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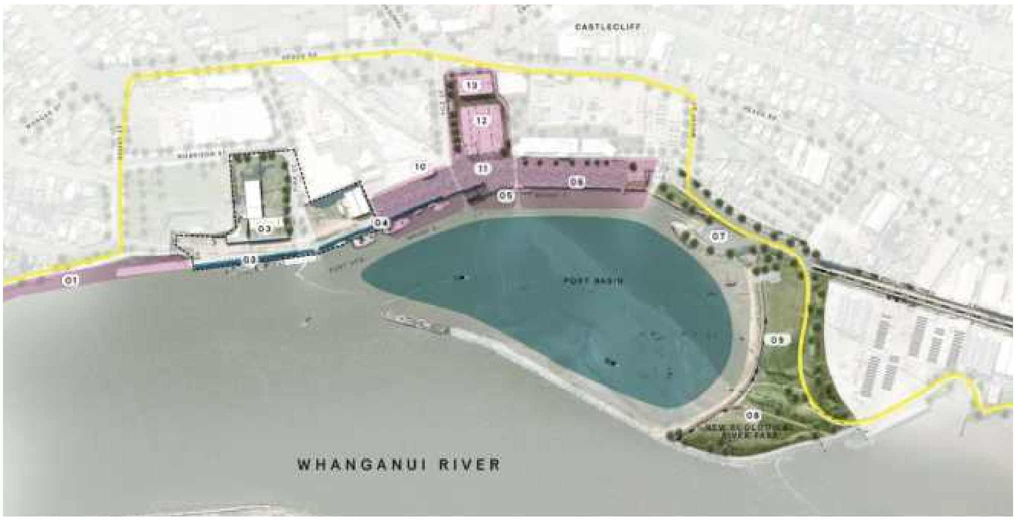
APPENDIX G

Biosecurity Assessment Report

Te Pūwaha: Whanganui Port Upgrade

Aquatic Biosecurity Risk Review and Assessment



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Executive Summary

Good biosecurity management protects native biodiversity by reducing the potential impacts of introduced invasive species on the local environment. As some invasive species have the ability to out-breed, out-compete, overgrow or even feed upon native species, keeping them out of the environment is a key component of protecting native biodiversity. Some aquatic invasive species (AIS) can also change the physical structure of the local environment by burrowing into the riverbed, undermining embankments and leading to slumps and erosion. Others are highly efficient predators and grazers and can wipe out a wide variety of life forms and transform highly productive, ecologically diverse habitats into semi-barren seabeds.

Redevelopment of Whanganui Port will have significant economic and social benefits to the local community. Accompanying redevelopment, however, are potential risks to native biodiversity that could arise in the event of poor biosecurity management practice. As indicated, AIS can have dramatic and lasting effects on local habitats and the wider environment. Whanganui Port is positioned in the tidally dominated Whanganui River estuary, not far from the river mouth. The twice daily ebb and flood of the tide, along with the occasional river flood event, prevents the establishment of both wholly freshwater and wholly marine AIS. Those that are capable of tolerating this fluctuating salinity can, however, potentially survive and thrive in this environment. AIS such as the Amur River Clam, Mitten Crab and North Pacific Sea Star, if accidentally liberated into this environment through poor biosecurity management practices, could each have devastating impacts not only on important kai moana resources but also on the very nature of the habitats present.

Redevelopment of the port creates also creates opportunities for improved biosecurity outcomes for the area through well managed construction and operational practice. Principles of good biosecurity practice must be included in the construction management plan which will guide the redevelopment. These include ensuring that any equipment used in water has been verified free of potential AIS before arrival at the port and only installing new or as new infrastructure (e.g. wharf piles). Establishment of a vessel cleaning facility in the port, in which the biological wastes arising are fully contained and directed to a landfill or sanitary sewer, will also help prevent the introduction of AIS. Such a collection system will also have the benefit of preventing the release of chemical contaminants, maintaining the overall environmental quality of the area. An incursion response plan, focussing on the necessary communications with the relevant authorities, should also be incorporated into the port's environmental management system.

1 Introduction

1.1 Location and Proposed Activities

Whanganui Port is located near the mouth of the Whanganui River which drains into the South Taranaki Bight. This location is the only port on the south Taranaki -western Manawatu coastline capable of handling small cargo vessels. The port structures have fallen into a state of disrepair and require remediation and redevelopment to ensure ongoing use for the community and local industry.

The dynamic riverine environment in which the port is located poses significant challenges to ongoing operations and maintenance. The Whanganui River is one of the longest in New Zealand and carries very large sediment loads. While much of this sediment flows out to sea, a large amount is deposited within upper reaches of the river estuary, as fine material flocculates out of suspension at salinities of 1-2.5 PSU[1]. This material is washed downstream and accumulates in the lower estuary, notably in the area of the port, leading to a requirement for ongoing or routine dredging of the river to maintain safe navigational access to the port and further upstream.

A proposal has been made by the Whanganui District Council to undertake remediation and redevelopment works of the port structures and local environment. This will involve a series of sub-projects, which includes:

- Replacement of wharf structures
  - demolition of existing structures
  - installation of new/replacement wharf piles
  - construction of new wharf structures
- Port redevelopment
  - Maintenance to the recreational boat ramp area
  - Create new vessel lifting bay and hardstand
  - Build new associated infrastructure
- Primary and ongoing maintenance dredging
- Foreshore reclamation

The project proponents take a long term view of the local environment and intend to protect the community and local awa by adopting development solutions that manage environmental risks. On this basis, this author has been commissioned to evaluate the potential aquatic biosecurity implications of the proposed activities and make recommendations to address any biosecurity-related risks.

The items to be addressed in the review and assessment include the following

- Describe the existing environment with respect to biosecurity, including the identification of known exotic species / biosecurity risks present in Whanganui River and the wider Whanganui region with reference to the Regional Pest Management Plan and any other relevant legislation (section 2).
- Describe the parts of the Project that are relevant to the biosecurity assessment including the temporary and ongoing activities which have the potential to facilitate the establishment and spread of marine pests and diseases into areas where they do not already occur (Section 3).
- Assess the actual and potential biosecurity risks associated with the temporary and ongoing activities of the Project. Address those effects with regard to relevant policy direction and

1 Wollast R 1988: The Scheldt Estuary. https://doi.org/10.1007/978-3-642-73709-1_11

recommend measures to avoid, remedy, mitigate or offset effects where the policy directions provide for this (Section 4).

- Provide measures to avoid, remedy or mitigate effects, and advice on the biosecurity management requirements that may inform the Project detailed design. This includes any additional requirements by legislation (Sections 4 & 5).

1.2 Aquatic Invasive Species: Impacts and Management

Biosecurity involves actively taking steps to reduce the potential for the introduction, establishment and spread of aquatic invasive species (AIS) and other non-indigenous species in an area in order to protect indigenous biodiversity. Good biosecurity practice focusses on preventing the introduction and establishment of AIS, rather than on eradication and management after introduction. Eradication in marine and estuarine environments is, if not outright impossible, costly and impractical to undertake due to the highly interconnected nature of aquatic systems.

In ports areas and harbours, AIS can have broad and far reaching impacts on the infrastructure. AIS are typically very efficient early-colonisers of artificial structures, quickly gaining a foothold on new surfaces such as jetties, pontoons, pilings and poles. Some AIS can rapidly clog seawater intake pipes[2], resulting in reduced operational efficiency and increased maintenance costs. The resulting economic cost of AIS can be substantial- the most recent estimate suggesting a global cost of over US 23 billion dollars in 2020 alone.[3]

The entry of AIS to an area has the potential to cause lasting environmental damage to native biological communities and ecosystems. Where living conditions are favourable and natural limits to the population growth of AIS are lacking, invasive species can spread widely and rapidly through the recipient native habitat. These aquatic pests, which may include micro-organisms, algae, plants, or animals, may outcompete, displace or even feed upon native species. This negatively impacts the local ecology as well as native biodiversity. Many of these species are referred to as 'ecosystem engineers' as they can cause wide reaching changes to the physical and ecological structure of affected environments. Preventing the establishment of AIS is thus consistent with the New Zealand Coastal Policy Statement (NZCPS) objectives for safeguarding and protecting natural ecosystems and indigenous flora and fauna.

Introduction of a new species to an area can occur through natural processes such as range extensions or due to the breakdown of natural barriers to dispersal (e.g. flooding or geological events that connect normally separate catchments or water bodies, climate change). AIS are typically introduced to a new area through human mediated transport as accidental 'hitch-hikers'. This may be on or in clothing, equipment, boats or other transportable infrastructure that has been used in areas where the AIS is already present. The northwest Pacific kelp *Undaria pinnatifida* for example, is only capable of spreading naturally at a rate of a few hundred metres per year, but after becoming established in Wellington Harbour in 1987[4] was spread by local vessel traffic across almost the entire country within 15 years. Other marine AIS present in New Zealand waters, including the fanworm *Sabella spallanzanii* and clubbed tunicate *Styela clava* have likewise been widely spread by biofouled vessels and equipment. Similarly, local vessel movements in the USA were largely responsible for the spread of the invasive zebra mussels from a single site of introduction in the Great Lakes in the mid 1980's to most large watersheds from the Atlantic to the Pacific oceans within approximately 20 years[5].

Three of AIS are worth noting for their marked impacts on the coastal environments in which they have become invasive: the Mitten crab, North Pacific seastar and Amur River clam.

The Mitten crab, native to freshwater and estuarine habitats off the east Asian coast, is a species which lives as an adult burrowed in river and stream embankments. Adults migrate into the estuary to reproduce, where

2 https://www.cabi.org/isc/datasheet/108338#toDistributionMaps
3 Cuthbert et al 2021: Science of the Total Environment 775:145238
4 Hay C, Luckens P 1987: *New Zealand Journal of Botany* 25(2): 329-332
5 https://www.nps.gov/articles/zebra-mussels.htm

the hundreds of thousands of offspring released from each adult wash out to sea. There the crabs develop and grow, settling to the sea bed after about two months. Juvenile mitten crabs then migrate en masse from the sea back up the river to dig burrows into the river bank in which to live and repeat the cycle. Outside its native range, this AIS has become a significant problem, with large numbers burrowing into embankments, undermining them and leading to slope instability and erosion. In addition the adults are efficient predators and resource competitors and have been implicated in declines in native crayfish and fish populations overseas.[6]

The North Pacific seastar is another species of particular concern. Native to the northwest Pacific, this species is a voracious predator and grazer with a massive reproductive output. Studies suggest that the population of this sea star grew to over 12 million individuals within two years of becoming established in Melbourne's Port Philip Bay in Australia. The species will consume mussels, scallops and other bivalve shellfish, egg masses, sponges, sea squirts as well as decaying fish and other fish waste. Rocky reef seabeds in Tasmania's Derwent Estuary were transformed within a few years following invasion by this AIS from productive, species rich environment to relatively barren, sediment covered habitats.[7]

The Amur River clam, native to Japan, China and the Korean peninsula is another rapidly proliferating AIS capable of significant and lasting impacts on native communities. The species is highly tolerant of fluctuating salinity and a wide range of sediment types (from soft mud to coarse sand) and can survive in relatively polluted environments. This bivalve filters out large quantities of plankton, leading to changes in local biological community structure as native species are consumed. It has led to the replacement and collapse of native shellfish populations and fisheries in North America and other areas to which is has become invasive.[8]

AIS may also, however, be intentionally introduced to a new area when it is considered beneficial. Pacific oysters, for example, are a rapidly growing seashore species that were likely introduced to Northland as an aquaculture species following accidental introduction to New Zealand[9]. The oysters rapidly spread beyond the farmed locations to become a major pest in the lower intertidal zone. AIS can thus spread not just between countries but also between islands, local areas, or even across oceans. The spread of AIS and their impacts on native biodiversity is a global concern, and efforts are being made globally to reduce their spread and effects.

2 Existing Environment and Management of AIS

2.1 Existing Location and Activities

Whanganui Port is located approximately 1000 m from the mouth of the Whanganui River estuary. Access to the port by sea is restricted by the presence of sand bars at the river mouth, so there is a restriction on the size of vessels that can find berthage there. The port structures have fallen into disrepair as goods have increasingly been moved into and out of the region by road rather than by sea. Currently only one coastal trader, the 34 m bulk carrier MV *Anatoki* regularly calls in the port[10]. The boat ramp area at the upstream side of the commercial wharf is used by recreational and small commercial vessels, though continual accumulation of riverine sediments does at times cause some restriction on vessel movements.

The key biosecurity risk activities associated with small boat operations arise from potential cleaning of the hull (either in or out of water) and release of bilge/seawater system-water that may be contaminated with fouling organisms. Cleaning typically involves waterblasting the hull followed by hand scraping. Cleaning in this manner actually increases the biosecurity risk in the area by releasing viable individuals or fragments,

6 http://www.iucngisd.org/gisd/species.php?sc=38
7 http://www.iucngisd.org/gisd/species.php?sc=82
8 http://www.iucngisd.org/gisd/species.php?sc=136
9 Dinamani P 1971: N*ew Zealand Journal of Marine and Freshwater Research* 5: 352-357.
10 Dilley, J 2021: Whanganui Port Redevelopment Navigation Safety Assessment DRAFT

which in the absence of collection may be washed directly back into the water.[11] As the low estuarine environment would be particularly vulnerable to colonisation by introduced marine species, this activity would be considered to pose a significant biosecurity risk to the area.

There is no evidence of any vessel cleaning or maintenance occurring at the boat ramp in Whanganui. The only larger slipway in the area where such cleaning and maintenance could occur is located at the Q-West boat building facility, approximately 350 m to the east of the existing boat ramp. Discussion with the operators of that facility (Wardale, pers.comm.) indicates that any vessels removed from the water there are cleaned inside the boat shed, with full containment and disposal of the solid arisings to a landfill.

2.2 AIS in the Region

Although located at the mouth of a large river, aquatic habitats in the port area of Whanganui are tidally dominated, with a vertical range of over 3 m during spring tides. This twice daily inundation by marine water limits the potential for colonisation by saline-intolerant species. This review therefore focuses on those marine and estuarine species that can inhabit the project area, excluding those species that can only survive in freshwater.

The 2009 Manawatu-Wanganui Regional Pest Animal Strategy[12] includes six (6) marine/estuarine species as 'animals to be managed', including:

- Clubbed tunicate (*Styela clava*)
- Chinese mitten crab (*Eriochier sinensis*)
- Mediterranean fanworm (*Sabella spallanzanii*)
- North Pacific sea star (*Asterias amurensis*)
- European (Green) shore crab (*Carcinus maenas*)
- Amur River clam (*Potamocorbula amurensis*)

Marine species, however, are not included within the latest Regional Pest Management Plan (RPMP)[13], following a reorganisation and clarification of responsibilities in the 2012 reform of the Biosecurity Act 1993[14]. These species are still of concern to the region, however, as are other marine species including:

- *Asian Paddle Crab (Charybdis japonica)*
- Asian Shore Crab *(Hemigrapsus sanguinea*)
- Aquarium Caulerpa (*Caulerpa taxifolia*)
- Australian droplet tunicate *(Eudistoma elongatum*)
- Cord Grass (*Spartina* alterniflora)
- Wakame (*Undaria pinnatifida)*

The only marine or estuarine species currently regulated in the RPMP is the estuarine cord grass *S. alterniflora*. This is designated for management to eradication in the plan, in joint responsibility with the Department of Conservation. While the species noted above (apart from *S. alterniflora*) are not present in the region or directly managed by Horizons, any local discovery of unwanted organisms is reported to the lead agency (Section 2.1 of the RPMP)Whanganui Port is not included in the Ministry for Primary Industry's port

11 McClary D, Nelligan R 2001: New Zealand Ministry of Fisheries Project ZBS2000-03 Final Report.
12 Lambie J 2009: Manawatu-Wanganui Regional Pest Animal Management Strategy. Horizons Regional Council, Palmerston North. ISBN: 978-1-877516-88-7
13 Horizons Regional Council 2017: Horizons Regional Council Pest Management Plan 2017-2037. Report No. 2017/EXT/1552 ISBN 978-1-98-853712-2
14 Biosecurity Law Reform Act 2012: www.legislation.govt.nz/act/public/2012/0073/latest/DLM3388104.html#DLM3388203

biosecurity monitoring survey programme. As such the number and extent of AIS already present in the port is not known with any certainty. While no marine AIS are therefore currently confirmed in the port, a number of highly transmissible species (notably *S. spallanzanii, S. clava, and U. pinnatifida*) are, however, present in either or both of New Plymouth and Wellington, so are considered within the transportable range for these pests.

2.3 Management of AIS in the Region

The Horizons One Plan[15] is a combined Regional Policy Statement, Regional Plan and Regional Coastal Plan. Under the coastal protection provisions of One Plan (Chapter 8), project proponents have a responsibility to protect the integrity of the coastal environment and it's ecosystems (Objective 8-2) in an integrated manner (Policy 8.1). This requires protecting and where appropriate enhancing native biodiversity. The One Plan also provides a number of rules relating to the spread of exotic and introduced plants in salt marshes and coastal dunelands

On a local/regional level, pests are assigned a specific level of intervention based on the perceived impacts and current distribution. The RPMP identifies the different priority pests and the appropriate management actions to be taken. Based on this, pests are targeted for:

- Exclusion (preventing establishment);
- Eradication; (complete removal)
- Progressive Containment (rolling back the spread); and,
- Sustained Control (limiting the spread).

Exclusion pests are those pests that are not currently present or established in an area, for which regulations are in place to actively restrict or prevent their import to that area. *Eradication* pests are those that have been detected in an area, typically at an early stage of the introduction process, for which efforts are made to eliminate the population. For Progressive Containment Pests, it has been recognised that the pest has become established in the area and eradication in the target area would be impossible to achieve. Efforts in this case are made at stopping their spread beyond existing natural boundaries by imposing controls on the population sizes and also vectors of their spread between areas. Species subject to Sustained Control are for those pests which have become well established and it is no longer possible to stop their spread. Management focusses instead on reducing the population size in an area in order to minimise / reduce environmental impacts.

3 Project Relevance for Biosecurity – Risks and Benefits

A number of different aspects of the proposed activities have direct relevance to the establishment and spread of AIS. Aside from the natural spread that occurs once an AIS becomes established, AIS typically colonise new locations incidentally by 'hitch-hiking' on artificial structures or vectors. For example, AIS can be transported into or out of the site by infested dredging/piling barges or associated support vessels. The new structures being put into place (jetty floats and poles, wharfs and pilings, etc.) all create novel artificial habitat which may be colonised by any AIS present.

Effective management of these aspects will ensure that the facility meets regional and national biosecurity standards. The relevant aspects are based on activities to be undertaken during both the construction and post-construction/operational phases of the development. In brief during the construction phase, equipment

15 Horizons Regional Council 2014: One Plan: The Consolidated Regional Policy Statement, Regional Plan and Regional Coastal Plan for the Manawatu-Wanganui Region. Report Number: 2014/EXT/1338 ISBN 978-1-927250-41-9

and materials will be moved into and out of the area; this transport increases the risk of a biosecurity incursion event. Routine practices once works are complete, such as vessel cleaning in the new hardstand area, will also increase the risk of incursion and establishment of AIS. These two phases are discussed in more detail below.

3.1 Construction Phase Risks

Redevelopment of the port area is comprised of several interdependent activities. The initial phase of redevelopment will see demolition of existing structures. This is likely to entail works from both the land and water as both land and barge-mounted cranes are used to remove wharf structures and piles. Following completion of demolition, construction will begin, during which wharf piles will be re-instated or upgraded, During construction, materials and some equipment will be moved into and out of the site and such movements can provide a vector for the movement of AIS. Some level of dredging of the bed of the estuary will also be required. Dredging will likely occur using a barge-mounted backhoe, with the spoil to be re-used in a small reclamation located upstream of the port area or disposed of at the designated disposal sites within the coastal marine environment. There is a risk that the backhoe bucket, if brought from another location infested with AIS, can spread potential marine pests to the area.

As noted above, there is a lack of information on potential marine pests already present in the port area. On this basis, it is difficult to ascertain whether the movement of dredge spoil during construction of the reclamation will result in the translocation of any AIS. It is, however, considered that the likelihood of this occurring is low.

The potential for these vectors to translocate AIS can be readily mitigated through the establishment of a biosecurity management plan emphasising good vector hygiene practices (i.e. cleaning and inspection). These risks and mitigations are discussed in the sections below.

3.2 Operational Phase Risks

On completion of construction, port operations will re-commence as normal. Larger vessels will again be stationed along the wharves and in addition land-side activities associated with the vessel lifting bay (e.g. vessel cleaning and maintenance, land-based support for marine industries) will occur. Broadly speaking, biosecurity risk during the operational phase may arise due to the presence of vessels (mobile risks), activities that occur (activity risks) and also due to the physical infrastructure of the harbour (infrastructure risks). These risks and mitigations are discussed in the following sections of this report.

3.2.1 Mobile Risks

Mobile risks that occur during this phase may arise through a variety of events and activities, including:

- movement of vessels[16] with hulls fouled by AIS;
- movement of vessels with sea chests and keel coolers fouled by AIS; and,
- arrival of recreational gear (e.g. small boats, wetsuits, fishing nets, traps, baits) fouled with AIS.

Fouling organisms may be attached to or find refuge within any wetted surface and as such AIS may be transported to and around the site on vessels both on and within the hull. Stationary/slow moving vessels (e.g. work barges) frequently have long intervals between docking and cleaning so often are heavily fouled. For moving vessels, any irregularity on the surface of the hull that disrupts the smooth flow of water can provide a location to which the dispersive stages of marine fouling organisms, including AIS, can attach. AIS may also find refuge within and become established inside the internal seawater systems of such vessels. This can include within the seawater intake pipes, and for larger vessels, within a sea chest (a flooded

16 'vessels' includes both powered and non-powered, recreational and commercial boats and ships

recess within the hull from which sea water is abstracted for use within the vessel – for system cooling, ballasting, sanitary plumbing, deck washing, etc), the internal seawater pipework or on keel coolers (structures on the hull designed to disperse engine heat directly to the sea).

Recreational equipment and fishing gear has been implicated in the movement of several AIS around New Zealand, notably the freshwater alga *Didymosphenia geminata* ('Didymo') and the marine wakame kelp *Undaria pinnatifida*. It is typically the microscopic life stages of AIS that pose the greatest biosecurity risk. For example, wet suited divers swimming through a stand of kelp in the Wellington-Kapiti area may brush against *Undaria* plants, inadvertently picking up the microscopic gametophytes of the alga. These gametophytes can readily survive extended lengths of time out of water if kept moist, and be transferred to an uninfested site when the gear is re-used. Effective management of recreational equipment is thus essential to achieve good biosecurity outcomes.

3.2.2 Activity Risks

A number of biosecurity risks may occur during the operational phase resulting from the activities occurring in the port area, including:

- In-water defouling of vessel hulls supporting populations of AIS;
- Release of hardstand effluent from vessel hulls fouled by AIS that are defouled on the hardstand area;
- Discharge of bilge water from fishing, small commercial and recreational vessels;
- Transportation and storage of previously used commercial equipment (e.g. fishing nets) to the site overland or on board a vessel is infested by AIS;
- Port maintenance/upgrade activities (e.g., maintenance dredging).

In-water defouling of vessel hulls whether intentional or unintentional, can result in the release of AIS and establishment on nearby surfaces (e.g., wharf faces, pilings). The simple action of a heavily fouled vessel's hull rubbing against a jetty can result in some scraping of biofouling and loss to the water. The amount of this activity within the port area at Whanganui is considered to be very low to negligible.

A far larger biosecurity risk, however, occurs when vessels are hauled out onto the hardstanding area of the port. Any such vessel, very likely sourced from areas infested with marine pests (e.g., *Undaria, Styela*), will require cleaning on haulout from the water. Cleaning of the hull, typically by high pressure waterblasting, is one of the first actions usually taken when a vessel is hauled from the water. This removes biofouling and permits access to the underlying coatings and structures. The arisings from this hull cleaning simply fall to the ground in uncontrolled settings and may contain whole individual and viable fragments of biofouling organisms[17].

If the arisings of hull cleaning are simply permitted to wash off the hardstand into the estuary, there is a high risk that any AIS present that are tolerant of the local environment will become established on the surfaces nearby. Any purpose built vessel lifting bay and travel-lift facility built at the port will require full containment and capture of the biological and contaminant arisings to reduce the realised biosecurity risk. Dependent upon local body requirements, liquid arisings could be safely disposed to trade waste, with solids disposed in an appropriate sanitary landfill.

Bilge waters (or any permanently wet space on board a vessel) can also contain AIS. Thus cleaning of these areas in the port could release AIS into the environment unless appropriate care is taken to prevent their spread.

17 Woods et all 2012: *Marine Pollution Bulletin* 64(7): 1392-1401

It is anticipated that the port redevelopment will provide a focal point for the development of local marine industries, including boat building and fishing. AIS are typically robust species capable of surviving brief periods out of water, particularly if they can avoid desiccation. Fishing nets and aquaculture equipment (e.g. floats, backbone and dropper lines) can provide a moist refuge for AIS. If this infested, pre-used equipment is re-deployed in water, it may result in the spread of a pest. Even if the equipment is apparently dry, the life stages of some species, such as the invasive kelp *Undaria* noted above, can still survive out of water for extended periods[18].

It is anticipated that some level of maintenance dredging of the port, access channel and approaches will be required to maintain minimum navigational depths. If the dredging equipment used is not normally resident in the river, there is a risk that equipment imported from other areas will be infested with AIS, which must be considered.

3.2.3 Infrastructure Risks

Biofouling of the infrastructure comprising the port creates a potential locus of infection by AIS and therefore biosecurity risk to the region. As noted previously, most AIS can rapidly colonise new artificial surfaces and thus newly installed infrastructure is susceptible to inoculation of a pest from a nearby vector (e.g., a biofouled vessel tied alongside). This can lead to the establishment of the AIS on the structure, which may in turn spread naturally to nearby native habitats. In addition, should the AIS remain undetected on the structure, it may reproduce and be passed on to other vectors that could spread the pest elsewhere, and thus create a ‘stepping stone’ for translocation throughout the region.

If not actively managed for biosecurity risks, the port itself may therefore become a node of transmission during the operational life of the facility. There are few to no safe harbours along this coast between Cape Egmont and Wellington, so there is the possibility that vessels from outside the region will seek shelter in the port. Should such vessels be fouled by AIS there is a risk they may become established in the port, either onto the fixed infrastructure of the wharves or on natural surfaces near the hardstand. While this cannot be directly controlled by port operators, compliance with the Regional Council’s and Ministry for Primary Industries’ rules on biosecurity should be encouraged. Effective, ongoing management of these risks must form an essential component of the standard operating and management practices of the port.

These and other risks are discussed in in Section 4 below.

3.3 Benefits for Biosecurity

The proposed port redevelopment may also result in improved biosecurity outcomes for the region due to an improved capacity for managing existing risks. Whanganui Port is not presently on the list of high risk surveillance sites monitored for marine pests by MPI, so there is little extant information on or treatment for potential marine or estuarine AIS in the area.

It is anticipated that the dedicated vessel haulout and hardstand area in the proposed development will be capable of capturing and treating the arisings of hull cleaning. This will reduce the potential biosecurity risk of the area, and the capture of paint residues from cleaning will facilitate effective environmental management.

3.4 Summary

The proposed port redevelopment will pose both risks and benefits for biosecurity management in the area. There is a risk that aquatic pests are transported to the area during or after demolition and construction works occur and that these become established. If established, the area could thereafter become a source population for the further spread of the pest to other areas once the facility is operational. Alternatively, the

18 Forrest B, Blakemore K 2002: Inter-regional marine farming pathways for the Asian kelp, *Undaria pinnatifida*. Draft report prepared for Kingett Mitchell Limited. 23 p.

presence of a vessel lift/hardstanding area in the port, with dedicated and properly maintained biological waste/paint residue capture capabilities, following best practice guidelines will result in improved biosecurity and environmental outcomes as the local vessel fleet becomes better managed.

4 Biosecurity Risk

4.1 Risk Assessment

The proposed port redevelopment will pose both risks and benefits for biosecurity management in the Whanganui area. An objective assessment of this risk is therefore required for the project proponents to develop a facility that follows the principles of environmental best practice.

Risk assessment requires an evaluation of the likelihood and consequences off a particular feature, action or event. From a biosecurity perspective, risk assessment addresses the probability that an invasive species will be introduced and/or become established in an area as well as the potential impacts of that invasion on the natural, social and economic environment.

A variety of factors must be considered when attempting to quantify the biosecurity risk posed by the proposed port redevelopment. The design of the wharf structures, for example, can potentially have an impact on the likelihood that an AIS can become established. The types and layout of structures that comprise the physical infrastructure of the port structures may affect the ability of the larvae of AIS to be retained in the area, settle on surfaces and become established[19].

The level and type of vector traffic into and out of the area is also of key importance. If this is comprised solely of local vessels that do not depart the region, the likelihood of an AIS incursion is low. Conversely, repeat visits by vessels normally resident in a location heavily infested with AIS will raise the likelihood of incursions. As noted in section 3 above, the nature of the activities that occur in the port also affect the assessment of risk. De-fouling a vessel in-water alongside a wharf would be considered an activity posing a high biosecurity risk. The risk would be markedly reduced by cleaning on the hardstand area where arisings are captured and disposed to a landfill.

Risk is assessed by combining semi-quantitative evaluations of likelihood and consequence in a matrix. Likelihood is rated on a 5 point scale (very unlikely, unlikely; possible; likely; very likely) with the potential impacts rated on a 4 point score (negligible; minor; moderate, major). A matrix is used to illustrate and combine the factors into relative risk, as follows:

19 Floerl O, Inglis G 2003: *Austral Ecology* 28:116-127

INCREASING LIKELIHOOD →

↓ *INCREASING IMPACT*

	VERY UNLIKELY	UNLIKELY	POSSIBLE	LIKELY	HIGHLY LIKELY
NEGLIGIBLE	VERY LOW	VERY LOW	LOW	LOW	LOW
MINOR	VERY LOW	LOW	LOW	MODERATE	HIGH
MODERATE	LOW	LOW	MODERATE	HIGH	CRITICAL
MAJOR	LOW	MODERATE	HIGH	CRITICAL	CRITICAL

It is often considered necessary to avoid features having ‘High’ and ‘Critical’ risk ratings, while ‘Very Low’ and ‘Low’ risk features are considered acceptable by society. Features offering moderate levels of risk may be considered acceptable under certain circumstances.

In this assessment, the potential impact of introducing any known marine AIS is considered ‘Major’ due to the connectivity of the marine environment. That impact will however, vary with the specific type of AIS being evaluated, in which case a species-by-species evaluation of risks may be warranted.

Assessed risk can be reduced, however, by implementing remediation or mitigation strategies. For example, the risk of introducing an AIS to an area when defouling a vessel on a hardstand may be reduced from ‘High’ to ‘Low’ by constructing facilities for capturing the arisings as generated and disposing to an appropriate sanitary landfill, with liquid arisings going to the trade-waste system. Each of the main activities discussed in section 3 above is subjected to a risk assessment and this is summarised in Table 2 below.

Table 2: Project Biosecurity Risk Assessment

Project Phase	Feature?	Likelihood	Impact	Assessed Risk
Construction	introduction of AIS on work barges and support vessels following flooding of the excavation	Possible	Major	High
	introduction of AIS on installed infrastructure	Unlikely	Major	Moderate
	spread of AIS in dredge spoil during construction of the reclamation	Possible	Moderate	Moderate
Operational	arrival of vessels with hulls fouled by AIS	Likely	Major	Critical
	arrival of vessels with sea chests and keel coolers fouled with AIS	Likely	Major	Critical
	arrival of recreational gear and equipment fouled with AIS	Possible	Major	High
	in-water defouling of vessels fouled with AIS	Unlikely	Major	Moderate
	release of hardstand effluent from vessel hulls fouled by AIS that are defouled on the boat lift / hardstand area	Likely	Major	Critical

Table 2: Project Biosecurity Risk Assessment

Project Phase	Feature?	Likelihood	Impact	Assessed Risk
	discharge of bilge /ballast water from fishing, small commercial and recreational vessels	Possible	Major	High
	port maintenance/upgrade activities	Unlikely	Major	Moderate
	the port becomes a locus of infection for further spread	Possible	Moderate	Moderate

Although as a general rule the impact of spreading marine AIS is considered to be major, an exception here to this relates to the potential translocation of AIS in dredge spoil to the proposed small reclamation. The reclamation is to be located within the port area, so the potential distance of any spread is quite low. In addition any AIS that may be present in one area of the port are likely to have already naturally spread to suitable habitats in close proximity. This also applies to dredge spoil disposal sites within the coastal marine area.

High biosecurity risk activities occur during the construction of the proposed port redevelopment, notably the potential for introduction of AIS on work barges and vessels used for installation of the infrastructure. This equipment is not likely to be normally resident within the area, so the risk of biosecurity incursion must be mitigated prior to arrival, potentially through a condition of the Consent. Though the other activities related to construction are considered to pose a moderate risk, addressing them must still be included in any construction management plan.

As indicated in the Risk Assessment above, the highest ('Critical') risks will occur once the port redevelopment is complete and full operations resume. In the absence of any management, it is highly likely that AIS will be released into the port as:

- vessels infested with AIS arrive in the port
- vessels are de-fouled in -water
- hardstand effluent releases AIS into the port

Many of these risks will be mitigated through compliance with existing regulatory regimes.

4.2 Risk Mitigation

As noted previously, in all cases the assessed risk can be reduced by adopting mitigation strategies. For the risks assessed in Table 2 above, the mitigations and subsequently revised risk are provided in Table 3. As indicated in the table, effective implementation of the suggested mitigations reduces the risk of incursion by marine/estuarine AIS to a low level for most activities.

A moderate risk remains, however, that the port will become a locus of infection for the further spread of marine AIS. The main commercial vessel servicing the area, the MV *Anatoki*, services a variety of other ports in New Zealand at which AIS, notably *Undaria*, *Styela* and *Sabella* are known to be present. For example, the Port of Timaru, known to be home to at least 21 marine AIS (including *Undaria*), was visited by the *Anatoki* on 23 October 2021, which then travelled directly to Whanganui, arriving 2 days later[20]. Should this vessel be fouled with *Undaria* sporophytes, the potential for spread to wharf structures at Whanganui is very high. Active management of the port, requiring that all users adhere to national guidelines on biosecurity, particularly with respect to biofouling management should, however, keep this risk at a low to moderate level.

20 https://www.marinetraffic.com/en/ais/details/ships/shipid:698828/mmsi:512000390/imo:8864153/vessel:ANATOKI

Table 3: Revised risk after mitigations

Item	Assessed Risk?	Mitigation	Revised Likelihood	Revised Risk
introduction of AIS on work barges and support vessels following flooding of the excavation	High	Inspect all barges and support vessels prior to use; no macrofouling to be permitted; comply with RPMP Rules 1 & 6	Very Unlikely	Low
introduction of AIS on installed infrastructure	Moderate	Installed infrastructure to be in new or as new condition (with independent verification)	Very Unlikely	Low
spread of AIS in dredge spoil during construction of the reclamation	Moderate	Examine dredge spoil sediments for potential AIS and verify free from infestation prior to use	Very Unlikely	Low
arrival of vessels with hulls fouled by AIS	Critical	Require non-local vessels to provide verification of cleaning within the last month or application of antifouling coating within the last 6 months; comply with RPMP Rule 1	Very Unlikely	Low
arrival of vessels with sea chests and keel coolers fouled with AIS	Critical	Require non-local vessels to provide verification of cleaning within the last month	Very Unlikely	Low
arrival of recreational gear and equipment fouled with AIS	High	Check and clean all equipment brought into the area; wetsuits and similar gear to be washed in warm soapy water	Very Unlikely	Low
in-water defouling of vessels fouled with AIS	Moderate	Prohibit activity; implement education programme to encourage user compliance	Very Unlikely	Low
release of hardstand effluent from vessel hulls fouled by AIS that are defouled on the boat lift / hardstand area	Critical	Install bunds (temporary or permanent) around washdown areas; install waste capture trenches or pits to capture all arisings; direct all liquid arisings through a sand filter to catch particulates prior to discharge	Very Unlikely	Low
discharge of bilge / ballast water from fishing, small commercial and recreational vessels	Critical	Prohibit activity within the port area; maintain facilities on the hardstand for pumpout and capture of all bilge waters; dispose captured waters to an appropriate facility; compliance with RPMP Rule 7	Very Unlikely	Low
transportation and storage of previously used commercial equipment fouled with AIS to the site overland or on board a vessel	High	All equipment to be declared and independently checked and verified free of AIS; compliance with RPMP Rule 2	Very Unlikely	Low
Port maintenance/upgrade activities	Moderate	Inspect all equipment (e.g. barges,dredgers) brought from outside the facility for compliance; ensure only new or 'as new' structures are installed in water	Very Unlikely	Low
the port becomes a locus of infection for further spread	Moderate	Adoption of the measures noted in this table; annual visual inspection of all submerged structures for AIS	Unlikely	Moderate

5 Management Actions & Conclusions

5.1 Management Actions

The mitigations and other strategies proposed herein should be incorporated into a Biosecurity Code of Practice (BCOP) for the Te Pūwaha Whanganui Port redevelopment project. Users (including constructors and any contractors present) would be expected to sight, agree to and comply with the BCOP in order to have access to the facility. The BCOP would codify expectations of all users and the necessary actions for reducing the risk of biosecurity incursion.

Biosecurity management procedures should be incorporated into the main construction management plan (CMP) as a condition of the Consent. This should focus on ensuring that the work barge, supporting vessel and any-mounted equipment is free of pests. All installed infrastructure is to be in new or 'as new' condition, and thus should not of itself pose any biosecurity risk.

Best practice biosecurity management practices also must be incorporated into the standard operating procedures for the port area, including:

- Routine surveillance;
- Capture of biological arisings; and
- Collection of vessel history information.

As one of the key areas of concern relates to the potential for the port to become a node of infection for other areas, a programme of routine surveillance of the infrastructure (the wharves, pilings and jetties) and resident vessels should form part of routine biosecurity management. All transient vessels should also be required to submit to a visual inspection if requested by the facility operators. This can include direct visual inspection of the structures and vessels by divers or using remote camera platforms. Longer term site surveillance can also be effected by monitoring passive settlement collectors deployed at key locations in the port, particularly near the vessel haulout/lifting bay. These are particularly useful tools for monitoring the process of colonisation of the newly installed structures by AIS as well as local species.

Capture of the biological and other arisings of cleaning is an essential component of good biosecurity and general environmental management. Vessels should only be hydroblasted or scraped clean of biofouling in bunded (permanent or temporary) areas of the hardstand. All material arising from such cleaning activities must then be disposed in a landfill. Liquid effluent from cleaning should also be collected and at minimum passed through a sand filter to capture the majority of the viable organisms and fragments.[21]

In order to ensure compliance with national guidelines and best practice on biosecurity, recent maintenance and voyage history information should be collected from all non-resident vessels prior to arrival. This should be coupled with an education and outreach programme to inform the owner/operators of vessels from source areas of the biosecurity risk posed by their vessel. International vessel arrivals must be able to demonstrate compliance with New Zealand's biofouling management regulations -the Craft Risk Management Standard (CRMS-Biofoul).[22]

One of the key, difficult to mitigate biosecurity risks posed by the operation of the port relates to surreptitious cleaning of vessels in-water by owner/operators attempting to reduce operational and maintenance costs. A public education programme, aimed at improving awareness amongst all users of the importance of good vessel hygiene and biosecurity practice, should be instituted. Ideally, the programme should be comprised of effective signage at each boat ramp and jetty area, a targeted social media campaign and public information meetings. Programme messaging should include:

- Regular, out-of-water cleaning of the vessel hull and niche areas;
- Regular application and maintenance of anti-fouling coatings;
- Prohibition of in-water defouling of vessels;
- Prohibition of any discharge of ballast or bilge water into the port;
- Promotion of the measures in the national 'Clean Below? Good To Go' vessel biofouling campaign; and,
- Promoting recreational users to check, clean and dry their gear before use, particularly if it has been used outside the local area.

Biosecurity risks do not disappear once construction is complete and the port returns to routine operations. A biosecurity response plan must therefore become part of the port's environmental management system. As marine biosecurity management is primarily a function of regional and central government in New Zealand,

21 McClary D, Nelligan R 2001: New Zealand Ministry of Fisheries Project ZBS2000-03 Final Report.
22 Ministry for Primary Industries 2018: Craft Risk Management Standard: Biofouling on Vessels Arriving to New Zealand. 9p.

the response plan should focus on rapid communication of information to the relevant authority and containing the potential spread until these authorities can respond appropriately.

5.2 Summary & Conclusions

Aquatic invasive species (AIS) can have marked and long lasting impacts on local species, habitats and ecosystems. Species such as the Mitten crab, North Pacific seastar and Amur River clam can all potentially result in devastating impacts on local kai moana and other native species as well as the physical structure of the banks of the Whanganui River.

The redevelopment of Whanganui Port has the potential to increase the risk that AIS are introduced to the area by providing new habitats for colonisation (e.g. the wharf pilings), increasing vessel traffic to the area to utilise the new facilities, and through the release of biological material from vessels cleaned onshore in the facility. All of these risks can, however, be readily mitigated. Installed infrastructure must be in new or as-new condition, free of any AIS. Equipment used for construction and ongoing maintenance (e.g. dredgers) must be inspected and verified as free of marine pest species prior to arrival at the port for use. Non-resident vessels should provide verification of cleaning within the last 6 months, or demonstrate compliance with the CRMS for international vessel arrivals. All vessel cleaning onshore must be contained such that the arisings are directed to trade-waste, be it solids to a landfill or liquids to the sanitary sewer system.

A biosecurity response plan included within the port's environmental management system should be used to guide managers in the event of an AIS incursion.

In summary, while this proposed redevelopment has the potential to result in the introduction of AIS, a well constructed, managed and operated facility can keep this risk to a minimum.

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