Item 1: Shotover Wastewater Disposal - Challenge Workshop & Deliberative Poll

SESSION TYPE: Workshop

PURPOSE/DESIRED OUTCOME:

Following Council's resolution in March to undertake further identification and assessment of land and/or hybrid wastewater disposal options, this workshop is the second in a series, following the 30 July workshop, which presented the project background, the Shotover Wastewater Treatment Plant (WWTP) long-term disposal options, and the proposed deliberative polling approach.

This workshop will provide an opportunity to test, challenge, and further explore the shortlisted wastewater disposal options, along with potential hybrid solutions. The workshop will also provide a forum to test assumptions, consider the structure of the multi criteria assessment (MCA), and understand key constraints identified through the technical assessment process.

The Deliberative Poll presentation will provide a draft set of questions for deliberative polling, as well as a draft process design incorporating feedback received during the 30 July workshop.

This workshop is a joint workshop with the Council, the Directors of the Queenstown Lakes District Council (QLDC) Three Waters and QLDC's Water Services Council Controlled Organisation (WSCCO), which is in its establishment phase.

DATE/START TIME:

Tuesday, 1 September 2026 at 1.30pm

TIME BREAKDOWN:

Challenge Workshop: 1.5 hours
Deliberative Poll Presentation: 30 minutes

PRESENTERS:

External

- Dr Alayna Ra - Technical Director WSP
- Anthony Kirk - Principal GHD
- Helen Barclay - Associate GHD
- Iain Walker - New Democracy Foundation
- Alice Siu - Deliberative Democracy Lab, Stanford University
- Directors of QLDC 3Waters

Internal

- Pennie Pearce - General Manager Strategy & Policy
- Tony Avery - General Manager Property & Infrastructure
- Maseina Koneferenisi - Programme Director, WSCCO Establishment Programme
- Campbell Guy -Senior Policy Advisor

Prepared by:

Name: Scott Paterson
Title: Project Manager
21 August 2026

Reviewed and Authorised by:

Name: Pennie Pearce
Title: General Manager Strategy & Policy
21 August 2026

ATTACHMENTS:

A	Alternative Disposal Options Early Insights Response & Challenge Workshop Pack
B	Deliberative Poll Draft Questions **(page 45)**
C	Deliberative Poll Draft Process Design **(page 56)**

Alternative Disposal Options Early Insights Response Pack

Follow up response to QLDC Asset and Infrastructure Committee Workshop on 30th July 2026

1

Purpose, scope, and key themes

Purpose: The purpose of this response document is to provide Councillors with a clear, evidence-based response to the questions, challenges, and information requests raised during the 30th July 2026 Early Insights workshop as part of the Shotover WWTP Alternative Disposal Options process. This additional information is provided prior to the Challenge Workshop.

Councillors clearly signalled they are not ready to narrow the discussion to the current shortlisted options. In particular, Councillors expressed a desire for further information to confirm that:

- all viable land-based disposal and reuse opportunities have been adequately explored;
- future regulatory, environmental and cultural risks have been appropriately considered;
- cost assumptions and funding approaches have been sufficiently tested;
- and long-term community values, willingness to pay and risk tolerance are better understood

Key themes and actions were to:

- Revisit and challenge assumptions around land disposal and reuse, including reassessing why land-based options were not shortlisted, testing whether any could accommodate 100% of future flows, and reconsidering opportunities such as Malaghans Road, Gibbston Valley, agricultural irrigation, golf courses, hybrid/seasonal reuse, and potable or greywater reuse.
- Improve understanding of environmental effects and wastewater quality, including communicating treatment performance more clearly, investigating alternative disposal approaches such as multiple discharge locations, and confirming whether disposal within the Lake Hayes catchment would necessarily affect lake water quality.
- Strengthen consideration of resilience, risk, and future flexibility, including the implications of regulatory change, intergenerational outcomes, demand management measures such as I&I reduction and volumetric charging, and the ability to adapt to changing wastewater volumes and community expectations over time.
- Make sure long-term strategic outcomes are protected, by considering how mana whenua aspirations can be reflected in practical solutions, evaluating long-term disposal resilience, and assessing the risks of losing future land disposal and reuse opportunities if they are not secured now.

Scope of this document

This document responds to the key themes and requests raised during the workshop. It provides additional information on land disposal and reuse opportunities, environmental effects, funding considerations, risk and resilience, and the assumptions and methodology applied within the multi-criteria assessment (MCA) process.

The intent of this document is not to re-run the optioneering process. Rather, it is to ensure Councillors have sufficient information to understand the basis of the current recommendations, identify any remaining uncertainties, and support informed decision-making on the future direction of the project.

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The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report.. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared the preliminary [cost estimate/prices] set out in section [section number(s)] of this report ("Cost Estimate") using information reasonably available to the GHD employee(s) who prepared this report; and based on assumptions and judgments made by GHD The Cost Estimate has been prepared for the purpose of option comparison and must not be used for any other purpose. The Cost Estimate is a preliminary estimate for comparative purposes only. Actual prices, costs and other variables may be different to those used to prepare the Cost Estimate and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD does not represent, warrant or guarantee that the [works/project] can or will be undertaken at a cost which is the same or less than the Cost Estimate.

3

Land disposal viability

This section provides response and further detail on the feasibility of land disposal in the Whakatipu basin area. It considers:

- Geological constraints on land suitability
- Hydrogeological constraints on hydraulic loading
- Environmental constraints on nutrient loading
- Information on Lake Hayes catchment constraint

Geological constraints

The biggest constraint to the disposal of wastewater in the Whakatipu Basin area is the geology. The Whakatipu basin is a schist bedrock basin carved out by repeated glaciations. Deposits of glacial till, alluvium and lake sediments have accumulated in areas on top of the schist. Together, the schist and deposits influence the area's groundwater and hydrology. The geological map (top image) shows where these different deposits are located (light colours) and the surrounding schist (dark colours).

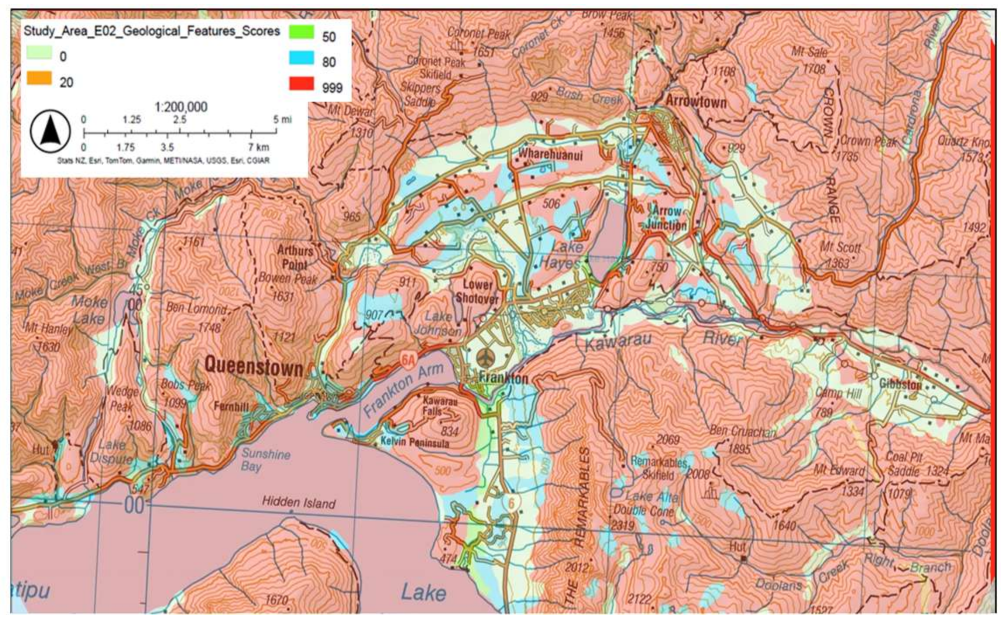
The schist rock is of low permeability, and the soil layer over the rock, when present, is thin. The schist areas are also typically steeply sloping. **Schist is not considered to be suitable for large scale, year-round, wastewater irrigation**. It may be suitable for small wastewater schemes where volumes are low relative to land area, and where irrigation is limited to seasonal application to make best use of evaporation and plant water uptake.

The thin soil layer and steep slopes of schist areas limits large scale irrigation to surface disposal methods (e.g. spray or trickle), and so irrigation is more likely influenced by rainfall and frost. **Rates of irrigation to schist need to be very low** to avoid wastewater pooling and flowing within the thin soil layer, creating springs and destabilising of the thin soil layer causing landslips. Such saturation of soils and run-off during rain events also promotes rapid, uncontrolled flow of applied wastewater to local streams.

The blue and green areas (bottom image) are glacial and alluvial sediments and consideration of wastewater disposal to land has focussed on these areas. These areas are highly variable in their thickness and permeability. Material can range from low-permeability weathered tills and lake silts, to highly permeable gravels that are hydraulically connected to groundwater and surface water systems. This variability makes it difficult to identify large areas capable of providing both adequate hydraulic capacity and separation from surface water.

The constraints map (bottom image) shows in red the areas of schist where wastewater disposal is not considered to be feasible at large scale volumes.

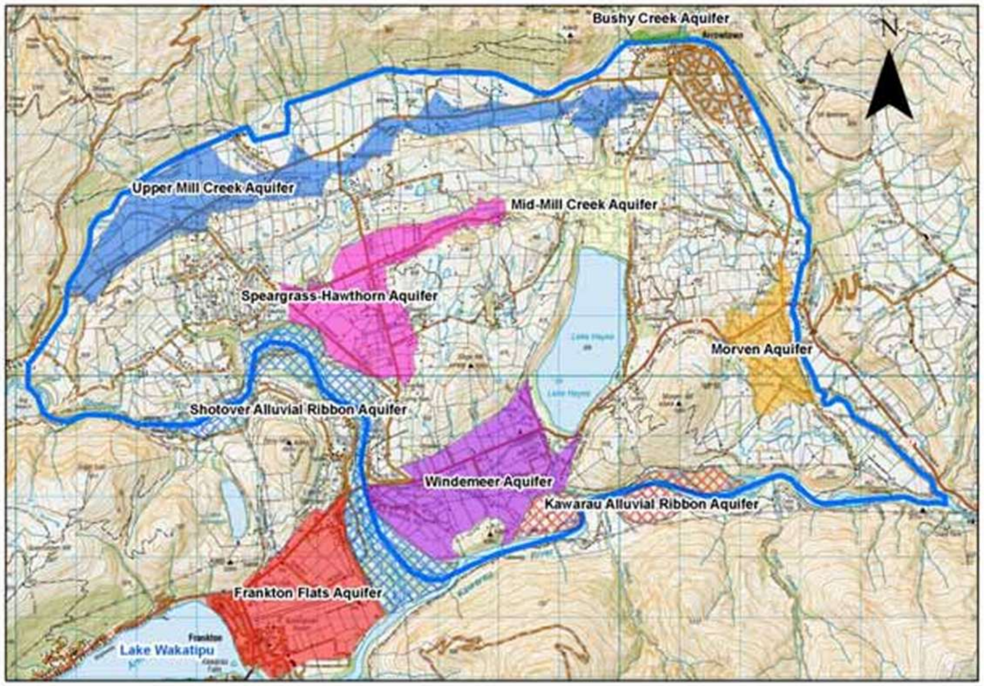
Geological map of the area showing different geological characteristics (schist is blue and purple on this map)



GHD geological constraints layer showing in red areas of schist

Whakatipu Basin aquifers

Aquifers: Within the Whakatipu Basin are a series of small, disconnected aquifers separated by schist bedrock ridges, glacial till and low-permeability lake sediments. These are shown in the figure below and include the Frankton Flats (red), Upper Mill Creek (blue), Mid-Mill Creek (yellow), Hawthorn-Speargrass (pink) and Morven aquifers (orange), together with the alluvial aquifer associated with the Kimi-ākau/Shotover River floodplain. Across much of the basin, groundwater is relatively shallow, typically occurring between 2 and 10 m below ground level.



ORC identified aquifers within the Whakatipu basin

Aquifer recharge: Recharge mechanisms vary between aquifers. The Hawthorn-Speargrass and Morven aquifers are primarily recharged by rainfall infiltration, while the Upper Mill Creek, Mid-Mill Creek and Frankton Flats aquifers receive recharge from both rainfall and adjacent surface water bodies. Groundwater age testing indicates residence times range from approximately 1 to 19 years, with the Hawthorn-Speargrass aquifer containing the youngest groundwater.

The low rainfall and limited recharge available to these aquifers constrains the volume of treated wastewater that can be discharged to land without significantly altering natural groundwater levels. ORC has estimated the mean annual recharge rates for each aquifer, with the Hawthorn-Speargrass aquifer receiving recharge equivalent to approximately 1,260 m³/day and the Upper Mill Creek aquifer approximately 4,300 m³/day. By comparison, the Shotover WWTP daily flow is predicted to increase to 26,000 m³/day in 2060. This volume substantially exceeds the natural recharge of the aquifers and so the outcomes of increasing groundwater levels and flows is an important consideration.

Groundwater flow: Groundwater flow within the basin is controlled by topography, the underlying schist surface and the surrounding river systems. In the lower basin, groundwater generally moves toward the Kimi-ākau/Shotover and Kawarau Rivers, with the Kawarau River forming the regional hydraulic low point. The Upper Mill Creek aquifer is constrained by schist and discharges to surface water in the vicinity of Millbrook and into Lake Hayes, meaning wastewater discharge could increase spring flows and affect the downstream lake environment. Groundwater within the Hawthorn-Speargrass aquifer flows toward the Shotover River, where groundwater emerges as springs on the river terrace that contribute to community drinking water supplies. Additional wastewater-derived groundwater entering these systems could therefore affect springs, and water quality in these areas, while increased groundwater levels may influence river terrace stability.

These groundwater flow patterns are a critical consideration for wastewater disposal because many of the basin gravels are highly permeable and offer relatively short groundwater travel times. This can reduce the opportunity for contaminants to be treated through soil and aquifer processes before groundwater discharges to rivers, springs, lakes or drinking water sources.

Drinking water: There are numerous private drinking water supplies through the basin, with QLDC public drinking water bores taking water from the Mill Creek aquifer, and the Shotover Ribon, upstream of the WWTP.

Conclusion: Any land-based wastewater disposal scheme in the basin must carefully consider effects to groundwater levels, groundwater flow direction, residence times, hydraulic capacity and connectivity to surface water bodies and public water supplies. Protection of community drinking water bores, spring-fed water supplies, Lake Hayes, the Shotover River and the Kawarau River therefore represent likely constraints on wastewater disposal to land within the Whakatipu Basin.

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Nitrogen sensitive areas

Nitrogen Sensitive Zones: ORC has mapped nitrogen sensitive areas within the basin which are generally above the aquifers. Prior to the 21 August 2025 repeal of the nutrient limits in the ORC Regional Plan: Water for Otago the orange areas shown on this map (upper figure) had a nitrogen limit of 20 kg N/ha/y to protect water quality in Lake Hayes and surrounds.

The nitrogen and phosphorous application rates, potential for uptake of nutrients by plants and potential for in-ground treatment, needs to be carefully considered. The previous ORC limit was to the amount of nitrogen leaving the root zone and leaching to groundwater, and this can depend on factors like plant choice and uptake. Given the limited nutrient uptake by plants that occurs during cold seasons, this effectively limits when nutrient application can be carried out.

Relatively limited natural attenuation of nitrogen is expected within the gravel aquifers, due to relatively low organic carbon content, so it can be expected that nitrogen leached to groundwater will ultimately migrate with groundwater flow.

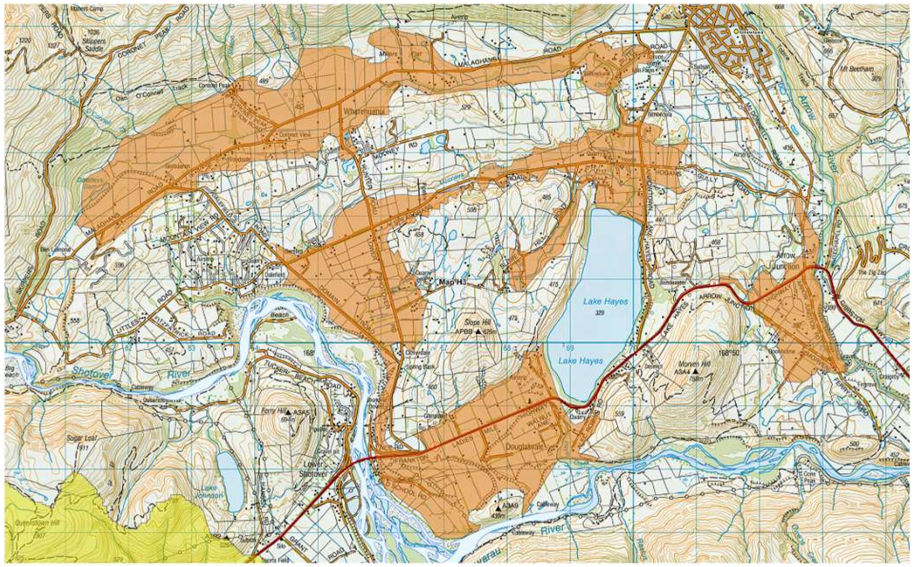
The WEPS do not prohibit wastewater disposal to land based on critical risk to surface water quality. Instead, wastewater discharges to land in the nutrient sensitive areas shown orange are likely to be categorised as Class 3 under the WEPS, and limited to 150 kgN/ha/y and 30 kgP/ha/y.

At the expected WWTP plant performance limit for Total Nitrogen of 8 g/m^3 this limits wastewater application rate to an average of 5 mm/day. At this rate a total irrigatable land area of at least **520 ha** is required based on projected 2060 volumes, with additional land to accommodate access, set-back distances and potentially rotation of irrigation.

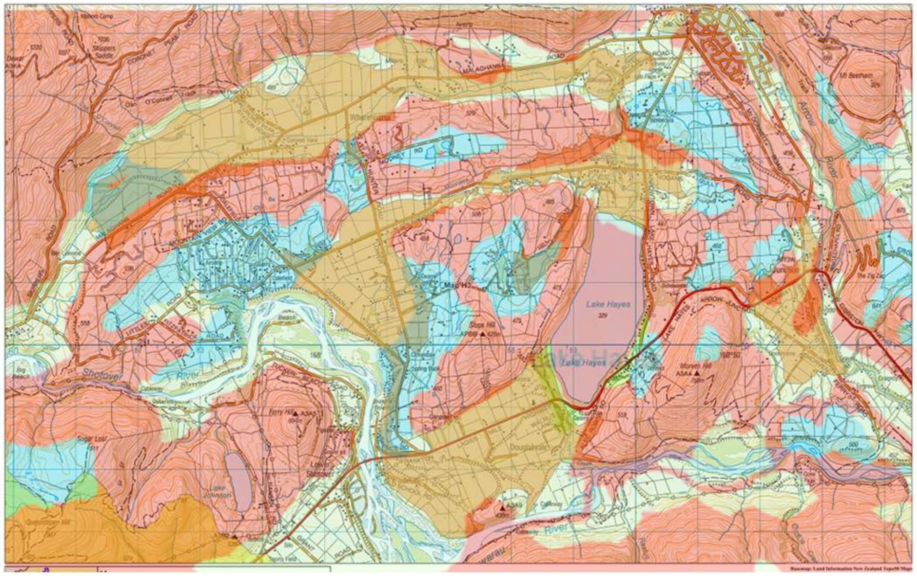
Constraints: When these nitrogen sensitive areas are overlain with the Schist areas as in the adjacent image the limitation on land available for disposal can be seen. Red areas show schist areas unsuitable for large-scale wastewater disposal and orange areas are nitrogen sensitive areas where there are sensitive groundwater receiving environments. Blue areas are lower permeability glacial till.

Critical Risks: Groundwater in the Upper Mill Creek and Mid-Mill Creek aquifers is constrained by schist, flows towards and ultimately discharges to Mill Creek, its tributaries and Lake Hayes. Limited in ground treatment and limited cold season uptake of nutrients by plants, means that there is a high likelihood of applied nutrients in these aquifers being transported to Lake Hayes.

Conclusion: The Whakatipu basin is highly constrained for large scale application of wastewater. Constrained aquifers and connection of groundwater to sensitive water bodies can limit the opportunity for wastewater application without significant water quality effects.



ORC Nitrogen Sensitive Area. Source: ORC Map H3



ORC Nitrogen Sensitive Areas map overlain with Geological Constraints map

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Lake Hayes catchment

Further information was requested by Councillors on the Lake Hayes catchment and the constraint of discharging wastewater within the catchment.

Lake Hayes Catchment: Lake Hayes is a highly studied, ecologically degraded lake that has experienced persistent eutrophication since wetland drainage and commencement of fertilizer application in the 1960s. This is evidenced as declining water clarity, eutrophication and periodic algal blooms that affect ecosystem health and recreational use.

The Regional Plan identifies the Lake Hayes catchment in green/blue in the adjacent figure. Runoff from land within this area, flows towards Lake Hayes contributing to the nutrient load in the lake.

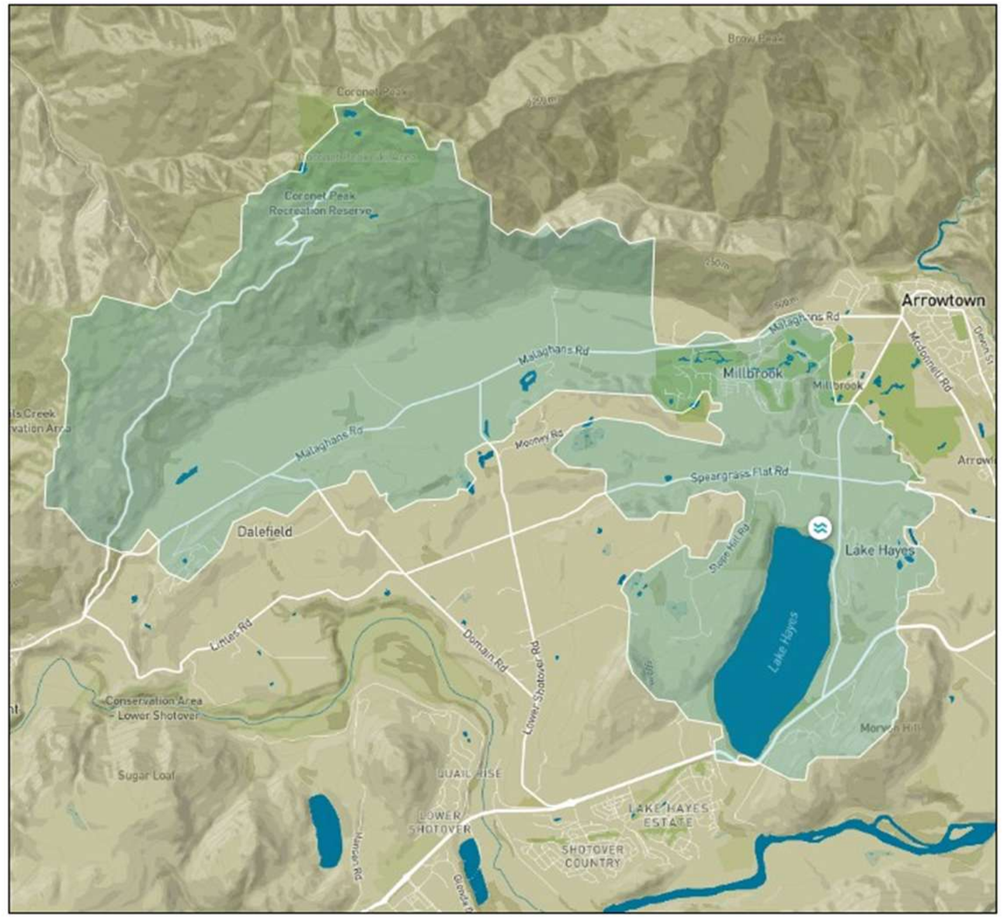
The lake also receives groundwater flow from Upper Mill Creek and Mid Mil Creek aquifers as previously described. Wastewater that is disposal of to land above this aquifer will flow into the aquifer. This groundwater flows east towards Millbrook where it reappears as surface water in Mill creek and its tributaries.

Mill Creek has high and increasing nitrate levels in breach of the regional water plan standard. Based on documented annual nutrient balance for Lake Hayes, the nitrogen load from the projected 2060 wastewater volumes equates to approximately 200% of the current nitrogen load entering the lake, and 500% of that load is currently phosphorous load entering the lake. i.e. significantly larger than all current catchment contributions to the lake.

Recycling of nutrients within lakes can be a dominant source of nutrients and inhibit water quality improvement even where catchment contributions reduce. The current conditions within the lake are expected to be due to such recycling processes. The nutrient conditions within the lake are expected to be very sensitive to any long-term increase in nutrient loading with large increases risking the lake becoming hypereutrophic, frequent algal blooms, very low water clarity and anoxic events.

Discharges of wastewater to land within this catchment area would need to consider the significant cumulative effects from historical and ongoing discharges within the catchment. Given the current lake conditions, this is expected to present a high consenting risk and a significant constraint for any potential land application of wastewater.

Drinking water: Within the catchment are several water supplies. The QLDC Lake Hayes drinking water supply is located to the north of the lake and draws groundwater from the Mid Mill Creek aquifer. Protection of these supplies is a key consideration for land-based wastewater disposal options in the area



Lake Hayes catchment outline (green/blue)

Conclusion: While not considered to be precluded, wastewater discharges to the Lake Hayes catchment are highly constrained and limited to smaller nutrient loads and irrigation rates to control effects on lake water quality.

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Land based disposal options

This section revisits some of the long-listed options for land disposal
It considers:

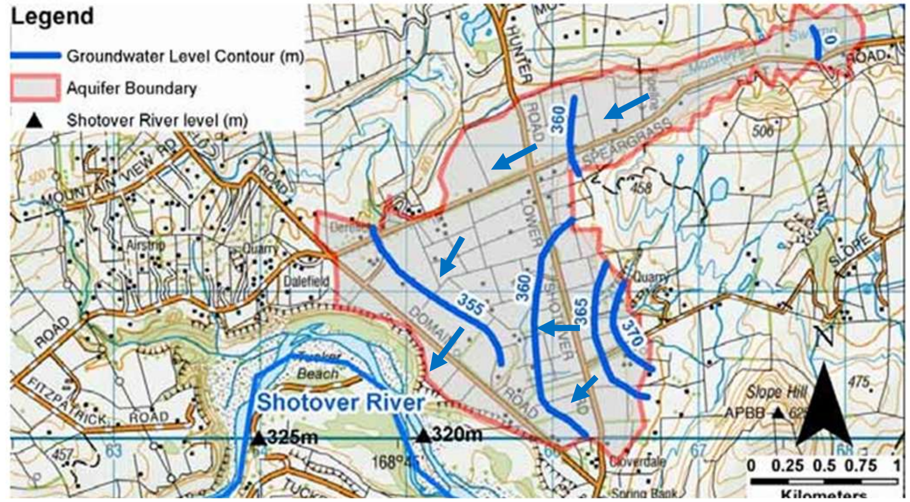
- Land based options within Whakatipu Basin
- Hybrid options
- Gibbston Valley and irrigation disposal
- Golf courses and reuse

8

Speargrass Flat

The land at Speargrass Flat sits above the Speargrass-Hawthorn aquifer making it a sensitive receptor to additional nutrients. The area comprises a mix of soils types, with approximately 50% of the area comprising thin soil layer and over schist. A mixed irrigation approach, with summer irrigation to the whole useable area and winter irrigation Class 3 land is considered to maximise the potential discharge to land.

Approx. area	**63 ha.** 80% useable area 50 ha (summer) Usable area winter 26 ha (~50% are not suitable for subsurface discharge) Land availability is limited to rural zoned land as most of the area has been developed with large high value properties
Distance from WWTP	5 km, 80 m elevation change
Groundwater	2 – 10 m deep
Catchment	The Speargrass Flat area lies above the Speargrass-Hawthorn aquifer. The aquifer flows towards the Shotover River in a direction parallel to Speargrass Flat Road where is appears as springs and where drinking water takes are located. The Mean Annual Recharge rate of the aquifer is approximately 1,260 m^3/day and this is almost exclusively through rainfall. Mean groundwater age is reported to be 1-2 years. Nutrient sensitive area.
Application rate	Interpreted as Class 3 WEPS, 150 kgN/ha/y, 30 kgTP/ha/y Governed by nutrient loading, with WWTP performance giving 8 mg/l TN, irrigation is limited to an average of 5 mm/day.
Critical risks	Impacts with spring water quality and geotechnical stability of riverbank with groundwater levels increases
Max disposal	**2,500 m^3/day (1,300 m^3/day winter)** 10% of 2060 volume, 22% of current volume, in summer
Conclusion	**Not suitable as a stand alone option. Could consider combining with other areas. Difficulties disposing in winter**



Outline of the Hawthorne-Speargrass Aquifer showing GW contours. Source: ORC 2014 Whakatipu Aquifer report

Possible land parcels in the Speargrass Flats area. Image: Google Earth

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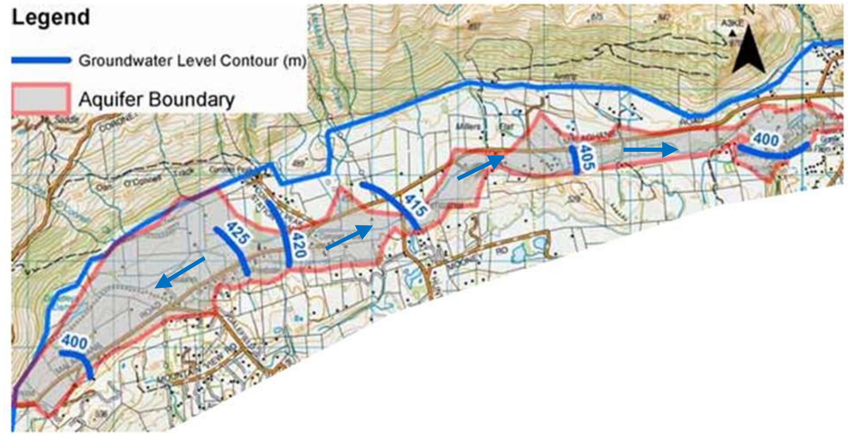
Malaghans Road

The Malaghans Road area is underlain by the Upper Mill Creek aquifer. The groundwater in this aquifer generally flows to the east where it surfaces at Mill Creek and feeds into Lake Hayes. Discharging of large amounts of wastewater in this area would have a high risk of impacting downstream water quality, including community water supplies for the Lake Hayes area.

We have assumed subsurface discharge.

Approx. area	**189 ha,** 30% of area not suitable due to soil type (gley soils) 80% useable area 106 ha
Distance from WWTP	10 km 140 m elevation change
Catchment	Above the Upper Mill Creek Aquifer. Aquifer mean annual recharge is about 4,300 m^3/day. Recharged through rainfall and from the slopes above the catchment. Aquifer discharges to surface water at Mill Creek and feeds Lake Hayes and is in a nutrient sensitive area Mean groundwater age 4-5 years, Depth typically 2-10m Nutrient sensitive area
Application rate	Interpreted as Class 3 WEPS, 150 kgN/ha/y and 30 kgP/ha/y Governed by nutrient loading to irrigation of 5 mm/day
Critical risks	Impact on Lake Hayes (~75-150% increase in phosphorus and 20-40% increase in nitrogen load to Lake at project disposal volume)
Disposal	**5,440 m^3/day** 21% of 2060 volume, 45% of current volume
Conclusion	**Not suitable as a stand alone option. Could consider combining with other areas. High risk of impacts to Lake Hayes. Difficulties disposing in winter**



Outline of the Upper Mill Creek Aquifer showing GW contours. Source: ORC 2014 Whakatipu Aquifer report

Possible land parcels near Malaghans Rd. Image: Google Earth

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Combined land disposal areas

As the Speargrass Flat and Malagans Road areas are not each large enough to cater for the 2060 average daily flow, a combined scheme including these and other areas has been considered, by combining possible land parcels along a conveyance route from the treatment plant to Malaghans Road, a distance of about 10 km.

A new pipe bridge would be required across the Shotover River for disposal options in this area.

The estimated total disposal volume for the combined area is estimated to be **8,600 m^3/day**. This is insufficient for disposal of the current average day flows from the treatment plant.

Possible land parcels from WWTP to Malaghans Rd. Image: Google Earth

Elevation profile from Shotover WWTP to Malaghans Rd

Approx. area	Malaghans	189 ha
	Speargrass	63 ha
	Other	15 ha
	Total gross area	**267 ha**
	Useable area (80%)	168 ha
Distance from WWTP	10 km 140 m elevation change	
Application rate	Class 3 WEPS, 150 kgN/ha/y and 30 kgP/ha/y Governed by nutrient loading to irrigation of 5 mm/day	
Critical risks	High risk of impacting Lake Hayes (~150-300% increase in Phosphorus and 25-50% increase in nitrogen load to Lake) Geotechnical stability of river bank with spring discharges	
Disposal	**8,600 m^3/d (7,400 m^3/d in winter)** 33% of 2060 volume, 72% of current volume, in summer	
Conclusion	**Even when areas are combined option is only a partial disposal option that is capped in capacity. High risk of impacting Lake Hayes.**	

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Crown Terrace - Option E

The Crown Terrace option was considered during the assessment process as an area feasible for land disposal of the full treated wastewater volumes. Because the area is not in a nutrient sensitive area or above an aquifer it is better suited to higher rate irrigation methods. The land would likely be Class 2 and nitrogen application limits under the WEPS would therefore be 250kg/ha/yr, reducing the area of land required compared to other areas in the Whakatipu basin.

Advantages

- Land has better geological and hydrogeological properties compared to the basin areas
- Can take a larger application rate
- Not as likely to affect groundwater aquifer
- Application rate of 12 mm/day possible
- Less land area required that in the Whakatipu Basin
- Moderate rate trench disposal better in winter

Disadvantages

- Distance and elevation from treatment plant -> high capex & ongoing operational costs (piping and pumping)
- Large area of land required
- Additional storage required onsite for peak wet weather flows

AI generated image of trenched wastewater disposal to land

Elevation profile from Shotover WWTP to Crown Tce

Approx. area	**288ha** total area, 80% useable area 240ha
Distance from WWTP	15km 360m elevation change
Groundwater	50 – 100m deep
Catchment	Glacial terrace composed of permeable gravels and alluvial deposits, variable depth to schist bedrock.
Disposal method	Moderate rate land disposal, assuming trenches with pipe approx. 1.5m deep at 2m spacings
Application rate	WEPS Class 2 limits, 250kgN/ha/year Governed by nutrient loading to irrigation of 12.5 mm/day
Risks	Land stability associated with increased groundwater levels Impacts to surface water quality
Disposal	**26,000 m³/day** 100%+ of current and 2060 flows, year round
Conclusion	**Feasible as a standalone land disposal option.** **Would have high annual operating costs due to pumping power requirements**

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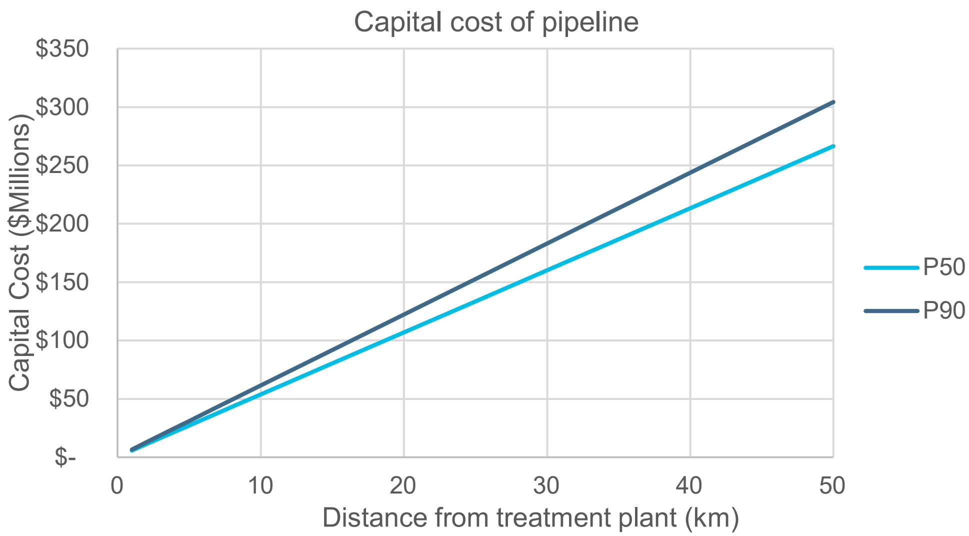
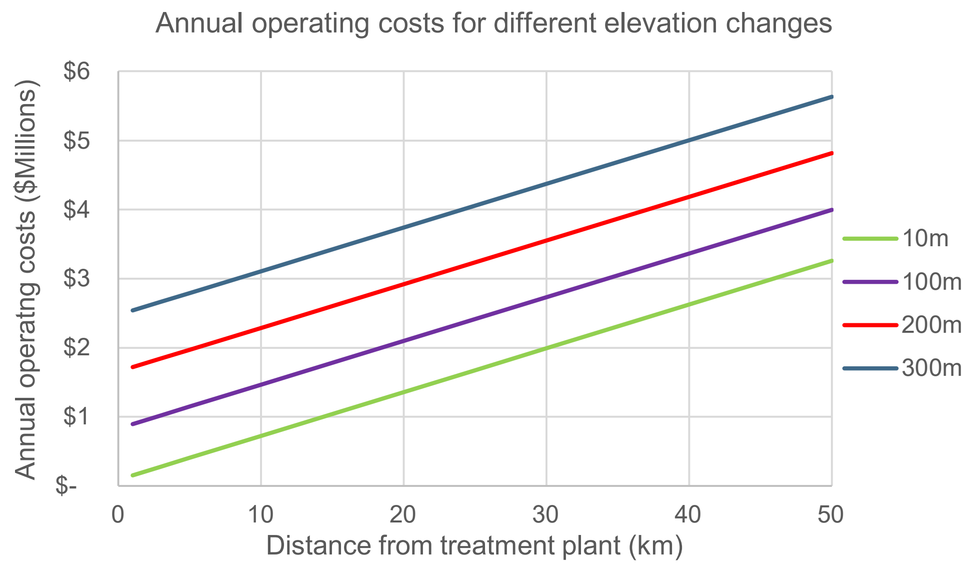
Pipe and pumping costs

Indicative ball-park costings





This graph shows indicative costs of installing a 700mm diameter pipe to pump the full 2060 flow in a rural road corridor for a range of distances from the treatment plant. These costs are inclusive of design, relevant consenting, and construction of the pipeline, but do not include the cost of any bridge crossings, pump stations, land, treatment, or disposal infrastructure.

There are large operating costs associated with pumping water up hill. This graph shows approximate operating costs each year, for a range of distances and elevation changes for the full 2060 flow.

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Gibbston Valley

The Gibbston Valley area has been suggested as a possible disposal site for treated effluent, where treated wastewater may be used to replace or supplement irrigation water

Land suitability: This area is alluvial soils that are suitable for wastewater disposal. The soils are generally thin, so in-ground wastewater treatment is likely to be limited.

Pipe and pumping: A 25km pipeline would be required with either a new bridge across the Kawarau, or a pipe following the state highway with a new pipe bridge across the Shotover River. The maximum elevation gain is approximately 120m, and the pumping costs would be considerable with an annual power requirement of 7.5GWh if all wastewater was transported to this area.

Crop irrigation: The Gibbson valley area has numerous vineyards, and limited areas suitable for large scale irrigation. Irrigation of treated wastewater to crops for human consumption has challenges and is not covered by the WEPS.

- Grapes require targeted irrigation of approximately 2-3 mm/day during the summer growing season with no irrigation required during winter (data from Irrigation NZ)
- High nitrogen content in wastewater can lead to leaf growth at the expense of fruit production.
- Depending on treatment and application method there may be withholding periods required prior to harvest.
- Public perception, sector and market food standards and brand impact would need to be considered.

There are numerous landowners that would need to be in agreement to be able to make it viable to pipe wastewater to the area for crop irrigation Land purchase may be required to be able to dispose of greater volumes.

It may be possible to dispose of a maximum of **7,800m³/day**, but this would likely only be in summer months when irrigation is required.

Possible land areas for irrigation in the Gibbston Valley and vicinity

Approx. area	325 ha, for a mixture of irrigable pasture and crops
Distance from WWTP	25km, 120 elevation gain
Groundwater	10 – 15m
Catchment	Glacial and alluvial deposits underlain by schist.
Disposal method	Trickle irrigation
Application rate	2-3 mm/day
Risks	Uncertainty relating to perception of applying wastewater to crops for human consumption
Disposal	**7,800 m³/day**, seasonal
Conclusion	Feasible for seasonal irrigation. Considerable costs. Difficulties with application to crops for human consumption. Only disposes of a portion of the flow

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Whakatipu Basin land option cost summary

A comparative cost estimate was prepared for these options. These are high level costs but provide the ability to compare different options. They are not for budgetary purposes, and are provided **for option comparison only**. These options are based on a high level estimate of the possible area of land available. The cost estimates are for the possible discharge volume, and therefore the cost of disposing of the full volume will be more (i.e., larger pipe, more land). Some of these options are not able to cater for the 2060 flow, nor the current flow from the WWTP and so would also require the river discharge, the costs of which is not included, The Frankton Flats land disposal option has been included for comparison, All options exclude the cost of an alternative discharge such as to the river.

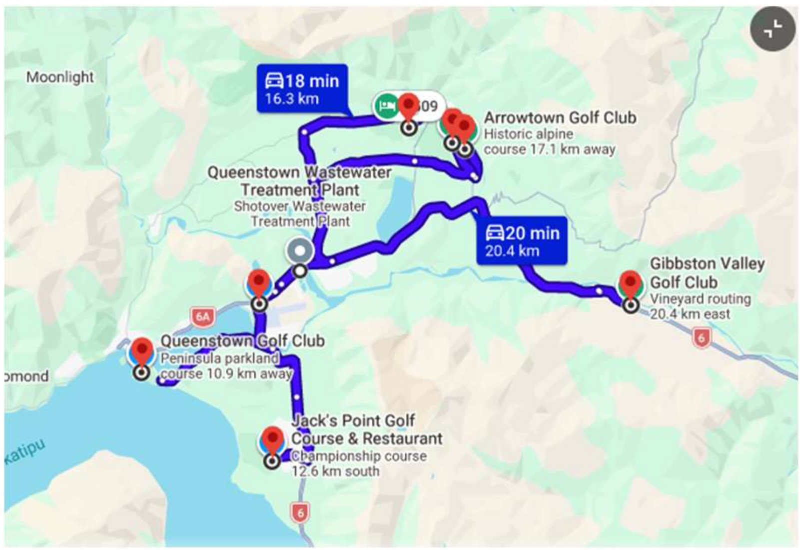
	Units	Speargrass Flats	Malaghans Rd	Combined land option	Crown Tce (Short list Option E)	Gibbston	Frankton Flats (Short list Option C)
Distance	km	5	10	10	15	25	3
Elevation gain	m	80	140	140	360	120	50
Total land area	ha	63	189	267	288	325	-
Land cost per ha	$/ha	$400,000	$400,000	$420,000	$200,000	-	-
Disposal method		Low rate, sub surface irrigation	Low rate, sub surface irrigation	Low rate, sub surface irrigation	Moderate rate, trench disposal	Low rate, surface irrigation	Bore holes + irrigation
Loading rate	kgTN/ha/y	150	150	150	250	250	-
Annual disposal volume	m^3/y	945,000	2,835,000	4,005,000	9,490,000	1,300,000	4,380,000
Percent of current flow	%	22%	65%	91%	100%+	30%	100%+
Percent of 2060 flow	%	10%	30%	42%	100%+	14%	58%
Cost of treatment	$	$20M	$20M	$20M	$20M	$20M	$46M
Cost of disposal	$	$27M	$68M	$93M	$228M	$112M	$33M
Cost of pipeline	$	$15M	$35M	$36M	$100M	$86M	$29M
Cost of land	$	$25M	$76M	$112M	$58M	-	-
TOTAL CAPITAL COST	**$**	**$130M - $150M**	**$290M - $330M**	**$380M - $430M**	**$580M - $660M**	**$320M - $360M**	**$150M - $170M**
Capital cost per m^3	$\$/m^3$	**$129**	**$98**	**$91**	**$60**	**$235**	**$27**
NPV pumping costs	$	$27M	$51M	$55M	$152M	$123M	$37M
Conclusion		**Partial option. Would require river discharge (additional cost)**	**Partial option. Would require river discharge (additional cost)**	**Partial option. Would require river discharge (additional cost)**	**Feasible solution for year-round disposal. Future capacity**	**Partial option. Seasonal. Would require river discharge (additional cost)**	**Partial option. Would require river discharge (additional cost)**

Golf courses and sports fields

Golf courses: To respond to Councillors suggestion regarding irrigation to golf courses, we have assessed the feasibility of irrigating to golf courses in the Queenstown area.

There are 7 golf courses within 25km of the WWTP with an estimated total irrigable area of 250 – 300 ha. The maximum likely irrigation demand for a golf course is about 700 mm/year, with this demand peaking during the summer months, and not required at all during winter. Based on this the maximum total reuse of wastewater if every golf course in the district was irrigated with treated wastewater would be 1,700,000 m^3/year. This is 17% of the total annual 2060 flow.

The cost of providing piped infrastructure to each of the courses would be very high, unless able to be combined with other nearby land disposal methods. In addition, consideration would need to be made to the impact on the surrounding environment, for example at Queenstown Golf Club, where the runoff would be into Lake Whakatipu, Millbrook and Arrowtown which are within the Lake Hayes catchment, although the wastewater may offset the use of fertilizer.



Approximate distances from Shotover WWTP. Source: Google Maps

Sports fields and parks could also be included with a network of recycled water or "purple pipes". This type of reuse is usually found in areas where there limited water availability, but it is not cost effective for areas like Queenstown where water is abundant.

Irrigation of golf courses and sports field could be considered in conjunction with other land disposal methods, for example, as was considered in the Frankton Bores options C and D.

Golf Course	Estimated irrigated area (ha)	Distance from WWTP
Jack's Point	45–60	13 km
Millbrook (36 holes)	80–100	16 km
The Hills	40–55	17 km
Queenstown Golf Club	35–45	11 km
Arrowtown Golf Club	25–35	17 km
Frankton Golf Centre	5–10	3 km
Gibbston Valley	10-20 ha	20 km
Total	**240–325 ha**	

Land use	Approximate peak day reuse potential
Golf courses only	4,000-6,000 m^3/day (summer)
Sports fields + parks	1,000-4,000 m^3/day (summer)

Conclusion	Not suitable due to seasonality. Could be considered in conjunction with land disposal if located in a similar area.

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Subsurface treatment wetlands

Purpose: Subsurface flow wetlands can provide an additional polishing step for treated wastewater by increasing land contact, hydraulic residence time, and exposure to natural treatment processes. Wastewater flows through a gravel media below the surface, where filtration, microbial activity, and plant-root interactions help reduce residual contaminants. For the Shotover WWTP, the primary benefit of a subsurface wetland is an additional environmental barrier rather than achieving significant removals of contaminants.

Treatment: Treatment within a subsurface wetland occurs through filtration of suspended solids, microbial breakdown of organic matter, nitrification and denitrification, and some plant uptake of nutrients. Wetlands can be effective for removing various contaminants and typical treatment removal values from literature is included in the table below. The variability of treatment performance reflects the passive nature of the treatment process and the type of configuration adopted. With the Shotover WWTP already producing a very high quality water, the incremental treatment benefit is likely to be minimal to modest.

Mana whenua: Subsurface wetlands in general align with mana whenua values through providing nature based treatment processes. However as outlined in their position statement, Kā Rūnaka understand that the subsurface wetlands would not provide substantive additional treatment of wastewater before it is discharged to the river and in their view, the characteristics of the underlying soils present the same risk of clogging that contributed to the failure of the previous disposal beds.

Example of a constructed wetland in Jiangsu Province, China, covering 3.5ha

Parameter	Typical Removal (%)[1,2]	Primary Removal Mechanisms
BOD_5	70-90%	Microbial degradation, filtration, sedimentation
Total Suspended Solids (TSS)	70-90%	Filtration through media, sedimentation, biofilm attachment
Total Nitrogen (TN)	<20-50%	Nitrification, denitrification, plant uptake and removal
Ammoniacal Nitrogen (NH_4-N)	<20-80%[3]	Nitrification and plant uptake
Nitrate Nitrogen (NO_3-N)	20-70%[3]	Denitrification
Total Phosphorus (TP)	10-20%	Adsorption to media, precipitation, plant uptake and removal
E. coli / Faecal Coliforms	90-99.9%	Filtration, adsorption, die-off, predation
Trace Organics / Pharmaceuticals	10-90%	Adsorption, biodegradation, plant uptake

1. IWA Biological Wastewater Treatment Series Volume 7 – Treatment Wetlands (2017)
2. Vymazal et al (2016) Occurrence and removal of pharmaceuticals in four full scale constructed wetlands in the Czech Republic – the first year of monitoring. Ecological Engineering.
3. Variable removals of TAN and TN primarily affected by the wetland configurations

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Volume reduction and reuse opportunities

- Reverse osmosis
- Grey water reuse
- Flow reduction
- Metering

Potable reuse

Reverse osmosis for drinking water reuse

Reverse osmosis doesn’t make contaminants disappear. Approx 80% becomes clean permeate, and the other 20% becomes a concentrated brine. At the 2060 future flow, there would still be about 5,200m^3/day which needs to be disposed of. Typically, this is disposed of to the ocean, but for an inland location like Queenstown, options are limited to evaporation, or discharge to deep wells.

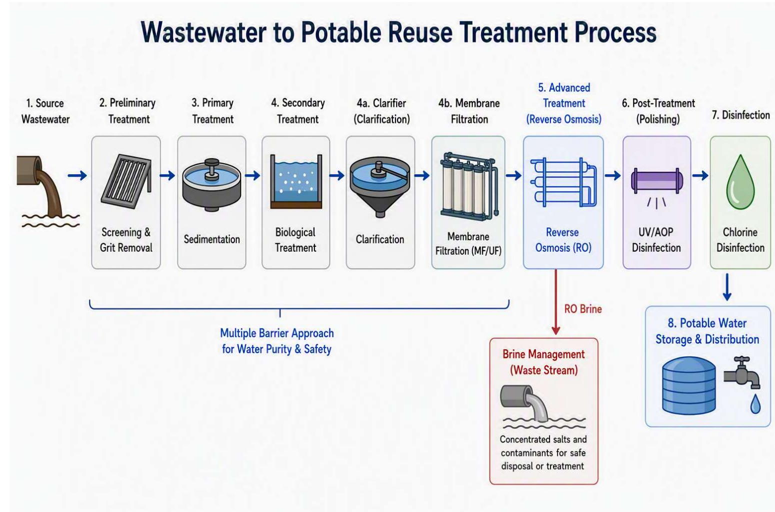
Extensive pre-treatment, such as membrane filtration is required prior to the reverse osmosis plant, and additional UV treatment and chlorine disinfection would be required after.

Energy requirements for RO are extensive. At more than 10 GWh/year this would be equivalent to a town of about 3000 people.

For cost comparison – the Western Corridor Recycled Water Scheme in Queensland if constructed today would be around $5B NZD. This treats 232 ML/day and includes 200km pipeline. And Sydney’s Upper South Creek Advanced Water Recycling Centre which is nearing completion and will treat 70ML for $2.4B NZD.

For a Shotover sized plant (30ML), equivalent costs would be >$600M for just the MF/RO plant, with additional UV and chlorination required. There would also need to be extensive pipework to distribute this water through the drinking water network, and a suitable disposal method developed for the brine. Total costs could be greater than $1B.

In the future there may be new technology that has a “zero liquid discharge” which will remove the need for brine dispose. New membrane systems in development are increasing permeate recover rates to 95 – 98% by using ultra high pressure or close circuit methods.



Conclusion	Feasibility and costs considered to be prohibitive to developing this option further

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Grey water reuse

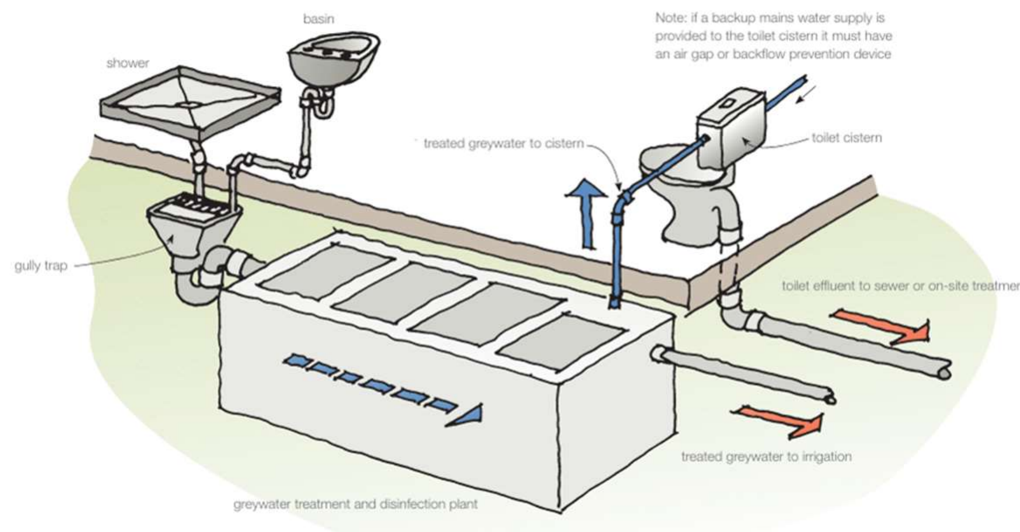
Grey water is lightly contaminated wastewater from showers, baths, hand basins, and laundries. It can be reused for non-potable purposes such as toilet flushing and garden irrigation, reducing potable water demand and wastewater generations. As much as 68% of domestic wastewater could be reused as greywater, reducing household wastewater production by 20-40%.

Grey water reuse is best suited at an individual building scale for use as toilet flushing and irrigation. It is easiest to implement at a new build stage, rather than retrofit, and could be considered for future new developments. This would have the benefit of reducing the amount of wastewater requiring treatment from these new developments, and could be beneficial in areas such as Gibbston Valley and the Southern Corridor which are further away from the Shotover WWTP.

Kapiti Coast District Council has been a strong advocate for greywater reuse and requires all new homes to install a grey water system and/or rainwater storage. to help with managing their water supply constraints.

Regulations: New Zealand, installation of a greywater recycling system will typically require building consent and must comply with the NZ Building Code, AS/NZS 1547 and local council requirements.

Treatment: Treatment is risk based, simple sub surface irrigation systems usually only requiring filtration. More complex systems, for toilet flushing or indoor reuse, may require additional components like secondary treatment, filtration, disinfection, and storage.



Conclusion	Could be investigated further as a requirement for future developments, but would not reduce existing wastewater volumes significantly.

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Flow reduction

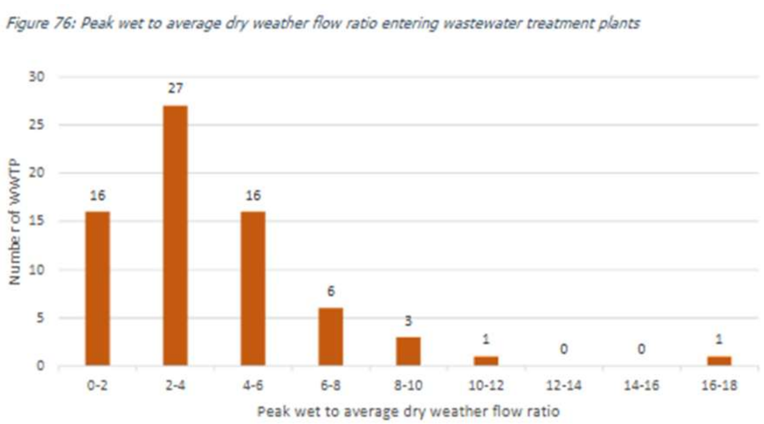
Could flow management reduce the amount of wastewater needing to be treated?

Inflow and infiltration reduction

Infiltration is groundwater entering the wastewater network, typically through leaky pipe joints, cracked pipes, and high groundwater conditions. **Inflow** is stormwater entering the system through improper connections, sump pumps, gully traps, manholes in ponded areas, and cross connections.

QLDC has relatively low inflow and infiltration, most likely due to the relatively new age of the network pipe assets. The QLDC peaking factor for average dry weather flows to peak wet weather is less than 2, putting it in the top 20% of councils in new Zealand..

Flow reduction using methods such as I&I programmes would be best to focus on the older Frankton and CBD areas and locations with shallow groundwater. Optimistically, a comprehensive I&I reduction programme could reduce the peaking factor by 10%, and therefore the peak wet weather flow would reduce accordingly.



Graph showing the peaking factor for Councils in NZ. Source Water NZ National Performance Review

Consumption behaviours

QLDC supplies a lot of water per connection, and sits a #9 of the top 10 NZ local authorities. This is most likely due to higher seasonal garden watering and irrigation demands.

Graph showing water supplied by the top 10 NZ Councils. Source RNZ article

While metering and consumptive charging could change water consumption behaviour of locals, it is unlikely to change visitor behaviour. A best case scenario of reducing residents wastewater production by 20% would reduce the 2060 peak day flow to about 22,300 m^3/day, a 14 percent decrease. Whilst this would be beneficial in reducing the flow through the treatment plant, it would not materially change the feasibility of any disposal options currently being considered.

- Predicted QLDC wastewater water produced per person — 265 l/person
- The national average domestic wastewater produced — 282 l/person/day
- Best practice / highly metered city — 180 l/p/day

Conclusion	I&I programmes and metering would be beneficial, but would not significantly reduce the flows to the treatment plant and the level of disposal required

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Long list MCA assessment

- Scoring rubric
- Sensitivity analysis
- MCA without cost lens
- Cost breakdowns
- Did assumptions exclude viable options

Scoring rubric

Further information was requested on the scoring detail. This table shows the scoring rubric used by the scorers for the short list options MCA scoring, which is similar to that used for the long list scoring (with a change to the base case).

Criteria Name	KPI Description	-5	-4	-3	-2	-1	0	1	2	3	4	5
Investment objectives												
Health and well-being of the surrounding waterways are maintained, protected and improved where practicable to support water quality.	• Ecosystem / Aquatic health effects. • Human health effects. • Nuisance growth. • Recreation impacts.	Water quality or impact is significantly worse compared to current discharge	Water quality is worse than current discharge.	Moderate negative impact compared to current discharge.	Slightly worse than current discharge.	Marginally worse than current discharge.	Water quality as per current discharge to Shotover	Requirements of proposed WW standards are met	Noticeable improvement over current discharge and proposed WW standards are met.	Moderate improvement (more then score 2) over the current discharge and proposed WW standards are met.	Major benefits over current discharge over current discharge and proposed WW standards are met.	Water quality or impact is significantly improved compared to current discharge to Shotover
The disposal of treated wastewater aligns with tikanga as guided by mana whenua.	• Mana whenua values and knowledge. • Alignment with mana whenua cultural practices, protocols and values.	Current Discharge - does not align with tikanga.										
Ability to service the community's and visitor wastewater needs now and into the future	• Can accommodate forecast population or economic growth over time. • Can accommodate peak day inflows. • Can be resilient to extreme climate events, climate change and natural disasters.	Unable to meet future flow rates even with upgrades	Significant upgrades required to meet future requirements	Major upgrades required to meet future requirements	Medium upgrades required to meet future requirements	Some upgrades required to meet future requirements	Base case requires some upgrade to channel to meet future flow rates	Minor upgrades required to meet future requirements.	Limited upgrades required to meet future requirements.	Minimal upgrades required to meet future requirements.	Can meet future flows with very minor or no upgrades.	Can meet future flows and more without significant upgrades. Resilient to events
Critical success factors												
Mō tātou, ā, mō kā uri ā muri ake nei. For us and our children after us	• Integration of whakapapa Intergenerational equity, innovation, and knowledge. • Te mana o te wai Mauri of the water is upheld or enhanced. • Ki uta ki tai Whole of catchment impact and holistic consideration.	Impact of current discharge te mana o te wai										
Cultural impacts to sites of significance and access to sites for cultural activities.	• Sites of cultural significance impacts • Physical access to site for cultural and recreational activities.	Impact of current discharge on site and access										
Impacts to the surrounding environment	• Natural waterway impacts • Biodiversity, birds	Impact is significantly worse than current case	Noticeable degradation of environmental quality and biodiversity when compared to current case.	Some harm to ecosystems and biodiversity, though less severe than -4.	Minor additional environmental stress or biodiversity loss to the current case.	Almost neutral but still slightly more detrimental to environemnt then the current case.	Impact of the base case on the environment	Marginal improvement over current case.	Noticeable improvement over current case with benefits to ecosystems and biodiversity.	Strong positive impact on environmental quality and biodiversity over current case.	Major benefits over current case.	Substantial benefits over current case to biodiversity and environment
Environmental impacts to surrounding catchment land, soil and groundwater	• Surface water effects • Soil health effects • Groundwater effects	Impact is significantly worse than current case	Impact is worse than current case.	Moderate negative impact compared to current case.	Slightly worse than current case.	Marginally worse than current case.	Impact of the base case on land, soil, GW	Marginal improvement over current case.	Noticeable improvement over current case.	Significant improvement over current case.	Major benefits over current case.	Impact is significantly better than current case
Visual effects - The extent to which there is a visual impact from options that differ from existing land use or impact the surrounding natural environment.	• Visual impacts, e.g., tanks, above ground structures,	Visual impact is significantly worse than current case	Visual impact is worse than current case.	Moderate negative visual impact compared to current case.	Slightly worse than current case.	Marginally worse than current case.	Visual impact of the base case on land, soil, GW	Marginal improvement over current case.	Noticeable improvement over current case.	Significant improvement over current case.	Major benefits over current case.	Visual impact is significantly better than current case
Amenity effects - The extent to which there is a receptor or social impact from options.	• Noise impacts • Risk to potential receptors • Recreational access • Air quality / odour risk	Impact is significantly worse than current case	Impact is worse than current case.	Moderate negative impact compared to current case.	Slightly worse than current case.	Marginally worse than current case.	Impact of base case on amenity values	Marginal improvement over current case.	Noticeable improvement over current case.	Significant improvement over current case.	Major benefits over current case.	Impact is significantly better than current case
Constructability and technical feasibility	• Technical feasibility • Technical / constructability risks • Compatibility • Technical robustness and operational resilience.	Constructibility is significantly worse than current case	Constructibility is worse than current case.	Moderate constructibility issues.	Slightly worse than current case.	Marginally worse than current case.	Technical feasibility of base case	Marginal improvement over current case.	Noticeable improvement over current case. Clear benefits in constructibility; simpler design or fewer constraints.	Significant improvement over current case. Strong technical feasibility; construction is straightforward and efficient.	Major benefits over current case. Highly practical and easy to implement; minimal risk or complexity.	Impact is significantly better than current case. Exceptional constructibility and technical feasibility; best-case scenario for implementation.
Sustainability - Carbon emissions and sustainable use of resources supporting organisational goals.	• Carbon emissions (operation carbon included) • Beneficial reuse	Sustainability impact is significantly worse than current case	Substantially worse	moderately worse	noticeable worse	slightly worse	Sustainability aspects of base case	negligible improvement	minor improvement	moderate improvement	major improvement	Sustainability impact is significantly better than current case
Operational reliability and maintainability	• Ease of operations / maintenance • Operational complexity and risks • Functionality	Significant and complex operational requirements. Very high complexity; requires extensive resources, specialized staff, and continuous monitoring.	High operational complexity. Noticeable increase in operational effort; multiple systems and frequent interventions needed.	Moderate operational complexity. Clear additional requirements beyond baseline; manageable but resource-intensive.	Slightly more complex than current case. Minor increase in operational tasks; some added checks or processes.	Marginally more complex than current case. Slightly higher operational effort then current case.	Operational requirements of base case	Marginal improvement over current case. Slightly reduced operational complexity; minor efficiency gains.	Noticeable improvement over current case. Clear reduction in operational tasks; simpler processes.	Significant improvement over current case. Strong operational efficiency; minimal intervention required.	Major benefits over current case. Very low operational complexity; streamlined and highly efficient.	Operational requirements are significantly less than current case. Exceptional simplicity; minimal ongoing effort and resource needs.
Property difficulties and impacts	• Property requirements, impacts and difficulties.	Significant property purchase or impacts	High property purchase or impact.	Moderate property purchase or impact.	Slight property purchase or impact.	Marginal property purchase or impact.	Impact of base case on property	Marginal improvement over current case for impact on property.	Noticeable improvement over current case for impact on property.	Significant improvement over current case for impact on property.	Major benefits over current case.	Impact on property is significantly better than current case
Achievability of indicated outcomes	• Level of confidence in meeting outcomes	Significantly unlikely to meeting design expectations	Very unlikely to meet design expectations	Unlikely to meet design expectations	Somewhat unlikely to meet design expectations	Slightly unlikely to meet design expectations	Likelihood in meeting the design expectations	Slightly likely to exceed design expectations	Somewhat likely to exceed design expectations	Likely to exceed design expectations	Very likely to exceed design expectations	Highly likely to meet the design expectations
Consent, design, construction implementation timeframe	• Consent lodged by May 2026 • Designed by Dec 2027 • Constructed by 2030	Upgrade complete after 2035.	Upgrade complete after 2034.	Upgrade complete after 2033.	Upgrade complete by 2032.	Upgrade complete by 2030, late than Base Case	Base case required no additional implementation time, would required long term consent expected to be acheived by 2030.	Faster than Base Case - Upgrade complete by 2029.	Upgrade complete by 2028	Upgrade complete by 2027	Upgrade complete by 2026	Upgrade complete by 2025.
Cost and Affordability	• Capital costs • Operation costs (annual) • Whole of life costs (NPV) • Stage ability	CAPEX>180M	CAPEX<180M	CAPEX<120M	CAPEX<80M	CAPEX<50M	CAPEX and Op costs of base case (CAPEX ~$30M)	CAPEX and OPEX are less than current case.	Noticeable cost benefits over current case.	Significant cost benefits over current case.	Major cost benefits over current case.	Exceptional cost efficiency.

Scoring snapshot

Further information was requested on the scoring reasoning. This table provides a snapshot of the scoring rationale that was collated for each option against each investment objective and critical success factor. A full commentary for each score for option was presented in the body of the short and long list MCA scoring reports.

					Options							
			BASE CASE	Commentary	A	Commentary	B	Commentary	C	Commentary	D	Commentary
			Current situation *Discharge to Shotover River*	Discharge into the Shotover River via the historical channel	*Land flow path to Kawarau River*		*Subsurface wetlands on Delta + Land Flow Path to Kawarau River*	In 2060, 100% of total treated effluent discharge to Kawarau River via a new rock outfall (land flow path) and subsurface wetland, expected average flow ~ 26,000 m3/d	*Deep well (Bore) injections at Frankton + Excess flow to Kawarau River*	In 2060, total average flow is 26,000 m3/d, bore discharge at Frankton 8000 m3/d (median probability, pending field investigation confirmation), with remaining flow (~16,000 m3/d on average) discharged to Kawarau River via wetland	*Shallow well (soakhole) injections at Frankton + excess flow to Kawarau River*	In 2060, total average flow is 26,000 m3/d, soakhole discharge at Frankton 1,500 m3/d (median probability, pending field investigation confirmation), with remaining flow (~23,000 m3/d on average) discharged to Kawarau River via wetland
Investment Objectives	**KPIS**	**Scoring Lead**										
The health and well-being of the surrounding waterways are maintained, protected and improved where practicable to support water quality.	• Ecosystem / Aquatic health effects. • Human health effects. • Nuisance growth. • Recreation impacts.	GHD	0	**Key considerations:** - Discharge solely to Shotover River, with mixing in near riverbank braids. - Diversion of river required to manage water quality.	2	**Key considerations:** - Discharge to river at the confluence of the Shotover and Kawarau Rivers.	2	**Key considerations:** - Discharge to river at the confluence of the Shotover and Kawarau Rivers.	3	**Key considerations:** - Discharge to river at the confluence of the Shotover and Kawarau Rivers. - Discharge to groundwater at Frankton Flats. - Subsequent discharge to Kawarau River via Frankton Flats groundwater flow paths.	3	**Key considerations:** - Discharge to river at the confluence of the Shotover and Kawarau Rivers. - Discharge to groundwater at Frankton Flats. - Subsequent discharge to Kawarau River via Frankton Flats groundwater flow paths.
				Assumptions: - Consistent with short term consent and predicted effects - Maintenance of diversion channel achieved, providing continuous flow for dilution		**Assumptions:** - Overland flow structure sufficiently sized to preclude public contact with treated wastewater. - Shotover River inflow to Kawarau promotes rapid mixing		**Assumptions:** - Overland flow structure sufficiently sized to preclude public contact with treated wastewater. - Shotover River inflow to Kawarau promotes more rapid mixing		**Assumptions:** - Overland flow structure sufficiently sized to preclude public contact with treated wastewater. - Shotover River inflow to Kawarau promotes more rapid mixing - Discharge of 12,500 m3/day to Frankton bores and 1,500 m3/day to sorts field irrigation		**Assumptions:** - Overland flow structure sufficiently sized to preclude public contact with treated wastewater. - Shotover River inflow to Kawarau promotes more rapid mixing - Discharge of 12,500 m3/day to Frankton soak holes and 1,500 m3/day to sorts field irrigation
				Rationale for scoring: - Localised water quality impacts in the Shotover River beyond the mixing zone, resulting in increases in nutrient concentrations in water quality in select parts of river braids. - Persistent change in river braids with maintenance of diversion, potentially impacting other braids due to reduced flow. - Public health risk being mitigated by exclusion riverbank area (reducing exposure).		**Rationale for scoring:** - Removes delta groundwater effects. - Reduces water quality effects in shallow riverbank areas. - Reduces potential for algal growth and nuisance growth. - Reduces potential for exposure with recreational land use. Score could be increased where an in-river diffuser allows for immediate mixing centrally within the river.		**Rationale for scoring:** - Removes delta groundwater effects. - Reduces water quality effects in shallow riverbank areas. - Reduces potential for algal growth and nuisance growth. - Reduces potential for exposure with recreational land use. Score could be increased where an in-river diffuser allows for immediate mixing centrally within the river.		**Rationale for scoring:** - Removes delta groundwater effects. - Reduces water quality effects in shallow riverbank areas. - Reduces potential for algal growth and nuisance growth. - Reduces potential for exposure with recreational land use. Score could be increased where an in-river diffuser allows for immediate mixing centrally within the river. - More diffuse discharge to Kawarau River, with smaller direct discharge mixing zone.		**Rationale for scoring:** - Removes delta groundwater effects. - Reduces water quality effects in shallow riverbank areas. - Reduces potential for algal growth and nuisance growth. - Reduces potential for exposure with recreational land use. - More diffuse discharge to Kawarau River, with smaller direct discharge mixing zone.

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MCA criteria – investment objectives

Further detail as requested on the investment objectives

Investment Objectives

Investment Objective	Key Performance Indicators	MCA Lead scorer
IO1 - The health and well-being of the surrounding waterways are maintained, protected and improved where practicable to support water quality.	1. Ecosystem / Aquatic health effects 2. Human health effects 3. Nuisance growth 4. Recreation impacts	GHD
IO2 - The disposal of treated wastewater aligns with tikanga as guided by mana whenua.	5. Mana whenua values and knowledge 6. Alignment with mana whenua cultural practices, protocols and values.	Iwi representatives
IO3- Ability to service the community's and visitor wastewater needs now and into the future up to the equivalent flows projected for 2060	7. Can accommodate forecast population or economic growth over time 8. Can accommodate peak day inflows 9. Can be resilient to extreme climate events, climate change and natural disasters	GHD

MCA criteria – critical success factors

Further detail as requested on the investment objectives and critical success factors

Social and Environmental Impacts

Critical success factor	Considerations	MCA Lead scorer
S&E1 - Mō tātou, ā, mō kā uri ā muri ake nei For us and our children after us.	• Integration of whakapapa Intergenerational equity, innovation, and knowledge. • Te mana o te wai Mauri of the water is upheld or enhanced • Ki uta ki tai Whole of catchment impact and holistic consideration.	Iwi representatives
S&E2 - Cultural impacts to sites of significance and access to sites for cultural activities.	• Sites of cultural significance impacts • Physical access to site for cultural and recreational activities.	Iwi representatives
S&E3 - Impacts to the surrounding environment.	• Natural waterway impacts • Biodiversity	GHD
S&E4 - Environmental impacts to surrounding catchment land, soil and groundwater.	• Surface water effects • Soil health effects • Groundwater effects	GHD
S&E5 - Visual effects	• The extent to which there is a visual impact from options that differ from existing land use or impact the surrounding natural environment	LandPro
S&E6 - Amenity effects	• Noise impacts • Risk to potential receptors • Recreational access • Air quality / odour risk	LandPro

MCA criteria – critical success factors

Further detail as requested on the investment objectives and critical success factors

Design, Delivery& Operations

Critical success factor	Considerations	MCA Lead scorer
CSF1 - Constructability and technical feasibility	• Technical feasibility • Technical / constructability risks • Compatibility • Technical robustness and operational resilience	GHD
CSF2 - Sustainability	• Carbon emissions (operation carbon included) • Beneficial reuse and sustainable use of resources supporting organisational goals	GHD
CSF3 - Operational reliability and maintainability	• Ease of operations / maintenance • Operational complexity and risks • Functionality	GHD
CSF4 - Property difficulties and impacts	• Property requirements, impacts and difficulties.	GHD and LandPro
CSF5 - Implementation timeframe	• Timeline • Addressing current performance issues	GHD
CSF6 - Costs and affordability	• Capital costs • Operation costs (annual) • Whole of life costs (NPV) • Stage ability	GHD

Sensitivity analysis scenarios

These tables show the weightings used for the different scenarios for the sensitivity analysis which is shown on the following pages. The scenarios were assessed with and without the cost and affordability critical success factor scores

Weighting Scenarios

	Scenario 1 Investment Objectives focused	Scenario 2 Effects focused	Scenario 3 Water quality and environment focused	Scenario 4 Iwi outcomes focused	Scenario 5 Implementability focused	Scenario 6 Even weighted	Scenario 7 National water standards and cost focused	Scenario 8 Iwi (high) outcomes focused	Scenario 9 Iwi (very high) outcomes focused	Scenario 10 Random alocation check
Investment Objectives										
The health and well-being of the surrounding waterways are maintained, protected and improved where practicable to support water quality.	15%	7%	20%	5%	5%	6.25%	29%	10%	2%	4%
The disposal of treated wastewater aligns with tikanga as guided by mana whenua.	10%	5%	5%	15%	5%	6.25%	3%	26%	36%	10%
Ability to service the community's and visitor wastewater needs now and into the future up to the equivalent flows projected for 2060.	10%	5%	5%	5%	5%	6.25%	3%	5%	2%	6%
Environmental and Social Impacts										
Mō tātou, ā, mō kā uri ā muri ake nei For us and our children after us	5%	8%	5%	10%	5%	6.25%	3%	12%	19%	10%
Cultural impacts to sites of significance and access to sites for cultural activities.	5%	8%	5%	10%	5%	6.25%	3%	12%	19%	0%
Impacts to the surrounding environment	5%	8%	10%	5%	5%	6.25%	3%	3%	2%	12%
Environmental impacts to surrounding catchment land, soil and groundwater	5%	8%	10%	5%	5%	6.25%	3%	3%	2%	2%
Visual effects - The extent to which there is a visual impact from options that differ from existing land use or impact the surrounding natural environment.	5%	8%	3%	5%	5%	6.25%	3%	3%	2%	7%
Amenity effects - The extent to which there is a receptor or social impact from options.	5%	8%	3%	5%	5%	6.25%	3%	3%	2%	3%
Design, Delivery and Operation										
Constructability and technical feasibility	5%	5%	5%	5%	10%	6.25%	3%	3%	2%	12%
Sustainability - Carbon emissions and sustainable use of resources supporting organisational goals.	5%	5%	5%	5%	5%	6.25%	3%	3%	2%	6%
Operational reliability and maintainability	5%	5%	5%	5%	8%	6.25%	3%	3%	2%	8%
Property difficulties and impacts	5%	5%	5%	5%	8%	6.25%	3%	3%	2%	1%
Achievability of Indicated Outcomes	5%	5%	5%	5%	8%	6.25%	3%	3%	2%	4%
Consent , Design, Construction Implementation Timeframe	5%	5%	5%	5%	8%	6.25%	3%	3%	2%	12%
Costs and affordability	5%	5%	4%	5%	8%	6.25%	29%	5%	2%	3%

Weighting Scenarios (no cost)

	Scenario 1 Investment Objectives focused	Scenario 2 Effects focused	Scenario 3 Water quality and environment focused	Scenario 4 Iwi outcomes focused	Scenario 5 Implementability focused	Scenario 6 Even weighted	Scenario 7 National water standards and cost focused	Scenario 8 Iwi (high) outcomes focused	Scenario 9 Iwi (very high) outcomes focused	Scenario 10 Random alocation check
Investment Objectives										
The health and well-being of the surrounding waterways are maintained, protected and improved where practicable to support water quality.	15%	6%	20%	5%	5%	6.67%	44%	12%	2%	4%
The disposal of treated wastewater aligns with tikanga as guided by mana whenua.	13%	5%	5%	15%	5%	6.67%	4%	18%	36%	10%
Ability to service the community's and visitor wastewater needs now and into the future up to the equivalent flows projected for 2060.	12%	5%	5%	5%	5%	6.67%	4%	10%	2%	6%
Environmental and Social Impacts										
Mō tātou, ā, mō kā uri ā muri ake nei For us and our children after us	5%	9%	5%	13%	5%	6.67%	4%	15%	20%	10%
Cultural impacts to sites of significance and access to sites for cultural activities.	5%	9%	5%	12%	5%	6.67%	4%	15%	20%	2%
Impacts to the surrounding environment	5%	9%	12%	5%	5%	6.67%	4%	3%	2%	12%
Environmental impacts to surrounding catchment land, soil and groundwater	5%	9%	12%	5%	5%	6.67%	4%	3%	2%	3%
Visual effects - The extent to which there is a visual impact from options that differ from existing land use or impact the surrounding natural environment.	5%	9%	3%	5%	5%	6.67%	4%	3%	2%	7%
Amenity effects - The extent to which there is a receptor or social impact from options.	5%	9%	3%	5%	5%	6.67%	4%	3%	2%	3%
Design, Delivery and Operation										
Constructability and technical feasibility	5%	5%	5%	5%	10%	6.67%	4%	3%	2%	12%
Sustainability - Carbon emissions and sustainable use of resources supporting organisational goals.	5%	5%	5%	5%	5%	6.67%	4%	3%	2%	6%
Operational reliability and maintainability	5%	5%	5%	5%	10%	6.67%	4%	3%	2%	8%
Property difficulties and impacts	5%	5%	5%	5%	10%	6.67%	4%	3%	2%	1%
Achievability of Indicated Outcomes	5%	5%	5%	5%	10%	6.67%	4%	3%	2%	4%
Consent , Design, Construction Implementation Timeframe	5%	5%	5%	5%	10%	6.67%	4%	3%	2%	12%
Costs and affordability	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Long list sensitivity analysis scores

The following tables shows the sensitivity analysis undertaken for the long list options for a range of different scenarios. In each scenario the weightings were adjusted to reflect the scenario focus. The tables show with and without the inclusion of the critical success factor relating to cost. It is noted that this analysis assumes that the fatally flawed scored were graded as -5 to allow the analysis to proceed.

Weighting Scenarios Scores

	Base case		1a	1b	2a	2b	2c	3a	4a	4b	5a	5b	6a	7a	8a
Weighting Scenario Scores	Base case (as intended under consent conditions)	Base case (as disposal field is currently performing)	Option 1 – High-rate land disposal a) Delta infiltration basins	Option 1 – High-rate land disposal b) Delta trenches	Option 2 – Moderate rate land disposal a) Airport and vicinity area	Option 2 – Moderate rate land disposal b) Southern corridor	Option 2 – Moderate rate land disposal alternate locations	Option 3 – Low-rate disposal a) Doc land / Coronet peak	Option 4 – Land flow path to river a) Shotover	Option 4 – Land flow path to river b) Kawarau	Option 5 – Deep well injections a) Frankton	Option 5 – Deep well injections b) Bridesdale	Option 6 – Shallow well injections a) Delta	Option 7 – Subsurface Wetland on a) Delta	Option 8 – Well Point or Soak holes a) Frankton
Scenario 1 Investment Objectives focused	-1.15	-3.50	-1.50	-1.45	1.20	-1.60	-1.35	-1.60	-0.40	0.15	0.15	-0.20	-0.35	0.15	1.80
Scenario 2 Effects focused	-1.15	-3.34	-1.88	-1.94	1.26	-1.66	-1.56	-1.78	-0.27	0.02	0.13	-0.16	-0.45	0.00	1.89
Scenario 3 Water quality and environment focused	-0.85	-3.38	-1.12	-1.00	1.45	-1.31	-0.76	-0.73	-0.28	0.56	0.60	0.10	0.04	0.64	1.85
Scenario 4 Iwi outcomes focused	-1.85	-3.60	-2.50	-2.55	1.35	-2.20	-2.15	-2.30	-1.10	-0.90	-0.80	-0.90	-1.40	-1.00	2.20
Scenario 5 Implementability focused	-0.88	-3.08	-1.89	-1.97	-0.04	-1.98	-2.23	-2.32	0.10	0.32	-0.20	-0.65	-0.49	0.13	1.05
Scenario 6 Even weighted	-1.06	-3.25	-1.88	-1.94	0.69	-1.81	-1.88	-2.06	-0.13	0.13	-0.06	-0.44	-0.50	0.00	1.50
Scenario 7 National water standards and cost focused	-0.51	-2.60	-0.38	-0.15	1.37	-0.87	-0.12	0.05	-0.32	0.58	0.75	0.31	0.28	0.78	1.50
Scenario 8 Iwi (high) outcomes focused	-2.58	-3.99	-2.79	-2.75	2.27	-2.40	-2.01	-2.14	-2.16	-1.81	-1.33	-1.17	-2.11	-1.80	3.00
Scenario 9 Iwi (very high) outcomes focused	-3.74	-4.44	-4.00	-4.02	2.94	-3.13	-2.81	-2.87	-3.44	-3.36	-2.57	-2.01	-3.56	-3.40	3.88
Scenario 10 Random allocation check	-1.14	-3.46	-2.38	-2.49	0.33	-1.95	-2.35	-2.91	-0.08	0.24	-0.22	-0.56	-0.57	-0.03	1.52

Weighting Scenarios Scores (no cost)

	Base case		1a	1b	2a	2b	2c	3a	4a	4b	5a	5b	6a	7a	8a
Weighting Scenario Scores (no cost)	Base case (as intended under consent conditions)	Base case (as disposal field is currently performing)	Option 1 – High-rate land disposal a) Delta infiltration basins	Option 1 – High-rate land disposal b) Delta trenches	Option 2 – Moderate rate land disposal a) Airport and vicinity area	Option 2 – Moderate rate land disposal b) Southern corridor	Option 2 – Moderate rate land disposal alternate locations	Option 3 – Low-rate disposal a) Doc land / Coronet peak	Option 4 – Land flow path to river a) Shotover	Option 4 – Land flow path to river b) Kawarau	Option 5 – Deep well injections a) Frankton	Option 5 – Deep well injections b) Bridesdale	Option 6 – Shallow well injections a) Delta	Option 7 – Subsurface Wetland on a) Delta	Option 8 – Well Point or Soak holes a) Frankton
Scenario 1 Investment Objectives focused	-1.32	-3.75	-1.63	-1.58	1.34	-1.70	-1.44	-1.78	-0.53	0.04	0.07	-0.25	-0.46	0.04	1.97
Scenario 2 Effects focused	-1.25	-3.52	-2.04	-2.12	1.43	-1.73	-1.63	-1.89	-0.31	-0.04	0.14	-0.13	-0.50	-0.05	2.07
Scenario 3 Water quality and environment focused	-0.85	-3.50	-1.12	-1.00	1.61	-1.27	-0.66	-0.65	-0.26	0.64	0.72	0.20	0.12	0.74	1.97
Scenario 4 Iwi outcomes focused	-2.10	-3.85	-2.75	-2.80	1.55	-2.38	-2.33	-2.44	-1.35	-1.15	-0.98	-1.03	-1.65	-1.25	2.45
Scenario 5 Implementability focused	-0.90	-3.30	-2.05	-2.15	-0.30	-2.20	-2.55	-2.60	0.20	0.40	-0.30	-0.85	-0.55	0.15	0.95
Scenario 6 Even weighted	-1.13	-3.47	-2.00	-2.07	0.73	-1.93	-2.00	-2.20	-0.13	0.13	-0.07	-0.47	-0.53	0.00	1.60
Scenario 7 National water standards and cost focused	-0.68	-3.68	-0.40	-0.04	2.04	-1.16	0.00	0.28	-0.48	0.88	1.16	0.52	0.48	1.20	2.16
Scenario 8 Iwi (high) outcomes focused	-2.53	-4.22	-2.60	-2.54	2.32	-2.24	-1.92	-2.04	-2.03	-1.57	-1.06	-0.94	-1.87	-1.54	3.01
Scenario 9 Iwi (very high) outcomes focused	-3.84	-4.54	-4.10	-4.12	3.02	-3.20	-2.88	-2.92	-3.54	-3.46	-2.64	-2.06	-3.66	-3.50	3.98
Scenario 10 Random allocation check	-1.24	-3.59	-2.46	-2.57	0.45	-2.01	-2.38	-2.89	-0.17	0.16	-0.25	-0.58	-0.65	-0.10	1.65

Long list sensitivity analysis rankings

The following tables show the sensitivity analysis undertaken for the long list options for a range of different scenarios. In each scenario the weightings were adjusted to reflect the scenario focus. The two tables show with and without the critical success factor relating to cost. It is noted that this analysis assumes that the fatally flawed scored were graded as -5 to allow the analysis to proceed. The number shown in the box is the option ranking for the given scenario.

Weighting Scenario Ranks	Base case (as intended under consent conditions)	Base case Base case (as disposal field is currently performing)	1a Option 1 – High-rate land disposal a) Delta infiltration basins	1b Option 1 – High-rate land disposal b) Delta trenches	2a Option 2 – Moderate rate land disposal a) Airport and vicinity area	2b Option 2 – Moderate rate land disposal b) Southern corridor	2c Option 2 – Moderate rate land disposal alternate locations	3a Option 3 – Low-rate disposal a) Doc land / Coronet peak	4a Option 4 – Land flow path to river a) Shotover	4b Option 4 – Land flow path to river b) Kawarau	5a Option 5 – Deep well injections a) Frankton	5b Option 5 – Deep well injections b) Bridesdale	6a Option 6 – Shallow well injections a) Delta	7a Option 7 – Subsurface Wetland on a) Delta	8a Option 8 – Well Point or Soak holes a) Frankton
Scenario 1 Investment Objectives focused	9	15	12	11	2	13	10	13	8	4	5	6	7	3	1
Scenario 2 Effects focused	9	15	13	14	2	11	10	12	7	4	3	6	8	5	1
Scenario 3 Water quality and environment focused	11	15	13	12	2	14	10	9	8	5	4	6	7	3	1
Scenario 4 Iwi outcomes focused	9	15	13	14	2	11	10	12	7	4	3	5	8	6	1
Scenario 5 Implementability focused	9	15	10	11	5	12	13	14	4	2	6	8	7	3	1
Scenario 6 Even weighted	9	15	11	13	2	10	11	14	6	3	5	7	8	4	1
Scenario 7 National water standards and cost focused	13	15	12	10	2	14	9	8	11	5	4	6	7	3	1
Scenario 8 Iwi (high) outcomes focused	12	15	14	13	2	11	7	9	10	6	4	3	8	5	1
Scenario 9 Iwi (very high) outcomes focused	12	15	13	14	2	7	5	6	10	8	4	3	11	9	1
Scenario 10 Random alocation check	9	15	12	13	2	10	11	14	5	3	6	7	8	4	1

Weighting Scenario Ranks (no cost)	Base case (as intended under consent conditions)	Base case Base case (as disposal field is currently performing)	1a Option 1 – High-rate land disposal a) Delta infiltration basins	1b Option 1 – High-rate land disposal b) Delta trenches	2a Option 2 – Moderate rate land disposal a) Airport and vicinity area	2b Option 2 – Moderate rate land disposal b) Southern corridor	2c Option 2 – Moderate rate land disposal alternate locations	3a Option 3 – Low-rate disposal a) Doc land / Coronet peak	4a Option 4 – Land flow path to river a) Shotover	4b Option 4 – Land flow path to river b) Kawarau	5a Option 5 – Deep well injections a) Frankton	5b Option 5 – Deep well injections b) Bridesdale	6a Option 6 – Shallow well injections a) Delta	7a Option 7 – Subsurface Wetland on a) Delta	8a Option 8 – Well Point or Soak holes a) Frankton
Scenario 1 Investment Objectives focused	9	15	12	11	2	13	10	14	8	5	3	6	7	4	1
Scenario 2 Effects focused	9	15	13	14	2	11	10	12	7	4	3	6	8	5	1
Scenario 3 Water quality and environment focused	11	15	13	12	2	14	10	9	8	5	4	6	7	3	1
Scenario 4 Iwi outcomes focused	9	15	13	14	2	11	10	12	7	5	3	4	8	6	1
Scenario 5 Implementability focused	9	15	10	11	5	12	13	14	3	2	6	8	7	4	1
Scenario 6 Even weighted	9	15	11	13	2	10	11	14	6	3	5	7	8	4	1
Scenario 7 National water standards and cost focused	13	15	11	10	2	14	9	8	12	5	4	6	7	3	1
Scenario 8 Iwi (high) outcomes focused	12	15	14	13	2	11	8	10	9	6	4	3	7	5	1
Scenario 9 Iwi (very high) outcomes focused	12	15	13	14	2	7	5	6	10	8	4	3	11	9	1
Scenario 10 Random alocation check	9	15	12	13	2	10	11	14	5	3	6	7	8	4	1

Short list sensitivity scores and rankings

The following tables show the sensitivity analysis undertaken for the short list options for a range of different scenarios. In each scenario the weightings were adjusted to reflect the scenario focus. The two tables show scores without the critical success factor related to cost. It is noted that this analysis does not include scores for the iwi scored objectives.

Short list scores (no cost)

	Current Situation	A	B	C	D
Weighting Scenario Scores (no cost)	Current situation (Discharge to Shotover River)	Land flow path to river via Kawarau	Subsurface wetlands on Delta + Land Flow Path to Kawarau	Deep well (Bore) injections at Frankton	Shallow well (soakhole) injections at Frankton
Scenario 1 Investment Objectives focused	0.00	0.84	0.74	0.04	-0.21
Scenario 2 Effects focused	0.00	0.64	0.62	-0.25	-0.54
Scenario 3 Water quality and environment focused	0.00	1.10	0.96	0.26	0.03
Scenario 4 Iwi outcomes focused					
Scenario 5 Implementability focused	0.00	0.70	0.45	-1.00	-1.45
Scenario 6 Even weighted	0.00	0.67	0.53	-0.53	-0.87
Scenario 7 National water standards and cost focused	0.00	1.20	1.12	0.88	0.68

Shortlisted sensitivity analysis rankings.

Scenario	**Option A** Land flow path to river via Kawarau	**Option B** Wetland on Delta + Land Flow Path to Kawarau	**Option C** Boreholes at Frankton (+ Option B)	**Option D** Soakholes at Frankton (+ Option B)
Scenario 1 Investment Objectives focused	1st	2nd	3rd	4th
Scenario 2 Effects focused	1st	2nd	3rd	4th
Scenario 3 Water quality and environment focused	1st	2nd	3rd	4th
Scenario 4 Iwi outcomes focused*	No scoring provided for criteria relating to Kai Tahu values – Scenario not used			
Scenario 5 Implementability focused	1st	2nd	3rd	4th
Scenario 6 Even weighted	1st	2nd	3rd	4th
Scenario 7 National water standards and cost focused	1st	2nd	3rd	4th

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Did assumptions exclude viable options?

Did assumptions exclude viable options?

Assumptions were made during the optioneering process about the cost of the option in comparison to the available budget. During the long list phase, options that were more than three times the LTP budget (>$250M) were considered cost prohibitive to the community, with the calculation that every $20M increase in capital cost is estimated to result in an approximate 43% increase in the wastewater charge component per rating unit.

This did preclude some expensive options from being considered, for example reverse osmosis for potable water reuse was not included on a long list of options for this reason.

Options that were a considerable distance (>10km) from the WWTP were also not taken forward to the long list. This included in locations such as Gibbston and the Crown Terrace. This consideration was raised during the peer review process, noting there was no longer a viable land only short listed disposal option. As a result, a further assessment of viable land only discharge options was undertaken, and the Crown Terrace (Option E) was included on the short list, as an option which could accommodate all 2060 wastewater flows.

On reviewing the constraints mapping of suitable land parcels and the large areas of land required, there are not thought to be any other areas that could be considered for the full 2060 volume, as per the project scope.

Hybrid options were considered during the short list assessment when it became clear there was not a land only disposal option, but these hybrid options all involved some discharge to water. The consideration of hybrid options was not exhaustive and focused on more feasible options. There may be other combinations of different land only disposal options that could be considered.

MCA without cost lens

Councillors asked about the MCA analysis and how this could be analysed without the cost lens. The critical success factor related to cost is CSF6 – Cost and Affordability and considered capital cost, operating cost, whole of life cost and the ability to stage the project.

The sensitivity analysis tables presented on the previous pages show the MCA results both with and without CSF6 included. Removing the cost criterion did not materially alter the ranking of options or the options identified for progression.

It is important to note that some non-cost criteria are indirectly influenced by factors that also drive cost. For example, options with higher costs are often more technically complex, which can increase implementation time and result in lower scores against CSF5 – Implementation Timeframe. Similarly, greater technical complexity can reduce scores for constructability, operational reliability, resilience, or maintainability. While these criteria are not direct measures of cost, they reflect real-world consequences of option complexity and therefore cannot be considered entirely in isolation from cost-related drivers.

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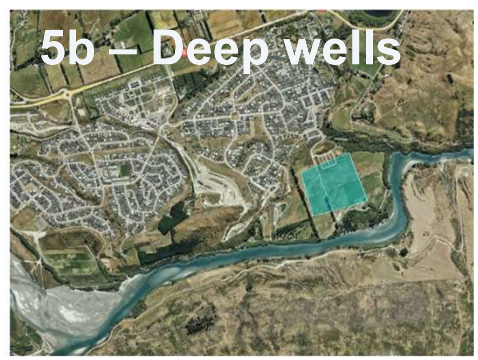
Are there other viable options?

In addressing the feedback from the early insights workshop, we have reviewed the long list of options, and the following long-listed technically feasible options that could be reconsidered or considered in combination with other options.

Long List Options	Reasoning for not progressing to short list	Alternative option consideration
(1a, 1b) High rate disposal on the delta	These options were not shortlisted due to the impact on recreation on the delta, excessive construction material requirement, and were not supported by iwi	The challenges remain the same, but these options could be considered more favourable by mana whenua when compared to a direct river discharge
(5b) Deep well injection to other areas e.g. Bridesdale	The Bridesdale deep well option was not progressed to the short list due to cost of a new bridge across the Shotover, and the limited available land area for distribution of wells. Frankton disposal (Option 3 and 4) was progressed to short list as deep disposal options.	Could be combined with deep bore disposal at Frankton or other areas. Could be developed in a staged manner. Does not require purchase of large amounts of land.
(6) Shallow well injection on the delta	Not supported by iwi due to degree of connection to surface water	Could be considered preferrable by mana whenua compared to the river discharge

Figure 3 Option 1a Infiltration Basin in the Shotover Delta - Indicative site area (yellow highlight)

Figure 4 Option 1b Trenches in Shotover Delta, indicative site area (blue highlight) and flood wall relocation (red lines)



Option 6 a, figure indicates site area which could be used for the shallow injection wells (red highlig

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Financial

- Cost breakdowns
- Funding and financial alternatives
- Long term affordability

Cost breakdowns – short list options

Information on the cost breakdown of options was requested. Additional detail on the cost breakdowns of component for each short-listed option can be found in Appendix A of the Short List Report. A snapshot of the summary is provided here. The cost estimate for Option A has since been updated as part of the preferred option development.

Item	Option A - Land flow path	Option B - Wetland	Option C - Bore	Option D - Soakholes
CAPEX Stage 1				
Tertiary Filtration	$ 5,954,405	$ 5,954,405	$ 5,954,405	$ 5,954,405
Treated water calamity pond	$ 1,387,352	$ 1,387,352	$ 1,387,352	$ 1,387,352
Recyced Water for truck wash	$ 1,279,910	$ 1,279,910	$ 1,297,368	$ 1,297,368
Land flow path and discharge structure	$ 7,348,413	$ 4,051,279	$ 4,051,279	$ 4,051,279
Wetland (3ha)	$ -	$ 17,805,977	$ 17,805,977	$ 17,805,977
Stage 1 Membrane + Transfer Pump + Pipeline	$ -	$ -	$ 8,615,814	$ 8,615,814
Stage 1 Borefield cost	$ -	$ -	$ 5,988,487	$ 5,400,987
Connection to golf course and sporfields	$ -	$ -	$ 207,000	$ 207,000
Physical works - Sub total	**$ 15,970,079**	**$ 30,478,923**	**$ 45,307,682**	**$ 44,720,182**
Contractor Cost	$ 8,095,185	$ 15,449,674	$ 23,985,343	$ 23,674,328
Construction Cost Base Cost	**$ 24,065,264**	**$ 45,928,597**	**$ 69,293,025**	**$ 68,394,509**
Construction Cost P50	$ 33,691,370	$ 64,300,036	$ 97,010,235	$ 95,752,313
Construction Cost P95	$ 38,504,423	$ 73,485,755	$ 110,868,839	$ 109,431,215
Consent, Investigation and Design Fees	$ 5,619,137	$ 6,751,003	$ 10,320,614	$ 10,245,139
Stage 1 CAPEX Cost P50	**$ 39,310,507**	**$ 71,051,038**	**$ 107,330,849**	**$ 105,997,452**
Stage 1 CAPEX Cost P95	**$ 44,123,560**	**$ 80,236,758**	**$ 121,189,454**	**$ 119,676,353**
CAPEX Stage 2 *(only applicable if discharge capacity greater than 12,500m³ /day is determined to be acheivable for Option C or D)*				
Membrane filtration upgrade	$ -	$ -	$ 11,555,589	$ 11,555,589
Conveyance	$ -	$ -	$ 5,184,984	$ 5,184,984
Boreholes or Soakholes	$ -	$ -	$ 6,930,045	$ 15,835,545
Physical works - Sub total	**$ -**	**$ -**	**$ 23,670,617**	**$ 32,576,117**
Contractor Cost	$ -	$ -	$ 12,530,941	$ 17,245,406
Construction Cost Base Cost	**$ -**	**$ -**	**$ 36,201,558**	**$ 49,821,523**
Construction Cost P50	$ -	$ -	$ 50,682,181	$ 69,750,132
Construction Cost P95	$ -	$ -	$ 57,922,493	$ 79,714,436
Consent, Investigation and Design Fees	$ -	$ -	$ 6,540,931	$ 6,580,011
Option Cost P50	**$ -**	**$ -**	**$ 57,223,112**	**$ 76,330,142**
Option Cost P95	**$ -**	**$ -**	**$ 64,463,423**	**$ 86,294,447**
Stage 1 + Stage 2 CAPEX Cost P50	**$ 39,310,507**	**$ 71,051,038**	**$ 164,553,960**	**$ 182,327,594**
Stage 1 + Stage 2 CAPEX Cost P95	**$ 44,123,560**	**$ 80,236,758**	**$ 185,652,877**	**$ 205,970,800**
OPEX Costs				
Annual operating costs Stage 1				
Renewals	$ 264,668	$ 373,771	$ 638,793	$ 632,918
Operations	$ 9,984	$ 29,952	$ 79,872	$ 79,872
Electricity	$ 71,034	$ 66,618	$ 141,370	$ 97,179
Other	$ 4,752	$ 4,752	$ 20,424	$ 16,673
Total annual operating costs Stage 1	**$ 350,439**	**$ 475,093**	**$ 880,459**	**$ 826,642**
Annual operating costs Stage 2				
Maintenance costs (assumed 1% civil, 3% mech)	$ 264,668	$ 373,771	$ 1,033,330	$ 1,124,290
Operations	$ 9,984	$ 29,952	$ 167,643	$ 167,643
Electricity	$ 71,034	$ 66,618	$ 369,247	$ 366,623
Other	$ 4,752	$ 4,752	$ 13,174	$ 52,774
Total annual operating costs Stage 2	**$ 350,439**	**$ 475,093**	**$ 1,583,395**	**$ 1,711,331**
Whole of life Cost *- 30 year period, assumes discount rate of 2% and depreciation funded 50%* **over 60 years**				
Net present value of CAPEX and OPEX, 30 years	**$ 47,912**	**$ 84,778**	**$ 187,931**	**$ 208,611**

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Alternative funding models

While the traditional approach is to fund projects (and typically all three waters projects) through council debt repaid via wastewater rates and Developer Contributions, several alternative funding models and tools could reduce the burden on existing ratepayers or change the funding responsibility. There is an opportunity to increase the use of these other tools that better align those who benefit with those who bear the cost.

Changes to the way capital projects are funded under most mechanisms does not materially change the debt burden on the Council's books. Who pays (for example all ratepayers or just those in growth areas) may change depending on the funding tool adopted, but the debt will still need to be repaid.

Extending the timeframe for repayment increases may reduce the annual payments but significantly increases the overall debt burden and can result in debt burden being passed onto future users.

There are no current three waters funding sources or grants for large scale metropolitan capital projects that do not require costs to be recouped.

Some potential funding sources to offset or repay capital costs are outlined below.

Traditional general rates

Council borrows to fund the project and costs are recovered through wastewater rates and charges. Places the full burden on ratepayers.

Targeted rates

Council allocates an additional rate to those expected to benefit from new infrastructure or an improved level of service rather than charging the entire ratepayer base for the infrastructure investment.

Development Contributions

(Growth Pays for Growth) Allocates the growth-related portion of the project to future development. Recovers costs through development contributions from new developments. Improves fairness by ensuring existing ratepayers do not fund all future capacity.

Visitor or Tourism Funding (not currently legal in NZ)

Recognises that visitors contribute significantly to wastewater flows. Potential mechanisms include visitor levies, accommodation levies, or tourism-related revenues. Reduces reliance on local ratepayers.

Infrastructure Funding and Financing (IFF)

Infrastructure financed through a special purpose funding entity. Debt repaid through targeted levies on benefiting properties.

Public-Private Partnership (PPP)

Private sector designs, finances, builds and/or operates infrastructure. Transfers some delivery and performance risk. May be suitable for very large-scale (in excess of $1B capex), high-value projects. Annual fee still typically funded through rates or levies on ratepayers.

Government Grants and Co-Funding

Seeks external funding from central government or environmental programmes. Particularly relevant for projects that deliver water quality, ecological, climate resilience, or environmental benefits. Can reduce total costs borne by local communities.

Developer agreements

Specific agreement with developers or large landowners, to fund a specific project or project component. Works when there is a strong incentive for a developer to agree to delivering infrastructure to accelerate pace at which development can occur. Requires tight administration.

Staged Delivery

Construct only the infrastructure required in the near term. Expand the system as growth occurs. Reduces initial borrowing and aligns expenditure with future demand. Creates risk if initial stages are scoped too small. Potential Funding Strategy for Shotover.

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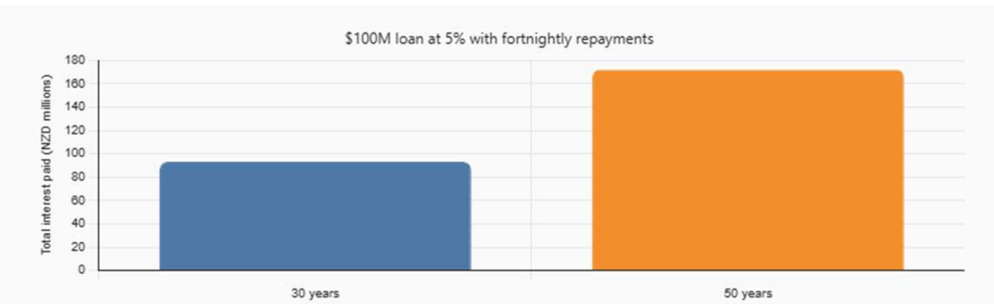
Longer term funding and financing

A question was asked about longer term funding. The community's willingness and ability to pay will need to be considered, along with the future needs of the community.

While longer term funding reduces the annual payments, there are several downsides. Using the example of a 50 year loan compared to a 30 year loan (at 5% interest) regular payments reduce by approximately 15% but the total cost increases significantly. For every $1 of fortnightly repayment reduction, there's an additional $2,080 in additional interest.



Graph of total interest on $100M loan over different time periods

- 30 year interest cost $93M
- 50 year interest cost $172M
- Additional interest $79M

Extending funding beyond the proposed 35-year consent term would reduce annual debt servicing costs but increase total borrowing costs and create a greater mismatch between debt repayment, asset life and regulatory approvals. A 50-year funding horizon may also reduce future financial flexibility and increase the risk that future ratepayers continue servicing debt for infrastructure that requires significant renewal, modification or replacement before the debt is retired.

Longer term funding considerations:

- **Future generations** may continue to pay for assets that no longer exist (pumps, UV treatment, electrical assets will need replacement before 50 years.
- **Reduced flexibility if technology changes.** Eg, over 50 years treatment technologies may change, or nutrient levels may tighten, reuse schemes may become viable or growth assumptions may change. Legacy debt could reduce the Council's flexibility to respond to these changes
- **Mismatch with consent duration**. There is no guarantee that the next consent will be granted on the same terms, and additional investment may be required before the debt is cleared.
- **Population growth uncertainty.** Over a 50 year period the population projections become much less certain.
- **Potential impact on future borrowing capacity**

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Strategic

- Risk
- Future regulatory changes
- Resilience
- Long term disposal resilience

Risk

Risk assessments have been undertaken throughout the process, and several risk workshops have been held throughout the project. An initial risk register was prepared as part of the long list phase,. At the short list phase a risk workshop was held to go through the risks associated with each of the short-listed options, and a more detailed risk assessment was prepared for the preferred option. These risk assessments are documented in detail in each of the reports at each phase.

Future regulatory changes has been a risk that has been realised throughout this project with the introduction of new National wastewater standards after the short list option selection.

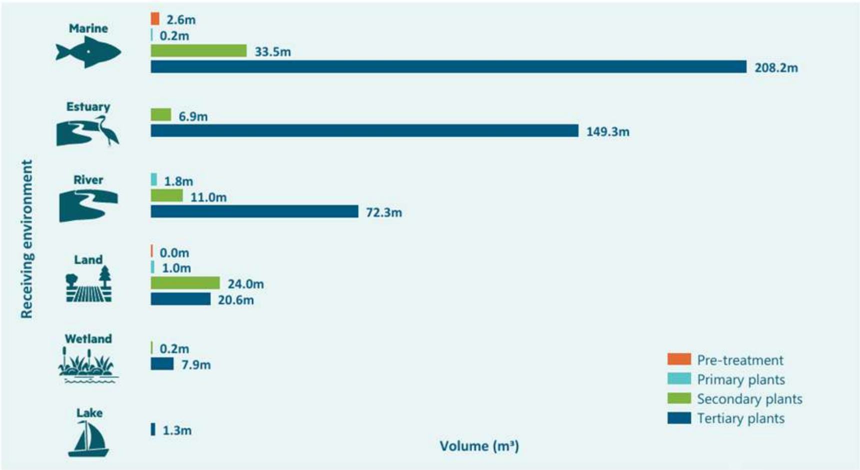
There may be other future changes that may introduce more stringent wastewater treatment, discharge quality, environmental monitoring, or receiving environment projection requirements during the life of the project. This could necessitate additional treatment infrastructure, operational upgrades, consent amendments, or increased compliance costs. Once consent is granted, this will provide initial surety for the duration of the consent. While the specific nature and timing of future regulatory changes cannot be predicted, solutions that provide flexibility, adaptability, and capacity for future treatment upgrades are likely to be more resilient over the project lifecycle.

Several recent NZ wastewater consents have included a condition to undertake periodic review of treatment technology and effluent disposal every 10 to 15 years, to enable more proactive future planning ahead of the future consent renewal.

A comment was made about future regulatory changes resulting in all wastewater discharges going to land. This would be highly unlikely and challenging and difficult to implement. Taumata Arowai's Network Environmental Performance report from 2024 states that 75% of all wastewater is discharged to marine environments, river-based discharges account for 15% of the volume discharge nationally, and that discharges to land are low (8.4%) relative to other locations as this type of treatment and discharge is primarily employed for smaller communities.

What are the consenting risks with Option 1? The principal consenting risks for the Kawarau River discharge option relate to demonstrating consistency with the Kawarau Water Conservation Order, addressing cultural and Te Mana o Te Wai considerations, and managing stakeholder perceptions regarding wastewater discharge to a high-value receiving environment. While technical assessments indicate that environmental and public health effects can be appropriately managed, there remains a risk that future wastewater standards, more stringent consent conditions, or appeals by stakeholders could increase project costs, extend consenting timeframes, or necessitate additional treatment infrastructure.

Te Mana o Te Wai considerations do not directly prohibit discharge to water, but it is an important consideration because it influences how the effects on freshwater are assessed and the extent to which cultural values have been recognised and provided for. The primary risk is not that the discharge will fail to meet water quality limits, but that a treated wastewater discharge to the culturally significant Kawarau River is viewed by mana whenua as inconsistent with tikanga, mauri and kaitiakitanga values. This may lead to stronger consent conditions, additional cultural monitoring requirements, extended hearing processes, or appeals, even where physical environmental effects are assessed as less than minor.



NZ Wastewater discharge volume by receiving environment. Source: Taumata Arowai Network Environmental Performance report 2024

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Resilience

Resilience was another key discussion topic raised at the early insights workshop, with questions asked about the resilience of the disposal to the river to changes in the river bank and changes in flow from climate change. The Shotover disposal solution needs to be assessed on its ability to meet current environmental and compliance requirements, but also its resilience to future change and uncertainty. This includes the ability to maintain performance during extreme weather events, respond to changing regulatory requirements, accommodate population growth and adapt to evolving environmental expectations over its operational life.

Long-term resilience can be enhanced through diversified disposal pathways, modular infrastructure that can be expanded over time, and solutions that avoid reliance on a single critical asset or environmental receptor. The preferred option should demonstrate an ability to adapt to future growth, technological advances, and changes in regulatory standards without requiring significant reinvestment or creating unacceptable service, environmental, or financial risks.

From a community perspective, resilience also includes affordability and financial sustainability, ensuring that the disposal solution remains manageable for future generations while continuing to protect public health, environmental values, and the reliability of wastewater services across the district.

Resilience has been considered at all aspects of the project, and is a key consideration of mana whenua, with their view on wastewater crossing over rivers, and consideration of flooding, earthquake, and other events.

- **Long term performance** A key project driver is to avoid repeat failure of the existing disposal field, therefore the assessment process focused on identifying disposal approaches that are more robust and less susceptible to clogging, and long term performance decline.

- **Future growth and capacity** All options were assessed against projected flows through to 2060 with the ability to increase capacity, expand infrastructure, or intensify treatment in the future was considered an important resilience measure

- **Operational resilience** The options assessment considered operation resilience such as the reliability of disposal performance, the ease of operation and maintenance, the risks of clogging or hydraulic failure, the dependency on specialised equipment and the ability to continue operating during equipment outages or maintenance events.

- **Natural Hazard resilience** Considerations on the impact of earthquakes, floods, landslides, and climate change impacts were made.

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Climate change and river geomorphology

Climate change projections for the Whakatipu basin and broader catchment are for:

- Increase in total rainfall, resulting from more frequent large (>25 mm/day) rainfall events
- Increase in prolonged dry periods, as a result of fewer rain days.
- Higher average temperature
- More frequent flooding events

Potential influence on land disposal:

Greater variability in operations, with more frequent groundwater recharge events increasing nitrogen mobility and increasing erosion risk. Warmer conditions may enable greater plant water uptake.

Potential influence on water disposal:

Higher average flows in the Kawarau River likely with greater lake catchment rainfall and more frequent run-off events.

Kawarau River disposal - Infrastructure operational resilience

Key operational risk for resilience of the Kawarau River in-river infrastructure includes:

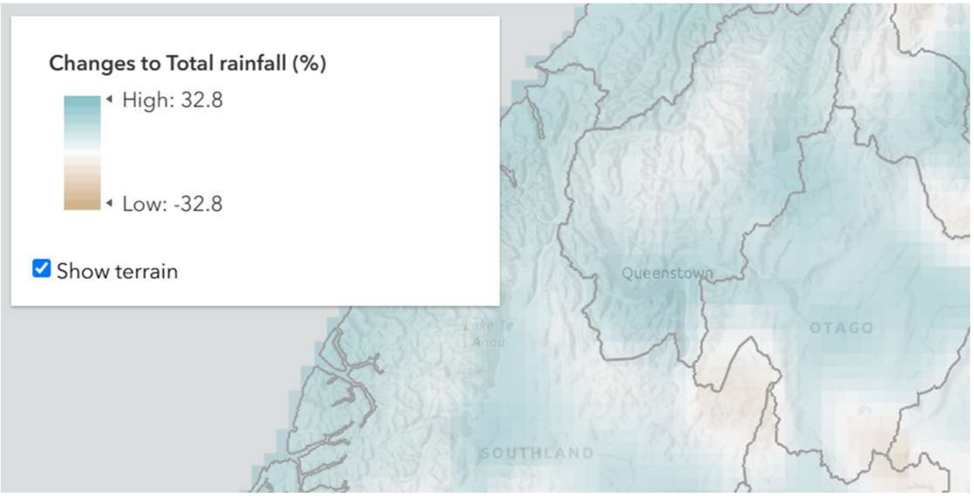
- Damage during flooding
- Foundation undermining with long term changes in river Channel morphology

During flooding events the Kawarau River flow upstream of the disposal location is constrained by high Shotover River inflow and actual water velocity is not expected to increase in the same manner as occurs for the Shotover River. Potential damage from flooding is expected to include scouring of placed rock fill and vegetation that becomes submerged with water, and potentially deposition of fine sediment as flows reduce. Subsurface infrastructure is not expected to be influenced as ongoing discharge is expected to limit backflow. Design of the structure, with rock armouring, must accommodate potential flood damage and maintenance after flooding.

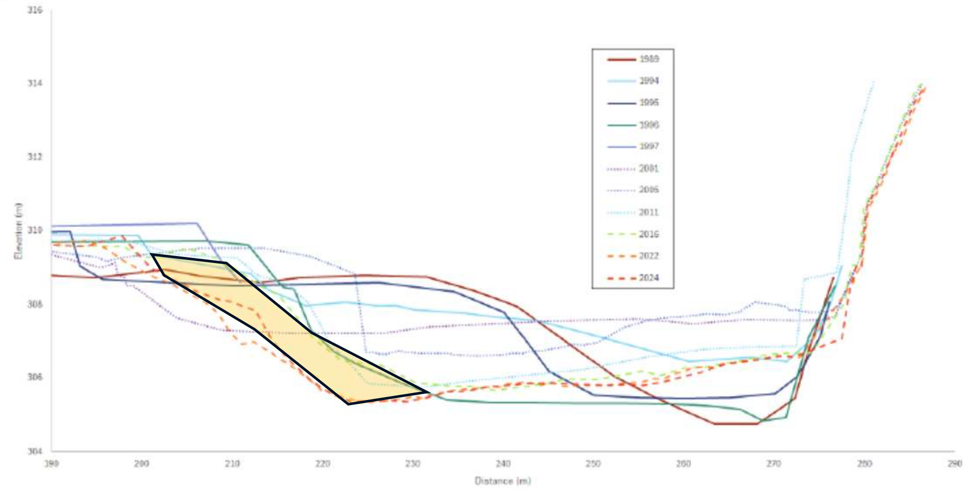
The Kawarau River channel has historically changed in shape as river gravels were deposited by the Shotover River during flood events and subsequently eroded and redistributed by Kawarau River flow.

The installation of the training line in 2011 is expected to have effectively stopped that deposition process over the length of the Kawarau River in the lee of the training line. Surveys of the Kawarau river channel by ORC have indicated that the since construction of the training line, in the vicinity of the proposed disposal, the channel depth has not changed significantly, but the channel has become more uniform and larger in area, with steeper true left riverbank (Shotover delta side). The channel in this location remains relatively wide (80m) and shallow (2.25m)

Without significant deposition of gravels at the disposal location, the rate of change of the river channel is expected to slow. Some minor and gradual broadening of the river may result, or a deeper mid-channel may establish. Infrastructure on the riverbank is likely less influenced by these changes, but this requires consideration in design and maintenance.



Annual Rainfall change by 2099 (SSP3-7.0) Source: Ministry for the Environment – Climate Projections Map



Kawarau River channel cross sections (Haskoning, 2025) - dashed lines are post training line construction (2011). Shaded area reflects increase in channel area between 2011 – 2024.

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Closing

This document responds to the feedback from the early insights Councillor workshop

- The additional investigation confirms that no land-based option in the Whakatipu Basin can accommodate 100% of projected 2060 flows other than the Crown Terrace, which carries considerable cost and significant ongoing pumping.
- There are land options that can discharge a portion of the projected flow that could be considered in combination with other disposal methods, however the constraints mean that these portions of projected flows are capped.
- Reuse and demand-management measures remain worth pursuing as complementary opportunities, but they are seasonal or partial and cannot replace a full-flow disposal solution.
- Sensitivity testing, including with cost removed, does not materially change the relative ranking of the shortlisted options.
- The remaining decisions are cultural and financial rather than technical, and will require continued engagement with mana whenua and the community

We welcome Councillors' questions and challenges at the next workshop and confirmation of the direction for the next phase.

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Shotover Wastewater Treatment Solution

Draft Deliberative Poll Questions

QUEENSTOWN LAKES DISTRICT COUNCIL

To	**QLDC Councillors**
Subject	Draft Deliberative Poll Questions for Councillor Input

Below are draft questions proposed for Deliberative Polling® on a long-term solution for the Shotover Wastewater Treatment Plant. It is recommended councillors read these questions in conjunction with the attached process design document prepared by The New Democracy Foundation & Stanford Deliberative Democracy Lab. Within the questions there are placeholders that will be updated through councillor input through challenger session/s.

Most questions are proposed on a 0 to 11 Likert scale for comparison before and after attending a deliberative workshop/event, learning from experts & those with different views, and receiving briefing materials. This is an essential difference between a Deliberative Poll® and a regular survey or poll; insight is gained through a representative group learning more about the topic and discussing its trade-offs.

It is estimated that it will take 10 to 15mins to answer the survey, this is in line with best practice. These questions have been reviewed by Alice Siu, Associate Director of the Deliberative Democracy Lab to ensure alignment with best practice Deliberative Polling® methods and questionnaire design.

For information on the process design please refer to the process design document.

TOPIC AREAS COVERED

Orientation
Topic 1: Ways to Discharge Treated Wastewater
Topic 2: Effects of Discharging Wastewater – what matter's
Topic 3: Understanding of Water Treatment Level
Topic 4: Concerns about Wastewater Disposal
Topic 5: Costs
Topic 6: Support for Specific Options
Topic 7: Media consumption & Knowledge sources

<u>After Deliberation</u>

Topic 8: Process of Determining Discharge Solution
Topic 9: <placeholder for additional post-deliberation questions - to be determined>

ORIENTATION

1.To what extent are you concerned with how treated wastewater is discharged?

0 – Extremely unconcerned	1	2	3	4	5	6	7	8	9	Extremely concerned	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

TOPIC AREA 1: WAYS TO DISCHARGE TREATED WASTEWATER

Once wastewater has been treated, there are three broad ways it can be discharged (disposed of after treatment):

- *Discharge to surface water, e.g. rivers, lakes and the coast (ocean),*
- *Discharge to land, e.g. irrigation (e.g. onto a field) & infiltration (through land to under groundwater),*
- *Hybrid discharge, typically a combination of land and water discharge.*

Knowing this, how strongly would you agree or disagree with the following?

2. Discharging treated wastewater to land is acceptable if it meets the regulatory requirements.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
O	O	O	O	O	O	O	O	O	O	O	O

3. Discharging treated wastewater to surface water is an acceptable if it meets the regulatory requirements.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
O	O	O	O	O	O	O	O	O	O	O	O

4. Discharging treated wastewater to land is preferable to discharging treated wastewater to surface water.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
O	O	O	O	O	O	O	O	O	O	O	O

5. Cost is an important consideration when comparing wastewater discharge options.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
O	O	O	O	O	O	O	O	O	O	O	O

6. When comparing wastewater discharge options, it is important that the discharge method performs reliably day to day, now and in the future.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
O	O	O	O	O	O	O	O	O	O	O	O

TOPIC AREA 2: EFFECTS OF DISCHARGING WASTEWATER – WHAT MATTERS?

How strongly would you agree or disagree with the following?

7. The effects of treated wastewater discharge can be effectively managed through treatment, monitoring and meeting regulatory requirements.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
O	O	O	O	O	O	O	O	O	O	O	O

8. The potential effects of treated wastewater discharge are well understood in the community.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
O	O	O	O	O	O	O	O	O	O	O	O

9. The Shotover Wastewater Treatment Plant treats wastewater to an acceptable standard.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
O	O	O	O	O	O	O	O	O	O	O	O

TOPIC AREA 3: UNDERSTANDING OF WATER TREATMENT LEVEL

10. The following question is about your understanding of wastewater treatment. If you are unsure, please select "Don't know".

a. The Shotover Wastewater Treatment Plant planned upgrades will treat wastewater to what level of treatment?

o Primary

o Secondary

o Tertiary

o Don’t know.

TOPIC AREA 4: CONCERNS ABOUT WASTEWATER DISPOSAL

To what extent are you concerned about the following regarding wastewater disposal options?

11. Environmental harm risk (contamination of waterbodies, and other environmental impacts).

0 - not at all concerned	1	2	3	4	5	6	7	8	9	10 - as concerned as can be	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

12. Public health risk (exposure to untreated wastewater).

0 - not at all concerned	1	2	3	4	5	6	7	8	9	10 - as concerned as can be	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

13. Infrastructure failure (equipment or network breakdown).

0 - not at all concerned	1	2	3	4	5	6	7	8	9	10 - as concerned as can be	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

14. Unexpected events/hazards and climate change risk (floods, storms, earthquakes).

0 - not at all concerned	1	2	3	4	5	6	7	8	9	10 - as concerned as can be	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

15. Growth and future capacity issues (the system no longer coping with demand of growth and visitors).

0 - not at all concerned	1	2	3	4	5	6	7	8	9	10 - as concerned as can be	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

16. Cost overruns and higher charges (higher costs of providing services to residents and businesses).

0 - not at all concerned	1	2	3	4	5	6	7	8	9	10 - as concerned as can be	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

17. Legal challenges and legislative change.

0 - not at all concerned	1	2	3	4	5	6	7	8	9	10 - as concerned as can be	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

TOPIC AREA 5: COSTS

The following questions are about the cost of wastewater disposal options. If you are unsure, please select “Don’t know”.

How strongly would you agree or disagree with the following?

18. A higher-cost wastewater disposal option can be acceptable if it provides better environmental outcomes.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

19. A higher-cost wastewater disposal option can be acceptable if the discharge method remains resilient to unexpected events and climate impacts.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

20. A higher-cost wastewater disposal option can be acceptable if it improves its day-to-day reliability.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

21. The preferred wastewater disposal option should provide an appropriate balance between cost, environmental outcomes, resilience & reliability.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

22.***<placeholder question regarding alternative funding and financing alternative models>***

Willingness to pay

QLDC charges residential households (owned or rented) on average around $1,180 per year, or $98 per month, in Whakatipu basin/Queenstown for wastewater (sewerage) services.

23. Knowing this, how much **more** would you be willing to pay per month for a wastewater disposal option that provides better environmental outcomes. Please indicate any number below. If you don't want to pay more, just write 0:

$ __________ per month

24. And, how much **more** would you be willing to pay for a wastewater disposal option that provides a higher level of wastewater treatment. Please indicate any number below. If you don't want to pay more, just write 0:

$ __________ per month

25. And, how much **more** would you be willing to pay for a wastewater disposal option that minimises treated wastewater discharge to surface water through land disposal. Please indicate any number below. If you don't want to pay more, just write 0:

$ __________ per month

TOPIC AREA 6: SUPPORT FOR SPECIFIC OPTIONS

As a reminder, there are three broad ways treated wastewater can be discharged (disposed of):

- *Discharge to surface water, e.g. rivers, lakes and the coast (ocean),*
- *Discharge to land, e.g. irrigation & infiltration (e.g. water soaks through land to groundwater)*
- *Hybrid discharge, typically a combination of land and water discharge.*

The following questions are about specific wastewater disposal options for the Shotover Wastewater Treatment Plant. If you are unsure, please select "Don't know". To what extent to you support or oppose:

26**. *<Placeholder for options list - in the process of being finalised during councillor challenger sessions>***

27. ***<Placeholder for another land-based and or hybrid land-based treated wastewater discharge solution, investigation in progress>***

0 - Strongly oppose	1	2	3	4	5	6	7	8	9	10 - Strongly support	Don't Know

28. That wastewater disposal options should continue to be reviewed over time as technology and information evolve.

0 - Strongly oppose	1	2	3	4	5	6	7	8	9	10 - Strongly support	Don't Know

29. To what extent do you agree that recycling of wastewater, such as for irrigation and industrial use, can address the current wastewater disposal needs of the Shotover Wastewater Treatment Plant?

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know

TOPIC AREA 7: MEDIA CONSUMPTION & KNOWLEDGE SOURCES

To what extent do you trust the following groups to provide you information about wastewater disposal:

30. Scientists

0 - Completely distrust	1	2	3	4	5	6	7	8	9	10 - Completely trust	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

31. Engineers

0 - Completely distrust	1	2	3	4	5	6	7	8	9	10 - Completely trust	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

32. Council staff

0 - Completely distrust	1	2	3	4	5	6	7	8	9	10 - Completely trust	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

33. Regulators e.g. national regulators of water standards/regulations

0 - Completely distrust	1	2	3	4	5	6	7	8	9	10 - Completely trust	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

34. Environmental groups

0 - Completely distrust	1	2	3	4	5	6	7	8	9	10 - Completely trust	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

35. News media

0 - Completely distrust	1	2	3	4	5	6	7	8	9	10 - Completely trust	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

36. Social media

0 - Completely distrust	1	2	3	4	5	6	7	8	9	10 - Completely trust	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

37. Elected members (Councillors)

0 - Completely distrust	1	2	3	4	5	6	7	8	9	10 - Completely trust	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

38. How confident are you in your ability to distinguish between expert evidence, advocacy, personal opinion and social media commentary on wastewater disposal solutions?

Not confident at all	1	2	3	4	5	6	7	8	9	Confident
	○	○	○	○	○	○	○	○	○	

Demographic questions

i. **Full Name**

ii. **Age** (census aligned)

iii. **Gender** (census aligned)

iv. **Ethnicity** (Multiple can be chosen)

v. **Location** (address)

vi. **Homeownership status** (census aligned)

AFTER DELIBERATION

TOPIC AREA 8: PROCESS OF DETERMINING DISCHARGE SOLUTION

Questions

To what extent to you disagree or agree with the following?

a. An appropriate range of wastewater disposal options has been considered.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

c. The advantages and disadvantages of different wastewater disposal options have been adequately considered.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

d. The information provided presents a balanced picture of the wastewater disposal options.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

e. I trust the information presented about wastewater treatment and disposal.

0 - Strongly disagree	1	2	3	4	5	6	7	8	9	10 - Strongly agree	Don't Know
○	○	○	○	○	○	○	○	○	○	○	○

<placeholder for more questions to be added after council workshop on 1st September>

Deliberative Poll SWWTP

Summary of deliberative process key project stages

QUEENSTOWN
LAKES DISTRICT
COUNCIL

What is needed from Councillors

QUEENSTOWN LAKES DISTRICT COUNCIL

Key input on:

- Deliberative Poll questions,
- Draft Deliberative Poll process design,
- Recruitment split and process (e.g. 80/20 & demographics),
- Stakeholder group and booklet (any feedback for initial drafting of materials),
- Online/participation option during event to view panel Q&A discussions (noting only randomly selected participants will be present and invited to in-person event and the focus of the analysis).

Deliberative Poll Process Summary

Partners: New Democracy Foundation, Stanford DDL, QLDC

QUEENSTOWN LAKES DISTRICT COUNCIL

Allows for statistical representativeness by age, gender, homeownership & ethnicity

Statistically representative baseline survey (80% Whakatipu, 20% Wider district)

Subset randomly selected to attend deliberative session (100 to 150 people)

Site Visit to SWWTP

Participants received booklet 2 weeks before event

Panel session are hybrid for public transparency. However, panel Q&A and analysis focuses on **randomly selected participants** in-person.

Deliberative Day (1 day, 3 Panels)

Speakers (10mins)
Group discussion (~45min)
Panel question & answers (~50mins)
Only randomly selected participants are invited in-person in the venue

Survey post-deliberation

Same questions as baseline poll

Insights presented to decision makers

September	October/November	November	5th December (Saturday)	December	December
• Process design made public • Recruitment commences • Finalise questionnaire • Establish stakeholder advisory group	• Finalise recruitment • Finalise speakers • Confirm online participation/hybrid for event • Advisory group review booklet and speaker list	• Reconfirm participants • Deliver briefing to participants • In-person site visits arranged to treatment plant	• Deliberative poll event Saturday 5th December	• Stanford analysis on poll (immediately after)	• Insights combined with WSP work.

Process Design Advice for Queenstown Lakes & District Council

[Text version for Review, Comment & Approval; Public Version to be Graphic Designed]

A Deliberative Poll on Treated Wastewater Options for Queenstown

Table of Contents

This advice has been adapted by newDemocracy from the general Guide to Deliberative Polling authored by Nuri Kim (nurikim@stanford.edu) and Alice Siu (asiu@stanford.edu) at the *Deliberative Democracy Lab at Stanford University*.

All materials are reviewed and approved by James S. Fishkin, director of the *Deliberative Democracy Lab at Stanford University*.

Introduction

What is the problem?

QLDC faces a decision on how to dispose of treated wastewater *where all courses of action will earn criticism*.

Some in the community will hold the view that cultural and environmental values should be the priority consideration in making the decision, others hold the view that value for money should be of priority. As this decision is required as a result of an initial solution not working as expected, other segments of the community will prioritise the solution with the least risk of failure.

All hold valid views, but council cannot make a decision which satisfies all perspectives.

Therefore, the purpose of this engagement is to assist councillors by providing insight as to the informed view of a representative sample of the community. Specifically, it seeks to identify thresholds at which the decision can best balance the span of those perspectives. At what level of additional risk, additional cost, or additional (non)adherence to environmental views on water do people's decisions change? This is a format where local community members can understand the range of views and ask questions to ensure they can weigh these trade-offs more accurately.

Who We Are

The newDemocracy Foundation is an Australian-based not for profit research foundation who trial methods to improve trust in public decisions. The focus of the organisation is to prioritise a role for representative samples of everyday people having a visible, substantive role in public decisions – akin to the complementary role played by a jury alongside a judge in the justice system. In the specific circumstances faced by QLDC, where there is an unavoidable time and scope constraints as a result of a court decision, newDemocracy recommended a Deliberative Poll as the appropriate method.

newDemocracy contacted the creators of the Deliberative Poll format, Stanford University's Deliberative Democracy Lab headed by Dr James Fishkin, proposing that they be directly involved – specifically drawing on their expertise for the technical elements of questionnaire design and random recruitment that are uniquely tailored for use in this format (as distinct from other deliberative process approaches).

As research organisations, we have no stake in the decision: our bias is to foreground the citizens' role and identify the best democratic opportunity. Success is when we enable an elected council to take a more trusted decision.

For those with a concern about potential bias in this project, we welcome you getting in touch. This work necessarily involves making subjective decisions, and the purpose of this document is to transparently show the decisions taken and the rationale behind them. If our logic needs challenging, then please challenge it – your input will help us build the most trusted process we can.

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Stanford University's Deliberative Democracy Lab – Alice Siu asiu@stanford.edu

Chapter 1.

Why Deliberative Polling®?

It is impossible for citizens to be well-informed about all public issues – there are simply too many to understand the complexity within each issue cannot be achieved at a population scale.

All of us have what social scientists call 'rational ignorance': there is little reason to confront trade-offs or invest time and effort in acquiring information or coming to a considered judgment if you are not being asked for your view! Therefore, the public is generally ill informed – and quite rationally so – about most issues of public interest yet still provide an "opinion" when asked for one in public opinion polls.

Opinion polls, as they are typically conducted today, are considered to provide us with a *glimpse* of what the public thinks right here and now. As a result, the outcome of these polls became an indispensable part of the political landscape.

The Stanford Deliberative Polling® approach suggests we reconsider the extent to which the results of these polls accurately reflect the public's true opinions and beliefs. In many cases, the public is unaware of the existence of the debate entirely. Other times, the issue may be well publicised enough to be visible, but only in simple sound bites presenting a single perspective and frequently with incomplete information.

Put simply, why do we ask people what they think when they haven't the time to think?

We wish to obtain public opinion that is not only representative but *also considered and well thought through*.

What is Deliberative Polling®?

Deliberative Polling® (hereafter DP) is an attempt to reframe public opinion research in a new and more constructive way.

Deliberative Polling® is a scientific process of public opinion consultation that measures opinion both before and after a process of balanced and informative deliberation. By providing a scientific random sample, a microcosm of the public, and then exposing them to transparently good conditions, we can reveal the public's *considered* judgments at the end of the process. This way, we can ensure the quality of the opinions collected at the end of the process while preserving the spirit of representativeness through statistical random sampling.

The process follows 5 key steps:

1. A **random, representative sample** is first polled on the targeted issues.
   - After this baseline poll, members of the sample are invited to gather at a single place for 1-2 days to discuss the issues (typically 100 to 150 people).
2. **Briefing materials presenting the diversity of perspectives** on the issue are sent to the participants and are also made publicly available. Active stakeholders in the decision should satisfy themselves that the materials fairly represent the pros and cons – indeed, stakeholders are invited to review and contribute to the materials and have an active role at the in-person event.
3. The participants **engage in Q&A panels** with a breadth of experts and political leaders based on questions they develop in small group discussions.

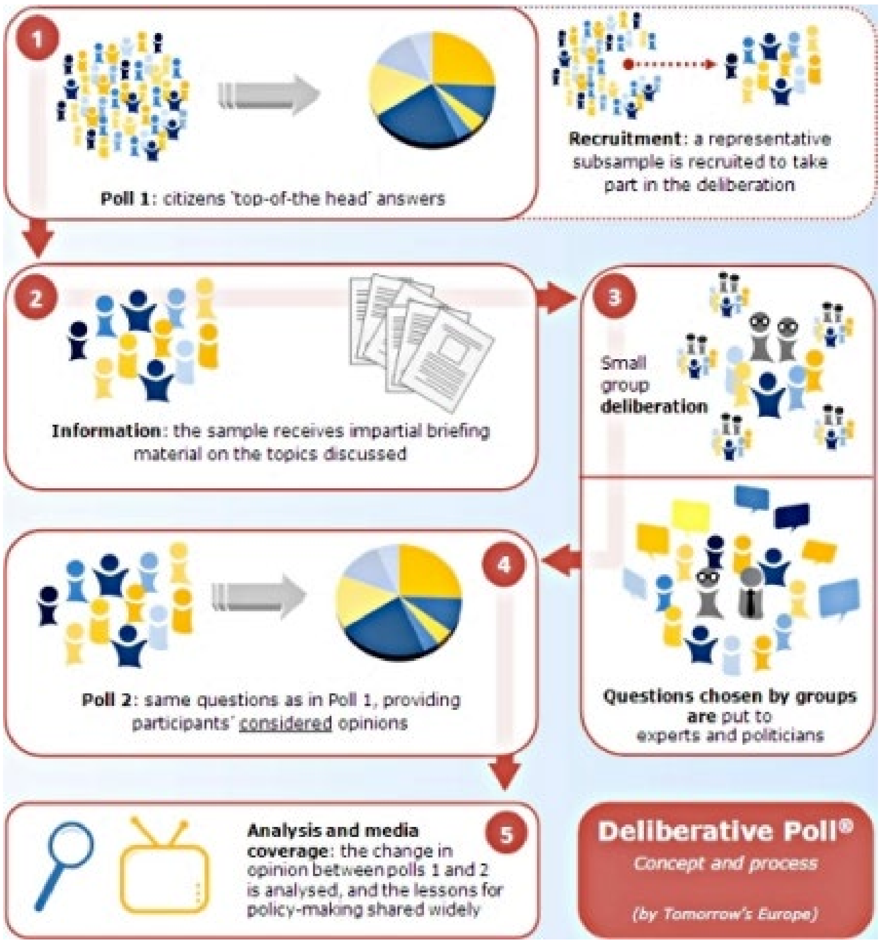
- The vast majority of the process will be live streamed so anyone in the community can follow along. We will add a *parallel stream of online participation for any interested community members*. As representative random sampling is a key part of the methodology, we will simply report the results of the self-selected cohort separately so elected councillors have an additional perspective to consider. All we ask is that these participants note that we need to prioritise questions coming from the random, representative sample in order to preserve the integrity of the process.

4. After the deliberations, the sample is *again asked the original questions*. The resulting **changes in opinion represent the conclusions the public would reach, if people had the opportunity to become more informed and more engaged by the issues.**
5. The change in opinion between poll 1 and poll 2 is analysed, and the lessons for policy making is shared.

This method has been used in numerous countries, at all tiers of government, and on a variety of topics, from weighing alternative energy sources to AI governance. We've attached a timeline of Deliberative Polls in Appendix A.

Figure 1. How Deliberative Polling® Works.

These five steps illustrate the core principles of the DP: representative sampling, informing the public on the issues with balanced briefing materials, small group deliberation, considered opinions, and making the results public.



Chapter 2.

The Format, the Process, and Logistics

In this chapter, we will explain the process of a face-to-face Deliberative Poll.

2.1 Face-to-face Deliberative Polls

The Queenstown Lakes District (QLD) Deliberative Poll will take place over 1 full day (Saturday) with an 'optional but encouraged' site tour of the Shotover Wastewater Treatment Plant made available to participants in the fortnight ahead of the in-person meeting. As an operating industrial facility, we are limited to small groups (8-10) being in the plant at any one time.

The poll is <u>not</u> open to the general public: participation is limited to a *randomly selected* pool of participants who are individually invited and nominally compensated for their participation (We'll make available a separate participation opportunity for interested community members, detailed in section 2.2.)

The event's program consists of **a series of small group discussions followed by plenary sessions** where experts and representatives (technical, cultural, financial) and public officials respond to questions formulated in the small groups.

Participants alternate between small group discussions among 8 people in each small group and plenaries with panels representing a breadth of experts and/ or policymakers.

The small group discussions are usually scheduled for 75 to 90 minutes. The plenaries are usually 75 to 90 minutes but may sometimes need to be longer depending on the agenda and number of small groups.

The essential steps in the process of a Deliberative Poll are as follows:

2.1.1 Confirmation of Scope of Topic

This arguably the most controversial and contested aspect of the project. We have to test a finite pool of options, when some in the community feel insufficient options have been developed.

In an ideal world, the solution preferred by mana whenua leaders and community groups would also be the solution with the best value and least risk of cost over-run. We are yet to encounter a scenario where this conveniently existed. As a result, we are testing how people *<u>prioritise</u>* the achievement of one goal over another at different levels of adherence to cultural and environmental values, with different levels of cost gap, and with different levels of risk.

Put another way, to secure the community's preferred solution, is an informed representative sample of the community willing to pay 10% more, 50% more, 100% more (and so on) and what is their tolerance for failure?

The purpose of the project is to answer to these questions. If the wider community or active stakeholders feel additional factors in the decision should be tested regarding a long-term solution for the Shotover Wastewater Treatment Plant, then we welcome hearing those views. Our key risk is having a list of questions which leave remaining blind spots for the councillors. Done well, the insight added will contribute to the final decision taken by councillors as they will understand the community's priorities.

2.1.2 Formation of a Stakeholder Advisory Group

It is key to the legitimacy of the process that stakeholders (and, by extension, participants and the wider community) are confident in the breadth, balance and accuracy of the materials.

The briefing materials and the selection of plenary session participants should therefore be reviewed by a group of stakeholders representing different points of view.

These stakeholders form the Stakeholder Advisory Group that should be asked to evaluate the briefing materials and recommend/review expert speakers who will respond to questions on the day.

For this decision, we are recommending this grouping of stakeholders:

a. Mana whenua and/or mana whenua representatives,
b. Council, as the host of the technical component (options for disposal) and the associated consultants,
c. Other Stakeholders (e.g. environmental and business stakeholders).

Existing stakeholder members, such as independent expert panels and mana whenua representatives involved alternative hybrid and/or land-based disposal investigation will be drawn upon where possible.

2.1.3 Enlist media partners

While we aim to deliver the best democratic opportunity for approximately 100 to 150 participants, this is a decision affecting the entire community of Queenstown – and they need to see enough to form their view as to whether the process earns their trust, and also to know of their opportunity to participate.

Local media should be provided with this document: helping the public understand the methodology is one important starting point. newDemocracy and Stanford Deliberative Democracy Lab are happy to be available for media questions.

Key timing for media should be in advance of the initial questionnaire, as it's the first step in the recruitment process. People receive surveys all the time, so knowing that this one is also the path to being lottery selected to participate is important to convey.

After this, we would aspire that in the 1-2 weeks ahead of the in-person meeting (perhaps tied to some of the randomly selected community members visiting the Shotover facility) that the basics of the methodology are shared in local news – ideally sharing the simple graphic in Section 1. The questionnaire and information booklet shared with participants will also be made public at this time.

**** Privacy ****

The contact information of participants is not released for privacy reasons.

Some members of the community will be happy to speak to media on the day – but not everyone. Participants will be asked for image releases for photography, and those who decline will be issued different coloured name badges as a way to ensure no images with them present are used.

2.1.4 Initial survey and recruitment of sample

The participant pool consists of a scientific (statistical) representative random sample of the Queenstown population.

In this instance, there is more than one way to define the population, so we will draw on two pools and report the results separately.

1. Queenstown residents: as these are the people bearing the cost of the chosen treated wastewater solution and/or located in closest proximity to the treatment plant and receiving environment, they will comprise 80% of the ~100 to 150 participants (post-event analysis can separate those serviced by the plant – particularly regarding willingness to pay).
2. Queenstown District: as the environmental reputation of Queenstown has impact beyond those paying for the solution, we recommend including this cohort as 20% of the ~100 to 150 participants.

Recruitment is done via stratified random sampling. This means nDF use Excel to do a random draw which is matched to the Census profile by gender, age, geography (residential address) and owner/renter status (the latter being an effective surrogate indicator of income and education). The aim is to comprise a room of people from all walks of life where anyone in Queenstown Lakes District can see someone like them deeply involved in the decision.

A critical question is to ensure Māori perspectives and representation in this process beyond census stratification of Māori in the random sample (as per Census date 2023 is 5.5% of the Queenstown Lakes population). To resolve this newDemocracy, Stanford and QLDC will work with mana whenua stakeholders and organisations on how best to approach this, which we achieve by sharing this design through the Stakeholder Advisory Group. This section will be further defined after initial meetings of this group.

It is also acknowledged that the DP is <u>not</u> the primary medium for receiving input from mana whenua, and this engagement is focused on the community view. Direct mana-to-mana engagement and relationships between elected council members and Ngāi tahu leaders and representatives remain the primary channels of engagement on this project.

* * *

Participants are given a survey on first contact *before* they are invited. This enables comparison of participants and non-participants (those who do not agree to come) to establish representativeness of the sampled group. These results are made public.

The initial survey can be conducted by letter drop and direct email (likely by Council's existing survey/ polling external provider). The outputs required are a statistically representative sample of survey results and a list of those people opting in to then participate in the DP.

The recruitment of the subset of ~ the 100 to 150 participants are then handled by newDemocracy and Stanford. Most citizens accept that we have no incentive in skewing a sample to include Person A at the expense of Person B with different views. Critically, we also won't see those views: we will simply see their demographic profile.

The general exclusion nDF apply across all random-sampling is that people in paid political employment are ineligible for selection. It is essentially impossible to determine a prescriptive list of people connected to a project who should be excluded (sibling of someone attached to project? close friend? neighbour? used to work together?), so to resolve decisions at the margin we ask participants if it would bear public scrutiny if it was known they were involved and allow the participant to make the decision. This has proven operationally effective.

* * *

The final opinions at the end of the in-person Deliberative Poll will be completed online (print available on request) in confidential questionnaires by self-completion.

While some might point to the issue of questionnaire mode effect if the initial survey is conducted by telephone, we believe - and a great deal of research supports this view - that the mode effect is minimal. This scenario (initial survey by phone, final survey by self-completion) is simply the most practical and cost effective.

FIELD NOTES: Survey firms/organizations

One of the key ingredients for success – whether using a commercial or in house polling firm- is the *number of call back efforts* made by the survey administering party. Choose a survey firm/organization with sufficient staffing to consistently call back the original sample for initial contact. This allows the recruited pool of participants to most closely reflect a random, representative sample of the public. (Unavailability can be down to time of day, thus presents a risk of 'systematic' exclusion of certain cohorts).

To obtain the best possible sample, survey firms should work as hard as possible to obtain interviews from those initially drawn in the sample (usually randomly chosen households/ addresses *with random selection within the household*, e.g., latest birthday method).

Calls should be made at different times of the day/week, and several call-backs are recommended. Council should obtain daily or bi-weekly reports from your survey firm to ensure they are making good progress towards this goal.

After respondents take the initial questionnaire, they should be invited to participate in the Deliberative Poll (in-person) event at the end of the questionnaire. Please note that the invitation should always be *at the very end of the questionnaire*. If the invitation is offered early on, certain people may be more likely to opt out of the initial survey altogether, introducing further self-selection bias. Some self-selection bias is inevitable; we simply seek to minimise this.

When asked about their intentions of attending, most will not say yes or no immediately but may want time to consider. An 'invitation style' information brief explaining the day's events and purpose should be sent, with an inline RSVP registration and call centre number available (council call centre can simply manually add caller details to the online RSVP tool). The project should have a number they can call to get their questions about the event answered.

We strongly recommend offering a modest honorarium as well. Not doing so results in skews to the sample – generally impeding the participation of the young, those in shift work, or people requiring paid/specialised transport to attend. We recommend ~$150 for the day as sufficient to cover expenses and make it worthwhile for people to incur small inconveniences to attend, participants attending the site visit will be compensated an additional $50 for their time.

Leading up to the Deliberative Poll, each participant receives briefing materials (at least 1-2 weeks prior) by mail in anticipation of the event.

2.1.5 The Deliberative Poll Event

We need to seat ~100 to 150 people at round tables (to enable group conversation).

When they arrive at the event, participants should register (and a list should be kept of those who have and have not arrived). They should be given name tags.

Table facilitation is not required: the tasks for participants are simple and facilitators can run the room in plenary, assisting on an ad hoc basis as needed.

Non-participants (observers, media) are free to attend the Deliberative Poll. Non-participants should register, receive their name badge and at the same time be given a list of ground rules establishing that they are not to speak in the small groups but may observe them

Media are encouraged to speak with participants during the coffee breaks. However, *lobbying* of participants about substantive matters is not appropriate. There should be differentiating name tags for participants, observers, staff, moderators, media, etc.

Given the nature of the topic (requiring knowledge of some scientific/ engineering concepts) a concise informational session on the solutions being tested should be delivered by QLDC (or nominated expert speaker) as the opening session.

The process unfolds with alternating small group and plenary sessions. In brief, the small groups discuss designated sections of the briefing materials during designated periods.
Each small group then chooses questions to be asked at the plenary session(s), progressively building greater knowledge and understanding across the entire group. Slido (or similar digital question aggregation and voting software) should be used for reasons of efficiency.

2.1.6 Final questionnaire

At the end of the process, after the final plenary, the participants return to their small groups. Ideally they should have 20 to 30 minutes to share impressions and reflect on what they have heard. Then the moderators distribute the final questionnaires. This wave has, in addition to the earlier questions, some event evaluation questions that are asked only in the "post-deliberation" questionnaire.

2.1.7 Data Analysis

We intend to collect questionnaire responses digitally (with limited paper versions available on request, then entered into the same database).

Data needs to be analysable so that we can study any opinion changes and knowledge gains. Initial analyses should be performed quickly so that results can be made publicly available – long delays can be a source of mistrust. The first analyses performed should include representativeness (comparing participants with those who turned down the invitation to attend) and changes in participants' opinions.

A sample timeline for these steps is illustrated in Appendix B.

2.2 Adding a Community Experience – the Online Deliberative Polls

Online projects are a great way to extend the reach of Deliberative Polls.

In Queenstown, we want to use this method for anyone with an active interest to share the experience of those in the room to the fullest extent possible. The same materials will be provided and the panel sessions – including presentations and Q&A – will be streamed to this group. There are limitations: we need to prioritise questions coming from the representative sample (as they are the representative sample).

The responses from this cohort will be reported separately as an additional input for QLDC councillors to consider.

Online DPs follow the same basic process as face-to-face DPs, with the following differences:

• Participants are required to "drop-in" prior to their first scheduled meeting to test their software. Moderators and any other technicians involved in this process should also be trained. Briefing materials sent to participants in advance are often distributed by email instead of by mail.

• When done as the sole format, online DPs are conducted over a number of weeks instead of in one longer continuous time block. In this instance – where we are running an in-person format and the online component is complementary, for logistics reasons we need to run concurrently with the in-person event.

There is a higher risk in online DPs of people dropping off partway through the process, which decision-makers should be aware of ahead of the process (i.e. it is not a true marker of process quality; it's simply a function of online engagement spanning a full day).

We will endeavour to have expert speakers available to answer questions after the conclusion of their in-person session.

Chapter 3.

Preparing the Briefing Materials

The briefing materials are the crucial component of the DP process.

Because the ensuing discussions will inevitably reflect the sub-issues mentioned in the briefing materials, balance and accuracy are our foremost concern at this stage. We exist to deliver more trusted public decisions, and perceptions of trying to promote one particular position will result in the legitimacy of the process may be called into question. The briefing materials must, therefore, be reviewed by the Stakeholder Advisor Group (representing different points of view) for accuracy and balance.

The key is making the materials balanced, comprehensive, engaging, and easy to read.

The briefing materials and the questionnaire should be developed hand-in-hand, as the questionnaire should be closely tied to the contents of the briefing document (e.g., knowledge questions, policy attitudes).

What goes in a briefing document?

The briefing document should consist of *essential background information*, presentation of key policy options, *arguments for and against* policy options, and a glossary of terms. It should have enough background information to provide a common basis for discussion between participants who differ widely in levels of political knowledge and interest.

How to put together a briefing document

Once you have settled on the specific issues to be addressed, the issues should be broken down into key policy options, covering a wide range of perspectives.

The selection of options is always (unavoidably) a simplification in that participants might, in the end, want to combine elements of different options (or might favour a marginal position that is not included at all in the document). But presenting concrete options is essential as it helps to organize and clarify the discussion.

Based on briefings with QLDC staff and councillors, we see eliciting considered views on these aspects of the decision (and the balance between them) as the highest priority –

1. Understanding of treated wastewater quality (vs river water) and resulting environmental impact.
2. Ranking of treatment solutions with community understanding and environmental values and expectations.
3. Risk tolerance: different options have different likelihoods of success.
4. Willingness to pay for solutions which have lower expected levels of environmental impact and greater adherence to community values.

Chapter 4.

Composing the Questionnaire and Analytic Considerations

4.1 The Questionnaire

As noted above, the questionnaire needs to be closely linked to the briefing document. These will need to be provided to the Stakeholder Advisory Group members in early September to enable booklet creation (which uses questionnaire as starting point).

It is also important to avoid long preambles to the questions in your survey, as these provide information that can influence respondents' answers. Questions should be open and not have embedded value judgments.

The questionnaire will include the following:

a. **Standard survey items on demographics**
   These are asked only at time 1, the initial questionnaire on first contact.
b. **Policy attitudes** about the issues covered in the briefing document generally and about the specific policy options outlined in the document.
c. **Empirical premises:** typically, claims about how some policy elements are causally connected to other elements.
d. **Knowledge questions** relevant to the topics under consideration (e.g. treated wastewater quality). Some of these could draw directly on facts mentioned in the briefing document, while others could be more broadly related to the topic at hand.
e. **Media/news consumption and/or political interest questions** are often included to establish difference pre- and post- event.

Political efficacy questions.

After the event, **event evaluation questions** should be included. These demonstrate participants' belief in the legitimacy (and utility) of the process.

The end of DP (t2) questionnaire should repeat <u>all</u> of the questions from the initial (t1) questionnaire except the demographic items.

Here are some general rules for writing survey questions that should be applied when designing the DP questionnaire:

• Scales:

- For comparability of policy questions, *try to use the same scale (7-point, 5-point) throughout your survey*, unless it is particularly called for to switch your mode. Questions with categorical responses (e.g., knowledge questions) do not need to follow this rule.

- Along the same line, *make sure the response valence is uniform across the questions*. For instance, if we are using a 5-point scale, the order of "Disagree strongly – Disagree somewhat – Neither agree nor disagree – Agree somewhat – Agree strongly" from left to right (or top to bottom) should be the same for all questions using this scale.

- Clearly label the mid- and end-points of the scale. Studies show that unlabeled scales often introduce additional response error.

• **Question wording and other:** Make sure you are adhering to all of the general rules for writing survey questions such as *avoiding double-barrelled question* wording and *trying to avoid (where practical) negative questions*. Also, the *questions should not be too long* although sometimes this is inevitable. Always be specific of the scope of the question you are asking (i.e., avoid being too general and all-encompassing); the more specific the question, the less random variance you will have in your measures.

Stanford CDD will assist with the construction of the questionnaire.

4.2 Data Analysis

In preparing your final project report, you will need to complete two sets of statistical analyses.

The representativeness analysis allows us to assess the extent to which we can claim generalizability of the overall process. We need to be sure that our participants at the event are indeed a microcosm of our population of interest. This is done by an *independent sample t-test*[1] between the event participants and non-participants on demographics (age, gender, education level, party id, etc), t1 attitudes, and t1 knowledge.

[1] *If the variable of comparison is not numerical by nature you should use a* χ^2 *test instead*.

If the representativeness analysis provides a test on the premise of our procedure, **the before/ after tests, on the other hand, are a direct measure of the effects of Deliberative Polling.**

The before/after tests are a series of paired *t*-tests on opinions and attitudes, issue-specific knowledge, and other democratic tendencies (e.g., political efficacy) at time 1 and time 2.

Chapter 5.

Small Group Discussions and Plenary Sessions

5.1 Logistics of Small Group Discussions

The small group process is intended to create an opportunity where participants can share their views and experiences together. It allows participants to consider multiple points of view on a particular issue. A great deal of the knowledge gain can come in anticipation of the event, but this information is processed, both collectively and individually, in the small groups.

However, it is important to underline that the purpose of a DP is not to change opinions, but rather to examine whether people respond differently when they are sufficiently informed and consider multiple perspectives on a specific topic of discussion. We do not view opinion change as a criterion for the success of a DP. When the process is complete, the product will be the considered opinions of the microcosm, whether that is the same as or different from the opinion that existed before the event began.

The second fundamental role of the discussions is to **allow each group to select questions to pose in the plenary sessions to panels of competing experts or policymakers.** After deliberating, each small group chooses 2-3 questions to be asked at the plenary session(s). These questions are asked by the person designated by the group, in his or her own words.

An important point to note is that participants are in no way asked to reach a shared opinion or come to a shared conclusion – simply to agree questions which will help inform them. Indeed, we wish to insulate the participants from social pressure to agree on a verdict. The only point for which consensus is required is with regard to the question to raise in the plenary sessions. Note that people who have very different views about an issue can still agree that it may be a good question to pose.

FIELD NOTES: Discussion Environment

Although it may not seem like an important matter, we believe it is crucial to keep the physical environment as congenial as possible. It is best to use round tables for the small group sessions with chairs spaced out. Classrooms are okay as long as chairs can be moved to make circles. Also, make sure there are snacks and drinks available throughout process, at least in the main area, so the participants can obtain refreshments and stay alert.

5.2 Guideline for Moderators

The facilitator(s) of the in-person meeting play a vital role in making sure that the discussion stays on track, that as many participants as possible contribute, and that the various perspectives on each issue get an airing in the discussion. The moderators are tasked with creating a protective (i.e. free from coercion/ groupthink) environment in which participants can share different perspectives and so form their own opinions: within the small group all voices need to be heard so that information, experiences, and arguments from different viewpoints are made available.

Some key points for moderators are as follows:

• Starting a session:

a. Facilitators should emphasize that everyone's voice counts, that nobody is expected to be an expert, and that all participants must listen to each other's perspectives. They should stress the importance of having a mutually respectful discussion, even if there are widely diverging positions within the group.

b. To help break the ice, moderators should – after their brief introduction – invite all participants to introduce themselves. It is best to go around the room (whether in person or online) so that each person says something—something simple about who they are, where they are from, etc.

c. The facilitator should then focus the discussion on the first issue on the agenda from the briefing document. Participants should be asked how they feel about the possible alternative policy responses, and to reflect on the rationales for and against and the potential consequences of each policy alternative. Participants often also speak of their own experiences and tell stories or recall things mentioned by friends.

d. When the substantive discussion gets under way, the idea is not to approach the materials in a didactic way. Rather, facilitators should take a minimalist approach, speaking as little as possible and allowing the discussion to unfold as a natural conversation. Participants usually do much more than discuss the briefing document. They discuss the issue from the vantage point of their lives and personal experiences.

e. **It is vital that moderators do not betray their own point of view or allow it to affect the way in which they facilitate the discussion or respond to participants.**

f. The facilitator should attempt to ensure that all participants contribute to the discussion and that is not dominated by a handful of people. Should someone begin to dominate the discussion, the facilitator should step in to gently but decisively restore an open environment. It is also important to encourage those who are less vocal.

g. **It is essential, too, that facilitators do not push for consensus in any way.** We do not expect or want all participants to reach agreement on the best/worst policy options. (The only item that requires group agreement is which question to pose to the plenary session.)

h. As the discussion proceeds, the facilitator should keep a mental checklist of the policy options and the pros and cons in the briefing document. If some of them are not covered, the facilitator can ask, "Does anyone disagree?" or "what do you think someone who disagrees might argue?" It is also possible to refer directly to the various points of view presented in the briefing document. The idea is to cover all the arguments for and against the various positions, and to encourage participants to examine which arguments they find credible.

i. The facilitator should not introduce information not contained in the briefing document or correct participants if they make inaccurate claims.

j. During the course of the discussion, the moderator should also take note of any topics the group finds especially important, as this topic might provide raw material for a possible question for the plenary session.

5.3 Plenary sessions with experts and policymakers

Plenary sessions with experts help to clarify participants' understanding of contested issues and to correct inaccurate information. Plenary sessions with policymakers help participants to understand the logistics and trade-offs of implementing particular policies and may also contribute to their sense of political efficacy (as they have an opportunity to interact with those who shape real-world policy).

Just as with the briefing documents, it is important that panels of experts/policymakers are well-balanced to maintain the legitimacy of the process. As noted in an earlier session, an advisory committee composed of stakeholders representing a broad spectrum of opinion should be asked to weigh-in on the selection of experts and policymakers for the plenary sessions.

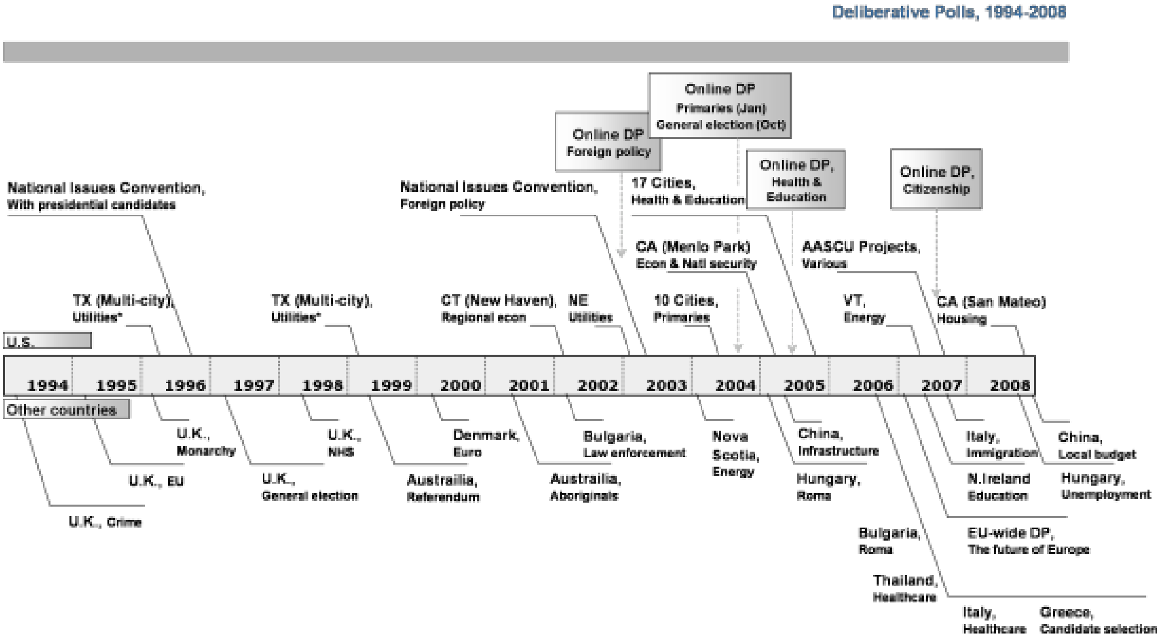
Plenary sessions are moderated by a neutral facilitator who selects the questions from those put forward by the small groups and asks the group spokespersons to publicly pose the questions to the experts. Experts are given a short time (1-2 minutes, depending on the number of groups/questions). Although the responses are brief, each expert has the opportunity to contribute multiple times as they respond to many different questions over the course of a plenary session.

The facilitator of the plenary session chooses the questions that will be posed from those put forward by the small groups, with the following guidelines:

> a. Eliminate redundancy. Combine similar questions from different groups where possible.
>
> b. Ensure the broadest possible range of themes is addressed.
>
> c. Ensure that each small group receives a response to at least one question.

Ideally, contested questions will receive answers from different points of view.

Appendix A – Overview of Deliberative Poll Use Internationally



* Altogether 8 Deliberative Polls were conducted in different parts of Texas in between 1996-1999.

Appendix B – Planned Project Timeline

August	Finalisation of DP specs Approval of Process Design Book venue Commence Briefing Book preparation Commence Questionnaire preparation
September	Process Design made public Confirm and invite Stakeholder Advisory Group (SAG) Finalise and release briefing book (draft) for SAG Finalise questionnaire Recruitment commences (questionnaire)
October	Finalise recruitment (wk 4) Finalise expert speakers Confirm online option for self-selected participants using Stanford tool (automated facilitation)
November	Reconfirm participants & deliver briefing book (-2 weeks) In-person site tours available for booking
Deliberative Poll In-Person Event	**Saturday December 5th**
Post-Deliberative Poll	Provision of detailed analytical report (Stanford CDD)

Appendix C – Running Sheet

***Note: site visits will have been made available 2-3 weeks prior**

Day 1: Saturday, December 5th **8:00 am – 5:00 pm**		
Registration & Light Breakfast	8:00 – 8:30	30 min
Convening Session	8:30 – 9:00	30 min
Welcome *Reference to Baseline Questionnaire /-* *Why We are Here / Instructions*		(15 min) (15 min)
Assume room set for table groups		
Small Group Discussion & Plenary #1 ***Technical Panel: Understanding the Problem and Options*** Briefing from QLDC (15mins) Small group question formulation (45 mins) Q&A from Technical Panel (55mins)	9:00 –11:00	
Refreshment Break	11:00 – 11:15	15 min
Small Group & Plenary #2 ***Values Panel: Understanding Mana Whenua and Environmental Perspectives and Values*** Baseline presentation from mana whenua (15mins) Small group question formulation (20 mins) Q&A with Values Panel (55mins)	11:20 – 12:50	1 hr 30 min

Lunch *Need 1 hr for 150x person logistics. Multiple serving locations needed.*	12:50 – 1:50	1 hr
Return to small groups. Encourage mixing and table change.	1:45	
Small Group & Plenary #3 Risk, Finance and Allocation – Who Should Pay and How? Q&A with councillors (3-5) and QLDC Finance (1 representative)	2:00 – 3:30	1 hr 30 min
Refreshments Available – stretch break		
Reflections & Debrief	4:00 – 4:20	20 min
Final Questionnaire Completion	4:20 – 4:50	20-30mins (buffer)
Headline Results **Noting analysis by demographic is required, report to the group on headline shifts through the day**	4:50 – 5:10	