Tennyson Street is an arterial road connecting Colombo St and St Martins in Beckenham, southern Christchurch.

[illegible] St.

The community has become concerned over the safety and effectiveness of crossings along the street.

This issue was elevated when there was a collision between a motor vehicle and a student from Beckenham School.

Background findings helped form the research question of:

Project objectives were to gather opinions of Beckenham and Tennyson Street safety from the community and the Christchurch City Council (CCC), assess the number of students that need to cross Tennyson Street, explore possible safety improvement options and gather opinions of these options.

Methods used included a previous course project and a community-initiated survey, interviewing council staff, using geographical information systems (GIS) to map the addresses of students, door to door street interviews, and online parent and community surveys.

The results indicate that although Tennyson Street is not a priority for safety improvements from the council, the community feels improvements should be made. The community largely support all suggested safety improvement options but prefer infrastructure changes over community-based options.

Variable speed limits have been implemented around New Zealand schools to reduce speeds to 40km/h. Ellison, Greaves & Daniels (2013) found mean speed was reduced through school zones but 29% was still above the 40km/h limit. This can create more potential risk as variation ƛƴ ăLJŜŜŘ ƛă Ɩăă2ŎƛƖűŜŘ ǿƛűK ǋŜŘdzŎƛƴ∃ ǋ2ƖŘ ăƖŦŜűȅ ό5ŜſΩAŎljdzƖΣ нлммύΦ {dzƴΣ 9ſ-Basyoung, Ibrahim & Kim (2018) found that school zones reduced fatal injury and collisions by 45% and found mean speed variation was also reduced. It is important to note this reduction was to 30km/h and in Canada as opposed to New Zealand were conditions are different. Even if school zones can be shown to significantly reduce speed, it is unlikely to be implemented on Tennyson Street as NZTA deems it too far from a school to be classified as a school zone (NZTA, 2011).

Initiatives from the community could help improve traffic safety. Traffic wardens have been shown to improve traffic safety by helping people cross the road at predetermined crossing points. Although there have been concerns in the past that they add to collision rates, this has proven to not be the case (Gutierrez et al. 2014 Rothman et al. 2015). Furthermore, it has been shown that it is important to have appropriate patrol times (Forbes 2016) and as Tennyson Street is not directly outside of the school, this would need to be addressed.

Wang et al. (2018) showed that of those students who had access to safer crossing methods, primary aged children were more likely to act dangerously when crossing roads. They concluded that the younger groups were at higher risk due to their inability to perceive the dangers and consequences of crossing dangerously due to ongoing brain growth.

From this background research, several project objectives were formed:

Previous 2017 GEOG309 Project and Community Survey

A previous GEOG309 project looked at reviewing traffic speeds in Beckenham that included a survey with community opinions. Another previous survey from the community was conducted in early 2018 regarding Tennyson St traffic safety. These surveys were used to help answer objective 1.

Christchurch City Council Traffic Engineer Interview

Talking to a traffic engineer gave an expert opinion on the traffic safety of Tennyson Street from a professional perspective. The engineer was aware of the concern around Tennyson Street and had been in contact with the community prior to the project. As the engineer is a representative of local government, the organisation likely to perform any road changes, he would be aware of their restrictions, which helped include only realistic potential options to be included when gathering opinions. This was to help answer objectives 2 and 5.

GIS to map school addresses

In order to assess how many students attending Beckenham School needed to cross Tennyson Street, a list of student addresses was acquired from the school. This consisted of only addresses and no other identifiable data. The school also removed entries of students who did not live near the Beckenham area for privacy reasons which brought the total number of entries to near 400 compared to the school role of about 480 (the addresses included instances of 2 or more students living at the same location). The list was geocoded using ArcGIS. Points were then selected and counted. This was to help answer objective 3.

Online Parents and Community Survey

Online survey tool Maptionnaire (2018) was used to create a survey to gauge community opinions on the safety on Tennyson Street and potential options for safety improvements. Maptionnaire has a geospatial mapping element where respondents can add points and lines to a base map which can then be exported for analysis later.

A survey aimed at gauging parents' opinions of traffic safety of primary school aged children was made and distributed in the weekly newsletter at Beckenham School and again advertised on school social media accounts after an initially poor response rate.

A second survey was created to gauge the opinions of Tennyson Street safety from the wider community. This survey started with a branching question which asked if the person answering has primary school aged children

Within the survey, there were many opportunities for respondents to express their opinion in comment sections. Common themes of respondents when asked about traffic safety in Beckenham were feeling that excessive speed was an issue and that there is a lack of appropriate crossing points. Most of the respondents failed to mention if they view the current speed limit as excessive or if they are witnessing drivers breaking the speed limit. Common comments about speed include: *ñSome cars drive too fast. The speed limit should be reduced considering the vast majority of drivers are residentsò; ñTraffic speed is an issueò;* and

Figure 2. Heat map showing areas where parents feel their child is unsafe specifically traveling along Tennyson Street.

During the survey, respondents were able to make comments specifically about traffic on Tennyson Street. Again, the common theme was that crossing the street is unsafe. Many

CCC island

4. What are the potential safety improvement options?

Six potential options to improve traffic safety along Tennyson Street were identified, including a mix of infrastructure improvements and community-based options.

Figure 5: Recommended speed signs on Tennyson Street

Recommended speed signs (Figure 5) are yellow speed signs that are not legally enforceable, however they give motorists a warning that it is recommended to alter their speed. These signs had been identified as an option by the council prior to the study and were made and installed during the study period. Widening the crossing islands along Tennyson Street was also identified as an option by the council, depending on future funding availability. The three most commonly used crossing islands are straight islands, where pedestrian's cross straight across

the road; diagonal islands, where pedestrians are directed to look towards oncoming traffic; and chicane islands where pedestrians are forced to turn to oncoming traffic before crossing the roads (Figure 6). The current islands on Tennyson Street are diagonal islands. Land narrowing is an option which can naturally reduce traffic speed without limits or road infrastructure. Reduced parking is also an option which can improve motorist and pedestrian visibility at crossings.

Figure 6: Island Crossing Design Types.

As previously noted, traffic crossing wardens have been shown to help improve traffic safety. Having dedicated wardens can give unsupervised children a safe place to cross the road, as well as being a supervisor for large groups. A walking school bus is another option from the community that is also supported by the New Zealand Transport Agency (2018c). A walking

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unsuitable due to the arterial nature of the street and would create noise pollution issues with breaking and accelerating of vehicles. Many of these options also require substantial funding from the council which has a limited budget.

5. What are the community's views on potential safety improvement options?

Infrastructure Safety Improvement Options

Recommended Speed Signs

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respondents believe the speed signs will improve safety of Tennyson Street and 79% of respondents support their implementation.

Traffic Island Improvements

Overall the wider community were neutral in supporting traffic island improvements and their improved safety capabilities. Parents like the idea of improving the island crossings specifically upgrading them to chicane islands. Parents preferred islands mostly on Tennyson Street to be upgraded, particularly the Norwood Street and Eastern Terrace islands. The wider community also2(f)5streettraffic g( )-3(mo)-3(st)-3(ly)13( )-3(ire)7(-3(i(g)5(e)]TJT)-5(w)5(i/P <</MCID 1>>BDC BT)%sETw1(w)5(ic

Reduced Parking

Combined survey results show 77% of respondents support reduced car parking around the crossing islands on Tennyson Street. Furthermore, 70% agree that these will improve traffic safety on the street. Again, this survey may have bias toward reduced parking if results were compared to those who live on Tennyson Street. In street interviews of Tennyson Street residents, respondents were less supportive of reduced parking.

Community-Based Safety improvement options

School Wardens & Walking School Bus

[illegible]wed 70% support the implementation of school wardens and 68% believe they will improve safety on Tennyson Street. 59% of parents support implementing the walking school bus and 61% believe it will improve safety on Tennyson Street. The wider community were not surveyed about these community-based safety improvement options as they are more relevant to improving safety of school children.

[illegible] respondents were asked of their willingness to volunteer. 2% were willing to volunteer as a school warden, 15% for the walking school bus and 4% were willing to volunteer for both. The [illegible] Respondents of the community survey were also asked about their willingness to volunteer as a school warden. The theory was that perhaps some retirees or other residents with some spare

Figure 7. Beckenham School Roll addresses are shown in the left image and the addresses of respondents to our parentôs survey are shown in the right image. Tennyson Street is highlighted by the red line and The Beckenham School zone is shown with the black outline. The right image shows a higher concentration of respondents to the north of Tennyson Street when compared to the Beckenham loop.

This research paper shows the Beckenham community view traffic speed and suitable crossing points as an issue in their suburb. Much of this concern is specifically directed at Tennyson Street with many parents expressing their apprehension with their children travelling around this street.

Solutions for this street are limited by council funds and the potential infrequent use of crossings. Traditional crossings such as zebra and signalised have been deemed inappropriate. All infrastructure solutions proposed in this report were met with favour by the community. This involved recommended speed signs, island improvements, lane narrowing and reduced parking. Community-based solutions were also meet with positivity by the community. School traffic wardens were slightly preferred by parents compared to walking school buses however volunteer willingness was higher for the walking school bus.

Due to the community feedback, this report finds the best solutions would combine infrastructure upgrades with community-based solutions. The Norwood Street island appeared

Christchurch City Council. (2018a). Tennyson St traffic speed data and Beckenham pedestrian counts. Provided.

Christchurch City Council. (2018b). Traffic Count data. Retrieved from https://www.ccc.govt.nz/transport/transport-projects/traffic-count-data

Rosenbloom, T. Hadari-Carmi, O. & Sapir-Lavid, Y. (2010).
Safety Science Volume 50.

Rothman, L., Perry, D., Buliung, R., Macarthur, C., To, T., Macpherson, A., . . . Howard, A. (2015). Do school crossing guards make crossing roads safer? A quasi-experimental study of pedestrian-motor vehicle collisions in Toronto, Canada. (1), 732.

Sun, D., El-Basyoung, K., Ibrahim, I., & Kim, A. (2018). Are school zones effective in reducing speeds and improving safety?

Wang, H., Tan, D., Schwebel, D., Shi, L., & Miao, L (2018). Transportation Research Part F: Traffic Psychology and Behaviour 58, 556-565.