

## **Port Future Study**

### **Peer review bridging document**

The Port Future Study was established in 2015 as a stakeholder and Māori collaborative process. Its objective was to formulate recommendations to Auckland Council for a long term port strategy. Recommendations were delivered to council in July 2016.

A Consensus Working Group and wider Reference Group were vehicles for the Study process. The Consensus Working Group commissioned a consortium of consultants, led by EY, to assist the group in developing its recommendations.

Time and other resources available to the Study and the consortium were limited, and the Consensus Working Group commissioned three independent peer reviews of specific topics in the analysis to draw out issues which might affect the Consensus Working Group's recommendations.

The peer reviews were undertaken concurrently with the consortium's work and input from peer reviewers was provided to EY on their draft technical report delivered 30 April 2016. The peer review comments below are made in respect to the final technical report, delivered 22 June 2016.

The peer reviewers, and topics were:

- Dr Tim Denne, Resource Economics: Cost-Benefit Analysis methodology
- Dr Richard Reinen-Hamill, Tonkin + Taylor: Navigability of Manukau Harbour analysis
- Dennis Kögeböhn, Hamburg Port Consulting GmbH: Volume and capacity modelling methodology

The full peer reviews reports are attached as an appendix to this document.

The tables below summarise key issues raised by the peer reviewers in their final reports, and assess the impact, if any, of issues raised on the Consensus Working Group's recommendations and content of the final Consensus Working Group report.

- Comments from peer reviewers have been lifted directly from final peer review documents.
- The tables indicate possible approaches to addressing the issues in future analysis.
- These tables do not address the validity of the points raised, or offer EY's response to the points.

It should be noted in future analysis that judgements about the cost/benefits of *moving to a new location* are not the same as the costs/benefits of *establishing a location option*. This distinction is at the heart of the Consensus Working Group's recommendations.

Prepared by Sam Tobin, Support to the Independent Chair

Reviewed by Dr Rick Boven, Independent Chair

July 2016

**Cost Benefit Analysis** Dr Tim Denne, Resource Economics

Item	Comment/issue raised by peer reviewer	Impact on CWG recommendations	Note for future analysis
<b>Opportunity cost of land at current site</b>	<p>"Whether the opportunity cost of port land is over-estimated by using current land prices... the quantitative [effects are] not estimated"</p>	<p>Do not affect recommendations.</p> <p>Uncertainty acknowledged and discussed at CWG meetings, and addressed by trigger study recommendation</p> <p><i>Comment</i> Lower opportunity cost (of the port remaining in current location) would reduce attractiveness of moving to a new location</p>	<p>Consider methodology and how impact of alternate opportunity costs can be tested to better understand sensitivity</p>
<b>External (e.g. environmental) costs</b>	<p>"There are very significant uncertainties over environmental costs that reflect the uncertainty of effects (more detailed analysis required than is possible in the EY-led study) and the absence of suitable data even if there was more certainty.</p> <p>Environmental costs were not quantified, but they were discussed within the multi-criteria analysis (MCA).</p> <p>The analysis of environmental (and other external costs) is difficult within the CBA. There are large data gaps and it is not clear that there would be sufficient data to add materially to the understanding of the costs and benefits of each option"</p>	<p>Do not affect recommendations.</p> <p>Uncertainty acknowledged and discussed at CWG meetings, and addressed by recommendations for trigger study and comprehensive investigation of identified location options</p> <p><i>Comment</i> Increased external costs would affect the attractiveness of all locations, to differing extents in the various categories.</p>	<p>Methodology in this project required CWG judgement on interplay between outputs of MCA and CBA</p> <p>Unless external costs can be quantified and included in future CBA, similar approach and judgements will likely be required</p> <ul style="list-style-type: none"> <li>• Clear understanding of MCA/CBA relationship should be established early in the process</li> <li>• Clear agreement on criteria and weighting is required</li> </ul>
<b>Volume projections</b>	<p>"Volume projections use a single (2.9%) rate of increase. This leads to an exponential rise over time. Analysis suggests a link of volumes to GDP and Treasury long term GDP forecasts fall in % terms over time.</p> <p>EY has used a simplistic approach to devising growth rates and a CAGR which leads to an exponential growth assumption over time.</p>	<p>Do not affect recommendations.</p> <p>Estimation and more fundamental uncertainties are important drivers of CWG recommendation for regular trigger assessment (also recommended by EY)</p>	<p>Build regression analysis into future modelling, clearly address issue within trigger study and ongoing monitoring.</p>

	I still hold that these would be better specified using regression analysis based on historical relationships between TEU numbers and population, GDP and other explanators”	<i>Comment</i> Lower growth in demand volume would extend the viability of the current location (only from a port performance point of view – does not consider other triggers and externalities)	
<b>Discount rates</b>	<p>“EY is using 6% and 2%. It would be useful to have a rationale for these choices.</p> <p>Discount rates are crucial in the analysis. The sensitivity analysis shows that the preferred solution differs with the choice of discount rate (Table 70 on p207 [of the EY report]). The discussion of discount rates therefore needs to provide a good rationale for the choice of rate as it is low by comparison with the NZ Treasury recommended rate. EY has added a section on discount rates. It states that they have chosen a low rate on the basis of the UK Treasury recommendations, but I think it needs a NZ context and to address the issue which NZ Treasury considers vital – whether there will be displacement of private investment capital.</p> <p>The explanation is not sufficient to provide assurance that the discount rate used (2.5%) is the best one to use.”</p>	<p>Do not affect recommendations.</p> <p>The two preferred options, Manukau and Firth of Thames (FoT) were preferred regardless of the discount rate chosen. 2.5% is appropriate for a study with an explicit timeframe longer than 50 years.</p> <p>Funding considered by CWG as not likely to be a major constraint, but addressed in note calling for investigation of ‘how and when a new port could be funded’</p> <p><i>Comment</i> Higher discount rate will affect both costs and benefits</p>	<p>More detailed consideration and explanation should be provided, possibly with scenario modelling of different rates across different timescales to assess sensitivity</p> <p>Assess ownership and funding models for new port establishment</p> <p>Requirements for transparency of modelling should be made clear at start of further analysis. Greater transparency may lead to improved buy-in and trust among stakeholders. This relates to all aspects of the analysis, but particularly the CBA.</p>
<b>Wider Economic Benefits (WEBs)</b>	<p>“EY includes wider economic benefits in the form of benefits of agglomeration (a 20% uplift in land values). However, agglomeration benefits arise from an increase in the density of employment. All other things equal, the release of port land increases land supply and arguably reduces employment density (Although this will depend on where employment might move from).</p> <p>I provided alternative numbers based on NZ research (Maré and Graham, 2009) in which a 1% higher effective density of</p>	<p>Do not affect recommendations.</p> <p>Uncertainty acknowledged and discussed at CWG meetings, and addressed by trigger study recommendation. In addition, the size of differences between the two preferred locations and the location logic for those locations</p>	<p>More detailed consideration and explanation should be provided, possibly with scenario modelling of different rates across different timescales to assess sensitivity.</p>

	<p>employment results in a 0.069% increase in productivity.</p> <p>EY initially noted that they are happy to use my numbers. However, in the final report EY applies (p148) “a 12% land use uplift to reflect the net positive agglomeration benefits overall accruing to Option 5 where the existing port land is redeveloped” while noting that “More detailed demographic modelling should be undertaken to determine the true net positive agglomeration benefits for each of the sites.”</p> <p>The approach taken is simplistic and does not make use of NZ-based research results on this issue.”</p>	<p>provided some confidence that wider benefits would not lift Muriwai or another potential locations into preference.</p> <p><i>Comment</i> Unclear: WEBs from alternative locations not included, nor were non-agglomeration benefits included in the EY study. Lower WEBs (of freeing up the land currently occupied by POAL) would make moving to a new location less attractive. WEBs may increase or decrease depending on use of land. Rate of change in Wynyard area is relevant and may offer example.</p>	
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**Manukau navigability** Dr Richard Reinen-Hamill, Tonkin and Taylor

Item	Comment/issue raised by peer reviewer	Impact on CWG recommendations	Note for future analysis
<b>Dredging – capital costs</b>	<p>“Due to the preliminary level of investigation and the existing knowledge presented we do not believe a single capital dredge volume based on an optimized channel dimension is appropriate. Taking into account the stage of this project and the limited information and knowledge of the site we recommended the use of PIANC guidelines and published guidance on matters such as stable side slopes to define the maximum channel dimensions.”</p> <p>...[EY have revised their modelling to] include a lower bound volume (non-conservative) based on [their] judgement and upper bound dredge volume that consider the PIANC guidance. The minimum area has been modified with a flattening of side slopes of 2.5(H):1(V) compared to 1.5(H):1(V). However, the base width (250 m) and depth (15.5 m) has been retained from the earlier draft. These dimensions are smaller than suggested by PIANC guidance.</p>	<p>Do not affect recommendations.</p> <p>Uncertainty acknowledged and discussed at CWG meetings, and addressed by recommendations for more detailed study and inclusion of FoT options in future location work</p> <p><i>Comment</i> Increased dredging costs will reduce the attractiveness of options</p>	<p>Conduct detailed field-work and modelling</p> <p>Adopt more conservative (i.e. larger) channel dimensions until greater knowledge of geologic and hydrologic conditions and dynamics are in place</p> <p>Ensure detailed design allows appropriately conservative costings to be included in CBA, and differentiate between capital and operational costs for dredging</p>

	<p>Using a uniform depth for the entire length of channel through the bar to the port does not recognise the variability in wave climate from the open coast to the sheltered harbour location, but may be suitable for this stage [of analysis]</p> <p>[EY's PIANC-driven re-assessment] resulted in a deeper and wider base width channel [resulted in capital dredge volumes in a] range from around 4Mm<sup>3</sup> (lower bound) to 60Mm<sup>3</sup> (upper bound). In my view this range encompasses the potential capital dredge volumes with my expectation that they would tend towards the mid to upper range as the wave height, period, tide range and sedimentation allowance is likely to increase the dredge depth of the bar from the 15.5 m used to determine the lower bound volume.</p> <p>... I would have anticipated more conventional and defensible slopes would have been applied for a pre-feasibility level assessment and would vary from open coast to sheltered harbour. However, I anticipate that the increased volume due to side slope change is within the margin of error.</p> <p>...</p> <p>The non-conservative channel dredge volumes form the basis of the Cost Benefit Assessment. ...[EY] states that the sensitivity testing has been carried out for the maximum capital dredging volumes and that there is no change in the rankings resulting from the increased volumes. However, we note that there is likely to be changes in the Cost Benefit ratio."</p>		
<b>Dredging - maintenance</b>	<p>"The range of maintenance dredging requirements is based on a proportion of longshore transport and dredging rates from other ports (minimum requirement) and 10 to 15% of the capital dredging (maximum requirement) attributed to PIANC (2014). The 10 to 15% range is consistent with the rule of thumb for silty/sandy nearshore conditions [however] using the proportion of alongshore drift is likely to underestimate actual maintenance dredging, as the channel excavation will disturb the existing equilibrium conditions.</p>	<p>Do not affect recommendations.</p> <p>Uncertainty acknowledged and discussed at CWG meetings, and addressed by recommendation for comprehensive investigation of identified location options</p>	<p>Adopt more conservative dredging regime until greater knowledge of geologic and hydrologic conditions and dynamics are in place</p> <p>Ensure detailed design allows appropriately conservative costings to be included in CBA, and differentiate</p>

	<p>The inference [drawn by EY] is maintenance dredging is to be done annually. Due to the physical setting we would anticipate the need for more frequent maintenance dredging to maintain navigable draft. ... the required dredging frequency may be between 3 and 4 times per year.”</p>	<p><i>Comment</i> Increased dredging costs of an option would reduce the attractiveness of that option</p>	<p>between capital and operational costs for dredging</p>
<p><b>Variability of the ebb tidal delta</b></p>	<p>[Relates to comments above on maintenance dredge volumes]</p> <p>“There is no detailed discussion in the report on the variability of the ebb tidal delta, although it is identified that the Manukau Heads represents a dynamic environment with strong tidal currents and waves....</p> <p>The basis of much of the assessment is on comparison of other ports such as Tauranga, Otago and Taranaki. This section identifies that the actual dredging rates at Taranaki and Otago have been less than inferred from numerical modelling suggesting modelling can over-predict sedimentation rates. The inference from these statements appears to be that any maintenance dredging volumes at Manukau will be less than modelling would suggest. At this phase of the study I do not believe these statements provide any useful guidance as no modelling has been carried out.</p> <p>...also states that at the Manukau entrance dredged volumes are likely to be less than the alongshore transport rate. Due to the more complex and higher energy system at this location I do not believe there is sufficient information to make this statement.</p> <p>The section states [that] annual dredging would likely to be required based on a comparison of dredging rates from Ports with similar sediment transport rates (Taranaki, Tauranga and Otago). Due to the nature of the environment at Manukau Heads I would anticipate at least annual maintenance dredging to be required and it is possible that it would be required more frequently.”</p>	<p>Do not affect recommendations.</p> <p>Uncertainty acknowledged and discussed at CWG meetings, and addressed by recommendation for comprehensive investigation of identified location options</p> <p>CWG reflected on concerns re: Manukau access and dredging, and judged its attractiveness to be reduced compared with Firth of Thames</p> <p><i>Comment</i> Increased dredging costs of an option would reduce the attractiveness of that option</p>	<p>Consider whether/how greater depth and breadth of analysis (possibly built on new field work) could be included in detailed study that follows on sites identified</p> <p>This should include viability of channel after adverse weather/sea condition events and implications for port operation, as well as wider environmental impacts</p>

Item	Comment/issue raised by peer reviewer	Impact on CWG recommendations	Note for future analysis
<b>Volume - Demand (trade task)</b>	<p>“Market projections rely on third party growth rate assumptions and CAGR for various periods respectively. Assessing the market demand and drivers, following further analysis would have to be included and become essential part of the volume projections:</p> <ul style="list-style-type: none"> <li>• Global economic development</li> <li>• New Zealand economy development and predominant import/export industries</li> <li>• Population development</li> <li>• Shipping line fleet development and deployment scenarios for New Zealand</li> <li>• Competition analysis with other New Zealand ports as well as Australian market development</li> <li>• Transport cost analysis</li> </ul> <p>Notably some of the above elements are referenced in the study but do not form part of the decision making for the growth prospects”</p>	<p>Do not affect recommendations.</p> <p>Uncertainty acknowledged and discussed at CWG meetings, and addressed by trigger study recommendation and establishment of sufficient berth length (with notes and conditions)</p> <p><i>Comment</i> Lower growth in demand volume would extend the viability of the current location (from a port performance point of view).</p>	<p>Consider increased breadth and depth of modelling. Further analysis may improve fidelity but probably not to within the margin errors caused by such long timeframes.</p> <p>Assessing scenarios re: demand and capacity volumes may help, and related economic impacts should be considered in Cost-Benefit analysis. Non-economic impacts of scenarios should be addressed within MCA if that methodology is retained, or quantified and addressed in CBA.</p>
<b>Volume - Capacity</b>	<p>“Capacity assessment is based on generic benchmarks which do neither consider side specifics such as the shape and location of the facilities nor the uniquely short container dwell time increasing capacities. The analysis should further combine the capacity demand for all commodities, highlight synergy effects and include more sound analysis of the following areas</p> <ul style="list-style-type: none"> <li>• Quayside on the basis of ship sizes, handling volumes, seasonality considerations and targeted productivities</li> <li>• Yard capacity considering the New Zealand specific dwell times and layouts, especially given the challenging shape of the Port of Auckland’s operational areas</li> <li>• Gate / Rail and Hinterland, i.e. initial road and rail network and respective interfaces capacity assessment.</li> </ul> <p>The aforementioned elements are considered crucial in order to derive timelines for the potential capacity constraint and related actions required to ensure continued volume growth can be accommodated.”</p>	<p>Do not affect recommendations.</p> <p>Uncertainty acknowledged and discussed at CWG meetings, and addressed by trigger study recommendation</p> <p><i>Comment</i> Lower growth in capacity volume would reduce the viability of the current location (from a port performance point of view)</p> <p>Previous studies and POAL recognise that footprint and berth length constraints will be reached unless expansion / extension is created</p>	<p>Analysis should determine and test approaches to regular monitoring and reporting of demand/capacity status and ‘headroom’ as Auckland changes, mega trends impact imports and exports, and as technology shift port performance limits.</p> <p>Commercial sensitivities may work to limit transparency however increased level of detail on performance improvement options (and timing) available to POAL would assist analysis and understanding of timing of capacity breach.</p> <p>Review full peer review report (attached as appendix) for further comments on expected design of more detailed study</p>

		Altered volume-related costs and benefits would be picked up in Cost-Benefit analysis.	
<b>Impacts on transport networks</b>	“[Conduct an] assessment of transport network capacity surrounding the port taking into consideration the port traffic as well as the development of personal vehicle traffic resulting from assumed population growth to ensure that the port’s handling volumes can be catered for on the road and rail network.”	<p>Do not affect recommendations.</p> <p>CWG recommendations not dependant on magnitude of timing of landside impacts. In addition, uncertainty recognised and addressed by trigger study recommendation. Comment considered as a recommendation for future analysis.</p> <p><i>Comment</i> Unclear: detailed traffic modelling of all location options required</p> <p>EY made comment on congestion impacts but considered detailed traffic modelling out of scope</p>	Consider conducting detailed traffic modelling involving KiwiRail, AT, and NZTA
<b>National port strategy (NPS)</b>	“[Hamburg Port Consulting] encourages the development of a National Port Strategy in order to ensure that demand is met while avoiding overspending in infrastructure development. As this may impact the outcome of the strategic port development plan for Auckland, it is suggested to ideally engage in a National Port Strategy development prior to determining the way forward for Auckland. This process however should be initiated rather soon. Where the National Level development is not possible, focus may be limited to a Northern Island ports strategic plan.”	<p>Do not affect recommendations.</p> <p>CWG has focussed on, and made recommendations for Auckland.</p> <p>CWG has noted “potential for a super-port”, and proposed consideration of wider upper-North Island implications when considering location options in the next stage of analysis</p> <p><i>Comment</i> A wider regional consideration would affect many issues including</p>	Consider scope of analysis, wider regional stakeholders and competition/ownership issues.



		funding, volumes (trade task demand), and ownership. Regional or even national growth strategies and plans may be affected	
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# Resource Economics

## **Port Study:**

*Peer review of cost benefit  
analysis*

4 July 2016

Prepared for

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Port Future Study Consensus Working Group

**Authorship**

Tim Denne

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# 1 Introduction

## 1.1 Background

This report summarises the peer review comments made on the cost benefit analysis (CBA) during the study period, plus the responses to comments made. Below I summarise the comments and responses and set out my residual concerns.

## 1.2 Summary of Comments

Table 1 summarises the peer review comments made over the period of the project, the responses and the extent to which these have been addressed adequately. This updates a table provided on 3<sup>rd</sup> May (Section 4) at which stage EY had agreed to make some changes, not all of which were subsequently addressed adequately.

Table 1 Summary of Comments and Responses

Topic	Issue	Response/Resolution
Scenarios vs trigger points	If the study uses volume trigger points to identify critical decisions rather than specific years, there might be a disconnect between population and volume projections.	EY explained that the trigger points are linked to population projections <b>Resolved</b>
Land Opportunity Cost	Whether the opportunity cost of port land is over-estimated by using current land prices. All other things being equal, if land supply increases, land price should fall.	EY accepts the point. It added the following comment in the report (p148): " <i>It is possible that the land value realised will vary depending on the supply and demand conditions of the market at the time is released. As the supply of land in the proposed development is of such a large scale, it is also possible that this might reduce the developed land value as prices fall as supply of land increases.</i> " <b>This addresses the issue raised, although the quantitative effect is not estimated</b>
External (eg environmental) costs	There are very significant uncertainties over environmental costs that reflect the uncertainty of effects (more detailed analysis required than is possible in the EY-led study) and the absence of suitable data even if there was more certainty.	Environmental costs were not quantified, but they were discussed within the multi-criteria analysis (MCA). <b>The analysis of environmental (and other external costs) is difficult within the CBA. There are large data gaps and it is not clear that there would be sufficient data to add materially to the understanding of the costs and benefits of each option.</b>
Perspective	EY initially suggested that they are taking a national perspective. A regional perspective may be more appropriate, given the interests of the decision makers.	A regional perspective will be taken <b>Resolved</b>
Transition/disruption costs	The focus appears to be on long terms costs and benefits rather than attempting to quantify transitional costs (eg running 2	EY agrees and the CBA now includes transition costs. <b>Resolved</b>

	ports) which are likely to be significant.	
Volume projections	Volume projections use a single (2.9%) rate of increase. This leads to an exponential rise over time. Analysis suggests a link of volumes to GDP and Treasury long term GDP forecasts fall in % terms over time.	EY has used a simplistic approach to devising growth rates and a CAGR which leads to an exponential growth assumption over time. <b>I still hold that these would be better specified using regression analysis based on historical relationships between TEU numbers and population, GDP and other explanators</b>
Freight cost assumptions	Analysis assumes a constant cost per TEU for rail freight because of data unavailability on rail origin-destinations.  I am not an expert on rail freight costs but it would be useful for this assumption to be considered by someone who is.	From my limited knowledge the approach taken appears reasonable given the data gaps. <b>Resolved</b>
Discount rates	EY is using 6% and 2%. It would be useful to have a rationale for these choices.	Discount rates are crucial in the analysis. The sensitivity analysis shows that the preferred solution differs with the choice of discount rate (Table 70 on p207). The discussion of discount rates therefore needs to provide a good rationale for the choice of rate as it is low by comparison with the NZ Treasury recommended rate. EY has added a section on discount rates. It states that they have chosen a low rate on the basis of the UK Treasury recommendations, but I think it needs a NZ context and to address the issue which NZ Treasury considers vital – whether there will be displacement of private investment capital. <b>The explanation is not sufficient to provide assurance that the discount rate used (2.5%) is the best one to use.</b>
Wider Economic Benefits	EY includes wider economic benefits in the form of benefits of agglomeration (a 20% uplift in land values). However, agglomeration benefits arise from an increase in the density of employment. All other things equal, the release of port land increases land supply and arguably reduces employment density (Although this will depend on where employment might move from).  I provided alternative numbers based on NZ research (Maré and Graham, 2009) in which a 1% higher effective density of employment results in a 0.069% increase in productivity.	EY initially noted that they are happy to use my numbers. However, in the final report EY applies (p148) “a 12% land use uplift to reflect the net positive agglomeration benefits overall accruing to Option 5 where the existing port land is redeveloped” while noting that “More detailed demographic modelling should be undertaken to determine the true net positive agglomeration benefits for each of the sites.” <b>The approach taken is simplistic and does not make use of NZ-based research results on this issue.</b>

### 1.3 Residual Concerns

EY has addressed many of the comments. Despite these, I continue to have residual concerns about the following issues:

- **Volume projections** – EY has analysed all historical data to produce constant average growth rates (CAGRs) as the basis for forecasting future volumes. This embeds projections with exponential growth and leads to assumptions of very rapid increases in TEUs coming through the port. An alternative approach more widely used in producing projections, in my experience, is that of finding statistically significant relationships between volumes and underlying drivers, eg GDP and population. And notably, projections of these factors show diminishing annual increases, including in the projections of population and GDP produced by StatsNZ and Treasury.<sup>1</sup>
- **Discount rates** - discount rates are crucial in the analysis. The sensitivity analysis shows that the preferred solution differs with the choice of discount rate (Table 70 on p207). The discussion of discount rates therefore needs to provide a good rationale for the choice of rate as it is low by comparison with the NZ Treasury recommended rate. EY states that it has chosen a low rate on the basis of the UK Treasury recommendations, but this needs a NZ context and to address the issue which NZ Treasury considers vital – whether there will be displacement of private investment capital. The explanation is not sufficient to provide assurance that the discount rate used (2.5%) is the best one to use.
- **Wider Economic Benefits** – EY applies (p148) a 12% uplift to land values for Option 5 where the existing port land is redeveloped. This reflects the agglomeration benefits of employment shifting to the port land. This appears to be based on international studies, although it is not well referenced. In contrast, NZ research (Maré and Graham, 2009) has demonstrated a 1% higher effective density of employment results in a 0.069% increase in productivity. EY has not attempted to estimate any change in density of employment, although all other things being equal, more land supply should reduce average employment density. EY notes that “More detailed demographic modelling should be undertaken to determine the true net positive agglomeration benefits for each of the sites.” To my mind they have not demonstrated whether the effect should be net positive or negative.

The approach taken is simplistic and does not make use of NZ-based research results on this issue.

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<sup>1</sup> In addition, the presentation of input data could be improved. For example I note that they still show NZ GDP growth rates in Figure 35 in US\$ without every labelling it as such (I would think most readers would assume these are NZ\$)

## 2 Comments of 22<sup>nd</sup> March

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### 2.1 Process

On 22<sup>nd</sup> March I met with Lauren Jewell (EY) to discuss the project. Lars Rognlien joined by Skype.

The overall approach to the CBA appeared to be going in the right direction. The following issues were raised where I had some questions or concerns.

### 2.2 Scenarios vs Trigger Points

Rather than undertaking an analysis of future port options against scenarios of future states of the world, the emphasis of their study is on volume capacity trigger points when decisions regarding the port future will need to be made. The study examines these trigger points occurring at different times (eg 4 million TEUs in 2030).

The implication is that the trigger points approach avoids undertaking scenarios. However, it is not clear how they are examining the interaction between these trigger points and, say, different population levels in Auckland: I presume it would matter to the results whether a trigger point is achieved when Auckland's population is 2 million vs 3 million. I do not know if this is important, but they are making a big thing of not using scenarios. I am unsure how they are avoided.

#### EY Response

*Not strictly correct – we are undertaking analysis on 5 options, do min, expand the ports footprint and 3 new location options to determine the relative costs and benefits of alternatives.*

*Scenarios are being undertaken that look at different triggers points that are primarily driven by volume. Ie if population is based on median forecasts, 4M TEU could be reached by x date. If population continues to grow at a rate higher than median forecasts 4M TEU will be reached earlier.*

*While this doesn't necessarily change the long term option outcome, it does change the medium term options with respect to interim reallocation of trade types, and changes the timing required for new port location decisions (ie land purchase, NoR, Detailed feasibility, investment in supporting infrastructure etc*

### 2.3 Land Opportunity Costs

When the port land is used as a port there is an opportunity cost of the land. It could have been used in some other use that would have provided for economic activity or to enhance Aucklanders wellbeing in some other way. EY is intending to use land values in similar location (eg Wynyard Quarter) as the basis for estimating land opportunity costs for the port.

This, combined with their stated assumption that total employment would not change in Auckland under the different options, raises some concerns.

Land values reflect the present value of future use of the land. Because land is the main scarce resource, agricultural land values reflect the string of future profits expected from farming, and urban land values reflect the stream of future profits that might be obtained from commercial use of



land. The implication of this is that **the total value of all commercial/industrial land in the Auckland region as a whole is a reflection of the total future surplus (profit) made by all businesses in the region**. If, as EY is assuming, there is no increase in total employment, there is a question over whether we would expect the total value of all land to increase in the region. Under these assumptions of no change in total employment, it might be more reasonable to assume that there is no increase in the total value of all land in Auckland.

The exceptions to this (and reasons why total land value might increase) would be that:

- There are agglomeration benefits reflected in increased business productivity; and
- There are amenity benefits from the use of the land that increase willingness to pay for the land.

However, the agglomeration benefits are being measured separately so to count them in land prices would be double counting. Amenity benefits might be included also (see below).

#### **EY Response**

*The right measure of opportunity cost of the port land is the value in its highest and best use. This value will reflect the utility, profits, amenities and other benefits that future occupants attribute to that location.*

*The impact on land values elsewhere is a pecuniary externality.*

*From first principles, the net incremental societal value from the site may arise from any number of channels:*

- *Higher amenity value compared to alternative sites*
- *Agglomeration economies enjoyed by the new occupants*
- *Less intensive land use – ie more land increases the productivity of labour and capital.*

*The agglomeration benefits that are captured in the separate assessment are those not perceived by the new occupants. Ie, existing Auckland CBD firms will become more productive if there are additional jobs/ workers in the CBD.*

**Note this debate was continued after the second round of comments: see below**

## **2.4 External Costs**

EY state that they are measuring external costs and benefits using the NZTA Economic Evaluation Manual (EEM) methodologies and/or data. The EEM:

- includes some estimates of external costs: air pollution, CO<sub>2</sub> and noise, although the values that are included in the EEM are generally out of date (they have not been updated for 10 years).
- does not include many others, eg visual impacts (the EEM provides recommended methodologies including using the analysis of costs of mitigation measures).

It is not clear what values are to be used by EY for effects not included in the EEM or if the EEM is being used without taking account of more recent data that would update these values.<sup>2</sup>

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<sup>2</sup> NZTA uses old values partly for consistency

**EY Response**

*We would be happy to take your advice on which parameters we should be using. EEM is our default option for undertaking CBAs.*

## 2.5 National or Regional Perspective

EY suggest that they are taking a national perspective. Given the interests of the decision makers, an Auckland regional perspective may be more appropriate. National impacts might be noted in addition to explain the differences.

**EY Response**

*I agree in principle. But:*

- The port is of national significance. It would be inappropriate to consider a relocation decision, without taking into account the ports role in the national supply chain.*
- CBA is not well suited to understand regional impacts. To truly understand the net impacts to the Auckland region we would need to know how initial benefits to residents and businesses would 'leak' outside the region through changes in prices, profits, investments, wages and spending patterns. A CGE model might be able to shed a light on this, but this is not within the scope of the project.*

*Direction from the CWG Chair is that we should be looking at regional perspective.*

## 2.6 Transition/Disruption Costs

The focus is on the differences in long run costs for different port options with less emphasis given to possible short-run disruption costs. These would include the costs of running two ports for a time or the transport disruption costs during the transition phase. These costs may be very significant for a project such as this.

They are admittedly harder to take into account, but the CBA should consider them and their magnitude.

**EY Response**

*Agreed. We won't be able to quantify these, but they should be discussed qualitatively. Likewise with port scale efficiencies.*

## 3 Comments of 20<sup>th</sup> April

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### 3.1 Process

These comments are based on a meeting with the project team (Lauren Jewell and Lynn Lai) on 13<sup>th</sup> April and a subsequent review of a report chapter entitled “Cost Benefit Analysis Process and Methodology”.

The overall direction of the analysis and methodologies used were reasonable, but questions or comments were made regarding the following:

- Land opportunity costs
- Wider Economic Benefits
- Volume projections
- Freight costs
- Discount rates

### 3.2 Land Opportunity Costs

The land opportunity cost is estimated for the different options. For the current land occupied by the port estimates have been made by JLL on the basis of land sales on the periphery of the CBD and an annual growth rate in values of 3% per annum (or 1% real).

I understand that the quantity of land that is currently occupied by the port is significant in comparison to the total CBD area. In simple terms, in the absence of an increase in demand (new industries starting in Auckland because of the port land being made available), increasing land supply would be expected to lead to a reduction in market price, which might be shared across commercial and residential land prices. The current approach uses the current land price as a reflection of opportunity cost rather than the expected price following release/rezoning of the land.

Estimating how large this reduction in price would be would require some estimate of the price elasticity of demand for land. It would be useful to at least discuss this effect, even if the data do not exist to quantify it.

#### EY Response

*This will be discussed qualitatively in the report. We accept Tim’s point on the land supply potentially leading to a reduction in land values.*

### 3.3 Wider Economic Benefits

EY uses a 20% uplift to land values to reflect agglomeration benefits. It would be useful to justify this. For example, NZ authors have found evidence that a 1% higher effective density of employment results in a 0.069% increase in productivity.<sup>3</sup> All other things equal, an increase in land supply would result in a reduction in density of employment and a reduction in agglomeration benefits.

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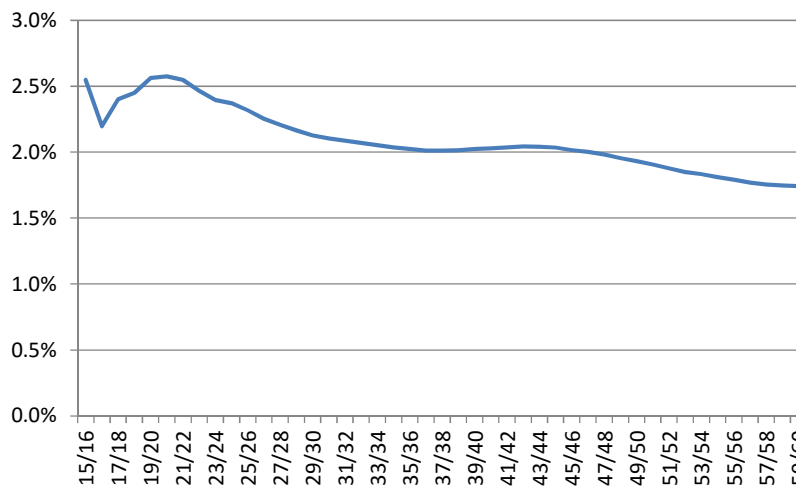
<sup>3</sup> Maré DC and Graham DJ (2009) Agglomeration Elasticities in New Zealand. Motu Working Paper 09-06.

### 3.4 Volume Projections

The report suggests that the volume projections have been made over 100 years using a CAGR of 2.9%. It would be useful to provide an alternative basis for these projections.

Using StatisticsNZ data on GDP and tonnes imported and exported through the port of Auckland,<sup>4</sup> a simple regression suggests that there is a statistically significant relationship and that total weight increases by slightly more on a percentage basis than GDP (1.1% increase in tonnes per 1% increase in real national GDP). Treasury for its long term fiscal modelling projects a declining percentage increase in GDP growth per annum. Using such a relationship would modify the otherwise exponential growth that would occur through using a constant annual growth rate.

Figure 1 GDP Growth rate (%)



Source: NZ Treasury Long-term Fiscal Model

#### EY Response

*To process – we are currently working out a range of volume forecasts to run scenarios.*

*The 2.9% forecast rate used was both an average of a series of forecasts we looked at as part of the literature review, and the Treasury half year economic and fiscal update 2015 average growth rate for imports and export. We understand that over the long run, the year-on-year rate might decrease. Therefore, we have built into the model a declining rate of growth post-peak of TEU volume.*

*The 2.9% was an initial growth rate to commence the model build, a more conservative growth rate may be applied in the final model.*

### 3.5 Freight Costs

The analysis assumes a constant cost per TEU for rail freight, ignoring any difference in distance transported. This is on the basis that capital costs of the rail network will dominate total costs and that changes in distance will not change total costs significantly. I am not an expert on rail freight costs but it would be useful for this assumption to be considered by someone who is.

<sup>4</sup> We understand that the POAL uses a freight-tonne concept, ie the greater of tonnes and a volume-based measure.

**EY Response**

*Ideally, we would use the distance travelled to drive the costs. However, due to the unavailability of rail origin-destination data, we have been unable to work out the distance travelled for the TEU volumes to work out the cost.*

*Therefore, as a proxy, we have followed the Ministry of Transport's methodology of dividing KiwiRail's total freight revenue divided by total TEU shipped.*

**3.6 Discount Rates**

EY is using 6% as the standard discount rate, based on NZTA recommendations for transport projects, and a 2% rate in sensitivity analysis, recognising that this is a long run decision for which the preferences of future generations are relevant. There is no detailed discussion of the rationale for these numbers, and they may be significant for the overall result. I do not disagree with the numbers, but it would be useful if the analysis provided some guidance for interpretation, particularly on whether the 2% or 6% number should be the focus.

**EY Response**

*To process – we will be including more text for the discount rates and why we have chosen them – and also publishing the results for a range of discount rates 2%-6%*

## 4 Overview as of 3<sup>rd</sup> May

### 4.1 Introduction & Process

This Section summarises the interactions with the study team to 3<sup>rd</sup> May, the issues discussed and the responses received.

At this stage I had held two meetings with the EY team (22 March and 13 April) and reviewed a number of other items:

- A Spreadsheet that sets out CBA data needs & overview
- A report chapter entitled Cost Benefit Analysis Process and Methodology
- A draft EY presentation to the CWG meeting of 20<sup>th</sup> April

I had not seen the full report on the Port Study so the comments are limited to the contents of the CBA. This might miss some things outside the CBA that perhaps should have been included.

### 4.2 Issues Raised and Resolved

Topic	Issue	Response/Resolution <sup>1</sup>
Scenarios vs trigger points	If the study uses volume trigger points to identify critical decisions rather than specific years, there might be a disconnect between population and volume projections.	EY explained that the trigger points are linked to population projections <b>Resolved</b>
Land Opportunity Cost	Whether the opportunity cost of port land is over-estimated by using current land prices. All other things being equal, if land supply increases, land price should fall.	EY accepts the point and will discuss the issue qualitatively in the report (recognising many other uncertainties in land prices). <b>Resolved</b>
External (eg environmental) costs	There are very significant uncertainties over environmental costs that reflect the uncertainty of effects (more detailed analysis required than is possible in the EY-led study) and the absence of suitable data even if there was more certainty. However, it is not clear if external costs are being quantified where possible in EY's study and if data available are being used. The suggestion is that, in the main, environmental effects will be treated qualitatively rather than quantitatively. There may be sensitivity options that can be used, eg the size of environmental costs that might change the preferred option, and whether such a level of costs might be reasonable.	It is likely that there will be large data gaps and uncertainties <b>Waiting to see the final treatment of environmental costs</b>
Perspective	EY initially suggested that they are taking a national perspective. A regional perspective may be more appropriate, given the interests of the decision makers.	A regional perspective will be taken <b>Resolved</b>
Transition/ disruption costs	The focus appears to be on long terms costs and benefits rather than attempting to quantify transitional costs (eg running 2 ports) which are likely to be significant.	EY agrees and the CBA now includes transition costs. <b>Resolved</b>

Volume projections	Volume projections use a single (2.9%) rate of increase. This leads to an exponential rise over time. Analysis suggests a link of volumes to GDP and Treasury long term GDP forecasts fall in % terms over time.	EY suggests that they have built a declining rate of growth post-peak of TEU volumes. And that a more conservative growth rate may be applied in the final model. <b>Waiting to see the final approach taken</b>
Freight cost assumptions	Analysis assumes a constant cost per TEU for rail freight because of data unavailability on rail origin-destinations.  I am not an expert on rail freight costs but it would be useful for this assumption to be considered by someone who is.	From my limited knowledge the approach taken appears reasonable given the data gaps. <b>Resolved</b>
Discount rates	EY is using 6% and 2%. It would be useful to have a rationale for these choices.	A rationale will be included. <b>Resolved</b>
Wider Economic Benefits	EY includes wider economic benefits in the form of benefits of agglomeration (a 20% uplift in land values). However, agglomeration benefits arise from an increase in the density of employment. All other things equal, the release of port land increases land supply and arguably reduces employment density (Although this will depend on where employment might move from).  I provided alternative numbers based on NZ research (Maré and Graham, 2009) in which a 1% higher effective density of employment results in a 0.069% increase in productivity.	EY notes that they are happy to use my numbers. <b>Resolved</b>

<sup>1</sup> All statements that the issue is resolved assume that the approach taken is consistent with EY comments

In general, the issues raised in the peer review have been responded to by the EY team to my satisfaction, although I am interested to see the final report to confirm that the issues have been addressed as noted above. Issues over which I would particularly like to see the final approach taken include the treatment of environmental (and wider external) costs and the approach taken to volume projections.

## 5 Additional Comments on Projections

### 5.1 Underlying Assumptions

Although EY undertakes sensitivity analysis on TEU growth rates, the underlying assumption appears to be that of a 2.9% CAGR until 4 million TEUs is reached. This is based on growth projections for GDP in particular.

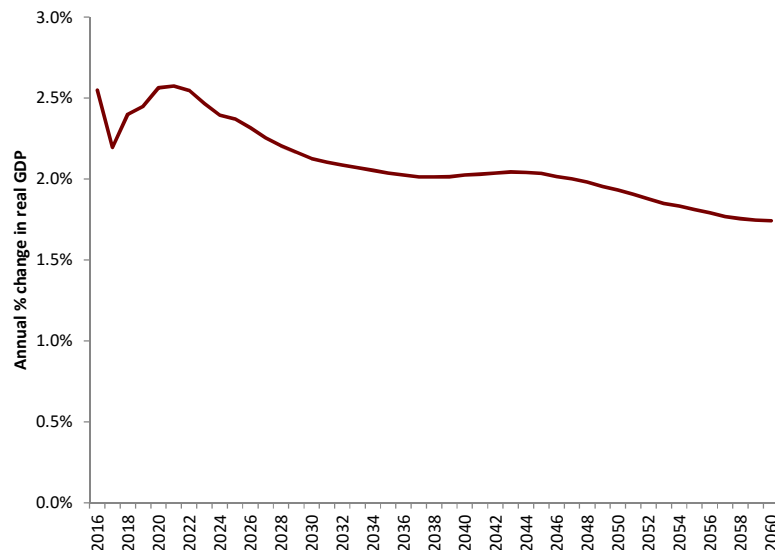
EY uses CAGRs to express historical and expected future growth rates in population and GDP, in addition to TEUs. The problem with this approach is that it builds in an expectation of ongoing equal-percentage increases that result in exponential growth rates. In contrast, **Statistics NZ and Treasury projections for population and GDP respectively both include declining percentage increases over time**, as seen in Table 2 and Figure 3.

Table 2 Auckland population estimates 2013-2043

Year at 30 June	Population Estimate	Annual % change over previous 5 years
2013	1,493,200	
2018	1,646,500	2.1%
2023	1,767,500	1.5%
2028	1,890,900	1.4%
2033	2,010,500	1.3%
2038	2,123,000	1.1%
2043	2,229,300	1.0%

Source: Statistics NZ, NZ.Stat website, Subnational population projections by age and sex, 2013(base)-2043.

Figure 2 Predicted change in real GDP 2016-2060



Source: Treasury Long-Term Fiscal Model

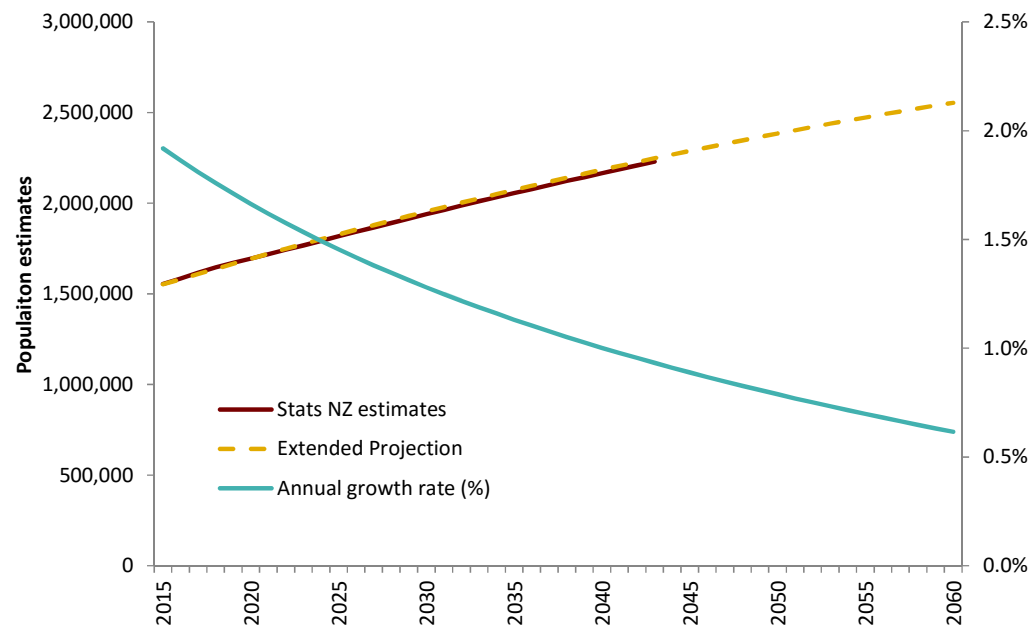
EY suggests population growth of 1.34% per annum, which was the CAGR from 2013 to 2043 in StatsNZ's data, but as Table 2 shows this had slowed down to 1% per annum by 2043. That said, in



the text (Section 7.2.1.2) EY suggests that population increases to 2.3 million by 2060; however, using 1.34% per annum it would be approximately 2.8 million.

To extrapolate Statistics NZ’s trend to 2060, we developed a regression model. This shows a continuing declining growth rate (Figure 3) and an Auckland population growing to 2.55 million in 2060. By 2060 the annual growth rate has fallen to 0.6%.

Figure 3 Population estimates 2013-2043

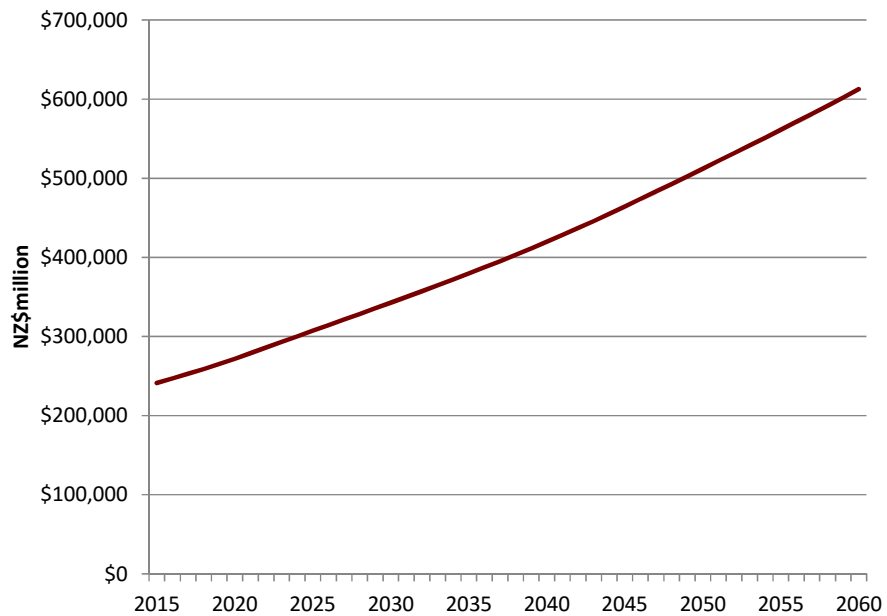


Statistics NZ estimates: NZ.Stat website, Subnational population projections by age and sex, 2013(base)-2043.

EY’s GDP projection numbers are somewhat confusing as they use OECD values in US\$, eg Figure 35. These growth rates incorporate an unknown exchange rate in addition to GDP growth.

We use Statistics NZ’s 2015 real GDP value to form the starting point, and then apply the percentage change in GDP from the Treasury’s Long Term Fiscal Model to predict future real GDP values. GDP rises to NZ\$612 billion in 2060 (Figure 4). Despite the falling percentage growth rate, annual growth increases in dollar terms.

Figure 4 Real GDP Projections (2015\$ values)



Source: Statistics NZ; Treasury Long Term Fiscal Model

## 5.2 TEU Projections

To understand the implications of slowing growth rates in GDP and population, we examined a number of possible relationships and subsequently regressed historical TEUs against:

- real GDP;
- real GDP/capita and lagged (1 year) TEU values;<sup>5</sup> and
- real GDP/capita, lagged (1 year) TEU values, and population.

We used the projections of GDP and population (discussed above) to project TEUs. Figure 5 illustrates the forecasted TEUs from 2016 to 2060.

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<sup>5</sup> Lagged (1 year) = TEU volumes last year was used as a determinant of volumes this year

Figure 5 Projected TEUs, 2016 – 2060

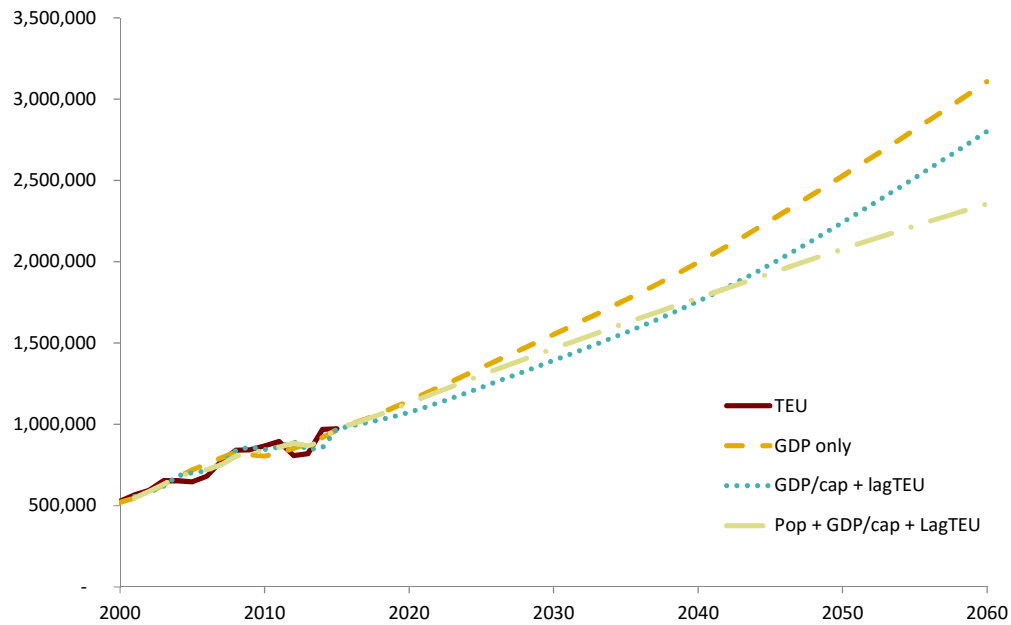


Table 3 presents the TEU projections from each model over 5 year intervals.

Table 3 Projected TEUs by each model (millions)

Year	Explanatory variables used to predict TEU		
	GDP only	GDP/cap + Lag TEU	Pop. + GDP/cap + Lag TEU
2015	0.97	0.97	0.98
2020	1.14	1.07	1.13
2025	1.35	1.23	1.30
2030	1.55	1.39	1.47
2035	1.77	1.56	1.62
2040	2.00	1.76	1.78
2045	2.25	1.98	1.93
2050	2.53	2.24	2.08
2055	2.81	2.52	2.22
2060	3.11	2.80	2.36
Reach 2 million TEUs	2041	2046	2048
Reach 3 million TEUs	2059	>2060	>2060

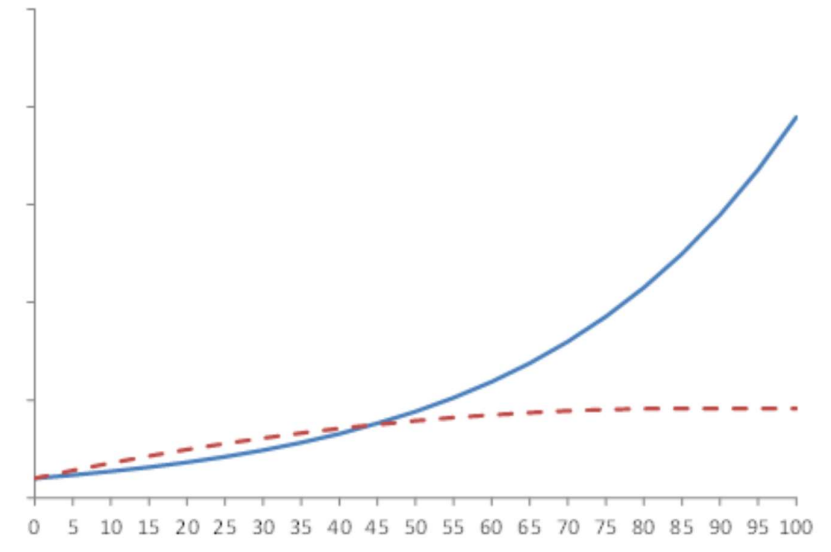
### 5.3 Additional Comment

Following a review of chapters 7 & 8 of the draft report, the following additional comment was made to EY:

*My concern is that you have tended to convert all historical data into CAGRs and then use these to project forwards. This embeds projections with exponential growth and leads to very rapid*

*increases in TEUs coming through the port: you are assuming the world looks like the blue line below, when it might look like the red line. StasNZ and Treasury project diminishing annual increases in population and GDP, for example.*

Figure 6 Projections based on CAGR vs Factor-defined



## 6 Additional Questions

### 6.1 Questions

On the 18<sup>th</sup> May, it was requested that I provide some additional detail on the TEU projections, including extending out to 2116 and commenting on:

- *Which explanatory variable would you recommend focusing on? (What is most strongly correlated with TEU growth, which are you most confident in, etc.)*
- *How sensitive are these predictions to population growth; for example, what happens if population growth slows at half the rate indicated by Treasury and Stats NZ?*
- *Does Treasury or Stats NZ provide any explanation for the declining rates in population; if so, could you please outline the key rationale for us? According to EY, they tend to underestimate population growth.*

### 6.2 Response to questions

1. *Which explanatory variable would you recommend focusing on? (What is most strongly correlated with TEU growth, which are you most confident in, etc.)*

We tested population and GDP as the obvious variables and found a very high correlation between both and TEU growth. However, it is difficult to know which is the most important factor because of the high correlations between the explanatory variables (as seen in the correlation matrix below).<sup>6</sup> For example, changes in GDP tend to move with changes in population. This effect ('*multicollinearity*') also makes it very difficult to understand the individual effect of each factor, as regression models cannot discern whether the change in TEUs was caused by one variable or another. Often this results in model estimates that are of low statistical significance (even though in reality they are highly correlated).

However, multicollinearity does not necessarily mean the predictions of the variable of interest (TEUs in this case) are inaccurate.

Correlation Matrix

	TEU	GDP (m)	Population (med)	GDP/cap	Lagged TEU
TEU	1.00	0.94	0.94	0.87	0.91
GDP (m)	0.94	1.00	0.99	0.95	0.90
Population (med)	0.94	0.99	1.00	0.89	0.92
GDP/cap	0.87	0.95	0.89	1.00	0.77
Lagged TEU	0.91	0.90	0.92	0.77	1.00

We have built models using combinations of these variables. We have also included lagged TEUs in which last year's TEU numbers are used to partially explain this year's TEUs. This allow us to see the influence of other factors on TEUs, controlling for past value of TEUs.

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<sup>6</sup> A correlation matrix shows the correlation coefficients (a value between 0 and 1) between a set of variables. The closer the correlation coefficient is to 1, the stronger the relationship.

**2. How sensitive are these predictions to population growth; for example, what happens if population growth slows at half the rate indicated by Treasury and Stats NZ?**

Statistics NZ give low, medium and high population projections for each region of New Zealand. As the Statistics NZ's population projections only go to 2043, we developed a regression model to extend each (high, medium and low) trend to 2116. We then applied the high, medium and low population projections to the model that included all three key explanatory variables (population, GDP/capita, and lagged TEU), as illustrated in Figure 7.

Figure 7 Projected TEUs to 2116

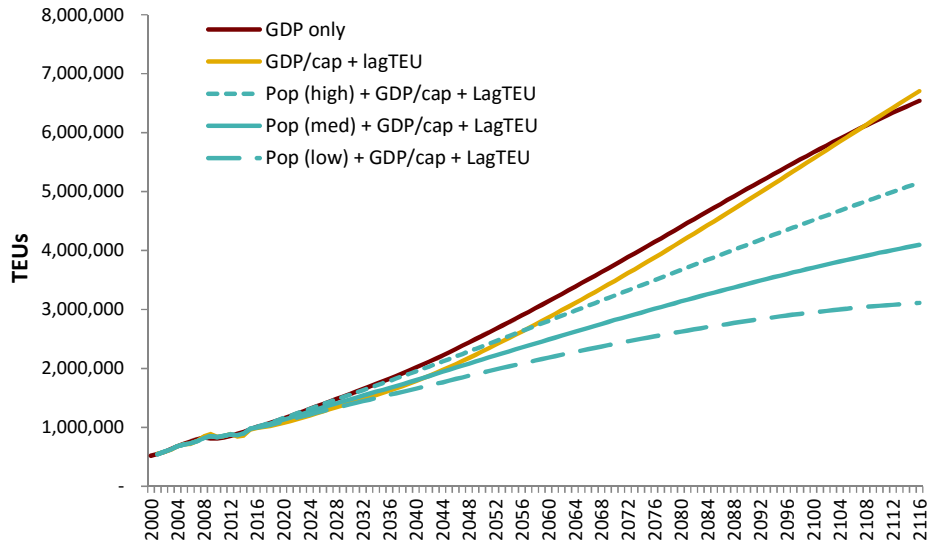


Table 4 presents the TEU projections from each model over 10 year intervals to 2115.

Table 4 Projected TEUs by each model (millions)

	<b>GDP only</b>	<b>GDP/cap + lagTEU</b>	<b>Pop (high) + GDP/cap + LagTEU</b>	<b>Pop (med) + GDP/cap + LagTEU</b>	<b>Pop (low) + GDP/cap + LagTEU</b>
<b>2015</b>	0.97	0.97	0.98	0.98	0.98
<b>2025</b>	1.36	1.24	1.36	1.30	1.25
<b>2035</b>	1.78	1.59	1.75	1.64	1.52
<b>2045</b>	2.28	2.02	2.16	1.98	1.79
<b>2055</b>	2.84	2.57	2.59	2.32	2.06
<b>2065</b>	3.45	3.17	3.02	2.66	2.30
<b>2075</b>	4.08	3.81	3.45	2.98	2.52
<b>2085</b>	4.72	4.49	3.88	3.29	2.72
<b>2095</b>	5.36	5.20	4.31	3.57	2.88
<b>2105</b>	5.95	5.92	4.72	3.84	3.01
<b>2115</b>	6.49	6.63	5.11	4.08	3.10
<b>Reach 2 million TEUs</b>	2040	2045	2042	2046	2053
<b>Reach 3 million TEUs</b>	2058	2063	2065	2067	2104
<b>Reach 4 million TEUs</b>	2074	2078	2088	2112	?

**3. Does Treasury or Stats NZ provide any explanation for the declining rates in population; if so, could you please outline the key rationale for us? According to EY, they tend to underestimate population growth.**

Table 5 presents the values underpinning the low, medium and high population projections for the Auckland region. The different growth rates vary with respect to three factors:

- Fertility rate - the average number of live births that women would have during their life;
- Male & female life expectancy at birth - the average length of life of a male/ female new-born baby assuming they experience the age-specific mortality rates of that year throughout their life; and
- Net migration – total arrivals minus departures over the previous five year period.

The numbers fall out of applying these inputs. Net migration is significant in this. Having constant migration in absolute numbers means that the percentage contribution is falling over time.

Table 5 Statistics NZ growth assumptions for the Auckland region

Measure	Period total fertility rate			Period life expectancy at birth - male			Period life expectancy at birth - female			Net migration		
	H	M	L	H	M	L	H	M	L	H	M	L
2018	1.91	1.88	1.85	81.7	81.3	80.8	85.4	85	84.5	100000	80000	60000
2023	1.95	1.86	1.77	82.9	82.4	81.6	86.6	86	85.3	60000	40000	20000
2028	1.97	1.85	1.73	84.1	83.4	82.4	87.6	86.9	86.1	60000	40000	20000
2033	1.97	1.84	1.71	85.3	84.3	83.1	88.6	87.8	86.7	60000	40000	20000
2038	1.98	1.84	1.7	86.4	85.2	83.8	89.5	88.5	87.3	60000	40000	20000
2043	1.98	1.84	1.7	87.4	86.1	84.4	90.4	89.3	87.9	60000	40000	20000

Source: Statistics New Zealand, NZStat website, Population projections, Subnational population projections, projection assumptions, 2013(base)-2043.

As I understand the GDP forecasts, these shift with the size of the labour force, so the declining growth in GDP will reflect a declining population growth and a shift in population structure over time.

Stakeholder Strategies Ltd  
Dilworth Trust Building  
22-32 Queen Street  
Auckland 1010

Attention: Rick Boven

Dear Rick

**Auckland Port Future Study**  
**Technical review of Manukau Harbour entrance coastal process assessment**

## **1 Purpose**

A Consensus Working Group set up by Auckland Council are undertaking a comprehensive study of future port options to recommend a long term strategy for the provision of port facilities taking into account economic, social, cultural and environmental matters. Manukau Harbour was identified as one of the potential site for siting a future port.

A consortia of consultants lead by EY and comprising Black Quay, GHD, Jasmax, Aurecon, eCoast and JLL, undertaken the study. The draft-final Consortium report indicates that while the Manukau harbour presents some challenges, responses to those challenges are within what could be reasonably be coped with by a modern port servicing an economy the size of Auckland.

Richard Reinen-Hamill, a coastal engineer from Tonkin + Taylor (T+T) was commissioned to assess the parameters and methodology applied to assessment of the technical viability of the Manukau Harbour for a large container port – particularly with regard to navigability of the bar and channels - and to consider the recommendations which emerge from the analysis.

## **2 Scope of works**

The scope of work involved the following steps:

- An initial high level review of draft-final report, followed by dialogue between the Independent Chair and Peer Reviewer as to material issues
- Dialogue between by Peer Reviewer, EY, Black Quay and eCoast expert to investigate these material issues, facilitated by EY
- Written feedback on material issues that exist in the Consortium analysis and the resulting final report.

T+T were provided with the following extracts of the draft report for the purposes of their initial review:

- EY (2016) extracts from Draft report (pages 19, 20, 143-148 and 174-178).



- Mead, S. and T. Haggitt (2016). Manukau Harbour and Firth of Thames Future Port Options: Coastal Processes and Biological Communities (technical appendices prepared by eCoast dated 9/03/2016)
- Mead S. (2016a). Manukau Harbour Dredge Volumes technical appendices prepared by eCoast dated 14/03/2016)
- Mead, S. (2016b). Technical note confirming direction and characteristics of sand movement at the heads as it relates to harbour access. Unheaded document, date unknown.

### **3 Assessment**

This section summarises our initial assessments and our assessment of the final report.

#### **3.1 Section 23.1.1 Coastal Process: Manukau**

This section of the Consortium report provides a summary of the coastal processes of the Manukau Harbour and its approaches from published and available sources to the author. It provides summary detail of wave climate, tidal flows and sediment transport.

There is no detailed discussion in the report on the variability of the ebb tidal delta, although it is identified that the Manukau Heads represents a dynamic environment with strong tidal currents and waves. It would have also been useful to provide information of tidal water levels and a discussion of the change in tidal flows from the harbour entrance to other locations within the harbour from the hydrographic chart.

The basis of much of the assessment is on comparison of other ports such as Tauranga, Otago and Taranaki. This section identifies that the actual dredging rates at Taranaki and Otago have been less than inferred from numerical modelling suggesting modelling can over-predict sedimentation rates. The inference from these statements appears to be that any maintenance dredging volumes at Manukau will be less than modelling would suggest. At this phase of the study I do not believe these statements provide any useful guidance as no modelling has been carried out.

The coastal environments of Taranaki, Tauranga and Otago are different to the Manukau Heads and, as such, the comparisons of dredging rates may not be useful. For example the report identifies that Port Taranaki is relatively sheltered in comparison to the Manukau Harbour entrance (Section 23.1.1, para 5) which questions the validity of the comparison. The wave climate and tidal flows in Tauranga are also less than at the Manukau Heads due to the lee coast setting and a significantly smaller tidal range.

Section 5 also states that at the Manukau entrance dredged volumes are likely to be less than the alongshore transport rate. Due to the more complex and higher energy system at this location I do not believe there is sufficient information to make this statement.

The section states (Para 11) that annual dredging would likely to be required based on a comparison of dredging rates from Ports with similar sediment transport rates (Taranaki, Tauranga and Otago). Due to the nature of the environment at Manukau Heads I would anticipate at least annual maintenance dredging to be required and it is possible that it would be required more frequently.

#### **3.2 Section 24 Manukau Harbour Dredge Volumes**

We understand from the main report that the design vessel for the long term maximum design is a 9,100 TEU vessel with a length of 320 m, beam of 45 m and a maximum draft of 14.5 m. Based on discussions with the project team it was also identified that tug assisted entry was considered for the Manukau Harbour. It would have been useful to set out this design criteria in this section.

Due to the preliminary level of investigation and the existing knowledge presented we do not believe a single capital dredge volume based on an optimized channel dimension is appropriate. Taking into account the stage of this project and the limited information and knowledge of the site we recommended the use of PIANC guidelines and published guidance on matters such as stable side slopes to define the maximum channel dimensions.

This section has been revised from the earlier draft to include a lower bound volume (non-conservative) based on the Consortia's judgement and upper bound dredge volume that consider the PIANC guidance<sup>1</sup>. The minimum area has been modified with a flattening of side slopes of 2.5(H):1(V) compared to 1.5(H):1(V). However, the base width (250 m) and depth (15.5 m) has been retained from the earlier draft. These dimensions are smaller than suggested by PIANC guidance.

Using a uniform depth for the entire length of channel through the bar to the port does not recognise the variability in wave climate from the open coast to the sheltered harbour location, but may be suitable for this stage as a lower bound assessment of capital dredged volumes due to the use of tug assisted navigation and a reduced frequency of operability (i.e. not all tide access).

The PIANC assessment resulted in a deeper and wider base width channel through the harbour entrance (22 m and 343 m respectively) and a higher level of the bar (5 m in lieu of 10 m that was used for the optimized volume assessment). There resulting capital dredge volumes for the minimum and maximum channel requirements range from around 4Mm<sup>3</sup> (lower bound) to 60Mm<sup>3</sup> (upper bound). In my view this range encompasses the potential capital dredge volumes with my expectation that they would tend towards the mid to upper range as the wave height, period, tide range and sedimentation allowance is likely to increase the dredge depth of the bar from the 15.5 m used to determine the lower bound volume.

I note that the design side slopes of 2.5 (H):1(V) are still steeper than published guidance on stable side slopes for this physical setting. I would have anticipated more conventional and defensible slopes would have been applied for a pre-feasibility level assessment and would vary from open coast to sheltered harbour. However, I anticipate that the increased volume due to side slope change is within the margin of error.

This section of the report now has a series of tables, but there appears to be inconsistency in the tables. The table on the first page of Section 24 appears to be the same as the table at the top of page 3, but values are slightly different.

The non-conservative channel dredge volumes form the basis of the Cost Benefit Assessment. Page 107 of the main report show dredging volumes of 4Mm<sup>3</sup> (Central), 35 Mm<sup>3</sup> (Puhunui) and 4.4Mm<sup>3</sup> (Hikihiki). There is a difference between the values used at Hikihiki (4.4 vs 4.7) and all values represent the minimum dredge scenario. Section 10.9 states that the sensitivity testing has been carried out for the maximum capital dredging volumes and that there is no change in the rankings resulting from the increased volumes. However, we note that there is likely to be changes in the Cost Benefit ratio.

### 3.3 Section 24 Maintenance dredging

The range of maintenance dredging requirements is based on a proportion of longshore transport and dredging rates from other ports (minimum requirement) and 10 to 15% of the capital dredging (maximum requirement) attributed to PIANC (2014). The 10 to 15% range is consistent with the rule of thumb for silty/sandy nearshore conditions based on a worldwide review of access channel

<sup>1</sup> PIANC (2014). Harbour approach channels design guideline. The World Association for Waterborne Transport Infrastructure, Report No. 121, Brussels, Belgium

sedimentation (van Leeuwen, 2015<sup>2</sup>). As discussed above, using the proportion of alongshore drift is likely to underestimate actual maintenance dredging, as the channel excavation will disturb the existing equilibrium conditions.

The inference from this section is maintenance dredging is to be done annually. Due to the physical setting we would anticipate the need for more frequent maintenance dredging to maintain navigable draft. We note PIANC (2014) recommend a minimum allowance of bottom changes between dredging of either 0.2 m or 1% of the channel depth, whichever is greater. Therefore, sedimentation of 0.2 m is likely to impact on navigation, particularly for the shallow optimized channel. Dividing the minimum maintenance dredging volumes of 275,000 m<sup>3</sup>/yr to 375,000 m<sup>3</sup>/yr by the minimum channel area through the delta (2km x 250 m = 500,000 m<sup>2</sup>) suggest minimum sedimentation depths of between 0.55 and 0.75 m. Dividing these depths by the minimum bottom change allowance suggests the required dredging frequency may be between 3 and 4 times per year.

Much of Section 24 has information that is repeated from the coastal process section with the upper bound volume based on PIANC guidance. I see this approach as relying on too much judgement when there is insufficient information known about the processes operating and further work is required to better understand the physical system and likely changes.

## 4 Summary

The Consortium report has identified that the entrance to the Manukau Harbour is high energy and highly dynamic, although there is limited detailed information and understanding on the physical processes at this location.

The report provides a range of estimates of capital and maintenance dredging using expert judgement and concept level design guidance from internationally published sources although there is a focus on the lower bound range of values for both, which we is non-conservative.

Due to the general understanding of the dynamic and high energy environment, lack of local information and knowledge, we prefer the consideration of values from the international guidance documents and guidelines, which we believe are more appropriate for concept level design considerations. However, we note the upper bound capital dredge volumes have been considered in the sensitivity analysis and did not change the ranking of port options, meaning that Manukau Harbour remains a potential option.

Significant research and assessment would be required in subsequent stages to better understand the physical processes and quantify both capital and maintenance dredging requirements.

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<sup>2</sup> Van Leeuwen, Y.B. (2015) Port and Channel Sedimentation: A hybrid model for rapid assessment, Thesis Delft University of Technology, November 2015.

## 5 Applicability

This report has been prepared for the exclusive use of our client Stakeholder Strategies Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

Authorised for Tonkin & Taylor Ltd by:



.....  
Richard Reinen-Hamill

Coastal Engineer

RRH

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.....  
Tim Fisher

Project Director



Stakeholder Strategies

STAKEHOLDER  
STRATEGIES

New Zealand

# PEER REVIEW FOR PORT FUTURE STUDY IN AUCKLAND, NEW ZEALAND

## Peer Review Summary



# PEER REVIEW FOR PORT FUTURE STUDY IN AUCKLAND, NEW ZEALAND

## Peer Review Summary

### **HPC Hamburg Port Consulting GmbH**

Container Terminal Altenwerder  
Am Ballinkai 1  
21129 Hamburg  
Germany  
Phone: +49-40-74008-192  
Fax: +49-40-74008-133  
E-Mail: [d.koegeboehn@hpc-hamburg.de](mailto:d.koegeboehn@hpc-hamburg.de)  
Internet: <http://www.hpc-hamburg.de>

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## EXECUTIVE SUMMARY

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HPC Hamburg Port Consulting GmbH has been requested to conduct a peer review on a draft version of the Ernst & Young (EY) consortium for Auckland's Port Future Vision Study. Focus of the review were sections 7 and 8 of the report, i.e. market potential and capacity assessments.

HPC provided draft comments which were partly addressed in a meeting in Auckland in early June, after which the comments were prioritised and put back to EY for action and consideration. A partial, high level response to the prioritised comments was received prior to the finalisation of their report in late June.

While several technicalities are highlighted which required further analyses key items highlighted in the initial review were as follows:

- Market projections rely on third party growth rate assumptions and CAGR for various periods respectively. Assessing the market demand and drivers further analysis would have to be included and become essential part of the volume projections:
  - o Global economic development
  - o New Zealand economy development and predominant import/export industries
  - o Population development
  - o Shipping line fleet development and deployment scenarios for New Zealand
  - o Competition analysis with other New Zealand ports as well as Australian market development
  - o Transport cost analysis

Notably some of the above elements are referenced in the study but do not form part of the decision making for the growth prospects.

- Capacity assessment is based on generic benchmarks which do neither consider side specifics such as the shape and location of the facilities nor the uniquely short container dwell time increasing capacities. The analysis should further combine the capacity demand for all commodities and highlight synergy effects and should include more sound analysis of the following areas
  - o Quayside on the basis of ship sizes, handling volumes, seasonality considerations and targeted productivities.



- Yard capacity considering the New Zealand specific dwell times and layouts, especially given the challenging shape of the Port of Auckland's operational areas
- Gate / Rail and Hinterland, i.e. initial road and rail network capacity assessment.

The aforementioned elements are considered crucial in order to derive timelines for the potential capacity constraint and related actions required to ensure continued volume growth can be accommodated.

The EY consortium has provided an update of the study pursuant to comments received also from other peer reviewers as well as on the prioritised comments provided by HPC. The review of the updated document reveals that the relevant sections are not being updated however, reference is made to the need for further analysis on the matter.

Despite the above need for further analysis, initial conclusions can be drawn related to the Auckland port development requirements as follows:

1. Where volumes continue to grow the existing port will inevitably become a constraint for the accommodation of trade.
2. Options for the improvement of the port's capacity within the current footprint and modification of the same should be further tested.
3. With limited options to expand within the port relocation options should be further considered and detailed.
4. An assessment of transport network capacity surrounding the port taking into consideration the port traffic as well as the development of personal vehicle traffic resulting from assumed population growth to ensure that the port's handling volumes can be catered for on the road and rail network.

The need for considering a relocation option is driven by the market development and maximum capacity in the port. As this will determine the timeline for the long term future thinking of the port development both aspects require more detailed analysis to understand the timing and extent to which alternative capacity is to be developed elsewhere. Further to the above, HPC encourages the development of a National Port Strategy in order to ensure that demand is met while avoiding overspending in infrastructure development. As this may impact the outcome of the strategic port development plan for Auckland, it is suggested to ideally engage in a National Port Strategy development prior to determining the way forward for Auckland. This process however should be initiated rather soon. Where the National Level development is not possible, focus may be limited to a Northern Island ports strategic plan.

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New Zealand

# PEER REVIEW FOR PORT FUTURE STUDY IN AUCKLAND, NEW ZEALAND

## Peer Review Report



# PEER REVIEW FOR PORT FUTURE STUDY IN AUCKLAND, NEW ZEALAND

## Peer Review Report

### **HPC Hamburg Port Consulting GmbH**

Container Terminal Altenwerder  
Am Ballinkai 1  
21129 Hamburg  
Germany  
Phone: +49-40-74008-192  
Fax: +49-40-74008-133  
E-Mail: [d.koegeboehn@hpc-hamburg.de](mailto:d.koegeboehn@hpc-hamburg.de)  
Internet: <http://www.hpc-hamburg.de>

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# 1. INTRODUCTION

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**In this draft report questions, open topics and first comments on the chapters 7, 8, 11, 12 and 13 of the Port Future Study are included. Pursuant to coordination of comments herein with EY and the Client a more detailed review report will be prepared on the basis of clarifications provided.**

## 1.1 Background

The Ports of Auckland are located in the city centre of Auckland. Various cargoes, like containers, bulk cargo, general cargo and vehicles are handled on the different terminals in the port. Operations are complemented by ferry traffic and cruise ship facilities.

New Zealand's economy has been robust in recent years and is expected to continue growing in the future. Hence, further increasing port capacity will be required in the Ports of Auckland. Due to the location of the port, the physical growth of the area towards the inland is deemed impossible. At the same time the growth of the area by reclamation is also limited for economic and environmental reasons. In anticipation of the future volume growth the Auckland City Council commissioned the Port Future Study. A consortium of consultants led by Ernst & Young ("EY") was appointed to conduct the study which includes market projections for the next 50 years, the analysis of the port's current performance and different options for capacity increase in the port. Furthermore, the study assesses alternative port locations where the maximum capacity in the existing port does not meet market requirements.

The project process is being supported by intense stakeholder engagement including the chamber of Commerce, the Ports of Auckland and many more organizations involved in the activities in the port, have founded a consortium called "Consensus Working Group" (CWG) to work on solutions for future challenges of the port. The CWG is moderated by Stakeholder Strategies.

With preliminary results of the Port Future Study being available and prior to final presentation to and discussion of the results with the stakeholders, outcomes shall be reviewed by an independent consultant to ease achieving agreement in the CWG on the study findings and recommendations.

## **1.2 Scope of Work**

The scope of this project is the peer review of the sections seven, eight, eleven and twelve of the “Port Future Study” prepared by EY. Therefore the market projections are checked and it is analysed if all assumptions and estimations on which the market projections are based are reasonable. The methodologies used to extrapolate the volumes for 50 years are analysed and it is examined if an appropriate, sound and complete methodology is used. As a result HPC will highlight aspects and factors which could be included in the derivation of market projections if necessary.

The capacity projections as well as the development options will also be reviewed. The assumptions and estimations on which the capacity calculations are based and the basics described for alternative operating schemes are checked. Also the methodologies which have been used to create the development options and relocation options are examined. It will be checked if all reasonable options have been considered and if the assessment of options is comprehensible. Further, capacity indications presented in the report will be assessed vis-à-vis industry benchmarks to highlight the level of ambition for further capacity increase.

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## **2. REVIEW OF CHAPTER “7 FUTURE STATE”**

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### **2.1 Expectations towards Future State – Market Forecast**

As part of a market forecast, the following key methodology elements are usually covered in the analysis and derived projections:

- Previous studies and their relevance
- Historic port performance
- Global trade development and pattern
- GDP – trade multiplier
- Population development in NZ
- For containers; TEU per capita
- Economic growth
- Key industries driving the economy, their impact on trade and anticipated future
- Discussion with key industry representatives, major freight forwarders and shipping line representatives on their future thinking related to trade and the port
- Shipping line routing, capacity and foresights (derived from shipping line interview)
- Ship size analysis considering the global fleet, order book and cascading effects, if any
- Competition analysis of other ports
- Consideration of potentials and limitations of other ports on the same trading lanes impacting vessel deployment impacting the port considered
- Hinterland connectivity analysis (road and rail), distribution centre connectivity, etc.
- Future thinking on changes to the production and consumption patterns impacting the future trade
- Derivation of low, base and high case volume projections, whereby the case base should be used as the planning basis for capacity development
- Projection of vessels calls spread across vessel sizes and call sizes



- “Smell check” on projected volumes e.g. against target TEU per capita.

## **2.2 Review of Chapter “7.1 Overview of assumptions”**

### **2.2.1 Content and Approach Overview**

- Combination of population, national GDP and world trade projections from official sources are referenced
- A literature review with the result of a number of other reports has been made.
- 2015 trade figures are used as a baseline.
- As a methodology the findings from literature review are extrapolated to 2060 and forecasts based on the GDP and other trade projections are done.

### **2.2.2 Questions and Open Topics**

- It is not clearly described which methodology is used for the forecast. How is a forecast derived by the findings from the literature review and how the referenced drivers are integrated into EY projections?
- Have any assumptions additional to the existing forecasts been used?

## **2.3 Review of Chapter “7.2 Demographic and Economic Conditions”**

### **2.3.1 Content and Approach**

- Three key drivers for demographic and economic projections are identified:
  - population growth;
  - economic growth; and
  - the location of economic activity in Auckland
- The first 2 drivers are described in following subchapters.
- Population projections for Auckland (Figure 33): Statistics New Zealand growth rates are used until the year 2043 and have been extrapolated until the year 2060.

### 2.3.2 Questions and Open Topics

- The third main driver (location of economic activity in Auckland) is not described in a separate subchapter, neither the key industries, nor their location. Which economy sectors are the drivers for the growth?
- It is mentioned, that over the projection period the Port's trade activities types will not change significantly, while in the section 11 of the Port Future Study draft makes reference to changing products. It is not clear whether the comment related to the continuation of cargo types (container, bulk, vehicles) or the handling volumes
- Summary of key inputs (Table 12):
  - Population grows in total New Zealand by 15% between 2030 and 2060; in Auckland region by 36% (more than double the total New Zealand growth)
  - National GDP grows by 92% for total New Zealand between 2030 and 2060; in the Auckland region also by 92%

What is the underlying rationale of the GDP growth for total New Zealand and the Auckland region being the same, while the population growth in the Auckland region is more than double the population growth in whole New Zealand? This seems to somewhat contradict Auckland's continued prime importance for the national economy.

- Population projections for Auckland (Figure 33): Why is the increase of the population of Auckland much higher after 2043 than before for all three scenarios? On which basis has the extrapolation of the statistics been done?
- It is not specified how "changes in demographics" (page 68) impact future activities and volumes at the port and how they are factored into the projections?
- Note that the referenced Auckland population on page 68 left column "2.3 million" does not reflect the 2060, but the 2045 value.

## 2.4 Review of Chapter "7.3 Global Trade"

### 2.4.1 Content and Approach

- Three mega-trends have been identified:
  - Diversification of developing countries
  - The emergence of larger upper and middle class

- Increased financial integration
- Key trading partners/countries are presented

#### **2.4.2 Questions and Open Topics**

- Reference is made to a next wave of globalisation into which the global economy will be carried. What is the rationale for it against the background of most manufacturing and assembling being in the meantime be done abroad and the referenced rate of containerisation of non-bulk cargoes as mentioned in section 13 of the study? What is the impact of the finding on the volume forecast?
- What is the expected development of trade with which markets?
- How are relevant findings from this analysis translated into the forecast?

### **2.5 Review of Chapter “7.4 Growth by Trade Type”**

#### **2.5.1 Content and Approach**

- This chapter includes a subchapter about container trade
- Reference is made to a container handling / GDP multiplier rule of thumb
- Four different container volume growth projections have been done based on the following drivers:
  - GDP
  - Historical Data from the last 5 years
  - Historical Data from the last 10 years
  - Historical Data from the last 20 years
  - New Zealand forecast volume trade growth (Based on Oxford Economics)
- In Figure 44 these four projections and 7 additional study results (extended by EY) are shown

#### **2.5.2 Questions and Open Topics**

- For containers a growth rate of 2-2.5 times the GDP is reference, but mentioned for “indicative purpose only”. There is no relation to the NZ volume development related to this figure in the past and an explanation for

potential deviations. It is not clear if and how this information has been used for any of the projections.

- In Figure 43 the diagram shows a linear trend, but in the text before it is described that this trend is based on a continuous growth rate of 4.2%.
- Further to Figure 43, it is mentioned to show “a continual increasing trend only” – what is the rationale behind it and how has this been factored into the forecasts in Figure 44?
- Ports in NZ often rely on the Rockpoint Model. Is it known to EY whether the same is the basis for any of the other referenced models?
- How are the information on growth (population and GDP) been integrated into the various forecast curves shown, especially where the new forecasts presented reflect past performance and GDP only, while no analysis on previous correlations are presented?
- Which of the container forecasts is used as the actual “base case” to determine port capacity sufficiency?

## **2.6 Review of Chapter “7.5 Multi-cargo”**

### **2.6.1 Content and Approach**

- Multi cargo includes dry bulk, liquid bulk, break bulk and vehicles
- For Multi-cargo two forecast scenario based on the GDP and the NZ trade growth have been developed and the results of 3 other studies are shown.
- Although it is mentioned that growth assumptions vary between industries, GDP and New Zealand trade growth have been used for the market forecast.
- For vehicles based on the drivers population growth, imports from Japan and GDP, three different scenarios have been developed and are shown with the findings from three studies from the years 2012-2015.
- Additionally the results of three other studies are shown in the diagram on page 79.
- For vehicles EY has developed forecasts in a lower, mid and upper range

### **2.6.2 Questions and Open Topics**

- While it appears that multi cargo (non-vehicle) forecasts are based on GDP and Oxford Economics, is there an EY analysis of drivers for the trade, is

there a relation to population and other impacting factors as presented in the relevant container section?

- Reference is made to the growth perspectives being dependent on the agricultural products, raw materials and other. Is there an analysis on how they see the future which is integrated in the forecasting method?
- Deviant from the container projections, no past performance analysis is made (5/10/15 years). What is the rationale for leaving these out compared to the container projections?
- Which of the container forecasts is used as the actual “base case” to determine port capacity sufficiency?
- Has a cross check been made on the vehicles/1000 persons resulting from the forecast values? With the ratio being fairly high already, it would be valuable to understand the further development, unless a sustained reduction in use of cars (in years) is expected which would increase throughput as well.
- As for the previous commodities, it is not clear which of the forecasts is used as the actual “base case” to determine port capacity sufficiency.

## **2.7 Review of Chapter “7.6 Cruise”**

### **2.7.1 Content and Approach**

- The cruise traffic in New Zealand is described
- The expected development of the size of cruise vessels and newbuilding is highlighted
- Passenger nationalities are referenced
- Past and near terms development of passenger and vessel quantities are highlighted.
- Other sources’ findings on – presumably Chinese – “first cruisers” are referenced
- In summary three scenarios from ATEED’s Cruise Action Plan are shown and extrapolated to 2060.

### **2.7.2 Questions and Open Topics**

- The drivers for the growth of cruise traffic are described in chapter 7.6.1.2, but it is not clear how these drivers have been incorporated into the forecast. A description of the worldwide development of cruise traffic in comparison

with the development in New Zealand is not done and the influence of external factors like marketing campaigns is mentioned, but it is not clear how this is integrated into the forecast.

- It is unclear whether interviews have been conducted with cruise lines in which they provided information related to the development of quantity of calls and ship sizes.
- What is the impact of short-term inaccessibility? If the vessel size is limited, which share of vessels would not call Auckland in future without adapting the infrastructure?
- Has a global cruise market analysis been made?
- What is the basis for the future state comment “continued rapid growth of cruising in Asia combined with the impact of the expanded Panama Canal has the potential to accelerate the growth of the cruise industry in Auckland”? How is this factored into the forecast and is the statement based on the assumption that long term more cruises will have significantly extended loops connecting the Caribbean, Asia, NZ and Australia?
- It is not clear which of the ATEED forecast scenarios should be used for capacity planning.
- What is the seasonality of the cruise business in Auckland, if any?

## **2.8 Review of Chapter “7.7 Other relevant trends”**

### **2.8.1 Content and Approach**

- The expected trends in consumption and technology, vessels, multi cargo fleets and cruise fleets are described.
- The development of TEU per capita handled in Auckland is shown.
- Technology Megatrends are listed.
- The global trends in the development of container vessels are shown as well as the following megatrends in container vessels:
  - Increasing vessel size
  - Improved vessel performance and reduced steaming speeds
  - Development of strategic alliances
- The trends mentioned before are applied to the New Zealand market to define design vessels.

- Multi-cargo Fleet Trends and Cruise Fleet Trends are described in the following subchapters.

### **2.8.2 Questions and Open Topics**

- Which influence do the mentioned trends have on the forecasts presented in the subchapters before and how are the findings of this chapter incorporated in the development of the forecast?
- Section 7.7.1.3 makes reference to TEU per capita indicating that “we could expect this to potentially reach 1 TEU per capita in 32 years” – how does not compare with other countries featuring similar conditions (developed country, island location, primarily domestic cargoes, comparatively strong exports)? What has driven the development and is it fair to assume the continued growth on the basis of the aforementioned?
- Chapter 7.7.1.4 is called “Technology Megatrends – Forecast Testing: It is not clear what the outcome of the said testing is and how this is reflected to validate the projections.
- Page 90: “...accounting for almost 60% of current orders.” Does this share refer to the total number of vessels or the capacity of ordered vessels, what is the impact on the projection, especially the share of vessels in different sizes calling Auckland?
- One of the megatrends in container vessels is the development of strategic alliances. It is not clear from the document why should this increase the number of port calls per journey (See page 91)? Is this based on a loop analysis not shown in the section?
- Trends are repetitive, as the global trend for container vessels is basically ship size, which is also mentioned as a mega trend.
- Has the influence of vessel size limitations of other (partly competing) ports in the region (NZ, Australia and as the case may be South Pacific Islands) been considered in the analysis?
- What are the sizes and number of vessels expected to call Auckland and what is the development of these numbers during the project period?
- Has a competition analysis highlighted Auckland specific constraints?
- What is the finding from figure 60?
- Is there an alternative route to Auckland to avoid the Torres Strait and what is the implication?

- On the cruise vessel forecast, reference is made to 8,000 – 8,500 passenger ships as the growing top end of the fleet. Harmony of the Seas accommodates 6,000 pax at approx. 360m. What is the source for even larger ships of that growing top end?

## **2.9 Review of Chapter “7.8 Port Operational Productivity and Trends”**

### **2.9.1 Content and Approach**

- Presentation of operational concept trends, specifically automation
- Presentation of matrix related to quayside capacity and yard dimensions and comparison to Auckland
- Benchmark between Auckland and Hongkong

### **2.9.2 Questions and Open Topics**

- This section is better located in the capacity section.
- Is there a reason, why the Port operational trends are related to containers only?
- Page 97
  - Please note that in global terms “ASC” stands for “Automated Stacking Cranes”, whereas automated straddle carriers are available from one vendor thus far, being marketed under the brand name AutoStrad.
  - A combination of straddle carriers and RTGs is not desirable from a safety perspective, hence should not be referred to as a “common example”
  - It is mentioned that “ports serving growing cities of more than 1 million people are seeing demand double every 10-20 years”. It is unclear what the source of this is and whether that differs from less populated areas.
- Page 98:
  - “Smaller ports adopt previously market leading technologies over time”. On which source is this based? Straddle carrier were invented a long time ago and newer terminals operate ASCs or



RTGs in various forms. However, ports like Brisbane with the AutoStrad are small, yet a technological pioneer.

- It is mentioned that secondary ports will not invest in the most innovative ASC system. Why wouldn't Auckland purchase the most effective ASC System if it commercially made sense? The market is small and unlike in the consumer goods industry innovation levels do not differ greatly between the manufacturers, given the tailor made nature of the equipment purchase.
- Generally the main drivers for the choice of an operational concept of a port are commercial factors. It is very important to determine the best operational concept for each single port by calculating if it is commercially valuable in terms of investment and operating cost. Influence factors are inter alia the forecasted volumes, peaking, the footprint, availability and cost of qualified workforce, energy cost, etc. Therefore it cannot generally be stated that operational concepts of bigger ports will cascade to smaller ones like Auckland.
- Benchmark with Hongkong
  - Please elaborate on the rational of benchmarking Auckland with Hongkong and which information can be drawn from it. Both Ports differ in trade (transshipment / domestic) size, shipping lines acceptance to accept waiting times, vessel sizes, etc.
  - The productivity of 333,000 TEU per STS per annum is ambitious and subject to validation. This however is based on a presumption. What is the basis for this?

## **2.10 Summary of findings on Chapter 7**

- The market analysis covers some of the typically expected methodology components, population growth, GDP and world trade projections.
- It is not clear from the section which of the information and if so how they become part of the forecast.
- An analysis of the products handled in the port and the development of the related business branches is not included in the section.
- It is not clear if stakeholder interviews have been conducted to support the projections.
- Vessel size analysis is presented pursuant to developing the volume projections, which is unusual.

- 
- A competition analysis is not referenced to in the section.
  - For the derivation of findings on the way forward a clear indication of the most likely scenario would be advantageous.
  - Trends in the economy have been referenced but it is not clear if these findings are integrated into the market forecast.
  - For containers, developed forecasts seem to rely on three different historic value scenarios and the GDP growth.
  - Not all statements about port operating systems are proven with sources and it is doubted that the general reasons for the choice of operating systems in ports are correct.

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### **3. REVIEW OF CHAPTER “8 CAPACITIES”**

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#### **3.1 Expectations towards Capacity Assessment**

As part of a capacity assessment, the following key methodology elements are usually covered in the analysis:

- Previous studies and their relevance
- Actual size, dimensions and operating system of the terminal
- Indication on possible constraints at
  - Quay
  - Yard
  - Gate
  - Rail
- Terminal specific data related to capacities in the various areas (dwell times, productivities, operating hours, etc.
- Potential improvement impact of the established system
- Potential improvement impact of new systems
  - Processes
  - (IT) Technology
  - Equipment
  - Integration
- “Art of the possible” consideration
- Specific ship size requirements
- Ship size analysis considering the global fleet, order book and cascading effects, if any
- Competition analysis of other ports
- Consideration of potentials and limitations of other ports on the same trading lanes impacting vessel deployment impacting the port considered
- Hinterland connectivity analysis (road and rail), distribution centre connectivity, etc.

- “Smell check” on projected capacity (moves p.a. for equipment, TEU/m quay)
- Indication on capacity constraints
- Options for the avoidance of constrained capacity
- Cost of options

### **3.2 Review of Chapter “8.1 Current Capacity”**

#### **3.2.1 Content and Approach**

- Current throughputs for containers and multi-cargo, including vehicles is shown.
- For multi-cargo the factors that are affecting the port’s multi cargo facility are listed.
- The maximum size of cruise vessels is examined.
- Reasons and plans for the relocation of liquid bulk are discussed.

#### **3.2.2 Questions and Open Topics**

- How do technology megatrends (as referenced to chapter 7.7.1.4) have an influence on the capacity of the port?
- Liquid bulk is presented as a stand-alone commodity without a forecast being available separately – please provide.

### **3.3 Review of Chapter “8.2 Future Container Capacity”**

#### **3.3.1 Content and Approach**

- It is shown how fast a volume of 2, 3 and 4 million TEU is reached in the port of Auckland under application of different growth rates.
- The limitation of available land for the yard is described.
- The two technologies Automated Straddle Fleet and Automated Stacking Cranes are described and capacities are calculated based on an industry benchmark and one, respectively two other studies applying the key figure productivity per ha and annum.
- The container berth productivities today and the required container berth productivities are shown.

### 3.3.2 Questions and Open Topics

- Which forecast described in chapter 7 is used for the calculations?
- Have dwell times been considered in the calculations of yard capacities?
- Why is a “productivity” of 20,000 -25,000 TEU/ha/annum described as the current “productivity” of the Ports of Auckland while on page 99 the current productivity is 28,000 TEU/ha/annum?
- Has the benchmark value been tested and corrected to adjust for TS being counted twice on the waterside, specifics of the terminals (railheads, on/off dock workshops etc)?
- The dwell time of two days is short for international standards; facing dwell times half as high as the average increases capacity (“productivity” in the EY wording) in the yard by 100%. Is this factored in?
- What is the evidence that “leading market technologies become more affordable and available for secondary ports” (see page 104) in future? Ship to shore crane prices have equally not experienced mass production price reduction impacts.
- Why is it assumed that peak factors and dwell times will grow with increasing throughput (see page 104)? Typically, peaks are the lower, the higher the frequency of arrivals. Why should generally dwell times increase with larger volumes? How is this considered in the calculations?
- What is the industry benchmark derived from (see page 105) on which the calculations are based (AutoStrad and ASC)?
- Berth Capacity: Has capacity been assessed only on the basis of m/TEU benchmarks, or is it based on the projected vessel pattern which will have a significant effect?
- How are berth capacity calculations reflecting the limitations from short berths and their respective inaccessibility for some ship sizes?
- How and why is the capacity increased by the implementation of automated straddle carriers instead of manual ones (see page 105)?
- Why are the capacity boundaries compared with benchmarks of what other, similar terminals achieve today which may not represent full utilisation?
- Long term berth capacities are indeed ambitious. Has a calculation check been made assessing the number of cranes deployed, their productivity and utilisation double-check these numbers? Similarly, are effects of the non-continuous berthline assessed?

- Reference related to berth capacity is made to various POAL information. Which other analysis is the assessment based on to highlight potential risks arising from the assumptions in the report?
- What are the gate and rail capacities and how can they develop?
- Are impacts from inland port activities included (on dwell time and capacity)?

### **3.4 Review of Chapter “8.3 Future General Cargo Capacity”**

#### **3.4.1 Content and Approach**

- Description of the influence factors and assumptions on the calculation of capacities and the clarification that only capacities for handling of automobiles are calculated.
- The static capacity is calculated on the basis of car parking slots and dwell times.
- Possibilities for the increase of capacity are outlined.
- Benchmarking with Southampton is done and a conclusion for the future handling of automobiles in the port.

#### **3.4.2 Questions and Open Topics**

- Which forecast has been used as a basis for the calculations and why?
- What is the definition of general cargo and multi-cargo?
- The POAL proposal includes the reclamation of 3ha to 6ha and the removal of 4ha (see page 106). What is the resulting win or loss of area described in the proposal – it may be between  $\pm 1$  and  $\pm 2$ ha?
- Why is an increase of dwell times from 2 to 7 days for cars expected? Could processing capacities be increased with volumes?
- It is unclear why different dwell times are used in the chapter:
  - On pages 107 and 111 a dwell time of two days is mentioned
  - On page 108 a weekly turnover is mentioned
  - On page 110 a dwell time of seven days is mentioned

Which dwell time is used for calculations and why?

- Have reductions of the capacity of car parks because of ramps been considered?

- A 5 story car park of 1ha area would increase the yard area by only 4 ha instead of 5 as mentioned on page 110.
- Why is the dwell time affected by a car park (see Page 110)?
- Why does the peak factor worsen with the increase of vessel frequency (see page 111), we expect the contrary unless massive increase in units per call are to be expected?
- What vessel sizes and call volumes are assumed for the calculations?
- Why does longer time at berths result in “more unpredictable effects on yard utilization” (see page 112)? What kind of effects are these?
- What is the capacity of the gate?
- How is the berth capacity (CEU) calculated, what are the results re berth occupancy?
- What are the financial implications of the proposed berths options and for how long would they suffice the requirements?

### **3.5 Review of Chapter “8.4 Future Cruise Capacity”**

#### **3.5.1 Content and Approach**

- Requirements of berths for cruise vessels in terms of size are determined
- Options for the increase of capacity are outlined.
- The neighbouring ports of Tauranga and Northport are described and possibilities to relocate cargoes from Auckland to the ports are shown.

#### **3.5.2 Capacities Questions and Open Topics**

- What is meant with the “proposal to orientate the proposed new ferry terminal along the length of Queens Wharf” (see page 115)?
- What is the exclusive reference to cruise for the section 8.4.3? Would that not rather be of interest for the container segment as part of complementary and competitive considerations?
- Why are RTG system benchmark values similar to AutoStrads?
- Why is the industry benchmark’s productivity used for the calculation of port capacities of Tauranga and not POAL Study’s or Upper North Islands Port Study’s productivity.

- Clarification is requested on the conclusion that it be a “struggle to accommodate any PCTC vessels” (see 117) at Northport?
- How is the need for cruise berths (in quantity) derived? Are seasonal factors taken into account, what is the resulting berth occupancy?

### **3.6 Review of Chapter “8.5 Capacity Conclusions”**

#### **3.6.1 Content and Approach**

- Short-term, medium-term and long-term options for the increase of capacity in the port are outlined.

#### **3.6.2 Questions and Open Topics**

- Which timeframe and which forecasts are meant by short-term, medium-term and long-term?
- Has a summary been provided for all types of cargoes/handling indicating their specific berth, yard space, etc requirements to highlight synergy potentials (Using car carrier berth for cruise when such berth is available etc.)?
- Has a consideration of the broader traffic impact on Auckland city centre been made to assess suitability of existing infrastructure to cater for the traffic generation?

### **3.7 Summary of Findings on Chapter 8**

- The general methodology of presenting existing capacities and future required resources for future required capacities is the correct approach.
- The section provides however for all business lines other than cars no evidence of current capacity utilisation and future prospects.
- It is not clear whether the port is already operating at maximum capacity or if there is some capacity left for the upcoming years. Hence it is not outlined how long the capacity would be sufficient under a defined volume scenario.
- A summary overview of requirements for each commodity is missing.
- Hinterland connections have not been considered and capacities of gates and railheads are not examined. Also traffic impacts on the city of Auckland have not been analysed which is crucial to understand the actual bottleneck of the port.



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## 4. REVIEW OF CHAPTERS 11, 12 AND 13

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### 4.1 Review of Chapter 11

#### 4.1.1 Content and Approach

- Various assumptions and potentially impacting aspects related to volume development are mentioned
- Supporting development of consumption etc. for market study are presented
- Testing future freight forecast is highlighted as section.
- Future megatrends are outlined

#### 4.1.2 Questions and Open Topics

- How are these information translated in the projections and assessments of the study?
- Please explain why there is an “international trends towards 1 TEU per person over time”. The ratio for NZ is extraordinarily high already. Other developed countries e.g. in Europe experienced lower rates (2012 data), such as
  - Denmark: 0.140
  - Ireland: 0.174
  - Germany: 0.2
  - Holland: 0.722\*
  - Belgium: 0.964\*

\*Note that the above values for Belgium and Holland result from their ports (Antwerp and Rotterdam) serving a significant proportion of the European Mainland's market, a circumstance not comparable with NZ.

- Please explain why there is more import, when consumers can bypass the domestic retailer in a largely globalised world as far as consumer goods are concerned.

## **4.2 Review of Chapter 12**

### **4.2.1 Content and Approach**

- Various container handling equipment is presented and key features listed

### **4.2.2 Questions and Open Topics**

- Please clarify source of e.g. productivities as they appear largely overrated.
- Several details in the section on the equipment is slightly incorrect, but considered not to have an effect on the study outcome regarding port development options.

## **4.3 Review of Chapter 13**

### **4.3.1 Content and Approach**

- Container terminal technology evolvement is discussed

### **4.3.2 Questions and Open Topics**

- The section makes reference to smooth operation being provided by automation and peaks being the driver of automation, which appears contradictory.
- Note that TOS are standard on all terminals and are not specific to automated facilities.
- STS automation is not as far evolved as referenced on page 39.
- Assessment of gate and rail technology would be advantageous.

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## 5. CONCLUSION

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At this stage of the review, firm estimates of the port's possible need for relocation cannot be made.

Given the uncertainty around the data used for the analysis the volume basis is to be confirmed. Further, critical input for an estimate of capacity adequacy as suggested by Ports of Auckland are required as used by EY since the chosen benchmark based approach may only serve as a “smell check” rather than analysis especially given the very short dwell times currently achieved. In terms of potential yard capacity this may assist in actually facilitating the targeted 3 million TEU, achieving the same capacity on the quay is depending on the actual ship size, vessel calls and operational factors, whereby the latter can be influenced by POAL.

Analysis showing the possibility to share capacities between different commodities would be advantageous to understand the extent to which the existing capacity use is maximised to date.

No visibility is currently available on the landside capacities as they are on the terminals (gates/rail) as well as the infrastructure network's capacity to accommodate the projected growth in handling volumes along with population growth.