

Bronte Welham

From: Amanda Scholes on behalf of Planning.Responses
Sent: 01 February 2018 09:45
To: Planning Scanning
Subject: FW: 38848 - (HE ref #4116 / 79420): WA/73/17/OUT: Land East of Wandleys Lane, Fontwell
Attachments: Atkins Land East of Wandleys Lane Technical note_1.0.pdf

From: Richard Temple
Sent: 31 January 2018 11:08
To: Planning.Responses
Subject: FW: 38848 - (HE ref #4116 / 79420): WA/73/17/OUT: Land East of Wandleys Lane, Fontwell

Please scan as Highways England response.

Regards,

Richard Temple | Senior Planning Officer, Directorate of Place, Arun District Council | Location: Phoenix House, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

Please note this information is given without prejudice and represents the informal view of the officer and not an official opinion of Arun District Council.

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Save the environment - think before you print.

Sent: 30 January 2018 17:34
To: 'Gary Heard'
Cc: Richard Temple; 'Ben Daines'; Planning SE; Bowie, David; Cleaver, Elizabeth
Subject: RE: 38848 - (HE ref #4116 / 79420): WA/73/17/OUT: Land East of Wandleys Lane, Fontwell

Dear Gary,

Further to your email below, please find attached Atkins' review of the modelling undertaken for Land East of Wandleys Lane.

There are a number of issues to be addressed before Highways England can issue a final formal substantive response.

Please can you review and address the comments and make the necessary amendments at your earliest convenience?

Regards,

Richard Franklin

Highways England Company Limited | Registered Office: Bridge House, 1 Walnut Tree Close,
Guildford GU1 4LZ | Registered in England and Wales No. 9346363
Web: www.highwaysengland.co.uk

Sent: 18 January 2018 17:02

To: Franklin, Richard

Cc: Planning SE; Bowie, David; Cleaver, Elizabeth

Subject: RE: 38848 - (HE ref #4116 / 79420): WA/73/17/OUT: Land East of Wandleys Lane, Fontwell

Thanks Richard

I attach the drawings that we have available.

Regards,

Gary Heard

Senior Associate

For and on behalf of Peter Brett Associates LLP
Calgarth House, 39-41 Bank Street, Ashford, Kent, TN23 1DQ



Sent: 17 January 2018 12:48

Subject: RE: 38848 - (HE ref #4116 / 79420): WA/73/17/OUT: Land East of Wandleys Lane, Fontwell

Hi Gary,

Thanks for your email.

I am just emailing to confirm that we have received your email of 11th January below.

Our consultant Atkins is currently reviewing the information provided and has asked if scaled drawings (preferably in CAD) are available for the junction plans in the Technical Note?

With regard to response, Highways England will aim to respond within 21 days, which means that we will aim to respond by 1st February, provided that Atkins have completed the review by then.

Regards,

Richard Franklin

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Web: www.highwaysengland.co.uk

Sent: 16 January 2018 11:46

To: Franklin, Richard

Subject: RE: 38848 - (HE ref #4116 / 79420): WA/73/17/OUT: Land East of Wandleys Lane, Fontwell

Morning Richard

I've just called your office but I have been advised that you don't have a phone number – hence the email.

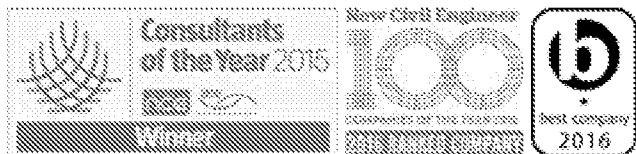
I'm following up my email below and I assume that you now have all of the information that you require. Can you please advise how your review of this information is progressing and when we may have a further response. If you'd like to give me a call on the landline number below that would be helpful. Many thanks.

Regards,

Gary Heard

Senior Associate

For and on behalf of Peter Brett Associates LLP
Calgarth House, 39-41 Bank Street, Ashford, Kent, TN23 1DO



From: Gary Heard

Sent: 11 January 2018 10:15

Subject: 38848 - (HE ref #4116 / 79420): WA/73/17/OUT: Land East of Wandleys Lane, Fontwell

Morning Richard

I tried to send you a couple of emails with model attachments etc – but I don't think it got through the firewalls. I reproduce the emails below and provide a link for you to download the files from.

<http://SimpleSend.it/d/b66c0263d2cc43859f856c05110ff481b9bbaa7f0d2d44>

Please find attached a technical note that addresses the comments you have raised in your emails of 18-12-2017 and 21-12-2017. I have also attached a number of other files as referred to within the note and as listed below. The east roundabout files will be sent on a separate email due to file sizes.

Traffic generation and distribution v18.pdf

This is the updated traffic flow diagrams (5.1 to 8.6) with the key colours adjusted.

Traffic generation and distribution v18 – HE flows.pdf

This is the traffic flow diagrams (A to G) illustrating the truing flows used within the attached models and as supplied by HE.

2019 A27-A29 West-AM-Cal.j9

2019 A27-A29 West-PM-Cal.j9

The Junctions 9 files for the 2019 AM and PM models of the west roundabout

2019 A27-A29 West-AM-Cal-Junctions 9 report_Main_Usebitmaps

2019 A27-A29 West-PM-Cal-Junctions 9 report_Main_Usebitmaps

Output files for the above models

2031 A27_A29 Fontwell W Rbt.lsg3x

2031 A27_A29 Fontwell W Rbt – full input data and results.doc

The Linsig file and output file for the west roundabout for 2031 Local Plan scheme with / without Wandleys Lane

2031 A27_A29 Fontwell W Rbt – MITIGATION – v02.lsg3x

2031 A27_A29 Fontwell W Rbt – MITIGATION - full input data and results v02.doc

The Linsig file and output file for the west roundabout for 2031 Local Plan scheme with / without Wandleys Lane and Wandleys mitigation.

2031 Sensitivity A27_A29 Fontwell W rbt – iT scheme.lsg3x

2031 Sensitivity A27_A29 Fontwell W rbt – iT scheme - full input data and results v02.doc

The Linsig file and output file for the west roundabout for 2031 Local Plan + Tye Lane scheme with / without Wandleys Lane

2031 Sensitivity A27_A29 Fontwell W rbt – iT scheme – MITIGATION v03.lsg3x

2031 Sensitivity A27_A29 Fontwell W rbt – iT scheme – MITIGATION v03 - full input data and results v02.doc

The Linsig file and output file for the west roundabout for 2031 Local Plan + Tye Lane scheme with / without Wandleys Lane and Wandleys mitigation.

As per my previous email I attach the east roundabout files as follows :

2019 A27-A29 East-AM-Cal.j9

2019 A27-A29 East-PM-Cal.j9

The Junctions 9 files for the 2019 AM and PM models of the east roundabout

2019 A27-A29 East-AM-Cal-Junctions 9 report.pdf

2019 A27-A29 East-PM-Cal-Junctions 9 report.pdf

Output files for the above models

2031 A27_A29 Fontwell E Rbt.lsg3x

2031 A27_A29 Fontwell E Rbt – full input data and results.doc

The Linsig file and output file for the east roundabout for 2031 Local Plan scheme with / without Wandleys Lane

2031 Sensitivity A27_A29 Fontwell E rbt.lsg3x

2031 Sensitivity A27_A29 Fontwell E rbt - full input data and results v02.doc

The Linsig file and output file for the east roundabout for 2031 Local Plan + Tye Lane flows with / without Wandleys Lane

We look forward to receiving your confirmation that the above and attached addresses your outstanding comments in relation to this application.

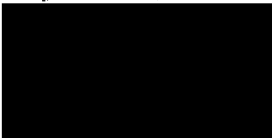
Regards,

Gary Heard

Senior Associate

For and on behalf of Peter Brett Associates LLP

Calgarth House, 39-41 Bank Street, Ashford, Kent, TN23 1DQ





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Technical note

Project:	Land East of Wandleys Lane	To:	Richard Franklin, David Bowie
Subject:	Lane East of Wandleys Lane Modelling Review	From:	Nii Dodoo
Date:	29 Jan 2018	cc:	Paul Harwood, Chris Cary, Alistair Bradley

1. Introduction

1.1. Background and Context

Atkins has been commissioned by The Highways England Spatial Planning team in Area 4 to review the traffic modelling undertaken by Peter Brett Associates LLP (PBA) for the Land East of Wandleys Lane Transport Assessment (reference WA/73/17/OUT). This technical note is to provide an informed opinion on whether the potential impacts of this proposal on the Strategic Road Network (SRN) have been adequately assessed and mitigated if necessary. The note should provide an informed view on whether the proposal will have a material impact upon the capacity of the SRN.

The Land East of Wandleys Lane planning application is for 157 dwellings and has been submitted to Arun District Council. The proposed site is located near the A27 Fontwell West and A27 Fontwell East Roundabouts. Highways England (HE) requested that the applicant provides further information in support of the application by modelling the development's impact on the A27 Fontwell West and A27 Fontwell East Roundabouts.

Highways England requested that the following scenarios were modelled:

Opening year

- Opening Year Base (existing geometry for both Fontwell West and Fontwell East Roundabouts - i.e. using Junctions 9 - with existing flows growthed to opening year using TEMPRO); and
- Opening Year Base + full development at Land East of Wandleys Lane.

2031 (End of Local Plan [LP])

- 2031 Base (Local Plan flows and mitigation for both Fontwell West and Fontwell East Roundabouts – i.e. using LINSIG); and
- 2031 Base + full development at Land East of Wandleys Lane.

2031 sensitivity test with Land East of Tye Lane development

- 2031 sensitivity base (Fontwell West Roundabout: Land East of Tye Lane flows and [i-Transport] mitigation / Fontwell East roundabout: Land East of Tye Lane flows and Local Plan mitigation – i.e. both using LINSIG); and
- 2031 sensitivity base + full development at Land East of Wandleys Lane.

To assist, Highways England provided the applicant with agreed models for these junctions / scenarios, prepared for the Lane East of Tye Lane development (WA/44/17/OUT). It was also advised by Highways England that the models should be reviewed to make sure models are fit for purpose. Peter Brett Associates LLP (PBA) has undertaken the modelling and provided the modelling outputs and an associated technical note.

Atkins has been requested to review the technical note and associated modelling, checking that the geometry is consistent with the Land East of Tye Lane modelling, and that the development flows have been added to the Land East of Tye Lane modelling flows correctly.

1.2. Documents Provided

Documents available:

- Email brief between Highways England and Peter Brett Associates LLP;

Technical note

- Email from Peter Brett Associates LLP on 11/01/2018 and associated documents;
- Modelling undertaken for Land East of Tye Lane development; and
- Drawing of the A27 Fontwell West Roundabout proposed partial signalisation scheme.

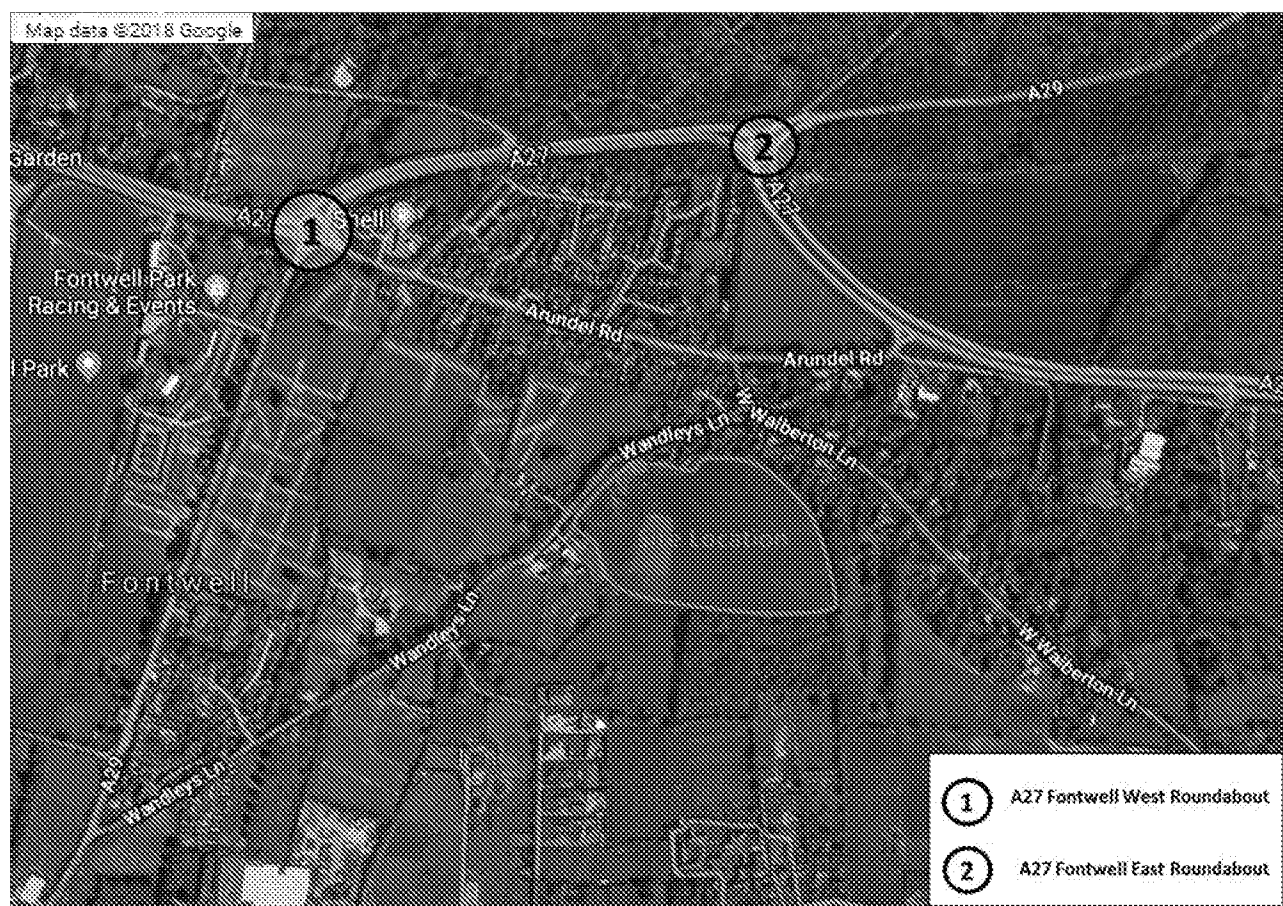
Technical note

2. Land East of Wandleys Lane

2.1. Site Information

The proposed site location is immediately east of Wandleys Lane, Fontwell (Error! Reference source not found.). The key proposed vehicular access point to the site is on Wandleys lane. The proposed development is for 157 dwellings.

Figure 1 Site Location



Fontwell West Roundabout is a four-arm un-signalised roundabout with single lane approaches on Arundel Road East and A29 South approaches. The A27 North and A27 West approaches both have two lanes with the A27 West approach flaring to three lanes at the roundabout.

Fontwell East roundabout is a three-arm un-signalised roundabout. The A27 West and South approaches both have two lanes however the A27 South approach flares to three lanes at the give-way line. The A29 East approach is a single lane that widens to two lanes approximately 55m back from the junction.

The two roundabouts are approximately 620m apart and are key connections to and along the strategic road network in this area.

2.2. Trip Generation and Trip Distribution

According to the Land East of Wandleys TA, a TRICS methodology was agreed with highways officers during the scoping stages of the assessment. This methodology was then used to obtain trip rates for the proposed 157-dwelling site. A review of TRICS using the same methodology described in the TA indicates that the Land East of Wandleys trip generation may slightly underestimate potential trip generation. A comparison of the TRICS outputs from the Land East of Tye Lane, Walberton TA also shows that trip generation is slightly higher than those used in the Land East of Wandleys TA. The TRICS outputs for Land East of Wandleys and Land

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East of Tye is shown in Table 1. In addition to this the trip rates shown in the Land East of Wandleys TA do not appear to match those referred in Appendix H which contains the raw TRICS outputs.

Table 1 Comparison of TRICS Outputs from Land East of Wandleys and Land East of Tye TAs

Description of Output	AM Peak (0800 - 0900)			PM Peak (1700 - 1800)		
	In	Out	Two Way	In	Out	Two Way
Lane East of Wandleys TRICS Output	0.108	0.361	0.469	0.32	0.165	0.485
Land East of Tye TA TRICS Output	0.143	0.401	0.544	0.364	0.212	0.576
Trip Gen using Land East of Wandleys Trip rate (157 dwellings)	17	57	74	50	26	76
Trip Gen using Land East of Tye Trip rate (157 dwellings)	22	63	85	57	33	90
Difference	+5	+6	+12	+7	+7	+14

The comparison of the TRICS outputs between the two TAs indicates that the trip generation for Land East of Wandleys may be underestimating to potential volume of development traffic generated by the site. Applying the trip rates from the Land East of Tye TA to the number of dwellings at Land East of Wandleys yields increased peak hours trips with additional two-way trips of 12 and 14 in the AM and PM peak hours respectively.

The Land East of Wandleys development trips were distributed onto the network using "Travel to work" data by Nomis at Super Output Area (MSOA) from the 2011 census. A high-level comparison with the Land East of Tye TA trip distribution indicates that the derived assumptions are consistent with each other.

Whilst the TRICS outputs differ between the two TAs, once the trips have been distributed onto the network the overall volume differences would be very minimal and are unlikely to have a substantial impact on modelling results on their own.

2.3. Forecast Traffic Flows

For the purposes of assessing the future impacts of the Wandleys Development traffic flows on the surrounding road network, Highways England requested two forecast years to be considered, 2019 and 2031. Background growth was interpolated from the 2017 to 2022 TEMPRO growth factors contained within the Wandleys TA. Using this method PBA derived growth factors of 1.0328 and 1.0327 for the AM and PM peak hours respectively.

In order to cross check these figures the same methodology as described in the Wandleys TA was used to obtain TEMPRO growth factors. Using TEMPRO version 7.2, data was refined to Arun rural principal roads, origin and destination NTM calculations were applied and growth factors of 1.0270 and 1.0261 were derived for the AM and PM peak hours respectively. These factors are lower than those derived using the interpolated method. A further check of the original TEMPRO growth factors from 2017 to 2022 in the Wandleys TA also indicates that these values are higher than those obtained using TEMPRO version 7.2 with a similar methodology.

Whilst it may be considered a robust option to have higher background growth, as both junctions are approaching or are at practical capacity the higher growth factors may mask the impact of additional development traffic. With slightly lower background growth the junctions may operate within practical capacity without the additional development traffic. Therefore, further clarification on the methodology and version of TEMPRO used to obtain background traffic flows should be provided.

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3. Traffic Flows Review

The traffic flow diagrams provided by Peter Brett Associates LPP have been compared to those included in the LinSig and Junctions 9 outputs. The following files have been compared, with no major differences or major concerns noted. In these cases, the traffic flows presented by PBA are consistent with those modelled.

- PBA's Figure B with relevant Junctions 9 output reports;
- PBA's Figure D with relevant LinSig reports;
- PBA's Figure E with relevant Junctions 9 LinSig reports;
- PBA's Figure F with relevant Junctions 9 LinSig reports;
- PBA's Figure G with relevant Junctions 9 LinSig reports.

On review of PBA's Figure C (2019 opening year base flows + Wandleys Lane development), a minor discrepancy has been noted in comparison to the flows input into the Junctions 9 model. In the PM peak on the west roundabout, PBA have modelled 154 ahead movements from the A27 Arundel Road West. This is 20 movements less than the 174 movements included in the flow diagram (PBA's Figure C). All other movements in PBA's Figure C are identical to the modelled flows. As part of the review, the junction was assessed based on the correct traffic flow of 174 ahead movements. A minor increase in RFC is recorded but this is considered to be of minimal impact. However, this error should be corrected.

The adding up of development flows has been checked and is considered to be correct. It is agreed that the sum of flows in PBA's Figure 6.1, Figure 8.4 and Figure D (AM peak hour) are equal to those in Figure G (2031 Local Plan base flows + Tye Lane + Wandleys Lane development, AM peak hour), and those in Figure 6.2, 8.5 and Figure D (PM peak hour) add up to the flows in Figure G (2031 Local Plan base flows + Tye Lane + Wandleys Lane development, PM peak hour).

It is also agreed, for the 2019 scenarios, that the sum of flows in PBA's Figure X, Figure Y and Figure Z correctly total the flows in Figure Q. However as mentioned in the previous section the background TEMPRO growth factors should be reviewed.

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4. Junction Model Review

Highways England officers provided several junction models to PBA to assess the development traffic impacts for both the Fontwell West and East Roundabouts. Both roundabouts currently operate as un-signalised roundabouts. However, there are improvements schemes proposed at both locations in the form of partial signalisation. Highways England have requested that PBA assess the potential impact of Wandleys proposed development traffic at both junctions in 2019 (Opening Year) and 2031 (End of Local Plan). In order to do this Highways England provided ARCADY model files of the existing junction arrangement for use in the 2019 scenario and the proposed LinSig files with partial signalisation for use in the 2031 scenario.

The following model files have been provided to Atkins:

Highways England model files provided to PBA

Existing Arrangement (ARCADY)

- A27 - A29 East-AM-Cal
- A27 - A29 East-PM-Cal
- A27 - A29 West-AM-Cal
- A27 - A29 West-PM-Cal

i-Transport Improvements (LinSig)

- A27_A29 Fontwell W Rbt - iT scheme

LP Improvement Schemes (LinSig)

- A27_A29 Fontwell E Rbt

It should be noted that details regarding the original validation of these models have not been provided to Atkins.

PBA used these model files to assess the potential impacts of Wandleys development traffic flows on junction capacity and performance. The following PBA model files were provided to Atkins.

2019 Opening Year Assessment (ARCADY)

- 2019 A27 - A29 East-AM-Cal
- 2019 A27 - A29 East-PM-Cal
- 2019 A27 - A29 West-AM-Cal
- 2019 A27 - A29 West-PM-Cal

2031 Local Plan Flows (LinSig)

- 2031 A27_A29 Fontwell E Rbt
- 2031 Sensitivity A27_A29 Fontwell E Rbt
- 2031 A27_A29 Fontwell W Rbt
- 2031 Sensitivity A27_A29 Fontwell W Rbt - iT scheme
- 2031 A27_A29 Fontwell W Rbt - MITIGATION v02
- 2031 Sensitivity A27_A29 Fontwell W Rbt - iT scheme - MITIGATION v03

Atkins has been requested to review the modelling undertaken by PBA, checking that the geometry is consistent with the Land East of Tye Lane modelling, as well as highlight potential issues that may impact on the SRN.

Technical note

4.1. 2019 Model Review

For the 2019 opening year assessments Highways England provided the ARCADY models for PBA to use for the junction assessments. The roundabout geometries for both junctions in the model files provided by Highways England and PBA were compared and were found to be consistent with no changes made.

4.1.1. Fontwell East Roundabout

4.1.1.1. Roundabout Geometry

As shown in Table 2, the geometries in the model files A27 - A29 East-AM-Cal and 2019 A27 - A29 East-PM-Cal provided by PBA 2019 were consistent with those provided by Highways England.

Table 2 Comparison of Fontwell East Roundabout Geometric Inputs

Highways England Model							
Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - A29 (E)	3.5	8.5	50	42	46	20	FAL SE
2 - A27 (S)	8	11.2	13.4	34	46	19	FAL SE
3 - A27 (W)	9.6	9.6	0	45	46	19	FAL SE
PBA Model							
Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - A29 (E)	3.5	8.5	50	42	46	20	FAL SE
2 - A27 (S)	8	11.2	13.4	34	46	19	FAL SE
3 - A27 (W)	9.6	9.6	0	45	46	19	FAL SE

The original details on model validation were not provided to Atkins. However, a review of the geometries suggests that a few of the measurements do not align with the existing layout of the junction. The measurements with the greatest disparity have been highlighted in red in Table 2.

On Arm 2 - A27 South approach the entry width has been entered as 11.2m however this appears to be overestimated (based on google maps measurements).

Arm 3 – A27 West approach the road half width has been entered as 9.6m. This is a two-lane approach however the approach road half width is not more than 8m. The increase in capacity on this approach may have been due to site observations and the calibration process, however information regarding the model validation has not been provided.

In summary, the use of the higher widths would overestimate the junction capacity and therefore lead to erroneous conclusions in terms of the performance of the junction in the future due to traffic growth (both background and development). It is therefore suggested that the model is updated to reflect more accurately the geometric parameters highlighted.

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4.1.1.2. Calibration

Intercept Adjustments have been directly entered on Arm 1 – A29 East approach based on Queue length surveys. These inputs for Highways England and PBA models are shown in Table 3.

Table 3 Intercept Corrections Applied in HE and PBA models

Model	Arm	Intercept Correction (PCU/hr)	Reason
HE 2019 A27 - A29 East-AM-Cal	1 – A29 E	-123	Queue Length Surveys
PBA 2019 A27 - A29 East-AM-Cal		-492	
HE 2019 A27 - A29 East-PM-Cal		-75	
PBA 2019 A27 - A29 East-PM-Cal		-300	

Queue length surveys have been provided as the reason for applying intercept corrections to the model. Without more information on the model validation process and methodology it is not possible to establish if they have been applied appropriately. However, it is not clear why the intercept corrections are not consistent between the PBA and Highways England models.

A further review of the traffic flows at the east roundabout suggests that intercept corrections should be applied to the A27 South approach in the AM and PM peak hours. In ARCADY the capacity of each approach is shared equally for all movements. The A27 South approach has two left lanes and one ahead. However, as shown in Figure 2, more than two thirds of the traffic using this approach are turning left in both the AM and PM peak hours. As there is unequal lane usage, intercept correction should be applied to reflect the capacity available for the traffic movements more accurately.

Figure 2 Fontwell East Roundabout South Approach Lane Usage



A review of the intercept corrections should be carried out and traffic flow movements should be taken considered.

Technical note

4.1.1.3. Flow Inputs

On review of PBA's Figure C (2019 opening year base flows + Wandleys Lane development), a minor discrepancy has been noted in comparison to the flows input into the Junctions 9 model. In the PM peak on the west roundabout, PBA have modelled 154 ahead movements from the A27 Arundel Road West. This is 20 movements less than the 174 movements included in the flow diagram (PBA's Figure C). All other movements in PBA's Figure C are identical to the modelled flows.

The 'Direct' 15-minute inputs method has been used for the AM and PM peak hours in the HE models. This method of traffic data input is considered the most accurate method of applying observed traffic flows in the Junctions model as this replicates the observed traffic profile. The PBA models have also adopted direct inputs however in scenario D1 2019 Opening Year Base, AM and PM the same OD matrix has been used each 15-minute period. This results in a flat profile which is not consistent with the HE models provided. However, for scenarios D2 2019 Opening Year Base + Wandleys, AM and PM the ODs entered for each 15-minute period are different and so it appears that the 'Direct' inputs method has been.

As a sensitivity test to understand the impact of traffic profiles on junction performance, the models were rerun using one-hour profiles. This had a substantial impact on junction performance and resulted in both the AM and PM peak hours operating over practical capacity.

Further clarity should be provided on how 15-minute direct inputs have been calculated as the junctions are very sensitive to changes in the traffic flow profiles.

4.1.2. Fontwell West Roundabout

Table 4 shows the geometries from the model files A27 - A29 West-AM-Cal and 2019 A27 - A29 West-PM-Cal. The table shows that the geometries provided by PBA 2019 were consistent with those provided by Highways England.

Table 4 Comparison of Fontwell West Roundabout Geometric Inputs

Highways England Model							
Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - A27 (N)	7.4	11.3	22	42	56	23	FAL SE
2 - Arundel Road	4.5	6.7	3.9	28	56	22	FAL SE
3 - A29 (S)	3.7	7.7	22	19	56	24	FAL SE
4 - A27 (W)	8	11.8	15	28	56	19	FAL SE
PBA Model							
Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - A27 (N)	7.4	11.3	22	42	56	23	FAL SE
2 - Arundel Road	4.5	6.7	3.9	28	56	22	FAL SE
3 - A29 (S)	3.7	7.7	22	19	56	24	FAL SE
4 - A27 (W)	8	11.8	15	28	56	19	FAL SE

Technical note

A review of the geometries suggests that a few of the measurements do not align with the existing layout of the junction. The measurements with the greatest disparity have been highlighted in red in Table 2.

On Arm 3 - A29 approach the entry width has been entered as 7.7m and the effective flare length has been calculated at 22m however upon review it appears that these may have been overestimated.

Arm 4 – A27 West approach the effective flare length has been entered as 15m, however this appears to have been underestimated.

A more detailed inspection of these measurements may be appropriate.

4.1.2.1. Calibration

Intercept Adjustments have been directly entered on several approaches based on Queue length surveys. These inputs for Highways England and PBA models are shown in Table 3.

Table 5 Intercept Corrections Applied in Highways England and PBA models

Model	Arm	Intercept Correction (PCU/hr)	Reason
HE 2019 A27 - A29 West-AM-Cal	2 – A. Rd	320	Queue Length Surveys
	3- A29	68	
PBA 2019 A27 - A29 West-AM-Cal	1 – A29 N	320	
	4 - A27 W	68	
HE 2019 A27 - A29 West-PM-Cal	1 – A29 N	-260	
	4 - A27 W	320	
PBA 2019 A27 - A29 West-PM-Cal	1 – A29 N	-260	
	4 - A27 W	320	

Details have not been provided on how the intercept corrections have been applied. Unlike the model files for the A27 A29 East Roundabout the inputs are consistent between the PBA and Highways England models. The intercept corrections are not consistent between the AM and PM peak hours. This could be due to calibrating the tidal flows along the A27, however details of the model calibration and validation have not been provided.

A further review of the traffic flows at the West roundabout suggests that intercept corrections should be applied to the A27 West approach in the AM peak hours. The A27 West approach has two left turn lanes and one lane for ahead, right and u-turn movements. As shown in Figure 3, there are very heavy left turn movements from the A27 West to the A27 East in the AM peak hour. These account for more than two thirds of the traffic on this approach and therefore an intercept correction to adjust the capacity on the approach would be advisable. Additionally, an intercept correction could be considered for the PM peak, however the flows are more evenly balanced in this peak hour.

Technical note

Figure 3 Fontwell West Roundabout West Approach Lane Usage



As the junctions are predicted to be nearing practical capacity in 2019 it is recommended that the intercept corrections are reviewed and robust reasons for their use provided.

4.1.2.2. Flow Inputs

Unlike the model files for the A27 A29 East Roundabout, one-hour profiles have been adopted for the West Roundabout model files. The flow profiles and inputs are consistent between the Highways England models and PBA models and the traffic flow diagrams provided. One arm is labelled incorrectly in all the ARCADY model files, the A27 north approach (arm 1) has been labelled as the A29 (N), however a review of the flows and geometries indicates that it is only a labelling error. A comparison of the flow inputs for the Fontwell East and West Roundabouts is shown in Table 6.

Technical note

Table 6 Intercept Corrections Applied in Highways England and PBA models

Model	Scenario	Flow Input	OD Matrix
HE 2019 A27 - A29 West	D1 2017 Base AM	One Hour Profile	One OD matrix
	D1 2017 Base PM	One Hour Profile	One OD matrix
PBA 2019 A27 - A29 West	D1 2019 Opening Year Base AM	One Hour Profile	One OD matrix
	D1 2019 Opening Year Base PM	One Hour Profile	One OD matrix
	D1 2019 Opening Year Base + Wandleys AM	One Hour Profile	One OD matrix
	D1 2019 Opening Year Base + Wandleys PM	One Hour Profile	One OD matrix
HE 2019 A27 - A29 East	D1 2017 Base AM	Direct Input	OD Matrix vary for each 15-minute period
	D1 2017 Base PM	Direct Input	OD Matrix vary for each 15-minute period
PBA 2019 A27 - A29 East	D1 2019 Opening Year Base AM	Direct Input	Same OD applied to each 15-minute period
	D1 2019 Opening Year Base PM	Direct Input	Same OD applied to each 15-minute period
	D2 2019 Opening Year Base + Wandleys AM	Direct Input	OD Matrix vary for each 15-minute period
	D2 2019 Opening Year Base + Wandleys PM	Direct Input	OD Matrix vary for each 15-minute period

4.2. 2031 Model Review

For the 2031 scenarios there are proposed improvements at both the Fontwell East and West Roundabouts. These improvements include changes to the junction layouts and partial signalisation. Highways England provided the following LinSig model files to PBA:

- A27_A29 Fontwell W Rbt - IT scheme
- A27_A29 Fontwell E Rbt

PBA updated these model files with new scenarios that include Land East of Wandleys development trips. PBA have also suggested further measures at the Fontwell West roundabout to mitigate the potential impact of Land East of Wandleys development trips. The following LinSig files have been provided to Atkins:

- 2031 A27_A29 Fontwell E Rbt
- 2031 Sensitivity A27_A29 Fontwell E Rbt
- 2031 A27_A29 Fontwell W Rbt
- 2031 Sensitivity A27_A29 Fontwell W Rbt - IT scheme
- 2031 Sensitivity A27_A29 Fontwell W Rbt - IT scheme - MITIGATION v02
- 2031 Sensitivity A27_A29 Fontwell W Rbt - IT scheme - MITIGATION v03

A review of the junction modelling has been conducted for both the A27-A29 East and West roundabouts.

Technical note

4.2.1. Fontwell East Roundabout

For the Fontwell East Roundabout two model files were provided by PBA:

- 2031 A27_A29 Fontwell E Rbt
- 2031 Sensitivity A27_A29 Fontwell E Rbt

A comparison of the modelling files indicates that the networks are identical to those from the Land East of Tye, provided by Highways England. The only differences are in the cycle times, signal optimisation and OD-matrices (however these have not been assigned correctly). The full model audit is provided in Table 7.

The first model file was for 2031 Local Plan scheme with / without Wandleys Lane and second for a sensitivity test with Tye Lane flows added on. However, the two model files provided are identical and both contain warning errors that desired flows do not match actual route flows. The OD matrices have been updated but it appears that the additional flows have not been assigned to the network in both model files.

The results reported for the 2031 A27_A29 Fontwell E Rbt model file match those reported in the PBA technical note. However, results for the sensitivity test do not match those reported in the note. Based on the modelling results PBA have concluded that no mitigation is required as it is predicted to operate within capacity after signal optimisation.

To understand the impacts of the additional traffic from Land East of Wandleys it is recommended that all traffic is assigned to the network, cycle time and signal time optimisation are implemented in scenarios 1 and 2 without Wandleys traffic flows. Cycle timings should be retained when testing future scenarios with Land East of Wandleys and Land East of Tye traffic flows. Signal timing optimisation should be carried out in all scenarios. An assessment of the potential impact on the SRN cannot be completed until these updated have been made.

Table 7 below presents a summary of review of the Fontwell East Roundabout.

Table 7 Fontwell East Model Audit

<u>Comment Number</u>	<u>Category</u>	<u>Comment</u>	<u>Recommendation</u>
1	Arms	Identical to Highways England model	No action required
2	Lanes	Identical to Highways England model	No action required
3	Lane length, External Links	Identical to Highways England model	No action required
4	Lane length, Internal Links	Identical to Highways England model	No action required
5	Saturation flows	Identical to Highways England model	No action required
6	Give-way movements	Identical to Highways England model	No action required
7	Connectors	Identical to Highways England model	No action required
8	Cruise times	Mean cruise time was not used and, instead, mean speed has been used. The mean speed is identical across both HE and PBA models.	No action required
9	Platoon dispersion / compression	Identical to Highways England model	No action required

Technical note

<u>Comment Number</u>	<u>Category</u>	<u>Comment</u>	<u>Recommendation</u>
10	Zones	Identical to Highways England model	No action required
11	Controllers	Identical to Highways England model	No action required
12	Pedestrian links, zones, connectors and flows	Not applicable	No actions required
13	Phase labelling	Identical to Highways England model	No action required
14	Minimum greens	Identical to Highways England model	No action required
15	Intergreens	Identical to Highways England model	No action required
16	Stage Sequence	Identical to Highways England model	No action required
17	Phase delays	Identical to Highway England model (not used in any case)	No action required
18	Prohibited moves	Identical to Highways England model	No action required
19	Time periods	Identical to Highways England model	No action required
20	Flow matrices	Traffic flows for scenarios 3 and 4 have not been assigned and the sensitivity test including Land East of Tye flows have not been included in the model.	OD matrices for the Sensitivity test should be updated to include Land East of Tye flows. Flows should be assigned onto the network correctly.
21	Scenarios	Sensitivity test scenarios do not include Land East of Tye Flows	Update flow matrices and assign flows correctly.
22	Optimisation	Traffic flows for scenarios 3 and 4 have not been assigned and the sensitivity test including Land East of Tye flows have not been included in the model.	
23	Cycle time	Cycle times in HE's model are 40 seconds in all four scenarios. In PBA's model, these have been adjusted to 45 seconds in the 2031 AM LP with MIT and 2031 AM LP with MIT + Wan scenarios, and to 35 seconds in the 2031 PM LP with MIT and the 2031 PM LP with MIT + Wan scenarios.	Cycle time optimisation should be carried out for AM and PM peak hours in the HE models. This cycle time should be used for future scenarios.
24	Signal timings	Signal timing optimisation should be carried using optimum cycle times from HE models have and once traffic has been correctly assigned to the network.	

Technical note

4.2.2. Fontwell West Roundabout

For the Fontwell West Roundabout several model files, shown in Table 8, were provided. These include two mitigation options that were considered by PBA. A review of the model files indicates that model files 1 and 2 are based on drawings provided by Highways England rather than the LinSig model provided. Model files 3 and 4 match the layout in the Highways England model provided.

A comparison model files 3 and 4 with the Highways England model found that the only network change was on the A27 East approach. This was an increase in flare length of 3 pcu as part of the proposed additional mitigation measure by PBA. The only other differences are in the cycle times, signal optimisation and OD-matrices. The full model audit is provided in Table 9.

A comparison of the cycle timings between the different scenarios indicates a disproportional change between cycle time, flows and network changes. Minor network changes or traffic flow increases have been accompanied by significant changes in cycle time. For example, widening the A27 East Arm by 0.7m per lane was accompanied by a change in cycle time from 40 seconds to 102 seconds. To assess the impact of development traffic flows in a pragmatic way, cycle timings should be optimised in the Highways England model and retained for other scenarios unless justified by substantial changes to network or traffic flow movements. Once optimum cycle times have been established in the Highways England model, signal timings can be optimised for each scenario.

Table 8 Review of Model Files Provided

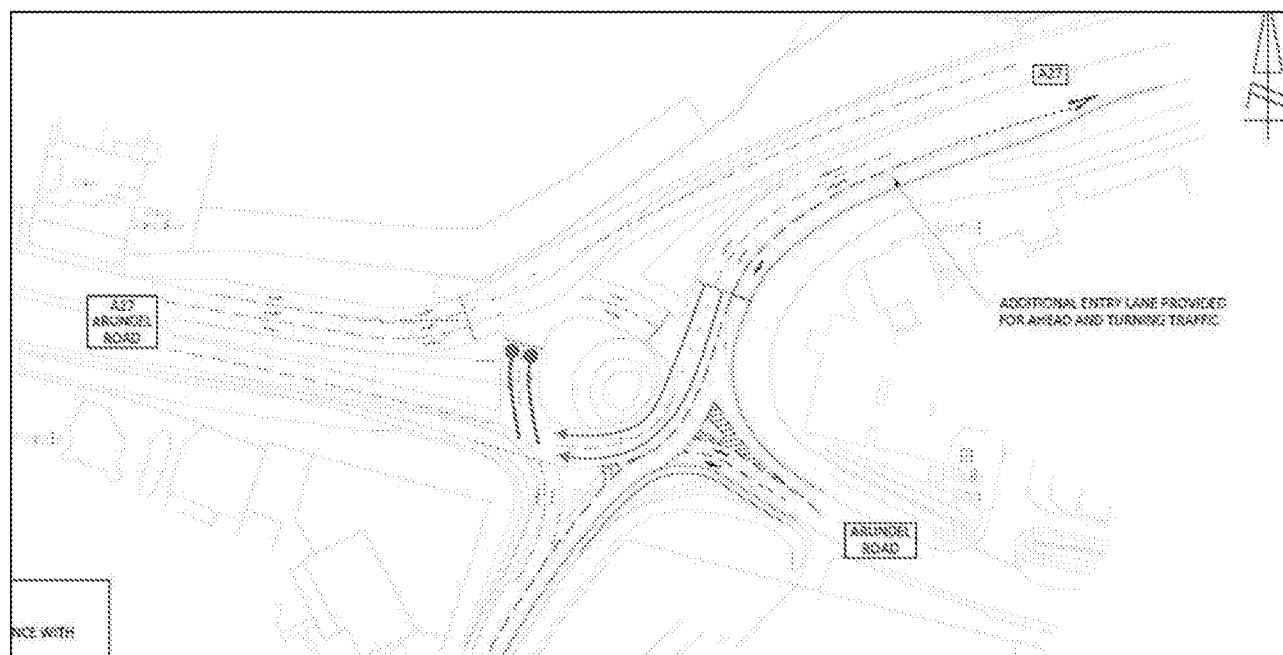
Model file Number	Model File	Description	Results consistent with Tech Note	Comment
1	2031 A27_A29 Fontwell W Rbt	2031 Local Plan scheme with / without Wandleys Lane	Yes	Model layout based on drawing from Highways England but is not consistent with the Highways England model provided. Cycle times between scenarios not consistent.
2	2031 Sensitivity A27_A29 Fontwell W Rbt - IT scheme - MITIGATION v02	2031 Local Plan scheme with / without Wandleys Lane and Wandleys mitigation. Mitigation proposal is to widen A27 East approach by 0.7m per lane. Assumed capacity increase of 100pcu per lane. Satflow on this approach has been increased by 70pcu per lane.	Yes	Unsure why cycle times differ so drastically to 2031 A27_A29 Fontwell W Rbt. Signal timings have not been optimised. Further explanation should be provided for the increase capacity. Note states 100pcu increase per lane but only 70pcu in model. Model does not match HE IT scheme model layout.
3	2031 Sensitivity A27_A29 Fontwell W Rbt - IT scheme	2031 Local Plan + Tye Lane scheme with / without Wandleys Lane	Yes	Unsure why cycle times differ so drastically to Highways England model scenarios.
4	2031 Sensitivity A27_A29 Fontwell W Rbt - IT scheme - MITIGATION v03	2031 Local Plan + Tye Lane scheme with / without Wandleys Lane and Wandleys mitigation. Mitigation proposal is to extend A27 East approach flare by 3pcu.	Yes	Cycle times should be reviewed.

Technical note

The proposed junction layout with partial signalisation, shown in Figure 4, results in very short circulatory stacking capacity. Based on the queue results in the proposed models, the queues in these short circulatory sections may extend beyond the non-blocking storage. As shown in Figure 4, this could result in a potential hazard if two lanes of traffic from the A27 East runs into the back of a queue on the western circulatory. Depending on the cycle time, staging and phasing, the predicted queues can vary significantly. Cycle time optimisation should be carried out and queue limits should be placed on circulatory sections based on non-blocking storage capacity.

As with the Fontwell East Roundabout, it is recommended that traffic is full assigned to the network, cycle time optimisation and signal optimisation are implemented in the Highways England models without Wandleys traffic flows. Cycle timings should be retained when testing future scenarios with Land East of Wandleys and Land East of Tye traffic flows. Signal timing optimisation should be carried out in all scenarios.

Figure 4 Fontwell East Roundabout Proposed Signalisation Layout



Technical note

Table 9 2031 Sensitivity A27_A29 Fontwell W Rbt - IT scheme - MITIGATION v03 Model Audit

<u>Comment Number</u>	<u>Category</u>	<u>Comment</u>	<u>Recommendation</u>
1	Arms	Identical to Highways England model	No action required
2	Lanes	Identical to Highways England model	No action required
3	Lane length, External Links	Identical to Highways England model	No action required
4	Lane length, Internal Links	Identical to Highways England model	No action required
5	Saturation flows	Identical to Highways England model	No action required
6	Give-way movements	Identical to Highways England model	No action required
7	Connectors	Identical to Highways England model	No action required
8	Cruise times	Mean cruise time was not used and, instead, mean speed has been used. The mean speed is identical across both HE and PBA models.	No action required
9	Platoon dispersion / compression	Identical to Highways England model	No action required
10	Zones	No change	
11	Controllers	Cycle times have been changed	Optimise cycle timings in HE model and retain them for future scenarios.
12	Pedestrian links, zones, connectors and flows	Not applicable	No action required
13	Phase labelling	Identical to Highways England model	No action required
14	Minimum greens	Identical to Highways England model	No action required
15	Intergreens	Identical to Highways England model	No action required

Technical note

<u>Comment Number</u>	<u>Category</u>	<u>Comment</u>	<u>Recommendation</u>
16	Stage Sequence	Identical to Highways England model	No action required
17	Phase delays	Identical to Highways England model (none included)	No action required
18	Prohibited moves	Identical to Highways England model	No action required
19	Time periods	Identical to Highways England model	No action required
20	Flow matrices	Flow matrices assigned appropriately	No action required
21	Scenarios	Highway England has modelled the following scenarios: - 2031 AM LP with MIT + Dev; and - 2013 PM LP with MIT +Dev PBA has modelled the following scenarios: - 2031 AM LP with MIT + Tye; - 2031 PM LP with MIT + Tye; - 2031 AM LP with MIT + Tye + Wandleys; - and - 2031 PM LP with MIT + Tye + Wandleys	No action required
22	Optimisation	Neither models have been optimised and are therefore consistent.	No action required
23	Cycle time	Highway England model: - 2031 AM LP with MIT + Dev: 45s; - 2031 PM LP with MIT + Dev: 58s PBA model: - 2031 AM LP with MIT + Tye + Wandley: 68s - 2031 PM LP with MIT + Tye + Wandley: 45s	Cycle time changes between all models and scenarios. Cycle times should be optimised and retained unless substantial changes to flows or junction layout have been made.
24	Signal timings	- Differences in signal timings are noted	Cycle timings should be optimised in HE model and then signal timings can be optimised.

Technical note

5. Conclusions

This review has identified key issues with the input data and modelling approach which are relevant and could have an impact on the result of the modelling assessment and conclusions.

The modelling results indicate that both the East and West roundabouts are predicted to operate at or close to practical capacity in the 2019 Opening PM peak hour without the additional Wandleys Lane development traffic. The West roundabout is also predicted to have one arm, A29 North, approaching practical capacity. The PBA technical note acknowledges that the addition of Wandleys lane does exacerbate the situation compared with the opening year models. In the 2031 scenarios the West roundabout is also predicted to operate above practical capacity even with improvements to mitigate the background traffic growth. This location is therefore predicted to be heavily congested in the future and as such sensitive to increases in traffic growth. It is therefore recommended that further details are provided on how the trip rates for the site and the TEMPRO growth factors were obtained. The cumulative impact of minor differences on a congested network could have a substantial impact.

For the 2031 scenarios, it is recommended that traffic is fully assigned to the network, cycle time optimisation and signal optimisation are implemented in the Highway England's models for both roundabouts. Cycle timings should be retained when testing future scenarios with Land East of Wandleys and Land East of Tye traffic flows. Signal timing optimisation should be carried out for all scenarios.

It is recommended that the ARCADY base models are reviewed and updated to ensure robustness for the baseline conditions which will form the basis for assessing the impact of the proposed development. LinSig models should be updated to ensure that changes in cycle time are proportional to changes to junction layout and traffic flow movements. LinSig models should also have all of the development traffic assigned to the network.

An assessment of the potential impact on the SRN would not be appropriate at this point until these changes have been completed in order to provide an accurate assessment of the development impacts on the network.