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Oleg Sennikov
 Templeton Kāpiti Limited

By e-mail only: oleg.sennikov@templeton.co.nz



A. PO Box 29623, Christchurch, 8540
 P. 03 377 7010
 E. office@carriageway.co.nz

Dear Oleg

RM210151: Response to Commissioner Minute 11

This letter responds to Minute 11 of the Commissioner. I note that the commissioner sets out that he has received sufficient information in respect of road safety matters, and so this letter solely relates to the matter of the capacity of the Kāpiti Road / Friendship Place roundabout.

Background

In my previous letter, I raised concerns that from the information provided to that time, the input traffic flows had not been provided and could not be calculated. This then meant that I was not in a position to be able to review the application of the methodology for traffic generation that had been set out by Mr Kelly.

In his most recent Supplementary Evidence (14 June), Mr Kelly has provided the 2018 traffic flows and the 2026 traffic flows, the latter being the 2018 traffic flows (without the supermarket traffic) which have been factored by 2% per annum for an 8-year period (16% in total). He also provides the 2026 traffic flows plus supermarket. Subtracting the 2026 'without supermarket' scenario from the 2026 'with supermarket' scenario enables the traffic generation arising from the supermarket to be found. I have shown this below.

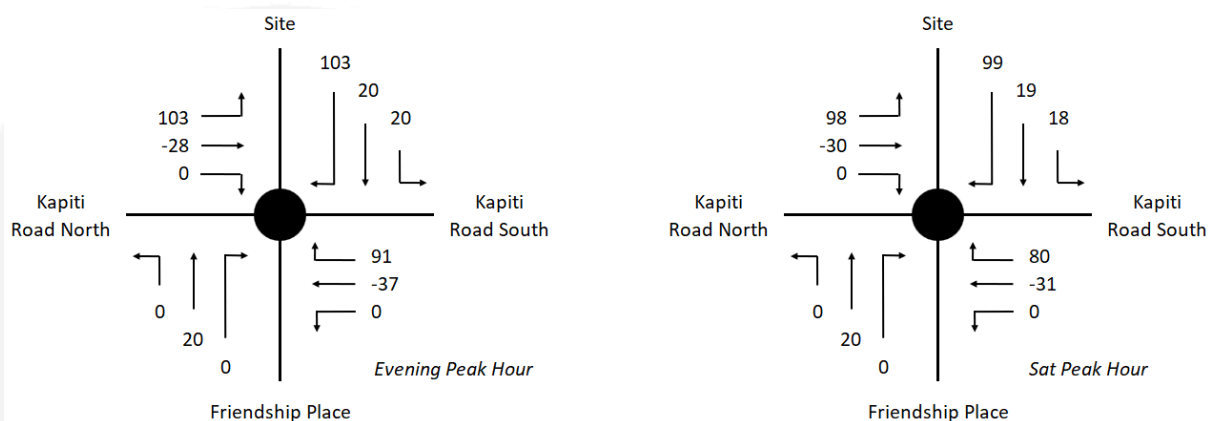


Figure 1: Traffic Generation and Assignment of Supermarket, Calculated Directly from Mr Kelly's Information

In passing, Mr Kelly has not provided the traffic flows associated with the scenario of doubling the traffic flows on Friendship Place, although he does report on this scenario within his Supplementary Evidence of 20 May 2022. However it is straightforward for these to be calculated, as I discuss subsequently.



To recap, there has been no dispute over the traffic generation of the supermarket described in the application documents, which I summarise below.

- Weekday:
 - Base figure: 213 vehicles entering and 213 vehicles exiting
 - Reduce by 5% to allow for non-car use: 202 vehicles entering and 202 vehicles exiting
 - Pass-by trips are 30% of this: 61 vehicles entering and 61 vehicles exiting
 - New trips are 70% of this: 141 vehicles entering and 141 vehicles exiting
- Saturday:
 - Base figure: 203 vehicles entering and 203 vehicles exiting
 - Reduce by 5% to allow for non-car use: 193 vehicles entering and 193 vehicles exiting
 - Pass-by trips are 30% of this: 58 vehicles entering and 58 vehicles exiting
 - New trips are 70% of this: 135 vehicles entering and 135 vehicles exiting

There was also no dispute regarding the distribution of trips.

Origin / Destination	% of Supermarket Trips
Kāpiti Road E of Arawhata	10.8%
Arawhata Road	5.9%
Expressway South	1.9%
Expressway North	11.0%
Milne Drive	2.5%
Te Roto Drive	5.0%
Langdale Avenue	16.6%
Kāpiti Road W of Langdale	31.3%
Kāpiti Landing Business Park	15.0%
TOTAL	100.0%

Figure 1: Table C2 from Mr Kelly's ITA

Analysis

From a review of the traffic generation and assignment produced by Mr Kelly for the scenario of applying 2% per annum to every approach, several conclusions can be drawn (note that at the outset I have not commented on matters where differences are small and are likely due to 'rounding' of the calculations).

Application of 5% Reduction to Allow for Non-Car Travel

During the weekday, 214 vehicles are shown as entering the site. This means that the 5% reduction to allow for non-car travel has not been applied, and so Mr Kelly's assessment of intersection performance shows slightly greater queues and delays than might otherwise be the case.

However, it appears that the 5% reduction has been applied to the Saturday peak hour.

Pass-by Traffic

The negative numbers shown on Figure 1 that arise on Kāpiti Road are due to pass-by traffic. For example, if a vehicle was travelling from (say) Kāpiti Road (southeast) to Kāpiti Road (northwest),



it is assumed to travel instead from Kāpiti Road (southeast) into the site, and then exit the site to turn onto Kāpiti Road (northwest) and resume its journey. This then means that the southeast-to-northwest movement reduces by 1, as the vehicle takes a different route. In other words, negative numbers are an expected outcome of allowing for pass-by traffic.

However, no negative numbers are shown associated with Friendship Place. I therefore conclude that Mr Kelly has not applied the concept of pass-by traffic to Friendship Place but only to the through movement of Kāpiti Road. This approach is incorrect in my view, as I would expect it is reasonable that a proportion of drivers that visit Kāpiti Landing would first visit the supermarket (or conversely, that drivers who have visited Kāpiti Landing would call into the supermarket on leaving).

Proportion of Trips Associated with Friendship Place

During the weekday peak (and accepting that the 5% reduction has not been applied), the trip distribution/assignment set out by Mr Kelly means that 15% of trips should be associated with Friendship Place. Since the supermarket generates 213 vehicles entering and 213 vehicles exiting, this means that there should be 32 vehicles travelling from Friendship Place to the supermarket, and vice versa. However the data presented shows that only 20 vehicles undertake such a movement.

A similar situation arises for Saturday; with 193 vehicles entering and 193 vehicles exiting the supermarket, this means that there should be 29 vehicles travelling from Friendship Place to the supermarket, and vice versa. Again, the data presented shows that only 19-20 vehicles undertake such a movement.

I conclude that Mr Kelly has not applied the expected 15% of trip generation to Kāpiti Landing, but rather, the value applied is in the order of 10%. This is the approach which is seen to experience the greatest queues and delays, and so any underestimation of the traffic flows exiting Friendship Place is potentially an important matter.

Proportion of Trips Associated with Left-Turn Out of Site

Typically it would be expected that a movement into the site is the same as the exit movement, so for instance where 103 vehicles turn left into the site from Kāpiti Road (northwest), there should be a corresponding movement turning right out of the site and back towards Kāpiti Road (northwest). This is generally seen, other than for the left-turn movement out of the site onto Kāpiti Road (southeast), which is only around 22% of the movement turning into the site from that direction.

This difference arises due to the proposed left-turn out of the site onto Kāpiti Road, to the southeast of the Kāpiti Road / Friendship Place roundabout. This means that instead of vehicles having to turn left out of the site at the roundabout, drivers instead use the proposed new left-turn facility. Thus the difference in traffic flows for this turning movement is reasonable in my view.

Conclusion

On balance, and taking into account the differences between the stated approach to calculating and assigning the supermarket trips, and the actual approach that appears to have been used, I consider that this this explains why I was unable to replicate the turning volumes from the information previously given.



Effects of Differences in Traffic Volumes

In his Supplementary Statement of 20 May, Mr Kelly presented the results of modelling the Kāpiti Road / Friendship Place roundabout without the supermarket in place.

I have created a new transportation model of the roundabout and calibrated the outputs of this to correspond to Mr Kelly's outputs. I have then populated the models using the supermarket traffic generation calculated in accordance with the stated methodology of the ITA:

- Applying 5% discount to the weekday to allow for non-car travel;
- Allowing for pass-by traffic on each turning movement;
- Allowing for 15% of generated traffic to use Friendship Place; and
- Allowing for 78% of traffic to exit via the southern vehicle crossing

I modelled the proposed roundabout layout as shown on Appendix B of Mr Kelly's Supplementary Statement.

As would be expected, the queuing and delays forecast at the roundabout differ from those modelled by Mr Kelly, because the input traffic flows are different.

For the scenario of applying 2% per annum to each approach:

- In the weekday in 2026:
 - With no supermarket and no geometric changes, the existing roundabout operates satisfactorily;
 - With the supermarket but no geometric changes, Friendship Place has significant queues and delays;
 - With supermarket and with the geometric changes (extra lane on Friendship Place and Kāpiti Road (northwest)), the queues and delays on Friendship Place reduce to levels very similar to those expected if there was to be no supermarket and no geometric changes were made.
- On a Saturday in 2026:
 - With no supermarket and no geometric changes, Friendship Place has significant queues and delays
 - With the supermarket but no geometric changes, Friendship Place has even larger queues and delays
 - With supermarket and with the geometric changes (extra lane on Friendship Place and Kāpiti Road (northwest)), the queues/delays on Friendship Place reduce to less than those expected if there was to be no supermarket and no geometric changes were made.

For the scenario of applying 2% per annum to Kāpiti Road but doubling the traffic flows on Friendship Place (from current values):

- In the weekday in 2026:
 - With no supermarket and no geometric changes, Friendship Place has significant queues and delays
 - With the supermarket but no geometric changes, Friendship Place has even larger queues and delays
 - With supermarket and with the geometric changes (extra lane on Friendship Place and Kāpiti Road (northwest)), the queues and delays on Friendship Place reduce to levels that are less than if there was to be no supermarket and no geometric changes were made.



- On a Saturday in 2026:
 - With no supermarket and no geometric changes, Friendship Place has significant queues and delays
 - With the supermarket but no geometric changes, Friendship Place has even larger queues and delays
 - With supermarket and with the geometric changes (extra lane on Friendship Place and Kāpiti Road (northwest)), the queues/delays on Friendship Place reduce to less than those expected if there was to be no supermarket and no geometric changes were made.

However, my modelling also identifies a capacity constraint on Kāpiti Road (southeast). For the scenario of applying 2% per annum to each approach, under all scenarios, the approach operates satisfactorily. However, the scenario of applying 2% per annum to Kāpiti Road but doubling the traffic flows on Friendship Place (from current values) shows that in both the weekday in 2026 and Saturday in 2026:

- With no supermarket and no geometric changes, the approach operates satisfactorily;
- With the supermarket but no geometric changes, the Kāpiti Road (southeast) approach has large queues and delays; and
- With supermarket and with the geometric changes (extra lane on Friendship Place and Kāpiti Road (northwest)), the queues and delays on Kāpiti Road (southeast) increase over and above those expected with no geometric changes.

Although the increase is not particularly large (around 15 seconds per vehicle), it means that under this scenario, the supermarket does not mitigate the effects which it causes.

In my view, the situation arises largely because under a scenario with a doubling of the traffic flows on Friendship Place, there is an increase in the amount of traffic exiting the supermarket site and travelling straight ahead onto Friendship Place. This traffic reduces the amount of gaps in the traffic stream on the roundabout that can be used by vehicles approaching on Kāpiti Road (southeast). That said though, this outcome typically only arises when an intersection approach is approaching its maximum capacity, when small changes in traffic volumes can have large effects.

Having reviewed My Kelly's modelling set out in his Supplementary Statement of 20 May 2022, I note that these conclusions are also evident in his results, that is:

- With 2% increase per annum on each approach, the geometric changes proposed by the Applicant mitigate the effects of the increase in traffic generated by the supermarket proposal.
- With a doubling of the traffic flows on the Friendship Place approach, the geometric changes proposed by the Applicant do not mitigate the effects of the increase in traffic generated by the supermarket proposal (due to the increased queues and delays on Kāpiti Road (southeast)).

I also reviewed the effects of changing the length of the proposed second traffic lane on Friendship Place and found that the delays were highly sensitive to even small changes to the lane length. Again, in my experience, this is indicative of an approach that is operating at close to capacity.



Summary / Conclusions

While the detail of the results of my own modelling differ from those of Mr Kelly, the overall outcomes are the same. That is, in my view, the results show that the roundabout is operating very close to (or at) its practical maximum capacity. If low (2% per annum) traffic growth is allowed for on Friendship Place, then the proposed improvement measures set out by the Applicant will mitigate the effects of the additional traffic generated by the supermarket. On the other hand, if higher traffic flows are allowed for on Friendship Place (a doubling of the volumes), then the effects are not mitigated. The higher traffic flows on Friendship Place would arise in this case if activities with Controlled status are taken into account.

I also note that although the layout shown by Mr Kelly appropriately mitigates the increase in queues and delays under the scenario of 2% growth on each approach, the outcome on Friendship Place is very sensitive to the length of the proposed second traffic lane. If this lane was shorter than presently modelled, then the mitigation is much reduced. Accordingly, if the commissioner is minded to approve the application, then in addition to a condition of consent that requires the formation of the second lane on the Kāpiti Road (northwestern approach) and the second lane on Friendship Place, I consider that a further condition of consent is necessary to ensure that the second lane on Friendship Place is no shorter in length than has been shown by Mr Kelly. This will avoid a potential scenario where the lane length is reduced (such as might occur through the detailed design and/or road safety audit process), and the expected mitigation is eroded.

Please do not hesitate to contact me if you require anything further or clarification of any issues.

Kind regards

Carriageway Consulting Limited

Andy Carr

Traffic Engineer | Director

Mobile: 027 561 1967 Email: andy.carr@carriageway.co.nz

