Hampshire County Council

PROOF OF EVIDENCE OF JONATHAN MUNDY IN RESPECT OF HIGHWAYS AND TRANSPORTATION

IN RELATION TO THE

Outline Planning Permission For The Demolition Of Existing Buildings And Development Of Up To 75 Dwellings, Open Space, Vehicular Access Point From Newgate Lane And Associated And Ancillary Infrastructure, With All Matters Except Access To Be Reserved. Land At Newgate Lane (North) Fareham.

PLANNING REFERENCE P/18/1118/OA

APPEAL REFERENCE APP/A1720/W/20/3252180

AND

Outline Planning Permission For The Demolition Of Existing Buildings And Development Of Up To 115 Dwellings, Open Space, Vehicular Access Point From Newgate Lane And Associated And Ancillary Infrastructure, With All Matters Except Access To Be Reserved. Land At Newgate Lane (South) Fareham.

PLANNING REFERENCE P/19/0460/OA

APPEAL REFERENCE APP/A1720/W/20/3252185

FEBRUARY 2021

List of Contents

Sections

List of Appendices

1. Qualifications and Experience

1.1 My name is Jonathan Mundy. I hold a Transport Planning and Engineering MSc and am an Incorporated Engineer member of the Institution of Civil Engineers.

1.2 I am a Principal Engineer in the Intelligent Transport Systems (ITS) Group at Hampshire County Council.

1.3 I have been engaged in the practice of traffic signal design for 29 years. This period has been spent exclusively working in the ITS Group at Hampshire County Council. I have extensive experience in the design of traffic signal junctions including traffic modelling using Linsig software. I also have extensive in the operation and maintenance of traffic signal junctions. My experience also covers auditing developer's traffic signal schemes. My experience ranges from concept design through to implementation on street of traffic signal junctions and pedestrian crossings.

1.4 I am familiar with the local transport network and surrounding area.

1.5 I have been requested by Fareham Borough Council (FBC) to provide expert witness services for the Inquiry.

2. Scope of Evidence

2.1 The planning applications were subject to an officer recommendation for refusal as detailed in the Officer Recommendations (CDC.1 and CDC.2). The Planning Committee resolved to refuse planning permission for both applications at the planning committee on 01/07/2020. The highway reasons for refusal relate to:

Northern application (P/18/1118/OA):

d) The application site is not sustainably located adjacent to, well related to or well-integrated with the existing urban settlement boundaries;

f) Insufficient information has been submitted to adequately assess the highways impacts arising from the proposed development;

g) The proposed access is inadequate to accommodate the development safely;

h) The proposed development would have an unacceptable impact on the junction of old Newgate Lane / Newgate Lane East resulting in a severe impact on the road safety ~~and operation of the local transport network~~;

i) The proposed development provides insufficient support for sustainable transport options;

o) In the absence of a legal agreement to secure the submission and implementation of a full Travel Plan, payment of the Travel Plan approval and monitoring fees and the provision of a surety mechanism to ensure implementation of the Travel Plan, the proposed development would not make the necessary provision to ensure measures are in place to assist in reducing the dependency on the use of the private motorcar.

Southern Application (P/19/0460/OA):

d) The application site is not sustainably located adjacent to, well related to or well-integrated with the existing urban settlement boundaries;

e) Insufficient information has been submitted to adequately assess the highways impacts arising from the proposed development;

f) The proposed access is inadequate to accommodate the development safely;

g) The proposed development would have an unacceptable impact on the junction of old Newgate Lane / Newgate Lane East resulting in a severe impact on the road safety ~~and operation of the local transport network~~;

h) The proposed development provides insufficient support for sustainable transport options;

o) In the absence of a legal agreement to secure the submission and implementation of a full Travel Plan, payment of the Travel Plan approval and monitoring fees and the provision of a surety mechanism to ensure implementation of the Travel Plan, the proposed development

would not make the necessary provision to ensure measures are in place to assist in reducing the dependency on the use of the private motorcar.

2.2 Those reasons related to insufficient information, access, contributions and Travel Plans were capable of being addressed through liaison with the appellant and they have been. However, Reason for Refusal h for the northern site which corresponds to Reason g for the southern site cannot be resolved. This is:

• The proposed development would have an unacceptable impact on the junction of old Newgate Lane / Newgate Lane East resulting in a severe impact on the road safety ~~and operation of the local transport network~~.

2.3 My evidence considers the traffic signal junction matters which are the subject of this Inquiry. My evidence considers the following:

- Signalling of the right turn movement from Newgate Lane East north towards Old Newgate Lane
- ~~Traffic distribution across the approach lanes on Newgate Lane East northbound~~

2.4 At Section 3 of my evidence I address relevant design guidance.

2.5 At Section 4 of my evidence I will deal with the signalling of right turn movement from Newgate Lane East north into Old Newgate Lane. I shall demonstrate that the development will introduce a predictable and unacceptable road safety hazard. I shall base my assessment on road safety records at similar nearby traffic signal junctions, review of other signal junctions, design practice adopted by other Local Authorities and the Stage 1 Road Safety Audit. The Appellant has based the design on national design guidance without consideration for local conditions.

~~2.6 In Section 5 of my evidence I will deal with the traffic distribution across the approach lanes on Newgate Lane East northbound. I will demonstrate that the traffic distribution used in the traffic signal model is incorrect and underestimates the resultant queuing and delays on Newgate Lane East northbound. I shall base my assessment on observed site data collected from similar sites and published papers.~~

2.7 My summary and conclusions are provided in Section 6.

2.8 My evidence should be read alongside that of Ms Parker (Planning), Mr Sibbett (Ecology), Mr Dudley (Landscape) and Mr Gammer (Transportation).

2.9 The evidence that I have prepared and provide for this appeal reference is true and I confirm that the opinions expressed are my true and professional opinions.

3 Relevant Design Guidance

3.1 I consider below the design guidance applicable to the signalling of right turn traffic movements.

3.2 Newgate Lane East is subject to a 40mph speed limit while Old Newgate Lane has a 30mph speed limit. The design guidance for traffic signal junction on roads subject to a speed limit of 40 mph and under is contained in Traffic Signs Manual Chapter 6 – Traffic Control (Department for Transport 2019).

3.3 Section 1.1.1 of the Traffic Signs Manual Chapter 6 states

> *"The Traffic Signs Manual (the Manual) offers advice to traffic authorities and their contractors, designers and managing agents in the United Kingdom, on the correct use of traffic signs and road markings on the highway network. Mandatory requirements are set out in the Traffic Signs Regulations and General Directions 2016 (as amended) (TSRGD)…. …..Whilst the Manual can assist with complying with the mandatory requirements, it cannot provide a definitive legal interpretation, nor can it override them. This remains the prerogative of the courts or parking adjudicators in relation to the appearance and use of specific traffic signs, road markings etc. at specific locations."*

3.4 Section 1.1.2 of the Traffic Signs Manual Chapter 6 states

> *"The advice is given to assist authorities in the discharge of their duties under section 122 of the Road Traffic Regulation Act 1984 and Part 2 of the Traffic Management Act 2004 in England and under Part 1 of the Roads (Scotland) Act 1984. Subject to compliance with the Directions, which are mandatory (see 1.4.2 and 1.4.3), it is for traffic authorities to determine what signing is necessary to meet those duties."*

3.5 Section 1.1.6 of the Traffic Signs Manual Chapter 6 states

> *"Engineers who design and maintain the road network must be able to offer consistent standards that can satisfy road users' needs. Traffic authorities depend on signing and signalling for the efficient control and movement of traffic, for enforcement of traffic regulations and, most importantly, as an aid to road safety"*

3.6 Section 8.4.1of the Traffic Signs Manual Chapter 6 states

> *"Separately signalled right turns should be considered in circumstances where opposed right turns may be unsafe, for example on roads where the 85th percentile speed is above 45 mph on the relevant approaches. They may also be considered if it is necessary to separate control between right turning traffic and adjacent ahead movements, for example, when trying to accommodate parallel pedestrians or when both right turns from opposite arms are heavy."*

4 Signalling of the Right Turn Movement from Newgate Lane East towards Old Newgate Lane

4.1 Currently Newgate Lane East and Old Newgate Lane form a 3 arm priority junction. Newgate Lane East comprises of a single lane in both directions through the junction. There is a separate centre lane for vehicles turning right from Newgate Lane East into Old Newgate Lane. Drivers making this right turn movement cross a single lane of on-coming traffic. Old Newgate Lane is a single lane which widens out on the immediate approach to the junction.

Figure 1: Development Location
Source: Extracted from Illustrative Framework Masterplan – Southern Parcel (August 2019), CDA.73

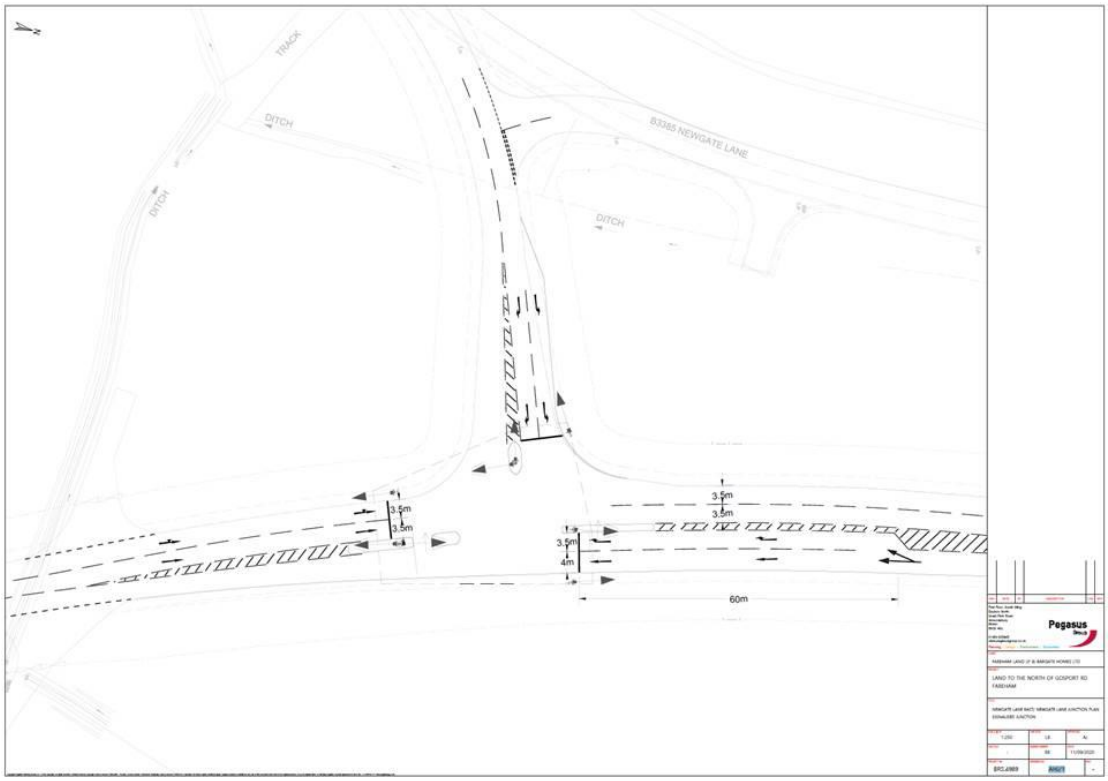


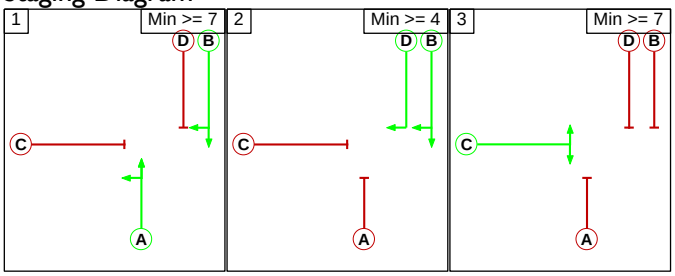
Figure 2: Proposed Newgate Lane/Old Newgate Lane traffic signal junction

4.2 The Appellant's proposal would introduce traffic signals at the junction. Newgate Lane East northbound would be widened on the approach from a single lane to two lanes through the junction. The nearside lane would be used by traffic travelling ahead and turning left and the offside lane by traffic travelling ahead only. Beyond the junction Newgate Lane East northbound would return to a single lane. Old Newgate Lane would be widened shortly before the junction from a single lane to two lanes. The nearside lane would be for left turning traffic and the offside lane for right turning traffic.

4.3 The traffic signal junction is proposed to operate in the following 3 stages

Stage 1 – Newgate Lane southbound ahead and right turn during gaps and Newgate Lane East northbound ahead and left turn (phases A and B)
Stage 2 – Newgate Lane East southbound ahead and right turn under indicative arrow signal (phases B and D)
Stage 3 – Old Newgate Lane (phase C)

Staging Diagram



4.4 The proposed staging would allow drivers to turn right from Newgate Lane East into Old Newgate Lane during stage 1. This would result in drivers turning right across two lanes of oncoming traffic. Poor driver judgement in finding a safe gap across two lanes of traffic travelling ahead within a traffic signal junction is considered to present an unacceptable safety hazard.

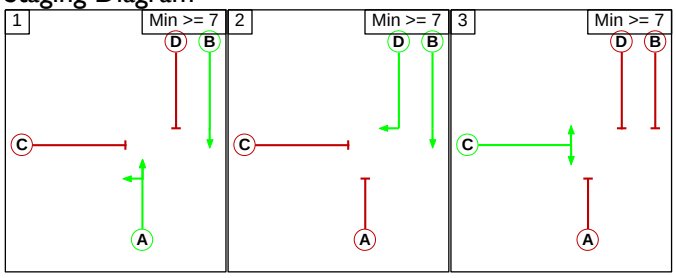
4.5 To eliminate this safety hazard would require the full signalisation of the right turn traffic movement from Newgate Lane East into Old Newgate Lane. Under this arrangement right turning drivers would be prevented from turning during gaps in the oncoming traffic flow. Right turning drivers would be held at a red signal and could only turn when the oncoming traffic was stopped at a red signal. This is the only acceptable method of allowing the right turning movement across 2 lanes of ahead traffic. The staging arrangement would be

Stage 1 – Newgate Lane southbound ahead and Newgate Lane East northbound ahead and left turn (phases A and B)

Stage 2 – Newgate Lane East southbound ahead and right turn under indicative arrow (phases B and D)

Stage 3 – Old Newgate Lane (phase C)

Staging Diagram



4.6 Under the Appellant's proposed staging the right turn movement from Newgate Lane north into Old Newgate Lane could at occur three points during the cycle of the signals

- during stage 1 with drivers turning right between gaps in the oncoming traffic flow
- during the interstage period between stages 1 and 2
- during stage 2 when they would have right of way with the right turn indicative arrow

4.7 Drivers arriving during stage 1 would have to make judgement to find a safe and acceptable gap in the oncoming traffic flow in which to complete their turn. The oncoming traffic may pass through the junction in two lanes. The presence of a vehicle approaching in the lane nearest to the waiting driver may obstruct the visibility to a vehicle in the furthest lane. When making a decision on when it is safe to turn the driver may have limited or no awareness of a vehicle in the furthest lane. The driver would make their decision on when to turn based on the gaps in the traffic flow in the traffic lane they can see. The safety risk occurs as the right turning driver who has started to make their turn and is partially across the oncoming traffic lanes comes into conflict with an unsighted vehicle travelling through the junction in the furthest lane.

4.8 The majority of drivers in the furthest lane would be travelling straight ahead through the junction. This means that they would not be slowing down or be expecting to slow as they would have a green signal and be so close to the junction. The speed differential would contribute to the severity of a collision. The most expected form of collision would be a side impact to the right turning vehicle and driver.

4.9 Stage 1 would run for the majority of the signal cycle and the majority of drivers wishing to turn right would be faced with having to judge a safe gap to turn across the 2 lanes of oncoming traffic.

4.10 The Appellant's proposal would introduce an unacceptable yet avoidable safety risk to the junction.

Safety implications of the proposed method of signalling the right turn movement

4.11 There are 246 traffic signal junctions in Hampshire as recorded on Hampshire County Council's Inview Fault Management System. Of these there are 40 junctions where right turn movements cross two or more opposing lanes of ahead traffic. These are listed in the Appendix A. The overriding majority (36 junctions) use a fully signalised phase to control the right turn movement. The fully signalised phase only permits drivers to turn right when they

receive a green signal and appears when all conflicting traffic movements are stopped at red. It eliminates the give way right turn movement. Of these 26 junctions have included this safety feature since their implementation. This consistent approach has been taken at junctions located in 30mph, 40mph and 50mph speed limits. The remaining 10 junctions have required the right turn movement to be changed to fully signalled to address a proven safety record. These junctions will be covered in detail later in section 4.18. This demonstrates a well-established and widespread approach to the design and control of right turning movements across 2 lanes of ahead traffic.

4.12 There remain just 4 junctions in Hampshire where the right turn movement may cross two opposing ahead lanes of traffic under a give way arrangement either with or without a right turn indicative arrow phase. It should be noted that none of these 4 junctions have been implemented in the past 20 years. These are listed in Appendix B. To date the personal injury rates at these junctions have not required the intervention of safety remedial measures. This is attributed to a range of factors as detailed below for each junction.

London Road/Vicarage Rd, Blackwater

- located within a 30mph speed limit
- right turn prohibition which operates on a part time basis and has been in place for over 30 years. At this junction drivers use well-established diversion routes which may be more convenient.

Botley Rd / Nutburn Rd, North Baddesley

- located within a 30mph speed limit
- short flare (30 metres) and merge distances (50 metres) lowers vehicle speeds through the conflict point at the junction.

Woodside Avenue/Judds Close, Eastleigh

- located within a 30mph speed limit

Premier Inn, A335 Leigh Road, Eastleigh

- located within a 30mph speed limit
- close proximity to another signal junction (Leigh Road/M3 Junction 11 southbound off slip) which is within 100 metres. The adjacent provides regulated gaps in the oncoming traffic flow in which to turn right.

4.13 The above factors are not applicable to the proposed Newgate Lane East/Old Newgate Lane traffic signal junction. This junction sits within a 40mph speed limit on Newgate Lane East. The flare and merge distances are far greater being 100 and 150 metres respectively.

This provides the opportunity for drivers to increase their speed through the junction on the approach to the conflict point. The proposed traffic signal junction at Newgate Lane East/Old Newgate Lane is located around 800 metres north of the adjacent traffic signals at Peel Common roundabout. At such a distance any gaps created by the Peel Common roundabout traffic signals would be closed by the time the traffic approached the Old Newgate Lane junction. A right turn prohibition is not proposed at the junction and would not be viable. The junction forms the only access to Old Newgate Lane and the diversion route would require traffic to turn around at Peel Common roundabout. This would introduce a diversion length of over 1.6 kilometres for the residents of Old Newgate Lane.

4.14 The use of a fully signalised phase for controlling right turn movements across two or more opposing lanes of ahead traffic at new traffic signal junctions has been adopted for over 20 years in Hampshire. The Appellant's proposal is contrary to this established practice.

Design Approach Adopted by Other Local Authorities

4.15 It is useful to understand the design approach adopted by other local authorities where right turn movements cross two or more opposing lanes of ahead traffic. None have a formal written policy for the treatment of right turning traffic across 2 or more lanes of traffic. There is often an informal policy or design preference in how the right turn movement should be signalled controlled and what would be acceptable to that local authority.

The position of Southampton City Council is

> *"preference is always to fully control the movement when cars have to cross two lanes or more"* (Daniel Ward, ITS Team Leader)

In Portsmouth City Council the view is

> *"would always push for a separate right turn lane where that movement is crossing 2 or more lanes."* (Steve Flynn, Principal Traffic & Development Management Engineer)

West Sussex County Council's position is

> *"would be not to accept a design that would require right turning traffic to look for gaps across two lanes of normal traffic."* (Barry Edmunds, Asset Manager – Traffic Signals and Street Lighting)

East Sussex County Council's view is

> *"Fully signalised stages, in my opinion offer the most flexibility and are certainly more familiar to drivers."* (Nick Killick, Project & Maintenance Manager - Traffic Signals – ITS)

Kent County Council has the view that the give way arrangement where vehicles cross two or more lane of opposing traffic is

> *"it is not something we would permit as it is a safety issue… Crossing two lanes of traffic is problematic due to poor driver behaviour."* (Toby Butler, Traffic & Network Solutions Asset Manager)

4.16 In the investigation it is evident that local authorities exercise a strong and consistent design approach to the treatment of right turning movements across 2 opposing traffic lanes with the use of a fully signalised phase.

4.17 The Appellant's proposal is contrary to that expected by other local authorities.

Safety records of right turning movements across 2 ahead lanes at traffic signal junctions

4.18 Until the mid 1990's in Hampshire it was common place that right turning traffic would gap seek across 2 or more lanes of opposing traffic. This occurred at junctions where the 85th percentile vehicle speeds did not require the right turn to be fully signalised.

4.19 From the mid 1990's a safety collision trend was identified at a growing number of traffic signal junctions. This started to highlight a deterioration in safety where right turning drivers were giving way across 2 lanes of opposing traffic. The results were side impact collisions between right turning and oncoming vehicles. Since 1998 there have been 10 traffic signal junctions where the right turn movement has been changed from a gap seeking arrangement to a fully signalised phase. These junctions are listed below. This remedial action was taken to resolve and eliminate the cross over collisions between right turning vehicles and opposing vehicles travelling ahead. This change of signalling occurred at the following junctions.

Portchester Road/Downend Road in Fareham (junction A)
The Avenue/Gudge Heath Lane in Fareham (junction B)
The Avenue/Bishopsfield Road/Veryan in Fareham (junction C)

Park Road South/Solent Road in Havant (junction D)
Park Road South/Elm Lane in Havant (junction E)
London Road/Rosemary Lane/Green Lane in Blackwater (junction F)
Forton Road/The Crossways/Lees Lane North in Gosport (junction G)
Southampton Road/Castle Trading Estate in Portchester (junction H)
Wellington Avenue/Hospital Hill/Princes Way in Aldershot (junction I)
A325/Kingsley Road at Sleaford (junction J)

4.20 A summary of the safety record at a number of these junctions is outlined below. Details of the collisions taken from Hampshire Constabulary's road safety collision database is detailed in Appendix C. The safety record shows the number of personal injury accidents which involved a vehicle turning right across 2 lanes of opposing traffic. The records cover 10 year periods before and after the right turn movements were fully signalised.

Portchester Road/Downend Road (right turn indicative arrow replaced with fully signalised phase on 20 August 2004) - Junction A
11 collisions in 10 years before signal change
0 collisions in 10 years after signal change

The Avenue/Gudge Heath Lane (right turn indicative arrow replaced with fully signalised phase on 1 February 1998) - Junction B
8 collisions in 8 years before signal change (no access to data pre-1990)
2 collisions in 10 years after signal change

The Avenue/Bishopsfield Road/Veryan (right turn indicative arrow replaced with fully signalised phase on 26 August 1998) - Junction C
4 collisions in 8 years before signal change (no access to data pre-1990)
0 collisions in 10 years after signal change

Park Road South/Solent Road (right turn indicative arrow replaced with fully signalised phase on 4 February 2008) - Junction D
13 collisions in 10 years before signal change
0 collisions in 10 years after signal change

Park Road South/Elm Lane (right turn indicative arrow replaced with fully signalised phase on 1 May 2007) - Junction E
22 collisions in 10 years before signal change
1collision in 10 years after signal change

London Road/Rosemary Lane/Green Lane, Blackwater (right turn indicative arrow replaced with fully signalised phase on 8 October 2003) - Junction F
24 collisions in 10 years before signal change
2 collisions in 10 years after signal change

4.21 It should be noted that 5 of the 10 junctions (junctions A to E) where safety remedial action was taken are within a 5 kilometre radius of the proposed junction. This may suggest a particular problem in this area.

4.22 All these junctions were located on roads where the speed limit was either 40mph or 30mph. Newgate Lane East has a speed limit of 40mph. All these junctions required right turning drivers to cross 2 lanes of oncoming traffic of which both lanes travelled ahead. This mirrors the junction arrangement at Newgate Lane East/Old Newgate Lane. There are no other known factors which indicate that the right turn movements should have been fully signalled at the time the junction was opened. This indicates that the Appellant's proposal mirrors the signal junctions which developed the collisions involving right turning vehicles.

4.23 The national design guidance contained in Traffic Signs Manual Chapter 6 (Traffic Control) section 8.4.1 states that a fully signalled right turn should be considered where an opposed movement would be unsafe. One example of when a fully signalled right turn should be considered is where the 85th percentile speed of oncoming vehicles exceed 45 mph. Others include where separate control between right turning traffic and adjacent ahead movements is required, for example, when trying to accommodate parallel pedestrians or when both right turns from opposite arms are heavy. While examples are provided in Chapter 6 section 8.4.1 they are not exhaustive. It should be noted that it is national guidance and that in the case of the right turn movement the local authority has found it necessary to apply a specific requirement to address a safety problem.

4.24 There are multiple similarities between the proposed junction arrangement and that of other traffic signal junctions in Hampshire which have suffered a proven collision record involving right turning vehicles. These junctions were deemed unsafe and required Hampshire County Council to implement safety remedial measures by changing to fully signalled signal arrangements. To proactively address a previously demonstrated safety problem at similar traffic signal junctions the right turn movement would be fully signalled.

4.25 It is demonstrated by the evidence from similar traffic signal junctions that the Appellant's proposal would introduce an unacceptable safety problem.

Road Safety Audit

4.26 A Road Safety Audit (Stage 1) for the traffic signal junction was commissioned by Pegasus Group. The audit was completed by Andy Paul on 23rd February 2020. Only one item was identified in the Road Safety Audit which highlighted the right turn movement. An extract from the Audit is shown below

> *"Location – Junction right-turn lane*
>
> *Summary: Potential collisions between northbound vehicles on Gosport Road and vehicles turning right into Newgate Lane*
>
> *The traffic signal staging diagram doesn't appear to show the Gosport Road southbound right-turn phase operating within a signal stage. DMRB CD123 states that, where the 85th percentile approach speed is greater than 72 kph (45 mph), there is an increased risk of collisions between right-turning vehicles seeking gaps and on-coming vehicles travelling at speed. DMRB also states that where the 85th percentile approach speed is greater than 72 kph (45 mph), right-turns should be separately signalled.*
>
> *Higher northbound vehicle speeds on Gosport Road (particularly in off-peak traffic conditions) may mean that gap acceptance by the drivers of right turning vehicles could lead to right-turn collisions or to sudden braking and shunt type collisions.*
>
> *RECOMMENDATION*
>
> *At detailed design stage, signal staging / phasing should incorporate a separately signalled right-turn into Newgate Lane. It would be appropriate to measure northbound vehicle speeds to design signal staging and phasing arrangements accordingly."*

4.27 The Audit identified a road safety concern with the proposed give way right turn movement at the junction. The recommendation was that the right turn movement should be fully signal controlled.

4.28 The Appellant's proposal is contrary to the recommendation of their own independent Road Safety Audit.

5 Traffic Distribution Across Approach Lanes

5.1 The Newgate Lane East/Old Newgate Lane junction has been modelled using Linsig3 which is a nationally accepted traffic signal modelling software. The use of this modelling software is accepted. The modelling software informs of the junction performance including maximum queue lengths, average vehicle delays and total junction delay. The Appellant's model incorrectly models the Newgate Lane East northbound approach in the AM peak. This relates to the distribution of traffic across the two lanes on the Newgate Lane East northbound approach. Critically this underestimates the maximum queue length, average delay per vehicle and total delay on this arm.

5.2 Newgate Lane East is currently a single lane through the junction in both directions. The proposed junction would introduce a 2 lane approach on the southern arm. The single lane would widen to 2 lanes over a distance of approximately 100 metres from the junction. The 2 lanes would continue through the junction reducing back a single lane around 180 metres to the north. This results in a flare on the junction approach and merge after the junction.

5.3 The 2 lane northbound flared approach would be required for capacity. Drivers would be able to choose which lane to use on the approach to the junction. The traffic use of the flared lane would have an impact on the junction capacity.

5.4 The Appellant's Linsig model has been based on a traffic distribution of 70% of ahead traffic using the main lane (offside) and 30% of ahead traffic using the flared lane (nearside) on the Newgate Lane East northbound approach. This distribution has been applied to both the AM and PM peak models. This traffic distribution has not been agreed for the AM peak and has a direct impact on the queue lengths, average vehicle delay and total delay on the Newgate Lane East northbound arm during this period.

5.5 It is unclear where the Appellant's use of the 70% and 30% traffic distribution has originated.

5.6 A technical paper was published called 'Modelling Merges at Traffic Signal Junctions' (Chris Kennett 2012). The paper produced a methodology for modelling merging movements beyond signal junctions using Linsig software. Three traffic signal junctions were included in the paper of which two included a flare and merge layout similar to the proposed Newgate Lane junction. One of the findings was the traffic distribution across the flared lanes on the approach to the junction. An extract is shown below;

"It is clear from these results that not only is there a direct relationship between the nearside lane flow and total flow but that there is an unequal balance of flow between nearside and offside lanes, corresponding to the total flow of traffic. Simply put, as traffic flow increases, there will always be a greater number of vehicles using the nearside lane to the offside, where the lanes merge on exit. As the Y intercept is close to zero, traffic distribution can be expressed as a percentage of total traffic, (73.4% of PCU using nearside lane) or even as a direct ratio of approximately 3:1"

5.7 The findings indicate that 73.4% of vehicles on the two lanes approaches used the nearside lane. The remaining 26.6% of vehicles used the offside lane.

5.8 A further technical paper was published called 'Merging Traffic at Signal Junction' (Chris Kennett 2015) which expanded on the previous 2012 work. Data from another seven were included in the paper. The conclusion from the paper is below.

"The new data collected reinforces the findings of the earlier paper; that traffic flow in lanes approaching a merge is predictable and can be modelled. Furthermore, there is a consistent bias towards the nearside lane.
This gives us confidence that traffic flow in the nearside lane can be reasonably predicted by the expression:
*Fn = 0.735*FT*

Where Fn is the nearside lane flow and FT is the total flow."

The enhanced findings re-enforced the work from the original study. This showed that 73.5% of traffic used the nearside lane and 26.5% used the offside lane on a two lane approach. The Appellant's traffic model has used a lane distribution split of 70% and 30% for the Newgate Lane East northbound traffic flow which is shown by the lane connector flows on the Linsig network layout view. Using the 70%/30% distribution assigns a lower number of vehicles to the nearside lane than indicated by the above findings. As a result the maximum queue lengths, average delays per vehicle and total delay on Newgate Lane East northbound are under reported by the Appellant's model in the AM peak.

5.9 Of the 246 traffic signal junctions in Hampshire there are 6 junctions which include a flare and merge lane arrangement in their layout which is used by the main traffic movement. These junctions with the flare and merge movements are;

Wellington Avenue/Hospital Hill/Princes Way at Aldershot (junction K)
(Wellington Avenue eastbound – 100 metre flare length and 60 metre merge)

A326/Jacobs Gutter Lane at Totton (junction L)
(A326 southbound – 160 metre flare length and 120 metre merge)

Park Road South/Elm Lane/Parkway at Havant (junction M)
(Park Road South northbound – 55 metre flare and 100 metre merge)

Bridge Road/Swanwick Lane at Bursledon (junction N)
(Bridge Road eastbound – 80 metre flare and 100 metre merge)
(Bridge Road westbound – 110 metre flare and 90 metre merge)

Rownhams Road/Nutburn Road/Rownhams Lane at North Baddesley (junction O)
(Rownhams Road westbound – 30 metre flare and 50 metre merge)

A327/A3011/Summit Avenue Fleet (junction P)
(A327 westbound – 35 metre flare and 75 metre merge)
A3011 eastbound – 75 metre flare and 90 metre merge)

5.10 All of the named movements flare out from a single lane to two lanes at the signal junction. The movements continue as two lanes through the junction before merging back into a single lane beyond the junction. These arrangements match that proposed on Newgate Lane East northbound.

5.11 Site observations on the lane distribution on the flared approaches at four of the above junctions were conducted in October 2020. This data is contained in Appendix D. The observations recorded the queue lengths in the nearside and offside lanes at the traffic signals at the start of green. The data was collected during the peak traffic periods (08:00-09:00 and 17:00-18:00). This periods mirror the peak hours modelled.

5.12 The findings indicated the following

AM peak
72.8% of vehicles queued in the nearside lane and 27.2% queued in the offside lane

PM peak
69.9% of vehicles queued in the nearside lane and 30.1% queued in the offside lane

5.13 The findings indicate that in the AM peak the lane distribution used in the Appellant's model differs from that obtained from the site measurements. The lane distribution of ahead traffic in the Appellant's model is shown by the lane connector flows displayed in the network layout view in the Linsig model. The Appellant has assigned 30% of ahead traffic to the nearside lane and 70% of traffic to the offside lane. This imbalance towards the use of

~~the offside lane is contrary to both the findings of Chris Kennett and Hampshire County Council's on street observations. The proposed junction layout does not preclude the use of either lane to travel ahead but the Appellant's assumption that the offside lane will carry 70% of ahead traffic is incorrect. The Appellant's model based on their 30%/70% traffic distribution underestimates the maximum queue length, average delay per vehicle and total delay on Newgate Lane East northbound in the AM peak.~~

~~5.14 The Linsig model has been re-run to test the sensitivity of the lane distribution in the AM peak. The model has used the lane distribution values obtained by Hampshire County Council (72.8% in the nearside lane; 27.2% in the offside lane). These values have a lower differential between the lanes than those derived by Chris Kennett's work (73.5% and 26.5%) but have a greater differential than those used by the Appellant's model (30%/70%) for the AM peak. It is unclear where the Appellant's use of the 30%/70% distribution has originated. The use of the 72.8% and 27.2% traffic distribution in the re-run models is based on up-to-date observed lane usage for signalised approaches with the same road layout as the proposed. The re-run models provide an accurate and robust lane use distribution. The results from the re-run model are considered to provide the true indication of maximum queue lengths, average delays per vehicle and total delay in the AM peak on Newgate Lane East northbound.~~

~~5.15 The results for the model with the fully signalised right turn phase are compared with the Appellant's model below. These use the 72.8%/27.2% lane distribution split which is the correct ratio.~~

~~Right turn fully signalised phase~~

~~30/70 represents 30% of Newgate Lane East northbound ahead traffic in the nearside lane and 70% of ahead traffic in the offside lane~~
~~72.8/27.2 represents 72.8% of Newgate Lane East northbound traffic in the nearside lane (left and ahead traffic) and 27.2% in the offside lane (ahead traffic)~~

5.16 Maximum queue lengths

AM peak – Maximum queue lengths

	75 dwellings		115 dwellings		190 dwellings	
	30/70	72.8/27.2	30/70	72.8/27.2	30/70	72.8/27.2
Newgate Lane East northbound	57.1	79.1	57.3	81.2	58.3	82.9
Newgate Lane East southbound	5.3	5.3	5.3	5.3	5.3	5.3
Old Newgate Lane	1.9	1.9	2.6	2.6	3.9	3.9

Table 1: Fully signalised right turn Maximum Queue Length (PCUs) AM peak
Source 30/70 results: RWA Linsig modelling support note, October 2020
Source 72.8/27.2 results: Hampshire County Council sensitivity modelling, October 2020

5.17 The above results in table 1 indicate that using the measured lane distribution (72.8% and 27.2%) the maximum queue length on Newgate Lane East northbound would increase for every scenario. The results indicate that the Appellant's traffic model underestimates the queues lengths on Newgate Lane East northbound by around 27% to 29% in the AM peak.

5.18 Delay per vehicle

AM peak – Delay per vehicle

	75 dwellings		115 dwellings		190 dwellings	
	30/70	72.8/27.2	30/70	72.8/27.2	30/70	72.8/27.2
Newgate Lane East northbound	41.1	64.3	41.5	66.0	42.4	68.5
Newgate Lane East southbound	6.2	6.2	6.5	6.5	7.2	7.2
Old Newgate Lane	68.0	68.0	72.6	72.6	85.7	85.7

Table 2: Fully signalised right turn - Delay per Vehicle (seconds) AM peak
Source 30/70 results: RWA Linsig modelling support note, October 2020
Source 72.8/27.2 results: Hampshire County Council sensitivity modelling, October 2020

5.19 The results for the delay per vehicle above show that using the measured lane distribution (72.8% and 27.2%) the times increase by 23 to 26 seconds on Newgate Lane East northbound. This indicates that the Appellant's traffic model underestimates the delay per vehicle by around 36% to 38% in the AM peak.

5.20 Total delay

AM peak – Total delay

	75 dwellings		115 dwellings		190 dwellings	
	30/70	72.8/27.2	30/70	72.8/27.2	30/70	72.8/27.2
Newgate Lane East northbound	19.77	29.88	19.97	30.7	20.40	31.94
Newgate Lane East southbound	1.28	1.2	1.35	1.3	1.53	1.5

Table 3: Fully signalised right turn - Additional peak hour delay on Newgate Lane East (hours)
Source 30/70 results: RWA Linsig modelling support note, October 2020
Source 72.8/27.2 results: Hampshire County Council sensitivity modelling, October 2020

5.21 The above results (table 3) for the total delay show that using the measured lane distribution (72.8% and 27.2%) the total delay for Newgate Lane East northbound traffic increases by 10 to 12 hours. This shows that the Appellant's traffic model prediction for total delay on Newgate Lane East northbound is underestimated by around 34% to 36% in the AM peak.

5.22 The results indicate that they Appellant's traffic model incorrectly predicts the queue lengths, delay per vehicle and total delay for Newgate Lane East northbound in the AM peak. This is because the incorrect traffic distribution has been applied.

5.23 The 72.8%/27.2% traffic distribution values derived from on street observations are the correct values that should be used in the AM peak model. When compared with the Appellant' traffic distribution split the results for the correct (72.8%/27.2%) split indicate a significant increase in queue lengths, average delays per vehicle and total delay on Newgate Lane East northbound in the AM peak. This indicates that the approach is highly sensitive to relatively small changes in lane usage which demonstrates that the traffic signal junction would operate over capacity with an exponential impact in queuing and delay.

6 Summary and Conclusions

6.1 My evidence considers the transport related matters which are the subject of this Inquiry. I have been instructed by FBC to provide expert witness services for the Inquiry. My evidence considers the following:

- Signalling of the right turn movement from Newgate Lane East north towards Old Newgate Lane

- ~~Traffic distribution across the approach lanes on Newgate Lane East northbound~~

6.2 I explain how under the Appellant's proposal drivers would give way across 2 lanes of ahead traffic when turning right and the safety hazards associated with this arrangement. I then continue to detail the fully signalled right turn movement which would eliminate this safety hazard. This would remove the give way arrangement and only allow the right turn movement when the ahead traffic lanes are stopped. The fully signalled right turn is the safe and therefore acceptable method of control.

6.3 I outline the design approach taken by other local authorities to the signalling of the right turn movement across 2 lanes of ahead traffic. Their design requirements would expect a fully signalled right turn movement.

6.4 Using personal injury collision records from other traffic signal junctions in Hampshire where drivers were able to turn right across 2 lanes of ahead traffic I demonstrate that a safety problem occurred. These resulted in safety remedial action being taken which changed the right turn give way arrangement to a fully signalled arrangement. The Appellant's proposal mirrors the signal junctions which developed the collisions involving right turning vehicles.

6.5 A Road Safety Audit was produced by the Appellant for their proposal. The Audit identified a road safety concern with the proposed give way right turn movement at the junction. The recommendation was that the right turn movement should be fully signal controlled.

~~6.6 In terms of the traffic signal modelling the Appellant's has used a lane distribution of 70% (main lane) and 30% (flared lane) on the Newgate Lane East northbound approach in both the AM and PM peaks. With reference to published papers and data collected from~~

~~other sites I demonstrate that this incorrectly reflects the traffic distribution across the lanes. The imbalance of traffic between the lanes should be greater than that used by the Appellant. As a consequence the Appellant's model underestimates the level of queuing and delay on the Newgate Lane East northbound arm in the AM peak. The site data collected from similar traffic signal junctions in Hampshire indicates that a traffic distribution of 72.8% (nearside lane) and 27.2% (offside lane) is correct for the AM peak. The lane distribution of 70% and 30% is agreed for the PM peak as it matches the site data collected.~~

~~6.7 The AM peak traffic signal models with the fully signalled right turn has been run with the correct 72.8% (nearside lane) and 27.2% (offside lane) traffic distributions. This demonstrates that the Appellant's model underestimates the maximum queue length on Newgate Lane East northbound by 21 to 24 PCU's across the three development scenarios. This equates to an underestimation of the queue length by 125 to 140 metres across the three scenarios which represents a shortfall of 27%. The average delay per vehicle is underestimated by between 23 and 26 seconds across the three development scenarios which represents a 35% shortfall. The total delay on Newgate Lane East northbound in the AM peak is undercalculated by around 12 hours which is a shortfall of 36%.~~

~~6.8 I demonstrate through traffic signal model that when the correct lane distribution is applied to Newgate Lane East northbound in the AM peak that the Appellant's model markedly underestimates the queuing, average delay and total delay on that arm of the junction.~~

Conclusions

6.9 It is concluded that the Appellant's proposal for the right turn movement to give way across 2 lanes of ahead traffic at the traffic signal junction would introduce a serious safety hazard. It is a hazard that would be unacceptable and can be eliminated with the use of a fully signalled right turn movement.

~~6.10 The Appellant's has incorrectly distributed traffic across the 2 lanes on the Newgate Lane East northbound arm in the AM peak traffic signal model. Applying the correct traffic distribution across the lanes indicates that the Appellant's model significantly~~

~~underestimates the level of queuing, average delay per vehicle and the total delay on Newgate Lane East northbound in the AM peak.~~

6.11 In my opinion, the unacceptable impact on highway safety ~~and the severe impact on the operation of the highway network~~ justifies FBC's decision to refuse the application in accordance with paragraph 109 of the NPPF.

Appendix A

List of traffic signal junctions in Hampshire where right turn movements are fully signalled across 2 or more lanes of ahead traffic

SCN No.	Site location
SIG004	Wellington Ave / Hospital Hill, Aldershot *****
SIG005	Farnborough Rd / Boundary Rd, Farnborough
SIG014	London Road/Rosemary Lane/Green Lane, Blackwater *****
SIG021	Aldermaston Rd / Priestley Rd, Basingstoke
SIG023	A325 Farnborough Road / Prospect Avenue, Farnborough
SIG027	Winchester Road/Brighton Hill, Basingstoke
SIG035	A325/B3004 Kingsley Rd, Sleaford *****
SIG036	A30/Beggarwood Lane, Basingstoke
SIG039	Reading Rd / Whitmarsh Lane, Chineham
SIG040	Reading Rd/Long Lane, Chineham
SIG046	Reading Road / Popley Way, Basingstoke
SIG049	Ash Road / North Lane, Aldershot
SIG066	Forton Road / The Crossways, Gosport *****
SIG079	A32 / Forest Way, Gosport
SIG083	Park Road / Solent Road, Havant *****
SIG084	Park Road Nth/Sth / Elm Lane, Havant *****
SIG086	Maurepas Way / St Georges Walk, Waterlooville
SIG087	Petersfield Rd/Crossland Drive, Havant
SIG092	Hulbert Rd / Curzon Rd, Waterlooville
SIG093	Hambledon Rd / Aston Road, Waterlooville
SIG099	Downend Road / Portchester Road, Fareham *****
SIG102	A27 Peak Lane, Fareham
SIG103	East Street / Castle Trading Estate, Portchester *****
SIG104	The Avenue / Bishopsfield Rd, Fareham *****
SIG111	A27 Cams Hall Access, Fareham
SIG112	The Avenue/Gudge Heath Lane, Fareham *****
SIG119	Southampton Rd/Mill Lane, Titchfield
SIG147	A343 Riverway, Andover
SIG180	Churchill Way West / Sinclair Drive, Basingstoke
SIG189	Government House Road, Farnborough
SIG205	Wellington Avenue / The Westgate, Aldershot
SIG210	Churchill Way/Tesco, Andover
SIG216	Newgate Lane/HMS Collingwood, Fareham
SIG225	A327 Summit Avenue/A303 Cove Road, Fleet
SIG232	A340 Aldermaston Rd/Park Prewett, Basingstoke
SIG234	A30 Winchester Road/Kennel Farm, Basingstoke
SIG242	Oakhanger Road/Inner Relief Road, Bordon

*** junctions where right turn was fully signalled as a safety remedial measure**

Appendix B

List of traffic signal junctions in Hampshire where right turn movements can give way across 2 or more lanes of ahead traffic

Site No.	Site location
SIG014	London Road/Vicarage Rd, Blackwater
SIG126	Botley Rd / Nutburn Rd, North Baddesley
SIG134	Woodside Avenue/Judds Close, Eastleigh
SIG156	Premier Inn, A335 Leigh Road, Eastleigh