Creyke Road Living Streets Pilot Project – Traffic Calming an Arterial Road in Christchurch, New Zealand

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ABSTRACT

Creyke Road alongside Christchurch's University of Canterbury carries about 14,000 motor vehicles and 900 cyclists per day, with about 1,500 road crossings by pedestrians on a typical university day. There are four other significant traffic generators on the street. Over a hundred houses are located on the 1 km long street, which is also a bus route. Traffic speeds and volumes were a concern of all key stakeholders.

The Christchurch City Council's "Living Streets" programme attempts to achieve a better balance amongst road users (such as pedestrians, cyclists and other traffic) and between road users and neighbouring development. As part of scheduled kerb (or "curb" in North America) and channel replacement on Creyke Road, it was decided to introduce the Living Streets philosophy.

The challenge was to develop a design concept that would maintain the road's arterial function, yet would significantly improve conditions for pedestrians, cyclists and residents. The design narrows the road, removes a significant amount of on-street parking, and provides cycle lanes, wide footpaths and numerous street trees. Three central islands with trees at significant locations make it easier for pedestrians to cross the road. Traffic speeds are expected to reduce, improving conditions for pedestrians, cyclists and residents.

Extensive consultation with residents and other stakeholders was undertaken to arrive at the final design. Construction was substantially completed in September 2004. Comprehensive monitoring was undertaken prior to construction to allow future study of the project, once traffic patterns have returned to normal, but follow-up surveys have not yet been done. Subjectively, the transformation of Creyke Road appears to be working well for pedestrians, cyclists and motorists.

1 INTRODUCTION

Christchurch is the largest city in New Zealand's South Island, with a population of 330,000 and an additional 50,000 in the greater Christchurch area. New Zealand's largest city, Auckland, has 1.2 million people out of the country's population of 4 million.

Creyke Road alongside Christchurch's University of Canterbury carries about 14,000 motor vehicles and 900 cyclists on a typical university day, with about 1,500 road crossings per day by pedestrians. There are four other significant traffic generators; Medbury School (a private boys primary school), ESR (Environmental Science and Research Ltd), a petrol (gasoline) station and a motel. Over a hundred houses are located on the 1 km long street, which is also a bus route.

The road is curvilinear and, prior to reconstruction, had motor vehicle traffic speeds averaging 48 km/h. The 85th percentile speed of traffic (the speed exceeded by 15% of motor vehicles) was 54 km/h. Figure 1 illustrates the location of Creyke Road in relation to Christchurch's central business district (CBD).

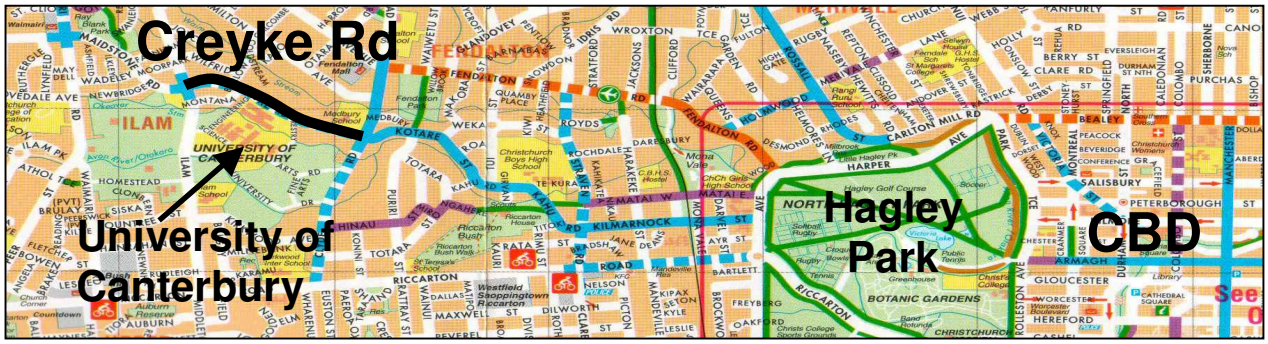

Figure 1 – Creyke Road location

The Council had scheduled replacement of kerbs ("curbs" in North America) and channels on Creyke Road and it was decided to use this opportunity to introduce the Living Streets philosophy as part of this work. This was the first arterial road included in the programme. While the programme is no longer being actively promoted, over 20 streets have been redesigned with significant resident input since the programme started in 2000.

In May 2001, work began to redesign Creyke Road as a Living Street. Extensive consultation with residents and other stakeholders was undertaken throughout the design stages. Construction began in December 2003 and was substantially completed in September 2004.

The design team wanted to emphasise the needs of pedestrians, cyclists and the people that live and work along the road, over the increasing dominance of motorised through traffic. The challenge was to develop a traffic calming[i] design concept that

would maintain the road's arterial function, yet would significantly improve conditions for pedestrians and cyclists, in particular.

Walking and cycling are the two most sustainable modes of transportation, with zero emissions of greenhouse gases, air pollutants, and noise, and minimal visual intrusion and safety impacts on other users. Opportunities to reduce the quantity and improve the quality of surface water runoff would also be desirable. A "sustainable transportation" solution was required.

The key to moderating the impact of motor vehicle traffic on Creyke Road was considered by the design team to be managing traffic speed. Traffic volume reduction was felt to be an unrealistic and unnecessary goal, as this would have compromised the arterial function of the road and drawn criticism for possibly re-routing traffic onto other streets.

Because the project was quite different from previous projects in Christchurch, extensive "before" surveys were undertaken. Corresponding "after" surveys have not yet been done, but they will allow comparisons to be made to assist in future planning for this and other streets in Christchurch.

A high quality of urban design was sought. Creyke Road is important to the University of Canterbury as its "front door" to the engineering school and other faculties. The other significant land users also felt that the appearance and function of the street were important to their own activities, and supported the project's aims.

Figure 2 below illustrates Creyke Road as it looked prior to implementation of the Living Streets pilot project.

Figure 2: Creyke Road before implementation of the Living Streets pilot project

2 DESIGN CONCEPTS

The concept developed for Creyke Road was relatively simple. Wider roads encourage drivers to travel faster while traffic generally travels more slowly on narrower roads. Long views down a street also encourage higher speeds. The road has been narrowed to the maximum extent practicable, still retaining a narrow traffic lane and a cycle lane in each direction. A general cross-section of half of the street is shown in Figure 3 below:

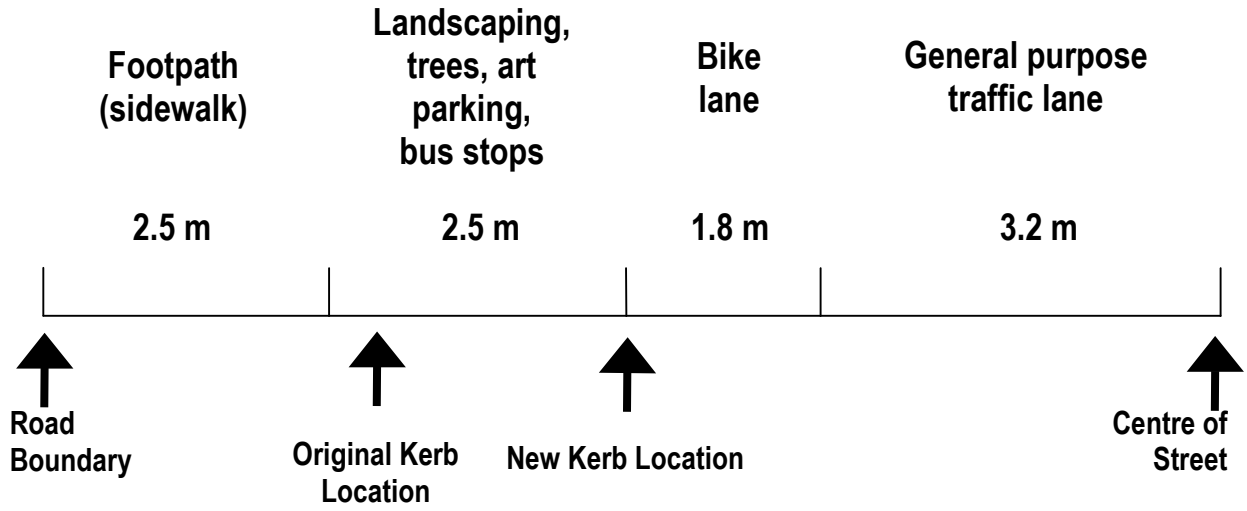

Figure 3: Cross-section of Creyke Road

At three key locations, where side streets created T-junctions with Creyke Road, a right turn lane has been provided to prevent interruptions to through traffic on Creyke Road from queuing traffic. At these locations, the road has been widened to accommodate the turn lane. To counteract the tendency for traffic speeds to increase at these widened locations, traffic islands were installed opposite the turn lanes, and trees (species “liquidambar”) planted in the islands to interrupt the long view of drivers.

Similarly, trees were planted alongside the road. A traffic calming effect is created by making a road appear narrow, and tall trees creating a narrow avenue accomplish this effect. The curvilinear nature of Creyke Road, coupled with the introduction of trees in the centre of the road where the road has been widened to accommodate turning traffic, will help to keep the vistas short once the trees have grown to a reasonable size, supporting the traffic calming concept. The project will change the balance on the street by making more road space available for other users and by reducing the space for driving and parking cars.

The provision of right turn lanes at key junctions has improved level of service for motor vehicles, particularly during peak periods, when queuing traffic previously interfered with traffic flow. This was an important consideration in gaining support for the project, given the road's arterial function.

But provision of the traffic islands, reinforced by the planting of 80 trees, in addition to helping narrow the road and control speeds, has introduced another key benefit. The islands create a refuge for pedestrians crossing the road, allowing them to cross in two stages. This technique greatly simplifies the task of crossing the road. Figure 4 (below) illustrates one of the three pedestrian refuge islands with its trees.

Figure 4: Crossing the road is easier for pedestrians and cyclists with the addition of islands. Trees on the islands will grow to help shorten the view and reduce speeds.

Parking is at a premium on campus and on streets around the university. Over 100 parking spaces existed on Creyke Road prior to reconstruction. The more car parking that was provided, the fewer opportunities would exist for planting and widening paths.

Fortunately, residents typically have ample off-street parking for themselves and their visitors, and were not too concerned by the potential loss of parking, so it was possible to remove two thirds of all parking. While not popular with students, especially as the university has been going through a process to introduce parking charges on campus, it was felt to be a necessary component of the overall plan. Put in context, the loss of nearly 70 parking spaces was somewhat academic in relation to the 3,000 spaces provided on campus. Creyke Road was never going to solve the university's parking problems, even if the road had been turned into a parking lot.

An underlying theme was to ensure that a high quality of urban design was used throughout the project. This was consistent with the Living Streets philosophy. The design aims to create a sense of place for residents as well as other stakeholders in the street. Special spaces have been created at a number of locations on the street to allow for street art and signs. Overhead wiring was put underground in a related initiative, reinforcing the aesthetic values sought for the street. Cost constraints, however, limited the choice of materials somewhat, so that asphalt was used for parking bays when coloured concrete pavers might have been more attractive.

The placement of kerb and channel between the vehicular part of the road (carriageway) and the more passive part (the berm) has allowed for a great deal of flexibility in the way various design elements can be arranged. About half of the street has a carriageway width of 10 m (reduced from 14 m prior to reconstruction), providing a cycle lane of 1.8 m and general traffic lane of 3.2 m in each direction. The berm width in these locations is 5 m on each side of the 20 m road allowance. The carriageway widens to accommodate right turn bays and islands at three locations. Residential driveways played a significant role in the location of carparks, tree pits and planted areas.

One of the features of the design is threshold treatments with coloured concrete pavers (Photo 3 below) at each end of the street to reinforce the concept of a new balance amongst road users on the street.

Photo 3: Threshold treatments at each end of Creyke Road signify to road users that this is no ordinary street. Medbury School in the background.

Before and after photographs of the same section of road (looking east towards the University of Canterbury's engineering library) illustrate the transformation of Creyke Road in Figure 5 below:

Figure 5: Creyke Road before (top) and after (bottom) reconstruction

In consultation with the university and the city council's waterways and wetlands staff, the team considered opportunities for management of stormwater runoff from Creyke Road that would complement the ecological management of the university's own internal drainage system.

Creyke Road's stormwater drainage sumps on the south side of the street were connected by pipes to Okeover Stream in the university and to Waimairi Stream on the north side of the road. Although it was not possible to implement sustainable drainage systems within the Creyke Road pilot project, there may be opportunities in the future to create waterways across university land between the street and the streams to provide opportunities for pollutant filtering, stormwater retention, riparian vegetation and wildlife habitat. On the street itself, the planted, grassed and widened berm areas will reduce the amount of stormwater entering the drainage system by increasing the amount of permeable surface.

3 TRAFFIC ENGINEERING "BEFORE" STUDIES

A comprehensive set of before counts exists to allow comparisons of traffic patterns before and after completion of the Living Streets pilot project. All modes of traffic have been studied, including pedestrians, cycles and motor vehicles.

Manual surveys traffic were undertaken in March 2003. Surveyors recorded all pedestrian and cyclist activity on most of Creyke Road during two ten hour days.

The survey area was divided into four zones, with each surveyor responsible for recording all pedestrian and cyclist road crossings and longitudinal movements within their zone. In addition, four screenlines (one in each zone) were used for counting longitudinal pedestrian and cyclist movements.

One of the survey locations is illustrated in Figure 6 below:

Figure 6: Manual traffic survey location on Creyke Road by the University of Canterbury's engineering school

Automatic pneumatic tube motor vehicle and cycle counters were installed in three locations to coincide with the manual counts. They were set up to record traffic speeds and volumes plus also to classify traffic into about a dozen types of vehicles, including bicycles. Figure 7 illustrates one of the locations.

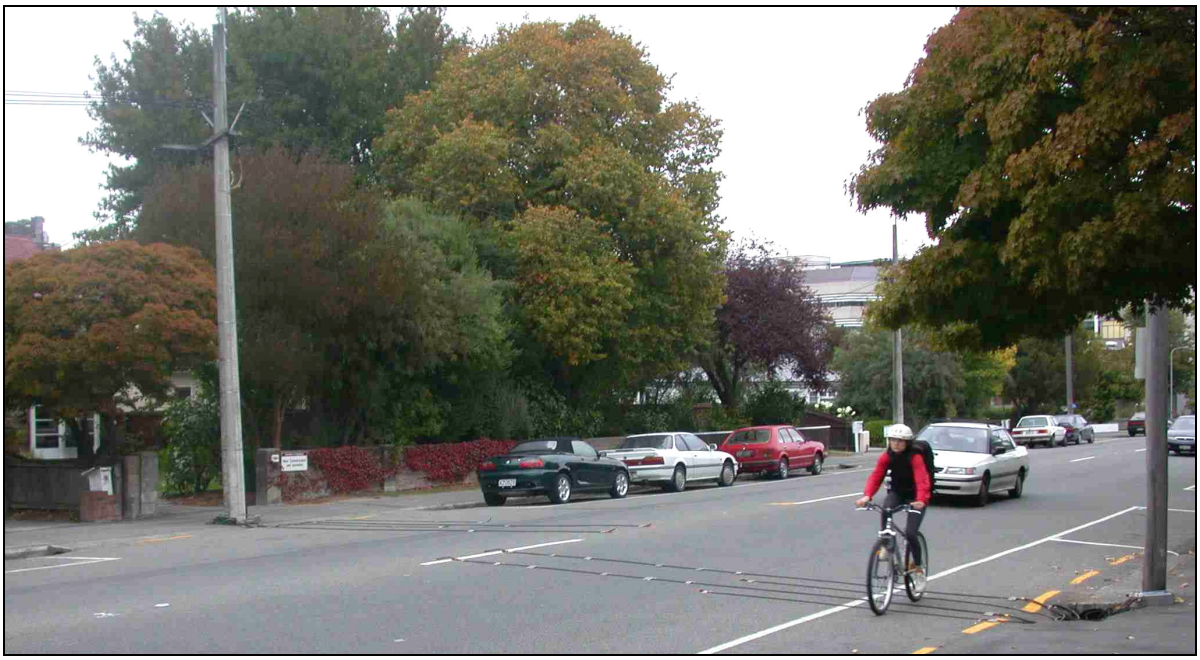

Figure 7: Automatic counters for cycles (short tubes) and motor vehicles on Creyke Road

The pedestrian and cyclist surveys revealed that during the ten hour survey (on an average week day during the university and school term), over 800 pedestrians walked along the street at its busiest location and nearly 1200 pedestrians crossed the road throughout the surveyed zones. Nearly 700 cyclists cycled along the road, while over 300 cyclists also crossed the street at various locations. These data are shown in Tables 1 and 2 below:

Table 1: Summary of Pedestrian Activity Levels (per 10-hour day)

Zone	**A**	**B**	**C**	**D**	
North Side Footpath	147	106	177	325	
South Side Footpath	669	469	474	251	
Total (longitudinal)	**816**	**575**	**651**	**576**	**TOTAL**
Crossing to North Side	195	204	89	74	561
Crossing to South Side	251	191	66	95	602
Crossing Total	**446**	**394**	**155**	**169**	**1163**

Table 2: Summary of Cyclist Activity Levels (per 10-hour day)

Zone	**A**	**B**	**C**	**D**	
Westbound	269	305	360	350	
Eastbound	264	277	321	314	
Total (longitudinal)	**533**	**582**	**681**	**664**	**TOTAL**
Crossing to North Side	33	105	7	10	155
Crossing to South Side	95	57	4	12	167
Crossing Total	**127**	**162**	**11**	**22**	**321**

The key results of the pedestrian surveys are illustrated in Figure 8 below, with cyclist survey results in Figure 9 below:

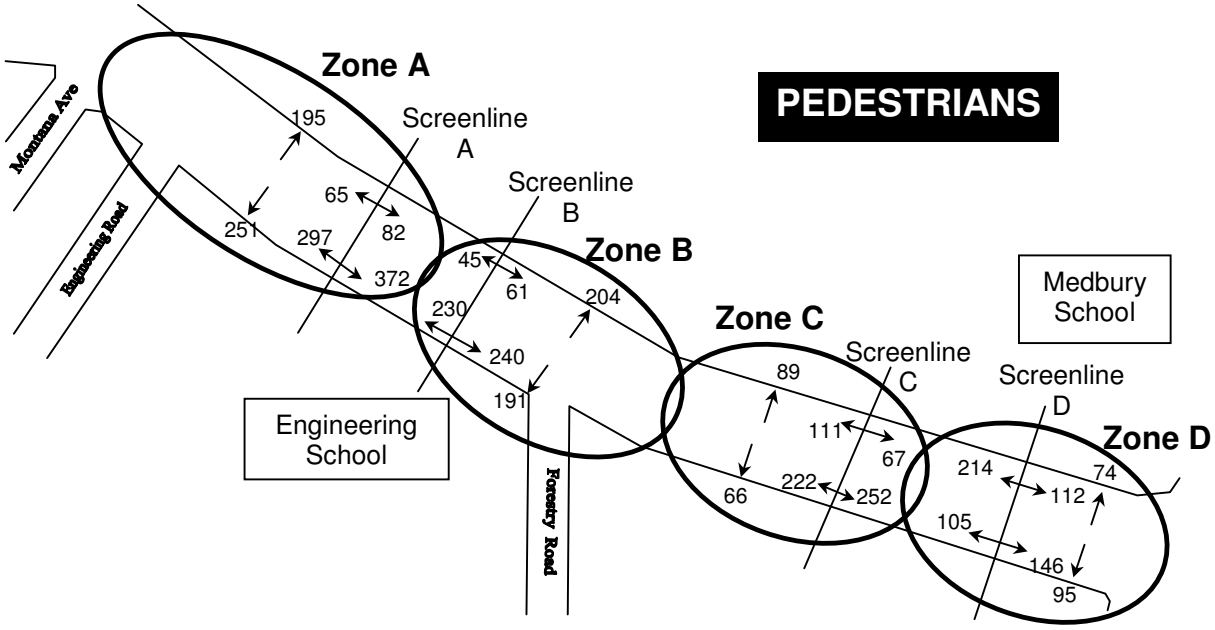

Figure 8: Pedestrian Movements

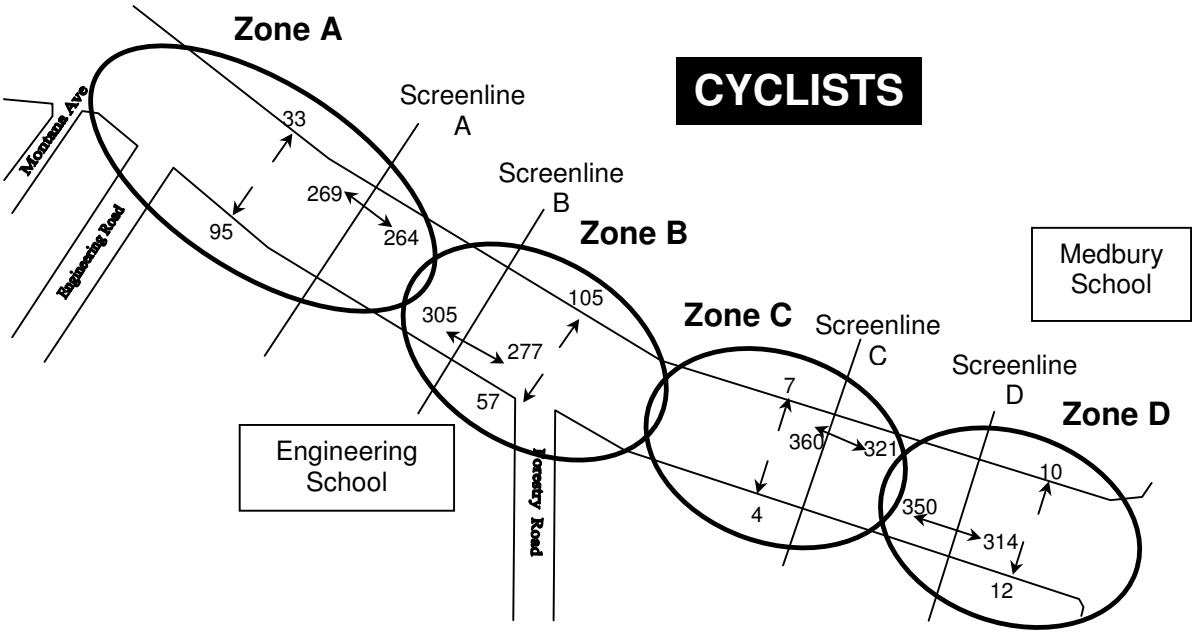

Figure 9: Cyclist Movements

Based on automatic counts of bicycle traffic, it is estimated that cycle traffic for a 24 hour period would be approximately 30% higher than the ten hour figures recorded here. Thus nearly 900 cyclists could be expected to cycle along the road during a typical day when university and school are in session, while over 400 cyclists would be

expected to cross the street. Pedestrian numbers are also likely to be about 30% higher for a 24 hour day, giving estimates of 1100 pedestrians along the street and 1500 crossing the street.

Results from the automatic motor vehicle counters are summarised in Table 4.

Table 4: Results of automatic counts of motor vehicle traffic

	7-day AADT	Mean Speed	85th Percentile Speed
Westbound	7,044	47.4 km/h	53.6 km/h
Eastbound	7,323	47.7 km/h	54.0 km/h
Total	14,367	47.5 km/h	53.8 km/h

During a typical university day, motor vehicle traffic volumes are estimated at about 14,000 vehicles per day.

4 INITIAL FINDINGS AND LESSONS LEARNED

Comprehensive monitoring has yet to be done since the street has been transformed and is needed to fully understand the implications of the changes. The street trees are still small and will take ten years or more to grow sufficiently to fully realise their urban design, traffic calming and aesthetic potential. Other plantings (such as ground cover, carpet roses and grass) are mostly in place. Street art at several key locations is still in preparation. Traffic is flowing steadily and pedestrians and cyclists are using the street with apparent ease and safety.

Extensive traffic monitoring was undertaken prior to construction, enabling meaningful "before and after" comparisons to be undertaken in future and ensuring that the project will become a fascinating and valuable laboratory for all involved.

In hindsight, a number of things could have been done differently. Up to 20 of the new trees have had their trunks broken by vandals, always an occupational hazard in a university environment. Larger, more robust specimens would have been more expensive, but would have been more resistant to breakage. They would also have achieved the desired traffic calming effect more quickly.

For reasons of economy, the central section of the road surface was retained, with new asphalt provided only at the edges to match the new kerbs and channels. This created an unsightly patchwork effect for the road surface that was criticised by a number of residents. Within a year, a decision was made to replace the surface from kerb to kerb, resulting in a more pleasing visual effect. The project would have been more attractive and generated more positive feedback from key stakeholders had this been done at the outset. Budgetary constraints also restricted the choice of materials, reducing the quality of urban design and aesthetics.

At one location, a central island and pedestrian refuge were deleted from the original concept plan to appease a few residents concerned about accessing their (shared) driveway. This has left a portion of the road wider than desirable, potentially allowing higher traffic speeds and reducing pedestrian safety at this location.

The ends of the street could have been narrowed to help signify the changed nature of the street to drivers entering Creyke Road from either end. A reduction of speed limit from 50 km/h to 40 km/h for the street would have been advantageous, but was not endorsed by decision-makers or technical staff. New Zealand road controlling authorities have generally been reluctant to experiment with speed limit reductions for urban roads, with most roads having a 50 km/h speed limit. Police enforcement is usually not commenced until drivers exceed 60 km/h.

Overall, these are minor concerns for a project with significant implications for urban traffic engineering on strategic roads.

5 CONCLUSIONS

The City Council's decision to transform Creyke Road as a Living Street was a bold move. Extensive consultation with all parties (both within the City Council and externally) has been a feature of the project and has resulted in a better outcome for all concerned. The University and school have both begun development projects on their abutting frontages that are consistent with the Living Streets concept. The entire streetscape has been transformed into a safer and more pleasant environment, with significant advantages for all road users. Some lessons can be learned from the implementation details for future projects, but overall the project has been successful.

Subjectively, the transformation of Creyke Road appears to be working well, but comprehensive monitoring will be required to fully understand the effectiveness of the project. The full impacts of the project may not be realised for many years, until the trees are mature. Creyke Road should provide inspiration for those involved in urban arterial road design in Christchurch and beyond.

As motor vehicle traffic increasingly affects our cities, this project has demonstrated that even major roads can be calmed without dire consequences for traffic movement. Every street transformed to make walking and cycling more viable helps increase the viability of these modes throughout the city.

Author Information

Andrew Macbeth has been active as a traffic engineer and transportation planner, specialising in sustainable transportation (including traffic calming and walking and cycling facility design) in New Zealand and Canada for more than 25 years. He has worked for the City of Toronto, Environment Canterbury, and the Christchurch City Council amongst others, prior to joining MWH in 2001. The author was the lead consultant for the Creyke Road project. He holds a bachelors degree in Civil Engineering from the University of Canterbury in New Zealand and a masters degree in traffic engineering and transportation planning from the University of Toronto in Canada.

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[i] "Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized street users." Institute of Transportation Engineers (ITE; USA)