A FURTHER INVESTIGATION OF 40KM/H SPEED ZONE
CASE STUDY OF UNLEY OF SOUTH AUSTRALIA

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Abstract: This paper seeks to present evidence quantifying the impact of arterial and collector roads on the 40km/h citywide speed limit scheme in the City of Unley, South Australia. The traffic data is extracted from comparison of daily flow profiles on weekdays and weekends on three study streets, which are likely to induce through traffic during rush hours as a result of their alignments and surrounding environment. Moreover, daily speed profiles are also investigated to provide information on efficiency of the scheme. From the data analysis, the noticeable difference in daily flow profiles between weekdays and weekends infers the phenomenon of through traffic migrating from nearby overloaded arterial and collector roads to the study streets during rush hours. In addition, the comparison of mean and the 85th percentile speeds in 2002 with those in 2001 illustrates the consistency of the influence of the 40km/h speed limit on travel speeds. The results of this study would provide information for traffic engineers and policy makers in their decision-making process.

Key Words: inefficient main roads, through traffic, local streets, 40km/h lower urban speed limit, traffic management

1. INTRODUCTION

The number of vehicles and the level of travel demands on road networks have been increasing over the years as a consequence of economic growth and dispersal of urban development. However, the improvement in levels of service for main roads (i.e. arterial and collector roads) cannot catch up with the rapid growth in travel demands resulting in delays and traffic congestions, especially during rush hours. As a result of constraints on the capacity of the roads, traffic is encouraged to migrate to local streets used as rat-run routes contributing to safety and amenity concerns in local residential areas. To solve these problems, Local Area Traffic Management (LATM) consisting of two essential components: traffic control devices and speed limits, is employed.

In the City of Unley (hereafter referred to as Unley), South Australia, the 40km/h local area speed limit trial initially commenced in a study area within the city in 1991 followed by the continuing trial in 1994 (LASL 1993; Allan 1997). The objective of the trials (lowering speed limit from 60km/h General Urban Speed Limit to 40km/h Local Area Speed Limit) was to investigate the effectiveness of the schemes in reducing speeds and traffic volumes in local residential areas. Moreover, the trials were also established to examine suitability of the schemes as an alternative to the installation of aggressive traffic control devices such as speed humps and road closures, which caused some negative impacts on residential amenity. On account of the achievement of the trials, the 40km/h citywide speed limit scheme has been

implemented to all local streets in Unley since January 1999 (Dyson et al. 2001), aiming to reduce speeds and traffic volumes so as to improve road safety and amenity.

However, the 40km/h citywide speed limit scheme seems not to be as very efficient as it could be due to the implementation of traffic management has not covered a macro scale, which in this case is arterial and collector roads forming a major grid road network of Unley. Therefore, some arterial and collector roads, which have constraints of capacity during rush hours, in conjunction with the lack of clear road hierarchy still cause through traffic travelling on local residential streets.

1.1 Aims and Objectives

This study aims to:
- continue evaluating the effectiveness of the 40km/h citywide speed limit scheme in Unley during rush hours on limited streets used as a case study.

The objectives of the study are to:
- analyse and interpret the comparison of daily traffic profiles on weekday and weekend focussing particularly on traffic volumes and speeds,
- assess the effectiveness of the 40km/h citywide speed limit scheme without the implementation of any other enforcement.

1.2 Scope of the Study

- Employed traffic data are secondary data (raw data) provided by Transport Systems Centre (TSC) at University of South Australia,
- Traffic data were collected continuously by pneumatic tube detectors from 25th March 2002 to 7th July 2002, totally 15 weeks. However, only data during the weeks, which did not have any enforcement, are used for the analysis,
- Three local residential streets, in which their characteristics are likely to induce through traffic during rush hours, are selected for a case study.

2. RESEARCH ISSUES

From literature, traffic management focused particularly on Local Area Traffic Management (LATM), it illustrates that LATM is to reduce vehicle speeds and traffic volumes on local streets to improve road safety and environmental amenity. To achieve these goals and objectives, Lower Urban Speed Limit (LUSL) schemes, which are part of LATM strategies, both in terms of General Urban Speed Limit (GUSL) and Local Area Speed Limit (LASL) are implemented extensively throughout Australia (Woolley et al. 2001) while the use of some aggressive traffic control devices such as speed humps and road closures is out of favour (Allan 1997; Dyson et al. 2001). The reasons of a reduction in acceptance of such traffic control devices are that they contribute some negative impacts on residential amenity, cost more resources to implement, reduce land value (in case of road closures) and the important thing is they are opposed by local residents, who are the main party that the scheme wants to give benefit to. Therefore, the role of LUSL (i.e. 50 or 40km/h speed limits) has been more evident during this decade (Woolley et al. 2001) as it can be seen that many city councils
have implemented them in their cities following the guideline of separate functions model of road hierarchy, which tries to distinguish the role of local residential streets from arterial and collector roads to give high benefit as much as it can to residents in local areas.

However, a remaining problem is that the process of treatment approaches is still not at a macro level. Although the LATM scheme is implemented in a citywide area, it focuses only on the scale of local residential streets. The traffic engineers and practitioners should concentrate not only on the local scale but focus on the macro scale also by including arterial and collector roads, which form the boundary of the area, to balance the system (e.g. improvement of levels of service on arterial and collector roads, acceptance of road users and residents, etc.). Nevertheless, there is less connection in road network management policies established by organisations, which are responsible for local streets and for arterial roads, as a result of constraints on their powers and independence in managing road systems beyond their responsibilities.

3. METHODOLOGY

This study employs only a quantitative research method to investigate and compare the daily flow and speed profiles on weekdays and weekends at different local residential streets, which are likely to induce through traffic during rush hours, within the 40km/h speed zone in Unley. The detail of the applied research methodology is described separately in three main parts: study areas, study design, and data collection method and approach to analysis.

3.1 Study Areas

The study areas include Wood, Joslin, and Arthur Streets, all of which are local residential streets in Unley locating at the south of the Adelaide Central Business District (CBD). These local streets seem to have different characteristics and are likely to induce traffic to migrate from nearby arterial or collector roads into them as a result of their alignment and surrounding areas. The details of each study street are described below:

- **Wood Street** lines in north-south direction parallel to King William Road, which is a major collector used as a main route to serve traffic from southern suburbs towards the CBD and vice versa during rush hours. Furthermore, Wood Street also connects to Weller Street making a continuing straight street of about 1.4 kilometres in north-south direction. This characteristic might encourage through traffic on this street. From the study of Evaluation of the Unley City Wide 40 km/h Limit by Dyson *et al.* (2001), Wood Street was categorised into a group of streets connecting collectors or arterials, and it had the average daily traffic (ADT) in a range of 800 to 2,000 veh/d. The locations of Wood Street, Weller Street and King William Road are shown in Figure 1.

- **Joslin Street** is another north-south street connected perpendicular to Greenhill Road and parallel to Goodwood Road as shown in Figure 1. In addition, there are three roundabouts installed on the street. From these characteristics, it might be used as a corner cut through between Greenhill and Goodwood Roads (i.e. major arterial roads) during rush hours. Joslin Street was also categorised into the same street group as
Wood Street, which was the street connecting collectors or arterials and had ADT in a range of 800 to 2,000 veh/d (Dyson et al. 2001).

- **Arthur Street** as shown in Figure 1 lines in east-west direction connecting King William Road (major collector) to Unley Road (arterial road), both of which are major routes towards the CBD. Moreover, there is a shopping centre near the junction of Arthur Street and Unley Road making this street busy for whole day. Arthur Street was categorised in a group of streets as alternatives to collectors and had ADT more than 2,000 veh/d (Dyson et al. 2001).

![Figure 1. Location map of study streets](image)

### 3.2 Study Design

A selected study design for this research is a cross-sectional study. The research is a further study from the Evaluation of the Unley City Wide 40km/h Limit by Dyson et al. (2001) to look into the daily flow and speed profiles of a few specific local streets in Unley. However, the distinct differences from the past study are 3-month period of data collection, which is
much longer compared with only 2-day data collection at each study site in the past study. These substantial data contribute to higher accuracy of results. Moreover, a further comparison between data on weekdays and weekends is carried out. From this comparison, the evidence quantifying the impact of nearby inefficient arterial and collector roads on the 40km/h citywide speed limit scheme could be extracted. It is worth noting that although this research is a cross-sectional study, some information from the past study may be used as supplementary to support the analysis.

3.3 Data Collection and Analysis Method

For the data collection method, speed and time of individual vehicles passing a given point on the study streets were collected from a secondary source, which in this case is Transport Systems Centre (TSC) at University of South Australia. These data are unpublished data that TSC collected for a further evaluation of the 40km/h citywide limit in Unley focusing on the enforcement. In this research, the required data are not processed data but raw data, which are population data since the use of the effective pneumatic tube detectors can collect data continuously for a long period of time. The data were collected from 25\textsuperscript{th} March 2002 to 7\textsuperscript{th} July 2002 on both movement directions (i.e. northbound and southbound or eastbound and westbound). Nevertheless, only data during the weeks, which had no any enforcement, are employed (i.e. 5 weeks on Arthur and Joslin Streets, and 3 weeks on Wood Street).

The data analysis is done on SPSS, which is a computer program suitable to analyse a large number of data statistically. The data are divided into two groups of each study street: weekday and weekend data. In each group, mean and the 85\textsuperscript{th} percentile speeds, and traffic volumes are plotted against time of the day (one-hour class interval). These values are calculated from the average of whole data of each specific hour of a day. Then the comparison of both groups on each study street and across study streets is employed to figure out the effectiveness of the 40km/h citywide speed limit scheme, which actually aims to reduce speeds and traffic volumes on local residential streets.

4. RESULTS

The outcomes of the study including data analysis and discussion will be described in this section, which is divided into two parts: traffic volumes and travel speeds. The daily profiles of traffic volumes and travel speeds on weekday and weekend are analysed. In addition, the results from past research, Evaluation of the Unley City Wide 40 km/h Limit in 2001, are also used to assist the analysis.

4.1 Traffic Volumes

In this section, the comparison of daily flow profiles on weekday and weekend will be illustrated to extract evidence quantifying the impact of nearby arterial and collector roads on the three study streets: Wood, Joslin and Arthur Streets in both movement directions, in which the Unley citywide 40km/h speed limit scheme has been implemented since January 1999. The impact is particularly focused on the rat-running phenomenon (an invasion of through traffic in local residential streets) occurring during a day, which could be identified from a distinct difference in daily flow profiles between weekday and weekend.
4.1.1 Wood Street

It can be seen from Figure 2a as shown below that daily flow profiles on weekdays and weekends on Wood Street northbound are similar to each other at most times of the day except there is a distinct difference during morning rush hours (7 to 9 a.m.). When average daily traffic (ADT) on Wood Street northbound on weekday is compared with that on weekend as shown in Table 1, it can be seen that the average weekday traffic is 30% greater than the average weekend traffic. It could be implied from this figure in collaboration with Figure 2a that most of the difference in the average daily traffic (i.e. 30%) is from traffic volumes during morning rush hours on weekday. Therefore, this could be deduced that during morning rush hours on weekday there is a lot of through traffic using Wood Street northbound as an alternative route towards the CBD instead of using King William Road, which is a parallel major collector road, to avoid traffic congestion (see Figure 1 for the locations of Wood Street and King William Road).

Table 1. Comparison of average daily traffic (ADT) on Wood Street 2002

<table>
<thead>
<tr>
<th>Traffic volumes on Wood St. (veh/d)</th>
<th>Northbound</th>
<th>Southbound</th>
<th>Difference</th>
<th>% of difference based on southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>1,029</td>
<td>930</td>
<td>99</td>
<td>11</td>
</tr>
<tr>
<td>Weekend</td>
<td>793</td>
<td>648</td>
<td>145</td>
<td>22</td>
</tr>
<tr>
<td>Difference</td>
<td>236</td>
<td>282</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of difference based on weekend</td>
<td>30</td>
<td>44</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These results conform to Dyson et al. (2001)’s study of the daily flow profile during weekday on Weller Street northbound in 1999, which connects directly to Wood Street extending the straight route parallel with King William Road towards the CBD. The locations of these streets and road can be seen in Figure 1. The daily flow profiles during weekday on both streets are similar; the traffic volumes and the percentage of flow particularly during the morning peak period are very close to each other. This evidence supports that the 40km/h citywide speed limit has no much influence on the invasion of through traffic on Wood and Weller Streets northbound during the morning rush hours on weekday due to a constriction in capacity of King William Road. However, outside the morning rush hours, traffic congestion on King William Road northbound is relieved. Therefore, road users prefer to use King William Road rather than Wood and Weller Streets bringing about a reduction in traffic volumes on both streets. During weekend, there is no problem about through traffic on Wood Street.
and Weller Streets northbound since King William Road can accommodate the travel demands properly. It is worthy of note that if King William Road were upgraded to cope with the morning traffic on weekday, the morning peak on Wood Street northbound would not be very high in relation to the afternoon peak.

From daily flow profiles on Wood Street southbound as shown in Figure 2b, it can be seen that the trend of the daily flow profile on weekday is reverse of that on Wood Street northbound. However, the tendency of the daily flow profile on weekend is similar to that in northbound. Table 1 illustrates that the average weekday traffic is 44% greater than the average weekend traffic. It can be seen that this difference is even greater than the difference occurring on Wood Street northbound (i.e. 30%). Therefore, it could be deduced in a similar way to Wood Street northbound that there is many through traffic using Wood Street southbound as an alternative route from the CBD back to southern suburbs in the evening rush hours.

4.1.2 Joslin Street

It can be seen from Figure 3a that the pattern of traffic volumes during weekday on Joslin Street northbound is similar to that on Wood Street northbound as described previously, especially in the morning rush hours. However, the daily flow profile during weekends on Joslin Street northbound illustrates a dissimilarity compared with that on Wood Street northbound. It can be seen that the peak on Joslin Street northbound is relatively high, and the daily flow profile on weekend is not similar to that on weekday at most times of the day. Furthermore, the average weekday traffic is just only 7% greater than the average weekend traffic as shown in Table 2. This result is distinctly different from the result on Wood Street northbound that the difference is up to 30% based on weekend.

![Figure a: Flow rate comparison, weekday vs. weekend](image)

![Figure b: Flow rate comparison, weekday vs. weekend](image)

Figure 3a and b. 24-hour flow rate profiles comparison between weekday and weekend Joslin Street 2002

<table>
<thead>
<tr>
<th>Traffic volumes (veh/d) on Joslin St.</th>
<th>Northbound</th>
<th>Southbound</th>
<th>Difference</th>
<th>% of difference based on Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>809</td>
<td>668</td>
<td>140</td>
<td>21</td>
</tr>
<tr>
<td>Weekend</td>
<td>753</td>
<td>520</td>
<td>234</td>
<td>45</td>
</tr>
<tr>
<td>Difference</td>
<td>55</td>
<td>149</td>
<td>234</td>
<td>45</td>
</tr>
<tr>
<td>% of difference based on weekend</td>
<td>7</td>
<td>29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As a result, two assumptions concerning the phenomenon of through traffic are established. The first assumption is there is less through traffic during weekday on Joslin Street northbound as a consequence of a little difference (i.e. 7%) in average daily traffic between weekday and weekend, which might be influenced by types of day (i.e. weekday and weekend) but not by the invasion of through traffic. However, this assumption is on the basis of less through traffic during weekend as well. The second assumption is there is a great deal of through traffic using Joslin Street northbound as a shortcut from Goodwood Road towards the CBD or Greenhill Road both on weekday and weekend. Locations of the roads and street are shown in Figure 1. To verify these assumptions, daily flow profiles on Joslin Street southbound are further investigated.

For the pattern of traffic volumes on Joslin Street southbound as shown in Figure 3b, it illustrates that the trend of a daily flow profile on weekday is reverse of that in northbound. For the trend of a daily flow profile on weekend, it illustrates a similarity to that on weekday at most times of the day except the evening rush hours. The comparison of average weekday traffic and average weekend traffic on Joslin Street southbound as shown in Table 2 shows that there is an extreme difference of 29% based on weekend. It could be implied from this figure in collaboration with Figure 3b that most of the difference in average daily traffic between weekday and weekend is from traffic volumes during evening peak period on weekday. Therefore, this could be deduced in a similar way to Wood Street southbound that there is a number of through traffic using Joslin Street southbound as a shortcut from Greenhill Road to Goodwood Road to avoid traffic congestion occurring by the intersection of both roads during evening rush hours on weekday. However, during other periods of the day including weekend, the congestion is relieved or does not occur, then drivers on Greenhill Road prefer travelling to Goodwood Road via the intersection to using Joslin Street as a shortcut.

According to the inference on Joslin Street southbound, the previously established assumptions could be verified. It could be concluded that the second assumption, which states that there is a number of through traffic using Joslin Street northbound both on weekday and weekend as a shortcut, seems to conform with the evidence found from the analysis of Joslin Street southbound since the daily flow profiles on weekday on Joslin Street in both directions are just reverse of each other and traffic volumes during weekend in northbound is much higher than that in southbound. The maximum traffic volumes during weekend on Joslin Street northbound and southbound occurring between 12 and 1 p.m. are 87 and 52 veh/h respectively illustrating 67 % difference based on southbound. Moreover, the difference in average weekend traffic between both directions as shown in Table 2 is 45% based on southbound. It is worth noting that if there was no through traffic during weekend on Joslin Street northbound, the daily flow profiles on weekend in both directions would be similar to each other.

The phenomenon of through traffic both on weekday and weekend happening on Joslin Street northbound could be explained by the characteristics of signalised intersection of Greenhill and Goodwood Roads. Since there is the use of the red arrow light to prohibit right turn movement during the period of green signal on the opposite direction to improve safety of drivers, who might get an accident (i.e. right-thru accident) caused by vehicles from the opposing direction; therefore, this might be the reason that encourages drivers on Goodwood Road using Joslin Street northbound as a shortcut to Greenhill Road on weekday and even weekend instead of waiting for the green arrow light at the intersection (if drivers fail to take a green arrow light phase, they have to wait for another cycle time). However, for Joslin Street
southbound, there is a number of through traffic occurring only during evening rush hours on weekday as a result of traffic congestion at the intersection while other periods of the day including weekend the congestion does not occur, then it is comfortable for drivers to turn left at the intersection.

4.1.3 Arthur Street

When average daily traffic on Arthur Street eastbound on weekday is compared with that on weekend as shown in Table 3, it can be seen that the average weekday traffic is 68% greater than the average weekend traffic. However, this result could not be deduced in a similar way to the analysis of Wood and Joslin Streets since Arthur Street has already been defined as an alternative to collector roads (Dyson et al. 2001). It could not be inferred that there is a number of through traffic occurring on weekday at daytime as a result of the great difference in average daily traffic between weekday and weekend, but the fact is Arthur Street serves through traffic rather than local traffic not only on weekday but also on weekend. Therefore, the difference in average daily traffic between weekday and weekend could be influenced by an effect of workday (i.e. weekday and weekend). A further analysis of Arthur Street westbound as described next supports this inference.

![Figure a: Flow rate comparison, weekday vs. weekend](Arthur Street eastbound)

![Figure b: Flow rate comparison, weekday vs. weekend](Arthur Street westbound)

Figure 4a and b. 24-hour flow rate profiles comparison between weekday and weekend

Arthur Street 2002

<table>
<thead>
<tr>
<th>Traffic volumes (veh/d) on Wood St.</th>
<th>Eastbound</th>
<th>Westbound</th>
<th>Difference</th>
<th>% of difference based on westbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>2,088</td>
<td>1,988</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>Weekend</td>
<td>1,239</td>
<td>1,366</td>
<td>-127</td>
<td>-9</td>
</tr>
<tr>
<td>Difference</td>
<td>849</td>
<td>622</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of difference based on weekend</td>
<td>68</td>
<td>46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Comparison of average daily traffic (ADT) on Arthur Street 2002

For Arthur Street westbound as shown in Figure 4b, it can be seen that the extensive period of high traffic volumes occurring on Arthur Street eastbound (see Figure 4a) during weekday (i.e. from 8 a.m. to 6 p.m.) does not occur on Arthur Street westbound, in which the period of high traffic volumes is only from 11 a.m. to 6 p.m. This could be inferred that Arthur Street eastbound is used by drivers, who avoid traffic congestion occurring on King William Road northbound during morning rush hours as described previously in the analysis of Wood Street,
to migrate to Unley Road having higher capacity and less congestion. Locations of the roads and street can be seen in Figure 1. The trend of the daily flow profile during weekend on Arthur Street westbound is similar to that in eastbound. The difference in average daily traffic between weekday and weekend as shown in Table 3 is 46% based on weekend, which is still high.

When average weekday traffic and average weekend traffic in eastbound are compared with those in westbound as shown in Table 3, it illustrates that there is a small number of difference, which are just 5 and −9 % based on westbound on weekday and weekend respectively. The negative percentage means traffic volumes in westbound is higher than that in eastbound and vice versa for the positive percentage. This result could be inferred that the average daily traffic in both directions should be similar to each other if there are similar effects influencing traffic volumes. This inference could be used to support the analysis of Joslin Street northbound during weekend that if there was no effect of through traffic, the traffic volumes in both directions should be similar to each other. Moreover, the daily flow profile of Arthur Street also support the argument that there is a number of through traffic occurring on Wood Street during rush hours since the traffic volumes during rush hours on Wood Street (local residential street) are even higher than the maximum traffic volume on Arthur Street (alternative to collector roads). If the argument were wrong, traffic volumes during rush hours on Wood Street would be very much lower than that on Arthur Street as a result of the distinct difference in road hierarchy.

4.2 Travel Speeds

In this section, mean and the 85th percentile speed profiles on weekday and weekend on three study streets: Wood, Joslin and Arthur Streets in both movement directions are analysed to provide information on efficiency of the 40 km/h citywide speed limit scheme in slowing speed during a day. Moreover, the study of mean and the 85th percentile speeds on local residential streets in Unley from 1998 to 2000 by Dyson et al. (2001) in the Evaluation of the Unley City Wide 40 km/h Limit is also used in the analysis. It is worth noting that the 40km/h limit has been implemented on the study streets since 1999 except Arthur Street, in which the 40km/h limit has been posted since the implementation of the 40km/h local area speed limit trial in 1991.

The following is a summary of the main findings from the analysis of travel speeds on the study streets.

- In the study of daily speed profiles on Wood Street as shown in Figure 5a to d, it illustrates that the 40 km/h citywide speed limit could control mean and the 85th percentile speeds to a range of 39 to 41 km/h and of 45 to 50 km/h respectively at most times of the day on Wood Street southbound but only during daytime on Wood Street northbound.

- The daily speed profiles on Joslin Street as shown in Figure 6a to d in general illustrates better results than those on Wood Street in terms of lower mean and the 85th percentile speeds at most times of the day owing to the application of roundabouts on Joslin Street in collaboration with the 40 km/h speed limit.
Figure a: Mean speed comparison, weekday vs. weekend
Wood Street northbound

Figure b: 85th percentile speed comparison, weekday vs. weekend
Wood Street northbound

Figure c: Mean speed comparison, weekday vs. weekend
Wood Street southbound

Figure d: 85th percentile speed comparison, weekday vs. weekend
Wood Street southbound

Figure 5a to d. Mean and 85th percentile speed comparison between weekday and weekend
Wood Street 2002

Figure a: Mean speed comparison, weekday vs. weekend
Joslin Street northbound

Figure b: 85th percentile speed comparison, weekday vs. weekend
Joslin Street northbound

Figure c: Mean speed comparison, weekday vs. weekend
Joslin Street southbound

Figure d: 85th percentile speed comparison, weekday vs. weekend
Joslin Street southbound

Figure 6a to d. Mean and 85th percentile speed comparison between weekday and weekend
Joslin Street 2002
For daily speed profiles on Arthur Street as shown in Figure 7a to d, the patterns of mean and the 85th percentile speeds are similar to each other in both directions. During daytime, mean speeds on weekday and weekend in eastbound fluctuate slightly around 39 and 40 km/h respectively while in westbound they are relatively lower. The tendency of the 85th percentile speeds is also similar to mean speed. It is very close to 45 km/h during daytime in both directions on weekday and weekend and rises up beyond this period.

Table 4. Summary of descriptive statistics of speed

<table>
<thead>
<tr>
<th>Study street</th>
<th>Direction</th>
<th>Mean speed (km/h)</th>
<th>85th percentile speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Weekday</td>
<td>Weekend</td>
</tr>
<tr>
<td>Wood</td>
<td>Northbound</td>
<td>40.6</td>
<td>40.8</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>40.7</td>
<td>39.8</td>
</tr>
<tr>
<td>Joslin</td>
<td>Northbound</td>
<td>38.8</td>
<td>37.8</td>
</tr>
<tr>
<td></td>
<td>Southbound</td>
<td>39.4</td>
<td>37.7</td>
</tr>
<tr>
<td>Arthur</td>
<td>Eastbound</td>
<td>39.3</td>
<td>40.4</td>
</tr>
<tr>
<td></td>
<td>Westbound</td>
<td>39.0</td>
<td>40.1</td>
</tr>
</tbody>
</table>

The summary of descriptive statistics of speed on the study streets as shown in Table 4 illustrates that the daily mean and the 85th percentile speeds on Joslin and Arthur Streets are close to each other but lower than those on Wood Street. Furthermore, it also shows that the daily mean and the 85th percentile speeds of study streets in 2002 are lower than the average of those on faster streets in 2000. This result, however,
could not be implied that all of the study streets have improvement in the reduction in mean and the 85th percentile speeds since there is no past data on these three streets to compare with, but it could be deduced that the 40 km/h citywide speed limit is still effective in remaining mean speed of around 40 km/h and the 85th percentile speed under 50 km/h in 2002.

- Mean and the 85th percentile speeds on Arthur Street are close to those on Joslin Street and even lower than those on Wood Street although Arthur Street has been defined as an alternative to collector roads (Dyson et al. 2001). This could be explained by the implementation of the 40km/h speed limit since 1991 in conjunction with strong enforcement on Arthur Street; therefore, mean and the 85th percentile speeds on Arthur Street has decreased with time since then and drivers are more familiar with and respect the limit to avoid being fined.

- Because the individual speed data employed for this research are only data on the weeks without enforcement during the survey period, mean and the 85th percentile speeds might receive an influence from the enforcement of other weeks (halo effect) causing a reduction in both mean and the 85th percentile speeds.

5. CONCLUSIONS

From the data analysis and discussions, the investigation into the daily flow and speed profiles on weekday and weekend of the three study streets: Wood, Joslin and Arthur Streets illustrates the evidence supporting the hypothesis of the impact of arterial and collector roads lacking capacity on local streets. The comparison of the daily flow profiles on weekday and weekend shows the invasion of through traffic into the study streets during rush hours illustrating the effect of nearby arterial and major collector roads lacking capacity on the 40 km/h citywide speed limit scheme in deterring through traffic.

For the research into mean and the 85th percentile speeds on the study streets, it illustrates the efficiency of the 40km/h citywide speed limit scheme in retaining mean and the 85th percentile speeds to the similar values in 2000. The scheme could keep mean speeds close to 40 km/h and the 85th percentile speeds to below 50 km/h but not lower than 45 km/h at most times of the day both on weekday and weekend. However, the daily speed profiles illustrate that during night-time, it is difficult to control speeds to the same level as those during daytime unless other suitable traffic control devices and enforcement are employed. Nevertheless, although speed is high during night-time, the number of traffic is very low. Therefore, it could be said that during night-time speeding causes high severity of accident and amenity problem such as noise pollution rather than high risk of accident.

In conclusion of the study of traffic volumes and travel speeds on three study streets: Wood, Joslin and Arthur Streets, it could be said that the 40 km/h citywide speed limit scheme in Unley is successful in slowing speed to the acceptable levels (i.e. mean speed of 40 km/h and the 85th percentile speed of 50 km/h), but it does not achieve the objective of deterring through traffic migrating from arterial and major collector roads to local residential streets during rush hours as a consequence of a lack of capacity of the roads. This incompetence contributes to concern for road safety and environmental amenity in local residential areas. Therefore, the suggestion is that to gain the optimal efficiency from implementing the 40km/h
citywide speed limit scheme, Arterial Road Traffic Management should be undertaken as a supplement to the 40km/h citywide speed limit scheme to balance the system.

REFERENCES


