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Shropshire Council

Gaskell Arms Junction Feasibility

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Confidential

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Gaskell Arms Junction Feasibility

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Introduction

WSP have been commissioned by Shropshire Council (SC) to conduct a feasibility study for the Gaskell Arms junction in Shropshire.

A need to undertake the feasibility study has arisen to understand the changes in traffic conditions due to upcoming developments, assess possible junction improvements and provide a cost benefit analysis for a proposed option.

Report Purpose

A need has been identified for improvements at the Gaskell Arms Junction in Much Wenlock, Shropshire. There are several large developments taking place in the surrounding area in the coming years which are likely to affect the operational efficiency of the junction. This document has been prepared to:

- Assess the existing junction and key issues.
- Assess the potential effect of development on the operation of the existing junction.
- Assess opportunities to change the layout of the existing junction.

The Gaskell Arms junction is at the intersection of A458 Victoria Road/Bridgnorth Road, A4169 Smithfield Road, the B4378 Bourton Road and High Street in Much Wenlock, Shropshire. The posted speed limit in this area is 30mph.

A desktop study was undertaken in October 2022 to determine what, if any, improvements to the existing infrastructure could be achieved.

Several existing constraints have also been identified that are worthy of further investigation as the scheme develops into detailed design.

Several options for future improvement were considered including:

- Bypass
- Compact Roundabout
- Signalisation
- Double Mini Roundabout
- Shared Space
- One-way System
- Signing and Lining

- Kerbing realignment
- Change of priority

The bypass option was initially discounted from further consideration as the costs would be far greater than the s106 contributions that Shropshire Council have received for improvements within Much Wenlock.

Both roundabout improvement options were discounted as there would not be enough space within the existing extent of highway boundary to provide the required infrastructure. The roundabouts would also not meet the standards required and have therefore been discounted.

The Shared Space option was discounted due to this now being withdrawn from government guidance.

Minor improvements schemes were discounted due to not having any meaningful foreseeable benefits.

Options for full and partial traffic signals have been assessed using the current and forecasted traffic information, using industry standard modelling software to assess the impacts of signalisation, these options are predicted to provide meaningful benefits to the existing junction. In addition, signalised options 1,2 and 5 have been discounted as they would create congestion issues throughout the junction.

The assessment results show that signalised Option 3 and 4 operate within practical reserve capacity. Junction assessments have been undertaken using industry standard VISSIM and LinSig modelling software, to assess the junction capacity for the scheme under existing traffic conditions (2022/2023) and scheme forecast year (2038). Option 4 which provides demand dependant signalisation of the junction performed better and so was taken forward as the preferred option, although the technical feasibility of this aspect of Option 4 needs to be reviewed further as part of detailed design.

As part of the study, scheme cost estimates have been developed and cost benefit analysis (CBA) have been calculated for Option 4.

Option 4 consists of: -

- Part signalisation with on demand activation when queues exceed 90m.
- High Street fully converted to being one-way northbound.
- Carriageway realignment to increase the width of the existing right turn lane.

There are also additional versions of this option which consist of
- Shineton Steet converted to be made one-way north westbound.
- Possible widening of the junction bell mouth for Smithfield Rd (A4169)

Conclusion

Based on the feasibility assessments carried out during this study, Option 4 has been deemed as the most suitable option to address the impact of the future development

High level scheme cost estimates are £269k.

The CBA gives a positive Net Present Value (NPV) concluding it is financially viable to undertake option 4.

Following a peer review and the Stage 1 Road Safety Audit (RSA), it has been concluded that a phased approach to the delivery of Option 4 at this junction would prove the most beneficial.

Once the benefits to traffic are established following implementation of each phase, further phases can be reviewed and considered. Signalisation of the junction is to be considered in the later phases of this Option 4 approach, this will also allow the technical feasibility of implementing signals to be reviewed further.

1

Introduction

Introduction

1.1 Overview

1.1.1. The Gaskell Arms junction in Much Wenlock, Shropshire, is known as such due to the Gaskell Arms Public House located to the southern side of the intersection. The junction is at the intersection of A458 Victoria Road/Bridgnorth Road, A4169 Smithfield Road, the B4378 Bourton Road and High Street in Much Wenlock, Shropshire.

1.1.2. The junction lies within the Much Wenlock conservation area, the extents of which are shown in Appendix D.

1.1.3. The area is served by several bus routes, the 18, 436 and 894 services all use this junction with the 18 and 894 using A458 Bridgnorth Road and A4169 arm of the junction and the 436-bus route using both the through route of A458 and A4169 arm. The details for all bus routes are provided in Appendix B.

1.1.4. Currently the junction experiences queues at peak travel times and is indicated to be operating at circa 90% capacity during the PM peak.

1.1.5. There are several large developments taking place in the surrounding area in the coming years, these developments are likely to affect the operational efficiency of the junction and therefore this review has been commissioned to assess the existing junction, the impact of the proposed developments and investigate opportunities for improvement at the existing junction.

2 Existing Conditions

2.1 Existing Junction

2.1.1. The Gaskell Arms junction in Much Wenlock, Shropshire, is known as such due to the Gaskell Arms public House located to the southern side of the intersection. The junction is at the intersection of A458 Victoria Road/Bridgnorth Road, A4169 Smithfield Road, the B4378 Bourton Road and High Street, there is also a small service road located to the south-east of the junction serving the car park to the Gaskell Arms.

2.1.2. The existing layout gives priority through the junction to A458, with uncontrolled give way junctions at all the adjoining roads. All roads at this junction are single carriageway two-way roads and subject to a posted 30mph speed limit.

2.1.3. There is an uncontrolled pedestrian crossing located to the east of High Street and outside the Gaskell Arms public house; this crossing has tactile paving slabs and a central refuge with pedestrian barriers.

2.1.4. There are 7.5t weight restrictions in place on both the B4378 Bourton Road and High Street. There are also several No Waiting at Any Time parking restrictions in the locality as shown in Appendix C.

2.1.5. The physical layout and associated Highway Boundary of the junction is one of the most restrictive elements when trying to provide a workable solution to address the existing and predicted traffic flows through the Gaskell Arms Junction. The main restriction is the existing layout of the buildings around the junction that also falls within a conservation area. The layout of existing buildings creates a pinch point between the Gaskell arms, 42 High Street and 34 Bridgnorth Rd that greatly limits the available space to implement traditional traffic management solutions.

2.1.6. The position of the Gaskell Arms in relation to the highway and nearby buildings proves to be an issue when looking to provide safer and effective pedestrian crossing points for any crossing provided within the junction. Current design standards require a forward visibility of 55m at pedestrian crossing for all road users (for 30mph 85th percentile of speed) and this is difficult to achieve within the existing layout.

Historic area

2.1.7. The junction lies within a conservation area (as shown in Appendix D) and is surrounded by historically significant buildings, imposing restrictions on the kind of material and improvements that can be implemented within the area. The conservation area encompasses the Gaskell Arms PH, approach on all arms of the junction, High Street, through Wilmore Street and Shineton Street. All works should consider the constraints of the conservation area and in consultation with the local planning authority.

2.2 Existing Accident Data

2.2.1. There are no recorded Personal Injury Collisions (PICs) occurring at the junction since 2018. Personal injury collisions are those where a police presence was required and where the collisions resulted in injury. Damage only collisions are not recorded in official data, therefore we are not able to assess the frequency of damage only collisions. However, we have been made aware of some damage only collisions occurring at this junction, and this has been taken into consideration whilst undertaking this feasibility study; however due to the inability to quantify the numbers this information cannot be weighted over the data that has been collected.

2.3 Existing Traffic Conditions and Flows

Right turn

2.3.1. The existing right turn facilities provided for A458 to A4169 and High Street, does not meet current design standards, with the right turn ghost island only being 1.5m wide are substandard. The substandard width of the right turn lane results in vehicles, particularly HGVs, straddling the right turn lane and the running lane of A458 (north/northwest).

2.3.2. The turning movements are further hindered by the tight turning radius when entering the junction from A4169, in tandem with the HGV and bus usage of this arm of the junction, vehicles must queue until there is opportunity to infringe into the ghost island to be able to access A458.

2.3.3. The road width on A4169 also poses a challenge for HGVs and buses accessing A4169 (Smithfield Road); the road is often obstructed and/or restricted by vehicles waiting to exit A4169 (Smithfield Rd) preventing larger vehicles from entering until vehicles within A4169 (Smithfield Rd) have exited and often requiring vehicles to hold back from the junction and wait further up A4169 (Smithfield Road) to allow HGVs and buses to enter and pass them which results in increased queuing on both A458 and A4169 (Smithfield Road).

2.3.4. The bell mouth of A4169 (Smithfield Road) is substandard and hinders the flow of traffic using A4169 due to the tight corner radii with A458, leading to larger vehicles over running the centre line to be able to navigate the turn.

2.3.5. Detailed in Figures 2-1 to 2-9 below are screenshots of the video footage from the day of survey (30/11/23) highlighting these issues.

Figure 2-1 - Camera 3-1 – AM Peak (08:00-09:00) – Incorrect use of right turn lane on Brignorth Road

Figure 2-2 - Camera 3-1 – AM Peak (08:00-09:00) – Use of right turn lane on Brignorth Road (HGV)

Figure 2-3 - Camera 3-1 - PM Peak (17:00-18:00) - Incorrect Use of right turn lane

2.3.6. As seen above in Figure 2-1and Figure 2-3 both cars and HGV's currently use the right turn lane on Bridgnorth Road and subsequently block northbound vehicles on Bridgnorth Road resulting in queues as shown in Figures 2-4 and 2-5 below.

Figure 2-4 - Camera 3-3 - AM Peak (08:00-09:00) Queuing on Bridgnorth Road caused by vehicles not using the right turn bay and blocking Bridgnorth Road

Figure 2-5 - Camera 3-3 - PM Peak (17:00-18:00) Queuing on Bridgnorth Road

2.3.7. Illustrated above in Figure 2-4 and Figure 2-5**,** in both AM and PM peak periods there is substantial queuing along Bridgnorth Road, caused by vehicles not using the right turn bay and blocking Bridgnorth Road.

2.3.8. Figures 2-6 and 2-7 highlight the issues of large vehicles turning into A4169 (Smithfield Road) from A458 Victoria Road.

Figure 2-6 - Camera 2-2 - AM Peak (08:00-09:00) – HGV & PSV setting back to allow junction to clear before left turn movement

Figure 2-7 - Camera 2-2 PM Peak (17:00-18:00) – PSV setting back to allow junction to clear before left turn movement

2.3.9. As seen above in **Figure 2-6** and **Figure 2-7**, these both illustrate that HGVs & PSVs sett back to allow the junction to clear before left turn movement into Smithfield Road.

Figure 2-8 - Camera 2-2- AM Peak (08:00-09:00) – Queuing on Smithfield Road

Figure 2-9 - Camera 2-2- PM Peak (17:00-18:00) – Queuing on Smithfield Road

2.3.10. As seen above in **Figure 2-8** and **Figure 2-9,** there is evidence of queuing along Smithfield Road.

2.3.11. Comparing the survey data on the day of survey to historical data and long-term historical Google traffic queueing data, the junction is not indicated to perform with significant queueing in typical conditions. The google traffic queuing can be seen in more detail in **Figure 2-10** and **Figure 2-11**.

Figure 2-10 - Google Traffic Queue (08:00) - 30th November 2022

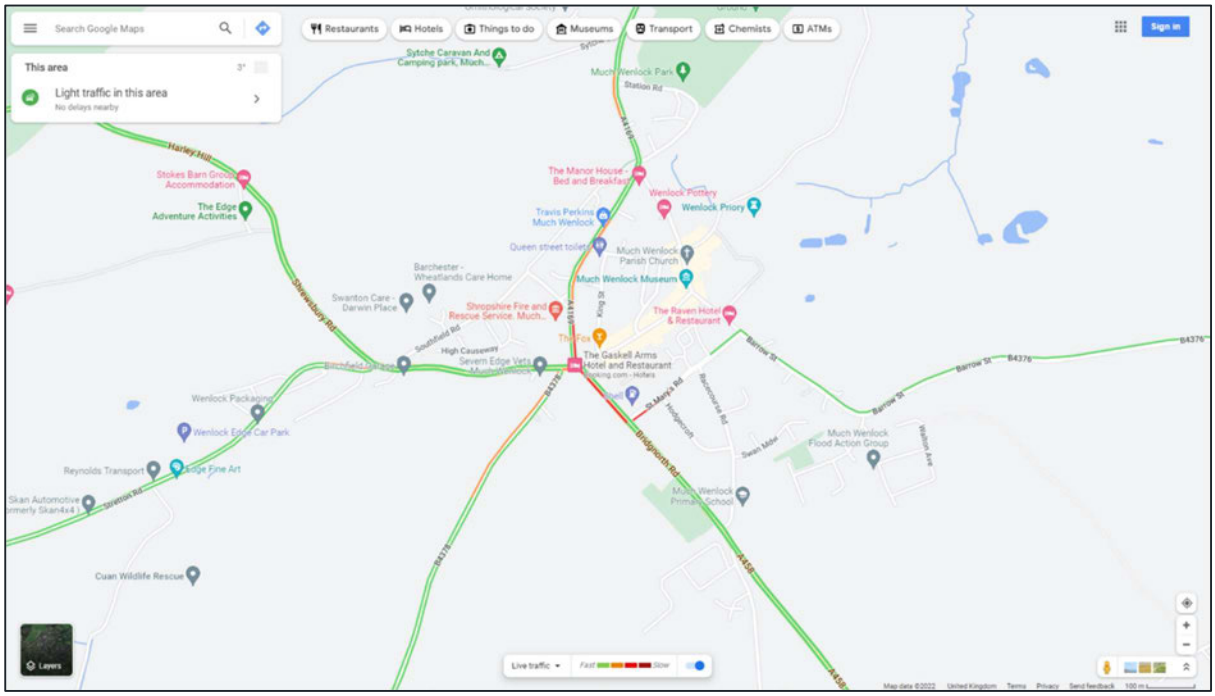


Figure 2-11 - Google Traffic Queue (17:00) - 30th November 2022

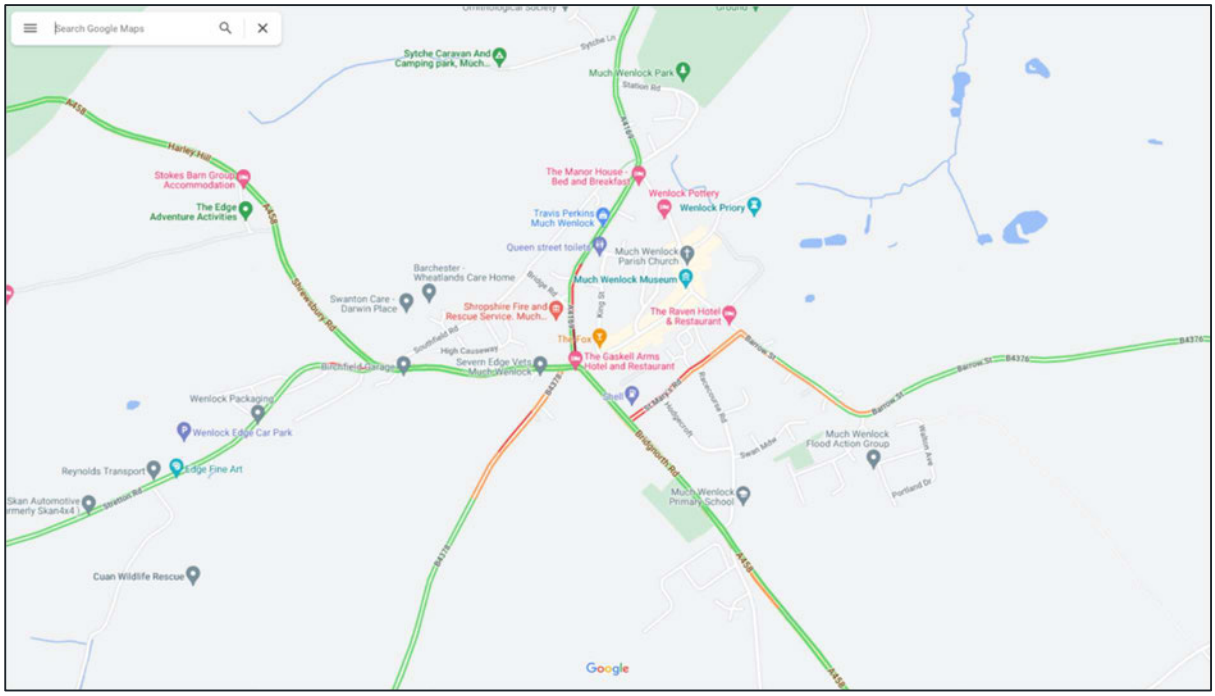


Figure 2-12 - AM Peak - Long Term Average/Typical Google Traffic (Much Wenlock)

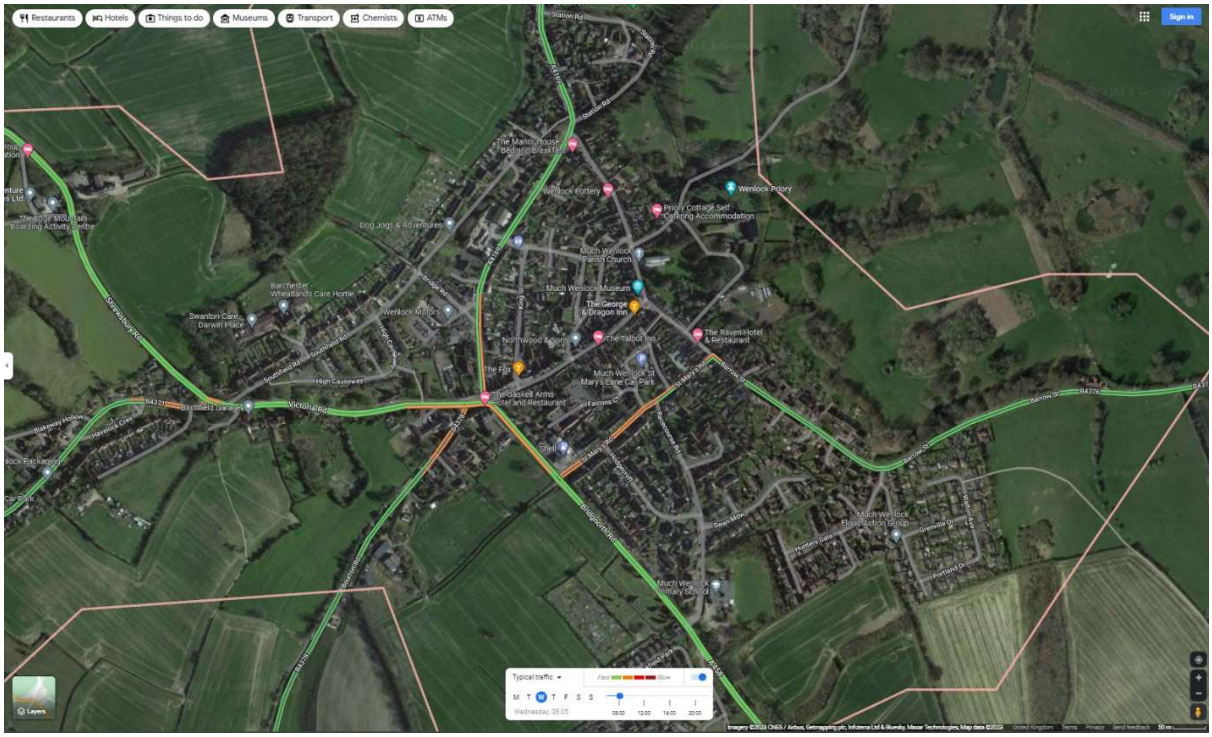
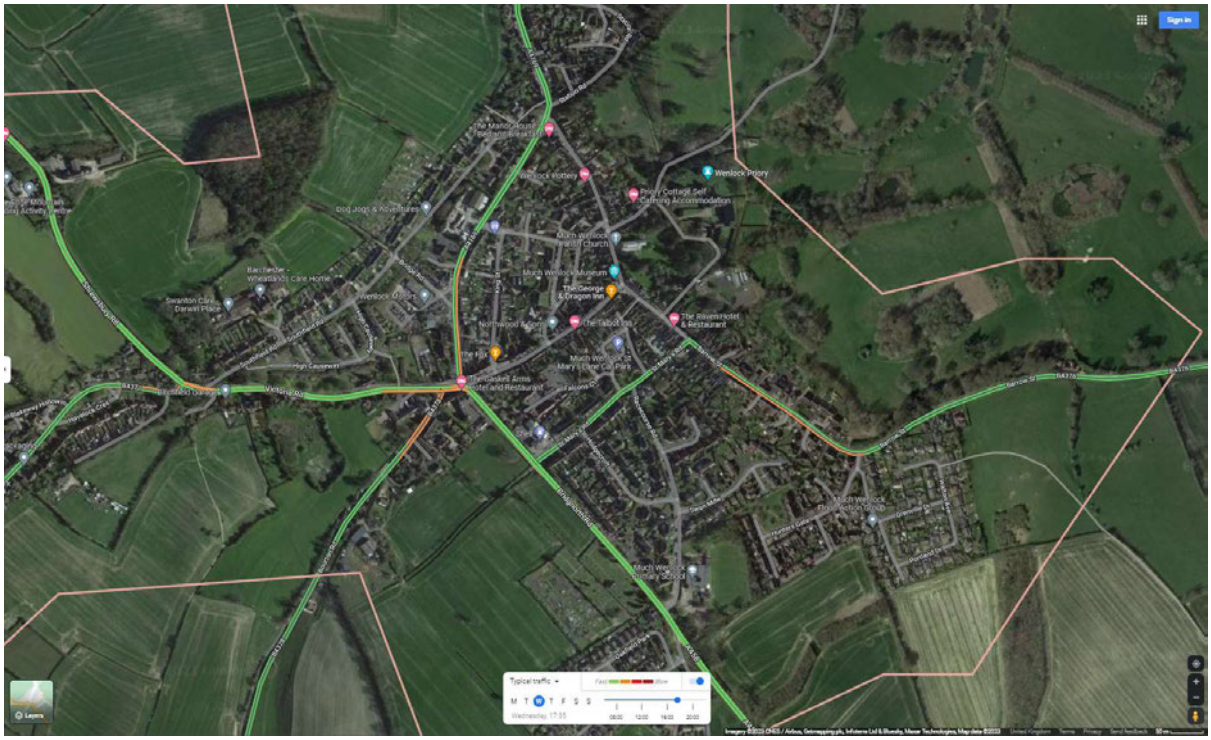


Figure 2-13 – PM Peak - Long Term Average/Typical Google Traffic (Much Wenlock)



2.3.12. As illustrated in **Figure 2-10** and **Figure 2-11** above the traffic and queues experienced on the day of survey on the 30th November 2022 were worse than the long term average/typical google traffic illustrated in **Figure 2-12** and **Figure 2-13** in both the AM and PM peak periods.

2.3.13. It can be seen from the video footage from the day of survey that queues can quickly build up but also reduced quickly due to the number of right-turning vehicles arriving at the give-way line on Smithfield Road and the issues highlighted previously.

2.3.14. The introduction of additional traffic may exacerbate the queues that currently occur at the junction, the additional traffic that is likely to route along A458 is likely to make the right turn movements into Smithfield Road and High Street more difficult which in turn may also compound the queuing along Smithfield Road.

Much Wenlock Town Council Survey

Residents Survey Summary

2.3.15. In March 2022, Much Wenlock Town Council (MWTC) conducted a survey that was sent out to 1,800 households in Much Wenlock. A total of 329 responses were received. The residents were asked a series of questions and opinions on how MWTC should plan for Much Wenlock.

2.3.16. From the responses received over 200 respondents determined that traffic management should be a priority for investment in the town.

2.3.17. When asked about the problems at Gaskell Corner, the main concern highlighted from the responses was poor air quality and speeding through the town.

2.3.18. The responses gathered also highlighted that local residents would prefer one-way streets to help alleviate and discourage ‘rat running’.

Traffic Surveys

2.3.19. The traffic surveys conducted by Much Wenlock Town Council illustrated that there were a total of 476 vehicles (7% HGV’s) going from Bridgnorth to Much Wenlock and 373 vehicles (8% HGV’s) travelling from Much Wenlock to Bridgnorth in the AM peak hours of 08:00-09:00.

2.3.20. At A4169 and Sytche lane Junction survey location, it showed that there was a total of 318 total vehicles (7% HGV’s) travelling from the Much Wenlock to Buildwas and 372 total vehicles (5% HGV’s) from Buildwas to Much Wenlock in the AM peak period (07:45-08:45)

Comparison to November 2022 Surveys

2.3.21. The traffic surveys conducted in November 2022 by WSP illustrated that there was a total of 578 vehicles (5.5% HGV’s) going from Bridgnorth to Much Wenlock and 386 vehicles (7% HGV’s) travelling from Much Wenlock to Bridgnorth in the AM peak hours of 07:45-08:45. In comparison to the November 2022 survey results above the flows are 100 vehicles higher in the AM peak in the November survey for vehicles

travelling from Bridgnorth to Much Wenlock, in comparison to the May surveys by Much Wenlock Town Council. The PM peak shows that the flows are similar.

2.3.22. At A4169 and Sytche lane Junction survey location, it showed that there was a total of 278 total vehicles (6% HGV's) travelling from the Much Wenlock to Buildwas and 331 total vehicles (7% HGV's) from Buildwas to Much Wenlock in the AM peak period (07:45-08:45). The results illustrate that the flows are relatively similar in number.

2.3.23. Therefore, the flows surveyed on the 30th November 2022 illustrate that they are reflective of typical conditions albeit some flows are slightly higher.

'Rat running'

2.3.24. Following conversations with MWTC and other key stakeholders it was highlighted that there may be issues with 'rat running' through the town to avoid congestion at the Gaskell Arms junction. The 'rat running' routes are illustrated in Figure 2-14 below.

Figure 2-14 — 'Rat Running' Routes

2.3.25. It is understood that there are three-main 'rat running' routes through Much Wenlock during peak times, where vehicles are using alternative routes to avoid the junction on the corner of the Gaskell arms. One route is understood to be Kings Street and Queens Street which vehicles use to avoid queues on A4169 (Smithfield Rd). Two further routes are understood to be along Shineton Street and along St Mary's Road and/or Racecourse Road, avoiding the Gaskell Arms junction completely. The roads

believed to be affected by ‘rat running’ are not suitable to take a large amount of traffic due to their residential nature.

2.3.26. An ANPR survey was conducted on Tuesday 28th of February 2022. The results from the ANPR survey illustrate the following.

2.3.27. In the AM Peak there were up to circa 12 vehicles that were captured between the ANPR on A4169 Shineton Street (north of Station Road) to the ANPR on Racecourse Road. In the PM peak there were up to circa three vehicles captured through Racecourse Road towards the ANPR located on A4169 Shineton Road.

2.3.28. In the return direction in the AM peak the survey showed that there was circa one vehicle captured along Racecourse Road, and in the PM peak there were up to circa three vehicles.

2.3.29. Across the wider AM period between 07:00 and 10:00, there were up to circa 23 vehicles (cars and LGV) captured between A4169 Shineton Road (north of Station Road) and Racecourse Road. In the wider PM period between 15:00 and 19:00 there were up to circa 27 vehicles (cars and LGV).

2.3.30. It was observed from the ANPR data that the following quantum of vehicles were also using King Street and St Mary’s Road to avoid the Gaskell Arms junction in the surveyed peak periods.

Table 2-1 – Other routes used to avoid queues on Smithfield Road

Survey Analysis	
	Traffic using King Street to avoid A4169 Smithfield Road junction with A458
AM Peak (1 hour)	6 vehicles
PM Peak (1 hour)	14 vehicles

Survey Analysis	
	Traffic using St Mary’s Road to avoid A4169 Smithfield Road junction with A458
AM Peak (1 hour)	4 vehicles
PM Peak (1 hour)	6 vehicles

2.3.31. The amount of traffic using these routes certainly corresponds/increases when queues are clearly visible to approaching traffic on Smithfield Road.

2.3.32. Part of the issue at Gaskell Arms junction are the number of arms joining A458 in close proximity, causing uncertainty and hesitation at give-way lines. The surveyed number of vehicles in the peak periods exiting High Street were low as shown in Table 2.2 below. Surveyed flows (see below) show a total of 29 vehicles entering the junction from High Street in the AM one hour peak period and 40 in the PM peak one hour peak period.

Table 2-2 – High Street peak hour turning movements.

AM Peak Turning Movement Data Summary

Class	U-Turn	Right	Left
Car	0.0	10.0	13.0
LGV	0.0	1.0	3.0
OGV1	0.0	1.0	1.0
OGV2	0.0	0.0	0.0
PSV	0.0	0.0	0.0
MC	0.0	0.0	0.0
PC	0.0	0.0	0.0
Total	0.0	12.0	17.0

PM Peak Turning Movemet Data Summary

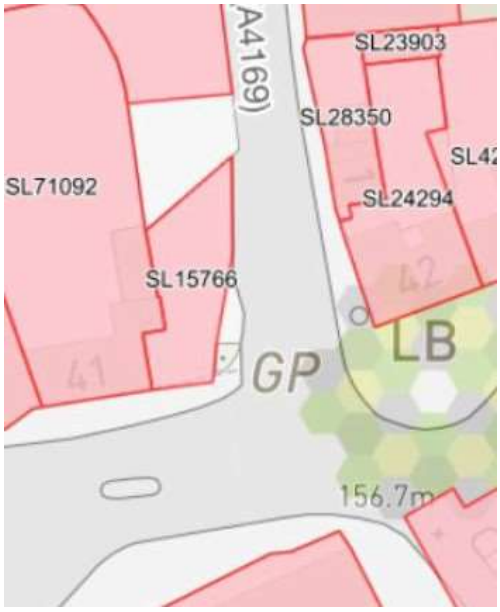
Class	U-Turn	Right	Left
Car	0.0	18.0	16.0
LGV	0.0	2.0	4.0
OGV1	0.0	0.0	0.0
OGV2	0.0	0.0	0.0
PSV	0.0	0.0	0.0
MC	0.0	0.0	0.0
PC	0.0	0.0	0.0
Total	0.0	20.0	20.0

2.3.33. If High Street were to be made one-way entry from A458, this would make the operation of Gaskell Arms junction far more efficient.

2.4 Highway Boundary

2.4.1. The existing Highway Boundary has the tightest footprint around the Gaskell Arms and prevents most traditional traffic management techniques being implemented. See Appendix E.

2.4.2. The land registry area:



2.4.3. From the charges register:

> *The land tinted pink on the filed plan and other land is subject to the following rights:*
>
> *"excepting and reserving unto the Vendor and his successors in title a right of way at all times and for all purposes with or without vehicles over and along the area of land coloured brown on the said plan and forming part of the property Secondly herein described for the purposes of access to and egress from adjoining land now or formerly belonging to the Vendor the Vendor and his successors in title paying a fair proportion according to user of the cost of maintaining and repairing such right of way".*

2.5 Visibility

- Visibility is limited from the Bourton Road approach only being able to see the Smithfield Road exit and High Street exit, without seeing east bound traffic from Bridgnorth Road.
- High Street visibility is good and can see all approaches to the junction.
- Visibility from Smithfield Road is good at the give way line.
- The Gaskell arms restricts views round the bends from both approaches on Victoria Road.

2.6 Additional Constraints

- Parking on High Street - Currently there are several ‘no waiting at any time’ parking restrictions (double yellow lines) along High Street with a small section for general parking close to the mouth of the junction for Kings Street. Under new proposals (separate to this report) the general parking will change to a short stay parking area between 8am and 6pm for a maximum stay of 2 hours. (No return within 2 hours). King Street proposals aim to input new double yellow lines on the approach to High Street (Approximately 120m). This is currently out for consultation. (Appendix F)
- Services – The existing plans do not show any High Potential Instance (HIPO) high pressure or high-capacity utility services in the immediate junction vicinity; although there are other lower risk utility services in the vicinity that may require diversions or protection works. (Appendix G)
- Pedestrians – there is currently one uncontrolled crossing point located within the vicinity of the junction. This crosses A458 on the Bridgnorth Road arm outside the Gaskell Arms Public House. The visibility at this location is restricted however the presence of the centre island provides a refuge for pedestrians allowing them to cross one lane at a time.
- Street Furniture – currently on site there are several existing bollards, planters, beacons, and road signs within the junction. Dependant on the outcome of the feasibility report and the preferred option consideration may be needed to alter, amend, relocate, or remove existing street furniture.
- Drainage – there is evidence of ponding on the south side of A458 outside the corner of the Gaskell Arms. This could be addressed as part of any civils work undertaken at the junction should this be required.
- Existing skid resistance – There is no road surface condition survey data available for the A458 showing the surface texture/ skid resistance levels. Although the existing carriageway condition appears to be relative sound it would be useful to further assess carriageway surfacing at design stage to determine if the additional high friction surfacing is required.
- Street lighting – There has been no assessment of the current street lighting at this location. It is recommended that a street lighting assessment be undertaken during detailed design.
- Cyclists - no existing formal cycle facilities within the locality and so therefore cycling improvements have not been considered.

2.7 Local Development

2.7.1. Planning permission has been granted for the Ironbridge Power Station Development and Tasley Garden Village. This will be developed over the current Local Plan period. It is predicted that this will lead to additional vehicles using A458 and A4169. This additional traffic is likely to exacerbate the existing congestion at the Gaskell Arms junction.

Iron Bridge Development

2.7.2. A development by Harworth Group of 1000 dwellings, retirement village and other local amenities, including schools and a park and ride facility, is situated 3.5 miles north of Much Wenlock and will be connected to A4169. The main connection to the road network and is due to be complete by 2038.

Tasley Bridgnorth

2.7.3. The emerging Local Plan identifies more development in Bridgnorth. A proposed development by Tasley Estates Ltd of up to 550 dwellings, neighbourhood centre, amenities such as hotel, public house, petrol/electric filling station, livestock market is situated 6.8 miles south of Much Wenlock and will be connected to A458 and is due to be complete by 2038. In addition, Tasley Garden Village, a development of 1,050 homes running parallel to the A458, are included in the draft Shropshire Local Plan that is currently under examination by a Government planning inspector and the Local Plan is yet to be adopted.

Eastern Belt Strategic Corridor

2.7.4. The Eastern Belt Strategic Corridor is section of road network that offers opportunity for economic development and has been identified as the primary focus for major employment development by Shropshire Council.

2.7.5. A458/A454 have been identified as part of the Eastern Belt Strategic Corridor and therefore the impact it may have on the Gaskell Arms junction will be taken into consideration.

2.8 Impact of development

2.8.1. MWTC has confirmed that the Ironbridge construction traffic will not be allowed to use the town to travel to site. The Tasley construction traffic is still awaiting confirmation on whether this will also be the case.

3 Opportunities for Improvement

3.1 Areas for improvement

The key areas of improvement that each option is considered against are:

- Impact on the existing and future traffic flows of the junction
- Impact on the existing and future traffic flows of the surrounding network
- Impact on pedestrian and road safety
- Impact on the road network within Much Wenlock

3.2 Options considered

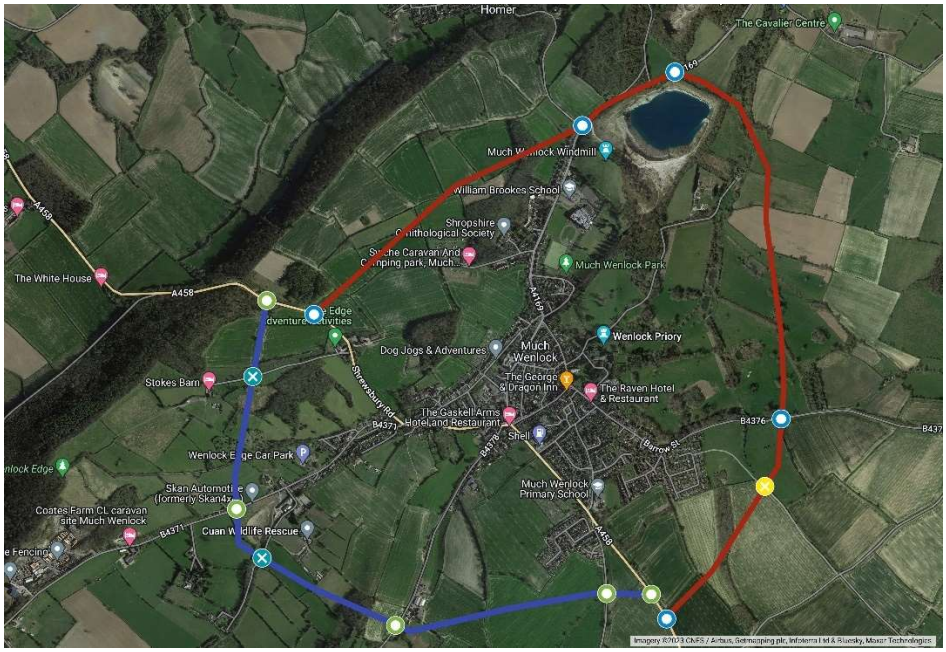
As part of this feasibility study, WSP have considered several options to provide improvements for this junction. WSP have looked at the following major through to minor options:

- Bypass
- Compact Roundabout
- Signalisation
- Double Mini Roundabout
- Shared Space
- One-way System
- Signing and Lining
- Kerbing realignment
- Change of priority

An explanation and assessment of these options are detailed below.

Major Options

Bypass



North Option
- Northern Bypass Option
- Bridge Required
- Junction Required
- Junction Required
- Junction Required
- Junction Required
- Junction Required

South Option
- Southern Bypass Option
- Junction Required
- Junction Required
- Junction Required
- Junction Required
- Junction Required
- Bridge Required
- Bridge Required

3.2.1. Consideration was given to the option of bypassing Much Wenlock and the Gaskell Arms junction. To bypass the town to the north (shown in red) would require a minimum 4km bypass which would require crossing a minimum of 4 existing roads and providing 2 new junctions on A458. This option would have a substantial environmental impact and require large amounts of green field land to be purchased.

3.2.2. The cost of providing this option would likely be in excess of £40m and could take a minimum of 5 years to provide and therefore this option has been discounted.

3.2.3. A shorter option was also considered, connecting A458 to A4169 along the same route, however, similarly to the full bypass the cost would be in excess of £20m, require significant green field land to be purchased and take a minimum of 4 years to complete, and so has been discounted.

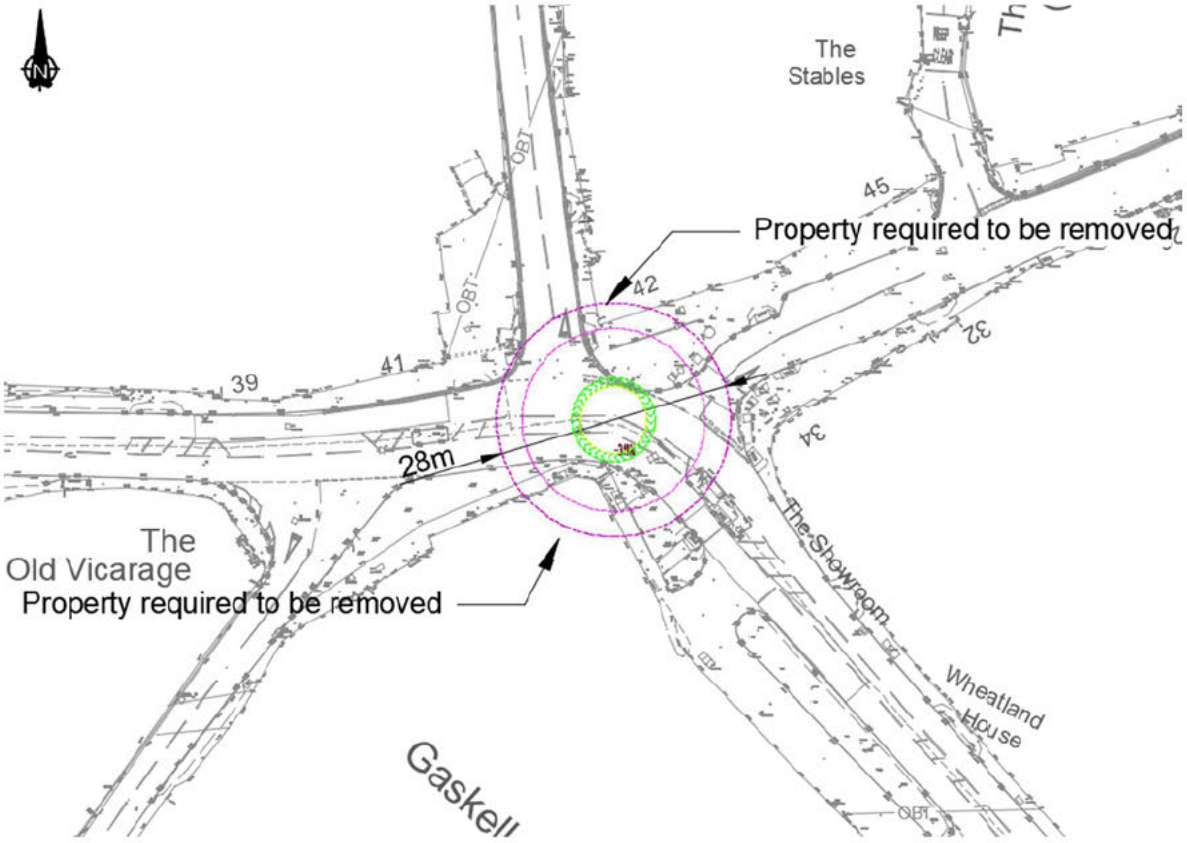
3.2.4. To bypass the town to the southwest would require a minimum 2km bypass, requiring a minimum of 4 road crossings and providing 2 new junctions on A458. This option would have a substantial environmental impact and required large amounts of greenfield land to be purchased and potentially some residential property to be purchased too.

3.2.5. The cost of providing this option would likely be in excess of £20m and could take a minimum of 4 years to provide and has therefore this option has been discounted.

Table 3-1 – Bypass - Pros and Cons

Pros	Cons
Through Traffic will be diverted away from the junction	Land may have to be procured through Compulsory Purchase Orders (CPOs). This is an expensive and long process
The additional capacity required because of future developments will be accommodated by the bypass	The land required for a bypass will be through a conservation area
Further developments would be possible in the local area	The cost to construct a bypass is in excess of £20m
	The bypass may not be used as the identified routes increase distance travelled

Compact Roundabout



3.2.6. Consideration has been given to providing a standard roundabout at the Gaskell Arms junction. The existing highway widths available at this location are not sufficient to allow a roundabout to be constructed in the current junction footprint. Land purchase would be required; it is likely that this would include the need to purchase and demolish historically significant buildings.

3.2.7. The cost of providing this option would likely be in excess of £3m and therefore this option has been discounted.

Table 3-2 – Roundabout - Pros and Cons

Pros	Cons
Provides a safe and efficient way to deal with the existing traffic capacity	Within the current available space there isn't sufficient space.
Addresses turning movement issues throughout the junction	The proposed roundabout is the smallest allowed by standards and capacity could be exceeded when future developments are considered
The proposal is for a standard layout making it easy for vehicles to pass through the junction quickly	

Moderate Options

Signalisation

3.2.8. Traffic signals, sometimes referred to as traffic lights, are a vital part of a transport network, providing a key operational function to improve free flow traffic conditions, reduce congestion and delays. Traffic signals require less land take and can be programmed to detect traffic flows and optimise who has priority. They also work well when there is a lot of traffic from one direction which could make a roundabout difficult to enter.

3.2.9. There are currently two types of intelligent traffic signal control systems, these being SCOOT (Split Cycle Offset Optimisation Technique) and MOVA (Microprocessor Optimised Vehicle Actuation). The standard method of traffic light control relies on the detection of vehicles on the stop line, whereas intelligent traffic control systems (SCOOT and MOVA) require detection on the approach to the traffic signals well in advance of the stop line.

3.2.10. The intelligent traffic control systems react automatically to the traffic conditions at their location and assign priority as deemed by their software. This allows the intelligent signals to adjust the green time required for each approach based on the number of vehicles approaching the signals, which helps maximise the operation of junctions. Ultimately, this solution supports the reduction in congestion and delays, which facilitates improvements in traffic flow and junction capacity.

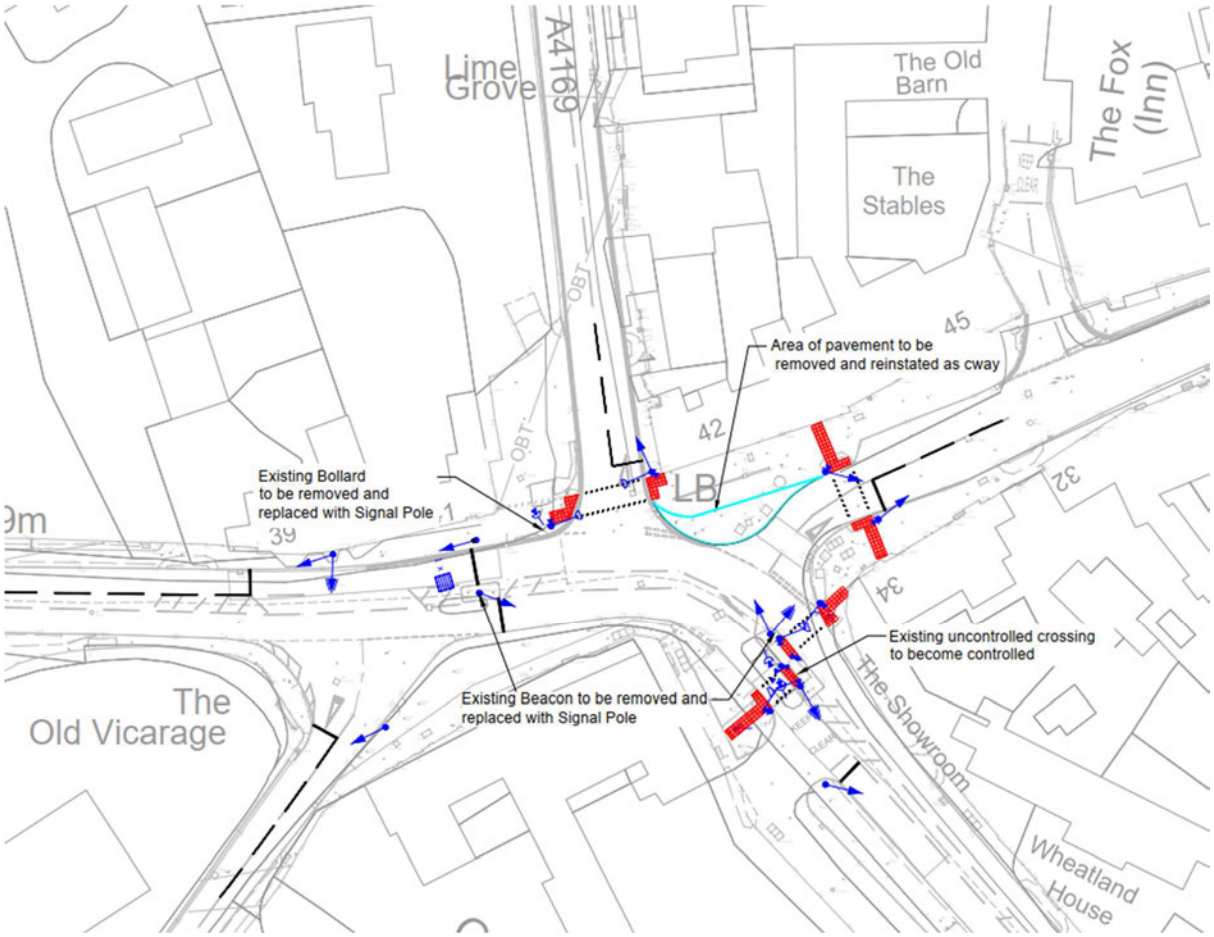
3.2.11. Intelligent traffic signals can be delivered in two forms. MOVA is a well-established method for the control of traffic light signals at isolated junctions and can cater for a range of traffic conditions from low to high traffic flows. MOVA functions to minimise delay at a junction, however if an approach becomes overloaded, then the system shifts to a capacity maximising function.

3.2.12. SCOOT differs from MOVA in that it operates across multiple junctions which feed into a central Urban Traffic Control system. The information across all junctions within the system is used to adapt the phasing of the traffic lights that are connected as a whole system, this optimises traffic flow of an area rather than one junction. Therefore, SCOOT control would not be appropriate at this location and has not been considered at this stage.

3.2.13. Consideration has been given to controlling the flow of vehicles through the junction using traffic signals. Several layouts and options have been considered and the most efficient is to signalise some of the arms.

3.2.14. Although this option will likely increase the journey time through the junction, the waiting times will be predictable and will allow all vehicle types to navigate the junction, preventing the existing issue where vehicles (especially buses and HGV's) are queueing for excessive time and potentially preventing 'rat running' though King Street.

Signalisation Option 1 Signalisation of all arms and additional Stop line on A458 (Victoria Rd).



Pros:

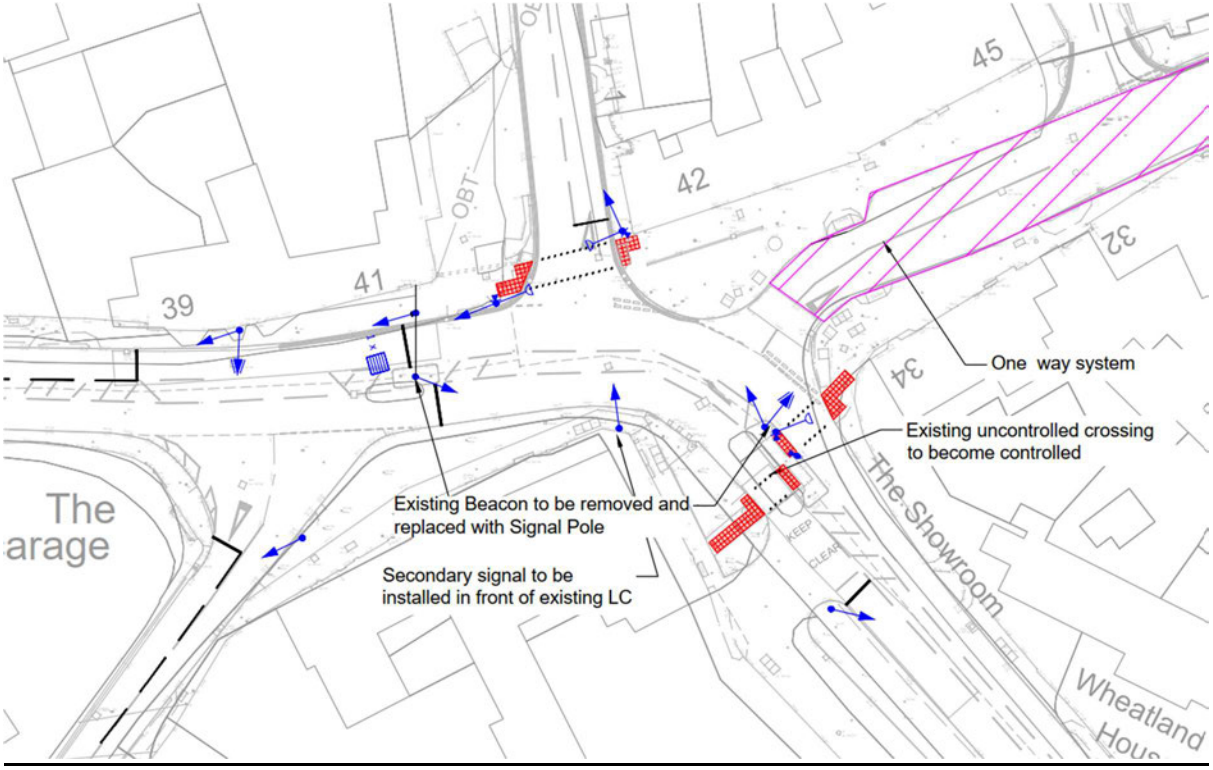
- Control of all arms will allow traffic signals to run optimally for the conditions at the junction.
- Pedestrians have the most complete facilities and will be able to safely manoeuvre around the junction under traffic control.

Cons:

- Large amount of civils work and increased maintenance cost compared to the existing junction layout.

Signalisation Option 2

Signalisation of all arms except High Street which would then form a ‘one-way’ system with Shineton Street. A stop line is provided on A458 (Victoria Rd).



Pros:

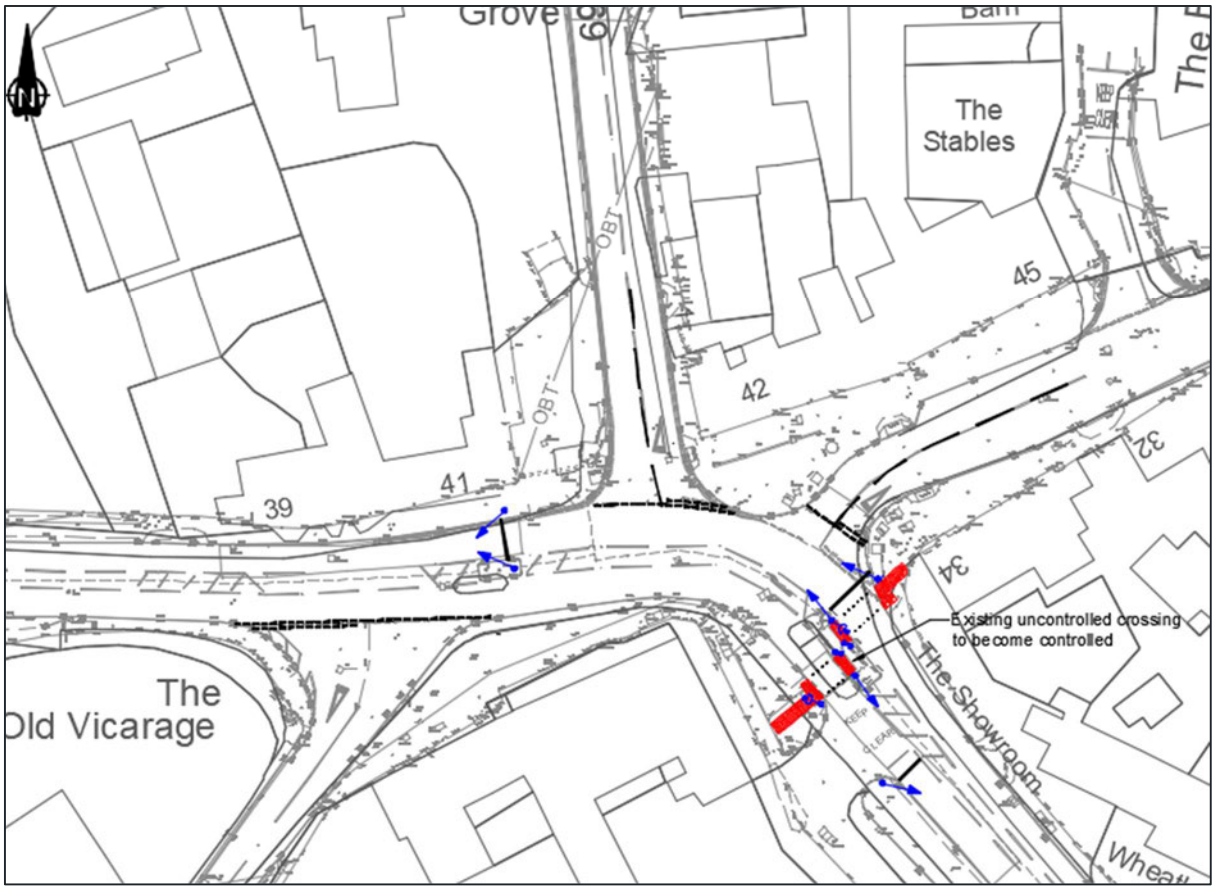
- Reduction in traffic entering the junction will improve traffic flows and benefits from all other arms being signalised.
- Pedestrians have clear and easy paths around the junction under traffic control.
- Minimal intrusive works required to implement ‘one-way’- system.
- Preventing the access to the junction via High Street will prevent traffic diverting round the network to avoid queues.
- Additional capacity along High Street for on street parking could be made available.

Cons:

- Additional work will be required to implement ‘one-way’ system.

Signalisation Option 3

Demand dependant signalisation of A458 only with give way and additional detection for A4169 (Smithfield Rd).



Pros:

- Least amount of intrusive work and will help provide opportunities for the traffic leaving A4169 to navigate the junction safely during periods of congestion. Implementing demand dependant signalisation would ensure there are no additional delays introduced to traffic (as a result of full-time signals) during the interpeak and off peak periods where the existing junction in typical conditions performs well.

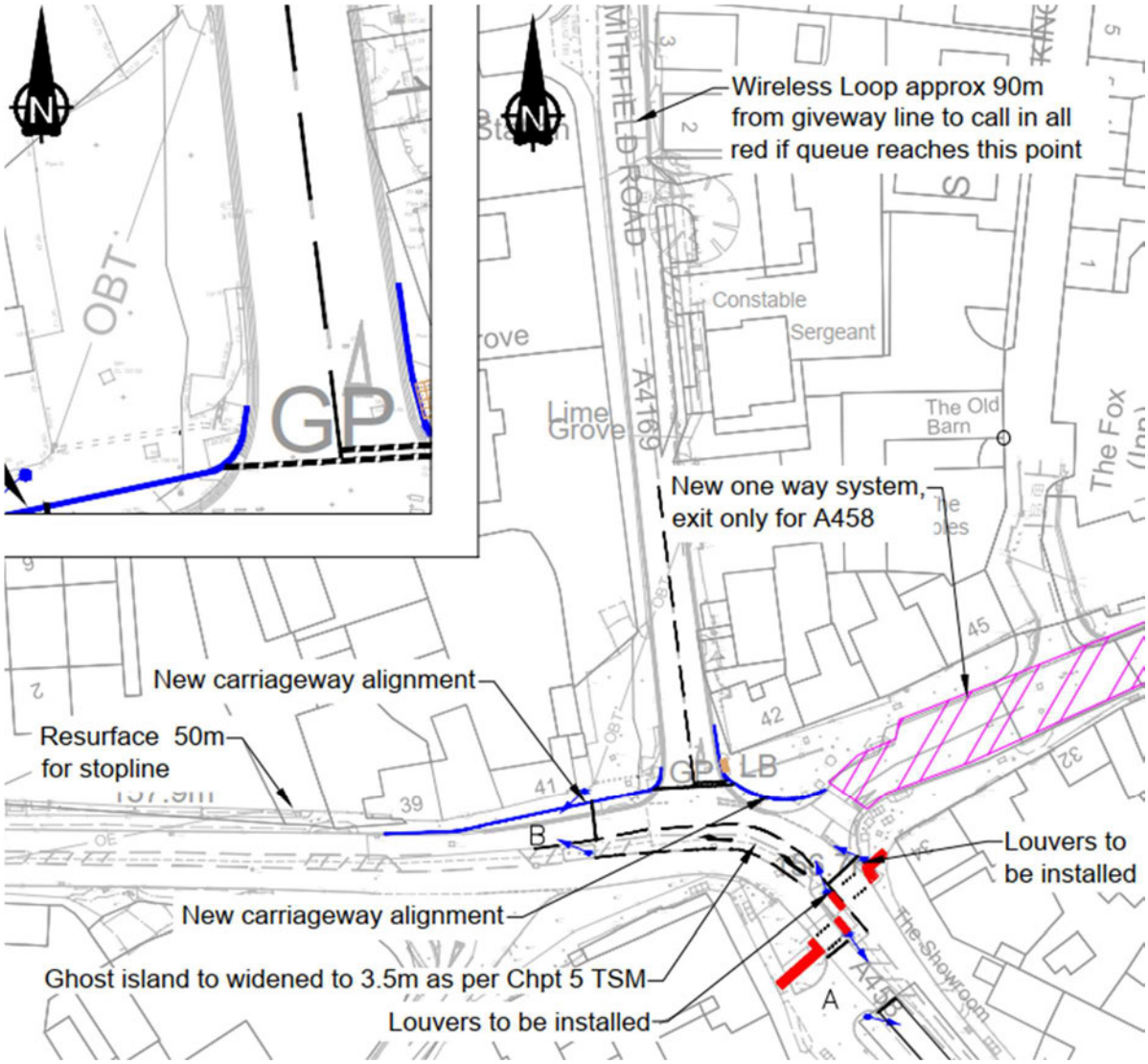
Cons:

- Maintenance of signal equipment and detectors.

Signalisation Option 4

Option 4 consists of: -

- Part signalisation with demand dependant activation (when queues exceed 90m);
- One-way along High Street to prevent ‘rat running’;
- Kerb realignment to increase the width of the right turn lane.



Pros:

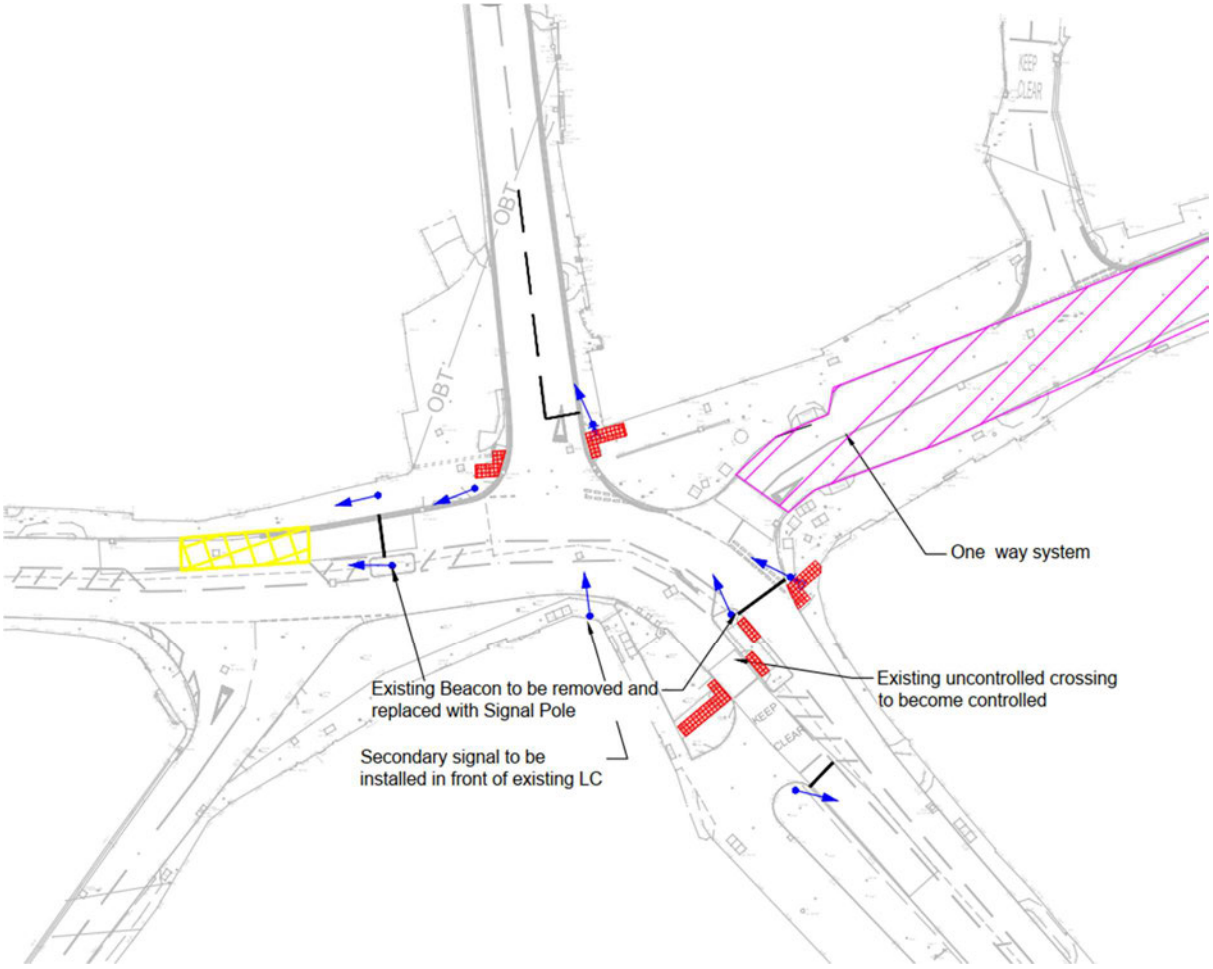
- This will help provide opportunities for the traffic leaving A4169 to navigate the junction safely.
- Minimal intrusive works required to implement one-way system.
- Preventing access to the junction via High Street will assist to prevent traffic diverting round the network to avoid queues.
- Additional capacity along High Street for on street parking could be made available.

Cons:

- Maintenance of signal equipment and detectors.
- Additional work will be required to implement one-way system.

Signalisation Option 5

Signalisation of all arms except High Street as a one-way system with Shineton Street. Bourton Rd is unsignalised to allow for free-flowing traffic. A yellow box is implemented to allow Bourton Rd opportunities to enter the junction.



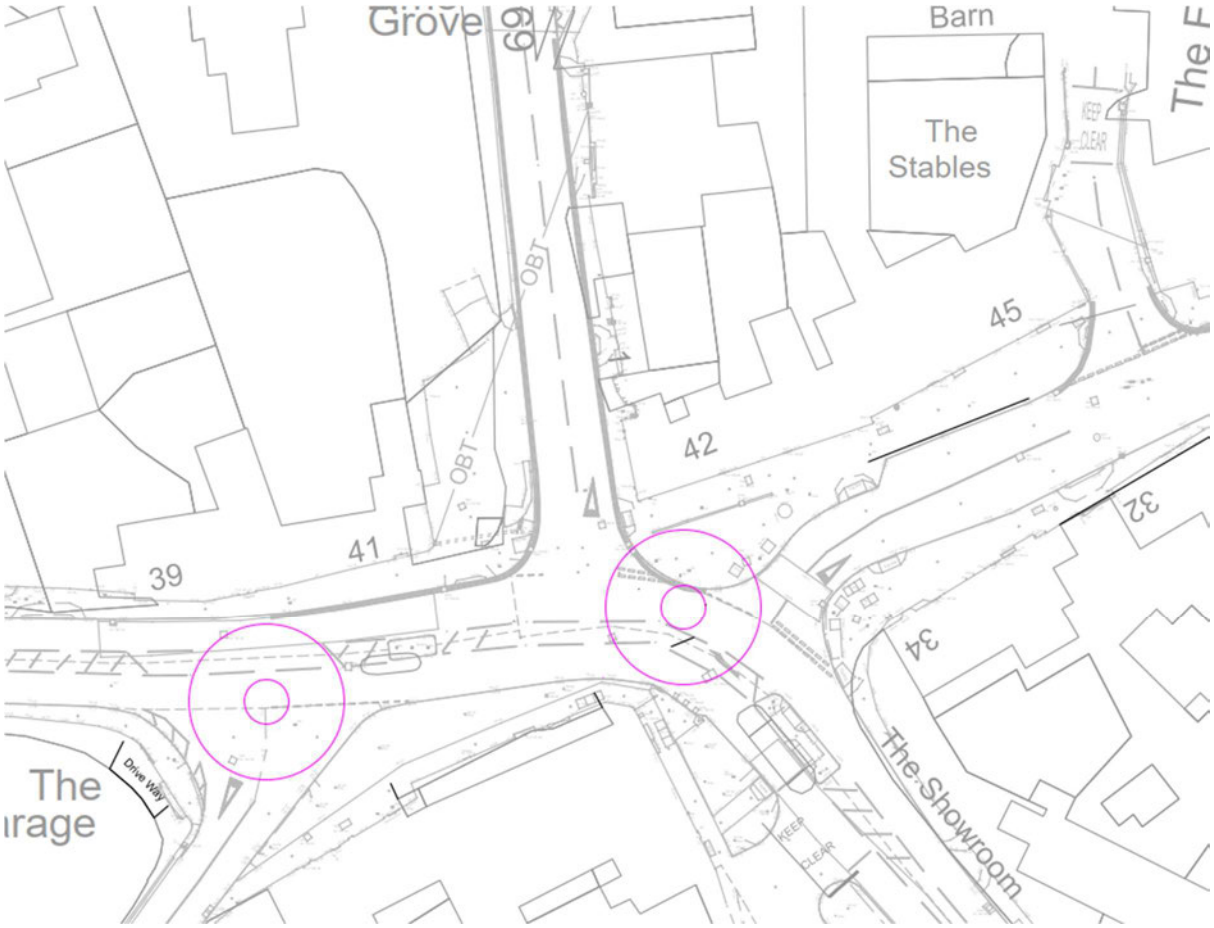
Pros:

- Reduction in traffic entering the junction will improve traffic flows and benefits from all other arms being signalised.
- Pedestrians have clear and easy paths around the junction under traffic control.
- Minimal intrusive works required to implement one-way system.
- Preventing the access to junction via High Street will prevent traffic diverting round the network to avoid queues.
- Additional capacity along High Street for on street parking will be made available.

Cons:

- Additional work will be required to implement one-way system.

Double Mini-Roundabout



3.2.15. Consideration has been given to the option of providing a double mini roundabout at the Gaskell Arms junction. There is sufficient highway width available to allow a double mini roundabout to fit within the existing highways boundary and provide pedestrian footways, however significant kerb alignment alterations would be required.

3.2.16. There would be significant issues due to deflection of the arms of roundabout. This is particularity prevalent on the movement between A4169 (Smithfield Rd) and A458 (Victoria Rd) in both access and egress. This is also true of the movement between High Street and A4169 (Smithfield Rd).

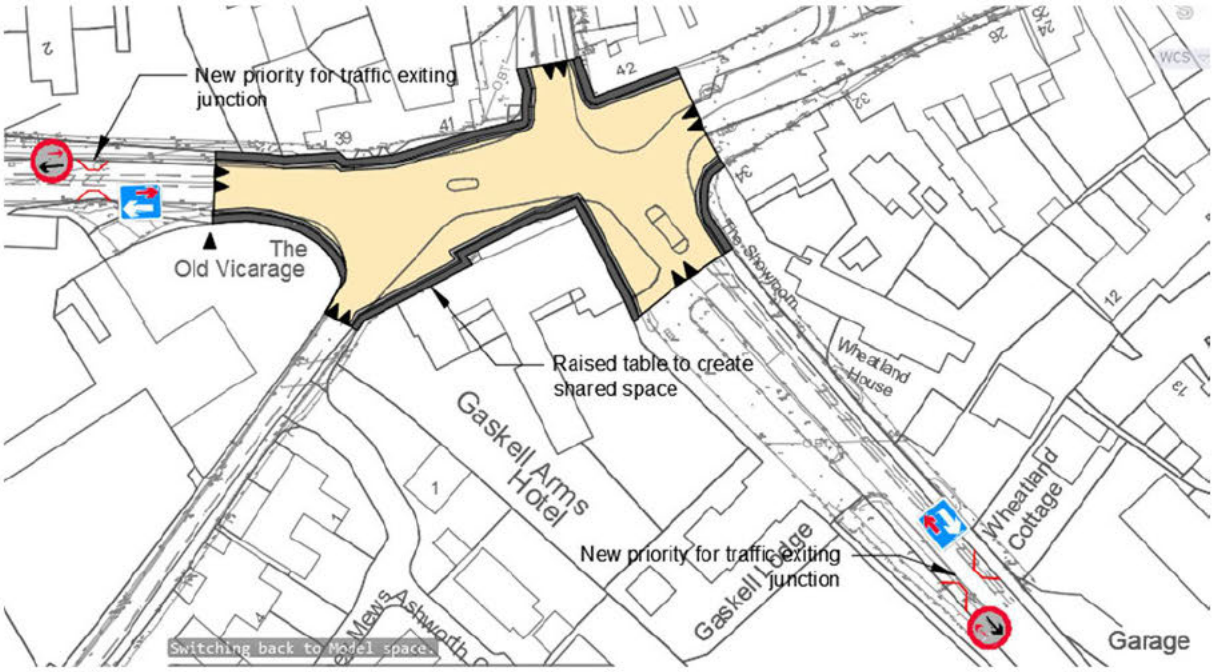
3.2.17. This option has been discounted due to guidance laid out in CD116 – Geometric design of roundabouts where it states in paragraph 2.9.1 that “Mini-roundabouts should not be installed where traffic flows or turning proportions differ significantly between arms.” This is the case at this junction where there is difference of up to 5,150 movements between A458 and High Street.

3.2.18. This option is further discounted when this option is tracked with vehicle tracking software. It is very clear that the double roundabout layout will not allow vehicles with the largest turning circle (DB32 Pantechnicon) to make the turning without either over running a kerb or intruding on the other side of the road.

Table 3-3 – Double Mini Roundabout - Pros and Cons

Pros	Cons
This option sits within Highway Boundary	This solution will not address the key issues with queuing as vehicles will still have to wait for an opportunity for road to be clear in both directions to navigate the junction.
Gaps in traffic are more frequent, increasing the amount of traffic flow through the junction	The mini roundabout cannot be used in designed way due to vehicle tracking showing turns out of A4169 are impossible.
	Extensive Civils works required
	Cannot be installed in accordance with guidance and legislation

Shared Space



3.2.19. Consideration has been given to the option of providing shared space at the Gaskell Arms junction. This would include providing new priority build outs on A458 (Victoria Rd and Bridgnorth Rd), with priority given to traffic exiting the junction, reducing approach speeds in tandem with a 20mph zone to be established as a 20mph speed limit is desired for shared spaces (in accordance with LNT1/11). The need for priority gate and speed change is supported by the speed survey undertaken with an average speed of 28.3mph on approach to the junction.

3.2.20. A shared space is designed to remove the delineation between pedestrians, cyclists and vehicles creating a more cooperative environment. The level at which the space is shared can range depending on the needs of the area, from completely removing all delineation to having changes in surface to show preferred vehicle paths.

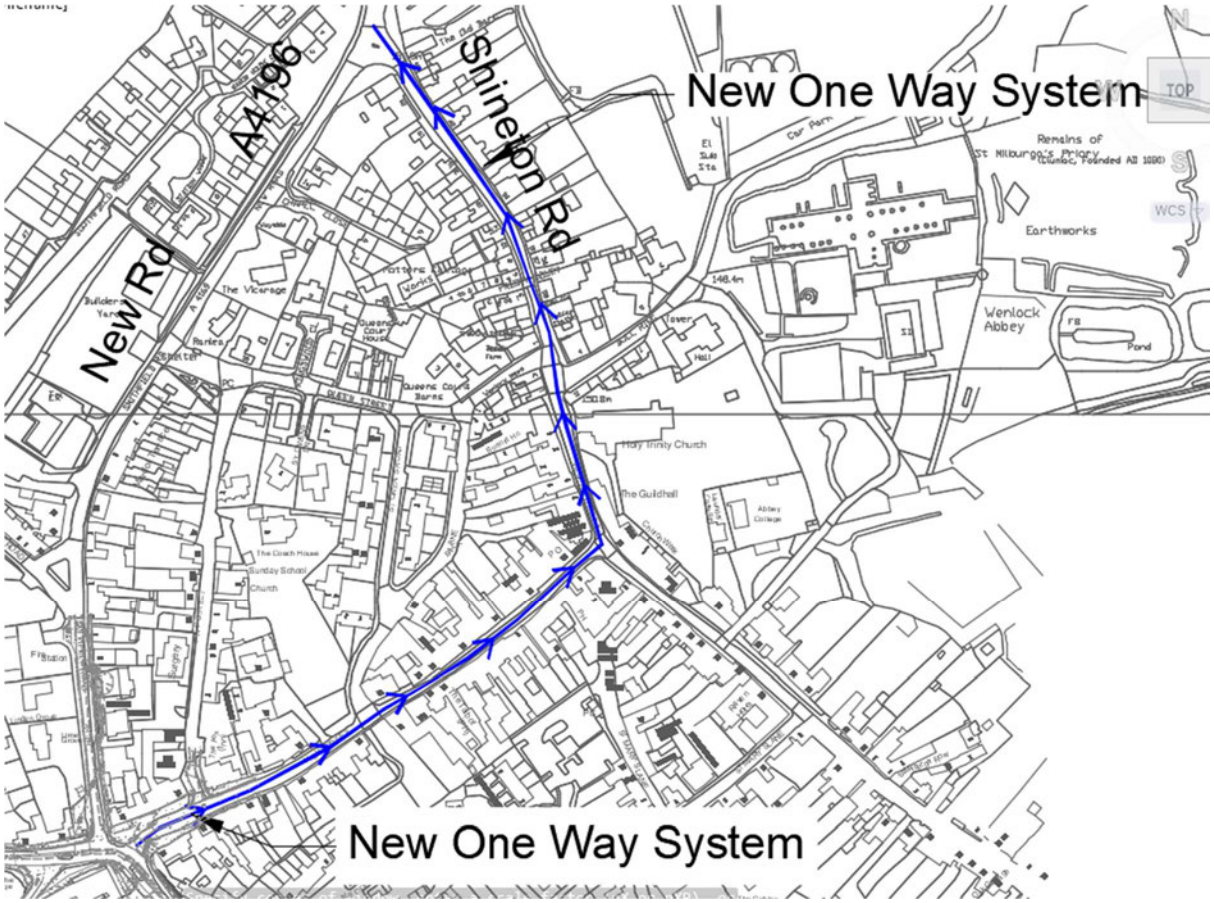
3.2.21. The existing guidance on shared use facilities from the Department for Transport (DfT) in The Inclusive Transport Strategy recommends "that local authorities pause the development of shared space schemes while WSP review and update the Department's guidance" and so this option has been discounted.

Table 3-4 – Shared Space

Pros	Cons
This option sits within Highway Boundary	This will not comprehensively address the queuing
Will provide a safer environment for pedestrians and other non-motorised users	This will promote alternative routes increasing traffic on local roads.

Minor Options

Traffic Management –one-way option



3.2.22. Consideration has been given to the option of providing a one-way system at and around the Gaskell Arms junction. There is an existing one-way system in place through the north section of High Street up to the junction with Wilmore Street and Barrow Street, the 'one-way' system would be extended along the entire section of High Street and continue north up Wimore Street, to Shineton Street up to the junction with AA4169 (New Rd). The one-way system would extend along the entire section of High Street (in its current direction) and resume on Shineton Rd from the junction with Queens Rd up to the junction with AA4196.

3.2.23. To implement the one-way system a TRO process would have to be undertaken and formal consultation undertaken. This work would have to be reviewed in conjunction with Shropshire Council who are reviewing the current parking facilities in the area.

Table 3-5 – One Way System

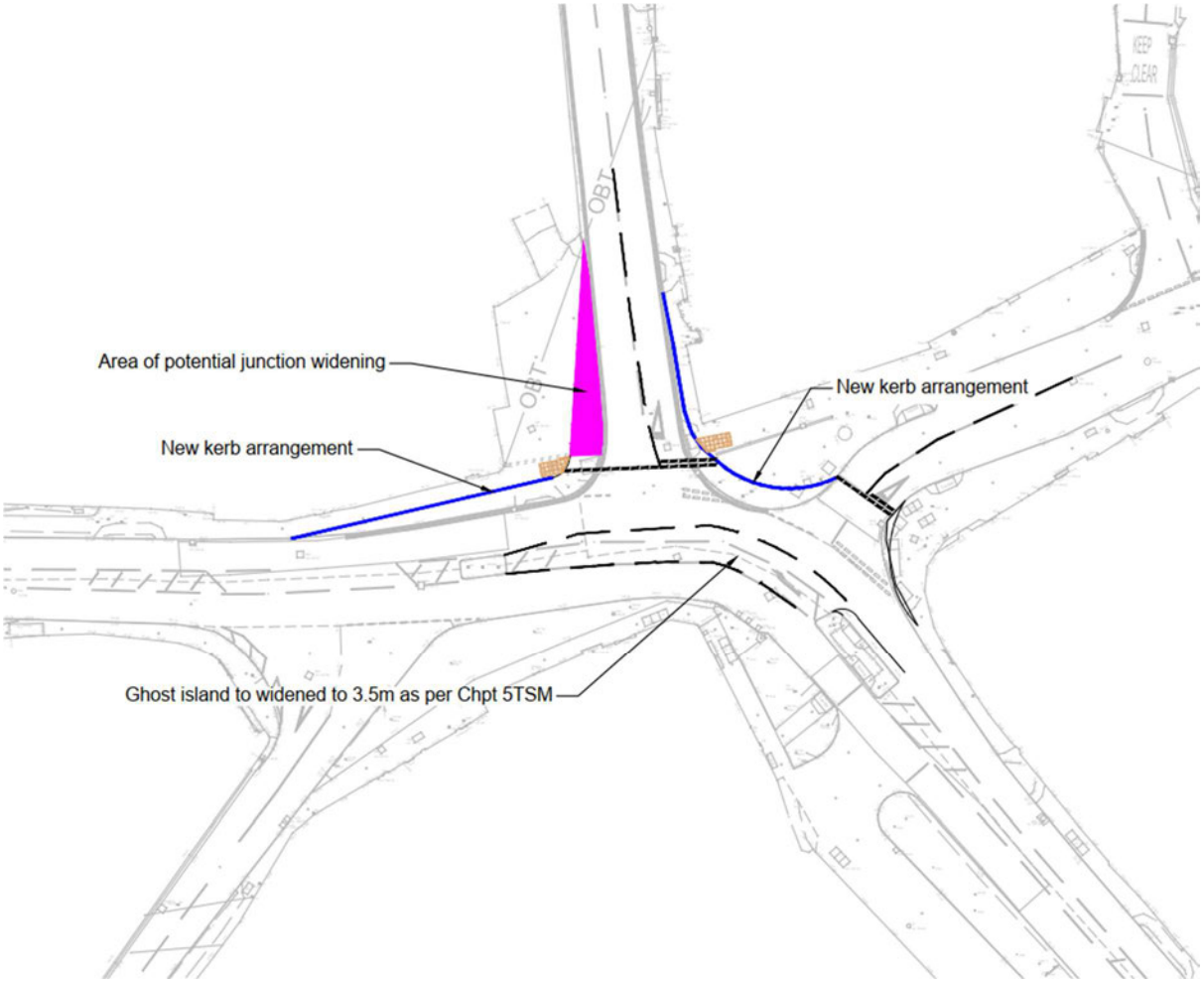
Pros	Cons
Minimal intrusive works required to implement	Does not address all the congestion issues relating to layout of existing junction
Preventing access to the Gaskell Arms junction via High Street will prevent traffic diverting round the network to avoid queues	Traffic calming and other measures may also need to be considered on Queen Street/King Street and Back Lane to avoid taking other routes through the Town to access Barrow Street
Additional capacity along High Street for on street parking could be made available	

Signing and Lining

3.2.24. Signing and Lining changes alone would not provide any meaningful congestion improvements to the junction; therefore, we have discounted a purely signing and lining scheme. However, improvements to the existing layout will likely be incorporated into any option that is recommended.

Carriageway Widening

3.2.25. Consideration has been made to re-align the existing carriageway throughout the junction. The existing layout results in a substandard ghost island for traffic to turn right on to High Street and A4169 (Smithfield Rd). In tandem with kerb realignment, it is recommended that consideration is given to acquiring/extending the extent of highway boundary to include a small plot of land to the west of Smithfield Road, allowing the kerb line to be moved and accommodate the turning of HGV's from A458 (Victoria Rd) into A4169 (Smithfield Rd) without having to intrude on the opposing lane of traffic.



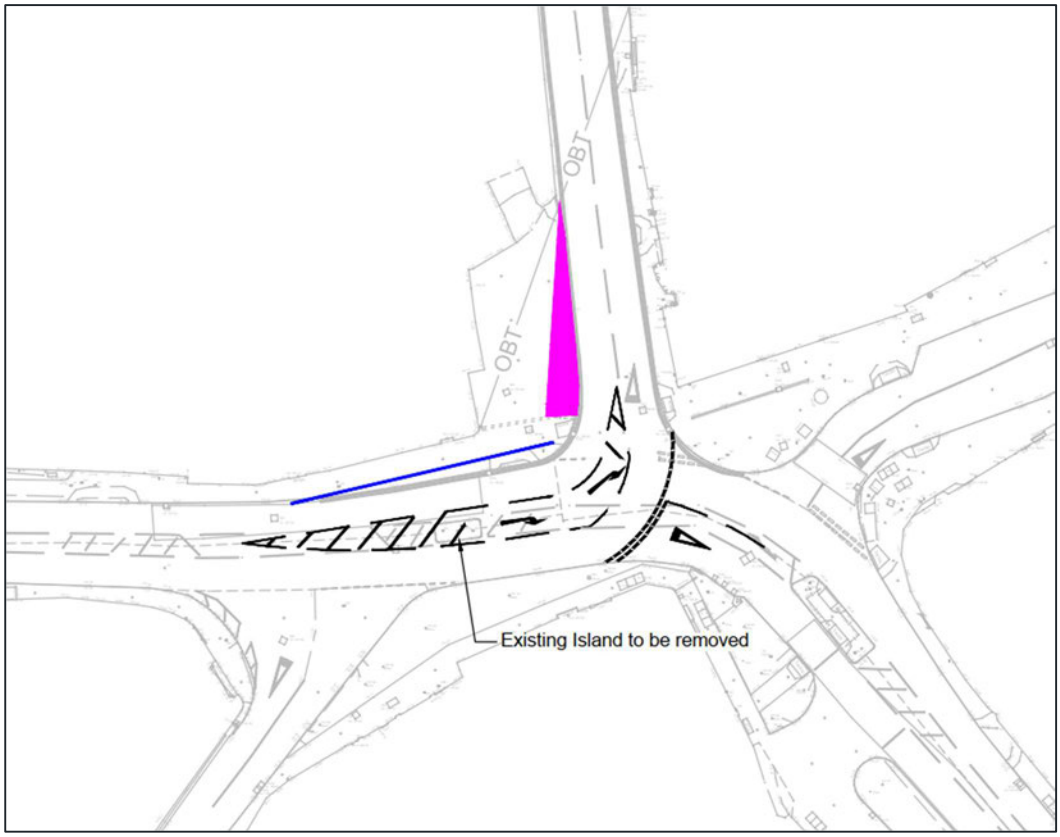
Pros	Cons
Minimal intrusive works required to implement	Does not address all the congestion issues relating to layout of existing junction
Preventing the access to junction via High Street will prevent traffic diverting round the network to avoid queues	Does not address the increase in required capacity due to developments
Additional capacity along High Street for on street parking will be made available	

Change of Priority

3.2.26. Consideration has been made to changing the priority at the junction. The existing layout is currently that Smithfield Road and Bourton Road are ‘give way’ junctions with A458 being the main route through Much Wenlock, with High Street also being a ‘give way’ junction which feeds on to A458.

3.2.27. The new proposal is that Smithfield Road and Bourton Road will now form the main route through Much Wenlock. With the Victoria Road now being the ‘give way’ junctions.

3.2.28. Due to the limited visibility around the junction, traffic flows and the constrained highway boundary it is felt that this option is likely to cause further congestion due to the large flows on certain routes now needing to ‘give way’. This would potentially block the turning movements of other vehicle and could cause additional safety concerns. Due to the highway boundary, there is insufficient space available to create the deflection and turning lanes required for this option without land take.



Pros	Cons
Minimal intrusive works required to implement	Does not address all the congestion issues relating to layout of existing junction. However, there would be insufficient space to create the deflection and turning lanes required for this option
Reduced speed through the junction	Does not address the increase in capacity required due to development.
	Could increase the risk of collisions

4 LinSig Modelling

4.1 Introduction

4.1.1. This section discusses and provides a summary of the modelling that has been undertaken for the signalised junction options, as stated above in Chapter 3. The modelling of the options has been undertaken initially in LinSig in order to determine the feasibility of the signalised options prior to the preferred option being modelled and tested in further detail within VISSIM.

The options modelled are as follows:

- Base Model
- Signalisation Option 1
- Signalisation Option 2
- Signalisation Option 3
- Signalisation Option 4

4.1.2. Industry standard software packages have been used to undertake the junction capacity assessments, including LinSig v3, which is an appropriate software package to compare the signalised scenarios.

4.1.3. The analysis results are presented with reference to the mean maximum queue (MMQ) and delay per vehicle.

4.1.4. LinSig v3 refers to the degree of saturation (DoS) for the modelled arms at the junction. DoS values below 90% generally indicate that an approach to the junction is operating with sufficient spare capacity to accommodate daily variations in traffic. A DoS between 90% and 100% suggests that delays could start to occur with some queuing forming, whilst a DoS in excess of 100% indicates the approach is operating over its practical capacity and as a result significant queuing and delay is likely to occur. It should be noted that queuing becomes exponentially worse with an DoS over 100% due to instability within the junction and modelling.

Base Model

4.1.5. The existing Gaskell Arms priority junction has been assessed using LinSig3 so that the performance of the signal options can be compared to the current conditions (in 2022/2023).

4.1.6. The existing junction layout is shown below;

4.1.7. All the options have been tested on the basis of the November 2022 surveyed turning movements to ensure an appropriate direct comparison can be made between the options and the existing operation of the junction.

4.1.8. The capacity assessment results for the AM and PM peaks for the Base model are summarised in **Table 3-6** below. Full results are contained in Appendix I.

Table 3-6 – Base Model Results

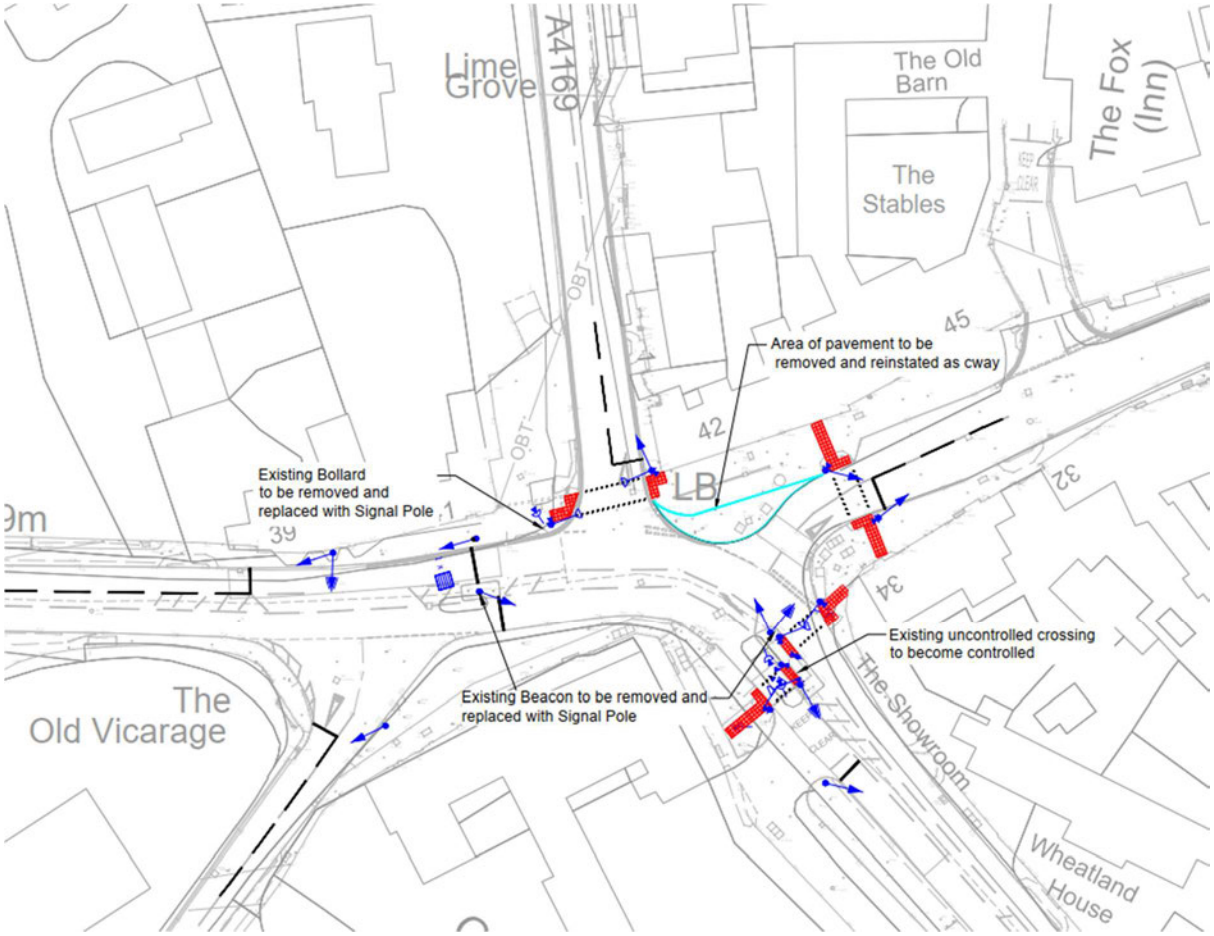
Arm Description	AM			PM		
	Mean Max Queue (PCU)	Delay (s/pcu)	Deg Sat (%)	Mean Max Queue (PCU))	Delay (s/pcu)	Deg Sat (%)
2022						
1/1 – A458 Victoria Road (Ahead and Right turn movements)	0.2	1.3	25.3	0.2	1.3	24.4
2/1 - Bournton Road (Right and Left turning movements)	0.3	6.5	33.9	0.2	5.6	29.5
3/1- Smithfield Road (Right turn and Left turn movements)	1.8	24.4	79.0	3.6	49.0	90.0
4/1 - Bridgnorth Road (Ahead and Right turning movements)	0.3	1.9	39.7	0.3	1.9	33.6
5/1 – Westbound Internal Stop Line (Ahead and Left turning movements)	0.3	1.3	33.4	0.2	1.2	28.1
6/1 - Eastbound Internal Stop Line (Ahead and Right turning movements)	0.2	1.2	27.8	0.2	1.2	26.9
12/1 – High Street (Right and Left turning movements)	0.0	2.2	3.4	0.0	1.5	1.5

4.1.9. The junction capacity results show that the junction currently operates within capacity (with a DoS of less than 100%), however, Smithfield Road is shown to be operating over practical reserve capacity in the PM peak (90%).

Signalised Option 1

4.1.10. Signalised Option 1 considers signalisation on all arms of the junction with an additional stop line on A458 (Victoria Road). **Figure 3-1** illustrates the junction layout for this Option.

Figure 3-1 - Signalisation Option 1 - Junction Layout/Design



4.1.11. This option was modelled using LinSig3 and the modelling results are illustrated in **Table 3-7** below.

Table 3-7 – Signalised Option 1 Modelling Results

Arm Description	AM			PM		
	Mean Max Queue (PCU)	Delay (s/pcu)	Deg Sat (%)	Mean Max Queue (PCU)	Delay (s/pcu)	Deg Sat (%)
2022						
1/1 – A458 Victoria Road (Ahead and Right turn movements)	[redacted]					
2/1 - Bournton Road (Right and Left turning movements)						
3/1- Smithfield Road (Right turn and Left turn movements)						
4/1 - Bridgnorth Road (Ahead and Right turning movements)						
5/1 – Westbound Internal Stop Line (Ahead and Left turning movements)						
6/1 - Eastbound Internal Stop Line (Ahead and Right turning movements)						
12/1 – High Street (Right and Left turning movements)						

Cycle time – 120 seconds (AM and PM)

4.1.12. As seen above in **Table 3-7**, the junction operates beyond capacity (with a DoS of more than 100%) and mean max queue of 93.1 pcu's in the AM peak on arm 4/1 - Bridgnorth Road (Left Ahead Right). In addition, the junction would operate with a high cycle time (beyond the normal limits for this type of junction) with considerable typical delays for vehicles on Bournton Road, Smithfield Road and Bridgnorth Road arms at this junction.

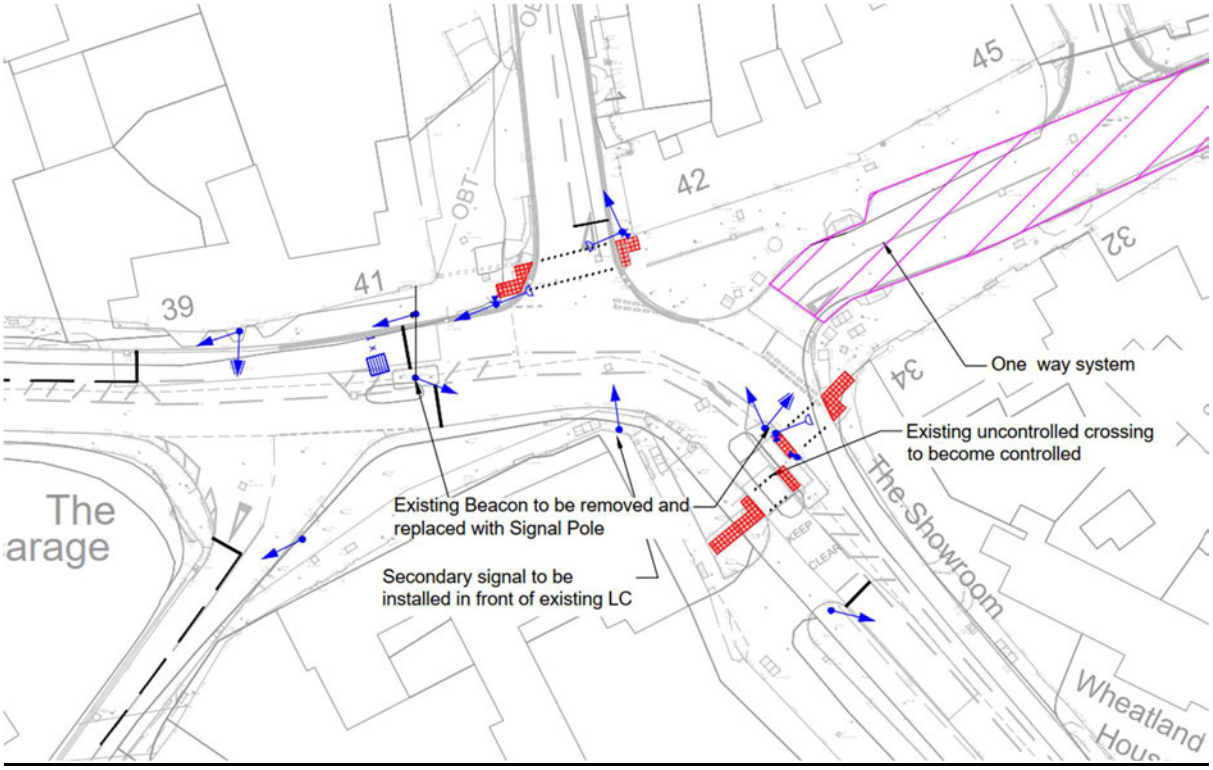
4.1.13. The results indicate the operation of the junction to be far worse than the existing operation (as shown in the base modelling). Therefore, this option was not deemed appropriate to be taken forward for inclusion within the VISSIM modelling.

Signalised Option 2

4.1.14. Signalised Option 2 considers signalisation on all arms of the junction except High Street which will be developed into a one-way system with Shineton Street. As seen below in

4.1.15. **Figure 3-2** illustrates the junction layout.

Figure 3-2 - Signalisation Option 2 - Junction Layout/Design



4.1.16. This option was modelled using Linsig3 and the modelling results are illustrated in **Table 3-8** below.

Table 3-8 – Signalised Option 2 Modelling Results

Arm Description	AM			PM		
	Queue (PCU)	Delay (s/pcu)	Deg Sat (%)	Queue (PCU)	Delay (s/pcu)	Deg Sat (%)
2022						
1/1 – A458 Victoria Road (Ahead and Right turn movements)	[redacted]					
2/1 - Bournton Road (Right and Left turning movements)						
3/1- Smithfield Road (Right turn and Left turn movements)						
4/1 - Bridgnorth Road (Ahead and Right turning movements)						
5/1 – Westbound Internal Stop Line (Ahead and Left turning movements)						
6/1 - Eastbound Internal Stop Line (Ahead and Right turning movements)						
12/1 – High Street (Right and Left turning movements)						

Cycle time – 130 seconds (AM) / 120 seconds (PM)

4.1.17. As seen above in **Table 3-8**, the modelling results for the Signalised Option 2 show that the junction performs close to capacity (DoS of less than 100) with arms 3/1-Smithfield Road (Right Left Ahead) and 4/1 - Bridgnorth Road (Left Ahead Right) experiencing a DoS beyond 90% in the AM peak.

4.1.18. However, in order to reduce the degree of saturation and ensure the arms operated within capacity, the cycle time had to be increase to 130/120 seconds in the AM and PM peaks respectively, this cycle time is beyond the normal limits for this type of junction and would result in high average delays for vehicles on Bournton Road, Smithfield Road and Bridgnorth Road arms at this junction in the peak periods. This would also introduce long delays at the junction during the interpeak and off peak periods where delays at the junction are not significantly present.

4.1.19. Therefore, this option was not deemed appropriate to be taken forward for inclusion within the VISSIM modelling.

Signalised Option 3

4.1.20. Signalised Option 3 considers the demand dependant signalisation on A458 with a give way and additional detection for A4169 Smithfield Road. **Figure 3-3** illustrates the junction layout and design for Signalised Option 3.

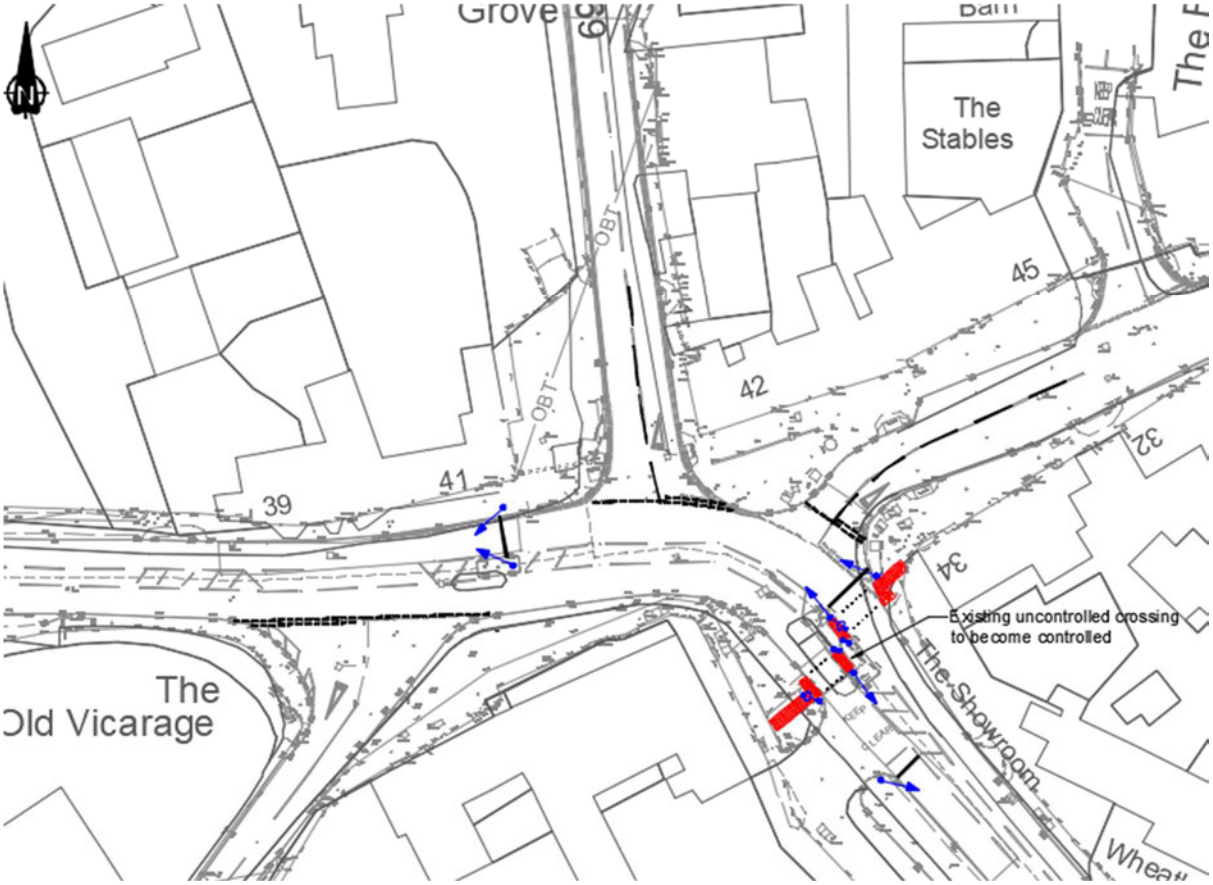


Figure 3-3 - Signalisation Option 3 - Junction Layout/Design

4.1.21. This option was modelled using Linsig3 and the modelling results are illustrated in **Table 3-9** below.

Table 3-9 – Signalised Option 3 Modelling Results

Arm Description	AM			PM		
	Queue (PCU)	Delay (s/pcu)	Deg Sat (%)	Queue (PCU)	Delay (s/pcu)	Deg Sat (%)
2022						
1/1 – A458 Victoria Road (Ahead and Right turn movements)	[redacted]					
2/1 - Bournton Road (Right and Left turning movements)						
3/1- Smithfield Road (Right turn and Left turn movements)						
4/1 - Bridgnorth Road (Ahead and Right turning movements)						
5/1 – Westbound Internal Stop Line (Ahead and Left turning movements)						
6/1 - Eastbound Internal Stop Line (Ahead and Right turning movements)						
12/1 – High Street (Right and Left turning movements)						

Cycle time – 600 seconds (AM and PM)

4.1.22. As seen above in **Table 3-9**, the modelling results for the Signalised Option 3 illustrate that the junction performs well below capacity (DoS of less than 100%).

4.1.23. With the Signalised Option 3, the cycle time has been set up to indicate that the demand dependant signals would be triggered by the detectors (situated circa 90m back from the junction on Smithfield Road) 6 times an hour in the AM and PM peak. Once triggered the LinSig model assumes traffic on Victoria Road and Bridgnorth Road would be held on a red traffic signal for seven seconds. This then allows opportunity and gaps for traffic on Smithfield Road to exit under priority during this period.

4.1.24. For the Signalised Option 3, it illustrates that the junction performs well below capacity (DoS of less than 100%). In addition, whilst additional delay is introduced to vehicles on Victoria Road and Bridgnorth Road, the levels are indicated to be low (subject to more detailed modelling within VISSIM).

4.1.25. With demand dependant signals implemented at the junction limited delay would then be introduced during the interpeak and off-peak periods to vehicles at the junction.

Signalised Option 4

Signalised Option 4 includes part signalisation with demand dependant activation (when queues exceed 90m), one-way along the whole of High Street which would also assist to prevent 'rat running' and kerb realignment to increase the width of the right turn lane.

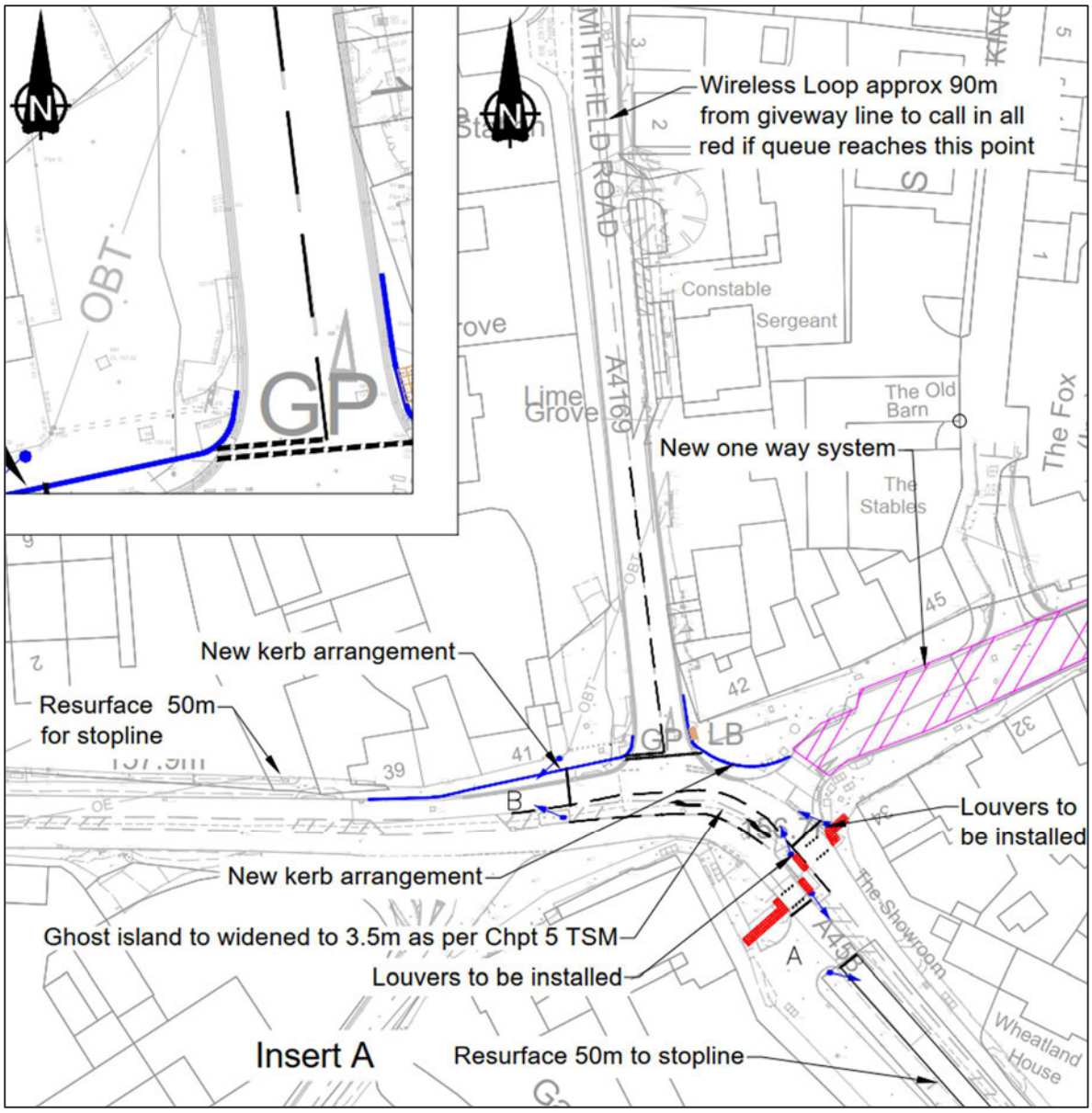


Figure 3-4 - Signalisation Option 4 - Junction Layout/Design

4.1.26. The additional amendments to the kerb alignment cannot specifically be modelled within LinSig to compare this option, however, it is fairly clear that if the revised kerb alignment can be provided it will result in the increased width for the right turning bay on and improved turning movements for vehicles into Smithfield Road.

Therefore, Signalised Option 4, would provide further improved modelling results to that shown in Signalised Option 3 within **Figure 3-3** above.

Summary

4.1.27. In summary, the LinSig modelling illustrated above shows that Signalisation Option 1, is not appropriate to take forward to testing in the VISSIM model, this is due to the junction operating beyond capacity (DoS of less than 100%) and far worse than the existing operation.

4.1.28. Signalisation Option 2 was determined to not be appropriate in comparison to the other options due to the junction operating near to capacity with a DoS on multiple arms over 90%. In order to reduce the degree of saturation and ensure the arms operated within capacity, the cycle time had to be increase to 130/120 seconds in the AM and PM peaks respectively, this cycle time is beyond the normal limits for this type of junction and would result in high average delays for vehicles on Bournton Road, Smithfield Road and Bridgnorth Road arms at this junction in the peak periods. This would also introduce long delays at the junction during the interpeak and off-peak periods where delays at the junction are not significantly present. Therefore, Signalisation Option 2 is also deemed as not appropriate to take forward for testing in VISSIM.

4.1.29. Signalised Options 3 and 4 provide the best results in terms of capacity/delay and operation of the junction compared to the results shown for the base existing arrangement. As Option 4 would provide the best results compared with the base existing arrangement, this option has been taken forward for testing within the VISSIM model.

4.1.30. From the review of options, there are a number of additional improvements that could also be made to Signalised Option 4. These variations are detailed below;

- Option 4a – As tested and shown above in **Figure 3-4**
- Option 4b – As shown above in **Figure 3-4,** with Shineton Street also made one-way.
- Option 4c – As shown above in **Figure 3-4**, with Shineton Street also made one-way and widening of the junction bell mouth for Smithfield Rd (A4169) to make left-turn movements for HGV's easier from Victoria Road.

4.1.31. These variations of Signalised Option 4 are considered further in Chapter 5 as part of the VISSIM modelling.

4.1.32. Following discussions with signal engineers and the detailed design team as part of the peer review and RSA, this highlighted that given demand dependant signalisation (linked to a signalised pedestrian crossing) is not a standard approach to controlling the operation of a junction, that this might not comply with current regulations.

4.1.33. Given that full signalisation of the junction is not indicated to provide benefits to the junction (unless there is a significant increase in traffic beyond the modelled period) partial signalisation of the junction remains the optimum arrangement as part of

Option 4. Therefore, following the peer review and RSA, a phased approach to delivering the proposed improvements is the most pragmatic approach to improving Gaskell junction. This would also allow the technical feasibility of implementing a signalised solution to be reviewed further.

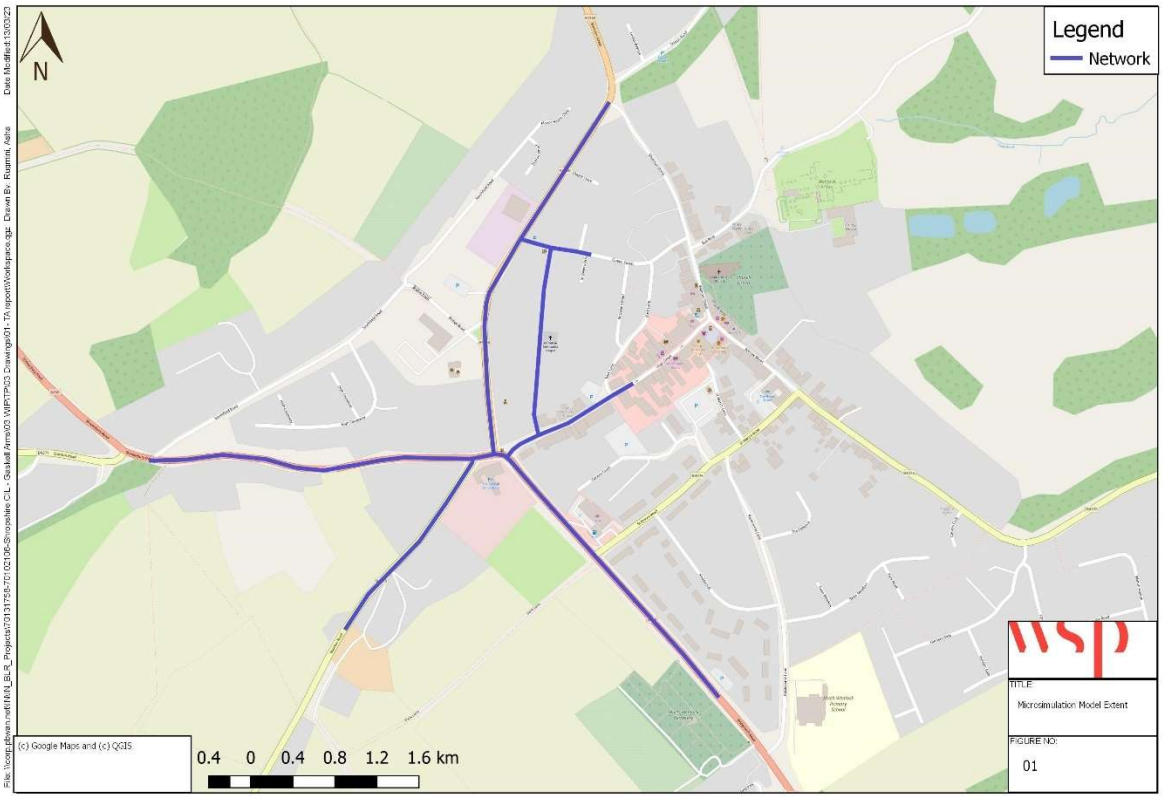
5 VISSIM Modelling

5.1.1. WSP have developed a transport microsimulation model to assess the impacts of the proposed improvements along A458 Bridgnorth Road junctions around Gaskell Arms Hotel in Much Wenlock in greater detail.

5.1.2. The extent of VISSIM network developed is shown in **Figure 3-5** with a key focus on the following 5 junctions:

- A458 Victoria Road / B4378 Bourton Road Junction
- A458 Victoria Road / A4169 Smithfield Road Junction
- A458 Victoria Road / High Road Junction
- King Street / High Street Junction
- A4169 New Road / Queen Street Junction
- Queen Street / King Street Junction

Figure 3-5 - Network Extent



5.2 Traffic surveys

5.2.1. The Following traffic surveys were carried out in November 2022 for the purpose of developing a base model of the existing junction:

- Automatic Traffic Count (ATC) survey
- Manual Classified Count (MCC) survey
- Queue length survey

- Link Counts
- ANPR survey

5.2.2. The ATC survey was carried out for 24 hours over a two-week period from 23 November 2022 to 6 December 2022 on A458 Bridgnorth Road.

5.2.3. Manual Classified Count and queue length surveys were carried out during 07:00-10:00 and 15:00-18:00 on 30th November at four locations shown below in **Table 3-10**.

Table 3-10: MCC Survey Details

S. No	Location	Survey Type
1	A458 Victoria Road / B4378 Bourton Road Junction	MCC, Queue
2	A458 Victoria Road / A4169 Smithfield Road Junction	MCC, Queue
3	A458 Victoria Road / High Road Junction	MCC, Queue
4	King Street / High Street Junction	MCC, Queue

5.2.4. Queue surveys provided the number of vehicles queuing along the give-way arms at above junctions.

5.2.5. Classified peak period flows along major roads were measured using link count surveys on 30th November 2022. Details of the survey type on each road are provided in **Table 3-11** and the locations are detailed in **Figure 3-6**.

Table 3-11: Link Count Survey Details

S. No	Location	Survey Type
1	B4378 Bourton Road	Link count
2	A458 Victoria Road	Link count
3	A4169 Smithfield Road	Link count
4	A458 Bridgnorth Road	Link count
5	High Street	Link count

5.2.6. Classified ANPR surveys were also conducted at all entry and exit points of the study area.

5.2.7. The ANPR traffic survey locations are also shown in **Figure 3-6**.

Figure 3-6: Survey Locations

5.2.8. From the link count survey data collected on 30th November 2022, the Peak hours were calculated from the ATC data as follows:

AM Peak: 07:45-08:45
PM Peak: 15:00-18:00

5.2.9. The peak hour traffic volume surveyed by the ATC for AM and PM peak hours are presented in **Table 3-12**.

Table 3-12: Peak Hour Traffic (vehicles) at the ATC Location

S. No.	Location	Direction	AM Peak Hour	PM Peak Period
1	A458 Bridgnorth Road	NB	[redacted]	
		SB		

5.2.10. The MCC survey data at each junction has been analysed and the peak hour turning movements at each junction during the AM and PM peak are summarised in **Table 3-13**.

Table 3-13: Peak Hour Traffic (in vehicles) Summary

S. No.	Junction	AM Peak	PM Peak
1	A458 Victoria Road / B4378 Bourton Road Junction	[redacted]	[redacted]
2	A458 Victoria Road / A4169 Smithfield Road Junction	[redacted]	[redacted]
3	A458 Victoria Road / High Road Junction	[redacted]	[redacted]
4	King Street / High Street Junction	[redacted]	[redacted]

5.2.11. The microsimulation model was developed in the VISSIM microsimulation software, using version 2022 (SP 06). VISSIM is a microscopic, behaviour-based, multi-purpose traffic simulation program developed by PTV. The model uses the psycho-physical car-following model, developed by Wiedemann, and a related lane-changing model.

5.2.12. The 2022 base year models have been developed to the following specification:

Warm up and cool down periods of 15 minutes for each scenario

Vehicle Types include:

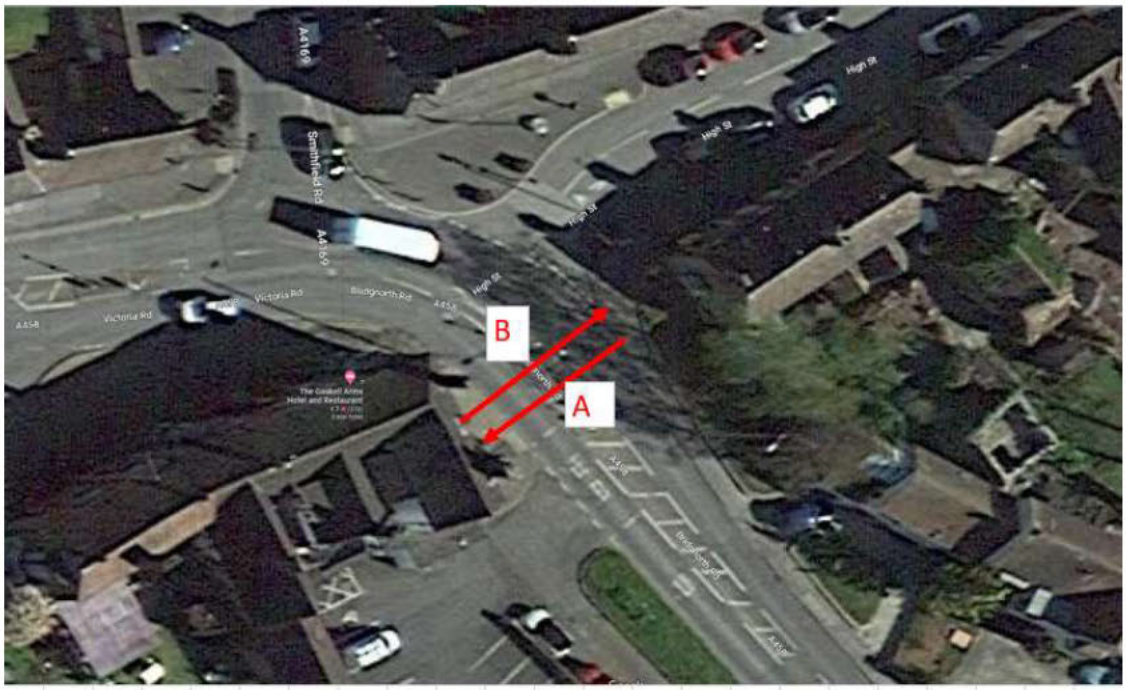
- Lights
- Heavies
- Buses

5.2.13. The posted speed limit of 30mph has been adopted as the speed limit on all the roads within the model. Speed data collected as part of ATC was used along Bridgnorth Road. From the video footage along Bourton Road, vehicles seem to travel at lower speeds such as 30 mph. Speed along this road has therefore been reduced to 20 mph to reflect the current conditions, where 90% of vehicles would travel at speeds less than or equal to 33mph.

Pedestrian Crossing Movements

5.2.14. The traffic surveys conducted on the 30th November 2022 provide data on the number of pedestrian movements across AA458 Bridgnorth Road. The movements made are illustrated in Image 6-1.

Image 6-1 – Pedestrian Crossing Movements on A458 Bridgnorth Road



5.2.15. Below, **Table 3-14** provides the summary of the pedestrian movements across Bridgnorth Road

Table 3-14 – Pedestrian Crossing Count Summary

Movement	AM Peak (0745-0845)		PM Peak (1500 – 1900)	
	Total People	Crossing Instances	Total People	Crossing Instances
A	3	3	9	5
B	3	3	5	3

5.2.16. During the observed AM Peak (07:45-08:45) there was a total of six crossing movements with three crossing movements from A-B and three from B-A. From the six crossing movements there were a total of six pedestrians involved.

5.2.17. In the observed PM Peak (17:00-18:00) there was a total of eight crossing movements with five crossing movements from A-B and three from B-A. From the eight crossing movements that occurred there was a total of 14 pedestrians involved.

5.2.18. It was noted from the video footage obtained that a number of the pedestrians did use the pedestrian island in front of the Gaskell Arms to cross Victoria Road, however, the number of pedestrians crossing in this location was even lower than the numbers identified above for the Bridgnorth Road crossing location.

5.2.19. Whilst crossing numbers are low, the provision of a stand-alone staggered Puffin crossing to replace the existing uncontrolled staggered pedestrian crossing would provide a safer crossing for pedestrians on an existing desire line, whilst discouraging pedestrians from using more dangerous routes around the junction.

5.2.20. To facilitate the implementation of the stand-alone staggered Puffin crossing, it requires High Street to be incorporated as part of the signalisation for the crossing or wider junction, in the interest of road safety due to the proximity of the crossing of the High Street junction with A458.

5.2.21. Signalisation of High Street and the junction to facilitate the stand-alone staggered Puffin crossing would increase delay through the junction due to the need to add additional phases to the timings. However, the alternative preferred solution is to make High Street one-way entry from A458, although it is appreciated this would require further consultation with wider stakeholders.

5.2.22. The RSA also highlighted that drivers entering the A458 from the Gaskell Arms side-road do so very close to the proposed controlled crossing location, without a dedicated signal and there is a risk of a vehicle colliding with a pedestrian.

5.2.23. In order to mitigate this and facilitate the proposed Puffin crossing, traffic entering the A548 from the Gaskell Arms side road could be provided with an additional traffic signal. Alternatively Gaskell Arms side-road could be made one-way southbound with the existing parking on the side-road relocated to the other side of the carriageway next to verge rather than up against the wall to the Gaskell Arms car park as existing.

5.2.24. However, it is acknowledged that wider consultation with stakeholders would be specifically needed in relation to these points.

Model Convergence

5.2.25. Demand is assigned in the model using Dynamic assignment although there are no route choices in the model. The model was run for convergence and the cost and path files were obtained. The following convergence criteria was set for both peak periods, based on the Transport for London (TfL) modelling guidelines (September 2021):

- Travel time on paths: 95% of travel times on paths change by less than 20% for four consecutive model runs
- Traffic volumes on edges: 95% of all edge traffic volumes change by less than 15 vehicles for four consecutive model runs

5.2.26. Path pre-selection was set using the following parameters:

- Avoid long detours – 2.5

5.2.27. Convergence was reached for each scenario in the minimum permitted amount of simulation runs as there is no route choice in the network.

5.2.28. The model was calibrated and validated such that conditions across the modelled network are representative of 2022 conditions across the observed network. This process involved examination of the network queueing and vehicle behaviour, checking for errors, and improving the performance of the model in terms of comparisons with observed data. The adjustments made included, but were not limited to, the following:

- Checking priority rules parameters and their locations to replicate observed driving behaviour,
- Adjust link and connector structure to better reflect lane-changing and vehicle interaction,
- Place and adjust reduced speed areas onto sections of links to ensure realistic traffic behaviour,
- Place desired speed decisions around the network to ensure traffic adhere to the relevant speed limit for specific roads,

5.3 Flow Comparison

5.3.1. Modelled link and turning counts have been compared against observed count data (MCC, link counts and ATC), collected in 2022; modelled results were extracted for an average of five 'random seeds', in accordance with TAG, and the average was compared against observed data. The model outputs presented here are an average of 5 runs using the random seed increment of 1 from starting random seed of 11.

5.3.2. During Calibration, modelled turning counts are compared against the observed turning counts. The flow calibration achieved in the VISSIM models for the AM and PM peaks for modelled areas against TAG criterion 1 has been presented in **Table 3-15**.

Table 3-15: Calibration TAG Criterion 1 against Survey data

	Flow < 700			700 < Flow < 2700			Overall		
	Number	No. Pass	%	Number	No. Pass	%	Number	No. Pass	%
AM	24	24	100%	0	0	0	24	24	100%
PM	24	24	100%	0	0	0	24	24	100%

5.3.3. The table shows that the models pass all the requirements specified in Criterion 1 as set in TAG criteria. The Criteria 2 requirements are satisfied when greater than 85% of compared flows have a GEH value of less than 5. **Table 3-16** shows the calibration summary against WebTAG Criterion 2, for the AM and PM peaks respectively.

Table 3-16: Calibration TAG Criterion 2 against Survey data

	GEH Statistics		
	GEH < 5	GEH < 6	GEH < 10
AM	100.0%	100.0%	100.0%
PM	100.0%	100.0%	100.0%

During validation, the link flows along the major roads in the model are compared with the observed link counts and ATC. **Table 3-17** and **Table 4-18** indicate that the model validates well against the observed link flows.

Table 3-17: Validation TAG Criterion 1 against Link Flows

	Flow < 700			700 < Flow < 2700			Overall		
	Number	No. Pass	%	Number	No. Pass	%	Number	No. Pass	%
AM	14	14	100%	0	0	0	14	14	100%
PM	14	14	100%	0	0	0	14	14	100%

Table 3-18: Validation TAG Criterion 2 against Link Flows

	GEH Statistics		
	GEH < 5	GEH < 6	GEH < 10
AM	100.0%	100.0%	100.0%
PM	100.0%	100.0%	100.0%

5.3.4. The performance of the model exceeds the validation criteria, in all peak hours, with 100% of modelled movements within 5 GEH of observed counts in AM and PM peaks. This satisfies the TAG requirements whereby 85% of modelled movements should obtain a GEH score of less than 5.

5.3.5. The TAG standards are also satisfied by individual vehicle classes.

5.4 Queue length comparison

5.4.1. Queue length data obtained from surveys were used for validation purposes. Queue results from the model were plotted along with observed data. Below **Figure 3-7** to

Figure 3-14 show that the model was able to replicate the current queuing pattern on all roads and reflect the conditions at the junction on the day of survey well.

Figure 3-7: Queue along B4378 Bourton Road in AM Peak

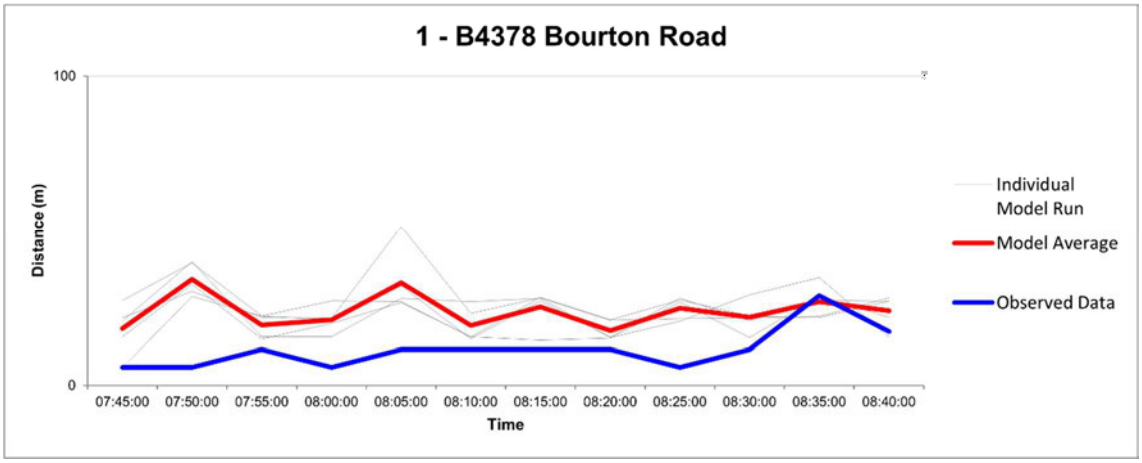


Figure 3-8: Queue along A4169 Smithfield Road in AM Peak

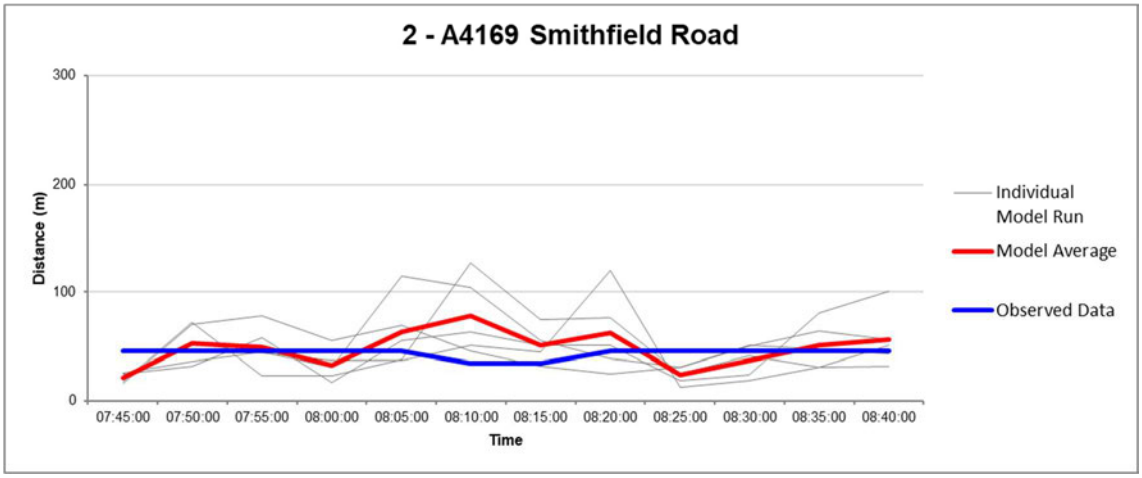


Figure 3-9: Queue along High Street in AM Peak

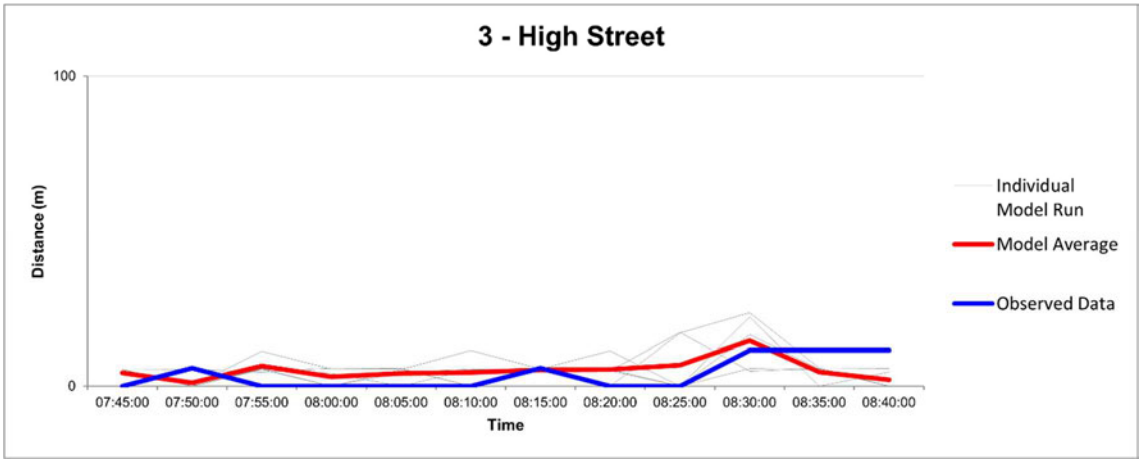


Figure 3-10: Queue along King Street in AM Peak

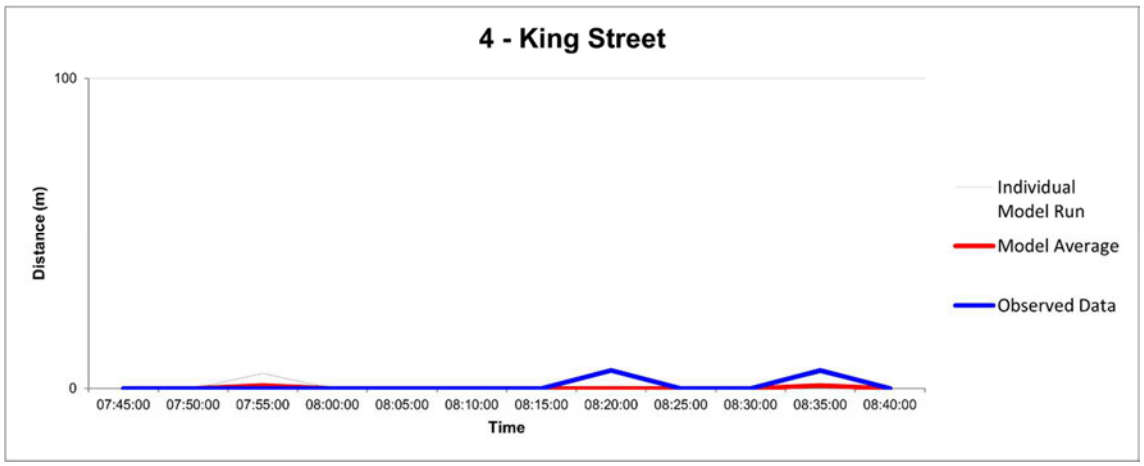


Figure 3-11: Queue along B4378 Bourton Road in PM Peak

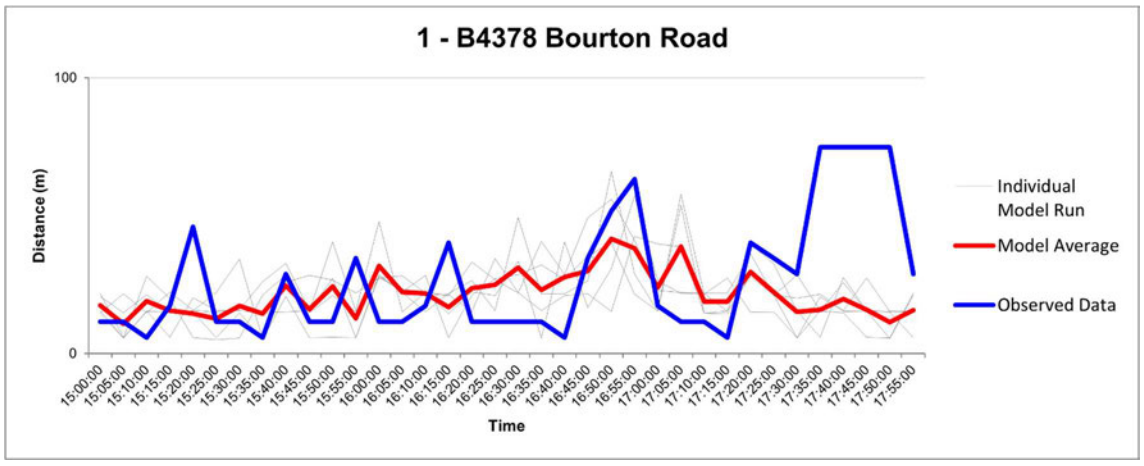


Figure 3-12: Queue along A4169 Smithfield Road in PM Peak

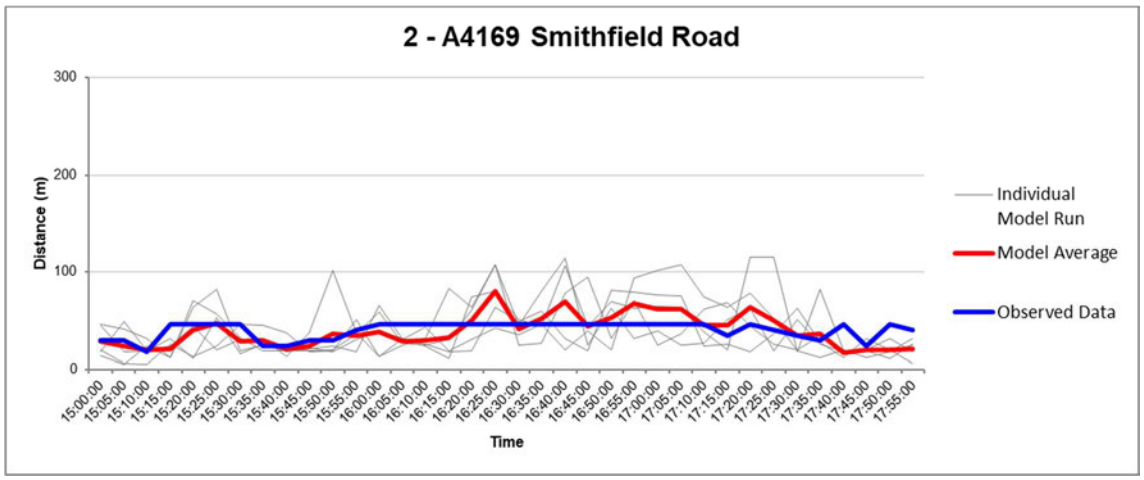


Figure 3-13: Queue along High Street in PM Peak

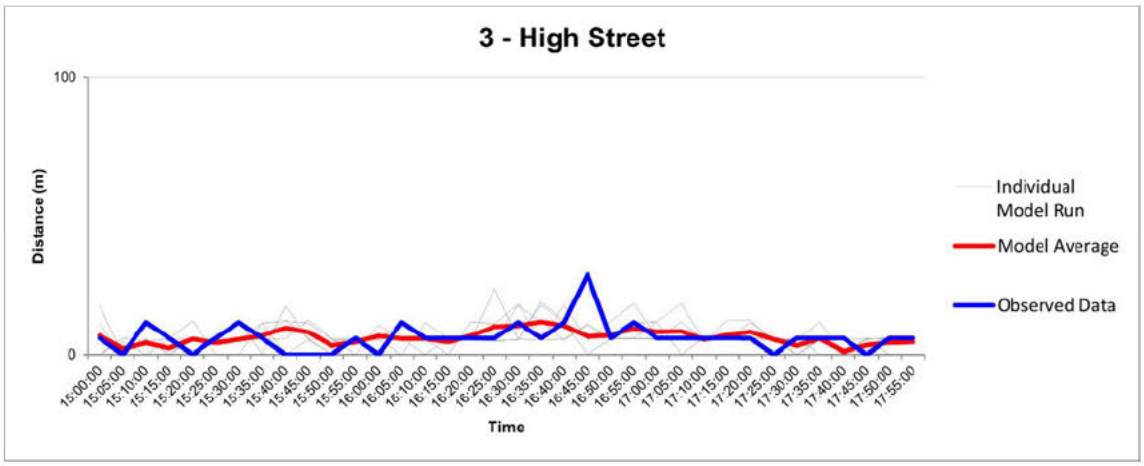
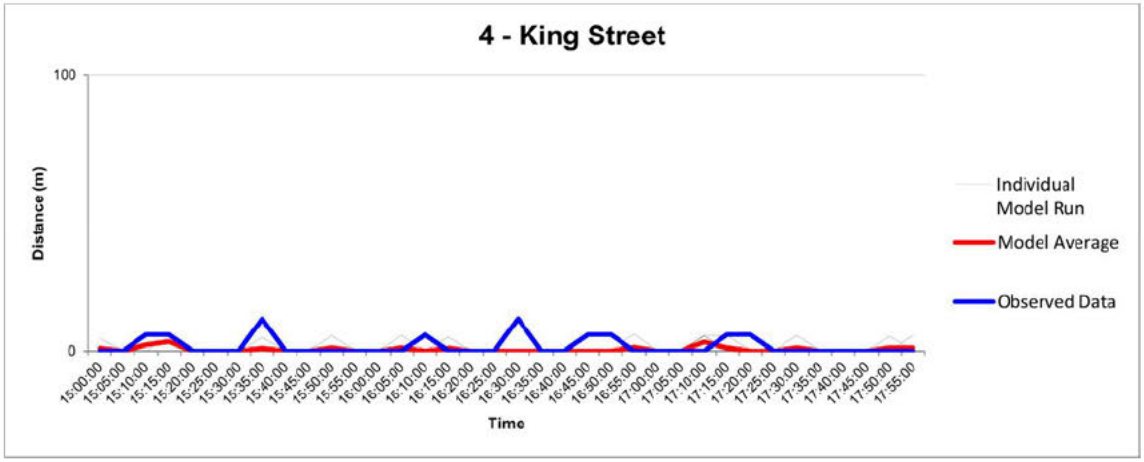


Figure 3-14: Queue along King Street in PM Peak



5.4.2. **Table 3-19** shows the comparison of modelled average (of the maximum queues) with the observed surveyed queue for AM and PM peaks. In general, the modelled queues closely follow the queue pattern observed, indicating that the model is a good representation of conditions on the day of survey.

Table 3-19: Queue Length Comparison

Junction	Approach	Mean Max Queue (metres)			
		AM Peak		PM Peak	
		Obs	Mod	Obs	Mod
A458 Victoria Road / B4378 Bourton Road Junction	B4378 Bourton Road	12	24	27	22
A458 Victoria Road / A4169 Smithfield Road Junction	A4169 Smithfield Road	44	48	40	39

Junction	Approach	Mean Max Queue (metres)			
		AM Peak		PM Peak	
		Obs	Mod	Obs	Mod
A458 Victoria Road / High Street Junction	High Street	4	5	6	6
King Street / High Street Junction	King Street	1	0	2	1

5.4.3. The calibration and validation of the model provides confidence that conditions across the modelled network are representative of 2022 conditions across the observed network. The model is therefore deemed suitable for use in reviewing and testing the future improvement options.

2038 Do Minimum and Do Something Queue Length Comparison

5.4.4. Queue length data obtained from the VISSIM modelling area illustrated below comparing the Base, Do Minimum and Do Something queues plotted against each other. Below in **Figure 3-15** and **Figure 3-30** below showed that the Do Something queues are relatively similar to the Base queues.

Figure 3-15 - Bourton Road Queue Length Comparison (Base/DM/DS) AM Peak

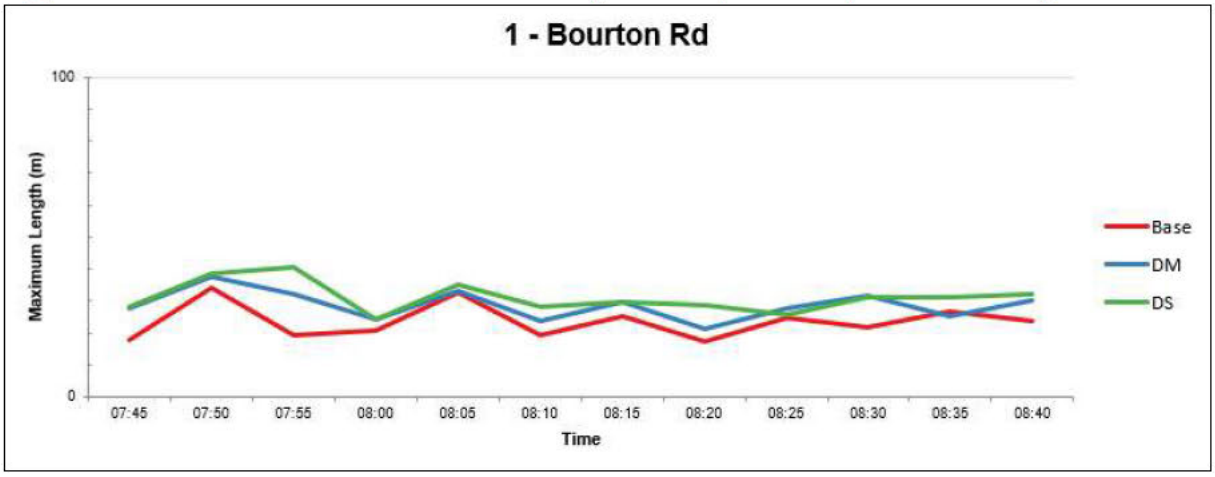


Figure 3-16 - Smithfield Road Queue Length Comparison (Base/DM/DS)AM Peak

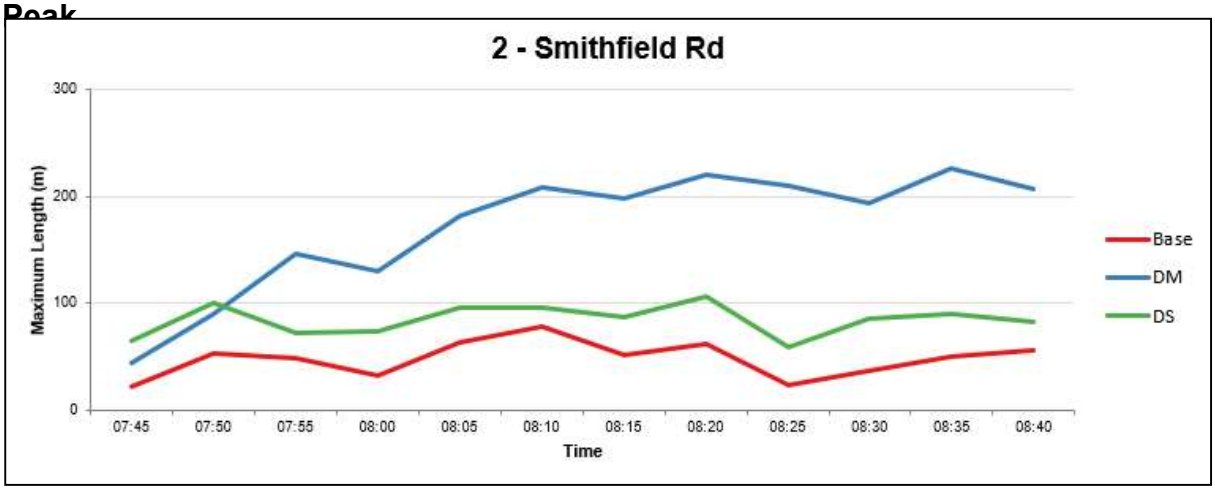


Figure 3-17 - High Street Queue Length Comparison (Base/DM) AM Peak

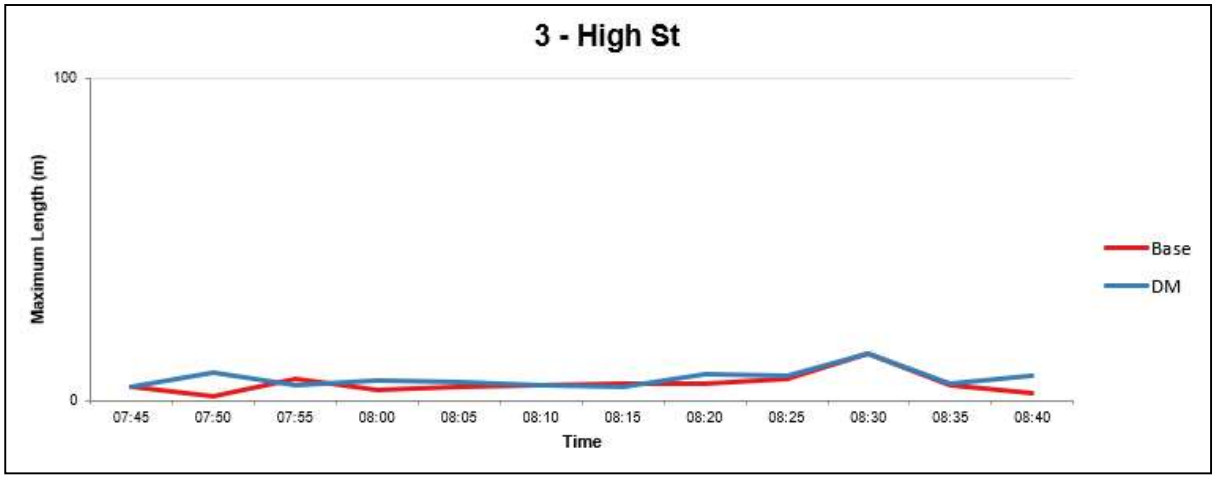


Figure 3-18 - King Street SB Queue Length Comparison (Base/DM/DS) AM Peak

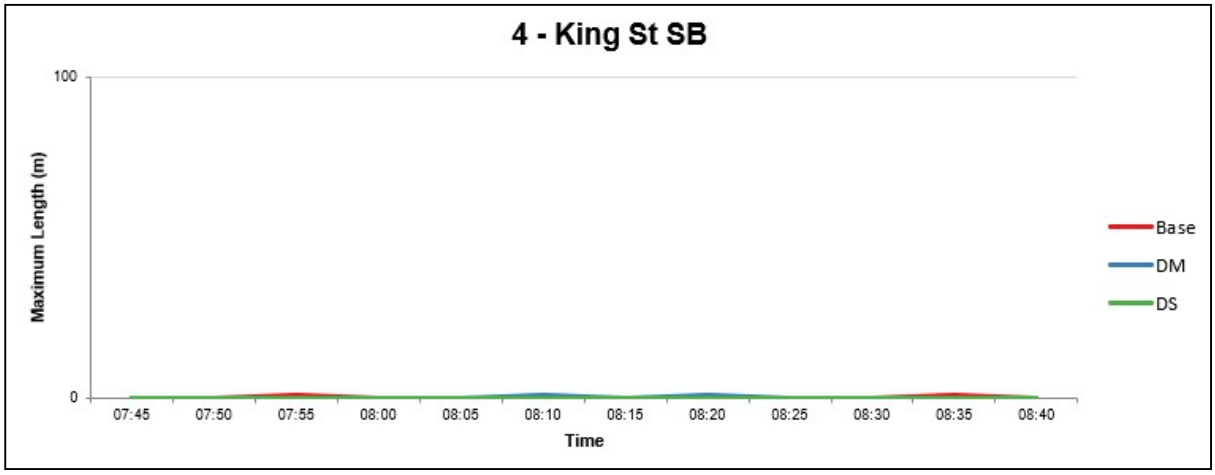


Figure 3-19 - King Street NB Queue Length Comparison (Base/DM/DS) AM Peak

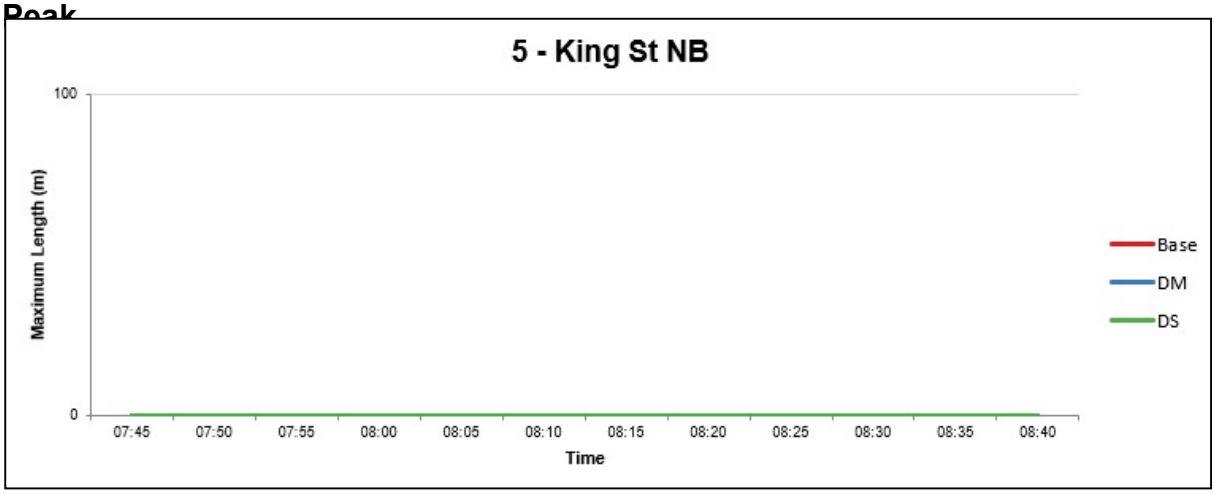


Figure 3-20 - Queen Street Queue Length Comparison (Base/DM/DS) AM Peak

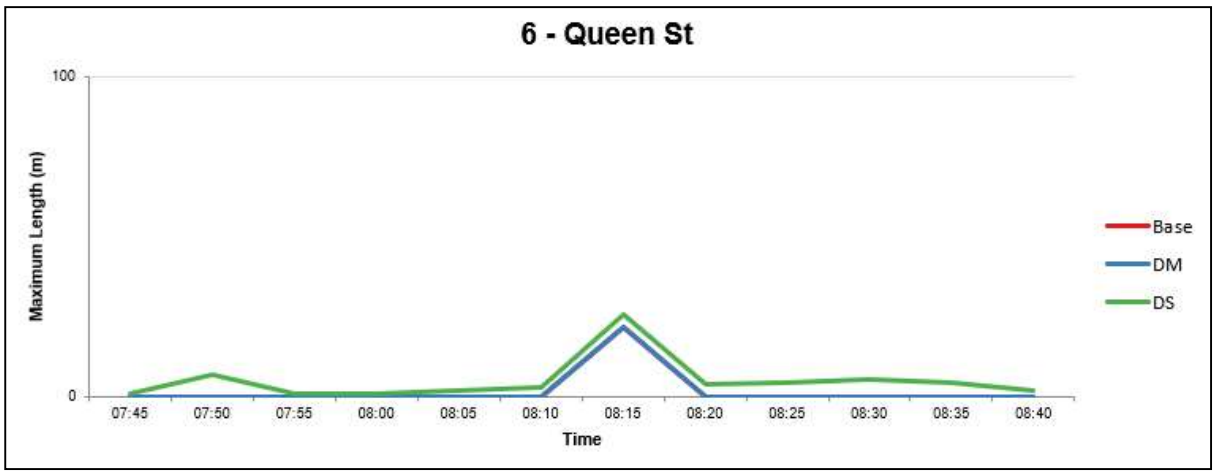


Figure 3-21 - Victoria Road Queue Length (DS) AM Peak

Figure 3-22 - Bridgnorth Road Queue Length (DS) AM Peak

Figure 3-23 - Bourton Road Queue Length Comparison (Base/DM/DS) PM Peak

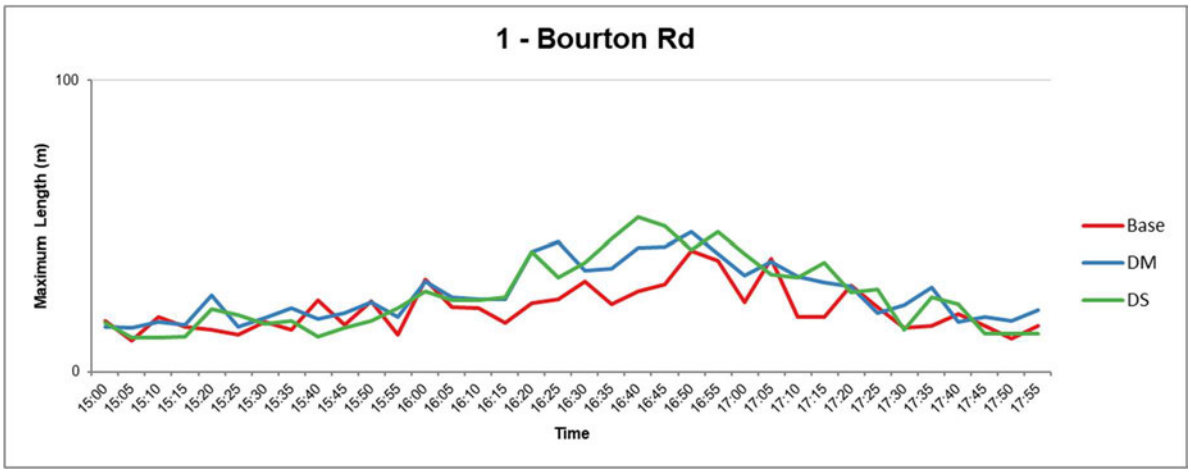


Figure 3-24 - Smithfield Road Queue Length Comparison (Base/DM/DS) PM Peak

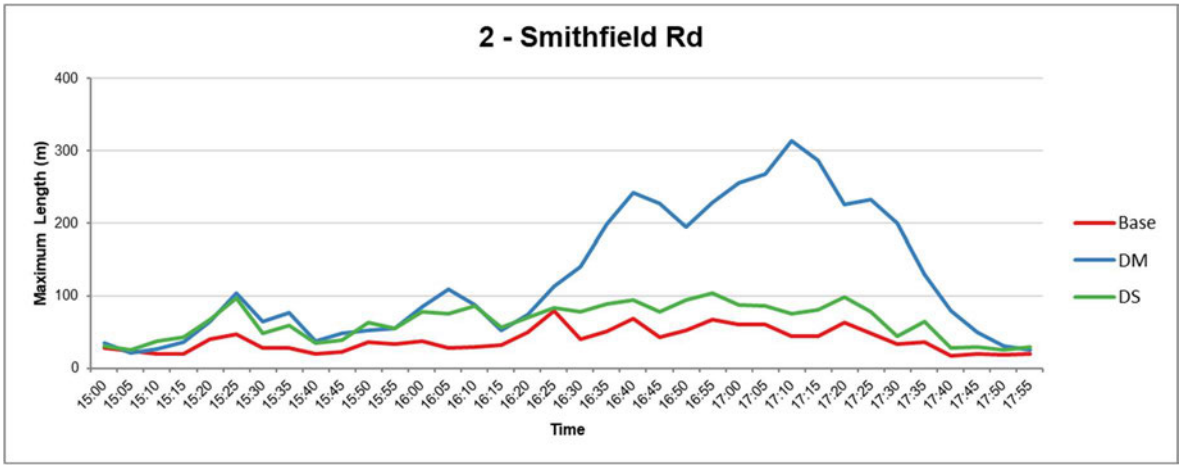


Figure 3-25 - High Street Queue Length Comparison (Base/DM) PM Peak

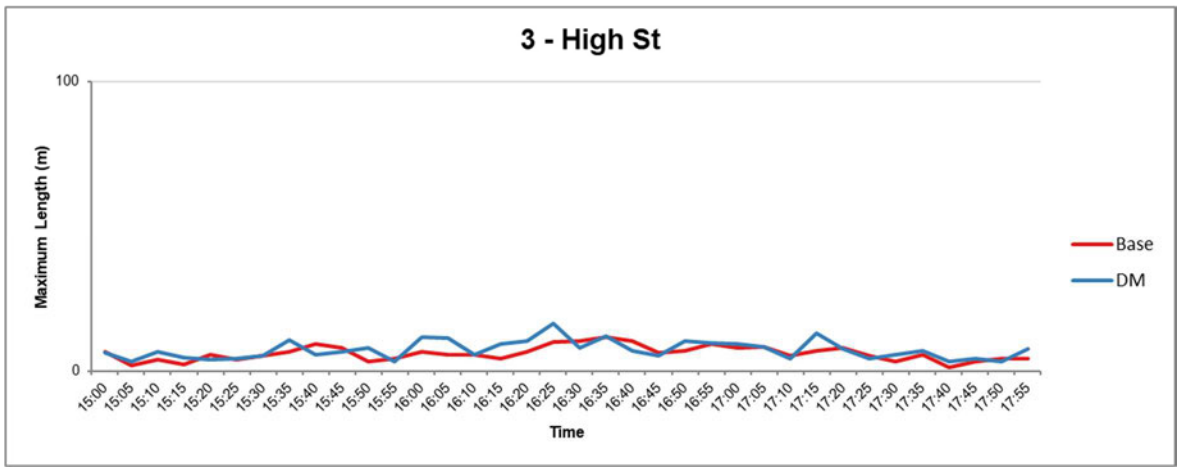


Figure 3-26 - King Street SB Queue Length Comparison (Base/DM/DS) PM Peak

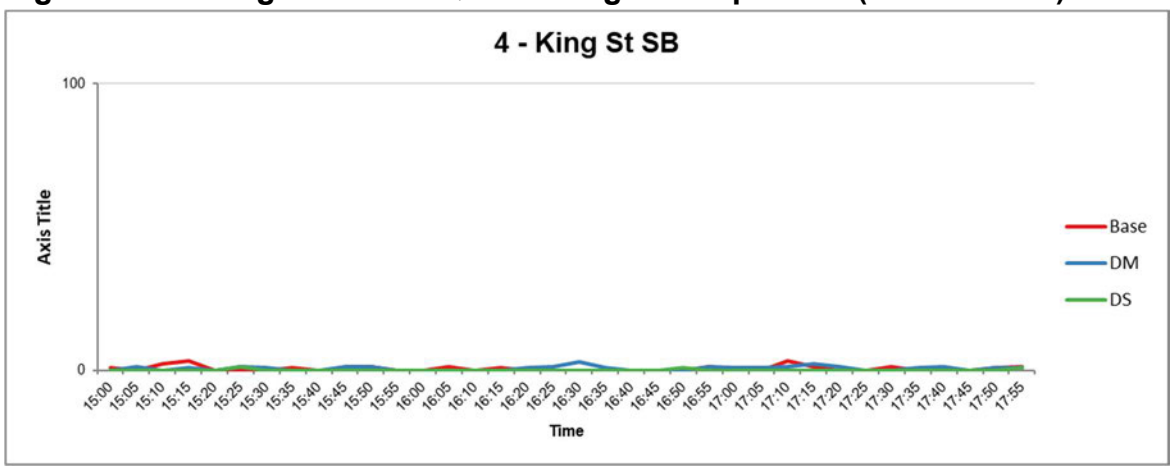


Figure 3-27 - King Street NB Queue Length Comparison (Base/DM/DS) PM Peak

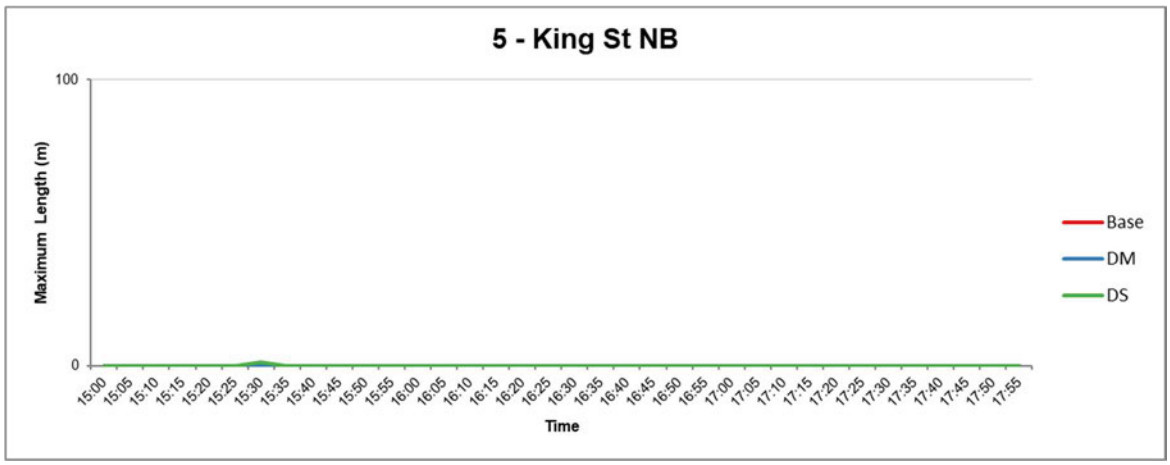


Figure 3-28 - Queen Street Queue Legnth Comparison (Base/DM/DS) PM Peak

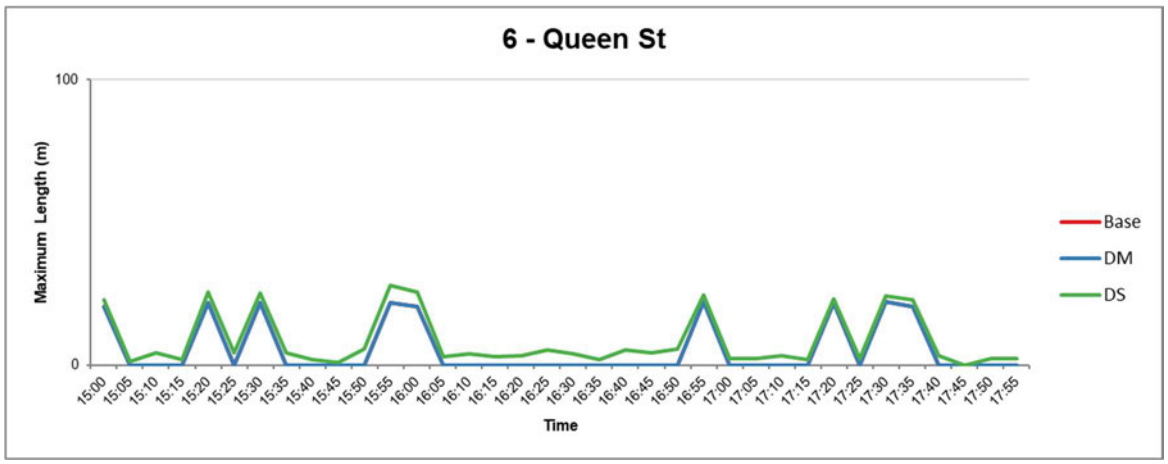
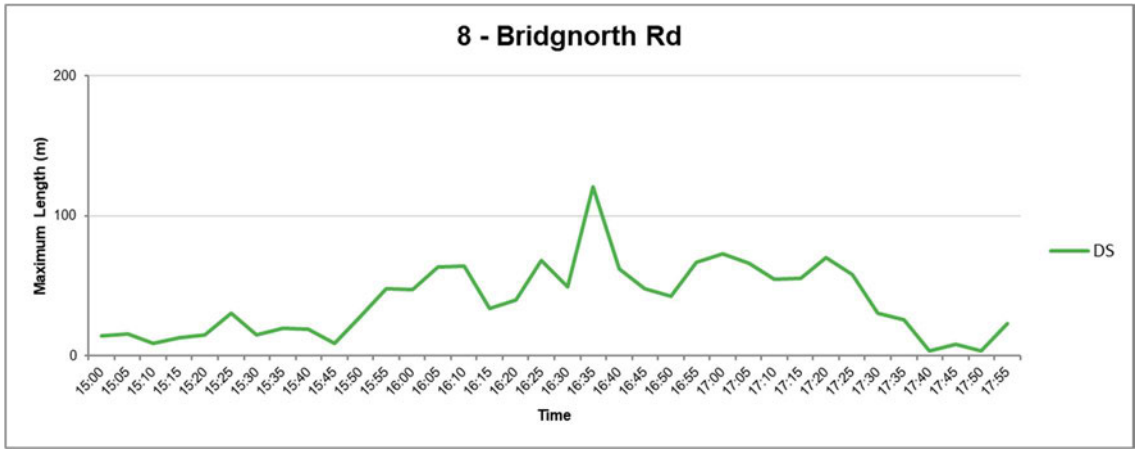


Figure 3-29 - Victoria Road Queue Length (DS) PM Peak

Figure 3-30 - Bridgnorth Road Queue Length (DS) PM Peak



Future Option Modelling

5.4.5. Future option assessments have been carried out for AM, and PM peak hours in the forecast year 2038 using following models:

2038 Do Minimum (DM)
2038 Do Something (DS)

Network Changes

5.4.6. The changes to network as part of the option modelling are detailed as below:

2038 Do Minimum - There have been no network changes in the future option Do Minimum (DM) scenario, but it would incorporate change in flows as impacted by the committed developments and expected growth in traffic flows.

2038 Do Something– The Signalisation Option 4 in the LinSig modelling provided the results that indicated improvements to junction performance, using the 2022 surveyed flows. This option and the variants (a to c) indicated in Chapter 4 have been reviewed and assessed in further detail within the VISSIM model.

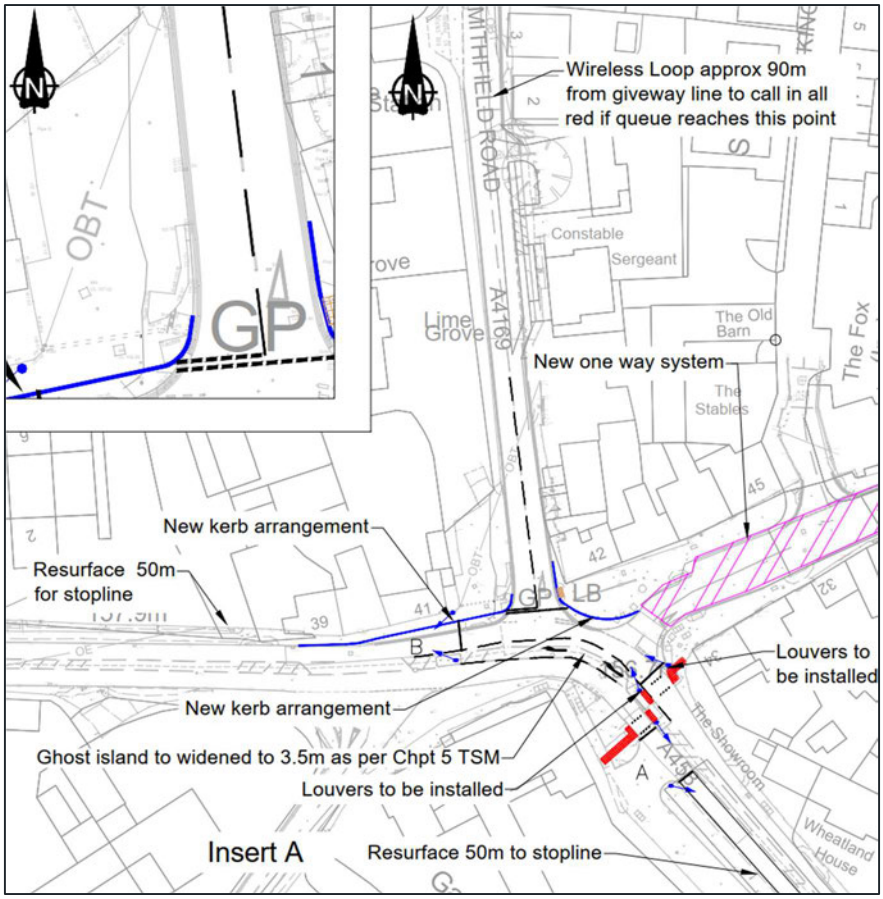
Therefore, the following signalisation options have been tested in the Do Something (DS) scenario.

DS Option 4a

- New kerb alignment East of Smithfield Road providing greater width for the carriageway and right turn bay.
- Signalised pedestrian crossing along Bridgnorth Road. This will be a push button-controlled crossing.
- A new demand dependent signal is proposed to reduce the queuing along Smithfield Road. A wireless loop detector is placed at Smithfield Road 90m away from the junction to detect queuing. If the queue length reaches 90m, the traffic signals on Victoria Road and Smithfield Road call a red stage on Victoria Road and Bridgnorth Road so that vehicles on Smithfield Road can turn under priority with no opposing flows. Right turn bay along Smithfield Road is widened. Width of the right turn bay increased so that it can better accommodate right turning vehicles at the entrance of High Street and Smithfield Road and reduce the propensity for vehicles to block traffic on A458.

- High Street is converted to one-way.

Figure 3-31: Do Something Scheme Option 4a



DS Option 4b

5.4.7. In addition to the improvements highlighted for Option 4a in Figure 3-3, Option 4b also includes Shineton Street made one-way for north west bound traffic.

DS Option 4c

5.4.8. In addition to the improvements highlighted for Option 4a in Figure 3-3, Option 4c also includes Shineton Street made one-way for north west bound traffic together with the widening of the junction bell mouth for Smithfield Rd (A4169) to make left-turn movements for HGV's easier from Victoria Road. As there is still more to investigate in relation to the area of land required to widen the junction bell mouth for Smithfield Rd (A4169), this Option 4c has not been modelled within VISSIM, however, it is clear that this option would perform better than Option 4b.

TRAFFIC FORECAST

5.4.9. The forecast year traffic has been calculated using TEMPro version 8 and RTF 2022 growth factors for Car, LGV and HGV and then those factors are converted for Light and Heavy vehicle classes using weighted averages. The base year flows for Lights

and Heavies are uplifted using the calculated growth factors. The growth factors considered are presented in **Table 3-20.**

5.4.10. Additional development trips from committed developments have been incorporated as part of the forecast year demand calculations. These include development trips to account for the following.

- Development at Ironbridge
- Tasley Development within Bridgnorth
- Additional traffic due to the Eastern Growth Corridor

5.4.11. In accordance with the TEMPro the growth The forecast year traffic has been calculated using TEMPro version 8 and RTF 2022 growth factors for Car, LGV and HGV and then those factors are converted for Light and Heavy vehicle classes using weighted averages. The base year flows

Table 3-20: 2022- 2038 Growth Factors

Year	AM Peak			PM Peak		
	Car	LGV	HGV	Car	LGV	HGV
2038	[redacted]			[redacted]		

5.4.12. The additional traffic generated due to the Ironbridge and Tasley developments has been obtained from the relevant agreed Technical notes and reports. The total flows incorporated on top of the TEMPro growth factors are shown in **Table 3-20.**

Table 3-21: Additional Traffic from Iron Bridge and Tasley Developments

Development	From Arm	To Arm	AM Peak Flow (vph)	PM Peak Flow (vph)
Iron Bridge	Smithfield Road	Victoria Road	40	18
	Victoria Road	Smithfield Road	17	42
	Total		**57**	**60**
Tasley	Smithfield Road	Bridgnorth Road	7	7
	Bridgnorth Road	Bourton Road	2	3
	Bridgnorth Road	Victoria Road	30	30
	Bridgnorth Road	Smithfield Road	11	8

Development	From Arm	To Arm	AM Peak Flow (vph)	PM Peak Flow (vph)
	Bourton Road	Bridgnorth Road	2	1
	Victoria Road	Bridgnorth Road	22	30
	Total		**74**	**79**

Additional Traffic due to Eastern Corridor:

5.4.13. To account for the Eastern Growth Corridor, an additional 10% of the TEMPro growth has been added to the relevant arms and turning movements at the junction.

5.4.14. Demand for the modelling period was developed from the peak hour demand using base year flow profiles.

Modelled Results

5.4.15. The following sections outline the results from the Signalised Option 4a and 4b improvement scenario (DS option) and provides a comparison against the Do-minimum (DM) model in the 2038 AM and PM peak scenarios. This section compares the differences between the scheme outputs for the following parameters:

- Network performance statistics
- Journey times
- Queue length

5.4.16. In line with the base model, the model outputs are an average of 5 runs using the random seed increment of 1 from starting a random seed of 11.

Network Performance Evaluation

5.4.17. Network performance statistics provide an indication of how the model is performing. They illustrate key statistics including:

- Total Time Taken (seconds) - Total travel time of vehicles travelling within the network for all vehicles that have already left the network and those that are in the model at the end of the evaluation period;
- Total Vehicles - Total number of vehicles which have already reached their destination and have left the network before the end of the simulation;
- Total Delay (seconds) - Total delay of all vehicles that are in the network or have already left it (completed their journey);
- Average Vehicle Time (seconds) - Average time spent by a vehicle within the model during the evaluation period;
- Average Speed (mph) - Average speed of vehicles in the model simulation period;

- Average Delay / Vehicle - Average delay experienced by each vehicle during the model simulation period;

5.4.18. **Table 3-22** compares the network performance summary for the AM peak for the 2022 base, 2038 DM scenario, and 2038 DS 4a / 4b scenarios.

Table 3-22: Network Performance Summary - AM Peak

Network Performance Statistic	2022 Base	2038 DM	2038 DS 4a	2038 DS 4b
Total Time Taken (s)	135471	205884	175838	190585
Total Distance (m)	1074270	1227960	1250292	1313384
Total Vehicles	1493	[redacted]	[redacted]	[redacted]
Total Delay (s)	31815	[redacted]	[redacted]	[redacted]
Average Time (s) / Vehicle	91	120	102	105
Average Time (s) / Mile	203	270	226	234
Average Distance (m) / Vehicle	719	717	724	724
Average Speed (mph)	18	14	16	15
Average Speed (kph)	29	22	26	25
Average Delay / Vehicle (s)	21	51	32	36

5.4.19. **Table 3-23** shows the comparison of the network performance summary for the PM peak for base, DM, and DS.

Table 3-23: Network Performance Summary - PM Peak

Network Performance Statistic	2022 Base	2038 DM	2038 DS 4a	2038 DS 4b
Total Time Taken (s)	363481	521647	450453	491171
Total Distance (m)	2958738	3406472	3434048	3608452
Total Vehicles	4100	[redacted]	[redacted]	[redacted]
Total Delay (s)	77684	[redacted]	[redacted]	[redacted]
Average Time (s) / Vehicle	89	111	96	100
Average Time (s) / Mile	198	246	211	219
Average Distance (m) / Vehicle	722	726	728	731
Average Speed (mph)	18	15	17	16
Average Speed (kph)	29	24	27	26
Average Delay / Vehicle (s)	19	41	26	30

5.4.20. From **Tables 3-22** and **3-23**, it can be seen that the average delay per vehicle has decreased considerably in both 2038 DS scenarios compared to the 2038 DM scenario, which is mainly due to the demand dependant signalling. The average speed in the DS network increases during both the AM and PM peak hours compared to DM, which also highlights there is less congestion in both 2038 DS scenarios compared with the DM.

5.4.21. Even though the number of total vehicles through the junction is more in the DS scenarios compared to the DM, average delay per vehicle is less by 19 and 15s respectively for DS Options 4a and 4b compared to DM. This is likely because of demand dependant signals which helps to reduce the queuing along Smithfield Road when it reaches queues beyond 90m.

Latent Demand

5.4.22. Latent demand is a measure of the traffic volume that could not enter the model when a queue extends back to the end of the outermost links of the model and is effectively an additional queue that cannot be accommodated within the model due to the prevalent queuing within the model.

5.4.23. None of the scenarios show latent demand in any peak.

Journey Time Comparison

5.4.24. Journey times for various sections as shown in **Figure 3-32** have been compared against the 2022 base, 2038 DM, and 2038 DS options.

Figure 3-32: ANPR locations

5.4.25. ANPR cameras were located at different places as shown in Table 3-24 The time taken for vehicles to cross them was recorded from the ANPR cameras. The routes which had at least more than 5 vehicles were only considered and those are listed in Table 3-25.

Table 3-24: Journey Time Routes- Full Routes

S. No	Route
1	Smithfield Road to King Street (2 to 3)
2	Smithfield Road to High Street (2 to 5)

S. No	Route
3	Smithfield Road to Bridgnorth Road (2 to 7)
4	Smithfield Road to Bourton Road (2 to 9)
5	Smithfield Road to Victoria Road (2 to 11)
6	King Street to Smithfield Road (4 to 1)
7	King Street to High Street (4 to 5)
8	King Street to Bridgnorth Road (4 to 7)
9	King Street to Bourton Road (4 to 9)
10	King Street to Victoria Road (4 to 11)
11	High Street to Smithfield Road (6 to 1)
12	High Street to King Street (6 to 3)
13	High Street to Bridgnorth Road (6 to 7)
14	High Street to Bourton Road (6 to 9)
15	High Street to Victoria Road (6 to 11)
16	Bridgnorth Road to Smithfield Road (8 to 1)
17	Bridgnorth Road to King Street (8 to 3)
18	Bridgnorth Road to High Street (8 to 5)
19	Bridgnorth Road to Bourton Road (8 to 9)
20	Bridgnorth Road to Victoria Road (8 to 11)

5.4.26. Average journey time comparisons for the different journey time routes during the AM peak for the base year and the 2038 future year options are provided in Table 3-25.

Table 3-25: Journey Time Comparison - AM Peak

S. No	Route	Journey Time (s)			
		2022 Base	2038 DM	2038 DS 4a	2038 DS 4b
3	Smithfield Road to Bridgnorth Road (2 to 7)	34	[redacted]		
4	Smithfield Road to Bourton Road (2 to 9)	51			
5	Smithfield Road to Victoria Road (2 to 11)	44			
6	King Street to Smithfield Road (4 to 1)	0			
8	King Street to Bridgnorth Road (4 to 7)	23			
9	King Street to Bourton Road (4 to 9)	59			
12	High Street to King Street (6 to 3)	0			
13	High Street to Bridgnorth Road (6 to 7)	33			
15	High Street to Victoria Road (6 to 11)	56			
16	Bridgnorth Road to Smithfield Road (8 to 1)	30			
17	Bridgnorth Road to King Street (8 to 3)	32			
18	Bridgnorth Road to High Street (8 to 5)	41			
19	Bridgnorth Road to Bourton Road (8 to 9)	44			
20	Bridgnorth Road to Victoria Road (8 to 11)	36			

5.4.27. Average journey time comparisons for the different journey time routes during the PM peak for the base year and the 2038 future year options are provided in in Table 3-26.

Table 3-26: Journey Time Comparison - PM Peak

S. No	Route	Journey Time (s)			
		2022 Base	2038 DM	2038 DS 4a	2038 DS 4b
2	Smithfield Road to High Street (2 to 5)	34	[redacted]		
3	Smithfield Road to Bridgnorth Road (2 to 7)	30			

S. No	Route	Journey Time (s)			
		2022 Base	2038 DM	2038 DS 4a	2038 DS 4b
4	Smithfield Road to Bourton Road (2 to 9)	43	[redacted]		
5	Smithfield Road to Victoria Road (2 to 11)	39			
7	King Street to High Street (4 to 5)	12			
8	King Street to Bridgnorth Road (4 to 7)	25			
9	King Street to Bourton Road (4 to 9)	54			
10	King Street to Victoria Road (4 to 11)	45			
11	High Street to Smithfield Road (6 to 1)	0			
12	High Street to King Street (6 to 3)	0			
13	High Street to Bridgnorth Road (6 to 7)	36			
15	High Street to Victoria Road (6 to 11)	56			
16	Bridgnorth Road to Smithfield Road (8 to 1)	30			
17	Bridgnorth Road to King Street (8 to 3)	33			
18	Bridgnorth Road to High Street (8 to 5)	40			
19	Bridgnorth Road to Bourton Road (8 to 9)	44			
20	Bridgnorth Road to Victoria Road (8 to 11)	35			

5.4.28. From Table 3-24 and Table 3-25, it is observed that there is significant reduction in journey time along the routes from Smithfield Road in DS scenarios compared to DM implying that the demand dependant signals assist to reduce queuing on Smithfield Road. Whilst journey times along routes from Victoria Road and Bridgnorth Road increase in the 2038 DS scenario compared to the 2038 DM scenario due to the introduction of the demand dependant signals, the average change in journey time is marginal compared to the average reduction in journey times achieved for Smithfield Road traffic.

5.4.29. The journeys from High Street have also become longer in the DS scenario as the exit through the intersection at the Bridgnorth Road has been closed, so the vehicles need to manoeuvre through Queen Street resulting in longer distance travelled thus longer journey time, however, the number of vehicles this affects during the peak periods is very low compared to traffic flows on other arms at the junction.

Queue Comparison

5.4.30. Table 3-27 shows the comparison of the modelled maximum queue (as an average of all modelled seeds within VISSIM) for both AM and PM peaks.

Table 3-27: Queue Length Comparison

Junction	Approach	Max Queue (metres)					
		AM Peak			PM Peak		
		2022 Base	2038 DM	2038 DS	2022 Base	2038 DM	2038 DS
A458 Victoria Road / B4378 Bourton Road Junction	B4378 Bourton Road	34.0	[redacted]				
A458 Victoria Road / A4169 Smithfield Road Junction	A4169 Smithfield Road	78.2					
A458 Victoria Road / High Road Junction	High Road	14.6					
King Street / High Street Junction	King Street	1.0					
Queen Street /King Street	King St NB	0.0					
New Road/Queen St	Queen St	22.0					
Victoria Road/Smithfield Road	Victoria Road						
Bridgnorth Road/Victoria Road	Bridgnorth Road						

5.4.31. The results illustrate that in the AM peak in the 2038 DS scenario the queues on A4169 Smithfield Road approach reduces significantly in comparison to the 2038 DM scenario, with queues reducing to 106.6m from 226.5m. In the PM peak the queue along AA4169 Smithfield Road reduces significantly from 314.3m in the DM scenario to 104.7m in the 2038 DS scenario. In the 2038 DS scenario the queues on King Street are reduced in comparison to the base and to the 2038 DM scenario reducing to 0m and 1.1m from 1.1m and 3.1m in the 2038 DM scenario.

5.4.32. However, on the B4378 Bourton Road, the DS scenario does increase queuing in comparison to both the 2022 base and 2038 DM, from 37.7m to 40.4m in the AM

Peak and 47.8m to 52.9m in the PM peak. This increase can be deemed as not a significant increase.

5.4.33. The difference in queues between all the options is also shown graphically for Smithfield Road in Figures 3-33 and 3-34.

Figure 3-33: AM peak queue comparison on Smithfield Road

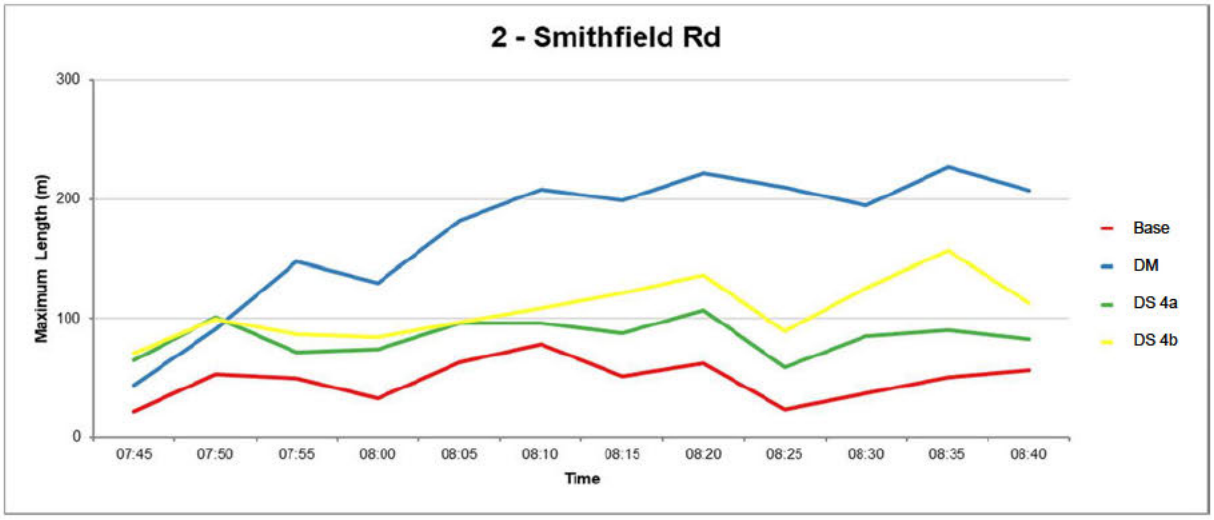
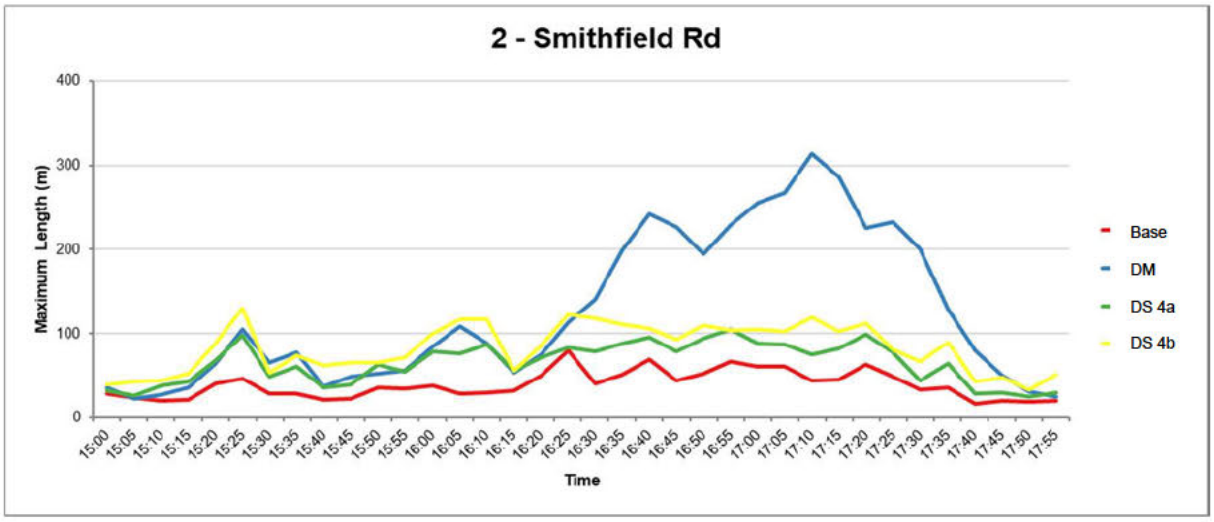


Figure 3-34: PM peak queue comparison on Smithfield Road



5.4.34. Overall, 2038 DS scenarios reduce queues at the junction in relation to the 2038 DM scenario.

5.5 Summary

5.5.1. A 2022 calibrated and validated base year model was developed for Gaskell Arms study area using VISSIM 2022.

5.5.2. Whilst full signalisation does not appear to be a viable option from the LinSig modelling carried out prior to the VISSIM modelling, given the level of traffic flows, at some point in the future, full signalisation of the junction could be an option. If a partial signal

option is implemented, then it is recommended that full ducting is provided at the junction to facilitate full signalisation of the junction at a future date.

5.5.3. The VISSIM model was further used to test the performance of proposed design change at the junction.

5.5.4. The model tested the following scenarios:

- Do Minimum - 2038
- Do Something (Signalisation Option 4a) – 2038
- Do Something (Signalisation Option 4b) – 2038

5.5.5. Based on the network performance and latent demand, the DS model scenarios outperform the DM scenario in both peak periods.

5.5.6. Journey time and queue length comparison show slight increase in delay along Victoria Road and Bridgnorth Road due to the demand dependant proposed signals. However, overall network delay is better in the DS scenarios compared to the DM scenario.

6 Preferred Option

6.1 Phased Approach

6.1.1. After considering all the proposed options, peer review and responding to the Stage 1 Road Safety Audit (RSA) which has been included in Appendix K of this report (along with the designer's response), it has been deemed that a phased approach of implementing Option 4 would be the most appropriate resolution, with further review and consideration of measures following the implementation of each phase, which would also allow further time to review the technical feasibility of the signalisation of the junction.

6.1.2. To facilitate the implementation of the stand-alone staggered Puffin crossing it requires High Street to be made one-way entry from A458 due to the proximity of the crossing to the High Street junction with A458 (in the interest of road safety).

6.1.3. If High Street was not made one-way entry from A458, then further signalisation of High Street and the junction would be needed (which would increase delay through the junction).

6.1.4. Given the decision on whether High Street being made one-way entry from A458 is key to the proposals, it is recommended that this is included within consultation proposals within Phase 1 before any improvements are made at the junction.

6.1.5. Consultation and implementation of creating a one-way traffic route, northbound, on Shineton Street could be consulted on later and potentially implemented as part of a later phase if determined to be appropriate.

6.1.6. Further to the RSA comments, this highlights that further/wider works would also need consideration as part of creating a one-way traffic route, northbound, on Shineton Street. As creating a one-way traffic route would prevent local traffic from exiting Smithfield Road to access the residential areas off the B4376. It is likely that additional traffic would transfer on to Queens Street to re-join Shineton Street / Wilmore Street as an alternative to approaching the A458 junction. Queens Street has restricted geometry and serves residential areas with on-street parking of resident's vehicles. There is a risk that increased two-way traffic flow on Queens Street could result in head-on traffic collisions, albeit at low speeds, where there is no record of any previous occurrences during the last ten year period.

6.1.7. The RSA therefore recommended that measures are implemented to prevent the potential detrimental impact of through-traffic movements on Queens Street. This could be reviewed and consulted on as part of a later phase but could incorporate traffic calming on Queen Street.

6.1.8. Therefore, it is proposed that Option 4 is implemented on a phased approach. as follows;

- **Option 4 – Phase 1**
  - Wider consultation with stakeholders for the proposals on Option 4 but also to specifically consult and review the High Street being made one-way entry from A458 (as the outcome could change the proposal being taken forward).
  - Wider consultation would also be specifically needed in relation to amendments to the Gaskell Arms side-road to facilitate the Puffin crossing. The RSA highlighted that drivers entering the A458 from the Gaskell Arms side-road do so very close to the proposed controlled crossing location without a dedicated signal and there is a risk of a vehicle colliding with a pedestrian.
  - Consultation would therefore be needed on whether traffic entering the A548 from the Gaskell Arms side road are provided with an additional traffic signal or alternatively whether the Gaskell Arms side-road is made one-way southbound with the existing parking relocated to the other side of the carriageway next to verge rather than up against the wall to the Gaskell Arms car park as existing.
  - Further review of land within the extent of adopted highway to confirm that the western kerb radii on Smithfield Road at the Gaskill Arms Junction can be realigned to allow easier turning movements for buses/HGVs turning into Smithfield Road.
- **Option 4 – Phase 2**
  - New kerb alignment East of Smithfield Road providing greater width for the carriageway and right turn bay.
  - Installation of ducting at the junction (in the vicinity of Smithfield Road) to allow cabling and Implementation of a future signalised option.
  - Realign western kerb radii on Smithfield Road at the Gaskill Arms Junction to allow easier turning movements for buses/HGVs turning into Smithfield Road (If this is confirmed as possible in Phase 1, following the further review of land within the extent of adopted highway).
- **Option 4 - Phase 3**
  - Trial the High Street to be made one-way entry from A458 (using Temporary Traffic Regulation Orders (TTROs)).
- **Option 4 – Phase 4**
  - If the Trial in Phase 3 is successful, make the High Street one-way entry from A458 permanent.
  - Implement stand-alone staggered Puffin Signalised pedestrian crossing to replace existing uncontrolled crossing on Bridgnorth Road.
  - Implement mitigation for Gaskell Arms side road, whether this be an additional signal head or implementation of one-way southbound routing of traffic along with the existing parking relocated to the other side of the carriageway next to verge rather than up against the wall to the Gaskell Arms car park as existing.

- Installation of further ducting at the junction (in the vicinity of the Puffin crossing) to allow cabling and implementation of a full future signalised option.

- **Option 4 – Phase 5**
  - Consultation and implementation of creating a one-way traffic route, northbound, on Shineton Street and associated mitigation proposed for Queen Street in relation to the diverted local traffic as highlighted in the RSA (mitigation would most likely be traffic calming measures on Queen Street).
- **Option 4 – Phase 6**
  - Review of the implementation and technical feasibility of a signalised solution at Gaskill Arms junction. Although implementation will be made easier with the earlier installation of ducting at the junction to allow cabling as part of the earlier phases.

6.1.9. The phased approach will include initial improvements that are quicker to implement (within Phase 2) following consultation. This would include having the curbs on both sides of Smithfield Road realigned to provide easier turning movements for larger vehicles, HGVs and buses.

6.1.10. Once the benefits to traffic are established following implementation of each phase, further phases can be reviewed and considered.

7 Cost Benefit Analysis

7.1.1. As there is only one viable option which provides the necessary improvement to capacity at this location, therefore the CBA is not being provided to show the proposed benefits of different options.

7.1.2. Furthermore, it should be noted that the CBA has been carried out before detailed design; this mean that whilst both a cost estimate and capacity modelling have been provided, these are indicative only and would need to be fully assessed at the detailed design stage. Any changes to either the cost estimate or modelling data would impact the outcome of the CBA.

7.2 Cost Benefit Analysis

7.2.1. The Cost Benefit analysis is carried out using the Present Value Method using the Discount Rate.

- Assumptions – an expected 25% return
- Total Project work costs = [redacted]
- Total expected return = [redacted]
- Discount Rate = 6.40% as per WSP Standards
- Therefore, the Present Value (PV) = [redacted]
- Net Present Value (NPV) = [redacted]

7.2.2. The full Cost Benefit Analysis report and Bill of Quantities can be found in Appendix J.

8 Conclusion

8.1 Conclusion

8.1.1. After gathering all the information for the various options, all but Option 4 were discounted from further investigation at this stage.

8.1.2. Option 4 was taken forward to VISSIM modelling which has shown a positive outcome can be achieved by this option.

8.1.3. Following discussions with signal engineers and the detailed design team as part of the peer review and RSA, this highlighted that given demand dependant signalisation (linked to a signalised pedestrian crossing) is not a standard approach to controlling the operation of a junction, that this might not comply with current regulations.

8.1.4. Given that full signalisation of the junction is not indicated to provide benefits to the junction (unless there is a significant increase in traffic beyond the modelled period) partial signalisation of the junction remains the optimum arrangement as part of Option 4. Therefore, following the peer review and RSA, a phased approach to delivering the proposed improvements is the most pragmatic approach to improving Gaskell junction. This would also allow the technical feasibility of implementing a signalised solution to be reviewed further.

8.1.5. Phasing the proposed improvements also allows the proposals to be adequately consulted with wider stakeholders at each phase and the impacts assessed appropriately following the implementation of each phase.

8.1.6. Signalisation of the junction can then be reviewed and considered further in the later phases of this Option 4 approach, along with creating a one-way traffic route, northbound, on Shineton Street.

8.1.7. In conclusion for this phased approach the results show that this option will provide improvement to the capacity and efficiency of the junction and would achieve a benefit for the local community.

9 Further Investigation

9.1.1. Statutory undertakers' utility information was provided by Shropshire Council. Further engagement is required with Statutory Undertakers to understand the full costs of utility works at this location. This will include any diversion / protection works and the cost of providing a suitable power supply to the site, for the traffic signalled control options. A stage 1 road safety audit has been undertaken to review the preferred option which has been included within Appendix 1 of this report together with a designer's response, however, further safety audits will also be undertaken as the proposals progress through detailed design and are then implemented.

9.1.2. No environmental impact assessment was undertaken as part of the study. It is suggested that an environmental impact assessment is undertaken to understand the full environmental impact of junction options.

9.1.3. Additional Traffic Regulations Orders and Temporary Traffic Regulation Orders will need to be considered at the detailed design stage.

9.1.4. Further consultation will be required with adjacent landowners to fully understand any constraints / issues further.

9.1.5. Further review of the partial signalisation of the junction with signal engineers and the detailed design team for implementation in Phase 6.

Appendix A

Location Plan

Appendix B

Bus Routes

Appendix C

Existing TROs

Appendix D

Conservation Area

Appendix E

Highway Boundary

Appendix F

Proposed TROs

Appendix G

Utilities

Appendix H

Option Drawings

Appendix I

LinSig

Appendix J

Cost Benefit Analysis and BoQ

Appendix K

Stage 1 Road Safety Audit

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