DMH Stallard

Matters 6 & 7 Hearing Statement

Mid Sussex Site Allocations DPD Examination in Public

On behalf of Welbeck Strategic Land (II) LLP

Matter 6 & 7: Hearing Statement

Mid Sussex Site Allocations DPD Examination in Public

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on behalf of

Welbeck Strategic Land II LLP

May 2021

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Appendices

A. Pell Frischmann A22 Modelling Report

1. Introduction

1.1 DMH Stallard LLP act on behalf of Welbeck Strategic Land (II) LLP ("Welbeck") in relation to the Mid Sussex Site Allocations DPD ("SA DPD") and the Examination in Public ("EiP").

1.2 Welbeck have a Promotion Agreement with the landowner of Imberhorne Farm, Imberhorne Lane, East Grinstead, part of which is allocated at Policy SA20 of the SA DPD and is known as Land West and South of Imberhorne Upper School, East Grinstead (the "Site").

1.3 Policy SA20 of the SA DPD allocates the Site for:

- 550 dwellings, including 30% affordable housing
- C4 hectares (net) playing fields for Imberhorne Secondary School
- Land for a 2FE Primary School (with Early Years provision)
- A mixed use 'hub', to include potential for a GP surgery
- A Care Village
- C40 hectares of Strategic SANG

1.4 This Hearing Statement responds to Matters 6 – Transport Infrastructure, Implementation and Monitoring, as well as Matter 7, as set out in the Inspector's Matters, Issues and Questions ("MIQs") – Document ID-02. It should be read in connection with the Regulation 19 representations (Doc ID SA20.10).

2. Matter 6: Are the transport, infrastructure, implementation and monitoring provisions of the plan sound?

Are there any necessary infrastructure needs that are not addressed in the Plan?

2.1 No comment.

Are there any sewerage, flood risk or water supply issues that could be described as significant constraints, and if so, can these realistically be overcome within the plan period, or would they impact on the effectiveness of the housing trajectory, or can they be described as 'show stoppers'? Should the Plan include a water efficiency policy, as recommended by Natural England? Should the Plan include a water supply/wastewater infrastructure policy, as recommended by Thames Water?

2.2 No comment.

Are there any issues arising from the development allocations of the Plan on the strategic highways network or on any locations with potential highways/ pedestrian safety issues? Can these issues be satisfactorily overcome? Several representations state that the Council's independently commissioned highways and transport studies, which generally support the site allocations in the Plan, are flawed; in what ways are these studies flawed? Is it acceptable/good practice for the highways impact of a scheme to be considered less than severe if the existing traffic conditions in the area, which admittedly not the result of the proposed allocation, are acknowledged to be severe; in other words, should the cumulative impact be the determining factor in assessing traffic impact in relation to the impact of a specific housing allocation? Reference is made to a recent study by WSP in relation to traffic conditions in the East Grinstead area; what were the principal conclusions of this study?

2.3 It has been demonstrated that there is suitable access to the Site allocated at Policy SA20 and that there will be connections to the existing pedestrian, cycling and highway network without giving rise to safety issues. This is set out in Doc. ID SA20.4 and at Appendix A (Pell Frischmann A22 Highways Modelling Report).

2.4 The Local Plan is informed by the district-wide Saturn modelling undertaken by Systra on behalf of MSDC. This type of model considers the impact of site allocations on the district as a whole and is an entirely standard and appropriate way of evaluating transport impacts at the Local Plan stage. This modelling concluded that the Plan could be delivered without causing a severe impact on the East Grinstead highway network. It is acknowledged that there are limitations associated with such a model in regard to the specific detail at a local level, however this can be addressed at planning application stage in the normal manner through the Transport Assessment process. Furthermore additional modelling on the A22 corridor (Appendix A) has been undertaken to supplement the MSDC modelling which supports the conclusions made therein.

2.5 From the information available, the 'WSP study' was undertaken for a different purpose, to inform the Tandridge Local Plan, and did not include the committed 'Atkins Do Minimum' improvement scheme at the junction and therefore should not be relied upon to provide the appropriate representation of the future operation of the junction in the context of the SA DPD. The study also only considers the junction in isolation and it is widely recognised by WSCC that the operation of this part of the East Grinstead highway network is inter-linked across a number of key junctions which each affect each other. As such there are limitations as to the weight of any conclusions which can be drawn from the standalone junction modelling.

2.6 To obtain a greater understanding of the existing operation and impact of development of A22 corridor it is necessary to undertake a traffic study on a corridor-wide basis. This has been done using a Microsimulation Model (VISSIM) which is appended at Appendix A to this statement and concludes that whilst some congestion is acknowledged in the future assessment scenarios, that the implementation of the committed Atkins and potential further strategic improvements can mitigate the impact of the proposed development at policy SA20 as well as planned growth and provide a betterment to overall journey times on some parts of the network.

Is policy SA35, which addresses the safeguarding of land for and delivery of strategic highway improvements, sufficiently justified, detailed and effective to enable the delivery of the following schemes: (i) A22 Corridor upgrades at Felbridge, Imberhorne Lane and Lingfield Junctions; (ii) A264 Corridor upgrades at Copthorne Hotel Junction; (iii) A23 junction upgrades at

Hickstead? Does the policy need to be extended to address potential highways issues in and around the proposed science and technology park to the north-west of Burgess Hill; the traffic impact of allocations SA12 and SA 13 to the south-east of Burgess Hill; and/or any other locations?

2.7 The Microsimulation modelling (Appendix A) has shown that strategic highway improvements on A22 corridor has the potential to facilitate development and even improve journey times on some links with the corridor. The policy to safeguard land (Policy SA35) ensures that these can be both delivered and the maximum potential benefit to the operation of the corridor to be achieved. The details of the schemes will be determined through further work with WSCC as highway authority through the normal Transport Assessment process as future planning applications come forward and therefore on this basis Policy SA35 is considered to be justified and sufficiently detailed to be effective.

Does the identification of detailed schemes for highways improvements provide the necessary certainty to enable key housing and employment allocations to be delivered, or is the opposite true, i.e. that securing detailed schemes at a relatively early stage in scheme delivery would be inflexible, and therefore counterproductive to effective scheme delivery? Is part of the solution in addressing the effectiveness of the Plan to set out a series of phased triggers or thresholds which would link the implementation of housing numbers to the delivery of key highways and sustainable transport improvements?

2.8 Policy SA35 is a policy acknowledging the potential need for highways improvements along the A22 (and other) corridor to support future growth. It does not identify that development can only occur where these highways improvement schemes have been implemented, but that land must be safeguarded, and proposals which might prejudice these highway schemes be resisted, so that where detailed planning application highways assessment requires junction mitigation, the land can be made available.

2.9 Policy SA35 is considered appropriate and necessary to acknowledge the importance and need for further corridor highway assessment and the possibility of future junction improvements, thereby resisting development proposal which could prejudice any schemes being delivered. It also remains sufficiently flexible to enable further consideration of the network and options to improve the flow of traffic, as part of the planning application process.

2.10 Policy SA35 specifically acknowledges that the detailed schemes to improve the identified locations (such as the A22) will be informed by more detailed design and feasibility work, as such, it is considered entirely flexible to enable schemes to come forward, where detailed highways assessment has considered schemes to be necessary. In relation to the A22 corridor, the drawings of the Felbridge, Imberhorne Lane and Lingfield Road junctions are simply 'areas of search', there are no detailed schemes shown, which further demonstrates flexibility in the implementation of the policy.

2.11 Furthermore, it is not considered necessary or appropriate for there to be a requirement for policy triggers or thresholds linking the implementation of housing to the delivery of key infrastructure, this would render the policy inflexible particularly where detailed planning application site assessment demonstrates that alterantive solutions are appropriate and at different stages in delivery. For example, the proposals which come forward on sites allocated within the SA DPD, such as the land west and south of Imberhorne Upper School, will be subject of vigorous highways assessment through the planning application process, if the junctions along the A22 are shown to require mitigation through that process, the applicant would be required to show detailed designs for the implementation of improvements, to be supported by policy SA35 in order to meet the relevant test, as set out in the NPPF (paragraph 109).

Is policy SA37 for the Burgess Hill/Haywards Heath Multifunctional Network both in principle and in relation to the preference of routes proposed for pedestrian and cycle routes, justified and effective? Although the policy is indicative, in view of the concerns expressed in some representations and the need for a measure of certainty, should the policy be linked to a realistic time frame for selection of preferred route(s) and final implementation of a preferred route(s)? What are the biodiversity impacts of pursuing the various options?

2.12 No comment.

Does the Plan adequately protect against the loss of playing fields and/or other community facilities?

2.13 Policy SA20 (land west and south of Imberhorne Upper School) requires a land swap agreement between WSCC and the developer/promoter to secure 6ha (gross) land to create new playing fields in association with Imberhorne Secondary School (c4ha net), this reflects the use of some land currently in use as playing fields, for primary access to the Site. This policy requirement will deliver a qualitative and quantitative enhancement of playing field provision thus protect against any loss.

3. Matter 7 – development management, uncertainties and risks

3.1 Welbeck intend to rely on previous evidence in respect of Matter 7.

Appendix A

Appendix A

Technical Note

Project	Imberhorne Farm, East Grinstead	**Prepared by:**	Rob Davies
Project No:	101470	**Approved by:**	Paul Cranley
Client:	Welbeck Land	**Status:**	Issue
Subject:	VISSIM Modelling Summary	**Date:**	May 2021

1 Introduction

1.1 Pell Frischmann (PF) is commissioned by Welbeck Strategic Land (II) LLP (the 'Promoter'), to provide transport planning and highways consultancy services, and to prepare this Technical Note (TN), in connection with the proposed development of land to the east and south of Imberhorne Upper School, Imberhorne Lane, East Grinstead, West Sussex (Policy SA20).

1.2 The purpose of this TN is to summarise the MicroSimulation (VISSIM) traffic modelling undertaken to understand the existing and future operation of the A22 corridor and inform the promotion of SA20. Full details of the VISSIM model together with the summary of results is contained within the Red Wilson Associates reports appended to this TN.

2 Previous Studies / Key Junctions

2.1 PF (and previously Iceni Projects) has been engaged with West Sussex County Council (WSCC) since 2017 in respect of the site. The study area pertaining to SA20 was agreed as being the A22 corridor from the A22 / A264 Felbridge junction to the A22 / Lingfield Road junction. The key junctions within the study area were identified as being:

- A22 London Road / A264 Copthorne Road (Felbridge) junction
- A22 London Road / Imberhorne Lane junction
- A22 London Road / Lingfield Road junction

2.2 The junctions detailed above have been subject to a two-stage traffic modelling approach with the first stage being a series of standalone junction assessment using LINSIG to provide an initial understanding of the existing and future operation of the junctions and to inform an optioneering process to determine potential improvements at each junction. This modelling was therefore used to provide an indication of the likely impact of the proposed development with the inclusion of potential improvements which would then need to be taken forward and considered within a Microsimulation (VISSIM) model of the wider network.

2.3 It was acknowledged and agreed through discussions with WSCC that there is a degree of interaction between the junctions referenced above and as such the operation of each of these junctions cannot only be considered in isolation to fully understand how they affect traffic movements across the highway network. To fully understand the operation of the A22 corridor, a Microsimulation model is required which enables the potential impact of traffic growth and planned development to be assessed on the corridor as a whole. This modelling tool is then able to better consider the overall impact on any strategic improvement schemes which could be introduced on this section of the A22 corridor to mitigate the impact of planned development and achieve a potential betterment in network performance.

3 Modelling Parameters

VISSIM Study Area

3.1 The parameters of the VISSIM modelling assessment were discussed and agreed with WSCC. The model was based on the previous models developed by WSCC and comprised two sections:

- Section 1 from A264 Copthorne Road by Birch Grove (signalised pedestrian crossing) A22 London Road east on Imberhorne Lane; and,
- Section 2 from A22 London Road by Lingfield Road (signalised pedestrian crossing) to A22 London Road by Jet Petrol Station (signalised pedestrian crossing).

3.2 Full details of the study area contained within each section of the model are shown within the Red Wilson Associates (RWA) reports appended to this TN. These reports also contain the relevant technical details of the VISSIM model.

3.3 The VISSIM model has been based on traffic surveys including a series of manual classified counts at key junctions and journey time surveys on key routes within the study area undertaken in March 2019. Using this information, a 2019 Base model was constructed and validated, and WSCC subsequently confirmed that it was 'comfortable that this provides a sound basis for assessing the impacts on A22 / A264 Felbridge, A22 Imberhorne Lane and A22 / Lingfield Road junctions'.

Assessment Scenarios

3.4 The modelling undertaken considered a future assessment year of 2031 to correlate with the end of the Local Plan period. A 2031 Future Base scenario was therefore derived which included the application of traffic growth, all relevant committed development (including Hill Place Farm, all Neighbourhood Plan developments and the relocation of Imberhorne Lower School and the associated development at Windmill Lane).

3.5 The 2031 Future Base scenarios also included proposed upgrades at the A22 / A264 Felbridge and A22 / Lingfield Road junctions known as the Atkins 'Do Minimum' schemes. It is understood from discussions with WSCC that these improvement schemes represent committed highway works and should therefore be included within the future baseline position.

3.6 The methodology outlined above and provided in detail within the appended RWA reports was agreed with WSCC as being appropriate for use in the context of assessing the impact of SA20 on the highway network.

3.7 It should also be noted that the traffic modelling undertaken does not include any allowance for modal shift or sustainable travel interventions in association with the proposed development. As part of the Transport Assessment process associated with any forthcoming planning application, a comprehensive sustainable transport strategy would be developed to maximise the opportunities which the location of the site presents in regard to both active travel and enhanced public transport use.

4 Potential Junction Improvement Schemes

4.1 The modelling process outlined above has enabled PF to develop strategic improvement schemes at the three key junctions which provide further benefit to the operation of the A22 corridor beyond that which would be achieved through the implementation of the Atkins Do Minimum schemes. The potential improvements are shown on the following drawings and are appended to this TN:

- **A22 / Imberhorne Lane:** Drawing number 101470-T-016A.pdf
- **A22 Felbridge Approach**: Drawing number 101470-T-015.pdf
- **A22 / Lingfield Road:** Drawing number 101470-T-002.pdf

4.2 The above drawings have been incorporated within the traffic modelling exercise contained within the RWA reports. Following discussion of the results with WSCC, the proposed layout for the A22 / Imberhorne Lane junction has been subject to slight modifications and these are shown on the drawing number 101470-T-O16C.pdf (although these minor modifications are not considered to have a material impact on the conclusions of the traffic modelling results).

4.3 The improvement schemes detailed above have been subject to a robust review including initial Stage 1 Road Safety Audit and swept path analysis. It acknowledged that the schemes would be subject to further refinement and updated traffic modelling as part of Transport Assessment process however they are considered to be appropriate to demonstrate how strategic improvements could be delivered to help facilitate planning growth outlined within the Local Plan.

5 MicroSimulation Modelling

5.1 RWA undertook the VISSIM modelling in conjunction with PF to assess the potential impact of the proposed development. This modelling was undertaken in two stages, the first of which considered the impact of the overall development (550 dwellings) on the network in conjunction with all three strategic highway improvements detailed in para 4.1. The second stage of modelling then sought to further consider the impact of the phased delivery of the proposed development whereby different quantums of dwelling numbers were modelled with the staged delivery of the three highway improvement schemes.

Stage 1 Modelling – Total Development (550 units)

5.2 The results of the modelling for the total development (550 dwellings) are shown in the following attached reports:

- East Grinstead – VISSIM Modelling – Section 1 V3
- East Grinstead – VISSIM Modelling – Section 2 V2

5.3 The results of the modelling for Section 1 are contained within Tables 7.1 and 7.2 which clearly demonstrates an improvement in overall journey times across the network between the future base and proposed scenarios during both AM and PM peak periods. The results for Section 2 contained within Tables 7.1 and 7.2 of the respective report also shows an improvement in overall journey times between nodes within this section of the network.

5.4 From these results it is clear that the strategic improvement schemes at the A22 Felbridge approach, A22 / Imberhorne Lane junction and A22 / Lingfield Road would not only mitigate the impact of development at SA20, but provide a betterment to the overall operation of the A22 corridor.

Stage 2 Modelling – Phased Delivery

5.5 The results of the modelling for the phased delivery of SA20 is shown in the following attached reports:

- RWA – 19-20-264 Section 1
- RWA – 19-20-264 Section 2

5.6 The modelling contained within Section 1 considered the following development scenarios:

- 200 units – Atkins Do Minimum schemes only
- 325 units – as 200 units plus improvement scheme at A22 / Imberhorne Lane
- 550 units – as 325 units plus improvement scheme at A22 Felbridge approach

5.7 The modelling contained within Section 2 considered the following development scenarios:

- 450 units – Atkins Do Minimum scheme only

5.8 The results of the modelling assessment for Section 1 are shown in Tables 2 to 7, and results for Section 2 are shown in Table 1 and 2 of the respective reports. These tables present the journey times for movements between nodes on the network for the different assessment scenarios and detail the comparative difference relative to the future base scenario. From this information it is possible to conclude that for each of the scenarios considered, the overall impact of traffic associated with SA20 can be accommodated without causing a severe detriment to journey times on the network. Furthermore, the results show a betterment in journey times on some parts of the network in these scenarios.

5.9 Whilst it is acknowledged that further modelling would be required at planning application stage to determine the specific trigger points for any associated highways works, the modelling provides comfort that SA20 could be developed in a phased manner and with the staged delivery of potential strategic improvements schemes on the A22 corridor.

6 Conclusions

6.1 A series of traffic modelling assessments has been undertaken of key junctions and links on the A22 corridor within the vicinity of to understand both the existing local traffic situation and enable the evaluation of the impact of the proposed development on the operation of the surrounding highway network.

6.2 These assessments comprised both stand-alone junction assessments to consider the impact on key junctions, and a microsimulation assessment (using VISSIM) to consider the impact of the proposed development on the overall performance of the network.

6.3 There has been continued engagement with WSCC throughout this process to ensure that the parameters of the assessment in terms of future scenarios, committed development, traffic growth and technical details of the model were agreed in advance of the assessments being undertaken.

6.4 The traffic modelling adopted a two-stage approach with the first stage using LINSIG to consider the impact of the proposed development on the operation of key junctions in isolation and enable potential improvement schemes to be developed.

6.5 The second stage of modelling was undertaken which sought to evaluate the impact of the improvement schemes on the operation of the wider network as a whole using VISSIM. This measured in terms of journey times across the network and most significantly on the A22 corridor, with the implementation of the potential improvement schemes.

6.6 The potential improvement schemes would provide a strategic benefit to the highway network (and in particular the operation of the A22), and not simply to mitigate the impact of the proposed development at Imberhorne Farm. This approach has been discussed and agreed with WSCC and is considered to be the most appropriate solution to accommodate expected traffic growth and facilitate the wider growth of East Grinstead.

6.7 The traffic modelling assessment also demonstrated that the development could be delivered in a phased manner, with the strategic improvement schemes potentially delivered at the stages of the development as indicated within the modelling. Any potential phasing, and the specific details of the potential strategic highway improvements schemes would be subject to further modelling and subsequent refinement as part of the normal Transport Assessment process associated with any forthcoming planning application.

Technical Note

Project – VISSIM Modelling – East Grinsted
Subject – Base / Future Base / Proposed Model Supporting Note – Section 1 V3

Prepared By – Arpit Shar Date – 18th November 2019
Checked By – Asif Kahn Date – 18th November 2019
Approved By – Spencer Wilson Date – 20th November 2019

Contents

1. Introduction

Purpose/Scope

1.1. Red Wilson Associates (RWA) has been appointed by Pell Frischmann to develop future base and future proposed micro-simulation models using VISSIM, to be presented to West Sussex County Council (WSCC) as part of the future development in the vicinity of A22 London Road/Imberhorne Lane.

1.2. WSCC do not have any specific modelling guidelines that relates to microsimulation modelling. Industry best practice was used to caveat and being able to demonstrate validation of the modelling in the morning (AM) and evening (PM) peak periods against recently undertaken traffic turning counts and journey time data (March 2019). The final models developed are in accordance with the Design Manual for Roads and Bridges (DMRB) Modelling Guidelines.

1.3. The whole area was divided into 2 sections as per the previous modelling undertaken and was kept similar in this exercise. This is assuming that there would be less/no interaction between these two networks/sections as they are over 300m apart.

1.4. Section 1 modelling was undertaken in VISSIM version 10.00-12 (dynamic assignment) previously, while Section 2 modelling in version 5.04-12 (static assignment).

1.5. The existing base models provided by Pell Frischmann for both sections were considered calibrated and validated at the time and fit for the purpose of being used as a base line for comparison.

1.6. These provided/considered validated base models were re-run with 20 different SEEDS for both sections as a validity check, results from which were then compared against the recent traffic turning counts and journey times to ascertain the validation.

1.7. The modelled JYT difference vs. surveyed data for section 2 was within the acceptable range/limit of under 60sec and/or 15% in both peaks. Hence, no additional work was required to improve this section.

1.8. However, section 1 modelled JYT comparison results against the surveyed data were not within the acceptable limit. Hence it was agreed to re-calibrate/validate this section using VISSIM version 10.00-12 along with static route assignment. As this is a linear network, there would be no/less route choice available.

1.9. The purpose of the VISSIM Base models was to ensure that an accurate representation of the existing traffic network structure and appropriate traffic signal and network data have been applied. In addition, these VISSIM Base models will form the basis for comparison against scheme proposals.

1.10. This report details the development and validation of the Base (2019), Future Base (2031) and Future Proposed (2031) VISSIM Modelling for Section 1 for AM and PM peak periods.

Study Area

1.11. The site is located near A22 London Road off Imberhorne Lane south of Heathcote Drive in East

Grinstead and is shown in Figure 1.0. There are businesses like TGM Fitness Centre, Imberhorne School, Wickes and Screwfix in the vicinity of the site access.

1.12. The study site is comprised of two major and minor junctions as follows:-

1a. A264 Copthorne Road by Birch Grove (signalised pedestrian crossing),

1b. A264 Copthorne Road / Crawley Down Road (priority junction),

1c. A22 London Road / A264 Copthorne Road (signalised junction),

1d. A22 London Road / Furze Lane (priority junction),

1e. A22 London Road / Imberhorne Lane (signalised junction),

1f. Imberhorne Lane / Hills Road (priority roundabout),

1g. Imberhorne Lane / Heathcote Drive.

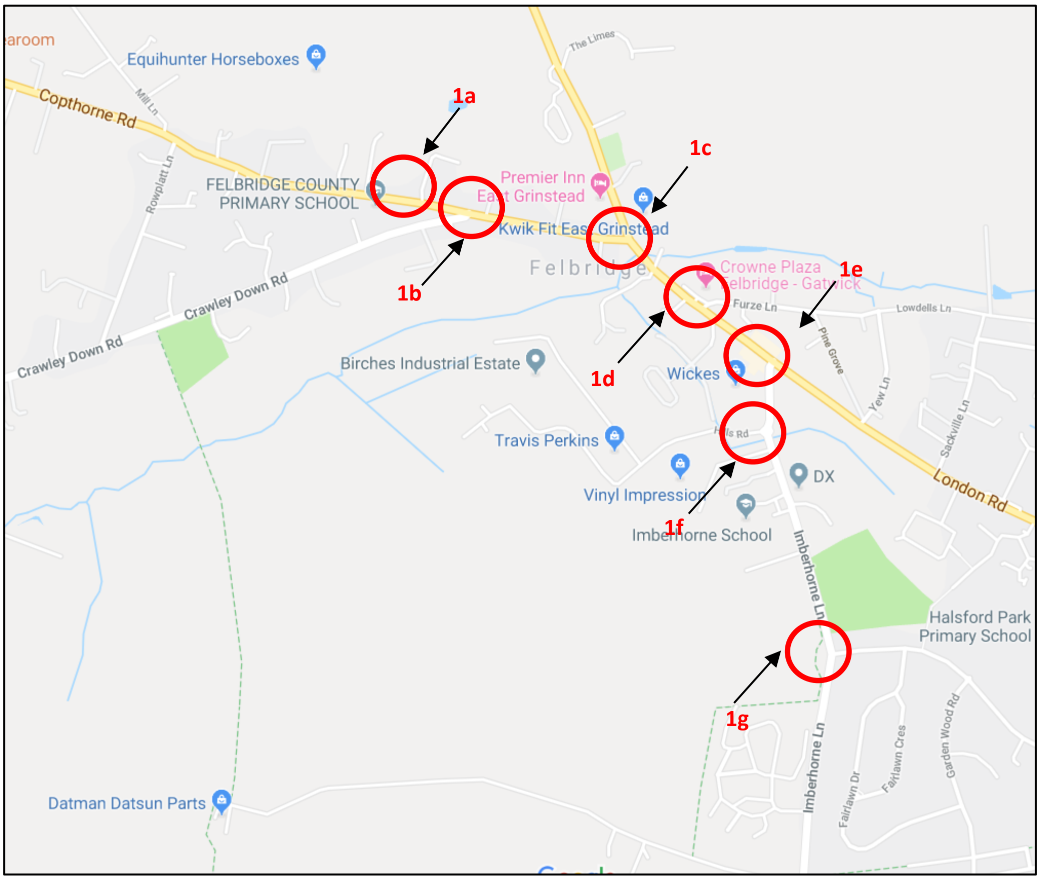

Figure 1.0 – Section 1 Study Area

2. Traffic Data Collection

Traffic Flow Survey

2.1. A data collection programme was undertaken to obtain traffic survey data in the morning (AM) and evening (PM) peak periods. The main surveys were undertaken on Tuesday 19th March for the entire site mentioned in Figure 1.0. Additional site observations were also carried for model calibration and validation purposes.

2.2. Traffic flows at some of the minor priority junctions were not available. Hence assumptions were made based on the calculated/adjusted traffic flows from the adjacent junctions as well as from previously provided validated model. These flows were balanced manually to control the traffic entering/exiting the network in north and southbound directions and were not considered as part of the calibration and validation process.

2.3. The time periods for the surveys were as follows:

- AM (Tuesday) – between 07:45 – 08:45,
- PM (Tuesday) – between 17:00 – 18:00.

2.4. However, model simulation peak period time was kept in a whole hour. It should not make a difference to the results as traffic flows for 1 hour peak used in the model were as in section 2.3. The model simulation time is as follow:-

- Friday AM peak hour: 08:00 – 09:00,
- Friday PM peak hour: 17:00 – 18:00, and

2.5. The vehicle classification used for recording turning count data in 15 minute intervals in the VISSIM models were as follows:

- Lights,
- HGVs (Heavy Goods Vehicles),
- Buses.

General Traffic Journey Time Survey

2.6. In-Car journey time data collected between all key sections in the north and southbound directions in the modelled area are as follows:-

- Weekday (Tuesday 19th Mar) – between 07:38 – 09:05,
- Weekday (Tuesday 19th Mar) – between 16:46 – 17:28.

2.7. This journey time survey data for the AM 1 hour peak was undertaken starting around 07:35 as opposed to the traffic surveyed data, which was at 08:00. Hence, the AM surveyed journey times was used as a reference to validate existing base VISSIM models as per the modelling guidelines with a difference of 15% or ± 60sec modelled journey time data. Journey Time sections undertaken and used in the VISSIM modelling (1 hour peak period) are as follows:-

A - London Road by Felbridge Close,

B – Imberhorne Lane / Heathcote Drive,

C – Imberhorne Lane / Hills Road,

D – London Road / Imberhorne Lane,

E – Eastbourne Rd Approach SB junction with London Road / Copthorne Road,

F – Copthorne Rd Approach,

G – Crawley Down Road.

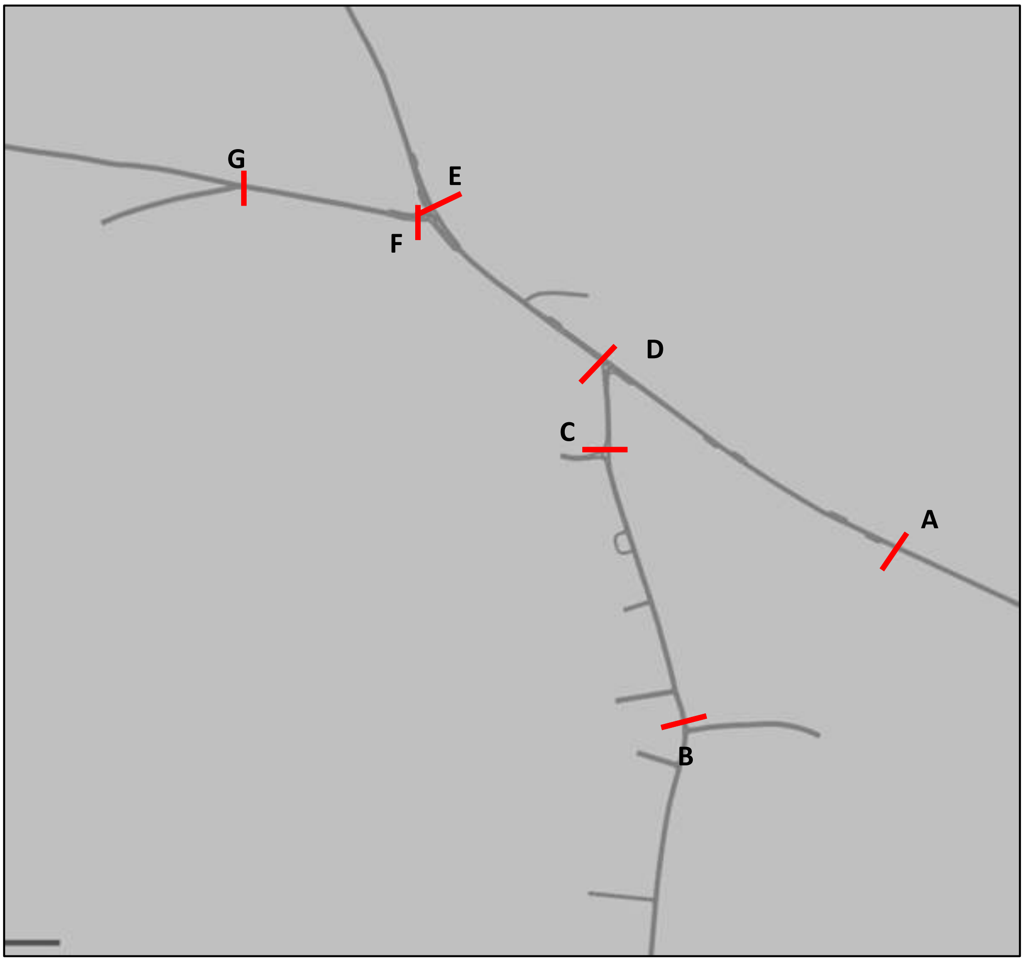

Figure 2.1 – Journey Time Sections

3. Calibrated Base Modelling

Model Development

3.1. VISSIM version 10.00-12 was used to code the outlined network in Figure 1.0 to calibrate signal timings, update the existing network layout and validate junction turning counts and journey time.

3.2. The previous version of models was developed in a Dynamic Route Assignment along with Origin/Destination (OD) routes. However, as this is a linear model with less/no interaction from rest of the network, less/no route choice availability and no OD data availability, the base models were developed using Static Route Assignment. This approach was agreed with the client prior to commencing model development.

3.3. The Fixed Time module was used to simulate signal operations.

3.4. All bus routes in the vicinity of the modelling scope were coded to the latest bus time tables. As no bus dwell times were available at each bus stop, average dwell time of 20second was used at each bus stop(s).

3.5. An internal audit was undertaken on completion of the model development prior to submission to external audit.

Simulation Parameters and Network Parameters

3.6. Recommended values were used based on the VISSIM template version 10.00-12. The simulation period for the AM and PM peak models includes a 15 minute warm-up period at the start of the simulation and a 15 minute cool-down period at the end with a 1 hour peak period. These warm-up and cool-down periods were used to replicate the existing network conditions/congestion in the models prior to collecting the data for comparison against the surveyed data.

3.7. Details of the simulation periods are presented in Table 3.1.

Peak Period	Start-up	Peak Hour	Cool-down
AM Peak	07:45- 08:00	08:00 - 09:00	09:00 - 09:15
PM Peak	16:45 - 17:00	17:00 - 18:00	18:00 -18:15

Table 3.1 – VISSIM base model simulation periods

Background

3.8. Bing/Google mapping was used to update the network layout. This was also supplemented by site visit to verify areas where background data was not available.

Vehicle Types and Classes

3.9. VISSIM uses individual vehicle models instead of Passenger Car Unit (PCU), which are grouped into vehicle types and are then grouped into vehicle classes. The following vehicle types were defined for the VISSIM model:-

- Lights (as Car, LGVs etc.),
- HGV (Heavy Goods Vehicles), and
- Buses.

Route Assignment

3.10. Due to the nature of the network as being more linear network and with no OD data available, local routing approach was used to develop the base models. Local routes are based on turning counts from survey data and proportions to take each turn into account at a junction. OD from previously provided model take as guidance to validate the traffic flows and those OD were adjusted accordingly to new traffic survey data.

Public Transport

3.11. Public transport data for bus routes within the model area (start times, routes, bus stops and frequency) were obtained from various online sources, which were then compared for reliability before inputting into the models. Bus stop locations were identified from the Google Maps, Street View and backed up by site visits. Average dwell times of 20 seconds assumed at all bus stops.

Priority Rules/Conflict Areas

3.12. Priority rules and Conflict Areas were applied at signalised and priority junctions to opposed turns (where applicable) to reflect on-street behaviour.

3.13. Priority rules were also used to replicate 'Yellow Box' and 'Keep Clear' markings where applicable. These rules were then adjusted to reflect the typical driving behaviour and their adherence to these traffic rules within the network as observed during site visits during calibration/validation process.

Reduced Speed Areas

3.14. Reduced Speed Areas (RSA) previously used in the previous version of the model was kept the same. This is to replicate lower speeds during turning manoeuvres and to calibrate through puts (saturation flow) at each signalised and non-signalised stop-line.

4. Validated Base Modelling

Base Model Validation

4.1. The VISSIM modelling results represent an average of 20 random SEEDs with an increment of 7 and starting SEED 49 in the AM and PM peak periods.

4.2. Each SEED in VISSIM represents different vehicular arrival times in the network, the stochastically variability of their driving behaviour and also selection of a certain distribution value e.g. speeds, dwell times etc. if applicable. None of the SEEDs replicate 'real life' better than another. It's more comparable to the daily changes of the traffic patterns at the same location.

4.3. The VISSIM Base modelling parameters were reviewed and adjusted continuously to better fit the observed driving behaviour during the calibration and validation process where applicable.

Traffic Flow GEH Statistic

4.4. The GEH statistic is a standard way of comparing observed and modelled flows as defined in the DMRB Volume 12, Chapter 4. It is used to remove the bias that exists when comparing flows of different magnitudes using percentages. For example, a difference of 10 in a flow of 100 vehicles per hour (VPH) is less significant (GEH = 3.0) than a difference of 100 in a 1000 VPH flow (GEH = 11.5), even though they both show a percentage difference of 10%.

4.5. The GEH statistic is calculated as follows:

$$GEH = \sqrt{\frac{(M-C)^2}{0.5 \times (M+C)}}$$

Where:
GEH...................is the GEH statistic;
M.......................is the modelled flow; and
C.......................is the observed flow.

4.6. In summary, the following set of acceptable ranges and limits have been used to assess model validation based upon all turning movements within the study area:

- GEH value: ≤5.0 in at least 85% of cases (< 3 for all critical links);

4.7. The AM and PM peak modelled traffic flow vs. surveyed data comparison shows that these models meet the validation criteria, where all the GEH values are less than 5 (100%) for all turning movements. In summary, all two models are considered to be validated well to the observed traffic flows. GEH comparison for the AM and PM peak periods are provided in Appendix A.

Car Journey Times

4.8. In car journey Time (JYT) survey data was undertaken on a weekday for the AM & PM peak periods. The JYT survey data ranges between 07:38 - 09:05 (AM) and 16:46-17:28 (PM) with an average of 2 to 3 runs for each JYT section.

4.9. Points to be noted that even though the JYT was across the whole route broken down in sections, it is comprised of less runs, slightly un-synced with the start/end peak hour times and only for 1 day. Hence, it does not represent an overall typical JYT for each route. The models were therefore adjusted where applicable to validate well as per the DMRB modelling guidelines.

4.10. A summary of the Journey Time (JYT) modelled vs. surveyed data comparison for the AM and PM peak periods is shown in Tables 4.1 & 4.2.

		Survey (Ave)		Base (Ave)	Actual Diff	%age Diff
	AM	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	Survey vs. Base	Survey vs. Base
SECTION 1	G to F	0:02:59	179	169	-10	-5%
	F to D	0:01:04	64	50	-14	-22%
	D to A	0:00:51	51	59	8	15%
	G to A	0:04:54	294	278	-16	-5%
	A to D	0:01:27	87	88	1	1%
	D to F	0:00:39	39	45	6	16%
	F to G	0:00:28	28	37	9	31%
	A to G	0:02:34	154	170	16	10%
	E to D	0:01:09	69	50	-19	-28%
	D to A	0:00:48	48	59	11	22%
	E to A	0:01:57	117	108	-9	-7%
	A to D	0:01:25	85	88	3	3%
	D to E	0:00:55	55	61	6	10%
	A to E	0:02:20	140	149	9	6%
	D to C	0:00:24	24	19	-5	-22%
	C to B	0:00:42	42	47	5	11%
	D to B	0:01:05	66	65	-1	-1%
	B to C	0:00:57	57	53	-4	-7%
	C to D	0:00:26	26	46	20	78%
	B to D	0:01:23	83	99	16	19%

Table 4.1 – AM Base VISSIM JYT validation results comparison vs surveyed data

	PM	Survey (Ave) JYT (hh:mm:ss)	Survey (Ave) JYT (sec)	Base (Ave) JYT (sec)	Actual Diff Survey vs. Base	%age Diff Survey vs. Base
SECTION 1	G to F	0:00:27	27	56	29	108%
	F to D	0:01:11	71	49	-22	-31%
	D to A	0:00:52	52	61	9	17%
	G to A	0:02:30	150	166	16	11%
	A to D	0:02:11	131	149	18	14%
	D to F	0:01:05	65	56	-9	-14%
	F to G	0:00:47	47	37	-10	-21%
	A to G	0:04:02	243	242	-1	0%
	E to D	0:01:29	89	50	-39	-44%
	D to A	0:00:58	58	61	3	5%
	E to A	0:02:28	147	110	-37	-25%
	A to D	0:01:46	106	149	43	40%
	D to E	0:01:28	88	68	-20	-22%
	A to E	0:03:13	194	217	23	12%
	D to C	0:00:54	30	21	-9	-29%
	C to B	0:00:42	42	44	2	5%
	D to B	0:01:36	72	66	-6	-9%
	B to C	0:00:36	36	72	36	99%
	C to D	0:01:41	101	85	-16	-15%
	B to D	0:02:16	137	157	20	15%

Table 4.2 – PM Base VISSIM JYT validation results comparison vs surveyed data

<u>Signal Timings</u>

4.11. Calibrated and Validated Base LINSIG models were produced as part of the project. Signal phases, stages, intergreen timings, phase delays, stage sequence and stage lengths were directly coded from Base LINSIGs into the Base VISSIM models.

<u>Error Logs</u>

4.12. An error logs were produced for all 2 peak periods to ensure there were no critical and/or a significant number of unacceptable errors produced at the end of each simulation run.

5. Summary and Conclusions - Base Models

5.1. Base VISSIM models were developed using March 2019 traffic survey flows and in-car Journey Time data for the morning and evening 1 hour peak periods respectively.

5.2. Car Journey Times are validated within 15% or ± 60 seconds when compared to the surveyed journey times for both peak periods, which is in accordance with the DMBR Modelling Guidelines.

5.3. As per the guidelines for traffic flow validation, 85% of all the traffic flows in the network should be validated to less than 5 GEH. Hence, the traffic flow in the network is validated to less than 5 GEH (100%) compared to the surveyed data for both peak period models.

5.4. The highest difference between modelled flow vs. surveyed flow that fails to clear in the network in the AM peak is from A22 London Road south to north by A264 Copthorne Road (approx. 40 vehicles, GEH. 2.0) followed by A22 London Road north to Imberhorne Lane (approx. 31 vehicles, GEH. 1.5). However, given the complexity of the network, it is not significant.

5.5. Similarly, the highest difference between modelled flow vs. surveyed flow failing to clear in the PM peak is from A22 London Road south to north by A264 Copthorne Road (approx. 51 vehicles, GEH. 2.6) follow by Imberhorne Lane to A22 London Road south (approx. 43 vehicles, GEH. 1.9).

5.6. Overall the VISSIM models both peaks based on the 2019 traffic flows and car journey time information shows that there is no existing significant capacity issue in the network.

5.7. These calibrated and validated Base VISSIM models are therefore considered fit to test any future scenario(s).

6. Future Base Models

Traffic Flows and Routes

6.1. Future Base traffic flows were provided by Pell Frischmann for the AM and PM peak periods (File name: 2031 BASE CASE AM & PM.xlsx). The Future Base 2031 Case used for each Peak to build the future base models.

6.2. VISSIM requires traffic data input by vehicle class. The vehicle class used in the Base models were comprised of lights, HGV and Bus. However, the future base traffic flows provided were only with HGV %age change and total vehicles. Therefore, %age split was applied from the 2019 to the 2031 traffic data for vehicular classes to derive the future base vehicle class split/uplift, except Bus which remained unchanged. This methodology was agreed with the Client prior to commencing proposed modelling.

6.3. The traffic flow comparison is provided in Appendix A.

6.4. Calibrated and validated Base VISSIM models (in section 5) were used as a basis to model the future base scenario for 2031 incorporating traffic growth and all local committed development flows (provided by Pell Frischmann).

6.5. Vehicle inputs and local routes were updated / amended to reflect the calculated growth in both peaks VISSIM models.

Signal Data

6.6. Signal timings in the future base LINSIG were reflected in the future base VISSIM models for all peak periods. However, the starting points (offsets) are changed where required without changing the stage lengths to fine tune offset timings.

Layout Changes

6.7. The VISSIM models have been updated to incorporate all highway improvements brought forward by the committed development as shown in Atkins proposals, drawing number 5107918/TP/PD/101 (Copthorne Road) . These changes are as follows:-

A264 Copthorne Road / A22 London Road

a. A264 Copthorne Road approach is currently comprised of a long lane (right turn) and a short flare (left turn) approx 56m. The left flare changed for left and right, flare length remains the same.

b. In order to accommodate the two lane traffic right turn from A264 Copthorne Road, A22 London Road SB exit changed from single lane to 2 lanes for approximately 100m with a merge.

c. Method of Control remains the same as in the Base.

Modelling Results Comparison

6.8. Traffic flow statistics is provided in Appendix A, where traffic flows are compared among survey flows (2019), base modelled flows (2019), future base calculated flows (2031) and future base modelled flows (2031) for the AM & PM peak periods.

Traffic Flow GEH Statistic

AM Peak

6.9. The highest GEH in the AM future base vs. future base calculated flow comparison is from A22 London Road south to north by A264 Copthorne Road (GEH: 1.7) followed by Imberhorne Lane right turn (GEH: 0.7) at southern junction, with a flow difference of 36 and 10 vehicles failing to cross the stop line.

6.10. The traffic flow has significantly increased in the AM future base from A22 London Road south to A264 Copthorne Road (127 vehicles), A264 Copthorne Road to A22 London Road south (112 vehicles) and A22 London Road north to south by Imberhorne Lane (110 vehicles). There will also be an increase in rest of the network, which ranges from 10 to 93 vehicles. Layout changes to the A264 junction improves throughput however there is additional congestion at the Imberhorne Lane junction as no improvements are proposed.

PM Peak

6.11. The highest GEH in the PM future base vs. future base calculated flow comparison is from A264 to A22 south (GEH: 0.9) with a flow difference of 24 vehicles failing to cross the stop line.

6.12. The traffic flow has significantly increased in the PM future base from A22 London Road south to north by Imberhorne (122 vehicles), A22 London Road south to north by A264 Copthorne Road (121 vehicles) and A22 London Road north to south by Imberhorne Lane (117 vehicles). There will also be an increase in rest of the network, which ranges from 50 to 99 vehicles.

6.13. These figures are considered not significant as it is well below 5 GEH.

Journey times

6.14. The AM base and future base modelling result comparison indicates that the journey times will increase slightly in northbound direction from A22 London Road south towards A22 Copthorne Road (A to G) by 11% (19 sec) and from Imberhorne Lane towards A22 south (B to D) by 42% (42 sec).

6.15. Similarly, the PM base and future base modelling result comparison indicates that the journey times will increase in southbound direction from A264 Copthorne Road towards A22 London Road south (G to A) by 67% (111 sec). The results also signify an increase in the northbound direction from Imberhorne Lane towards A22 south (B to D) by 24% (37 sec).

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	AM	Survey (Ave) JYT (sec)	Base (Ave) JYT (sec)	FBase (Ave) JYT (sec)	Actual Diff Base vs. FBase	%age Diff Base vs. FBase
SECTION 1	G to F	179	169	91	-79	-46%
	F to D	64	50	56	6	11%
	D to A	51	59	60	1	2%
	G to A	294	278	207	-72	-26%
	A to D	87	88	104	16	18%
	D to F	39	45	48	2	5%
	F to G	28	37	37	0	1%
	A to G	154	170	189	19	11%
	E to D	69	50	54	5	10%
	D to A	48	59	60	1	2%
	E to A	117	108	115	6	6%
	A to D	85	88	104	16	18%
	D to E	55	61	53	-8	-13%
	A to E	140	149	156	8	5%
	D to C	24	19	19	1	3%
	C to B	42	47	47	1	1%
	D to B	66	65	66	1	2%
	B to C	57	53	84	32	60%
	C to D	26	46	56	10	21%
	B to D	83	99	141	42	42%

Table 6.1 – AM Base VISSIM JYT validation results comparison vs Future Base

		Survey (Ave)	Base (Ave)	FBase (Ave)	Actual Diff	%age Diff
	PM	JYT (sec)	JYT (sec)	JYT (sec)	Base vs. FBase	Base vs. FBase
SECTION 1	G to F	27	56	127	71	127%
	F to D	71	49	85	36	73%
	D to A	52	61	64	4	6%
	G to A	150	166	277	111	67%
	A to D	131	149	142	-7	-5%
	D to F	65	56	44	-13	-22%
	F to G	47	37	38	0	1%
	A to G	243	242	223	-19	-8%
	E to D	89	50	84	35	70%
	D to A	58	61	64	4	6%
	E to A	147	110	149	38	35%
	A to D	106	149	142	-7	-5%
	D to E	88	68	53	-16	-23%
	A to E	194	217	194	-23	-10%
	D to C	30	21	25	3	15%
	C to B	42	44	45	1	2%
	D to B	72	66	70	4	6%
	B to C	36	72	51	-20	-28%
	C to D	101	85	68	-17	-20%
	B to D	137	157	120	-37	-24%

Table 6.2 – PM Base VISSIM JYT validation results comparison vs Future Base

7. Proposed Modelling

7.1. The VISSIM future base models were updated to develop proposals for the same year 2031, which were based on the future proposed LINSIG timings and Method of control. The traffic growth factor agreed was used to produce development flows, where routing proportions were kept similar to base and future base year modelling with minor adjustments where necessary.

Layout Changes

7.2. The layout changes are shown on Iceni Projects drawing number 17-T050 02 A (Imberhorne Lane) :-

A264 Copthorne Road / A22 London Road

a. Increase of the northbound bound A22 London Road flare of 160metres back to the hotel entrance/exit Including a right turn pocket into Furze Lane

b. London Road southbound right turn lane is proposed to be increased with the white lining removed to the north of the junction. This lane will operate as ahead and right due to the additional 2 lanes proposed on London Road to accommodate Copthorne Road right turning traffic.

A22 London Road / Imberhorne Lane

c. A22 London Road southbound 1 long lane with a right turn flare length of 110m.

d. A22 London Road northbound exit single lane changed to 2 lanes just by petrol station

e. A22 London Road northbound flare changed for ahead and left.

f. A22 London Road northbound flare length increased to 63m.

g. Imberhorne Lane remained the same.

Traffic Flow GEH Statistic

AM Peak

7.3. The highest GEH in the AM proposed vs. proposed calculated flow comparison is from A22 London Road south to A22 London Road North (GEH: 2.1) (Copthorne junction) with a flow difference of 47 vehicles failing to clear the stop line.

7.4. The traffic flow has increased in the AM proposed compared to AM future base from Imberhorne Lane south to north at Imberhorne Ln / Heathcote Drive junction (85 vehicles) and A22 London Road north to Imberhorne Lane (45 vehicles). There will also be an increase in rest of the network, which ranges from 1 to 85 vehicles. However, due to the layout changes at north and south junctions the network would still perform well.

PM Peak

7.5. The highest GEH in the PM proposed vs. proposed calculated flow comparison is from A22 London Road south to A22 Eastbourne Road north (GEH: 0.6) with a flow difference of 15 vehicles failing to clear respectively.

7.6. The traffic flow has increased in the PM proposed compared to PM Future base from Imberhorne Lane north to south at Imberhorne Ln / Heathcote Drive junction (76 vehicles) and A22 London Road north to Imberhorne Lane (69 vehicles). There will also be an increase in rest of the network. However, due to the layout changes at north and south junctions the network would still perform well.

7.7. These figures are considered not significant as it is well below 5 GEH.

Journey times

7.8. The AM future base and proposed modelling result comparison indicates that the journey times largely improve across the network. The most significant improvement can be found between A22 London Road south towards A22 Copthorne (A to G) and from Imberhorne Lane towards A22 south (B to D) which were the routes which increased the most between the base and future base.

7.9. When comparing the PM future base and future proposed results an even more significant improvement in journey times can be seen with an overall network reduction in journey times of 156 seconds.

		Survey (Ave)	Base (Ave)	FBase (Ave)	FPro (Ave)	Actual Diff	%age Diff
	AM	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 1	G to F	179	169	91	68	-23	-25%
	F to D	64	50	56	67	11	19%
	D to A	51	59	60	59	-1	-1%
	G to A	294	278	207	194	-13	-6%
	A to D	87	88	104	84	-20	-19%
	D to F	39	45	48	47	-1	-2%
	F to G	28	37	37	37	0	0%
	A to G	154	170	189	168	-21	-11%
	E to D	69	50	54	67	13	24%
	D to A	48	59	60	59	-1	-1%
	E to A	117	108	115	127	12	10%
	A to D	85	88	104	84	-20	-19%
	D to E	55	61	53	65	13	24%
	A to E	140	149	156	149	-7	-4%
	D to C	24	19	19	21	2	9%
	C to B	42	47	47	49	2	3%
	D to B	66	65	66	70	3	5%
	B to C	57	53	84	92	7	9%
	C to D	26	46	56	42	-14	-25%
	B to D	83	99	141	134	-6	-5%

Table 7.1 – AM VISSIM JYT comparison

		Survey (Ave)	Base (Ave)	FBase (Ave)	FPro (Ave)	Actual Diff	%age Diff
	PM	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 1	G to F	27	56	127	87	-40	-32%
	F to D	71	49	85	88	3	3%
	D to A	52	61	64	62	-3	-4%
	G to A	150	166	277	237	-40	-14%
	A to D	131	149	142	89	-53	-37%
	D to F	65	56	44	44	1	2%
	F to G	47	37	38	38	0	0%
	A to G	243	242	219	178	-52	-23%
	E to D	89	50	84	84	0	0%
	D to A	58	61	64	62	-3	-4%
	E to A	147	110	149	145	-3	-2%
	A to D	106	149	142	89	-53	-37%
	D to E	88	68	53	56	4	7%
	A to E	194	217	194	145	-49	-25%
	D to C	30	21	25	29	4	18%
	C to B	42	44	45	45	0	-1%
	D to B	72	66	70	74	4	6%
	B to C	36	72	51	49	-3	-5%
	C to D	101	85	68	55	-13	-19%
	B to D	137	157	120	104	-16	-13%

Table 7.2 – PM VISSIM JYT comparison

8. Summary and Conclusion

8.1. Existing base VISSIM models provided by Pell Frischmann were calibrated/validated for traffic flows, journey times and signal timings for the base year 2019 for the morning and evening peak periods. These models were previously based on Dynamic Route assignment with origin/destination routes (end to end). However as agreed, a static route assignment base model was developed due to the nature of the network being linear and with no/less interaction from side roads as well as less route choice.

8.2. These base validated VISSIM models were then used as a bench mark to produce future base and future proposed scenario models (2031) along with the layout changes at London Road / Imberhorne Lane junction.

8.3. The re-validated base VISSIM models were considered best fit for the purpose and to provide a benchmark for assessing the impact of the future demand in regards to the scheme and committed development within the vicinity of the study area, as the base modelling results compared to observed values was a close match for both traffic flows and journey times in the AM and PM peak periods.

8.4. The base vs. future base modelling result comparison indicates that the AM journey time will increase in the northbound direction, while the southbound will have improvements from Copthorne Road towards A22. PM journey time will increase in both the northbound and southbound directions.

8.5. Comparing the future base and proposed modelling results, it indicates that overall there is an improvement in journey times across the network in both the AM and PM peak. The improvements are most significant in the PM peak which was anticipated to be the more congested peak hour in comparison to the AM.

8.6. Please note that these results are based on the calculated traffic growth, which may change in 2031.

8.7. The overall scheme testing in VISSIM modelling with the projected traffic flow indicates that the scheme will perform well and will have no significant impact on the network.

Technical Note

Project – VISSIM Modelling – East Grinsted
Subject – Base / Future Base / Proposed Model Supporting Note – Section 2

Prepared By –	**Arpit Shar**	Date – **15th October 2019**
Checked By –	**Asif Kahn**	Date – **16th October 2019**
Approved By –	**Spencer Wilson**	Date – **20th October 2019**

Contents

1. Introduction

Purpose/Scope

1.1. Red Wilson Associates (RWA) has been appointed by Pell Frischmann to develop future base and future proposed micro-simulation models using VISSIM, to be presented to West Sussex County Council (WSCC) as part of the future development in the vicinity of A22 London Road/Lingfield Road.

1.2. WSCC do not have any specific modelling guidelines that relates to microsimulation modelling. Industry best practice was used to caveat and being able to demonstrate validation of the modelling in the morning (AM) and evening (PM) peak periods against recently undertaken traffic turning counts and journey time data (March 2019). The final models developed are in accordance with the Design Manual for Roads and Bridges (DMRB) Modelling Guidelines.

1.3. The whole area was divided into 2 sections as per the previous modelling undertaken and was kept similar in this exercise. This is assuming that there would be less/no interaction between these two networks/sections as they are over 300m apart.

1.4. Section 2 modelling was undertaken in VISSIM version 5.04-12 (static assignment), while section 1 modelling in VISSIM version 10.00-12 (dynamic assignment).

1.5. The existing base models provided by Pell Frischmann for both sections were considered calibrated and validated at the time and fit for the purpose of being used as a base line for comparison.

1.6. These provided/considered validated base models were re-run with 20 different SEEDS for both sections as a validity check, results from which were then compared against the recent traffic turning counts and journey times to ascertain the validation.

1.7. The modelled JYT difference vs. surveyed data for section 2 was within the acceptable range/limit of under 60sec and/or 15% in both peaks. Hence, no additional work was required to improve this section.

1.8. The purpose of the VISSIM Base models was to ensure that an accurate representation of the existing traffic network structure and appropriate traffic signal and network data have been applied. In addition, these VISSIM Base models will form the basis for comparison against scheme proposals.

1.9. This report details the development and validation of the Base (2019), Future Base (2031) and Future Proposed (2031) VISSIM Modelling for Section 2 for AM and PM peak periods.

Study Area

1.10. The site is located near A22 London Road / Lingfield Road Junction in East Grinstead and is shown in Figure 1.0. There are businesses like Homebase, Aldi and McDonald's in the vicinity of the study area.

1.11. The study site is comprised of two major and minor junctions as follows: -

1a. A22 London Road by Lingfield Road (signalised pedestrian crossing),
1b. A22 London Road /Lingfield Road (priority roundabout),
1c. A22 London Road / Maypole Road (priority junction),
1d. A22 London Road by Maypole Road (signalised pedestrian crossing),
1e. A22 London Road / Garland Road (priority junction),
1f. A22 London Road / A22 Station Road (unsignalised junction),
1g. A22 Station Road / Park Road (priority junction),
1h. A22 Station Road by Park Road (signalised pedestrian crossing),
1i. A22 London Road by Moat Road (signalised pedestrian crossing),
1j. A22 London Road / Moat Road (priority junction),
1k. A22 London Road by Jet Petrol Station (signalised pedestrian crossing)

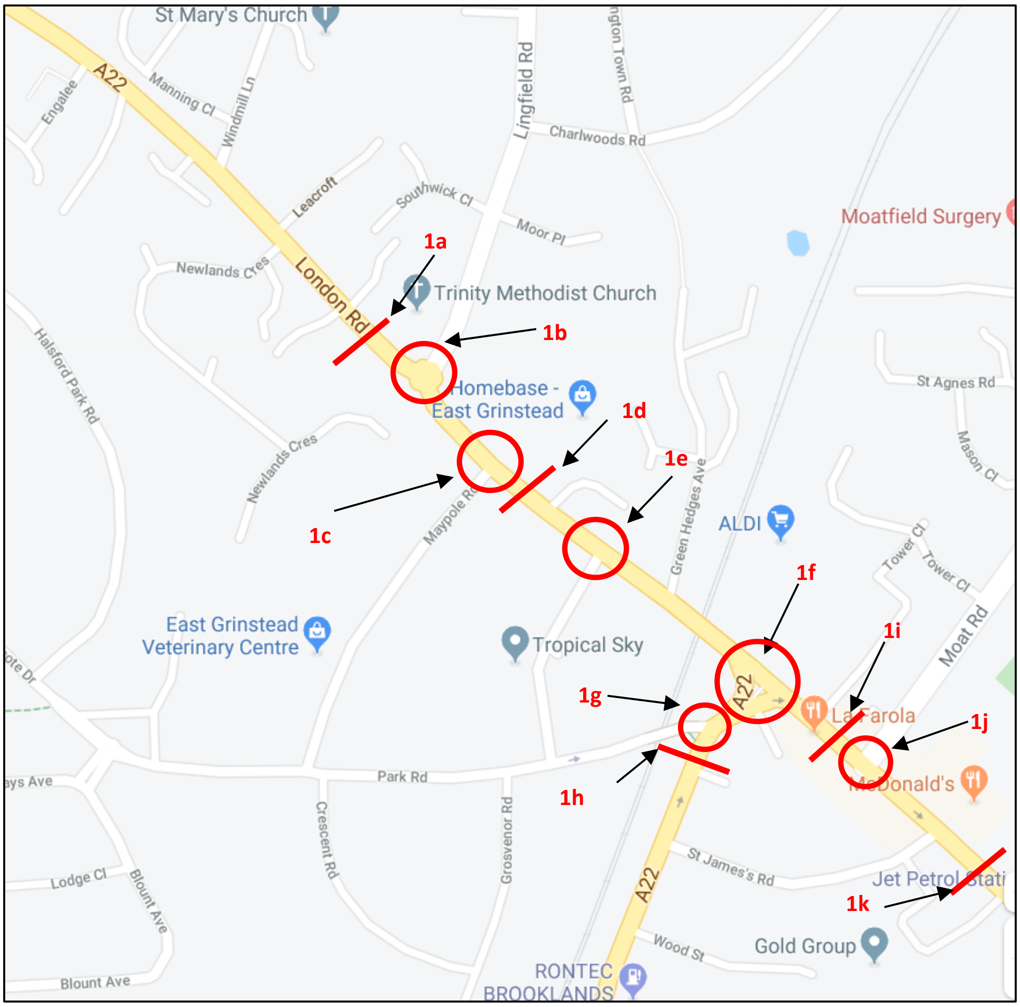


Figure 1.0 – Section 1 Study Area

2. Traffic Data Collection

Traffic Flow Survey

2.1. A data collection programme was undertaken to obtain traffic survey data in the morning (AM) and evening (PM) peak periods. The main surveys were undertaken on Tuesday 19th March for the entire site mentioned in Figure 1.0.

2.2. The time periods for the surveys were as follows:

- AM (Tuesday) – between 08:00 – 09:00,
- PM (Tuesday) – between 17:00 – 18:00.

2.3. The vehicle classification kept same as provided approved base models as before as follows:

- Car
- LGV
- MGV
- HGV
- Coaches,
- Buses.

General Traffic Journey Time Survey

2.4. In-Car journey time data collected between all key sections in the north and southbound directions in the modelled area are as follows:-

- Weekday (Tuesday 19th Mar) – between 08:52 – 08:59,
- Weekday (Tuesday 19th Mar) – between 17:31 – 17:34.

2.5. This journey time survey data for the AM 1-hour peak was undertaken at the end of the peak hour around 08:52 which has only 2 sample runs. Similarly, PM Peak the journey time data covers only mid-peak time period with 2 samples only. Hence, the AM & PM surveyed journey times was used as a reference to validate existing base VISSIM models as per the modelling guidelines with a difference of 15% or ± 60sec modelled journey time data. Journey Time sections undertaken and used in the VISSIM modelling (1-hour peak period) are as follows: -

H - London Road by Lingfield Road,

I – London Road by Maypole Road,

J – London Road by Moat Road,

K – London Road by White Lion Close (Jet Petrol Station),

L – Station Road by Park Road,

M - London Road from Lingfield Road (additional marker).

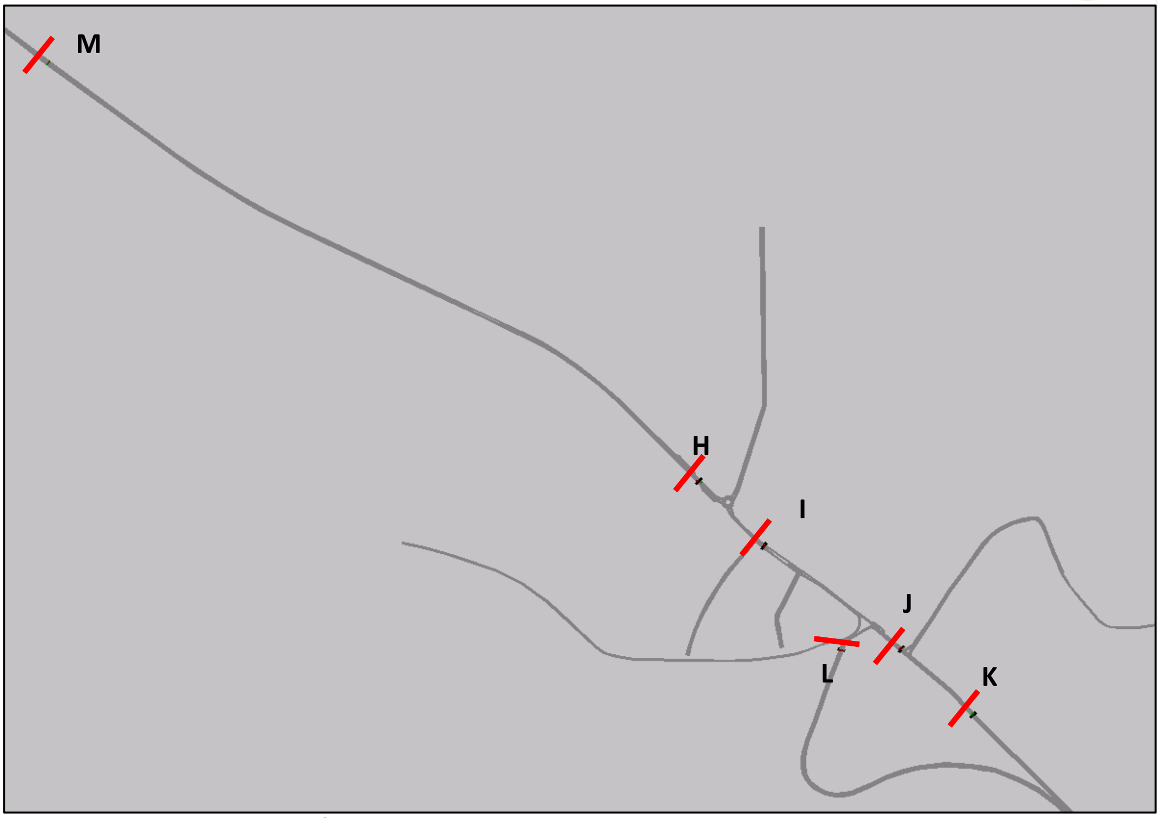


Figure 2.1 – Journey Time Sections

2.6. In-Car journey time survey data collected for southbound from H to K and in northbound direction from L to H only.

2.7. During simulation of the existing base VISSIM models provided by the client, the queues on London Road southbound approach by Lingfield Road extended beyond journey time marker H. Hence an additional journey time marker 'M' was added on London Road approximately 1300 meters north from marker H in both directions (as shows in figure 2.1) to evaluate the journey time and latent demand.

3. Calibrated Base Modelling

Model Development

3.1. The Existing base VISSIM models for year 2019 were provided by Pell Frischmann, which were to be used as a point of reference to test future base and proposed modelling.

3.2. VISSIM version 5.40-12 was used to code the outlined network in Figure 1.0 to calibrate VISSIM models and validate junction turning counts and journey time.

3.3. These base VISSIM models were then adjusted with minor tweaks for priority rules along with minor traffic flow adjustments to bring them within the acceptable limit for traffic flow and journey time validation against the traffic surveys where applicable.

3.4. The Fixed Time module was used to simulate signal operations.

3.5. All bus routes, bus dwell times at each bus stop kept same as provided base models by client.

3.6. An internal audit was undertaken on completion of the model development prior to submission to external audit.

Simulation Parameters and Network Parameters

3.7. There are no changes in simulation and network parameters in provided approved base models. The simulation period for the AM and PM peak models includes a 15 minute warm-up period at the start of the simulation and a 15 minute cool-down period at the end with a 1 hour peak period. These warm-up and cool-down periods were used to replicate the existing network conditions/congestion in the models prior to collecting the data for comparison against the surveyed data.

3.8. Details of the simulation periods are presented in Table 3.1.

Peak Period	Start-up	Peak Hour	Cool-down
AM Peak	07:45- 08:00	08:00 - 09:00	09:00 - 09:15
PM Peak	16:45 - 17:00	17:00 - 18:00	18:00 -18:15

Table 3.1 – VISSIM base model simulation periods

Vehicle Types and Classes

3.9. VISSIM uses individual vehicle models instead of Passenger Car Unit (PCU), which are grouped into vehicle types and are then grouped into vehicle classes. The following vehicle types were defined for the VISSIM model: -

- Car
- LGV
- MGV
- HGV
- Coaches,
- Buses.

Route Assignment

3.10. OD from previously provided model used as guidance to validate the traffic flows and those OD were very slightly adjusted accordingly to new traffic survey data.

Public Transport

3.11. Bus routes and bus dwell time at each bus stops previously used in the previous version of the model was kept the same.

Priority Rules/Conflict Areas

3.12. Priority rules were slightly adjusted few places in approved base models (where applicable) to reflect on-street behaviour.

3.13. Priority rules were also used to replicate 'Yellow Box' and 'Keep Clear' markings where applicable. These rules were then adjusted to reflect the typical driving behaviour and their adherence to these traffic rules within the network as observed during site visits during calibration/validation process.

3.14. Reduced Speed Areas (RSA) previously used in the previous version of the model was kept the same. This is to replicate lower speeds during turning manoeuvres and to calibrate through puts (saturation flow) at each signalised and non-signalised stop-line.

4. Validated Base Modelling

Base Model Validation

4.1. The VISSIM modelling results represent an average of 20 random SEEDs with an increment of 1 and starting SEED 1 in the AM and PM peak periods.

4.2. Each SEED in VISSIM represents different vehicular arrival times in the network, the stochastically variability of their driving behaviour and also selection of a certain distribution value e.g. speeds, dwell times etc. if applicable. None of the SEEDs replicate 'real life' better than another. It's more comparable to the daily changes of the traffic patterns at the same location. The VISSIM Base modelling parameters were reviewed and adjusted continuously to better fit the observed driving behaviour during the calibration and validation process where applicable.

Traffic Flow GEH Statistic

4.3. The GEH statistic is a standard way of comparing observed and modelled flows as defined in the DMRB Volume 12, Chapter 4. It is used to remove the bias that exists when comparing flows of different magnitudes using percentages. For example, a difference of 10 in a flow of 100 vehicles per hour (VPH) is less significant (GEH = 3.0) than a difference of 100 in a 1000 VPH flow (GEH = 11.5), even though they both show a percentage difference of 10%.

4.4. The GEH statistic is calculated as follows:

$$GEH = \sqrt{\frac{(M-C)^2}{0.5 \times (M+C)}}$$

Where:
GEH....................is the GEH statistic;
M........................is the modelled flow; and
C........................is the observed flow.

4.5. In summary, the following set of acceptable ranges and limits have been used to assess model validation based upon all turning movements within the study area:

- GEH value: ≤5.0 in at least 85% of cases (< 3 for all critical links);

4.6. The AM peak modelled traffic flow vs. surveyed data comparison shows that these models meet the validation criteria, where 88% all the GEH values are less than 5 for all turning movements. Out of 17 turning counts 2 turnings counts above 5 GEH where GEH are 5.1 and 6.6 respectively.

4.7. The PM peak modelled traffic flow vs. surveyed data comparison shows that these models meet the validation criteria, where all the GEH values are less than 5 (100%) for all turning movements. In summary, all two models are considered to be validated well to the observed traffic flows. GEH comparison for the AM and PM peak periods are provided in Appendix A.

Car Journey Times

4.8. In car Journey Time (JYT) survey data was undertaken on a weekday for the AM & PM peak periods.

4.9. Points to be noted that even though the JYT was across the whole route broken down in sections, it is comprised of less runs, not covering whole peak hour and only undertaken for a day. Hence, it does not represent an overall typical JYT for each route. The models were therefore adjusted where applicable to validate well as per the DMRB modelling guidelines.

4.10. A summary of the Journey Time (JYT) modelled vs. surveyed data comparison for the AM and PM peak periods is shown in Tables 4.1 & 4.2.

			Survey (Ave)		Base Model (Ave)	Actual Diff	%age Diff
	AM	Length (meter)	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	Survey vs. Base	Survey vs. Base
SECTION 2	H to I	161	0:00:28	28	49	21	77%
	I to J	286	0:00:37	37	30	-7	-18%
	J to K	162	0:00:17	17	27	10	58%
	H to K	609	0:01:22	82	107	25	30%
	L to I	264	0:00:33	33	46	13	40%
	I to H	159	0:00:12	12	32	20	165%
	L to H	423	0:00:45	45	78	33	73%
	M to H	1305			206		
	H to M	1298			123		

Table 4.1 – AM Base VISSIM JYT validation results comparison vs surveyed data

			Survey (Ave)		Base Model (Ave)	Actual Diff	%age Diff
	PM	Length (meter)	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	Survey vs. Base	Survey vs. Base
SECTION 2	H to I	161	0:00:38	38	51	13	35%
	I to J	286	0:00:48	48	31	-17	-35%
	J to K	162	0:00:14	14	27	13	95%
	H to K	609	0:01:40	100	110	10	10%
	L to I	264	0:00:59	59	47	-12	-20%
	I to H	159	0:00:22	22	31	9	41%
	L to H	423	0:01:21	81	78	-3	-4%
	M to H	1305			412		
	H to M	1298			124		

Table 4.2 – PM Base VISSIM JYT validation results comparison vs surveyed data

Signal Timings

4.11. Calibrated and Validated Base LINSIG models were produced as part of the project. Signal phases, stages, intergreen timings, phase delays, stage sequence and stage lengths were directly coded from Base LINSIGs into the Base VISSIM models.

Error Logs

4.12. An error logs were produced for both peak periods to ensure there were no critical and/or a significant number of unacceptable errors produced at the end of each simulation run.

5. Summary and Conclusions - Base Models

5.1. Base VISSIM models were provided by Pell Frischmann, which were to be used as a point of reference to validate against the March 2019 traffic survey flows and in-car Journey Time data for the morning and evening 1 hour peak periods respectively.

5.2. Car Journey Times are validated within 15% or ± 60 seconds when compared to the surveyed journey times for both peak periods, which is in accordance with the DMBR Modelling Guidelines.

5.3. As per the guidelines for traffic flow validation, 85% of all the traffic flows in the network should be validated to less than 5 GEH. Hence, the traffic flow in the network is validated to a limit within 5 GEH compared to the surveyed data for both peak period models.

5.4. The highest difference between base modelled vs. surveyed traffic flow that fails to clear in the network in the AM peak is from A22 Station Road south to north by Station Road / Park Road (approx. 239 vehicles, GEH. 6.6) followed by A22 Station Road to A22 London Road north (approx. 166 vehicles, GEH. 5.1) by London Road / Station Road. However, given the complexity of the network, it is not significant.

5.5. Similarly, the highest difference between modelled flow vs. surveyed flow failing to clear in the PM peak is from A22 Station Road to A22 London Road south by London Road / Station Road (approx. 126 vehicles, GEH. 4.8) followed by A22 London Road south to A22 London Road North (approx. 103 vehicles, GEH. 4.0) by London Road / Lingfield Road.

5.6. Overall the VISSIM models both peaks based on the 2019 traffic flows and car journey time information represents that there is no existing significant capacity issue in the network.

5.7. These calibrated and validated Base VISSIM models are therefore considered fit to test any future scenario(s).

6. Future Base Models

Traffic Flows and Routes

6.1. Future Base traffic flows were provided by Pell Frischmann for the AM and PM peak periods (File name: 2031 BASE CASE AM & PM.xlsx). The Future Base 2031 Case used for each Peak to build the future base models.

6.2. VISSIM requires traffic data input by vehicle class. The vehicle class used in the Base models were comprised of Car, LGV, MGV, HGV, Coaches. However, the future base traffic flows provided were only with HGV %age change and total vehicles. Therefore, total number of additional flows was applied from the 2019 to the 2031 traffic data for each vehicle compositions, except Bus which remained unchanged. There are no changes in traffic composition between base and future base models. This methodology was agreed with the Client prior to commencing proposed modelling.

6.3. The traffic flow comparison is provided in Appendix A.

6.4. Calibrated and validated Base VISSIM models (in section 5) were used as a basis to model the future base scenario for 2031 incorporating traffic growth and all local committed development flows (provided by Pell Frischmann).

6.5. Vehicle inputs and local routes were updated/amended to reflect the calculated growth in both peaks VISSIM models.

Signal Data

6.6. Signal timings in the future base LINSIGs were reflected in the future base VISSIM models for all peak periods.

Layout Changes

6.7. The VISSIM models have been updated to incorporate all highway improvements brought forward by the committed development as shown in Atkins drawing 5107918/TP/PD/301. All t changes were included in Future Base LINSIG models. These changes are as follows:-

A22 London Road / Lingfield Road

a. Existing give-way priority roundabout replaced with a signalised junction along with controlled pedestrian crossings on all arms.

b. A22 London Road Northern approach is currently a single lane (ahead/right) with a bus stop lay-by approx 108m from the roundabout. The single lane is maintained (ahead) with a proposed left turn flare approx 87m (including existing bus stop).

c. Existing standalone controlled pedestrian crossing removed and replaced with controlled pedestrian facilities at the junction.

d. Proposed flare on Lingfield Road for right turn traffic approx. 59m, while maintaining the existing left turn lane and a bus stop.

e. Proposed controlled staggered pedestrian crossing facilities on Lingfield Road exit, Lingfield Road left and right turn approaches. In addition, proposed straight pedestrian crossing across A22 London Road.

f. Existing bus stop on A22 London Road northbound exit.

g. Proposed Method of Control is shown in Figure 6.1.

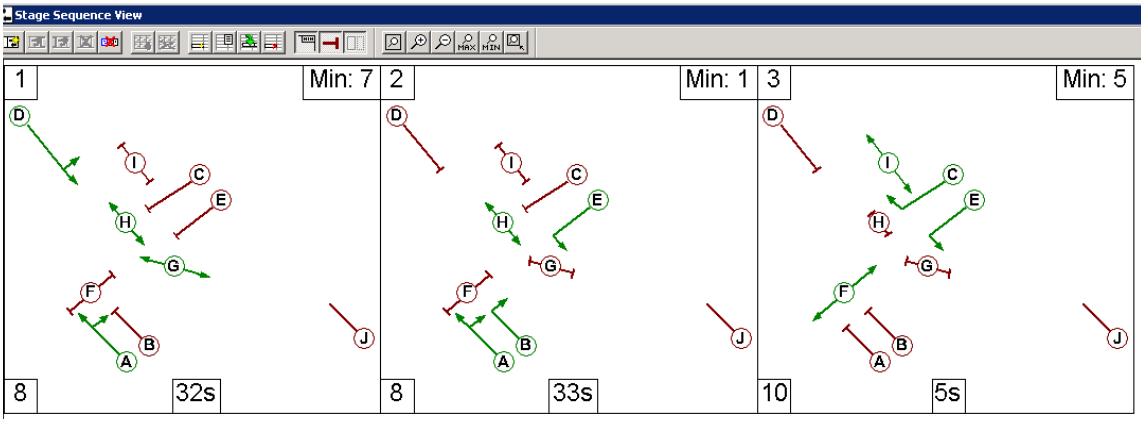


Figure 6.1 – Future Base Method of Control

h. Ahead long lane maintained on A22 London Road Southern approach, with a proposed right turn flare approx. 29m. Storage before stopline (right turn flare) is proposed to be approx. 2 PCUs with a right turn storage of 3 PCUs after the stopline.

<u>Modelling Results Comparison</u>

6.8. Traffic flow statistics is provided in Appendix A, where traffic flows are compared among survey flows (2019), base modelled flows (2019), future base calculated flows (2031) and future base modelled flows (2031) for the AM & PM peak periods.

<u>Traffic Flow GEH Statistic</u>

AM Peak

6.9. The highest GEH in the AM future base vs. base calculated and modelled flow comparison is from A22 London Road south to north by Park Road (GEH: 10.4, 395 vehicles fail to clear) followed by A22 London Road south to north (GEH: 5.3, 168 vehicles fail to clear) at London Road / Maypole Road junction.

6.10. The traffic flow has increased in the AM future base particularly at Station Road / Park Road junction from A22 Station Road south to north (+193 vehicles) followed by London Road / Maypole Road junction from A22 London Road north to south (+143 vehicles), A22 London Road south to north (+140 vehicles). There will also be an increased traffic flow in the network ranges from 29 to 111 vehicles.

PM Peak

6.11. The highest GEH in the PM future base vs. base calculated and modelled flow comparison is from Park Road to A22 Station Road north (GEH: 7.0, 103 vehicles fail to clear) and A22 Station Road south to north (GEH: 5.2, 213 vehicles fail to clear) at Station Road / Park Road junction, followed by A22 London Road south to Lingfield Road (GEH: 4.1, 86 vehicles fail to clear) at A22 London Road / Lingfield Road junction.

6.12. The traffic flow has increased in the PM future base particularly at Station Road / Park Road junction from A22 Station Road south to north (+220 vehicles) followed by London Road / Maypole Road junction from A22 London Road north to south (+142 vehicles), A22 London Road south to north (+162 vehicles). There will also be an increased traffic flow in the network ranges from 46 to 132 vehicles.

<u>Journey times</u>

6.13. The AM base and future base journey time result comparison indicates that the journey times will increase slightly in the northbound direction from A22 Station Road south towards A22 London Road north (L to H) by 17 sec (21%).

6.14. However, it should be noted that the journey time on A22 London Road northern arm by Lingfield Road southbound will be increased significantly (M to H) by approx. 84 sec (41%), which may result in traffic failing to enter and clear through the network.

6.15. Similarly, the PM base and future base modelling result comparison indicates that the journey times will have less or no increased journey time throughout the network. The notable increase will be in northbound direction from A22 Station Road to A22 London Road by approx. 11 sec (14%).

	AM	Length (metre)	Survey (Ave) JYT (hh:mm:ss)	Survey (Ave) JYT (sec)	Base Model (Ave) JYT (sec)	Future Base Model (Ave) JYT (sec)	Actual Diff Base vs. FBase	%age Diff Base vs. FBase
SECTION 2	H to I	161	0:00:28	28	49	39	-10	-21%
	I to J	286	0:00:37	37	30	32	2	5%
	J to K	162	0:00:17	17	27	27	0	1%
	H to K	609	0:01:22	82	107	98	-9	-8%
	L to I	264	0:00:33	33	46	66	20	43%
	I to H	159	0:00:12	12	32	28	-3	-11%
	L to H	423	0:00:45	45	78	95	17	21%
	M to H	1305			206	290	84	41%
	H to M	1298			123	123	1	0%

Table 6.1 – AM Base VISSIM JYT validation results comparison vs Future Base

	PM	Length (metre)	Survey (Ave) JYT (hh:mm:ss)	Survey (Ave) JYT (sec)	Base Model (Ave) JYT (sec)	Future Base Model (Ave) JYT (sec)	Actual Diff Base vs. FBase	%age Diff Base vs. FBase
SECTION 2	H to I	161	0:00:38	38	51	30	-21	-41%
	I to J	286	0:00:48	48	31	34	2	7%
	J to K	162	0:00:14	14	27	28	1	3%
	H to K	609	0:01:40	100	110	92	-18	-16%
	L to I	264	0:00:59	59	47	63	16	34%
	I to H	159	0:00:22	22	31	26	-5	-17%
	L to H	423	0:01:21	81	78	89	11	14%
	M to H	1305			412	138	-275	-67%
	H to M	1298			124	125	1	1%

Table 6.2 – PM Base VISSIM JYT validation results comparison vs Future Base

7. Proposed Modelling

7.1. The VISSIM future base models were updated to develop proposals for the same year 2031, which were based on the future proposed LINSIG timings and method of control. The traffic growth factor provided by Pell Frischmann was used to produce development flows, where routing proportions were kept similar to base and future base year modelling with minor adjustments where necessary.

Layout Changes at A22 London Road / Lingfield Road

7.2. The layout changes of the future proposed modelling are detailed in Pell Frischmann drawing number 101470-T-002.

7.3. The main changes to the junction are as follows:-

- Carriageway widening on Lingfield Road and London Road
- Increase size of pedestrian splitter island on Lingfield Road situated between the left and right turn movements
- Increase length of the right turn movement flare movement on London Road from 2 to 3 PCU's

Modelling Results Comparison

7.4. Traffic flow statistics is provided in Appendix A, where traffic flows are compared among survey flows (2019), base modelled flows (2019), future base calculated flows (2031) and future base modelled flows (2031) for the AM & PM peak periods.

Traffic Flow GEH Statistic

AM Peak

7.5. The highest GEH in the AM proposed vs. proposed calculated and modelled flow comparison is from A22 Station Road south to north by Park Road (GEH: 9.2, 352 vehicles fail to clear) followed by A22 London Road south to north (GEH: 4.3, 139 vehicles fail to clear) at London Road / Maypole Road junction.

PM Peak

7.6. Similarly, the highest GEH in the PM proposed vs. future base calculated and modelled flow comparison is from Park Road to A22 Station Road north (GEH: 7.9, 121 vehicles fail to clear) and A22 Station Road south to north (GEH: 3.9, 161 vehicles fail to clear) at Station Road / Park Road junction, followed by A22 London Road north to south (GEH: 3.8, 104 vehicles fail to clear) at A22 London Road / Lingfield Road junction.

Journey times

7.7. The AM future base and proposed modelling result comparison indicates that the journey time will not be affected in southbound (0sec, 0%) from H to K and northbound (-13sec, -13%) from L to H. Journey time section M to H will remain similar to the future base.

7.8. Similarly, the PM future base and proposed modelling result comparison indicates that the journey times will have less change in journey time throughout the network. The journey time will have no significant impact (2sec, 2%) southbound (H to K) and (-8sec, -9%) northbound (L to H) in the PM. The notable increase will be in southbound direction from A22 London Road north to south (M to H) by approx. 7 sec (5%).

			Survey (Ave)		Base Model (Ave)	Future Base Model (Ave)	Future Pro Model (Ave)	Actual Diff	%age Diff
	AM	Length (meter)	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 2	H to I	161	0:00:28	28	49	39	39	0	-1%
	I to J	286	0:00:37	37	30	32	32	0	0%
	J to K	162	0:00:17	17	27	27	27	0	0%
	H to K	609	0:01:22	82	107	98	98	0	0%
	L to I	264	0:00:33	33	46	66	56	-10	-16%
	I to H	159	0:00:12	12	32	28	26	-2	-8%
	L to H	423	0:00:45	45	78	95	82	-13	-13%
	M to H	1305			206	290	267	-23	-8%
	H to M	1298			123	123	123	0	0%

Table 7.1 – AM Base VISSIM JYT results comparison Future Base vs Future Proposed

			Survey (Ave)		Base Model (Ave)	Future Base Model (Ave)	Future Pro Model (Ave)	Actual Diff	%age Diff
	PM	Length (meter)	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 2	H to I	161	0:00:38	38	51	30	32	1	5%
	I to J	286	0:00:48	48	31	34	34	0	1%
	J to K	162	0:00:14	14	27	28	28	0	0%
	H to K	609	0:01:40	100	110	92	94	2	2%
	L to I	264	0:00:59	59	47	63	56	-7	-12%
	I to H	159	0:00:22	22	31	26	25	-1	-4%
	L to H	423	0:01:21	81	78	89	81	-8	-9%
	M to H	1305			412	138	144	7	5%
	H to M	1298			124	125	125	0	0%

Table 7.2 – PM Base VISSIM JYT results comparison Future Base vs Future Proposed

8. Summary and Conclusion

8.1. Existing base VISSIM models for year 2019 were provided by Pell Frischmann, which were to be used as a point of reference to test future base and proposed modelling.

8.2. These base VISSIM models were then adjusted with minor tweaks for priority rules along with minor traffic flow adjustments to bring them within the acceptable limit for traffic flow and journey time validation against the traffic surveys. These adjusted base VISSIM models were considered best fit for the purpose and to provide a benchmark for assessing the impact of the future demand in regards to the scheme and committed development within the vicinity of the study area, as the base modelling results compared to observed values was a close match for both traffic flows and journey times in the AM and PM peak periods.

8.3. During simulation of the existing base VISSIM models provided by the client, the queues on London Road southbound approach by Lingfield Road extended beyond journey time marker H. Hence an additional journey time marker 'M' was added on London Road approximately 1300 meters north from marker H to evaluate the latent demand entering the network as well as journey time difference.

8.4. These adjusted base VISSIM models were then used as a bench mark to produce and test future base and future proposed scenario models (2031) along with the layout changes at Lingfield Road junction with A22 London Road.

8.5. The base vs. future base modelling result comparison indicates that there will not be any significant change in the AM peak journey time (-9sec, -8%) southbound (H to K), while the northbound (L to H) will increase marginally (17sec, 21%). Similarly, the journey time in the PM peak will slightly increase (11sec, 14%) northbound (L to H), with no significant change (-18sec, -16%) southbound.

8.6. The base vs. future base modelling result comparison for the additional marker M to H indicates that journey time will increase (84sec, 41%) in the AM peak, while decrease (-275sec, -67%) in the PM peak in the southbound direction. It should be noted that the traffic turning right from London Road north to Maypole Road is nearly half in the PM peak period compared to AM peak period (AM: 60, PM: 30). Hence, there is less traffic turning right into Maypole Road that results in less queues and blocking back southbound.

8.7. The proposals significance improvement for capacity is the increased right turn flare length on London Road northbound / Lingfield Road approach from 2 to 3 PCU compared to the future base. Secondary benefits that would be experienced are:

- The widening of the pedestrian splitter island on Lingfield Road will provide an increased pedestrian comfort factor when crossing both London and Lingfield Road

- The increased carriageway widening will assist in reducing vehicle friction experienced from stationary vehicles at bus stops, parking etc.

8.8. The future base and proposed modelling result comparison indicates that the journey time will not be affected in southbound (0sec, 0%) from H to K and northbound (-13sec, -13%) from L to H. Similarly, the journey time will have no significant impact (2sec, 2%) southbound (H to K) and

(-8sec, -9%) northbound (L to H) in the AM and PM peaks respectively.

8.9. However, it should be noted that there will be an increased queuing on Station Road northbound (Link No. 15) leading to traffic failing to enter into the network, which is as a result of increased traffic in future base and proposed scenarios. VISSIM modelling indicates latent demand on Station Road as follows: -

	FB	FP
AM	100	60
PM	30	5

8.10. The overall scheme testing in VISSIM modelling with the projected traffic flow indicates that the scheme will perform within capacity without any significant impact on the network.

9. Appendix A – Base/Future Base/Future Pro Modelling Results

Technical Note

Project:	**RWA-19-20-264**
Client:	**Pell Frischmann**
Subject:	**East Grinstead Additional VISSIM Runs- Section 1**

Prepared by:	**Martha Hoskins**	Date:	**21/02/2020**
Checked by:	**Spencer Wilson**	Date:	**25/02/2020**

1. Introduction

1.1. Red Wilson Associates (RWA) has been appointed by Pell Frischmann to develop additional future proposed micro-simulation models using VISSIM, to be presented to West Sussex County Council (WSCC) as part of the assessment of the future development in the vicinity of A22 London Road/Imberhorne Lane.

1.2. WSCC do not have any specific modelling guidelines that relates to microsimulation modelling. The final models developed are in accordance with the Design Manual for Roads and Bridges (DMRB) Modelling Guidelines.

1.3. The study area was divided into two sections as per the previous modelling undertaken and was kept similar in this exercise. This is assuming that there would be less/no interaction between these two networks/sections as they are over 300m apart.

1.4. Section 1 modelling was undertaken in VISSIM version 10.00-12 (dynamic assignment) previously, while Section 2 modelling in version 5.04-12 (static assignment).

1.5. The following report details the additional future proposed scenarios in Section 1 of the model and their corresponding results.

1.6. All simulation parameters have remained unchanged from the previously submitted model runs.

2. Scenarios

2.1. Table 1 shows the designs tested for the associated number of units. Within the section 1 model the following scenarios have been tested in both the AM and PM peaks;

Table 1 - Scenarios

Number of Units	A22/ Imberhorne Lane Junction	A22/ Felbridge Junction	A22 Felbridge Approach
200	Existing	Atkins 5107918/TP/PD/101B	Existing
325	101470 - T - 016A	Atkins 5107918/TP/PD/101B	Existing
550	101470 - T - 016A	Atkins 5107918/TP/PD/101B	101470 - T - 015

2.2. All associated design drawings can be found in Appendix A.

2.3. Traffic flows were provided by Pell Frischmann for the AM and PM peak periods. The Future Development 2031 Case flows have been used for each scenario.

2.4. For the 200 units assessment, the previously submitted future base model was used as a basis. For the 325 and 550 units assessments, the previously submitted future proposed model was used as a basis.

2.5. The journey times have been measured for multiple different routes and split into a number of segments. The map of the sections can be found below:

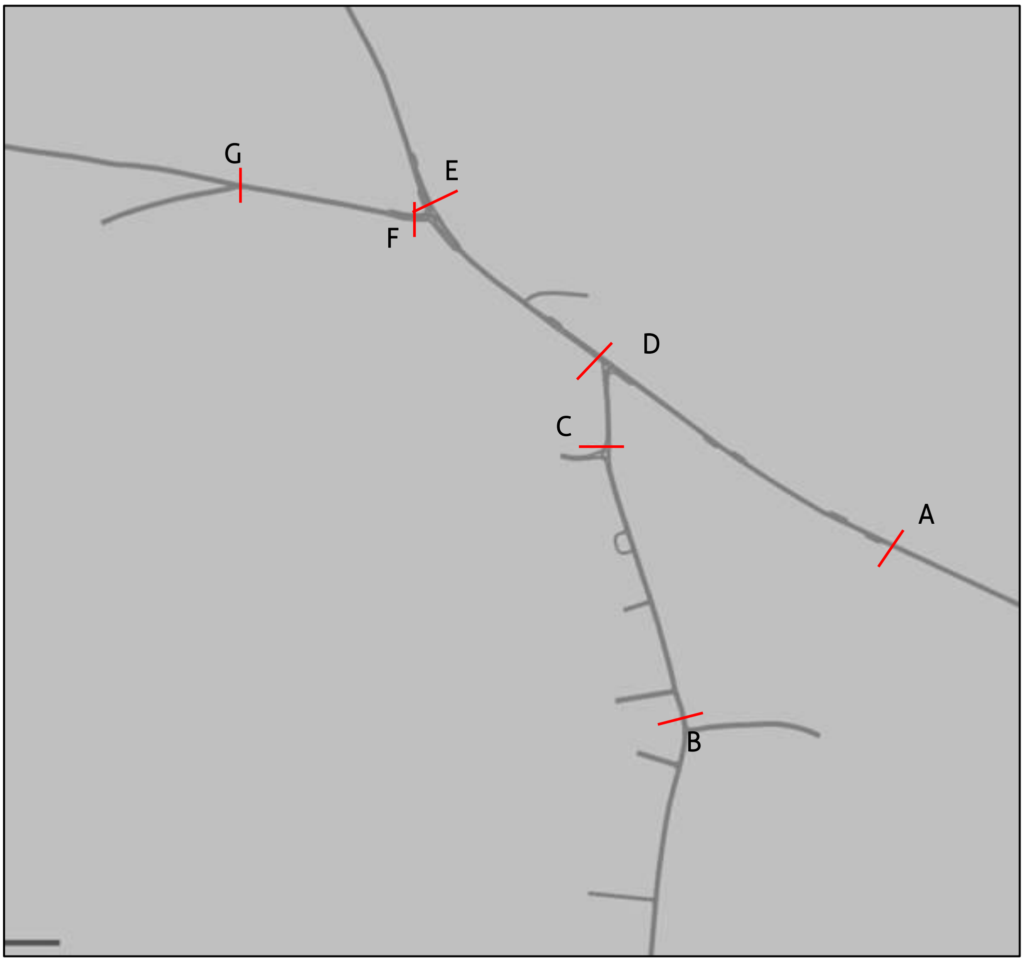


Figure 1 - Journey Time Sections

3. Future Proposed- 200 Units

3.1. As previously stated, 200 units were assessed assuming no additional design changes from the future base.

3.2. Using the traffic flows provided by Pell Frischmann, the vehicle inputs and routes were updated to account for the additional traffic expected as the result of a 200 unit development.

3.3. No further amendments were made to the model.

<u>Traffic Flow GEH Statistic</u>

AM Peak

3.4. The highest GEH in the AM future proposed 200 units vs. future proposed 200 units calculated flow comparison is from A22 London Road north to Imberhorne Lane (GEH: 0.9). All GEH values for the AM peak are below 1.0 showing a good level of convergence.

3.5. When comparing the future base AM traffic flows against the future proposed with 200 units there is only a slight increase in traffic flows for each movement. Turning movements tend to increase as a result of the development however no turning movement increases by more than 35 vehicles in the model.

PM Peak

3.6. The highest GEH in the PM future proposed 200 units vs. future proposed 200 units calculated flow comparison is from Imberhorne Lane north to Imberhorne Lane south (GEH: 3.2). All GEH values for the PM peak are below 5.0 and as such are not considered to be significant.

Journey Time Results

AM Peak

3.7. The AM journey time results in table 2 show that the introduction of 200 units will not have a significant impact on journey times in the assessed area.

3.8. The greatest increase in journey time (30 seconds) is anticipated to be for vehicles travelling from Copthorne Road to A22 London Road.

3.9. All other changes in journey time are by 10% or less and as such are considered insignificant.

Table 2 - AM Journey Time Results for Future Proposed 200 Units

		Survey (Ave)			Base (Ave)	FBase (Ave)	FPro (Ave)	Actual Diff	%age Diff
	AM	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 1	G to F	0:02:59	179	179	169	91	120	29	32%
	F to D	0:01:04	64	64	50	56	56	0	1%
	D to A	0:00:51	51	51	59	60	60	0	0%
	G to A	0:04:54	294	294	278	207	236	30	14%
	A to D	0:01:27	87	87	88	104	91	-13	-13%
	D to F	0:00:39	39	39	45	48	44	-3	-7%
	F to G	0:00:28	28	28	37	37	37	0	0%
	A to G	0:02:34	154	154	170	189	172	-16	-9%
	E to D	0:01:09	69	69	50	54	56	1	2%
	D to A	0:00:48	117	48	59	60	60	0	0%
	E to A	0:01:57	186	117	108	115	116	1	1%
	A to D	0:01:25	85	85	88	104	91	-13	-13%
	D to E	0:00:55	55	55	61	53	49	-3	-6%
	A to E	0:02:20	140	140	149	156	140	-16	-10%
	D to C	0:00:24	24	24	19	19	19	0	-1%
	C to B	0:00:42	42	42	47	47	49	2	3%
	D to B	0:01:05	65	66	65	66	68	1	2%
	B to C	0:00:57	57	57	53	84	81	-3	-4%
	C to D	0:00:26	26	26	46	56	52	-4	-7%
	B to D	0:01:23	83	83	99	141	133	-8	-5%

PM Peak

3.10. The PM journey time results in table 3 show that the introduction of 200 units will not have a significant impact on journey times in the assessed area.

3.11. The greatest increase in journey time (7 seconds) is anticipated to be for vehicles travelling from Imberhorne Lane to A22 London Road north.

3.12. All other changes in journey time are by less than 5% and as such are considered insignificant.

Table 3 - PM Journey Time Results for Future Proposed 200 Units

		Survey (Ave)			Base (Ave)	FBase (Ave)	FPro (Ave)	Actual Diff	%age Diff
	PM	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 1	G to F	0:00:27	27	27	56	127	125	-2	-2%
	F to D	0:01:11	71	71	49	85	83	-2	-2%
	D to A	0:00:52	52	52	61	64	63	-2	-3%
	G to A	0:02:30	150	150	166	277	271	-6	-2%
	A to D	0:02:11	131	131	149	142	141	-1	-1%
	D to F	0:01:05	65	65	56	44	43	-1	-2%
	F to G	0:00:47	47	47	37	38	38	0	0%
	A to G	0:04:02	242	243	242	223	221	-2	-1%
	E to D	0:01:29	89	89	50	84	82	-2	-2%
	D to A	0:00:58	58	58	61	64	63	-2	-3%
	E to A	0:02:28	148	147	110	149	145	-4	-3%
	A to D	0:01:46	106	106	149	142	141	-1	-1%
	D to E	0:01:28	88	88	68	53	52	-1	-2%
	A to E	0:03:13	193	194	217	194	192	-2	-1%
	D to C	0:00:54	54	30	21	25	23	-1	-6%
	C to B	0:00:42	42	42	44	45	45	0	0%
	D to B	0:01:36	96	72	66	70	68	-1	-2%
	B to C	0:00:36	36	36	72	51	55	4	8%
	C to D	0:01:41	101	101	85	68	71	3	4%
	B to D	0:02:16	136	137	157	120	127	7	6%

4. Future Proposed- 325 Units

4.1. The future proposed 325 units test was undertaken using a revised future proposed model in accordance with table 1.

4.2. Using the traffic flows provided by Pell Frischmann, the vehicle inputs and routes were updated to account for the additional traffic expected as the result of a 325 unit development.

4.3. Apart from the aforementioned changes, no other amendments were made to the model structure or simulation parameters.

<u>Traffic Flow GEH Statistic</u>

AM Peak

4.4. The highest GEH in the AM future proposed 325 units vs. future proposed 325 units calculated flow comparison is from A22 London Road south to A22 Eastbourne Road (GEH: 1.7). All GEH values for the AM peak are below 2.0 showing a good level of convergence.

PM Peak

4.5. The highest GEH in the PM future proposed 200 units vs. future proposed 200 units calculated flow comparison is from Imberhorne Lane north to Imberhorne Lane south (GEH: 3.8). All GEH values for the PM peak are below 5.0 and as such are not considered to be significant.

Journey Time Results

AM Peak

4.6. The AM journey time results in table 4 show that following amendments to the design, when introducing a development of 325 units, there is unlikely to be a significant impact on journey times.

4.7. The greatest increase in journey time when comparing the future base with the future proposed (10 seconds) is anticipated to be for vehicles travelling in either direction between Eastbourne Road to A22 London Road.

4.8. All increases and decreases in journey time between the future base and future proposed are anticipated to be by 10% or less and as such are considered insignificant.

Table 4 - AM Journey Time Results for Future Proposed 325 Units

		Survey (Ave)			Base (Ave)	FBase (Ave)	FPro (Ave)	Actual Diff	%age Diff
	AM	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 1	G to F	0:02:59	179	179	169	91	66	-24	-27%
	F to D	0:01:04	64	64	50	56	65	9	16%
	D to A	0:00:51	51	51	59	60	60	0	-1%
	G to A	0:04:54	294	294	278	207	191	-16	-8%
	A to D	0:01:27	87	87	88	104	87	-17	-16%
	D to F	0:00:39	39	39	45	48	61	14	29%
	F to G	0:00:28	28	28	37	37	37	0	0%
	A to G	0:02:34	154	154	170	189	186	-3	-2%
	E to D	0:01:09	69	69	50	54	65	10	19%
	D to A	0:00:48	117	48	59	60	60	0	-1%
	E to A	0:01:57	186	117	108	115	124	10	9%
	A to D	0:01:25	85	85	88	104	87	-17	-16%
	D to E	0:00:55	55	55	61	53	79	26	50%
	A to E	0:02:20	140	140	149	156	166	10	6%
	D to C	0:00:24	24	24	19	19	20	1	6%
	C to B	0:00:42	42	42	47	47	49	2	5%
	D to B	0:01:05	65	66	65	66	70	3	5%
	B to C	0:00:57	57	57	53	84	81	-4	-5%
	C to D	0:00:26	26	26	46	56	48	-8	-14%
	B to D	0:01:23	83	83	99	141	129	-11	-8%

PM Peak

4.9. The PM journey time results in table 5 show that the impact of introducing 325 units at the development can be mitigated by the design amendments proposed at Imberhorne Lane.

4.10. It is anticipated that journey times will improve in the PM peak with one journey time improving by over one minute (79 seconds between Copthorne Road and A22 London Road). The reverse journey on this route (northbound) also shows a significant reduction in journey time by 48 seconds.

4.11. The route travelling from A22 London Road south to Eastbourne Road also sees a significant reduction in journey time measuring at 44 seconds in the model. All other increases or decreases in journey time are seen to be insignificant.

Table 5 - PM Journey Time Results for Future Proposed 325 Units

		Survey (Ave)			Base (Ave)	FBase (Ave)	FPro (Ave)	Actual Diff	%age Diff
	PM	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 1	G to F	0:00:27	27	27	56	127	60	-68	-53%
	F to D	0:01:11	71	71	49	85	75	-9	-11%
	D to A	0:00:52	52	52	61	64	63	-1	-2%
	G to A	0:02:30	150	150	166	277	198	-79	-28%
	A to D	0:02:11	131	131	149	142	89	-53	-37%
	D to F	0:01:05	65	65	56	44	49	6	13%
	F to G	0:00:47	47	47	37	38	37	-1	-2%
	A to G	0:04:02	242	243	242	223	175	-48	-21%
	E to D	0:01:29	89	89	50	84	74	-10	-12%
	D to A	0:00:58	58	58	61	64	63	-1	-2%
	E to A	0:02:28	148	147	110	149	137	-12	-8%
	A to D	0:01:46	106	106	149	142	89	-53	-37%
	D to E	0:01:28	88	88	68	53	62	9	17%
	A to E	0:03:13	193	194	217	194	150	-44	-23%
	D to C	0:00:54	54	30	21	25	26	2	6%
	C to B	0:00:42	42	42	44	45	45	0	-1%
	D to B	0:01:36	96	72	66	70	71	1	2%
	B to C	0:00:36	36	36	72	51	49	-2	-5%
	C to D	0:01:41	101	101	85	68	56	-12	-17%
	B to D	0:02:16	136	137	157	120	106	-14	-12%

5. Future Proposed- 550 Units

5.1. The future proposed 550 units scenarios were tested using the previously submitted proposed model, with the revised Imberhorne lane junction layout in accordance with table 1.

5.2. No further amendments were made to the model assuming the vehicle routing and inputs were to remain unchanged from the previously submitted future proposed model.

<u>Traffic Flow GEH Statistic</u>

AM Peak

5.3. The highest GEH in the AM proposed vs. proposed calculated flow comparison is from A22 London Road south to A22 London Road North (GEH: 2.1) (Copthorne junction) with a flow difference of 47 vehicles failing to clear the stop line.

5.4. The traffic flow has increased in the AM proposed compared to AM future base from Imberhorne Lane south to north at Imberhorne Ln / Heathcote Drive junction (85 vehicles) and A22 London Road north to Imberhorne Lane (45 vehicles). There will also be an increase in rest of the network, which ranges from 1 to 85 vehicles. However, due to the layout changes at north and south junctions the network would still perform well.

PM Peak

5.5. The highest GEH in the PM proposed vs. proposed calculated flow comparison is from A22 London Road south to A22 Eastbourne Road north (GEH: 0.6) with a flow difference of 15 vehicles failing to clear respectively.

5.6. The traffic flow has increased in the PM proposed compared to PM Future base from Imberhorne Lane north to south at Imberhorne Lane / Heathcote Drive junction (76 vehicles) and A22 London Road north to Imberhorne Lane (69 vehicles). There will also be an increase in rest of the network. However, due to the layout changes at north and south junctions the network would still perform well.

5.7. These figures are considered not significant as it is well below 5 GEH.

Journey Time Results

AM Peak

5.8. The AM journey time results in table 6 show that following amendments to the design, when introducing a development of 550 units, there will largely be an improvement in journey times across the network.

5.9. The most significant improvement (20 seconds) can be found between A22 London Road south towards A22 Copthorne (A to G).

5.10. The highest increase in journey time in the model was experienced between Eastbourne Road to the north and A22 London Road (12 seconds) however this is only an increase of 11%.

5.11. All other increases and decreases in journey time between the future base and future proposed are anticipated to be by 10% or less and as such are considered insignificant.

Table 6 - AM Journey Times for Future Proposed 550 Units

		Survey (Ave)			Base (Ave)	FBase (Ave)	FPro (Ave)	Actual Diff	%age Diff
	AM	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 1	G to F	0:02:59	179	179	169	91	68	-22	-25%
	F to D	0:01:04	64	64	50	56	67	11	19%
	D to A	0:00:51	51	51	59	60	59	-1	-1%
	G to A	0:04:54	294	294	278	207	194	-12	-6%
	A to D	0:01:27	87	87	88	104	84	-20	-19%
	D to F	0:00:39	39	39	45	48	47	-1	-2%
	F to G	0:00:28	28	28	37	37	37	0	0%
	A to G	0:02:34	154	154	170	189	168	-20	-11%
	E to D	0:01:09	69	69	50	54	68	13	24%
	D to A	0:00:48	117	48	59	60	59	-1	-1%
	E to A	0:01:57	186	117	108	115	127	12	11%
	A to D	0:01:25	85	85	88	104	84	-20	-19%
	D to E	0:00:55	55	55	61	53	66	13	25%
	A to E	0:02:20	140	140	149	156	150	-6	-4%
	D to C	0:00:24	24	24	19	19	21	2	8%
	C to B	0:00:42	42	42	47	47	49	1	3%
	D to B	0:01:05	65	66	65	66	69	3	5%
	B to C	0:00:57	57	57	53	84	91	7	8%
	C to D	0:00:26	26	26	46	56	43	-14	-24%
	B to D	0:01:23	83	83	99	141	134	-7	-5%

PM Peak

5.12. When comparing the PM future base and future proposed 550 units results an even more significant improvement in journey times can be seen with an overall network reduction in journey times of 151 seconds.

5.13. The model demonstrates that the most significant improvements in journey time can be seen between A22 London Road south and Copthorne Road (52 seconds) and, Eastbourne Road (49 seconds).

Table 7 - PM Journey Times for Future Proposed 550 Units

		Survey (Ave)			Base (Ave)	FBase (Ave)	FPro (Ave)	Actual Diff	%age Diff
	PM	JYT (hh:mm:ss)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	JYT (sec)	FBase vs. FPro	FBase vs. FPro
SECTION 1	G to F	0:00:27	27	27	56	127	92	-36	-28%
	F to D	0:01:11	71	71	49	85	88	3	4%
	D to A	0:00:52	52	52	61	64	61	-3	-5%
	G to A	0:02:30	150	150	166	277	241	-35	-13%
	A to D	0:02:11	131	131	149	142	89	-53	-37%
	D to F	0:01:05	65	65	56	44	45	1	3%
	F to G	0:00:47	47	47	37	38	38	0	0%
	A to G	0:04:02	242	243	242	223	171	-52	-23%
	E to D	0:01:29	89	89	50	84	84	0	0%
	D to A	0:00:58	58	58	61	64	61	-3	-5%
	E to A	0:02:28	148	147	110	149	146	-3	-2%
	A to D	0:01:46	106	106	149	142	89	-53	-37%
	D to E	0:01:28	88	88	68	53	57	4	8%
	A to E	0:03:13	193	194	217	194	146	-49	-25%
	D to C	0:00:54	54	30	21	25	29	4	16%
	C to B	0:00:42	42	42	44	45	45	0	-1%
	D to B	0:01:36	96	72	66	70	73	4	5%
	B to C	0:00:36	36	36	72	51	49	-3	-5%
	C to D	0:01:41	101	101	85	68	55	-13	-20%
	B to D	0:02:16	136	137	157	120	104	-16	-13%

6. Summary and Conclusion

6.1. On behalf of Pell Frischmann, RWA have undertaken additional testing in VISSIM for the development proposal in East Grinstead located in the vicinity of Imberhorne Lane.

6.2. All scenarios have been tested in both the AM and PM peak 2031 future year. Pell Frischmann provided RWA with all flow scenarios and drawings to be assessed.

6.3. A development of 200 units was tested assuming no design amendments to the junction of Imberhorne Lane or the A22 Felbridge approach. On comparing the future base and future proposed modelling results, the impact of a 200 unit development on journey times is anticipated to be insignificant.

6.4. A development of 325 units was tested assuming no design amendments to the A22 Felbridge approach but amendments to the design of the Imberhorne Lane junction. On comparing the future base and future proposed modelling results, the impact of a 325 unit development on journey times is anticipated to be insignificant in the AM but with noticeable improvements in the journey times in the PM.

6.5. A development of 550 units was tested assuming all proposed design amendments are implemented. In comparison to the previously submitted future proposed, this included minor amendments to the design at the junction of Imberhorne Lane. The comparison between the future base and future proposed results shows a significant improvement in journey time again more noticeably in the PM peak.

Technical Note

Project:	RWA-19-20-264		
Client:	Pell Frischmann		
Subject:	East Grinstead Additional VISSIM Runs- Section 2		
Prepared by:	Martha Hoskins	Date:	03/03/2020
Checked by:	Spencer Wilson	Date:	04/03/2020

1. Introduction

1.1. Red Wilson Associates (RWA) has been appointed by Pell Frischmann to develop additional future proposed micro-simulation models using VISSIM, to be presented to West Sussex County Council (WSCC) as part of the assessment of the future development in the vicinity of A22 London Road/Imberhorne Lane.

1.2. WSCC do not have any specific modelling guidelines that relates to microsimulation modelling. The final models developed are in accordance with the Design Manual for Roads and Bridges (DMRB) Modelling Guidelines.

1.3. The study area was divided into two sections as per the previous modelling undertaken and was kept similar in this exercise. This is assuming that there would be less/no interaction between these two networks/sections as they are over 300m apart.

1.4. Section 1 modelling was undertaken in VISSIM version 10.00-12 (dynamic assignment) previously, while Section 2 modelling in version 5.04-12 (static assignment).

1.5. The following report details the additional future proposed scenarios in Section 2 of the model and their corresponding results.

1.6. All simulation parameters have remained unchanged from the previously submitted model runs.

2. Scenarios

2.1. Within the section 2 model, 450 units have been tested in both the AM and PM peaks. The flows were tested within the future base model which included design drawing 5107918/TP/TD/301A provided to Pell Frischmann by Atkins.

2.2. All associated design drawings can be found in Appendix A.

2.3. Traffic flows were provided by Pell Frischmann for the AM and PM peak periods. The Future Development 2031 Case flows have been used for each scenario.

2.4. The journey times have been measured for multiple different routes and split into a number of segments. The map of the sections can be found below:

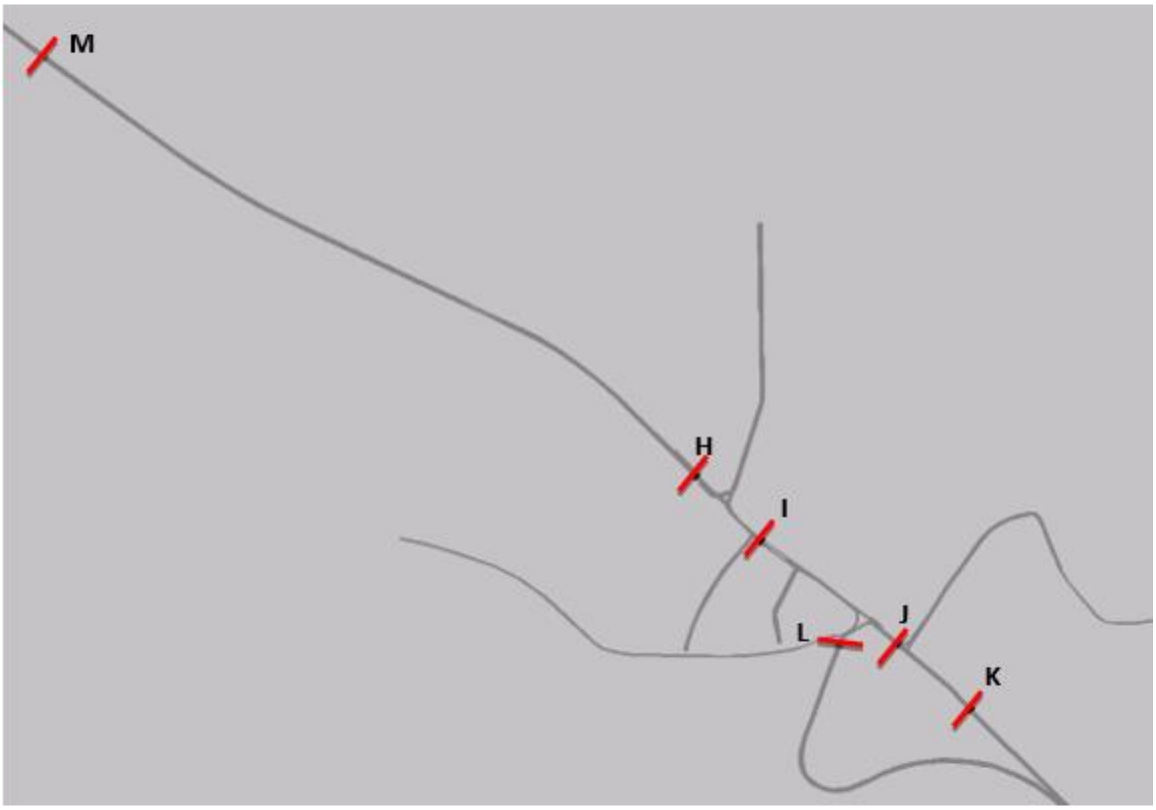


Figure 1 - Journey Time Sections

3. Future Proposed- 450 Units

3.1. As previously stated, 450 units were assessed assuming no additional design changes from the future base.

3.2. Using the traffic flows provided by Pell Frischmann, the vehicle inputs and routes were updated to account for the additional traffic expected as the result of a 450 unit development.

3.3. No further amendments were made to the model.

Journey Time Results

3.4. Comparisons have been drawn between the base case and 450 unit test and between the future base and 450 unit test.

AM Peak

3.5. The AM journey time results in table 1 show that the introduction of 450 units will not have a significant impact on journey times in the assessed area.

3.6. All differences in journey time between the future base and 450 unit test are below 5% and therefore the impact can be seen as neutral.

Table 1 - AM Journey Time Results for Future Proposed 450 Units

			Base Model (Ave)	Future Base Model (Ave)	450 Unit Test (Ave)	Actual Diff	%age Diff	Actual Diff	%age Diff
	AM	Direction	JYT (sec)	JYT (sec)	JYT (sec)	Base vs. 450 Unit	Base vs. 450 Unit	FBase vs. 450 Unit	FBase vs. 450 Unit
SECTION 2	H to I	Southbound	49	39	39	-11	-22%	0	-1%
	I to J	Southbound	30	32	32	1	5%	0	0%
	J to K	Southbound	27	27	27	0	1%	0	0%
	H to K		107	98	98	-9	-9%	-1	-1%
	L to I	Northbound	46	66	69	22	49%	2	4%
	I to H	Northbound	32	28	29	-3	-10%	0	1%
	L to H		78	95	97	19	25%	3	3%
	M to H	Southbound	206	290	283	78	38%	-7	-2%
	H to M	Northbound	123	123	123	1	1%	0	0%

PM Peak

3.7. The PM journey time results in table 2 show that the introduction of 450 units will not have an impact on journey times in the assessed area.

Table 2 - PM Journey Time Results for Future Proposed 450 Units

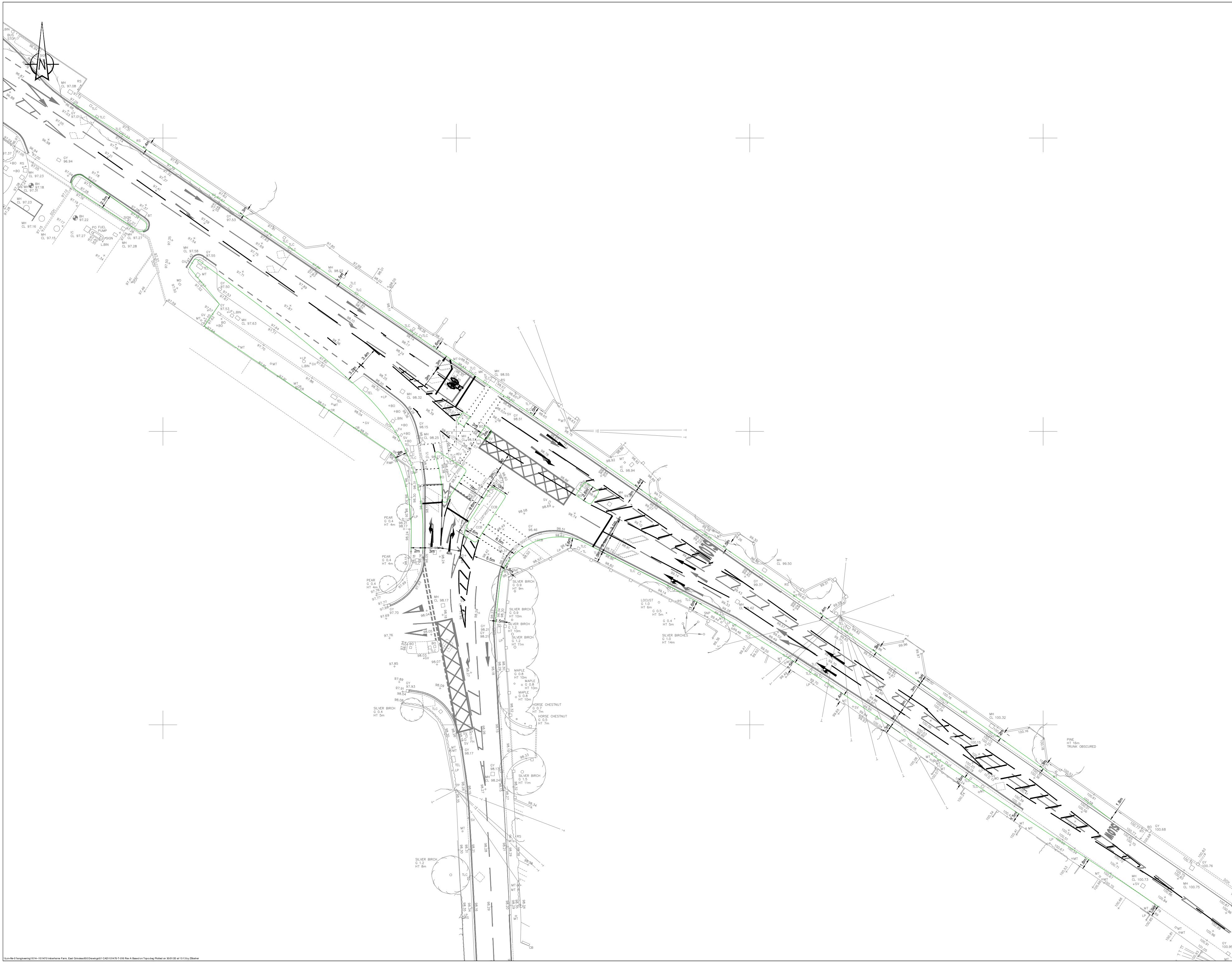
			Base Model (Ave)	Future Base Model (Ave)	450 Unit Test (Ave)	Actual Diff	%age Diff	Actual Diff	%age Diff
	PM	Direction	JYT (sec)	JYT (sec)	JYT (sec)	Base vs. 450 Unit	Base vs. 450 Unit	FBase vs. 450 Unit	FBase vs. 450 Unit
SECTION 2	H to I	Southbound	51	30	30	-21	-41%	0	0%
	I to J	Southbound	31	34	34	3	8%	0	1%
	J to K	Southbound	27	28	28	1	3%	0	0%
	H to K		110	92	92	-18	-16%	0	0%
	L to I	Northbound	47	63	63	15	33%	-1	-1%
	I to H	Northbound	31	26	26	-5	-17%	0	0%
	L to H		78	89	88	10	13%	-1	-1%
	M to H	Southbound	412	138	138	-275	-67%	0	0%
	H to M	Northbound	124	125	125	1	1%	0	0%

4. Summary and Conclusion

4.1. On behalf of Pell Frischmann, RWA have undertaken additional testing in VISSIM for the development proposal in East Grinstead located in the vicinity of Imberhorne Lane.

4.2. The 450 unit test has been tested in both the AM and PM peak 2031 future year. Pell Frischmann provided RWA with the 450 flow scenarios.

4.3. A development of 450 units was tested assuming the same road layout as the future base scenario. This therefore includes design drawing 5107918/TP/TD/301A provided to Pell Frischmann by Atkins. On comparing the future base and future proposed modelling results, the impact of a 450 unit development on journey times is anticipated to be insignificant.



KEY

- Topographical Survey
- Proposed Kerb Line
- Proposed Road marking
- Existing Road marking

DISCLAIMER:

Based on interpretation of Highway Boundary. The drawing should be considered as representative of boundaries as provided by WSCC and should be subject to confirmation of land title by suitably qualified legal persons.

REV	DESCRIPTION	DRN	CHK	APP	DATE
A	Footway widths amended to allow for minimum width avoiding the use of third party land. Original A3 drawing scaled up to A1 for purposes of clarity.	ZB	KM	PC	Jan 2020

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Architect/Client/Contractor

Welbeck Land

Project

Imberhorne Farm

Drawing Title

A22/Imberhorne Farm Proposed Layout

	Name	Date
Drawn	ZB	Dec 2019
Designed	ZB	Dec 2019
Checked	KM	Dec 2019
Approved	PC	Dec 2019

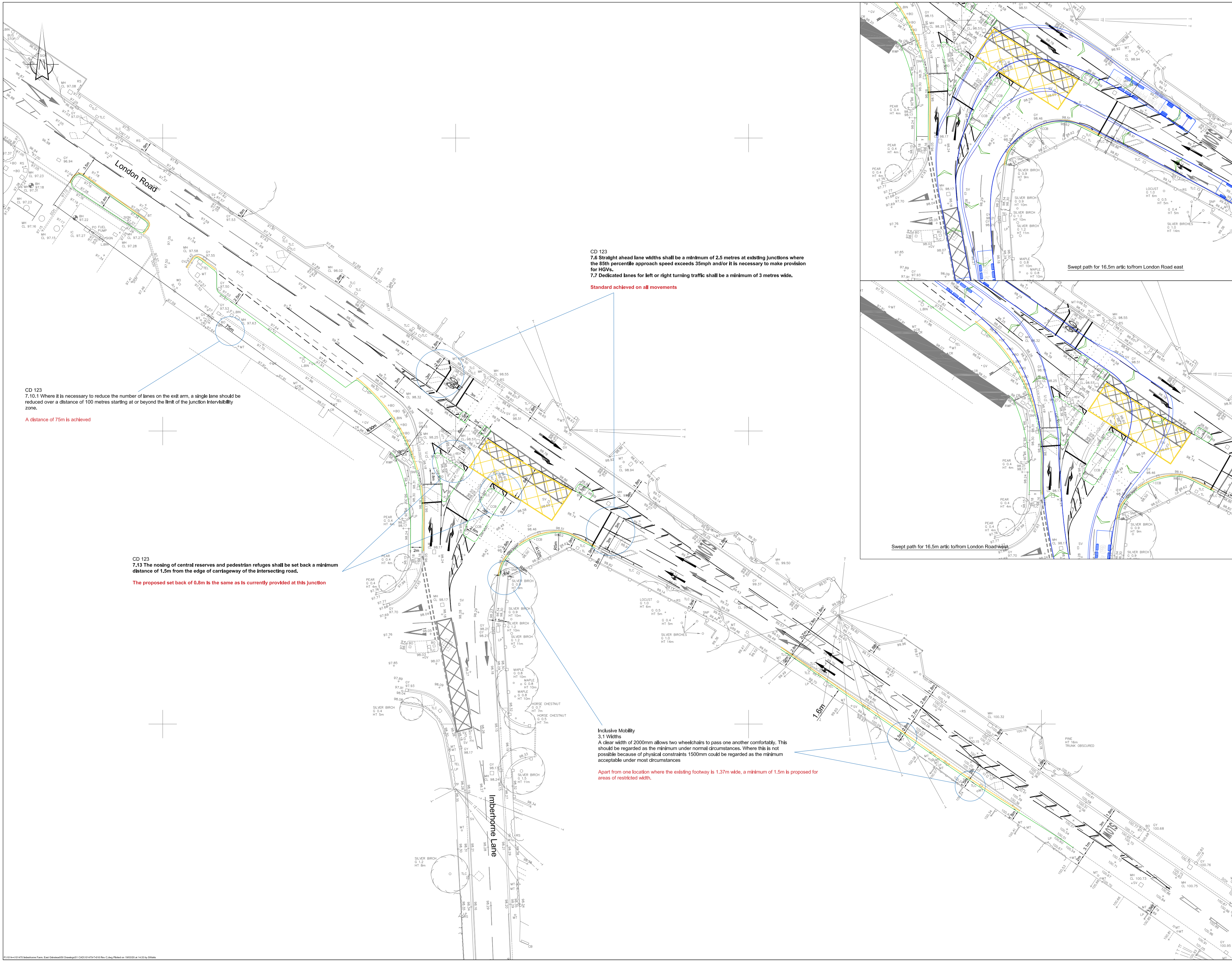
Scale: 1: 200 @ A0

File No.: 101470-T-016 Rev A Based on Topo.dwg

Drawing Status

Drawing No.: 101470 - T - 016

Revision: A



REV	DESCRIPTION	DRN	CHK	APP	DATE
C	Layout amended to improve operation	JH	SW	TM	19.03.20
B	Swept paths added	ZB	KM	PC	Jan 2020
A	Footway widths amended to allow for minimum width avoiding the use of third party land. Original A3 drawing scaled up to A1 for purposes of clarity.	ZB	KM	PC	Jan 2020

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Architect/Client/Contractor
Welbeck Land

Project
Imberhorne Farm

Drawing Title
A22/Imberhorne Farm
Proposed Layout

	Name	Date
Drawn	ZB	Dec 2019
Designed	ZB	Dec 2019
Checked	KM	Dec 2019
Approved	PC	Dec 2019

Scale 1: 200 @ A0
File No. 101470-T-016 Rev C.dwg
Drawing Status

Drawing No. 101470 - T - 016
Revision C

NOTES:

GENERAL

1. Do not scale from drawing.
2. All dimensions are in meters, unless stated otherwise.
3. This drawing to be read & printed in colour.
4. This drawing to be read in conjunction with other contract drawings.

KEY

- Topographical Survey
- Existing Roadmarking
- Existing Yellow Roadmarking
- Proposed White Roadmarking
- Proposed Kerb Line
- Proposed Back of Footway

P:\1014--\101470 Imberhorne Farm, East Grinstead\50 Drawings\51 CAD\101470-T-015 Based on Topo.dwg Plotted on 08/01/20 at 15:06 by ZBosher

Pell Frischmann

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Project: Imberhorne Farm

Drawing Title: Proposed Road Widening with Associated Ghost Islands

	Name	Date
Drawn	ZB	Dec 2019
Designed	ZB	Dec 2019
Checked	PC	Dec 2019
Approved	PC	Dec 2019

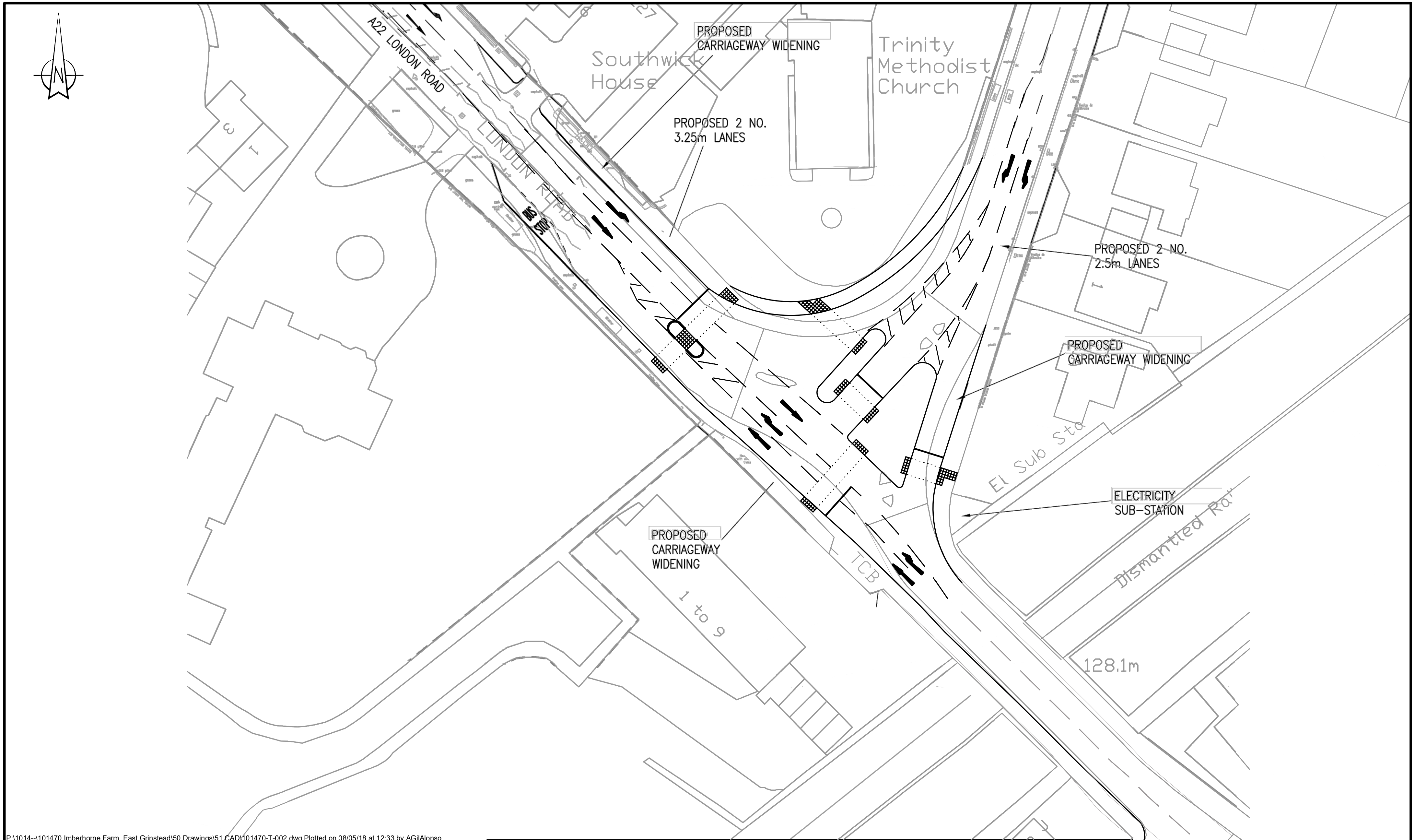
Scale: 1: 500 @ A3

File No. 101470-T-015 Based on Topo.dwg

Drawing Status

Drawing No. 101470 - T - 015

Revision: -



P:\1014--\101470 Imberhorne Farm, East Grinstead\50 Drawings\51 CAD\101470-T-002.dwg Plotted on 08/05/18 at 12:33 by AGilAlonso

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Project: Imberhorne Farm, East Grinstead

Drawing Title: Indicative Amendments to Proposed Lingfield Junction Layout

	Name	Date
Drawn	AGA	08/05/18
Designed	AGA	08/05/18
Checked	TM	08/05/18
Approved	PC	08/05/18

Scale: 1:500 @ A3

File No. 101470-T-002.dwg

Drawing Status: DRAFT

Drawing No. 101470-T-002

Revision