

**BEFORE THE WAIKATO REGIONAL COUNCIL**

**IN THE MATTER** of the Resource Management  
Act 1991

**AND**

**IN THE MATTER** of Submissions and Further  
Submissions lodged by  
Winstone Aggregates (a  
division of Fletcher Concrete  
and Infrastructure Ltd) and  
Fulton Hogan Limited on the  
Proposed Waikato Regional  
Plan Change 1.

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**STATEMENT OF PRIMARY EVIDENCE OF PETER CLOUGH  
FOR  
WINSTONE AGGREGATES AND FULTON HOGAN LIMITED**

**Submitter ID 73992  
Submitter ID 74048**

**3 MAY 2019**

**BLOCK 2  
Parts C1-C6: Policies, Rules and Schedules (most)**

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## 1. INTRODUCTION

### Qualifications

- 1.1 My name is Peter William John Clough. My qualifications include a Bachelor of Arts in Geography and Land Economy from Cambridge University, a Master of Science in Recreational Land Management from the University of Reading, and a Post Graduate Diploma in Agricultural Economics from Massey University in Palmerston North. I have served on the Executive Committees of the New Zealand Agricultural and Resource Economics Society and the New Zealand Branch of the Australian Agricultural Economics Society.

### Experience

- 1.2 I am employed by the New Zealand Institute of Economic Research Inc. (NZIER) as a Senior Economist. I have over 30 years' experience of economic research and consulting, mostly from working at NZIER but also from secondments to English Nature, the UK's statutory advisor on environmental policy, the Ministry of Economic Development (working on climate change policy and sustainable energy), and at the Ministry of Transport. I have specialised in applying economics to hard-to-quantify areas of environment and public health and safety, and in comparative analysis of economic instruments and other policy measures in fields such as biosecurity, energy and transport, land use, biodiversity conservation, and water use.
- 1.3 I have prepared technical reports and presented expert testimony in various resource management settings, such as:
- (a) the efficient use of water by different users of an aquifer in the Opiki Basin,<sup>1</sup>
  - (b) the economic value of using natural resources for electricity generation for weighing against effects on the environment, for instance in the re-consenting of the Lake Kaniere, McKay's and Patea hydro-electric power schemes, the

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<sup>1</sup> Opiki Water Action Group Inc v Manawatu Wanganui Regional Council [2004]

amendment of the Rakaia Water Conservation Order and associated re-consenting of the Lake Coleridge Hydro-electric Scheme, and application for consents on several new wind generation farms,

- (c) the economic value and affordability of options for re-consenting wastewater treatment plant at Feilding, Shannon, and Foxton in the Manawatu catchment,
- (d) the economic consequences of environmental policy proposals, such as the economic trade-offs between visual overlays and extraction at Belmont Quarry, appropriate offsets for new activities creating greenhouse gas emissions,<sup>2</sup> restricting land clearance for biodiversity conservation and the use of biodiversity offsets.<sup>3</sup>

## **Background**

- 1.4 I understand the proposed Waikato Regional Plan Change 1 (PC1) covers a range of land use measures with the intent of reducing contaminants entering the Waikato and Waipa river catchments. As stated in Mr Dan McGregor's evidence, Winstone is generally supportive of the direction and pace of change in PC1. I have been asked to outline the economic contribution of quarrying in the region, and the consequences of planning being applied in a manner restrictive of quarrying operations.
- 1.5 My evidence will focus on the broader context of the economic consequences of aggregate production for the Waikato regional economy.

## **2. CODE OF CONDUCT**

- 2.1 Although not necessary in respect of council hearings, I can confirm I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2014. I have complied with the

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<sup>2</sup> See Environmental Defence Society (Incorporated) & Taranaki Energy Watch Incorporated v Taranaki Regional Council & Stratford Power Ltd. [2002];

<sup>3</sup> Minister of Conservation v Hutt City Council [2003]; Department of Conservation v Wairoa District Council [2007]

Code of Conduct in preparing this evidence and I agree to comply with it while giving oral evidence before the hearing committee. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

### **3. EXECUTIVE SUMMARY**

- 3.1 This evidence examines the characteristics of aggregate production in the Waikato region against the key economic considerations in the Resource Management Act, in section 5's references to economic well-being, and section 7(b)'s references to efficient use of resources.
- 3.2 Quarrying of aggregates and rock in Waikato has a significance far beyond its relatively modest economic impacts. In 2017 Quarrying contributed around 0.2% of Waikato's gross domestic product and 0.3% of the region's total employment, but it also supplied materials that are fundamental to the provision and maintenance of infrastructure on which the economy depends. In 2017 Waikato accounted for around 20% of New Zealand's production tonnage of rock and aggregate, compared to around 8% of the nation's gross domestic product. Waikato is one of the largest producers in New Zealand, supplying infrastructure projects both in Waikato and other regions.
- 3.3 If access to aggregate resources in the region is unnecessarily restricted by provisions in the region's planning documents, there will be greater negative effects than necessary including a likelihood of increased costs for all activities that rely directly or indirectly on aggregates, with increased costs of supplying aggregate products and increased cost in bringing forward the date at which new quarries are needed.
- 3.4 Aggregate quarrying is a regionally significant industry because of its underpinning role in development and maintenance of infrastructure, and without continuing access to aggregate sources close to demand, infrastructure costs would rise and its affordability would

decrease, with impacts for all the region's industries that use and rely on that infrastructure. .

#### **4. SCOPE AND STRUCTURE OF EVIDENCE**

4.1 I have structured my evidence as follows:

- (a) The role of economic analysis under the Resource Management Act;
- (b) The role of aggregate products in the Waikato region;
- (c) The effects of planning restrictions on quarrying for community well-being; and
- (d) The efficiency of placing restrictions on access to resources and operating requirements through planning provisions.

#### **5. ROLE OF ECONOMICS UNDER THE RMA**

5.1 I understand the purpose of the Resource Management Act (Act) is to promote the sustainable management of natural and physical resources (section 5(1)). Section 5(2) of the Act defines sustainable management as using resources in a way that enables people and communities to provide for their well-being and their health and safety, while sustaining the potential of those resources to meet reasonably foreseeable future needs and avoiding, remedying or mitigating any adverse effects of activities on the environment. Section 5(2)(a) explicitly excludes minerals from the sustaining potential requirement, in recognition that such a requirement would preclude any use of finite or exhaustible non-renewable resources and limit their contribution towards community well-being. However, sustainable management still applies to the environmental effects of utilising mineral resources which need to be avoided, remedied or mitigated.

5.2 In numerous decisions the Environment Court has recognised the various economic threads woven into the Resource Management Act (RMA). The relevance of economics to decisions under the Act is most obvious in references to enabling economic well-being in

section 5 and to efficiency in section 7(b) and some other parts of the Act, in particular section 32's requirement to assess costs and benefits of changes in plans and regulations. The Resource Management Amendment Act (2013) has reinforced this relevance with its s32(2)(a) requirement for cost benefit assessments to consider how opportunities for economic growth and employment are affected.

- 5.3 Despite the idea persisting in the public at large that "economic" means "commercial" or "financial", economics is not confined to matters covered by financial transactions or the simple enumeration of costs, jobs and effects on incomes. The defining characteristic of economics is its insights into choices made under conditions of scarcity: how limited resources are used in the satisfaction of potentially unlimited human wants.
- 5.4 Economics encapsulates "well-being" in the notion of economic welfare, which is related to people's consumption possibilities, both of marketed goods and services and of other less tangible non-market effects, such as the contributions to quality of life derived from the natural environment. "Efficiency" is about obtaining greatest value from use or non-use of available resources, where value in principle covers both marketed and non-market effects. Economic value is expressed in people's willingness to pay for things, which is easy to see for marketed goods where money is exchanged to purchase them. In practice non-market effects, such as the quality of air, water, landscape or biodiversity, are difficult to quantify or bring into the economic calculus. They often arise out of shared resources which people pay for indirectly, through the taxes and rates paid to government agencies that provide public goods, or through restraint on private activity, either voluntary or imposed by regulation. There is value in improvements in environmental conditions but they are also not costless, often entailing expenditures or opportunity costs – income forgone – by some for the benefit of the wider community.
- 5.5 The Act can be viewed as a process for assessing and controlling effects that are not managed in markets, such as "externalities"

caused when people's actions create effects that fall uninvited and uncompensated on third parties.

- 5.6 It is common in RMA contexts to present an *economic impact analysis* of a proposed application that shows how the expenditures on an activity impact on such economic variables as production, value added and employment. Such impacts include both the direct effect of spending in the locality by the project, and the indirect effect of expenditure that flows out to stimulate other sectors in the local economy. This is useful but does not cover the full economic consequences of proposed projects and plan changes.
- 5.7 An alternative analysis frame is that of *cost benefit analysis* which compares the effects of a proposal against a counter-factual in which it does not proceed, and identifies the costs and benefits of one option against the other. Such cost benefit analysis looks at the present value of effects of the proposal over time, which is appropriate for considering the availability and use of an exhaustible finite resource such as rock. It also in principle allows non-market effects in the analysis if they can be valued consistently with market values, although in practice this is possible for only a few such effects.
- 5.8 The economic impacts of any activity are generally greatest in the construction or establishment phase of a new development. Opening a new quarry would inject more expenditure into the local economy and provide a short term stimulus for suppliers in the establishment phase, but it could increase the long term cost of aggregates compared to those from extended use or further development of existing quarries. So an impact analysis would be a misleading indicator of economic benefit. Similarly, an activity can have economic significance far greater than its economic impact would suggest where it harnesses a natural resource which would otherwise be untapped. Economic value arises not just from the observed transactions in the economy but also from avoiding the need to use more costly alternatives in sustaining economic activities.



## 6. AGGREGATES IN THE WAIKATO REGION

- 6.1 Rock is a fundamental but often overlooked input into the infrastructure on which the economy runs, as well as in numerous building products. Aggregate is used in large quantities for roads and concrete, with lesser quantities used for fill, drainage material and harbour and river protection (riprap). It is obtained either by excavating material and crushing it to desired sizes, or by extracting gravel and sand from riverbed, lacustrine or coastal deposits.
- 6.2 Although rock and aggregates are abundant in the Earth's crust, their cost of extraction and value in use varies widely. The cost of producing aggregates varies with the amount of over-burden that must be removed to access the useable rock material. The value of rock extracted depends on the quality of the material extracted and its versatility in use for a variety of products. There is uncertainty about the extent and quality of rock in a given resource until it is extracted, and assessments of a given resource may change over time.
- 6.3 The high weight of aggregate makes it expensive to transport relative to the cost of extraction, so aggregate markets in the economy tend to be localised. An industry rule of thumb is that the price of aggregates doubles with every 30 kilometres transported.<sup>4</sup> If the price at the quarry gate were \$15 per tonne (roughly the price of aggregate for roading use), transporting material 30 kilometres would double the cost of the product as it would incur another \$15 per tonne, implying a cost of \$0.50/tonne-kilometres travelled. Higher value aggregate products can bear the cost of transport better than lower value ones: - transport costs would eliminate the profit margin on lower value fill materials and unprocessed aggregate products. Closure of quarries and relocation of source materials by even a small number of kilometres can make an appreciable difference to the cost of material for its users.

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<sup>4</sup> Aggregate and Quarry Association refer [https://issuu.com/contrafed/docs/q\\_m\\_1612\\_issuu\\_rev/47](https://issuu.com/contrafed/docs/q_m_1612_issuu_rev/47)

- 6.4 Rock may not be scarce but, readily accessible resources of high quality rock are not common, both because of natural variation in the underlying rocks and because of restrictions on land use and quarrying activities imposed with the intention of reducing effects of extraction on neighbouring communities. So, when considering consenting or planning for extractive activities the broad economic question is about the relative scarcities of what is being sought (extracted minerals) and the potential environmental effects associated with extracting that material. Where the aggregate is locally scarce, and extraction would result in adverse effects on something which is relatively abundant, then it can be economically worthwhile and efficient to endure the adverse environmental effect to obtain the benefit of the extracted aggregate. In economic terms it is efficient to restrict quarrying, by limiting extraction or imposing costly measures on residual discharges to air or water, only to the point where the marginal cost of additional restriction is equal to the marginal benefit obtained from it. Big changes in a short period of time can be disruptive of quarry operations and necessitate costly changes to the pattern of aggregate supply, whereas gradual adjustment with successive smaller changes over time will have less costly effects.
- 6.5 A long term (forty year)<sup>5</sup> study of demand for aggregate concluded that aggregate consumption is closely correlated with population and income growth. The relationship allows for technical factors that have lowered the demand for aggregate such as change in building practices<sup>6</sup> and specification of better performing materials<sup>7</sup> for roading. Roading and construction activities are the principal uses of rock and aggregate in New Zealand. Cyclical fluctuations in these activities, as for instance from upswings and downswings in building

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<sup>5</sup> O'Brien J ' *Planning for Growth? The Determinants of Aggregates Demand in New Zealand*', IPENZ engineering TreNz 2006-003, 2006

<sup>6</sup> Reduction in safety and load factors required for reinforced concrete, greater use of pre-stressed concrete factors and achievement of higher concrete strengths using additives noticeably affected demand for aggregate in the 1970s.

<sup>7</sup> Upgraded specifications for basecourse in roading have reduced the ratio of aggregate used in roading to that for building from about 6:1 in the 1950's to 2:1 in the mid 2000s

activity, or the demands for rock created by specific roading projects, can cause peaks and troughs in quarrying activity.

- 6.6 To illustrate the scale of aggregates' contribution to the built environment, over 4,000 tonnes of aggregates are used in the construction of one kilometre of standard highway pavement, while the building of a new six lane motorway can consume in excess of 20,000 tonnes for the same distance. Up to 250 tonnes of aggregate can be used in the construction of a single new house, although those of wooden frame and cladding construction would use substantially less.<sup>8</sup>
- 6.7 Aggregate is produced to meet demand so production figures are useful indicators of demand. For aggregate defined as rock, gravel and sand used for protection works, building, roading, fill, and sand for industry, over the period 2008-2017, the production of aggregate to meet demand in the Waikato region peaked at 7.75 million tonnes in 2017 with a value of about \$97 million.<sup>9</sup> This volume equates to an average of 18.8 tonnes per person resident in the region (458,000 residents in the Waikato region in 2018<sup>10</sup>). This is a high figure compared to 2008 when national quarrying was 11 tonnes per person<sup>11</sup>. It follows a decline in production after the Global Financial Crisis in 2008 and reflects a recovery buoyed by large road projects in the region. It also reflects Waikato's proximity to Auckland, which has experienced recent strong growth in population and building activity, generating demand for rock in excess of what its few quarries can supply.
- 6.8 The long-term demand for aggregate broadly moves in line with population which provides the employment base for local economic activity. Based on aggregate production data from New Zealand Petroleum and Minerals and Statistics New Zealand population data,

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<sup>8</sup> From "Providing solid foundations for New Zealand", Aggregate and Quarry Association of New Zealand, [www.aqa.org.nz](http://www.aqa.org.nz)

<sup>9</sup> Figures based on annual Mining Production Statistics from New Zealand Petroleum and Mining, and Census population results and population estimates from Statistics New Zealand, covering the Greater Wellington Region (including Wairarapa). Definitions of rock vary, but this evidence excludes such minerals as clay for brick-making or limestone for agriculture.

<sup>10</sup> Statistics New Zealand Sub-national Population Estimates as at June 2018

<sup>11</sup> Aggregate and Quarrying Association (2011) Foundations for our future

I estimate the Waikato accounts for 20% by volume of New Zealand's production of non-metallic minerals, or 23% by value. The corresponding figures for Waikato's share of national output are 19% by volume and 15% by value. These shares are greater than Waikato's share of total economic production (8% of national GDP in 2017<sup>12</sup>), which implies that production is substantially above local demand and also reflects demand in neighbouring regions.

- 6.9 Development of new resources close to cities can be constrained by spread of residential areas and the "reverse sensitivity" of new residents to the effects of quarrying activity, the difficulty of finding green-field sites suitable for quarrying and limitations on quarry operations associated with heavy truck movements on local roads. Finding alternative sources of material to quarries constrained by operating restrictions to reduce adverse neighbourhood effects associated with discharges to air and water, removal and deposition of over-burden, extraction operations and transport of product, will involve higher costs, both because of longer transport routes from more distant sources and also because of consent processes and establishment costs of developing new quarries.

## **7. THE EFFECT OF PLANNING RESTRAINTS ON COMMUNITY WELL-BEING**

- 7.1 While unnecessarily restrictive planning provisions and regulation of quarrying can make continuing operation of such facilities uncertain, that need not be the case. To illustrate the contribution of quarrying to the Waikato region, I estimate the economic impacts it has at present, and discuss the implications of changes to those impacts.<sup>13</sup>
- 7.2 The starting point is MBIE's Mineral Production statistics, which show that in 2017, Waikato produced 8.96 million tonnes of non-metallic minerals with a value of \$177 million. Of these, 7.75 million tonnes were aggregates of rock, sand and gravel, with a value of \$97 million if proportional to volume. Of these aggregates, 44% were identified

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<sup>12</sup> Based on Statistics New Zealand, Regional Gross Domestic Product tables

<sup>13</sup> This is an exercise particularly difficult at present, due to changes in presentation of MBIE's Regional Mineral Production Statistics, which do not disclose volumes produced of a range of non-metallic minerals (which were available in previous years), and also by delays in release of 2018 Census material which would provide more detail on employment.

as for roading, 27% for building, 18% for fill material, 9% were sand for industry use and 2% were rocks for reclamation and protection.

- 7.3 Taking the \$97 million as the Waikato's gross output value of quarrying and applying a ratio of gross output to value added for the metal ore and non-metallic mineral sector from Statistics New Zealand's input output tables, the contribution of quarrying to GDP in the region would be \$40.3 million in 2017. This is 0.18%-0.20% of regional GDP.<sup>14</sup> The employment associated with this production is more difficult to estimate, as published sources only record regional employment in mining rather than the disaggregated subset of non-metallic mineral quarrying. In 2018 Infometrics estimate regional mining employment to be 1,326, but this will also include around 350 employed in gold production at Waihi, around 150 engaged in ironsands production at Taharoa, and around 170 employed in coal production around Huntly, Maramarua and Rotowaro. That would leave around 670 employed in quarrying, the majority in aggregates and rock production. That would amount to 0.3% of total employment in the Waikato region.<sup>15</sup>
- 7.4 These estimates are necessarily approximate due to data limitations. While neither the GDP figures nor the employment estimates seem particularly substantial against the regional totals, quarrying is proportionately more significant in the Waikato economy than it is in the national economy and it does create value and employment from an otherwise unused natural resource.
- 7.5 Very few business operations account for a large proportion of value added in any modern, diversified urban economy. While quarries make a positive contribution to economic activity as measured through employment and expenditures in the local economy, the main significance of quarrying is in supplying material inputs to other businesses and infrastructure that support all economic activity. Quarries create value from a local natural resource servicing a market

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<sup>14</sup> Waikato's GDP was \$22,780 million according to Statistics New Zealand's Regional GDP estimates for year ending March 2017, or \$20,361 million according to Infometrics Waikato Regional Total for 2018. The quarrying production figures are for calendar years so may be between these two estimates if there are no calculation differences between them.

<sup>15</sup> Infometrics (2018) estimates total employment to be 215,345 full time equivalents.

for aggregates in building and construction, roading and other public infrastructure (including exports from the region) that is most cost effectively supplied from local sources because of transport costs.

- 7.6 Direct spending by a quarry, like other businesses, will have an indirect flow-on or “economic multiplier” effect to the extent that it stimulates added business for suppliers of inputs to quarrying, and from added spending by those who receive income from it. In a 2008 study of the national quarrying activity, NZIER estimated multipliers on input supply of 1.9 for value added and 2.63 for employment, and the multipliers for combined effect on input supply and added consumer expenditure of 3.00 and 5.14 in value added and employment respectively.
- 7.7 While economic multipliers are sometimes presented to show the interconnections of a business with other parts of an economy, they have inherent limitations for considering the effects of potential changes in economic activity, and data limitations make them less reliable for local economies.<sup>16</sup> Data issues aside, all regional or local multipliers will be lower than those at national level, as a regional economy is smaller and more reliant on importing from other regions than the national economy, so additional spending experiences more “leakage” out of the region. In the case of quarries, multipliers also understate the importance of the material supply to the economy: if restriction of material increases the cost of aggregate supply and reduces the amount of investment in infrastructure such as roads or flood defences, the impediments this creates for local economic well-being, such as increased traffic congestion, wear and tear on vehicles or periodic losses from flood damage, are not the sort that show up in a multiplier based on inter-industry transactions.

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<sup>16</sup> Further explanation on the limitations of multipliers is provided by the Australian Bureau of Statistics, which no longer publishes them. See <http://www.abs.gov.au/ausstats/abs@.nsf/Previousproducts/5209.0.55.001Main%20Features4Final%20release%202006-07%20tables?opendocument&tabname=Summary&prodno=5209.0.55.001&issue=Final%20release%202006-07%20tables&num=&view=>

7.8 As I stated above, contribution to the regional economy is not the full measure of quarrying's economic significance. The main significance of quarrying lies not in its contribution to the measured economy, but in its significant role in providing materials and affecting their price for use in infrastructure which supports the value adding activities of all other sectors in the local regional economy that use aggregates or products derived from them, including building and construction, infrastructure and utility suppliers, property managers and operations of owner-occupied housing. Put another way, the aggregates and quarrying industry is significant for Waikato despite its relatively modest contribution to measured GDP and jobs, because of its underpinning role in infrastructure costs. Without quarrying facilities in the region in easy transport distance from the sources of demand, costs would increase, and affordability decrease, for all activities that use aggregate-based infrastructure – including infrastructure such as settling ponds and water treatment plant that may be developed directly to advance the aims of PC1.

## **8. THE EFFICIENCY OF RETAINING ACCESS TO QUARRY RESOURCES AND PROVIDING FOR THEIR DEVELOPMENT**

8.1 Quarrying provides a capability to meet infrastructure needs that is most effectively met by local resources. That local sourcing also provides a source of resilience against the effect of disruptions to normal supply of materials. The economic value of such resilience is difficult to estimate but there is a strategic value in having that capability. The costs of business disruption caused by such events as floods or earthquakes is not so readily valued as property damage and other tangible losses but can be substantial.

8.2 Demand for rock and aggregate tends to be price inelastic (i.e. relatively unresponsive to price changes), so any additional cost of quarried material due to supply restraints requiring aggregate to be sourced from further afield would be mostly borne by local consumers rather than result in reduced consumption. As the largest consumers of aggregate within the region are Councils these bodies will be the most affected by price increases and additional costs they face will ultimately be borne by their ratepayers. In other words, for what is

essentially the same service – supply of aggregates to infrastructure – there would be additional cost to be met from ratepayers' disposable incomes, which would reduce their ability to spend on other activities in the region, to the detriment of well-being of both ratepayer consumers and other businesses that would benefit from additional spending that is forgone. Such risk of aggregate price increases would be reduced, if not eliminated, if PC1 is introduced at a level, and at a rate, so as not to significantly change the depletion of current aggregate resources, unnecessarily prevent the expansion or development of existing quarries, or bring forward the date at which new quarries need to be developed.

- 8.3 There is an economic value in providing for quarries to work out their resources to the point where they are no longer economically worthwhile to extract, as this defers the date at which new resources need to be brought into production, and defers the present value cost of their development. In the longer term costs will rise as new resources will need to be found and developed, but planning can foster efficient use and development of resources by not unnecessarily restricting access to, preventing development or expansion of, or accelerating depletion of, these quarries' existing resources.
- 8.4 There are no complete alternatives to ensuring that there are quarries which can produce sufficient quality aggregates within the Region. Crushed aggregate from demolition concrete can be re-cycled and used as an alternative to coarse aggregate for use in new concrete products or roading or drainage materials.<sup>17</sup> However, this typically needs to be blended with raw coarse aggregate, as it is difficult to know the properties of recovered material and a high percentage of recycled aggregate can negatively affect new concrete's strength. As with fresh aggregate, the high cost of cartage (both gathering material as well as distributing products) and need for a reliable source of recovered material at a consistent grade quality affect the economic

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CCANZ (2010) Recycled aggregates in new concrete; Technical Report TR 14, Cement and Concrete Association of New Zealand.



feasibility of recycling materials.<sup>18</sup> It seems very unlikely that recycled aggregate could substitute for more than a fraction of the range of materials available from newly quarried material.

- 8.5 When existing quarries are restricted or closed, production at the remaining quarries may rise, resulting in increased environmental effects at these quarries as well as increased traffic movements around these sites. Consent conditions may restrict such adverse effects but any residual adverse effect would add to the full societal cost of supply resulting from volumes produced in the region or volume made up from more distant sources.

## **9. SUMMARY AND CONCLUSIONS**

- 9.1 In 2017 Waikato accounted for around 20% of New Zealand's production tonnage of rock and aggregate, compared to around 8% of the nation's gross domestic product, as it supplied demand in both Waikato and other regions, particularly Auckland. It contributed around 0.2% of Waikato's GDP and around 0.3% of the region's total employment. Waikato is one of the largest producers of quarried rock and aggregate in New Zealand, and its quarrying has an economic significance far beyond its relatively modest economic impact, as it supplies material for the physical infrastructure on which the economy depends. In my opinion it is a regionally significant industry because of its underpinning role in development and maintenance of infrastructure, and without continuing access to aggregate sources close to demand, infrastructure costs would rise and its affordability would decrease, with impacts for all the region's industries that use and rely on that infrastructure.
- 9.2 Rock is a fundamental input into the infrastructure on which the economy runs, with few cost effective substitutes for the range of uses of rock in roading, building and civil construction. It is expensive to transport relative to its cost of extraction, and ensuring low cost supply requires economically accessible resources close to the

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<sup>18</sup> I understand from Winstone that recycled aggregates are very expensive to produce and are of limited use in concrete. They can be used to make a low grade base course but this product is far more expensive than the excess low grade scalped material – a by-product of the production processes of other local greywacke quarries.

location of demand. Availability of versatile high quality rock faces increasing constraints as existing resources have been depleted and residential encroachment has increased restrictions on use of new resources. Regional economic well-being and the efficient use of resources will be served if PC1 that aims to improve water quality in the Waikato and Waipa Rivers and improve the quality of life for the region's residents, is introduced in a way that does not unduly restrict continued operation expansion and development of existing quarries already set up for extraction, as this has lower economic cost of supplies and environmental effect than sourcing aggregates at greater distance or establishment of new quarries.

**Peter Clough**  
**03 May 2019**