with some of these risks occurring against a background of existing biosecurity risk in the region. Mitigation of risk pathways and vectors associated with the proposal will contribute to risk reduction. Specific mitigation options for biosecurity risks associated with the proposed dredging are discussed below. POTL proposes to manage all risks in an integrated way through the development and implementation of a dredge management plan (DMP) that includes biofouling management plans (BFMPs) for each vessel. A draft DMP accompanies the application for resource consent.[28]

5.1 Vessel movements

Any international vessels contracted for the project that are from overseas will be required to meet the CRMS's long-stay requirements, which require the hull and niche areas to be inspected and cleaned within 30 days prior to arrival in Aotearoa New Zealand, or the vessel to be hauled out and cleaned by an MPI-approved treatment supplier within 24 hours of arrival. International vessels will also need to comply with the BWM Convention, which requires any ballast to be exchanged en route or treated. Any domestic vessels contracted for the project that are from outside the region will be required to meet Rule 1 under the BOPRC's RPMP, whereby 'the occupier in charge of a craft moving to or within Bay of Plenty waters must ensure that the hull has no more than a slime layer and / or barnacles'.[29] In addition, should the Clean Hull Plan (Section 2.2) proposed by the councils in Northland, Auckland, Bay of Plenty and Waikato be implemented, there may be similar or additional legislative restrictions on domestic vessels entering the region.

It is therefore recommended that vessel-specific risks are primarily managed by providing evidence of compliance with the relevant national and regional rules and regulations. Any international vessels associated with the dredging activity should be required to provide evidence that they comply with the CRMS long-stay requirements and the BWM Convention. Domestic vessels associated with the dredging activity entering the Bay of Plenty from other regions should provide evidence of good hull and topside husbandry / cleanliness for case-by-case approval by BOPRC as the competent authority. Given that the actual dredge and the particular risks associated with it are not yet known, it is recommended that vessels entering the Bay of Plenty CMA from other regions follow an approved BFMP. This has been the approach adopted for other recent capital dredging projects in Aotearoa New Zealand (e.g. deepening and widening of the shipping channel in Lyttelton; Sneddon et al. 2016). The BFMP should include, but not be limited to, a description of:

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[28] A draft version of the dredge management plan (DMP) has been prepared and is submitted with the application. In this context, the document is primarily a template, with the vessel-specific information to be completed once these details are known prior to submission to council for certification should the consent be granted.

[29] This requirement aligns with the biofouling threshold for 'long-stay vessels' (i.e. vessels that will remain in Aotearoa New Zealand for 29 consecutive days or longer, or visit areas not approved as places of first arrival).

1. The vessel/s and its/their attributes that affect biosecurity incursion risk, including key operational attributes (e.g. periods of time idle, voyage speed), maintenance history (including any prior inspection and cleaning undertaken), and voyage history since last dry-docking and antifouling (e.g. countries visited and duration of stay).
2. Key sources of potential marine biosecurity risk from ballast water, sediments and biofouling. This assessment should cover the hull, niche areas, entrainment spaces and associated equipment, and consider both submerged and above-water surfaces / components.
3. Findings from previous inspections, if available.
4. Risk mitigation prior to arrival in the region, including but not limited to:
    a) Routine preventive treatment measures and their efficacy – for example, the age and condition of any antifouling coatings applied, or MGPS installed within internal seawater systems.
    b) Any specific inspections of treatments for submerged and above-water surfaces that will be undertaken to meet Rule 1 under the RPMP prior to departure to the Bay of Plenty. Treatments could include, for example, in-water removal of biofouling or above-water cleaning to remove sediment.
    c) Expected desiccation period of above-water surfaces prior to departure and during transit to the Bay of Plenty (i.e. period of air exposure since last dredging operations).
5. Record-keeping and documentation of all mitigation undertaken.

The above recommendations align with MPI-produced guidance material regarding the development of BFMPs for vessels.[30] It is recommended that the documentation is submitted to BOPRC at least 20 days prior to the vessel's arrival in the Bay of Plenty Region. If, upon due consideration of the BFMP, any vessel is considered to pose unacceptable risk from biofouling, ballast or sediment, additional risk mitigation measures can be implemented. For biofouling, undertaking an in-water survey of the vessel immediately prior to its departure for the Bay of Plenty and implementing any cleaning or hull maintenance as required is a feasible approach to ensure it arrives with clean submerged surfaces. The entire hull and niche areas should be inspected by a suitably qualified person, and the vessel should be visibly free of macrofouling, particularly notifiable or unwanted species, RPMP pests or any other species otherwise designated by MPI as marine pests. Risk mitigation measures for ballast water and sediments also exist for dredge vessels. For ballast, exchanging the water en route at least 12 nautical miles from shore is a feasible approach to reduce risk. For sediment, thorough inspection and reactive cleaning or cleaning and disinfection of the dredge hopper and any other relevant topside areas can be implemented when required. In addition, the expected desiccation period of above-water surfaces potentially contaminated with sediment (i.e. the period of air exposure since the last dredging operations) should be considered as desiccation is known to reduce survival of marine pests.

[30] https://www.mpi.govt.nz/dmsdocument/27855-Guidance-for-vessel-owners-developing-a-Biofouling-Management-Plan

5.2 Dredge spoil disposal

To mitigate marine biosecurity risks associated with dredge spoil disposal, it is generally recommended that the disposal ground is relatively close to the dredged area and has similar depth and sediment characteristics. This is because the propagules of most species could travel these distances by natural dispersal, and therefore the movement itself is arguably of little consequence if the species is already established in the region. While there is a lack of specific information relating to the connectivity of the dredging and dredge spoil disposal sites, the proposed dredge spoil disposal sites meet these criteria of close proximity and comparable depth and sediment characteristics. The main disposal site is approximately 10 km from the port area, which is a similar or smaller distance to comparable capital dredging projects (e.g. Lyttelton). While the main disposal site is deeper than the shipping channel, the sediment here is also predominantly sand. As such, many marine NIS capable of living in the soft sediment habitats to be dredged may be able to spread naturally to the disposal ground, with the time frame of such spread dependent on their dispersal characteristics. The transfer of dredge spoil from the dredge area to the disposal grounds also represents a continuation of an existing consented activity, as the same disposal grounds are proposed.

At present, Tauranga Harbour is well studied from a biosecurity risk perspective. This is primarily due to its inclusion in the NMHRSS programme. In addition to extensive diver surveys of hard substrate habitats, the NMHRSS programme carries out 100 benthic sled tows (mainly targeting soft sediment taxa) and 80 crab trap lines in Tauranga Harbour each summer and winter, including a large number in the proposed dredging area (Appendix 3). This level of search effort means that there is a high likelihood that any NIS introductions will be detected at the dredging site and adjacent artificial habitats. It is recommended that the ongoing 6-monthly NMHRSS data for Tauranga Harbour be used to inform (and potentially update) the risk profile of the disposal of dredge material at the proposed sites (i.e. the distribution of known risk species as well as any new introductions prior to dredging activities occurring).

A precautionary approach would be to survey dredge locations immediately (e.g. within 2 weeks) prior to dredging for the presence of populations of marine NIS already known to occur in Tauranga Harbour (e.g. *S. spallanzanii*, *C. japonica* and *O. oratoria*) or other NIS that may establish in the future. This would provide up-to-date information on whether populations of marine NIS are present in the dredging zone and may be moved with dredge spoil. Alternatively, additional ad hoc surveying could be undertaken to provide some level of additional information on NIS population occurrence in the dredge locations (or aligned activities, such as BOPRC's routine pest monitoring activities in the port area, could be supported and extended). Any detections of high-risk species (i.e. primary target species) within the dredging area should require an additional assessment of biosecurity risk. This could be enabled by consent conditions that allow BOPRC (as the competent authority) to consider risks based on the results of the above surveys, and that require POTL to commission new risk assessments by a suitably qualified expert when a material change in risk is likely to have occurred. This approach would enable adaptive management to protect against the possibilities of future increases in NIS abundance or the incursion of new NIS into the dredging area. If risks were to increase, the activity should be reconsidered on a case-by-case basis. Additional controls might include alternate disposal location for this dredge spoil, for example disposal at the sites within the harbour if the detected pest taxa are also known to occur there or disposal on land if there are no suitable at sea disposal sites. Dredge spoil may be able to be

decontaminated via extended out of water storage periods, although the efficacy of this approach against the relevant marine pests would need to be tested.

5.3 Altered shipping patterns

Risks posed by any changes to shipping patterns as a result of the capital dredging activities are expected to be negligible and will be adequately addressed by the mandatory CRMS (addressing biofouling risks) and BWM Convention (addressing ballast water risks). No specific mitigation measures are proposed for the current application.

Table 3. Summary of potential marine pest risks resulting from the proposed dredging activities, their incremental significance, and recommended mitigation actions required to reduce the risk to a negligible level.

Issue	Potential effect	Incremental significance of effect (before mitigation) *	Mitigation actions	Incremental significance of effect (after mitigation) *
Transfer of marine pests through vessel movements	Vessels from outside of the Bay of Plenty Region introduce marine pests that do not already occur in the region.	**More than minor:** Dependent upon vessel region of origin and level of risk mitigation undertaken prior to arrival. Dredging-related vessel movements will represent a small sub-set of vessel movements that already occur in the region.	• Comply with national and regional hull biofouling legislation and operate under a biofouling management plan (BFMP) specific to the vessel(s). • Provide BFMPs to BOPRC at least 20 days prior to arrival. If deemed necessary upon due consideration of the BFMP by BOPRC, undertake additional mitigation measures for biofouling, ballast or sediment. • Available mitigation measures include in-water biofouling surveys (and potentially cleaning), ballast water exchange en route, and inspecting, cleaning or otherwise decontaminating spaces that may hold sediment.	**Less than minor:** Good vessel maintenance and cleanliness will reduce the likelihood that new pests will be bought into, or transferred within, the region.
Transfer of marine pests through dredge spoil disposal	Introduction of marine pests at the disposal sites due to transfer of dredge spoil material from the dredge location to the spoil disposal grounds. Physical disturbance of the seabed leads to increased susceptibility to colonisation by disturbance-tolerant pest species.	**Minor:** Soft sediment species are most likely to be spread via this mechanism. The majority of marine NIS established in Tauranga Harbour are hard substrate species, although four NIS have been detected in the proposed dredge area through the MHRSS programme. The Asian paddle crab (*C. japonica*) is currently subject to control programmes by BOPRC and Manaaki Te Awanui. The	• Risk of established NIS range expansions reduced due to the close proximity of dredge and disposal sites and environmental similarity. • NMHRSS data for Tauranga Harbour used to inform (and update) the risk profile of the disposal of dredge material at the disposal sites.	**Minor:** Additional surveys and commissioning of new risk assessments if relative risk changes will protect against future threats. However, lack of information regarding survivability in dredge spoil and background connectivity between the dredging sites and spoil grounds means that some risk must be

Issue	Potential effect	Incremental significance of effect (before mitigation) *	Mitigation actions	Incremental significance of effect (after mitigation) *
		remaining three species are not listed as specific biosecurity threats or subject to management controls in the Bay of Plenty or Aotearoa New Zealand. Survival of organisms during transport is likely to be limited due to burial effects. Continuation of an activity that has occurred for many decades as the same disposal sites is proposed.	• Additional ad hoc surveying of the dredged area and surrounding area by Bay of Plenty Regional Council. • Case-by-case consideration of risks based on the results of above surveys by Bay of Plenty Regional Council and commissioning of new risk assessments by a suitably qualified expert when a material change in risk is likely to have occurred.	assumed for pests already occurring in or adjacent to the dredged area (i.e. *S. spallanzanii*, *C. japonica* and *O. oratoria*).
Transfer of marine pests through changed shipping patterns	Capital dredging allows larger vessels to visit the port and leads to ship arrivals from new global source regions (i.e. new port-to-port connections), potentially introducing marine pests that do not already occur in the region.	**Negligible:** Port of Tauranga is Aotearoa New Zealand's largest export port and already globally connected, with vessel visits from all major shipping hubs. Risk will relate to international vessel arrivals and is already mitigated by legislation governing levels of acceptable hull fouling (CRMS) and ballast water discharge (BWM Convention).	• No specific mitigation measures are proposed for the current application.	**Negligible:** Minimal risk exists.

*** Significance of effect:** Nil (no effects at all), Negligible (effect too small to be discernible or of concern), Less than minor (discernible effect but very limited in area or duration, or only a very slight change in existing conditions), Minor (noticeable but will not cause any significant adverse effects), More than minor (noticeable that may cause adverse impact but could be potentially mitigated or remedied), Significant (noticeable and will have serious adverse impact but could be potentially mitigated or remedied), Unacceptable (extensive adverse effects that cannot be avoided, remedied or mitigated).

6. Summary and conclusions

The application for resource consents for maintenance and capital dredging within Tauranga Harbour is likely to present an incremental change in marine biosecurity risk due to vessel movements and dredge spoil disposal. Dredge vessels arriving from outside the Bay of Plenty Region represent a biosecurity risk. Elevated risk occurs if the region of origin has marine NIS of concern not currently present within the region, and if risk mitigation measures have not been implemented for these vessels prior to their passage to the port. Dredge spoil disposal may also act as a pathway for the inadvertent transfer of marine NIS from the dredge location to the spoil disposal grounds. The majority of NIS established within Tauranga Harbour primarily colonise hard substrates, and there is likely to be a lack of suitable habitats for these taxa at the disposal grounds. However, the Mediterranean fanworm (*S. spallanzanii*), Asian paddle crab (*C. japonica*) and possibly the Japanese mantis shrimp (*O. oratoria*) present specific risks that may warrant additional safeguards (e.g. pre-dredging surveillance, adaptive management), which would also protect against any future NIS incursions. There are several records of detections of three additional non-indigenous soft sediment–dwelling species (including a bivalve, a crab and a whelk) in the proposed dredge area. However, none of these species are listed as specific biosecurity threats, nor are they subject to management controls in the Bay of Plenty or other areas of Aotearoa New Zealand. It is also noted that survival during transport to the disposal sites is considered likely to be limited for most organisms due to burial within the barge.

To manage risks from vessels used for the dredging operations, it is recommended that international vessels are required to provide evidence of compliance with the CRMS and BWM Convention, and that all vessels operate under BFMPs. BFMPs for all vessels should be provided to BOPRC for approval at least 20 days prior to the vessel arriving in the region. If any vessel is considered to pose unacceptable risk from biofouling, ballast or sediment, additional risk mitigation measures should be implemented. These could include inspection and cleaning of the hull and niche areas, en route ballast water exchange, or inspection and cleaning of the dredge hopper or other areas potentially contaminated with sediment. The biosecurity risks associated with the disposal of dredge spoil are mitigated to some extent by the proximity of the dredge and disposal sites and their environmental similarity. It is recommended that the 6-monthly NMHRSS data for Tauranga Harbour be used to further inform the risk profile of dredge material prior to the start of capital dredging work. Additional survey work in the dredging area (i.e. outside the NMHRSS survey area) should also be considered to complement data from the NMHRSS programme.

The proposed activities will occur against a background of existing biosecurity risks in the region, including existing established populations of marine NIS and other controlled and uncontrolled activities and associated vector movements. Mitigation of risk pathways and vectors associated with the proposal will contribute to risk reduction. To ensure that the most appropriate measures to address marine pest risk are in place, a draft DMP that includes provisions to manage vessel-specific biofouling risks via vessel-specific BFMPs has been prepared and is to be implemented by POTL. If the proposed mitigation measures are implemented appropriately, the residual marine biosecurity risk and associated adverse environmental effect is expected to be minor or less than minor.

7. Appendices

Appendix 1. Proposed dredging areas and disposal sites

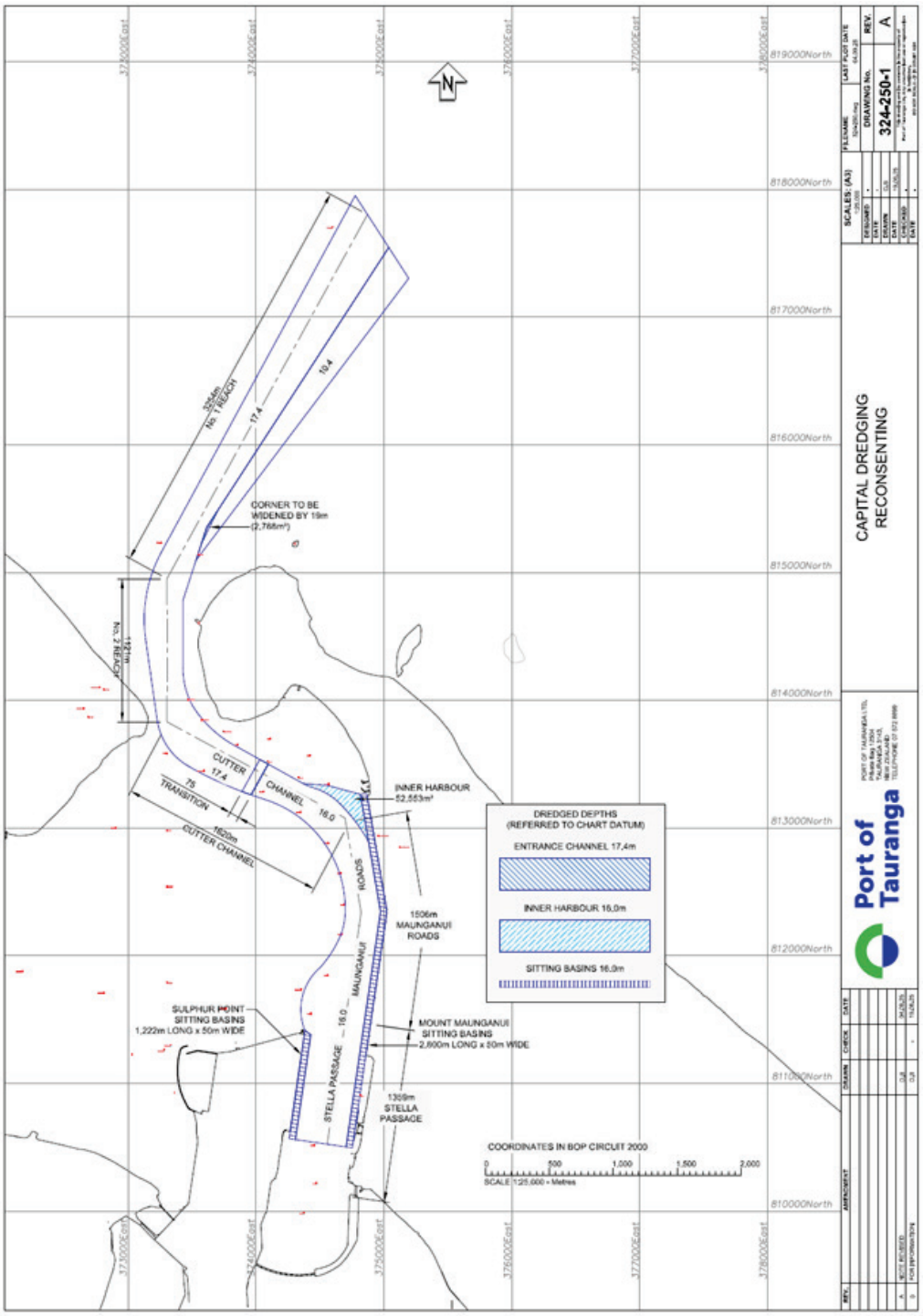


Figure A1.1. Proposed capital dredging (blue-shaded areas) to occur within the existing shipping lane (blue polygon). Source: Supplied by Port of Tauranga Limited.

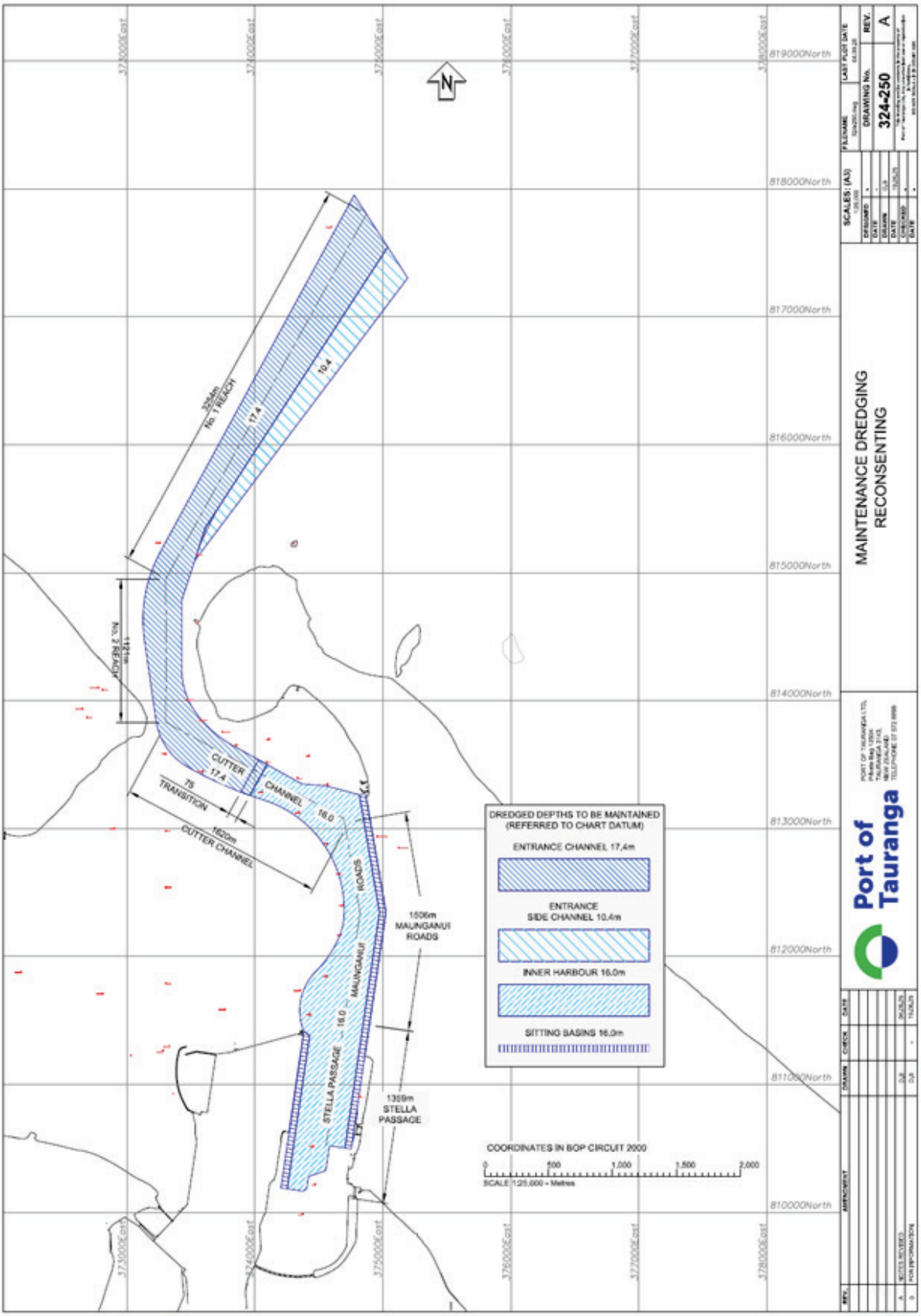


Figure A1.2. Proposed maintenance dredging (blue-shaded areas) to occur within the existing shipping lane (blue polygon). Source: Supplied by Port of Tauranga Limited.

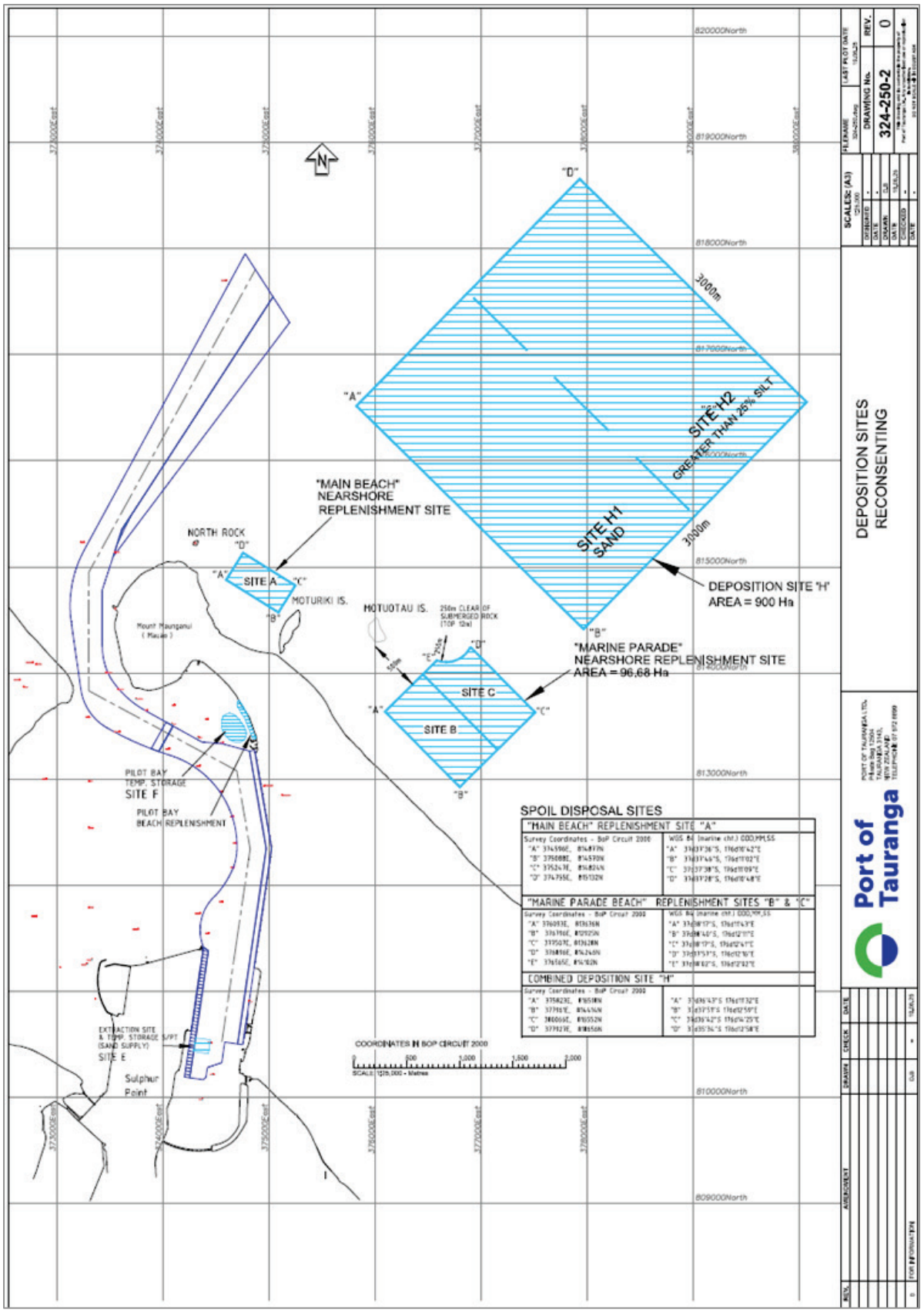


Figure A1.3. Proposed dredge spoil disposal grounds (blue-shaded areas). Source: Supplied by Port of Tauranga Limited.

Appendix 2. Existing populations of non-indigenous species

Table A2.1. Non-indigenous marine species that have previously been detected within the southern basin of Tauranga Harbour (excluding species found only as vessel hull fouling). Data sourced from the joint Ministry for Primary Industries (MPI) and National Institute for Water and Atmospheric Research (NIWA) Marine Biosecurity Porthole..[31] Records are for species listed as established in Aotearoa New Zealand but may represent one-off detections in Tauranga Harbour. Species commonly recognised as marine pests are indicated with blue shading.

Phylum	Class	Order	Species	Common name
Porifera	Demospongiae	Poecilosclerida	*Amphilectus fucorum*	Shredded carrot sponge
Cnidaria	Hydrozoa	Anthoathecata	*Ectopleura crocea*	Pink-hearted hydroid
Cnidaria	Hydrozoa	Anthoathecata	*Ectopleura larynx*	Organ pipe hydroid
Cnidaria	Hydrozoa	Anthoathecata	*Eudendrium capillare*	Slender stick hydroid
Cnidaria	Hydrozoa	Leptothecata	*Clytia ?linearis*	Benthic hydroid
Cnidaria	Hydrozoa	Leptothecata	*Monotheca pulchella*	Australian hydroid
Cnidaria	Hydrozoa	Leptothecata	*Obelia longissima*	Hydroid
Cnidaria	Hydrozoa	Leptothecata	*Plumularia setacea*	Little sea bristle
Mollusca	Bivalvia	Cardiida	*Theora lubrica*	Asian semele
Mollusca	Bivalvia	Limida	*Limaria orientalis*	File shell
Mollusca	Bivalvia	Mytilida	*Arcuatula senhousia*	Asian date mussel
Mollusca	Bivalvia	Ostreida	*Magallana gigas*	Pacific oyster
Mollusca	Gastropoda	Neogastropoda	*Tritia burchardi*	Australian dog whelk
Mollusca	Gastropoda	Nudibranchia	*Pelagella meracula*	Nudibranch
Mollusca	Gastropoda	Nudibranchia	*Polycera hedgpethi*	Nudibranch
Mollusca	Gastropoda	Nudibranchia	*Thecacera pennigera*	Nudibranch
Annelida	Polychaeta	Sabellida	*Sabella spallanzanii* * † ‡	Mediterranean fanworm
Annelida	Polychaeta	Spionida	*Polydora hoplura*	Shell boring worm
Arthropoda	Malacostraca	Amphipoda	*Apocorophium acutum*	Amphipod
Arthropoda	Malacostraca	Amphipoda	*Caprella penantis*	Caprellid shrimp
Arthropoda	Malacostraca	Amphipoda	*Jassa* cf. *marmorata*	Tube-building amphipod
Arthropoda	Malacostraca	Amphipoda	*Jassa slatteryi*	Tube-building amphipod
Arthropoda	Malacostraca	Amphipoda	*Monocorophium acherusicum*	Amphipod
Arthropoda	Malacostraca	Stomatopoda	*Oratosquilla oratoria*	Japanese mantis shrimp

[31] https://www.marinebiosecurity.org.nz/search-for-species

Phylum	Class	Order	Species	Common name
Arthropoda	Malacostraca	Decapoda	*Charybdis* (*Charybdis*) *japonica* ‡	Asian paddle crab
Arthropoda	Malacostraca	Decapoda	*Pyromaia tuberculata*	Fire crab
Bryozoa	Gymnolaemata	Cheilostomatida	*Schizoporella* cf. *errata*	Arborescent bryozoan
Bryozoa	Gymnolaemata	Cheilostomatida	*Thalamoporella californica*	Arborescent bryozoan
Bryozoa	Gymnolaemata	Cheilostomatida	*Arbopercula angulata*	Encrusting bryozoan
Bryozoa	Gymnolaemata	Cheilostomatida	*Bugula neritina*	Arborescent bryozoan
Bryozoa	Gymnolaemata	Cheilostomatida	*Bugulina flabellata*	Arborescent bryozoan
Bryozoa	Gymnolaemata	Cheilostomatida	*Celleporaria nodulosa*	Encrusting bryozoan
Bryozoa	Gymnolaemata	Cheilostomatida	*Watersipora subatra*	Red ripple bryozoan
Bryozoa	Gymnolaemata	Ctenostomatida	*Amathia distans*	Arborescent bryozoan
Bryozoa	Gymnolaemata	Ctenostomatida	*Amathia verticillata*	Spaghetti bryozoan
Chordata	Teleostei	Blenniiformes	*Omobranchus anolius*	Oyster blenny
Chordata	Teleostei	Blenniiformes	*Parablennius tasmanianus*	Blenny
Chordata	Ascidiacea	Aplousobranchia	*Clavelina lepadiformis* ‡	Light-bulb ascidian
Chordata	Ascidiacea	Aplousobranchia	*Didemnum vexillum*	Carpet tunicate
Chordata	Ascidiacea	Aplousobranchia	*Diplosoma listerianum*	Colonial ascidian
Chordata	Ascidiacea	Phlebobranchia	*Ciona intestinalis*	Vase tunicate
Chordata	Ascidiacea	Phlebobranchia	*Ciona savignyi*	Pacific transparent sea squirt
Chordata	Ascidiacea	Stolidobranchia	*Botrylloides diegensis*	Colonial ascidian
Chordata	Ascidiacea	Stolidobranchia	*Botrylloides giganteus*	Colonial ascidian
Chordata	Ascidiacea	Stolidobranchia	*Polyandrocarpa zorritensis*	Colonial ascidian
Chordata	Ascidiacea	Stolidobranchia	*Polyandrocarpa* sp.	Colonial ascidian
Chordata	Ascidiacea	Stolidobranchia	*Styela clava* *‡	Clubbed tunicate
Chlorophyta	Ulvophyceae	Bryopsidales	*Codium fragile* subsp. *fragile*	Green sea fingers
Ochrophyta	Phaeophyceae	Ectocarpales	*Hydroclathrus clathratus*	Brown seaweed
Ochrophyta	Phaeophyceae	Laminariales	*Undaria pinnatifida* *‡	Wakame / Asian kelp
Rhodophyta	Florideophyceae	Halymeniales	*Grateloupia subpectinata*	Red seaweed
Rhodophyta	Florideophyceae	Halymeniales	*Grateloupia turuturu*	Devil's tongue weed

* Unwanted organism under the Biosecurity Act 1993.

† Notifiable organism under the Biosecurity (Notifiable Organisms) Order 2016.

‡ Designated marine pest in the Ministry for Primary Industries (MPI) marine pest guide (MPI 2022).

Appendix 3. NMHRSS programme survey effort

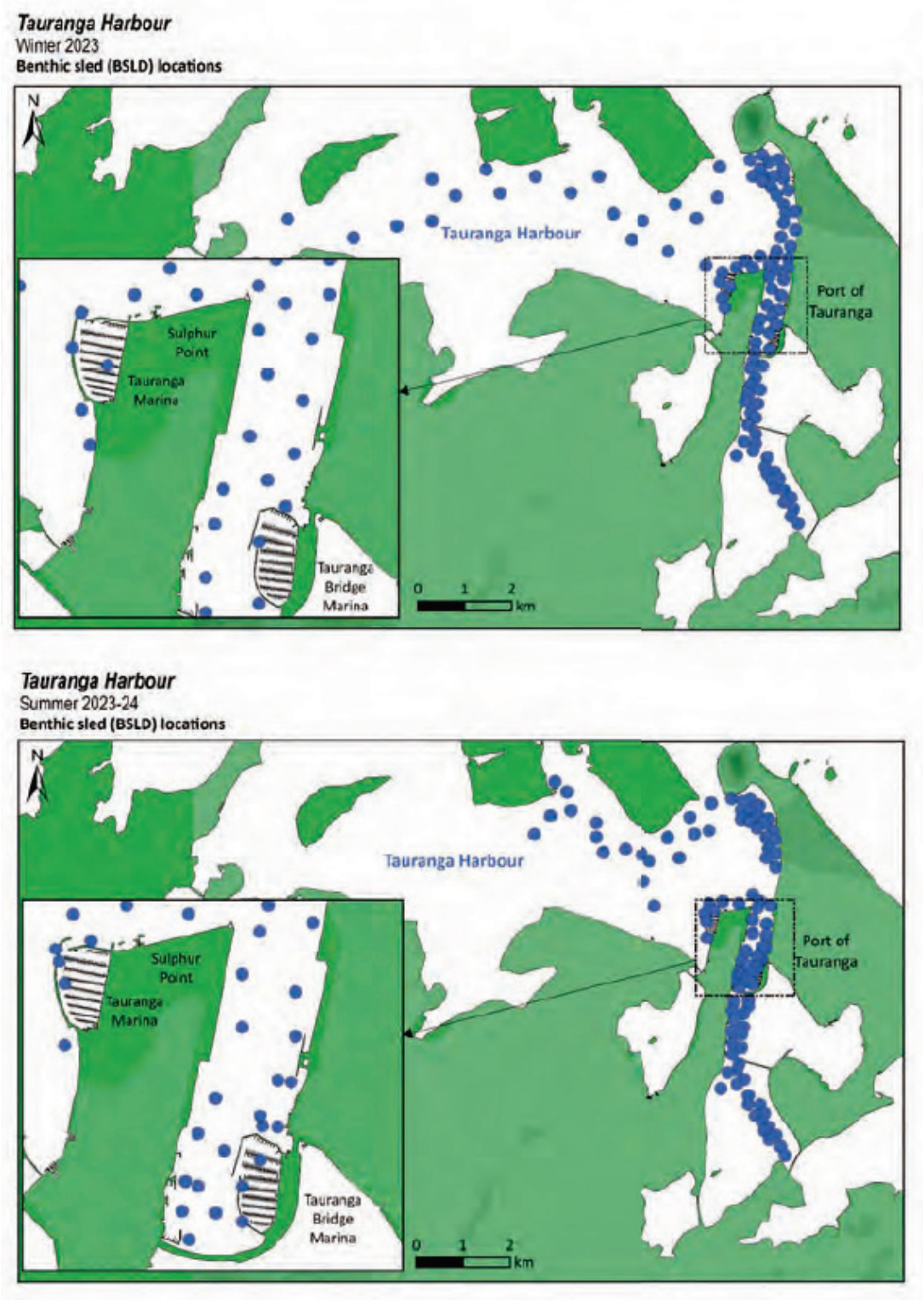


Figure A3.1. Locations sampled using benthic sled techniques during the winter 2023 and summer 2023/24 National Marine High Risk Site Surveillance (NMHRSS) programme surveys of Tauranga Harbour. Source: Woods et al. (2024).

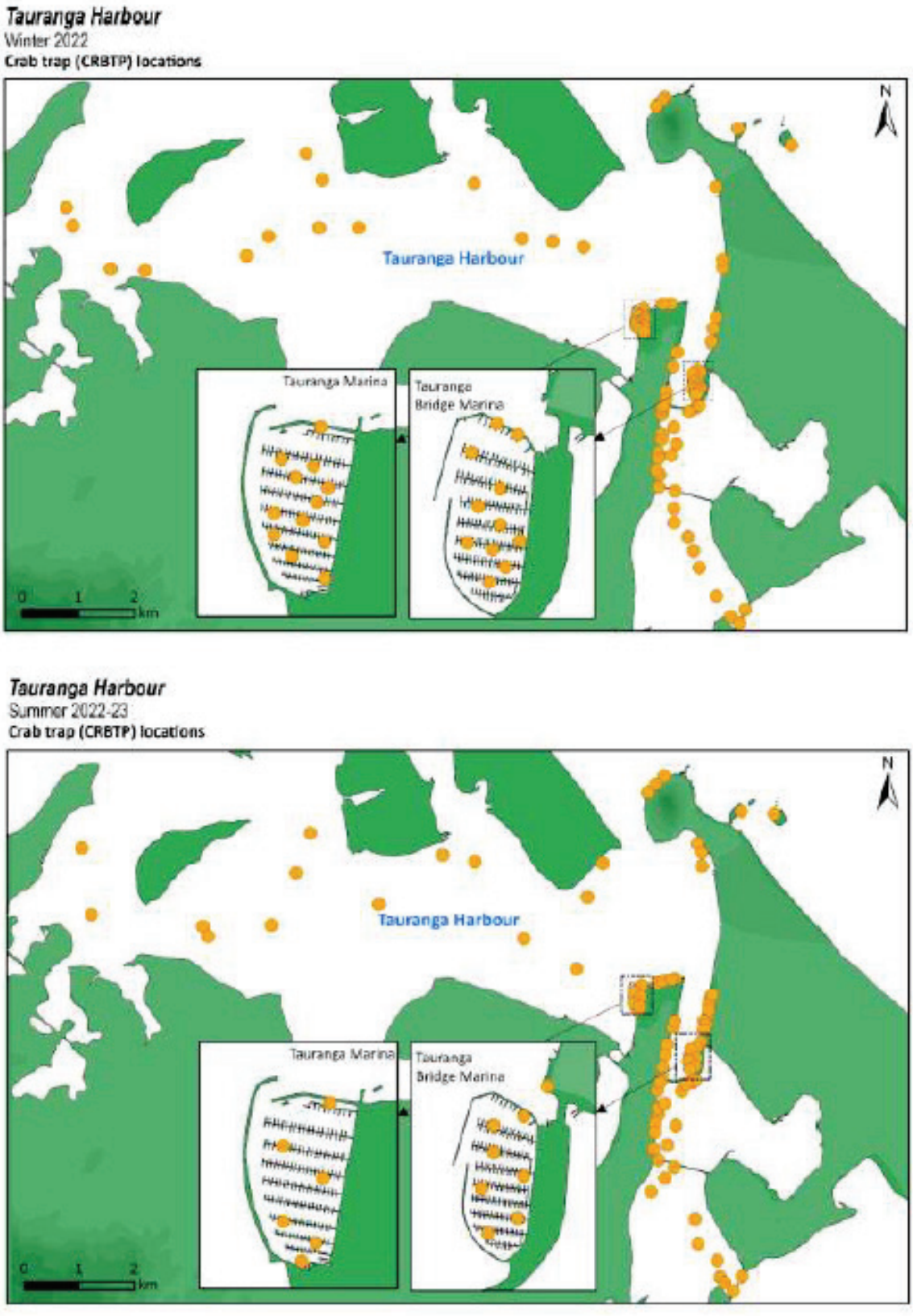


Figure A3.2. Locations sampled using crab trap techniques during the winter 2023 and summer 2023/24 National Marine High Risk Site Surveillance (NMHRSS) programme surveys of Tauranga Harbour. Source: Woods et al. (2024).

8. Acknowledgements

I am grateful to Rowan Johnstone (Port of Tauranga Limited), Gavin Kemble (Enspire), and my colleagues Bailey Lovett, Lisa Floerl and Susi Bailey for helpful discussions and contributions to this report.

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