21 August 2023

File Ref: OIAPR-1274023063-3946

[redacted]

Tēnā koe [redacted]

Request for information 2023-194

I refer to your request for information dated 24 July 2023, which was received by Greater Wellington Regional Council (Greater Wellington) on 24 July 2023. You have requested the following:

"It has been raised with me about the 'temporary toilets' for bus drivers in Karori that were put in in 2018/19 and when will the matter be resolved?

https://www.stuff.co.nz/dominion-post/news/wellington/129231067/wellington-bus-drivers-lament-dire-state-of-toilet-facilities

This is raised in the context of the overall performance of the bus service in Karori in particular what are GWRC's plans for;

- *Bus priority lanes (for peak commuter times)*
- *Ensuring sufficient width on the roads for current & future planned buses*
- *Increasing frequency & reliability to meet demand*
- *Clarifying when (or if) the bus service timetable set in 2018 in Karori will be fully implemented*
- *A travel demand bus service similar to Tawa (noting that Tawa has a population only about 2/3 of Karori*

I would appreciate if someone from GWRC could answer the above along with advising me what feedback, to WCC, has GWRC given to date in respect of the proposed bike lanes through Karori along with the need for bus priority lanes. In particular specific concerns around the available road space for buses."

Greater Wellington's response follows:

Temporary toilets in Karori

We have a programme to install new driver toilets at a number of locations. The first three toilet units in Karori, Houghton Bay and Darlington Road are scheduled for completion by late October 2023. These dates are indicative and may change as the projects progress. However, Metlink is working closely with the supplier to complete the projects to these dates.

Bus priority lanes (for peak commuter times)

Greater Wellington is not the road controlling authority – this is Wellington City Council's responsibility, and as such we are unable to make "plans" for bus lanes. However, we do continue to work closely with Wellington City Council to designate more bus lanes across the city generally. Greater Wellington officers have been in frequent contact with Wellington City Council staff during the design phase of the Karori Connections Transitional Cycleway. We have campaigned for a bus lane heading towards the city on Glenmore St from the intersection of Garden Road. This was unable to be accommodated within the available corridor without either removing all parking on both sides of the road or combining the footpath and uphill cycleway into a shared path which was rejected due to safety concerns.

The bus lane on Chaytor Street is being removed as part of this Transitional Cycleway project. Greater Wellington officers initiated this change, as the existing bus lane is too narrow for buses to undertake general traffic unless it is at a complete standstill. Our travel time analysis indicated that greater travel time savings would be gained by reallocating this road space to provide for a separated uphill cycleway – i.e., that the delays caused to outbound buses following cyclists up the hill exceed the travel time savings provided by the existing inbound bus lane.

The horseshoe bend at the top of Glenmore Street has been the topic of lengthy discussion. Greater Wellington has been clear that a shared bus/bike lane in this location is unsafe and unacceptable due to the delays it would cause to the busiest bus route in the city. Wellington City Council officers and their consulting traffic engineers have reviewed the designs and found that there is room to widen the road corridor to include a separate bicycle shoulder. Greater Wellington are funding the road widening works in this area.

We also note that travel times on the Karori corridor are variable throughout the day; congestion is not just a peak time issue. Our travel time analysis conducted for the proposed Glenmore Street (Garden Road to Bowen Street) bus lane indicates that there would be substantial benefit in the bus lane being operational 7am-7pm, seven days per week (or even full-time), rather than the standard 7am-9am weekdays.

Ensuring sufficient width on the roads for current & future planned buses

It is Wellington City Council's responsibility as the road controlling authority to ensure that roads in its jurisdiction are suitable for vehicles permitted under the Vehicle Dimensions and Mass Rule. Greater Wellington officers have reviewed all Transitional Cycleway designs which affect bus routes to ensure that current fleet and, where relevant, planned articulated buses can track safely. Greater Wellington is also working with Wellington City Council on some targeted sites (such as the intersections of Miramar Avenue and Park Road, and Hobart Street and Broadway) to resolve issues with road layout which cause problems for the current fleet. We note that this is not an isolated issue, and our buses must cross the centreline in many places around the city. There are places where this is a geometrical inevitability (like Mount Victoria), and others which could be mitigated by Wellington City Council removing car parks near corners on narrow streets (such as Miramar Heights, Highbury, Ngaio-Khandallah, Kowhai Park, Melrose, and Roseneath).

Increasing frequency & reliability to meet demand

The route 2 service capacity is a known issue, amplified by cancellations and suspensions. NZ Bus, the operator for Karori, has been doing an excellent job of improving their reliability over the last few months. Their reliability is averaging above 99.5%. Based on this, we are working with them to restore the 65 trips which were suspended in October 2022. We have recently confirmed that this will happen for the start of school Term 4. Additionally, we are working with NZ Bus to add in more bus trips for Term 1, 2024. In the longer term, we are working towards the introduction of the articulated bus fleet to provide a step-change in capacity.

Please see **Attachment 1** which is a presentation Metlink gave to Council on Route 2 capacity, **Attachment 2** which is accompanying notes for this presentation and **Attachment 3** which is an investigation approval document that discusses the options to address the route 2 capacity issues with the current focus on articulated buses to manage capacity.

Clarifying when (or if) the bus service timetable set in 2018 in Karori will be fully implemented

The timetables were implemented as contracted when the network changes took effect in July 2018. Changes since then include:

- One short working of Route 34 (departing Karori Mall at 07:35) removed in February 2019 due to driver shortage.
- All-day frequency of Route 2 increased from 10mins to 7.5mins in October 2020 when Route 2 was branched.
- Additional shoulder-peak trips on Routes 33 and 34 added in September 2021
- Temporary suspension of some services (including seven on Route 2) in October 2022 (scheduled for reinstatement October 2023).

The bus service timetable serving Karori from the start of Term 4, 2023 (9 October 2023) will provide higher levels of service than the timetable set in 2018.

A travel demand bus service similar to Tawa (noting that Tawa has a population only about 2/3 of Karori)

On-Demand is a bespoke solution to a particular problem in the Tawa case (narrow streets with low patronage, providing community connectivity). The Tawa On-Demand service is a trial which has recently been extended to include Porirua Central Business District. We appreciate that this new Public Transport mode is convenient and provides a good pathway to mode-shift by providing accessible connections to bus and rail interchanges, as well as local travel. This extended trial will help us understand how it can best be developed in future to service communities if/when it becomes available for funding by Central Government. Currently, this requires a change in legislation.

There are currently no plans to extend On-Demand services to Karori.

In particular specific concerns around the available road space for buses

There is a widespread issue around Wellington City that many of the bus stops are not long enough and lack entry and exit tapers. This means buses often stop with the rear end poking out into the live traffic lane, which creates a traffic safety hazard and creates an accessibility barrier for people boarding or alighting the bus. Many of the stops were set out many decades ago, when a standard bus was 11m long and there were fewer cars on the road (so they were less likely to park right next to bus stops), so this was less of a problem. Nowadays a standard bus is 12.6m long. Accepted best practice (and Waka Kotahi guidance) is that the bus box should be 15m long, with a 15m lead in and 9m lead out.

Further information

Greater Wellington officers will continue to work closely with Wellington City Council officers to ensure that public transport needs are considered appropriately in the design of road improvement projects on established Metlink bus routes.

While we have outlined above a number of points where the proposed cycleway does not match our preferences, we understand that there are many reasons why this cannot be done, at least in the short term. On the whole, the staff of our two organisations have an excellent working relationship, and Wellington City Council officers have endeavoured to include as many bus improvements as they can.

If you have any concerns with the decision(s) referred to in this letter, you have the right to request an investigation and review by the Ombudsman under section 27(3) of the Local Government Official Information and Meetings Act 1987.

Please note that it is our policy to proactively release our responses to official information requests where possible. Our response to your request will be published shortly on Greater Wellington's website with your personal information removed.

Nāku iti noa, nā

Samantha Gain
Kaiwhakahaere Matua Waka-ā-atea | Group Manager Metlink

Bus capacity on Route 2

3 August 2023 – Council Workshop

Fiona Abbott – Senior Manager Assets & Infrastructure, Metlink
Bonnie Parfitt – Senior Manager Network & Customer, Metlink

metlink

Proudly part of Greater Wellington Te Pane Matua Taiao

Purpose

To provide an update on Route 2 capacity issues and options to fix

AGENDA

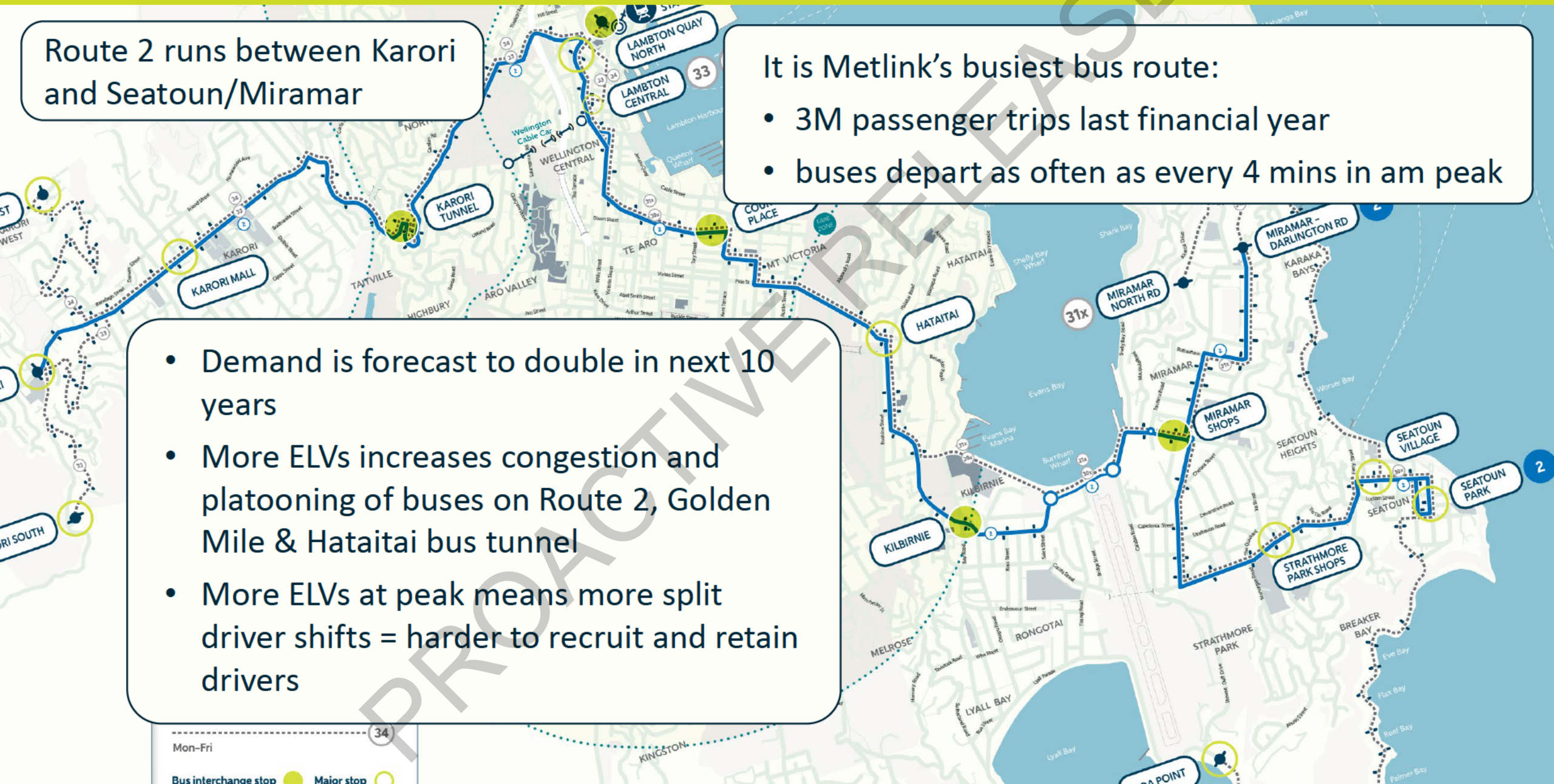
- Background
- Tunnels constraint
- Bespoke double decker design options
- Multi Criteria Assessment (MCA)
- Electric Articulated Buses
- Infrastructure dependencies
- Engagement approach
- Next steps

Background

Route 2 runs between Karori and Seatoun/Miramar

It is Metlink's busiest bus route:

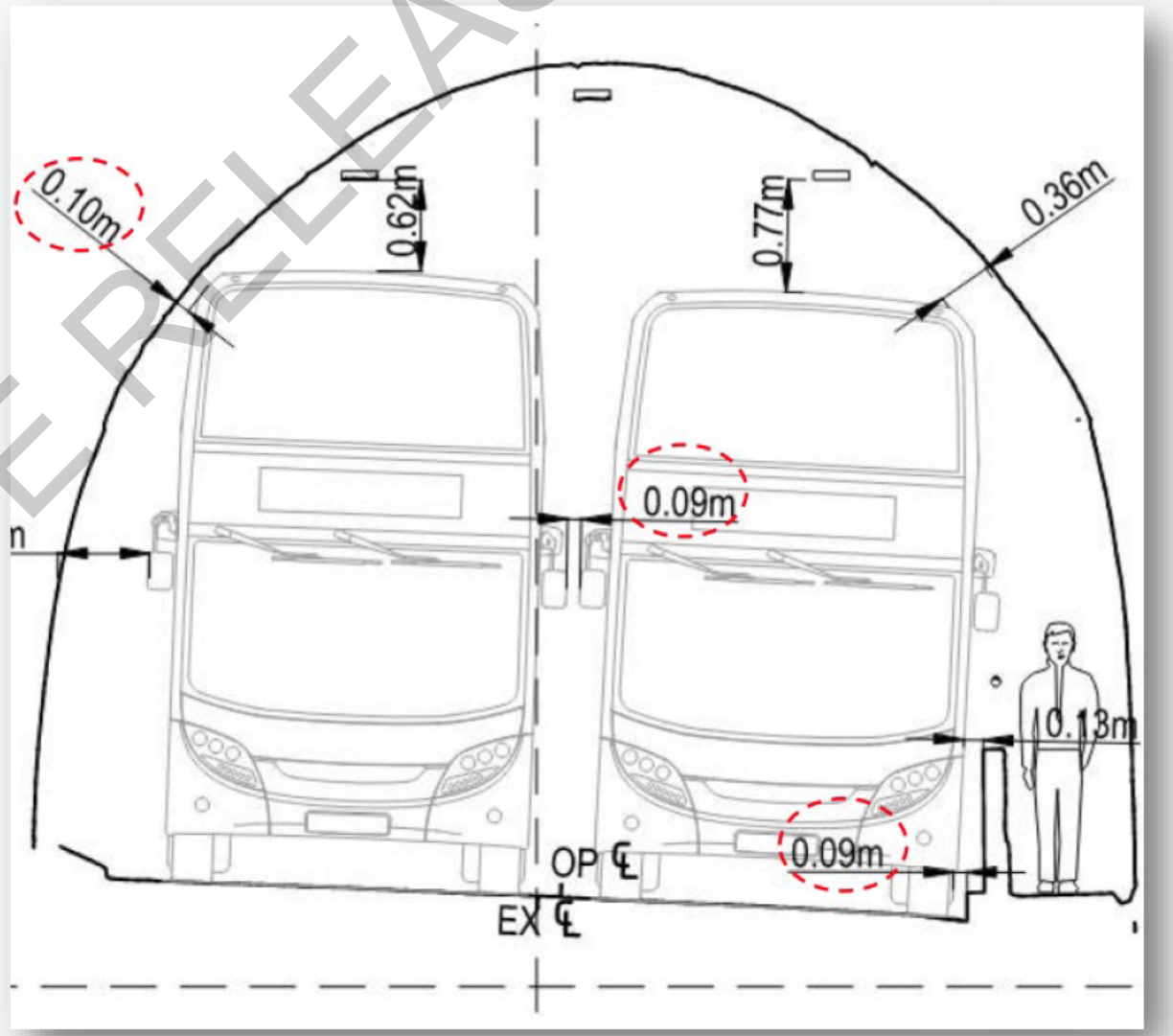
- 3M passenger trips last financial year
- buses depart as often as every 4 mins in am peak



- Demand is forecast to double in next 10 years
- More ELVs increases congestion and platooning of buses on Route 2, Golden Mile & Hataitai bus tunnel
- More ELVs at peak means more split driver shifts = harder to recruit and retain drivers

Tunnels are a constraint for double deckers

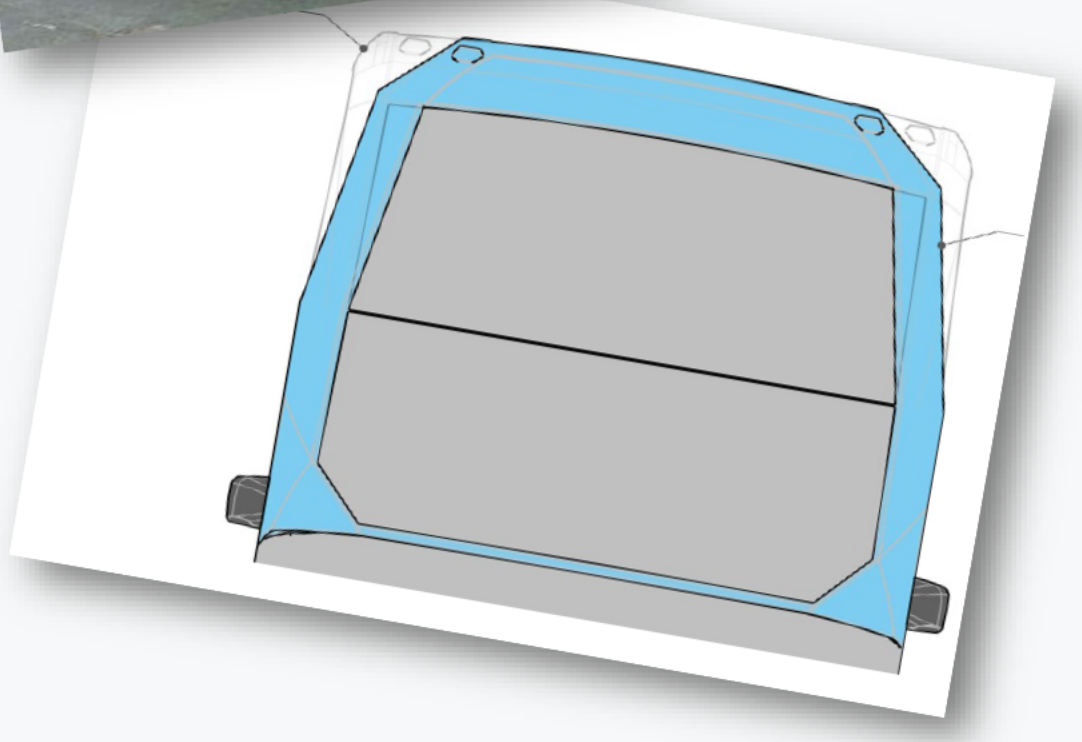
Karori & Seatoun Tunnel walls have been mapped for double deckers. **This work confirmed there are unsafe clearances.**



Bespoke double decker design options

Double decker **design options** considered include:

- **Guidance system plus auto lowering suspension -** this is unproven technology and there may be possible public resistance.
- **Low height double deckers** - these are lower but still don't provide a safe clearance. These also reduce seating
- **Bespoke double decker design with chamfered corners** – improved clearance but still not sufficient to be safe



Alternative approaches available:

- **modify tunnels** for double deckers
- **change route** so double deckers avoid tunnels
- **use single deck articulated buses**, or
- **increase frequency** of current fleet (ELVs)

Multi Criteria Assessment (MCA)

1 **First stage** – shortlist against key feasibility criteria:

- Safety
- implement in 1-2 years
- maintain access to suburbs
- travel time

<u>Options eliminated through this stage:</u>

- convert Karori tunnel into a viaduct
- construct a new road tunnel
- new pedestrian and cycle tunnel (to replace footpath in tunnel)
- widen Garden Road to Northland
- operate Karori Tunnel as one-way
- close Karori Tunnel to general traffic
- re-route Route 2 via Kelburn
- Low height double deckers

Multi Criteria Assessment (MCA)

2 **Second stage** – detailed multi criteria assessment

10 shortlisted options assessed for:

- capacity provided
- bus travel time
- passenger comfort
- likely community response
- access during construction
- road user safety
- corridor clearance
- regulatory implications
- feasibility
- delivery timeframe
- depot compatibility
- driver numbers
- operational challenges

Multi Criteria Assessment (MCA)

RANK	OPTION DESCRIPTION	TOTAL SCORE
1	Articulated bus	17
2=	Increase frequency of Route 2	9
2=	*Increase frequency of Route 18	9
2=	Additional Route 33 and 34 peak buses	9
5	Re-route Route 2 via Kelburn Viaduct	2
7	Re-route route 2 via Raroa Road / Aro Street	-2
8	Lower Karori Tunnel	-8
9	Part-time one-way tunnel operation	-7
10	Widen Karori Tunnel	-8

First choice by a significant margin is articulated buses – high capacity and can use tunnels

Second choice is to run additional ELVs (status quo), increased congestion/platooning and not suitable to meet a doubling of demand

**Route 18 frequency planned to increase to meet specific demand for cross suburban travel (bypassing the city so does not add to city bus congestion).*

Electric Articulated Buses

Electric articulated buses are an option now due to the incoming LGWM and Transitional Cycleways infrastructure, *e.g. in-line bus stops*

Some features of these buses include;

<u>Maximum capacity 116 passengers:</u>

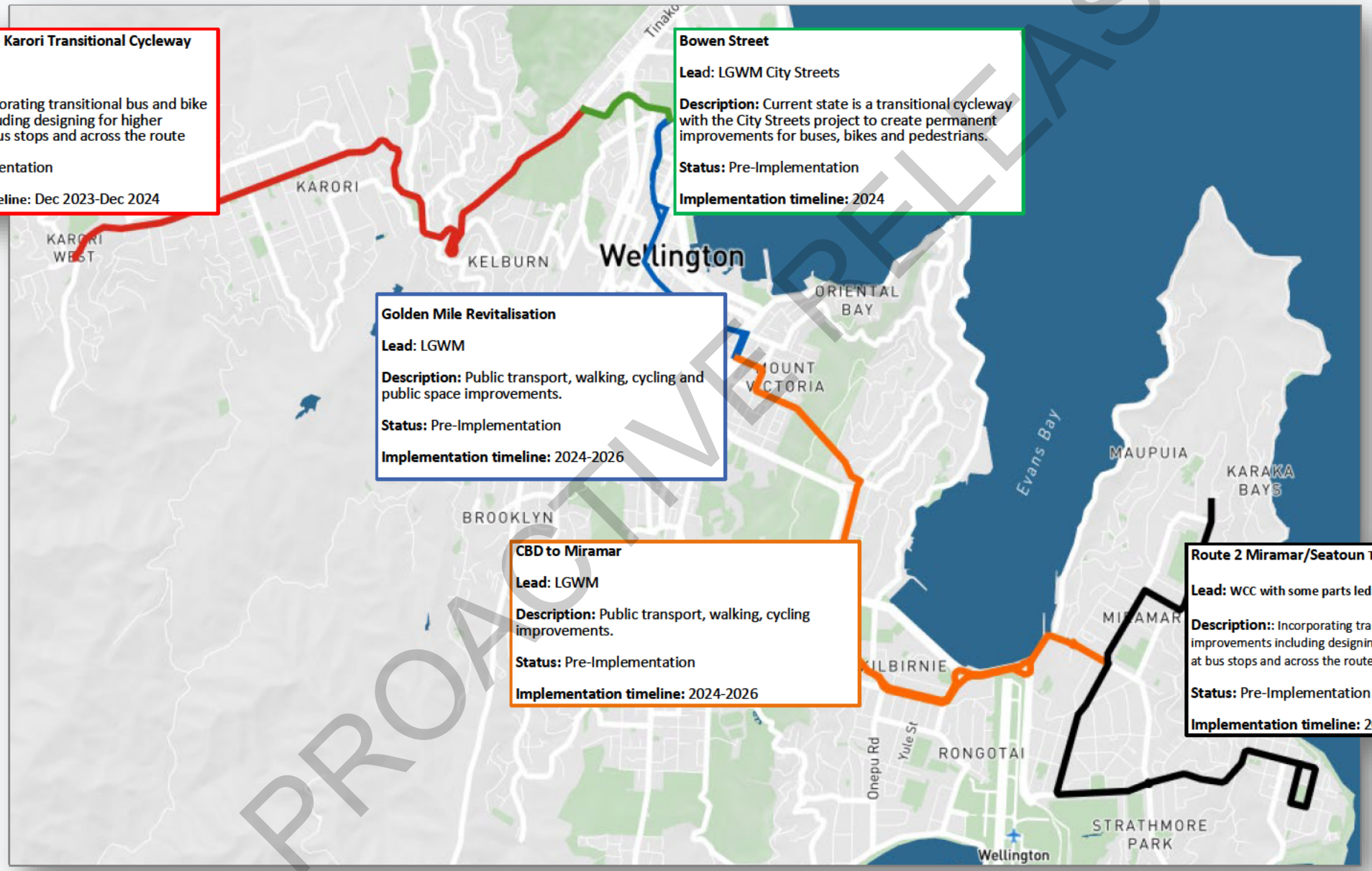
- 70% more than ELVs (68 passengers)
- 16% more than DD (100 passengers)

<u>Size:</u>

- 43% longer than an ELV
  (18m compared to 12.8m)
- 4% larger turning circle
  (24m compared to 23m)

- Fewer drivers required
- Similar running cost per passenger

Infrastructure dependencies



Botanic Gardens to Karori Transitional Cycleway

Lead: WCC

Description: Incorporating transitional bus and bike improvements including designing for higher capacity buses at bus stops and across the route

Status: Pre-implementation

Implementation timeline: Dec 2023-Dec 2024

Bowen Street

Lead: LGWM City Streets

Description: Current state is a transitional cycleway with the City Streets project to create permanent improvements for buses, bikes and pedestrians.

Status: Pre-Implementation

Implementation timeline: 2024

Golden Mile Revitalisation

Lead: LGWM

Description: Public transport, walking, cycling and public space improvements.

Status: Pre-Implementation

Implementation timeline: 2024-2026

CBD to Miramar

Lead: LGWM

Description: Public transport, walking, cycling improvements.

Status: Pre-Implementation

Implementation timeline: 2024-2026

Route 2 Miramar/Seatoun Transitional Cycleways

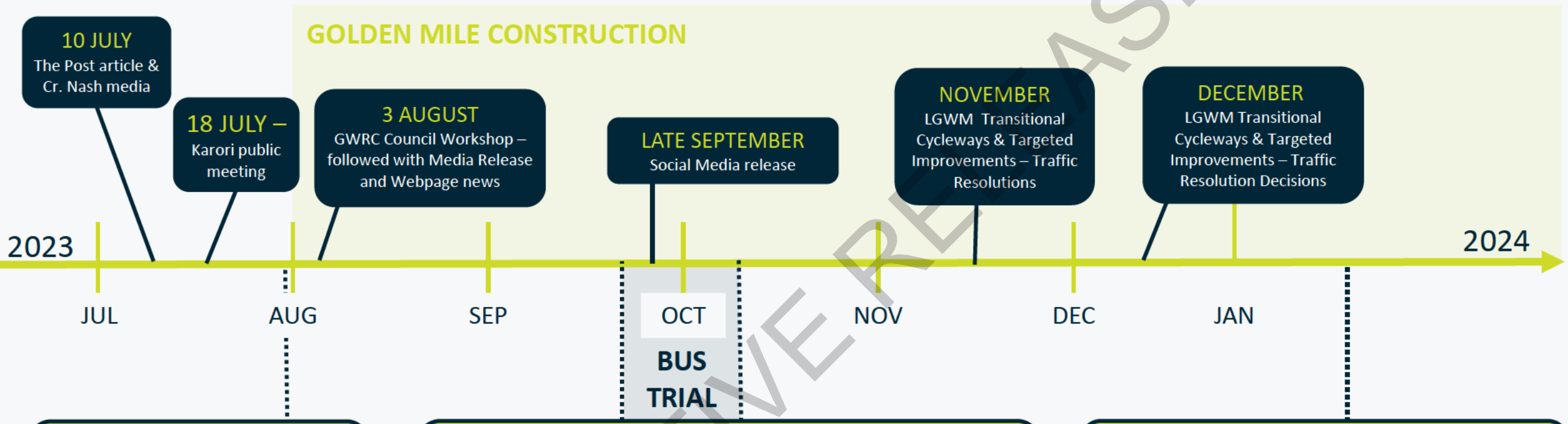
Lead: WCC with some parts led by GWRC

Description:: Incorporating transitional bus and bike improvements including designing for higher capacity buses at bus stops and across the route.

Status: Pre-Implementation

Implementation timeline: 2024

Engagement approach



WEEK COMMENCING 31 JULY
Targeted engagements

- Unions through NZBus
- Disability community
- Cycling community
- Living Street Aotearoa (promoting walking-friendly communities)

Directly reaching out to share information on the project, potential for artic vehicles, asking for their perspectives and if/how they would like to be involved

SEPTEMBER / OCTOBER
Articulated bus trial Comms -

- Web news page
- Key messages
- FAQs
- Contact Centre

Media release after 3 August council workshop (web news page live)
Key messages out, including details about the other potential options that did not pass the Multi Criteria Assessment

Social media post during trial
"You may have seen a long, bendy bus snaking its way around town. You'll remember we talked about this last month as an option to meet the increasing capacity along route 2. Read about it here (link to our media release)"

EARLY 2024
Public comms – "Exciting news to announce"

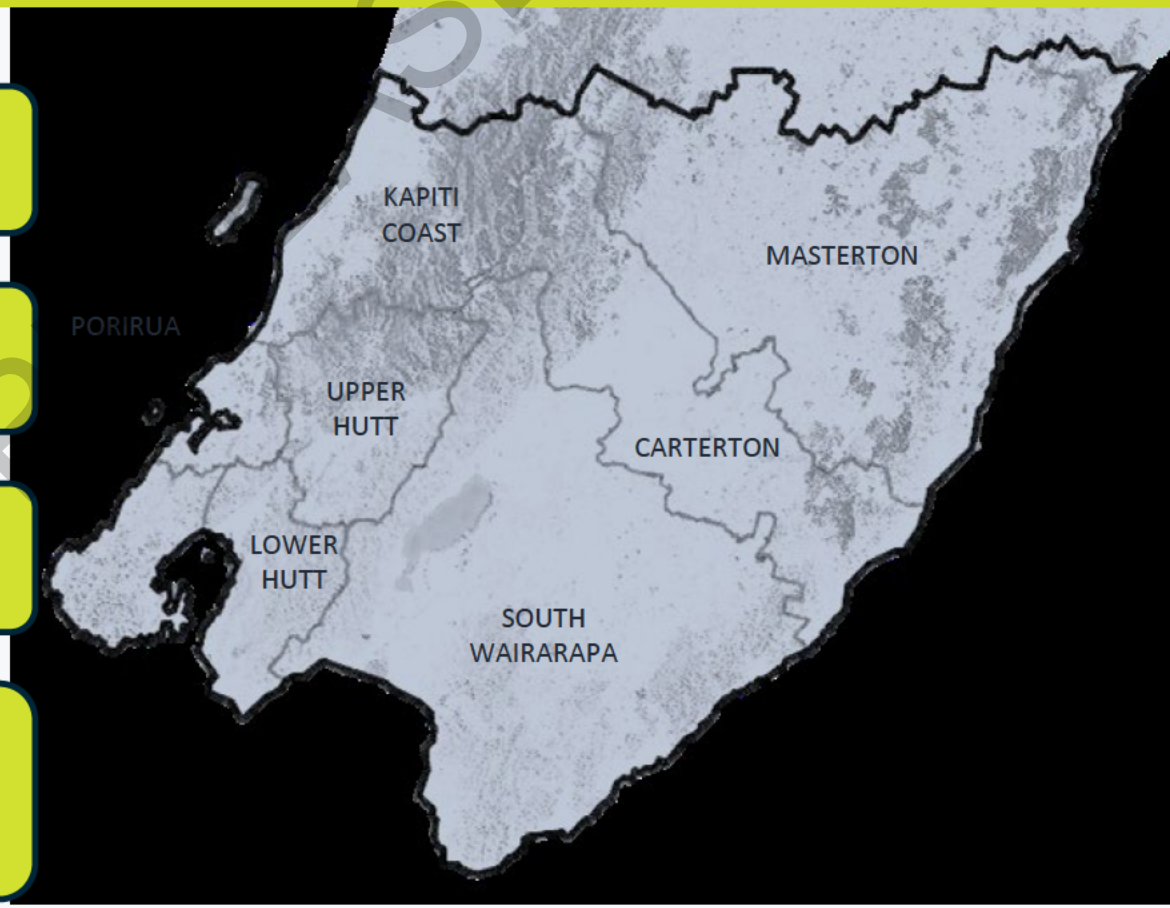
- Web news page (with project doc)
- Key messages
- FAQs
- Contact Centre

Stakeholder engagement / comms

- Public and customer comms
- Project update, timelines and expectations
- Vehicle design

Next Steps

- Engagement/communications
- Articulated bus trial
- Contract negotiations with NZ Bus
- Continually review dependencies, costs, risks and benefits of articulated buses
- Purchase Electric Articulated Buses **mid-2024** (if proceed) – *to be in service January 2026*



Bus capacity on Route 2 – notes from presentation

Slide 2
Provide you with background to Route 2 and increasing demand, tunnels, double deckers, our assessments which arrived at electric articulated buses as the best solution and our next steps.

Slide 3
Route 2 runs between Karori and Seatoun/Miramar
It's our busiest route and in the last financial year just was the first to reach 3 million passenger trips in a year
Buses are already running more frequently than any other route and depart as often as every 4 minutes in the mornings
Demand is increasing and is forecast to double in the next 10 years
Just adding more buses to meet the demand increases congestion and platooning, affecting route 2 and also other routes sharing the Golden Mile and Hataitai tunnel and requires more drivers

Slide 4
We mapped Karori and Seatoun tunnels to see if we could use our usual Double Deckers to meet demand.
The diagram is of Karori tunnel.
Double deckers won't fit safely, leaving 100mm [when we need at least 400mm which itself is less than the best practice of at least 500mm]

Slide 5
We've considered technology to provide more clearance but it's unproven and doesn't provide a safe clearance
Lower double deckers are produced but still don't have enough clearance and lose seating at the back
We have had a proposal which narrows the top of the bus but it's still not a safe clearance
Bottom line is we can't fit double deckers in tunnels so need to consider alternative options.

Slide 6
We contracted an engineering firm to undertake a Multi Criteria Assessment of options
We undertook a significant process and involved a broad range of stakeholders including LGWM, WCC, and GW reps.
A shortlist was developed by testing options for safety, being able to implement the solution within a couple of years and maintaining service levels.
This eliminated 8 of the options, leaving a shortlist of 10 options for detailed assessments.
We have produced a business case that collates the problems, potential solutions, the process, and the preferred options.

Slide 7
The 10 shortlisted options were assessed against 13 different aspects .

Slide 8
Articulated buses were identified as the best option by a significant margin.

Ultimately, articulated buses allow us to carry a lot more passengers per bus while still being bale to use the Karori and Seatoun tunnels.
The next best option is status quo and accepting problems from congestion.

Slide 9
We can consider articulated buses now because of infrastructure changes being introduced along Route 2 by LGWM and Transitional Cycleways.
This includes in line bus stops.
An articulated bus will carry 70% more passengers than the existing ELV buses and is also more than a double decker.
They are more maneuverable than their size suggests
Fewer buses also means fewer drivers being required
Current estimates are that articulated buses would have a similar running cost per passenger since we need fewer buses.

Slide 10
Introducing articulated buses would wait until LGWM and Transitional Cycleways projects have made improvements to bus stops and the road network
We will need to make specific changes ourselves alongside these such as to some intersections
Due to the timing of the other programmes, we are looking to introduce articulated buses from January 2026. That means ordering them mid next year.

Slide 11
Media picked up on articulated buses with a Post article last month.
We have started to brief key audiences.
Following this workshop, we will provide wider communications explaining why articulated buses are our preferred option.
In late September we will have an articulated bus from Auckland run along most of Route 2 to check our calculations on how the buses will work, which may attract further attention.

Slide 12
These are our next steps – we will try and do as many tasks concurrently as possible to manage the timelines efficiently.
Our key decision point will be mid next year when we need to decide whether to buy articulated buses in time for when infrastructure changes are expected to be ready.
We also need to determine whether we will put in interim arrangements to try and manage the capacity including diesel buses

Investigation Approval Document – Introduction of Articulated Buses on Route 2

Purpose

This document summarises work undertaken on meeting future demand for Route 2 of the Metlink bus network, including the results of an externally led Multi Criteria Assessment.

This work has confirmed that traditional solutions to increase capacity are unsuitable for Route 2 and that there is a compelling case to introduce articulated buses.

This document also seeks agreement to next steps. The proposed next steps will advise Metlink's intention to progress our preferred option which is to use articulated buses to resolve the Route 2 capacity problem. Any implementation is subject to further investigations of dependencies, costs, risks, and benefits.

Introduction

Route 2 runs between Karori and Seatoun/Miramar and is the busiest route in the Metlink bus network. Patronage has recovered to pre-pandemic levels and in the 2022/23 financial year Route 2 became the first route to exceed 3 million annual passenger trips. On a typical weekday 9,600 trips are taken along the route, and 12,000 on a busy day.[1]

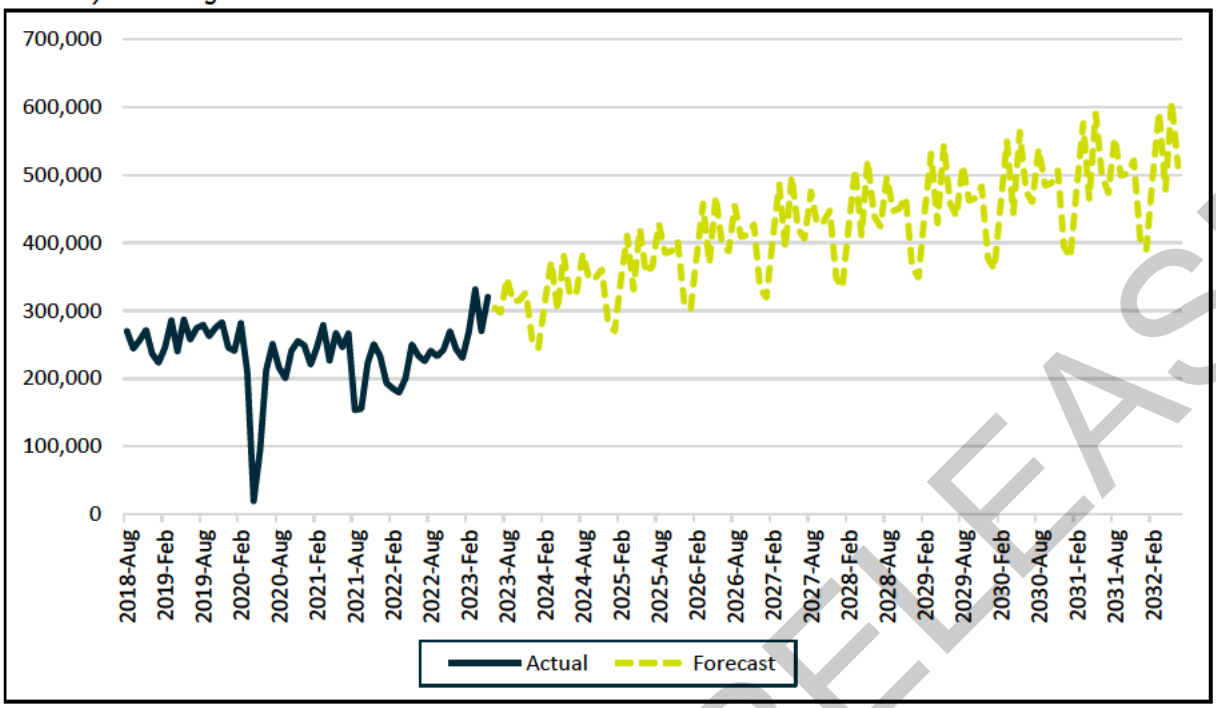
Route 2 is currently serviced by electric large vehicles (ELVs) with a Peak Vehicle Requirement (PVR) of 23 buses.

Problem Statement

Demand on Route 2 is forecast to double by 2033 and to continue increasing beyond this. The diagram below illustrates this increase in demand.

[1] 95th percentile. Source Metlink Network and Customer team.

Monthly boardings on Route 2



This increase in demand is positive given our mode shift objectives but will require a substantial increase in capacity to be provided. Metlink's modelling predicts that by 2031, in Karori alone, there will be times in the morning when 600 people at once will be left waiting at bus stops unable to board buses that are already full.

Traditional solutions

Traditional solutions to increase capacity, using additional ELVs or introducing double deckers have been explored but will not work for Route 2.

Additional ELVs

Simply adding more ELVs to Route 2 is not a suitable long-term solution – Route 2 is already running at a high frequency (7.5 minutes compared to 30 minutes on most other routes) and adding additional buses will cause congestion along the route in the form of bunching/platooning of buses.

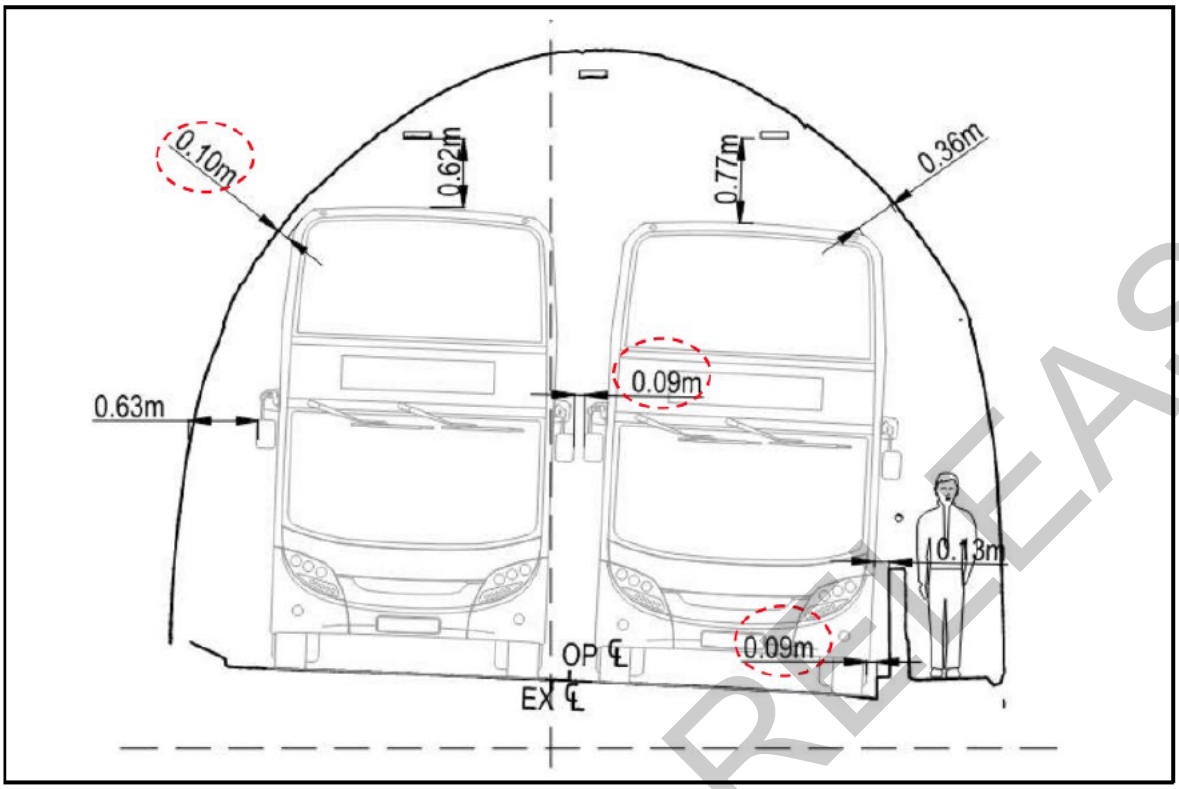
Additional ELVs on Route 2 would also add to the number of buses using the shared Golden Mile, which is reaching capacity, and will also add to congestion and delays at the one-way Hataitai bus tunnel. Causing congestion along the Golden Mile and Hataitai bus tunnel negatively impacts all bus services sharing this part of the route, not just Route 2 services.

Adding additional ELVs would also require recruitment and retention of more drivers to work peak-only split shifts, which has proven difficult for operators and led to the cancellations of services.

Double Deckers

Metlink introduced double decker buses to address capacity challenges on other routes. Detailed mapping of the Karori and Seatoun tunnels on Route 2 was undertaken to assess whether they could accommodate double decker buses. This confirmed that double decker buses cannot be operated safely through either tunnel.

Karori tunnel double decker clearance [2]



A bespoke bus guidance system was also investigated which would have helped buses operate within small tolerances and automatically lower the bus's suspension when approaching the tunnels. However, this would have required bespoke buses and there were concerns with the accuracy of sensors including when they are wet. The small tolerances and reliance on unproven technology would have also led to public concerns of safety.

Route changes to allow double decker buses to bypass the Karori tunnel have also been investigated but suitable alternatives were not found. The geographic layout of Karori means that larger vehicles rely heavily on using the Karori tunnel to provide access to the central city and that other routes are unsuitable and/or add significant delays.

Internal analysis of articulated buses

Investigations by Metlink staff in mid-2021 indicated that articulated buses held significant promise.

Metlink then undertook a high level Multi Criteria Analysis to test articulated buses against other potential solutions for Route 2. This was completed in late-2022 and identified articulated buses as the preferred option.

Detailed Multi Criteria Assessment

Metlink's Senior Leadership Team requested that a more detailed Multi Criteria Assessment be undertaken, including to identify any other alternative options which may not have been previously

[2] Tunnel Clearance Surveys Karori, Seatoun and Mt Victoria Factual Report; BECA (for GWRC), 2021.

considered. A contract for the Multi Criteria Assessment was awarded to the engineering consultancy company WSP in late January 2023.

WSP led workshops with staff from Metlink, Wellington City Council and Let's Get Wellington Moving, and undertook their own additional analysis.

A long list of 13 options were identified. A pass/fail test was applied to remove any options that were not feasible against the following criteria:

- provides sufficient capacity to support growth
- safe for both passengers and other road users
- implementable within the next 1-2 years
- maintains access to Karori, Northland, and Seatoun
- has similar or better travel time compared to driving.

Ten of the 13 options passed this test and proceeded to the detailed assessment. These were:

1. widen the Karori Tunnel (thereby providing clearance for double deckers)
2. lower the Karori Tunnel (thereby providing clearance for double deckers)
3. part-time one-way operation of Karori Tunnel (allowing double deckers in the centre of the tunnel)
4. re-route Route 2 via Raroa Road / Aro Street (therefore avoiding Karori Tunnel)
5. re-route Route 2 via Raroa Road and Kelburn Viaduct (therefore avoiding Karori Tunnel)
6. increase the frequency of peak services (Routes 33 and 34)
7. increase frequency of Route 18
8. increase frequency of Route 2
9. modified double deckers (bespoke design with top corner chamfered to fit tunnels)
10. articulated buses.

These ten options were then assessed against the following criteria:

- capacity provided
- bus travel time
- passenger comfort
- community response
- access during construction
- road user safety
- corridor clearance
- regulatory implications
- feasibility
- delivery timeframe
- depot compatibility
- driver numbers
- operational challenges.

When assessed against these criteria, the articulated bus option had the highest scoring by a significant margin and was ranked at the first choice. This applied when using both unweighted and weighted criteria.

Summary table from Multi Criteria Assessment (preferred option highlighted)

Option No.	Description	Total score	Unweighted ranking	Weighted ranking
1	Widen Karori Tunnel	-8	9=	10
2	Lower Karori Tunnel	-8	9=	8
3	Part-time one-way tunnel operation	-7	8	9
4	Re-route route 2 via Raroa Road / Aro Street	-2	7	7
5	Re-route Route 2 via Kelburn Viaduct	2	5	5
6	Additional peak buses from Karori	9	2=	2=
7	Increase frequency of Route 18	9	2=	2=
8	Increase frequency of Route 2	9	2=	2=
9	Modified double deckers	-1	6	6
10	Articulated bus	17	1	1

The full Multi Criteria Assessment can be accessed here.

Advantages of articulated buses for Route 2

Articulated buses provide a high-capacity bus solution which, unlike double deckers, can use the existing Karori and Seatoun tunnels. Any articulated buses introduced would be electric, in line with Metlink's electrification approach.

Example of electric articulated buses

The capacity of articulated buses is higher again than double deckers and is 89% higher than ELVs.

Capacity and planning capacity by bus type

Bus type	Maximum capacity	Planning capacity	% increase over ELV
ELV	68	61	n/a
Double decker	100	90	48%
Articulated bus	128	115	89%

Articulated buses are more manoeuvrable than might appear, having a turning circle of 24 meters as opposed to 23 for an ELV. Articulated buses also follow similar tracking curves as ELVs.

Despite this, infrastructure requirements are still necessary for articulated buses due to their increased length over ELVs. This particularly affects bus stops and some intersections.

Opportunity for Greater Wellington

Infrastructure changes are being implemented along much of Route 2 through Let's Get Wellington Moving (LGWM), including its City Streets programme, and through Wellington City Council's Transitional Cycleways projects. For example, improved bus stops are being introduced which are longer and in-line with the road.

Example of in-line bus stop

These infrastructure changes will improve existing bus services but can also accommodate articulated buses. This has allowed Metlink to consider introducing articulated buses since the scale of infrastructure work which Metlink would otherwise have to fund, consult on, and implement, is significantly reduced.

Impact assessments

Discussions have been held internally, and with NZ Bus as the Route 2 operator, to understand the impacts of introducing articulated buses. Engagement is yet to occur with the community but forms part of next steps.

Infrastructure changes

Some parts of Route 2 are not included in the areas covered by these other programmes, most notably the Miramar/Seatoun end of Route 2 which is outside the coverage area of both LGWM and Transitional Cycleways.

There are also some additional changes within areas covered by LGWM and Transitional Cycleways. For example, some intersections that would need to be changed are not in their scope. Although these changes are deemed necessary to introduce articulated buses, they are also desirable for ELVs, including some situations where ELVs currently cross the centreline.

To verify the accuracy of infrastructure designs prior to construction and confirm that all necessary changes will be made to allow the safe operation of articulated buses, we propose undertaking a trial using an articulated bus from another city. This trial process will minimise the risk of having construction rework which would cause cost increases and time delays. This trial would be undertaken in September 2023 school holidays, allowing an articulated bus to be available and for an appropriate public communications approach to be in place.

Parts of the route where an articulated bus risks becoming stuck would be avoided but checked in a second trial following necessary infrastructure changes being built.

Low Cost Low Risk (LCLR) funding will be sought for infrastructure changes, including for future financial years. This reflects that there are separate infrastructure projects (including contribution to multiple Transitional Cycleways projects) and that these projects span multiple years.

Summary of infrastructure costs

Cost type	Budget to be met from	Opex/Capex	Cost
Transitional Cycleways Bus Infrastructure design (FY24)	Route 2 Capacity Increase LCLR (103598)	Opex	$178,500
WCC Transitional Cycleways Bus Infrastructure construction (FY24)	Route 2 Capacity Increase LCLR (103598)	Opex	$657,500
Miramar/Seatoun Bus Infrastructure – construction (FY24-25)	Route 2 Capacity Increase LCLR (103598)	Opex	$400,000
Articulated bus trial (FY24)	Route 2 Capacity Increase LCLR (103598)	Opex	$10,000
Articulated bus trial (FY25)	Route 2 Capacity Increase LCLR (103598)	Opex	$10,000
Total			**$1,256,000**

Diversion routes

Existing diversion routes for ELVs might not accommodate articulated buses. We are investigating this further but it is likely that some routes will need to be made articulated bus capable, such as those used as diversion routes for the Golden Mile. Other diversion routes may not be realistically viable to be modified, which will restrict services along those diversion routes to available ELVs. i.e.

ELVs using Route 2 as part of a mixed articulated bus/ELV fleet plus any others available as replacements.

Once further information is available on diversion routes a judgement will need to be made on how many to include in scope versus impacts of not having these.

Summary of diversion route costs

Cost type	Budget to be met from	OPEX/CAPEX	Cost
Diversion route infrastructure design and construction	TBC	Opex	$200,000
Total			**$200,000**

Depots

NZ Bus will not have the necessary capacity to charge articulated buses for Route 2. Their current depots are based in Kilbirnie, Karori and Kaiwharawhara. Kilbirnie will have fully utilised its charging capacity by the time articulated buses are introduced, while Karori and Kaiwharawhara have not been electrified.

NZ Bus estimate the cost of electrification as approximately $3M per depot.

The cost to electrify depots is from increasing route capacity via electric buses - the cost applies regardless of whether it is articulated buses, additional ELVs or other types of electric vehicles that are used to provide that additional capacity on Route 2.

Greater Wellington has secured land in Lyall Bay and is currently investigating the feasibility of building a bus depot on this site, including provision of some bus parking and charging from late 2024. If this development proceeds then the site will be able to accommodate the full fleet of articulated buses.

This mitigates concerns regarding depots (although it creates a corresponding dependency on the Southern Depot solution proceeding as expected and that NZ Bus agree to utilise it).

There may be advantages to Greater Wellington in also electrifying the Karori depot, as this would minimise dead running from the Southern Depot to the beginning of Route 2. The Western (Karori) Feasibility Project is investigating options for the Karori depot which may lead to its electrification.

Depots also provide maintenance facilities. The Southern Depot solution is intending to incorporate articulated bus requirements into its maintenance facilities, although interim facilities may not be able to fully accommodate these so some maintenance may need to be outsourced offsite by NZ Bus initially.

The costs for maintenance will be subject to negotiation with NZ Bus but it is expected that additional maintenance associated with the larger size of the bus and articulation components will be offset on a PVR basis by their higher capacity.

It is difficult to disentangle Route 2 depot requirements from wider, but sometimes related, work on depots. For the purpose of this document, the assumptions used are that:

1. depot facilities will be available for all articulated buses to be housed and charged, either at the Southern Depot or through new/additional capacity elsewhere
2. depot costs, including housing, electrification and maintenance will be the same on a PVR basis as those currently paid to NZ Bus for ELVs.

Based on these assumptions, no depot costs have been allowed for as part of this project.

Training

Drivers will need training on the use of articulated buses upon their introduction. After this, articulated buses should form part of the wider training suite NZ Bus provides to its drivers. The cost, if any, to Greater Wellington for developing and implementing this training will need to be negotiated with NZ Bus. In the interim, this is being treated as a contingency cost of $50,000 in case Greater Wellington needs to meet this cost.

NZ Bus had a concern that drivers would need a Class 5 licence ('truck and trailer') to drive articulated buses, but we have since confirmed with Waka Kotahi that this won't be the case because articulated buses are classed as a single vehicle (allowing them to be driven with a class 4 licence, like double deckers and ELVs).

Summary of training costs

Cost type	Budget to be met from	OPEX/CAPEX	Cost
Miscellaneous driver training	TBC	OPEX	$50,000
Total			**$50,000**

Timetables

NZ Bus expressed concerns that inefficiencies may be created through having a specific bus type that can be used only on Route 2. It is acknowledged that this will need to be considered when timetables are developed. It is difficult to account for this as a cost but is likely to be minimal and would be reflected in the eventual PVR rather than being a specific cost to account for (along with driver hours and kilometres).

Safety

NZ Bus have a requirement that road infrastructure and bus stops will accommodate articulated buses, including that buses will not cross the centre line along Route 2 even if ELVs currently do. They are also seeking assurance that buses paths will not conflict with cycleways.

NZ Bus have also noted that safety will be a concern shared by drivers.

We are working closely with NZ Bus, including sharing information with them on LGWM and City Streets designs and incorporating their concerns into feedback we are providing into those projects. Discussions on route safety have been, and will continue to be, an area of cooperation with NZ Bus. To date there have been a number of discussions with NZBus on the proposed infrastructure design with positive feedback such that the design work has been able to proceed with their support.

We are also liaising with Greater Wellington's Health and Safety team on the introduction of articulated buses.

Work was commissioned to identify whether articulated buses pose additional safety risks for cyclists. This found that, despite public concerns overseas, the evidence was not conclusive of a higher risk. Engagement with the cyclist community forms part of proposed next steps and will allow us to investigate any concerns from cyclists further.

Costs implications related to safety are reflected in the infrastructure requirements and bus design, rather than being a specific cost type, so do not have a specific cost to account for.

Accessibility

Waka Kotahi's Requirements for Urban Buses (RUB) requirements for disability access will be met and we will engage with the disability sector early to check whether articulated buses introduce any accessibility issues.

Costs implications related to accessibility are reflected in the infrastructure requirements and in standards for articulated bus procurement and fitout, so do not have a specific cost to account for.

Māori

The proposal for articulated buses has been assessed against Te Whāriki (Greater Wellington's Māori Outcomes Framework). No particular implications have been identified for Māori (mana whenua and mātāwaka). The scope of this project is within an existing route corridor and will only have moderate impacts regarding the road adjustments.

Metlink is engaging with Greater Wellington's mana whenua partners on public transport network more broadly through the Regional Public Transport Plan. If mana whenua identify broader interests through this plan or any other mechanism, how to best recognise these interests will be explored in partnership with them.

Residents and businesses

Meeting public transport demand will be positive for communities but there are some negative impacts for residents and businesses through the loss of car parks. These are predominantly through LGWM and Transitional Cycleways projects, but the additional infrastructure changes required specifically for articulated buses (which GW will lead) are estimated to remove a further 155 car parks.

Metlink operations

No significant impacts were identified for our internal operations if articulated buses are introduced. Although an additional variable/complexity in the bus fleet, this is considered analogous to the introduction of double deckers and does not pose concerns for our business-as-usual operations or require funding.

Ongoing operator cost implications and the number of articulated buses

To assess the viability of articulated buses more broadly, we have had preliminary discussions on costs with NZ Bus. These indicate that both the purchase and running costs of articulated buses will be similar to ELVs on a per passenger basis. On this basis, we do not envisage operator costs to increase from introducing articulated buses. However, operator costs are subject to a number of variables which are yet to be confirmed and are subject to negotiation with NZ Bus. These include going to market to confirm the cost to purchase buses, final timetabling, and whether NZ Bus will use the Southern Depot and the costs for doing so.

The number of buses is also to be decided, including after taking into account ongoing costs when these are confirmed.

A mixed fleet is possible, providing a combination of ELVs and articulated buses. The optimal number of articulated buses is likely to be between 19 (plus two spares[3]) and 29 (plus three spares). 29 articulated buses would meet the full PVR but some ELVs could still be used in place of articulated

[3] Based on an industry standard ratio of spares being 10% of PVR.

buses during off peak periods. These would not contribute to an increased PVR as these buses would be used on other routes during the peak.

The number of EABs introduced can go further and exceed the immediate increase in capacity required for Route 2, if desired, without wasting resource. Route 2 is the core of Metlink's east-west network, but there are several peak services which provide additional capacity through Hataitai (12e, 30x, 31x, 35 and 36) and Karori (33 and 34). Front-loading additional capacity into Route 2 (by making a larger initial order for articulated buses) could delay the need to increase the frequency on overlapping peak routes in the shorter term.

When the initial tranche of articulated buses arrives, the ELVs currently operating on Route 2 can be transferred to other routes. NZ Bus will not be over-supplied with buses, as the delivery of the articulated buses will coincide with the need to replace 27 end-of-life diesel buses.

The chosen number of articulated buses would be purchased as the initial tranche. These could then be added to in later years using the timetable change process.

Funding of articulated buses

Articulated buses would be funded through existing funding sources which would otherwise be used to purchase ELVs.

If the Bus Growth business case funding apportioned to NZ Bus operated routes is received, this will allow for an estimated initial tranche of 15 articulated buses to be purchased. If Metlink's fleet acquisition plan is fully funded, there would then be sufficient funding to provide all 29 articulated buses if desired.

A decision on the number of articulated buses for the initial tranche can be delayed until funding and costs are both confirmed.

Ownership model

The ownership model for articulated buses will also need to be decided, for example whether articulated buses would be operator owned, a transferring asset or owned by Greater Wellington. This will be identified following decisions on the asset control decision-making framework which is due to be presented to Council in mid-August 2023.

Risk Assessment

The following key risks have been identified to successfully increasing capacity on Route 2 via the introduction of articulated buses.

Risk assessment

#	Risk Description		Rating	Controls
1	Dependency - LGWM infrastructure	Very high		David Boyd managing relationship, Luke Benner liaising closely with infrastructure counterparts, governance includes LGWM owner Interface Manager.
2	Dependency – Transitional Cycleways	Very High		David Boyd managing relationship, Luke Benner liaising closely with infrastructure counterparts.
3	Dependency – drivers/unions willingness to drive articulated buses	Very high		Project Manager and project team liaison with NZ Bus who lead the relationship with drivers.
4	Dependency - NZ Bus agreement	Medium		Fortnightly meetings in place between project team and NZ Bus, NZ Bus have acknowledged the need to introduce articulated buses.
5	Public opposition/perceptions, including cyclist safety and loss of some car parks.	Medium		A study was commissioned and did not identify elevated risks for cyclists. Consultation to interface with Let's Get Wellington Moving and Transitional Cycleways programmes.
6	Dependency - Southern Depot or other appropriate housing and charging capacity is available in time for commissioning and training, including charging	Medium		Close liaison occurring between projects. Interim approach to be used, if necessary, ahead of wider construction.
7	GW unable to get Seatoun/Miramar changes built in time.	Medium		Planning underway. Contingencies may be possible to run articulated buses on the Karori side of the route only in the short term.
8	Low Costs Low Risk funded infrastructure is subject to Waka Kotahi approval.	Medium		Early engagement with Waka Kotahi via Finance.

Timeline

The timeline for implementation of articulated buses is driven by infrastructure dependencies. The necessary LGWM and City Streets led infrastructure changes are expected to be completed in December 2025. Greater Wellington led changes for the Seatoun/Miramar end of the route will also be timed for completion by December 2025. This determines the planned implementation date of articulated buses entering service as being January 2026.

NZ Bus have advised that they need a minimum window of 14 months to procure articulated buses before they can enter service. It is preferable to allow at least 18 months to provide some contingency, especially as this window needs to include procurement, build, delivery, commissioning/fit out, compliance checks and associated corrective action, driver training, etc.

This provides a deadline of June 2024 to proceed with placing an order for the purchase of articulated buses. This is a key decision point – if buses are procured but dependencies on infrastructure and depots do not eventuate, articulated buses will become a stranded asset which cannot be used on the Metlink network, and which will leave demand on Route 2 unmet.

Until this deadline, there is an opportunity to undertake engagement/consultation on articulated buses to check for any unforeseen negative impacts, and to firm up costs and dependencies (both their certainties and timeframes) before making any decision to proceed with the purchase of articulated buses. This includes undertaking commercial negotiations with NZ Bus.

In the interim, the additional changes within areas covered by LGWM and Transitional Cycleways, will need to commence in November 2023 and will incur some costs for Greater Wellington. This will

primarily be engineering design costs in relation to Botanic Gardens to Karori Cycleway to accommodate larger buses. If articulated buses were not to proceed, these changes will still benefit the operation of ELVs so will still deliver benefits to the bus network.

Costs

The costs noted from the Impacts Assessments section of this document are summarised below, along with project costs. All costs will be refined through the next steps outlined below.

Summary of all implementation costs

Cost type	Budget to be met from	OPEX/CAPEX	Cost
Infrastructure costs	Route 2 Capacity Increase LCLR (103598)	Opex	$1,256,000
Diversion route infrastructure costs	TBC	Opex	$200,000
Training costs	TBC	Opex	$50,000
Project costs	TBC	Opex	$744,739
Total			**$2,250,739**

A detailed costings spreadsheet, including phasing, is held here. Note that no contingency has been allowed for additional costs at this point but costs will become clearer prior to deciding to proceed with the purchase of articulated buses.

Cost comparison with other options

If capacity were to be increased on Route 2 using ELVs instead of articulated buses, many of these costs will not be necessary. There would be a small proportion of sunk costs which were incurred to date, but infrastructure might not proceed further and ELVs would be delivered under BAU so will not require project costs.

However, the resulting congestion problems, including along Route 2 and along the Golden Mile, may represent a hidden cost in the form of other infrastructure changes being initiated, or brought forward, in an attempt to deal with the resulting problems. That may include some of the infrastructure changes intended for articulated buses.

Next steps

The proposed next steps are:

1. Engage with disability sector regarding infrastructure, through Transitional Cycleways (but not specifically discussing articulated buses at this time).
2. Engage with Councillors through a Transport Committee workshop on 3 August 2023.
3. Formally advise LGWM and City Streets of our intention to implement articulated buses, so that the dependency on their work and its timeframes are clear.
4. Identify the ownership model.
5. If applicable, formally request NZ Bus to go to market to determine purchase costs for articulated buses.
6. Commence contract negotiations with NZ Bus, subject to the final decisions whether to proceed with their purchase.
7. Engage with targeted stakeholders such as disability community, cycling community and Living Streets Aotearoa (prior to the wider community).
8. Develop a communications plan, including identifying engagement with drivers and unions, and the general public.
9. Undertake an articulated bus trial along most of Route 2 in September 2023.
10. Continually update dependencies, costs, risks and benefits to inform decisions on whether to proceed with purchasing articulated buses.
11. Identify any interim arrangements required to meet demand on Route 2.

Recommendations

It is recommended that you:

note that demand on Route 2 is reaching capacity and is expected to double by 2033

note that traditional solutions of more frequent services or double deckers are not suitable to meet this demand

note that articulated buses have been identified as the preferred solution to meet demand, both internally and through a detailed Multi Criteria Assessment

agree to proceed with the steps outlined in this document to implement Articulated Buses on Route 2.

Gareth Edwards
Project Manager Route 2 Capacity Project
10 July 2023

Addendum to Investigation Approval Document – Introduction of Articulated Buses on Route 2

Review of modified double decker option

On 11 July 2023 the Manager Assets and Infrastructure received an unsolicited email from bus manufacturer Alexander Dennis Ltd (ADL) noting that "… there have been claims that double-decker buses are unable to operate in these areas which isn't correct as we have designed a fully compliant double decker EV that can operator on these routes."

At the request of the Manager Assets and Infrastructure this email and attachments showing the proposed design were reviewed. The outcome, as described by the Principal Advisor Bus Fleet, was as follows:

> Having reviewed the ADL presentation against the options considered during the MCA, we consider that the ADL modified DD proposal would not change the preferred option recommended by the MCA. The following are the key reasons.
>
> - This specific modified DD option was not available at the time of the MCA work. But modified DD concepts (1. top corners shaved off, which was an early ADL proposal, and, 2. lowered the roof height) were still evaluated through the MCA.
> - The larger of the two modified DD concepts considered had a passenger capacity of 87, which is 7 less than the 95 stated by ADL. This point does not change the outcome as the EAB offers 116 passenger capacity.
> - During the MCA the team debated the clearance required between a DD bus and the tunnel walls settling on a figure of 400mm. It should be noted that this is less than is considered optimum by the roading engineers, but accepted on the basis we have been successfully operating with this clearance at the Hataitai bus tunnel. The modified DD, while has made a significant improvement to the width across the top of the bus, it is well short of achieving the targeted safety clearance of 400mm. Additionally the fact that the entrance to the Karori tunnel is a bend, and not straight as it is for the bus tunnel, was of concern when settling on the minimum clearance measurement.
> - The dwell time of the EAB is anticipated to be much better than any DD option.
> - The larger the bus we can accommodate, the greater the impact on reducing the stress on driver recruitment, lower congestion and pushes out the point when a further capacity step change will be required for route 2.
> - Another point is that DD buses do have issues around passengers moving up and down the stairs. Single deck buses are less challenging to passengers in terms of moving around inside the bus.
> - It should be noted that for this particular bus option to achieve the 95 passenger load, the standee area is limited to behind the rear door only. This may be difficult to manage in practice.

Updated capacity figures

During development of a PowerPoint presentation for Council workshop 3 August 2023, the capacity figures included were queried by Alex Campbell and were subsequently discussed between Alex, Paul Blane and myself.

Differences in maximum capacity can occur because of different ways the maximum can be specified for a bus, for example taking into account weight limits or practical limitations on space which may be lower than the manufacturer's stated capacity. This has led to maximum capacity figures being revised from those used in the Investigation Approval Document.

Planning capacity was consistently applied as 90% of the maximum capacity, i.e. has also varied but only when reflecting a change in maximum capacity. The table below shows the figures used in the paper as opposed to those being used now including for the workshop presentation. For completeness, the figures used in the Multi Criteria Assessment (as provided by Metlink to WSP) are also included in the table below.

Bus type	MCA		Governance paper		Now	
	Max Cap	Plan cap	Max Cap	Plan cap	Max cap	Plan cap
ELV	68	61	68	61	68	61
DD	110	99	100	90	100	90
EAB	116	104	128	115	116	104

These revisions from the Investigation Approval Document do not have a material effect on the chosen option of articulated buses – the preferred option is underpinned by the Multi Criteria Assessment. This was more favorable towards double deckers for capacity than it should have been based on the revised figures, but still identified articulated buses as preferred option despite this.

Gareth Edwards
Project Manager
Route 2 Capacity Project
21 July 2023