FINAL REPORT: BIKE ROUTE FEEDBACK

Group 9

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KIN 464

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1.0 Executive Summary

Since the 2010 Winter Olympic Games in Vancouver, health promotion of active transportation such as cycling has increased throughout the city with more funding allocated to improving existing bike lanes by making it more accessible for all ages and abilities (Chong, 2010). Our group wanted to observe three bike lanes in West Vancouver/Downtown Vancouver to determine if they comply with the standards of the City of Vancouver and cyclist through our own observations and surveys distributed to cyclists (City of Vancouver, 2016). Our observation took place on February 9th, 2018 of the three bike lanes; Cambie Bridge Shared path; Nelson Street between Richards and Homer; Richards Street between Smithe and Nelson. During our observations, we noted the differences between each bike lane and the different rules the bike routes adhere too according to the Transportation Design Guidelines (City of Vancouver 2017). A month after our initial observation on March 9th, 2018, we conducted short surveys to 15 cyclists (5 from each bike route) on the space of the bike lane, intersection safety, and bike lane surface quality. Majority of the scores were very positive and rated highly in their overall satisfaction towards each bike lane. With the Nelson Street and Richards Street bike lanes recently renovated, all of the participants of the survey responded with positive feedback. The Cambie Bridge Shared Path, however, our survey displayed cyclist dissatisfaction with adequate spacing.

The main concerns that bicyclists reported through the survey came from safety and spacing. Safety for cyclists is an important issue as they not only need to adapt to the weather conditions, they must also share the road with countless other cars. Therefore, recommendations were made through separate categories. The first category was being properly prepared; this is through using correct equipment and gear. The second category was more external which meant increasing the development of signage to warn, alert or update drivers, cyclists, pedestrians and so forth. Ultimately, the goal is to reduce collisions and accidents by ensuring that the public is completely aware of their surroundings, neighborhood, and environment.

Spacing is an issue that can transcend into a safety issue when there is a lack of organization or structure. Having local pathways being shared by multiple elements will create congestion and confusion. To prevent these events from occurring, signage and road work must be done. Distinguishing lines and areas permissible only for cyclists, cars, and pedestrians will help provide clarity. Signs to indicate which side the cyclists are on or if the road is unidirectional, bi-directional or shared and etc. will additionally aid the spacing situation.

2.0 Introduction & Literature Review

Cycling is a very space efficient source of transportation used today throughout the world (Zipf, 2018). Bike lanes have been identified to be an effective tool, which increases mobility and accessibility (Tucker et al., 2017). There are many health benefits to cycling as well as convenience, affordability, and equity (Zipf, 2018). Having designated bike routes throughout the city allows people with 'All Ages and Abilities (AAA)' such as families with children, seniors, hand cyclists, and people with mobility challenges to get from one destination to another (Zipf, 2018).

The City of Vancouver has created a transportation design guideline that provides 10 general rules to consider when designing bike routes for 'All Ages and Abilities (AAA)' (City of Vancouver, 2017). The 10 "general rules" include:

- Rule #1: Build the types of cycling facilities that feel comfortable for all;
- Rule #2: Target motor vehicle volume below 500/day (below 50/peak hour);
- Rule #3: Target motor vehicle speed below 30km/hr median (below 40km/hr 95th percentile); Rule #4: Consider the interplay between parking and roadway width: 8m (26ft) allows parking on one side/10m (33ft) allows parking on both sides;
- Rule #5: Design bike lane width for comfortable passing: 2.5m (8ft) unidirectional/3.0m (10ft) bidirectional;
- Rule #6: Provide adequate lighting along the entire length of the route;
- Rule #7: Create separate spaces for walking and cycling;
- Rule #8: Provide smooth and paved travel surfaces;
- Rule #9: Keep grades below 3% as much as possible;
- Rule #10: Design intersections thoughtfully and reduce conflicts, increase visibility and provide clear direction of movement (City of Vancouver, 2017).

In 2016, the City of Vancouver decided to design and upgrade bike lanes throughout Downtown, Vancouver (City of Vancouver, 2016). Implementing these bike lanes helped promote the Transportation 2040 Project (City of Vancouver, 2016). This project aims to support environmentally friendly of transportation for Vancouverites. In addition, introducing these bike lanes promotes bicycle use, increases roadway safety and improvements in public health (Kondo et al., 2017) The three designated bike routes that will be discussed in this project include the Cambie bridge shared path built in 1985, Nelson Street between Richards and Homer Street built in 2016, and Richards Street between Smithe and Nelson Street built in 2013. The purpose of this report is to examine and compare these bike routes through survey questions and observations. Furthermore, we are planning to see if there are adjustments that could be made to these routes to further improve them.

3.0 Methods

For our qualitative assessment of three bike routes, we have selected the Cambie Bridge Shared Path, Nelson between Richards and Homer, and Richards between Smithe and Nelson. The reasoning for the selection of these three bike routes is that they are relatively in the same vicinity with respect to each other. With them being in the same vicinity, the space limitation in Downtown Vancouver requires strategic design and consideration resulting in vastly different bike lanes. Our goal is to survey the cyclist who uses the bike routes and to determine if they are satisfied with space, comfortability, lighting, and ease of use. We want to observe these three bike routes because of how cars and cyclists may interact in dense traffic setting of Downtown Vancouver.

Our observation of these bike routes took place on February 9th, 2018. We intend to collect data through visual information and taking pictures for further analyzation. The survey of the bike lanes was on foot and began at the south side of the Cambie Bridge walking towards downtown to the Nelson Street between Richards and homer bike lane and then to the Richards Street between Smithe and Nelson bike lane. Our group collected data through visual observations of each of the bike route to determine which rules they adhere to according to The Transportation Design Guidelines of the City of Vancouver (2017). Once we have collected and analyzed the data, we plan to return to the bridge and conduct surveys on the users of the bridge (Appendix A). We will collect information from 5 cyclists on each bicycle lane as well as have them complete our consent form. The survey consists of 3 questions regarding space, safety through intersections and the riding surface. After the surveys are completed our group will compare and analyze the data for the three bike routes.

3.1 Observations - Cambie Bridge

The present Cambie Bridge is the third installment, which was built in 1985 to replace the out-dated Cambie Bridge prior to the beginning of Expo 86 in Vancouver (Griffin, 2015). The Cambie Bridge is a 6-lane roadway that runs north connecting central Vancouver with Downtown Vancouver. The Cambie Bridge shared path is proven to be an important route for commuters as the usage of the shared path continues to increase annually as a result more individuals who decide to choose active transportation and the growing population in Vancouver (LaClaire, 2018).

Our observation began at 10:45 am on February 9th, 2018 beginning on West 2nd Ave. Before stepping on the shared path, we noticed that the Olympic Village Skytrain Station is east of the bridge. The first intersection traffic lights are controlled by pedestrians and cyclist. Walking up the shared pathway, we also noticed that there is a steep incline that may be challenging and a pedestrian-only walkway located on the opposite side. As we continued towards downtown, we noticed multiple street signs for pedestrians and cyclists as well as signs painted on the pavement. Additionally, we noticed that there is an abundance of streetlights on the pathway. At the northern side of the bridge sits a Shaw bike share station and the intersection is also pedestrian/cyclist controlled.

3.1.1 Rules - Cambie Bridge

During our visual observation of the Cambie Bridge shared path, we noticed that the width of the shared path greatly exceeds 3 meters which allow for comfortable bidirectional passing (Rule 5) (LaClaire, 2018). The wider shared path allows a high capacity of individuals to use this route during busier hours and after events. In addition, there are no overhanging structures or trees that would obstruct the natural lighting, while the streetlights and the shared path light provide abundant and adequate lighting along its entire length (Rule 6). Furthermore, the surface of the Cambie Bridge shared path is comprised of asphalt which provides a smooth ride and does not have any large imperfections that will impair the safety of the pedestrian and the cyclists (Rule 8).

3.2 Observations - Nelson Street

The location of Nelson Street, between Richards and Homer Street is very congested and is considered a busy street regardless when traveling during day or night time. By commuting through Nelson Street, you are able to access main attraction areas in Vancouver, which include BC Place, Rogers Arena, Yaletown, and other popular streets such as Granville, Burrard, and

Robson. Therefore, with these main attractions being accessible through bike lanes, the bike lane between Richards and Homer must be adequate and safe for pedestrians who choose to access them.

For the observation of the bike lane on Nelson, between Richards and Homer Street we arrived from the Cambie Bridge to Richards Street by 11:15 am. We chose this time in hope of gathering data from those who are going for lunch, work, or a leisurely bike ride as the weather started to clear up in the afternoon. An interesting feature about the bike lane on Nelson is that it has a rent – a – bike station sponsored by Shaw. By acquiring a membership, it allows you to be able to pick up a bike at any Shaw Go location and return it back to any Shaw Go location when finished. With Nelson Street being a very busy area for commuters, having a station here makes sense to help reduce traffic congestion, save people's time and money, while also trying to protect the environment. The accessibility of rent-a-bike stations is also an astounding idea to promote active living and health promoting.

3.2.1 Rules - Nelson Street

The busy Nelson street bike route has separate spaces for walking and cycling (Rule 7). This bike lane is protected by a median divider that creates a comfortable space for the rider which can reduce collisions with cars (City of Vancouver, 2017). Additionally, the one-way direction of the traffic and the bike lane results in a smooth transition through the intersection. This greatly helps to reduce conflicts while also increases visibility to provide clear direction of movement (Rule 10). Signage and green coloured paint on the ground in conflict zones such as alleys and intersections increases the safety of the individuals. The cyclist has the right of way on this street with many signs stating, "yield to bicycles". From our visual observations, the unidirectional flow of cyclist in the lane has at least 2.5 meters which allow for comfortable passing (Rule 5). The width of this bike lane is optimal width for multi-group cycling and those who chose other forms of active transportation.

3.3 Observations - Richard Street

The bike lane on Richards between Smithe and Nelson is located towards the center of Vancouver downtown business district making it very accessible for Vancouverites to commute around the city. This bike lane is also close to popular and recognizable Vancouver sites of downtown such as the Vancouver Public Library, the Orpheum theatre and BC Place.

We arrived at Richards Street between Smithe and Nelson at 11:35 AM to begin our observations. We noticed that this is in a busy area with many cars and cyclist passing through this street. According to the City of Vancouver from 2008 to 2011 alone, transportation in this bike lane, has increased by 40% and it continues to increase (2017). We noticed that there are a lot of street signs enforcing cars to "yield to bicycles". Additionally, we observed that there was a lot of branches from trees overhanging the street which could become a foreseeable nuisance that can disrupt the smoothness of the road or block natural sunlight.

3.3.1 Rules - Richard Street

From our observations, our group noticed that this bike lane has separate spaces for walking and cycling (Rule 7). The parking spaces for the cars are adjacent to the bike lane protecting the cyclist from traffic. By having a separate walking and cycling space it will reduce the chance of a collision or an unexpected accident. This choice of action will further provide a sense of protection and safety to cyclists and walking pedestrians while they are on their

commute. Furthermore, the Richards bike lane provides a smooth and paved travel surface for the cyclists (Rule 8). We determined that the surface of the bike lane's smooth asphalt results in a safe, consistent and comfortable ride. Lastly, we also concluded that the intersection on both sides of this street is thoughtfully designed to reduce road conflicts and to increase visibility (Rule 10). Just like the Nelson Street bike lane, there are yield signs, painted signs and green paint on the asphalt in conflict zones that greatly increases the safety of the cyclists. The one-way direction of Richards Street also allows the cyclist to feel safer due to the cyclist not having to worry about oncoming traffic. Overall, the visibility, awareness, and declaring who has the right of way are all factors that increase the safeness of cyclists.

4.0 Limitations - Cambie Bridge

The Optimal width (Rule 5), adequate lighting (Rule 6) and smooth and paved travel surfaces (Rule 8) are able to make the Cambie Bridge a great route for commuting or an enjoyable recreational bike ride. However, it also has its limitations. Having a shared space for pedestrians and cyclists can bring upon communication errors as well as create a loss of comfortability when there are more people in the shared space. With the shared path being on a bridge, the steeper gradient may cause difficulty for novice riders, young children and seniors (City of Vancouver, 2017). On the shared path, there is no signage that displays the degrees of the gradient in the sections that is unable to follow the recommended gradient of 3% or lower.

4.1 Limitations - Nelson Street

In relation to the Cambie Bridge, a major limitation of the specific street section of Nelson between Homer and Richards is that it is on a steep hill. Although there is an arrow indicating that this bike lane is a one-way direction heading downhill (City of Vancouver 2017), the user of this lane may face challenges such as the narrowing of this lane at the end due to a dedicated right turn lane for cars. The narrowing of the lane could cause space conflict and the hill may make it difficult for a cyclist to slow down as only one cyclist may enter at a time, this can increase the chance that two riders can collide or make it a hazard for pedestrians on the sidewalks. The faster speeds may result in communication errors from the divers and cyclist in the conflict zones.

4.2 Limitations - Richards Street

Furthermore, a specific limitation to Richards between Smithe and Nelson is by being a one-way street, the protected bike lane itself is a unidirectional bike lane, and is a narrow lane to pass due to being between the parking lane and the sidewalk. There is a higher risk of collisions while passing other cyclists or cycling side by side with a friend, as it can be a challenge to try to avoid others.

5.0 Results and Findings

Our group decided to complete our surveys one month after our initial observation on March 9th, 2018 due to the weather conditions being similar. We also conducted our surveys at the same time as the initial observations to keep consistency.

5.1 Cambie Bridge
Table 1:

Question	1	2	3
Cyclist 1	No	10	Yes
Cyclist 2	No	10	Yes
Cyclist 3	No	10	Yes
Cyclist 4	Yes	10	Yes
Cyclist 5	No	10	Yes

We gathered information on the Cambie Bridge between 10:45 am – 11:15 am. A short series of questions were asked to random cyclists. The first question being asked, 'with the space provided for the bike lane, do you think the space is adequate and safe for cycling?' Yes or No. Based on the feedback received from the survey, only one out of the five respondents believed that there is an adequate amount of space for safe cycling on the Cambie Bridge. The other four respondents thought the opposite and are clearly displeased with the spacing of the shared path bridge. Although this bicycle lane is wider than most, this shared path with pedestrians can be troublesome which is possible for why cyclists vouched for the Cambie bridge lacking the adequate amount of space need to provide general safety.

Question two provided further insight into the cyclists' perspective of how safe they felt when it came to cycling on the shared path bridge. The participating cyclists were asked on a 1-10 scale, with 1 being the worse score for safety and 10 being the best for their safety. Potentially due to the fact that there are no intersections on the bridge and there are dividers separating the cars and the path, all five survey participants answered with 10's across the board. Although our sample size is small, the Cambie Bridge is a bicycle lane that enters its way into or out of the busy streets of downtown Vancouver. Therefore, this shared bicycle lane does avoid the conflict of motor vehicles, busy intersections and a large amount of possibly confusing traffic signs. It can be foreshadowed that other cyclists may feel similarly the same way on the 1-10 scale.

Our final survey question had yet another yes or no answer question in terms of the roads level of smoothness to provide a comfortable ride. All five of the cyclists who partook in the survey answered with yes. Therefore, in the public's eyes and mind, the Cambie Bridge bicycle lane does have a smooth surface for cyclists to ride their bike on comfortably.

In conclusion, after gathering information from observations and survey's it can be supported that the Cambie Bridge shared path is excellent in terms of safety and surface smoothness but the spacing requires further work.

5.2 Nelson Street
Table 2:

Question	1	2	3
Cyclist 1	Yes	10	Yes
Cyclist 2	Yes	10	Yes
Cyclist 3	Yes	9	Yes
Cyclist 4	Yes	10	Yes
Cyclist 5	Yes	8	Yes

We conducted our survey of the Nelson Street between Richards and Homer bike lane at 11:15 am – 11:35 am. A group of 5 cyclists was asked to be participants in our survey. In which this survey consisted of 3 questions which provided us additional external information in terms of the population's thoughts on this bicycle lane's safety, spacing, and comfort. The results are shown in Table 2 and the Nelson street bicycle lane came out overwhelmingly positive. All the participants who volunteered answered with high satisfaction.

Despite the small sample size, all the cyclists who volunteered to be a part of the survey had high praises about the bicycle lane on Nelson Street. Question 1 was a yes or no answer that questioned the cyclist on whether he or she believed that the Nelson Street bicycle lane had enough space sufficient for cyclists to comfortably ride together and if with the space given, is it safe? Five out of the five cyclists who did the survey all said yes. Which further implies that they all believe that this bicycle lane has enough space and is safe enough for riders to go on.

Question 2 gave further information in terms of safety through a 1-10 scale question. The question asked the cycling participant how safe does he or she feel when riding through the busy intersections of this downtown environment when they are on Nelson Street. With 1 being the worst score of not feeling safe at all to 10 being the best score of feeling very safe, the results, in the end, had all participants scoring 8 and above. Out of the five people in our sample, three answered with a score of 10 and the other two respondents answered with a 9 and an 8 respectively. Although not every participant answered with a 10 for safety, the mean of the scores results in 9.4 which could be looked at as 94%. That is still a high percentage of cyclists who feel very safe when riding on Nelson Street.

Lastly, question 3 targeted the comfort of the cyclists had when they were cycling on the bicycle lane. The question asks the cycler if they believe that the road surface was smooth enough to ride on and they could answer with a yes or a no. Five out of the five cyclists answered with a yes. All the survey respondents agreed that the Nelson street bicycle lane had a smooth and even surface to ride on.

Based on the results provided by the public, it is supported that the Nelson Street bicycle lane is a highly spacious, comfortable and safe pathway to cycle.

5.3 Richards Street
Table 3

Question	1	2	3
Cyclist 1	Yes	9	Yes
Cyclist 2	Yes	10	Yes
Cyclist 3	Yes	8	Yes
Cyclist 4	Yes	9	Yes
Cyclist 5	Yes	9	Yes

We conducted our short surveys at 11:35 am on March 9, 2018. Following the same design of surveying five cyclists, we asked them the same questions about spacing, safety, and comfort that also corresponded with the city of Vancouver's guidelines. The Richards Street bicycle lane can be found in one of downtown Vancouver's busier locations, however, the results that were gathered afterward showed that despite how busy or chaotic it may get downtown, cyclists still felt a very good sense of satisfaction in all aspects. After the completion of question one, the outcome showed us that all five cyclists believed that the Richards bicycle lane does have an adequate amount of spacing to provide a safe ride. The Richards bicycle lane is applicable to rule #7 in the 'Transportation Design Guidelines' which is to create separate spaces for walking and cycling. This definitely helps provide extra space and comfort for the cyclists as they know pedestrians and motor vehicles will have their own pathway that won't conflict theirs.

Following up is question 2 which provides extra information on the cyclist's thoughts about their safety when cycling down this busy neighborhood road. The answers were on a scale of 1-10 and the results came back with every cyclist scoring at least 8 or above. One out of the five answered with an 8, the other three answered with a 9 and the last participant gave the Richards bicycle lane a 10. The mean of the scores for question two is 9.0 which could be represented as 90%. Therefore, even though not all the scores are at a 10 for the level of safety, the sample size's average is still at an extremely high level for such a busy street downtown.

The final question from the survey, identical from the Cambie Bridge and Nelson Street survey asked the five cyclists about their perspective of their evenness of the surface to provide a comfortable bike ride. The answer could be answered with either a yes or a no and the final results ultimately had all five respondents agree that the surface of the Richards bicycle lane is even and smooth enough to provide a comfortable ride for cyclists. Thus, concluding that 100% of our sample size sides with Richards being even and smooth to enhance personal comfort.

Based off of the results from our survey and our observations, it can be supported that the bike lane on Richards between Smithe and Nelson is a comfortable, safe and spacious bicycle lane that can provide a pleasurable and convenient experience for all cyclists.

6.0 Discussion

6.1 Cambie Bridge

According to our findings, the data suggest that there are differences between the three bike routes. With the Cambie bridge being a shared path compared to Nelson Street and Richards Street being dedicated bike lanes, the results from our survey show that the space of the shared path is not adequate for the cyclist. Although the shared path follows the adequate width of more than 3 meters (Rule 5), the bidirectional traffic of cyclist and pedestrians as well a no dividers to separate the pedestrian and cyclists may result in the majority of the surveyed individuals to feel uncomfortable. Our current survey findings showed that the Cambie Shared Path did not meet the participant's standards of adequate space and safety and ranked this lane the worse out of the three routes. This route can be challenging to a cyclist who rides in groups during busier hours. Our results regarding the intersections and surface showed that there are no complaints. On both the northern and southern side, there is pedestrian/cyclist controlled traffic lights which enable the users to safely cross without the fear of traffic. The Cambie shared path survey results also included positive feedback to the surface and ride quality. The ride quality may be excellent but there could be a few challenges regarding the incline of the bridge. The connection of the shared path with the bridge is subjected to inclines that may be difficult for novice cyclists, children, and elderly riders. We can conclude that our observations and survey results fall in line with the considerations of improvements and has plans to construct an addition shared path bike lane on the southbound side (Luymes, 2018). The additional bike route on the southbound side can alleviate the congestion that some riders experience and to also provide a better experience for the users.

6.2 Nelson Street

Nelson between Richards and Homer had also very positive reviews when it came to adequate spacing. This street is very residential and has apartments and high rises all along the street, with many people living in this area there are many ways of protecting people walking and biking. This bike lane does not have a built-in the barrier, however, there is about a 2-foot drawn on the asphalt barrier which allows cars to park beside as well. This provides safety as cars are not speeding by the bicyclists, but biking besides parked cars which do not move. With a painted HOV sign on the ground as well, this indicates that there is enough space for more than one bicyclist as well. The crosswalks protect the bicyclists as they have their own green painted lane to bike on to cross the street, which separates themselves from walking pedestrians. This green strip has a white painted bicycle on it as well, showing that this lane is meant for bicycle usage and it is wide enough (3m) to protect bikers from turning cars.
There were also high votes for the safety of crossing the street in the intersections of this street. With another designated bike lane used to cross the street, there is a higher chance of safety from both cars and pedestrians.

6.3 Richard Street

The bike route on Richards between Smithe and Nelson Street had very positive results when it came to having adequate space. The positive feedback may be due to the separated bike lane with a barrier protecting the cyclists from the traffic. However, because it is a one-way biking lane that flows downhill, there is not much inflow of traffic on this street resulting in a sufficient amount of space for one cyclist to go down. The positive survey results may be due to the sufficient number of signs painted on the surface of the route and adjacent to the bike lane

which indicates that cyclist has the right of way. Additionally, specified signs indicate that motor vehicles must yield to the cyclist and must not obstruct the intersection and a highly visible sign that indicates the narrowing of the bike lanes for the right turn of traffic. There were also positive outcomes when it came to the smoothness of the road. With the bike lane being made of asphalt, with no bumps or loose gravel, this bike lane is smooth and easy to ride on for many different ages with ease. This street is very open and congests a lot of traffic, and with the street lights placed all along this street, there should be no problems of having to dodge loose debris on the road or indicating the signs in the late night or early mornings.

7.0 Limitations

Although there was very insightful and intriguing information from all of the individuals who chose to participate in our study, there are some challenges and limitations that must be discussed if we were to further our research in this field of study. A factor that could potentially skew our information is a sample size of individuals participating in the survey. The benefit of having a larger sample size is that we can generalize the survey information that was collected, to a larger population rather than just off of 5 surveys per location. Out of the 15 people who we questioned, only two of those individuals were women. There was a very high number of male cyclists in the afternoon, leading to potential biases on opinions. In the future, it could be optimal to have more variability in the demographics of gender to possibly have different opinions about the bike lanes. Moreover, the weather could have influenced the survey results. It rained in the morning, and in the afternoon, it did not clear up as the rest of the day was cloudy. There can potentially be a lack of cyclists in comparison to if the weather was a sunnier day. Choosing to go out on a better conditioned day could have been better as more cyclists would have traveled through the lanes and we would have been able to obtain more opinions on Vancouver bike lanes. To further get more insight of opinion through Vancouver cyclists, ask the cyclists more open-ended questions. Have your surveys be qualitative, allowing for the cyclists to display their displeasures or their happiness towards the bike lanes.

8.0 Recommendations

There are quite a few strategies that can be administered to better protect and promote the safety of cyclists. In our study design findings, most survey respondents answered with a score of 8 or above out of 10 in terms of their safety at intersections. In addition to that result, the respondents also believed that the three observed bicycle lanes all had even surfaces that were smooth enough to provide a comfortable ride for the cyclists. However, some results returning back from the sample population yielded that adequate space for safe riding was an issue. Despite most of those that were displeased with the spacing came from the Cambie Bridge participants, it still highlights the potential issues and irritations that cyclists feel when they go out for their ride. Due to the reason that no participant placed a complaint or disagreed with the smoothness and the comfort of the road surface, no recommendations will be made for that aspect. Ultimately, the main concerns that could be better improved are safety and spacing.

To improve the safety of cyclists in the city and protect them from collisions or accidents, there can be two categories that can help. The first category is more internal; it is what the cyclist can do for themselves which is wearing a helmet, wearing reflective gear, have bright blinking lights on their bicycle and equipping a bell or horn. By preparing yourself with the right gear and equipment drivers and pedestrians can easily identify that there is a cyclist on the road.The second category is more external; it is what is being done outside of the cycler’s power to better

protect them. Implementing more road signs to provide more warning and caution to the population that there are active cyclists on the road as well. While increasing the amount of warning/caution signs, there must be a balance that needs to be kept to avoid distracting drivers as well as confusing them too. Road signs that would be beneficial include but not limited to are:

- Bicycle crosswalk lights/sign
- Incoming busy intersections
- Shared road signs or full lane signs
- Hill incline/decline %
- Whose right of way – Yield signs
- Bicycles (right, left or straight) only

The use and presence of these few signs are just examples of how to better provide information and warnings to everyone around the area. There will be more direction for drivers, cyclists, and pedestrians so hopefully, fewer people will be commuting around confused.

Recommendations to fix spacing concerns will first be to split the confusion between pedestrians and cyclists. Create a painted line just like in Stanley Park to divide the pathway between pedestrians and bicycle riders. Although the space will be divided into two, cyclists will know that they have a certain lane to themselves. If a line cannot be painted, signs should be put up to indicate to pedestrians stay right and cyclers stay left or vice versa. Providing greener coloured bicycle lanes will also indicate to the public that area is reserved for bike riders only. A key issue as to why spacing is an issue is because there hasn't been enough funding and development in Vancouver to make cycling another efficient way of transportation. Accessibility to all cities and areas for all ages and abilities hasn't been applied yet making bicycling riding a difficult form of transportation especially if traveling from one city to another. Once more development occurs the number of green bicycle lanes, protected bike lanes, and bike shares will begin to appear. Therefore, further promoting bicycling as an improved and more efficient form of travel.

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Appendix A

Quick Survey Questions for All Bike Routes

1) With the space provided for the bike lane, do you think the space is adequate and safe for biking?
Y/N

2) On a scale of 1-10, how safe do you feel as a cyclist, riding through the intersections in this downtown environment?
1, 2, 3, 4, 5, 6, 7, 8, 9, 10

3) Do you think the biking surface is smooth enough to bike comfortably?
Y/N