Waimea Dam
Economic Cost of The No-Dam Alternative

November 2016

Northington Partners

Executive Summary

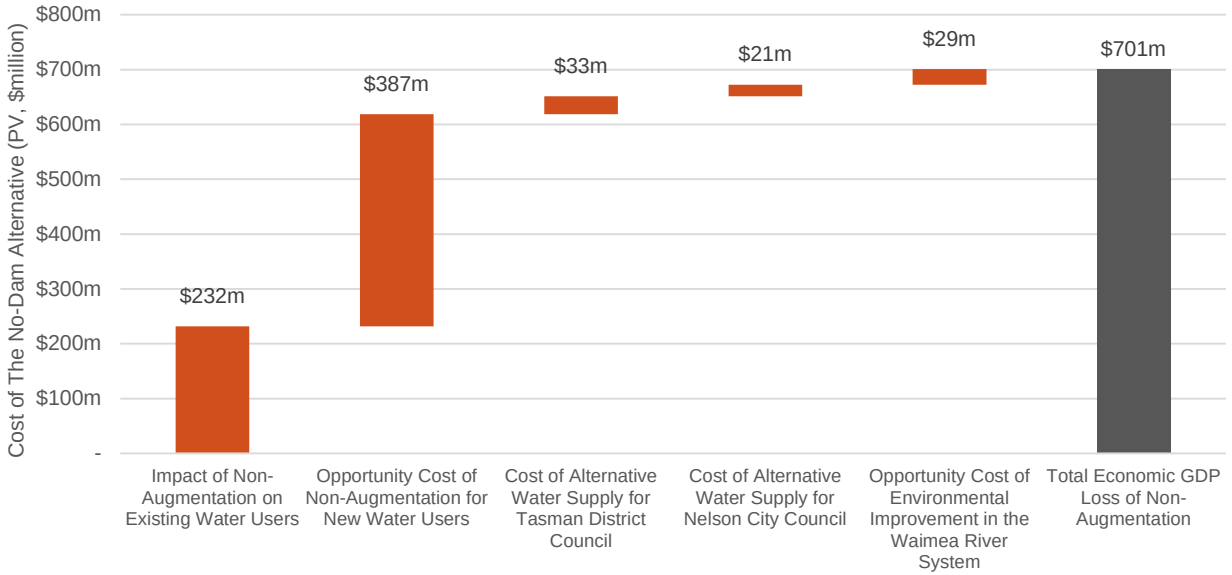
We estimate the total financial and economic cost of the No-Dam Alternative at $700 million

This report provides a summary of the potential financial and economic impacts of the Waimea Dam not going ahead ("**No-Dam Alternative**"). Our estimate draws on a number of existing reports and focuses on five core components:

1. Impact of Non-Augmentation on Existing Water Users;
2. Opportunity Cost of Non-Augmentation for New Water Users;
3. Cost of Alternative Water Supply for Tasman District Council;
4. Cost of Alternative Water Supply for Nelson City Council; and
5. Opportunity Cost of Environmental Improvement in the Waimea River System.

Cost estimates for each component are presented in Figure 1. The estimated total impact on the No-Dam Alternative is $700 million.

Figure 1: Aggregate Cost of Non-Dam Alternative (Mid-Point)



Introduction and Scope

Background

Waimea Irrigators Limited ("**WIL**" or "**Company**") has been established in conjunction with the Tasman District Council ("**TDC**") as the vehicle to advance the funding, technical development and construction of the Waimea Dam augmentation scheme ("**Waimea Dam**").

WIL has engaged Northington Partners to provide a summary of the potential economic impacts of the Waimea Dam project not proceeding ("**No-Dam Alternative**"). Our assessment is primarily based on existing work that has been completed by a range of parties over an extended period, and is intended to provide a high level summary of the financial and economic consequences of the No-Dam Alternative. These estimates take account of the alternative courses of action available to all of the stakeholders in the Waimea Dam.

The implications of the No-Dam Alternative have been assessed in the context of the 2014 Regional Plan changes introduced by the Tasman District Council regarding Waimea Water Management and Water Augmentation. In the event that the Waimea Dam does not proceed, these plan changes provide a framework for managing water use for rural, urban, industrial and environmental purposes. For irrigators, the new rules will be implemented by:

i. Reducing all allocations in line with each user's previous use (over the 2003 – 2013 period), or standard allocations for specific soil types or specific crops;

ii. Implementing new rationing trigger levels and allocation cuts required in the event of drought episodes of different severity; and

iii. Placing restrictions on the types of activity that can be allocated new water.

Without the Waimea Dam, successively deeper rationing cuts will be triggered as river flows pass lower thresholds, with 70% cuts when flows at the Appleby Bridge in the Lower Waimea are at or below 800 litres per second.

Scope of Our Assessment

Our summary has focussed on the following key components:

a. The loss of potential output from limiting primary production and supporting industries on land that is currently irrigated;

b. The opportunity cost associated with the inability to provide irrigation to dryland;

c. The potential economic cost of foregone regional growth resulting from limits to water quality, availability and reliability;

d. The cost to the Tasman District Council of providing an alternative storage solution to meet the domestic, urban and industrial needs of the projected population of the wider Waimea Basin over the next 50 years;

e. The cost to the Nelson City Council of providing an alternative water solution to meet the needs of the projected population of the Nelson region over the next 50 years; and

f. The environmental and social costs of maintaining the health of the Waimea River and associated amenities (and the extent to which these benefits are utilised / available to Nelson city residents).

All source documents referenced throughout this report are listed in Appendix II.

Section 1

Cost Components of No-Dam Alternative

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Impact of Non-Augmentation - Existing Water Users

The total impact of potential water restrictions on existing irrigators is estimated at $231m

Introduction

Approximately 3,800 hectares are currently irrigated in the Waimea Catchment, and all land uses would be adversely affected under the No-Dam Alternative.

Measurement Basis

All previous economic impact reports have used variants of the same analytical framework:

- Based on the potential for up to 70% cuts in current water allocations, the productive irrigable area is estimated to reduce from 3,800 ha to 705ha in a worst case scenario;
- The reductions in area are assumed to be applied on a pro-rata basis across all existing crop types;
- Potential impacts of more moderate water cuts are modelled using linear interpolation between the current position (no loss) and the worst case scenario.

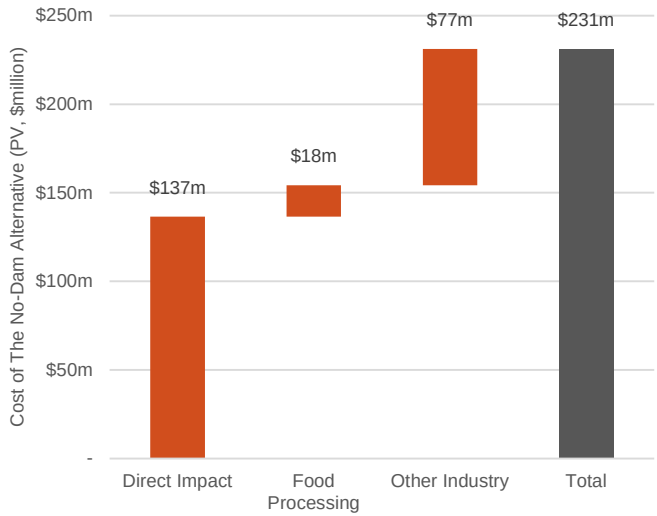
NZIER (2014) used a CGE model of the Nelson-Tasman economy to estimate the economic impacts of a 20% and 35% reduction in water availability. Impacts are measured in terms of regional GDP, and reflect the direct impact on existing irrigators through lower production and margins, as well as indirect impacts on the food processing and other industries.

The present value of aggregate impacts are measured over a 25 year period (discounted at 8%).

Results

The aggregate impact on non-augmentation (at the mid-point of the 20% and 35% scenarios) is summarised below in Figure 2. The total reduction in regional GDP is $231m, of which approximately 60% is due to the direct impact on existing irrigators.

Figure 2: Economic GDP Cost of Non-Dam Alternative to Existing Water Users (Mid-Point)



Source: NZIER (2014) Waimea Dam Economic Assessment

Separate results for the 20% and 35% scenarios are set out in Section 2.

Opportunity Cost of Non-Augmentation – New Water Users

The opportunity cost of being unable to supply an additional 1,800 hectares of irrigated land is estimated at $387m

Introduction

The Waimea Dam is expected to provide sufficient new water to irrigate 1,800 hectares, enabling a significant potential increase in production volume and profitability compared to current dryland uses.

If the Waimea Dam does not proceed, the potential GDP uplift will not be realised and this value therefore represents an opportunity cost of the No-Dam Alternative.

Measurement Basis

NZIER (2014) modelled the potential impact of the new irrigated area using the same framework as previous reports, but with updated capital costs, margins and some variations to the assumed crop types.

The assumed composition of the new irrigated area is set out in Table 1.

Table 1: Assumed New Crop Areas

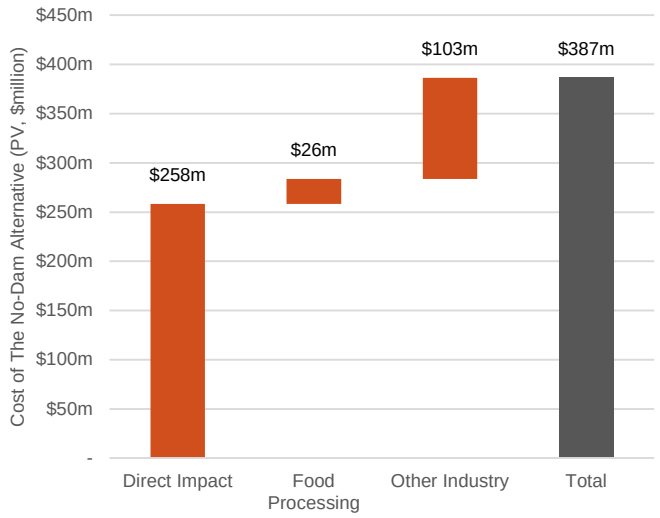
Crop Type	New Area (Hectares)
Pasture	400
Apples	960
Kiwifruit	90
Grapes	200
Berries	150
Total New Area	**1,800**

NZIER (2014) assessed the economic impact of the new irrigation with the same modelling framework that was used to measure the potential impact of non-augmentation on the land which is currently irrigated.

Results

The total opportunity cost of non-augmentation is $387m (measured at the mid-point of the 20% and 35% scenarios). As summarised in Figure 3, most of this value relates to the direct loss from new irrigated land, although approximately 33% is derived from the impact on downstream industries.

Figure 3: Economic GDP Cost of Non-Dam Alternative to New Water Users (Mid-Point)



Source: NZIER (2014) Waimea Dam Economic Assessment

Separate results for the 20% and 35% scenarios are set out in Section 2.

Cost of Alternative Water Supply for Tasman District Council

Based on the available information, we estimate the cost of an alternative water source for TDC at $33m

Introduction

If the Waimea Dam is not built, TDC will need to pursue an alternative solution. The estimated cost of establishing a different water source represents another impact of the No-Dam Alternative.

Measurement

A number of reports have examined a wide range of alternatives to the Waimea Dam at varying levels of design and cost detail. Some of the alternatives will deliver sufficient water to service both consumptive and environmental requirements, but typically at lower levels than the Waimea Dam.

In the context of this assessment, we are interested in the cost of a scheme which only services TDC's urban and industrial demand. Because the economic impact of the No-Dam Alternative on irrigation and environmental benefits is accounted for separately elsewhere, incorporating the cost of a full alternative to the Waimea Dam would include an element of double counting.

The Morrison Low (2015) report references a number of alternative water supplies and storage solutions without providing any detail or cost estimates. However, the report does state that the "alternative water storage solutions for urban supply could cost in the order of two times the estimated cost to construct the urban capacity of the dam". In the absence of any better information, we have used this statement as the basis for our cost estimate. We have made no adjustment for expanded urban demand, although we note current demand growth is significantly above the existing TDC plan.

Result

Our cost estimate for an alternative water supply for TDC is summarised in Table 2 below.

Table 2: Estimated Cost of Alternative for TDC

Component	Value
Total Estimated Capital Cost (P_{95})	$82.5m
Allocation to TDC for Urban / Industrial Use	20%
Cost Multiplier for Alternative	2.0x
Total Cost Allocation	**$33.0m**

Source: Northington Partners' Analysis

Cost of Alternative Water Supply for Nelson City Council

We estimate that the cost of providing an alternative future water supply for NCC could be approximately $21m

Introduction

While Nelson City Council ("**NCC**") is not currently a direct abstractor from the Waimea aquifer, the Waimea Dam could potentially provide NCC with sufficient water to service its future regional needs. Initial modelling has assumed that approximately 5% of the Scheme's storage capacity would be allocated for this purpose.

If the Waimea Dam does not proceed, NCC would at some stage need to pursue another water source and the potential cost of this alternative therefore represents the opportunity cost of the No-Dam Alternative.

Measurement

NCC has commissioned a number of studies regarding alternatives to the Waimea Dam. However, given the long lead time before the additional water source will be needed, all of the assessments have been at a relatively high level and have not included detailed costings.

An indicative cost for one alternative can be derived using information provided in a report by NCC (2012). This relates to a high dam on the Roding River, designed to augment the water already extracted from this source. A summary of our assessment is set out below in Table 3, and includes the following steps:

i. The cost estimates in the NCC (2012) report have been adjusted to 2016 dollars;

ii. That value is then discounted for 10 years to account for the delay before the extra water will be needed. While NCC reports that the water may not be needed for a further 30 years under the status quo, the NZIER (2015) report sets out a range of factors that may accelerate the requirement for an additional source under the No-Dam Alternative. We have therefore arbitrarily assumed a 10 year delay for the purposes of our analysis, but note that the outcome is not overly sensitive to this assumption.

Table 3: Construction Cost of Roding High Dam for NCC

Roding High Dam	Low	High	Mid-Point	Source
Volume (m3/day)	10,000	20,000	N/A	Nelson City Council (2012) Water Supply Asset Management Plan 2012-2022
Construction Cost in 2008 ($m)	$20.9m	$34.0m	$27.5m	
Inflation Factor to Q1 2016	115%	115%	115%	CPI – RBNZ
Estimated Construction Cost in 2016	$24.0m	$39.1m	$31.6m	
Delay in Dam Construction	10 years	10 years	10 years	Discussions with NCC, NZIER (2015)
Real Discount Rate	4%	4%	4%	NPL Estimate
Cost in PV ($m)	**$16.2m**	**$26.4m**	**$21.3m**	

Result

Based on mid-point values, we suggest the cost of providing an alternative future water supply for NCC is approximately $21m.

Opportunity Cost of Environmental Improvement in the Waimea River System

We suggest a lower bound for the value of environmental benefits at $28.6m

Introduction

On the face of it, there will be no further environmental degradation in the Waimea River catchment under the No-Dam Alternative because of the increased restrictions that would be placed on consumptive users.

However, the Waimea Dam will enable an increase in the minimum environmental flow to be raised from 800 l/s to 1,100 l/s at the Appleby Bridge. The No-Dam Alternative therefore imposes an opportunity cost relating to this foregone benefit.

Measurement

Attributing a monetary value to the environmental benefit associated with the increase in the minimum flow is extremely difficult. While in theory there are a range of approaches that can be applied, each has practical implementation issues and typically relies on a number of key input parameters that are difficult to determine.

One approach is simply to base the value of the environmental benefit on the estimated cost of providing the benefit. While this is clearly a very crude measure, we suggest that it provides a reasonable lower bound on the likely value. The actual value of the environmental benefit is expected to be higher, especially considering that allowance for the enhanced environmental flow is one of the key enablers for the "consentability" of the scheme.

Previous work indicates that catering for the proposed increase in the minimum flow in the Waimea River requires 30% of the overall live storage in the dam. The cost of the environmental improvement is therefore assumed to be 30% of the overall capital cost for the scheme, plus 30% of the assumed on-going operating costs.

Result

Our cost assessment is summarised in Table 4 below, based on values referenced in the Morrison Low (2015) and NZIER (2015) reports.

Table 4: Cost Allocation to Environmental Benefit

Component	Value
Estimated Capital Cost (P_{95})	$82.5m
Allocation to Environmental Benefit	30%
Cost Allocated to Environmental Benefit	$24.8m
Annual Operating Costs	$0.5m
Capitalisation Rate (Real)	4%
Total Capitalised Costs	$12.5m
Cost Allocated to Environmental Benefit (30%)	$3.8m
Total Cost Allocation	**$28.6m**

The degree to which the environmental benefit is enjoyed by (and therefore could be allocated to) residents living in both the Nelson and Tasman regions is obviously difficult to measure. However, we note that NZIER (2015) consider an allocation range between 20% and 50% for Nelson residents. Given the relativities between the populations of the two regions, we suggest that a minimum allocation of 30% to Nelson seems reasonable.

Section 2

Economic Impact Scenarios for No-Dam Alternative

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Incremental Economic GDP Loss from Non-Augmentation - 20% Water Cut

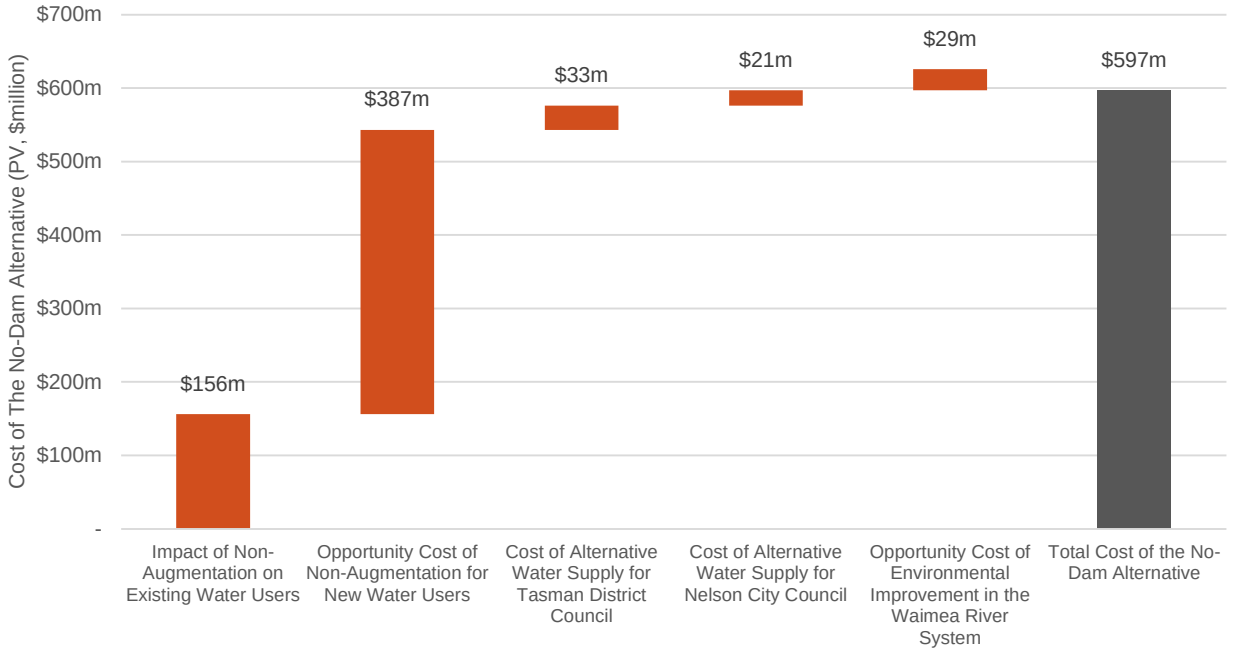
Impact of 20% Water Cut

Summarised in Table 5 and Figure 4 below is the impact of non-augmentation on existing water users on the basis of a 20% water cut. The estimated total impact of the No-Dam Alternative is $597 million under this scenario.

Table 5: Cost of Non-Dam Alternative (20% Water Cut)

Component	GDP PV$m
Impact of Non-Augmentation on Existing Water Users	$156m
Opportunity Cost of Non-Augmentation for New Water Users	$387m
Cost of Alternative Water Supply for Tasman District Council	$33m
Cost of Alternative Water Supply for Nelson City Council	$21m
Opportunity Cost of Environmental Improvement in the Waimea River System	$29m
Total Cost of the No-Dam Alternative	**$597m**

Figure 4: Cost of Non-Dam Alternative (25% Water Cut)



Incremental Economic GDP Loss from Non-Augmentation - 35% Water Cut

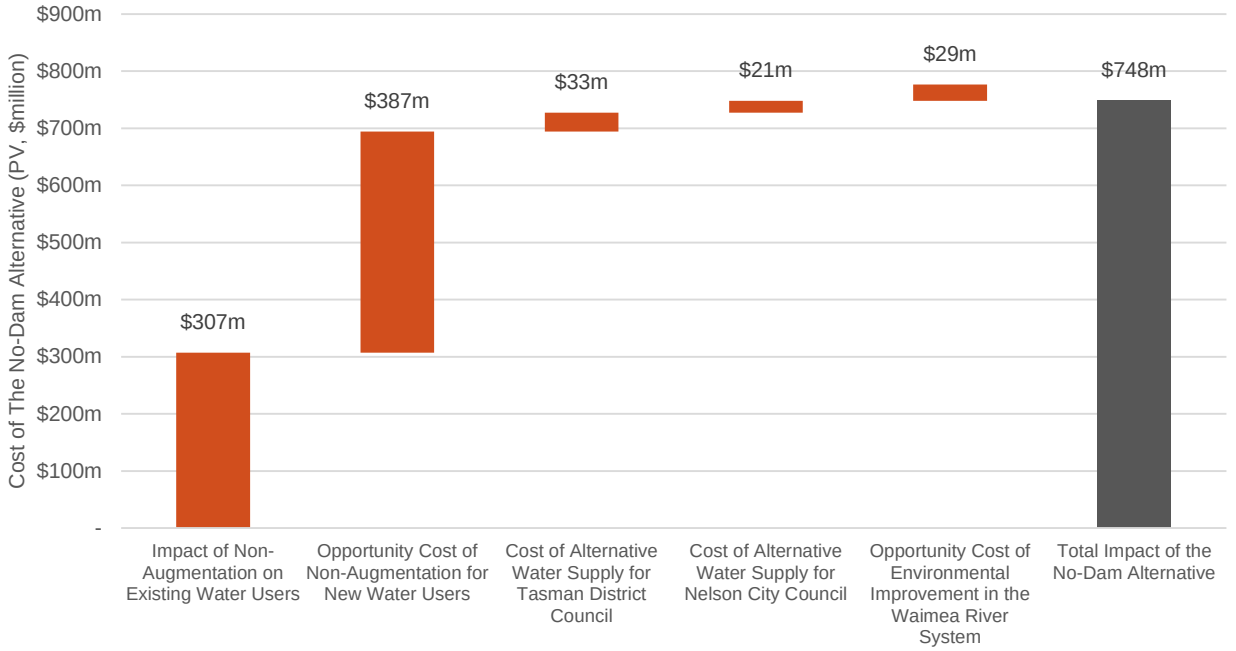
Impact of 35% Water Cut

Summarised in Table 6 and Figure 5 below is the impact of non-augmentation on existing water users on the basis of a 35% water cut. For this scenario the estimated total impact of the No-Dam Alternative is $748 million.

Table 6: Cost of Non-Dam Alternative (35% Water Cut)

Component	GDP, PV$m
Impact of Non-Augmentation on Existing Water Users	$307m
Opportunity Cost of Non-Augmentation for New Water Users	$387m
Cost of Alternative Water Supply for Tasman District Council	$33m
Cost of Alternative Water Supply for Nelson City Council	$21m
Opportunity Cost of Environmental Improvement in the Waimea River System	$29m
Total Cost of the No-Dam Alternative	**$748m**

Figure 5: Cost of Non-Dam Alternative (35% Water Cut)



Appendices

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Appendix I: Qualifications, Declarations and Consents

Declarations

This report is dated 1 November 2016 and has been prepared by Northington Partners at the request of Waimea Irrigators Limited for the purposes as set out on page 2. This report, or any part of it, should not be reproduced or used for any other purpose. Northington Partners specifically disclaims any obligation or liability to any party whatsoever in the event that this report is supplied or applied for any purpose other than that for which it is intended.

Qualifications

Northington Partners provides an independent corporate advisory service to companies operating throughout New Zealand. The company specialises in mergers and acquisitions, capital raising support, expert opinions, financial instrument valuations, and business and share valuations. Northington Partners is retained by a mix of publicly listed companies, substantial privately held companies, and state owned enterprises.

The individuals responsible for preparing this report are Greg Anderson B.Com, M.Com (Hons), Ph.D and Richmond Tait B.Com, B.Sc.

Disclaimer and Restrictions on the Scope of our Work

In preparing this report, Northington Partners has relied on information provided by Waimea Irrigators Limited . Northington Partners has not performed anything in the nature of an audit of that information, and does not express any opinion on the reliability, accuracy, or completeness of the information provided to us and upon which we have relied.

Northington Partners has used the provided information on the basis that it is true and accurate in material respects and not misleading by reason of omission or otherwise. Accordingly, neither Northington Partners nor its Directors, employees or agents, accept any responsibility or liability for any such information being inaccurate, incomplete, unreliable or not soundly based or for any errors in the analysis, statements and opinions provided in this report resulting directly or indirectly from any such circumstances or from any assumptions upon which this report is based proving unjustified.

We reserve the right, but will be under no obligation, to review or amend our report if any additional information which was in existence on the date of this report was not brought to our attention, or subsequently comes to light.

Furthermore, our assessment is reliant on a number of key assumptions that have been outlined in this report. Should any of these assumptions not be accurate, our assessment and our conclusions could be materially affected.

Indemnity

Waimea Irrigators Limited has agreed to indemnify Northington Partners (to the maximum extent permitted by law) for all claims, proceedings, damages, losses (including consequential losses), fines, penalties, costs, charges and expenses (including legal fees and disbursements) suffered or incurred by Northington Partners in relation to the preparation of this report; except to the extent resulting from any act or omission of Northington Partners finally determined by a New Zealand Court of competent jurisdiction to constitute negligence or bad faith by Northington Partners.

Waimea Irrigators Limited has also agreed to promptly fund Northington Partners for its reasonable costs and expenses (including legal fees and expenses) in dealing with such claims or proceedings upon presentation by Northington Partners of the relevant invoices.

Appendix II: References

Reference	Full Title of Report / Source
Cook & Northington (2011); Waimea Community Dam Economic Impact Analysis	Waimea Community Dam Economic Impact Analysis; report to Nelson Regional Economic Development Agency
Morrison Low (2015); Business Case to support Council investment in the Waimea Community Dam	Business Case to support Council investment in the Waimea Community Dam report to Tasman District Council
NCC (2012); Water Supply Asset Management Plan 2012-2022	Water Supply Asset Management Plan 2012-2022
Northington Partners (2010); Financial and Economic Assessment of Water Augmentation in the Waimea Catchment	Financial and Economic Assessment of Water Augmentation in the Waimea Catchment; report to Waimea Water Augmentation Committee
NZIER (2014); Waimea Dam Economic Assessment	Waimea Dam Economic Assessment - Review and update of economic impact assessment of Waimea Community Dam
NZIER (2015); NCC Value in Waimea Dam	NCC Value in Waimea Dam - Outflow from a dam Economic benefits for Nelson City of the proposed Waimea Community Dam NZIER report to Nelson City Council
RBNZ	Reserve Bank of New Zealand – Consumer Price Index (CPI) Calculator
Tokin & Taylor (2007); Assessment of Water Augmentation Options for the Waimea Plains – Final Report Summary	Assessment of Water Augmentation Options for the Waimea Plains – Final Report Summary for Waimea Water Augmentation Committee / Tasman District Council.

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