Report prepared for the Environmental Protection Authority

Review of economic analysis submitted in support of Coastal Resources Limited marine dumping consent application

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1 November 2018

sapere research group

About the Author

Kieran Murray provides expert evidence, testimony and reports in the fields of regulation, competition analysis and public-policy, including market design. He has served as an economic consultant on these matters for public agencies and private companies in over 15 countries in the Asia Pacific Region. Kieran co-founded and jointly leads Sapere. He is an expert lay member of the New Zealand High Court and serves as an International Arbitrator for the PNG Independent Consumer and Competition Commission.

About Sapere

Sapere Research Group is one of the largest expert services firms in Australasia and a leader in provision of independent economic, forensic accounting and public policy services. Sapere provides independent expert testimony, strategic advisory services, data analytics and other advice to Australasia's private sector corporate clients, major law firms, government agencies, and regulatory bodies.

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Introduction

1. Coastal Resources Limited (CRL) has applied to the Environmental Protection Authority (EPA) for a consent to increase the quantity of dredged material it dumps at an existing site 25km east of Great Barrier Island. In support of its application, CRL provided an economic assessment of its dumping proposal prepared by Property Economics Limited, dated April 2018.

2. In this report, I review the information provided by the applicant and its experts through the lens of economic analysis. In doing so I assess:

   - the adequacy of the analysis of alternative methods of disposal of the dredged material
   - whether the best available information and best practice has been used for assessing the relevant and respective costs and benefits of alternative methods of disposal.

3. I recommend that the EPA should seek further economic analysis that:

   - assesses the questions asked in the survey which informed the CRL prediction of future demand for disposing of dredged material, and evaluates the results obtained and the quantum of the contingency added by CRL
   - tests how sensitive the predicted quantities are to the assumptions supporting those predictions, including assumptions as to the price that would be charged for the Northern Disposal Area relative to other options.
   - considers the geographical source of the material, and the composition of the dredged material from that source, and the hence the alternatives for that dredged material.

Qualifications and experience

4. My full name is Kieran O'Neill Murray.

5. I am a professional economist working primarily in the fields of economic analysis of regulation, cost benefit and competition analysis, and market design. I have served as an economic consultant on these matters in more than 15 countries.

6. My expertise as an economist has been recognised in my appointment, by the Governor General, as an expert lay member of the New Zealand High Court under the Commerce Act 1986, and my appointment by the Governor General of Papua New Guinea as an International Arbitrator for appeals from the PNG Independent Consumer and Competition Commission.

7. I am a Managing Director of Sapere Research Group, a firm I co-founded. Sapere is one of the largest expert services firms in Australasia, employing 60 specialist advisers, and a leader in providing independent economic, forensic accounting and public policy services.

8. Serving as an expert economist, I have testified on more than 30 occasions. I have testified before Select Committees of New Zealand's House of Representatives, the High Court, the Environment Court, the Environment Protection Agency, the Human Rights Tribunal, the Waitangi Tribunal, the Human Rights Tribunal, the New Zealand Commerce Commission, and the Energy Regulatory Commission of the Philippines. I have provided expert evidence and reports to the Australian Federal Court, the Australian Consumer and Competition Commission, the Australian Energy Market Commission, the Australian Energy Regulator, the (former) National Electricity Code Administrator in Australia, the Energy Market Authority in Singapore, and presented to the Federal Energy Commission of the United States.

9. Earlier in my career I served in public policy roles, including as an economic advisor to the Rt Hon Mike Moore (subsequently Director-General of the World Trade Organisation) during his term as Leader of the Opposition; a member of the Rt Hon James Bolger Prime Ministerial Task Force on Targeting Social Assistance; an economic advisor to the New Zealand Minister of Finance, the Hon David Caygill, and as an economist at the New Zealand Treasury Department.

Code of conduct

10. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2014, and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is entirely within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

The application and the role of economic analysis

Existing and proposed consents

11. I understand CRL holds an existing consent that authorises it to dispose dredged sediment, by bottom dump barge, at a defined site 25km east of Great Barrier Island.[1] This site is referred to as the Northern Disposal Area. As the consent holder, CRL administers the consent to ensure compliance and undertakes monitoring and reporting to the EPA.[2] CRL does not dredge or transport material to the site, though it does own a barge which it leases to entities undertaking those activities.

12. The consent now permits a maximum volume of 50,000m^3 per annum for the next 17 years (the existing consent expires on 31 December 2032). Prior to November 2015, the consent permitted disposal varying between 7,800m^3 and 127,000m^3 per annum for the first 3 years of the consent.[3] The variation in the consent volume prior to November 2015 was to provide for specific new developments, and in particular the Sandspit Marina.[4]

13. CRL has applied to the EPA for a 35-year consent to dump each year up to 250,000m^3 of dredged material from source sites within the Auckland and Waikato regions. Hence, if granted, the consent would permit an additional 200,000m^3 of dredged material to be dumped in each of the next 17 years relative to the current permit, and 250,000m^3 to be dumped each year for a further 18 years beyond the expiry of the current consent.

The statutory requirement

14. When considering an application for a consent to dump material in the marine environment, the EPA must take into account a range of factors.[5] These factors include:

    - alternative methods of disposal of the waste or other matter[6]

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1 Beca, (2018), *Northern Disposal Area - Physical Oceanography Assessment, Dredged Material Disposal Options and International Deep Water Disposal Sites,* 22 April 2018, page 7, appendix 4 to the application.

2 Mr Simon Male, 25 October 2018, paragraph 3, applicant's evidence.

3 Beca, ibid, page 7.

4 Osbornehay, (2018), *Marine consent to dump application and supporting impact assessment*, May 2018, page 1, Impact Assessment, applicants evidence.

5 Clause 59, Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012.

6 Clause 59(2)(B)(c)), ibid.

- whether there are practical opportunities to reuse, recycle, or treat the waste or other matter.[7]

15. The EPA must refuse an application for a marine dumping consent if it considers (amongst other things) that:

    - the waste or other matter may be reused, recycled, or treated without imposing costs on the applicant that are unreasonable in the circumstances;[8] or
    - dumping the waste or other matter is not the best approach to its disposal in the circumstances.[9]

16. Economic analysis can assist the EPA in balancing the various matters it must consider by providing insights into what other methods of disposal are economically practical and would not impose unreasonable costs on the applicant. In the following section I review the information provided by the applicant and its experts through the lens of economic analysis. In doing so I assess:

    - the adequacy of the analysis of alternative methods of disposal of the dredged material
    - whether the best available information and best practice has been used for assessing the relevant and respective costs and benefits of alternative methods of disposal.

7 Clause 59(2)(B)(d)), ibid.

8 Clause 62 1A (a) (ii), ibid.

9 Clause 62 1A (c), ibid.

Analysing the application through an economics lens

Existing demand for dumping dredged material

17. In economic terms, the demand for dumping dredged material is a 'derived demand'; it is a consequence of the demand for use of the marine environment for activities which benefit from dredging. As a derived demand, the amount of dredged material seeking to be dumped under the marine consent will be a function of the benefits obtained from dredging, and the cost of dumping that material at sea relative to any other disposal or reuse option.

18. We can glean some information, about recent demand and supply conditions for dumping dredged material at sea, from the information provided by applicant and its experts. As shown in Table 1 below, the primary sources of recent demand have been:

- development of the new Sandspit marina, which opened in 2016;[10] this development produced over half the material dumped to date under the existing consent
- maintenance of existing marinas, accounting for around one-third of the dredged material (and a little over half of this volume came from one marina, Pine Harbour)
- property development made up the rest, with about 15% of the material cited as coming from Hobsonville Point, where the mud flats were dredged so that residents at the new development could look out on a 'wet edge'.[11]

Table 1 Source of current disposal volumes

Source	Aggregate volume 2013 – 2018 m³	% of total
New marina development - Sandspit	106,895	53%
Marina maintenance (over 50% from one marina, Pine Harbour)	63,165	32%

[10] http://www.sandspitmarina.co.nz/

[11] https://hobsonvillepoint.co.nz/assets/Uploads/Hobsonville-Point-Newsletter-May-2016.pdf

Source	Aggregate volume 2013 – 2018 m^3	% of total
Property development – Hobsonville Point	29,740	15%
Total	199,800	100%

Source: Property Economics, table 3, page 20

19. The annual demand for dredged material has varied significantly, as would be expected given such a large proportion of demand is derived from new developments, which are inherently 'lumpy' in nature. In the roughly two year period since the existing consent allowed 50,000m^3, from November 2015 to April 2018 (the latest information reported by Property Economics), a little under 40,000m^3 was dumped on average per year.

20. We know from economic theory that demand for dumping dredged material will be downward sloping; that is, as the cost of dumping increases the demand for dumping reduces because at some point the cost exceeds the benefit or less costly alternatives become feasible. Hence, the volumes dumped in recent years may not be indicative of future demand, if further economic benefits from dredging become available or existing alternatives become uneconomic or infeasible, or vice versa – I consider the projections of future demand below.

21. We can also deduce some information about the economic costs of dumping dredged material under the existing consent:

- significant fixed costs are incurred by CRL in obtaining the consent, administering the consent and meeting its conditions; Property Economics estimates that CRL's operation requires revenue of \$3.75/m^3[12]
- entities providing transport services invest in specialised equipment (barges and tug boats), and incur operational costs with the return journey taking 15 to 24 hours, and must cover the cost of days lost because of weather conditions – Mr Male estimates that trips are delayed on about 50 days a year because of weather.[13]

22. These costs characteristics would suggest the cost curve is relatively flat, though upward sloping as additional costs are incurred with additional volumes. In the stylised form adopted by economists, this supply curve becomes vertical at 50,000m^3, as that is the annual limit under the existing consent. Mr Male advises that the

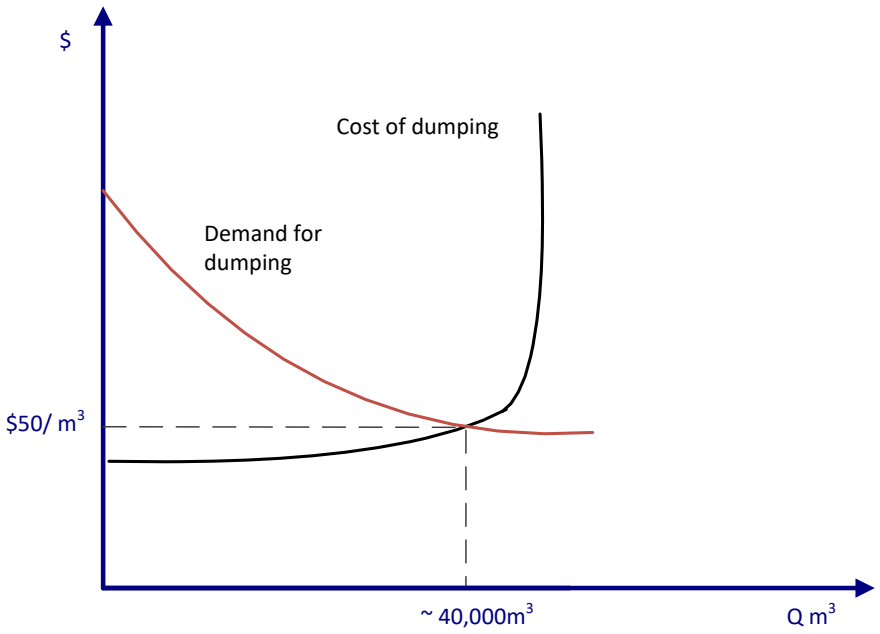
[12] Property Economics identifies \$806,000 in costs of obtaining and administering the consents to date, Property Economics Report – April 2018, page 25, appendix 6 to the application.

[13] Mr Male, paragraph 35, op cit.

current cost to transport and dispose of dredged material, once loaded into a barge, is approximately $50/m3.[14]

23. Figure 1 presents this information about recent historical demand and supply for dumping dredged material at the currently consented site in the form of stylised supply and demand curves. The chart shows quantity on the horizontal axis, with volumes increasing to the right. Cost is shown on the vertical axis, with cost increasing vertically.

Figure 1 Recent demand for dumping dredged material



Expected demand for dumping dredged material

24. The applicants anticipate a substantial increase in demand for dumping dredged material. CRL provide a prediction of a 5 fold increase in demand, which would be sustained over a 10 year period.[15]

25. Figure 2 below adjusts the stylised supply and demand curves for the expansion in demand expected by CRL – this expansion in demand is represented by an outward shift of the demand curve. If the consent were granted, there would also be an outward shift of the supply curve reflecting the greater capacity for dredged material to be dumped at the Northern Disposal Area.

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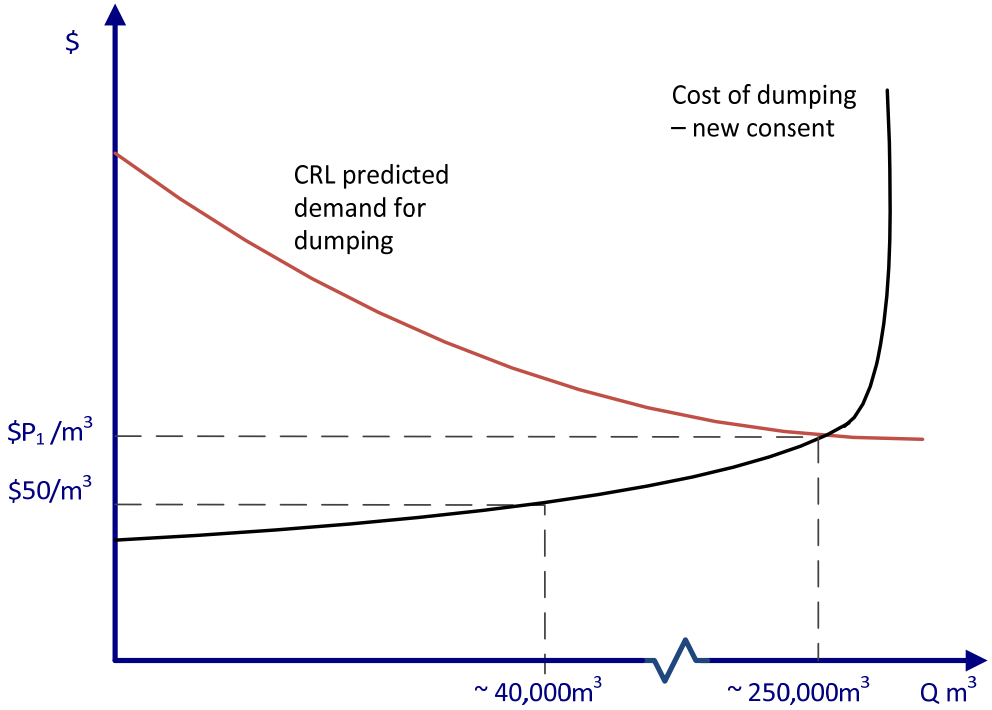
14 Mr Male, paragraph 35, op cit.

15 See Mr Male, figure 6, paragraph 55.

Figure 2 Expected expansion in demand and supply if consent granted



26. As drawn, Figure 2 indicates that the economic price charged for transporting and dumping the expected increase in dredged material would rise from the current price of around $50/m^3 to some higher amount, P_1. This increase in price would reflect the additional economic costs incurred in meeting the expanded demand, including the cost of obtaining the new consent, and additions to equipment. Aggregate operating costs would increase as the number of barge trips increases, however Property Economics anticipates that variable costs would fall due to increased economies of scale.[16]

27. It is possible that an increase in economies of scale could lead to the price charged for transporting and dumping dredged material falling, but Property Economics does not make this claim. Property Economic does, however, suggest that the demand for dumping may be more than that expected by CRL, given "the potential for additional demand from the wider Waikato region".[17] Where an economic resource is scarce – the applicant's evidence is that there are few if any practical alternative options for disposal of significant volumes of dredged marine sediment[18] – and demand for that resource is rising, standard economic theory would predict the price of access to the scarce resource would increase.

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16 Property Economics, page 25, op cit.

17 Property Economics, page 21, op cit.

18 Mr Male, paragraph 60, op cit.

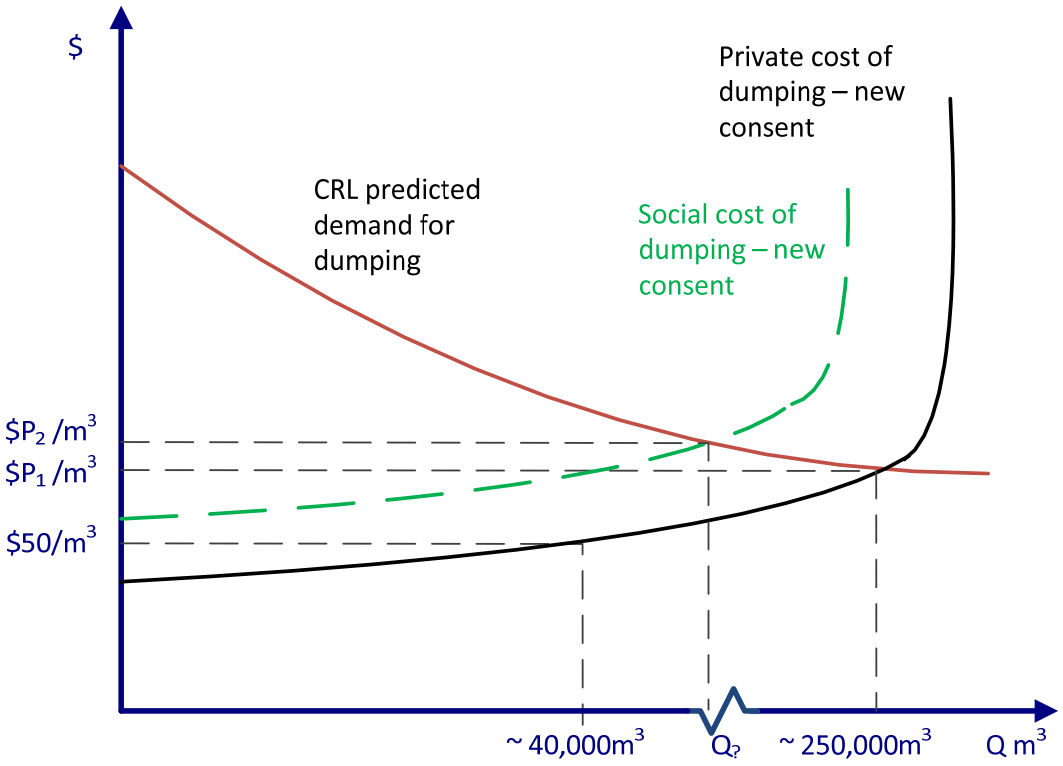
28. In the absence of additional information, it would be reasonable for the EPA to assume that the future price for transporting and dumping dredged material at the Northern Disposal Area (indicated by P_1 on Figure 2) will be higher than the current price of around \$50/m³. As a consequence, the economic assessment needs to consider alternative options that would be practical at that higher future price, not the current price. That assessment appears not to have been undertaken by Property Economics.

Total costs are higher

29. In arriving at its decision on whether to grant the consent, the EPA will consider a broader range of matters than just the private economic costs to the entities undertaking dredging. Economists illustrate these wider social costs, or externalities, by shifting the supply curve up and to the left. In this way, the curve reflects both the private costs incurred by the entity using the resource and the environmental and other costs of that activity.

30. Figure 3 redraws the expected supply and demand curves represented in Figure 2 for the externalities of dumping in the marine environment.

Figure 3 Allowing for environmental costs in dumping dredged material



31. The implications for an economic assessment of the application is that the alternatives that are relevant are those that would have a total cost (economic and social) of P_2, a cost that will certainly be higher than the current charge of \$50/m³. A further implication is that a quantity of dumping which balances the interests of

the entities wishing to undertake dredging, with environmental or other objectives, would be lower than the maximum private demand for dumping dredged material (at a price that covers the costs of transport and administering the consent). This quantity is represented as Q_2 in Figure 3.

32. The Property Economics report does not appear to consider these implications nor provide information that would inform the EPA in its judgement as to the values of P_2 and Q_2.

Stimulus for increase in demand not well explained

33. CRL explain that their expectation of a 5 fold increase in demand was informed from a survey completed a year ago. CRL added a contingency to the information obtained from its survey to arrive at its estimated annual volume of 250,000m^3.[19] The questions asked in the survey, the results obtained, the quantum of the contingency added by CRL, and the assumptions supporting that contingency are not discussed in the Property Economics report.

34. Some information in relation to the expected demand can be extracted from comparing the current disposal volumes (table 3, Property Economics, page 20) with the CRL estimate of expected demand (table 4, Property Economics, page 21). Based on this comparison, CRL expect:

- The Ports of Auckland to dump 30,000 m^3 of material annually from its maintenance dredging once it completes the reclamation at Fergusson Terminal; CRL notes that the Ports of Auckland have indicated it may seek a consent to dispose of dredged material at the Auckland Explosive Dumping Group but no application has yet been made.[20]
- Each of the existing marinas would increase its maintenance dredging significantly – for example, in the last 5 years, the Hobsonville Marina has disposed a total of just over 17,000m^3, or a bit under 3,500m^3 per annum on average. CRL expect that quantum to jump to 25,000m^3 per annum – that is, increase by a multiple of 7. Pine Harbour has dumped on average about 7,500m^3 but CRL expects that quantity to increase by 20% to average 9,000m^3; Half Moon Bay has disposed of an average 1,200m^3 in the past 5 years but CRL expects that quantity to increase by 66% to average 2,000m^3 per annum.
- Two existing marinas – Pine Harbour and Half Moon Bay - would undertake new 'capital' dredging (that is non-maintenance dredging), with an aggregate 140,000m^3 of dredged material to dump.
- Development of facilities associated with hosting the America's Cup yacht race would add 70,000m^3 of dredged material.

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19 Mr Male, paragraph 54, op cit.

20 Mr Male, paragraph 54, op cit.

- In addition, CRL provide for other unspecified maintenance of 50,000m^3 per annum over the 10 year period, and unspecified new capital dredging of 100,000m^3 per annum over the 10 year period.

35. Property Economics provides no assessment of whether these projections are reasonable, nor any explanation of why such large increases in dredging are expected from existing activities, nor insights into what would cause the demand for new dredging. Nor does Property Economics provide any sensitivity analysis in relation to the assumption used to derive these predictions – there is no assessment by Property Economics, for example, of how the predictions would change if CRL were to increase its prices, diesel costs were to rise, or economic growth were to slow.

Quantities assessed as aggregate but source is disaggregated

36. In its assessment, Property Economics considers the total expected annual quantum – that is, 250,000m^3 – as an aggregate quantity, and evaluates alternatives for this entire quantum. There are several difficulties with this approach.

37. Firstly, the approach does not account for the 50,000m^3 currently consented for the Northern Disposal Area.

38. Secondly, as the quantities are to be sourced from a number of disaggregated sites, consideration should be given as to whether there is potential for alternatives to cater for the smaller volumes from those sites. For example, the quantities dredged in constructing the new Sandspit marina were initially proposed to be taken to adjacent land. The developers did not gain resource consent for this disposal method.[21] However, in applying for the consent the project sponsors presumably considered that taking the material for landfill was economic in terms of financial costs. It is possible that other sites are also economic for comparatively small volumes, a factor not considered by Property Economics.

39. Third, the approach taken by Property Economics assumes that all dredged material is equivalent. However, this is not the case. Technical assessment prepared by the applicant shows sediment from Pine Harbour Marina, Half Moon Bay Marina, Sandspit Marina and Whitianga Marina were generally dominated by muds with varying degrees of sand and gravel sized particles. The sediments in the access channel at Pine Harbour Marina and the area at Hobsonville Point were sandy with smaller proportions of gravel and mud. Sediments in Hobsonville Marina were mostly silt sized with some sand. Some of the deeper sediments from Sandspit Marina were cohesive clay that would remain as the lumps it was dug up, whereas the other sediments were significantly less cohesive and would have mixed together as a thick liquid during and after dredging.[22] The potential costs and options for reuse of

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21 http://www.stuff.co.nz/auckland/local-news/rodney-times/4006129/Sandspit-marina-project-moored

22 Bioresearches (2018) Northern Disposal Area – Assessment of Source Material, Ecological and Sediment Quality Effects Assessment of Disposal, appendix 5 of the application.

dredge material depends on the type of sediment. Cohesive clay, for instance, would not require the same level of treatment or dewatering time as less cohesive silts and mud.

40. A more informative assessment would have considered whether there are alternative uses for at least some of dredged material.

Unable to replicate cost comparisons

41. In assessing landfill alternatives, Property Economics provide an estimate of $12 to $15 million in trucking costs. I have not been able to replicate this calculation from the source material referenced in the Property Economics report. The method of calculation is also not well explained. For example, the report says that a consent for 250,000m^3 per annum would require "15,000 to 19,500 truck trips (or 3,000 to 3,900 per annum)". There is no explanation for why a 5 year period was used to calculate the cost of disposing the annually consented volume.

42. Mr Male draws on his considerable industry experience and estimates that, if material dredged from Pine Harbour were taken to land landfill, the cost would be approximately $250/m^3. This estimate falls within a plausible range and seems reasonable. For example, public charges for disposal at Rosedale landfill are advertised at $164.50 per tonne for clean fill,[23] with a cubic metre of dredged material weighing anywhere from just over a tonne (mostly water) to nearly 2 tonne (wet sand). The distance from a Port of Auckland loading site to Rosedale is 20km with average transport costs in New Zealand (2011) about $4 per km.[24]

43. However, it seems unlikely that the Rosedale landfill would be the preferred alternative for all of the sources of dredge material. The material expected to come from the Waikato region, for instance, would seem unlikely to be trucked to the North Shore. The costs of a landfill alternative may vary considerably, depending upon the location. For example, the Mahurangi River Trust reported a low end cost of $40/m^3 for extraction, transport, dewatering and placement.[25] As discussed above, an analysis which considered the likely alternatives for each significant source of dredged material would be more informative.

44. I agree with Property Economics that any community costs associated with other alternatives, such as increased truck movements, are relevant to comparing the total cost of each option.[26] This is a further reason why a disaggregated analysis is required, as these wider costs will vary depending upon the alternative assessed.

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23 https://www.wastemanagement.co.nz/for-home/transfer-stations/north-island/auckland/north-shore-transfer-station

24 https://www.transport.govt.nz/assets/Uploads/Research/Documents/UTCC-Freight-Charge-Comparison-Report.pdf

25 Stimpson and Co. (2017) Report on options and process for reaching a decision on dredging at Porirua Harbour

26 Property Economics, page 22, op cit.

45. In the final section of this report, I recommend that the EPA seek additional information and analysis to better understand the costs and benefits of each disposal method, and the practical opportunities to reuse or treat the waste.

Recommendations for additional analysis and information

46. The Property Economics analysis essentially proceeds by accepting the CRL prediction of 250,000 cm^3 as certain, and then considering whether another option exists to take that aggregate volume of dredged materials.

47. In my view, the economic analysis should begin by assessing the questions asked in the survey which informed the CRL prediction, and evaluating the results obtained and the quantum of the contingency added by CRL. It should test how sensitive the predicted quantities are to the assumptions supporting those predictions, including assumptions as to the price that would be charged for the Northern Disposal Area relative to other options.

48. The economic analysis of the alternatives should consider the geographical source of the material, and the composition of the dredged material from that source, and the hence the alternatives for each significant source of dredged material.