



Transport Evidence Explanatory Note CD/PMP/K15

Keynsham Transport Strategy - Future Highway Network Performance

Prepared for

Bath & North East Somerset Council

April 2016



CH2M

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Document history

Project: B&NES Place-Making Plan (PMP) - EIP Transport Evidence

Title of report: Transport Evidence Explanatory Note 3: Keynsham Transport Strategy - Future Network Performance

This document has been issued and amended as follows:

Version	Date	Description	Created by	Verified by	Approved by
1.0	22/04/2016	DRAFT	Lee Templeman	David Lear	David Lear
2.0	29/04/2016	FINAL	Lee Templeman	David Lear	David Lear



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Acronyms and Abbreviations

B&NES	Bath & North East Somerset Council
DPP	Draft Placemaking Plan
EA	Enterprise Area
KTS	Keynsham Transport Strategy



SECTION 1

Introduction

1.1 Context

Bath & North East Somerset Council (B&NES) published its DRAFT Place-Making Plan (DPP) on the 16th December 2015 and the formal consultation period ended on 3rd February 2016. The Place-Making Plan will upon adoption form part 2 of the Local Plan (working alongside part 1 - the adopted Core Strategy) and will supersede the 2007 B&NES Local Plan. B&NES has now submitted the DPP to the Planning Inspector for examination. The examination hearings are scheduled to take place in Summer/Autumn 2016 and if found sound, it is anticipated that the Place-Making Plan will be adopted in December 2016.

Transport evidence needs to be submitted alongside the Plan to the examination to support the proposals outlined in the DPP. One of the areas where additional evidence was considered necessary was to make the case for growth in and around Keynsham and infrastructure necessary to support this growth to support set out in Part 3 of the DPP (Diagram 13).

The purpose of this evidence is therefore to demonstrate that proposed transport measures for the Keynsham area identified in the Keynsham Transport Strategy are capable of maintaining a satisfactory level of highway operation in the future with identified development sites built out. This incorporates changes made to the existing highway in Keynsham since the Core Strategy assessment work (CH2M, February 2014).



SECTION 2

Forecasting Assumptions

2.1 Land Use Development

Committed and agreed land use development assumed in the forecast year S-Paramics model testing includes the following:

- Somerdale (Policy KE2A): 700 dwellings and 10,000 square metres of B1;
- Riverside and Fire Station Site (Policy KE2B): Mixed use retail/residential;
- Land Adjoining East Keynsham (Policy KE3A): 250 dwellings;
- Land Adjoining East Keynsham (Policy KE3A): Business Uses (B1/B2/B8);
- Safeguarded Land at East Keynsham (Policy KE3B): EXCLUDED;
- Land Adjoining South West Keynsham (Policy KE34): 200 dwellings;
- Bilbie Green (Site K2A): 266 dwellings (planning permission granted February 2015 (12/00049/FUL); and
- The Meadows (Site K2B): 285 dwellings (planning permission granted July 2011 (09/04351/FUL).

2.2 Infrastructure Works

Infrastructure works included in the S-Paramics **Scenario 1** network for the future year testing includes the following:

- Keynsham Town Centre Improvements: Bath Hill/Temple Street - 'as installed';
- A4175 Station Road/Somerdale Entrance: signalisation improvement (KE2A);
- A4175 Station Road/Avon Mill Lane junction: signalisation improvement (KE2A). In line with DPP Part 3, paragraph 50, the tested scheme includes a second approach lane on the southbound A4175 Keynsham Road approach;
- Bath Road/Chandag Road: new mini-roundabout - 'as installed';
- Bath Hill/Avon Mill Lane mini-roundabout: widening improvement to Avon Mill Lane (KE2A);
- Bath Hill/Wellsway mini-roundabout: no change; and
- A4/A4174 Hicks Gate Roundabout: no change.

No change to the length of High Street between Charlton Road and Bath Hill/Temple Street was assumed. The effect of a public realm scheme making this length one-way southbound has been considered in other work. (Core Document ref: **CD/PMP/K16**: 'Keynsham S-Paramics Model 2015 and 2022 Town Centre Option Tests', Mott MacDonald, June 2015).

Scenario 2 assumes, in addition to the above works, the introduction of an improvement scheme at Hicks Gate roundabout (Core Document **CD/PMP/K13**: 'A4/A4174 Hicks Gate Roundabout Improvement Options', CH2M, November 2014). The layout tested was the Option 1 arrangement shown in this report.



SECTION 3

Model Results and Commentary

3.1 Network Performance

Table 3.1 compares the network performance output statistics for Scenarios 1 and 2 in the morning peak period (7:00-10:00am). The results show that the mean network delay is circa 6 minutes under Scenario 1, with a small increase to this with the addition of the Hicks Gate Roundabout scheme in Scenario 2. However, the percentage of the traffic demand accommodated by the network over the simulation period is 98-99% in both scenarios. This demonstrates that the level of highway network improvement identified in the DPP is in line with the need to accommodate the growth resulting from the various developments in the Town Centre and on the edge of Keynsham.

Table 3.1: Network Performance Statistics, Weekday Morning Peak Period (7:00-10:00am)

Scenario	Mean delay (s)	Total Distance Travelled (km)	% Demand Complete	Mean Speed (mph)	Comments
Scenario 1	359	72,251	99.1%	19	3% runs locked-up
Scenario 2	394	71,333	98.3%	17	10% runs locked-up

Table 3.2 compares the same network performance output statistics for Scenarios 1 and 2 in the evening peak period (3:00-7:00pm). Both scenario results show a much higher mean delay compared to the morning peak period. Critically, In Scenario 1, only around 93% of the demand is accommodated during the simulation period, suggesting that the network could struggle to cope with the anticipated forecast traffic levels. The network performance indicators do show a marked improvement with the introduction of the Hicks Gate scheme in Scenario 2, with a notable improvement in the percentage of demand serviced by the network capacity available. This shows that the inclusion of an improvement scheme for Hicks Gate Roundabout as set out in the DPP would need to form a key part of the future highway strategy.

Table 3.2: Network Performance Statistics, Weekday Evening Peak Period (3:00-7:00pm)

Scenario	Mean delay (s)	Total Distance Travelled (km)	% Demand Complete	Mean Speed (mph)	Comments
Scenario 1	685	103,460	93.2%	10	13% runs locked-up
Scenario 2	524	109,309	97.3%	13	3% runs locked-up



3.2 Network Travel Times

Figures 3.1 and 3.2 show the mean network travel time profile (in seconds) for Scenarios 1 and 2 for the morning and evening peak periods, respectively. Figure 3.1 shows that in the morning peak period the inclusion of the proposed improvement scheme at Hicks Gate leads to an increase in the overall mean network travel times, which is consistent with the network statistics. This is not down to a lack of performance in the local operation of the Hicks Gate improvement scheme (Option 1) itself, as testified to by the previous evaluation work set out in Core Document **CD/PMP/K13**, but down to the fact that the scheme improves the ‘peak’ throughput of traffic from the A4 Bath Road and A4174 Ring Road, so affecting conditions at other junctions in the Town Centre. Even so, the ‘net’ adverse effect is limited to a change of little more than 50-60 seconds at the 8:30am ‘peak’ time.

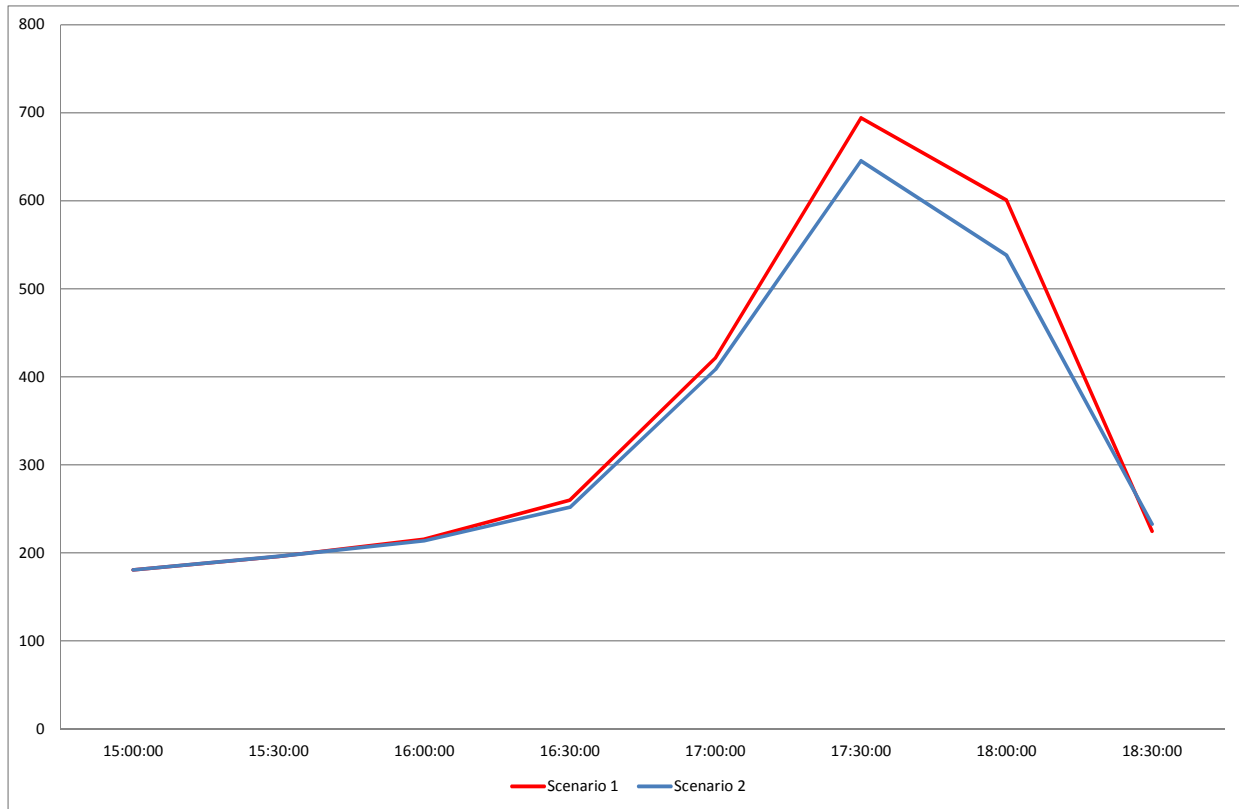
Figure 3.1: Mean Network Travel Time Profile, Weekday Morning Peak Period (7:00-10:00am)



Figure 3.2 shows that the addition of a Hicks Gate improvement scheme has a positive impact on mean network journey times in the 3:00-7:00pm period and, whilst seeming small, it has a big effect on the mean network delay and the percentage of the traffic demand accommodated as already noted. Although this modelling assessment covers a four hour period, it is clear from the profile that journey times only show a significant spike over the 5:00-6:00pm period, with conditions starting to get more congested in the ‘shoulder’ period from 4:30-5:00pm.



Figure 3.2: Mean Network Travel Time Profile, Weekday Evening Peak Period (3:00-7:00pm)



3.3 Route Travel Times

Predicted journey times on selected routes through the town centre, and along the A4 Bath Road/Keynsham Bypass have been assessed and compared. The routes selected are shown graphically in Figure 3.3 and are as follow:

- RED: From Charlton Road (Kelston Road junction) to Hicks Gate via St Ladoc Road and the A4175 Bristol Road/Durley Hill;
- GREEN: From Charlton Road (Kelston Road junction) to the A4175/A431 mini-roundabout junction at Willsbridge, via High Street and the A4175 Station Road/Keynsham Road;
- BLUE: From Charlton Road (Kelston Road junction) to Broadmead Roundabout via Bath Hill and the B3116 Bath Road. The differing directional routes via High Street (to Charlton Road) and Ashton Way/Rock Road/Temple Street (from Charlton Road) reflect the presence of the no right turn from Charlton Road to High Street; and
- PURPLE: From A4 Bath Road (Pixash Lane junction) to Hicks Gate via the Bypass.

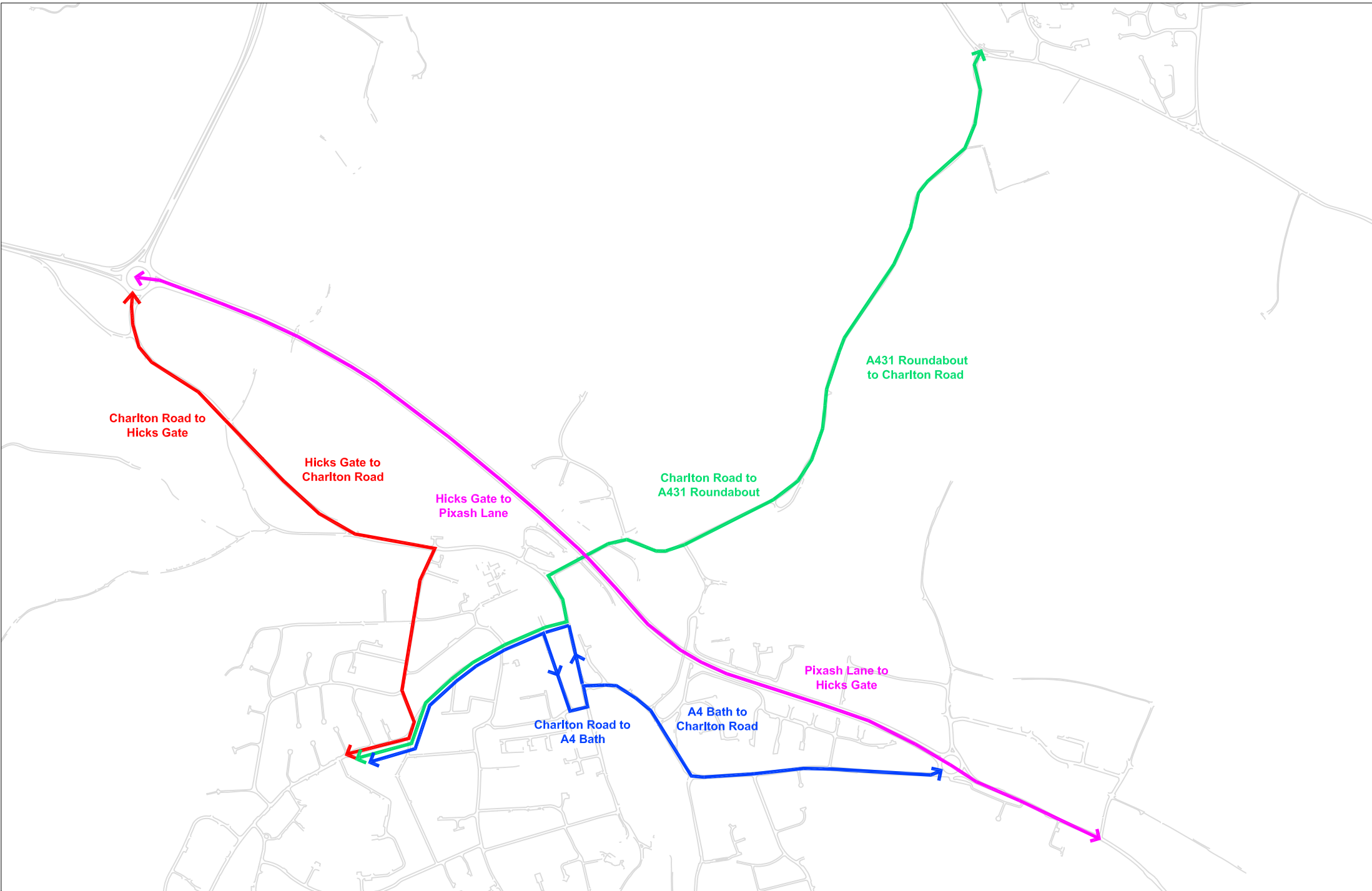


Figure 3.3: Model Journey Time Routes



Figure 3.4 below compares the Scenario 1 and 2 modelled average travel times along these selected directional routes for the morning peak hour (8:00-9:00pm), so equating to the period when the mean network journey times indicated in Figure 3.1 are highest. The graph shows that the travel times are typically comparable in each scenario, with the longest journey time associated with any route being around 550 seconds or circa 9 minutes. The higher times along the Keynsham Bypass in the westbound direction reflect the delays at Hicks Gate Roundabout in this period and expressly the exit blocking created by queuing on the A4 Bath Road into Brislington, which affects the journey time for straight-ahead traffic. The latter is not possible to address with a stand-alone improvement scheme at Hicks Gate, so this is why there is no apparent difference between the two scenarios. The consistently highest journey time associated with the route from Broadmead Roundabout to Charlton Road reflects the delays present at the Chandag Road, Wellway and Temple Street/Bath Hill mini-roundabouts, and also slow moving conditions on the ‘give way’ High Street approach to the Charlton Road junction.

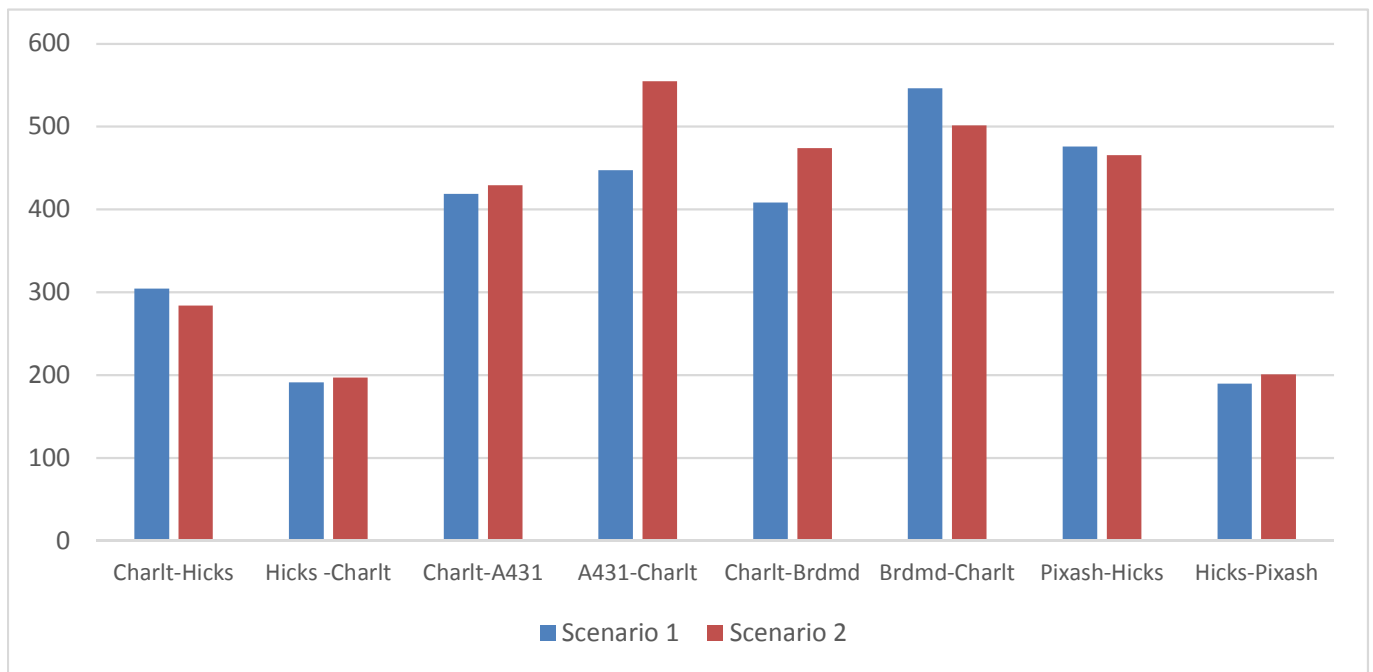


Figure 3.4: Selected Route Travel Times, Weekday Morning Peak Hour (8:00-9:00am)

Figure 3.5 below compares the Scenario 1 and 2 modelled travel times along the same selected routes in the weekday evening peak hour 5:00-6:00pm. Again, this accords with the peak in the overall average journey times in the network over the 3:00-7:00pm period. The route from the A431/A4175 junction at Willsbridge to Charlton Road stands out in terms of the highest journey time in both scenarios, but particularly in Scenario 1 without a Hicks Gate scheme. In the case of the former the predicted journey time is circa 850-900 seconds, or 14 minutes. Much of this is due to delay on the A4175 Keynsham Road approach to the Avon Mill Lane junction, caused in part by slow moving traffic in Station Road but also exit blocking from Avon Mill Lane caused by queuing traffic backing-up from the ‘shuttle working’ pinch-point under the railway bridge. As will be noted in Section 4, the possible provision of a link road from Avon Mill Road to the A4 Bath Road could serve to reduce traffic pressure at this existing pinch-point, and so assist in improving conditions at the A4175 Station Road/Avon Mill Lane junction. However, this is not included in or reflected in these analyses.



SECTION 3 – MODEL RESULTS AND COMMENTARY

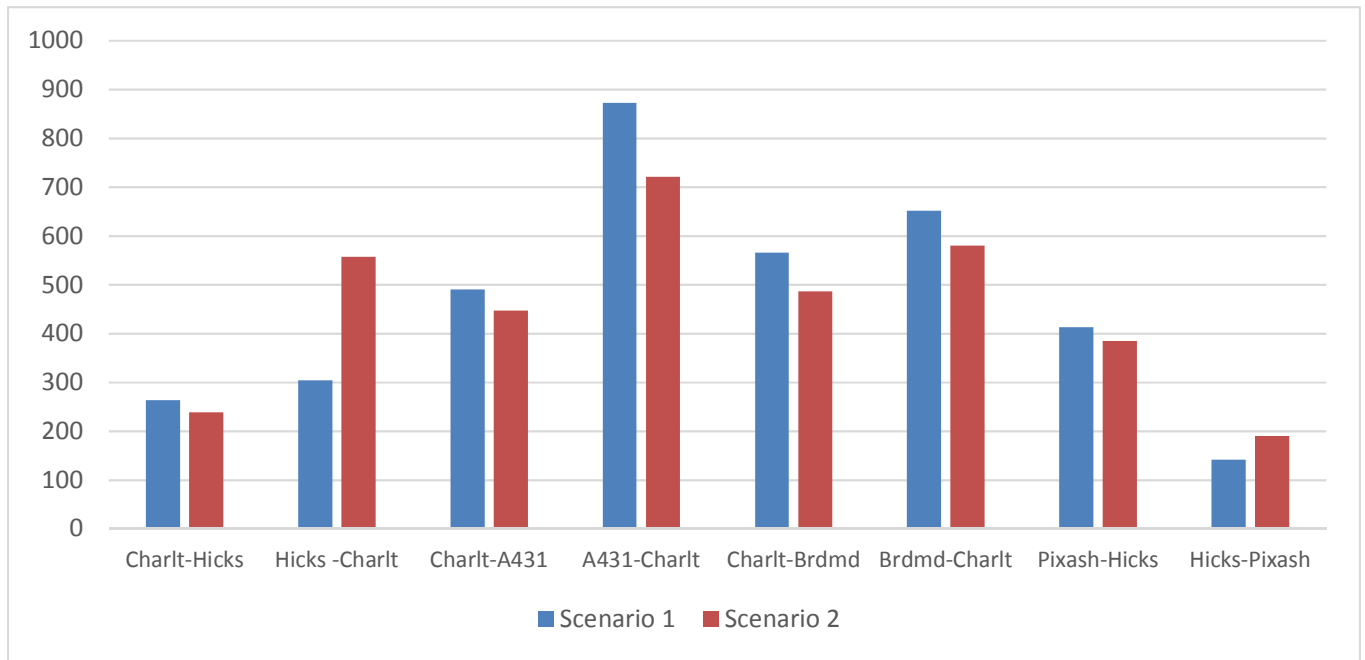


Figure 3.5: Selected Route Travel Times, Weekday Evening Peak Hour (5:00-6:00pm)

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SECTION 4

Other Infrastructure Schemes

4.1 Avon Mill Lane-A4 Link

Core Document **CD/PMP/K14** considered options for introducing a new link road connecting the A4175 Keynsham Road with the A4 Bath Road, with the aim of reducing through traffic and congestion within Keynsham town centre. Whilst a link is not included in the two scenario tests described in Sections 2 and 3 to this Evidence Note, this work is cross-referenced as the delivery of this scheme could further assist in improving future highway conditions in Keynsham. This work considered and assessed two potential options for an Avon Mill Lane/A4 Bath Road Link Road as follows:

- Option 1: A link road alignment running from Avon Mill Lane to the north of the paper recycling depot, and then east of the sewerage treatment works to a new roundabout, where a one-way northbound connection would be made using the existing narrow route through the railway embankment to the southern section of Broadmead Lane by Waitrose. The new route alignment would then run east, connecting to Pixash Lane via a widened bridge over the mainline railway; or
- Option 2: This would follow the same alignment as far as the new roundabout just north of the railway line, but with the linkage through the railway embankment improved to provide two-way working with increased headroom. Pixash lane would be stopped up to the east of this new roundabout

The modelling carried out by CH2M and reported in July 2015 showed that the proposed link road could provide significant operating benefits to the Keynsham highway network by reducing forecast traffic volumes using the southern part of Avon Mill Lane, Bath Hill East and the section of the B3116 Bath Road between the Wellsway mini-roundabout and Broadmead Roundabout. In essence, this scheme would take out traffic routing between the A4 Bath Road and the A4175 Keynsham Road, although operation of the A4175 Keynsham Road/Avon Mill Lane would remain critical as this part of the route would enjoy no traffic relief.

In The DPP Part 3, paragraph 50, it is stated in part that other transport actions could include “Investigate schemes to introduce one-way operation on the High Street in the short term, possibly during off-peak hours only” and “Investigation of other strategic improvements that could reduce the volume of through traffic in the town centre, allowing one-way operation of the High Street to cater for increased future traffic demand”. Possible layouts for introducing one-way southbound operation along the section of the High Street between Charlton Road and Temple Street/Bath Hill were considered in Core Document **CD/PMP/K6** ‘Keynsham High Street Public Realm’, CH2M, July 2015. As far as long term operation was concerned, the modelling undertaken for the link road examined to what extent this would relieve highway conditions in the High Street

With the High Street one-way scheme included in the modelling analysis the network statistics showed that both link road options would be effective in mitigating the long-term impact of implementing these works in the morning peak period. However, this was not the case during the evening peak period where the network became notably more unstable in operation with the inclusion of the High Street works. As such, based on work to date, it suggests that if a Avon Mill Lane-A4 Bath Road link road was constructed it would not compensate for capacity reduction issues created by the High Street scheme in the long term. However, it would offer noticeable operational benefits to other parts of the network as noted.



SECTION 4 – OTHER INFRASTRUCTURE SCHEMES

Based on the results from this assessment work, it was recommended that a link road between the A4175 and the A4 Bath Road should not be dismissed, but identified as a scheme meriting further investigation in the DPP. This is noted in DPP Part 3 as such but, as a 'preferred' scheme is not fixed or defined in sufficient detail at this time, it was not taken as a 'given' in the future highway testing described in this Evidence Note.



SECTION 5

Summary and Conclusions

5.1 Summary

This report has presented the results of modelling assessment work seeking to demonstrate that proposed transport measures for the Keynsham area identified in the Keynsham Transport Strategy are capable of maintaining a satisfactory level of highway operation in the future with identified development sites built out. The assessment has taken account of changes made to the existing highway in Keynsham since the Core Strategy assessment work carried out by CH2M in February 2014. A further scenario has been tested in which a proposed improvement at Hicks Gate roundabout is assumed to be in-place.

The assessment work has shown that the Keynsham network with recent and identified highway works implemented is capable of accommodating future growth during the weekday morning peak period (7:00-10:00am), albeit with a high degree of delay. However, during the afternoon/evening period from 3:00-7:00pm the assessment suggests that the network would struggle to cope with the predicted demand during the 5:00-6:00pm peak hour, unless a significant improvement scheme to the A4/A4174 Hicks Gate Roundabout is implemented. Even so, a significant degree of congestion would remain, although the network results suggest that the network would just cope in accommodating the passage of nearly all the forecast traffic in the weekday 3:00-7:00pm period.

This assessment does not include a possible link road between Avon Mill Lane and the A4 Bath Road, which is discussed and assessed in Core Document **CD/PMP/K14**. This is because this possible improvement is very much in the investigative stage, and noted as a further measure meriting further work in the DPP. In view of this, it was not considered reasonable to assume this link road as being a 'given' in examining the future operation of the Keynsham highway network.

5.2 Conclusions

Forecast S-Paramics modelling of the highway network in and around Keynsham suggests that it could just cope in highway operating terms, but is liable to become highly unstable in future with all the predicted land use developments in place, particularly during the evening peak hour. A major improvement scheme at the A4/A4174 Hicks Gate Roundabout will be pre-requisite to accommodating the forecast traffic levels in the weekday 3:00-7:00pm period. However, this will only provide limited relief to the routes through the Town Centre and, as such, slow moving conditions are likely to prevail during much of the 4:30-6:00pm 'peak' identified in the mean journey time profile (Figure 3.2). However, the overall network statistics for this period do show that over 97% of the forecast demand is accommodated with a Hicks Gate scheme in place (Scenario 2).

Consideration of other further highway improvements, such as a possible Avon Mill Lane-A4 Bath Road Link Road, are clearly desirable to maintain the reliability and resilience of the Keynsham highway network in the face of significant development growth within the town. This is because a future network operating close to or at capacity could be subject to considerable variability in journey time reliability in the 'peak' periods, as the S-Paramics model runs (30 iterations) have demonstrated. This is recognised in the DPP, where policy provision is made for further investigation of strategic improvements.



SECTION 5 – SUMMARY AND CONCLUSIONS

The further investigation and delivery of an improvement scheme for the A4/A4174 Hicks Gate junction need not be constrained in programming terms to a ‘trigger point’ defined by a given quantum of planned or on-going development being built and occupied in and around Keynsham. This junction already experiences operating problems in the weekday morning and evening peak periods, although it should be noted that a big causation factor is the queuing on the A4 Bath Road towards Brislington which exit blocks this partially signalled roundabout. As such, a stand-alone improvement scheme for Hicks Gate will not serve to address all the congestion issues in this location, but preliminary investigation work done to date shows that improvements can be made to reduce delays to the significant movements between the A4 Keynsham Bypass and the A4174 Ring Road.