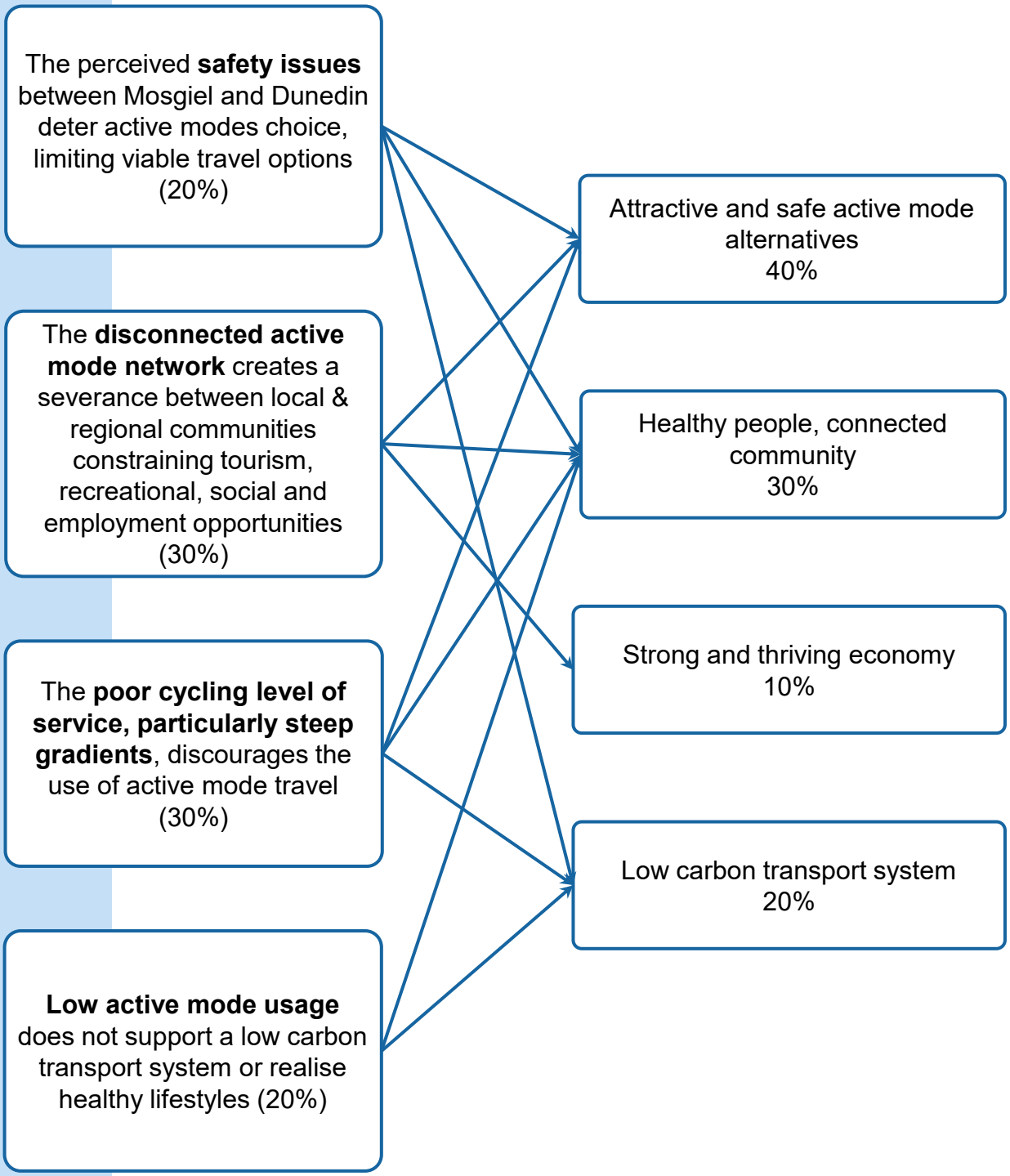
Appendix A. Investment logic map

Dunedin Tunnels Trail

INVESTMENT LOGIC MAP
Activity

PROBLEM ▶ **BENEFIT**



Business Problem Owner: Jesse Jacometti
Facilitator: Matthew Noon
Accredited Facilitator: No

Version no: 1
Initial Workshop: 9 September 2020
Last modified by: 15 October 2020
Template version: 1.0

Benefits map (title)

Subtitle

BENEFIT MAP

BENEFIT	INVESTMENT BENEFIT	MEASURE	DESCRIPTION	BASELINE	TARGET
Attractive and safe active modes alternatives 40%	Reducing deaths and serious injuries	Deaths and serious injuries	Number of deaths and serious injuries resulting from active mode related crashes (data source: CAS)	2 DSI 2019/2020	0 DSI 2035
	Improved public perceptions of the safety of active modes	Perception of active modes	Qualitative analysis of how safe and attractive people perceive cycling (data source: DCC's People Panel Survey)	31% Negative 07/2020	16% Negative 07/2030
Healthy people, connected community 30%	Improve level of service for active modes	Active mode level of service (including travel time & gradient)	Level of service assessment for active modes (data source: google maps for travel time, GPS for gradients, LoS assessment)	CLOS Score = D 2020	CLOS Score = B+ 2030
	Reduced health expenditure	Economic health benefits of cycling	Assessment of money saved on health related costs for cyclists	$157,000 saved 2020	$393,000 saved 2030
Strong and thriving economy 10%	Improved accessibility for active modes	Access to key social, commercial and employment destinations by active modes	Proportion of population living within 600-meter distance to a safe and secure primary cycling route that connects to key destinations	33% 07/2020	44% 07/2030
	More people cycling	Number of tourist and recreational cyclist	A count of the number of people cycling for recreational purposes or as a tourist	tbc 07/2020	tbc 07/2030
Low carbon transport system 20%	Improved move share	More people using active modes for transport	Mode shift towards more people walking and cycling for transport (data source: DCC residents opinion survey, Journey to work data)	2% 2018	5% 2035

RESPONSIBILITY FOR DELIVERING THE BENEFITS		
Name	Position	dd/mm/yyyy

Business Problem Owner: Jesse Jacometti
Facilitator: Matthew Noon
Accredited Facilitator: No

Version no: 1
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Appendix B. Long list workshop notes

Insightful solutions. Empowering advice.

Workshop 2: Longlisting & Assessment

Prepared for: Dunedin City Council
Job Number: BNCL-J001
Revision: Draft
Issue Date: 4 December 2020
Prepared by: Matthew Noon, Associate Director
Reviewed by: Stephen Carruthers, Associate

1. Introduction

Following the successful delivery of an Investment Logic Mapping (ILM) workshop for the Dunedin Tunnels Trail Project Single Stage Business Case in September 2020, further work has been undertaken in developing the business case. This technical note summarises the discussion and outcomes from Workshop 2 which considered:

- Outcomes from Workshop 1 – ILM, Problem Statements and Investment objectives
- The developing evidence base
- Longlisting option development
- Shortlisting and Alternatives and Options Assessment Multi Criteria Analysis

2. Stakeholders

The workshop was held 3 November 2020 and attendees were:

- Jess Jacometti – Dunedin City Council
- Glenn O'Connor – Bonisch
- Stacey Hitchcock – Dunedin City Council
- Nick Sargent – Dunedin City Council
- Jared Oliver – Dunedin City Council
- Christine McBratney – Community Board
- Stephen Carruthers – Abley (via video link)
- Matthew Noon – Abley (facilitator)
- Simon Collie – Bonisch
- Anja McAlevey – Waka Kotahi
- Eric Teekman – Waka Kotahi (via video link)

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3. Workshop 1 Revalidation

The meeting commenced with a review and recap of the outcomes from workshop 1. As part of this, clarification was provided that the scope of the SSBC was to improve the safety of cyclists (and pedestrians) travelling between Dunedin and Mosgiel. This focus on active modes had also been validated through the ILM and development of the problem statements in workshop 1. It was noted that this focus would also assist the longlisting stage as it precluded non-active mode interventions such as enhanced public transport services.

The geographical scope of the SSBC was also confirmed to extend from the Factory Road cycleway in Mosgiel to the Dunedin end of the strategic cycle network assumed to be the proposed route on South Road, Caversham. This is broadly shown in Figure 1.

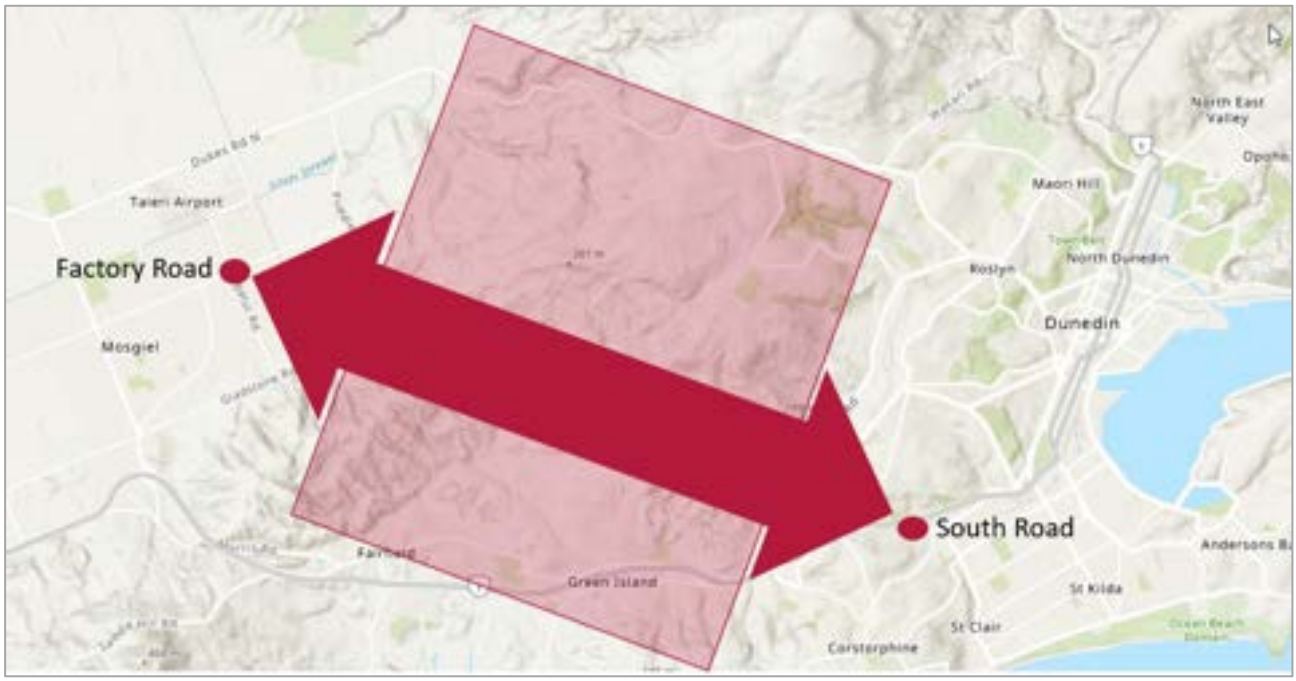

Figure 1 Project scope

Investment Logic Map

While the ILM outputs were generally agreed to by the stakeholders, a query was raised prior to the workshop whether it fully captured the lack of accessibility between Mosgiel and Dunedin. This was discussed further among the stakeholders and following the clarification of the SSBC scope being focused on *active modes accessibility* rather than *general accessibility*, it was agreed to accept this position.

Problem Statement Development

As a result of the ILM, draft problem statements were proposed to the stakeholders for consideration. Table 1 shows the initial and revised statements including an explanatory note regarding any changes.

Table 1 Problem Statements

Proposed PS	Agreed PS	Notes
A lack of **accessible and attractive** active mode options between Mosgiel and Dunedin result in high car dependency (30%)	The **poor cycling level of service, particularly steep gradients, discourages the use** of active mode travel (30%)	*This statement was refined to further clarify the key problem affecting active mode uptake was severe gradients (up to <11%)*
Low active mode usage does not support a low carbon transport system or realise healthy lifestyles (30%)	**Low active mode usage** does not support a low carbon transport system or realise healthy lifestyles (30%)	No change
The **disconnected active mode network** creates a severance between local communities constraining commercial, social and employment opportunities (20%)	The **disconnected active mode network** creates a severance between local & regional communities constraining tourism, recreational, social and employment opportunities, affecting the uptake of low carbon transport choices and healthy lifestyles (30%)	*This statement was modified to ensure it captured all of the impacts that a disconnected network impacted on, such as inhibiting access to/from the wider recreational cycle trails.*
The perceived **safety issues between Mosgiel and Dunedin** deter active modes choice, limiting viable travel options (20%)	The perceived **safety issues between Mosgiel and Dunedin** deter active modes choice, limiting viable travel options (20%)	No change

Benefit Map

A draft benefits map was shared with stakeholders and was confirmed with the acknowledgement that this was reviewed[1] as the business case was developed. Key points for future consideration included:

- Ensuring appropriate use of safety statistics as a measure. This could be better achieve using an exposure, rather than an absolute, basis.
- Segmenting the route for assessment purposes due to the different localised conditions e.g., reductions in carbon emissions may be higher when considered on an inter-route segment compared to end to end.
- The *Strong and Thriving Economy* measure (within 600m) may be too long and needs to consider the quality of connections to the route – which may be quite poor and therefore discourages active travel uptake.

An additional KPI has been added to measure the increase in recreational and tourism cycling.

[1] While noting that Waka Kotahi has a recommended list of investment performance measures

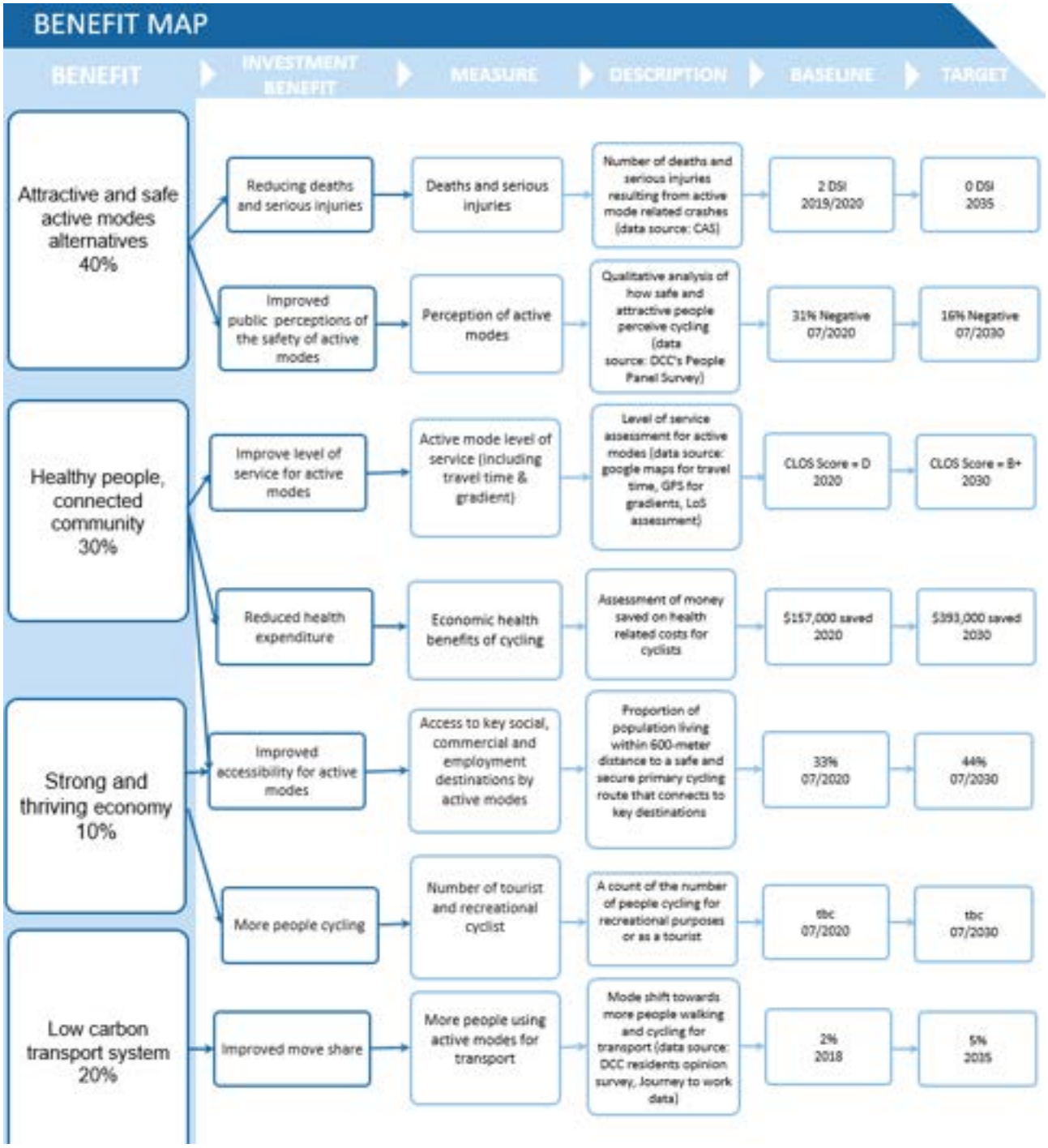

Figure 2 Benefits map

Investment Objectives

The following draft investment objectives were also proposed:

1. To reduce deaths and serious injuries of active modes crashes between Mosgiel and Dunedin by 100% by 2035
2. To improve perceptions about the safety of active modes between Mosgiel and Dunedin by 15% by 2030
3. To improve the level of service for active mode network for communities to enable cohesion and participation in social, commercial and employment opportunities by 50% by 2030
4. To increase active mode share for journeys between Mosgiel and Dunedin by 3% by 2035

General agreement was confirmed with these objectives; however, it was noted that with the refinement of the problem statement 1 (addressing gradient) and problem statement 3 (expanding to include recreational opportunities) further refinement would be appropriate. This could see specific reference regarding gradients to be no more than 5% along the corridor or an agreed level of service target. It was agreed that the business case team would consider this further.

The investment objectives were revised to the following. It was considered that gradient is addressed appropriately through investment objective 3, which has been slightly reworded to include tourism and recreation.

1. To reduce deaths and serious injuries of active modes crashes between Mosgiel and Dunedin by 100% by 2035
2. To improve perceptions about the safety of active modes between Mosgiel and Dunedin by 15% by 2030
3. To improve the level of service of the active mode network for communities to enable cohesion and participation in tourism, recreation, social, ~~commercial~~ and employment opportunities by 50% by 2030
4. To increase active mode share for journeys between Mosgiel and Dunedin by 3% by 2035

4. Evidence Development

4.1 Tunnel Assessment

A technical assessment of the tunnels was successfully undertaken by Bonisch and identified no ‘fatal flaws’ to their consideration. Key points noted include:

- The CPTED (Crime Prevention through Environmental Design) assessment identified some areas where improvement would be required, particularly regarding sight lines and visibility, however there was nothing that could not be suitably addressed.
- The geotechnical/ structural assessment confirmed that they were all in acceptable condition, although remedial work will still be required.

4.2 Factors in cycle uptake

Canadian research has identified that integrated cycle networks, separated from other (preferably low volume) traffic flows, has a major influence on a person’s decision to cycle. This is was found to be particularly relevant for potential cyclists who have limited experience on the road (interested but concerned).

There was some discussion among stakeholders about how the relative priorities, as shown in Figure 3, might apply in the Mosgiel – Dunedin context e.g., topography is very location specific, there was general agreement regarding the factors being key considerations.

Prioritization	1	2	3	4	5	6	7	8
Factor	There are bike routes	Traffic	The Street Network	The Topography	The Environment En-route	The Distance	Neighbourhood Land Use	The Population Density
Points (135 Total)								
Priority 1 = 3 points	50	25	17	16	12	9	4	2
Priority 2= 2 points								
Priority 3 = 3 points								

Figure 3 Factors affecting cycling uptake

4.3 BEATS Research

BEATS[2] is a multi-sector research programme, overseen by the University of Otago, with collaboration between academia, schools, local government and wider community. The BEATS programme is investigating individual, social, environmental and policy influences on adolescents' active transport (walking or cycling) to school.

Key findings from this research include:

5. 60.7% of adolescents living within 2.25km used active transport modes.
6. Active Travel to School (ATS) was negatively correlated with adolescents' perceptions of walking or cycling to school being unsafe.
7. The dominant influence on the intention to cycle to school was attitude (''Cycling to school is interesting", ''Cycling to school is stimulating") in Dunedin.
8. School children who use active transport to travel to school are more likely to use active modes, be more physically and encourage their own children to use active transport as adults[3].

As can be seen in Figure 4, while Taieri College in Mosgiel has a higher ATS percentage compared to some Dunedin schools, participation rates are still below 50% in an area with comparatively lower traffic volumes and no topography constraints, and indicate an opportunity for greater uptake in ATS.

[2] https://www.otago.ac.nz/beats/index.html

[3] This finding also accords with NZ Transport Agency report 420 regarding the benefits for long term behaviours from realizing active transport to schools.

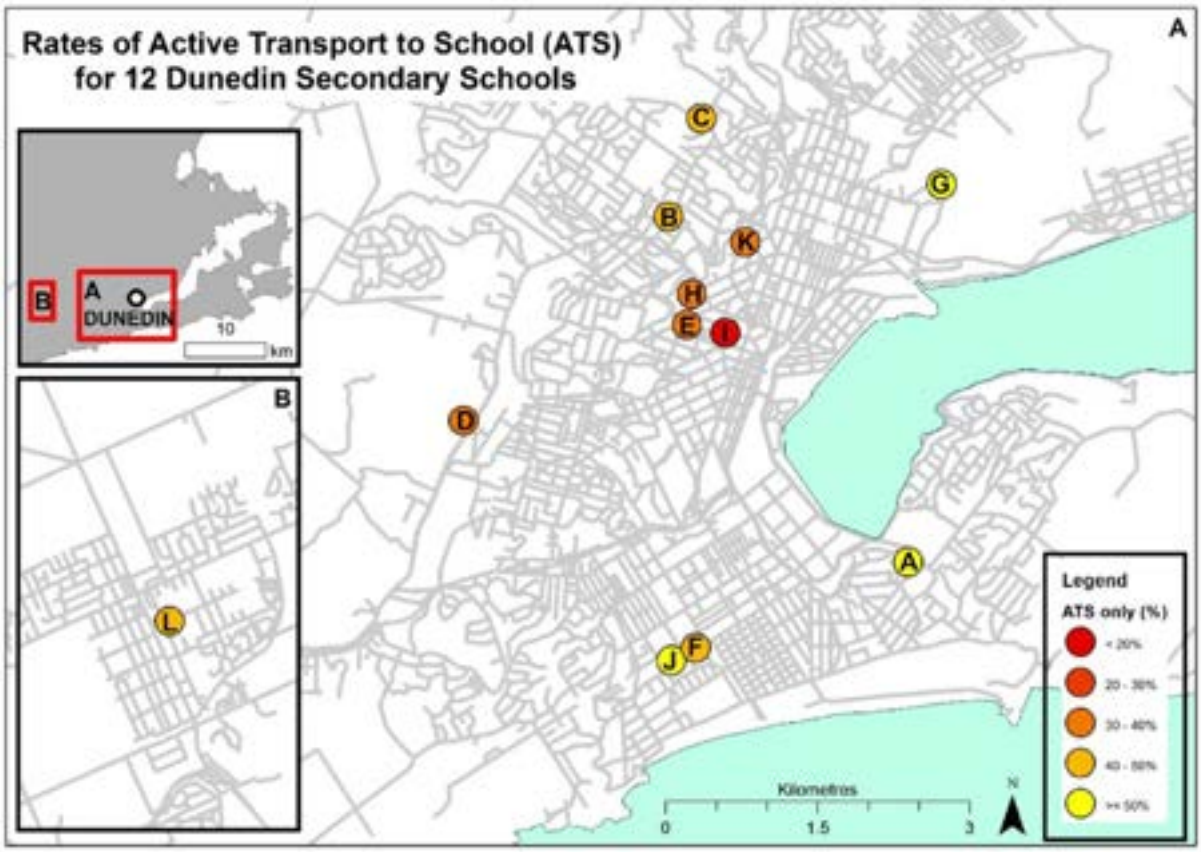

Figure 4 ATS Dunedin - Mosgiel

4.4 Level of Service Assessment

Levels of service (LoS) refers to the experience of the user related to different cycling facilities. A six-point scale is used, A- F, with A being 'very satisfied' and F being 'very dissatisfied'. For example, a fully segregated, off road route, provides a much higher LoS compared to simple lane markings on a general traffic road. Research Report 660 *Factors affecting cycling level of service* identifies factor scores for shared pathways with Figure 5 showing key factors and scoring.

When applied to the user perceptions with Mosgiel, the cycling level of service was assessed as a 'D'.

Factor	Categories for CLOS	Score	Notes
Uphill gradient	-2.9% 3.0-6.9% 7.0-9.9% ≥10.0%	A B C+ C	Scoring system has been assigned using professional judgement and takes into account the scoring approach by gradient using in Auckland Transport's existing tool.
Downhill gradient	-4.9% 5.0-9.9% 10.0-14.9% ≥15.0%	A B C+ C	Scoring system has been assigned using professional judgement and takes into account the scoring approach by gradient using in Auckland Transport's existing tool.
Surface quality	Sealed pavement that is well maintained with good drainage. Sealed pavement with good drainage but some defects, some debris likely on path. Unsealed pavement or sealed pavement with significant defects, significant debris likely on path, poor drainage, slippery pavement materials.	A C E	Scoring system has been assigned using professional judgement and takes into account the scoring approach by gradient using in Auckland Transport's existing tool. Analysis of surface quality data, both from the instrumented bicycle and rider's ratings, suggests that surface quality is a key determinant of cyclists' perceptions of LOS.
Social safety	Frequent sections with human activity, or buildings overlooking path. Good path lighting. Clearly identifiable escape routes. Some human activity or buildings overlooking path. Good path lighting. Escape route available. No human activity. Path is visually blocked from buildings by walls or vegetation. Adequate path lighting. No escape route available. No human activity. Path is visually blocked from buildings by walls or vegetation. No path lighting. No escape route available.	A B C E	Scoring system has been assigned using professional judgement and takes into account the scoring approach by gradient using in Auckland Transport's existing tool. Existing approaches such as CPTED should guide design.

Figure 5 Factor ratings for shared pathways (abridged)

4.5 Health Benefits

The stakeholders were also presented with an analysis of the health benefits of active transport modes following Waka Kotahi research as shown in Figure 6. When applied to the Mosgiel area[4] only, the annualised per person benefits were as assessed as between $1,615 and $2, 292. When applied to 2018 census data, it is estimated that annual savings between $325,000 - $460,000 could be made to the health sector related costs if just 5% of people commuted by bicycle. The current journey to work mode share in Mosgiel is 2%.

Cycling		Benefit weight			Weighted sum - annual benefit per person
		1	0.85	0.15	
Scenario of annual health benefits		Activity status			
		Sedentary	Inactive	Active	
		Prevalence			
		15.0%	34.5%	50.5%	
Low	$3,112	$467	$913	$236	$1,615
Mean	$3,765	$565	$1,104	$285	$1,954
High	$4,417	$663	$1,295	$335	$2,292
		Km over which benefits are received			Weighted per-km benefit
		1250	900	624	
Low		$0.37	$1.01	$0.38	$1.77
Mean		$0.45	$1.23	$0.46	$2.14
High		$0.53	$1.44	$0.54	$2.51

Figure 6 Monetised health benefits of active transport modes[5]

[4] Bush Road, Mosgiel Central, Seddon Park and Mosgiel East statistical areas
[5] NZTA Research Report 359

5. Longlisting

The longlisting process began with a discussion of the Waka Kotahi Intervention Register which encourages all options to be considered ranging from lower cost initiatives such as integrated planning and demand management, through to higher cost options such as optimising the existing network or new infrastructure.

With reconfirmation of the objective to address *active travel* routes between Mosgiel and Dunedin, the following alternatives were identified during the longlisting discussion.

Table 2 Longlist options

Option #	Option	Detail	Intervention Hierarchy
1	E-bike provision	Role out e-bikes to affected communities	Optimisation
2	Gondola/Travelator/ Cycle Lifts	Introduction of automated infrastructure to mitigate against gradient issues	Optimisation/ New Infrastructure
3	New route – Chain Hills tunnel connecting into existing route via North Taieri Road	Connection into North Taieri Road requiring road widening and shared paths The route would not utilise Caversham Tunnel.	Optimisation/ New Infrastructure
4	Three Mile Hill	Three Mile Hill Road is a sealed, two way road connecting Mosgiel with the Taieri Road in north-west Dunedin	Optimisation
5	Friends Hill Rd	Friends Hill Road is an unsealed, single lane track that connects Mosgiel/Wingatui with the Taieri Road in north-west Dunedin	New Infrastructure
6	Construct a new tunnel	Beside new rail tunnel at Kaikorai Valley Fairfield to Mosgiel	New Infrastructure
7	Existing SH1 corridor	Alter the designation of the motorway to enable active modes to use the corridor.	Optimisation
8	Upgrade existing route	Upgrading the existing route to marked cycle lanes from Caversham to Mosgiel providing safety improvements	Optimisation
9	Upgrade existing route + Caversham Tunnel	Reopen Caversham tunnel under Lookout Point to address gradient issue before continuing on upgraded cycle lanes through Green Island to Mosgiel.	Optimisation/ New Infrastructure
10	New route using Chain Hills and Caversham Tunnels and rail corridor	Reopening the Caversham and Chain Hills tunnels and connecting them by an off-road cycleway track to Mosgiel north of SH1 along the existing railway alignment.	New Infrastructure
11	New route using Chain Hills and Caversham Tunnels and link track	Reopening the Caversham and Chain Hills tunnels and connecting them by an off-road cycleway track to Mosgiel north of SH1 along the existing railway alignment and private farm track through to North Taieri Road.	New Infrastructure

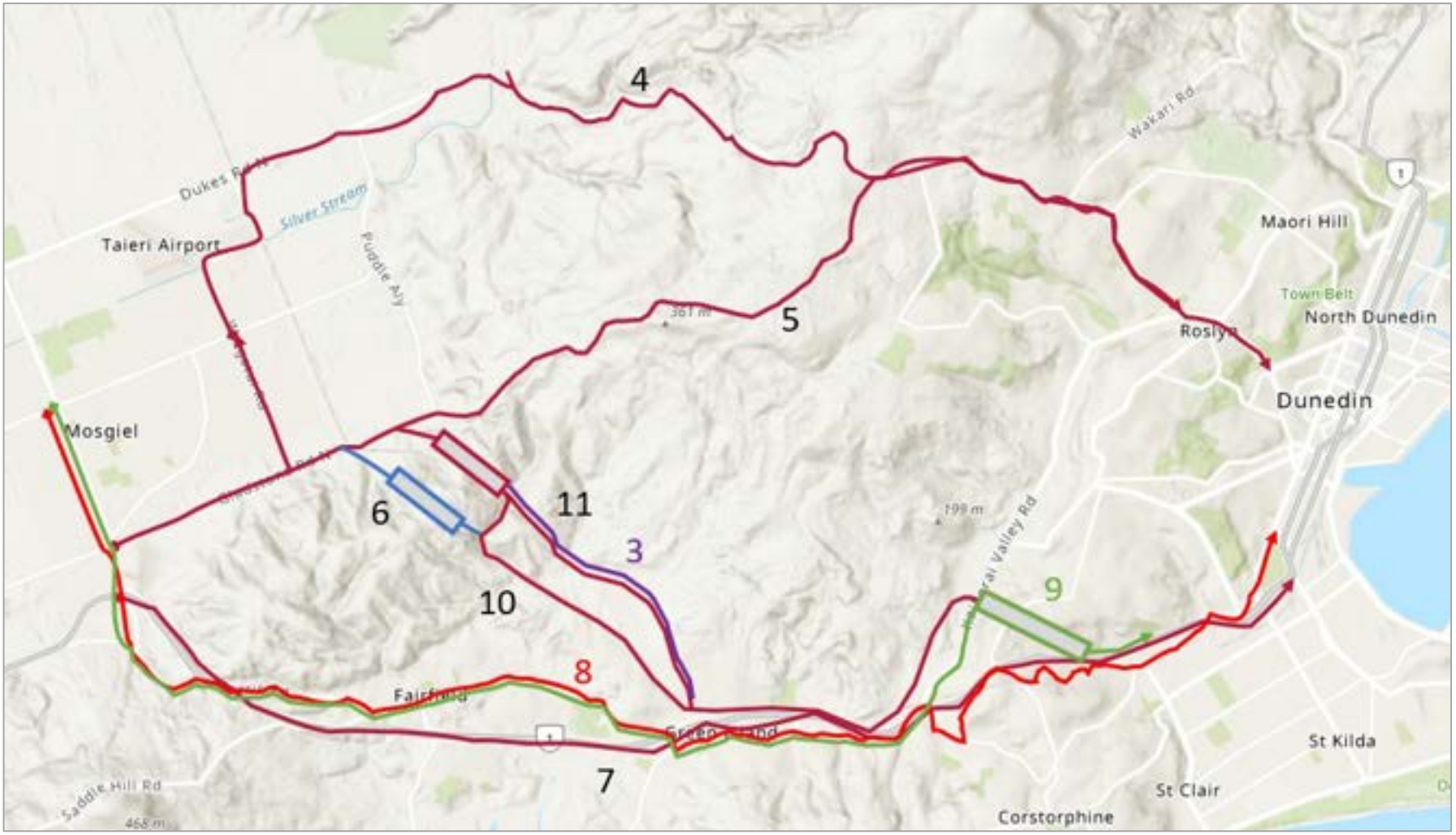

Figure 7 Location of longlist

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5.1 Long list to short list

Following the identification of the longlisting, the options were assessed to test their feasibility and ability to achieve the investment objectives, and resulted in the identification of the shortlist for further assessment. The discounted options are highlighted in red, the shortlisted options are highlighted green.

Table 3 Assessment of the longlist

Option #	Option	Considered for further assessment
1	E-bike provision	**Rejected** due to only addressing cycle issues and would not provide any pedestrian improvements
2	Gondola/Travelator/ Cycle Lifts	**Rejected** due to cost and technical feasibility considerations and would not provide pedestrian improvements
3	New route	**Rejected** as it would only improve a short section of route and not address investment objectives
4	Three Mile Hill	**Rejected** as it would not connect into communities of Fairfield and Green Island, as well as also having significant gradient issues.
5	Friends Hill Rd	**Rejected** as it would not connect into communities of Fairfield and Green Island, as well as also having significant gradient/access issues.
6	Construct a new tunnel	**Rejected** due to initial cost estimates ($60,000 per linear metre) making the scheme unaffordable
7	Existing SH1 corridor	**Rejected** to not being compliant with the Safe System approach as carriageway is of insufficient width to be implemented and would not achieve gradient investment objective
8	Upgrade existing route	**Accepted** for further assessment.
9	Upgrade existing route + Caversham Tunnel	**Accepted** for further assessment.
10	New route using Chain Hills and Caversham Tunnels and rail corridor	**Accepted** for further assessment.
11	New route using Chain Hills and Caversham Tunnels and link track	**Accepted** for further assessment.

6. Shortlist Assessment

The shortlisting process identified four options for initial assessment in addition to the 'Do-Nothing' option.

In accordance with Waka Kotahi guidance, the Alternatives and Options Assessment Multi Criteria Analysis approach was applied, scoring the options against the criteria from 1 (poor) to 5 (high alignment/achievement).

6.1 Shortlist option description

Do min

The do min existing route is a two way single lane route. For the most part no cycle protection (cycle lanes) is provided. There is generally on-street parking, a range of intersection type and many vehicle crossings into residential and commercial properties. The route follows: SH87 Gordon Road, Quarry Road, Morris Road, Main Road, Main South Road (with a short section of shared path), Stevenson Road, Corstorphine Road, South Road (or as an alternative from Stevenson Road up SH1 off ramp around onto South Road which is a shared path of low quality).

Upgrade the existing route

This would follow the same route as described in the do min but would include cycle protection along the whole route. This would primarily be in the form of cycle lanes (buffered where space allows) and shared paths where the cross section or land use does not provide enough space for cycle lanes. This would be achieved by the removal of parking and narrowing of traffic lanes. It may also necessitate lower speed limits in some areas.

It is noted that cycle lanes and shared traffic lanes are currently in development by DCC for Main Road/ Main South Road and South Road. However, these have not yet received approval or funding and so are not in the do min.

Upgrade existing route plus Caversham Tunnel

This is the same as the option above, but at the end of Main South Road the route turns left up Kaikorai Valley Road which has existing cycle lanes to the Caversham Tunnel. It would connect from the tunnel through to South Road.

New route using Chain Hills and Caversham Tunnels and rail corridor

Reopening the Caversham and Chain Hills tunnels and connecting them by an off-road cycleway track to Mosgiel north of SH1 along the existing railway alignment.

New route using Chain Hills and Caversham Tunnels and link track

Reopening the Caversham and Chain Hills tunnels and connecting them by an off-road cycleway track to Mosgiel north of SH1 along the existing railway alignment and private farm track onto North Taieri Road.

6.2 Short list assessment

		Option				
		1: Do Min	2: Upgrade Existing Route	3: Upgrade existing route + Caversham Tunnel	4: New route using Chain Hills and Caversham Tunnels and rail corridor	5: New route using Chain Hills and Caversham Tunnels and link track
Investment Objectives	1) To reduce deaths and serious injuries of active modes crashes between Mosgiel and Dunedin by 100% by 2035	1	2	2	4	4
	2)To improve perceptions about the safety of active modes between Mosgiel and Dunedin by 15% by 2030	1	2	2	5	4.5
	3)To improve the level of service for active mode network between Mosgiel and Dunedin to enable community cohesion and participation in social, commercial and employment opportunities by 50% by 2030	1	1	2	5	4
	4)To increase active mode share for journeys between Mosgiel and Dunedin by 3% by 2035	1	1	2	5	5

The initial assessment identified options 4 and 5 (Chain Hills and Caversham Tunnels and rail corridor or link track respectively, as most highly aligned with the investment objectives. The do minimum option scored poorly across the all the objectives. Options 2 and 3, which involve upgrading the existing route (with or without the Caversham tunnel) had low – moderate alignment.

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		Option				
		1: Do Min	2: Upgrade Existing Route	3: Upgrade existing route + Caversham Tunnel	4: New route using Chain Hills and Caversham Tunnels and rail corridor	5: New route using Chain Hills and Caversham Tunnels and link track
Practical Feasibility	Technical -technical or practical ease/difficulties when implementing	**5**	**1.5**	**4**	**4**	**4**
	Safety & Design - Level of potential hazards posing H&S risk in design, operation or maintenance	**3**	**2**	**3**	**3**	**3**
	Consentability - Level of consenting complexity/ difficulty and risk on implementability	**2**	**1**	**3**	**4**	**5**

With regard to the practical feasibility of the options, the Do Minimum option scored 5 (difficult/complex) for its technical feasibility due to it failing to meet the 'Safe System' approach to road safety although it scored better for Safety & Design and Consentability. Upgrading the existing route was identified as the most practical across the three assessment areas, while options 3, 4 & 5 were all found to have more challenges with regard to their practical feasibility. Option 5 scored slightly worse for consentability due to the link track element involving private landowners with concerns about their willingness to engage.

		Option				
		1: Do Min	2: Upgrade Existing Route	3: Upgrade existing route + Caversham Tunnel	4: New route using Chain Hills and Caversham Tunnels and rail corridor	5: New route using Chain Hills and Caversham Tunnels and link track
Timing, Cost, Risks	Scheduling - When could it be delivered?	**0-2 years**	**0-2 years**	**2-5 years**	**2-5 years**	**2-5 years**
	Cost - Likely range: upfront capital cost	**TBC**	**$28m**	**$31m**	**$28.7m**	**$28.5m**
	Key Risks & Uncertainties - Any significant risks or uncertainties	**1**	**3**	**3**	**4**	**4**

From a scheduling perspective, it was believed that any option could be delivered within a 5-year timeframe, however the do minimum and upgrading of the existing route could be realised earlier.

Costing information was provided to stakeholders, following an indicative assessment by Bonisch. The costing assessment was predicated on ensuring all options achieved the same 'Safe System' rating and this can be seen in the overall similarity of the likely upfront costs e.g., all were within +/- $30million. Some discussion occurred about the comparative high cost related to the upgrading of the existing route, however due to the significant roading and lighting upgrades (including potential widening and route segregation), the higher cost threshold was understood.

Options 4 and 5 were seen as having a slightly higher risk/uncertainty rating due to their requirement for access to the Kiwirail or private land elements, whereas option 3, although using the Caverham Tunnel, would not have any significant impact on third party land.

		Option				
		1: Do Min	2: Upgrade Existing Route	3: Upgrade existing route + Caversham Tunnel	4: New route using Chain Hills and Caversham Tunnels and rail corridor	5: New route using Chain Hills and Caversham Tunnels and link track
Climate, Te Ao Maori	Mitigation - Expected impact on demand for travel by car		Neutral	Reduce	Reduce	Reduce
	Adaptation - Exposure to climate change risk or natural hazards over time		Maybe	Maybe	Maybe	Maybe
	Te Ao Maori - What, if any, impact on Te Ao Maori	Nothing Identified	Nothing Identified	Nothing Identified	Nothing Identified	Nothing Identified

All options were rated similarly for their impact on Climate Change (mitigation and adaptation) and Te Ao Maori considerations. The 'neutral' rating assigned to the climate change mitigation potential of upgrading the existing route was due to the expectation that this would not materially encourage adoption of active modes. Options 3, 4 & 5 were all however expected to result in an increased uptake of active mode usage.

		Option				
		1: Do Min	2: Upgrade Existing Route	3: Upgrade existing route + Caversham Tunnel	4: New route using Chain Hills and Caversham Tunnels and rail corridor	5: New route using Chain Hills and Caversham Tunnels and link track
Environmental/ Social	Identify - Any significant environment, social or cultural effects	Nothing to mitigate	Nothing significant	Significant. Due to utilities and services within the tunnels i.e., gas and waste water, in an area experiencing flooding.	Significant. Due to utilities and services within the tunnels i.e., gas and waste water, in an area experiencing flooding.	Significant. Due to utilities and services within the tunnels i.e., gas and waste water, in an area experiencing flooding.
	Mitigation - Avoid, Remedy or Mitigate	Nothing to mitigate	Nothing to mitigate	Possible to avoid, remedy or mitigate depending on final solution selected e.g., rerouting of waste water pipes.	Possible to avoid, remedy or mitigate depending on final solution selected e.g., rerouting of waste water pipes.	Possible to avoid, remedy or mitigate depending on final solution selected e.g., rerouting of waste water pipes.

Options 1 and 2 were not seen as having any environmental or social effects whereas the remaining options, with their potential for more substantial changes to the environment e.g., possible rerouting of waste water pipes or other utilities were seen as having potential significant environmental, social or cultural effects. However, the opportunity for mitigation was seen as higher and realistic.

	Option				
	1: Do Min	2: Upgrade Existing Route	3: Upgrade existing route + Caversham Tunnel	4: New route using Chain Hills and Caversham Tunnels and rail corridor	5: New route using Chain Hills and Caversham Tunnels and link track
Fatal Flaw	Non compliant with Safe System	None Identified	None Identified	None Identified	None Identified

Only option 1 was considered to have a fatal flaw due to its clear non-alignment with the Safe System approach. The Safe System approach requires all elements of the road system to be complementary to realise a safe road system increasingly free of death and serious injury. Do minimum interventions would not be aligned with this requirement as they were considered to be insufficient to support these requirements

Summary

The application of the Alternatives and Options Assessment Multi Criteria Analysis approach has clearly identified that a do minimum response to the problems and related investment objectives would not be sufficient. Options 2, 3, 4 & 5, which involve either upgrading the existing route or the introduction new route all passed this first level of assessment and are therefore recommended for further analysis as part of the business case process.

It is noted that options 2 & 3 and options 4 & 5 are essentially a comparison of an upgrade of the existing route compared to a new alignment through the tunnels. While the existing route was not fatally flawed it did have a much lower achievement of the investment objectives.

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Appendix C. Shortlist workshop notes

Insightful solutions. Empowering advice.

Workshop 3: Shortlisting

Prepared for: Dunedin City Council
Job Number: BNCL-J001
Revision: Draft
Issue Date:
Prepared by: Stephen Carruthers, Associate
Reviewed by: Matthew Noon, Associate Director

1. Introduction

Workshop 3 of the Tunnels Trail Business Case focussed on assessing the shortlist of options to identify the preferred route to be carried forward into preliminary design.

2. Stakeholders

The workshop was held 24 March 2021 and attendees were:

- Gerard Hyland – Dunedin Tunnels Trust
- Jon Dean – Spokes
- Christina McBratney – Saddle Hill Community
- Anja McAlevey – Waka Kotahi
- Jesse Jacometti – Dunedin City Council (PM)
- Stacey Hitchcock – Dunedin City Council (Transport Planning)
- Nick Sargent – Dunedin City Council (Transport Strategy Manager)
- Paula Dickel – Dunedin City Council (Property)
- Kim Everett – Dunedin City Council (Com's)
- Kurt Cole – Boffa Miskell (for Dunedin City Council)
- Stephen Carruthers – Abley
- Matthew Noon – Abley (facilitator)
- Simon Collie – Bonisch
- Glenn O'Connor – Bonisch

Apologies - Arnold Storm – Kiwirail, Eric Teekman – Waka Kotahi, Jared Oliver – Dunedin City Council (Three waters), Larna McCarthy – Greater Green Island Community Network.

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3. Overview of previous workshops

The workshop commenced with a review and recap of the outcomes from workshops 1 and 2. This included the problems and benefits, investment objectives, the longlist to shortlist process and confirmation of the shortlist.

Points of clarification were that tourism is included in the investment objectives and that the description of Mosgiel to Dunedin includes connections into the suburbs in between (Abbotsford, Fairfield and Green Island). It was clarified that these points are described in the strategic case.

The discussion also confirmed that the cycle lanes designed in the Safer Streets business case should not be included in the do-minimum assumptions as they are unlikely to be funded in the foreseeable future. This is particularly relevant for Factory Road, South Road and Main Road. It was also confirmed that Main South Road would be treated with speed limit reduction, speed bumps and sharrows. These improvements should be assumed in the do-minimum.

The outcome of workshop 2 was that two route options were carried forward to concept design:

1. The tunnels trail route
2. Upgrade existing route (southern cycle route)

4. Concept designs

Between workshop 2 and 3, Bonisch developed a concept design for the tunnels route and design scoping for the southern cycle route. Workshop attendees were taken through the routes by the designers highlighting key design issues and factors to be considered in the MCA.

The designs were also used to develop initial cost estimates which in turn were used in the economic assessment.

5. Shortlist MCA

The route options were assessed in workshop 2, however, this was on the basis of relatively high level information. The concept design process was used to develop more robust information to inform the assessments. The design team reassessed the scores from workshop 2 with this information.

In the shortlist workshop, attendees discussed the original scoring and the new scoring based on the technical recommendation from the concept design to agree a final score for each criterion. This assessment process is described below.

Investment objectives

The do-minimum route and southern route investment objectives scores did not change (4 and 6 respectively) see Table 1, however, the tunnels trail route was reduced by 1 point acknowledging that the distance of the route may limit the potential increase in mode share. Although it was discussed that the rapid uptake of e-bikes may reduce the disincentive of the distance and encourage more people to cycle. The overall score for the tunnels route was 18, demonstrating a much higher alignment with the investment objectives that the other options.

It was noted that the sections of the southern route that utilise existing cycle facilities are not up to the standard that would be provided by the tunnels route.

Table 1 Assessment of investment objectives

		1: Do Min	Technical recommendation	2: Upgrade Existing Route	Technical recommendation	4: New route using Chain Hills and Caversham Tunnels and rail corridor	Technical recommendation
Investment objectives	1) To reduce deaths and serious injuries of active modes crashes between Mosgiel and Dunedin by 100% by 2035	1	1	2	2	4	4
	2)To improve perceptions about the safety of active modes between Mosgiel and Dunedin by 15% by 2030	1	1	2	2	5	5
	3)To improve the level of service for active mode network between Mosgiel and Dunedin to enable community cohesion and participation in social, commercial and employment opportunities by 50% by 2030	1	1	1	1	5	5
	4)To increase active mode share for journeys between Mosgiel and Dunedin by 3% by 2035	1	1	1	1	5	4
	Higher score the better achievement of objectives	4	4	6	6	19	18

Practical feasibility

As more information was available following concept design an additional criterion was added to assess the property impacts as shown in Table 2. The technical recommendation assessed the southern route and tunnels route as a 5. However, the property advisor at the workshop (Paula Dickel) advised that she foresaw no particularly issues about these acquisitions compared to other property impacting projects, so it was agreed to reduce the score to 3 for both routes.

The score of the do-min was significantly reduced noting that there may have been an error in the original scoring. The four criteria were assessed as 1 for a total score of 4 where originally it was scored as 10 with a high technical feasibility score.

The southern route score also significantly increased in the reassessment from 4.5 to 12.5, with the technical difficulty and consentability criteria being scored higher due to the significant retaining that is required along Morris Road to provide separation from traffic.

The tunnels trail score increased from 11 to 16, with increases in the safety in design assessment due to maintaining the tunnels and the consentability as there are contaminated land, archaeological sites, earthworks, bridging over and working alongside waterways, building consent for underpass, and KiwiRail consent issues to address.

It was clarified in the workshop that safety in design relates to the operation and maintenance of the asset rather than the safe design of the asset itself.

Table 2 Assessment of practical feasibility

		1: Do Min	Technical recommendation	2: Upgrade Existing Route	Technical recommendation	4: New route using Chain Hills and Caversham Tunnels and rail corridor	Technical recommendation
Practical feasibility	Technical - technical or practical ease/difficulties when implementing	5	1	1.5	4.5	4	4
	Property impacts	Not assessed	1	Not assessed	3	Not assessed	3
	Safety & design - level of potential hazards posing H&S risk in design, operation or maintenance	3	1	2	2	3	4
	Consentability - level of consenting complexity/ difficulty and risk on implementability	2	1	1	3	4	5
	Higher score has more feasibility issues	10	4	4.5	12.5	11	16

Timing, costs, risks

Table 3 shows the scoring assessment for the timing, cost and risk criteria. It should be noted that the updated technical assessment also included Cost – Operational/Maintenance and Value for Money (based on Benefit-Cost assessments) which was not originally assessed due to the technical detail that was required at the time of workshop 2.

No changes were made to the do minimum option assessment.

While the cost of the southern route was reduced, the funding and timing risk score was increased as the BCR is below 1 meaning the option is going to struggle to attract funding. This also resulted in a 5 for value for money.

The tunnels trail route funding and timing risk slightly reduced as it is possible to achieve a BCR above 1 and is therefore potentially fundable.

Table 3 Assessment of timing, costs, risks

		1: Do Min	Technical recommendation	2: Upgrade Existing Route	Technical recommendation	4: New route using Chain Hills and Caversham Tunnels and rail corridor	Technical recommendation
Timing, cost, risks	Scheduling - when could it be delivered?	0-2 years	0-2 years	0-2 years	2-5 years	2-5 years	2-5 years
	Cost - likely range: upfront capital cost	1	1	5	4	5	5
		$0	$0	$20m	$21.8m	$20.7m	$27.6m
	Cost - operational/maintenance	Not assessed	1	Not assessed	3	Not assessed	4
	Value for money	Not assessed	1	Not assessed	5	Not assessed	3
	Funding and timing risks	1	1	3	4	4	3
	Higher score has higher cost and funding risk (not score for scheduling)	2	4	8	16	9	15

Climate, Te Ao Maori

The project team have engaged with local iwi, but been advised that they there are no issues of particular concerns from a Te Ao Maori perspective, as such no score was given to this criterion see Table 4.

It was identified that the tunnels route will likely have a bigger impact on reducing vehicle travel demand than other options. No climate change risks were identified.

Table 4 Assessment of climate, Te Ao Maori

		1: Do Min	Technical recommendation	2: Upgrade Existing Route	Technical recommendation	4: New route using Chain Hills and Caversham Tunnels and rail corridor	Technical recommendation
Climate, Te Ao Maori	Mitigation - expected impact on demand for travel by car	1	1	Neutral	2	Reduce	3
	Adaptation - exposure to climate change risk or natural hazards over time	None identified	None identified	Maybe	None identified	Maybe	None identified
	Te Ao Maori - what, if any, impact on Te Ao Maori	None identified	None identified	None identified	None identified	None identified	None identified
	High score more positive impacct (only mitigation scored)	1	1		2		3

Environment and social

Table 5 details the social or cultural effects assessment and no changes were made following the technical assessment. While it was noted that there is an issue related to waste water pipes in the tunnels potentially overflowing, which would be addressed by the tunnel improvements, this is not as a direct consequent of the tunnels project – it is a pre-existing issue that is not attributable to the project and predominantly out of scope for the project.

Table 5 Assessment of Environmental and social

		1: Do Min	Technical recommendation	2: Upgrade Existing Route	Technical recommendation	4: New route using Chain Hills and Caversham Tunnels and rail corridor	Technical recommendation
Environmental / social	Identify - any significant environment, social or cultural effects	Nothing to mitigate	Nothing to mitigate	Nothing significant	Nothing significant	Significant. Due to utilities and services within the tunnels i.e. gas and waste water in an area experiencing flooding	Significant gas and waste water issues can be mitigated by the project
	Mitigation - avoid, remedy or mitigate	Nothing to mitigate	Possible to avoid, remedy or mitigate depending on final solution selected e.g., rerouting of waste water pipes.	Nothing to mitigate	Possible to avoid, remedy or mitigate depending on final solution selected e.g., rerouting of waste water pipes.	Possible to avoid, remedy or mitigate depending on final solution selected e.g., rerouting of waste water pipes.	Possible to avoid, remedy or mitigate depending on final solution selected e.g., rerouting of waste water pipes.
	Higher score has higher environmental/social negative impact	0	4	4	6	8	8

Fatal flaw

The concept design identified that the do minimum and southern route would not be compliant with a safe system (Table 6), primarily due to the level of separation that is able to be achieved from traffic which in places is either high volume or high speed (up to 80km/hr speed limit). The tunnels route is able to achieve minimum standard or better.

Table 6 Assessment of fatal flaws

	1: Do Min	Technical recommendation	2: Upgrade Existing Route	Technical recommendation	4: New route using Chain Hills and Caversham Tunnels and rail corridor	Technical recommendation
Fatal flaw	Non compliant with Safe system	Non compliant with Safe system	None identified	Non compliant with safe system	None identified	None identified
Lower is better	5	5	1	5	1	1

Overall scoring and weight scenarios

The scores for all the sections were combined to a summary score shown in Table 7. It was discussed in the workshop that the actual number itself was not important, but the relatively between the options was the important factor.

To test the scoring system, two weighting scenarios were considered. A scenario that gave alignment to the investment objectives 50% of the overall scoring, and a scenario that gave 50% weighting to cost and risk.

In each of the three score the southern route had the worst score. The tunnels trail scored the best when the alignment with investment objectives was given more weighting. The do minimum scored the best with no weight or the cost and risk weighting was applied.

This assessment says that if the investment objectives are to be achieved the tunnels trail route is the best option.

Table 7 Total scoring and weight scenarios

	Do min	Southern route	Tunnels trail route
Total non weighted	-12	-31.5	-19
Total objectives weighted (50% objectives)	-4.375	-6.0625	3.5
Total cost weighted (50% price/risk)	-7.375	-14.3125	-8.875

6. Conclusion

Based on the process that has been carried out through workshops 1,2 and 3 the tunnels trail route has been confirmed as the preferred route and will be carried forward into preliminary design.