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Kopu Marine Precinct Ecology Report

Prepared For

Urban Solutions Ltd.

February 2019

REPORT INFORMATION AND QUALITY CONTROL

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Document Name	AA4539 Kopu_Ecology_V1.1

Version History:	V0.1	18/02/2019
	V1.0	04/04/2019
	V1.1	30/04/2019

EXECUTIVE SUMMARY

This report provides detail of the ecological opportunities and constraints associated with the redevelopment of the Kopu Marine Precinct. It provides detail on the existing ecological values, as determined from a literature review and a site visit.

It is proposed that a number of upgrades are made to the existing facilities and which include paved commercial slipways, improvements to the barge abutment, paved and unpaved hardstand areas, new accessways and a dedicated recreation boat ramp area.

The site is located on the true right bank of the lower Waihou River. It is within the CMA as identified in the Waikato Region Coastal Plan. The CMA boundary is upstream at the Kopu Bridge. The site sits within the large Firth of Thames Area of Significant Conservation (ASCV10 – Waihou River to Tararu). The ecological values associated ASCV10 include internationally important wetland (RAMSAR site), an important area for resident and frequenting rare and threatened native wader, coastal and freshwater birds, nationally significant mangrove and mudflat communities and extensive shellfish beds. Although the Kopu site is captured within the broader ASCV 10, the only ASCV criterion which relates specifically to the site, is the possible use by bird species of conservation interest. Overall, the desktop review indicates the site has low ecological value and low significance.

The site visit focused specifically on the habitats in and surrounding the larger redevelopment area (the area surrounding the existing facilities). This included terrestrial freshwater and intertidal habitats. The existing habitats have been highly modified and included rank/ungrazed stopbanks, a burrow pit used to extract sediment to replenish the stopbanks, transitional wetlands, drainage canals, mangrove stands and mudflats. With the exception of the mangrove stands, all vegetated habitats were either dominated by or showed significant encroachment of exotic plant species. The botanical value of the vegetation through the site is low. Some avifauna were observed during the site visit and although birds are likely to use this vegetation, that use is also likely to be limited. The intertidal mudflats host a low diversity, and abundance of benthic macroinvertebrates. Relative to the wide availability of intertidal mudflats in the general area, this very small area within the footprint of the proposed marine precinct is unlikely to be heavily utilised by, or important to, the ecology of wading birds. The occasional presence of several bird species listed under the NZ Threat Classification Lists cannot be discounted but is unlikely to be significant in terms of the ecological requirements and natural range and use of local habitats by such species.

The redevelopment will lead to an increase in the overall footprint of the site, however there is not considered to be any specific ecological constraints to the development. The development should look to leverage existing facilities and features to minimise the overall footprint, including features such as the existing slipway. 'less' rather than 'more' reclamation/infilling of mangrove/mudflat and maritime edge habitat, would be preferred. This would also be in line with the underlying values which support the wider ASCV status and also the reported intermittent use of the area by bird species of conservation importance. Opportunities to carry out weed control and native replanting could also be incorporated into final designs.

Overall, there are considered to be no significant ecological values or constraints to the proposed Kopu Marine Precinct development, either within or outside the CMA. Overall, the likely effects are considered to be less than minor.

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1 INTRODUCTION

Thames Coromandel District Council is proposing to redevelop existing marine and ancillary land facilities at 11 Quay St, Kopu, to accommodate increased marine activities including boat haul out, house transportation and transfer of aggregate via barge. The proposal involves works inside and outside of the CMA and includes a refurbished slip-way, a commercial wharf, extended barge abutment, commercial and recreational parking facilities and hard stand areas. Minor dredging around the slipway may be required to allow boats with a four metre draught to be hauled out at high-tide. New road access ways may also be created. It is unclear if a stormwater upgrade is part of the proposal. The redevelopment area is to be named the Kopu Marine Precinct.

This report has been commissioned by Urban Solutions Ltd on behalf of Thames Coromandel District Council. It details the findings from a desktop study and investigation of the ecological values of the site proposed to be redeveloped. This report is intended to inform the concept design for the redevelopment, in regards to any ecological constraints and/or opportunities. It is not intended to provide a comprehensive assessment of ecological effects.

2 PROPOSED WORK

Three potential concept designs have been proposed for the Kopu Marine Precinct. They are Concept 4, Concept 5 and Concept 6 (Appendix A).

Concept 4 and Concept 5 cover the same approximate footprint, overlaying the existing developed area and expanding immediately north. These concepts would include a secondary access way at King Street, a paper road north of Quay Street. Both designs would roughly double the existing facilities footprint.

Concept 6 has the largest overall footprint, with a commercial area overlaying the existing facilities and extending northwards (in the same manner as Concept 4 and 5) and a recreational boat ramp and parking area further downstream. This concept would involve creating new access way at King Street (a paper road north of Quay Street) and Princes Street.

The proposed work may include some or all of the below, depending on which concept design is chosen.

Facilities within CMA:

- Two paved slipway (current slipway is unpaved);
- An extended barge abutment (extending 20 m from the river edge); and
- A recreational boat ramp.

Facilities outside of CMA:

- New access ways at King Street and/or Princes Street;
- Expanded hardstand (paved and unpaved);
- Trailer boat parking areas; and
- Toilet and storage facilities.

We have assumed that only minor dredging would be required around the structures within the CMA.

3 DESKTOP ASSESSMENT

The current facilities at 11 Quay St, Kopu, include an unsealed boat ramp, a barge dock and load/offload area, an unsealed carpark, a haul-out accessway for Kopu Marine, and an aggregate stockpile area.

The site is located on the true right bank of the lower Waihou River. It is within the CMA as identified in the Waikato Region Coastal Plan. The CMA boundary is upstream at the Kopu Bridge.

The Waihou River, with a 1100 km^2 catchment, is the largest river feeding into the Firth of Thames. It is also the largest contributor of fine sediment to the Firth[1][2]. Waikato Regional Monitoring at Te Aroha suggests that the River is well oxygenated but suffers from poor clarity and excessive total N, total P and *E. coli* loads. This water quality is likely also to broadly characterise the river water quality at the Kopu site, notwithstanding its tidal nature.

Estuarine vegetation monitoring carried out by the Waikato Regional Council in 2006[3] described the estuarine vegetation surrounding Kopu as consisting of mangroves (*Avicennia marina subsp. australasica*) fragmented by tall fescue (*Festuca arundinacea*) and marsh clubrush (Bolboschoenus fluviatilis). Towards the Kopu boat ramp (the proposed redevelopment site) saltwater paspalum (*Paspalum vaginatum)*, spartina (*Spartina spp.*) and divided sedge (*Carex divisa*), all of which are exotic species, were common. Oioi (*Apodasmia similis*) and sea rush (*Juncus kraussii*) occur in small pockets around the boat ramp. It was also noted that stock fencing was either absent or located within the CMA along this stretch of coastline.

The site sits within the large Firth of Thames Area of Significant Conservation (ASCV10 – Waihou River to Tararu). ASCV are identified using criteria derived from the New Zealand Coastal Policy Statement[4] (which include ecological values, specifically):

1) Presence of protected areas;
2) Wetlands, estuaries and coastal lagoons of national or international significance;
3) Habitats, breeding sites, roost sites or feeding sites of marine mammals and birds; and
4) Ecosystems, flora and fauna habitats with regionally, nationally or internationally significant or threatened ecosystems or species.

Within Appendix IV of the Waikato Regional Coastal Plan the values associated with ASCV10 include the following ecological values:

- Internationally important wetland (RAMSAR site);
- Resident and frequenting rare and threatened national and international migratory waders, coastal and freshwater bird species;
- Nationally significant mangrove and mudflat communities; and
- Extensive shellfish beds and gathering of shellfish.

Although the Kopu site is captured within the broader ASCV 10, the only ASCV criterion which relates to the site, is the possible use by bird species of conservation interest. The RAMSAR site is marginally within ASCV 10, as the true left bank of the Waihou River Mouth marks its eastern boundary. This is well downstream from the Kopu Marine Precinct site. The overwhelming majority of the RAMSAR site falls within the adjacent ASCV9 (Kaiaua to Waihou River).

There are no important high-water roost sites within the vicinity of the site but the farmland and stop banks on either side of the Waihou River are reported to be commonly used as temporary roost sites during spring tides and adverse weather[5]. Such use at the site has not been documented and is likely to be infrequent.

Overall, the desk top review indicates the site has low ecological value and low significance.

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[1] Vant, B. (2016). Water quality and sources of nitrogen and phosphorus in the Hauraki Rivers, 2006 – 2015. Report prepared for Waikato Regional Council. WRC TR 2016/17.

[2] Swales, A., Gibbs, M., Olsen, G., Ovenden, R., Costley, K., Stephens, T. (2016). Sources of eroded soils and their contributions to long-term sedimentation in the Firth of Thames. Report prepared by NIWA and Dairy NZ for Waikato Regional Council. WRC TR 2016/32.

[3] Graeme, M. (2006). Estuarine Vegetation Survey: Inner Firth of Thames. Prepared by Natural Solutions Marine and Terrestrial Ecologists Ltd for Environment Waikato. EW TR 2006/40.

[4] New Zealand Coastal Policy Statement 2010 (2010). Department of Conservation, Wellington, New Zealand.

[5]Dowding, J.E. (2013). Sites of importance to coastal and estuarine birds on the east coast of the Waikato Region. Prepared by DM Consultants for the Waikato

4 SITE ASSESSMENT

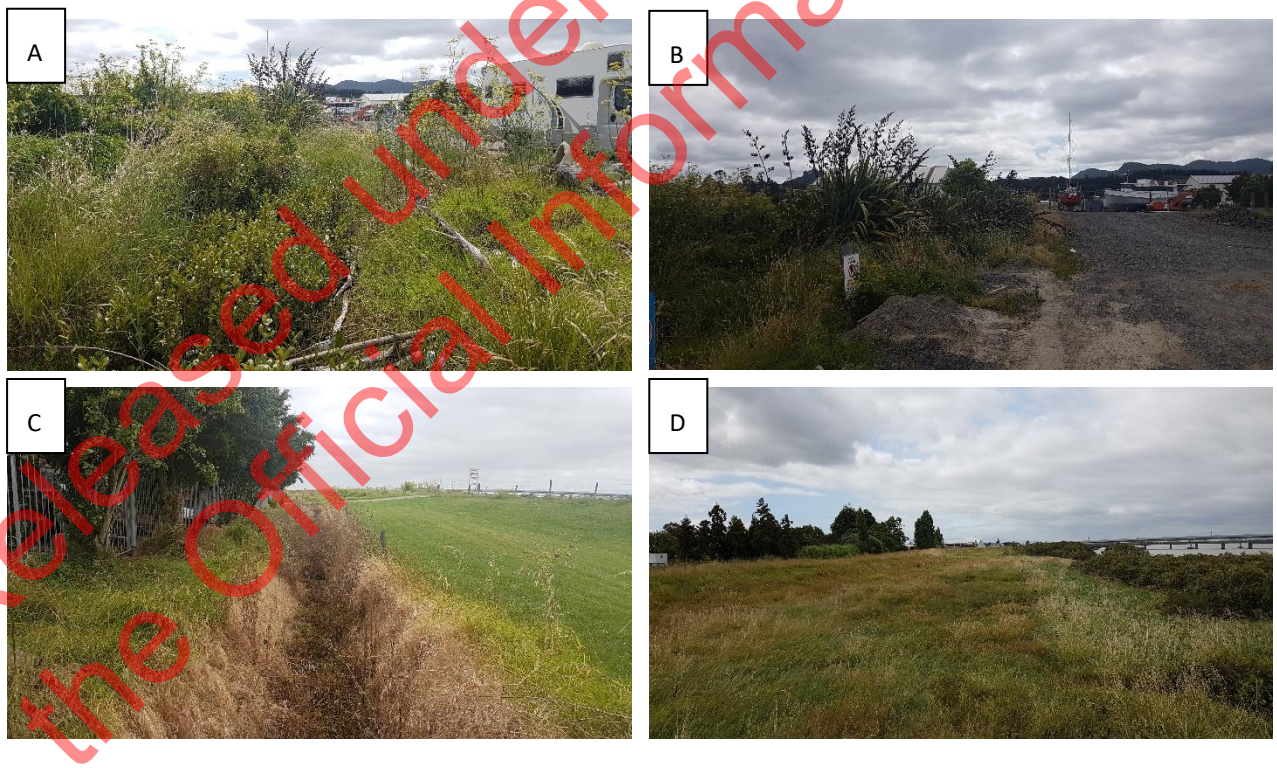
A site assessment was carried out on 21 January 2019 over an ebbing tide. The site visit assessed ecological values surrounding the existing facilities footprint and within the proposed expanded footprint of Concept 4 and 5.

At the request of Urban Solutions Ltd, no assessment of the recreational area proposed in Concept 6 was undertaken. Also, given the limited potential for other than very minor impacts on localised subtidal areas, no sampling of subtidal areas was undertaken.

4.1 Ecology Near Existing Facilities

The existing environment is highly modified. Modified areas include:

- A small man-made tidally influenced watercourse (40 m in length) at the northern end of the carpark (Figure 1A, 1B). This had mangrove seedlings in the lower 15 m, then rushes and weed species. A row of mature flax (*Phormium tenax*) lined the upper true right side.
- Mown grass to the east, on either side of the bike trail (Figure 1C).
- Ungrazed, weed infested paddocks to the south (Figure 1D).
- Mangrove habitat and transitional wetland to the west of the stockpile area (Figure 1E). A 10 m wide stand of mangroves, between 1.5 to 3 m high, transitions into a small brackish wetland containing sea rush, marsh clubrush, flax, divided sedge and pastoral weeds. The brackish wetland was approximately 10 m wide and contained a high density of crab holes. Mangrove seedlings were growing along the lower edge of the riprap wall on either side of the barge wharf. There was a stand of small mangrove trees between the barge wharf and boat ramp (Figure 1F).



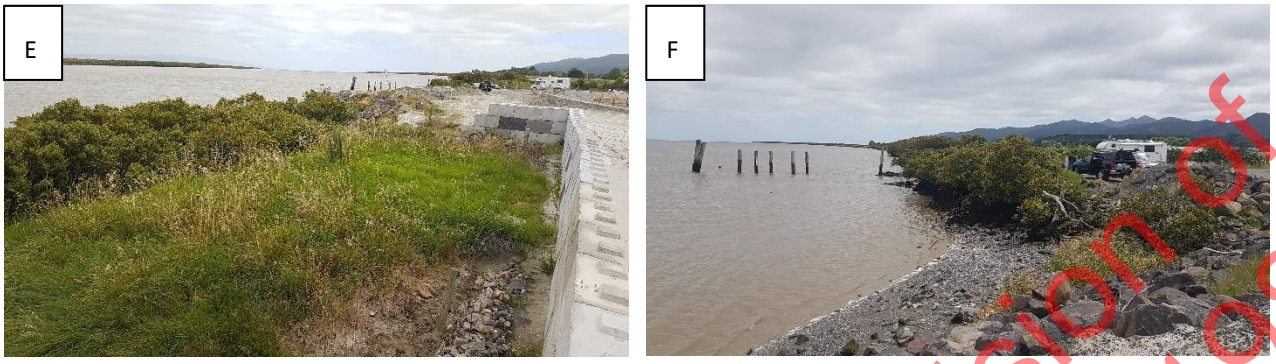


Figure 1: Habitats around the periphery of the existing facilities. A) downstream end of watercourse, B) Upstream end of watercourse, C) Mown grass surrounding the entrance, D) Ungrazed, weed infested pasture to the south, E) Mangrove stand and transitional wetland beside stockpile area, F) Mangrove stand between boat ramp and barge wharf.

4.2 Proposed expansion areas

The proposed development will include expansion into terrestrial and intertidal habitats, as well as the creation of a new road, King Road, which will act as an accessway for recreational vehicles. Refer to Appendix A for a site map.

4.2.1 Terrestrial habitats

The proposed carpark and paved hardstand area will partially sit upon the shoreward (western) slope of the stop banks. At the time of survey, the stop bank appeared to be a former stock grazing area, as evidenced by the fencelines along its length. Stock was present on the eastern slopes of the stop bank. There was no evidence of grazing on the shoreward slopes where vegetation was characterised by rank pasture and pastoral weeds (Figure 2A). No significant native vegetation was noted. The lower slopes, adjacent to the borrow area, were mainly water tolerant weeds, including saltwater paspalum and glyceria (*Glyceria maxima*) (Figure 2B).

King Street, the proposed secondary access road, is an existing paper road and is located between 21 and 25 Queen Street. The strip of land has weedy overgrowth similar to that on the stop bank (Figure 2C).

4.2.2 Freshwater habitats

A stormwater drain lies along the shoreward edge of the commercial buildings (Figure 2D) and runs north from the Kopu Bridge to the Te Kupata Stream. A smaller drain joins this along the edge of 21 Queen Street.

The drains are highly modified, 1 to 1.5m wide, have steep banks approximately 1.5 – 2 m high and little shade. Both banks were dominated by exotic weedy vegetation, with sporadic, immature natives noted. Strong periphyton (algal) growth was noted on the silty substrate. Mosquitofish/Gambusia (*Gambusia affinis*), an exotic fish classified as an unwanted organism, was recorded in these canals.

A number of small pipes were noted in the canal bank which discharged water, mostly from rooftops, from several of the adjacent industrial premises.

A new canal crossing will need to be created in order for King Street to access the site.

4.2.3 Intertidal habitat

An intertidal area, spanned approximately 15 m from the edge of the stop bank to a stand of mature mangroves (Figure 2E). On talking with the local digger operator (who was collecting soil samples for the 4Sight land and water quality report), this intertidal area was created as a borrow are, allowing convenient excavation of marine sediment to top up the stop bank when required. The inlet for this borrow area is adjacent to the boat ramp and the borrow area extends alongshore as far as the Te Kupata Stream. This area was characterised by a deep layer of fine sediment, with a shallow (<2 cm) oxic layer. Given the modified nature and historical use and purpose of this area, no biological cores were collected here.

Between the river channel proper and the borrow area, is a stand of mangroves. This mangrove was separated into two narrow bands (5 – 10 m wide each), one on the river side and one on the borrow area side, separated by a thin wetland (Figure 2E, 2F, 3G). The wetland included a number of transitional saltwater/freshwater plant species. These included glasswort (*Salicornia quinqueflora*), shore primrose (*Samolus repens*), remuremu (*Selliera radicans*), sea rush and marsh clubrush. Saltwater paspalum and divided sedge were also recorded here. The mangrove stand contained trees roughly 5 m high, with the seaward stand having fewer, but larger diameter trees than the shoreward stand. The mangrove stand facing the Waihou River was situated on a steeply sloping shoreline. The pneumatophore growth was roughly limited to the extent of the mangrove canopy dripline.

The Waihou River intertidal area seaward of the mangrove stand, was characterised by a narrow band of firm, coarse sediment and shell hash, then a deep layer of finer sediment towards the low tide channel (Figure 2H). An algal film was noted on finer sediment.

Four benthic invertebrate cores were collected from the fine sediment areas likely to be impacted by the proposed works. These had low taxonomic diversity. A total of eight taxa were identified and no more than six taxa identified at any one location. *Paracorophium sp.*, a tube building crustacean, was the only commonly observed macroinvertebrate within the sediment sampled. A full list of taxa identified is located in Appendix B.

Surface sediment was also taken at the coring locations for heavy metals and PAHs analysis. The analytical results for these are reported in the Kopu Marine Precinct Soil Investigation Report. All metal and PAH values were below ANZG Sediment Default Guideline Values (DGV)[6] with the exception of mercury, which was slightly elevated (above 0.15 mg/kg), but still below the ANZG – GV - High (1 mg/kg) at three of the four sites. No investigations as to the source of mercury was undertaken as part of this assessment.

4.2.4 Avifauna

A total of 14 avifauna species were seen or heard, during the site visit. Conditions were fine with a moderate south-westerly breeze. A list of the bird species recorded is presented below. No At Risk or Threatened bird species listed in the NZ Threat Classification Lists[7] were recorded. No migratory wading birds were recorded during the site visit.

An information board located along the bike trail stated that the Waihou River Wetland system, which includes the mangrove, borrow areas and stop banks, was also important for a variety of shag species including pied shag (*Phalacrocorax varius*), little shag (*Phalacrocorax melanoleucos*) and black shag (*Phalacrocorax carbo*).

While no shags were observed during the site visit, the pied shag is classified At Risk – Recovering, while the black shag is At Risk – Naturally uncommon[7].

Banded rail (classified At Risk – Declining) have also been observed within the wider area[8]. The local habitat, including mangrove stands, mudflats and saltmarsh, is suitable to support banded rails.

Table 1: Bird species recorded during the site visit.

Species	Common Name	Status[7]
Todiramphus sanctus	Kingfisher	Not threatened
Larus dominicanus	Black-backed gull	Not threatened
Porphyrio melanotus	Pukeko	Not threatened

[6] Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia

[7] Robertson, H.A.; Baird, K.; Dowding, J.E.; Elliott, G.P.; Hitchmough, R.A.; Miskelly, C.M.; McArthur, N.; O'Donnell, C.F.J.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A. 2017: Conservation status of New Zealand birds, 2016. New Zealand Threat Classification Series 19. Department of Conservation, Wellington. 23 p

[8] Bell, J., Blayney, A. (2017) Use of mangrove habitat by banded rail (*Gallirallus philippensis assimilis*). Report prepared for Waikato Regional Council. WRC Technical Report 2017/24.

Egretta novaehollandiae	White-faced heron	Not threatened
Circus approximans	Australasian harrier	Not threatened
Spur-winged plover	Spur-winged plover	Not threatened
Gerygone igata	Grey warbler	Not threatened
Hirundo neoxena	Welcome swallow	Not threatened
Carduelis carduelis	Goldfinch	Introduced and naturalised
Emberiza citronella	Yellow hammer	Introduced and naturalised
Carduelis chloris	Greenfinch	Introduced and naturalised
Phasianus colchicus	Pheasant	Introduced and naturalised
Anas platyrhynchos	Mallard duck	Introduced and naturalised

4.2.5 Other notes

During the site inspection, the Department of Conservation was undertaking a dog-based survey for rats due to concerns that rats get onboard vessels servicing Great Mercury Island. The site contains ample habitat for rats and other mammalian predators.

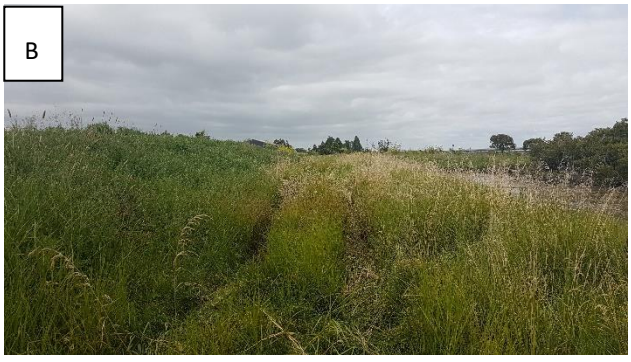
4.2.6 Princes Street area

No formal site assessment was undertaken in this area. Based on information for the wider site, collected from the desktop and site assessments, it is likely that the Princes Street area, both within and outside of the CMA will have broadly similar characteristics.

Satellite imagery show that Princes Street is already partially established (as a driveway for residential and commercial properties). A drain exists behind (on the river side) these properties with semi-grazed pasture seaward of this. There is an existing access way across the drain. At the edge of the CMA there is a thin area of transitional wetland, which gives way to mangroves. Mangroves appear to have been historically cleared from the proposed site of the boat ramp. Mature mangroves exist on either side of this area.

A

B



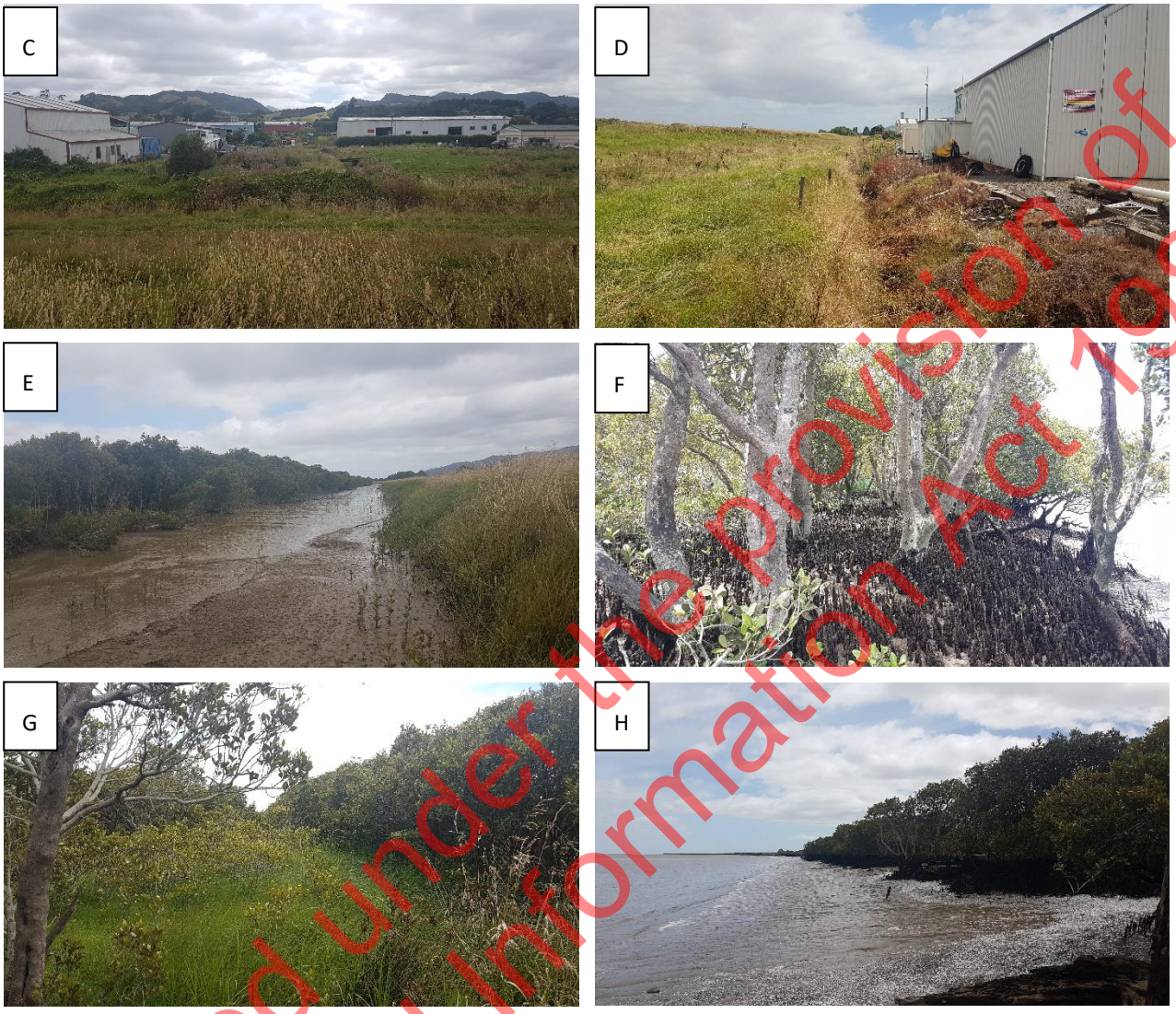


Figure 2: Habitats within proposed redevelopment area. A) Ungrazed paddocks on upper stop bank, B) Lower stop bank, C) Looking straight down King Street paper road, D) Drainage canal along edge of industrial buildings, E) Burrow pit area, F) Seaward mangrove stand, G) Wetland between mangrove stands, H) Foreshore area with consolidated shellhash changing to fine sediment.

5 ECOLOGICAL CONSTRAINTS AND OPPORTUNITIES

5.1 Summary of Ecological Values

The CMA component of the Kopu Marine Precinct sits within ASCV10 for the Waikato Region, which extends from the Waihou River (as far downstream as the Kopu Bridge) to Tararu and is adjacent to ASCV9 which contains the Firth of Thames RAMSAR site. The ecological values of ASCV10 include the extensive mudflat and mangrove habitats it contains and that it provides important roosting and feeding habitat for resident and migratory rare and threatened wader, coastal and freshwater birds.

The proposed redevelopment site contains a wide range of habitats, including terrestrial, freshwater and marine environments. These have by in large been heavily impacted by human activities or are artificially created environments.

With the exception of the mangrove stands, all vegetated habitats were either dominated by or showed significant encroachment of exotic plant species. The botanical value of the vegetation through the site is low. Some avifauna

were observed during the site visit and although birds are likely to use this vegetation, that use is also likely to be limited.

The intertidal mudflats host a low diversity, and abundance of benthic macroinvertebrates. Relative to the wide availability of intertidal mudflats in the general area, this very small area within the footprint of the proposed marine precinct is unlikely to be heavily utilised by, or important to, the ecology of wading birds.

The occasional presence of several bird species listed under the NZ Threat Classification Lists cannot be discounted. Such use is unlikely to be significant in terms of the ecological requirements and natural range and use of local habitats by such species. Rare, threatened or at risk bird species will not be adversely impacted by the proposal.

The sediment showed low concentrations of heavy metals and PAH, with the exception of mercury which was elevated above the ANZG DVG at three of four sites sampled. The source(s) and ecological significance of the elevated mercury have not been investigated and are outside the agreed scope of this work. The human health risk and any handling and disposal requirements associated with elevated mercury are reported on in the Kopu Marine Precinct Soil Investigation Report.

5.2 Facilities within the CMA

The CMA area within the proposed precinct falls within the ASCV10 and near the margin of ASCV9. Given its minor scale, there is no significant potential for the proposed work, or the new precinct to have an impact on the ecological values which support the ASCVs and in particular to impact the ecology of rare, threatened and at risk species of birds, invertebrates or other biota. Any impacts will be less than minor and probably negligible.

While we have assumed that any dredging requirements will be minor and restricted the immediate area around each structure, we note the elevated mercury that occurred in sediments sampled from three of the intertidal sites and which may be removed or disturbed by dredging and constructions works. That matter does not raise specific ecological or water quality issues but is a matter that is dealt with in terms handling and disposal of excavated material as discussed in the 4Sight Land and Water Quality report.

5.2.1 Paved slipways

Two slipways will extend out through the intertidal area and are proposed to allow haul out of boats with a maximum draught of 4 m, on a low high tide.

There are no significant ecological values that will be impacted by the development of the slipway.

Given there is an existing slipway, an opportunity potentially exists to utilise and improve the existing structure, as opposed to creating a new structure. Either way, the effects are minor, and ecological considerations are not a significant consideration in which option is pursued

The area potentially to be used for parking or hardstand facilities has previously been cleared of mangroves, is highly modified, and has previously been used as a ‘soil’ borrow area for stopbank maintenance.

5.2.2 Extended barge abutment

It is proposed that the barge abutment extend an additional 20 m out into the river channel from its current location. This would extend its footprint thorough the intertidal area.

The intertidal community near this location is note notable in terms of abundance or species richness and is unlikely to be frequently utilised by or important to wading bird species. There are no specific ecological constraints to extending the barge abutment by 20 m.

5.2.3 Paved hardstand and trailer boat parking areas.

The paved hardstand and trailer boat parking area would partially be developed through the borrow area. As noted the borrow area has resulted in a modified habitat, however it is still likely to fall within the confines of the CMA which will require land to be reclaimed. It holds no significant ecological value.

Ecological effects being minor, they are not important drivers for concept design in this case.

The above notwithstanding, it is noted that design options for the hardstand and trailer parking areas that required 'less' rather than 'more' reclamation/infilling of mangrove/mudflat and maritime edge habitat, would be preferred. This would also be in line with the underlying values which support the wider ASCV status and also the reported intermittent use of the area by bird species of conservation importance.

5.3 Facilities outside of the CMA

Facilities outside of the CMA will largely be developed over the existing facilities area and the overgrown or semi-grazed stop banks.

Ecological effects will be minor. There are no ecological constraints with reclamation/infilling of this area.

An opportunity to improve the ecological value of the habitat around the site exists and efforts could be made to improve the contribution of native vegetation to the site, through planting and weed control. Pest control should also be considered and will benefit both native flora and fauna that use the wider site.

5.3.1 Unpaved hardstand

The unpaved hardstand will largely occupy the existing unpaved area, with some expansion to the south. Expansion will be through ungrazed pasture and there are no specific ecological constraints to expanding into this area.

5.3.2 Paved hardstand and trailer boat parking areas.

Outside of the CMA the paved hardstand and trailer boat parking area would largely be developed over the lower stop bank. The lower stop banks are weed infested and have limited botanical value, or value to avifauna.

Ecological effects being minor, they are not important drivers for concept design in this case.

5.3.3 Road improvements

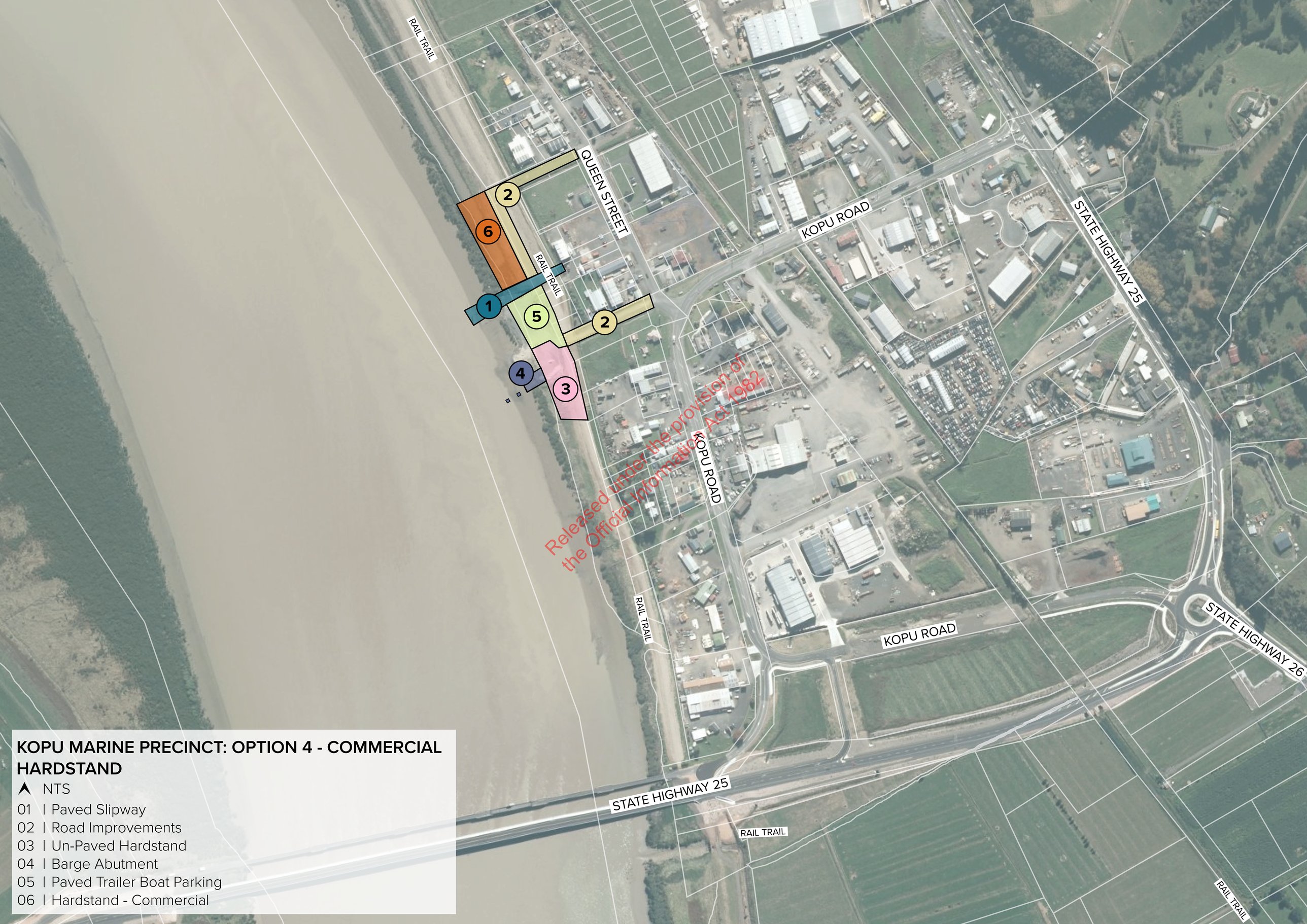
A new road at King Street is proposed in all concept design options. This would require clearance of an ungrazed strip of land, currently overgrown by weed species and the crossing of the drain behind the commercial facilities. There are no significant ecological values that would be impacted by these improvements, nor improvements made to Quay Street.

6 SUMMARY

Overall, there are considered to be no significant ecological values or constraints to the proposed Kopu Marine Precinct development, either within or outside the CMA. Overall, the likely effects are considered to be less than minor.

Appendix A:

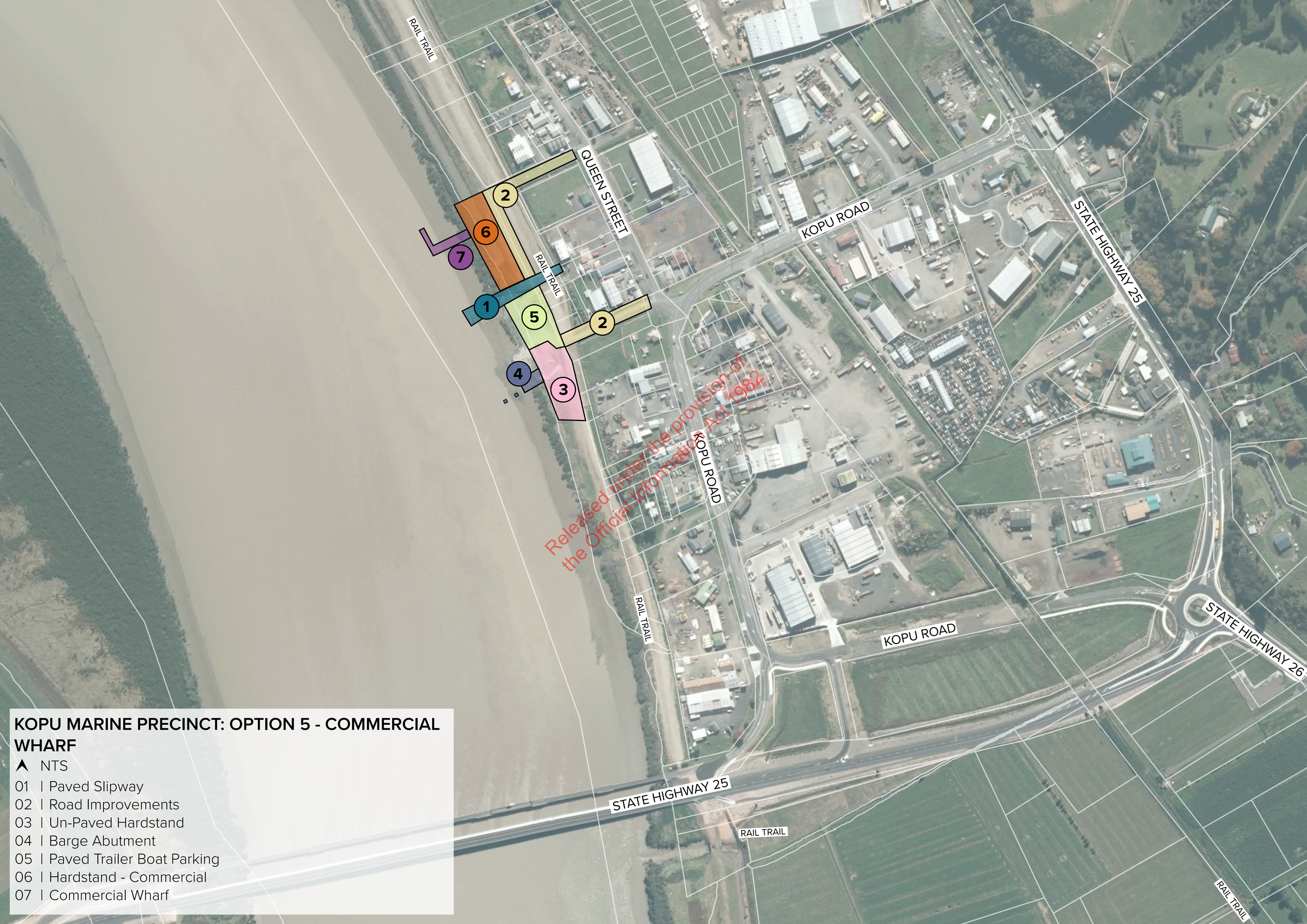
Site map and concept design options



KOPU MARINE PRECINCT: OPTION 4 - COMMERCIAL HARDSTAND

NTS

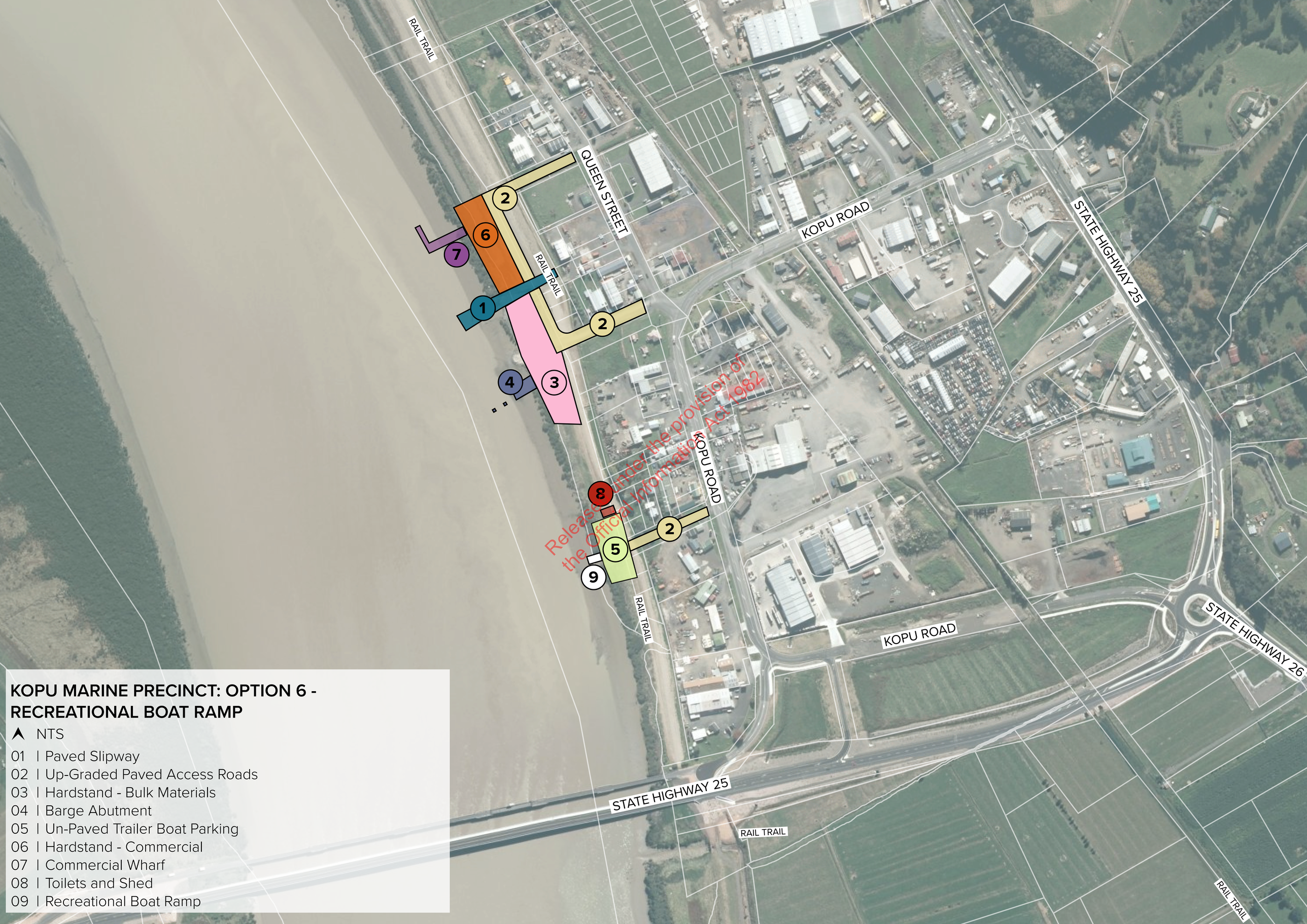
01 | Paved Slipway
02 | Road Improvements
03 | Un-Paved Hardstand
04 | Barge Abutment
05 | Paved Trailer Boat Parking
06 | Hardstand - Commercial



KOPU MARINE PRECINCT: OPTION 5 - COMMERCIAL WHARF

NTS

01 | Paved Slipway
02 | Road Improvements
03 | Un-Paved Hardstand
04 | Barge Abutment
05 | Paved Trailer Boat Parking
06 | Hardstand - Commercial
07 | Commercial Wharf



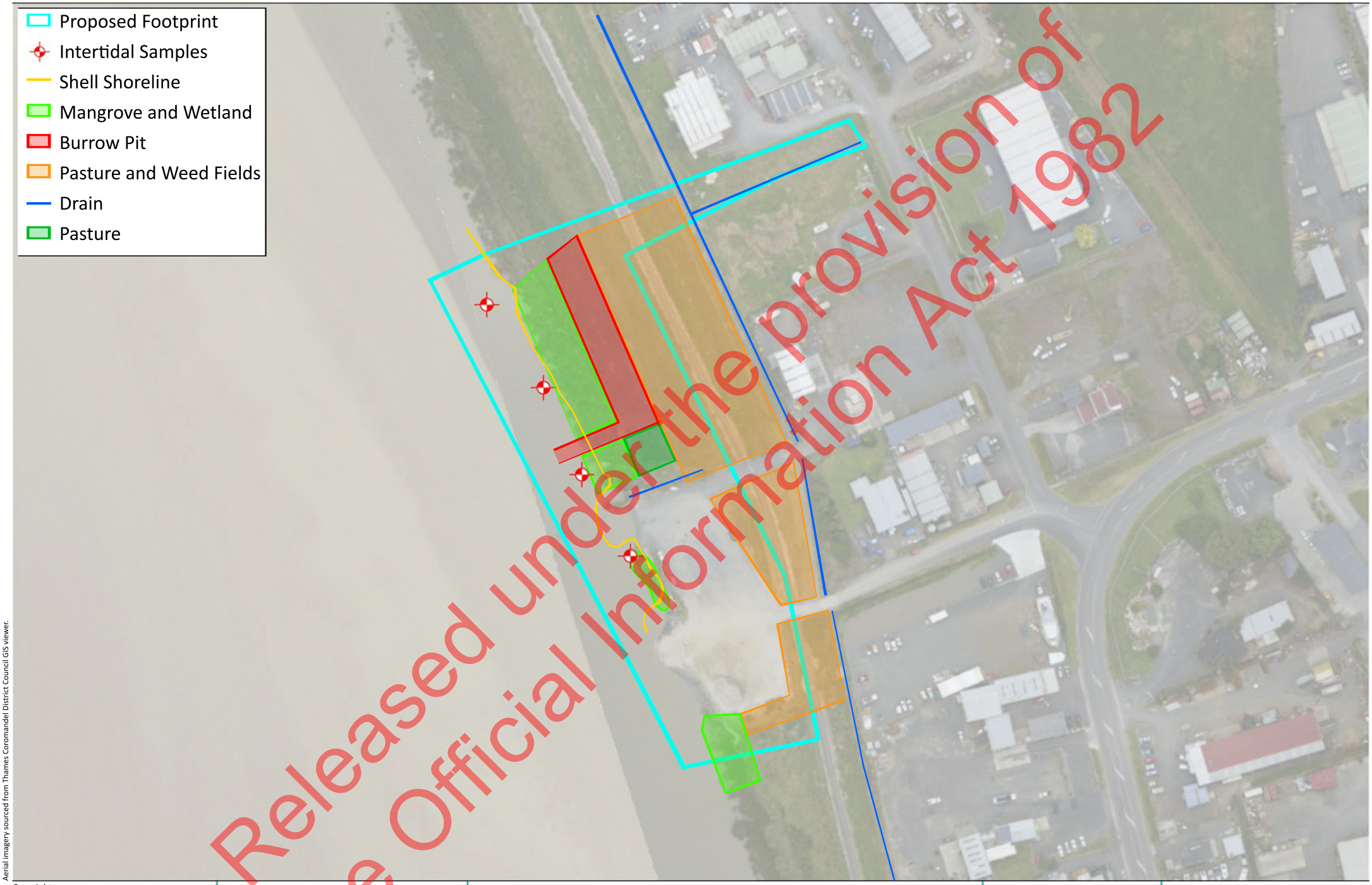
KOPU MARINE PRECINCT: OPTION 6 - RECREATIONAL BOAT RAMP

NTS

01 | Paved Slipway
02 | Up-Graded Paved Access Roads
03 | Hardstand - Bulk Materials
04 | Barge Abutment
05 | Un-Paved Trailer Boat Parking
06 | Hardstand - Commercial
07 | Commercial Wharf
08 | Toilets and Shed
09 | Recreational Boat Ramp

Appendix B:

Raw benthic invertebrate data



Aerial imagery sourced from Thames Coromandel District Council GIS viewer.

N

Scale 1:2,000 @ A4

0 40 80m

AA4539 - Kopu Landing Site

Figure 1: Site Location and Features

Figure prepared for Urban Solutions Ltd by 4Sight Consulting.

Date: 25/02/2019
Version: 1.0
Drawn: Sam Hendrikse
Checked: Arie Spyksma
Approved: Arie Spyksma

4SIGHT CONSULTING

Species	Kopu 01	Kopu 02	Kopu 03	Kopu 04
POLYCHAETA				
Nicon aestuariensis	3	5	3	1
Scolecolepides benhami		1		
OLIGOCHAETA		7	2	4
GASTROPODA				
Potamopyrgus estuarinus			1	
CRUSTACEA				
Copepoda				1
Exosphaeroma sp.		1		
Paracorophium sp.		45	13	28
Tenagomysis sp.		1		
Total species in sample	1	6	4	4
Total specimens in sample	3	60	19	34