WAIMEA WATER AUGMENTATION PROJECT

ASSESSMENT OF ALTERNATIVE OPTIONS

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Problem Statement

- Water deprivation in summer months
- Occurs frequently and often quite severe
- Affects many entities and activities
  - Environmental supporting capacity of rivers
  - River users
  - Irrigators
  - Urban water supplies

Presentation Topics

- History
- Rationing Stages and Projected Demands
- Demand Assumptions
- Water Gaps and Storage Requirements
- Plan B options
- Domestic Harvesting
- Preferred Option – Waimea Community Dam
- Option Assessment and Analysis

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History

- 1991 Agriculture New Zealand (MAF) Report – Water Augmentation Options Waimea Basin
- 2003 Tasman Regional Water Study
  - Several Reports (MWH and Lincoln E)
  - Concluded that in-catchment solutions to be optimal
- Waimea Water Augmentation Committee (WWAC)
  - 2004 to 2007 - Phase 1 Feasibility Study
    - Identified 18 sites
    - Multi Criteria Assessment undertaken
    - Outlines how Lee Valley Dam was identified as preferred option

History

- Waimea Water Augmentation Committee
  - 2007 to 2010 - Phase 2 Detailed Investigation – Lee Valley Dam (Site 11)
  - 2011 to 2014 – Phase 3 Detailed Design
  - Dec 2014 – Resource Consent Application Lodged
  - March 2015 – Consent Granted
- Long-Term Plan 2015-2025
  - Committed $25 million to Waimea Community Dam (Lee Valley)

Summary of Options Pre-1993

Option	Peak Water Yield (m3/day)	Area able to be irrigated (ha)	Est. Cost (1993)		Comment
			Total ($m)	$ / ha	
Small Dams eg Teapot Valley	11,000	260	6.4	24,600	Not many available adjacent Waimea, small and water quality issues
Faulkner Type – Small Moutere Geology Dams	850	~20	0.105	5,300	Small storage – not many sites available adjacent Waimea
Roding Dam (Pipe Reticulation)	43,000	1000	24.9	24,900	NCC take water now through a weir and tunnel. Dam would increase storage availability
Deep Bores	1,300	30	0.17	5,800	Limited and small flow 100 m3/day
Motueka River	43,000	1000	6.12	6,120	WCO now
Lake Rotoroa	34,500	805	41.5	51,600	National park
Wairoa Gorge Dam	357,000	8340	82.7	9,920	Land is now inhabited in around and close this site
Lake Rotoiti	86,400	2016	66.3	32,900	National park
Bells Island (Wastewater System)	9,000 approx	200	1.4	7,000	Considered in late 90's cost and quality issues
Central Road Community Water Scheme	10,700	250	1.48	6,050	Regional Plan limitations
Turkeys Nest Type Dam	430	~10	0.16	16,000	Numbers needed and land area required

2003 Tasman Regional Water Study

- Relook at options from 1993 Water Augmentation Options Waimea Basin Study
- Updated estimates
- Included option of dam in the Upper Wairoa River just below fork of left and right branches

Option	Area able to be irrigated (ha)	Est. Cost (1993) by MWH		Comment
		Total (m $)	$ / ha	
Wairoa Gorge Dam	7,000 - 8000	140	18,700	• The CCI adjusted cost from the previous estimate was $103M – it was unclear what was allowed for P&G, engineering and contingency in original. Estimate included reticulation. • Land is now inhabited in and around and close this site
Pipeline ex Rotoiti/Buller River to Wakefield	2,000	115+M	$57,500	• The CCI adjusted cost from the previous estimate was $112+M. • Cost is for pipeline only and excludes pumping station, break tanks, intake, controls, power supply and reticulation.
Upper Wairoa River – below the forks i.e. left and right branches – This was a high level option from the study – not considered previously	3,700	41.3	$13,800	• This cost included reticulation and based on a 2051 demand projections and pumping and reticulating adjacent catchments i.e. Wai-iti, Redwood, other Waimea and coastal – sub-catchments. A subset option also includes further areas in the adjacent Moutere Catchment. Capital cost estimate rose to $91.8M • Later work discounted this site for various reasons

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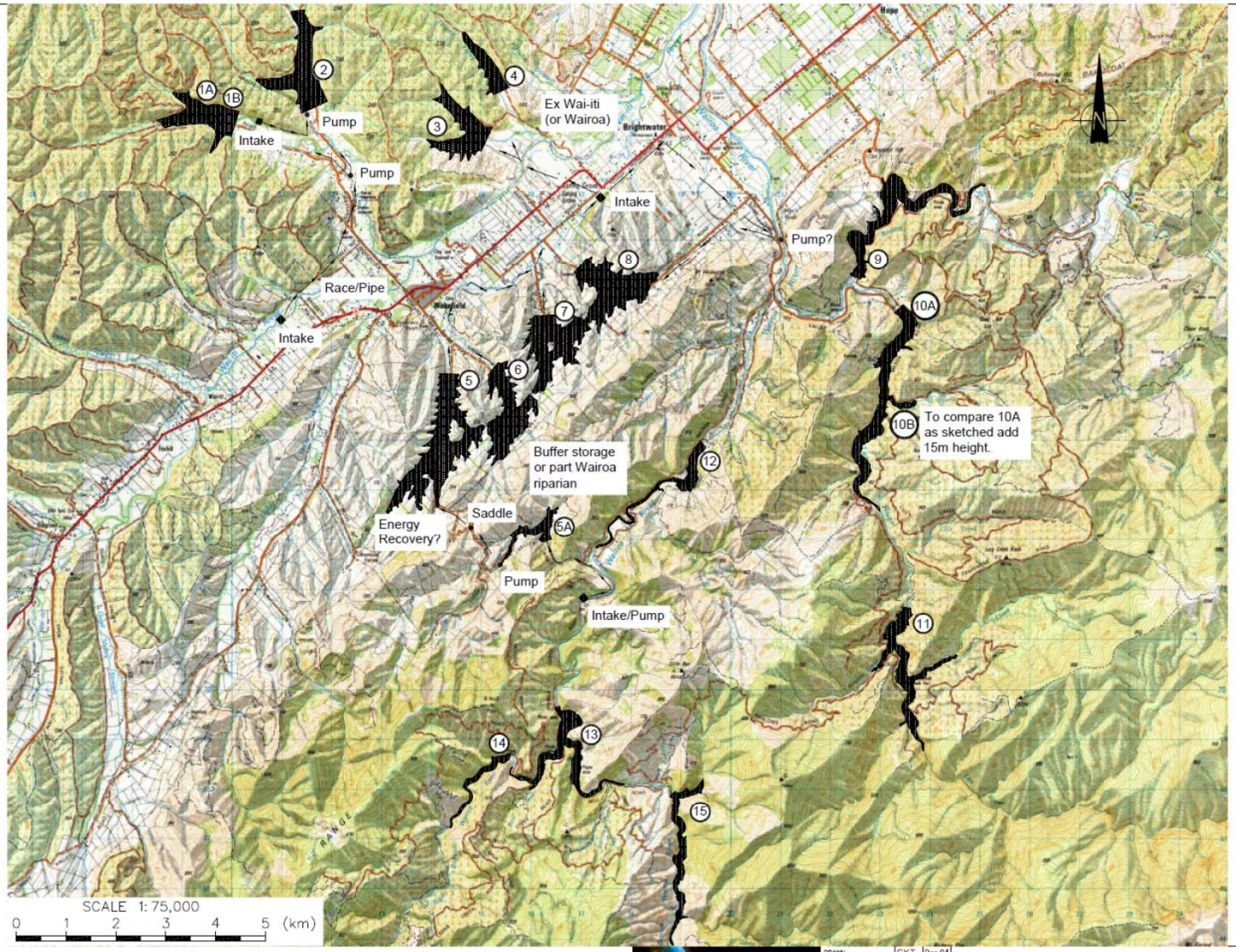
2004 Waimea Water Augmentation Committee

- WWAC led Phase 1 Study from 2004 to 2007
- Detailed review of water augmentation options
- Assessment
  - Large number of sites – narrowed down
  - Focused on storage > 5,000,000 m3 to cater for 2000/2001 drought
  - Comprehensive scope;
    - Included smaller streams with supplementary flows from other catchments
    - Storage Dams on larger rivers
  - Assessed engineering, environmental and social factors
  - 18 sites identified (T&T topographical Map Dec 2004)



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WAIMEA WATER
AUGMENTATION COMMITTEE
WAIMEA BASIN STUDY
Options

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WWAC Waimea Basin Study Dec 2004

2004 Waimea Water Augmentation Committee

- Iterative Assessment
  - 18 sites narrowed down to 10 sites
  - 10 sites assessed and ranked on technical and environmental criteria
  - 5 highest ranking sites assessed in further detail
    - Environmental – impacts/improvements to environment and river flows
    - Engineering – geological and technical constructability
    - Consentability/public acceptance
    - Scale of impact on affected residents
  - This led to short list of 2 sites
    - Upper Lee Valley (Site 11)
    - Left (eastern) Branch of Wairoa River (Site 15)

2004 Waimea Water Augmentation Committee

- Overview of Assessment outcomes
  - Catchments too small to maintain 5,000,000m3
  - Water quality problems due to geological terrain
  - Struggle to meet base flow requirements
  - Considerable social impact due to habitation
  - Geotechnical issues (fragmented rock, close to faults)
  - Impact on high-use recreational area

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2004 Waimea Water Augmentation Committee

- Overview of Assessment outcomes
  - Site 15 and 11
    - Don’t have geological, water quality and catchment constraints
    - Shortlisted as preferred sites
- Further comparative assessment of 2 shortlisted sites
  - 27 features were identified and assessed
  - Preferred site was identified – Upper Lee Valley (site 11)

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2007 Lee Valley Dam Phase 1 Feasibility Study

- Focused specifically on dam site (site 11) and reservoir location
- Proposal for 53m high earth embankment dam
- Storage of 13,000,000 m3
  - Meet current shortfall and demand projections for 50 years
  - Confirmed irrigation of 6,400 hectares/hectare.e (including urban supply)
  - Allow to maintain minimum flow of 1100 l/s at Appleby bridge
- Estimated cost $20-$25 million (2007)
- Recommended further detailed investigations

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Presentation Topics

- History
- Rationing Steps and Projected Demands
- Demand Assumptions
- Water Gaps and Storage Requirements
- Plan B options
- Domestic Harvesting
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Rationing Stages

- Step 1 rationing, greater of:
  - 10% of consumption reduction (average last 8 years)
  - 20% of consent
- Step 2 rationing, greater of:
  - 17.5% of consumption reduction (average last 8 years)
  - 35% of consent
- Step 3 rationing, greater of:
  - 25% of consumption reduction (average last 8 years)
  - 50% of consent
- Step 4 (does not apply to community water supplies)
- Step 5 - essential human health
  - 125L/day/person (occurred 2000/2001)

Based on last 16 years could occur 9 out of every 10 years

Based on last 16 years could occur 1 out of every 6-10 years

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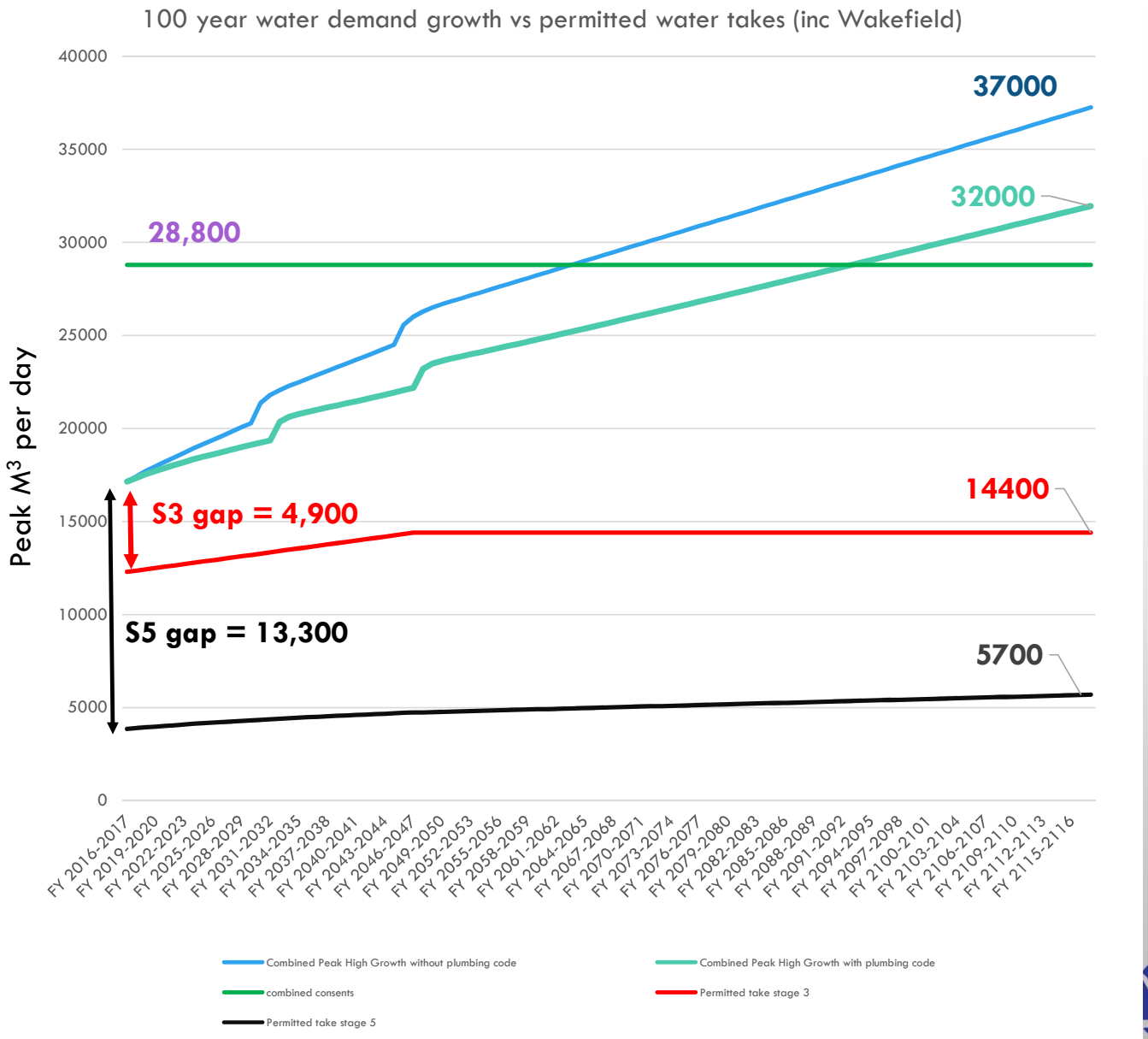
Projected Demands - Combined 100-Year Demand

(inc. Wakefield)



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Demand Assumptions

- High Growth Scenario for 100 years
  - Includes Wakefield
  - 37,000 m3/day in 2117
- High Growth Scenario for 30 years
  - Excludes Wakefield (has sufficient water for 30 years)
  - 24,000 m3/day in 2047
- Rationing Scenario based on 2000/2001 drought
  - 60 days at stage 3 rationing
  - 40 days at stage 5 rationing

Demand Assumptions

- Calculated Storage based on 85% average peak week demand
- Irrespective of growth, Stage 3 abstraction fixed and limited to;
  - 12,211 m3/day (excl Wakefield)
  - 14,396 m3/day (incl. Wakefield)
- Stage 5 abstraction limit can increase with population growth
- Calculations for storage include additional 100,000m3 to cover water loss, evaporation or refreshing flows

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Water Demands

	Daily 2017 (excl. Wakefield) (m3/day)	Daily 2047 (excl. Wakefield) (m3/day)	Daily 2047 (incl. Wakefield) (m3/day)
Peak Week Daily Demand	**15,900**	**24,000**	**37,000**
Stage 3 Rationing (permitted abstraction)	11,000	12,200	14,400
Stage 5 Rationing (permitted abstraction)	2,600	3,500	5,700
Rationing Stage	**Daily Water Gap 2017**	**Daily Water Gap 2047**	**Daily Water Gap 2117**
Stage 3	4,900	11,800	22,600
Stage 5	13,300	20,500	31,300

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Water Gaps

- Step 3
  - 4,900 m3/day in 2017
  - 11,800 m3/day in 2047
  - 22,600 m3/day in 2117 (incl Wakefield)
- Step 5
  - 13,000 m3/day in 2017
  - 20,000 m3/day in 2047
  - 31,000 m3/day in 2117 (incl Wakefield)

Storage Requirements

Rationing Stage	2017 (m3)	2047 (m3)	2117 (m3)
Stage 3 (60 days)	249,000	601,000	1,153,000
Stage 5 (40 days)	452,000	697,000	1,064,000
Total (100 days)	**701,000**	**1,298,000**	**2,217,000**

Summary

- 800,000 m3 in 2017 (700,000m3 + 100,000m3)
- 1,400,000 m3 in 2047 (1,300,000m3 + 100,000m3)
- 2,300,000 m3 in 2117 (2,200,000m3 + 100,000m3)

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Plan B Options – Urban Supply Only

- Riverside storage
- Motueka aquifer
- Roding River storage
- Teapot valley storage
- Nelson City Council

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Riverside Storage

1. Storage Options;
    1. 500,000 m3 (meet 2017 Stage 3 Demand)
    2. 800,000 m3 (meet 2017 Stage 5 Demand)
    3. 1,400,000 m3 (meet 2047 Stage 5 Demand)
    4. 2,300,000 m3 (meet 2117 Stage 5 Demand)

Riverside Storage (500,000m3)

- Scope
  - 4 Riverside abstraction bores
  - Storage Pond 1 x 500,000m3
  - Land Acquisition 20 ha
  - Transfer trunk main 4.8 km x 360mm pipe
  - Ultra-Filtration Membrane Plant (4,000 m3day capacity)

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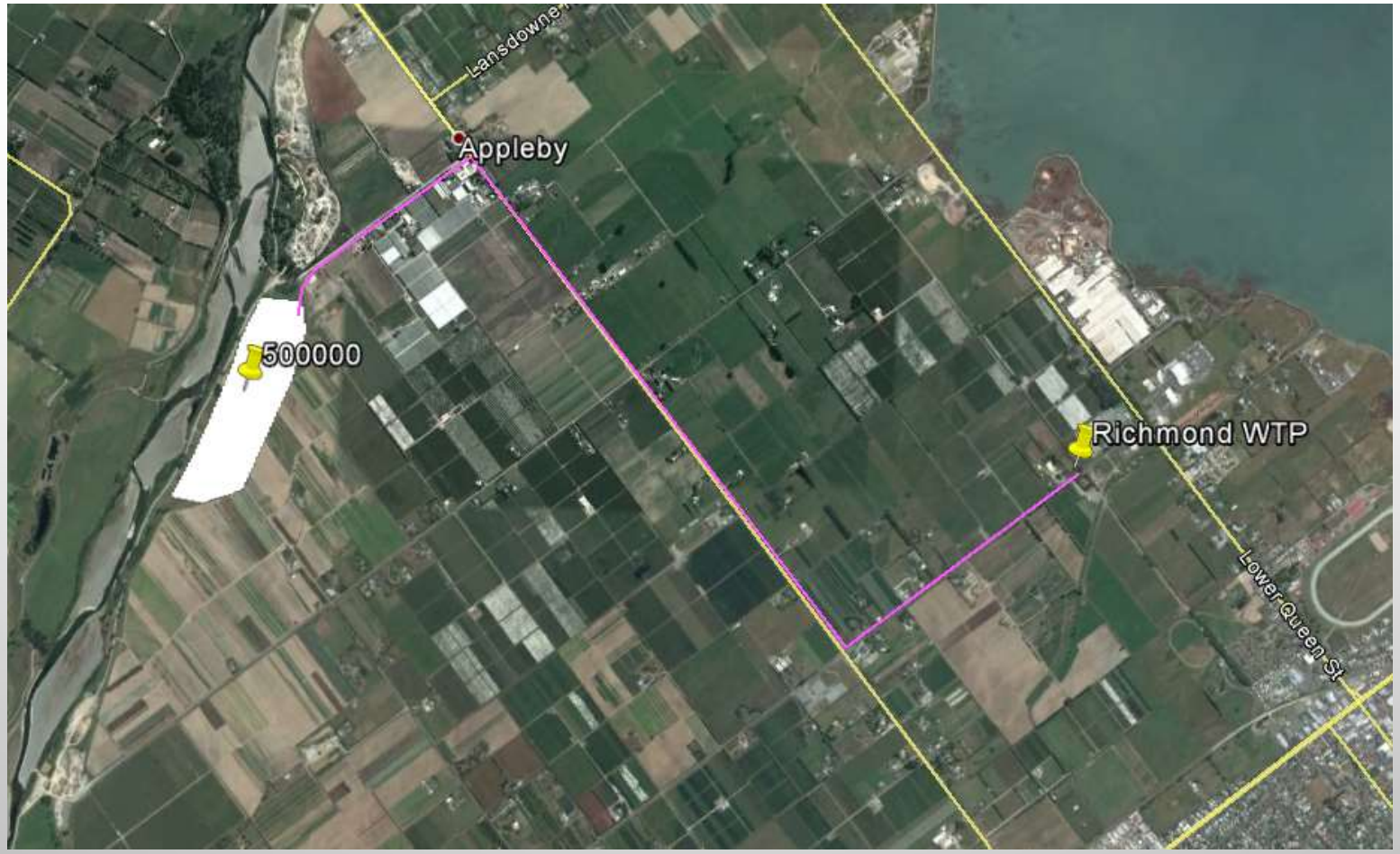
Riverside Storage (500,000m3)



Riverside Storage (500,000m3)

- Cost Estimates
  - Abstraction Bores and Piping $ 500
  - Storage and Pumping $ 6,050
  - Pipework to T/Plant $ 3,000
  - UF Membrane T/Plant $ 5,540
  - **Physical Works** **$ 15,090**
  - Land Purchase $ 2,150
  - Consents, Fees & PM $ 2,460
  - Scope Risk (25%) $ 4,900
  - **Project Estimate** **$24,600**

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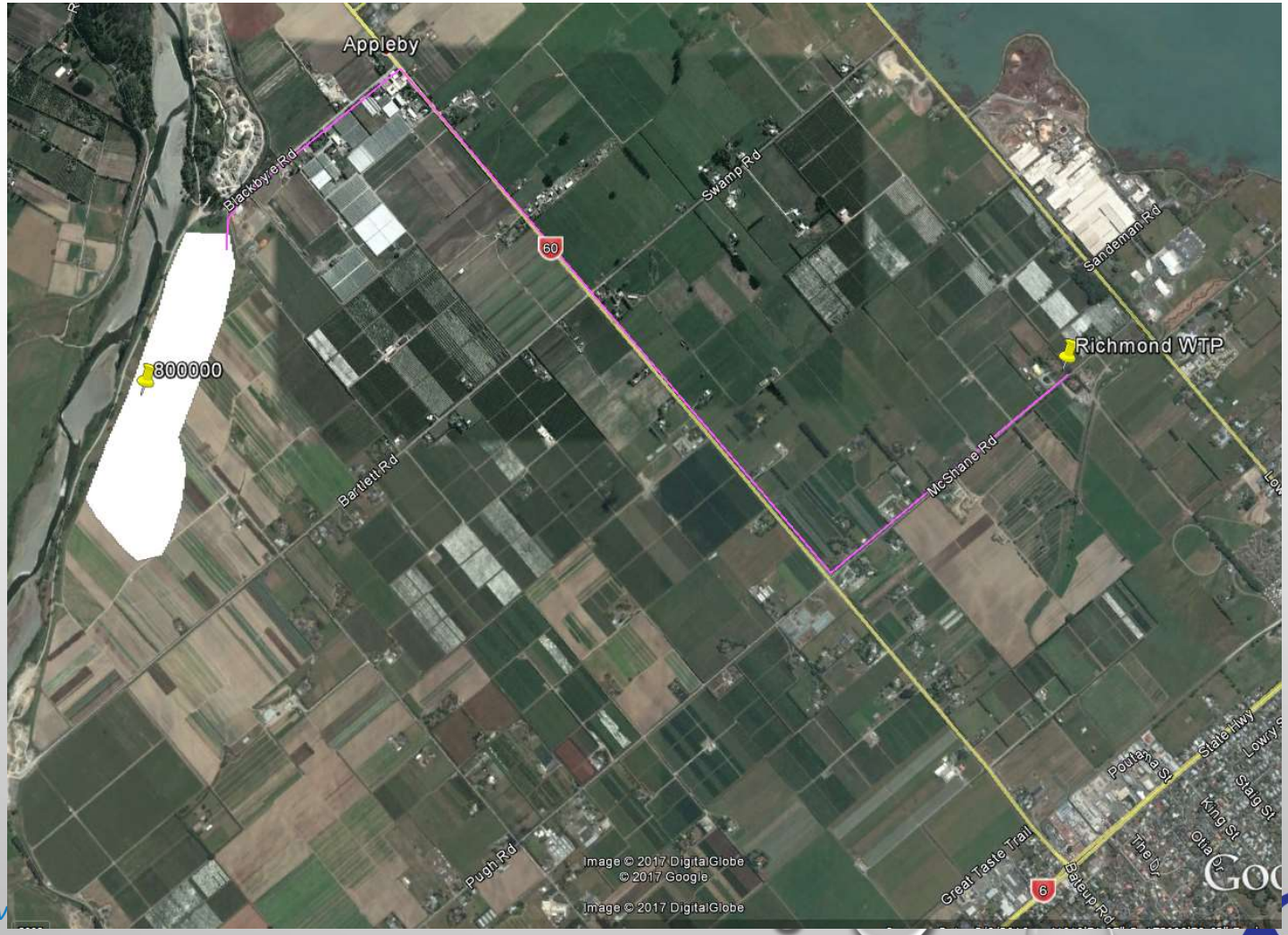
Riverside Storage (800,000m3)

- Scope
  - 8 Riverside abstraction bores
  - Storage Pond 1 x 800,000m3
  - Land Acquisition 32 ha
  - Transfer trunk main 4.8 km x 560mm dia pipe
  - Ultra-Filtration Membrane Plant (13,000 m3/day capacity)

Riverside Storage (800,000m3)



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Riverside Storage (800,000m3)

- Cost Estimates ($'000)

• Abstraction Bores and Piping	$ 800
• Storage and Pumping	$ 9,300
• Pipework to T/Plant	$ 5,200
• UF Membrane T/Plant	$ 19,800
• **Physical Works**	**$ 35,100**
• Land Purchase	$ 3,300
• Consents, Fees & PM	$ 4,800
• Scope Risk (25%)	$ 10,800
• **Project Estimate**	**$54,000**

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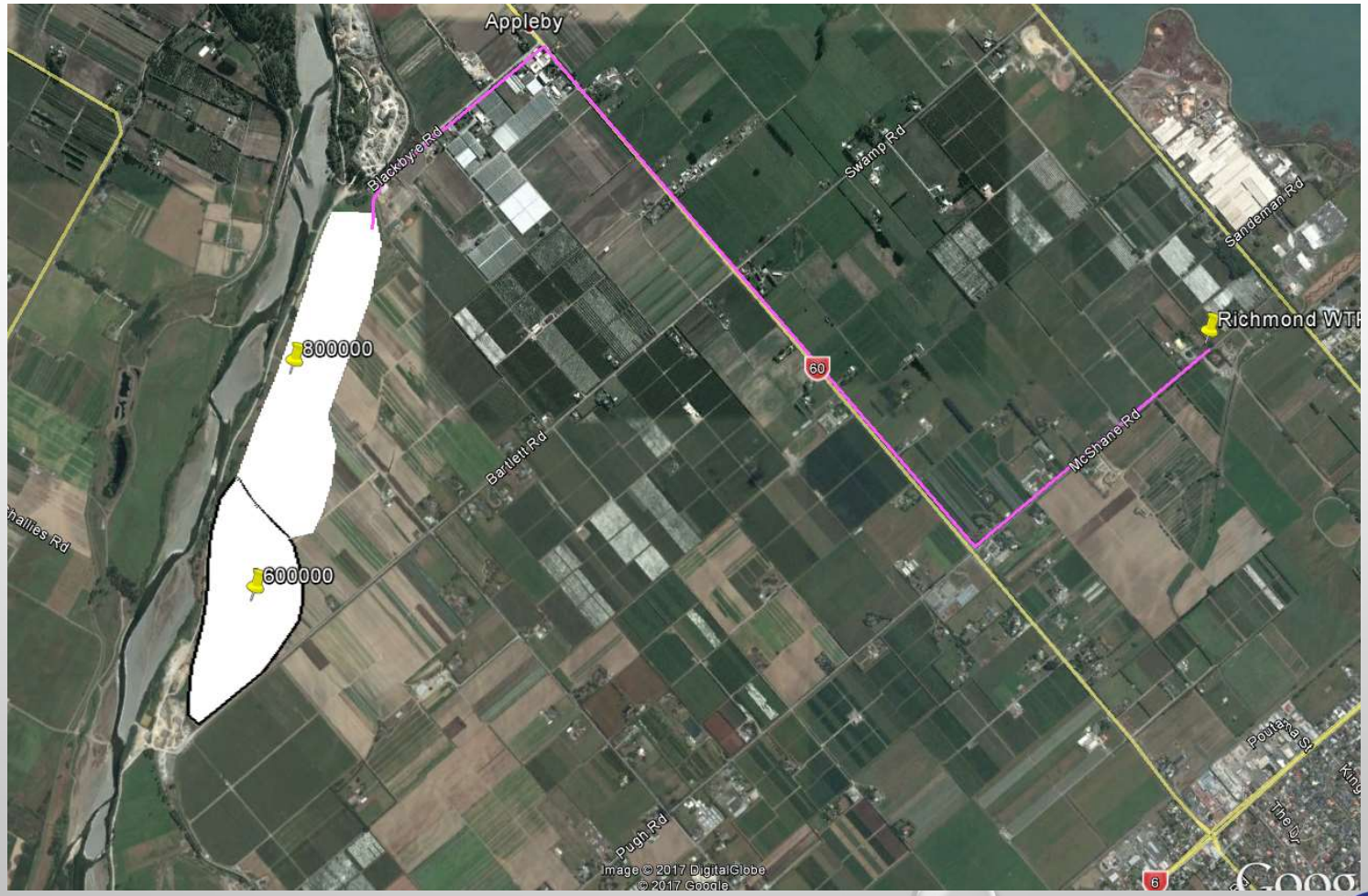
Riverside Storage (1,400,000m3)

- Scope
  - 12 Riverside abstraction bores
  - Storage Ponds - 1 x 800,000m3 and 1 x 600,000m3
  - Land Acquisition 56 ha
  - Transfer trunk main 4.8 km x 710mm pipe
  - Ultra-Filtration Membrane Plant (20,000 m3/day capacity)

Riverside Storage (1,400,000m3)



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Riverside Storage (1,400,000 m3)

- Cost Estimates ($'000)

• Abstraction Bores and Piping	$ 1,300
• Storage and Pumping	$ 16,400
• Pipework to T/Plant	$ 7,600
• UF Membrane T/Plant	$ 28,700
• **Physical Works**	**$ 54,000**
• Land Purchase	$ 5,800
• Consents, Fees & PM	$ 7,400
• Scope Risk (25%)	$ 16,800
• **Project Estimate**	**$84,000**

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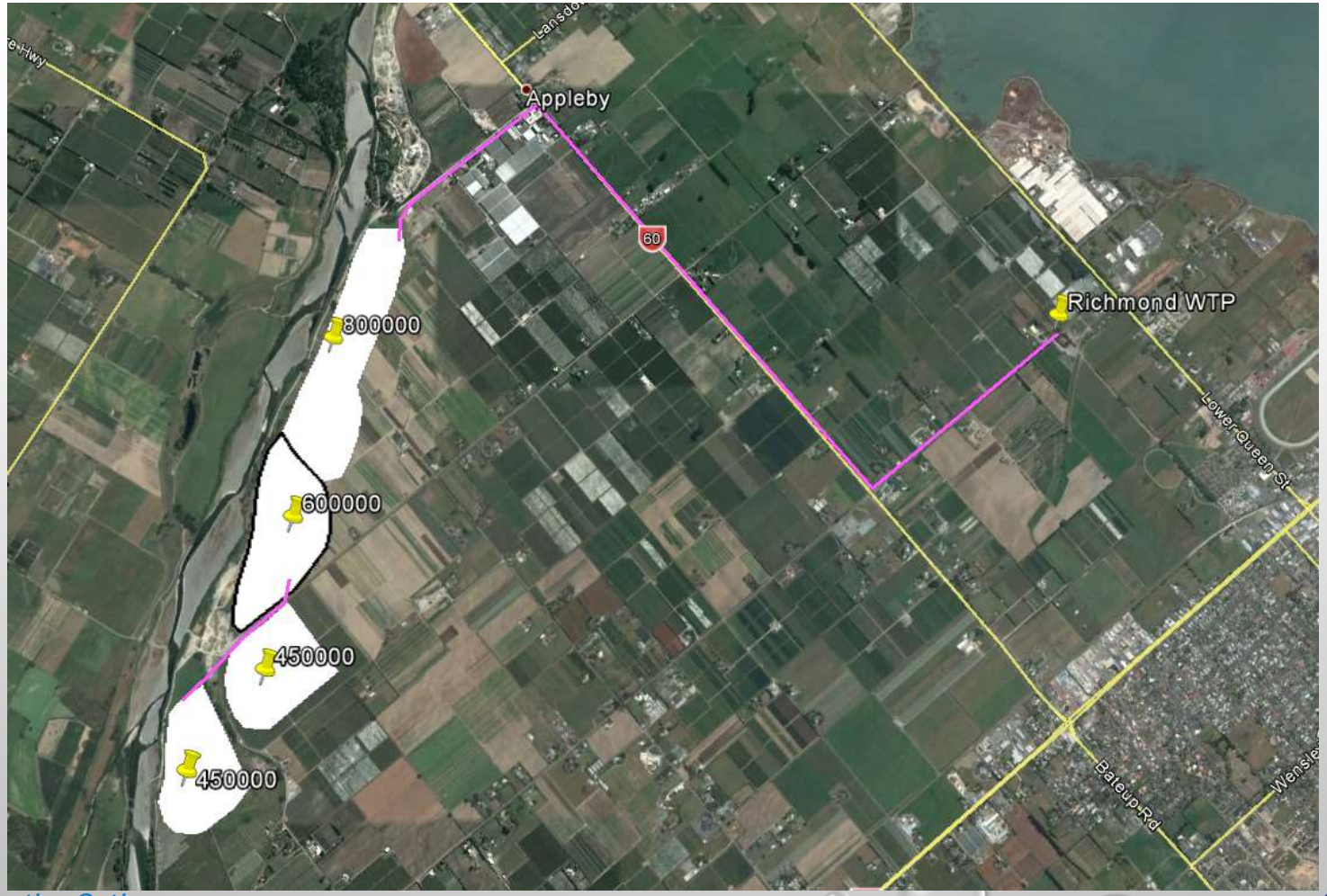
Riverside Storage (2,300,000m3)

- Scope
  - 18 Riverside abstraction bores
  - Storage Ponds - 1 x 800,000m3, 1 x 600,000m3 and 2 x 450,000m3
  - Land Acquisition 92 ha
  - Transfer trunk main 4.8 km x 800mm pipe and 0.75km x 710mm pipe
  - Ultra-Filtration Membrane Plant (31,000 m3/day capacity)

Riverside Storage (2,300,000m3)



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Riverside Storage (2,300,000 m3)

- Cost Estimates ($'000)
  - Abstraction Bores and Piping $ 2,000
  - Storage and Pumping $ 20,800
  - Pipework to T/Plant $ 9,900
  - UF Membrane T/Plant $ 34,800
  - **Physical Works** **$ 67,500**
  - Land Purchase $ 9,500
  - Consents, Fees & PM $ 9,500
  - Scope Risk (25%) $ 21,500
  - **Project Estimate** **$108,000**

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Riverside Storage – Operational Costs

Storage Option	Riverside Bores	Pumping to WTP	Treatment	Admin, Depreciation, Insurance etc	Opex p.a.
500,000 m3	$28,000	$10,000	$320,000	$430,000	**$788,000**
800,000 m3	$56,000	$41,000	$1,050,000	$1,150,000	**$2,297,000**
1,400,000 m3	$84,000	$64,000	$1,600,000	$1,750,000	**$3,498,000**
2,300,000 m3	$126,000	$98,000	$2,500,000	$2,300,000	**$5,024,000**

- Based on treatment plant being operable for 150 days
- Based on treating raw water for 100 days per year

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Riverside Storage - Risks

- Consentability
  - Irrigator interests
  - neighbours interests
  - flight path bird strike
- Constructability
  - 5.0 metre deep - 3.0 metres below ground and 3.0 above ground
  - May not be able to go deeper than 1.0 m without affecting groundwater
  - Seismic considerations - earth retaining structures above ground
  - Geological constraints
- Operational
  - Water Quality

Summary - Riverside Storage

Storage	Capital Cost ($'000)	Opex ($ p.a.)	Daily Flow (m3)	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
500,000 m3	$24,600	$788,000	4,000	4,900	11,800	22,600
				13,300	20,500	31,300
800,000 m3	$54,000	$2,297,000	13,000	4,900	11,800	22,600
				13,300	20,500	31,300
1,400,000 m3	$84,000	$3,498,000	20,000	4,900	11,800	22,600
				13,300	20,500	31,300
2,300,000 m3	$108,000	$5,024,000	31,000	4,900	11,800	22,600
				13,300	20,500	31,300

Green – could meet water gap demand

Red – does not meet demand

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Option 1: Riverside storage – conclusion

- The only storage option at 2,300,000 m3 that meets water demand for 100 years will cost over $5,000,000 annually in operating expenses
- Only contributes to urban water supply, not river health or irrigation water security
- Significant issues that present challenges in consenting, geological constraints, seismic issues, and storage location amenity concerns
- The capital cost ranges from $3,480 to $6,150 per m3/day
- **Option 1: Riverside storage is not as cost-effective as the Waimea Community Dam option**

Plan B Options – Urban Supply Only

- Riverside storage
- Motueka aquifer
- Roding River storage
- Teapot valley storage
- Nelson City Council

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Motueka Aquifer

- Consented Volumes (20,500 m3/day)
  - 4,500 m3/day from Recreation Centre and Fearons Bush
  - 16,000 m3/day from Parker Street
    - 10,109 for Motueka urban
    - 5,891 m3/day available for Mapua
- Aquifer Capacity
  - 35,000 – 45,000 m3/day potential
  - 21,200 – 31,200 m3/day available for Mapua, Richmond, Brightwater

Motueka Aquifer

- Consenting additional volumes
  - Requires plan change to increase community supply abstraction
    - Cultural Interests (exporting water to another catchment)
    - Community Interests
    - Re-run ground water model to verify available volumes and draw-down effects
    - Plan change could take at least 18 months and cost $300,000 to $1 million.
    - Council processing costs $150,000 excluding appeals (Waimea Dam $200,000)

Motueka Aquifer

- Scope
  - Abstraction bores
  - Pumping to Old Coach Road
  - Transfer trunk main 17.0 km from bores to Mapua
  - Storage tanks Old Coach Road site
  - Gravity trunk mains from Old Coach Road site to Richmond WTP
- 3 Options
  - 5,900 m3/day to Mapua only
  - 13,000 m3/day to Mapua, Richmond and Brightwater
  - 31,000 m3/day to Mapua, Richmond and Brightwater

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Motueka Aquifer

Abstraction	Bores	Trunk main to Old Coach Road	Reservoir Storage Old Coach Road	Gravity Main to Richmond WTP	Capital Cost ($'000)
5,900 m3/day	6	17km x 375mm dia	10,000 m3	None	**$35 - $40,000**
13,000 m3/day	10	17km x 710mm dia	20,000 m3	22km x 710mm dia	**$100 -$120,000**
31,000 m3/day	18	17km x 900mm dia	30,000 m3	22km x 1000mm dia	**$160 -$200,000**

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Summary – Motueka aquifer

Supply (m3/day)	Capital Cost ($'000)	Opex ($ p.a.)	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
5,900	$35 - $40,000	$750,000	4,900	11,800	22,600
			13,300	20,500	31,300
13,000	$100 - $120,000	$1,600,000	4,900	11,800	22,600
			13,300	20,500	31,300
31,000	$160 - $200,000	$2,800,000	4,900	11,800	22,600
			13,300	20,500	31,300

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Option 2: Motueka Aquifer - conclusion

- The only supply option of 31,000 m3/day that meets water demand for 100 years will cost at least $160,000,000 to construct and $2,800,000 annually in operating expenses
- Only contributes to urban water supply, not river health or irrigation water security
- Requires a pipe to be installed across the Moutere inlet, which significantly raises capital cost
- The capital cost ranges from $5,810 to $8,460 per m3/day
- **Option 2: Motueka aquifer is not as cost-effective as the Waimea Community Dam option**

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Plan B Options – Urban Supply Only

- Riverside storage
- Motueka aquifer
- Roding River storage
- Teapot valley storage
- Nelson City Council

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Roding River Storage

- Current Roding Weir Source
  - 909 m3/day or 1/15th of authorised daily abstraction at 300kpa pressure
- Roding High Dam
  - 1994 Study outlined two dam options at current weir site
  - Dam volumes varied between 1.2 – 5.1 million m3
  - Range of abstraction flows; 22,000, 30,000 and 50,000 m3/day
  - Urban supply only
  - No contribution to maintain minimum flows in Roding River
  - No allowance for irrigation in Waimea Plains

Roding River Storage

- Scope and Estimates
  - High dam with capital cost $45 - $75 million
    - Included cost of building dam and headworks
    - Included piping to Marsden Valley Pumpstation
  - Piping from Marsden Valley to Richmond Reticulation
    - Various options from single trunk main to 2 or more trunk mains
    - Capital cost likely to be $15 - $25 million
  - Treatment Plant
    - Located probably in Marsden Valley, could be along Richmond Hills
    - Capital Cost for 50,000 m3/day $35-$40 million
  - Operating Costs
    - Dam costs similar to Lee Valley less JV costs, say $1.0-$1.2 million
    - Treatment Plant Costs of $2.4 to $2.6 million p.a.

Roding River Storage

- Consenting
  - Similar considerations as Lee Valley Dam consent
  - Requires consent from Nelson City Council
    - Minimum Flow considerations
    - Community Interests
    - Irrigator Interests
    - Consent could take at least 18 months and cost $300,000 to $1 million.
    - Council processing costs $150,000 excluding appeals (Waimea Dam $200,000)

Summary - Roding River Storage

- Capital Estimates
  - Storage Capacity — 1,200,000 m3 to 5,100,000m3
  - Abstraction Options — ~~22,000m3/day~~, 30,000m3/day, ~~50,000m3/day~~
  - Dam and Piping — $45,000,000 to $75,000,000
  - Trunkmain to Richmond — $15,000,000 to $25,000,000
  - Treatment — $35,000,000 to $45,000,000

  Total Estimate — **$95,000,000 to $145,000,000**
- Operational Estimates
  - Dam — $1,000,000 to $1,200,000
  - Treatment — $2,400,000 to $2,600,000

  Total Estimate — **$3,400,000 to $3,800,000**

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Option 3: Roding River Storage - conclusion

- Requires new dam, extensive trunk main installation, and a new water treatment plant
- Capital costs exceed $95,000,000 and annual operating costs would start at $3,400,000
- Only contributes to urban water supply, not river health or irrigation water security
- Consent required similar to Waimea Community Dam consent, which is already in place
- The capital cost is around $4,000 per m3/day
- **Option 3: Roding River storage is not as cost-effective as the Waimea Community Dam option**

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Plan B Options – Urban Supply Only

- Riverside storage
- Motueka aquifer
- Roding River storage
- Teapot valley storage
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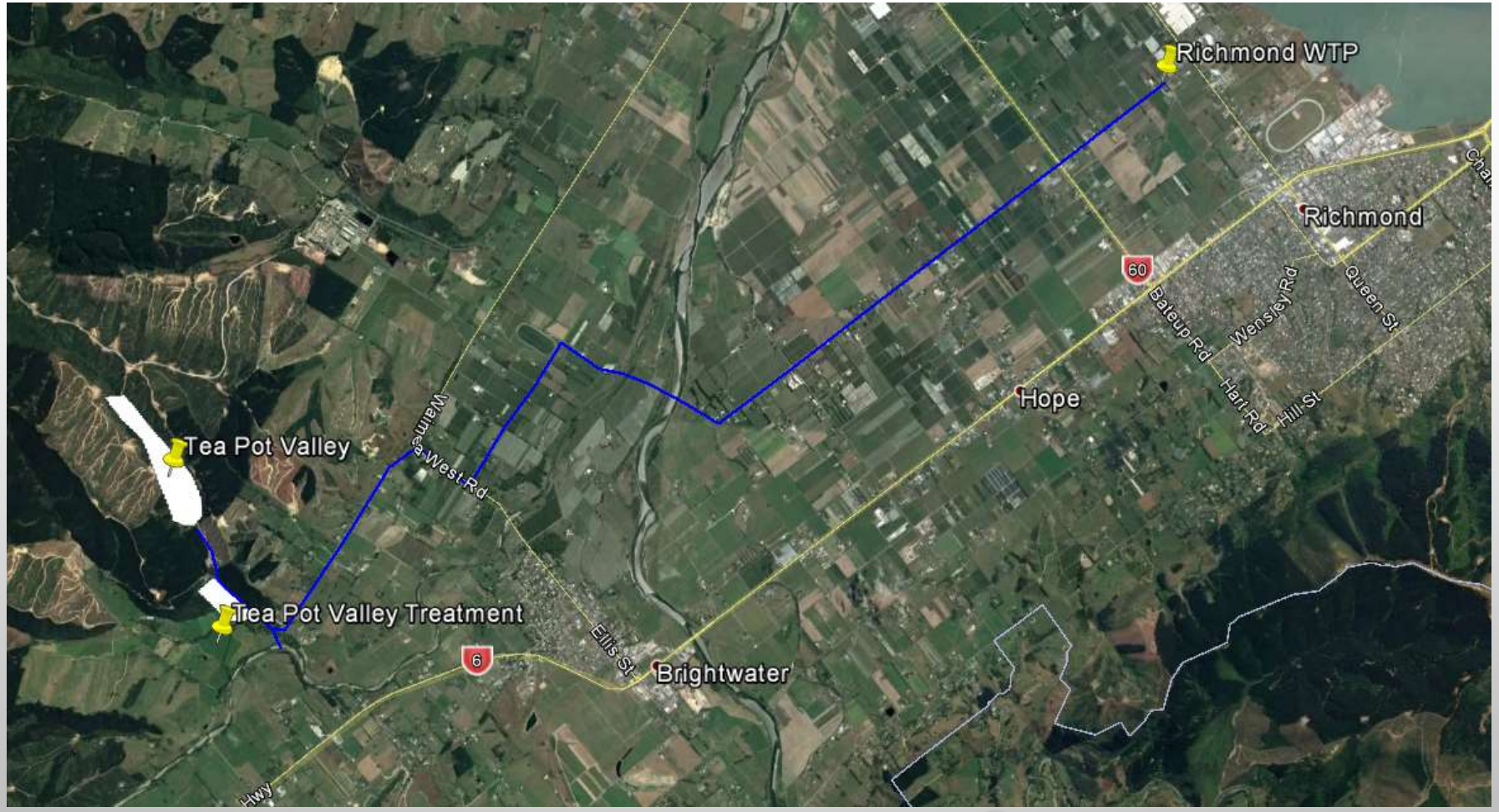
Teapot Valley – Dam Site

- Not shortlisted for reasons already stated
- Description
  - Storage volume of 500,000 m3
  - Catchment can only support 200,000 m3
  - Additional winter pumping of 300,000 m3 required from Wai-iti River
  - Insufficient volumes to maintain minimum river flows in Waimea River
  - Catchment geology results in poor water quality
  - Water Treatment would be required

Teapot Valley – Dam Site

- Scope
  - Dam Construction (500,000m3)
  - Land Acquisition 40 ha
  - Riverside pumpstation to supplement storage and pump to Richmond WTP
  - Trunk Main from Riverside pumpstation to Dam 1.35 km x 450mm dia pipe
  - Transfer trunk main to Richmond WTP 11.0 km x 500mm dia pipe
  - Riverside Treatment Plant (4,000 m3/day capacity)

Teapot Valley – Dam Site



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Teapot Valley – Dam Site

- Cost Estimates ($'000)

• Dam Construction	$ 5,400
• Pumpstation	$ 1,500
• Trunk Main – to dam	$ 1,200
• Trunk Main – to Richmond	$ 12,000
• T/Plant (4,000 m3/day)	$ 8,100
• **Physical Works**	**$ 28,200**
• Land Purchase (40ha)	$ 2,150
• Consents, Fees & PM	$ 6,600
• Scope Risk (25%)	$ 9,200
• **Project Estimate**	**$ 46,150**

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Teapot Valley – Dam Site

- Consentability
  - Similar to Lee Valley Dam Option
  - Winter abstraction from Wai-iti River to supplement storage (300,000m3 per year)
  - Potentially only urban supply
  - Neighbours interests
- Operational
  - Storage only 500,000 m3 – catchment support 200,000m3
  - Water quality problems due to geological terrain
  - Considerable social impact due to habitation

Teapot Valley – Dam Site – Operational Costs

Storage	Pumping Station ($ p.a.)	Treatment ($ p.a.)	Admin, Insurance etc ($ p.a.)	Depreciation ($ p.a.)	Opex ($ p.a.)
500,000 m3	$50,000	$326,000	$250,000	$485,000	**$1,111,000**

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Summary – Teapot Valley

Storage	Capital Cost ($'000)	Opex ($'000 p.a.)	Daily Flow (m3)	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
500,000 m3	$46,150	$1,111	4,000	4,900	11,800	22,600
				13,300	20,500	31,300

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Option 4: Teapot Valley Dam - conclusion

- Significant list of issues to overcome
- Maximum water storage with this option will not meet water demand
- Capital costs include significant land purchase
- Only contributes to urban water supply, not river health or irrigation water security
- The capital cost is $11,540 per m3/day
- **Option 4: Teapot Valley Dam is not as cost-effective as the Waimea Community Dam option**

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Plan B Options – Urban Supply Only

- Riverside storage
- Motueka aquifer
- Roding River storage
- Teapot valley storage
- Nelson City Council

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Plan B Options - Nelson City Council Water Supply

- Nelson supply capacity = 50,000 m3/day (ex Tantragee WTP)
- The 50,000m3/day supply capacity subject to;
  - All membranes being renewed in 2018/19
  - Upgrade Pumpstation on duplicate raw water ex Maitai Dam
  - Upgrade Tantragee Water Treatment Plant
  - Build additional on-site storage
  - Rough order cost all four items $19-$24 million
- Nelson City peak demand = 30,000 m3/day (Feb 2017)
- Nelson City Council has requested margin 10-15,000 m3/day

Plan B Options - Nelson City Council Water Supply

- Potentially 5-10,000 m3/day surplus available
- Requires upgrade of reticulation to supply Richmond
  - Rough Order Cost = up to $10 million
- Potential cost share for Tasman District Council
  - Share of Upgrade to Tantragee WTP – potentially $2.0 - $4.8 million (10%-20%)
  - Upgrade of reticulation to supply Richmond – up to $10 million
- Risks
  - Any supply to Richmond would be subject to Nelson rationing/restrictions
  - Reduces the capacity Nelson has invested in to date

Plan B Options - Nelson City Council Water Supply

Supply (m3/day)	Capital Cost ($'000)	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
5,000	$12,000 - $12,400	4,900	11,800	22,600
		13,300	20,500	31,300
10,000	$14,000 - $14,800	4,900	11,800	22,600
		13,300	20,500	31,300

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Option 5: Nelson City Water Supply - conclusion

- Nelson City could have 5-10,000 m3/day available
- Will require investment at Tantragee Plant ($19-$24 million)
- Will require upgrade of reticulation to Richmond (up to $10 million)
- Capital contribution could be $12 - $14.8 million
- Only contributes to urban water supply, not river health or irrigation water security
- Increases reliance on Maitai Dam and Roding River takes which is a risk
- Reduces the capacity Nelson City Council has invested in to date
- The capital cost is $1,480 - $2,400 per m3/day
- **Option 5: Nelson City Water Supply option is not as cost-effective as the Waimea Community Dam option**

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Presentation Topics

- History
- Rationing Stages and Projected Demands
- Demand Assumptions
- Water Gaps and Storage Requirements
- Plan B options
- Domestic Harvesting
- Preferred Option - Waimea Community Dam
- Option Assessment and Analysis

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Domestic Water Harvesting

- Urban Domestic Households (excl rural restricted connections)
  - Richmond 4551
  - Hope/Brightwater 1068
  - Mapua 862
  - **Total Urban** **6,481 (**metred connections)
- 2017 Peak Week Daily Demand = 15,900 m3/day

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Domestic Water Harvesting

- Water Conservation (residential water tanks)
  - Domestic Potable Water Consumption = 700 litres/day
    - Baths and Showers 25% (175 l/day)
    - Toilets 25% (175 l/day)
    - Kitchen 10% (70 l/day)
    - Laundry 20% (140 l/day)
    - Gardening 20% (140 l/day)
  - Rainwater tanks
    - Toilets 175 l/day
    - Gardening 140 l/day
    - Total 315 l/day

Domestic Water Harvesting

- Urban Domestic Households = 6,481 (metred connections)
- Current Peak Week Daily Demand = 15,900 m3/day
- Potential Conservation

Watertank Takeup	Toilets (m3/day)	Gardening (m3/day)	Combined Saving (M3/day)	Portion of PWDD (%)
100%	1,134	907	2,041	12.8%
60%	680	545	1,225	7.7%
30%	340	272	612	3.9%

Domestic Water Harvesting

- Size of Water Tanks
  - 100 days @ 315 litres/day (toilet and garden) 31.5 m3
  - 100 days @ 175 litres/day (toilet only) 17.5 m3
- Water Tank Installation per property
  - 1 x 22.5 m3 tank $ 3,500
  - Pump and Power (0.55kw) $ 500
  - Rainwater collection $ 500
  - Plumbing (toilet and gardening) $ 500
  - Total Capital Cost per property $ 5,000
- Total Cost for 6,481 urban properties = $32,400,000
- Operating Costs = c$40 p.a. (power)
- Pumps and plumbing will need to be maintained ($60/year?)

Summary - Domestic Water Harvesting

- Conserves up to 2,041 m3/day (100% take-up, 12.8% of PWDD)
- Not sufficient to meet water augmentation requirements
- Capital Cost = $5,000/property
- Annual Operating costs = $40-$100/property
- Future option for water conservation, but not current augmentation
- Comment - unlikely to get 100% take-up in short-term

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Preferred Option – Waimea Community Dam

- Identified as preferred option (site 11)
- Located in Upper Lee Valley

WCD – Capacity Allocations

Allocations	Ha/Ha.e	Extractive (%)	Volume (m3/day)	Portion of Dam Capacity (%)
Environmental Flow			**95,200** (1,100 l/s)	**30%**
Consented Irrigation	3,800	49%	163,000	34%
Future Irrigation Waimea Plains	1,500	19%	64,400	14%
Future Irrigation outside Waimea Plains	550	7%	23,600	5%
Total Ha	**5,850**		**251,000**	**53%**
Current Consented Urban & Industrial	620	8%	26,600	6%
Future Consented Urban & Industrial	780	10%	33,400	7%
Total Ha.e	**1,400**	**18%**	**60,000**	**13%**
Regional Future Capacity (NCC and other)	515	7%	**22,000**	**5%**
Total Extractive Capacity Ha.e	**7,765**	**100%**	**428,200**	**100%**

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Waimea Community Dam

- Already Consented
- Storage Volume 13,000,000m3
- 53 m high earth embankment dam
- Meets current shortfall and demand projections for 100 years
- Meets 1 in 60 year drought
- Capacity undertake the following concurrently
  - Maintain minimum flow of 1100 l/s at Appleby bridge
  - Irrigate up to 5,860 hectares (via aquifer)
  - Supply up to 60,000m3/day for Urban supply (via aquifer)

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Waimea Community Dam - Estimates

Storage (m3)	Allocation	Capital Cost ($'000)	Opex ($ p.a.)	Daily Flow (m3)	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
13,000,000	Environment (min. river flow)	$17,200	$715	95,200 (1100 l/s)	N/A	N/A	N/A
	Urban	$9,580		60,000	4,900	11,800	22,600
					13,300	20,500	31,300
	Irrigators	$37,120	$686	251,000	N/A	N/A	N/A
	Nelson CC	$5,000 (?)	$0	22,000	N/A	N/A	N/A
	MFE (FIF)	$7,000	$0	N/A	N/A	N/A	N/A
	Total	**$75,900**					

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Option Assessment and Analysis

- Compares the following Options;
  - Riverside Storage
  - Motueka Aquifer
  - Roding River Dam
  - Teapot Valley Dam
  - Nelson City Council
  - Waimea Community Dam (Preferred Option)
- First Table compares;
  - Storage
  - Capital Expenditure
  - Operational Expenditure
  - Daily Flows
  - Capex per m3/day delivered
  - Rationing Compliance with Step 3 and/or Step 5

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Water Augmentation Options	Storage (m3)	Capital Cost ($'000)	Opex ($'000 p.a.)	Daily Flow (m3)	Capital Cost/Daily Flow ($'000/m3/day)	Rationing Step	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
Riverside Storage	500,000	$24,600	$788	4,000	6.15	3	4,900	11,800	22,600
						5	13,300	20,500	31,300
	800,000	$54,000	$2,297	13,000	4.15	3	4,900	11,800	22,600
						5	13,300	20,500	31,300
	1,400,000	$84,000	$3,498	20,000	4.20	3	4,900	11,800	22,600
						5	13,300	20,500	31,300
	2,300,000	$108,000	$5,024	31,000	3.48	3	4,900	11,800	22,600
						5	13,300	20,500	31,300
Motueka Aquifer	N/A	$35 - $40,000	$750	5,900	6.36	3	4,900	11,800	22,600
						5	13,300	20,500	31,300
		$100 - $120,000	$1,600	13,000	8.46	3	4,900	11,800	22,600
						5	13,300	20,500	31,300
		$160 - $200,000	$2,800	31,000	5.81	3	4,900	11,800	22,600
						5	13,300	20,500	31,300
Roding River Storage	4,000,000	$110,000	$3,600	30,000	3.67	3	4,900	11,800	22,600
						5	13,300	20,500	31,300
Teapot Valley Dam	500,000	$46,150	$1,111	4,000	11.54	3	4,900	11,800	22,600
						5	13,300	20,500	31,300
Nelson City Council	N/A	$12 - $12,400	NCC water charges	5,000	2.40	3	4,900	11,800	22,600
		$14 - $14,800	NCC water charges	10,000	1.48	3	13,300	20,500	31,300
Waimea Community Dam	13,000,000	9,580	$714	31,000	0.31	3	4,900	11,800	22,600
		26,780			0.86	5	13,300	20,500	31,300

Option Assessment And Analysis

Second table compares compliance with intangibles

- Risks
  - Consentability
  - Constructability
  - Operability
  - Land/Access
- Benefits
  - Regional – *Nelson CC and Tasman DC*
  - Urban Demand – *meets demand*
  - River Flows – *maintain min flows Waimea River*
  - Irrigators – *Allow irrigators to continue irrigating during summer months*
  - Wider District – *those not directly benefitting from water augmentation option*
- Dis-benefits
  - Harvesting Impact On Other Areas
  - Economic Opportunity Cost
- Strategic Fit
  - Growth Demand – *can accommodate*
  - NPS-FWM Obligations
  - LTP 2015-25 Objectives – "*Contribute up to a maximum of $25 million towards the Waimea Community Dam. The funding is mainly to be used to secure water for Council's reticulated water supply users and contribute to the environmental health of the Waimea River*"
  - Council Vision – "*Thriving Communities enjoying the Tasman Lifestyle*"

		Risks				Benefits					Disbenefits		Strategic Fit			
Option	Daily Flow (m3/day)	Consentability	Constructability	Operability	Land/Access	Regional	Urban	River Flows	Irrigators	Wider District	Harvesting Impact on others	Economic Opportunity Cost	Meets Growth Demands	NPS-FWM Obligations	LTP 2015-2025 Objectives	Council Vision
River Storage	4,000															
	13,000															
	20,000															
	31,000															
Motueka Aquifer	5,900															
	13,000															
	31,000															
Roding River Dam	30,000															
Teapot Valley Dam	4,000															
Nelson City Council	10,000															
Waimea Community Dam	37,000															

Green – Low risk/compliant Orange – medium risk/marginally compliant Red – high risk/not compliant

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WAIMEA WATER AUGMENTATION PROJECT

ASSESSMENT OF ALTERNATIVE OPTIONS

Richard Kirby
Engineering Services Manager

3 October 2017 Version 1.0

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