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MEMO

TO: Dean Christie, NTP Development Holdings Ltd
FROM: Nick Fuller, Principal Transport Engineer
PROJECT REF: 0383-012_Pound Rd_TM005

FTAA-2505-1057: POUND ROAD, CHRISTCHURCH APPLICANT RESPONSE TO MINUTE 14

1. This memorandum provides additional transport information to assist the Applicant's response to the questions raised by the Panel in Minute 14.

Significance of Transport Effects

Transport Efficiency

2. Including the full development traffic on the road network without upgrades to the State Highway 1 (SH1) / Pound Road and Pound Road / Waterloo Road intersections will lead to peak period congestion. The traffic model provides results for the worst 15-minute period and these indicate:
 - i. **SH1 / Pound Road 2038 AM with Development:** The right turns to and from Pound Road are over-capacity, with delays of 81 to 119 seconds (both Level of Service F¹). All three arms have movements that are over a degree of saturation of 0.9², with the right turn out of Pound Road being at a degree of saturation of 1.011;
 - ii. **Pound Road / Waterloo Road 2038 AM with Development:** The movements that are over-capacity at this intersection are the Pound Road south shared left turn and through approach (a degree of saturation of 1.0) and the Waterloo Road west shared left turn and through approach (a degree of saturation of 0.959). Only the Pound Road south shared left turn and through approach is at Level of Service F, with delays of between 86 and 91 seconds;
 - iii. **SH1 / Pound Road 2038 PM with Development:** The right turns to and from Pound Road plus the SH1 eastbound through movement are over the typically accepted degree of saturation limit, although these are all less than a degree of saturation of 1.0. However, the only movement with delays that trigger Level of Service F is the right turn out of Pound Road and this has a delay of 104 seconds; and
 - iv. **Pound Road / Waterloo Road 2038 PM with Development:** The movements that are over-capacity at this intersection are the Pound Road north shared left turn and

¹ Where Level of Service 'A' is typically considered excellent operation, 'E' is at or approaching capacity and 'F' is over-capacity.

² The SIDRA user manual identifies a practical maximum degree of saturation at traffic signals as being 0.9.



through approach (a degree of saturation of 0.927) and the Waterloo Road east shared left turn and through approach (a degree of saturation of 0.911). None of the movements are at Level of Service F.

3. The Levels of Service referred to above are based on the predicted delay to traffic at the intersection. Although not commonly used, there is a similar Level of Service framework for degrees of saturation, where Level of Service D is from 0.9 to 0.95, Level of Service E from 0.95 to 1.0 and Level of Service F is greater than 1.0³.
4. A degree of saturation of greater than 0.9 but less than 1.0 means that the predicted traffic can be accommodated by the intersection, but there is less ability to accommodate small fluctuations in traffic flows (such as rainy days). A degree of saturation of greater than 1.0 means there is more traffic than can be accommodated on that movement and drivers may not get through the intersection during the first green signal phase at the intersection. Queues will notably increase in both of these scenarios, although drivers would be expected to get through the intersection on the second green phase.
5. Given the above operation of the intersections, I would expect the increased delays to only occur at weekday AM and PM peak periods. As previously indicated, the modelling reports on a worst 15-minute period during the peak hours, so the effects would be less outside of that period and considerably less outside the peak hours.
6. I consider that the intersection operation would be similar or better than other intersections on the Strategic Road Network⁴, such as SH1 / Yaldhurst Road traffic signals and the SH1 / Sawyers Arms Road roundabout. Whilst this level of operation is not ideal, it is not without precedent (particularly in New Zealand's main urban centres) and is being tolerated in a Christchurch context. I would typically consider this scale of effect to be more than minor, although in this instance I consider they are potentially significant given they affect the Strategic Road Network.
7. I also consider that drivers will be provided with an opportunity to safely travel through the intersections because they are traffic signal controlled, albeit some drivers may not get through during the traffic signals cycle they arrive in. This can be contrasted with uncontrolled intersections (e.g. stop-controlled) where delays may be significant due to the absence of 'gaps' in traffic and/or result in increased risk taking and unsafe movements by drivers.
8. The average additional in delay for vehicles travelling through the intersections (because of the development) is between 47 and 62 seconds, depending on the peak hour. In my opinion, some drivers will notice this delay during the peak hours, although this additional travel time is not so noticeable that they would need to alter their commuting patterns.

³ From the SIDRA 10 user manual, Table 5.14.5.

⁴ The Strategic Road Network is State Highways and Arterial Roads. These are the dominant elements of the road network that connect the major localities of the region, both within and beyond the main urban area. They have a focus on accommodating through traffic.



Transport Safety

Transport Safety - General

9. I have reviewed the crash record at the SH1 / Pound Road and Pound Road / Waterloo Road intersections (including the rail crossing) and found that there have been no Fatal or Serious injury crashes at these intersections in the most recent five-year period available. Reducing the potential for these crashes is the focus of road safety efforts.
10. I have used crash prediction models for the intersections⁵ and (based on the existing volumes) these models predict that the existing intersections should have a combined crash rate of 0.834 Fatal or Serious crash per year (which converts to 3.373 crashes per year when considering all crash types⁶). As such, the intersections are currently operating more safely than what the modelling prediction indicates. This is not uncommon, as the models are a best estimate based on reported crashes at other intersections, rather than requiring detailed inputs of the specific location being assessed.
11. I have updated these models with the predicted 2038 traffic growth without and with development traffic volumes, which suggests that:
 - i. The crash rate would increase to 0.985 Fatal or Serious crashes (4.156 total crashes) in 2038 without the development; and
 - ii. The crash rate would increase to 1.016 Fatal or Serious crashes (4.312 total crashes) in 2038 with the development.
12. These crash prediction models are somewhat simplistic, as they only consider the traffic volumes through the intersection and not specific features. As outlined above, the actual crash rates at this intersection are considerably less than those predicted. However, in summary, the prediction models suggest that the increase in crash rate in 2038 because of the proposed development would be minimal. For context, the increase in Fatal and Serious injury crashes would be an additional crash every 32 years.

Transport Safety – Rail Crossing

13. The NZ Transport Agency Crash Compendium (used for the crash predictions at the intersections) does not include a model for the rail crossing. I extended the review period for this Pound Road rail crossing and found there have been no Fatal or Serious crashes in ten-years. I note that KiwiRail have confirmed that it has all relevant safety features (such as bells, lights and barrier arms).
14. To further understand the potential for crashes at rail crossings, I reviewed the safety of the rail crossings at Hoskyns Road, Pound Road, Lincoln Road, Selwyn Street, Antigua Street, Montreal Street and Gasson Street for the most recent ten-year period available. These crossings all include reasonably short stacking between intersections and the rail corridor, and are therefore similar to the Pound Road rail crossing and provide a suitable

⁵ Using the formula set out in the NZ Transport Agency *Crash Estimation Compendium* – 26 May 2025 edition.

⁶ This includes Non-Injury and Minor Injury, in addition to Fatal and Serious crashes.



basis for comparison. No Fatal or Serious crashes were reported for these other rail crossings.

15. The review identified some non-injury crashes (8 crashes) at these crossings, typically where drivers have hit the barriers as they are descending. There was one minor crash reported, but I do not consider this a relevant indicator of an assessment of safety, as it was the result of a driver evading Police.
16. I am also aware and find it important to mention the recent fatality publicly reported at the Lincoln Road rail crossing. This would not yet be in the NZ Transport Agency Crash Analysis System database, as there is a lag between crashes occurring and the database being updated. Based on public reporting of the crash, I understand this was related to an e-scooter crossing the tracks late at night, rather than being a congestion-related crash.
17. Overall, there remains an increased risk of Fatal / Serious crashes on the Pound Road rail crossing as a result of the development and congestion at these intersections. That said, I consider this would be a low probability (say 10+ years, noting there are no models to confirm this), but there is potential for fatalities to occur. Given the uncertainty regarding the likelihood of these crashes occurring, I consider the effects of safety at the rail crossing are potentially significant.

Transport Safety & Capacity Summary

18. I originally concluded in the ITA that the effects on transport safety and efficiency of construction of the full development without upgrading the SH1 / Pound Road and Pound Road / Waterloo Road intersections would be significant. This was based on a combination of additional delay to the Strategic Road Network, plus the risk of fatalities at the rail crossing notwithstanding the low probability of that occurring.
19. I would not have necessarily reached the same conclusion with similar effects on a part of the transport network that is not Strategic. As identified above, the operation of these intersections with the development but without improvement will be similar to or better than other existing parts of the Strategic Road Network, with that operation being tolerated by road users within Christchurch.
20. Having further reviewed the safety of comparable rail crossings and for the reasons otherwise outlined above, my opinion has altered to conclude that the effects are "potentially significant", given my safety concerns are unquantified regarding frequency of fatal / serious crashes.

Transport Economics

21. The following provides estimates of the annual delay at the intersections associated with the additional congestion because of the development without the recommended upgrades. This includes traffic growth, as this is the basis of the traffic modelling undertaken to date.



Change in Delay

22. I have estimated the additional delay at the intersections as follows (and as set out in **Attachment 1**):
- i. Calculate the additional total delay through the SH1 / Pound Road and Pound Road / Waterloo Road intersections during the AM and PM peak hours because of the development. This is initially based in seconds and is taken from the intersection capacity models;
 - ii. Makes an assumption to convert this into a daily estimate, noting the additional delay because of the development would be less outside the peak hours as the intersections would be operating within capacity; and
 - iii. Multiplies the above by 365 days per year. This is an over-estimate, we there are typically 260 weekdays per year and this would be further reduced when accounting for public holidays and typical business closures over Christmas. However, I have adopted a higher value to take a precautionous approach.
23. The above suggests that the additional delay at these intersections could be:
- i. 2033 (55% of site area developed⁷): 49,414 additional hours per year; and
 - ii. 2038 (100% of site area developed): 169,059 additional hours per year.

Road Safety

24. The number of crashes predicted at the intersections has also been estimated for the above interim years using the crash prediction model discussed in paragraph 9 (see also **Attachment 2**). The resultant increase in crash rates because of the proposed development (without the upgrades) is:
- i. 2033 (55% of site area developed): 0.106 additional crashes in total, with 0.021 of these being Fatal or Serious; and
 - ii. 2038 (100% of site area developed): 0.156 additional crashes in total, with 0.031 of these being Fatal or Serious.

Intersection Performance – End of Stages

Stage 1 Completion

25. The intersection operation at the end of Stage 1 (2031) is predicted to be satisfactory. All movements are predicted to operate with a degree of saturation of less than 0.9, so within the commonly accepted threshold. The worst Level of Service on any movement is predicted to be 'E', which is approaching capacity although not over-capacity. Noting as stated above, over-capacity is not an unheard-of occurrence along Strategic Road Networks.

⁷ This accounts for traffic generated by activity on the site, but does not include an estimate of construction traffic generation.



Stage 2 Completion

26. The intersection operation at the end of Stage 2 (2033) is acceptable during the AM peak hour. All movements are predicted to operate with a degree of saturation of less than 0.9 and Level of Service not worse than 'D'. However, the PM peak operation indicates that the right turn from Pound Road to SH1 is over the 0.9 degree of saturation threshold, albeit the worst Level of Service is predicted to be 'E'.

Stage 3 Completion

27. The intersections are predicted to be over-capacity in the AM and PM peaks upon completion of Stage 3 (2037). The following occurs under this scenario:
 - i. **SH1 / Pound Road AM Peak:** The right turns to and from Pound Road are over-capacity, with delays of 71 to 95 seconds (both Level of Service F). All three arms have movements that are over a degree of saturation of 0.9;
 - ii. **Pound Road / Waterloo Road AM Peak:** The Pound Road south shared left turn and through approach and the Waterloo Road west shared left turn and through approach have degrees of saturation of greater than 0.9. No movements are at Level of Service F, although the northbound queue on Pound Road (from Waterloo Road) is predicted to queue back to SH1;
 - iii. **SH1 / Pound Road PM Peak:** The right turns to and from Pound Road plus the SH1 eastbound through movement are over a degree of saturation of 0.9. However, only the right turn out of Pound Road is at Level of Service F; and
 - iv. **Pound Road / Waterloo Road PM Peak:** The intersection operates satisfactorily with all movements operating with a degree of saturation of less than 0.9 and no movements at Level of Service F.

Interim Upgrade Options

28. The SH1 / Pound Road intersection is the first to become over-capacity, with the key issue being the capacity of the right turns to and from Pound Road (i.e. is at a Level of Service F). Additional capacity is provided in the proposed intersection upgrade design by providing an additional right turn lane from Pound Road, which in turn frees up green time to also provide additional capacity for the right turn from SH1. An additional southbound through lane is then required at the Pound Road / Waterloo Road intersection to provide additional capacity at that location.
29. One interim improvement option considered was remarking the Pound Road approach to SH1 to change it from separate right and left turn lanes, to provide a right turn plus a shared left and right turn lane. The left turn out of Pound Road currently runs at the same time as the right turn into Pound Road (and again with the right turn out of Pound Road), so whilst some traffic may divert to the newly marked shared left and right lane, this is not anticipated to be sufficient to bring the intersection back within capacity. This is because traffic in the shared left and right lane will be held by pedestrians crossing SH1 and this traffic would not be held up in the exclusive right turn lane, making the shared left and right lane less attractive for right turning traffic.



30. We have also considered the ability to construct the additional right turn lane ahead of undertaking improvements at the Pound Road / Waterloo Road intersection. The additional right turn lane is proposed to realign Pound Road to the west because there is greater separation to the road boundary on that side, particularly at the intersections. Therefore, providing the additional right turn lane on the Pound Road approach to SH1 requires amendments to that road between the two intersections. These changes require Pound Road north of Waterloo Road to be realigned so the approaches line up. Given this, we consider that the only practical way of undertaking the recommended upgrades is to complete both intersections at the same time. This would also be the logical approach when considering traffic management and procurement of contractors for the upgrades.

Pound Road Shared Path

31. Mr Inness discusses the practicality of providing a shared path on Pound Road linking to Road 1 within the subdivision. I understand there are engineering constraints to providing that path.
32. I discussed the effects of not providing this shared path in paragraphs 19 to 25 of my Section 55 response (dated 18 December 2025). In brief, I consider that the shoulders of Pound Road can be marked as cycle lanes to provide a space for these users. This would be a continuation of the existing facilities on the Pound Road north approach to Waterloo Road.
33. This arrangement would also be similar to that on Russley Road (SH1) north of Yaldhurst Road to Harewood Road, which provides on-road cycle lanes next to a busier section of road than Pound Road with a speed limit of 60km/h to 80km/h. Whilst not ideal, I consider the proposed Pound Road cycle lane arrangement is acceptable.
34. Although requiring pedestrians to walk through the subdivision to access the footpaths on Waterloo Road increases the trip length, I anticipate that the number of pedestrians seeking will be low and the effects of this will also be acceptable.



Attachment 1: Intersection Delay Estimate



Intersection	Period	Peak	Vehicles	Delay	Total Delay (secs)							
SH1 / Pound Rd	2033 No Dev	AM	2412	17.8	42933.6							
		PM	2642	21.6	57067.2							
	2033 With Dev	AM	2647	23.2	61410.4							
		PM	2892	39.5	114234							
	Change	AM				18476.8						
		PM				57166.8						
Waterloo Road / Pound Rd	2033 No Dev	AM	1790	16.4	29356							
		PM	1792	13.6	24371.2							
	2033 With Dev	AM	2062	21.4	44126.8							
		PM	2041	15.4	31431.4							
	Change	AM				14770.8						
		PM				7060.2						
Total Peak Delay (secs)		97475										
Total Peak Delay (hours)		27.08										
Assumed daily delay (hours)	135.38		5 If 10% of traffic occurs in a peak hour (20% in the AM plus PM peak) there could be a factor of 5 to get to daily)									
Assumed delay per year (hours)	49414	365										

Intersection	Period	Peak	Vehicles	Delay	Total Delay (secs)	\$ per hr		AM	PM			
SH1 / Pound Rd	2038 No Dev	AM	2566	18.3	46957.8			31.4	33.6			
		PM	2626	19.8	51994.8			30.8	13.7			
	2038 With Dev	AM	2941	49.7	146167.7			62.2	47.3			
		PM	3084	53.4	164685.6							
	Change	AM				99209.9	33.37	\$ 919.62				
		PM				112690.8	33.57	\$ 1,050.84				
Waterloo Road / Pound Rd	2038 No Dev	AM	1898	16.8	31886.4							
		PM	1897	14.8	28075.6							
	2038 With Dev	AM	2404	47.6	114430.4							
		PM	2355	28.5	67117.5							
	Change	AM				82544	33.37	\$ 765.14				
		PM				39041.9	33.57	\$ 364.07				
Total Peak Delay (secs)		333487										
Total Peak Delay (hours)		92.64										
Assumed daily delay (hours)	463.18		5 If 10% of traffic occurs in a peak hour (20% in the AM plus PM peak) there could be a factor of 5 to get to daily)									
Assumed delay per year (hours)	169059	365										



Attachment 2: Crash Models



SH1 / Pound Road	2038 No Dev	2038 With Dev	Change Due to Dev	SH1 / Pound Road	2024	2033 No Dev	2033 With Dev	Change Due to Dev
At (injury crashes per year)	0.607	0.612	0.005	At (injury crashes per year)	0.600	0.60	0.61	0.003
bo	0.121	0.121		bo	0.121	0.121	0.121	
Q major	27300	27200		Q major	25600	26693	26629	
b1	0.12	0.12		b1	0.12	0.12	0.12	
Q minor	15700	19500		Q minor	14400	15236	17679	
b2	0.04	0.04		b2	0.04	0.04	0.04	
Crash modification factors	1	1		Crash modification factors	1	1	1	
All Crashes	2.167	2.185	0.018	All Crashes	2.143	2.158	2.171	0.012
Ratio of fatal / serious to all crashes (Interregional Conn Above from Table A43 of MCBM Appendix 2)		0.28						
Pound Road / Waterloo	2038 No Dev	2038 With Dev	Change Due to Dev	Pound Road / Waterloo	2024	2033 No Dev	2033 With Dev	
At (injury crashes per year)	0.378	0.404	0.026	At (injury crashes per year)	0.234	0.33	0.35	0.018
bo	0.00226	0.00226		bo	0.00226	0.00226	0.00226	
Q major	15700	19500		Q major	14400	15236	17679	
b1	0.14	0.14		b1	0.14	0.14	0.14	
Q minor	3600	3900		Q minor	1300	2779	2971	
b2	0.46	0.46		b2	0.46	0.46	0.46	
Crash modification factors	1	1		Crash modification factors	1	1	1	
All Crashes	1.989	2.127	0.138	All Crashes	1.230	1.758	1.852	0.093
Combined Fatal & Serious	0.985	1.016	0.031	Combined Fatal & Serious	0.834	0.938	0.960	0.021
Combined All Crashes	4.156	4.312	0.156	Combined All Crashes	3.373	3.917	4.022	0.106
Ratio of fatal / serious to all crashes (Urban Connector) Above from Table A43 of MCBM Appendix 2		0.19						