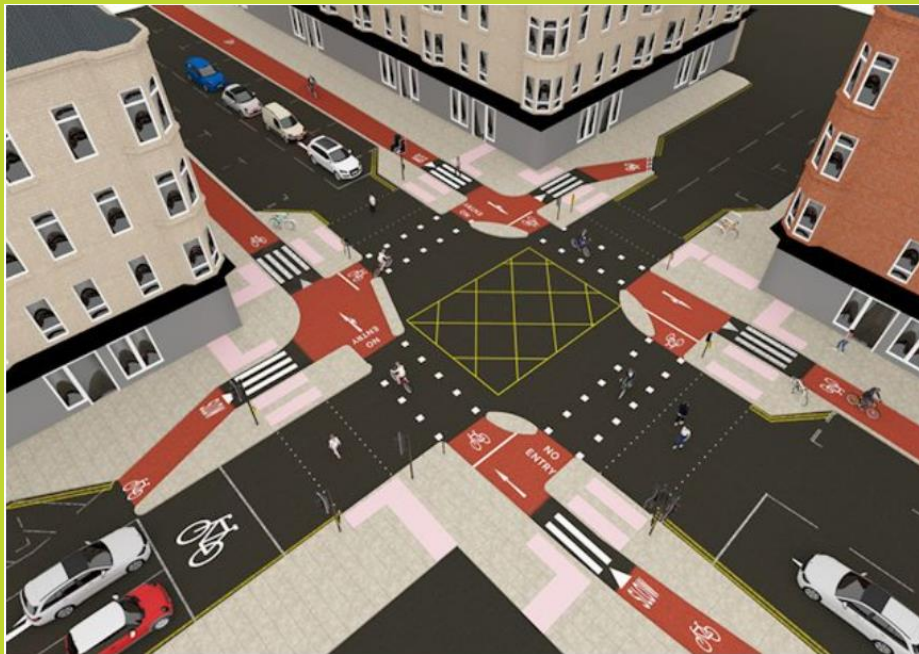


Glasgow South City Way

Protected junctions and their impact on user comfort and safety



28 April 2022

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Contents

Contents	2
Executive Summary	3
Introduction	5
Methodology	9
Findings	12
Video monitoring	12
Survey of junction users	19
Conclusion	25
The pedestrian experience	25
The cyclist experience	26
Looking to the future	27
Appendix A: Cyclist/Pedestrian interactions	29

Useful links

Link 1: <https://glasgow.gov.uk/index.aspx?articleid=25574>

Executive Summary

The Glasgow South City Way project aims to deliver a high quality active travel corridor from the heart of the South Side to Glasgow City Centre. Protected junctions are being trialled at two locations along the Victoria Road section of the project and are the first such junctions to be trialled in Scotland. A protected junction is a road junction designed so that people travelling on foot, by cycle, and in vehicles are all separated as they pass through the junction. The aim is to make the junctions safer for all road users, and particularly for people on cycles.

The study looked at the pedestrian and cyclist experiences at the two protected junctions. Monitoring took place before the junctions were introduced (baseline March 2019) and after the junctions had been given time to settle and for usage to bed-in (follow-up September 2021). The study included the following:

- Video footage was recorded at baseline and follow-up to count and analyse the behaviours of cyclists and pedestrians crossing at the junctions.
- Pedestrians and cyclists were surveyed at follow-up to find out about their experiences of using the new junctions.

The total cycle traffic through the junctions had almost doubled between March 2019 and September 2021. Meanwhile pedestrian traffic had changed much less (up slightly at one junction and down at the other). The protected junction appeared to be making the experience for cyclists and pedestrians a safe one, with all of the cyclists and two thirds of the pedestrians surveyed reporting feeling either safe or very safe when using the protected junctions.

Using the video footage we analysed the behaviour of pedestrians crossing at the junctions (for pause, jaywalking and diagonal crossing), however, we were not able to reliably analyse the interactions between cyclists and pedestrians. Combining the video footage analysis and the survey data together we were able to provide an overall picture of the user experience at the protected junctions.

For pedestrians, crossing at the protected junction is different from a standard junction as it involves crossing the cycleway first then crossing the road. The cycleway and road are under separate light controls so when it is safe to cross the cycleway it is not necessarily safe to cross the road. Video footage showed that pedestrian behaviour had changed between the pre and post intervention monitoring. At the protected junction fewer pedestrians were crossing on the diagonal and instead they were using the pedestrian path to cross each arm

of the junction separately. Jaywalking had increased suggesting pedestrians feel safer 'chancing it' by crossing when traffic can flow through the junction. This was confirmed on our site visit by the significantly shorter time it took to circulate the junction by jaywalking than by complying with the red/amber/green light controls.

Some pedestrians reported confusion with the crossing signs and the position of signals at the new junction layout. The survey responses raised concerns for the experience of vulnerable groups using the protected junctions, including the light controls not having sound for people with sight impairment, and trip hazards due to the differing level of path and road.

In the survey some pedestrians reported that they did not hear cyclists and cyclists were not using their bells. These negative reports of cyclist behaviour were supported by reports of cyclists ignoring red lights or not stopping and reports of cyclists travelling in the wrong direction. Furthermore, two pedestrians reported having been in a collision with cyclists.

Conclusion

The majority of **pedestrians** interviewed felt either safe or very safe using the junctions. The pedestrian experience involves crossing the cycleway and the road which is more complicated than before, but pedestrians are jaywalking suggesting they feel comfortable crossing at the junctions.

The survey evidence indicates that **cyclists** feel safe using the protected junctions and this is backed up by the large increase in the number of cyclists from pre to post intervention monitoring.

However, there were reports from the survey of cyclists not complying with 1-way flow and the red lights which brought them into conflict with pedestrians. This anecdotal evidence suggests that further work may be required to support the roll out of protected junctions, for example looking at education or measures to get cyclists to comply with the new layout.

Introduction

South City Way and protected junctions

The Glasgow South City Way (the SCW project) aims to deliver a high quality active travel corridor from the heart of the South Side to Glasgow City Centre enabling everyday journeys to be carried out in a sustainable manner.

Aims and objectives

The objectives of the SCW project are:

- Increasing modal shift helping achieve the Cycling Action Plan for Scotland vision of 10% of everyday trips made by bike by 2020;
- Creating a safer, convenient, seamless and segregated cycle route through the city;
- Connecting to and through major short trip generators;
- Supporting public transport as the first alternative to active travel;
- Improving the liveability of associated areas;
- Contributing to sustainable place-making, delivering high quality design projects and improving the urban realm whilst meeting the need and aspirations of the community;
- Integrating the needs of pedestrians.

Outcomes

The outcomes listed below will be evaluated for the SCW as a whole in the follow-up monitoring and evaluation. This report considers one piece of the new SCW infrastructure – the protected junctions – and looks at the impact that the junctions have had on the comfort and safety of pedestrians and cyclists.

Sustrans Scotland and Glasgow City Council have agreed on the following outcomes for overall SCW monitoring and evaluation. A separate baseline report addresses these outcomes at a project wide level:

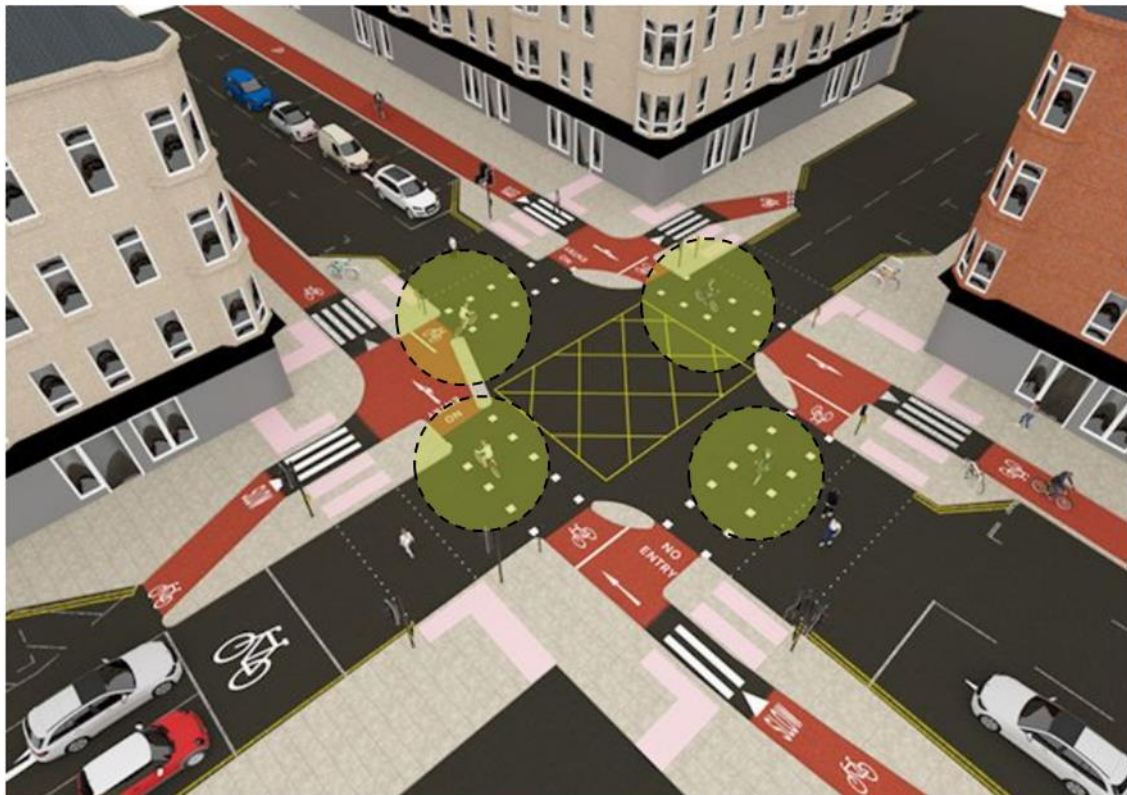
1. Increase in levels of active travel
2. Increase in level of purposeful trips made by walking and/or cycling
3. Improved reliability of public transport
4. Improved air quality
5. Improved quality of public realm
6. Increased economic vitality

Protected Junctions

A protected junction is a road junction designed so that people travelling on foot, by cycle, and in vehicles are all separated as they pass through the junction. The aim is to make the junctions safer for all road users, and particularly for people on cycles. Protected junctions are being trialled at two locations along the Victoria Road section of the SCW project and are the first such junctions to be trialled in Scotland¹.

Cyclists travelling along the SCW follow a segregated cycleway. At the protected junction cyclists remain on the segregated cycleway separated from other users including when turning left and turning right at the junction. The aim is to make the junctions safer for all road users, and particularly for people on cycles. Figure 1 shows a design for the protected junctions on Victoria Road. At both junctions the road crossing Victoria Road is 1-way to cars and cycles.

Figure 1: Cyclists using the protected cycleway to turn right at Allison Street junction



Source: Glasgow City Council

¹ Examples of protected junctions of different designs to Glasgow can be found in London and Manchester.

Figure 2 and Figure 3 show pictures taken during a site visit to the SCW in December 2021. They show a cyclist using the segregated cycle lane to turn right and pedestrians & cyclists waiting to cross at the junction with one pedestrian jaywalking.

Figure 2: Cyclist using the protected cycleway to turn right at Allison Street junction



Source: photo taken during site visit in December 2021

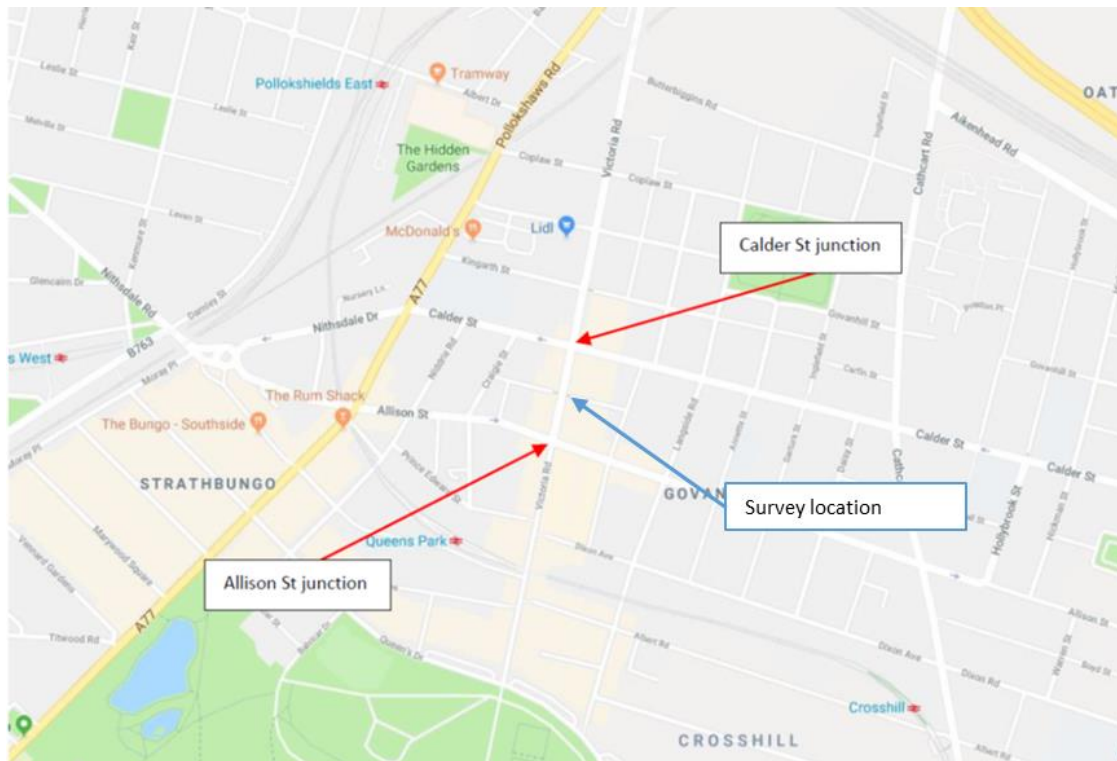
Figure 3: Pedestrians using the protected junction at Allison Street junction showing compliance (in background) and jaywalking (in foreground)



Source: photo taken during site visit in December 2021

Figure 4 below shows the locations of the two protected junctions where Victoria Road crosses Allison Street and Calder Street junctions. Video monitoring was carried out at both the junctions. The blue box is where a survey of pedestrians and cyclists was carried out.

Figure 4: Locations of the protected junctions at Allison Street and Calder Street junctions (arrows indicate the direction of the 1-way traffic crossing Victoria Road at the junction)



Methodology

Video Monitoring

Baseline video footage (ie pre intervention) was recorded during a week in March 2019 before construction work on the SCW project had begun. Follow-up video footage (ie post intervention) was recorded during a week in September 2021 approximately 9 months after the SCW Phase 3 section along Victoria Road was fully open. Cameras were installed at positions with a clear view of each of the junctions and footage was recorded from 07:00 to 19:00 hours.

The recorded footage was reviewed by Sustrans to produce an analysis brief for the survey company to analyse the footage. The analysis brief specified that the following measures should be recorded from the video footage:

- Pedestrian jaywalking
- Pedestrian crossing on the diagonal
- Pedestrian pause before crossing
- Cyclist group behaviour
- Whether cyclists cross the junction on cycleway, pelican crossing or road
- Interactions between cyclists and pedestrians
- Cyclists' use of high-vis clothing

Due to cost (analysis of footage is time consuming) footage from two hours of each day was analysed. Earlier counts of pedestrians and cyclists on the SCW route close to the junctions had established the peak and off-peak hours which were included in the analysis. The hours of footage analysed were:

- Weekday: peak 08:00 to 09:00, off-peak 11:00 to 12:00.
- Weekend: peak 13:00 to 14:00, off-peak 08:00 to 09:00.

A template was provided to the survey company to complete and return the results of the analysis. A sample of the results from the survey company were quality checked by Sustrans.

The video monitoring data for each junction was analysed in Excel. Data from pre and post intervention monitoring formed the basis of data tables which were analysed using pivot tables.

Survey of junction users

A survey of cyclists and pedestrians was carried out as part of the post intervention monitoring in September 2021. The survey was carried out on Victoria Road on the stretch between the two protected junctions and involved interviewing pedestrians and cyclists travelling along Victoria Road after they had crossed through one of the junctions. The survey was carried out in the same week that video footage was being recorded and covered four days - 15, 16, 18 and 19 September - two weekdays and two weekend days.

The survey asked the cyclists how safe they felt using the protected junction. It asked cyclists and pedestrians how safe they felt when walking on the junction and asked how much they agreed with a number of statements rating the safety of the junction, and how concerned they were on a number of safety issues. The survey also asked users how they changed their own behaviour at the junction to accommodate other users, and how they saw others changing their behaviour. The survey included a free text box for any other comments or suggestions about the junction.

The survey results were quality checked. The quantitative data was analysed using R, then graphed in Excel. Qualitative data from the free text responses was analysed to identify any key themes that emerged from the responses.

Limitations of study

Limitations of the survey and video data

The survey of users was carried out during the post intervention monitoring only so there was no baseline data for comparison.

The video footage was recorded at pre and post intervention monitoring. There were limitations with the data produced from the footage.

- The new layout meant pedestrians were crossing a cycleway and a road, almost as two separate crossings (when before there was just a single carriageway to cross). This meant there were more opportunities for a pedestrian to pause while crossing and so care was needed when comparing the pre and post counts of pause before crossing.
- The data grading the interactions between cyclists and pedestrians was inconsistent and no 'Precaution' interactions were recorded for Calder Street junction at baseline. The cycling/pedestrian interactions data has not been included in the main body of the report but for completeness has been included in Appendix A.

Limitations due to timing

The pre intervention monitoring took place in March 2019 and the post intervention monitoring took place in September 2021. For much of the two and a half years in between there had been restrictions in place for Covid-19 and this may have changed behaviours in addition to any changes brought about by the creation of the SCW and the protected junctions.

The volume and speed of vehicle traffic passing through the junctions may have changed and we are not able to attribute the changes observed between how much was due to reduced motor traffic and how much was due to the junction design.

The video footage analysis was planned to cover 7 days. However due to an unexpected road closure there was no meaningful data on the Sunday of pre intervention monitoring at Allison Street junction and therefore Sundays were excluded from our analysis.

The footage for pre intervention monitoring was recorded in March while the footage for post intervention monitoring was recorded in September which may have had an effect on behaviours such as use of hi-viz by cyclists.

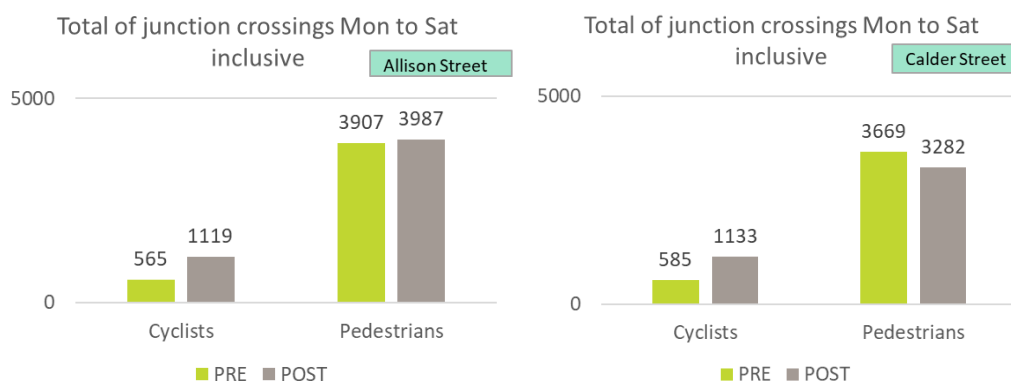
Findings

Video monitoring

Pedestrian and Cyclist Volumes

Figure 5 compares the total flows of pedestrians and cyclists at the two junctions for Monday through to Saturday of the pre and post intervention monitoring (Sundays are excluded due to missing data). The counts at Allison Street and Calder Street junctions were similar as the main traffic flow is along Victoria Road (see map in Figure 4). The counts of cyclists were very similar at Allison Street and Calder Street junctions and cyclist numbers almost doubled between pre and post. Pedestrian numbers at Allison Street junction were similar at pre and post, whilst at Calder Street junction pedestrian numbers fell.

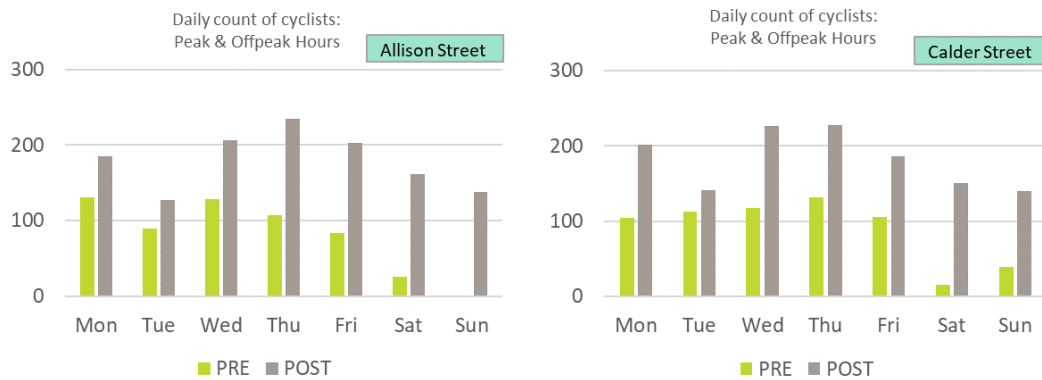
Figure 5: Crossings by cyclists and pedestrians (Monday to Saturday)



Crossings are total recorded during peak hour and offpeak hour over 6 days. Pre 12th to 18th March 2019 (excl. 17th); Post 13th to 18th September 2021

Figure 6 gives the daily count of cyclists at pre and post which shows an increase in the number of cyclists on all 7 days of the week. Cyclist numbers have increased significantly on weekends.

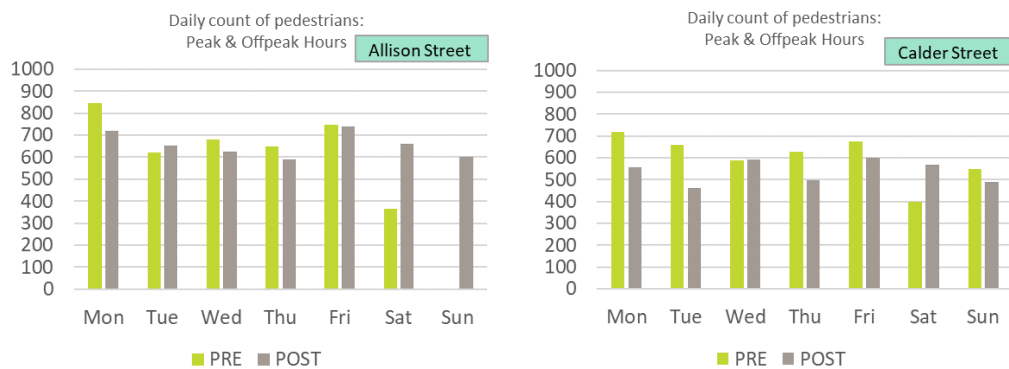
Figure 6: Daily count of cyclists (peak hour + off-peak hour)



Pre 12th to 18th March 2019; Post 13th to 19th September 2021

Figure 7 shows the daily count of pedestrians – typically around 500 to 700 on weekdays at both pre and post. Pedestrian numbers have increased on Saturday.

Figure 7: Daily count of pedestrians (peak hour + off-peak hour)



Pre 12th to 18th March 2019; Post 13th to 19th September 2021

The graphs for Allison Street junction shows that there was no data on the Sunday of pre intervention monitoring due to an unexpected road closure. For this reason Sunday has been excluded from the rest of our analysis.

Pedestrians crossing the junction

Video footage of pedestrians crossing the Allison Street and Calder Street junctions during the peak hour and offpeak hour comprised nearly 15,000 pedestrian crossings. The footage was analysed for three different pedestrian crossing behaviours:

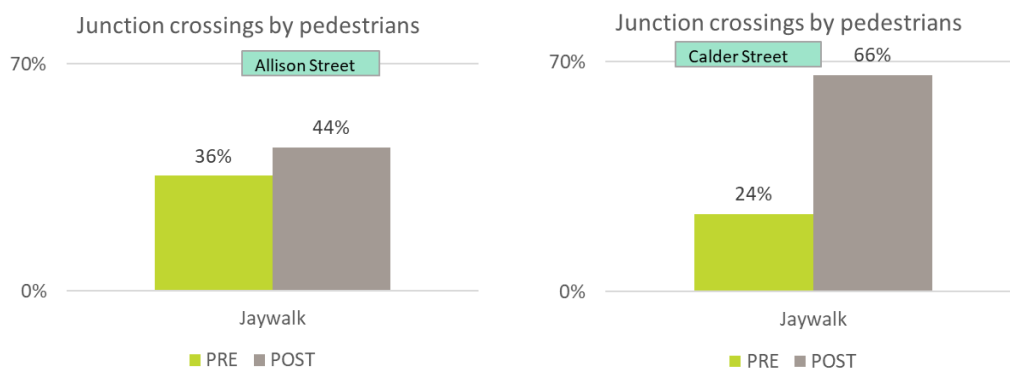
- **Jaywalking:** Do pedestrians start to cross the road when the pedestrian priority is on the 'all red' phase? (Pedestrian crossings of the junction arm carrying 1-way traffic *approaching* the junction were not included as there is minimal conflict with road users and this applies to both Allison Street and Calder Street junctions).
- **Crossing on the diagonal:** Do pedestrians cross in a straight line across each junction arm, or on a diagonal across the centre of the junction?
- **Pause before crossing:** Do pedestrians wait before crossing the road? If pedestrians come to a full stop when approaching the kerb they are recorded as pausing. If pedestrians slow down when approaching the kerb, carry on walking down the road to wait for a vehicle to pass, or cross the road without slowing they are recorded as not pausing.

Where the behaviour was observed for a group of pedestrians each individual pedestrian was recorded.

Jaywalking

As displayed in Figure 8, the percentage of pedestrians jaywalking increased between pre and post at both Allison Street junction (+8 percentage points) and Calder Street junction (+42 percentage points).

Figure 8: Pedestrian jaywalking (% of pre-crossings and % post-crossings)



Note: data excludes Sundays

One interpretation of this data is that the protected junction was making it feel safer for pedestrians to cross. However, jaywalking can also suggest that pedestrians are frustrated by the timings and stages of the junctions and therefore feel compelled to jaywalk rather than wait for the green man. There is anecdotal evidence of this from our own experiences on our site visit.

We tried crossing the Allison Street junction complying with the green man at all crossings. Travelling in a clockwise and anticlockwise direction around the junction it took 5 and 6 minutes respectively to complete one lap. It felt frustrating to be a pedestrian and the crossings had to be made on separate light changes as you just missed the green light on the connection. When we allowed jaywalking the times reduced significantly to 40 seconds and 60 seconds. It felt safe for an adult with no mobility impairments, but jaywalking would not feel safe if you were crossing with young children or had mobility impairments.

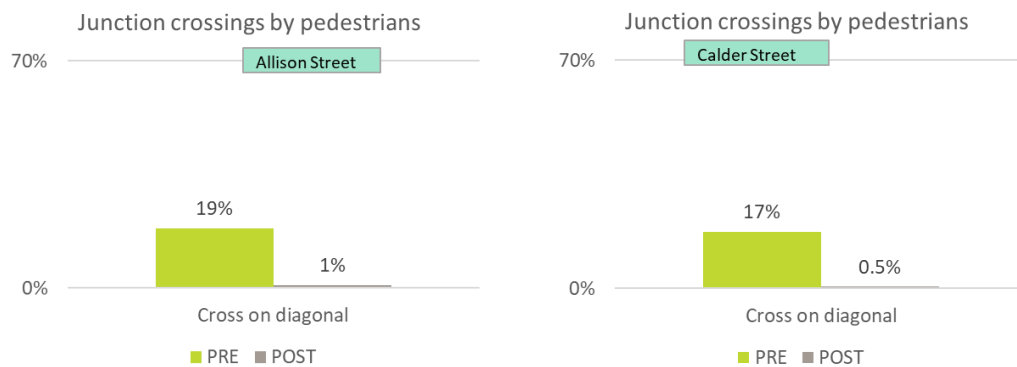
Junction staging and timings provided by Glasgow City Council indicated that it was taking 104 seconds for one lap with the all-green for 20 seconds in each cycle². A pedestrian arriving at the junction and only crossing on green will require between 3 and 4 full cycles of the lights to go once round, or roughly 300 to 400 seconds. This cross checks with the 5 to 6 minutes recorded on our field trip.

Crossing on the diagonal

If the protected junction was making it easier for pedestrians to cross each arm of the junction separately (circulate around the junction), we would expect to see diagonal crossings reduce. Figure 9 shows that diagonal crossings fell dramatically at Allison Street and Calder Street junctions. Taking the two junctions together diagonal crossings made up less than 1% of crossings at post intervention monitoring.

² Timings depend on the time of day. The numbers are based on mid-morning and assume pedestrian and cyclist traffic are activating the lights.

Figure 9: Pedestrian crossing on the diagonal (% of pre-crossings and % post-crossings)



Note: data excludes Sundays

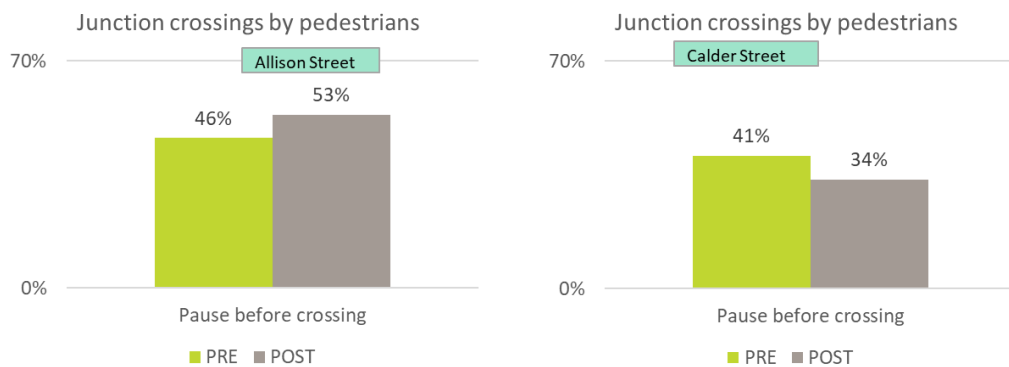
Crossing on the diagonal increases pedestrian's exposure to traffic and may suggest that they feel the roadway is safe enough to warrant tolerating the increased exposure. The steep decrease in diagonal crossings at both Allison Street and Calder Street junctions could suggest that pedestrians feel less safe in the roadway after the construction of the protected junctions, however anecdotal evidence from our field trip suggests that another factor may have contributed towards the decrease.

We tried crossing the junction on the diagonal one-way and back-again and it took around 2 minutes which is more than double the 50 to 60 seconds taken to circulate once round the junction with jaywalking. The speed and relative safety at which you can circulate the junction with jaywalking may mean that pedestrians are choosing to jaywalk rather than cross on the diagonal and this may explain the decrease in diagonal crossings from pre to post.

Pausing before crossing

As displayed in Figure 10, there was an increase in pedestrian pause before crossing at Allison Street (+7 percentage points) and a fall in pause before crossing at Calder Street (-7 percentage points).

Figure 10: Pedestrian pause before crossing (% of pre-crossings and % post-crossings)



Note: data excludes Sundays

We can see two opposing factors affecting the need for pedestrians to pause before crossing:

- The new junction layout requires pedestrians to cross a cycle lane first then a vehicle carriageway. The light control for vehicles was in opposite phase to the light control for cycles. This could lead to an **increase** in pause before crossing.
- Traffic through the junction now flowed through 2 lanes (instead of 4 lanes) calming the traffic flow and making it easier for the pedestrian to cross. This could lead to the pause before crossing to **reduce**.

On our site visit the junction at Calder Street junction felt more open with clearer visibility of other road users than the junction at Allison Street junction. This difference in the layout of the two junctions may contribute to the observed differences in pausing and jaywalking behaviour. The more that pedestrians jaywalk the less they will tend to pause before crossing (as they will not automatically stop when the light is red). We note that the **significant increase** seen in jaywalking at Calder Street junction (in Figure 8) is also consistent with the fall in pause before crossing at Calder Street junction seen above.

Cyclists crossing the junction

Video footage of cyclists crossing the Allison Street and Calder Street junctions during the peak hour and off-peak hour contained over 3,400 cyclist crossings which were included in the analysis. The footage was analysed for four different cyclist behaviours:

- Cyclist group behaviour
- Whether cyclists cross the junction on cycleway, pelican crossing or road

- Cyclists' use of high-viz clothing
- Interactions between cyclists and pedestrians

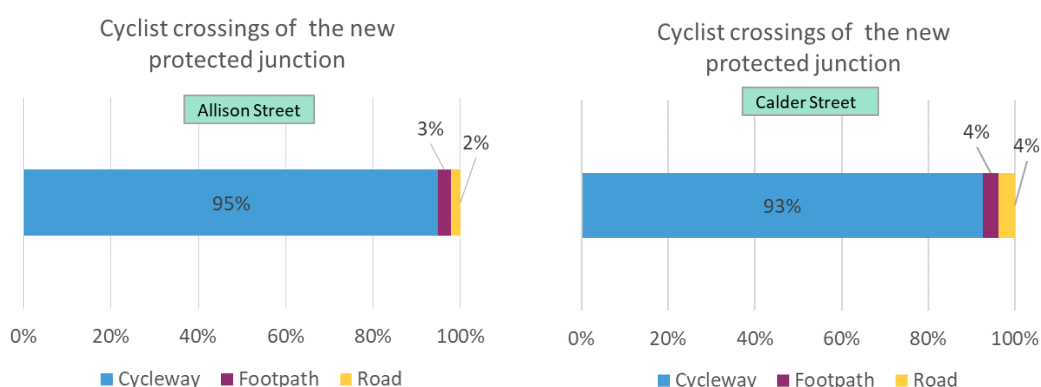
Cyclist group behaviour

When cyclists crossed in groups we counted the number in each group. The vast majority of crossings were made by individual cyclists with a small number of pairs. Less than ten crossings were recorded with a group size of 3 or more in the pre and the post intervention monitoring.

Whether cyclists cross the junction on cycleway, pelican crossing or road

The video footage recorded for post intervention monitoring showed that most cyclists followed the segregated cycleway through the protected junction as intended in the junction design (see Figure 11). Taking the two junctions together, around 3% of cyclists were using the main carriageway and around 3% were using the pathway to cross the junction.

Figure 11: Route taken by cyclists through the protected junction (% crossings at post)



We analysed whether cyclists were travelling side-by-side or single file through the junction. We found that 99.5% of cyclists were travelling single file through the protected junctions when previously (pre-intervention) 97% of cyclists had been single file. The segregated cycleway restricts the width making it more difficult for cyclists to travel side by side.

Cyclists' use of high-viz clothing

Around a quarter of cyclists at pre and at post were wearing hi-viz clothing.

Interactions between cyclists and pedestrians

The grading analysis of cyclist/pedestrian interactions in the footage was unsuccessful so has not been included in the main body of the report, but for completeness is included in Appendix A.

Survey of junction users

Profile of respondents

Post intervention, a total of 218 interviews were carried out with cyclists and pedestrians on the SCW close to the protected junctions at Allison Street and Calder Street junctions. Most of those interviewed had experienced the protection junction as walkers. The breakdown between walking and cycling is given in Table 1.

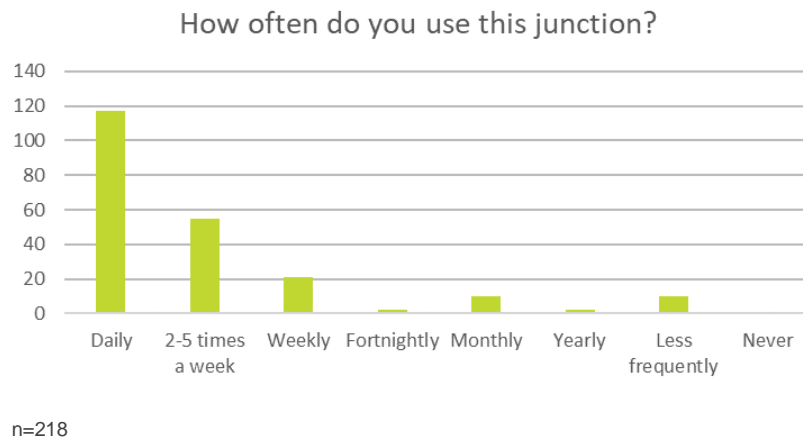
Table 1: Mode of transport experienced to access the protected junctions

Mode of transport to access junction	Count
Walking only	176
Cycling only	14
Walking and cycling	28
Total	218

Source: Survey results

The survey asked how frequently the user accessed the junction. Figure 12 shows that around half of those surveyed were using the junction daily, and around a quarter were using the junction between 2 to 5 times each week, indicating they had a considerable amount of experience of using the protected junctions.

Figure 12: How often do you access the protected junction?

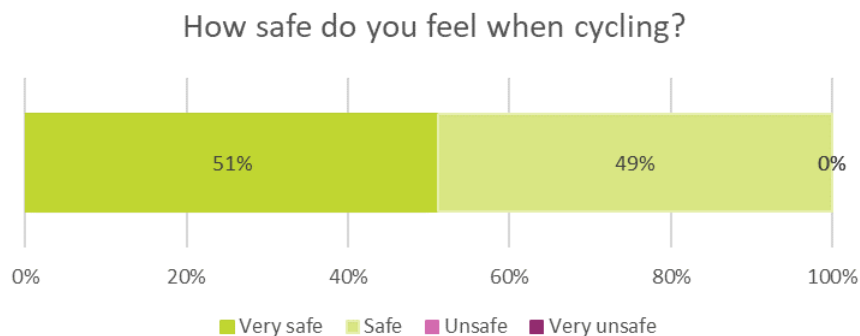


Survey results

Cycling safety

Respondents who had accessed the junctions by cycling were asked 'How safe do you feel when cycling on this junction?'. They were asked to grade safety on a four point scale from very safe to very unsafe. 100% of cyclists felt either very safe or safe using the protected junctions. No cyclists reported feeling unsafe using the junctions.

Figure 13: Survey: how safe to you feel when cycling?

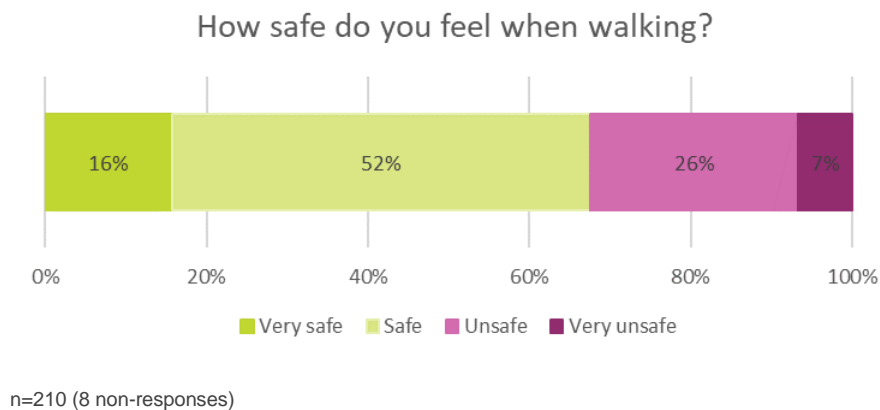


Includes respondents who had accessed the protected junctions by cycling, n=41 (1 non-response)

Walking safety

The survey asked users to rate 'How safe do you feel when walking on this junction?'. This question was asked to cyclists and pedestrians. 68% felt very safe or safe when walking at the junction.

Figure 14: Survey: how safe do you feel when walking?



Safety issues

The survey showed all users a list of safety issues and asked them to grade them as *major concern/ minor concern/ no concern*. The range of safety issues listed were a major concern for between 9% and 30% of those surveyed.

The safety issues of highest major concern were:

- 30% Speed of cyclists
- 29% Parked cars obstructing your route
- 28% Volume of motorised traffic

The safety issues of lowest major-concern were:

- 16% Volume of cyclists
- 15% Behaviour of pedestrians
- 9% Personal safety

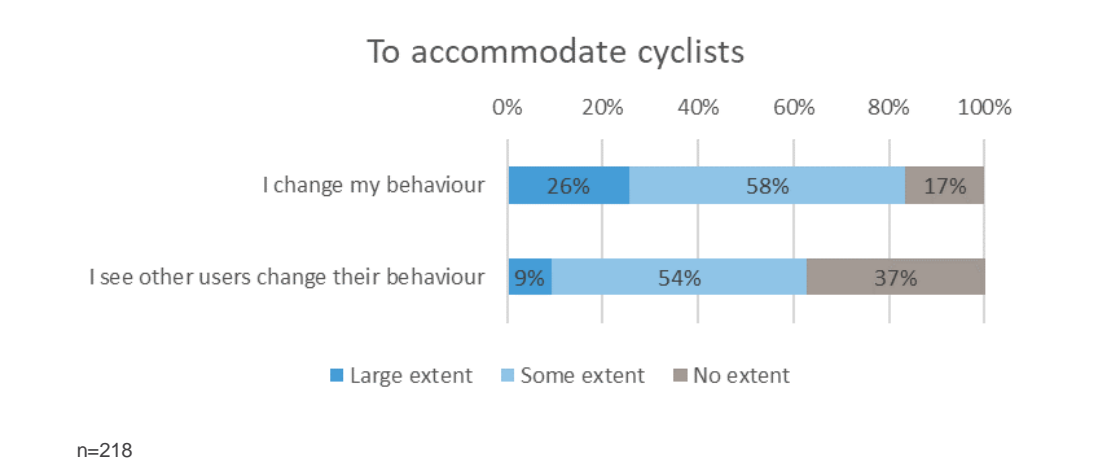
Changing behaviours to accommodate other users

The survey asked about changing behaviours – of the user themselves and as seen in other users – when using the protected junction. Respondents were asked to grade the change in

behaviour as *large extent/ some extent/ no extent* in response to accommodating each of the following types of user: pedestrians, cyclists, motorists and wheelchair users.

For all types of user the respondents perceived their own change in behaviour to be greater than that seen in other users. For example 84% of respondents perceived changing their behaviour to accommodate cyclists at the junction, while only 63% of respondents perceived others changing their behaviour. This is shown in Figure 15.

Figure 15: When using this junction, to what extent do behaviours change to accommodate cyclists?



The extent to which behaviours change to accommodate the different types of user are given in the Table 2. 'I change my behaviour to accommodate cyclists' is at the top of the list, while 'I change my behaviour to accommodate motorists' is at the bottom. Changes in behaviour to accommodate pedestrians and wheelchair users have similar scores.

Table 2: To accommodate other users: behaviours change by a large/some extent

To accommodate user	I change my behaviour	I see others change their behaviour
Cyclists	84%	63%
Pedestrians	79%	70%
Wheelchair users	79%	66%
Motorists	75%	58%

n=218

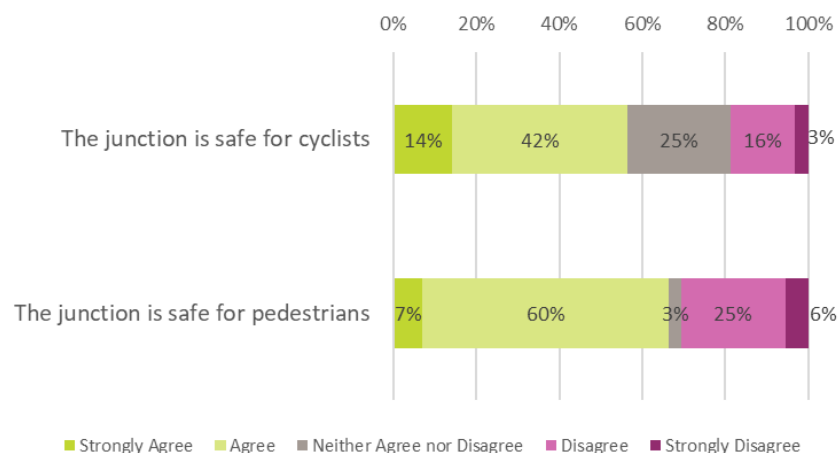
Statements about the protected junction

Respondents were asked about the extent to which they agreed with statements about the protected junction. They were asked to grade their agreement as *strongly agree/ agree/ neither agree nor disagree/ disagree/ strongly disagree*. The results are shown in the Figure 16.

67% of respondents strongly agreed or agreed with the statement 'The junction is safe for pedestrians', while 31% disagreed or strongly disagreed with this statement and only 3% of respondents were neutral.

56% of respondents strongly agreed or agreed that 'The junction is safe for cyclists'. This contrasts to cyclists own perception of safety where all 41 respondents (100%) reported feeling either safe or very safe when cycling on the junction (see Figure 13).

Figure 16: How much do you agree with the following statements about the protected junction?



n=218

Influence on choice of journey route

Survey respondents were asked 'Has the presence of the junction influenced your journey route today?' In total 28% reported that the junction had influenced their journey route to either a large extent or some extent; 72% reported it had no influence.

Qualitative analysis

The survey asked pedestrians 'If you feel unsafe/very unsafe please explain why' and this question received 60 comments. The survey also asked 'Are there any other comments or

suggestions you'd like to make about this junction' and this question received 110 comments. A qualitative analysis of the free text responses to these questions identified several themes.

1. Poor pedestrian experience – under this theme:
 - **2x pedestrians reported having been in a collision with cyclists, one of these was cycling through a red light.**
 - 31x reported confusion at new junction – with the new layout, lights, crossing signs
 - 13x reported signage needs to be improved – signs need to be more visible at a distance, lights for pedestrians need to be rotated, signal position for crossing, better signage required
 - 4x traffic lights system does not have sound for people with sight impairment, could be better designed for vulnerable groups
 - 2x trip hazard due to differing levels of path and road
2. Cyclist behaviour not compliant – comments included:
 - **18x reported cyclists travelling in wrong direction,**
 - **16x reported cyclists ignoring red light, or cyclists not stopping**
 - **7x reported cyclists on the pavement**
 - 6x speeding
 - 7x not using bells, aggressive behaviour towards pedestrians
3. Supportive of junction and new layout
 - 13x happy with design, more of this type
 - 3x very good, should be used as model for other programmes
4. Other (19 in total)
 - Bus journey taking longer, are lights taking longer to change?
 - Arrangements at LIDL junction causing confusion
 - Too much traffic, one lane for cars not enough
 - Cars speeding, cars badly parked
 - Tight turning at junction, corners too tight

Conclusion

The pedestrian experience

Pedestrian behaviour at the protected junctions

Video footage showed that pedestrian behaviour had changed between the pre and post intervention monitoring. At the protected junction fewer pedestrians were crossing on the diagonal and were instead sticking to the pedestrian path to cross each arm of the junction. Jaywalking had increased suggesting pedestrians feel safer 'chancing it' by crossing when traffic can flow through the junction. On our site visit it felt safe for an adult with no mobility impairments to jaywalk, but this may not feel safe if you were crossing with young children or had mobility impairments.

At the kerbside there was an increase in pedestrians pausing at Allison Street junction but a decrease in pausing at Calder Street junction. It is unclear why this would have been. The new junction layout required the pedestrian to cross the cycle lane then the road, where the light control for vehicles is in opposite phase to the light control for cycles, and this is likely to have increased the number of pedestrian pauses. However, if the new junction layout gave clearer visibility of oncoming traffic this should have reduced pedestrian pauses. On our site visit the junction at Calder Street junction felt more open which may have contributed to the decrease in pausing.

Perceptions of pedestrian safety

68% of pedestrians reported feeling very safe or safe when walking at the junction which is similar to the 67% of all respondents who strongly agreed or agreed with the statement 'The junction is safe for pedestrians'.

There was strong evidence that people were changing their behaviour to accommodate other users at the junctions. 84% of respondents perceived changing their own behaviour to accommodate cyclists at the junction; 79% to accommodate pedestrians; 79% to accommodate wheelchair users; and 75% perceived changing their behaviour to accommodate motorists. This suggests that the cyclist flows and behaviours are the greatest challenge for the pedestrian crossing at the protected junction.

The survey finding that over two thirds of pedestrians feel safe and that pedestrians are changing their behaviour to accommodate other users at the junction supports the high and increased level of jaywalking in the video analysis.

Some pedestrians reported confusion with the crossing signs and the position of signals at the new junction layout. Pedestrians reported that they did not hear cyclists and cyclists were not using their bells. Two pedestrians reported having been in a collision with cyclists and in one of these the cyclist was reported to have cycled through a red light.

Concerns for vulnerable groups

There were reports that the signs at the junction need to be more visible at a distance and that lights for pedestrians need to be rotated. Some reported that the lighting system does not have sound for people with sight impairment, and some reported trip hazards due to the differing level of path and road.

The cyclist experience

Cyclist behaviour at the protected junctions

The video analysis showed that 95% of cyclists were using the segregated cycleway to cross the protected junction, as was intended in the junction design. Taking the two junctions together around 3% of cyclists were crossing using the road and 3% of cyclists crossed using the footpath to cross at the junction (they may have been walking with their bike). The survey results support the video analysis, and both suggest that cyclists are comfortable using the new layout of the protected junction.

Among the 218 survey respondents, 7 reported cyclists on the pavement; 16 reported cyclists ignoring red lights or not stopping and 18 reported cyclists travelling in the wrong direction. Google street view shows a cyclist travelling the wrong direction down the cycle way to cross at the junction (Figure 17).

Figure 17: Cyclist crossing the protected junction at Allison Street junction travelling in the wrong direction down the cycleway



Source: google street view

Perceptions of cyclist safety

All 41 of the cyclists who responded to the survey reported feeling either very safe or safe when cycling at the junction indicating that the junction gives them protection from motorised vehicles. Meanwhile only 56% of all respondents (cyclists and pedestrians) strongly agreed or agreed with the statement that 'The junction is safe for cyclists'. This suggests that perceptions of cyclist safety are different from the perspectives of the cyclist and the pedestrian.

Looking to the future

As mentioned in the introduction the two projected junctions are the first of their kind in Scotland. The pedestrian and cyclist experiences at the protected junctions represent a change in priorities and is a different experience from crossing at a standard junction. The pedestrian experience involves crossing the cycleway and the road, which is more complicated than before, but pedestrians are jaywalking suggesting they feel comfortable crossing at the junctions. The survey evidence indicates that cyclists feel safe using the junctions and this is backed up by the large increase in the number of cyclists from pre to post intervention monitoring.

However, there were reports from the survey of cyclists not complying with 1-way flow and the red lights which brought them into conflict with pedestrians. This anecdotal evidence

suggests that further work may be required to support the roll out of protected junctions, for example looking at education or measures to encourage cyclists to comply with the new layout.

Two areas for potential further monitoring work are:

- i. A count of cyclists capturing the direction of cyclists travelling along the cycleway would be informative e.g. a pneumatic tube cycle counter could be installed temporarily on the cycleway.
- ii. Following up on potential concerns for the experience of vulnerable groups using the protected junction. This could be investigated further through accompanied walks e.g. a walking experience followed by a discussion.

Appendix A: Cyclist/Pedestrian interactions

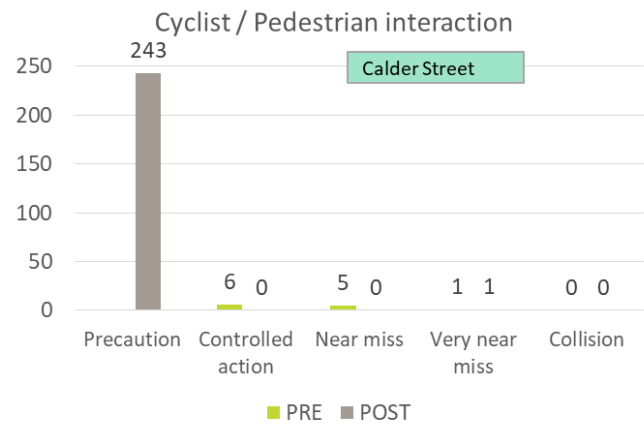
The video footage analysis rated interactions from a single camera angle and at quite a distance from the interactions. This made it difficult to grade the interactions between cyclists and pedestrians and for this reason the analysis has been excluded from the main report but for completeness has been included here as an appendix.

The interactions between cyclists and pedestrians that was recorded on the video footage were analysed according to a grading system:

- Precaution – pedestrian, or cyclist, markedly slowing down in the roadway in response to another cyclist or pedestrian requiring the same space;
- Controlled Action – pedestrian, or cyclist, changing their direction in response to another cyclist or pedestrian requiring the same space;
- Near Miss – pedestrian, or cyclist, rapidly slowing down, stopping or changing direction to avoid collision with another cyclist or pedestrian;
- Very Near Miss – pedestrian, or cyclist, using emergency braking or a violent swerve to avoid collision with another cyclist or pedestrian; and
- Collision – contact between a cyclist and a pedestrian.

Figure 18 gives the pre and post data at Calder Street junction. No 'Precaution' interactions were recorded at pre and this could be because it is hard to judge a precaution interaction. More severe interactions may be clearer but are infrequent with 13 interactions recorded at 'Controlled action' or more severe at Calder Street junction during the pre and post intervention monitoring. No 'Collisions' were recorded.

Figure 18: Cyclist/Pedestrian interactions at Calder Street junction



Pre n= 624; Post n= 1273. Includes data on Sundays.

The interactions data from Calder Street junction has no data on precaution interactions at pre intervention monitoring, and is missing data on higher grade interactions at post intervention monitoring. No interactions data was available for Allison Street junction at post. For these reasons the interactions data was unreliable and has not included in the analysis in the body of the report.