IN THE MATTER of the Resource Management Act 1991 (the **Act**)

AND

IN THE MATTER Applications CRC192408, CRC192409, CRC192410, CRC192411, CRC192412, CRC192413 and CRC192414 to the Canterbury Regional Council, and Application RC185627 to the Selwyn District Council, by Fulton Hogan Limited to establish a quarry operation at 107 Dawsons Road and 220 Jones Road.

STATEMENT OF EVIDENCE OF TIMOTHY JOHN WRIGHT

DATED THE 14TH OF OCTOBER 2019

---

1. INTRODUCTION

1.1. My full name is Timothy (Tim) John Wright. I am a director of QTP Limited and have held this position since April 2009. QTP is a specialist transport planning consultancy with particular expertise in transport assessment and transport modelling.

1.2. My qualifications include a Masters Degree in Civil Engineering from the University of Nottingham, UK (1995, class 2:1). I am a Chartered Professional Engineer (CPEng) and registered under the Chartered Professional Engineers New Zealand Act 2002. I am a Member of Engineering New Zealand (MENZ), a Member of the Chartered Institution of Highways and Transportation (MCIHT), a Member of the ENZ Transportation Group and of the New Zealand Transport Modelling User Group (a sub-group of the ENZ Transportation Group).

1.3. I have been professionally engaged in transport planning, transport modelling and traffic engineering for over 20 years, predominantly in the private sector. During my career I have prepared and reviewed many transport assessments including resource consents, plan changes, area plans, transport modelling and strategic studies.

1.4. Early in my career, I provided development control advice to the Highways Agency (the UK equivalent to the NZ Transport Agency), responding to planning applications with the potential to impact upon the strategic road network. I have also undertaken a number of traffic impact assessments for industrial developments generating high numbers of heavy vehicles. I led the development of the Christchurch Assignment and Simulation Traffic model in 2010/2011 and completed the most recent update[1] to the model earlier this year.

1.5. I have visited the site and observed the operation of the access to the existing Pound Road quarry on Monday 23rd September 2019.

1.6. While this is a Council Hearing, I acknowledge that I have read the Environment Court's Code of Conduct for Expert Witnesses, as contained in section 7 of the Environment Court's Practice Note 2014, and I agree to comply with it.

1.7. The data, information, facts and assumptions that I have considered in forming my opinions are set out in my evidence that follows. The reasons for the opinions expressed are also set out in the evidence that follows.

1.8. I confirm that the matters addressed in this brief of evidence are within my area of expertise, with the exception of where I confirm that I am relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from my opinions expressed in this

[1] The Christchurch Assignment and Simulation Traffic model (CAST) was updated and expanded in 2018/19 for the Greater Christchurch Partnership Model Management Group (MMG) to improve forecast traffic network volumes and performance in Selwyn and Waimakariri Districts, in addition to Christchurch City.

brief of evidence. I have specified where my opinion is based on limited or partial information and I have identified any assumptions I have made in forming my opinions.

2. SCOPE OF EVIDENCE

2.1. In this matter I have been asked by Christchurch City Council[2] to review the applicant's assessment of traffic effects of the proposed activity, being the development of a quarry, (to be known as the Roydon Quarry) at 107 Dawsons Road and 220 Jones Road[3] (which is located between Curraghs, Dawsons, Maddisons and Jones Roads).

2.2. Accordingly, my evidence addresses the following matters:

a) Identification of the key potential effects of the proposal on the safety and efficiency of the transport network;
b) A review of the assumptions made and processes adopted in the applicant's assessment of the effects of the Roydon Quarry on the efficiency and safety of the transport network and the adequacy of the measures proposed to mitigate such potential effects; and
c) Recommended conditions of consent to address potential traffic effects.

2.3. In preparing my evidence, I have considered the following documents:

a) The Integrated Transportation Assessment (**ITA**) forming Appendix C of the November 2018 Resource Consent Application (**RCA**);
b) The Statement of Evidence of Andrew David Carr, dated 2 September 2019;
c) The Response to the Request for Information (**RRFI**) in relation to transport matters prepared by Stantec, dated 27 February 2019;

[2] Hereafter referred to as '**CCC**'.
[3] Hereafter referred to as 'the Site'.

d) The submission on the RCA prepared by the Waipuna / Halswell-Hornby-Riccarton Community Board on behalf of the Christchurch City Council, dated 5th June 2019;

e) The submission on the RCA prepared by the NZ Transport Agency, dated 4th June 2019;

f) The submission on the RCA prepared by Kiwirail, dated 6th June 2019;

g) The Evidence of Andrew Alan Metherell on Traffic Effects, dated 23rd September 2019; and

h) The Evidence of Timothy (Tim) Martin Kelly, a peer review of the transportation assessment for Fulton Hogan, dated 23rd September 2019.

3. EXECUTIVE SUMMARY

3.1. I have reviewed the Integrated Transport Assessment (ITA) that forms Appendix C of the RCA. The traffic effects evidence of Mr Metherell adopts a revised assessment process from that of the RCA that relies on the development of a project-specific 'micro-simulation' model of the study area. Traffic generation estimates have also been reduced from those relating to a maximum daily traffic generation of 1,500 heavy vehicles per day to 1,200 heavy vehicles per day.

3.2. The revised approach potentially allows for a more accurate basis of assessment than the more conventional approach adopted within the ITA.

3.3. However, documentation of the project model development, calibration, validation and forecasting has not been provided. Development of a project model of the scale of that described in the traffic effects evidence would be expected to be subject to Peer Review. Because the model development documentation has not been made available and no evidence of an independent Peer Review process is provided, I am not able to advise if the revised modelling forms a robust basis of assessment of the traffic effects of the proposal.

3.4. Further, the presented 'maximum day' modelling of the AM peak hour is based on demands that are less than I observed during this period at the comparable Pound Road quarry. Thus the demands assessed in the AM peak hour may actually reflect an under-estimate of demands to/from the quarry.

3.5. Notwithstanding the above matters, the presented degree of queuing modelled on the southbound approach to the SH1 / Dawsons Road roundabout (typically 40m to 50m in the 2028 and 2038 modelling) is substantially longer than the modelled queues of around 10m in the RCA modelling. I am concerned that, based on the information provided, there is a significant and insufficiently mitigated safety risk of long truck and trailer vehicles from the quarry queuing back across the Dawsons Road level crossing as a train approaches.

3.6. In my view, further information is required to confirm the validity of the modelling and to ascertain the frequency of occurrence of the southbound queue to the SH1 roundabout extending back to the rail crossing.

3.7. If, through the result of the above processes, it can be demonstrated that there is a sufficiently low risk of southbound heavy vehicles straddling the railway, then I recommend two adjustments to the proposed conditions of consent and an addition in order to adequately mitigate other potential adverse traffic effects that I have identified.

3.8. The proposed changes / additions to the proposed conditions are summarised as:

a) specifying one of two network improvement options offered that I consider will reduce the potential for adverse effects from heavy vehicles routing through the Templeton community;
b) ensuring that a cycle and pedestrian crossing of Dawsons Road is included in the road network upgrades to be provided and that the scope of the detailed design road safety audit covers all such works; and

c) ensuring that electronic queue warning signs and detection system is provided on the SH1 approaches to the Dawsons Road roundabout as and when required by the NZ Transport Agency.

4. POTENTIAL TRANSPORT EFFECTS

4.1. I identify the key potential transport effects of the quarry as follows.

a) Potential safety and efficiency effects on the operation of Jones Road at the site access intersection;
b) Potential safety and efficiency effects on the operation of State Highway 1 at the Dawsons Road roundabout to be constructed as part of the NZ Transport Agency's Christchurch Southern Motorway Stage 2 project (CSM2);
c) Potential safety effects on the operation of the Dawsons Road / Jones intersection (presently give-way);
d) Potential safety effects on the operation of the Dawsons Road level crossing; and
e) Potential safety impacts on the Jones Road cycle and pedestrian path under construction.

5. REVIEW OF APPLICANT'S TRAFFIC ASSESSMENT PROCESS

5.1. The ITA forming Appendix C of the RCA is the key document identifying the applicant's assessment of traffic effects as part of the resource consent application lodged in November 2018.

5.2. The traffic effects evidence of Mr Metherell adopts a revised assessment process that relies on the development of a project-specific 'micro-simulation' model of the study area. For this reason, I set out in the following paragraphs the key features of the original and revised assessment process and the implications of these for the assessment of traffic effects.

5.3. The ITA adopted the conventional approach to assessing the transport effects of a proposal:

a) Future year (2026) 'base' traffic volumes on the road network in the absence of the proposed development are estimated. In this case, this was based on traffic modelling conducted in 2012 using a version of the strategic Christchurch Transportation Model (**CTM**) prepared for the appraisal of the CSM2 project[4] ;

b) Trips associated with the proposed development are estimated. Within the ITA, this was based on trip data from the Pound Road quarry site on the basis that the proposed Roydon Quarry will replace the existing Fulton Hogan Pound Road quarry over time.

c) Development traffic trips are then distributed onto the road network based on the anticipated origins and destinations of trips to/from the site and the anticipated routing of these trips. Within the ITA, this was undertaken based on the addresses recorded for some six weeks of data (30,000 records) at the Pound Road quarry weighbridge. The assumed routing between the quarry and the destinations is understood to be a manual process, based on logical routes.

d) The development traffic to/from the quarry is then simply added to the base flows to form the 'with-development' flows.

e) Intersection-based traffic modelling was undertaken of the estimated 2026 base and with-development flows using the industry standard SIDRA intersection modelling software. Separate intersection models were prepared for the site access intersection (the heavy vehicle access), the intersections of Dawsons Road with State Highway 1 Main South Road (**SH1**) and Jones Road, and the Dawsons Road level crossing. The modelling estimates the delays and queues in the base and with-development scenarios upon which the severity of the assessed traffic impact is based.

[4] The CSM2 model was developed by consultants Beca Infrastructure Ltd and Peer Reviewed by Traffic Design Group Ltd.

5.4. The RRFI on transport matters presented further modelling sensitivity tests for the site access that considered relatively minor changes, in absolute terms, to assessed heavy vehicle numbers that reflect changes in the assumed distribution of quarry traffic.

5.5. Based on the above assessment process, evidence prepared by Andrew Carr identified adverse road safety effects on SH1 caused by queues of vehicles extending back from the Dawsons Road level crossing in the 'with-development' modelling. He considered that the application should not be approved. The S42a Planners Report prepared by Selwyn District Council (**SDC**) considered the effects significant.

5.6. The traffic effects evidence of Andrew Metherell now draws on a different modelling process to that presented within the ITA as part of the RCA. Traffic generation estimates have also been reduced from those relating to a maximum daily traffic generation of 1,500 heavy vehicles per day to 1,200 heavy vehicles per day.

5.7. Turning first to the revised traffic generation estimates, I note that in terms of the traffic modelling, it is the hourly trips attributed to the site that are more pertinent than the daily volumes. The RCA site access modelling indicates 136 movements (two-way) were assumed for the AM peak hour modelling attributed to a daily maximum demand of 1,500 heavy vehicles. This was based on the maximum recorded vehicle volume at the Pound Road quarry between February and September 2018 from 08:00 to 09:00.

5.8. During the survey I conducted at the site access on Pound Road on Monday 23rd September, I recorded 119 two-way movements. This figure is only 12% lower than the 136 two-way movement adopted as the basis of assessment of the AM peak hour within the RCA. Given the daily fluctuations in trips to/from the quarry, as illustrated within Figure 9-3 of the ITA, I consider the trip generation adopted in the ITA an appropriate basis of assessment of peak hour trip generation that will occur at Roydon Quarry.

5.9. By contrast, the modelling presented within the traffic effects evidence indicates a peak hour trip generation of 110 trips two-way. The modelling presented within Annexure B of the traffic effects evidence describes the adopted trip generation as a 'very occasional one-off occurrence' and refers to this as a maximum day. Given this is less than the 119 trips two-way I have observed at the Pound Road quarry, which it is stated the Roydon Quarry will replace, I don't consider this statement accurate. In this regard, the potential effects of the quarry in the traffic effects evidence may be under-estimated to some degree.

5.10. The revised approach to that adopted within the ITA is based on the development of a new micro-simulation traffic model and is described as follows based on the limited information presented in Annexure B to the traffic effects evidence:

a) The micro-simulation project model network extends from SH73 to the north to CSM2 to the south and from Weedons Ross Road to the west to Pound Road in the east;
b) The future year 'base demands' are based initially on those of the CAST model. CAST is a 'middle-tier' model that provides a more refined estimate of demands, traffic flows and network operation than the parent CTM model, a version of which was used as the basis of the assessment within the ITA.
c) The base demands in the micro-simulation model are reported to be subject to base-year calibration to local area traffic counts and network performance.
d) The base demands are assigned to the road network and the operation of the network simulated on a vehicle-by-vehicle basis within a 'micro-simulation' model. This is referred to in the traffic effects evidence as the Do-Minimum scenario.
e) The travel demands associated with the quarry traffic are added to the base demands and are similarly assigned and simulated within the micro-simulation project model. The network is also adjusted to include

proposed improvements, such at the Dawsons Road / Jones roundabout and the site access intersection.

5.11. This revised approach potentially allows for a more accurate basis of assessment than the more conventional approach adopted within the ITA, particularly as it uses a more refined and updated basis of input demands from the 2018 CAST model than the 2012 CTM adopted in the ITA.

5.12. A notable difference in the two approaches is that the revised approach adopted in the traffic effects evidence assumes development traffic may 'displace' non-development traffic from the network in response to increasing congestion. By contrast, the conventional approach adopted in the RCA simply adds development traffic on top of the base flows, irrespective of any increasing congestion which may in practice result in some trips re-routing to less congested routes. Similarly, the micro-simulation project model allows for vehicle trips to change to their optimal route in responses to changes in the assumed road network that affect travel times and distance, such as the changes to the proposed configuration of the Dawsons Road / Jones Road intersection under the 'with development' scenario.

5.13. Thus, the conventional approach is generally pessimistic, or 'worst case' in terms of modelled network impacts. The revised approach may be considered more realistic in this regard, but is reliant on the accurate modelling of traffic conditions on alternative routes to which non-development traffic may re-route.

5.14. However, documentation of the project model development, calibration, validation and forecasting has not been provided. Development of a project model of the scale of that described in the traffic effects evidence would be expected to be subject to Peer Review. Because the model development documentation has not been made available and no evidence of an independent Peer Review process is provided, I am not able to advise if the

modelling forms a robust basis of assessment of the traffic effects of the proposal.

5.15. There are many processes and assumptions applied in the development of a project traffic model that are critical to the assessed network operation in the do-minimum and with-development scenarios. In my view, these should be subject to independent Peer Review before the model results are relied upon as the basis of assessment of traffic effects. Such key processes and assumptions include (but are not limited to):

a) How the base demands from the CAST model have been appropriately processed within the project model;
b) How the demands have been refined further to the project model zone structure;
c) The appropriate profiling of demands throughout the model periods;
d) The method of assignment used for light and heavy vehicles;
e) The composition of vehicles to/from the Quarry, noting that my observations at the Pound Road Quarry are that a significant number are truck and trailer units;
f) Assumptions regarding train frequencies, length and speeds and how these may vary in the future;
g) The precise nature of the network coding employed, noting that simulated performance in micro-simulation models can be very sensitive to 'stop line' positions and many link attributes that can affect modelled behaviour; and
h) The reflection of driver behaviour with regards to the need to avoid vehicles queuing across the level crossing.

5.16. Notwithstanding my views above regarding the need for documentation of the development of the project model and independent peer review, the following chapters refer to the traffic modelling presented in both the ITA of the RCA and the traffic effects evidence with regards to the locations of the

potential traffic effects I outlined at Section 2, above. These sets of modelling are referred to as 'RCA modelling' and 'evidence modelling' from herein.

6. SITE ACCESS INTERSECTION

6.1. Based on my observations at the existing Pound Road quarry access during the morning peak hour on Monday 23rd September, my key safety concern at the site access relates to the provision of adequate deceleration and acceleration lanes, in addition to sufficient right-turn storage. Whilst I have not undertaken a detailed check of the design proposed within the ITA against relevant standards, I consider the proposed concept design appropriate. Notably, it includes a long deceleration lane, allowing heavy vehicles to move clear of the main highway when slowing to approach the site. This represents a significant improvement in safety and efficiency for other users of Jones Road when compared to the current situation at Pound Road where no deceleration lane is provided.

6.2. With respect to the modelled operation of the intersection, I note that the SIDRA analysis presented within the RRFI indicated a delay of 25 seconds (Level of Service (LoS[5]) C) for an assumed demand of just 4 heavy vehicles per hour performing the right-turn from the site in the AM peak hour. The modelled delays increased to 28 seconds (LoS D) with the right-turn demand increasing to by just 2 vehicles per hour to 6 vehicles per hour.

6.3. This modelling would suggest that should demands for quarry material to the southwest of the site (i.e. for construction in the Rolleston area) increase significantly at any point in future years, then right-turn delays could likewise increase significantly. This could potentially raise a safety issue as delayed truck-drivers seek to take smaller gaps in the main road traffic.

6.4. However, in practice I note that locations to the southwest may also be accessed by performing the left turn from the site access and routing instead

[5] Level of Service in this context is the categorisation of performance based on modelled delays, with LoS A being minimal delays and LoS F representing high delays typically in excess of 70 seconds.

via Dawsons Road to SH1. Thus it is unlikely that this potential safety issue would eventuate due to the availability of this alternative route.

6.5. It is not possible to ascertain the delays for this right-turn movement from the site within the traffic evidence modelling as the delays are presented at the total approach level and thus are more reflective of the assumed higher demand for the left-turn.

6.6. I have checked the NZ Transport Agency's Crash Analysis System (**CAS**) for any reported crashes occurring in the vicinity of the access to the Pound Road quarry. It is reassuring that no reported crashes have occurred at this location.

7. SH1 / DAWSONS ROAD ROUNDABOUT

7.1. I understand from the RRFI that the construction of the Dawsons Road roundabout is scheduled to open in the first half of 2020, following the opening of CSM2.

7.2. The roundabout circulating lanes are located approximately 52m back from the Dawsons Road level crossing. Thus a key concern is whether northbound queues from the level crossing are more likely to extend back to the SH1 intersection when a train is present, as a result of the quarry.

7.3. The RCA modelling of the Dawsons Road level crossing was undertaken for standard length trains of 500m and long trains of 900m.

7.4. For the standard length trains, this indicated a 95 percentile queue for an 85 percentile quarry day that exceeds the available storage capacity back to the roundabout on the majority of occasions that a train uses the crossing during the modelled 7am to 6pm period. The 95 percentile queue is the queue length that will be exceeded on 5% of occasions, given variability in traffic demands. The 85 percentile quarry day corresponds to an 0800-0900 trip generation of 109 trips 2-way. This compares to 119 2-way trips I have observed during this period at the Pound Road quarry.

7.5. For the long trains, the modelling indicates a 95 percentile queue for a median quarry day that exceeds the available storage capacity back to the roundabout on all occasions that a train uses the crossing during the modelled 7am to 6pm period. The median quarry day corresponds to an 0800-0900 trip generation of 95 trips 2-way. This compares to 119 2-way trips I have observed during this period at the Pound Road quarry.

7.6. Pertinently, the 'without development' model runs for both standard and long trains indicate a 95 percentile queue that does not exceed the available queue space throughout the day.

7.7. The presentation of the evidence modelling is more extensive and complex, being for two different intersection options for the Dawsons Road / Jones Road roundabout and for two future appraisal years. The queuing presented is described as a 'worst case' but it is not clear if this is the worst case of many simulation runs of the same scenario (allowing for the randomness associated with micro-simulation) or if this is worst case in terms of the quarry trip generation estimates, which as noted earlier, are actually less in the AM peak hour than I have observed at the Pound Road quarry. It is also not clear if the modelling allows for long train lengths. Regardless, the modelling indicates a northbound queue length of 30-40m for the 'with development' scenario at 2028 and 2038 when the crossing is closed, with modelled queue lengths being around just 5m less in the base case (without development).

7.8. The project transport model reporting forming Annexure B of the traffic effects evidence goes on, at section 7, to present reporting on queue lengths for multiple model runs, assuming a train arrives on average once per hour during each model period. It is assumed the modelling is based on average train lengths only. The modelling indicates that the available queue space northbound back to SH1 will be exceeded on 59% of occasions a train passes during the AM peak period, 43% of occasions during the interpeak period and 25% of occasions during the PM peak period for the quarry 'busiest day'. It is

not clear why, in the PM peak hour the percentage of occasions that the queue exceeds the available length should increase from 25% on the 'busiest day' to 32% for the median day.

7.9. My assessment of the revised analysis presented is that the quarry will increase the proportion of occurrences for which queues block back to the SH1 roundabout. Noting that the quarry trips assumed for the 'busiest day' modelling are less than I have observed at the Pound Road quarry, the comparable proportions are 43% without quarry / 59% with quarry in the AM peak period, 8% / 43% in the interpeak period and 14% / 32% in the PM peak period.

7.10. I have undertaken a cross-check of the modelled proportions of time that the rail arms will result in queueing back to the SH1 roundabout.

7.11. I have obtained data from the Christchurch Transport Operations Centre who monitor train frequencies and barrier times at the Hoskyns Road rail crossing to the southwest of the Dawsons Road crossing. This confirms that trains arrive, on average, once per hour during much of the day, but with great variability around this. Information provided by KiwiRail confirms the warning times (approximately 26s) and barrier activation times at Dawsons Road and that train lengths are currently up to 900m.

7.12. In-line with the analysis undertaken for the RCA, I have modelled the 'without development' and 'with development' scenarios using SIDRA Intersection software (7.0).

7.13. Notwithstanding my views presented above regarding the need for publication of the project-model development process and its independent peer review, and possible under-estimation of quarry trips, I have based my analysis on project model flows presented within the traffic evidence. It is of note that the 'with-development' flows northbound at the rail crossing are actually slightly lower than the 'without development' flows. This is noted within Annexure B of the traffic effects evidence, the explanation being that

the shifting of the Dawsons Road / Jones Road intersection further north makes Dawsons Road less attractive for non-development traffic. Whilst this may be the case, it is also suspected that the additional trips to from the quarry displace some non-development trips from the network on to alternative routes due to increases in delay. Thus the change in modelled queuing northbound on approach to the Dawsons Road rail crossing is due only to the change in traffic composition, with a higher proportion of the vehicles being longer, heavy vehicles routing to/from the quarry.

7.14. My AM peak analysis indicates that the proportion of instances that the 52m queue space back to the SH1 roundabout will be exceeded increases from 37% to 55% with the quarry for 500m standard freight trains. For 900m trains the proportion of occurrences increases from 62% to 76%. These findings broadly reflect the micro-simulation analysis of the traffic effects evidence, which is to be anticipated given the vehicle demands used are the same.

7.15. In summary, the revised analysis presented in the traffic effects evidence indicates a modest, but significant increase in the proportion of train crossings that will result in queueing back to the SH1 roundabout.

7.16. I agree with Mr Metherell and Mr Kelly that the installation of queue warning signs on approach to the roundabout would be an appropriate way to mitigate the safety risk of drivers encountering unexpected queues of stationary traffic blocking the roundabout. In my view, this should be a condition of consent, rather than the subject of monitoring, in order to effectively mitigate the risk of injury to motorists. In my view, it may also be more effective to activate the queue detection signs based on the rail barrier detection system rather than based on queue detection loops. Given the short-queueing space available and long length of trucks bound for the quarry (20m+) a queue could extend from a loop detection point to the roundabout in a matter of a few seconds. Drivers should we warned way in advance of the roundabout of the possible presence of queues. Furthermore, the observed practice of the stopping of vehicles on approach to the level crossing to check

for approaching trains could cause queue detectors to trigger the warning signs frequently and unnecessarily.

8. DAWSONS ROAD / JONES ROAD INTERSECTION

8.1. As noted within the ITA and the traffic evidence, the existing Dawsons Road / Jones Road four-way priority intersection has a very poor crash record. My analysis of the reported crashes within CAS identifies some 15 crashes since 2013 that are due to approaching vehicles on Dawsons Road failing to give-way to traffic on Jones Road. Five of these crashes have resulted in serious injury and one in a fatality.

8.2. The close proximity of the existing intersection to the rail crossing means that a queueing space of just 14m is available between Jones Road and the rail crossing. The proposal has significant potential safety effects at this location as a 20+m truck and trailer unit to/from the quarry could not dwell at the northbound stopline and be clear of the rail crossing. Similarly, southbound a truck and trailer unit could not stop at the railway crossing without impeding traffic on Jones Road.

8.3. The proposal to alter the present intersection configuration, incorporating a roundabout at a more northerly location, should provide safety benefits to both quarry and non-quarry traffic. I consider this a positive potential traffic effect of the proposal.

8.4. Two options have been prepared at the conceptual design level. Option 1 is a standard four-arm roundabout. Option 2 is a three-arm roundabout with Jones Road east of Dawsons Road forming a give-way intersection.

8.5. In my view, Option 2 is preferable with regard to the road hierarchies of both the Christchurch and Selwyn District Plans that place Dawsons Road higher in the traffic movement function than Jones Road. Option 2 is also highly preferable to assist in discouraging heavy vehicles to/from the quarry from using Jones Road to route through Templeton in order to minimise

community impacts. Option 1 would facilitate through-routing on Jones Road and does not reinforce the relative traffic function of roads in the road hierarchy. Option 2 also has the advantage of providing little impediment to northbound traffic on Dawsons Road approaching the roundabout which must give way only to the relatively few right-turners southbound on Dawsons Road. This reduces the risk of queues of vehicles blocking back from the roundabout to the railway line. The northbound queueing space available between the roundabout and the level crossing is significantly greater for Option 2 than Option 1, being around double, further reducing the risk of northbound quarry traffic blocking back to the railway line.

8.6. As noted within the Dawsons Road Level Crossing Safety Impact Assessment (**LCSIA**) submitted at part of the RRFI, the Option 2 intersection configuration should include banning the right turn from Dawsons Road into Jones Road immediately north of the rail crossing. This is to prevent right-turners giving way to oncoming traffic from blocking northbound through-vehicles which could result in queueing back across the level crossing.

8.7. The option exists to install a solid median on Dawsons Road north of the rail crossing, making the Jones Road / Dawsons Road intersection Left-In, Left-Out only (**LILO**). This would eliminate the risk described above of right-turners causing a queue blocking back over the rail crossing. It would also serve to reduce the occurrence of through-routing on Jones Road east of Dawsons Road. However, the key impediment to this option is that this is presently a bus route for which it is highly desirable to allow the right-turn from Jones Road to Dawsons Road. South-westbound vehicles, including buses, could continue to through-route on Jones Road by first turning left at Dawsons Road and then U-turning at the SH1 roundabout.

8.8. However, the presence of U-turners from Dawsons Road as the minor arm approach, including buses, could have safety and efficiency implications on the operation of the SH1 roundabout. Thus, on balance, I don't consider the

LILO variant of Option 2 preferable to the conceptual design presented within the ITA.

9. DAWSONS ROAD LEVEL CROSSING

9.1. The effects of the Dawsons Road level crossing on the operation of the Dawsons Road / SH1 roundabout has been the subject of analysis within the ITA and the traffic effects evidence. It has been the focus of attention in Mr Carr's evidence and I have provided my views above in relation to this. However, little focus has been placed on the potential for southbound queues on the Dawsons Road approach to SH1 to block back to the level crossing.

9.2. The modelling presented within the ITA indicated only minimal queuing on the southbound approach to the roundabout for the 'with-quarry' scenario at 2026. This indicated a maximum day 95 percentile queue of less than one vehicle, or around 10m or less, in both peak hours, compared to a stacking space of approximately 50m. Hence this potential for southbound queuing to block back to the rail crossing was not raised as an issue in Mr Carr's evidence nor in the traffic effects evidence of Mr Metherell.

9.3. Whilst not the purpose of the diagram, this potential issue is illustrated in Figure 6-1 of Annexure B of the traffic effects evidence. The diagram is a screenshot from the 2038 AM peak micro-simulation model, illustrating how the southbound queue on Dawsons Road to SH1 can 'swamp' the queue measured at the rail crossing.

9.4. The significance of such a queue is that it may prevent long heavy vehicles (truck and trailer units) from moving clear of the rail crossing when the warning lights and bells are activated by an approaching train. Truck and trailer units transporting materials from the quarry are in excess of 20m long. Thus the potential safety effects of the proposal are due to:

a) Any increase in queue length back from the SH1 roundabout that increases the number of instances when vehicles will block back to the railway; and

b) The change in composition of the traffic using Dawsons Road southbound that will result in a significantly higher proportion of long vehicles that would not be able to clear the level crossing should they proceed when there is insufficient clear road space ahead.

9.5. Figures 6-5 to 6-7 and 6-11 to 6-13 of Annexure B of the traffic effects evidence illustrate the modelled queues for the AM, interpeak and PM peak periods at 2028 and 2038. It is not clear to me if the queue lengths illustrated are the maximum values from several runs of the same scenario (given randomness in the micro-simulation) or if they relate to average values from multiple model runs, or are extracted from single model runs based on the 'worst case' traffic generation, which as I have noted earlier, may actually reflect an under-estimate of demands to/from the quarry. Given the analysis presented in Chapter 7 of the same Annexure B, for northbound rail closures based on multiple runs, I deduce that the above referenced queue plots are not maximum values, but averages or those of a single model run.

9.6. The southbound queues illustrated are consistently greater than 30 metres at 2028 throughout the day for the 'with-quarry' scenario being greatest in the AM peak at around 40 metres, being around 10 metres longer than for the do-minimum scenario. The 2038 queue illustrations are similar but show queues in excess of 50 metres at times during the morning peak hour. As noted above, this would appear to be a very different situation to that indicated by the modelling supporting the RCA that indicated a 95 percentile queue of around 10m or less in the peak hours.

9.7. The LCSIA submitted as part of the RRFI pre-dates the revised modelling of the traffic effects evidence that indicates significantly longer queues southbound on approach to the SH1 roundabout than within the ITA forming part of the RCA. The LCSIA does not specifically address the issue of queuing

back from the SH1 roundabout, instead referring to the potential for queueing back from the Jones Road roundabout.

9.8. Whilst the LCSIA identifies yellow box hatching and signage at the level crossing itself, I am concerned that this measure will be insufficient mitigation to effectively reduce the potential for long vehicles from the quarry to queue back from SH1 across the railway given:

a) The level of persistent queueing now indicated in the revised modelling back from SH1 throughout the day and particularly in the AM peak period; and

b) The large increase in the use of the crossing by long vehicles (truck and trailer units) coming from the quarry.

9.9. Whilst I do not have a detailed breakdown of vehicle types and lengths that will service the quarry, my observations at the Pound Road quarry indicate that truck and trailer units will be a significant proportion of heavy vehicles to/from the quarry. Indeed such vehicles, of a 23m length, are the basis of the indicated design of the site access intersection. Assuming such vehicles comprise between 25% and 50% of all heavy vehicle movements from the quarry, the proposed 1,200 maximum HCV daily movements would translate to between 150 and 300 of these long vehicles exiting the quarry per day, the large majority of which are forecast to traverse the Dawsons Road rail crossing southbound.

9.10. Given these factors and the potential fatal consequences of long vehicles straddling the railway, then based on the information provided, I consider this a significant and insufficiently mitigated safety risk.

9.11. I have attempted to formulate potential mitigation measures, but at this stage, I am not yet able to recommend anything suitable. It would be useful to give this further consideration with input from the other traffic experts.

9.12. Further information from the evidence modelling undertaken may inform the frequency of occurrence of the southbound queue to the SH1 roundabout extending back to the rail crossing, in a similar manner to that presented in Chapter 7 of Annexure B of the traffic evidence for the northbound queue back from the level crossing. I would however further note that:

a) It is not clear if the modelling currently reflects the required behaviour of vehicles to observe the proposed yellow box hatching and not proceed across the railway line until the road ahead is clear (requiring up to 23m for long vehicles) and the effects this has on efficiency and queueing;

b) Documentation regarding the development of the project model and its independent Peer Review should be made publically available in order to confirm that the model is a robust basis of assessing the traffic effects of the proposed quarry; and

c) The 'maximum day' modelling of the AM peak hour is based on demands that are less than I observed during this period at the comparable Pound Road quarry.

10. QUARRY TRAFFIC ROUTING THROUGH TEMPLETON

10.1. A key concern for local residents is that quarry trucks will route through residential areas of Templeton.

10.2. During my visit to Templeton on Monday 23rd September, I did observe a number of heavy vehicles routing through Templeton, performing the east-west manoeuvre via the staggered intersections of Railway Terrace and Waterloo Road with Kirk Road. Heavy vehicles longer than 9m are prohibited from traversing the railway southbound due to the short available queue space between the railway and SH1.

10.3. Logically, there is little reason for trucks to be routing east-west through Templeton given the high standard signalised intersection of Pound Road at SH1 to the east. I consider it is likely that slower speeds on SH1 due to road

works associated with the CSM2 and the Main South Road Four Laning (**MSRFL**) are currently influencing truck driver's route choice, resulting in increased use of the Waterloo Road / Jones Road corridor.

10.4. With these works are required to be completed as a proposed condition of consent, this should greatly reduce the number of trucks presently using the Waterloo Road / Jones Road corridor. Similarly, with the works completed, the logical route for Trucks between the quarry and all locations east of the SH1 / Pound Road intersection is via SH1 Main South Road.

10.5. The distribution of quarry heavy vehicle trips assumed within the ITA and the evidence modelling is based on that the addresses recorded for some six weeks of data (30,000 records) at the Pound Road quarry weighbridge. I consider this a sounds basis for estimating the typical distribution of quarry heavy vehicles. The proportion of demand for quarry materials in Templeton and the immediate surrounds is likely to be very small. Logically, quarry trips to other destinations would take alternative routes. Accordingly, the ITA assesses a quarry heavy vehicle demand on Jones Road east of Dawsons Road of just 5 vpd or 0.3% of the maximum daily quarry demand. I consider this logical.

10.6. By contrast, the distribution illustrated within Figures 2-1 to 2-3 of Annexure B of the traffic effects evidence identifies peak hour quarry heavy vehicle trips of 5 to 7 vph on Jones Road east of Dawsons Road, thus comprising around 5% of hourly quarry heavy vehicle trips.

10.7. Closer inspection of the above diagrams indicates that the modelled heavy vehicle volumes are through-routing through Templeton to/from Pound Road. This is considered likely to be a product of the micro-simulation model assignment technique and doesn't necessarily reflect a logical route choice for heavy vehicles to/from the quarry.

10.8. Accordingly, whilst I consider the risk of a significant number of quarry heavy vehicle trips to be made via Templeton to be low, this potential risk is further mitigated by the following factors:

a) The proposed change to the configuration of the Jones Road / Dawsons Road intersection under Option 2 will make Jones Road a less attractive route choice between the Quarry and Pound Road. This is due to the change of priority under the proposed T-intersection that requires westbound trips on Jones Road to give-way to Dawsons Road;

b) The reconfiguration of the Jones Road / Dawsons Road intersection increases the travel distance on the Jones Road / Waterloo Road corridor and introduces intersection delays, making this a less attractive alternative to using the upgraded SH1 corridor between Pound Road and Rolleston;

c) The proposed Transportation Management and Routing Plan offered as a proposed condition of consent should further assist in reducing the risk of quarry heavy vehicles routing through Templeton; and

d) CCC and SDC as the Road Controlling Authorities for the sections of Jones road and Railway Terrace between Dawsons Road and Kirk Road could implement heavy vehicle restrictions. Whilst there are potential issues with effective enforcement of heavy vehicle restrictions, I consider that symbolic signage at both ends of this route should further assist in discouraging heavy vehicle use and reinforce the Roydon Quarry Transportation Management and Routing Plan.

11. JONES ROAD CYCLE AND PEDESTRIAN PATH

11.1. The off-road shared use cycle path on the south side of Jones Road between Curraghs Road and Dawsons Road, forms part of the CSM2 project and is largely complete. This will connect with the Jones Road cycleway being progressed by SDC between Rolleston and Templeton to the south and to the planned Southern Express Major Cycle Route (**MCR**) to the north being progressed by CCC. The route will form part of a regional cycle network,

allowing cycling between Rolleston and the Christchurch MCR network on cycle-friendly facilities.

11.2. Figure 6-3 of the ITA illustrates the NZ Transport Agency's plans for the CSM2 cycle path on Jones Road in the vicinity of Dawsons Road. It includes a simple 1.5m wide refuge on the short section of Dawsons Road between Jones Road and the Railway.

11.3. The ITA identifies that the additional separation provided due to the intersection reconfiguration will make the crossing less complex for cyclist because the crossing would be located further from the intersection. This is true of the Option 1 configuration. However, for the Option 2 configuration, the crossing remains in the same close proximity to the Jones Road intersection as at present. The ITA considers that the traffic volume on Dawsons Road of up to 350 vph on the busiest day will still allow cyclists to cross the road safely. However, this does not acknowledge the impact that the significant increase in the number of heavy vehicles will have on the perceived safety of the facility and the actual safety implication of a high number of large (wide) vehicles passing within close proximity to cyclists in a central refuge. As a minimum, I consider it essential that the central median is sufficiently wide to accommodate cyclists safely with a sufficient buffer not to compromise cyclist safety, or perception of safety, whist potentially being located on an island between two streams of very large vehicles. Otherwise this is potentially a very intimidating environment for cyclists. Such a design could undermine the whole philosophy of the MCRs that have been designed with safety in mind to appeal to a large number of people who have expressed safety as a primary barrier to cycling as 'interested but concerned' non-cyclists.

11.4. Presently the proposed condition relating to safety audit applies to the Jones 'Road / Dawsons Road roundabout'. I consider this requires further clarification with regard to the extent of the works subject to safety audit to

ensure this includes the cycle crossing of Dawsons Road, as described in section 12, below.

12. PROPOSED CONDITIONS OF CONSENT

12.1. I have noted at section 9 above that based on the traffic information provided, I consider there remains a significant and insufficiently mitigated safety risk. This risk is of long vehicles from the Quarry being impeded by queues on Dawsons Road approaching the proposed SH1 roundabout and being unable to move clear of the railway as a train approaches.

12.2. I have not identified a condition of consent that I consider would sufficiently mitigate this risk.

12.3. I have however also noted that at present there is insufficient documentation regarding the development of the project model referred to within the traffic effects evidence and its independent Peer Review. These should be made publically available in order to confirm that the model is a robust basis of assessing the traffic effects of the proposed quarry.

12.4. Assuming that the project model is considered a robust basis of assessment, it may require adjustment to reflect the required behaviour of vehicles to observe the proposed yellow box hatching and not proceed across the railway line until the road ahead is clear (requiring up to 23m for long vehicles). This may have a significant effect on the modelled efficiency and queueing.

12.5. Then I suggest that further information be gathered and presented from the model. This should identify the frequency of occurrence of the southbound queue to the SH1 roundabout extending back to the rail crossing, in a similar manner to that presented in Chapter 7 of Annexure B of the traffic evidence for the northbound queue back from the level crossing.

12.6. If, through the result of the above processes, it can be demonstrated that there is a sufficiently low risk of southbound heavy vehicles straddling the

railway, then I would recommend the following adjustments to the proposed conditions of consent for the reasons set out in my evidence above:

15) Roading upgrades shall be undertaken in accordance with Option 2 of the Stantec ITA (Appendix C of the AEE). This shall include provision of a roundabout on Dawsons Road, ~~and~~ roading upgrades on Jones Road~~.~~, and a shared-use cycle and pedestrian crossing of Dawsons Road.

18) The consent-holder shall arrange for a detailed design road safety audit to be carried out of the works required in conditions 14 and 15 above ~~Jones Road / Dawsons Road roundabout~~. The audit shall be carried out by a suitably- qualified, independent traffic engineer. Matters raised in the audit shall be considered by the consent-holder, and the audit and outcomes will be provided to the Council.

Under 'Traffic'

At any point in time during the period of consent, the NZ Transport Agency may implement an electronic warning system to advise vehicles on SH1 approaching the Dawsons Road roundabout of queues ahead. This shall be provided at the expense of the consent holder.

I thank the Commissioner for affording me the time to present this evidence.

Tim Wright

14th of October 2019