Knights Road trial layout: Report on engagement feedback and data

April 2021



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Introduction

This report analyses the feedback and data collected during March 2021 while a trial layout was in place on Knights Road. This analysis has informed recommendations for an amended trial layout that will be in place during May 2021.

Background

In March 2021 we trialled a new road layout outside Waterloo Station and along Knights Road between Waterloo Station and Willoughby Street. Knights Road was selected for the site of this trial because it is a key connecting route between Waterloo Station, the new Beltway cycle route and the central city.

This trial is part of a national programme supported by Waka Kotahi NZ Transport Agency. It helps councils and communities work together to rapidly design and test temporary changes that enable more people to choose active and public transport. The Knights Road trial is funded 90% by Waka Kotahi and 10% by Hutt City.

Purpose of the trial

The purpose of the trial was to make the journey a safer, well-used and more attractive connection regardless of how you choose to get around.

Throughout the trial we worked with the community to find a safer layout for all modes of transport. Children on bikes, people on e-scooters and people walking on the footpath should feel safe using this key connecting route, while keeping the road functioning well for other users.

We may only use temporary materials for the trial and we need to comply with the safety regulations for a 50 kilometres per hour speed environment.

What outcomes did we want to achieve?

We wanted to achieve two outcomes from the trial:

The road layout is safer for all users

We wanted to see safer speeds on the footpath and on the road, more separation for people using different modes of transport and as a result improved perceptions of the safety of their journeys for all users of Knights Road.

The road layout functions efficiently

We wanted to see the road continuing to work well for travel, local residents and services such as public transport, rubbish collection and street sweeping.

A road layout that achieves these outcomes could then be applied on key routes to connect the network of cycleways and shared pathways in Lower Hutt to each other and to the places people need to go.

Results of first trial

A trial layout was in place on Knights Road, from Willoughby Street to Waterloo Station, from Friday 26 February until Monday 29 March 2021. The layout included:

- two temporary lanes for bikes and e-scooters marked with paint and delineators
- speed cushions and signage to encourage slower speeds around the Waterloo intersection
- reduced parking on the south side of Knights Road to make way for temporary lanes
- median strip retained to allow for turning vehicles into streets and driveways.

During the trial, we gathered data and feedback to measure how the trial layout performed against the outcomes we wanted to achieve.

Waterloo Station intersection

During community consultation in 2020, the community perceived the intersections in front of Waterloo Station to be the most dangerous part of Knights Road. People were concerned about congestion, vehicle speeds and conflicts with pedestrians. As a result, the trial was extended to include changes to this area. For the trial layout we installed speed cushions to reduce approach speeds, we highlighted pedestrian crossings through red colouring, and we installed green flexiposts to improve left turning movements. A pop-up park was installed at Birch Street to provide a 'home' for the project as well as seating, art and native plants.

Key results of community feedback and data analysis

Overall during the trial period:

- vehicle traffic volumes were unchanged
- journey times were improved, for most journeys
- 'near-misses' at this intersection decreased
- Speeds at this intersection were lower
- turning movements were easier

Overall data and feedback collected show the changes at Waterloo Station created a layout that is safer for all modes of transport and does not negatively impact the function of the road. The changes improved the function of the road for turning movements, most journeys and for bus services. The colour of the flexiposts created some confusion for some cyclists.The majority of people perceived that pedestrian safety improved as a result of the trial at Waterloo station. Sixty percent of survey respondents supported the pop-up park staying in place beyond June 2021.

Recommendation: that these changes remain in place for the second phase of the Knights Road trial, with minor changes to the colour of the flexiposts.

Knights Road

During community consultation in 2020, the community voiced concerns about speeding; high volumes of traffic; and perceptions that people on foot and bikes, scooters and e-scooters were unsafe travelling on Knights Road.

We trialled a separated pathway for bikes and e-scooters on both sides of Knights Road. We used delineators to create a visual 'barrier' between the road and the separated pathway. We trialled different types of delineators on the north and south sides of the road. Parking on the south side was removed for most of the trial length between Waterloo Station and Willoughby Street. This layout came from community engagement in 2020.

Key results of community feedback and data analysis

Overall during the trial period:

- vehicle traffic volumes were unchanged
- more people cycled
- extreme speeding decreased, and average speeds remained unchanged
- journey times improved, for most journeys
- most people did not perceive that pedestrian and vehicle safety improved as a result of the trial
- more people on bikes and e-scooters used the separated pathway rather than the pavement or the road.

We also found that the functioning of Knights Road was compromised for residents' parking, street sweeping and, on the north side, for rubbish collection - but not for public transport and emergency services.

The main themes of feedback from the community were:

- support for a separated lane to provide a safe space for people on faster wheels such as bikes and e-scooters, away from the footpath and more separated from the traffic
- the level of parking loss was unacceptable
- support for a safe connection between the Beltway, Waterloo Station and the central city bikes, e-scooters, mobility scooters and other micromobility modes of transport

Recommendation: that trial layout be amended to return parking to both sides of the road, provide better separation between bikes, scooters and traffic; and options for a better connection to the Beltway are investigated.

Measures and outcomes in detail

Table 1 below shows the measures and outcomes we wanted to achieve from the first trial, and what the results were. Green = achieved. Amber = achieved in part, some issues or no consensus. Red = not achieved.

Table 1: Trial measures and outcomes

Waterloo Station	**Key Outcome: Road layout is safer for all modes of transport**
Safer speeds	Reduction in conflict speed, median speed and approach speed
	Reduction in extreme approach speeds
Separation of modes of transport	More space between interactions resulting in fewer near miss incidents. Those that did occur happened at lower speed
	Reduction in near miss incidents for pedestrians by interaction (60.4%) & volume (75.3%)
	All modes showed a reduction in critical conflict rate by interaction volume
Perception of safety for all modes is improved	Improved perception of safety for pedestrians and for buses No consensus on perception of improved safety for bikes, scooters and private vehicles
	Perception from majority of survey respondents is that vehicles are moving more slowly

Waterloo Station	**Key Outcome: Road layout is still functional**
Efficient journeys	No change or positive change to eastbound journeys Reduction in journey time to westbound journey (Pohutukawa/Cudby to CBD) Improvements to ease of right turning movements at Birch St, Pohutukawa St and Knights Road Reduced queuing overall No delays to bus service timetable Minor increase in journey time from Oxford Terrace roundabout to Willoughby St, greater increase from 8.30am-9am
Functional for service providers	Easier for buses to pull into stops at Waterloo Station without blocking traffic No impacts on bus schedule or complaints from drivers No problems raised by emergency services
Perception of function	50% of respondents felt that turning movements are more difficult for vehicle drivers, no consensus on difficulty for bikes and scooters

Layout on Knights Road	**Key Outcome: Road layout is safer for all modes of transport**
Safer speeds	No change to median or V85 speeds in either direction
	No significant changes to journey times
	Reduction in extreme speeds throughout the monitoring period
Separation of modes of transport	Improved separation, but the outcome of moving 'fast wheels' (bikes and e-scooters etc) off the footpath and away from the carriageway was not fully achieved
	Theme of support for mode separation: fast wheels off footpath, segregation from vehicles. The following percentages of respondents referenced separation as important for safety • 21% of residents survey respondents • 25% public survey respondents • 24% school survey respondents While the trial layout provided enough separation for some users, it was not enough separation for the least confident users:
Perception of safety for all modes is improved	Mixed feedback from surveys and comments, but not achieved. Delineators improved the perception of safety in the bike/e-scooter lane but not enough for the least confident users to move off the footpath.

Layout on Knights Road	**Key Outcome: Road layout is still functional**
Efficient journeys	Volume of traffic and average speed were unchanged from baseline Increase in number of bikes recorded on the road compared to baseline Time for eastbound journeys was unchanged or slightly reduced Reduction in journey time by 10-15 seconds throughout the day to westbound journey (Pohutukawa/Cudby to central city); increase in time by 20 seconds) for westbound journey (Oxford Terrace roundabout to central city) so that eastbound & westbound journeys both take 60-70 seconds; increased by 30-40 seconds 8.30am-9am. Theme of desire for connection of layout to Beltway and to CBD Reduced queuing overall No delays to bus service timetable
Functional for service providers	No impacts on bus schedule or complaints from drivers No impacts for emergency services Rubbish collection on the north side initially compromised, but trial amended to compensate. Rubbish collection on south side easier Street sweeping on the south side was compromised
Functional for residents	Residents found trial negatively impacted accessing their properties and services to their properties (rubbish collection, sweeping)

Detailed findings

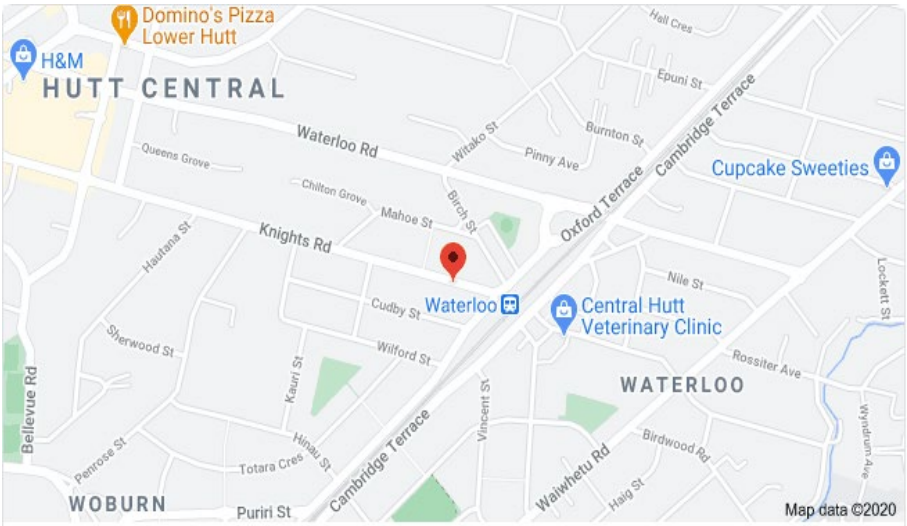
Part 1: Motor vehicle traffic data

Pneumatic tube vehicle counts

This mechanical method of traffic counting records actual vehicle numbers, speeds, type of vehicle and direction - in 15-minute intervals.

This method is typically deployed for one week, and after that the counts are downloaded for analysis. Baseline data was collected from 11-20 October 2020 and trial data was collected from 29 March to 1 April 2021. Both periods were during the school term and daylight saving times.

Counter location: The red bubble on the map below shows where the counter was located.



Map for -41.213485, +174.919292

Conclusions and summary of findings

Safer speeds - we saw a reduction in extreme speeds without a change in mean or V85 speeds, indicating unchanged journey times. V85 speed is the speed that 85% of drivers will drive at or below under free-flowing conditions.

Efficient street functioning – the unchanged journey times support the Mooven data (see page 20), and verbal reports from Tranzurban from live monitoring of their bus services, that the trial layout has not increased journey times down Knights Road. This means for vehicles there are still efficient journeys despite the changed layout.

Main findings:

- **More of the vehicles travelling west towards the central city are speeding** than vehicles travelling east towards Waterloo Station. (20% of westbound traffic >50km/hr compared with 10.5% of eastbound traffic >50km/hr)

- Traffic not exceeding the speed limit also shows **higher speeds (mean and V85) travelling west** toward the CBD than travelling east toward the station. This pattern was unchanged from the October baseline and during the March 2021 trial layout period.

    - This is probably because of the counter location, as eastbound traffic is likely to be slowing for the corner. This indicates that vehicle speeds in both directions are likely to be higher on the straighter section of road close to Willoughby and Mahoe Streets.

- There is a **higher volume of eastbound traffic towards Waterloo Station than westbound traffic** towards the central city during the week and during the weekend during baseline and trial periods. This is the opposite pattern to what is seen in the cycle data.

- **Overall volume** of traffic appears **almost unchanged** in March compared with October. Both periods show **reduced traffic compared with the historic data** - annual average daily traffic (AADT) of approximately 7,500 rather than 12,000.

- **No change to the average speed or to the v85 speed** in either direction during the trial period compared to baseline. This supports the Mooven and Beca finding (see page 20) of no change to journey time for vehicle traffic on Knights Road.

- There is a **reduction in the extreme speed events** during the trial period, compared with baseline. This change is more marked for eastbound traffic than for westbound.

Figures 1 to 6 and Table 2 on the following pages show the data that support this summary of conclusions and summary findings.

Figure 1: Eastbound vehicle speeds on Knights Road by hour during baseline (Oct) compared to trial period (March)

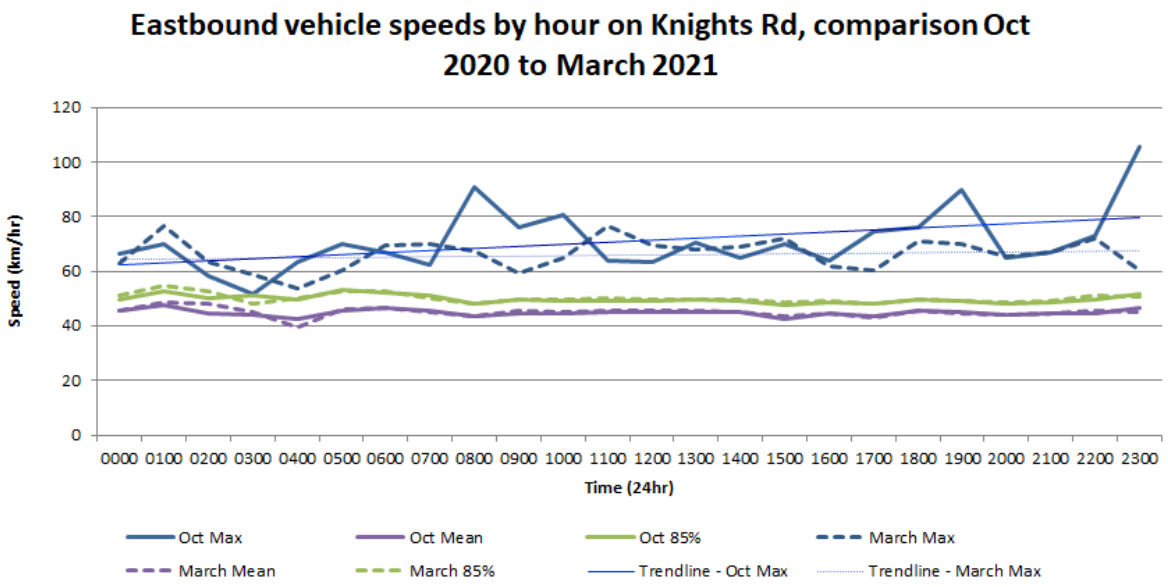


Figure 2: Westbound vehicle speeds on Knights Road by hour during baseline (Oct) compared to trial period (March)

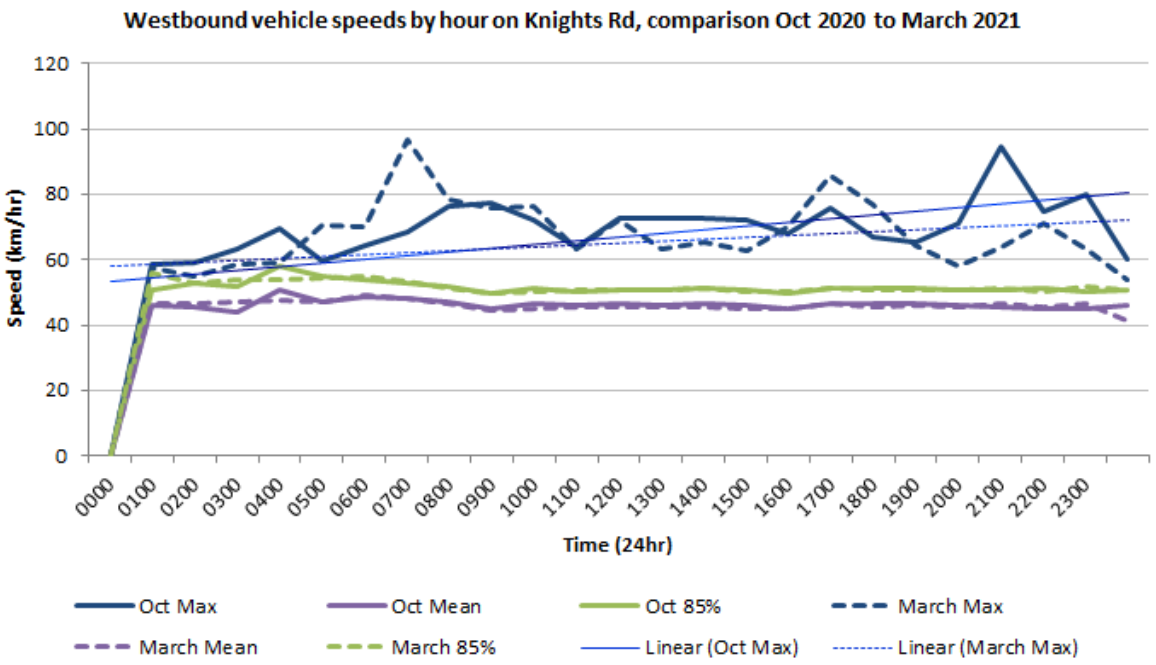


Figure 3: Volume of eastbound traffic on Knights Rd, by day, baseline compared to trial

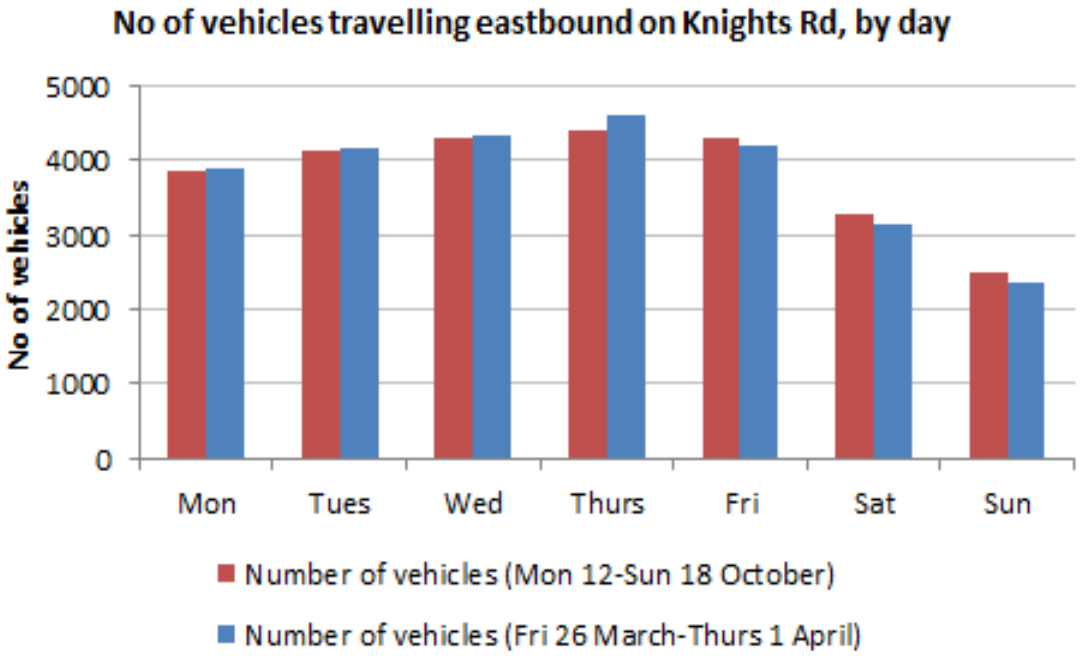


Figure 4: Volume of westbound traffic on Knights Rd, by day, baseline compared to trial

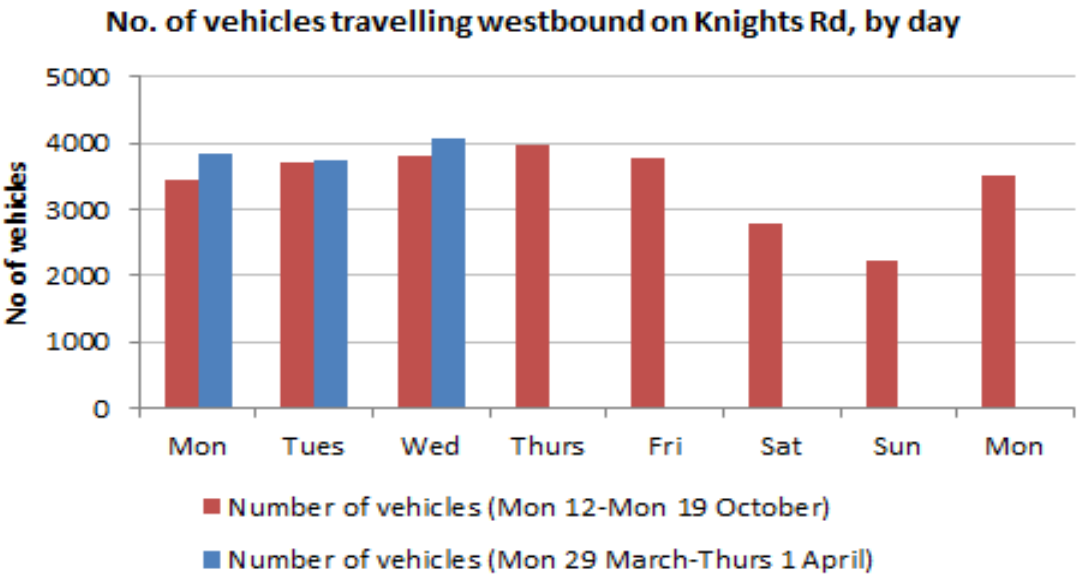


Figure 5: Percentage of eastbound traffic on Knights Rd >50km/hr, by day, baseline compared to trial

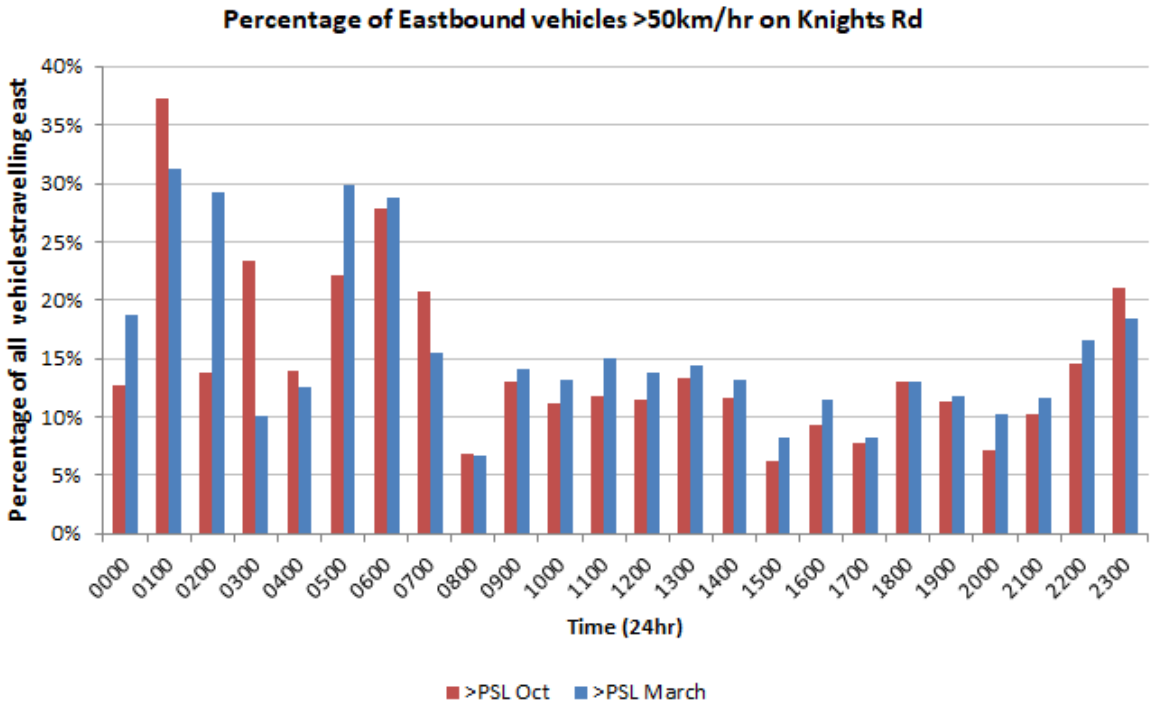


Figure 6: Percentage of westbound traffic on Knights Rd >50km/hr, by day, baseline compared to trial

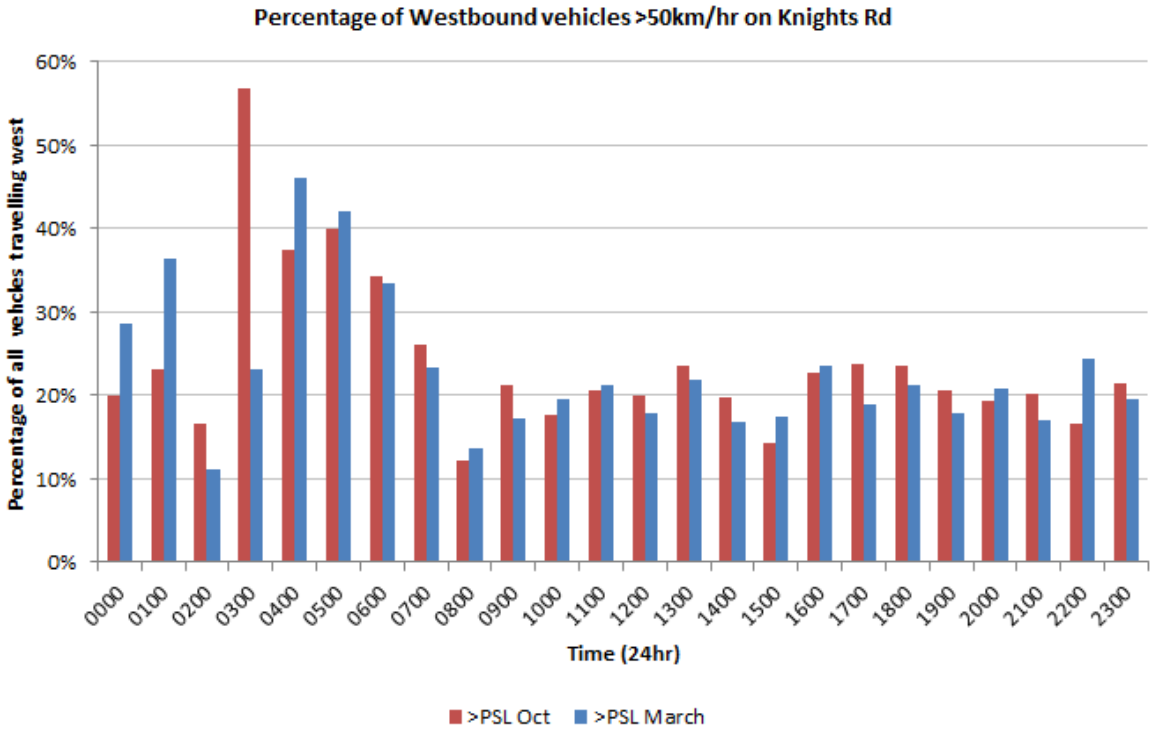


Table 2: Comparison of tube count data at baseline compared with during the trial layout

	Oct 11-20, 2020		**March 26-April 1, 2021**	
	Eastbound	Westbound	Eastbound	Westbound
Average speed	44.5km/hr	46.2km/hr	44.7km/hr	45.6km/hr
v85 speed	49.1km/hr	50.9km/hr	49.3km/hr	50.9km/hr
Maximum speed	105.8km/hr	94.7km/hr	76.9km/hr	96.7km/hr
Annual Average Daily Traffic (AADT)	3839 (SD=651)	3392 (SD=599)	3822 (SD=790)	3876 (SD=1924)
Average Weekly Daily Traffic (AWDT)	4153 (SD=241)	3691 (SD=599)	4249 (SD=258)	3876 (SD=1727)
Average Week End Daily Traffic (AWET)	2896 (SD=554)	2494 (SD=405)	2754 (SD=536)	No data

BECA BlipTrack Information

As part of the Knights Road trial, Beca engineers installed temporary on-road Bluetooth detection devices (BlipTrack) to understand the vehicle traffic along the road. This focused on the intersection of Knights Road, Oxford Terrace and Pohutukawa Street near Waterloo train station.

The trial sampled vehicles over two periods. The first period was from 12 to 16 October 2020 and this formed the baseline data. The second period was during the first trial and captured 31 March and 1 April 2021. It was delayed from the planned repeat measures (from 8 March) by the increased Covid Alert levels during this time, which impacted Beca's work programme.

Two routes were surveyed over the two periods, and the diagram is shown below.



Journey times on route 1

Figures 7 and 8 below show eastbound travel from Willoughby Street to the Oxford Terrace roundabout shows little change in travel time, consistently 60-70 seconds. Baseline time for westbound travel is approximately 20 seconds quicker than eastbound, at 40-50 seconds.

With the trial layout in place, it increased by 20 seconds so that the journey time during off-peak periods is similar in both directions, 60-70 seconds. Between 8.30 and 9am at peak traffic volumes, travel westbound towards the central city takes 30 to 40 seconds longer than at off-peak times.

Figure 7: Journey time on route 1 (Knights Road eastbound)

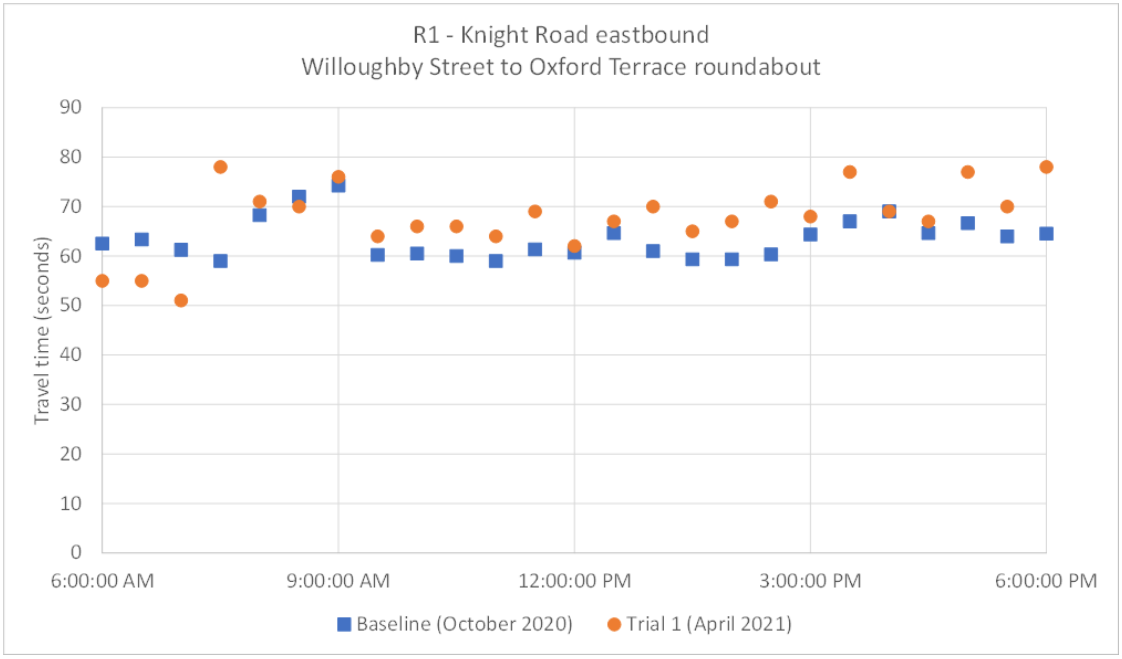
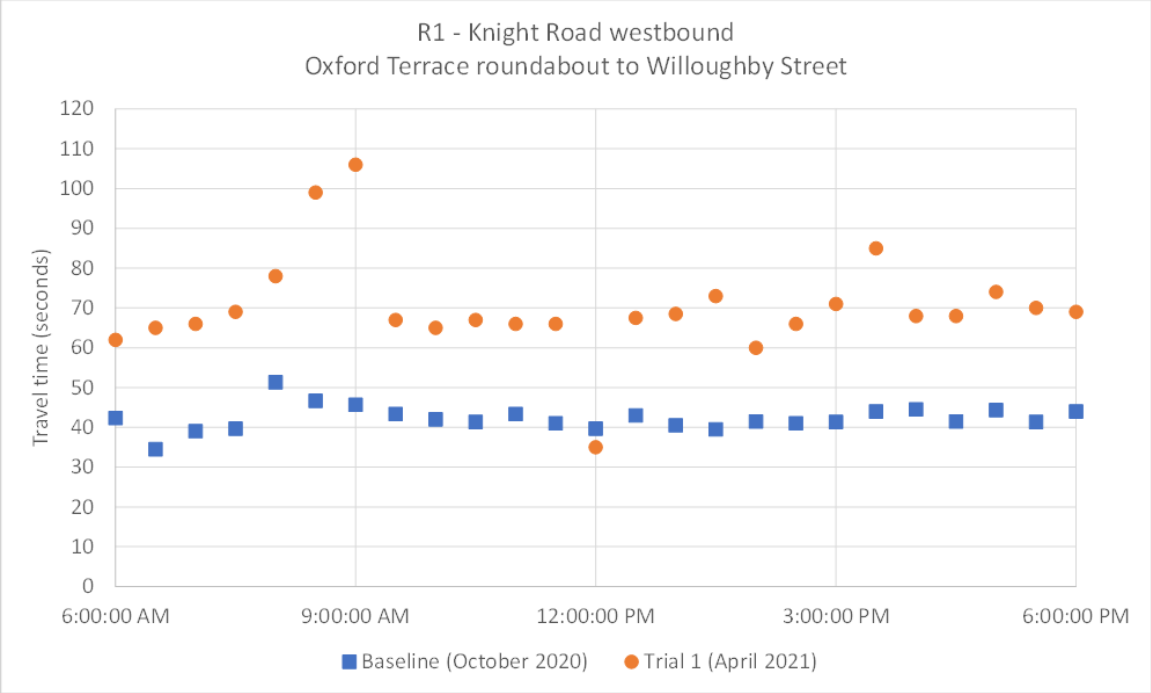


Figure 8: Journey time on route 1 (Knights Road westbound)



Journey times on route 2

Figures 9 and 10 below show during baseline (October) eastbound travel from Willoughby Street to the Pohutukawa Street/Cudby Street intersection took about 60 seconds at off-peak times, increasing to 90-100 seconds during the 8.30am-9am morning peak and 80 seconds at 3.30pm.

With the trial layout in place, this reduced to 45-50 seconds throughout the day, an decrease of 10-15 seconds for most of the day and a decrease of 55 seconds during the morning peak.

This data supports the drone footage information, which shows that the more consistent speeds at the Waterloo Station intersection have made right turning movements easier at Birch Street and Pohutukawa Street.

Westbound travel from the Cudby Street/Pohutukawa Street intersection to Willoughby Street changed very little between baseline and the trial layout.

Figure 9: Journey time on route 2 (Knights Road eastbound)

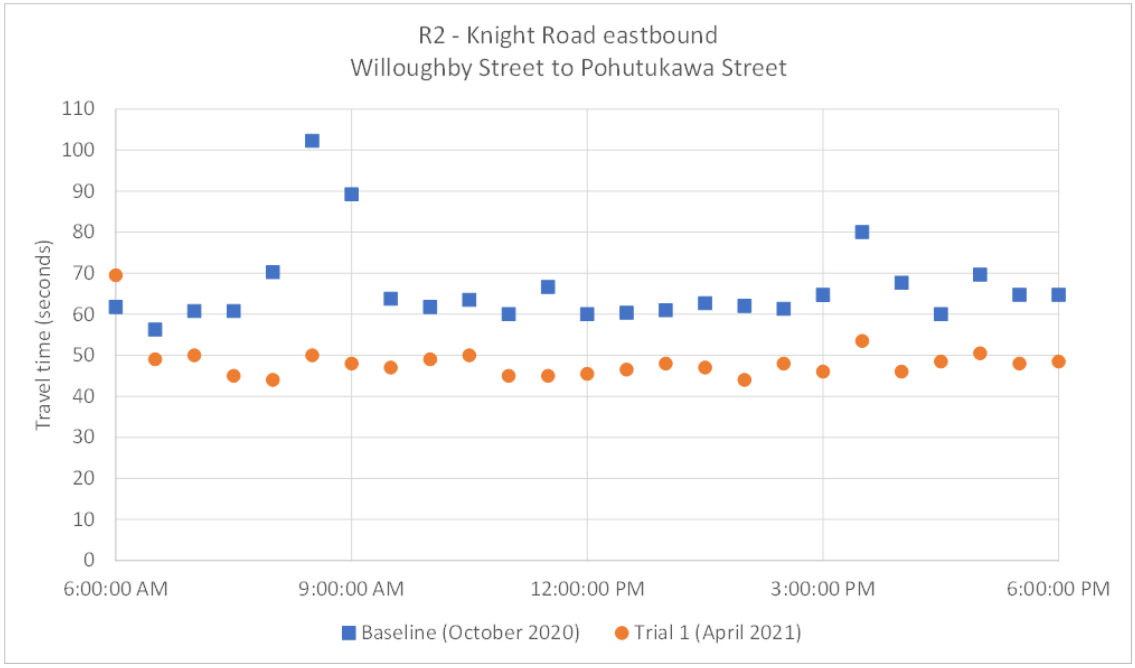
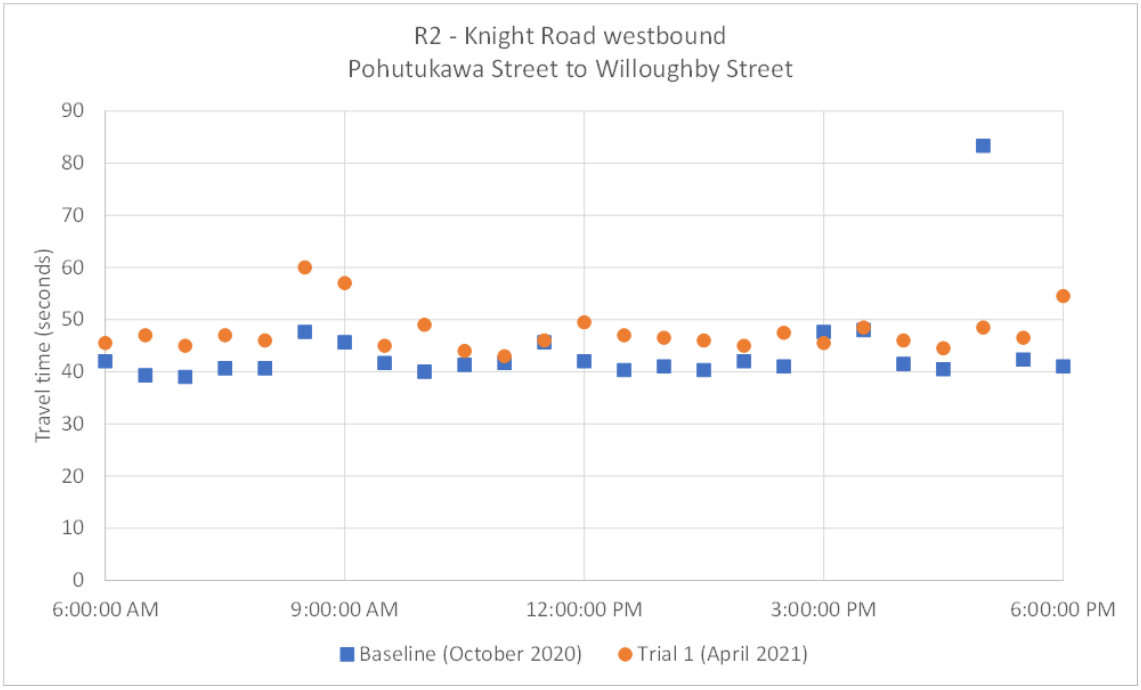


Figure 10: Journey time on route 2 (Knights Road westbound)



Mooven traffic monitoring data

As part of the Knights Road trial, Mooven monitored Knights Road and other key routes during a six-week baseline period (4 August 2020 – 19 September 2020) and again during the trial period once the layout was mostly in place (24 February 2021 and 29 March 2021).

We measured journey time, average journey speed and queuing, with data collated in 15-minute intervals, except during peak times when it was taken at five-minute intervals. Figure 10 below shows the map of monitored routes, along with key events during the trial.

The full report from Mooven is available on request.

Figure 11: Map of monitored routes, and key events during the trial



Note: The coloured lines indicate the routes that were monitored

Impacting events and key periods:		
19/02/21	23/02/21	Test 1 Installation
24/02/21	7/03/21	Normal Conditions
8/03/21	12/03/21	Roadworks North
13/03/21	16/03/21	Normal Conditions
17/03/21	18/03/21	Weetbix Tryathlon
19/03/21	29/03/21	Normal Conditions

Summary: impact of trial layout on travel down Knights Road

Journey time

The biggest impact was during installation, where there were delays of one minute and 40 seconds. Events (Weetbix TRYathlon, roadworks on the eastbound journey beyond the trial) also increased journey time by up to 20 seconds.

We compared normal conditions during baseline (4 August to 19 September 2020) to normal conditions during phase one of the trial (24 February to 7 March, 13 to 16 March, and 19 to 29 March 2021).

There were marginal improvements in speed and journey times eastbound, towards Waterloo Station, taking between two and 10 seconds less. Average journey time ranged between one minute 30 seconds and one minute 45 seconds, so the difference is almost unnoticeable for a typical driver's journey. Westbound (towards the central city), the journey time is 15-20 seconds longer during the morning peak (8.15-8.45am), otherwise it is very consistent with baseline, and the evening journey is slightly quicker, by approximately five seconds.

On Waterloo Road

Eastbound: Typical and consistent peaks in journey time occur between 8 and 9am, 3 and 4pm and 5 and 6pm. During these peaks the journey time increases by 20 to 30 seconds. There is very little variation in journey time and speed: Delays increased by one or two seconds, undetectable to any road user.

The impact of events is similar to that on Knights Road, with 15-second increases during the roadworks and TRYathlon, and westbound increases during these events around 20-25 seconds. Installation on Knights Road also saw a small increase in the morning traffic on Waterloo Road.

Bloomfield Terrace northbound sees a decrease in average journey time by an average of 15seconds consistently across the day. Southbound is also seeing a decrease in journey time, though not as consistent or as large.

Pohutukawa Road northbound is showing a slight increase in journey time (five seconds) during some parts of the day compared with baseline, as is Oxford Terrace southbound (maximum increase of 12 seconds at morning peak).

Drone footage

We took video footage using a drone to see the impact of the layout changes at Waterloo intersection. This is limited by wind speed, contractor availability and drone battery life (about 20 minutes).

To establish a baseline, drone footage was taken between 8-9am, 3-4pm and 5-6pm in October and November 2020. Anecdotal reports from residents and road users, and the pattern of traffic visible from Mooven, indicated that these were the peak traffic times.

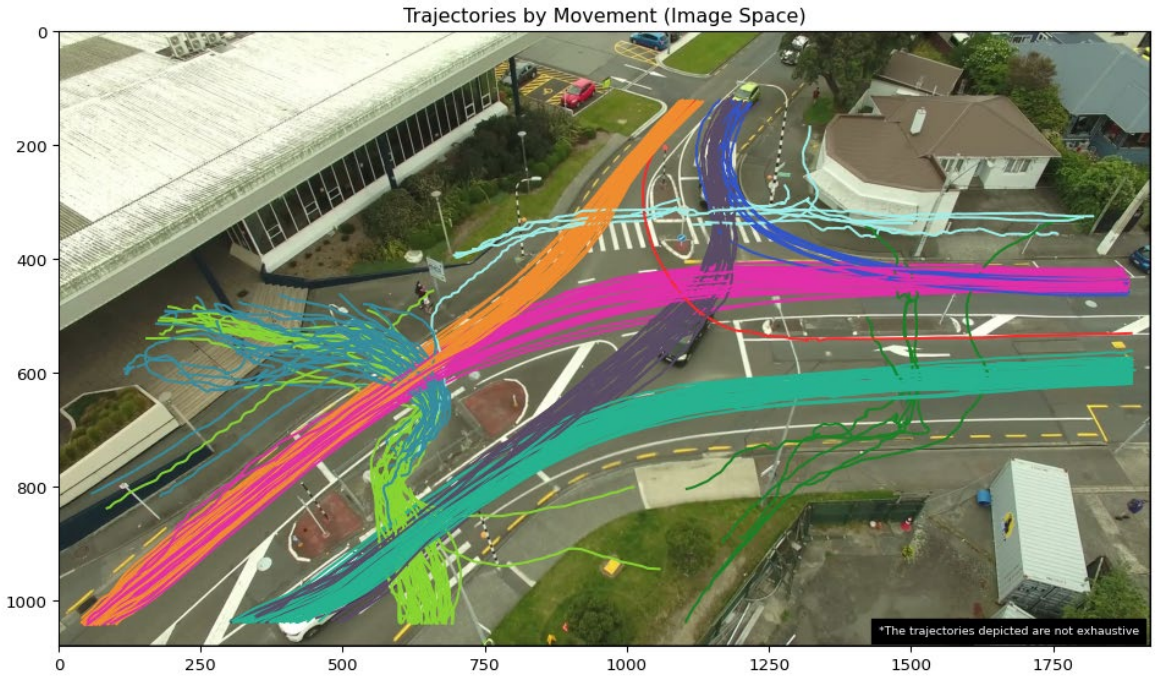
This was repeated at 8am and 3pm in March 2021, with the trial layout in place, but not at 5pm because baseline drone data showed fewer movements and fewer conflicts at this

time, so little new information.

About 300 minutes of data was collected. This means that video data was taken at periods of peak congestion, and therefore at lower speeds than is seen across the day and measured by Beca, Mooven and tube count data. A key point to note is that the same movements occur at other times with less frequency, and in a higher speed environment.

This information was analysed by Transoft, who use specialised software to track trajectories of road users and quantify interactions and 'near miss' information. This type of work is proactive and yields richer information more quickly than crash report data.

The image below shows the distribution of all movements at Waterloo Station, taken from the drone footage of this intersection.

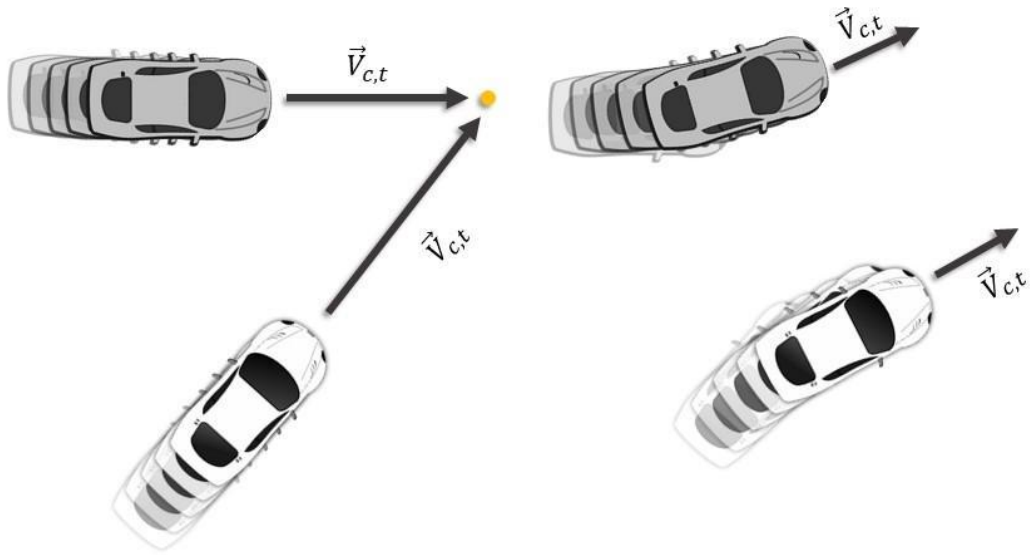


What measures were used?

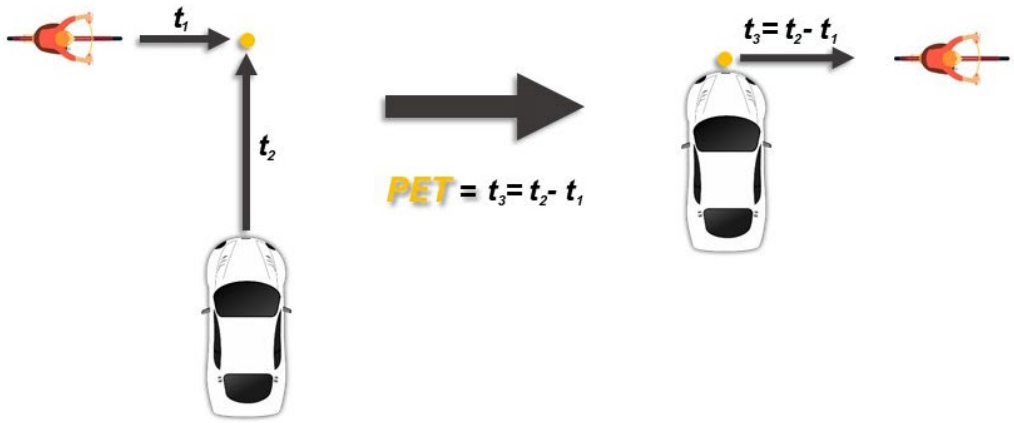
Surrogate Safety Metrics used: surrogate safety measures are used to proactively identify locations that have a high risk of crashes but where the risk has not yet resulted in actual crashes. They are used because crashes are rare events and tend to be under-reported, meaning that it can take a long time to 'see' a high risk area only using actual crash statistics. Ethically, it is preferable to act on areas identified as high-risk using surrogate safety metrics where possible, rather than waiting for actual crashes to reach a statistically significant threshold. Essentially, these surrogate safety measures look at the number and severity of 'near-misses' happening at a set location. They allow us to quantify the video data collected at Waterloo Station, and to compare the interactions captured during the baseline to those captured with the trial layout in place.

The two surrogate safety measures used for this trial are industry standards and both relate back to human reaction time.

Time-to-collision (TTC) is the time required for two vehicles to collide if they do not change their direction or their speed. In the example below, the two cars were headed for the same point, but both turned.



Post-encroachment time (PET) is the time difference between when two road users cross paths. If this value is small, then two could have been involved in a crash and it indicated how much they "missed" each other by.



Both TTC and PET are measures of proximity and speed. Acceleration, object size, and collision angle are measures of severity. These are what has been used in the analysis to quantify the interactions being seen. The main difference between them is that TTC does not require the users to have crossed paths.

Definitions:

Interaction = PET or TTC was 5-10 seconds. Classified as an 'interaction' but not as a conflict.

Minor conflict = PET or TTC was 3-5 seconds.

Critical conflicts = PET or TTC was less than 3 seconds. We have referred to these in the report as 'near miss'.

Using the drone footage, 1587 'interactions' have been identified and the PET or TTC value has been identified. Thirty different scenarios in which these interactions occur have been identified. Conflicts and critical conflicts have been graphed, and the 100 interactions with the lowest PET or TTC value in seconds have been 'tagged' – we can see the videos for each of these. These conflicts are graphed by conflict speed and by the safety indicator value in seconds, and identified as occurring during baseline or when the trial layout is in place. (see figure 13).

Results of drone footage

Overall, the results look very promising. When the trial layout was in place, the number of near-miss interactions was reduced and the speed at which these near-misses occurred was lower. This effect was largest for pedestrian interactions and for interactions that occurred on the Oxford Terrace pedestrian crossing.For pedestrians, the critical conflict rate by interaction reduced by 60% and by volume by 75%. At the Oxford Terrace crossing, there was a 59% reduction in the critical conflict rate by volume and a 75% reduction in the critical conflict rate by interaction.

There were not enough critical conflicts on the Pohutukawa Street pedestrian crossing in the drone footage captured to draw statistically significant conclusions here.

Table 3 below gives more detail on how the changes at Waterloo intersection have reduced the likelihood of critical conflicts and reduced speeds.

Table 3: reductions in critical conflicts and speed at Waterloo Station intersection

Reduction in critical conflicts and speed

	Critical conflict by volume (How likely to be involved in a conflict)	Critical conflict rate by interaction (How likely to be involved in a critical conflict)
All road users	29.2% reduction	5% reduction
All pedestrians	75.3% reduction	60.4% reduction
Oxford Terrace crossing	75.5% reduction	59.1% reduction

Conflict speed

	Conflict speed	Median speed
Pedestrian conflict	7.7% reduction	4.8% reduction
Vehicle to vehicle conflict	5.2% reduction	7.5% reduction

Why is this important?

The severity of consequences between different modes and at different speeds has been well-researched and can be seen below. Even at relatively low speeds, the injury consequences of collisions are severe, particularly for older people and for modes of travel that are less protected. The graph below shows the impact of speed on the risk of severe injury and fatality.

Figure 12: Severe injury and fatality risk and impact speed[1]

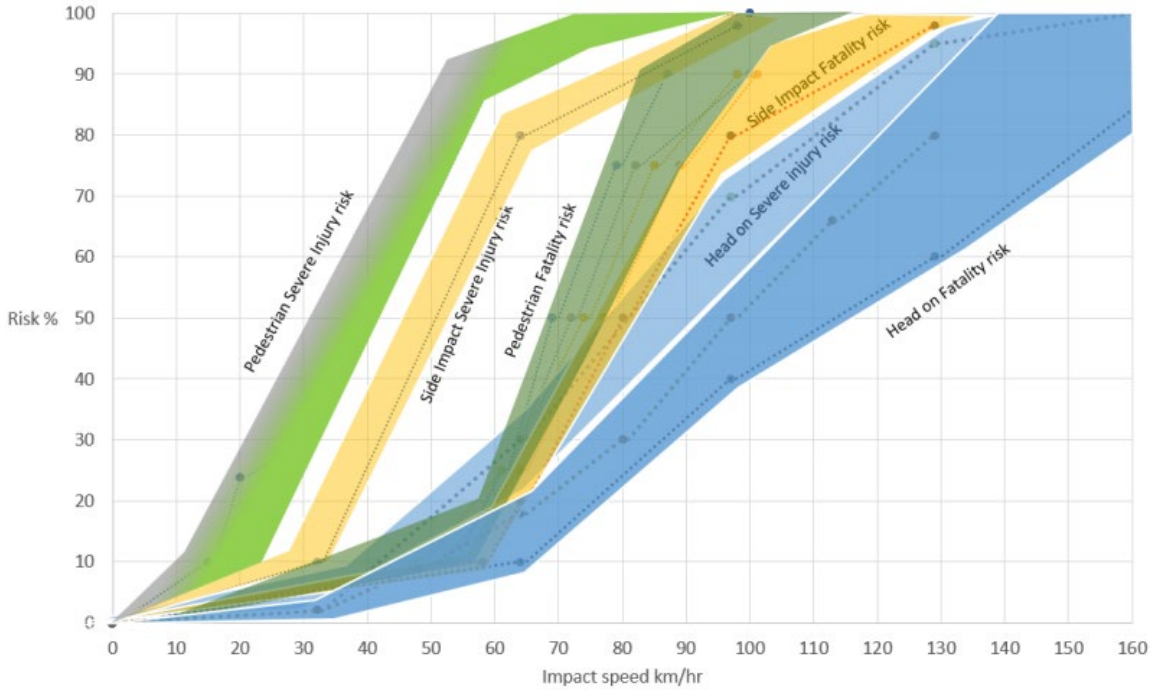
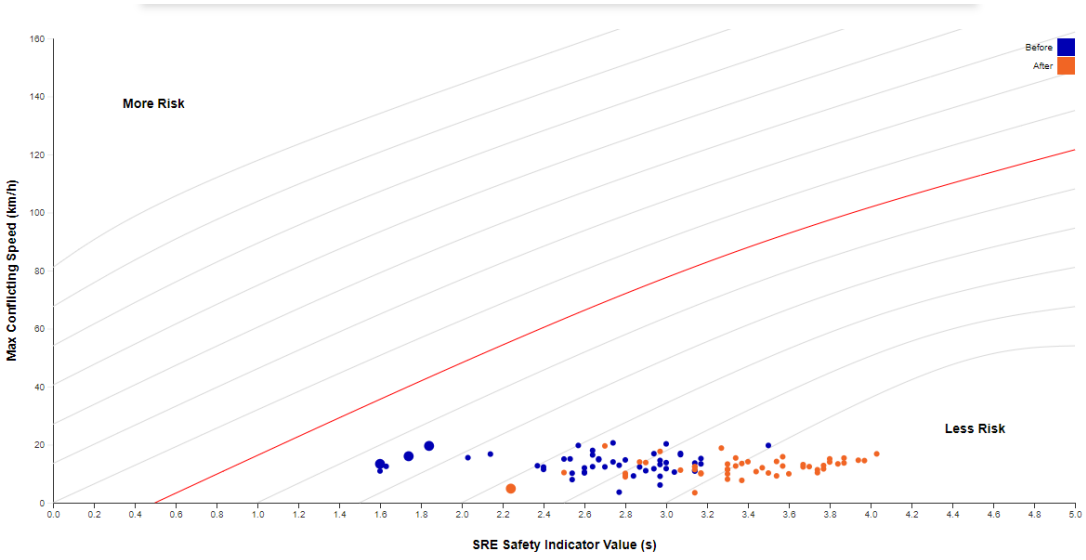


Figure 13: Changes to conflicts and speeds at Waterloo Station Intersection, trial layout compared to baseline from analysis of drone footage



[1] Image taken from Mackie Research Report: https://www.bikeauckland.org.nz/wp-content/uploads/2018/09/Mackie-Research-Report_Speed-vs-injury-risk.pdf

The table below shows that after the trial layout was put in place, interactions are happening at lower speeds, and there are fewer critical incidents. Those that are happening are at lower speeds.

Table 4: Changes to conflicts and speeds at Waterloo Intersection during the trial compared to baseline

			Reduction
Conflict	All Road Users	Critical Conflict Rate by Interaction	5.0%
		Critical Conflict Rate by Volume	29.2%
		Minor Conflict Rate by Interaction	-5.8%
		Minor Conflict Rate by Volume	21.2%
	All Pedestrians	Critical Conflict Rate by Interaction	60.4%
		Critical Conflict Rate by Volume	75.3%
		Minor Conflict Rate by Interaction	-2.2%
		Minor Conflict Rate by Volume	36.2%
	Oxford Terrace Crosswalk	Critical Conflict Rate by Interaction	59.1%
		Critical Conflict Rate by Volume	75.5%
		Minor Conflict Rate by Interaction	-3.3%
		Minor Conflict Rate by Volume	38.0%
Speed	Ped Conf	Conflict speed	7.7%
		Median Speed	4.8%
	Veh-veh	Conflict speed	6.2%
		Median Speed	7.5%
	Approach	Knights Road	23.7%
		Pohutukawa St	-2.3%
		Oxford Terrace	21.4%

Part 2: Cycle Count Data

Strava data

The Strava app and website allows users to track and upload their rides (and runs) using GPS data, either from Strava's dedicated app on a smartphone or via a third-party GPS bike computer.

The Strava 'heat maps' below shows data for cyclists between April 2018 and April 2020. It shows that Knights Road and Waterloo Road are two of the residential roads in Lower Hutt most used by cyclists who record their rides on Strava. This is a small subsection of all cyclists using this route. The data also excludes Strava cycle rides where the cyclist has their settings set as 'private'.

Figure 14: Strava data heatmap for cyclists – April 2018 to April 2020

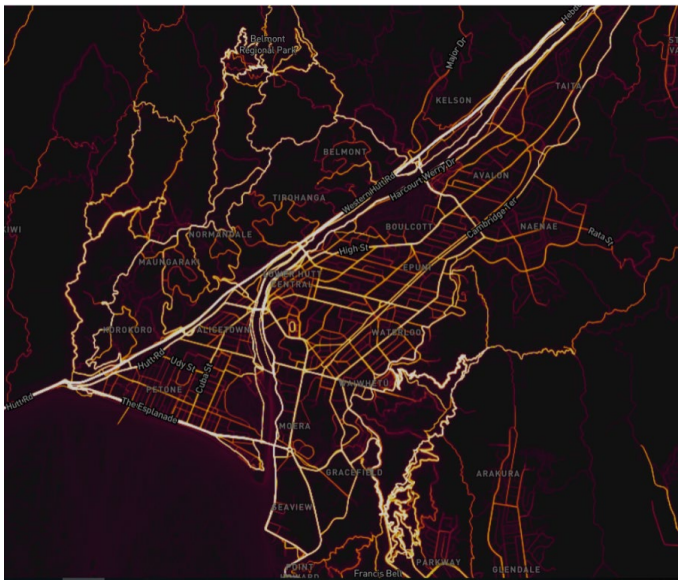
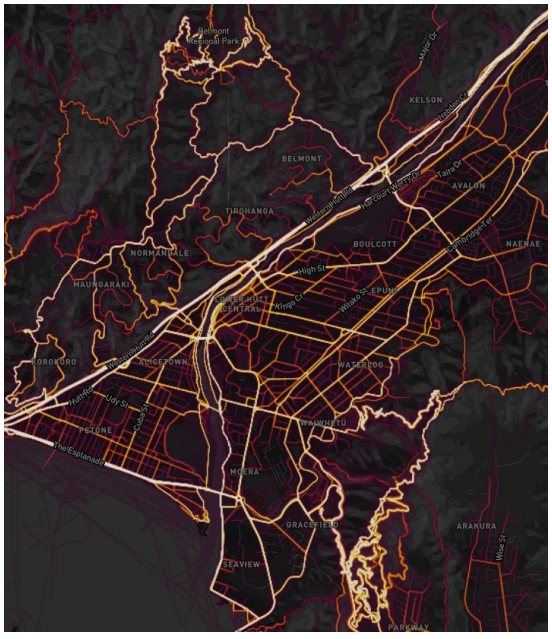


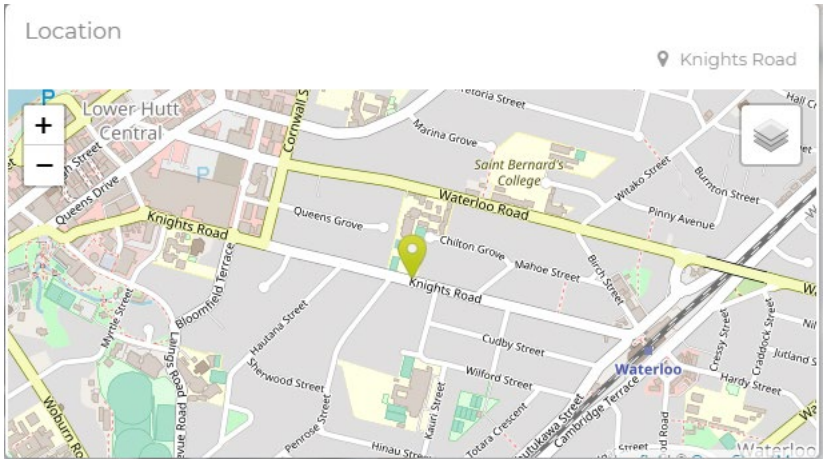
Figure 15: Strava data heatmap for cyclists – April 2019 to April 2021



Cyclist data analysis

Eco-Vision is an online platform that analyses pedestrian and cyclist count data.

The counter was located at the pedestrian crossing outside Chilton St James School on Knights Road, as shown in the map below. The baseline data was taken in November 2020 and compared with the trial during March 2021. Both time periods were during school term time with no public holidays.



We used November 2020 and March 2021 as comparators because both are during the school term time with no public holidays, were after the COVID alert levels 3 and 4, and have relatively good weather. March was the period the trial was completely installed.

Increase in cyclists using Knights Road

The daily average has increased by 25 cyclists per day. On the peak day there were 39 more cyclists in March 2021 than in November 2020.

Figure 16: Cyclist data from November 2020

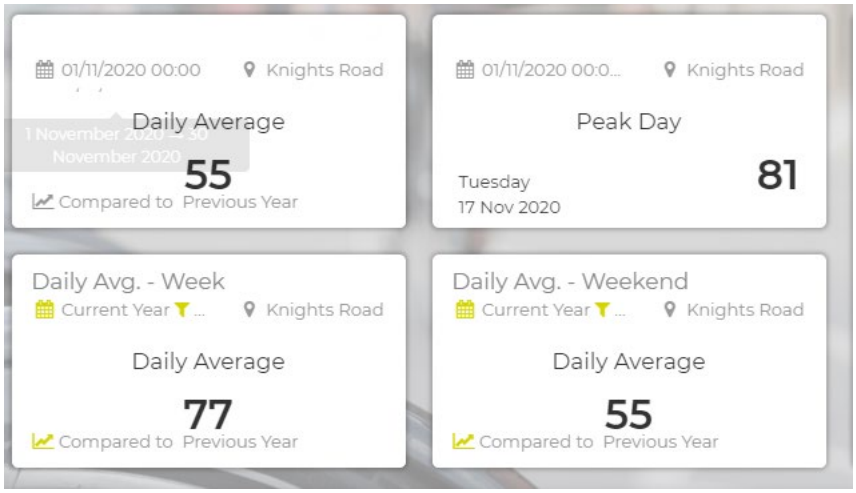
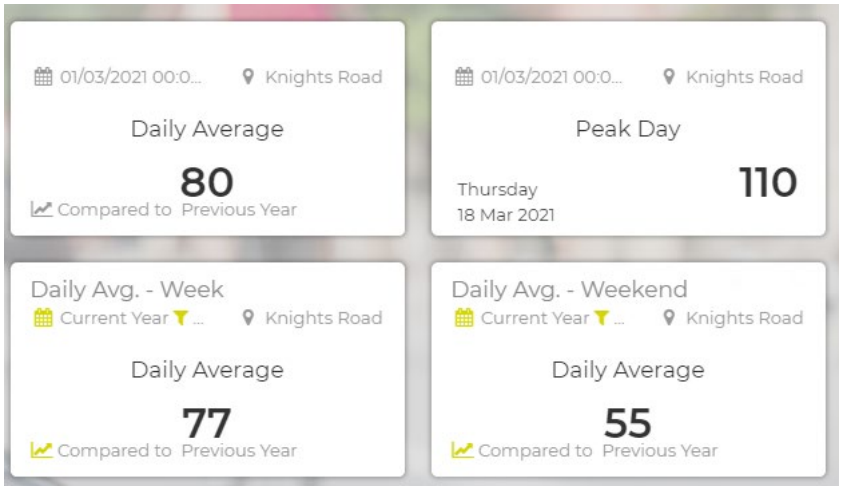


Figure 17: Cyclist data from March 2021



Direction of travel

Both in November 2020 and in March 2021, we see more cyclists heading into the central city (westbound) than towards the station (eastbound) past this counter. It should be noted that this will not capture riders either on the footpath, or that turn off on Willoughby Street.

Figure 18: Cycle data, November 2020

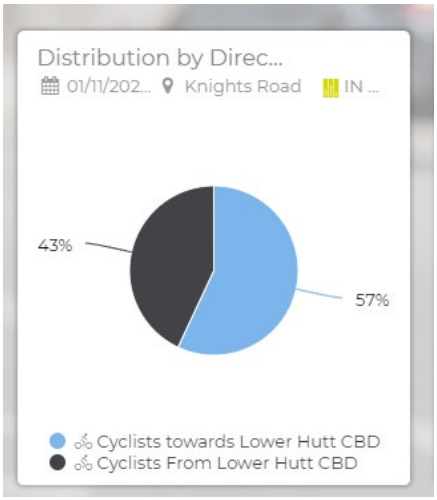
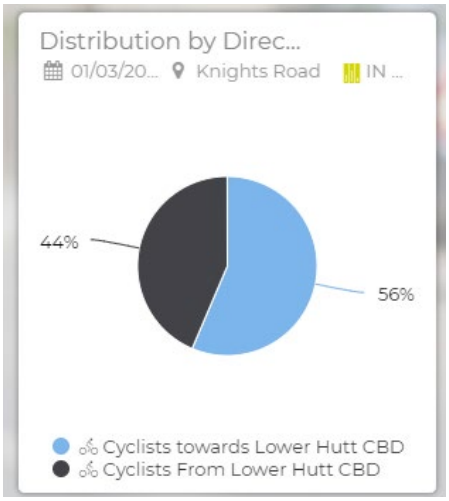


Figure 19: Cycle data, March 2021



The **daily** time series data shows that on almost every day in both months there are more cyclists going towards the central city than away from it.

In total, there were 711 cyclists that went past the counter on Knights Road in November 2020, compared with 1,081 in March 2021.

Figure 20: November 2020: Daily time series of cyclists along Knights Road by direction

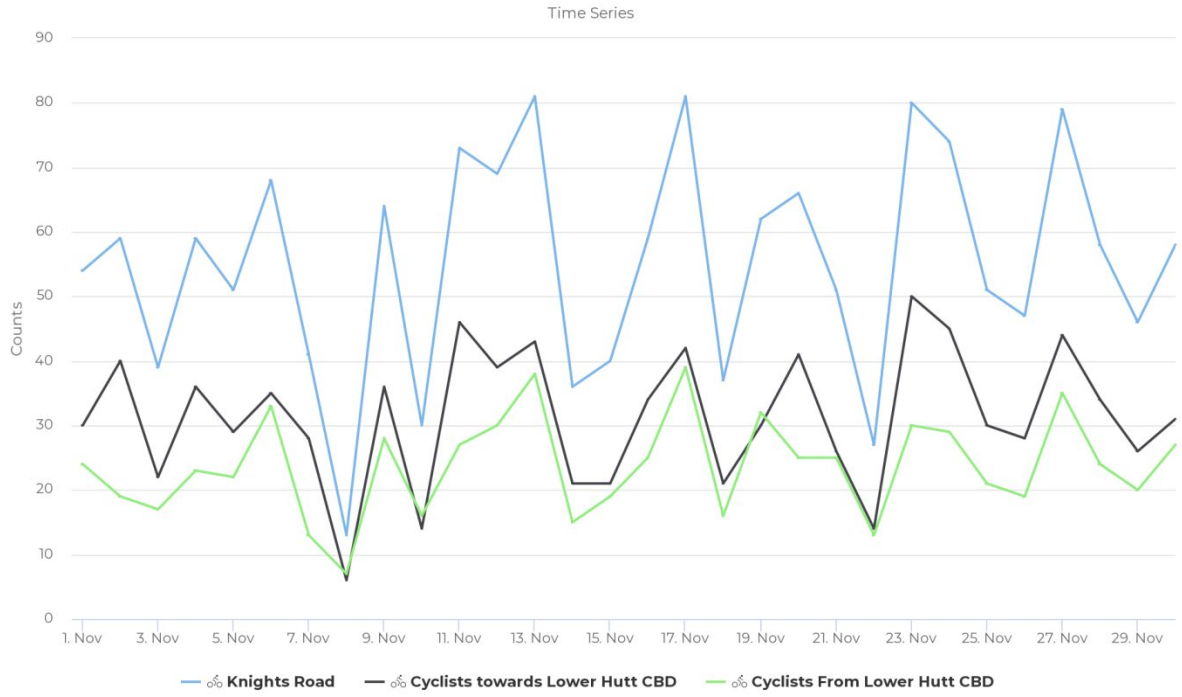
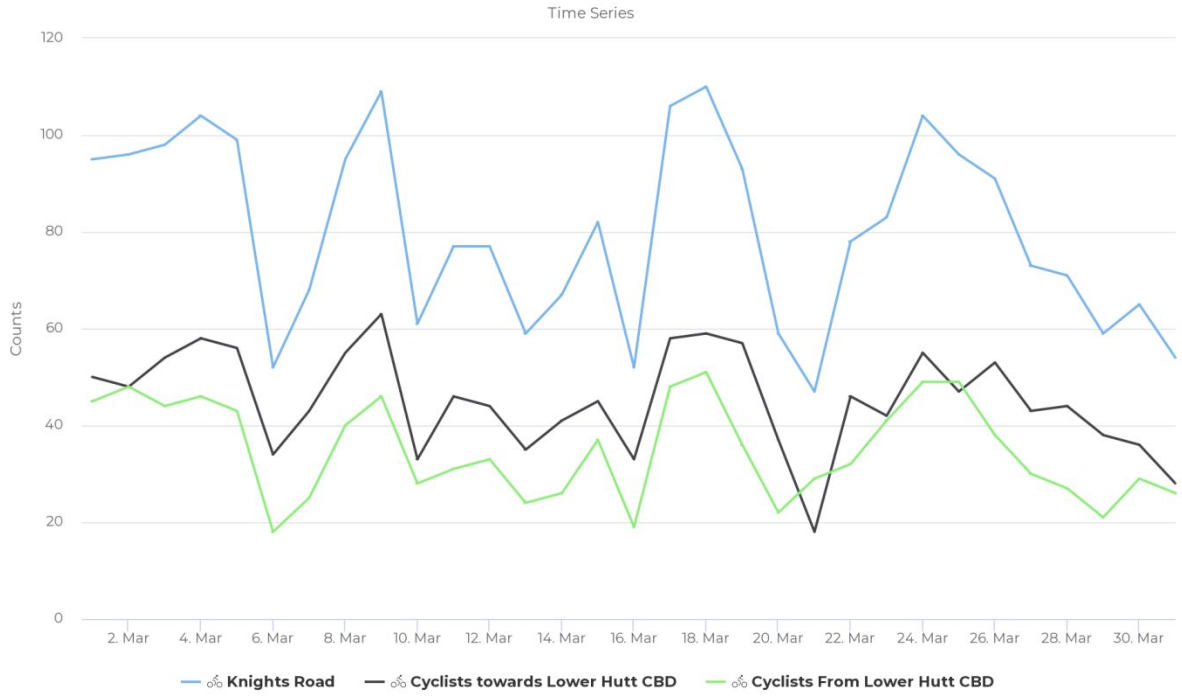


Figure 21: March 2021: Daily time series of cyclists along Knights Road by direction



Variable flow

There are more riders during the working week than at the weekend, and peak times are between 6 and 8am in the morning, supporting the idea that most of these are commuters. In November 2020 there were more cyclists on a Friday than on other days, while March shows a more even spread of riders during the week, and more riders on each day.

Figure 22: Daily profile November (on left) and hourly profile November (on right)



Figure 23: Daily profile March (on left) and hourly profile March (on right)

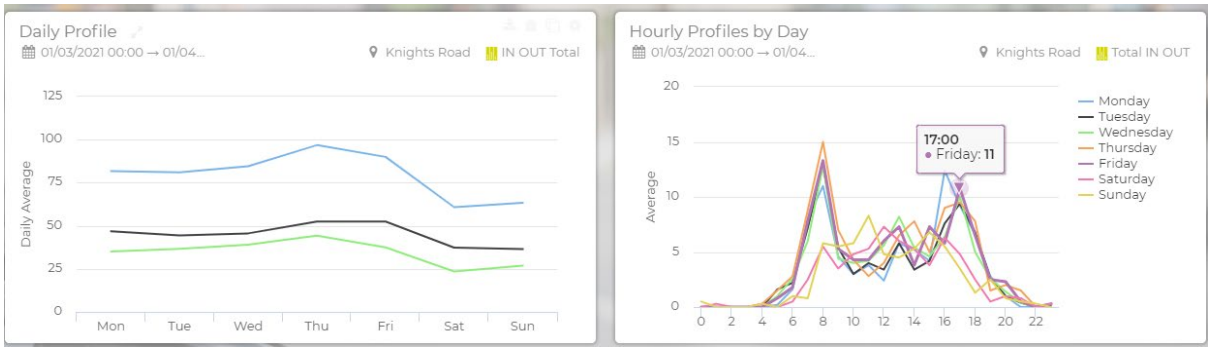
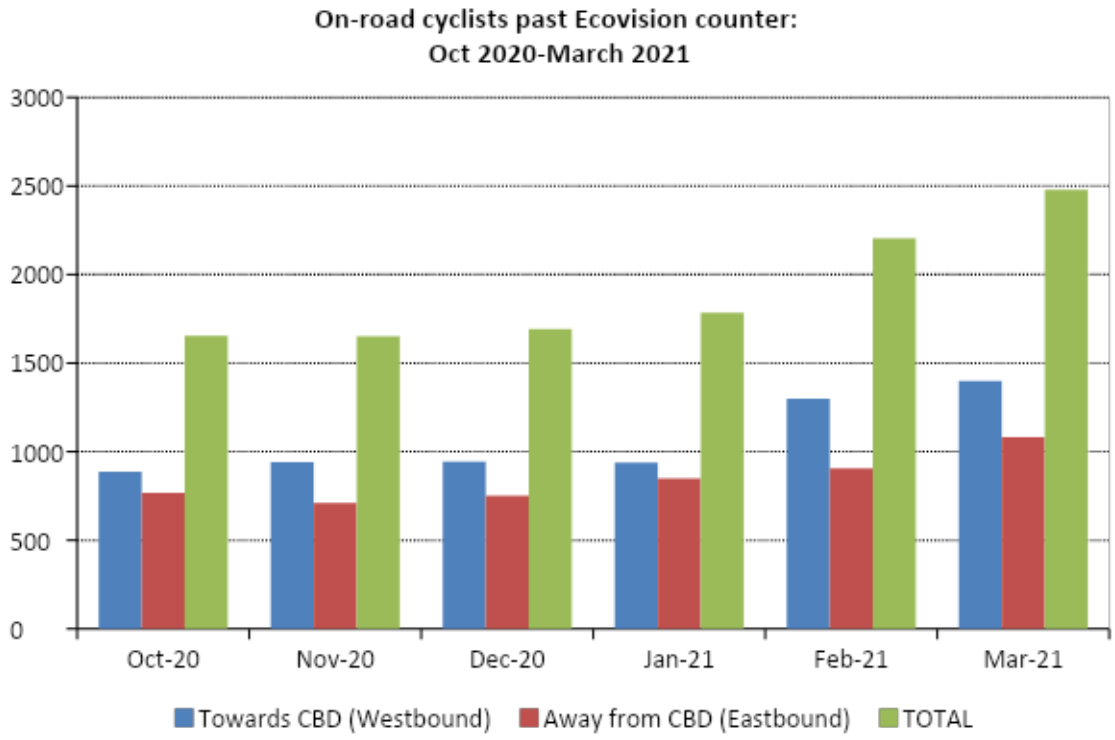


Figure 24 below demonstrates that the overall trend each month since October 2020 shows an increase in the number of on-road cyclists riding past the counter.

Figure 24: On-road cyclists counted, October 2020 to March 2021



Manual counts of cyclists, pedestrians and scooters at Waterloo intersection

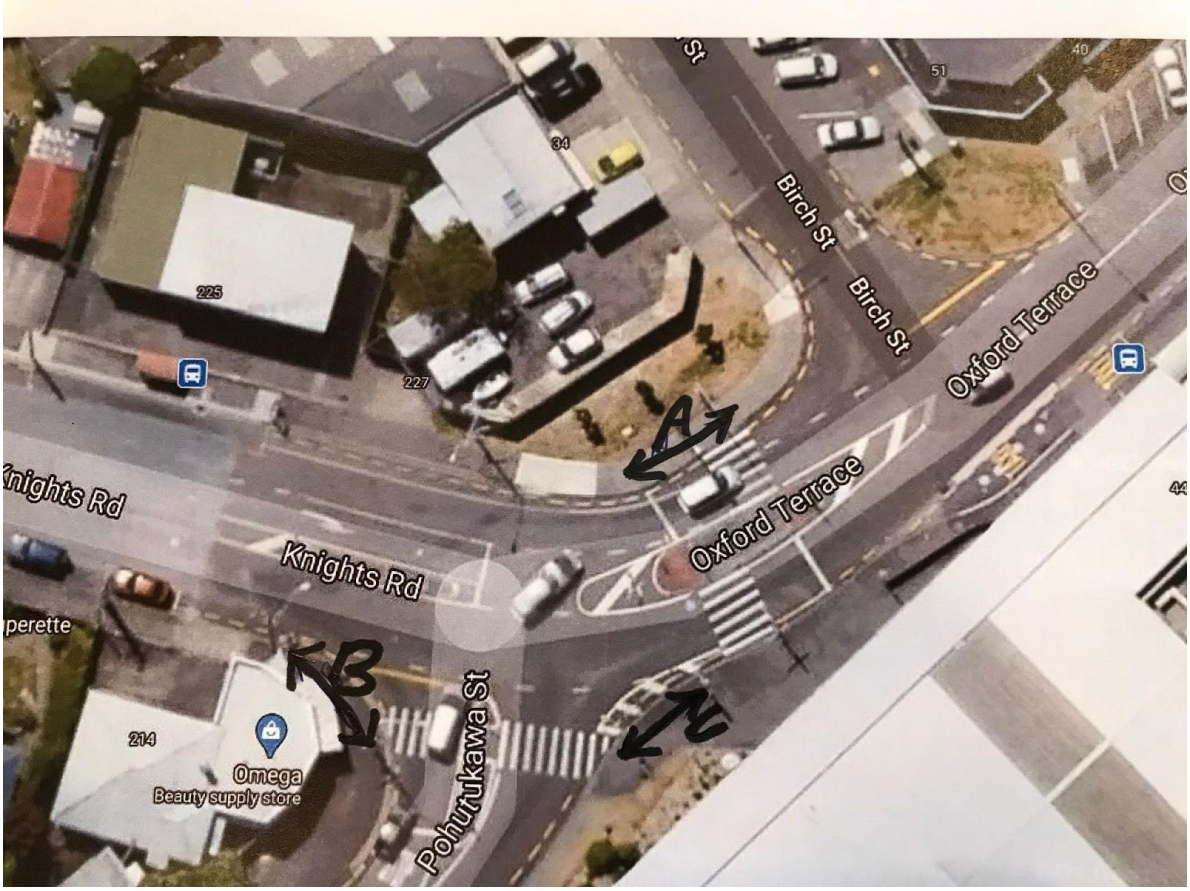
Manual counts were done for the number of movements by pedestrians, cyclists, people on scooters and others outside of Waterloo Intersection in October, November and February (pre-trial) and repeated in March. Drone footage provided another source as it shows all of the same routes used for manual counting. Counts were done at peak traffic times, 8am-9am, 3-3.30pm and 5-5.45pm. For each time, mode, and journey measured, an average number of journeys were calculated for baseline (pre-trial) and with the trial layout in place.

These counts allowed observations about the age of pedestrians, cyclists, people on scooters such as which schools they were attending by uniform, whether they were using electric or standard bikes and scooters, and allowed 'other' users such as prams, mobility scooters, e-longboards etc to be counted. Recorders were able to see more of the 'why' users chose a certain route.

Route A – movements between Waterloo Station or Birch St and Knights Road, on the north side of Oxford Terrace.

Route B – Movements between Waterloo Station or Pohutukawa Street and Knights Road, on the south side of Knights Road

Manual counts of cyclists, pedestrians and scooters were taken at routes A and B shown



The numbers of people for each movement at these points in each 30 minute count period were recorded by mode of transport, and an average was calculated for the pre-trial counts and for the during the trial counts. There are 4 movements for each point as follows.

Point A

A1 - from north side of Knights Rd over pedestrian crossing toward Waterloo Station

A2 - from north side of Knights Road onto Oxford Tce travelling north

A3 - from Waterloo Station over pedestrian crossing travelling down north side Knights Rd

A4 - from Oxford Tce/Birch Road travelling down north side of Knights Road

Point B

B1 - from south side of Knights Rd over pedestrian crossing of Pohutukawa St

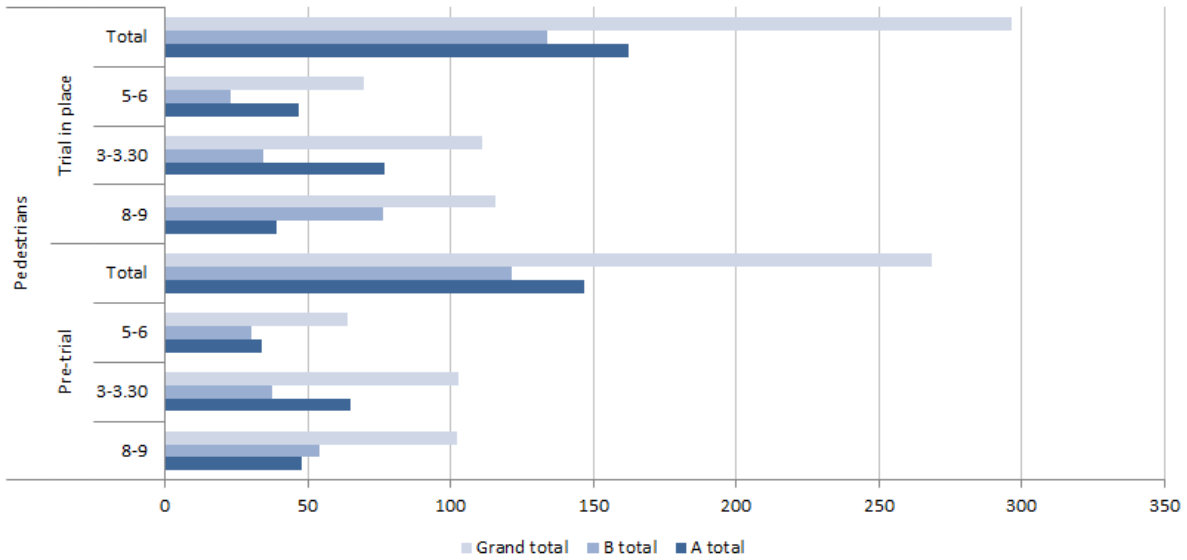
B2 - from south side of Knights Rd turning right onto Pohutukawa St,

B3- from Waterloo Station over pedestrian crossing of Pohutukawa St to Knights Rd

B4 - from Pohutukawa St turning left Knights Rd

Data for each movement is available on request, but has been collated for ease of interpretation in figures 25 and 26 below. The route specific information shows the variability by time of day of specific movements towards and away from the station, and reflects that most cyclists ride on the left, so is movement-specific, except for those bikes on the footpath. Therefore at point A, bikes recorded were generally on the footpath and moving toward the crossing.

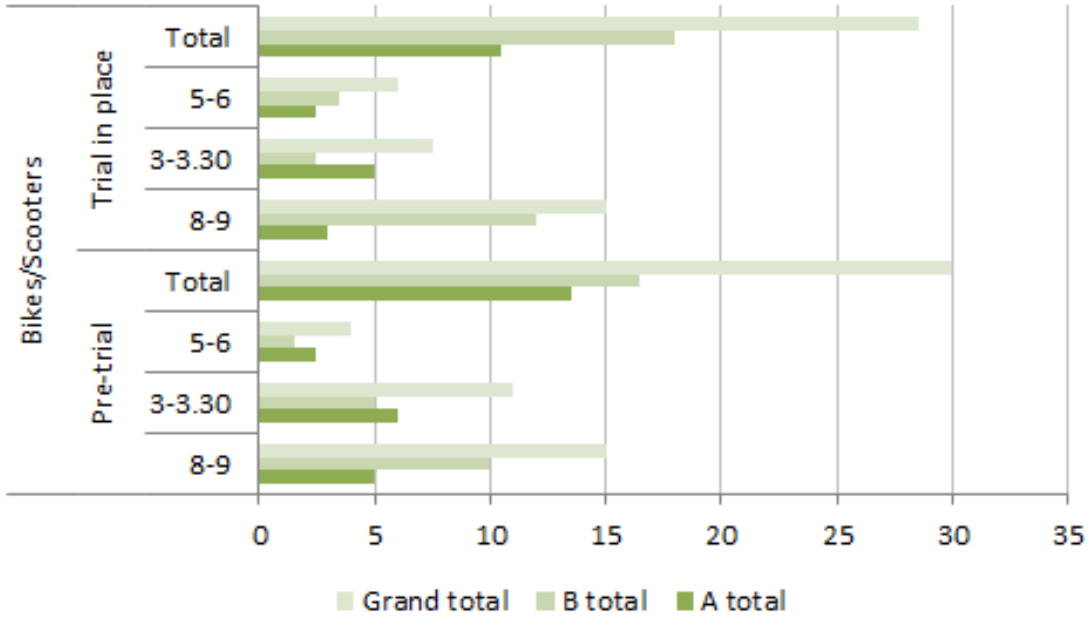
Figure 25: Average number of pedestrian movements past point A and B, by time of day, baseline compared to when trial is in place



Overall, the most concentrated time for pedestrian movements at both points A and B is after school, between 3 and 3.30. Route B3 - from Waterloo Station over pedestrian crossing of Pohutukawa St to Knights Rd - was the most used route between 8am and 9am by both pedestrians as well as by people riding bikes and scooters. It had the most pedestrian movements (46) of any time measured between 8am and 9am when the trial was in place. Route A4 - from Oxford Tce/Birch Road travelling down the north side of Knights Road - was the most used by pedestrians between 3 and 3.30. Movements of people riding bikes and scooters were more evenly split between the routes in the afternoon and evening than in the morning.

The average number of movements of pedestrians measured during the 2.5hrs of count data increased from 268 at baseline to 296 during the trial. There were large numbers of people coming from Knights Road past the pop-up park and going towards Waterloo Station. People coming from Waterloo Station tend to use route B (south side). The average number of movements of people riding bikes and scooters past points A and B was slightly less (1.5 fewer movements overall) when the trial was in place compared to baseline at these times. This is different to what we see via the Ecovision counts, which shows an average daily increase of 25 cyclists per day. This difference may be due to an earlier commuter pattern.

Figure 26: Average number of people on bikes and scooters moving past point A and B, by time of day, baseline compared to when trial is in place



Part 3: Community survey data

There were four different surveys used to collect feedback about the trials. The first was a hard-copy survey filled in by attendees at the trial launch on Friday 26 February. The others were targeted to residents of Knights Road and adjacent roads, to school communities and to the general public. These were available online during March and in hard-copy delivered to audience groups and at engagement events. More than 1800 hard copy surveys were printed, and the survey feedback opportunities were promoted through social media, and email communications, adverts in the Hutt News and at engagement events. In total, 466 surveys were returned.

School Survey Demographics and modes of travel

A survey was created for school communities (students, parents and staff) and was available online during the first trial and in hard copy at six of the local schools closest to Knights Road. Seventy five surveys were completed. Results of these surveys are below, and key findings are summarised in bullet points:

85% of surveys were returned by Sacred Heart College (47%) and St Peter & Pauls (39%). Both of these are special character schools, rather than having a local catchment as with Hutt Intermediate. We would expect to see a higher proportion of students living further from school and taking private and public transport.

53% of respondents were parents or guardians, 40% were students and the remainder were staff. This means that 60% of the respondents to the school community survey were adults.

Figure 27: Main mode of transport to school used by school community respondents

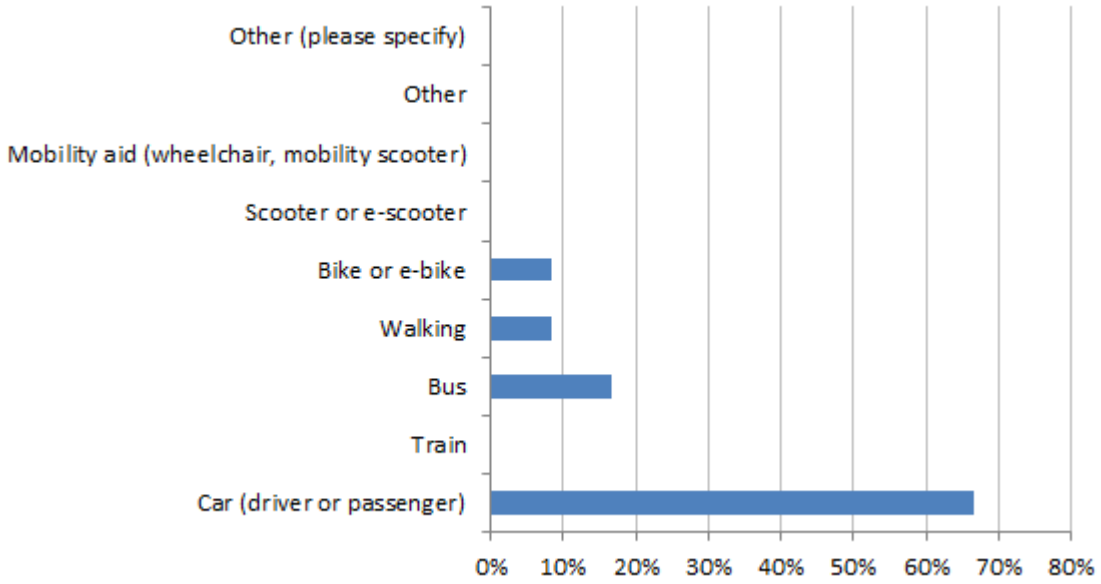
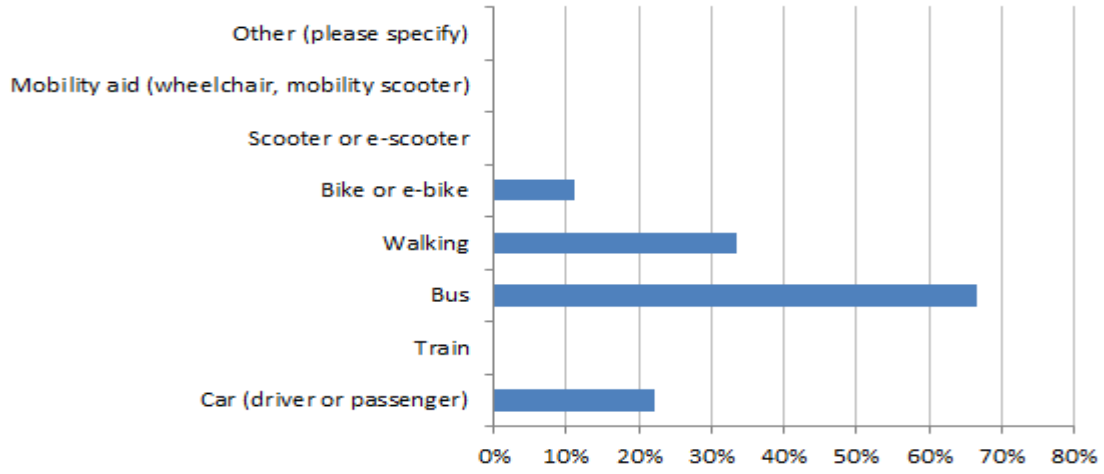


Figure 28: Other modes of transport to school used by school community respondents



Cars are the primary mode of transport for 66% of the school survey respondents, with 34% walking, biking or using public transport. Bus and walking are the next most frequent modes of transport, with bikes making up around 10% of transport methods overall.

Residents Survey Respondents: Resident specific information

The residents survey was available online and a hard copy was delivered to 1,000 properties on Knights Road and adjacent roads. 180 surveys were returned. Residents on Knights Road itself made up 41% of survey respondents, with residents of roads on the south side of Knights Road made up 31% of respondents.

Figure 29: Distribution by street of residents survey respondents

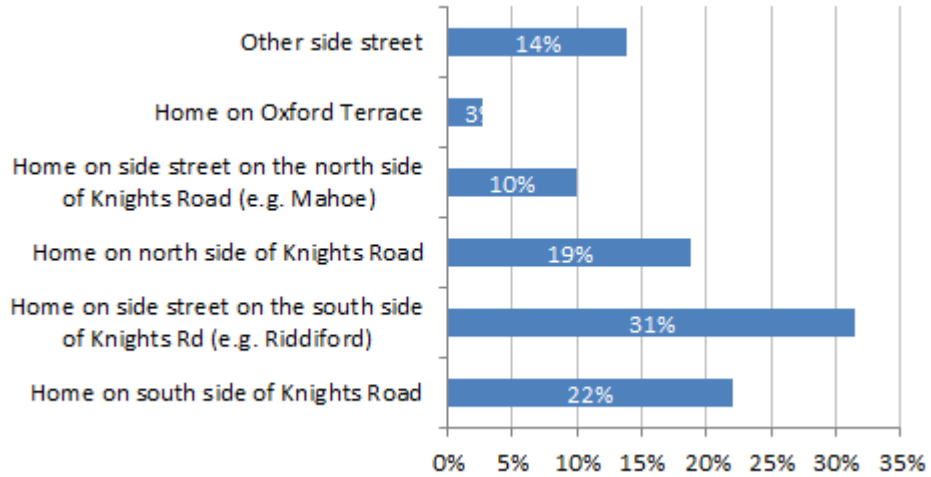
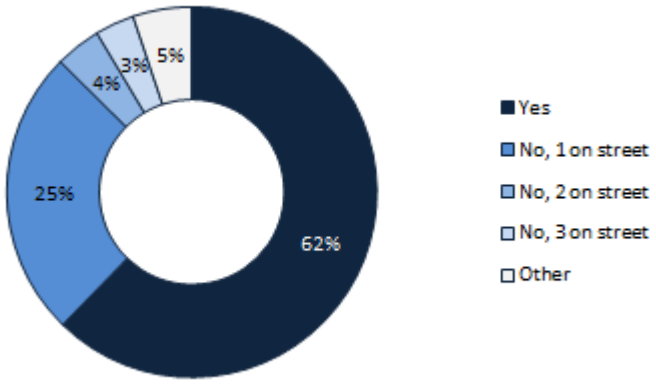


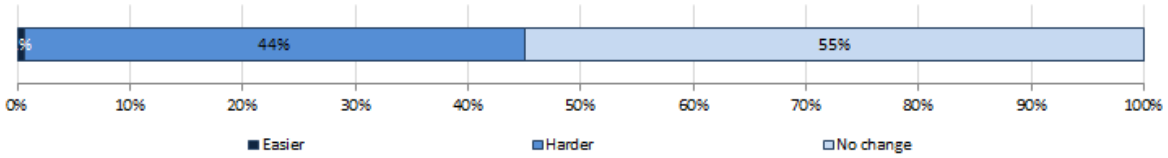
Figure 30: Percentage of residents of Knights Road and adjacent streets who have sufficient off-street parking for cars belonging to people who usually live in their homes



Respondents were asked if they had sufficient off street parking for the vehicles belonging to people usually resident in their home. This question aimed to assess how many homes, on average, rely on on-street parking on a daily basis outside of the trial impact. 38% of residences do not have sufficient off-street parking for the vehicles belonging to their residents.

Figures 31 to 33 below relate to residents' experiences exiting their driveways. Overall, the impact on function here is more negative than we would expect, but for each point question we are seeing no change in function for 55%-67% of respondents.

Figure 31: Trial layout impact on resident ability to get in and out of driveway



As 60% of respondents lived in residences that are not on Knights Road, we would expect to see that for at least 60% of respondents there was no change to the ability to enter and exit their driveways.

Figure 32: Trial layout impact on resident ability to see footpath users when entering and exiting driveway

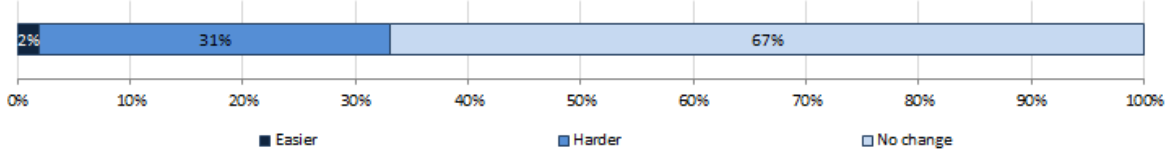
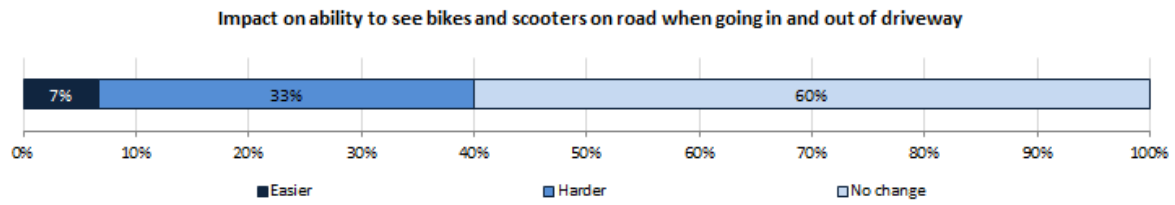


Figure 33: Trial layout impact on resident ability to see bikes and scooters on the road when entering and exiting driveway



Figures 32 and 33 above relate to the field of vision of residents exiting their properties. 60% of respondents lived in residences that are not on Knights Road and so no changes were made at their driveways. For the 22 % of respondents living on the south side of Knights Road, where parking was reduced during the trial, we would have expected that the reduced on-street car parking would have meant fewer barriers to seeing bikes and scooters on the road. Therefore we would have expected that for 82% of respondents there would have been no change or it would have been easier to see bikes and scooters on the road, depending on whether there were often cars parked near their driveways. This is not the case, instead we see 67% reporting that the trial layout has either made no change or has made it easier to see bikes and scooters when exiting their driveway.

Demographics: Public Survey

The group of people who responded to the public survey were evenly split by gender, predominantly aged between 51 and 79 (72%), and travel down Knights Road frequently, 86% travel down Knights Road at least several times a week.

Figure 34: Public survey respondents by age

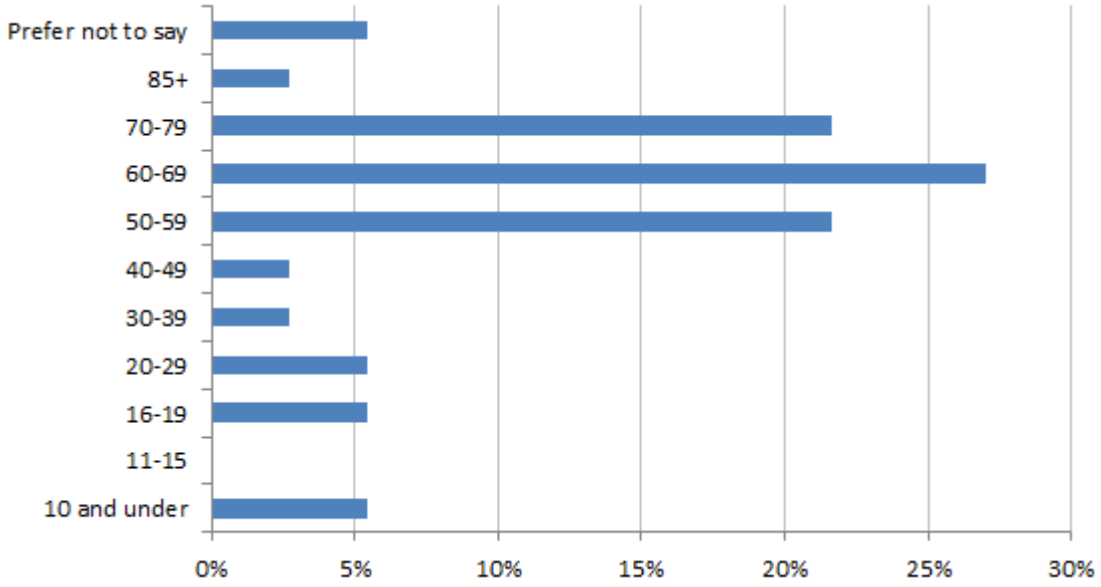


Figure 34: Public survey respondents by gender

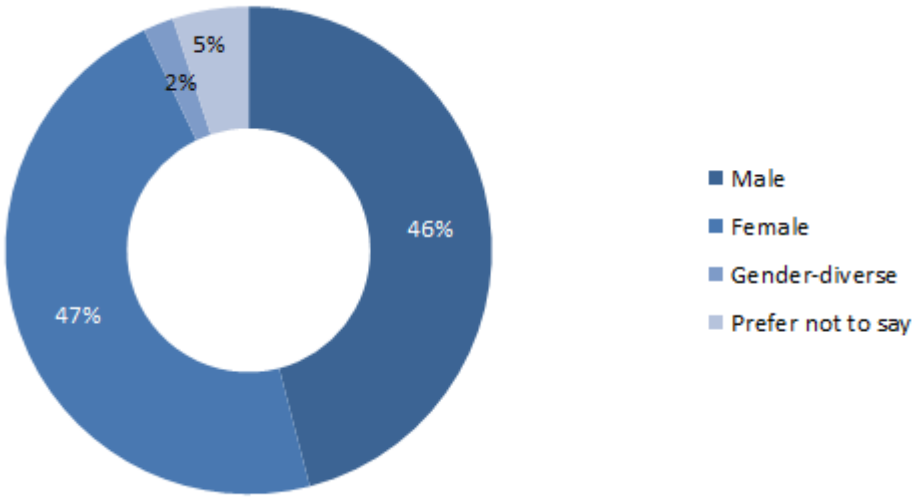
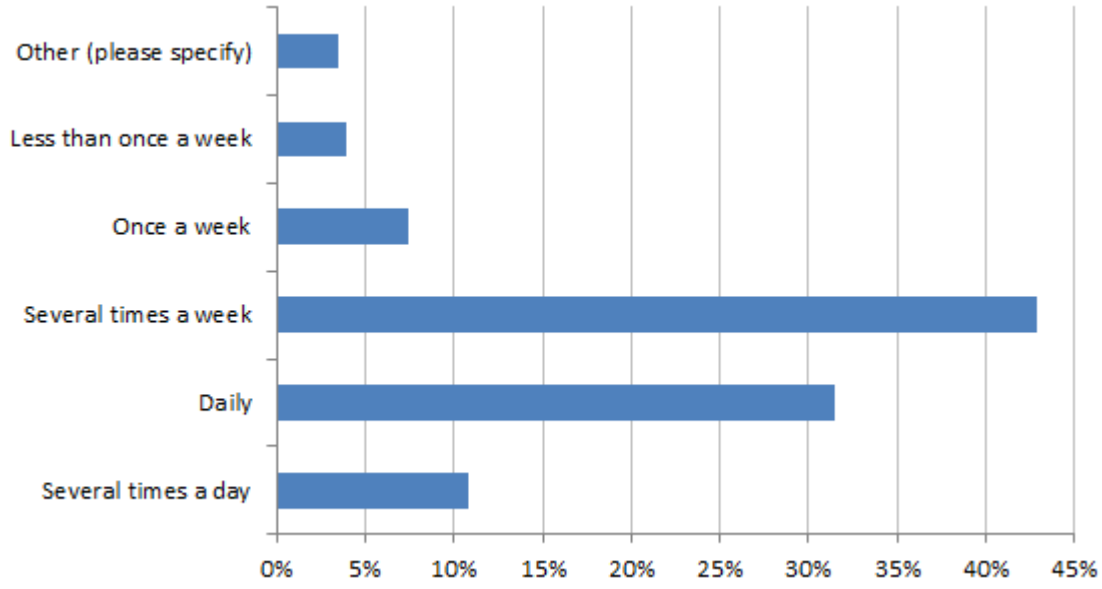


Figure 34: Public survey respondents by frequency of travel down Knights Road



Collated Results for Residents, School Communities and Public Surveys: Waterloo Station



Overall, at Waterloo Station:

- 61% of respondents perceived that the changed layout has slowed vehicles
- 49% perceive that the intersection is safer for pedestrians (20% neutral)
- 30% perceive that the intersection is safer for people on bikes and e-scooters (22% neutral)
- 25% perceive that the intersection is safer for vehicles (26% neutral)
- 49% perceive that turning movements are more difficult for vehicles
- 27% perceive that turning movements are more difficult people on bikes and e-scooters

In comparison to the quantitative measures of speed and numbers of near misses, the perception of safety and of speed at Waterloo Intersection shows that survey respondents perceive less of a change than the data shows. In general, for each statement, the school community survey respondents had the largest percentage who agreed, and the public survey respondents had the lowest percentage.

Waterloo Station

Figure 35: I feel that the new layout outside of Waterloo Station has slowed vehicles at this intersection

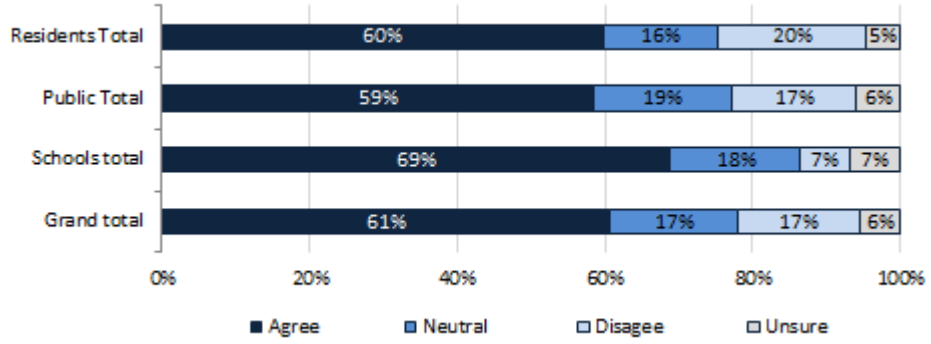


Figure 36: I feel that this intersection is safer for pedestrians as a result of the new layout

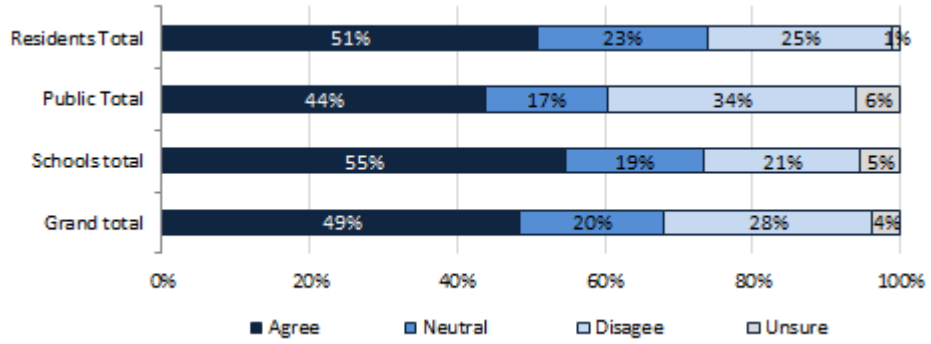


Figure 37: I feel that turning movements for vehicles are more difficult as a result of the new layout

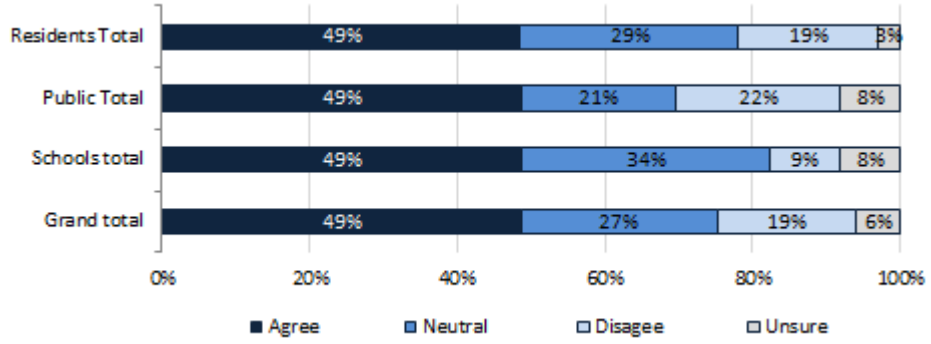


Figure 38: I feel that the intersection is safer for vehicles as a result of the new layout

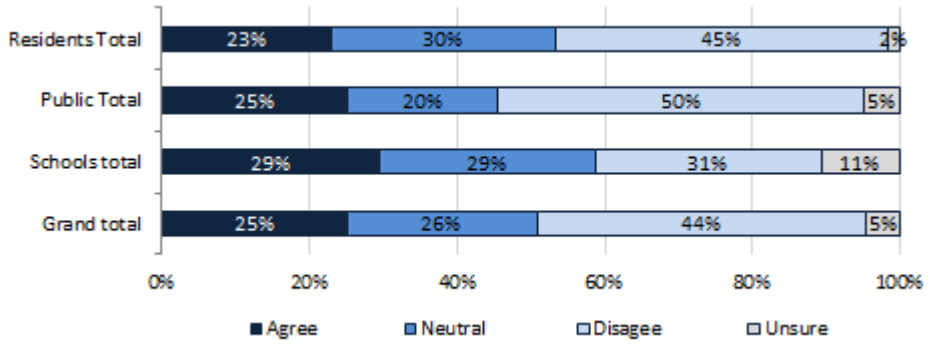


Figure 39: I feel that the intersection is safer for people on bikes and e-scooters as a result of the new layout

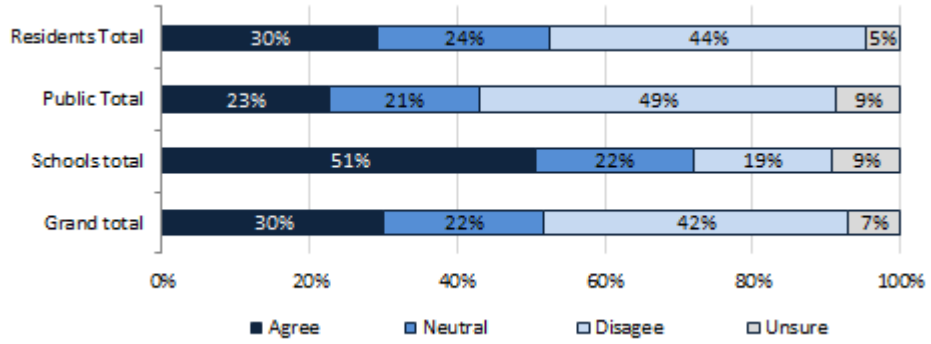
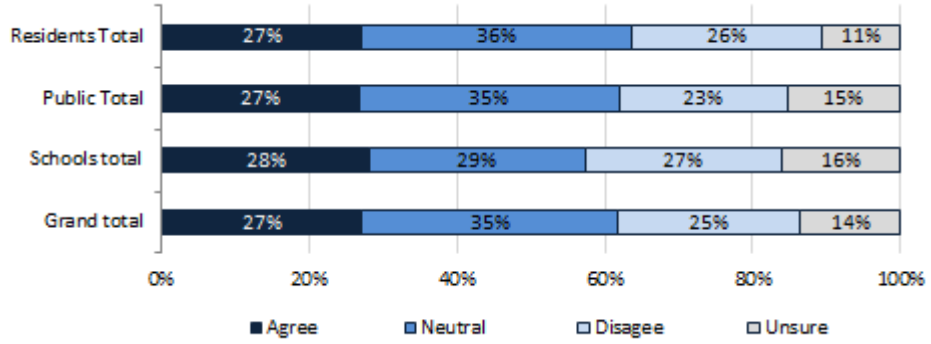


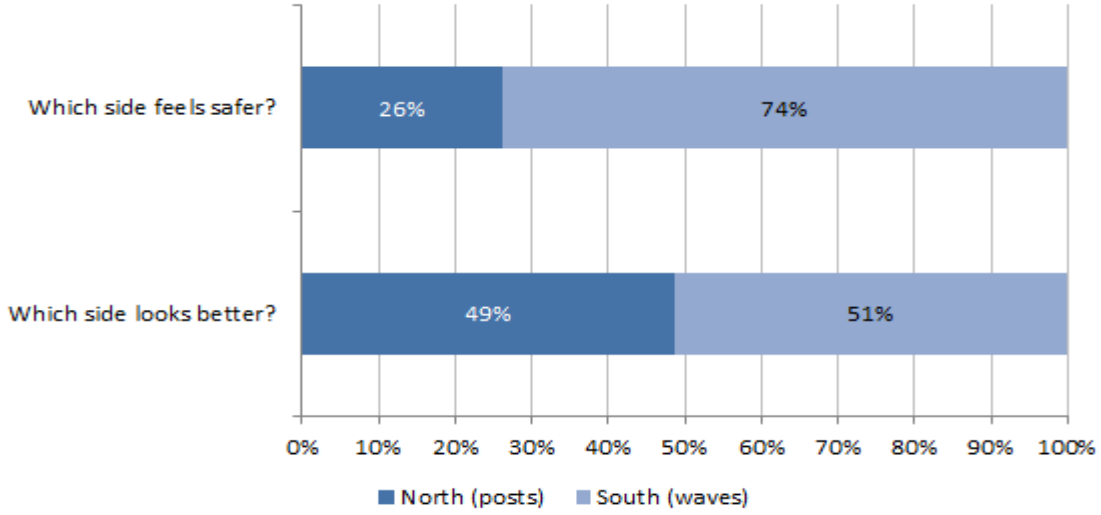
Figure 40: I feel that turning movements for people on bikes and e-scooters are more difficult as a result of the new layout





Overall, the south side, where on-street parking was removed and the white 'wave' delineators were in place, felt safer for a majority of people. Visually, there was almost no preference for either layout.

Figure 41: Comparison of the layouts on each side of Knights Road[2]



Overall, the perception of improvement in safety for journeys between Waterloo Station and Willoughby Street was most positive for journeys by bike (34% perceived the new layout had improved safety, and most negative for journeys by car (17% felt that the new layout had improved safety). For each statement, school community respondents were most likely to perceive an improvement and residents were the least likely.

[2] This question was asked at the launch event, and in the paper surveys for schools and for the general public.

Figure 42: I feel that the new layout has made it safer for people to walk between Waterloo Station & Willoughby Street

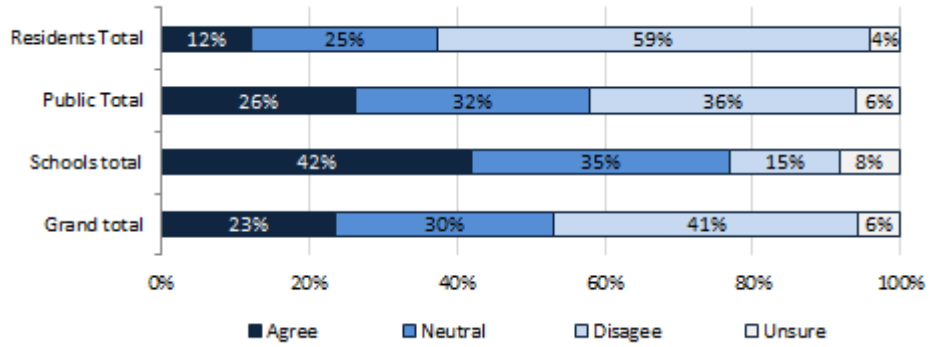


Figure 43: I feel that the new layout has made it safer for people to bike between Waterloo Station & Willoughby Street

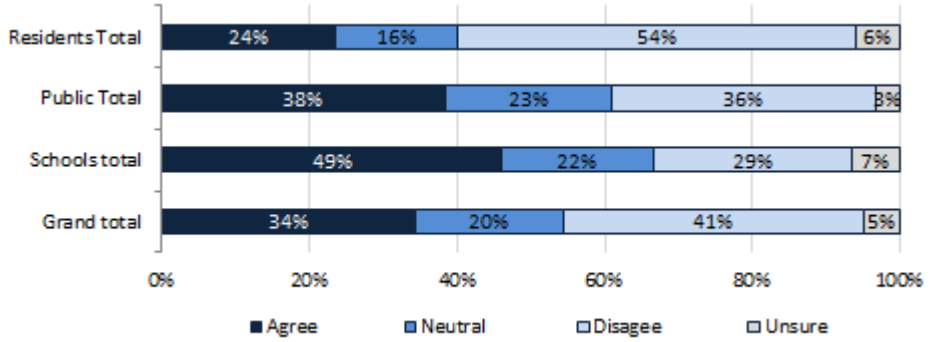
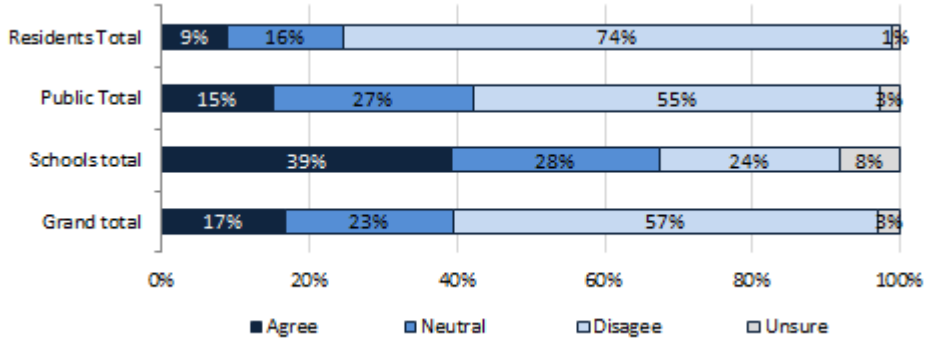


Figure 44: I feel that the new layout has made it safer for people to drive between Waterloo Station & Willoughby Street





A pop-up park at Birch Street opposite Waterloo Station was created using recycled and donated materials, and materials purchased from local stores. Artwork was created by MIX Art Centre, local artists and students from Hutt Intermediate and Sacred Heart College. The pop-up park was created as a result of community feedback collected during engagement in 2020, asking for seating, a physical site to stay informed about the project, art and native plants. In the surveys, we asked whether respondents would like to see the park stay in place after the end of the project (June 2021) and whether they would find a more formal noticeboard helpful (coreflute signage has been used so far).

A majority of survey respondents (59%) would like to see the pop-up park stay in place beyond June 2021 and 52% of respondents would find a noticeboard here useful.

Figure 45: Would you like the pop-up park to stay in place beyond June 2021?

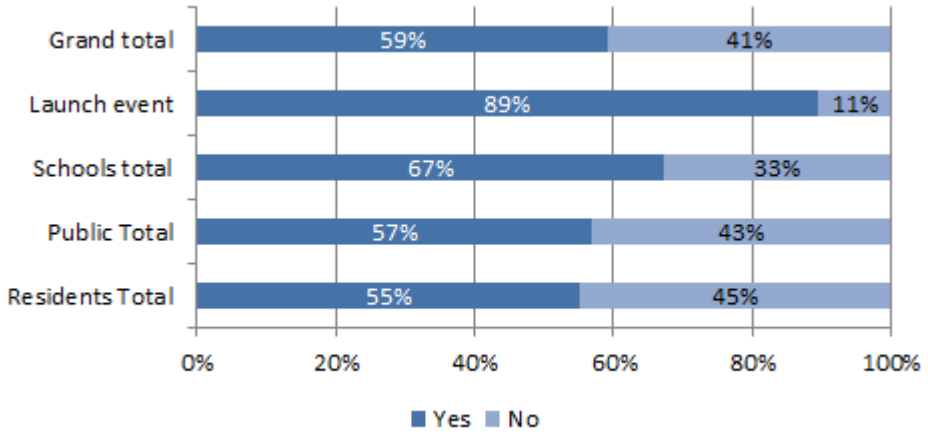


Figure 45: Would you find a more formal community noticeboard at the pop-up park useful?

