

**Before the Independent Hearing Panel appointed by the
Queenstown-Lakes District Council**

Under The Resource Management Act 1991

In the matter of the Te Pūtahi Ladies Mile Plan Variation

Prepared for Waka Kotahi
(Submitter)

Statement of Evidence of David John Robert Smith for Waka Kotahi – Traffic

Dated 20 October 2023

STATEMENT OF EVIDENCE OF DAVID JOHN ROBERT SMITH FOR WAKA KOTAHI

1 Summary of Evidence

- 1.1 My full name is David John Robert Smith. I am a Technical Director – Transportation Planning at Abley Limited, based in Christchurch. My evidence is given on behalf of Waka Kotahi in relation to the application for the proposed Te Pūtahi Ladies Mile (TPLM) Variation to the Queenstown-Lakes Operative District Plan, seeking to introduce mixed use zoning including residential, education and commercial activities along Ladies Mile to the east of Frankton.
- 1.2 I have reviewed the traffic and transportation effects of the TPLM Plan variation as notified including the outcomes of transportation modelling undertaken by the Abley team under my direction. I have also continued to engage with Mr Shields and Council to collaboratively work through any matters of disagreement.
- 1.3 Mr Shields presents Bluetooth and bus travel time data which demonstrates there is currently substantial congestion and associated delays on the SH6 corridor in the vicinity of the Shotover Bridge and TPLM site. I have undertaken further assessment to understand the current performance of the local transportation network using TomTom analytics data collected in March 2023. My analysis concludes that delays during the morning peak impact SH6 in the westbound (2-6 minutes delay) direction and during the evening peak impact SH6 in the eastbound (3-10 minutes delay). Additionally local connections to SH6 are impacted with lengthy delays on Stalker Road and Howards Drive in the morning and Hawthorne Drive in the evening.
- 1.4 The TomTom data demonstrates that the lane merges on the approaches to the Shotover bridge are the bottlenecks on the SH6 corridor in the morning and evening peak period. I have calculated that the capacity of the bridge itself and associated merges is approximately 1590 vehicles per hour. This is less than the capacity of 1,700 vehicles per lane per hour referenced in Mr Shields' evidence, which I understand this has been taken directly from Waka Kotahi's submission on this Plan variation. The updated traffic modelling of TPLM demonstrates that the capacity of the bridge is reached in the morning peak and exceeded by 8% in the evening peak.
- 1.5 I also consider that prior to reaching this theoretical capacity, the performance of a corridor will deteriorate. The capacity is not a value at which performance will deteriorate, instead it is the absolute maximum number of vehicles that could theoretically be accommodated.

This is evident based on the current performance of the corridor whereby observed traffic volumes are below 1,590 vehicles per lane per hour and yet there are extensive delays on the network.

- 1.6 There are several improvements planned by Waka Kotahi along the SH6 corridor as part of the delivery of the New Zealand Upgrade Programme (NZUP) Queenstown package. This includes intersection upgrades along SH6 at key intersections from the SH6/6A intersection through to Howards Drive, and bus lanes in both directions to enable buses to bypass congestion along the corridor. I understand that there are uncertainties with respect to the timing of the delivery of this package of improvements. I further understand that Waka Kotahi do not intend to upgrade, replace or duplicate the existing SH6 Shotover Bridge between Ladies Mile and Frankton. This means that only finite vehicle movement capacity is and will continue to be available along the corridor, and removing people from their cars and attracting them to public transport is essential to increasing the people movement capacity of the corridor. This can in my view be achieved to an extent by providing bus priority through the NZUP package as part of wider initiatives to invest in public transport.
- 1.7 I have reviewed the transportation modelling results to understand the impacts of TPLM traffic on the local and wider transportation network including the SH6 corridor in the vicinity of the Shotover Bridge. I have concluded that the impact of TPLM, including the interventions as proposed by Mr Shields, will result in further deterioration in the performance of the key intersections along SH6 Ladies Mile. This is evidenced by large delays at the intersections of SH6 / Stalker Road and SH6 / Howards Drive in the morning peak period. Although I note there is no assessment presented of the SH6 bottleneck in the evening peak period, my view is that the current large delays on the SH6 corridor to the west of the Shotover Bridge will be exacerbated by any increase in traffic associated with the TPLM site.
- 1.8 I have reviewed the planning provisions stated in Appendices B and D of the Sections 42A report. My view is that all the transport infrastructure, development staging and wider initiatives to support the take up of alternative modes of transport and reduction in vehicle use, need to be well understood in the context of the TPLM Plan variation.
- 1.9 These need to be satisfactorily addressed through development controls or other planning mechanisms to have confidence that the impacts on the transport network are well understood and can be addressed in an ongoing fashion as the TPLM area develops.

Without addressing these matters, I would expect that the performance of the local and wider transport network would worsen beyond that currently experienced by motorists accessing and travelling along SH6.

1.10 There are in my view several areas of risk and uncertainty relating to the delivery of infrastructure and staging of development. I recommend that these are addressed through the proposed planning provisions and are as follows:

- a an upgrade to the existing SH6 / Stalker Road intersection which manages conflicting demands across the intersection approaches to achieve efficient operation as far as practicable;
- b an upgrade to SH6 / Howards Drive intersection which manages conflicting demands across the intersection approaches to achieve efficient operation as far as practicable;
- c corresponding treatments to urbanise the SH6 corridor in keeping with a 60 kph environment;
- d retaining or enhancing objectives 49.2.5 and 49.2.6, and any planning mechanisms, that support the early establishment of non-residential activity within TPLM;
- e delivery of the following NZUP components should in my view be completed prior to any development:
 - i SH6 Howards Drive intersection upgrade;
 - ii SH6 westbound bus lanes along Ladies Mile; and
 - iii SH6 westbound and eastbound bus lanes along SH6 to between the Shotover Bridge and SH6 / 6A with associated intersection improvements.
- f install northbound bus priority on Stalker Road and any additional bus priority to provide for continuous unimpeded as far as possible throughout local roads in Shotover Country and Lake Hayes Estate;
- g regular traffic monitoring be undertaken to measure the success of the various initiatives aimed at reducing reliance on private vehicle travel;

- h the implementation of effective and ongoing travel planning including regular monitoring be integrated into the Transport Interventions Plan; and
- i a requirement for the preparation of an Integrated Transportation Assessment for resource consent applications on the TPLM Plan variation site be included in the planning provisions.

1.11 My view is that the above matters must be satisfactorily addressed in order to achieve the outcomes that are sought through the Transportation Strategy and Mr Shields' evidence

2 Introduction

2.1 My name is David John Robert Smith.

2.2 I hold a Bachelor of Technology (with Honours) in Industrial Operations Research and Master of Philosophy in Operations Research from Massey University. I am a Chartered Member of the Institute of Logistics and Transport (CMILT), a member of Engineering New Zealand (MEngNZ) and a member of the NZ Modelling User Group sub-group of ENZ. I have been appointed to the NZ Transport Agency Independent Professional Advisors panel for Transportation Modelling. I am also certified as a Hearings Commissioner having complete the Making Good Decisions course in 2019.

2.3 I hold the position of Technical Director of Transportation Planning at Abley. I have been in this position since 2018 and have been at Abley for over 11 years. I lead a range of development planning and transportation planning projects for both public and private sector clients.

2.4 My previous work experience includes 23 years of transportation planning and engineering experience. I have managed and led numerous projects related to transportation business cases, transportation research and Resource Management Act (RMA) related matters for public and private sector clients. As an expert witness I have represented Environmental Protection Authority, Foodstuffs South Island Limited, Auckland Council, Selwyn District Council, Queenstown-Lakes District Council (QLDC), Taupō District Council, Ports of Auckland and Fonterra.

2.5 My role in relation to TPLM is as an independent expert witness to Waka Kotahi on traffic and transportation matters.

2.6 In my assessment I have reviewed the following documents:

- a Waka Kotahi submission;
- b Transportation Strategy; and
- c Transport-related matters in the Section 42A report and appendices.

3 Code of conduct

3.1 While this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

4 Involvement with the Proposal

4.1 I have been involved in the development and operation of the Queenstown-Lakes Tracks Transportation Model (the Model) over the past 11 years and have run the model for QLDC, Waka Kotahi and Otago Regional Council (the Way2Go partners) for numerous transportation planning studies.

4.2 In 2020 /2021, the Abley team under my direction ran the Model for QLDC as an input to the development of a Transportation Strategy prepared by Mr Shields to inform the Ladies Mile Masterplan. The output Technical Note is appended as Appendix F to the Transportation Strategy. The modelling was essentially 'handle-turning' based on inputs and assumptions supplied by Mr Shields, and I did not provide my own interpretation or assessment of the impacts of the Ladies Mile Masterplan.

4.3 In May 2023, Waka Kotahi engaged Abley including myself as transportation expert advisor to review the Transportation Strategy included with the Te Pūtahi Ladies Mile Plan Variation. The outcome of my review has fed into Waka Kotahi's submission on the Plan Variation.

4.4 Subsequent to the lodgement of the submission, Mr Sizemore from Waka Kotahi and I have engaged with Mr Shields to collaboratively work through points of difference with respect to the Transportation Strategy. Mr Shields, Mr Sizemore and I agreed to test the Ladies Mile proposal as notified using the most recent base and future year Model which has

superceded the model used to inform the Masterplan in 2020/21. As previously the Abley team has run the model under my direction. The modelling task has again been ‘handle-turning’ based on the inputs from the Plan Change and as directed by Mr Shields, with the outputs included from page 29 of Appendix C to Mr Shields evidence.

4.5 I have subsequently read the traffic-related sections of the Section 42A report and accompanying evidence prepared by Mr Shields including his Appendix C technical memo. I have also continued to engage with Mr Shields and Council to collaboratively work through any matters of disagreement.

5 Scope of Evidence

5.1 My evidence addresses the following:

- a Description of the current performance of the transport network in vicinity of TPLM;
- b Future transport investment in vicinity of TPLM;
- c Impacts of the proposal;
- d Areas of uncertainty and risk; and
- e Mitigation and planning provisions.

6 Description of the current performance of the transport network in vicinity of TPLM

6.1 In paragraph 51 of Mr Shields evidence, analysis of journey travel times based on June 2023 Bluetooth data is presented which concludes:

- a Up to eight-minute delays in the westbound direction along SH6 between Howards Drive (in the east) and Hawthorne Drive (in the west) in the morning peak hour.
- b Up to six-minute delays in the eastbound direction along SH6 between Lake Hayes Rod and the SH6/SH6A intersection in the evening peak hour.

6.2 In Mr Shields’ paragraph 52, June 2023 bus journey time data from Otago Regional Council is presented along the same SH6 corridor, with westbound morning peak delays and eastbound evening peak delays of up to six and four minutes respectively. This demonstrates that bus journey times are currently impacted on by traffic congestion on the SH6 corridor.

- 6.3 I have undertaken further assessment to understand the current performance of the local transportation network using TomTom analytics data collected in March 2023. I have chosen this month as a typical summer month which is not impacted on by public holidays, school holidays, adverse weather conditions or the peak ski season.
- 6.4 I have extracted 15th, 50th and 85th percentile journey times on the SH6 corridor by hour in both the westbound and eastbound direction, as well as journey times to access SH6 on three key side roads: Hawthorne Drive, Stalker Road and Howards Drive. The location of these corridors, along with peak hour delays, is shown in **Error! Reference source not found.** below, and the full assessment is attached as Appendix A.
- 6.5 My analysis shows the following delays during the 8am – 9am morning peak:
- a SH6 westbound, 2 to 6 minutes delay
 - b Stalker Road, 3.5 to 12 minutes delay
 - c Howards Drive, 45 seconds to 5 minutes delay.
- 6.6 My analysis shows the following delays during the 5pm – 6pm afternoon peak:
- a SH6 eastbound, 3 to 10 minutes delay
 - b Hawthorne Drive, 1 to 16 minutes delay.
- 6.7 Figures 3.2 and 4.2 of Appendix A demonstrate the location of the bottlenecks on the SH6 corridor in the morning and evening peak period by plotting the speed of traffic along the highway. The locations of these bottlenecks are shown by stars on Figure 1.
- 6.8 In the morning peak, congestion forms at the westbound merge point to the west of the SH6 / Stalker roundabout with congestion along SH6 largely confined to the east side of the Shotover Bridge. I have calculated that approximately 90% of the total westbound delay in the morning peak along the SH6 corridor occurs on the east side of the Shotover Bridge.
- 6.9 In the evening peak, congestion forms at the eastbound merge point to the east of the SH6 / Stalker roundabout with congestion along SH6 largely confined to the west side of the Shotover Bridge. I have calculated that approximately 90% of the total eastbound delay in the evening peak along the SH6 corridor occurs on the west side of the Shotover Bridge.

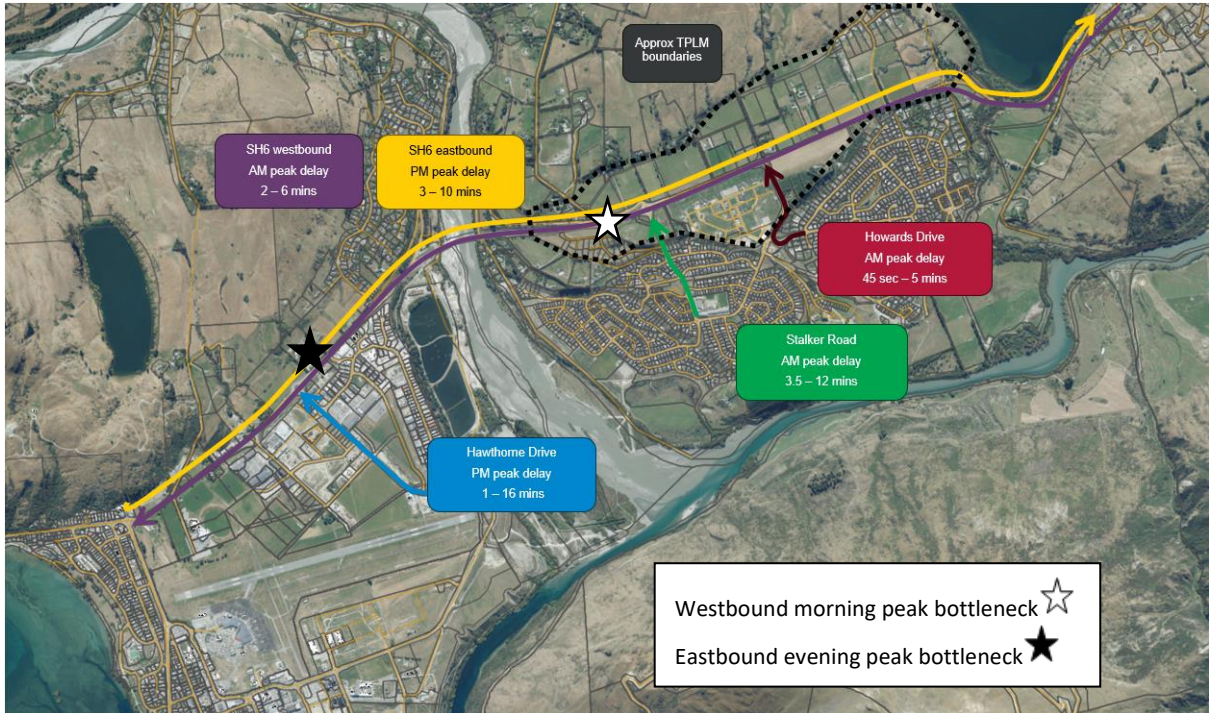


Figure 1: Range of peak hour delays and bottleneck locations (March 2023 TomTom data)

7 Network bottlenecks and capacity

- 7.1 In 2018 I was commissioned by QLDC to provide expert transportation advice for the Wakatipu Basin chapter of the Stage 2 Proposed District Plan review¹. I undertook an assessment of the theoretical capacity of the Shotover Bridge, which I estimated at 1590 vehicles per lane per hour using the Waka Kotahi standard methodology and 1560 vehicles per lane per hour using the Austroads Guide to Traffic Management Part 3 assessment methodology.
- 7.2 Subsequent to this, WSP prepared the Integrated Transport Assessment (ITA)² for the Ladies Mile Housing Infrastructure Fund (HIF) application in December 2018 which calculated that the throughput of the westbound merge on the east side of the Shotover Bridge was 1515 vehicles per lane per hour. This is an important assessment as this merge (that is where two lanes merge into one to the west of the Stalker Road roundabout) is the point that limits the flow across the bridge, and is the point at which the extensive queuing observed in section 6 of my evidence propagates back from.

¹ <https://www.qldc.govt.nz/media/5nlgkqhc/s2239-qldc-t14-smith-d-evidence-30676892-v-1.pdf>

² https://www.qldc.govt.nz/media/npagvd0l/002-ecm_5953266_v1_ladies-mile-hif-dbc-app-07d-opus-integrated-transport-assessment-pdf.pdf

- 7.3 I note in the WSP ITA, my theoretical 1,590 vehicles per lane per hour is quoted and 1,600 vehicles per lane per hour was applied in the ITA. WSP's rationale for applying 1,600 is that additional congestion downstream at the Tucker Beach Road intersection (that is prior to the recent grade separation of the right turn from Tuckers Beach onto SH6) was restricting capacity at the time that the 1,515 capacity was calculated and 1,600 is a more representative value post-grade separation.
- 7.4 For the purposes of my assessment I consider that the capacity of the Shotover Bridge is in this range of 1,515-1,600 vehicles per lane per hour, and remain of the view that the theoretical capacity calculated in my 2018 work for QLDC remains relevant at 1,590 vehicles per lane per hour. I further consider that this is an appropriate capacity for both westbound and eastbound movements across the bridge.
- 7.5 I observe that Mr Shields has quoted a capacity of 1,700 vehicles per lane per hour and I understand this has been taken directly from Waka Kotahi's submission on this Plan variation. I note that 1,700 vehicles per lane per hour is an upper limit capacity for a rural corridor³ and does not take into account the specific local context including the absence of shoulders on the bridge, percentage of heavy vehicles and directionality of flow, which are three additional factors included in my own theoretical assessment. I also note 1,700 vehicles per lane per hour exceeds the assessment based on observed data undertaken by WSP.
- 7.6 I also consider that prior to reaching the theoretical capacity, the performance of a corridor will deteriorate. The capacity is not a value at which performance will deteriorate, instead it is the absolute maximum number of vehicles that could theoretically be accommodated. This is evident based on the current performance of the corridor whereby observed traffic volumes are below 1,590 vehicles per lane per hour and yet there are extensive delays on the network.

8 Future transport investment in the vicinity of TPLM

- 8.1 There are several improvements planned by Waka Kotahi along the SH6 corridor as part of the delivery of the New Zealand Upgrade Programme (NZUP) Queenstown package⁴. These include:

³ Based on the US Transportation Research Board Highway Capacity Manual

⁴ <https://www.nzta.govt.nz/projects/nz-upgrade-programme-queenstown-package/>

- a The installation of signals along SH6 at key intersections between and including the SH6/6A intersection and Hawthorne Drive;
- b The establishment of a westbound bus lane along SH6 between Howards Drive and the Shotover Bridge;
- c The upgrade of SH6 / Howards Drive to a roundabout with an underpass at Ladies Mile for pedestrian and cyclist movements;
- d The establishment of a westbound bus lane along SH6 between Hardware Lane and the SH6/6A intersection, and eastbound between the SH6/6A intersection and Hawthorne Drive; and
- e Further improvements along SH6 to the south of the SH6 / SH6A intersection and along SH6A between Queenstown town centre and Frankton.

8.2 I note that the delivery of this package of improvements is referred to by Mr Shields in the Transportation Strategy and his statement of evidence, and I defer to Mr Sizemore with respect to the timing and funding of the improvements.

8.3 I further understand that Waka Kotahi do not intend to upgrade, replace or duplicate the existing SH6 Shotover Bridge between Ladies Mile and Frankton. This means that only finite vehicle movement capacity is and will continue to be available along the corridor, and removing people from their cars and attracting them to public transport is essential to increasing the people movement capacity of the corridor. This can in my view be achieved to an extent by providing bus priority through the NZUP package as part of wider initiatives to invest in public transport.

9 Transportation modelling in Queenstown-Lakes District

9.1 Since 2012, I have maintained and managed the Queenstown Lakes Tracks Transportation Model (the Model) for the Queenstown Lakes District Council (Council). Simplistically, this is a model that replicates current and forecasts future traffic volumes, speeds and congestion, and can be used to understand the impacts of current or future changes in infrastructure or development. In 2017 and again in 2022, I updated the Transportation Model to reflect recent changes in the Queenstown Lakes District (District). I have used the Transportation Model to inform local transport planning projects for both Waka Kotahi and the Council.

- 9.2 I was the technical lead for the Queenstown Integrated Transport Programme Business Case (QITPBC) and more recently was the team leader for the delivery of transportation modelling for the current suite of business case work in progress including the Queenstown Transport Business Case (QBC), which is a work stream that further addresses transport issues in the District. The QBC was endorsed by Way To Go, and formally approved by Council, Waka Kotahi (and its Board), and Otago Regional Council.
- 9.3 Most recently the model was updated to a base year of 2022 with future assessment years out to 2053. This update was undertaken to support Otago Regional Council's Wakatipu Public Transport Business Case currently being prepared by WSP. This is the latest version of the model and as stated in section 4, this has been run by Abley under my direction to understand the impacts of the TPLM plan change.
- 9.4 There are several assumptions and features of the Model that provide important perspective with respect to interpreting the results including:
- a The Model is informed by land use development forecasts that have been prepared for and endorsed by QLDC. This means that the Model anticipates residential and non-residential growth throughout the District between the base year of 2022 and as far into the future as 2053. Through a series of mathematical models, the growth forecasts are converted into the quantum of travel demand, distributed based on the location of households, employment centres, retail and hospitality offerings, education facilities, tourist activities and other competing activities. The resultant demand for travel is then assigned to the road network.
 - b The base year modelled traffic flows on key corridors are compared to traffic counts to ensure that they are reflective of the level of vehicular activity on the network. A range of validation checks are undertaken to compare the 'fit' of the Model against guidance issued by Waka Kotahi⁵ so that the level of confidence in the Model is well understood.
 - c The Model interacts with a bespoke public transport (PT) model operated by WSP which predicts the level of uptake for public transport and consequent reduction in vehicle trips on the road network. This means that the Model can take into consideration the

⁵ <https://www.nzta.govt.nz/resources/transport-model-development-guidelines/>

impact of future investment in public transport including the introduction of new services, more frequent services and the provision of bus lanes.

- d The Model and bespoke PT model, interaction therein, and the response of the model to additional public transport investment is in line with industry best practice and has been peer reviewed through the development of the Queenstown Transport business cases to provide further confidence in the level of reliance that can be placed upon them.
- e For the TPLM modelling, the input assumptions with respect to the activities on Ladies Mile and level of public transport provision have been provided by and agreed with Mr Shields.
- f On this basis it is my view that the updated modelling that I have provided to Mr Shields and corresponding reporting included in Appendix C to his evidence is agreed as fit-for-purpose and is suitable for a high-level assessment of the TPLM development.

9.5 At my request, Mr Shields has undertaken more detailed intersection modelling (using Sidra Intersection software) of the SH6 / Stalker Road roundabout and proposed SH6 / Howards Drive roundabout based on the demand flows calculated by the Model. Mr Shields has shared these models with me for my review and I am comfortable that the intersection modelling (for these two intersections) has been undertaken in accordance with industry best practice. The intersection modelling assessment is also included in Appendix C to Mr Shields statement of evidence.

10 Impacts of the proposal

10.1 I have reviewed the interpretation of the Abley Modelling provided by Mr Shields and subsequent Sidra Intersection modelling presented in Appendix C technical note, and have undertaken my own interpretation of the same transportation modelling as presented in this section of evidence.

10.2 As noted in section 7, I consider that the theoretical capacity of the Shotover Bridge is approximately 1,590 vehicles per lane per hour, but note that the performance of the network deteriorates prior to this value as evidenced by the current delays and queuing occurring on the east side of the Shotover Bridge in the morning peak hour and west side in

the evening peak hour. This differs from Mr Shields assessment, which assumes a higher capacity of 1,700 vehicles per lane per hour.

- 10.3 I have prepared a table of traffic volumes on the bridge from the Abley modelling included in Appendix C to Mr Shields’ evidence as below. I have highlighted in bold where the volume exceeds the theoretical capacity and noted the percentage that flow exceeds the 1590 capacity in each instance.

Table One Summary of modelled flows on Shotover Bridge with TPLM

Period	No mode shift		With mode shift	
	Westbound	Eastbound	Westbound	Eastbound
Morning peak	1814 (+14%)	1111	1581	1005
Interpeak	1441	1477	1350	1388
Evening peak	1340	1923 (+21%)	1235	1710 (+8%)

- 10.4 I agree with Mr Shields’ conclusions that morning peak westbound (towards Frankton) and evening peak eastbound (from Frankton) flows exceed capacity if mode shift away from vehicular trips is not achieved. With the implementation of a mode shift as calculated by the WSP bespoke PT model, and based on the implementation of bus lanes and frequent bus services as set out in the Transport Strategy, the peak hour volumes drop by a little over 200 vehicles per hour. This results in a modelled 1,581 westbound vehicles in the morning peak hour (which is <1% below my calculated 1,590 capacity) and 1,710 eastbound in the evening peak hour (which is 7.5% over and above 1,590). I reiterate that this is contingent on the delivery of the interventions and development as proposed in the Plan variation.

- 10.5 I expect that these volumes will result in queuing and delays that are similar to or greater than what is currently experienced. Noting the WSP observation in the Ladies Mile ITA that the maximum observed throughput at the lane merge locations on each side of the bridge broadly aligns with this capacity, any additional traffic over and above would in my view result in longer delays and queues than what is currently observed and/or the current levels of delay and queuing occurring over a longer period. This is a phenomenon known as peak spreading whereby congestion spills over from the peak hour (in this case 8-9am and 5-6pm) into the shoulder hours of 7-8am and 9-10am, and/or 4-5pm and 6-7pm.

- 10.6 I have reviewed Mr Shields Sidra Intersection analysis and note that his modelling indicates extensive queueing at the SH6 / Stalker Road roundabout and proposed future SH6 /

Howards Drive roundabout in the morning peak. Most notably the modelling with TPLM included (along with interventions included in the TPLM Transport Interventions Plan), calculates the network will operate with:

- a up to 2 minute average delays on the Stalker Road approach with up to 28 vehicles queued;
- b 6-7 minute average delays on the SH6 east approach to Stalker Road with up to 209 vehicles queued;
- c 2-3 minute average delays on the Howards Drive approach with up to 22 vehicles queued; and
- d 10 minute average delays on the SH6 east approach to Howards Drive with up to 132 vehicles queued.

10.7 The average queueing space per vehicle is approximately seven metres which means that the SH6 east approach modelled queue of up to 209 vehicles will extend back in the order of 1.5 km and will queue back well past the Howards Drive roundabout, which is 750m away. This means that the Howards Drive intersection will perform considerably worse than has been modelled. The combined queue back along SH6 from Stalker Road aggregated across both intersections is approximately 341 vehicles or 2.4 km in length on SH6.

10.8 I have tabulated these Sidra modelling results, alongside the observed delays from Mr Shields Bluetooth analysis and my TomTom analytics data presented in section 6, as below.

Table Two Morning Peak Hour Travel Times on Key Corridors (minutes)

Corridor	2023 Bluetooth ⁶	2023 TomTom ⁷	2053 Modelled with TPLM ⁸
SH6 westbound delay	5 – 9	2 - 6	16 - 17
Stalker Road northbound	not assessed	3.5 - 12	2
Howards Drive northbound	not assessed	1 - 5	2 - 3

⁶ Observed average and maximum delay from June 2023 Bluetooth analysis in Mr Shields’ evidence Appendix C

⁷ Observed 15th %ile to 85%ile delay from March 2023 data analysis included as Appendix A to my evidence

⁸ Average delay from Sidra modelling included in Mr Shields’ evidence Appendix C

Table Three Evening Peak Hour Travel Times on Key Corridors (minutes)

Corridor	2023 Bluetooth	2023 TomTom	2053 Modelled with TPLM
SH6 eastbound delay	3 – 6	3 - 10	not assessed
Hawthorne Drive northbound	not assessed	1 - 16	not assessed

10.9 I observe that the 2053 modelled morning peak SH6 queueing has worsened considerably and there is some modest improvement in Stalker Road and Howards Drive delays compared to the current network performance. I consider that this improvement is due to:

- a the assumed mode shift of Shotover Country and Lake Hayes Estate residents towards public transport, which lessens traffic volumes on Stalker Road and Howards Drive; and
- b the addition of TPLM as a northern leg to these intersections breaks up the SH6 traffic stream, especially where TPLM traffic may be driving through the roundabout and travelling into Stalker Road and Howards Drive.

10.10 I further note that with the currently modelled roundabout configuration, traffic from TPLM in the morning turning right to access Frankton gets priority over SH6 westbound through traffic and traffic exiting Shotover Country and Lake Hayes Estate. This is evidenced by the very low levels of delays for Lower Shotover Road and the TPLM access approaches in Mr Shields’ modelling.

10.11 On balance I have concluded that the impact of TPLM including the interventions as proposed will result in further deterioration in the performance of the key intersections along SH6 Ladies Mile.

10.12 In paragraphs 54 (c) and 54 (d) of Mr Shields’ evidence these long delays are acknowledged and a preference is stated to introduce traffic signals for both of these intersections. I agree with this assessment and have recommended to Mr Shields that additional assessment be undertaken to demonstrate the potential for signals to lessen the delays and queuing.

10.13 Mr Shields has presented an assessment of the evening peak hour performance of the two roundabouts at TPLM. As noted in section 6 the impact of the Shotover Bridge constraint is on the network upstream (that is to the west) of the bridge. My expectation is that the impacts on the SH6 corridor in the evening peak to the west of the bridge will be similar to

the impacts as modelled in the morning peak to the east of the bridge. I have recommended to Mr Shields that additional assessment be undertaken to demonstrate the impacts of TPLM on delays and queuing at SH6 / Hawthorne Drive and other key SH6 intersections that may be impacted on the west side of the Shotover Bridge.

- 10.14 The additional modelling of signals along Ladies Mile and an assessment of impacts on SH6 during the evening peak hour are in my view required to understand the effects of the TPLM plan variation on the local and wider network.

11 Areas of uncertainty and risk

- 11.1 There are several areas of uncertainty and risk with respect to the network performance. These are as follows:

- a The delivery of the NZUP package including bus lanes and Howards Drive intersection upgrade. Mr Shields' assessment relies on the delivery of these improvements and does not consider the transport effects if these are not delivered or are only delivered in part prior to development. If these are not delivered prior to the establishment of TPLM, the ability to achieve the mode shift to public transport relied on by Mr Shields will be compromised. I defer to Mr Sizemore with respect to the timing and funding of these improvements;
- b Establishing supporting bus priority. The delivery of NZUP will in my view provide residents with a much more attractive public transport offering compared to the current situation. However, the addition of bus lanes along SH6 will not entirely solve the challenge of providing a fast and reliable bus service if traffic is held up on local streets. There is a risk that if supporting bus priority is not provided to access SH6, especially along Stalker Road, buses will get held up for lengthy periods in congestion which will deter existing and potential future public transport users.
- c Achieving behaviour change. One of the challenges facing the transport planning industry is encouraging the uptake of more sustainable modes of transport. Mr Shields' assessment relies on a transformational shift from vehicle reliance to a 20-21% public transport mode share across the Shotover Bridge (compared with current 3.3% Journey to Work mode share in Shotover Country and Lake Hayes Estate)⁹. The reality in the

⁹ Source – page 33 of TPLM Transportation Strategy taken from 2018 Statistics New Zealand census data

context of the TPLM may itself be worse (or better) than modelled, and I further note that the assessment assumes that there will be a corresponding mode shift away from vehicle use in the suburbs or Shotover Country and Lake Hayes Estate. There is a risk that if this unprecedented shift away from vehicle usage is not achieved, then the outcomes will be worse than as modelled;

- d Establishing schooling and employment within TPLM. Mr Shields' assessment relies on the positive outcomes associated with providing schooling, employment, retail and recreational destinations within TPLM. I support the inclusion of these activities as they reduce the requirement for TPLM, Shotover Country and Lake Hayes Estate residents to travel further west to reach similar destinations by providing these locally (including within walking distance or much of the area). There is a risk that, if these are not established, then the transport impacts will be worse than modelled. This would also be the case if a substantial amount of residential activity were established prior to the schools, commercial and recreational activities being established. If this were the case, network impacts and performance would worsen (compared to the current situation) until supporting land use activities are established within TPLM (along with transport upgrades discussed above);

- 11.2 I have considered these risks in the context of the LPTM application and proposed mitigation and planning provisions that address these matters of uncertainty and risk as far as practicable.

12 Mitigation and planning provisions

- 12.1 In my view the risks highlighted in section 11 should be addressed through planning provisions or other development controls as a form of eliminating or reducing the likelihood of these risks as far as practicable. I address each in turn in the paragraphs below as well as other mitigation which I recommend to mitigate the traffic effects of TPLM and manage the effects on the local and wider transportation network.

Installation of signals at SH6 / Stalker Road and SH6 / Howards Drive

- 12.2 I have reviewed the Sidra Intersection modelling undertaken by Mr Shields and consider that neither of the SH6 roundabouts will work satisfactorily in the future. I consider that to manage the demands from each approach, including TPLM traffic, the SH6 / Stalker Road

should be upgraded to traffic signals and the SH6 / Howards Drive roundabout included in the NZUP Queenstown package should be built as a signalised intersection.

- 12.3 The upgrade of these intersections to traffic signals in my view should be accompanied by a reduction in the speed environment along SH6 to 60 kph. The geometry of roundabouts can be effective in reducing speeds, however as traffic signals do not require traffic to reduce speed and divert from their path they are less safe in high speed environments (such as the current 80 kph speed limit along SH6). On this basis I do not consider that traffic signals are suitable unless a 60 kph environment is established.
- 12.4 In addition to reducing the speed limits, the corridor should also be urbanised such that SH6 is not only posted as 60 kph but feels like a 60 kph environment to road users. This is a safety principle known as making roads 'self-explaining'. Noting that there are currently large setbacks of the current urban development on the south side of SH6 and the TPLM proposal includes setbacks on the north side of SH6, the corridor (in its current form) is not appropriately designed to implement a 60 kph posted speed.
- 12.5 A further option which could be considered is the signalisation of key approaches at the roundabouts where conflicts in movements result in large delays for SH6 and Shotover Country / Lake Hayes Estate traffic. The principle here would be to install traffic signals on the TPLM approaches to the roundabouts, and stop traffic exiting TPLM at Lower Shotover Road and Howards Drive when SH6 queues exceed specific lengths. This is a treatment which is often installed at roundabouts to manage conflicting demands where high volumes of traffic on one or more approaches may dominate other approaches resulting in lengthy delays. As highlighted in section 6, this is already occurring at the Stalker Road roundabout where SH6 traffic causes lengthy delays to Stalker Road traffic.
- 12.6 I recommend that additional design work and modelling be undertaken to find a suitable solution for the corridor and this should include:
- a Testing signals in addition to reconfiguring the corridor to be more in keeping with a 60 kph urban environment; and
 - b Testing the signalisation of TPLM (and potentially SH6) approaches to the roundabout to minimise delays across all roundabout approaches in the morning peak period.

- 12.7 I further recommend that the planning provisions be updated based on the outcomes of this additional assessment work to include;
- a an upgrade to SH6 / Stalker Road intersection which manages conflicting demands between the intersection approaches to achieve efficient operation as far as practicable;
 - b an upgrade to SH6 / Howards Drive intersection which manages conflicting demands between the intersection approaches to achieve efficient operation as far as practicable; and
 - c corresponding treatments to urbanise the SH6 corridor in keeping with a 60 kph environment.

Stage non-residential development in advance of residential development

- 12.8 The TPLM Transport Interventions Plan signals that the primary school, high school, town centre and playing / sports fields will indicatively be established between 2027 and 2031. The non-residential development should ideally be in place before a substantial amount of residential development take place in TPLM.
- 12.9 This will be challenging as establishing schools is not the mandate of Council but will sit with the Ministry of Education. Should residential development go ahead prior to the establishment of the Primary School and High School, additional morning peak traffic will be generated by TPLM over and above that included in the transportation modelling assessment with worsening performance of the network. I understand that the TPLM team have been engaging with the Ministry of Education regarding establishing schools along the corridor and note the schools are indicatively scheduled to be established after substantial residential development has occurred.
- 12.10 Similarly, if residential development proceeds prior to the establishment of the town centre and community facilities, additional traffic will be generated in both peak periods (and during the middle of the day) as TPLM will have fewer employment, shopping, hospitality and recreational activities within the development. I note that the early establishment of these activities delivers additional benefits to Shotover Country and Lake Hayes Estate residents, reducing their reliance on competing destinations further afield.

12.11 I note that it may be difficult to prepare development controls to seek opportunities to establish non-residential development as early as possible in the development process, as much of this will be outside of the control of QLDC and developers. To an extent the market will dictate when commercial and educational activities will be established, and there is some likelihood that this would occur relatively early in the development of TPLM due to the lack of similar activities in the vicinity. However, the lack of certainty does mean that the transport outcomes presented in Mr Shields assessment may not eventuate. I note that objectives 49.2.5 and 49.2.6 address these matters and I support the inclusion of these and any other initiatives that can support the early establishment of non-residential activity.

Deliver NZUP prior to development

12.12 I consider that the NZUP Queenstown package should be delivered prior to the development of TPLM. Whilst the package includes works along the length of the SH6 and SH6A corridors, in the context of the development of TPLM, at a minimum the following NZUP components should in my view be completed prior to any development:

- a SH6 Howards Drive intersection upgrade;
- b SH6 westbound bus lanes along Ladies Mile; and
- c SH6 westbound and eastbound bus lanes along SH6 to between the Shotover Bridge and SH6 / 6A with associated intersection improvements.

12.13 I recommend that this be added to staging rules 49.5.10, 49.5.33 and 49.5.50.

Provide additional bus priority prior to development

12.14 The delivery of high-quality public transport services is fundamental to encouraging and ultimately achieving a mode shift away from private vehicle trips. Whilst the installation of bus lanes on SH6 goes some way to providing a reliable bus service, it is noted that the current traffic congestion experienced within Shotover Country and Lake Hayes Estate hampers public transport movement.

12.15 I recommend that northbound bus priority be installed on Stalker Road and additional bus priority be installed to provide continuous and unimpeded bus movement as far as possible throughout local roads in Shotover Country and Lake Hayes Estate. This maximises the potential for providing regular, reliable bus services that are an attractive alternative to car

dependency. In my view if buses get caught up in congestion (as is currently the situation) the mode shift aspirations proposed in the TPLM will not be feasible.

- 12.16 The extent and provision for bus priority will be impacted on by the preferred intersection forms at the SH6 / Stalker Road and SH6 / Howards Drive intersections and should in my view be designed as a package with adequate provision for bus priority on all approaches where congestion has the potential to impede the direct and reliable movement of buses.
- 12.17 I recommend that the requirement for bus priority along Stalker Road (at a minimum) be added to staging rules 49.5.10, 49.5.33 and 49.5.50.

Monitor mode shift and link to staging of development

- 12.18 I support the inclusion of the development of workplace and school travel plans in the planning provisions. Best practice travel plans include a monitoring component to measure the effectiveness of the travel plans in encouraging the uptake of alternative modes. This is especially important in the context of TPLM due to the level of reliance on achieving a mode shift away from private vehicle use.
- 12.19 I recommend that regular traffic monitoring be undertaken as TPLM is established and continue in an ongoing fashion to measure the success of the various initiatives aimed at reducing reliance on private vehicle travel. I further recommend that the implementation of effective and ongoing travel planning including regular monitoring be integrated into the Transport Interventions Plan.

Summary

- 12.20 My view is that all the transport infrastructure, development staging and wider initiatives to support the take up of alternative modes of transport and reduction in vehicle use, need to be well understood in the context of the TPLM Plan variation. These need to be satisfactorily addressed through development controls or other planning mechanisms to have confidence that the impacts on the transport network are well understood and can be addressed in an ongoing fashion as the TPLM area develops. Without addressing these matters, I would expect that the performance of the local and wider transport network would worsen beyond that currently experienced by motorists accessing and travelling along SH6.
- 12.21 Due to the level of uncertainty with the delivery of infrastructure and achieving mode shift, I recommend that the preparation of an Integrated Transport Assessment be a requirement

for all development resource consent applications and this be reflected in the planning provisions for TPLM. This in my view will be an effective means of providing an appropriate level of assessment taking into consideration the future state of the transport network and travel behaviour.

- 12.22 I also consider that ongoing collaboration between the Way To Go partners is fundamental to ensuring that the delivery of transport infrastructure is coordinated for all modes and integrated as far as possible with the staging of development in the TPLM area.

13 Conclusions

- 13.1 I have reviewed the traffic and transportation effects of the TPLM Plan variation as notified including the outcomes of transportation modelling undertaken by the Abley team under my direction. I have concluded that the impact of TPLM including the interventions as proposed will result in further deterioration in the performance of the key intersections along SH6 Ladies Mile.

- 13.2 There are in my view several areas of risk and uncertainty relating to the delivery of infrastructure and staging of development. I recommend that these are addressed through the planning provisions and are as follows:

- a an upgrade to the existing SH6 / Stalker Road intersection which manages conflicting demands across the intersection approaches to achieve efficient operation as far as practicable;
- b an upgrade to SH6 / Howards Drive intersection which manages conflicting demands across the intersection approaches to achieve efficient operation as far as practicable;
- c corresponding treatments to urbanise the SH6 corridor in keeping with a 60 kph environment;
- d retaining or enhancing objectives 49.2.5 and 49.2.6, and any planning mechanisms, that support the early establishment of non-residential activity within TPLM;
- e delivery of the following NZUP components should in my view be completed prior to any development:
 - i SH6 Howards Drive intersection upgrade;

- ii SH6 westbound bus lanes along Ladies Mile; and
 - iii SH6 westbound and eastbound bus lanes along SH6 to between the Shotover Bridge and SH6 / 6A with associated intersection improvements.
- f install northbound bus priority on Stalker Road and any additional bus priority to provide for continuous unimpeded as far as possible throughout local roads in Shotover Country and Lake Hayes Estate;
- g regular traffic monitoring be undertaken to measure the success of the various initiatives aimed at reducing reliance on private vehicle travel;
- h the implementation of effective and ongoing travel planning including regular monitoring be integrated into the Transport Interventions Plan; and
- i a requirement for the preparation of an Integrated Transportation Assessment for resource consent applications on the TPLM Plan variation site be included in the planning provisions.

13.3 My view is that the above matters must be satisfactorily addressed in order to achieve the outcomes that are sought through the Transportation Strategy and Mr Shields' evidence.



David John Robert Smith

20 October 2023

Appendix A

Appendix A

Ladies Mile Plan Variation - TomTom data analysis technical note

Prepared for	Waka Kotahi
Job Number	NZTA-J321 - Ladies Mile Plan Variation Stage 1
Revision	Final
Issue Date	11 October 2023
Prepared by	Mat Collins
Reviewed by	Dave Smith

Executive summary

This technical note provides a summary of TomTom data received by Abley to provide an understanding of current travel times on SH6 and key corridors near the Te Pūtahi Ladies Mile (TPLM) Site. Peak hour delays have been calculated between 15th percentile and 85th percentile travel times and fall into a broad range as shown in Figure 0.1.

A summary of the 15th, 50th percentile and 85th percentile travel times for these roads, across a 24 hour period, is provided in Figure 0.2 to Figure 0.6, and a quantitative and qualitative summary is provided in each Section of this technical note.

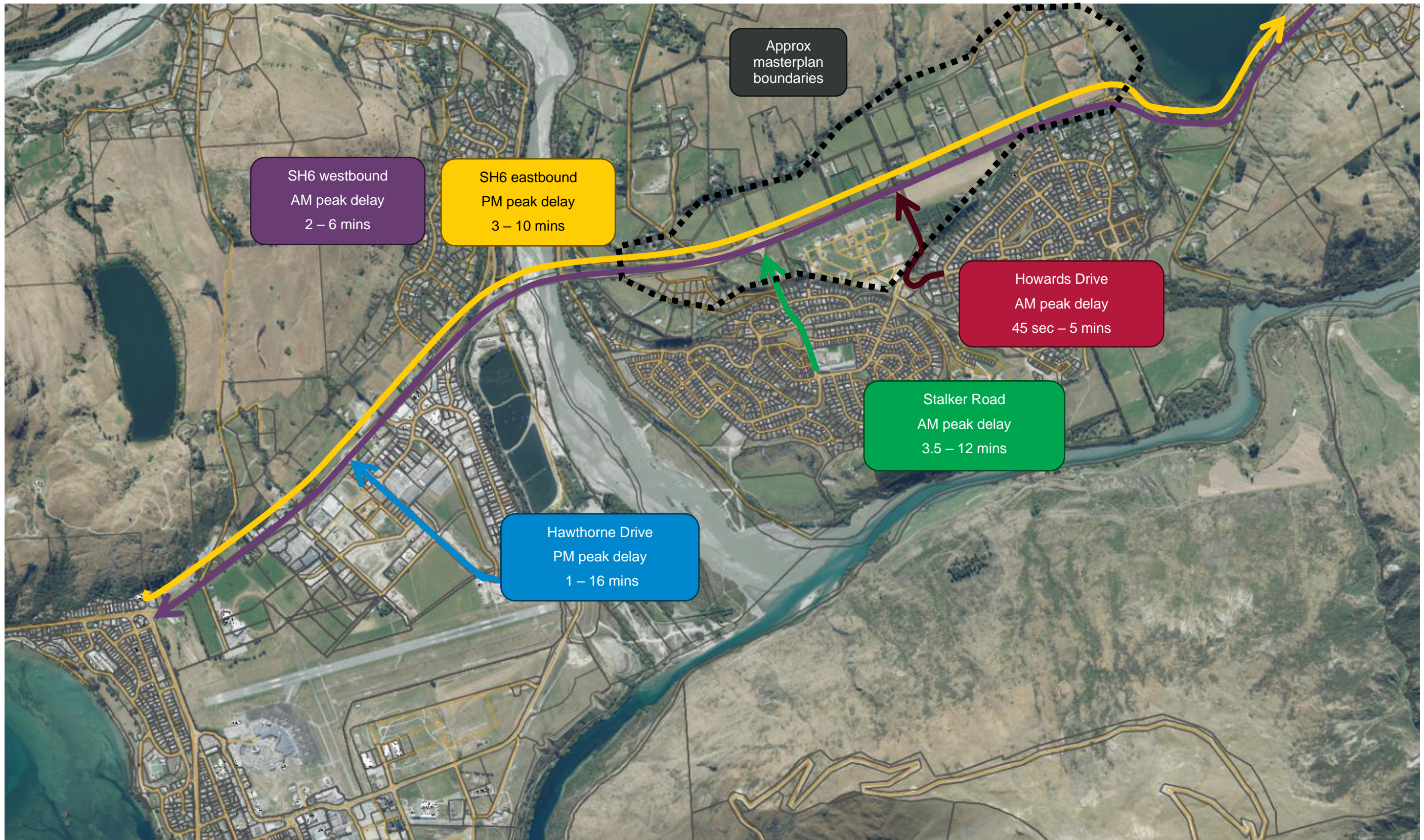


Figure 0.1 Indicative peak hour delays (March 2023)

Percentile	00:00hrs - 01:00hrs	01:00hrs - 02:00hrs	02:00hrs - 03:00hrs	03:00hrs - 04:00hrs	04:00hrs - 05:00hrs	05:00hrs - 06:00hrs	06:00hrs - 07:00hrs	07:00hrs - 08:00hrs	08:00hrs - 09:00hrs	09:00hrs - 10:00hrs	10:00hrs - 11:00hrs	11:00hrs - 12:00hrs	12:00hrs - 13:00hrs	13:00hrs - 14:00hrs	14:00hrs - 15:00hrs	15:00hrs - 16:00hrs	16:00hrs - 17:00hrs	17:00hrs - 18:00hrs	18:00hrs - 19:00hrs	19:00hrs - 20:00hrs	20:00hrs - 21:00hrs	21:00hrs - 22:00hrs	22:00hrs - 23:00hrs	23:00hrs - 00:00hrs
15	331	336	341	343	327	335	345	366	377	377	382	382	379	376	379	383	381	383	363	353	359	356	351	337
50	390	391	392	391	374	378	393	414	430	427	434	434	431	428	431	438	438	514	412	400	409	408	405	390
85	457	461	458	459	444	439	460	484	509	500	514	516	511	507	511	547	585	763	543	462	476	475	475	459

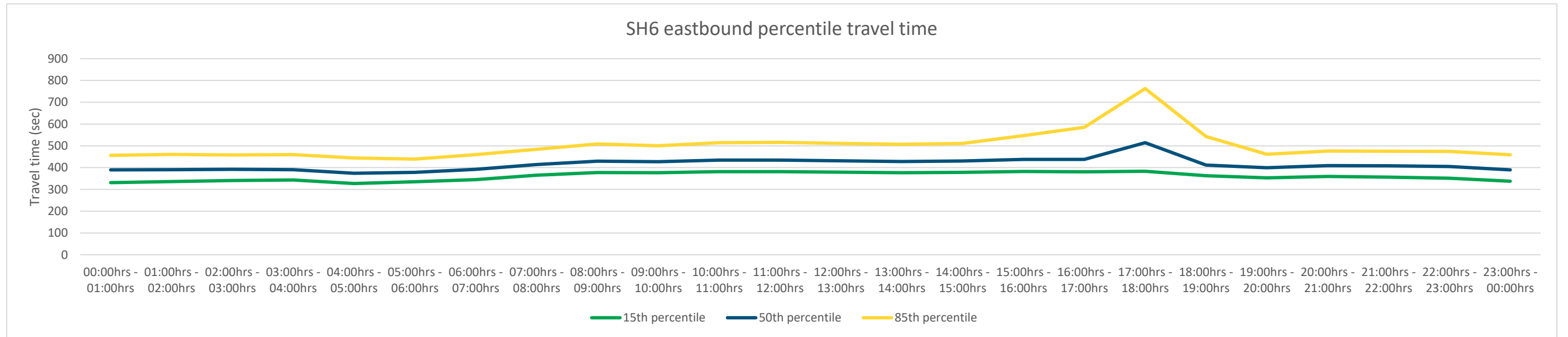


Figure 0.2 15th, 50th, and 85th percentile travel times in seconds for SH6 (eastbound), between SH6A and Arrowtown-Lake Hayes Road

Percentile	00:00hrs - 01:00hrs	01:00hrs - 02:00hrs	02:00hrs - 03:00hrs	03:00hrs - 04:00hrs	04:00hrs - 05:00hrs	05:00hrs - 06:00hrs	06:00hrs - 07:00hrs	07:00hrs - 08:00hrs	08:00hrs - 09:00hrs	09:00hrs - 10:00hrs	10:00hrs - 11:00hrs	11:00hrs - 12:00hrs	12:00hrs - 13:00hrs	13:00hrs - 14:00hrs	14:00hrs - 15:00hrs	15:00hrs - 16:00hrs	16:00hrs - 17:00hrs	17:00hrs - 18:00hrs	18:00hrs - 19:00hrs	19:00hrs - 20:00hrs	20:00hrs - 21:00hrs	21:00hrs - 22:00hrs	22:00hrs - 23:00hrs	23:00hrs - 00:00hrs
15	343	351	360	343	337	344	357	389	432	386	383	385	385	385	388	388	387	383	367	360	365	364	357	351
50	402	402	408	395	380	390	403	448	575	444	437	439	440	439	445	446	445	443	416	409	415	417	408	405
85	481	486	499	479	452	455	465	572	990	603	529	538	540	536	551	553	567	607	491	481	489	494	489	477

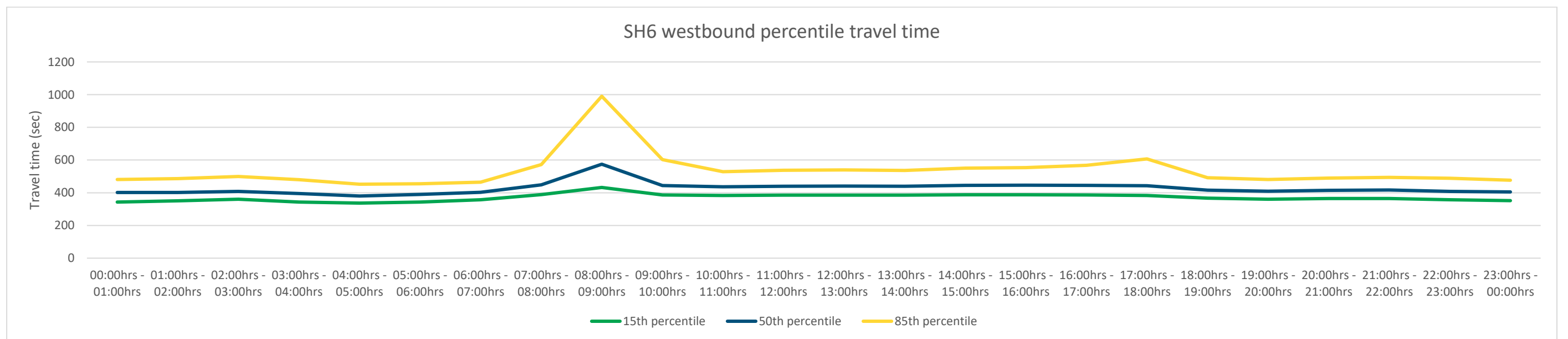


Figure 0.3 15th, 50th, and 85th percentile travel times in seconds for SH6 (westbound), between Arrowtown-Lake Hayes Road and SH6A

	00:00hrs - 01:00hrs	01:00hrs - 02:00hrs	02:00hrs - 03:00hrs	03:00hrs - 04:00hrs	04:00hrs - 05:00hrs	05:00hrs - 06:00hrs	06:00hrs - 07:00hrs	07:00hrs - 08:00hrs	08:00hrs - 09:00hrs	09:00hrs - 10:00hrs	10:00hrs - 11:00hrs	11:00hrs - 12:00hrs	12:00hrs - 13:00hrs	13:00hrs - 14:00hrs	14:00hrs - 15:00hrs	15:00hrs - 16:00hrs	16:00hrs - 17:00hrs	17:00hrs - 18:00hrs	18:00hrs - 19:00hrs	19:00hrs - 20:00hrs	20:00hrs - 21:00hrs	21:00hrs - 22:00hrs	22:00hrs - 23:00hrs	23:00hrs - 00:00hrs
15	70	71	64	78	67	76	74	81	81	80	81	82	83	82	83	89	90	90	79	76	77	75	75	73
50	87	86	86	90	86	96	89	96	97	96	98	99	101	100	102	135	138	162	96	91	92	90	89	87
85	105	104	102	104	107	122	114	129	139	131	134	134	149	146	159	447	493	1077	173	112	116	111	106	105

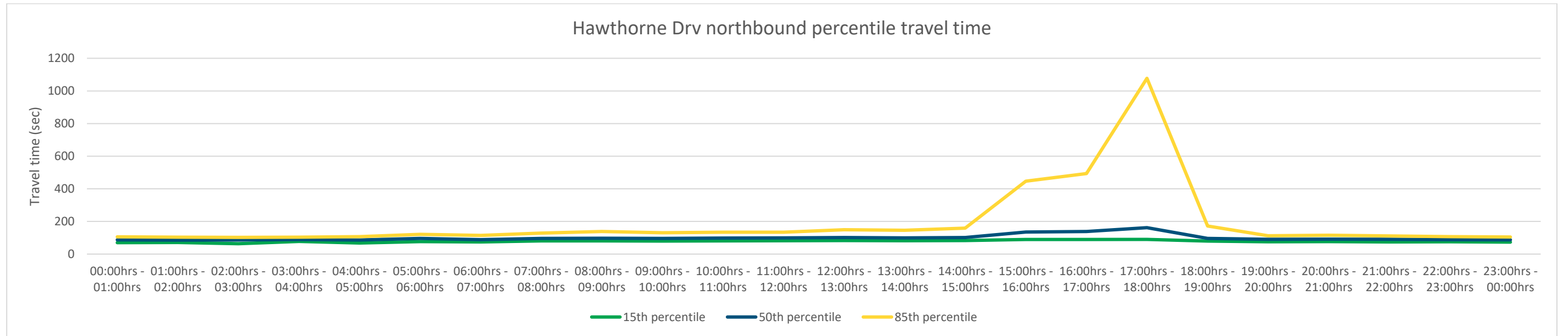


Figure 0.4 15th, 50th, and 85th percentile travel times in seconds for the Hawthorne Drive (northbound), between Glenda Drive and SH6

	00:00hrs - 01:00hrs	01:00hrs - 02:00hrs	02:00hrs - 03:00hrs	03:00hrs - 04:00hrs	04:00hrs - 05:00hrs	05:00hrs - 06:00hrs	06:00hrs - 07:00hrs	07:00hrs - 08:00hrs	08:00hrs - 09:00hrs	09:00hrs - 10:00hrs	10:00hrs - 11:00hrs	11:00hrs - 12:00hrs	12:00hrs - 13:00hrs	13:00hrs - 14:00hrs	14:00hrs - 15:00hrs	15:00hrs - 16:00hrs	16:00hrs - 17:00hrs	17:00hrs - 18:00hrs	18:00hrs - 19:00hrs	19:00hrs - 20:00hrs	20:00hrs - 21:00hrs	21:00hrs - 22:00hrs	22:00hrs - 23:00hrs	23:00hrs - 00:00hrs
15	50	57	54	41	47	56	54	59	77	58	55	56	55	56	56	58	57	56	55	54	55	57	55	52
50	63	67	65	51	56	65	64	73	266	71	67	67	68	67	69	71	69	67	67	65	68	69	66	64
85	81	80	70	66	68	78	81	117	775	173	89	84	87	87	90	98	90	88	86	81	85	85	82	79

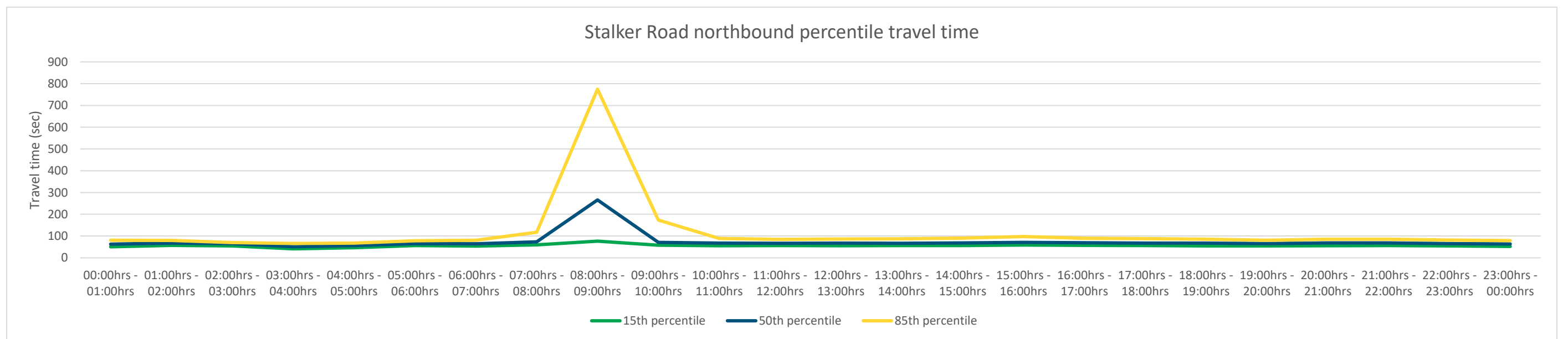


Figure 0.5 15th, 50th, and 85th percentile travel times in seconds for the Stalker Road (northbound), between Jones Avenue and SH6

	00:00hrs - 01:00hrs	01:00hrs - 02:00hrs	02:00hrs - 03:00hrs	03:00hrs - 04:00hrs	04:00hrs - 05:00hrs	05:00hrs - 06:00hrs	06:00hrs - 07:00hrs	07:00hrs - 08:00hrs	08:00hrs - 09:00hrs	09:00hrs - 10:00hrs	10:00hrs - 11:00hrs	11:00hrs - 12:00hrs	12:00hrs - 13:00hrs	13:00hrs - 14:00hrs	14:00hrs - 15:00hrs	15:00hrs - 16:00hrs	16:00hrs - 17:00hrs	17:00hrs - 18:00hrs	18:00hrs - 19:00hrs	19:00hrs - 20:00hrs	20:00hrs - 21:00hrs	21:00hrs - 22:00hrs	22:00hrs - 23:00hrs	23:00hrs - 00:00hrs	
15	52	49	55	57	45	48	49	51	59	51	51	51	50	50	50	50	50	50	50	49	49	50	51	50	49
50	60	65	64	70	53	58	59	63	105	62	62	61	60	61	60	61	61	61	60	57	57	59	60	59	59
85	78	128	73	79	68	71	79	101	347	93	89	86	88	87	89	88	93	93	77	73	74	74	75	75	

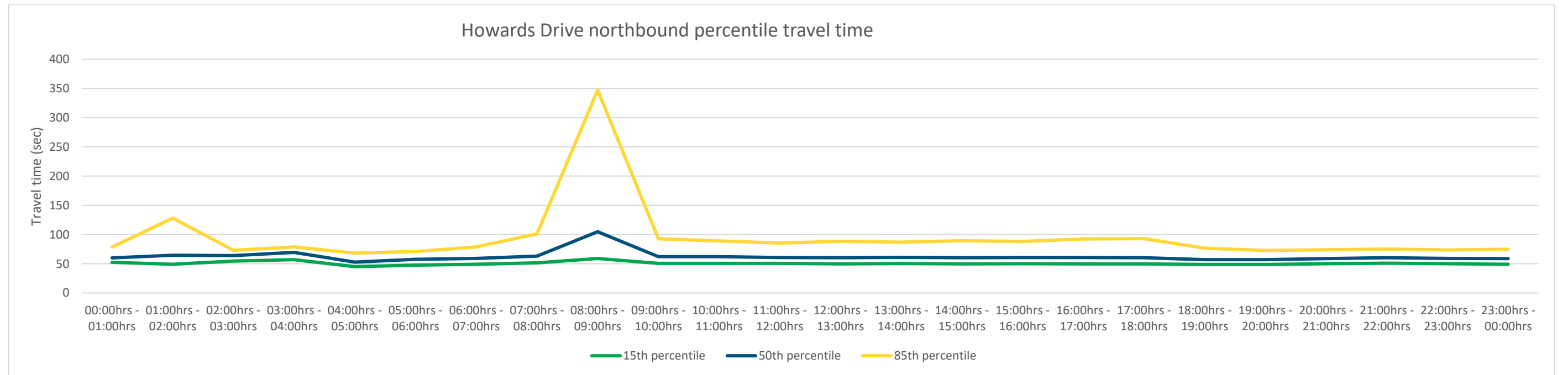


Figure 0.6 15th, 50th, and 85th percentile travel times in seconds for the Howards Drive (northbound), between Sylvan Street and SH6

1. Introduction

Queenstown-Lakes District Council (Council) has prepared a Plan variation application to establish Te Pūtahi Ladies Mile (TPLM) Zone. Abley have been commissioned by Waka Kotahi NZ Transport Agency (Waka Kotahi) to act as an expert witness, including the preparation of transport planning and modelling evidence.

This technical note provides a summary of TomTom data received by Abley, to provide an understanding of typical travel times on the local transport network in the vicinity of TPLM.

2. Data source and scope

Abley extracted travel time and speed data from TomTom analytics for the March 2023 period, for the following roads (refer to Figure 2.1):

- SH6, between Arrowtown-Lake Hayes Road in the east and Kawarau Road in the west (eastbound and westbound data)
- Hawthorne Drive, between Glenda Drive in the southeast and SH6 in the northwest (northbound data only)
- Stalker Road, between Jones Avenue in the south and SH6 in the north (northbound data only)
- Howards Drive, between Sylvan Street/Luna Place in the south and SH6 in the north (northbound data only)

The data covered the following time periods:

- Weekdays between 1 March 2023 and 31 March 2023 (i.e. excluding weekends)
- 24hr period, split into 1hr increments

From this data, TomTom analytics provides:

- Average vehicle speeds, provided for each hourly increment and at 5 percentile increments.
Note that where we refer to the 15th percentile vehicle speed, this represents high congestion with slow speeds
- Travel times for each route, provided for each hourly increment and at 5 percentile increments.
Note that where we refer to the 85th percentile travel time, this represents high congestion with long travel times.

The data set is based on sampled traffic data, i.e. the data does not include all traffic movements that occurred however it is understood that in the order of 15% of all vehicles in the fleet are captured by TomTom data. The data set is considered of a sufficient size to provide an appreciation of typical speeds and travel times for the study area.

Each route is addressed in turn in the sections below.

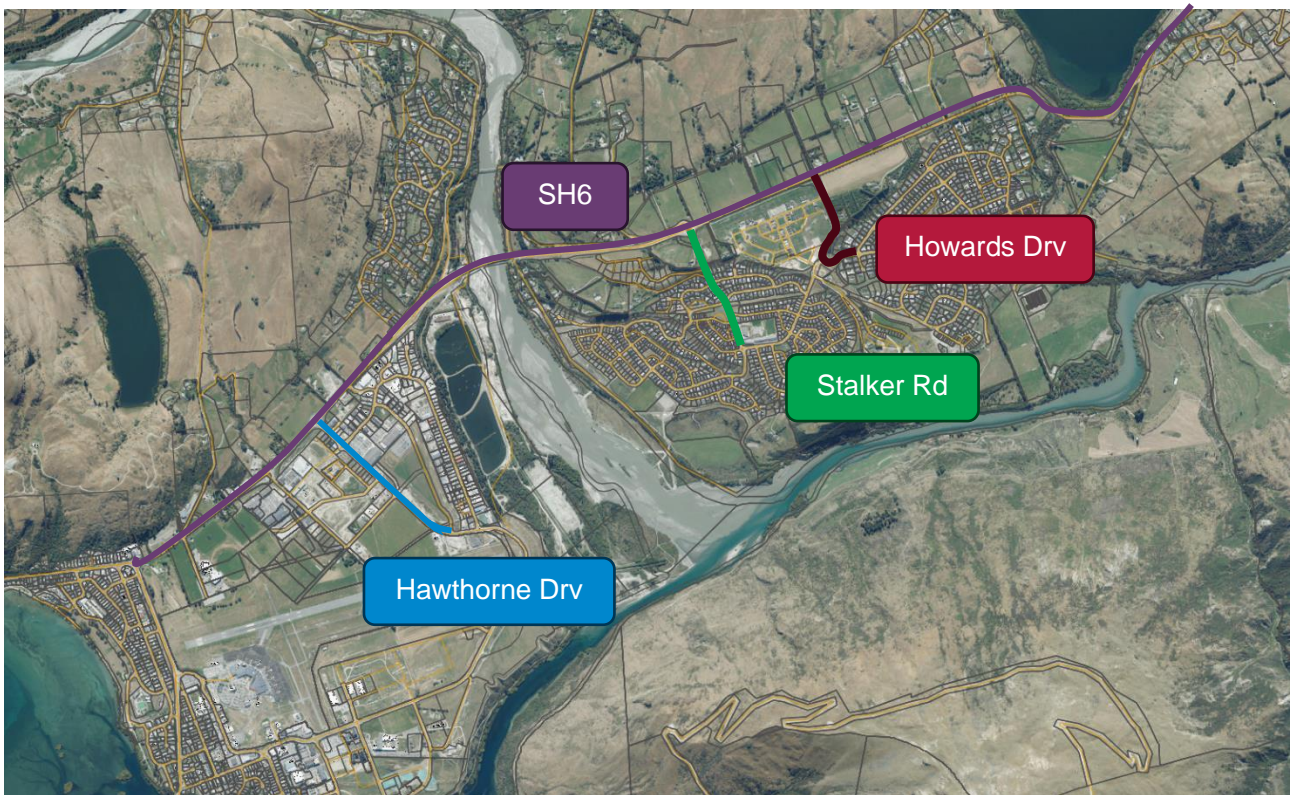


Figure 2.1 Geographic scope of TomTom data

3. State Highway 6 (eastbound)

This section summarises the TomTom data for SH6 in the eastbound direction, between Kawarau Road in the west and Arrowtown-Lake Hayes Road in the east. It includes both urban and rural areas, and varying speed limits. To simplify our discussion, we have not separated data into urban and rural sections, unless otherwise specified.

The 15th, 50th and 85th percentile travel times, based on hourly intervals, are shown in Figure 3.1. The travel times data along the segment is summarised as follows:

- The shortest travel times were generally recorded between 11pm and 5am
- The longest travel times were generally recorded between 5pm and 6pm
- Comparing congested periods to free flow conditions¹
 - 50th percentile travel times for the segment were around 2mins slower
 - 85th percentile travel times for the segment were around 6mins 20sec slower.

Figure 3.2 provides a visualisation of areas of congestion during the 5pm to 6pm period, using 15th percentile vehicle speeds. This indicates that:

- Congestion tends to be heaviest between Kawarau Road and Hardware Lane, particularly at the SH6/Hawthorne Drive roundabout where eastbound traffic merges on SH6
- Lesser increases in congestion also occur at the Stalker Road and Howards Drive intersections.

¹ We have used the average 50th percentile travel time during uncongested periods as the assumed free flow travel time.

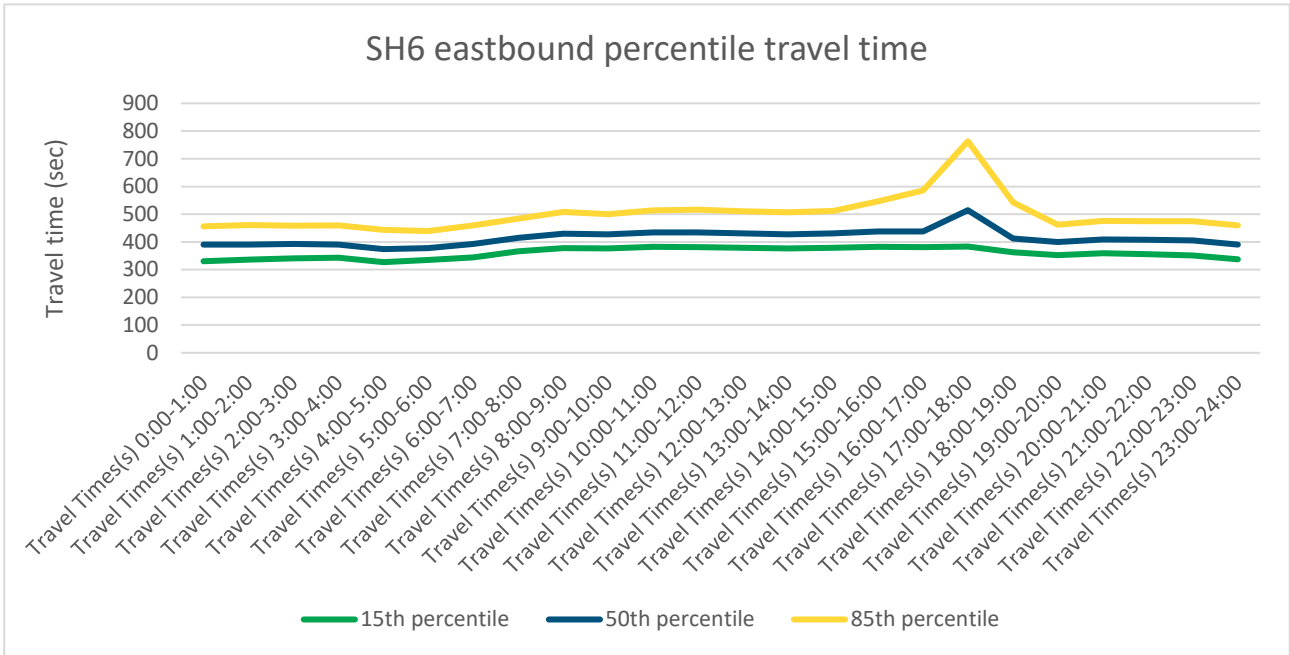


Figure 3.1 SH6 eastbound 15th, 50th and 85th percentile travel times

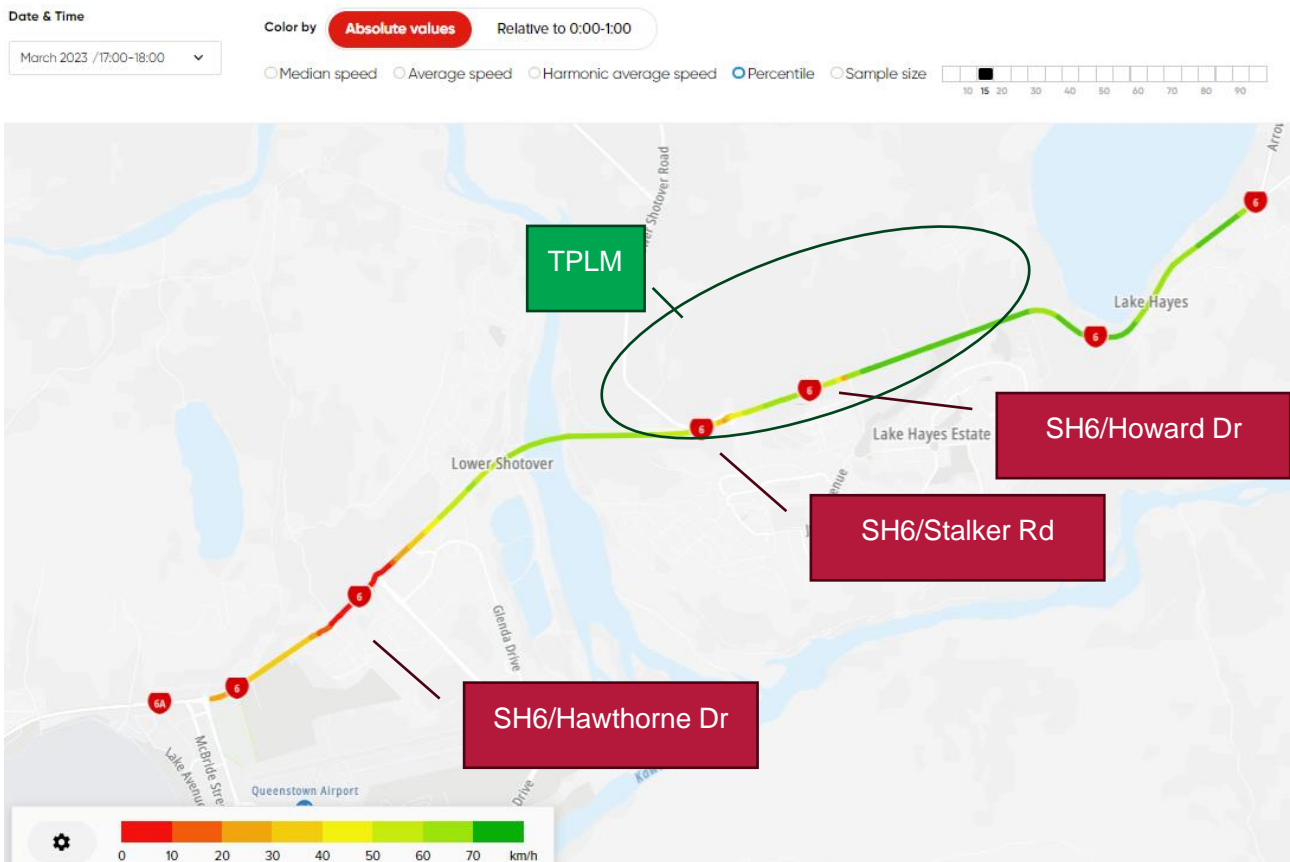


Figure 3.2 SH6 eastbound 15th percentile vehicle speeds, 5pm to 6pm

4. State Highway 6 (westbound)

This section summarises the TomTom data for SH6 in the westbound direction, between Arrowtown-Lake Hayes Road in the east and Kawarau Road in the west. This segment includes both urban and rural areas, and varying speed limits. To simplify our discussion, we have not separated data into urban and rural sections, unless otherwise specified.

The 15th, 50th and 85th percentile travel times, based on hourly intervals, are shown in Figure 4.1. The travel times data along the segment is summarised as follows:

- The shortest travel times were generally recorded between 11pm and 5am
- The longest travel times were recorded between 8am and 9am
- Comparing congested periods to free flow conditions
 - 50th percentile travel times for the segment were around 3mins slower
 - 85th percentile travel times for the segment were around 10mins slower.

Figure 4.2 provides a visualisation of areas of congestion during the 8am to 9am period, using 15th percentile vehicle speeds. This indicates that:

- Congestion occurs at the Howards Drive intersection, as traffic from the Lake Hayes development joins SH6
- Congestion occurs at the Stalker Road intersection, as traffic from the Lower Shotover development joins SH6 and westbound traffic merges on SH6 on the roundabout exit
- Lesser increases in congestion occurs at the Hawthorne Drive, Grant Road, and Kawarau Road intersections.

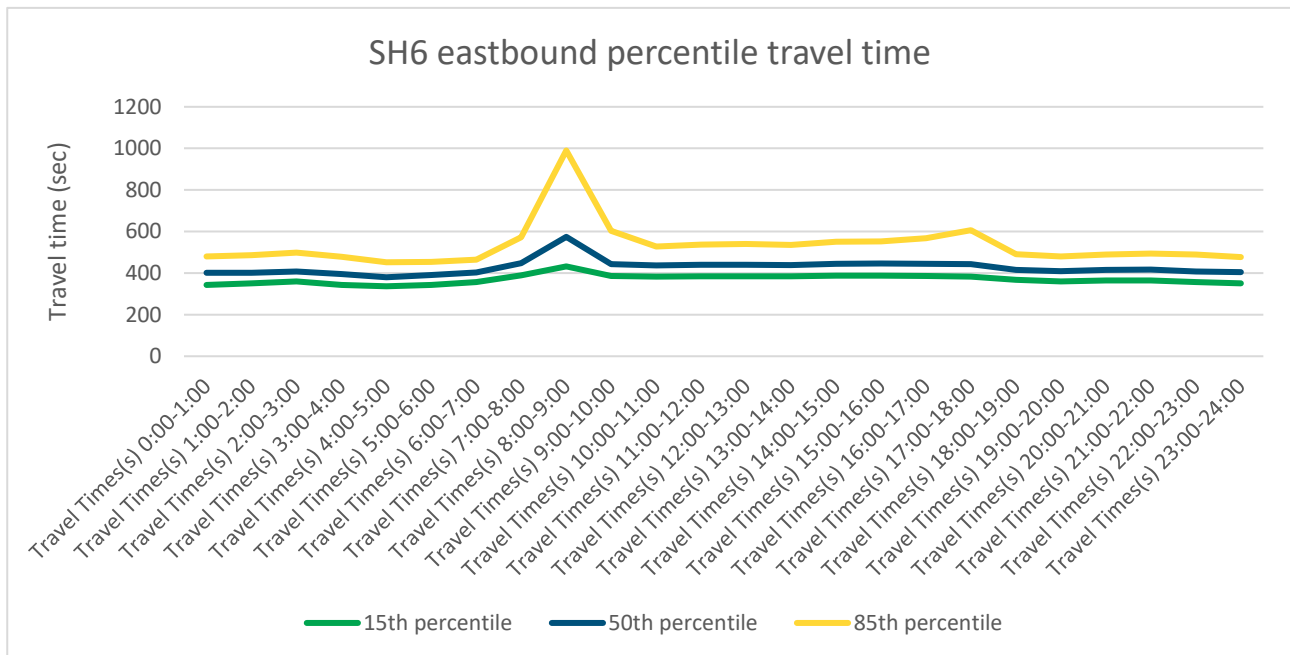


Figure 4.1 SH6 westbound 15th, 50th and 85th percentile travel times

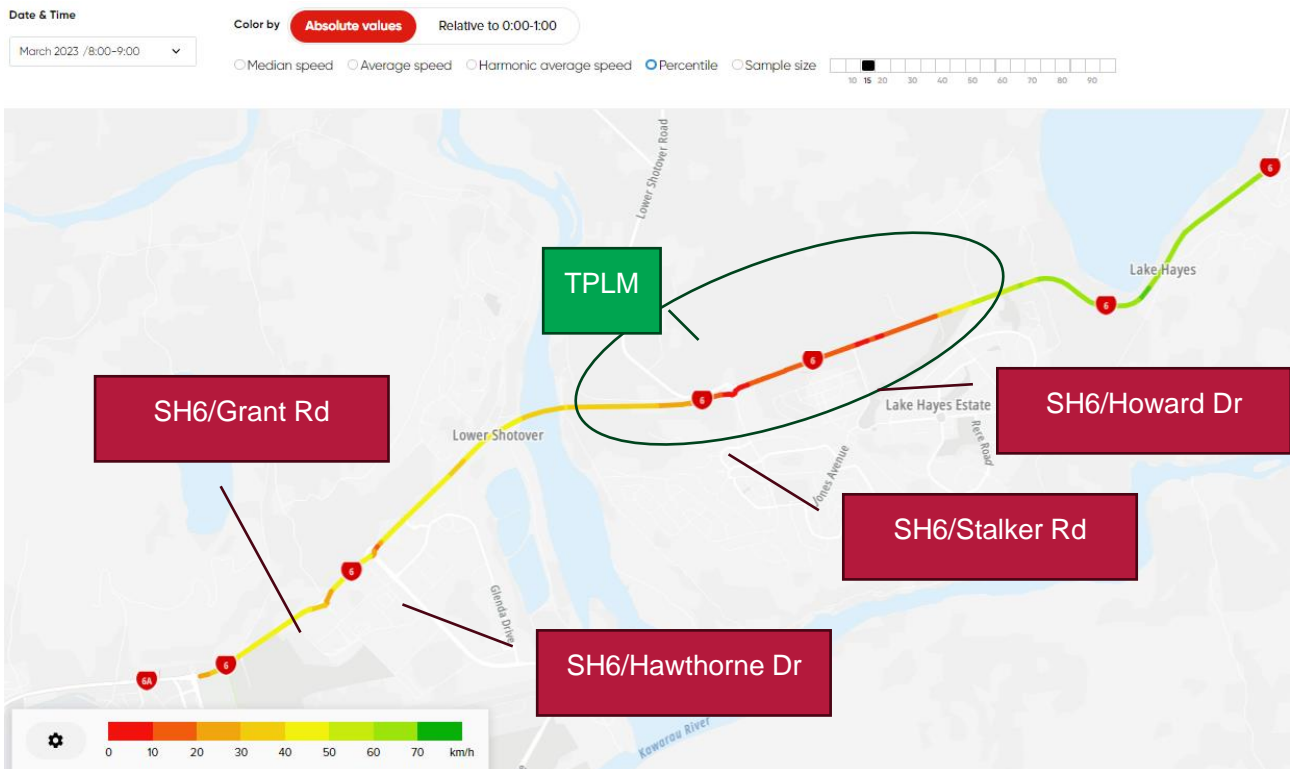


Figure 4.2 SH6 westbound 15th percentile vehicle speeds, 8am to 9am

5. Hawthorne Drive (northbound)

This section summarises the TomTom data for Hawthorne Drive in the northbound direction, between Glenda Drive in the southeast and SH6 in the northwest.

The 15th, 50th and 85th percentile travel times, based on hourly intervals, are shown in Figure 5.1. The travel times data along the segment is summarised as follows:

- The shortest travel times were generally recorded between 11pm and 5am
- The longest travel times were recorded between 5pm and 6pm
- Comparing congested periods to free flow conditions
 - 50th percentile travel times for the segment were around 1min slower
 - 85th percentile travel times for the segment were around 16 mins 30sec slower

Figure 5.2 provides a visualisation of areas of congestion during the 5pm to 6pm period, using 15th percentile vehicle speeds. This indicates that speeds reduce around the Hawthorne Drive/Brookes Rd intersection, and queues extend back from the SH6/Hawthorne Drive intersection to this general vicinity.

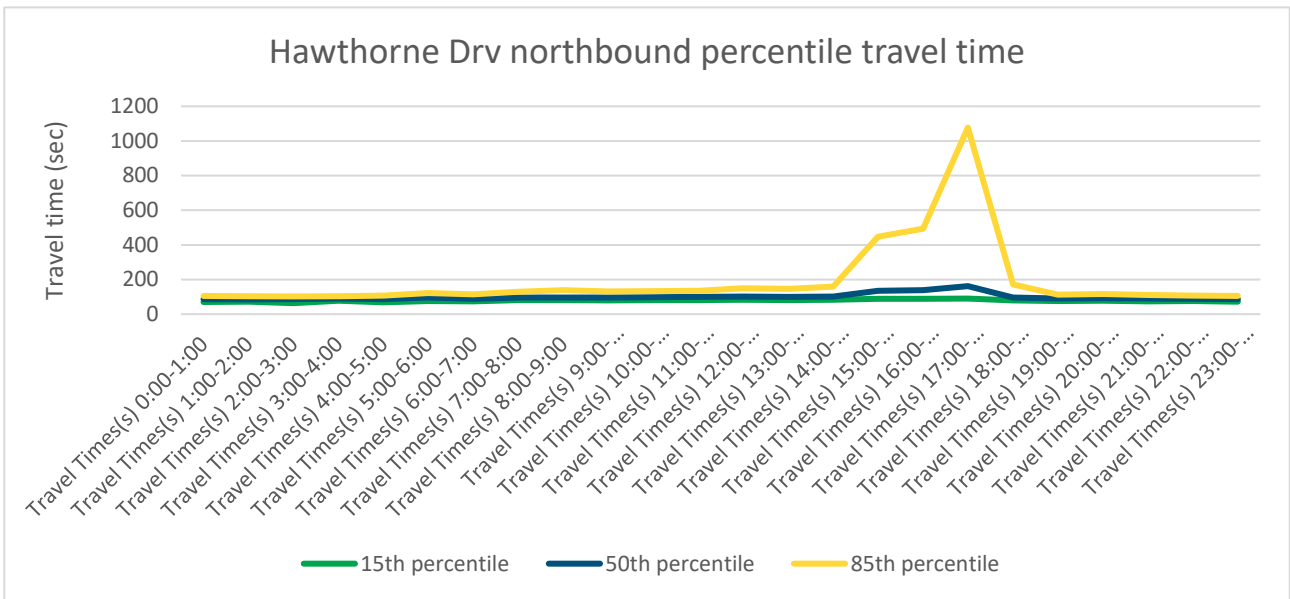


Figure 5.1 Hawthorne Drive northbound 15th, 50th and 85th percentile travel times

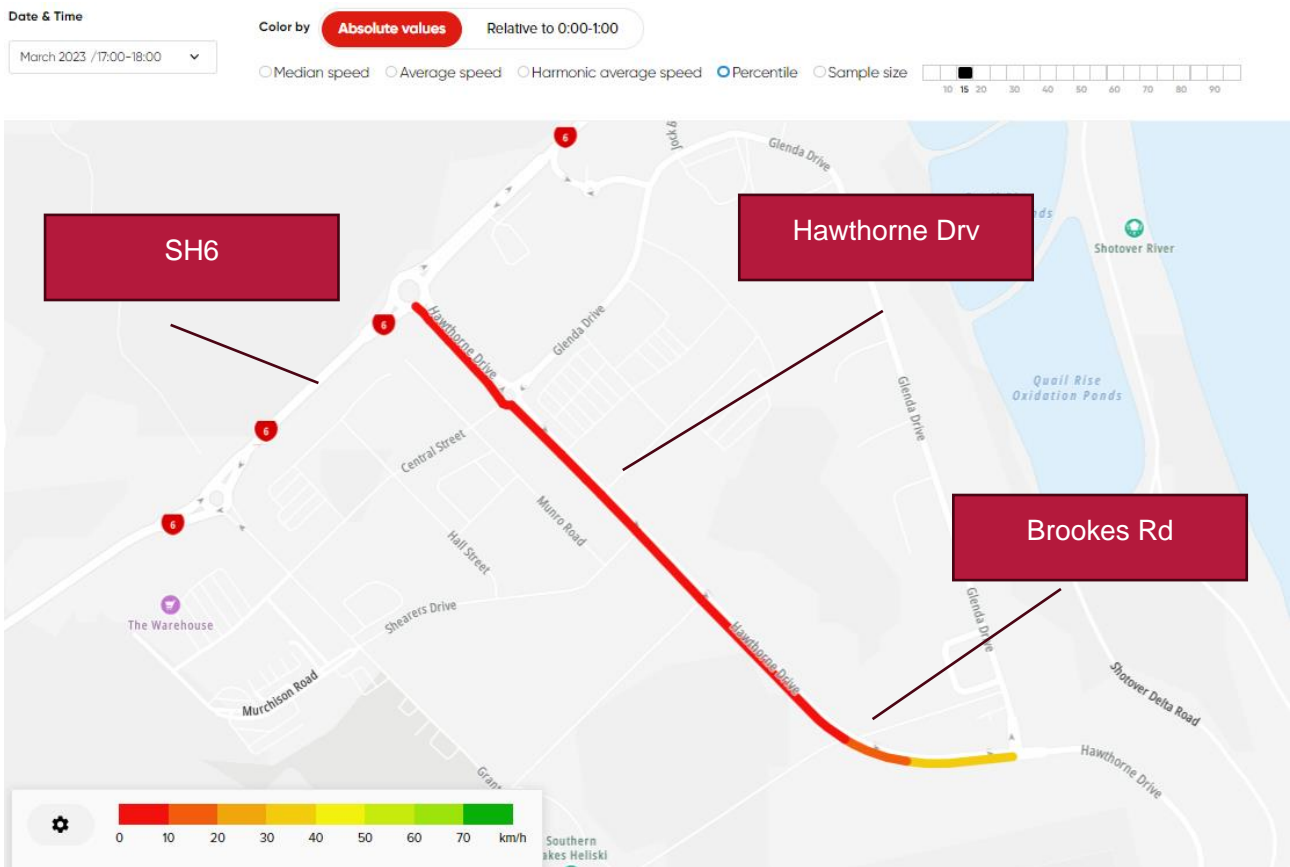


Figure 5.2 Hawthorne Drive northbound 15th percentile vehicle speeds, 5pm to 6pm

6. Stalker Road (northbound)

This section summarises the TomTom data for Stalker Road in the northbound direction, between Jones Avenue in the south and SH6 in the north.

The 15th, 50th and 85th percentile travel times, based on hourly intervals, are shown in Figure 6.1. The travel times data along the segment is summarised as follows:

- The shortest travel times were generally recorded between 6pm and 6am
- The longest travel times were recorded between 8am and 9am
- Comparing congested periods to free flow conditions
 - 50th percentile travel times for the segment were around 3min 30sec slower
 - 85th percentile travel times for the segment were around 12min slower.

Figure 6.2 provides a visualisation of areas of congestion during the 8am to 9am period, using 15th percentile vehicle speeds. This indicates that:

- vehicle speeds slow around the Stalker Road/Coventry Crescent intersection, indicating queuing from the SH6/Stalker Road intersection back to the area.

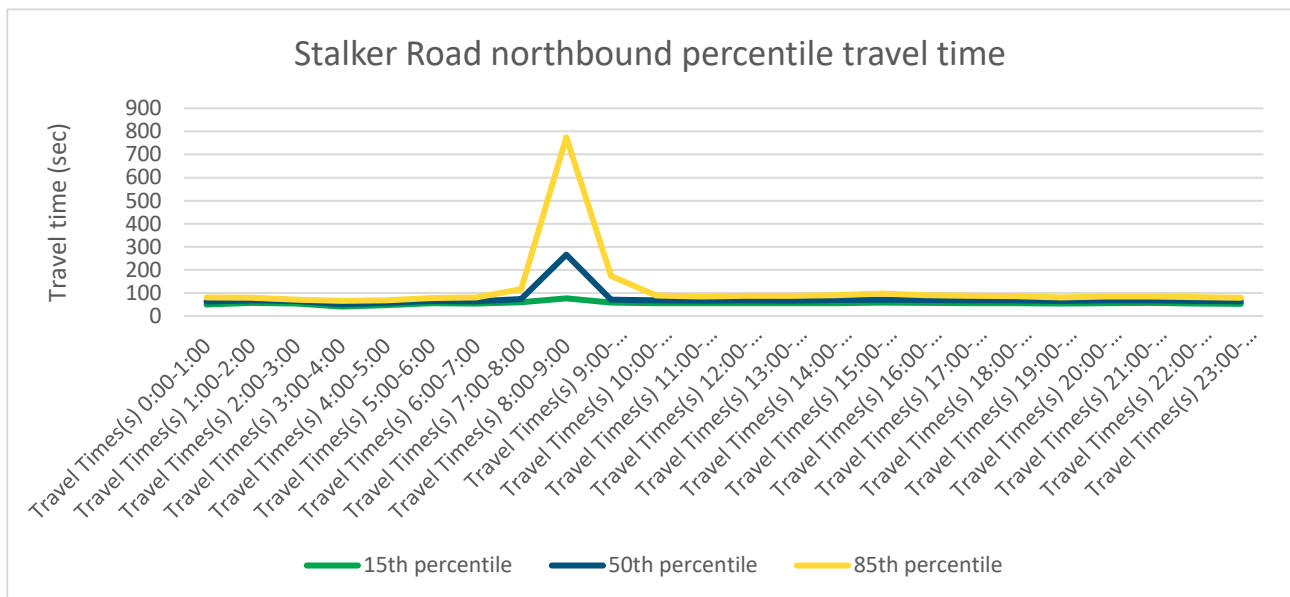


Figure 6.1 Stalker Road northbound 15th, 50th and 85th percentile travel times

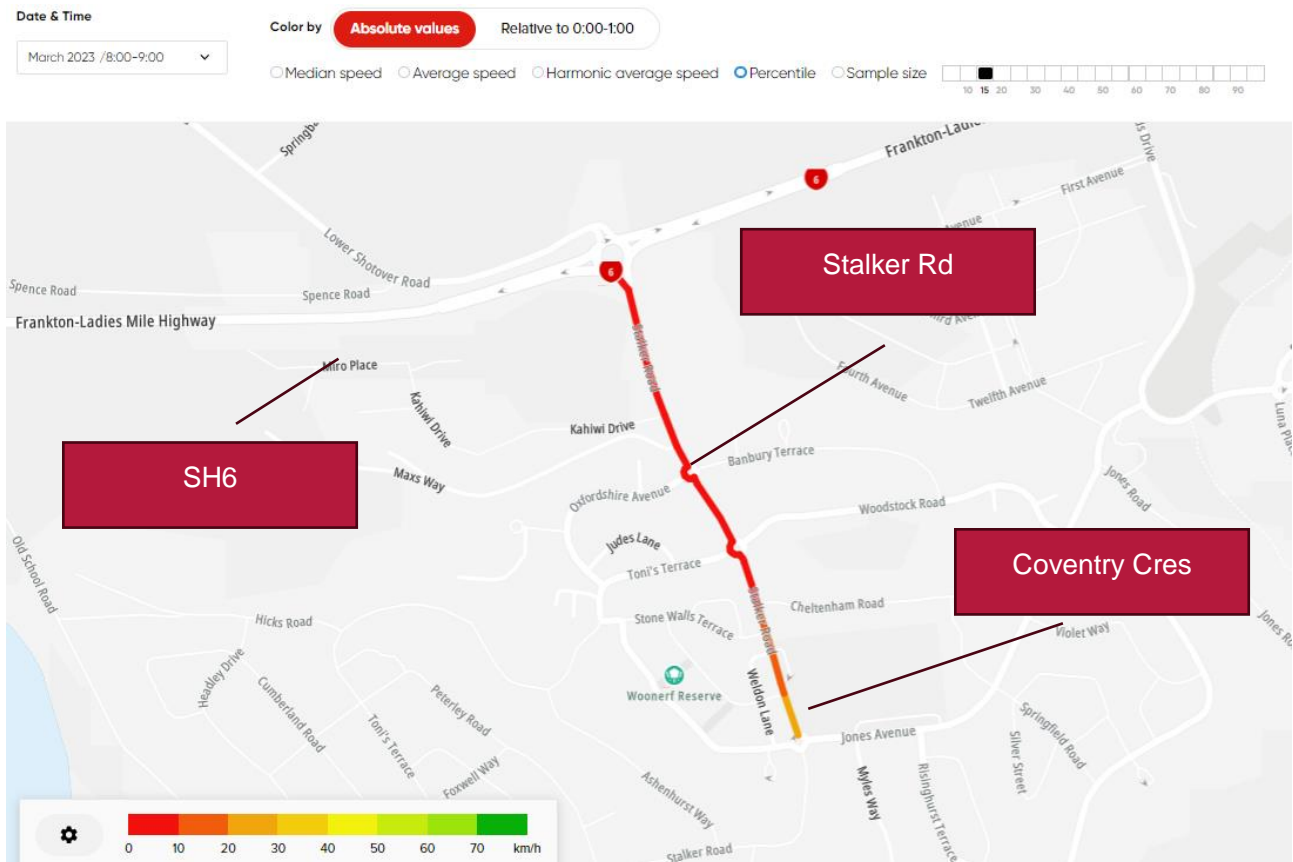


Figure 6.2 Stalker Road northbound 15th percentile vehicle speeds, 8am to 9am

7. Howards Drive (northbound)

This section summarises the TomTom data for Howards Drive in the northbound direction, between Sylvan Street/Luna Place in the south and SH6 in the north.

The 15th, 50th and 85th percentile speeds, based on hourly intervals, are shown in Figure 7.1. The travel times data along the segment is summarised as follows:

- The shortest travel times were generally recorded between 6pm and 6am
- The longest travel times were recorded between 8am and 9am
- Comparing congested periods to free flow conditions
 - 50th percentile travel times for the segment were around 45sec slower
 - 85th percentile travel times for the segment were around 5min slower.

Figure 7.2 provides a visualisation of areas of congestion during the 8am to 9am period, using 15th percentile vehicle speeds. This indicates that:

- Vehicle speeds are slow along the full segment, indicating queuing from the SH6/Stalker Road intersection extends back to (and likely beyond) the Howards Drive/Sylvan Street intersection

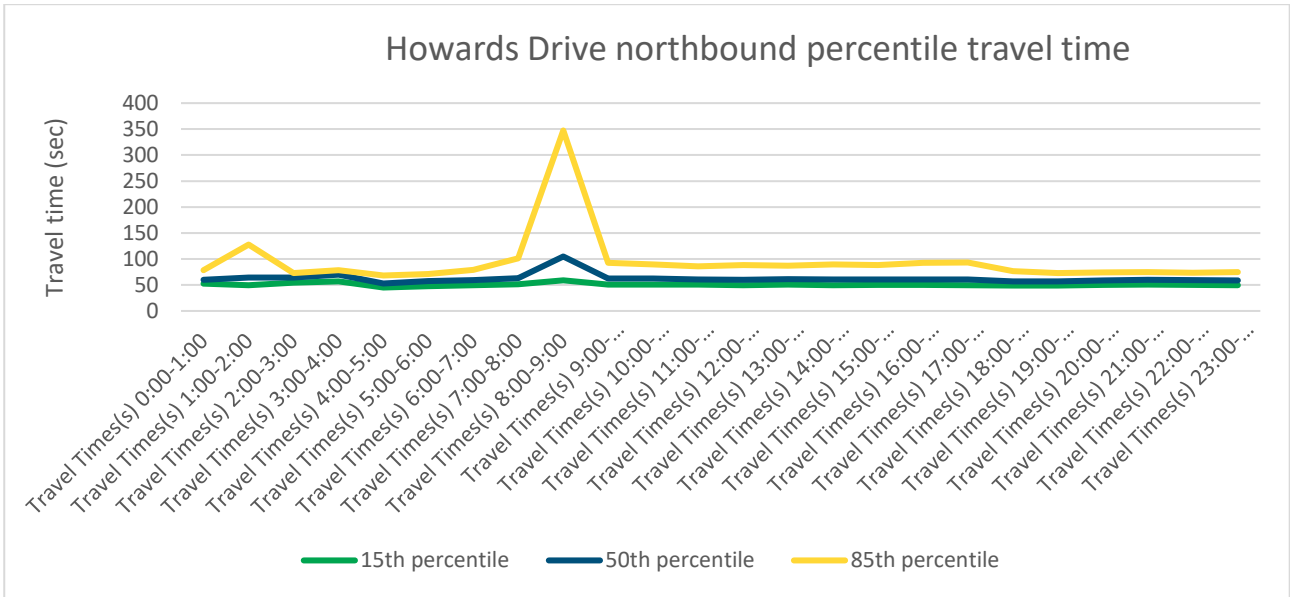


Figure 7.1 Howards Drive northbound 15th, 50th and 85th percentile travel times

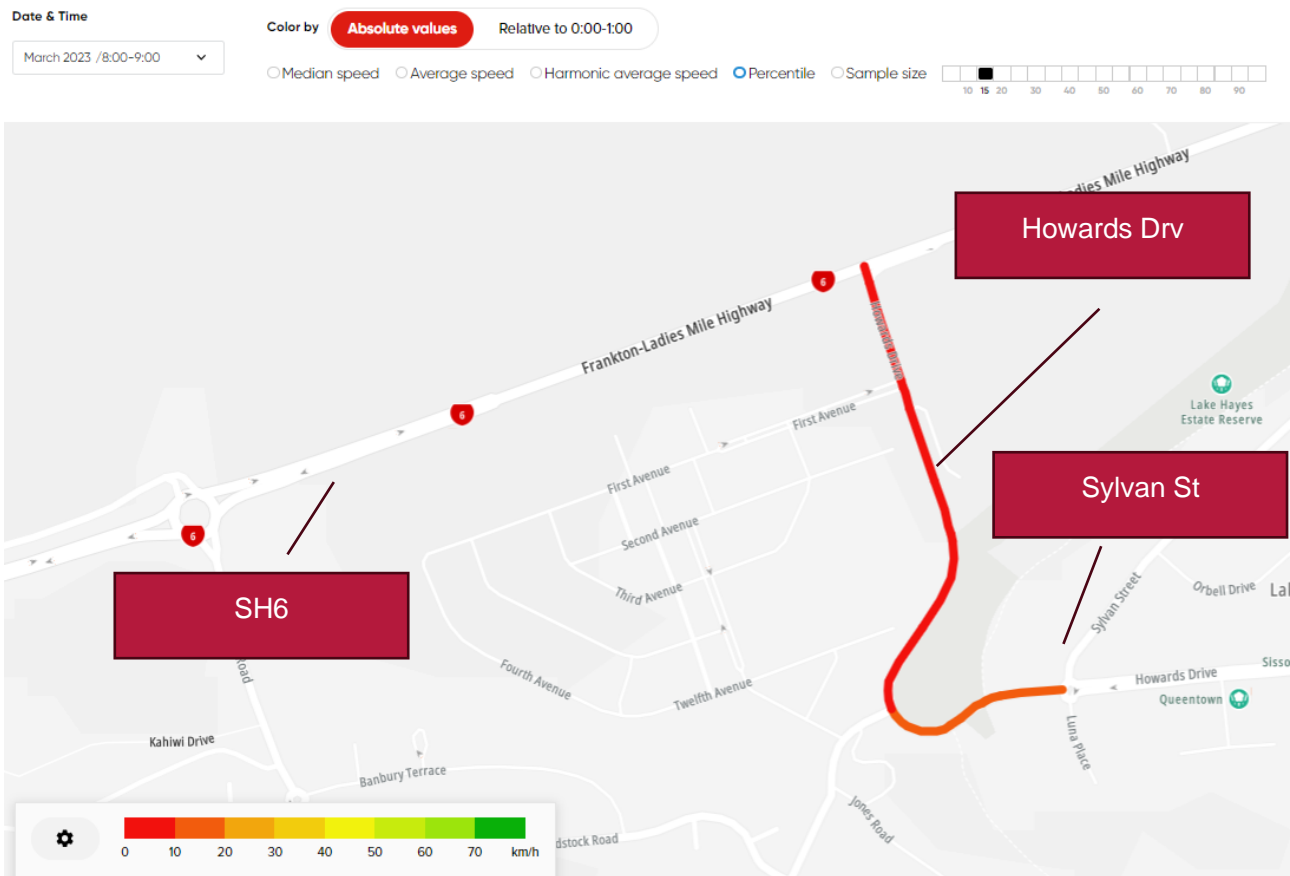


Figure 7.2 Howards Drive northbound 15th vehicle speeds, 8am to 9am

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