IN THE MATTER of the Resource Management Act 1991 and the Local Government (Auckland Transitional Provisions) Act 2010

AND

IN THE MATTER of the Proposed Auckland Unitary Plan

STATEMENT OF EVIDENCE OF STEPHEN JOHN PRIESTLEY FOR PORTS OF AUCKLAND LIMITED IN RELATION TO TOPIC 005 - RPS ISSUES

ALTERNATIVE PORT INVESTIGATION

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RUSSELL McVEAGH

D A Nolan / S H Pilkinton
Phone +64 9 367 8000
Fax +64 9 367 8163
PO Box 8
DX CX10085
Auckland 1140

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EXECUTIVE SUMMARY

A. POAL has commissioned an independent investigation into alternative locations for an Auckland port. The investigation has been prepared in part to inform decision making on submissions on the Proposed Auckland Unitary Plan that seek that the Port of Auckland be relocated or an alternative location be considered. In this evidence, I summarise the findings of the investigation team.

B. The influence of the Resource Management Act 1991, directive policies in the New Zealand Coastal Policy Statement 2010 and the mapping of significant ecological, natural character and landscape areas in the Proposed Auckland Unitary Plan have created a highly constraining environment in respect of the establishment of significant infrastructure in the coastal environment.

C. The investigation uses a Constraints Map (refer **Annexure B**) and sector analysis of the Auckland region to demonstrate the highly constrained nature of the Auckland coastline in the context of establishing infrastructure at the scale of an alternative port. The Constraints Map identifies two levels of constraints: first order "no go" constraints and second order “high” constraints. These constraints influence the “consentability” of an alternative port.

D. Despite the overall conclusion of the investigation team (based on the Constraints Map analysis) that all potential alternative port sites are highly constrained and therefore potentially "unconsentable", concept designs for four alternative locations: two in the Manukau Harbour; one near Ponui Island; and one in the Firth of Thames, were investigated to test and compare the effects, suitability and cost of these locations.

E. The Manukau site (refer **Annexures D** and **E**) near Clarks Beach is adjacent to first order constraints of a Significant Ecological Area - Marine 1 / Coastal Protection Area 1 and the Auckland International Airport Obstacle Limitation Surface designation. The site requires 140 hectares of reclamation and capital dredging of 40 million m^3 of material. The port would connect to land by a 1 kilometre bridge. A new and widened road (17 kilometres) and new rail (11.5 kilometres)

connections would be required. The estimated capital cost for this site is $5.2 billion.

F. A separate Manukau Harbour option near Puhinui (refer **Annexures F** and **G**) was also considered as that location was recently promoted by private interests. It is of similar design and has similar environmental effects to the Clarks Beach alternative. However, based on the Constraints Map, its direct location within the Auckland International Airport Obstacle Limitation Surface and Significant Ecological Area - Marine 1 / Coastal Protection Area 1 and proximity to an Outstanding Natural Feature means that the Puhinui location is simply not feasible and was not evaluated further than for cost comparison.

G. The Ponui site (refer **Annexures H** and **I**) is located off Kawakawa Bay near Ponui Island between first order constraints of Outstanding Natural Landscapes areas. It requires a 160 hectare reclamation, 5.5 million m^3 of dredging and 16 million m^3 of sand material imported for fill, likely from a Hauraki Gulf dredged source. A 6 kilometre bridge / causeway for road and rail would connect the port to the mainland at Waitawa Regional Park. A 28 kilometre new and widened road and a 26 kilometre new rail connection would also be required. The estimated capital cost for this site is $5.1 billion.

H. The Kaiaua site (refer **Annexures J** and **K**) is located north of Kaiaua in the Firth of Thames within a first order constraint being the RAMSAR wetland of international significance. The reclamation footprint is 100 hectares with dredging of 32 million m^3. Of this, 22 million m^3 would need to be disposed of to sea. A 23 kilometre road and 36 kilometre rail connection is required. The estimated cost of this site is $5.5 billion.

I. The high level assessment of effects on the environment completed for the sites (refer **Annexure L**) is summarised in **Table 1** below. Table 1 uses a traffic light system where red is highly negative, orange is moderately negative, yellow is a low negative and grey is neutral.

J. All concept designs would:

(a) Cost between $4.4 and $5.5 billion to construct.

(b) Require significant dredging, reclamation and disposal.

(c) Generate significant adverse effects on ecological values and natural character and landscape values.

(d) Cause significant adverse social and community disruption.

(e) Be contrary to the regional growth strategy of the Auckland Plan.

(f) Require high ongoing maintenance dredging costs.

Table 1 – Summary Effect Comparison

Locations and effect level			
Activity	Manukau	Ponui	Kaiaua
Construction			
Dredging			
Dredging disposal			
Reclamation			
Structures			
Road and Rail			
Operational			
Port Operations			
Dredging and Disposal			
Road and Rail			
Project wide			
Social			
Regional Planning			

K. The concept port designs and the associated assessment of effects on the environment that each design would generate demonstrate that the effects of establishing an alternative port would be significant. Furthermore, the concept design locations appear potentially "unconsentable" based on the first and second order constraints present in each location and the significant adverse effects that are likely to be caused by construction and operation.

L. The overall conclusion is that there are no alternative port locations for Auckland that are justifiable in the foreseeable future.

1. INTRODUCTION

1.1 My full name is Stephen John Priestley. I am a Senior Technical Director with Beca Limited in Auckland.

Qualifications and experience

1.2 This evidence is based on an investigation undertaken by a multi-disciplinary team with expertise in coastal engineering, coastal planning, landscape architecture, GIS mapping and ecology. My qualifications and experience are set out in my brief of evidence on this topic relating to Coastal Engineering. The qualifications and experience of each of the contributors to the investigation are set out in **Annexure A** to this evidence.

1.3 If required, those other members of the expert team will be available to answer any questions that the Hearings Panel might have.

Code of conduct

1.4 I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2011. I have complied with the Code of Conduct in preparing this evidence and I agree to comply with it while giving oral evidence before the Hearings Panel. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

Scope of evidence

1.5 As noted above, this evidence is based on an investigation prepared by a multi-disciplinary team to examine alternative port locations for Auckland. This evidence summarises the findings of that investigation. It is intended to inform decision making on those submissions and further submissions that have sought that the Port of Auckland be relocated or an alternative location be investigated. For example, Heart of the City has opposed the entirety of Ports of

Auckland Limited's (POAL) primary submission, partly on the basis that alternative port locations should be investigated. In its further submission, Heart of the City states:[1]

> Port Precinct reclamations of the scale recommended by POAL are not required to accommodate the anticipated growth in freight demand for Auckland over the life of the Unitary Plan. There are a range of possibilities for catering for the growth in Upper North Island freight, and there are several approaches to considering alternatives:...
>
> - Look at options for additional and/**or alternative ports** in the Auckland region. One leg of this approach is also to suggest alternative uses of part or all of the current port land. Waterfront transformations in other cities provide examples, and commentators like Michael Parker (ref: Pine Tree Paradox) and others have opened the discussion for Auckland. On our back doorstep, Sydney and Brisbane have relocated their ports. Auckland should at least consider the option of developing one expandable 'green port' that provides for all cargo types.
>
> **[Emphasis added]**

1.6 The recent work is an update to a similar investigation undertaken in the late 1990s, which culminated in the 1999 "Port Development Options for the Auckland Region" Report.[2] Both were undertaken by a multi-disciplinary, independent team of experts from the fields of landscape, ecology, coastal processes, port design and planning. While I am not an expert in all these fields, I was the investigation lead and based on my above experience I am qualified to summarise the findings of the investigation and its implication for the Proposed Auckland Unitary Plan (PAUP) hearings.

1.7 This approach to evidence presentation is similar to the earlier 1990s investigation where I led the engineering design inputs and Dr Phil Mitchell led the overall team. Dr Mitchell then gave evidence in a similar manner to this statement of evidence as the project team lead in the Environment Court hearings for the Fergusson Container Terminal extension resource consent application.

1.8 The location of alternative ports has focused on the Auckland Region but, at the request of POAL, a location in the Firth of Thames was also considered.

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1 Further submission number 2935, page 46 / 194.

2 "Port Development Options for the Auckland Region", Beca (1999).

2. CONSTRAINTS MAP

2.1 The approach taken was to investigate the availability of any suitable alternative port locations. This began with preparation of a Constraints Map (refer **Annexure B).**

2.2 Two levels of constraints were identified; first order constraints (shown in red) – "no go" locations that mean an alternative port location would be "unconsentable" under the Resource Management Act 1991 (RMA); and second order constraints (shown in orange) – which provide a significant RMA consenting impediment to the establishment and operation of an alternative port.

2.3 "Unconsentable" for the purpose of this evidence means that either the activity would not likely secure resource consents due to the significance of effects and/or contrary nature to planning provisions or that a plan change process would unlikely be successful due to the restrictions of the constraints, particularly the first order constraints.

2.4 First order constraints are set out in Table 2.

Table 2 - First order constraints

Constraint	Rationale
Outstanding Natural Character Areas	An assumption of this study is that the scale and associated modifications caused by the establishment and operation an 80 hectare port would have significant adverse effects that could not be avoided, and that it would be very difficult to remedy or mitigate the effects on these areas / features. An alternative port in these locations would fail to give effect to the New Zealand Coastal Policy Statement 2010 (NZCPS) (in particular, Policies 13 and 15) which states that development is to avoid adverse effects in areas of Outstanding Natural Character, Outstanding Natural Features and Outstanding Natural Landscapes and to avoid significant adverse effects and avoid, remedy or mitigate other adverse effects on other areas of natural character, natural features & landscapes within the coastal environment. Recent case law has affirmed this direction of the NZCPS. The PAUP prohibits[3] reclamation within an area of outstanding natural feature(s) or outstanding natural character.
High Natural Character Areas	
Outstanding Natural Landscapes within the coastal environment	
Outstanding Natural Features	
Residential zones within the RUB	An alternative port in the vicinity of these areas would generate sensitivity issues – in terms of amenity, visual effects and public use of

[3] Unless required for safe and efficient operation of significant infrastructure.

Constraint	Rationale
	and access to the CMA. As a result, all existing residential areas are a "no go" constraint.
Marine Reserves	Marine reserves (administered by the Department of Conservation (DOC)) are determined to be locations that contain outstanding, rare or distinctive marine habitats or ecosystems. Marine reserves are the highest level of marine protection in New Zealand. Identified interaction with a port location would result in a port option being incompatible. Areas of international significance (e.g. RAMSAR wetland areas) are identified as having the same significance as marine reserves.
Significant Ecological Area – Marine 1 (SEA-M1) / Coastal Protection Area 1 (CPA-1)	Locations under the Auckland Regional Plan: Coastal that are of regional, national or international significance due to their ecological, landform or geological values have been defined as Coastal Protection Areas (CPA). These areas are classified as CPA types 1 or 2. CPA-1 areas contain features that are more significant than those in CPA-2 areas. CPA-1 areas are considered "no go" areas. Capital dredging and reclamation in a CPA-1 is prohibited under the Auckland Regional Plan: Coastal. The PAUP equivalent classification is SEA-M1 and M2. The PAUP prohibits[4] reclamation in a SEA-M1.
Sites and places of significance to Mana Whenua	Sites and places of significance to Mana Whenua are significant features of the physical and cultural landscape (eg. Pa, Wahi Tapu sites and Urupa). These features are distinct from the range of cultural features including middens and food pits. Port establishment would be expected to result in the destruction of these sites or significant degradation of their value and therefore these sites are "no go" constraints.
Auckland Airport Obstacle Limitation Surface (OLS)	The Auckland Airport Obstacle Limitation Surface (OLS) prevents any activities from being established that would penetrate the envelope of the OLS, without approval from Auckland Airport. The OLS envelope extends from 0 metres at the runway concentrically outward to 52 metres at 4 kilometres from the runway and 100 metres at 8 kilometres from the runway. The height of loaded ships is >50 metres and quay ship-to-shore cranes with raised booms are >100 metres. Dispensation from Auckland Airport is highly unlikely to be obtained. Therefore the OLS contour is a "no go" constraint.
RAMSAR sites	As noted above in the commentary of Marine Reserves, RAMSAR sites are internationally significant wetland areas. Given the extent of this significance, RAMSAR sites are considered "no go" constraints.

2.5 Second order constraints are set out in Table C.

Table 3 – Second order constraints

Constraint	Rationale

[4] Unless required for safe and efficient operation of significant infrastructure.

Constraint	Rationale
Regional and local parks	Regional and local parks attract uses that are incompatible with port activities and generally are afforded a high level of planning protection. They are therefore considered to be second order constraints.
Significant Ecological Area – Marine 2 (SEA-M2) / Coastal Protection Area 2 (CPA-2)	SEA-M2 / CPA-2 are areas of regional, national or international significance that do not fit the SEA-M1 or CPA-1 classification as they are considered more robust or of less ecological significance than SEAM-M1 or CPA-1 sites. They are still highly valued and therefore are second order constraints.
Sites of value to Mana Whenua	A port would be considered an incompatible uses and these sites have a high level of protection. However, mitigation of effects may be possible and therefore these areas are considered as second order constraints.
Conservation Areas and Reserves	DOC terrestrial land is generally of high value and set aside for conservation purposes. It is unlikely (though not impossible) that the required approvals (concessions) would be able to be obtained to utilise DOC land for port activities. These areas are therefore considered to be second order constraints.
Cable Protection Areas	Development in these areas would require relocation of cables, which would be a major undertaking. These areas are therefore second order constraints.
Established marine activities (mooring / aquaculture)	Existing marine use and assumed occupation permits / zones protects this primary use of coastal space. Such areas are therefore second order constraints.
Water Supply Management Areas	Road and rail transport connections through these areas are likely to be incompatible with this protected land use and these areas are therefore considered to be second order constraints.

2.6 Enabling attributes were also shown on the Constraints Map. As shown on **Annexure B**, these are:

(a) the existing rail network (NIMT);

(b) State Highways;

(c) business/industrial zoned land; and

(d) areas of 12 to 15 metres of water depth.

2.7 The Constraints Map was split into seven sectors to enable easier review. The sectors were identified using harbour catchments/ridgelines, broad scale landscape characteristics and in

some places the edge of the urban area. These are shown on the Constraints Map as thick white lines.

2.8 The investigation team collectively reviewed the Constraints Map to identify potentially suitable locations for an alternative port location within each sector. To understand the scale of the alternative port for this review, and to prepare concept designs, the current commercial port footprint (with existing and consented infrastructure) was used, including:

(a) A minimum of 80 hectares of port land area.

(b) Minimum water depths of 12.75 metres (12.5 metres + 0.25 metres sedimentation allowance) below Chart Datum (CD) in the approach channels, and up to 13.5 metres below CD in the berths.

(c) Shelter from wind and shelter from waves such that significant wave heights in the port basins would be 0.5 metres or less.

(d) 17 shipping and support vessel berths with a total berth length of 3,200 metres.

(e) Road and rail connections serving regional and national distribution networks.

2.9 Other considerations included:

(a) International shipping requirements (e.g. east coast preferred over west coast to suit international shipping routes, as stated in the evidence of Mr Peter Morris).

(b) Connections to utilities such as high voltage power supply and fire fighting water supply.

(c) Adaptation to climate change effects such as sea level rise, increased rainfall and increased wind speeds.

2.10 Based solely on the Constraints Map, for an alternative port on the scale of the characteristics set out in paragraphs 2.8 and 2.9, there

are very few locations that are not covered by red "no go" first order constraint layers.

2.11 The Kaipara Harbour is one of the few locations that appears to offer a potentially suitable alternative port location. However, the Kaipara Harbour was not selected as an alternative port location as it would require extensive inner harbour dredging and reclamation to establish a port and is a large distance from the existing distribution centroid in Auckland. More importantly, the Kaipara Bar is treacherous with inadequate depth and would require a large volume of continuous dredging and disposal to maintain a safe navigable channel. This would be prohibitively expensive, likely cause significant adverse effects that would be difficult to mitigate and have high uncertainty in terms of its continued operation. In addition, international shipping logistics companies are understood to prefer East Coast ports because most of New Zealand's main ports are on the East Coast where a level of vital interconnectedness can therefore be maintained.

2.12 The site attributes for the Kaipara Harbour are similar for the Manukau Harbour location, which has similar harbour dynamics but is in a more preferable west coast location much closer to the distribution centroid in Auckland. As an alternative location, an option in the Manukau Harbour was therefore selected for further investigation. This enables a good understanding of the issues that would come up for any theoretical Kaipara Harbour location.

3. ALTERNATIVE CONCEPT DESIGNS

3.1 Despite alternative locations being constrained from a consenting perspective (as shown on the Constraints Map in **Annexure B**), three alternative locations were nevertheless selected for concept design to test and compare the effects, suitability and cost of these locations. The three selected locations and the rationale for selection are shown in Table 4. These alternative concept designs are based on the same design rationale for a "like for like" replacement port as described in **Annexure C**. A fourth location was subsequently investigated at POAL's request to allow consideration of a location that was subject to a private investigation by other interests in 2013.

3.2 As an aside, the yard areas required for the alternative ports are all considerably larger (140 hectares to 175 hectares) than the existing Port of Auckland at its current location (80 hectares). This situation arises because the required berth length rather than the yard area has governed the design of the port area footprint. The concept designs use a yard width of 300 metres, however, the concept designs did not enable berths on the outer face of any alternative port because it would require dredging, deeper perimeter structures and wave protection adjacent to it. This demonstrates the benefit of having a sheltered harbour port, such as the Port of Auckland in its current location, as all the yard perimeter can be used for berth space.

Table 4: Selected Alternative Port Locations

Port	Location	Selection Rationale
Manukau Island Port	Manukau Harbour - southern shore (north east of Clarks Beach)	The Manukau Harbour has an existing small port; there are locations within the harbour that are very close to enabling infrastructure and the freight distribution centroid; the Harbour was the preferred alternative location in a 1989 Port Development Plan; and it provides a concept alternative West Coast site for comparison to East Coast port locations.
Ponui Island Port	Hauraki Gulf - south of Ponui Island (offshore from Kawakawa Bay)	This location has proximity to adequate water depth and some degree of shelter; it provides a concept alternative east coast site for comparison; and it was the preferred alternative option in the previous 1999 study.
Kaiaua Land Port	Firth of Thames – western shore (north of Kaiaua)	This site provides an alternative that is out of the region; it enables comparison of a mainland based port; and the investigation of a Firth of Thames site was requested by POAL in response to public comments by other parties indicating the viability of such a site.

Manukau Harbour Alternative Port Location

3.3 The site selected is north-east of Clarks Beach, outside the Auckland Airport OLS 110 metre height contour, as the existing port crane booms extend approximately 100 metres above yard deck level when elevated. The port site is located approximately 1 kilometre off the coastline, outside the first order constraint CPA-1 zone. Refer to **Annexures D** and **E** showing the conceptual port layout and navigation channel.

3.4 The port concept has two finger type reclamations 400 metres apart extending northwards with internal quays. The service area is located at the landward end of the fingers across the 400 metre basin width. The reclamation is connected to land by a 1km bridge and new road (17 kilometres) and rail (11.5 kilometres) routes provide transport links to the nearby road and rail corridors. The estimated capital cost of the port and transport connections is $5.2 billion.

3.5 Significant reclamation of 140 hectares would be required over a second order constraint (an intertidal area frequented by wading birds) to create the port infrastructure. Significant dredging of 40 million m^3 is also required to construct the port basin and navigation channel, including within the same second order constraint intertidal area, across the Manukau Bar, and for berthing and ship turning basins. This quantity of dredging would require offshore disposal to a dispersive site and potentially cause significant ecological effects.

3.6 Maintaining a safe navigational channel on an ongoing basis across the Manukau bar would be a significant technical issue. The estimated length of maintenance dredging over the bar is approximately 3.8 kilometres. This trench type trapezoidal channel would be prone to sedimentation from the extensive littoral drift northwards up the coast. It is estimated some 500,000 m^3 annually could be interrupted by the channel which would require continuous maintenance dredging and recycling back into the sediment system northwards of the channel. The unknown effects of this ongoing maintenance dredging on coastal processes could be significant. The cost of this maintenance dredging including the port basin and navigation channels is estimated to be $19 million per year.

Additional Manukau Harbour location

3.7 For comparison to the base Manukau Harbour option, and assuming no first order constraints existed, an alternative site near Puhinui adjacent to Papakura Channel and Auckland International Airport has been assessed. This is shown as **Annexures F** and **G**. The site provides a direct transport link to the south-western motorway and North Island Main Trunk Line (rail).

3.8 This location was selected at POAL's request because it was promoted by private interests a year ago as an area where a new port might be developed (those behind the private investigation included Russell Kilvington and Mark Oxley, who I understand are Heart of the City's "port advisers"). There is a cost saving compared to the base Manukau Harbour option (estimated to be $0.8 billion, mostly due to shorter transport connections, so the cost would be in the order of $4.4 billion).

3.9 However, this site is directly located within a first order "no go" constraint. It is located within the Auckland Airport OLS (so any container cranes would intrude significantly into the restricted airspace, as would large container ships entering the port). The site is also adjacent to an outstanding natural feature, and it would need to be located within a SEA-M1 / CPA-1.

3.10 This location would require a similar scale of reclamation and dredging as for the Clarks Beach option, with all of the associated significant effects likely to result.

3.11 Given the first order constraints identified above, it is perhaps not surprising that this idea does not seem to have progressed, to my knowledge.

Ponui Island, Hauraki Gulf Alternative Port Location

3.12 The site selected is approximately 2 kilometres offshore, south-east from Ponui Island in water depth between -8 metres and -12 metres CD. Refer to **Annexures H** and **I** showing the conceptual port layout and navigation channel. To help orientate the Panel, on **Annexure I** Kawakawa Bay is identified on the bottom left. This port location was selected to be clear of the outstanding natural landscape areas on the mainland and Ponui Island, shown as red first order "no go" constraints.

3.13 The port is a U-shaped island of 160 hectares in area including a northern breakwater about 1.5 kilometres long to provide protection from northerly aspect waves. As the site is located in deep water, dredging at the port itself is minimised but channel dredging over

about 3.5 kilometres is required to form a navigation channel. It is assumed that dredged material from the navigation channel would be used to help form the port, but that a further 16 million m^3 of material would still be required. Realistically, this would have to be sand fill. For cost estimate purposes sand is assumed to be available within 20 kilometres of the site. It would be reasonable to assume that this would have to come from a Hauraki Gulf dredged source, which will generate associated adverse effects.

3.14 A 6 kilometre bridge connection for road and rail is required in the coastal marine area (CMA) to connect the port to the mainland at Waitawa Regional Park near Kawakawa Bay. This road and rail connection within the coastal marine area would be a significant piece of infrastructure in its own right and nothing of a similar scale currently exists in New Zealand. From here a new 0.8 kilometre-long link through the Waitawa Regional Park would connect to the existing road. The road and rail transport connections would then follow approximately the existing road alignment through the Wairoa River valley to Clevedon and on to Papakura, a distance of some 26 kilometres for the rail and 28 kilometres for the road. The estimated cost of the port and transport connections is $5.1 billion. The annual maintenance dredging cost would be approximately $10 million.

Firth of Thames Site (Kaiaua) Alternative Port Location

3.15 Site selection in this sector is largely dictated by the northern-most flat land area and nearest access to deeper water. The site selected is north of Kaiaua Township on the coast, between the settlements of Wharekawa and Whakatiwai. The concept port footprint covers land zoned for a quarry. Refer to **Annexures J** and **K** showing the conceptual port layout and navigation channel. **Annexures J** and **K** also show in a red-hatch the RAMSAR wetland of international significance (which is a first order constraint that can also be seen on the Constraints Map in **Annexure B**).

3.16 The port is aligned approximately parallel with the coast with smaller return quays to minimize the length of the main quay. The reclamation footprint is 100 hectares and the total port footprint is 175

hectares, as part would be built on the adjacent land. Dredging of 32 million m^3 is required to create the port basin and navigation channel, which extends 8 kilometres to reach deep water. As for the Manukau alternative, dredged material would be used in the port reclamation but an excess of 22 million m^3 of dredged material would need to be disposed of to sea, with associated significant adverse effects. There would also be annual maintenance dredging required of 180,000 m^3 because of the location, which would also have to be disposed of to sea.

3.17 A 23 kilometre-long connection to State Highway 2 is required, including new transport corridors to ease horizontal curvature and provide a more direct link. A new rail corridor extends for a further 13 kilometres to connect with the North Island Main Trunk Line. **Annexure J** shows these connections (colored blue and purple), being a mixture of new or widened road and rail infrastructure, from the alternative port to the existing State Highway 2. From State Highway 2 to the existing rail line, the new rail link is shown in green. In terms of length, this new transport link would be 30 per cent longer than the recent Transmission Gully proposal in the Wellington Region. The estimated cost of the port and transport connections is $5.5 billion. The annual maintenance dredging cost would be approximately $14 million.

4. CONSENTABILITY AND ENVIRONMENTAL EFFECTS

4.1 The investigation assumed that a plan change process would be required to establish appropriate planning controls for an alternative port location and to provide operational certainty to a commercial port. This is necessary because POAL is not a requiring authority (and in any case a designation cannot apply to the CMA).

4.2 A desktop assessment of environmental effects is included in **Annexure L**. The assessment assigned an "effects level" using the qualitative "traffic light" scale from highly negative (red), moderately negative (orange), low negative (yellow) and neutral (grey). A comparative summary of the assessment is shown in Table 5.

Table 4 – Comparative effects summary

Locations and effect level			
Activity	Manukau	Ponui	Kaiaua
Construction			
Dredging			
Dredging disposal			
Reclamation			
Structures			
Road and rail			
Operation			
Port operations			
Dredging and disposal			
Road and rail			
Project wide			
Social			
Regional planning			

4.3 Although the table includes an entry for social effects, no consideration was given to likely effects on Mana Whenua in respect of "consentability". Intuitively, from the experience of the investigation team, it was felt likely that all of the alternative locations would be of equally serious concern to Mana Whenua.

4.4 The Manukau Harbour location would have highly negative effects associated with port construction including dredging, disposal of dredged material and reclamation, especially on ecology. Construction of road and rail links would have moderately negative effects. Long-term and operational effects from maintenance dredging, disposal of dredged material and the impact of port activity and the presence of the reclamation and dredged areas (on coastal processes and ecology, including the West Coast beaches, and in terms of visual impacts) would be highly negative.

4.5 The Manukau Harbour location would have adverse social effects and is contrary to the Auckland Plan and PAUP as it promotes development outside the Rural Urban Boundary (RUB) and duplicates transport infrastructure requirements in the region (with associated

social effects, for example compulsory land acquisition). The Manukau location is located closer to existing transport links than the other sites assessed. However, the “consentability” would be very difficult given the potential impact on West Coast beaches, the scale of the reclamation and dredging on the harbour and the 1 kilometre access bridge crossing a SEA-M1 / CPA-1.

4.6 The alternative Manukau Harbour location near Puhinui has similar "general" environmental effects to the Clarks Beach site. However, its location within the Auckland Airport OLS and SEA-M1 / CPA-1 and proximity to an Outstanding Natural Feature means the location is simply not feasible and in the opinion of the investigation team likely “unconsentable”.

4.7 The Ponui location would have highly negative construction effects relating to the reclamation and road and rail links and moderately negative effects from the dredging. Long term and operational effects, including the visual impact of the port activity and the impact on ecology, would be highly negative. The port would also have highly negative social and regional planning effects, such as loss of amenity values (including at the Waitawa Regional Park), promotion of development outside the RUB and duplication of transport infrastructure.

4.8 Adequate water depth and shelter makes the Ponui location attractive from an operational point of view. However, it requires substantial volumes of fill to create the port reclamation. It is surrounded by "no go" natural character and landscape constraints which it would significantly adversely affect. The opinion of the project team was that the ”consentability” would be extremely difficult because of the first order constraints and all of the effects described.

4.9 The Kaiaua port would have highly negative effects from the construction of the road and rail links, the dredging, disposal of dredged material, and reclamation. Long term and operational effects, including the visual impact of the port activity and the impact on ecology (particularly the international wading bird RAMSAR site), would be highly negative. The port would also have highly negative

social and regional planning effects, such as loss of amenity values, promotion of development outside the RUB and duplication of transport infrastructure. In my opinion, and that of the investigation team, it would likely be "unconsentable" because of its location with the RAMSAR site and as a result of the other effects the investigation and project team have identified.

4.10 All of the concept designs would:

(a) Cost between $4.4 and $5.5 billion dollars.

(b) Require significant amounts of dredging, reclamation and disposal.

(c) Generate significant adverse effects on ecological and natural character and landscape values.

(d) Cause social and community disruption. The transport connections would exacerbate this and result in many directly affected landowners.

(e) Be contrary to the regional growth strategy of the Auckland Plan and would cause unintended regional development as labour, servicing and distribution infrastructure relocates closer to the alternative port location.

(f) Have high operational costs due required maintenance dredging.

4.11 The “consentability” of all these sites would be very difficult based on the first order constraints and the effects generated due to the scale of construction and operation. In all probability, enabling legislation would most likely be necessary to provide for an alternative port due to the highly constrained nature of the region when considering the effects that an alternative "like for like" port would create.

5. CONCLUSION

5.1 Using the Constraints Map and sector analysis of the Auckland region it is concluded that there are very few unconstrained locations for infrastructure the scale of an alternative Auckland port.

5.2 The Kaipara Harbour is less constrained; however, a site in the Manukau Harbour was selected for assessment as it has similar harbour dynamics but is a preferable West Coast location being much closer to Auckland.

5.3 The concept port design locations of the Manukau Harbour, Ponui and Kaiaua and the assessment of environmental effects that each location would generate can be used to conclude that the effects of establishing and operating an alternative port with the necessary transport connections would be significant.

5.4 The concept design locations are all constrained by first order "no go" constraints. This, coupled with the significant adverse effects each location would generate, makes each location appear potentially "unconsentable" under the RMA. The overall conclusion is that there are no alternative port locations for Auckland that are justifiable in the foreseeable future.

Stephen John Priestley

17 October 2014

ANNEXURE A – Alternative Port Study Project Team Qualifications and Experience

Project Team

Stephen Priestley: Project Lead

(Refer to this Statement of Evidence above.)

Paul Kennedy: Ecological Specialist

(Refer to the Statement of Evidence of Mr Paul Kennedy for Topic 005 RPS Issues.)

Kane Satterthwaite: Port Design Specialist

Kane is a Chartered Professional Engineer holding a Bachelor of Engineering (Civil) from the University of Auckland and a Master of Engineering Science (Construction Management) from the University of New South Wales. He is a member of the Institute of Professional Engineers of New Zealand.

Kane has 20 years' experience in maritime and civil infrastructure projects in Asia, Middle East, South Pacific, Central America and New Zealand. His particular expertise is contract management and construction for large scale maritime projects including breakwaters, revetments, dredging and reclamation, quays and port infrastructure. His experience also includes project planning, design, technical review and project bid documentation for general marine and infrastructure projects.

Relevant work experience includes:

- Ports of Auckland Multi-cargo Development – Engineer for concept wharf options for multi-cargo operations at Captain Cook Wharf, Marsden Wharf, Bledisloe Wharves B1 and B2 and Kings Low Landing. Cost estimate range NZ $93-150m.
- Rena Project – Engineer for concept barge landing and small harbour design options for Motiti Island, Tauranga.
- PrimePort Timaru – Project Manager for concept design of a 215m long wharf structure for a proposed cement handling facility. Estimated cost NZ$ 15m.
- East Container Terminal, Colombo, Sri Lanka – Review of Employers Requirements for a US$ 75m D&C quay 400m long with berth pocket to -18mCD.
- Colombo Port Expansion Project, Colombo, Sri Lanka – Chief RE and Deputy RE for construction of a US $400m ADB port project including a 5km breakwater, 1km breakwater, port basin to -18m CD, 20 million m3 reclamation and a 9km navigation channel. The new port will be capable of handling 400m long 12,500 TEU vessels and provide for three 1.2km quays, resulting in additional capacity of 7.2m TEU.
- Diyar Al Muharraq, Bahrain – Chief RE and SRE for construction of a US $450m waterfront development including dredging, reclamation and shore protection. The project featured marina's, canals and several breakwaters and beach precincts. The footprint area was 12km2, and the works included 75 million m3 of reclamation and 40km of shore protection.

- Bua Bay Integrated Port, Vanua Levu, Fiji – Engineer's Representative for construction of a FJ$ 25m port facility for timber processing and export. The piled wharf structure extended 354m offshore to water depth -12m CD.
- Rokobili Port EIA, Suva, Fiji – Engineer for assessing services and yard facilities on several options for a new port in Suva (estimated cost range FJ $445-700m).
- Kings Wharf Rehabilitation and Upgrading, Suva, Fiji - Engineer's Representative/RE for two ADB funded construction contracts (FJ $30.2million) at Kings Wharf container port in Suva. The works featured pile and beam upgrading, new wharf deck, new fendering systems and stabilising 60,000m3 of marine sediment for seismic upgrading.
- Eastern Marina Extension, Gulf Harbour – Resident Engineer for construction of marina extension to provide mega-yacht anchorage and space for up to 4 Americas Cup yacht bases (NZ $3.2m)

Ben Frost: Natural Character and Landscape Assessment Specialist

Ben Frost is a Senior Landscape Architect at Beca and holds a Bachelor of Landscape Architecture and Diploma of Landscape Design from Unitec NZ. He has over 8 years professional experience and a member of the New Zealand Institute of Landscape Architects.

He specialises in landscape planning and assessment which has included the evaluation of visual, landscape, and natural character effects related to energy and infrastructure projects, mining, coastal / rural / urban development, and estuarine management. This experience has required him to prepare and present evidence at council hearings and attend caucusing for the environment court. He has led and completed a number of landscape assessments that identified natural character, amenity and landscape values at both district and regional scales.

Recent studies include the Coromandel District Landscape review, Natural Character Assessment of the Auckland Region, and the Evaluation of Geological Sites and Landforms and whether they quality as Outstanding Natural features across the Auckland Region.

Recent relevant experience includes:

- Outstanding Natural Landscape Review – Kaimai Ranges (2013) - Review and field evaluation assessment of the proposed 'Kamai Ranges' ONL for Waikato Regional Council.
- Volcanic Cones Sightlines and Height Sensitive Areas (2013) - Evaluation of the recommendations of the 1997 study focusing on those scheduled to be deleted for Auckland Council. Undertook site visits to each of the scheduled viewpoints and retook photographs as a comparison between the 1997 and 1975 studies. Undertook a review and provided recommendations in response to geo-preservation society submissions.

- Outstanding Natural Landscape Review – Rangitiki Foredunes (2013) - Review and field evaluation and assessment of the proposed 'Rangitiki Foredunes' ONL
- Outstanding Natural Landscape Review – Tauroa Peninsula Dunefield & Coastal Flank (2013) Review and field evaluation of the proposed 'Tauroa Peninsula Dunefield & Coastal Flank' ONL as proposed in the Northland RPS
- Thames Coromandel Landscape Review – Detailed Assessment(2013) Detailed property level assessment of the entire district taking into account feedback from residents.
- Landscape Evaluations of Geological Sites and Landforms – Auckland Region (2012) NZILA Distinction Award (Landscape Planning & Environmental Studies Category) Undertook analysis of past case law, the RMA and current policy, to determine the evaluation criteria for assessment of the 270 sites, followed by fieldwork evaluation and photography to determine those that qualify as Outstanding Natural Features.
- Landscape & Natural Character Assessment – West Coast Region of the South Island (2012 - 2013) Delineation of the coastal environment and identification and description of areas of high and outstanding natural character employing key environmental indicators / parameters based on the 2010 NZCPS. Description and rating of identified Outstanding Natural Landscapes.
- Natural Character Assessment – Auckland Region (2012) Delineation of the coastal environment for the Auckland Region and identification of areas of high and outstanding natural character employing key environmental indicators / parameters based on the 2010 NZCPS – for the Auckland Regional Council.
- Thames Coromandel Landscape Review (2011) Undertook a thorough re-assessment of the Outstanding Natural Landscapes and Amenity Landscapes across the Peninsula following on from the original assessment and peer review in 2008.
- East West Connections, Auckland Transport, (2014 – current) Assessment of the visual, landscape and natural character implications of multiple transport options connecting Onehunga to Penrose.
- AMETI Mokoia Pa, Auckland Transport (2014 – current) Responsible for designing a landscape response to the Mokoia Pa section of the AMETI transport corridor
- Mt Crawford and Palmer Head Water Reservoir Feasibility Study (2014) Evaluation of the landscape, natural character and amenity implications and consenting risks of three emergency water storage reservoirs on the Miramar Peninsula, Wellington.

Blair Masefield: Strategic and RMA Planning Assessment Specialist:

Blair is a qualified Planner with a Bachelor of Resource and Environmental Planning (honours) from Massey University, is a full member of the New Zealand Planning Institute, and active member of the New Zealand Coastal Society.

He has eleven years' experience in strategic and statutory Planning roles across a range of major infrastructure, environmental, policy and strategic planning projects in New Zealand and the UK.

He has experience in development scoping and strategic consenting advice, complex AEE preparation, expert evidence and environmental management plans. He has held Project Management roles on medium to large infrastructure planning projects and applied his statutory process understanding to managing technical inputs from a range of environmental specialists. Blair has a sound knowledge of the New Zealand Coastal Planning Framework and is a regular presenter at NZ Coastal Society conferences.

Relevant experience and projects include:

- Penlink Re-consenting (2014 – Ongoing) – lead planner preparing the consents and designation alterations and managing 14 environmental specialists for a 7km road and 600m bridge across the CMA;

- Te Atatu Interchange Design and Construct (2014 – ongoing) – lead planner for the design and construct team rebuilding and widening the Te Atatu Interchange on SH16, Auckland.

- Transmission Gully PPP Bid (2013) – prepared the consenting strategy for a PPP redesign of a new 23km 4-lane road north of Wellington, including high level effects assessments and consentability;

- Refining NZ Erosion Management Strategy (2012-2013) – led this strategy development in response to an erosion issue. It included an evaluation process to select response options. Using the strategy Blair consented a 540m back-wall and dune restoration.

- NRC Moorings and Marinas Strategy (2012-2013) - prepared a Draft Moorings and Marinas Strategy for Northland including an evaluation framework to assist NRC in making decision over a range of options for allocation of space.

- Onehunga Foreshore Project (2010 – 2012) – provided tender evaluation and application review services on the consentability and environmental impacts of 3 tenders for a consent-design- construct contract involving a 7ha of reclamation.

- Waterview Connection (2010 – 2012) – Senior planner throughout the pre and post lodgment phases of this project including through the Board of Inquiry. The project secured consents and designations for two three lane tunnels, significant motorway infrastructure and two kilometers of widened coastal causeway, partially through a marine reserve.

- Major Coastal Infrastructure Consenting, ARC (2007 - 2008) - sole qualified processing planner in the Coastal Consents team at Auckland Regional Council. He focused on managing the consenting process for larger or complex infrastructure projects which contained coastal aspects but also included other Regional Consent requirements under the Air, Land and Water Plan and the Erosion & Sediment Control Plan.

Hugh Leersnyder: Strategic and RMA Planning Reviewer

Hugh is an Environmental Scientist at Beca with over 30 years in applied resource management. He holds a Bachelor of Agricultural Science, (Agricultural Engineering/Natural Resource Economics), Massey University, a Bachelor of Science, (Zoology), Massey University, 1991, and a Master of Science (Environmental Science/Geography) (First Class Honours), University of Auckland,

He has an extensive science (biological and physical) and coastal planning background including a detailed knowledge of regional government resource management responsibilities. Hugh is an accredited RMA Commissioner and has been involved in a number of resource consent roles for coastal and major infrastructure projects representing either the applicant or the regulator.

Relevant experience and projects include:

- Capital Dredging of Lyttelton Harbour, Lyttelton Port of Christchurch (LPC), October 2013 – Present: coordinating a range of experts in the preparation of the assessment of effects on the environment from the dredging and disposal of 12.5 million cubic metres of sediment

- Rena Project, "The Swedish Club", insurers for Daina Shipping Company, June 2012- Present – part of a team considering the medium to long term options for the management of the Rena's wreck.

- Majuro Airport runway safety area, Republic of Marshall Islands Ports Authority, March – June 2012 – environmental approvals to allow the construction of a runway safety area (RSA) at the Amata Kabua International Airport (AKIA) including dredging and reclamation

- Okiato Ferry ramp dredging Hearing Commissioner, Northland Regional Council, NZ, November 2011 - hearing an application for dredging and associated alterations to a boat ramp at Okiato to accommodate overnight berthing of the Opua vehicular ferry

- Port Otago Dredging Hearing Commissioner- Otago Regional Council, February to June 2011 - considering coastal permit applications for the dredging and disposal of 7.2 million cubic metres of sediment from the entrance channel of Otago Harbour

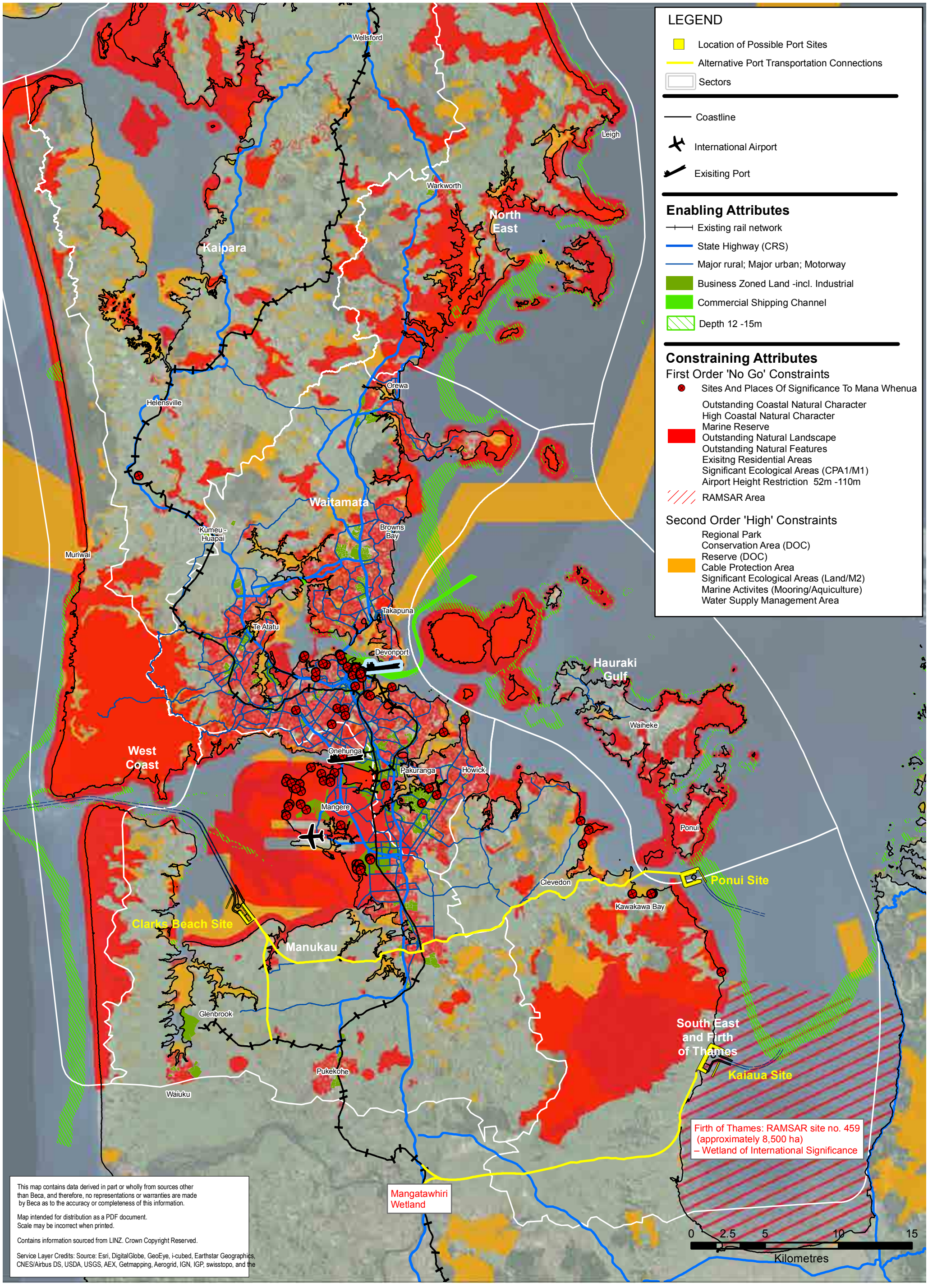
- MacKays to Peka Peka Expressway, Wellington – NZ Transport Agency, 2010 - 2012 - preparation of the Construction Environmental Management Plan for an 18 km expressway

- Additional Waitemata Harbour Crossing, NZ Transport Agency, June 2010 –October 2010 - coordinated environmental input to the consenting issues (or the degree of environmental effects) associated with various options

- Waterview Connection, Auckland – NZ Transport Agency, 2006 – 2011 - managing a number of the environmental work packages for the approvals required to construct the Auckland motorway connection from SH 20 (Mt Roskill) to a connection with SH16 at Waterview, including a section of marine causeway

- Pine Harbour Marina Dredging and Disposal Consent Application Processing, Auckland Regional Council, 2009 - prepared the officer's hearing report for the resource consent applications

ANNEXURE B – Constraints map



ANNEXURE B - CONSTRAINTS MAP

DRAWN: AYF
REVIEWED: KS
BECA REF: 3122425

SCALE: 1:350,000 @ A3
ORIGINAL SIZE: A3
SHEET 1 OF 1

ANNEXURE C – Alternative Port Design Criteria and Concept Design Parameters

Design Criteria

An overarching design principle is that any alternative port is to match the capacity of the existing port as a minimum. However, a 'greenfields' development allows optimisation (e.g. of quay layout and yard areas) so improvements are expected. Another important feature of any port development is future proofing to cater for expansion, though this matter is not explored here, as the study objective is to investigate an equivalent port to the existing.

Based on the existing port the following design criteria have been adopted to base the alternative port location concept designs:

- Minimum port land area to cater for wharf margins, yard, internal traffic, workshop and administration requirements – 80 ha with yard depth to be similar to berth length (this is based the on existing commercial port area).
- Berth requirements – 5/300 m long berths, 3/250 m long berths, 3/200 m long berths, 6/50 m berths for tugs, pilot vessels and barges (this is based the on existing commercial port area).
- Port cargo capacity – will vary depending on cargo mix but will be based on above land area and berth provisions.
- Dredged depths – approach channels to be a minimum of 12.75 m CD (12.5m + 0.25m sedimentation allowance) and allow for two-way traffic: 300m long berths; 13.5m CD: 250 m long berths; 12.5 m CD: 200 m long berths; 11.0 m CD: 50 m long berths; 7.0 m CD.
- Wave protection – rock/armour protection for 50 year event and 0.5% damage, and 200 year event with 5% damage. Significant waves in port area to be limited to 0.5 m height.
- Road and rail links – 2 lane state highway equivalent with grade separation at each major intersection. Resilience is required with access not dependent on a sole link. Single line rail to NIMT with grade separation at each major intersection.
- 20MVA power supply at 11kV or 22kV.
- Substantial water supply (for fighting and bunkering ships).
- Port area capable of being extended / expanded in the future.
- Climate Change – 1.0 m MSL increase over next 100 years, and rainfall and wind increase for extreme events of 20% (Note: the existing port doesn't have these allowances).

The following guidelines were used to aid development of the concept alternative port layouts:

- Design Principles for Small and Medium Marine Container Terminals, PIANC (World Association for Waterbourne transport Infrastructure) report No 135-2014
- Navigation Projects, Chapter 5, USACE, EM 1110-2-1100, July 2003
- Port Engineering, Volume 1 – Harbour Planning, Breakwaters and Marine Terminals, Per Bruun, 1989

Concept Design Parameters

Safe navigation and relatively calm water for berthing and mooring is paramount. Navigation channels with the least bends and corners are preferred. The nominal design channel depth is -12.75m CD (12.5m water depth + .025m sedimentation allowance) to match the existing Rangitoto channel depth.

Two-way ship traffic has been allowed for, and based on the design vessel this gives a nominal channel width of 250m. High currents >1.5 knots require increasing this basic channel width to 300m. Channel horizontal turns require widening and for this study either a cut-off turn or a circle turn has been adopted, depending on the site.

A turning basin is required to orient ships to the quay alignment for berthing. The turning basin is based on ship length, currents, layout of channels and docks and tug and pilot arrangements. A circular basin of dimension 1.5 × design vessel length (300m x 1.5=450m) has been adopted for this study. The turning basin configuration would need to be checked using a ship simulator, particularly for currents exceeding 1.5 knots, such as in the Manukau Harbour.

Wave protection for the berthing basin is provided by a combination of breakwaters, yard reclamation with revetment and offshore mudcrete bunds. Wave heights within the port basin are envisaged to be limited to 0.5m. Use of dredged material for offshore wave protection bunds has a dual purpose in cost effective disposal of material.

The wave climate for each selected site is moderate and the design significant wave height is less than 3m. The largest breakwater structure required is at the Ponui Island site in ~12.5m water depth. For a design significant wave

height ~3m, concrete armour units are typically used as large rock armour is difficult to source in significant quantities.

An approximate comparison was undertaken between concrete armour units and rock armour which indicated that the rock armour option is between 1.5-2 times more costly than the concrete armour units. Accordingly concrete armour units were selected for the Ponui Island site. All other sites have rock armour as they are more protected.

A sea level rise of 1m and a storm surge of 0.6m have been adopted to assess quay and yard levels design significant wave heights and overtopping.

Significant quantities of high quality rock will be required for each potential port location.

Ideally the majority of dredged material would be reused as reclamation fill for the new port or some other land reclamation project, as this is generally cost effective and environmentally desirable. However the dredging and reclamation can be imbalanced due to other site selection parameters, such as proximity to deep water, wave protection, transport length and environmental reasons.

Material that cannot be used in reclamation has to be disposed to dump sites offshore beyond the territorial sea limits, which is an expensive operation. Due to the significant quantities of dredging and reclamation, cost estimates are sensitive to changes in quantity or rates.

No investigation into seabed material type has been undertaken however the following has been assumed based on knowledge of the sites:

- Clarks Beach (Manukau Harbour) – inner harbour location on mudflats, assumed to be majority fines material
- Ponui Island – sited in deep water southeast of Ponui Island, assumed to be a mix of fines and sandy material
- Kaiaua (Firth of Thames) – sited adjacent the coast near Kaiaua township, assumed to be majority fines material

The implication of substantial fines material is that it is unsuitable for reclamation fill without treatment, such as mixing with coarse material or stabilising. Cement stabilising treatment, which produces a material known as mudcrete, has been undertaken successfully at the existing Ports of Auckland

site now for some 20 years, and is an effective way of using otherwise unsuitable material in reclamation.

Sandy material may be placed by hydraulic fill into reclamation as core material, which is typically cost effective compared to rock fill options. However issues such as liquefaction under earthquake loading and settlement need to be considered. Settlement of deep reclamations, both underlying and reclaimed material, is a matter to be addressed in preliminary and detailed design. Surcharge and deep-compaction are methods used to address settlement and compaction.

Soft fine seabed material may need to be removed and replaced with more suitable material on which to found reclamations, such as stabilised material (mudcrete), quarry run or sand fill with minimum fines content. A nominal thickness of 1m removal under breakwater and revetment foundations has been allowed for in this study. An alternative treatment method is to surcharge the seabed material for a set period to induce consolidation.

Site specific geotechnical investigations would be needed for each site to determine dredging material classification, foundation conditions and liquefaction potential.

Potential quay types include:

(a) Solid concrete block wall and capping beam

(b) Caisson with infill and capping beam

(c) Reinforced concrete piled structure and deck and under-deck revetment with down-stand wall or sheetpile

A block wall type quay requires firm foundations and may not be suitable seismically. A caisson type quay may offer cost advantages and is common overseas but requires specialist casting and placing equipment. For the purpose of this study a 30m wide reinforced concrete piled structure and deck with under-deck revetment has been adopted, as this type of quay has been constructed in New Zealand and cost data is readily available.

A typical yard width of 300m has been adopted adjacent to quays. This width includes the quay structure, transport lanes, container stacking area and outer

traffic lanes. The total yard area for the new port layouts is approximately double the 80Ha area of the existing Port due to the provision of 300m yard width adjacent the full new quay length. In contrast the existing port has doubled sided quays on fingers with lesser wharf width, demonstrating the benefit of a harbour port with natural wave protection.

Wherever feasible, widening and upgrading of existing road transport routes has been adopted and costed. Allowance has been made for easing obvious tight horizontal geometry. Existing vertical geometry is assumed to be suitable.

Land acquisition widths have been assumed as follows:

(d) Widening existing road and add rail corridor – 20m

(e) New road and rail corridor – 40m

(f) New rail corridor – 20m

The above width allowances are based on relatively flat land and minimal earthworks. Greater width will be required for intersections and any significant cutting or filling.

The cost estimate assumes that existing Ports of Auckland container cranes and yard plant and equipment are to be transferred to the new Port.

ANNEXURES D-K – Alternative Ports

Base Width 300m

Base Width 300m

Dredging to -15.3m
12.75 x 20% Swell Factor

Bridge

Bridge

Legend

Existing

- State Highway
- Road
- Rail

Indicative

- New Rail
- New Road
- New Road/Rail
- Existing Road Widening / New Rail
- Indicative Channel Designation
- Dredging Required

Constraining Attributes

First Order 'No Go' Constraints

- Sites And Places Of Significance To Mana Whenua
- Outstanding Coastal Natural Character
- High Coastal Natural Character
- Marine Reserve
- Outstanding Natural Landscape
- Outstanding Natural Features
- Exisitng Residential Areas
- Significant Ecological Areas (CPA1/M1)
- Airport Height Restriction 52m -110m
- RAMSAR Area

Second Order 'High' Constraints

- Regional Park
- Conservation Area (DOC)
- Reserve (DOC)
- Cable Protection Area
- Significant Ecological Areas (Land/M2)
- Marine Activites (Mooring/Aquicuture)
- Water Supply Management Area

0 1.25 2.5 5
Kilometres

ANNEXURE D - MANUKAU HARBOUR (CLARKS BEACH) ALTERNATIVE PORT LAYOUT

DRAWN: AYF
REVIEWED: KS
BECA REF: 3122425

SCALE: 1:120,000 @ A3
ORIGINAL SIZE: A3
SHEET 1 OF 1

Legend

Existing

- State Highway
- Road
- Rail

Indicative

- New Rail
- New Road
- New Road/Rail
- Existing Road Widening / New Rail
- Indicative Channel Designation

Constraining Attributes

First Order 'No Go' Constraints

- Sites And Places Of Significance To Mana Whenua
- Outstanding Coastal Natural Character
- High Coastal Natural Character
- Marine Reserve
- Outstanding Natural Landscape
- Outstanding Natural Features
- Exisitng Residential Areas
- Significant Ecological Areas (CPA1/M1)
- Airport Height Restriction 52m -110m
- RAMSAR Area

Second Order 'High' Constraints

- Regional Park
- Conservation Area (DOC)
- Reserve (DOC)
- Cable Protection Area
- Significant Ecological Areas (Land/M2)
- Marine Activites (Mooring/Aquicuture)
- Water Supply Management Area

0 0.25 0.5 1
Kilometres

ANNEXURE E - MANUKAU HARBOUR (CLARKS BEACH) ALTERNATIVE PORT LAYOUT

North

DRAWN: AYF
REVIEWED: KS
BECA REF: 3122425

SCALE: 1:30,000 @ A3
ORIGINAL SIZE: A3
SHEET 1 OF 1

Legend

- Dredging Required
- Indicative Channel Designation

Indicative Transport Connections

- New Rail
- New Road/Rail
- State Highway
- Rail
- Road

Constraining Attributes

First Order 'No Go' Constraints

- Sites And Places Of Significance To Mana Whenua
- Outstanding Coastal Natural Character
- High Coastal Natural Character
- Marine Reserve
- Outstanding Natural Landscape
- Outstanding Natural Features
- Exisitng Residential Areas
- Significant Ecological Areas (CPA1/M1)
- Airport Height Restriction 52m -110m
- RAMSAR Area

Second Order 'High' Constraints

- Regional Park
- Conservation Area (DOC)
- Reserve (DOC)
- Cable Protection Area
- Significant Ecological Areas (Land/M2)
- Marine Activites (Mooring/Aquicuture)
- Water Supply Management Area

Base Width 300m

Base Width 300m

Base Width 300m

Dredging to -15.3m
12.75 x 20% Swell Factor

0 1 2 4
Kilometres

ANNEXURE F - MANUKAU HARBOUR (PUHINUI) ALTERNATIVE PORT LAYOUT

North

DRAWN: AYF
REVIEWED: KS
BECA REF: 3122425

SCALE: 1:100,000 @ A3
ORIGINAL SIZE: A3
SHEET 1 OF 1

Legend

- Indicative Channel Designation
- State Highway
- Road
- Rail

Indicative Transport Connections

- New Rail
- New Road/Rail

Constraining Attributes

First Order 'No Go' Constraints

- Sites And Places Of Significance To Mana Whenua
- Outstanding Coastal Natural Character
- High Coastal Natural Character
- Marine Reserve
- Outstanding Natural Landscape
- Outstanding Natural Features
- Exisitng Residential Areas
- Significant Ecological Areas (CPA1/M1)
- Airport Height Restriction 52m -110m
- RAMSAR Area

Second Order 'High' Constraints

- Regional Park
- Conservation Area (DOC)
- Reserve (DOC)
- Cable Protection Area
- Significant Ecological Areas (Land/M2)
- Marine Activites (Mooring/Aquicuture)
- Water Supply Management Area

0 0.25 0.5 1 Kilometres

ANNEXURE G - MANUKAU HARBOUR (PUHINUI) ALTERNATIVE PORT LAYOUT

DRAWN: AYF
REVIEWED: KS
BECA REF: 3122425

SCALE: 1:30,000 @ A3
ORIGINAL SIZE: A3
SHEET 1 OF 1

Legend

Existing

- State Highway
- Road
- Rail

Indicative

- New Road
- New Road/Rail
- Existing Road Widening / New Rail

Constraining Attributes

First Order 'No Go' Constraints

- Sites And Places Of Significance To Mana Whenua
- Outstanding Coastal Natural Character
- High Coastal Natural Character
- Marine Reserve
- Outstanding Natural Landscape
- Outstanding Natural Features
- Exisitng Residential Areas
- Significant Ecological Areas (CPA1/M1)
- Airport Height Restriction 52m -110m
- RAMSAR Area

Second Order 'High' Constraints

- Regional Park
- Conservation Area (DOC)
- Reserve (DOC)
- Cable Protection Area
- Significant Ecological Areas (Land/M2)
- Marine Activites (Mooring/Aquicuture)
- Water Supply Management Area

0 0.75 1.5 3
Kilometres

ANNEXURE H - PONUI ISLAND ALTERNATIVE PORT LAYOUT

DRAWN: AYF
REVIEWED: KS
BECA REF: 3122425

SCALE: 1:100,000 @ A3
ORIGINAL SIZE: A3
SHEET 1 OF 1

Legend

Existing

- State Highway
- Road
- Rail

Indicative

- New Road/Rail
- Existing Road Widening / New Rail
- Indicative Dredged Channel

Constraining Attributes

First Order 'No Go' Constraints

- Sites And Places Of Significance To Mana Whenua
- Outstanding Coastal Natural Character
- High Coastal Natural Character
- Marine Reserve
- Outstanding Natural Landscape
- Outstanding Natural Features
- Exisitng Residential Areas
- Significant Ecological Areas (CPA1/M1)
- Airport Height Restriction 52m -110m
- RAMSAR Area

Second Order 'High' Constraints

- Regional Park
- Conservation Area (DOC)
- Reserve (DOC)
- Cable Protection Area
- Significant Ecological Areas (Land/M2)
- Marine Activites (Mooring/Aquicuture)
- Water Supply Management Area

250m Base Width

0.1 Kawakawa Bay

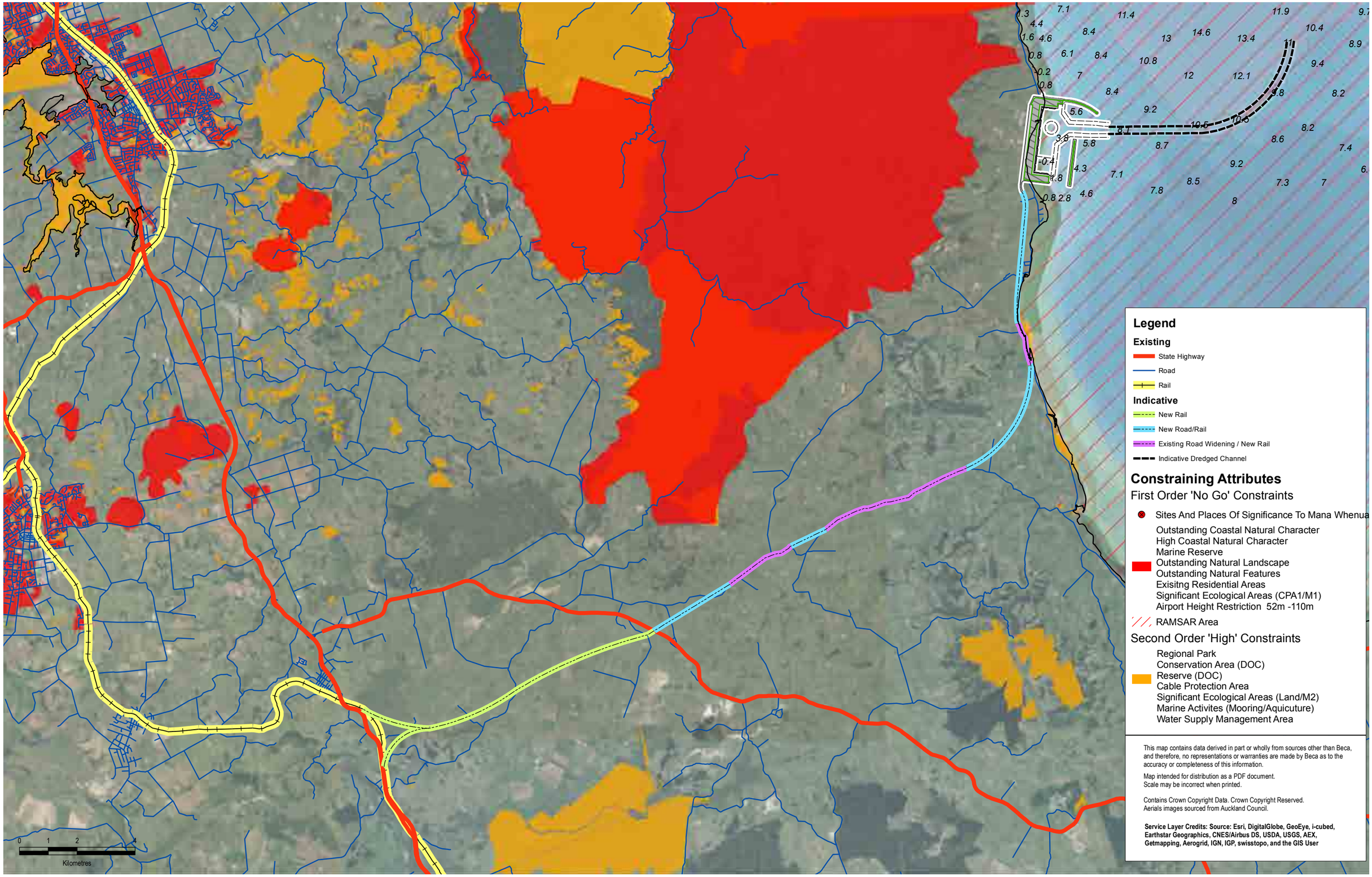
0 0.25 0.5 1 Kilometres

North

ANNEXURE I - PONUI ISLAND ALTERNATIVE PORT LAYOUT

DRAWN: AYF
REVIEWED: KS
BECA REF: 3122425

SCALE: 1:30,000 @ A3
ORIGINAL SIZE: A3
SHEET 1 OF 1

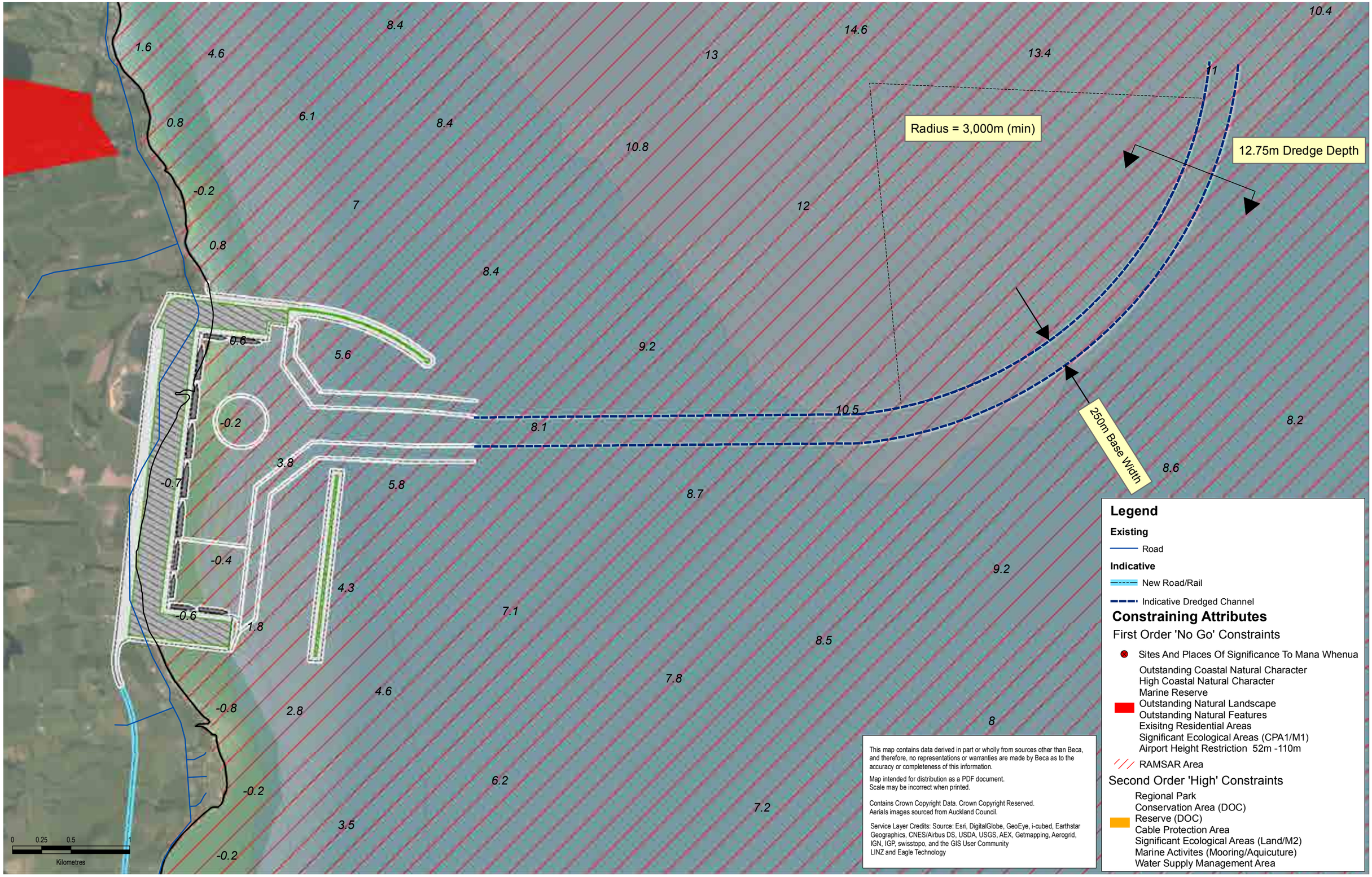


ANNEXURE J - FIRTH OF THAMES SITE (KAIAUA) ALTERNATIVE PORT LAYOUT

North

DRAWN: AYF
REVIEWED: KS
BECA REF: 3122425

SCALE: 1:120,000 @ A3
ORIGINAL SIZE: A3
SHEET 1 OF 1



ANNEXURE K - FIRTH OF THAMES SITE (KAIAUA) ALTERNATIVE PORT LAYOUT

DRAWN: AYF
REVIEWED: KS
BECA REF: 3122425

SCALE: 1:30,000 @ A3
ORIGINAL SIZE: A3
SHEET 1 OF 1

ANNEXURE L – Assessment of Effects

Manukau Harbour (Clarks Beach) Alternative Port Effects Assessment

Activity	Effect	Rationale
Construction		
Dredging		• 40 M m^3 estimated capital dredging to create the channel and berthing basin; • 0.80 M m^3 estimated annual maintenance dredging; • Dredging through a CPA2 / M2 SEA intertidal areas; • Unknown effects of bar dredging / intervention on sand migration to/from Auckland's west coast beaches; • Wading bird effects.
Dredging disposal		• 34 M m^3 estimated capital dredging disposal; • Most disposal beyond the 12NM limit; • Habitat smothering and temporary loss; • This will be a dispersive site due to the high energy environment.
Reclamation		• 140 hectares of reclamation; • Reclamation of a CPA2 / M2 SEA; • Localised accretion and changed coastal processes around the reclaimed area and port basin, including possible mangrove colonisation; • Due to close proximity there will be wider effects on the intertidal area (CPA2/M2 and CPA1/M1) identified for wading birds; • Mortality of and habitat loss for marine biota (includes creatures & plants); • The extent of reclamation construction activity would fundamentally undermine the site's landscape values.
Structures		• 1 km connection from the island port to land. CPA/M 1 zone so have assumed a bridge would be required; • Temporary construction staging and piling disturbance.
Road and rail		• 5.5 km of new connecting road (including 500m bridge over inlet) and upgrading of 11.4 km of Linwood/Hingaia Roads; • New 11.5 km rail spur connecting to the Glenbrook spur near Kingseat; • Temporary construction discharges to streams and coastal margins; • Located in rural land or involves upgrading an existing road; • Some affected communities but not a densely populated area; • While some effects will be high on balance the effects likely to be moderate.
Operation		
Port operations		• The vertical scale, horizontal extent, and bulk associated with container storage, cranes, and ships would have significant visual & amenity effects;

Activity	Effect	Rationale
		• Significant visual effects associated with lighting and dominance of ships; • Elevation of connecting bridge to preserve habitat and coastal processes will add to the overall visual impact; • Ecological effects from operation including noise and lights on wading / shore birds and the on-going maintenance dredging and disposal of significant volumes; • Changed coastal processes; • Maui Dolphin habitat.
Maintenance dredging		• Side casting of 0.5 M m^3 per year for maintenance dredging of the bar; • Continuous side cast dredging causing localised ecological effects at the Manukau Bar; • Unknown effects of bar dredging / intervention on sand migration to/from Auckland's west coast beaches; • Ecological effects not high due to existing high mobility of sediments in this location; • Offshore disposal effects from 0.30 M m^3 per year; • High energy location means a dispersive disposal site will be needed.
Road and rail		• Operational noise and light from transport connections through greenfield locations affects amenity; • Local community impacts of increased traffic along transport connections; • Localised effects from contaminant runoff into freshwater and coastal environments; • Effects likely to be mitigated.
Project wide		
Social		• Local adverse effects on Clarks Beach, Patumahoe and surrounding settlements with potential benefits to the Papakura and Pukekohe centres; • Potential land-use changes may alter the social fabric of existing communities and adversely affect the local and wider communities perception of the area; • Specific land effects of severance and perceived or actual loss of value for directly affected land required for the transport connections; • Loss of amenity from visual, lighting, noise and other operational effects; • Local employment a potential benefit; • While some effects would be high, particularly initially, on balance the effects are moderate.
Regional planning		• Employment and servicing for the Port likely to drive land use change outside of the RUB including residential expansion and warehousing and distribution in rural production land; • The port location and associated pressure for land use change is contrary to the Auckland Plan; • Duplication of transport connections (as existing motorway and rail infrastructure would still be required)

Activity	Effect	Rationale
		and scarce public resources diverted to construct, operate and maintain these; • Some expected improvement in existing motorway and rail network capacity however only limited reduction to congestion as port cargo movements are a small contributor to total traffic volumes; • Enables release of existing Port land for alternative uses.

Ponui Island Alternative Port Effects Assessment

Activity	Effect	Rationale
Construction		
Dredging		• 5.5 M m^3 estimated capital dredging to create the channel and berthing basin; • 0.13 M m^3 estimated annual maintenance dredging; • Changes to velocities and flows around the Port; • Continual deposition of sediment in dredged channels within the harbour requiring biannual maintenance dredging; • Localised accretion and changed coastal processes around the bridge and causeway connection and possible mangrove colonisation; • Unknown effects on Tamaki Strait entrance (Sandspit passage).
Dredging disposal		• Capital dredging reuse in the reclamation.
Reclamation		• 21.5 M m^3 of reclamation (5.5 M m^3 from dredging and 16 M m^3 borrow); • 160 hectares of reclamation; • Mortality of and habitat loss for marine and avian biota is significant; • The extent of reclamation and sheer scale of construction activities would compromise natural character and landscape values.
Structures		• 6 km connection from the island port to land; • Would have to be a bridge from the port to McCallums Island, rest could be a causeway; • Temporary construction disturbance; • Effects on habitat loss and coastal processes from the causeway construction.
Road and rail		• 28 km of new connecting road and upgrading of the road network; • New 26 km rail spur connecting to the NIMT at Papakura; • Significant earthworks in and severance of the Waitawa Regional Park – could require a tunnel; • Temporary construction discharges to freshwater and coastal environments; • Located in rural land or involves upgrading an existing road; • Some affected communities but not a densely populated area; • Large number of directly affected landowners; • While some effects will be high on balance the effects likely to be moderate.
Operation		
Port operations		• The vertical scale, horizontal extent, and bulk associated with container storage, cranes, and ships would dominate the seascape resulting in significant visual & amenity effects;

Activity	Effect	Rationale
		• Outstanding landscapes and high natural character of Ponui Island and Kawakawa Bay headland adversely affected; • The barrier created by the bridge, causeway and port reclamation would irrevocably undermine the natural character and seascape values of the Tamaki Strait; • Ecological effects of the operation on wading / shore birds and the on-going maintenance dredging and disposal; • Brydes whale habitat in the wider Hauraki gulf.
Maintenance dredging and disposal		• 0.13 M m^3 per year for maintenance dredging of the port basin and channel and offshore disposal; • Habitat smothering and temporary disturbance; • Able to achieve a managed site in lower energy environment.
Road and rail		• Operational noise and light from transport connections through greenfield locations; • Community impacts of increased traffic along transport connections; • Localised effects from contaminant runoff into freshwater and coastal environments; • Effects likely to be mitigated.
Project wide		
Social		• Local adverse effects on Kawakawa Bay, Clevedon and surrounding settlements and possible some benefits to the Papakura and Maraetai centres; • Loss of or at least significant reduction in value of Waitawa regional park; • Potential land-use changes may alter the social fabric of existing communities and adversely affect the local and wider communities perception of the area; • Specific land effects of severance and perceived or actual loss of value for directly affected land required for the transport connections; • Loss of amenity from visual, noise and other operational effects; • Local employment a possible benefit; • While some effects would be high, particularly initially, on balance the effects are moderate.
Regional planning		• Employment and servicing for the Port likely to drive land use change outside of the RUB including residential expansion and warehousing and distribution. Suitable land would be in the Clevedon Valley; • The port location and associated pressure for land use change is contrary to the Auckland Plan; • Duplication of transport connections (as existing motorway and rail infrastructure would still be required) and scarce public resources diverted to construct, operate and maintain these; • Some expected improvement in existing motorway and rail networks however probably limited effect on congestion as port cargo movements generally outside

Activity	Effect	Rationale
		peak travel times; • Enables release of existing Port land for alternative uses.

Kaiaua Alternative Port Effects Assessment

Activity	Effect	Rationale
Construction		
Dredging		• 32 M m^3 estimated capital dredging to create the channel and port basin; • 0.18 M m^3 estimated annual maintenance dredging; • Dredging through a RAMSAR wetland of international significance; • Sedimentation of navigation channel; • Effects on aquaculture areas would need to be mitigated.
Dredging disposal		• 22 M m^3 capital dredging disposal; • Disposal beyond the 12NM limit; • Significant ecological effects due to volume; • Would achieve a depositional site so more manageable than the Manukau disposal.
Reclamation		• 10 M m^3 reclamation and landside filling; • 100 Ha of reclamation; • Significant adverse effect on the RAMSAR site; • Habitat loss.
Structures		• Much less effects than other locations as this is a mainland based port so no connecting structure required.
Road and rail		• 23 km of connecting road via Miranda and Mangatangi to connect to SH2 at Mangatawhiri; • New 36 km rail spur following the road connection to Mangatawhiri then on a further 13km to connect to the NIMT near Mercer; • Located in rural land or involves upgrading an existing road; • Some affected communities but not a densely populated area; • Numerous stream crossings and large extent of earthworks; • Temporary construction discharges; • Expect to alter alignment to avoid the Mangatawhiri Wetlands; • While some effects will be high on balance the effects likely to be moderate.
Operation		
Port operations		• The extent and scale of modification associated with the reclamation and breakwaters would fundamentally undermine the natural character values and broader seascape of the Firth of Thames; • The vertical scale, horizontal extent, and bulk associated with container storage, cranes, and ships would dominate the local landscape resulting in significant visual & amenity effects; • Ecological effects of the operation on wading / shore birds and the on-going maintenance dredging and disposal; • Brydes whale habitat in the wider Hauraki Gulf.
Maintenance		• 0.18 M m^3 per year for maintenance dredging of the port

Activity	Effect	Rationale
dredging and disposal		basin and channel; • Offshore disposal effects from 0.18 M m^3 per year; • Habitat smothering and temporary disturbance; • Able to achieve a managed site in lower energy environment.
Road and rail		• Operational noise and light from transport connections through greenfield locations affects amenity; • Local community impacts of increased traffic along transport connections; • Effects likely to be mitigated.
Project wide		
Social		• Local adverse effects on Kaiaua, Miranda and surrounding settlements but also growth benefits to these communities; • Loss of or at least significant reduction in value of the RAMSAR site which locals likely affiliate with; • Potential land-use changes may alter the social fabric of existing communities and adversely affect the local and wider communities perception of the area; • Specific land effects of severance and perceived or actual loss of value for directly affected land required for the transport connections; • Loss of amenity from visual, noise and other operational effects; • Local employment a possible benefit plus regional benefits accrue to the Waikato and Hauraki areas; • While some effects would be high, particularly initially, on balance the effects are moderate.
Regional planning		• Potential for structural changes to the Auckland regional economy if Port traffic is diverted to non-Auckland location (e.g. Tainui Inland Port). This could alter the demand for warehousing, servicing and distribution networks that have service the port and other sectors; • Difficult to comment. Not contrary to any regional strategy as outside the region but as a port is envisaged in regional planning documents it is inconsistent; • Duplication of transport connections (as existing motorway and rail infrastructure would still be required) and scarce public resources diverted to construct, operate and maintain these; • Some expected improvement in existing motorway and rail networks however probably limited effect on congestion as port cargo movements generally outside peak travel times; • Enables release of port land for other uses but loss of the port and the economic growth it provides likely to be an overall regional disbenefit.