Southbourne

Level Crossing Baseline Safety Review

On behalf of **Chichester District Council**

Project Ref: 49551 | Rev: AA | Date: August 2020

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Document Control Sheet

Project Name: **Southbourne Level Crossing Baseline Safety review**

Project Ref: **47785**

Report Title: **Level Crossing Baseline Safety review**

Doc Ref: **47785/001**

Date: **September 2020**

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Revision	Date	Description	Prepared	Reviewed	Approved
A	August 2020	Update to report based on comments made by WSCC	DC	PB	PB
B	September 2020	Update to report based on comments made by CDC and WSCC	NM	PB	PB
C	November 2020	Final Issue	DC	PB	PB

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Non-Technical Executive Summary

Stantec, has been commissioned by Chichester District Council (CDC) to provide advice on the potential impacts of the proposed Southbourne development on the level crossing at Stein Road. This crossing is known as the Southbourne Level Crossing. The proposed development site is located at Southbourne in Chichester District.

Stantec has undertaken a baseline review of the railway level crossings at Stein Road and Inlands Road. The baseline review includes a review of the All Level Crossing Risk Model (ALCRM) assessment score for the crossings, details of their existing configuration and a summary of the usage of the crossings.

ALCRM assessments are undertaken by National Rail (NR) at all level crossings in England, Scotland and Wales. They assess the risk associated with the level crossing in a way that is standardised and comparable across the network.

The latest ALCRM assessment at the Stein Road crossing was carried out in February 2019. The ALCRM risk classification for the Stein Road crossing is G3, considered a High Risk category.

The latest ALCRM assessment at the inlands Road crossing was carried out in July 2019. The ALCRM risk classification for the Inlands Road crossing is D2, considered a High Risk category.

Transport modelling has also been undertaken to gain an indication of when a bridge over the railway line maybe triggered in light of the Southbourne development proposals. The transport modelling for this work considered two potential development site location options for the development. These are as follows and have been reviewed from documents provided by CDC:

- Option A: North East of Southbourne site location (Site A NE Southbourne) promoted by Barton Willmore.
- Option B: North West of Southbourne location (Site B NW Southbourne) promoted by Lichfields/Church Commissioners.

Both these options envision the delivery of 500 dwellings early in the plan period (Phase 1), with up to 2,000 dwellings being subsequently provided in the long term.

This report summarises the results of transport modelling testing to understand when a bridge over the railway line may be required at Southbourne as a result of the Southbourne development. The report takes into account dialogue held with CDC and WSCC regarding assumptions about how the Chichester Area Transport Model (CATM) SATURN model has been used to inform the number of development trips that are likely to cross the railway line.

A Paramics Discovery micro-simulation model has been used to understand and indicate if and when a bridge over the railway may be triggered when the Southbourne development is built out. The AM period was modelled and analysed as it was considered that this is when most trains crossed the level crossings in the Southbourne area and would best illustrate the impacts of the proposed development on the level crossings.

The following dwelling scenarios were considered:

- 250 dwellings; this tests for a scenario below the 500 dwellings generally assumed to be delivered early in the plan period (Phase 1)
- 500 dwellings, the amount indicated by both visions as deliverable early in the plan period (Phase 1)
- 750 dwellings

- 1,000 dwellings
- 1,250 dwellings.

In informing the demands that would cross the railway line, the CATM SATURN model provided a starting point. A worst-case scenario and an alternative more likely scenario were considered in deriving the demands from SATURN to inform the microsimulation model. The main difference between the alternative scenario demands and the worst-case scenario demands, is in the set of assumptions of how the SATURN model flows have been used to inform the Paramics Discovery microsimulation. This pertains to how the demands from the Southbourne development would assign to the wider road network and hence how much of the demands from the Southbourne development would cross the railway level crossing.

In the worst-case scenario it was assumed that 80% of the demands from the Southbourne development would cross the railway level crossing at Stein Road. The SATURN model had in contrast assigned all trips from the development heading to western destinations such as Havant, via the ‘back roads’ such as Old Farm Lane. It was considered that the model was erroneous in this regard as it would be expected that most of the trips would head south and cross the railway level crossing before heading west along the A259 Main Road.

While the SATURN model zoning and network definition is detailed to the east of Southbourne and beyond including Chichester, the same could not be said of destinations to the west. Southbourne is on the periphery of the western edge of the simulated area of the SATURN model. Therefore, the zoning on the western area of the model including Havant, is coarse and the network definition is less detailed. This means that route choice to destinations to the west of Southbourne is not as representative as it could be and was considered to be erroneous. The SATURN model was developed to represent Chichester accurately and is therefore a suitable tool to inform the impacts of the emerging Local Plan. On the other hand, the model detail is limited on the western periphery, hence the need to manually adjust the SATURN assignment of trips from the Southbourne development for input into the Paramics Discovery microsimulation model.

While West Sussex County Council (WSCC) and Chichester District Council (CDC) had agreed the need to manually adjust the SATURN assignment to inform the microsimulation modelling, it was considered that the 80% assumption was a worst-case scenario and it was necessary to explore a further test with alternative assumptions. In particular, it was considered that for trips with destinations towards the southern part of Chichester/Manhood/Bognor/A27E, as well as for trips with destinations to the north, the assignment predicted by SATURN was reasonable and accurate and hence there was no need to manually adjust the assignment of these trips. The SATURN assignment of some traffic towards Chichester city centre (north)/Summersdale/Lavant was also considered reasonable in routeing through Funtington/East Ashling.

Therefore, in the alternative scenario testing, the SATURN assignment of trips heading into Chichester whether using the A250 Main Road towards southern destinations or using the northern ‘back roads’ including through Funtington/East Ashling, have been retained from that predicted by the SATURN model. Furthermore, trips heading northwards such as via the B2147 Foxbury Lane to destinations to the north, have also retained the SATURN assignment. However, trips to western destinations including the Havant area, have been modified but to a lesser extent than in the worst-case scenario. In the alternative test only 20% of the trips predicted by SATURN as assigning via the ‘back roads’ such as Old Farm Lane Road have retained the SATURN predicted routeing, while the other 80% was manually adjusted to cross the level crossing at Stein Road, before heading westwards using the A259 Main Road. These assumptions have been used to inform the alternative scenario test microsimulation model. This alternative scenario test was considered as more representative in its demand assumptions than the worst-case scenario demands and has subsequently been taken forward to inform the microsimulation modelling. This has therefore informed the results of the microsimulation modelling reported in this study.

Visual and analytical outputs of the micro-simulation modelling were used to assess the model. It was considered that the variation in maximum queue lengths in metres provided an easily understandable parameter to inform when a bridge may be required. The analysis considered that the changes in queue length in the southbound direction was the most critical direction to look at given that in the AM peak period, most trips would be leaving the development and crossing the level crossings to access the wider network via the A259 Main Road to the south of the railway line. Following discussions with WSCC and CDC, it was agreed that a time metric such as delays or journey times be also reported. Path journey times have been analysed and reported in this analysis although the it has been considered that queue length analysis has been more informative of the potential impacts of the Southbourne trips and when a bridge may be required.

It was evident from the results that queue lengths increase noticeably in the southbound direction by the 500 dwellings scenario, increasing more still through the 750 dwellings to the 1,250 dwelling scenarios. The results indicate that the number of time slices with queues doubling, increases sharply between the 750 dwelling and 1,000 dwelling scenarios. This appears to suggest that an indicative threshold for a bridge may be reached by the 750 home scenario or by the 1,000 dwelling scenario. In the main, this outcome is consistent with the worst case. This indicates that a bridge may be required in the scenario with 750 dwellings. The outputs of this modelling are intended to provide an indicative trigger point for a bridge rather than to prescribe when a bridge is required. They must therefore be understood in the context of the limited nature of the modelling exercise, to be indicative rather than being prescriptive .

In the context of this study, the indicative trigger for a bridge applies to both the Site A NE Southbourne and Site B NW Southbourne options. The main difference is that in the Site A NE Southbourne option, the phasing indicates that about 152 dwellings are planned south of the railway line. It is considered that these dwellings have less impact on the need for a level crossing given their location. Therefore, with the Site A NE Southbourne option, it may be possible to provide the 152 dwellings plus the limiting 750 dwellings assumed to be north of the railway line (or 902 dwellings for this option).

In conclusion, the study suggests that for Site A NE Southbourne option, 902 dwellings can be provided before the indicative threshold for a bridge is reached (750 dwellings north of the railway line plus the 152 dwellings estimated south of the railway line). Indications are that beyond this, a new bridge would be likely to provide some benefit, if the peak car demand could not be reduced by other measures to encourage sustainable travel choices

For Site B NW Southbourne option, 750 dwellings all north of the railway line can be provided as an indicative threshold. Beyond 750 dwellings, a new bridge would be likely to provide some benefit, if the peak car demand could not be reduced by other measures to encourage sustainable travel choices.

1 Introduction

1.1 Introduction

1.1.1 Stantec, has been commissioned by Chichester District Council (CDC) to provide advice on the potential impacts of the proposed Southbourne development on the level crossing at Stein Road. This crossing is known as the Southbourne Level Crossing. The proposed development site is located at Southbourne in Chichester District.

1.1.2 Southbourne Parish Council (SPC) has requested an understanding of the impact of the development trips at Southbourne on the level crossing at Stein Road. It is required to gain an understanding of a trigger point (in number of dwellings) to determine when a requirement for a bridge can be justified in transport terms.

1.1.3 This study is related to and arises from the wider work that Stantec undertook in 2018 for CDC as part of the Transport Study to inform the Local Plan Review (LPR). During the course of the Local Plan Regulation 18 Consultation following the 2018 study, representations were made by various stakeholders on a number of issues including representations pertaining to a lack of consideration to 'address congestion caused by railway crossings'. In June 2019, Stantec produced a technical note 'Chichester Local Plan – Consultation responses, sensitivity tests' that addressed the representations. The technical note included the results of sensitivity tests undertaken to understand the impacts on railway crossings. The sensitivity tests were informed by the Chichester Area Transport Model (CATM). This study builds further to these sensitivity tests.

1.1.4 The study comprises of the following key tasks:

- Baseline Review of existing level crossing conditions in the area on Stein Road and on Inlands Road using Network Rail information;
- Transport modelling assessment of the potential impact of the proposed Southbourne development on the level crossings to indicate a trigger point for when a railway crossing bridge maybe required.

1.1.5 A small micro-simulation model has been developed as the main tool to inform the transport modelling. The micro-simulation model provides both analytical outputs and also acts as a visual tool to help understand how trips from the proposed Southbourne development may impact the railway level crossings. The increase in queue lengths compared to a Reference Case scenario without the development has been used as the assessment output parameter as it was found to better inform a trigger point for a bridge than a comparison of journey time changes or delays. The widely used Paramics Discovery (version 22.03) micro-simulation software has been used.

1.1.6 The modelling has focussed on the Stein Road level crossing although in principle, the results can be considered to be representative of the Inlands Road level crossing as well. The Paramics Discovery model consisted of coding a stretch of road to represent Stein Road on both sides of the level crossing.

1.2 Southbourne development location

1.2.1 The transport modelling for this work considered two potential development site location options for the Southbourne development. These are as follows and have been reviewed from documents provided by CDC:

- Option A: North East of Southbourne site location (Site A NE Southbourne) promoted by Barton Willmore[1]

- Option B: North West of Southbourne location (Site B NW Southbourne) promoted by Lichfields/Church Commissioners[2].

1.2.2 The proposed North East Southbourne development site and the locations of the two level crossings are shown in Figure 1-1 while the North West Southbourne development site location is shown in Figure 1-2.In August 2020 the Parish Council published a draft Neighbourhood Plan which set out proposals for expansion of the village to the east. These proposals are considered broadly consistent with Option A (Site A NE Southbourne) for the purposes of this exercise as outlined in Section 4 of this report.

[1] Barton Willmore – A Vision for Southbourne.pdf (A Vision for Southbourne Vision Document February 2019)

[2] 1 West D2654_R001_REVI_Southbourne Vision_reduced.pdf (Land at Southbourne Vision Document February 2019)

Figure 1-1: Site A North East Southbourne site and level crossing locations

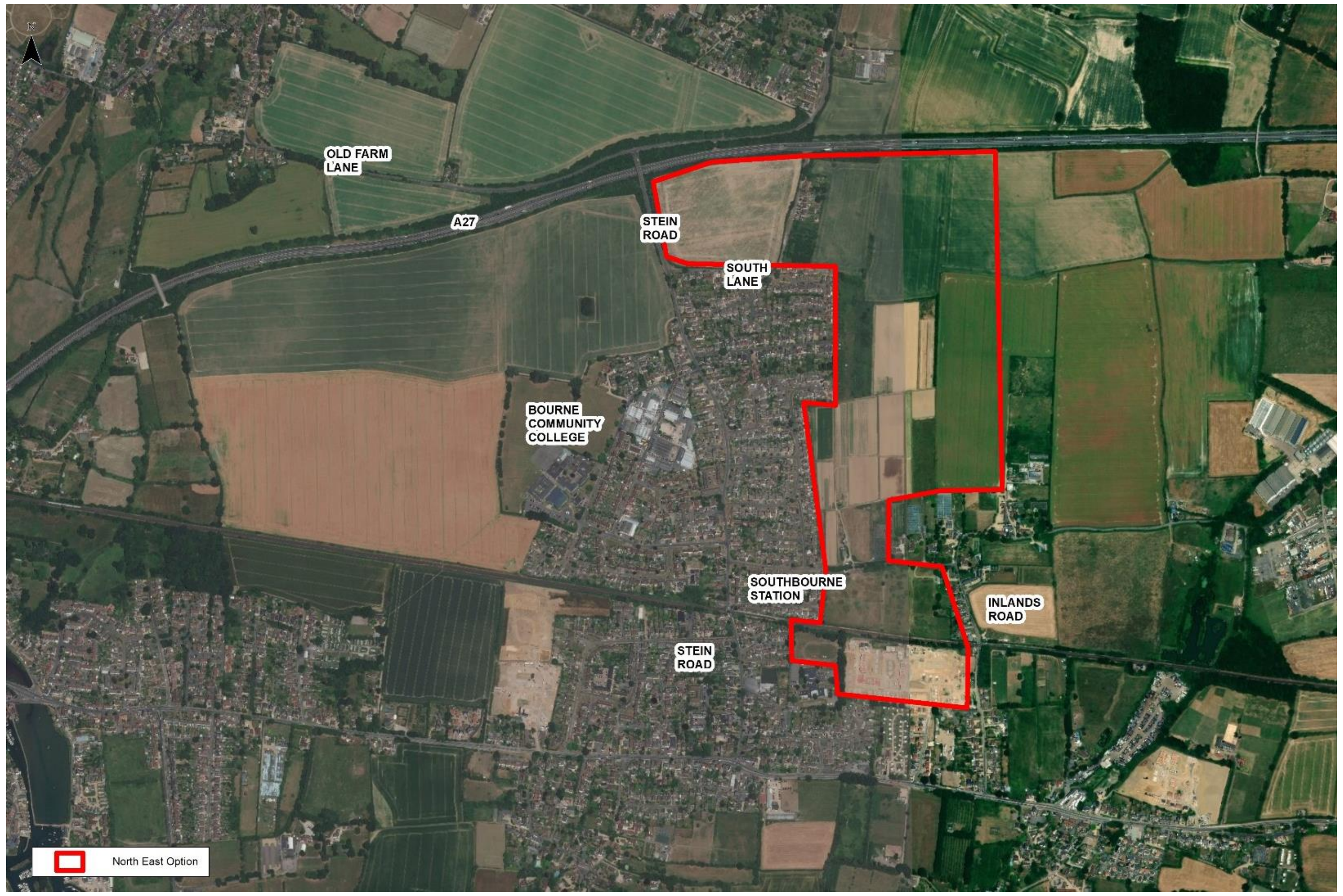
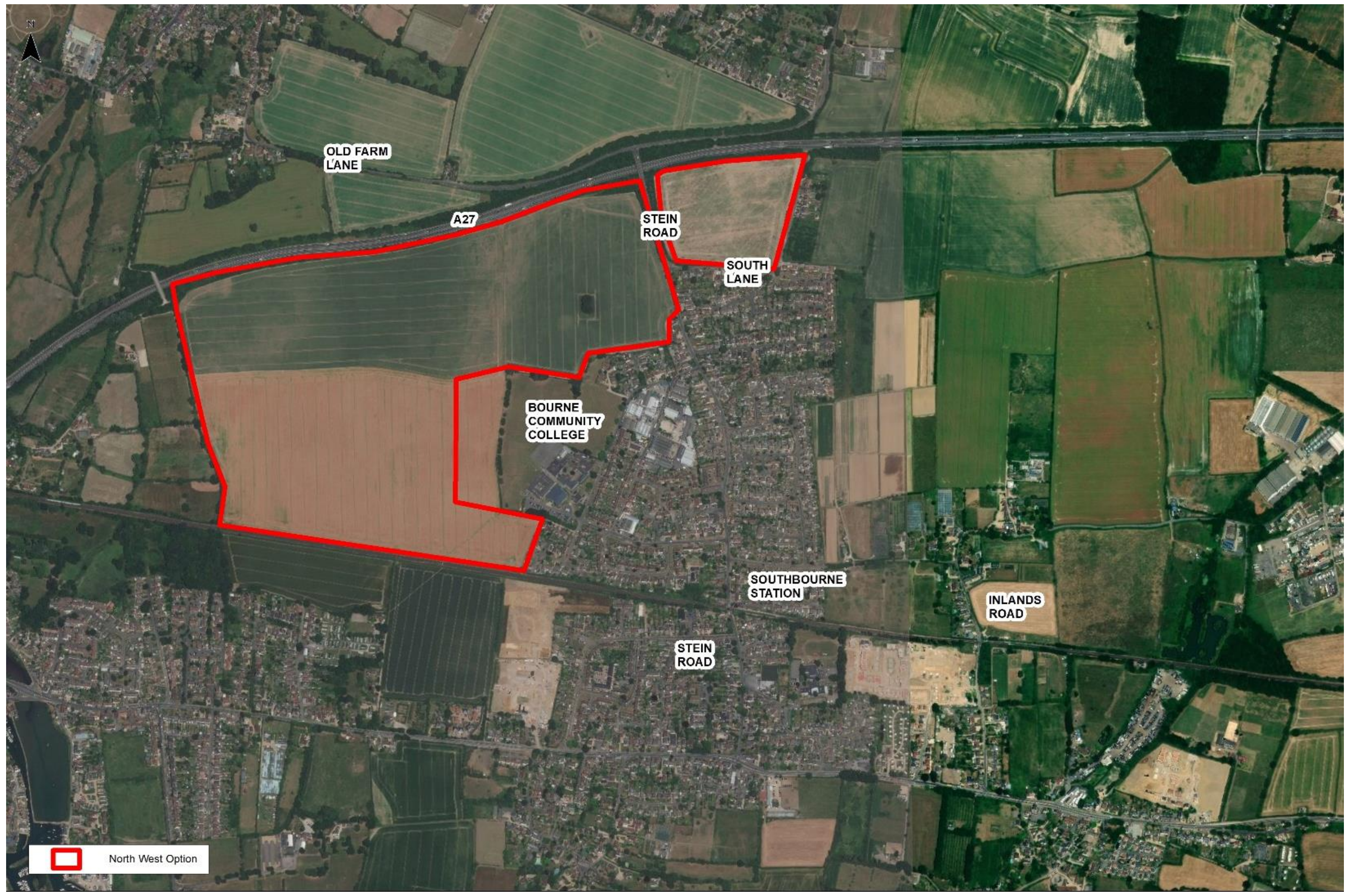


Figure 1-2: Site B North West Southbourne site location



1.3 Report Structure

1.3.1 Following this introduction this report is set out as follows:

Section 2 reports on the Baseline Review which includes a review of the All Level Crossing Risk Model (ALCRM) assessment score for the Stein Road and Inland Road level crossings which are undertaken by Network Rail (NR),

Section 3 reports on the South East Area Route Study,

Section 4 reports on the Southbourne development proposals,

Section 5 reports on the Paramics Discovery Modelling,

Section 6 provides a summary and conclusions.

2 Baseline Review

2.1 Introduction

2.1.1 This section reviews the existing information available for each of the Stein Road and Inland Road level crossings. This includes a review of the All Level Crossing Risk Model (ALCRM) assessment score for the crossings, details of their existing configuration and a summary of the usage of the crossings. Information related to any known recent incidents at the crossings is also included within this section.

2.2 Background Information

2.2.1 ALCRM assessments are undertaken by National Rail (NR) at all level crossings in England, Scotland and Wales. They assess the risk associated with the level crossing in a way that is standardised and comparable across the network. The outcome of the ALCRM assessment is provided on NR's website together with contextual information including crossing's location, how much traffic (rail, road and pedestrian) it receives and the crossing's history of near misses and accidents.

2.2.2 ALCRM Risk Classification is provided as a number and a letter, e.g. D6:

- The letter represents an **Individual Risk Score** which applies only to those traversing the crossing on the highway network and ranges from A to M where A is the highest risk value and M is the lowest risk value. Individual Risk is defined as the probability of fatality to a 'regular user' who is assumed to use a crossing for a daily return trip or 500 trips per year. These type of trips are also labelled as 'functional' in the rest of this report; and

- The number refers to a **Collective Risk** which is the total risk for the crossing and includes the risk to users, train staff and passengers. This can range from 1 to 13 where 1 is the higher risk value and 13 the lowest value. The NR website states that *"the Collective Risk score is the most important part when prioritising crossings".*

2.2.3 To aid understanding, the ALCRM scores are categorised into three levels of risk. Table 2-1 below shows the possible ALCRM scores and where they lie in terms of risk level, with High Risk scores in red, Medium Risk scores in orange and Low Risk scores in yellow.

Table 2-1: ALCRM Classifications

Risk		INDIVIDUAL RISK												
		A	B	C	D	E	F	G	H	I	J	K	L	M
COLLECTIVE RISK	1	A1	B1	C1	D1	E1	F1	G1	H1	I1	J1	K1	L1	M1
	2	A2	B2	C2	D2	E2	F2	G2	H2	I2	J2	K2	L2	M2
	3	A3	B3	C3	D3	E3	F3	G3	H3	I3	J3	K3	L3	M3
	4	A4	B4	C4	D4	E4	F4	G4	H4	I4	J4	K4	L4	M4
	5	A5	B5	C5	D5	E5	F5	G5	H5	I5	J5	K5	L5	M5
	6	A6	B6	C6	D6	E6	F6	G6	H6	I6	J6	K6	L6	M6
	7	A7	B7	C7	D7	E7	F7	G7	H7	I7	J7	K7	L7	M7
	8	A8	B8	C8	D8	E8	F8	G8	H8	I8	J8	K8	L8	M8
	9	A9	B9	C9	D9	E9	F9	G9	H9	I9	J9	K9	L9	M9
	10	A10	B10	C10	D10	E10	F10	G10	H10	I10	J10	K10	L10	M10
	11	A11	B11	C11	D11	E11	F11	G11	H11	I11	J11	K11	L11	M11
	12	A12	B12	C12	D12	E12	F12	G12	H12	I12	J12	K12	L12	M12
	13	A13	B13	C13	D13	E13	F13	G13	H13	I13	J13	K13	L13	M13

2.2.4 When considering the impact of proposed development, it is understood that NR undertake an ALCRM assessment and consider whether the impact of development would lead to a change in Individual and/or Collective Risk. NR are the only organisation able to undertake ALCRM assessments, and they do so for their own purposes, or will do so for third party organisations via their consultancy arm, for a suitable fee. These are used by NR in particular to assess the impact of proposed developments and negotiate potential mitigations when considered (by NR) to be required. NR's approach is understood to be that only a change in risk category (from Low to Medium or from Medium to High) triggers the potential need for mitigation at a crossing.

2.2.5 Narrative risk assessments provide much more detail about the ALCRM assessment for a level crossing, but a review of the NR website indicates that these are only undertaken for crossings with a very high-risk score of A1-C3. None of the crossings considered within this note fall into these classifications and therefore no narrative risk assessments are available.

2.2.6 NR's website makes clear that they consider that the safest form of railway would not have any level crossings, and they would prefer to close as many as possible. They consider that this, and other safety measures, are important in managing the railway network. Hence, NR are looking to eliminate risk at level crossings, by closing them or improving equipment at crossings where 'reasonably practicable'. Where crossing closure is not appropriate, or agreement cannot be reached to do so, one or more of the following measures can be implemented to reduce risk where this is considered to be necessary:

- Improving visibility and line of sight at crossing;
- Fitting LED road traffic lights, improving their brightness;
- Installing new technology to inform users of a second train approaching the crossing in quick succession to the first;
- Installing barriers at open crossings;

- Providing a fleet of mobile safety vehicles for operation by British Transport Police to discourage deliberate misuse and to record offences at level crossings;
- Using crossing red light safety cameras;
- Installing power-operated gates at user worked crossings;
- Providing audible warning devices; and
- Using miniature stop lights at user worked crossings.

2.2.7 There may also be traffic management measures that can be implemented to more effectively manage the interaction at crossings and encourage better discipline by users. An example may be where traffic queuing is likely to occur, and so yellow box markings and signage could be used to alert drivers to the risks and discourage misuse and queuing onto the crossing itself.

2.3 Existing Conditions at the Level Crossings

2.3.1 The ALCRM assessments take into consideration the number of trains travelling through a crossing per day, and the speed and type of trains. These details are the same for both crossings included within this study, as they all lie on the same line. The information provided on the NR website indicates an approximate total of 190-194 trains per day travelling through these crossings.

2.3.2 The recorded maximum line speed for trains at all crossings is 75mph and both passenger and freight trains use the line.

2.3.3 A review of the Crashmap website (www.crashmap.co.uk) identified no collisions at the level crossing within the last five years.

2.3.4 The following sections provide details on the current ALCRM score, protection arrangements and crossing usage for each of the nine crossings included within this study. This review has utilised existing information available from Network Rail[3].

2.4 Stein Road, Southbourne (Road Crossing)

Current Protection Arrangements

2.4.1 The Stein Road crossing has train signalling protection, CCTV monitoring, road traffic light signals, full barriers and an audible alarm.

[3] Level Crossing Data August 2020 - https://www.networkrail.co.uk/communities/safety-in-the-community/level-crossing-safety/

Crossing Usage

2.4.2 The current expected number of crossings per day is 4,509 vehicles and 648 pedestrians or cyclists. The Stein Road crossing allows connectivity from the A259 to Old Farm Lane and Westbourne to the north of Southbourne. It also the main crossing allowing connectivity within Southbourne and access between the two platforms at Southbourne Station.

ALCRM Score

2.4.3 The latest ALCRM assessment at this crossing was carried out in July 2020. The ALCRM risk classification for the Stein Road crossing is G3, considered a High Risk category.

2.5 Inlands Road (Road Crossing)

Current Protection Arrangements

2.5.1 The Inlands Road level crossing has road traffic light signals and an audible alarm. It also has half barrier equipment but no CCTV or train signalling protection.

Crossing Usage

2.5.2 The current expectation for use within the ALCRM assessment is 1,107 vehicles and 108 pedestrians or cyclists. The crossing is on Inlands Road, to the east of Southbourne it is a minor road linking Inlands with Southbourne to the west and Hambrook to the east. Any traffic associated with new development north of Inlands is likely to use this crossing to travel south towards the A259.

ALCRM Score

2.5.3 The latest ALCRM assessment at this crossing was carried out in July 2019. The ALCRM risk classification for the Inlands Road crossing is D2, considered a High Risk category.

2.6 Summary of ALCRM Assessments

2.6.1 Table 2- 2 summarises the information presented on the NR website regarding the latest ALCRM assessments for the crossings in this study.

Table 2-2: Summary of ALCRM Assessments

Crossing Name	Crossing Type	Assessment Date	Risk Score	Key Risk Drivers	Types of Trains	Line Speed	*No. trains per Day Approx.	Census (current expectation)	Current Protection Arrangements
Stein Road	Road Crossing with full barriers	July 2020	G3	Frequent trains, Large number users, Near station, Sun glare	Passenger & freight	75mph	190	4,509 Vehicles and 648 pedestrians or cyclists.	Train signalling protection, CCTV monitoring, road traffic light signals, full barriers and an audible alarm
Inlands Road	Road Crossing with half barriers	July 2019	D2	Frequent trains, User misuses, Blocking back	Passenger & freight	75mph	194	1,107 Vehicles and 108 pedestrians or cyclists.	Traffic light signals, an audible alarm, half barrier equipment

* note discrepancies between the approximate numbers of trains per day. The data has been extracted from NR data and the lower value taken in 2020 may be as a result of the inclusion or otherwise of non-timetable movements, such as NR's own track inspection, maintenance trains or other unplanned movements of empty stock or locomotives of the days for which the data was interrogated. Regular timetabled movements of empty passenger stock at the beginning and end of services are likely to be included as standard at both crossings.

3 South East Area Route Study

3.1 Introduction

3.1.1 This section reviews the proposals contained within the South East Route: Sussex Area Route Study SER SARS (September 2015) which are associated with the level crossings within this study.

3.1.2 There are proposed options for journey time and frequency improvements on the West Coastway services, but it is reckoned that further work is required on deciding station stops patterns along the line.

3.1.3 West Coastway to London journey time are more challenging to improve as space around the line is limited and close distances between level crossings which leads to difficulties to improve line speed and service frequencies.

3.1.4 There is only one clear option exists. If the full set of Brighton Main Line enhancements identified in Section 5.5 of the route study are delivered in CP6, this would allow a maximum of extra 2 train-per-hour in the peak periods from the West Coastway as the result. Hence, this would reduce the generalised journey time in peak periods.

3.2 Crossing Proposals

3.2.1 The SER SARS does not provide details of the ALCRM assessment scores or analysis resulting from the proposals with no justification for which crossings should be retained or closed. Nor does it explicitly indicate potential closures of level crossings along the West Coastway line, therefore, as the level crossings at Southbourne are vital for local use it is highly likely these will not close in the foreseeable future. Keeping in mind NR's general desire to close level crossings where possible - but in the absence of any evidence from NR in this regard the position remains ambiguous.

3.2.2 The construction of a bridge over the railway, however, will mitigate any foreseeable traffic increase at these level crossings, and, therefore, assist in the reduction of the ALCRM risk.

4 Southbourne Development Proposals

4.1 Introduction

4.1.1 The assessment utilised the 2035 Reference Case Chichester Area Transport Model (CATM) used for the assessment of the Local Plan. The AM peak model was used which is deemed to incorporate the largest traffic demand and highest level of train services over the periods modelled.

4.2 Phasing Assumptions informing the modelling tests

North East Southbourne

4.2.1 A review of the Barton Willmore vision document indicated potential development parcels for the Site A NE Southbourne site proposals and how at least 2,000 homes could be accommodated on the site overall. It is noted that the emerging Local Plan assumes that 1,250 homes would be delivered over the Plan period and hence the transport modelling has assumed this to be the upper limit of testing.

4.2.2 Three phases are indicated in the Barton Willmore document as follows in terms of delivery of homes:

- Phase 1: 500 dwellings including a parcel (Parcel F) which is located south of the railway line and would be accessed off the A259 Main Road. It has been assumed that trips from this parcel would to all intents and purposes will not significantly impact the level crossing and as such would not be dependent on a bridge. It was estimated from the parcel hectarage (site capacity and parcels – included as Appendix A in this report) information in the document, that approximately 152 homes of the 2,000 homes planned, would be on parcel F. Thus, in the event that 500 homes were indicated to be the trigger point for a bridge for example, the Site A NE Southbourne Option could in fact deliver up to 652 homes including the estimated 152 homes south of the railway line.

- Phase 2: would deliver an additional 750 homes to give a total of 1,250 homes. The Barton Willmore proposals indicate that a proposed bridge over the railway line (with potential for relocating the station). The proposed connection over the railway line would reduce traffic from the existing level crossings on Stein Road and Inland Road.

- Phase 3: A Future Expansion Area would deliver a further 750 dwellings to provide the full potential of 2,000 homes in total. The proposals indicate that a new A27 Junction would be required by this stage. This scenario has not been considered in this modelling as a limit of 1,250 consistent with the plan period ambition has been considered the upper limit.

4.2.3 In August 2020 the Parish Council published a draft Neighbourhood Plan which set out proposals for expansion of the village to the east. Draft Policy SB2 seeks “provision for, and contribute to delivering as soon as possible during the construction period, a new road and cycle bridge over the railway line”. Policy Map Inset 1 (set out in Appendix B to this report) does not indicate a new link to the A259 to the east of Inlands Road, though the Neighbourhood Plan is not specific regarding any potential change in traffic flows, including an increase on traffic using the Inlands Road crossing. Therefore, for the purposes of investigating the potential impacts of the proposed development on the level crossing at Stein Road, this report assumes the Inlands Road crossing is not used by potential development traffic, as this will provide a “worst case” scenario to test.

North West Southbourne

4.2.4 The vision document for this option states that a development of this scale may be reasonably take up to 10 years to complete depending on market and macro-economic conditions. It is stated that the first 500 dwellings could be delivered from Stein Road early in the plan period from two outlets delivering in the region of 100 – 150 dwellings per annum, including affordable housing.

4.3 Assumed Model Testing

4.3.1 Following the above information for both options, it was considered reasonable to undertake testing for the following scenarios for both sites:

- 250 dwellings which tests for a scenario below the 500 dwellings generally assumed to be delivered early in the plan period (Phase 1)
- 500 dwellings, the amount indicated by both visions as deliverable early in the plan period (Phase 1)
- 750 dwellings
- 1,000 dwellings
- 1,250 dwellings.

4.4 Trip Generation

4.4.1 The trip generation for the Southbourne development for the modelled scenarios are presented in Table 4- 1. The trip rates assumed those used in the Local Plan modelling and would apply to both the Site A NE Southbourne and Site B NW Southbourne development locations.

Table 4-1: Trip generation

Test Scenario	No of Homes	Arrivals	Departures	Total Trip Generation
1	250	27	95	122
2	500	55	189	244
3	750	82	278	360
4	1000	109	378	487
5	1250	136	473	609

4.5 Application of the SATURN Model

4.5.1 It was considered that the SATURN based Chichester Area Traffic Model (CATM) model would be an appropriate tool to inform the number of development trips that would cross the level crossings. As an area-wide strategic model that assigns traffic to minimum cost routes, it was found that most development trips north of the railway line, did not cross the railway line to then join the A259 Main Road to the south. Instead the trips mainly routed northwards over the A27 before joining the local roads.

4.5.2 A review of the traffic assigned from the development as modelled within the SATURN model showed that the level of traffic using the highway network to reach the zones in the Havant area of the model was distorted. This is due to the model being more detailed around the Chichester area and away from county boundary given the purpose of the model to test the impacts of the emerging Chichester Local Plan. The model is therefore robust in assessing the impact of the Local Plan and can be relied upon for this purpose.

4.5.3 In contrast, the model detail including zoning and network definition, is limited and coarse on the western periphery of the simulated area. The coarser zoning and limited network detail on the western edge of the model, meant that the route choice of trips from the Southbourne development to western destinations external to West Sussex, such as Havant, was poorly represented and erroneous. It was for this reason that the need arose to manually adjust the SATURN assignment of trips from the Southbourne development for input into the Paramics Discovery microsimulation model.

4.5.4 It must be stated that the key trips within the model, such as that of the strategic trips associated with Chichester and through trips are not impacted, with only short distance trips towards Havant witnessing issues.

4.5.5 Two approaches were considered to manually adjust the SATURN assignment trips. The first is termed a Worst-case scenario and the second an Alternative scenario. These scenarios are now explained.

4.6 Worst-case Scenario Assumptions

4.6.1 Figure 4-1 depicts three assignment scenarios that assist in understanding the demand assumptions used in the microsimulation modelling. These have all been shared with WSCC and CDC with the methodology agreed between both parties.

4.6.2 Within Figure 4-1, the three assignment assumptions are shown based on trip generation for 750 dwellings from the Southbourne development. The flows are in units of Passenger Car Units (PCUs).

4.6.3 The values indicated in Black are the unadjusted SATURN assigned trips. It shows that of the 360 trips generated in the AM peak, 286 trips (~80%) would head north and not cross the railway line to the south. Of these 286 trips, 160 trips then head to destinations to the west, such as Havant. The other 126 trips heading northwards is split into 67 trips which head further north, and the remaining 59 trips use routes, such as Common Road to head to Chichester to the east. Only 74 trips (~20%) head south to cross the railway line before using the A259 to head west (1 trip) or head east towards Chichester (73 trips).

4.6.4 The second set of values, shown in Purple are the Worst-case scenario assignment assumptions. The worst-case scenario assumed that 80% (288 trips) of the trips generated by the development in the AM peak would head southwards and cross the railway line at Stein Road. The other 20% (72 trips) would head north and would not impact the level crossing.

4.6.5 The worst-case scenario assumes that only the 67 trips travelling to destinations further north would retain their routeing. The 59 trips assigned in SATURN to head into Chichester using routes to the north, are assumed instead to head south and cross the railway line. A similar assumption has been made for 155 of the 160 trips predicted by SATURN to head north from Southbourne and then west towards Havant. The 155 trips would head south instead and cross the railway level crossing, with only 5 retained on the route predicted by SATURN. This assignment is considered to be a worst-case assumption of the number of trips that may cross the level crossing southbound.

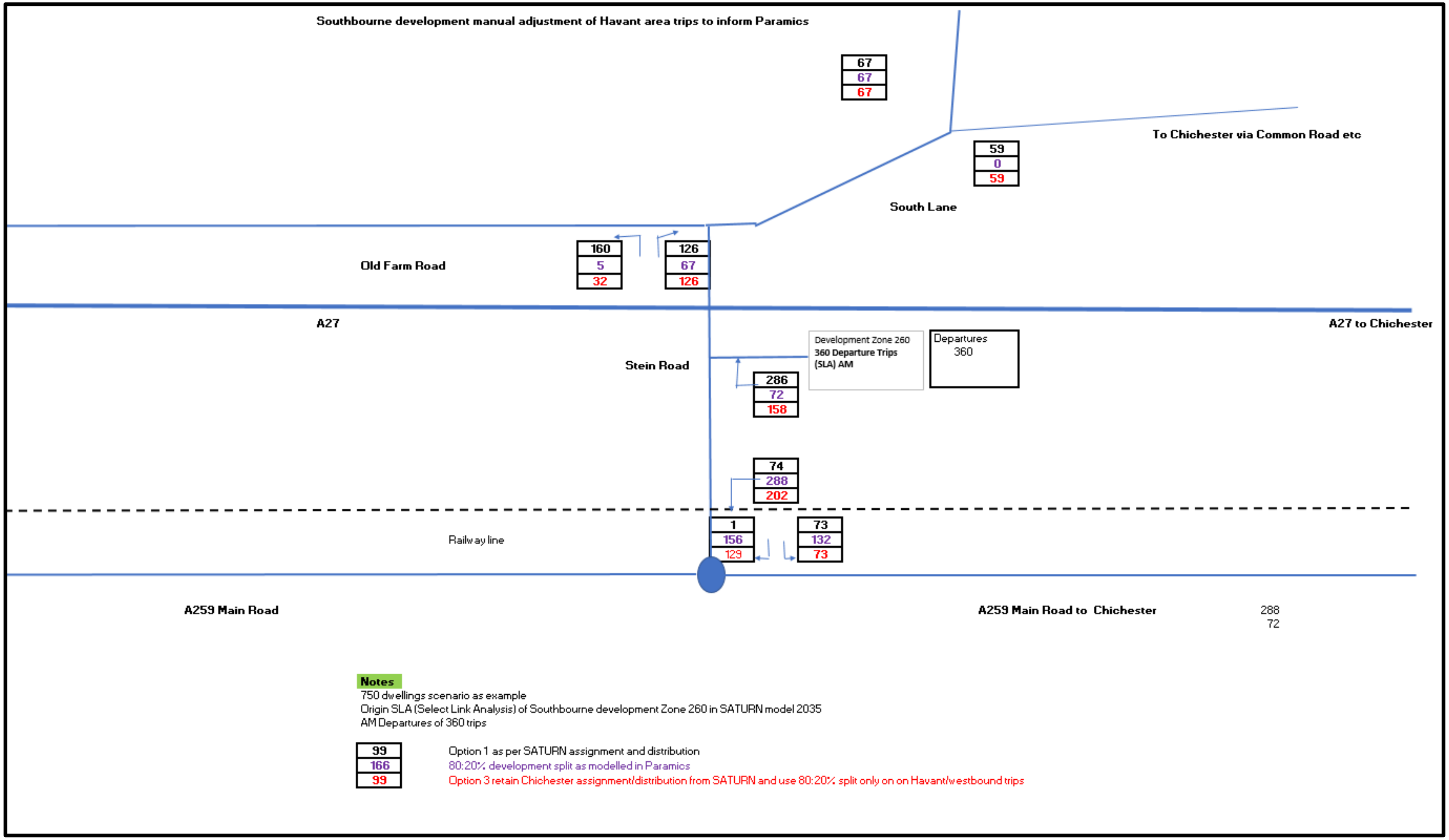
4.6.6 The final set of values and subsequent distribution assumptions indicated in Red relate to the Alternative scenario assignment which is further expanded upon in the following section.

4.7 Alternative Scenario Assumptions

4.7.1 Following discussions with WSCC and CDC it was agreed that an additional test should be undertaken. This section provides technical detail on the assumptions used for this test known as the Alternative scenario assignment test.

4.7.2 The flow highlighted Red as illustrated in Figure 4-1, are the alternative assignment assumptions. In this scenario, amendments have been made for trips heading towards Havant only.

Figure 4-1: Assignment Assumptions (750dwelling example)



4.7.3 In this scenario, it is assumed that of the 160 trips assigned in SATURN to head north and then west towards Havant and the A3(M), 80% of these trips (128 vehicles) would head south and cross the level crossing at Stein Road while 32 trips or 20% would head north and then west and therefore not have any impact on the level crossing.

4.7.4 The 126 trips predicted to head north by SATURN is retained. Therefore, of the total 360 development trips, 158 would head north and as such would use the level crossing. The remaining 202 trips would head south and use the level crossing. Of these73 trips as predicted by SATURN would head east along the A259 towards Chichester and 129 would head west towards Havant.

4.7.5 The calculations are illustrated below for completeness:

Northbound trips from the Development site are calculated as follows:

158 trips = 126 (direct from SATURN) + 20% of the160 trips that SATURN assigns westwards towards Havant using the backroads (or +32 trips)

The 126 northbound trips then split into 67 trips and 59 trips as per SATURN assignment

Southbound trips from the Development site are calculated as:

202 trips = 360 trips – 158 northbound trips

The 202 trips are further split into 73 trips eastbound (as per assignment from SATURN) and 129 trips westbound on the A259.

The 129 trips comprise 80% of the 160 that SATURN assigns westwards towards Havant using the backroads (or 128 trips) + the 1 trip that SATURN assigns on the A259 westbound

4.7.6 These Alternative scenario assumptions vastly retain the assignment assumptions from the SATURN model and have therefore been used to inform the Paramics modelling and outputs presented in this report.

5 Paramics Modelling on Level Crossing

5.1 Introduction

5.1.1 In order to assist in understanding the impacts of development traffic on the level crossings, a small micro-simulation model was developed. The model was created using Paramics Discovery v22.0.3 the latest version available at the onset of the testing. The micro-simulation model in addition to being an analytical tool, also acts as a visual tool that therefore aids understanding of the operation of the level crossings as the number of proposed Southbourne homes are increased. In particular, the changes in queue length on the approaches to the level crossing can be visually assessed and understood, as are the potential changes in delays experienced by travellers.

5.2 Methodology

Model Area and Zones

5.2.1 The modelling has focussed on Stein Road level crossing although in principle, the basic modelling principals would remain the same as would the number of crossing closures, it was agreed that due to the base traffic flows, development traffic flow impact, type of barrier control and closure per train movement and carriageway lane widths. It was agreed that any forecast traffic conditions at Inlands Road would not necessitate a bridge and Stein Road would provide a stronger indication of if a bridge is required. Network Rail could decide to close both crossings following any bridge being in place but might have to provide an additional footbridge to reduce diversions for pedestrians.

5.2.2 The Paramics Discovery model consisted of coding a stretch of road to represent Stein Road on both sides of the level crossing. The model consists of two zones representing the entry and exit point of traffic at the northern end (Zone 1) and similarly on the southern end of the model (Zone 2). An aerial map was used to provide an overlay against which the model was coded and to give context to the model. Figure 5 -1 shows a snapshot of the Paramics Discovery model with zones shown as blue boxes north and south of the railway line level crossing on Stein Road.

Network and Signal

5.2.3 The road (Stein Road) in Paramics Discovery was modelled as a 30 mph single carriageway which reflects the onsite conditions.

5.2.4 The West Coastway railway line was modelled as a road without any traffic flow spanning across the north-south Stein Road to create the level crossing ‘junction’.

5.2.5 The level crossing is represented by a traffic signal at the intersection node of the road and railway line. This allowed traffic to be stopped to simulate the times during which the barriers were down and the level crossing closed to traffic. The signal timings were taken from a survey done on 19 November 2019 for a 1-hour period between 07:42 and 08:42 at Stein Road Level Crossing, and 08:50 to 09:50 at Inland Road. Both level crossings were surveyed within the AM peak period (07:00-10:00).

5.2.6 The modelled period used in the micro-simulation model covered the period from 07:15 to 09:15 with a 30 minute warm up and cool down period either side of the modelled peak hour which was assumed to be 07:45 and 0845 which captured the high number of trains at the level crossings. The use of warm up and cool down periods is in line with good practice and enables network conditions leading to and after the modelled peak hour to be captured.

5.2.7 By coding in train schedules within the Paramics model, it is possible to visually represent traffic stopped at the level crossing as a train passes. Figure 5-2 shows a snapshot at around 07:42 when traffic has been stopped as a train passes the level crossing. A 'tram vehicle' shape has been used in model to represent a train within the micro-simulation model.

Figure 5-1: Paramics Discovery Model network snapshot

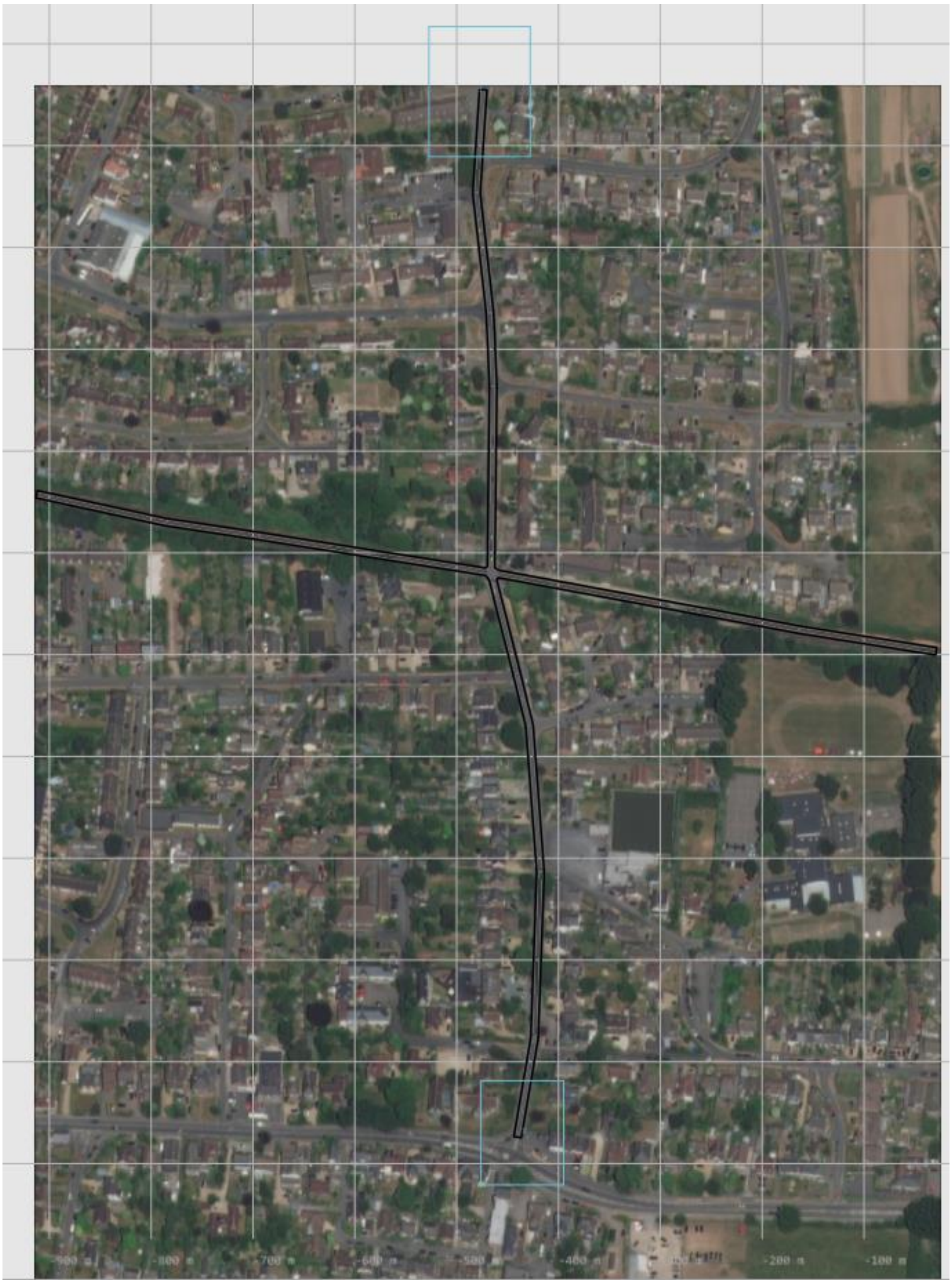
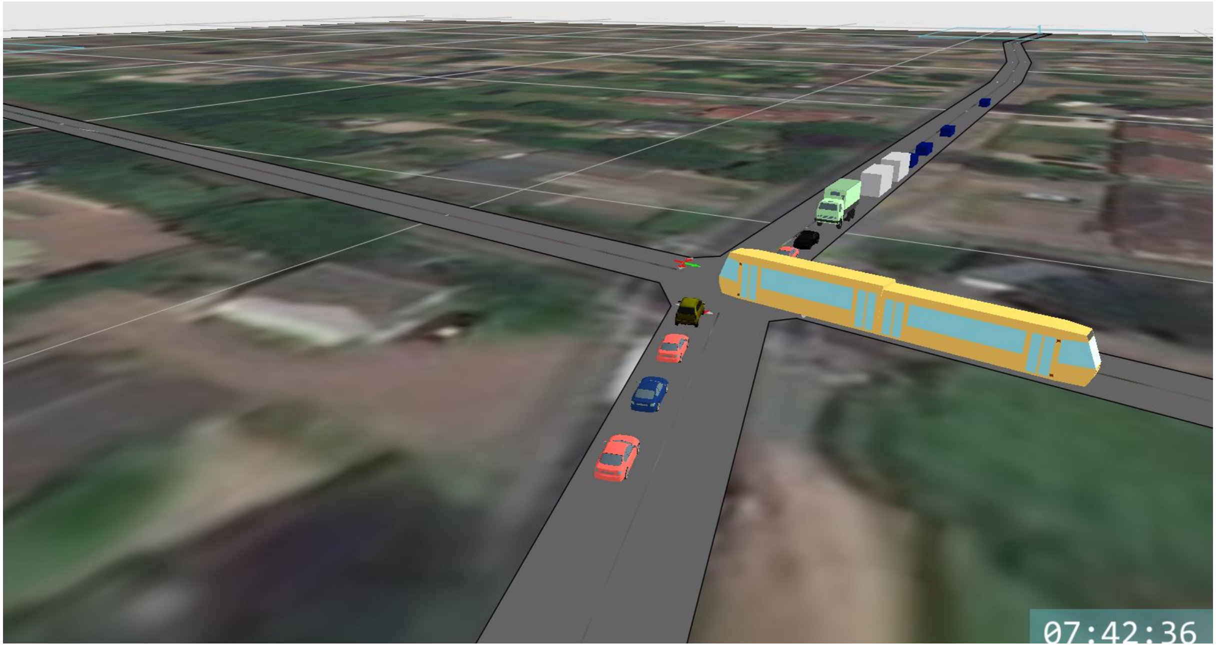


Figure 5-2: Paramics Discovery Model network snapshot with road traffic stopped as train crosses level crossing



Demand Profile

5.2.8 A West Sussex Permanent Automatic Traffic Count (ATC) site at A259 Southbourne West of Thorney Road was used to determine the actual peak hour of the area for each direction being the closest ATC site that was available in the locality. The set of data on ordinary weekdays (Tuesday to Thursday) in June 2019 showed that the peak hour in the locality of the Southbourne area was from 07:45 to 08:45. The data was in 15 minute intervals. This ATC count data was also used to estimate a demand profile of the build up and decay of traffic demand used in the Paramics model.

5.3 Modelled Scenarios

5.3.1 As previously noted, the modelled development scenarios were informed by a review of the vision documents for both the Site A NE Southbourne development site location and the Site B NW Southbourne development site location. These are listed below:

- 250 dwellings which tests for a scenario below the 500 dwellings generally assumed to be delivered early in the plan period (Phase 1)
- 500 dwellings;
- 750 dwellings
- 1,250 dwellings

5.3.2 The development demands from each scenario were added to the Reference Case Demands which represents the Without Development scenario. The Reference Case formed the baseline against which the proposed development scenarios were compared.

5.4 Results

5.4.1 The following model output parameters were initially considered:

- Difference in queue length in metres, comparing each modelled scenario (With Development Scenario) against the Reference Case (Without development). To expedite this comparison, queue routes were coded in each model to measure the queue length in both the southbound and northbound stop lines. These were measured at 5 minute intervals

- Changes in journey times in seconds comparing each modelled scenario (With Development Scenario) against the Reference Case (Without development). Journey time paths routes were coded in each model to measure the southbound and northbound journey times across the level crossing (Zone to Zone journey time). Path journeys times southbound and northbound from each respective zone to the stop line were also coded to measure delays at the stop line. These journey times/delays were measured at 5 minute intervals.

5.4.2 In all cases the analysis has been informed by ten (10) model runs to take account of the potential day to day variability in network conditions. This is in line with good practice when using micro-simulation models.

Queue Length Analysis

Southbound

5.4.3 Figures 5-3 shows the variation of maximum queue lengths in metres in the southbound direction at the level crossing across the modelled scenarios. The actual outputs used for the plot are shown in Appendix C as Table C5-1. Table C-1 further adds context to the changes in queue lengths. It shows the changes in queues as a growth factor compared to the queue length in the equivalent 5 minute interval of the Reference Case.

Figure 5 -3: Variation of Southbound Maximum Queue lengths (metres) at Level Crossing by Number of Dwellings

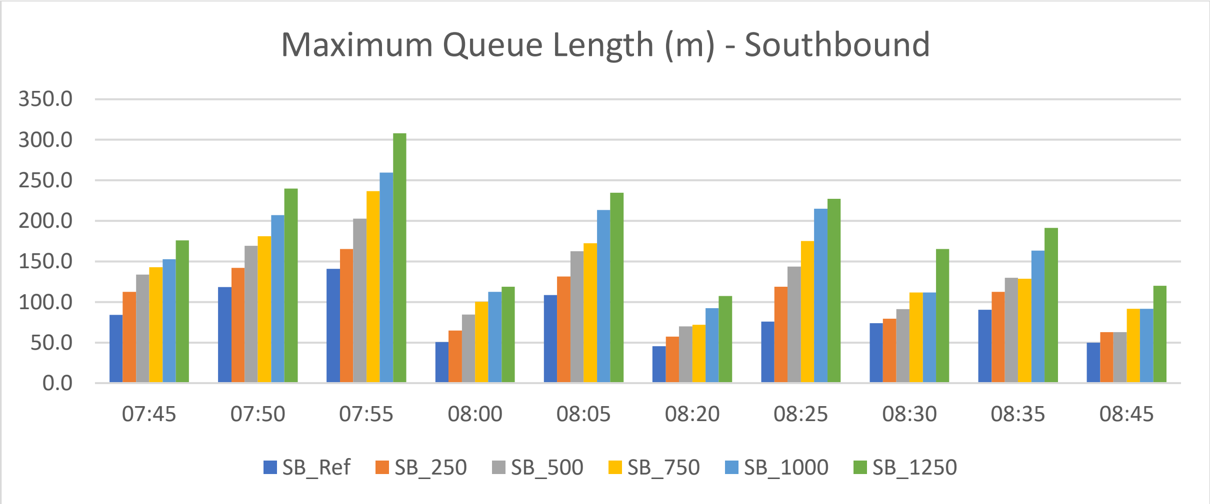


Table 5 - 1: Southbound Maximum Queue Lengths growth factors compared to Reference Case

From time	To time	SB_Ref	SB_250	SB_500	SB_750	SB_1000	SB_1250
07:40	07:45	1.0	1.3	1.6	1.7	1.8	2.1
07:45	07:50	1.0	1.2	1.4	1.5	1.7	2.0
07:50	07:55	1.0	1.2	1.4	1.7	1.8	2.2
07:55	08:00	1.0	1.3	1.7	2.0	2.2	2.3
08:00	08:05	1.0	1.2	1.5	1.6	2.0	2.2
08:15	08:20	1.0	1.3	1.5	1.6	2.0	2.4
08:20	08:25	1.0	1.6	1.9	2.3	2.8	3.0
08:25	08:30	1.0	1.1	1.2	1.5	1.5	2.2
08:30	08:35	1.0	1.2	1.4	1.4	1.8	2.1
08:40	08:45	1.0	1.3	1.3	1.8	1.8	2.4

5.4.4 It can be seen that the maximum queue length has increased by a factor of 50% or more in all but one time slice and that the scenario with 750 dwellings at the time slice 07:55 to 08:00, shows a doubling of the queue length.

5.4.5 During the 5-minute interval, 0750 to 0755, where queues are highest, the maximum queue length has grown by about 70% to 236.5 metres from 141m in the Reference Case, for the 750 dwellings scenario. Assuming a passenger car unit (pcu) is equivalent to 5.75 metres long, this equates to a maximum queue length increase from 25 pcus to 42 pcus.

5.4.6 In the scenario with 1,000 dwellings, the queues have grown by a factor of 70% or more in all but one time slice. Four time slices show a doubling or more than doubling of the queue lengths, when compared to the Reference Case.

5.4.7 With 1,250 dwellings, the queue lengths are seen to more than double in all but one time slice when compared to the queue lengths in the Reference Case. The remaining time slice shows a doubling of queues.

5.4.8 These changes are further illustrated in Table C5-2 of Appendix C which shows the actual increases in maximum queue length compared to the Reference Case, and in Table C5-3 which shows the corresponding percentage (%) increase in queue length reflecting the growth factors discussed above.

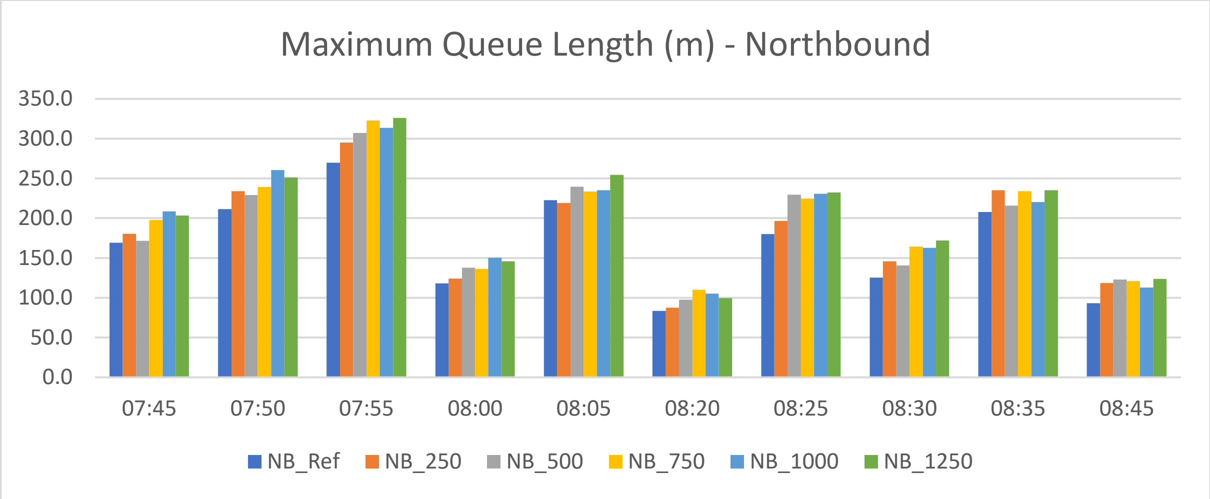
5.4.9 It is evident from the results that queue lengths increase noticeably by the 500 dwellings scenario, increasing more still through the 750 dwellings to the 1,250 dwelling scenarios. The results indicate that the number of time slices with queues doubling, increases sharply between the 750 dwelling and 1,000 dwelling scenarios. This appears to suggest that a bridge may provide some benefit by the 750 dwelling scenario or by the 1,000 dwelling scenario, if peak traffic flows cannot be reduced or managed by other means, such as provision of additional on-site facilities to decrease external car travel demand..

5.4.10 For context in relation to the local road network, the results indicate that in the Reference Case, queues may occasionally extend and potentially block egress/access from/to the Stein Road/Cooks Lane junction about 117 metres to the north of the railway line. By 500 and 750 dwellings scenarios, queues may extend past the Stein Road/Manor Road junction approximately 160 metres to the north. Between 750 dwellings and 1,000 dwellings, the queue length may approach or extend past the southern junction of Stein Road and Kelsey Avenue about 250 metres north of the railway line. This could result in a need to consider additional road markings to help vehicles emerge safely from these minor roads onto Stein Road.

Northbound

5.4.11 The equivalent results for the northbound direction are shown in Figure 5-4. The actual outputs used for the plot are shown in Appendix C as Table C5-2. The southbound direction is the most critical direction as more trips in the morning peak period are expected to use the level crossing in this direction.

Figure 5 -4: Variation of Northbound Maximum Queue lengths (metres) at Level Crossing by Number of Dwellings



5.4.12 The queue length increases in the northbound direction are less pronounced, as evidenced by the noticeably lower growth factors compared to those seen in the southbound direction. Growth in queue length ranges between 10% to 40% at most across the scenarios. The queue lengths are not predicted to extend back to the Stein Road/A259 Main Road junction approximately 360 metres to the south of the railway line (see Table B5-4). The model represents average conditions, so queues may be longer on certain busier than average days, but the margin for additional queuing is considered sufficient that a queue long enough to reach the junction would be unlikely or rare enough not to be considered a significant operational and safety issue. It does indicate that there may be a level of additional development above 1250 dwellings which could cause an impact which the Local Highway Authority would likely consider to be severe under the NPPF. Regardless of the levels of development, any measures to reduce the traffic using the Stein Road Crossing, including potentially allowing development to utilise the Inland Road crossing, will reduce the impacts upon the Stein Road, and reduce any queue.

Table 5 – 2: Northbound Maximum Queue Lengths growth factors compared to Reference Case

From time	To time	SB_Ref	SB_250	SB_500	SB_750	SB_1000	SB_1250
07:40	07:45	1.0	1.1	1.0	1.2	1.2	1.2
07:45	07:50	1.0	1.1	1.1	1.1	1.2	1.2
07:50	07:55	1.0	1.1	1.1	1.2	1.2	1.2
07:55	08:00	1.0	1.1	1.2	1.2	1.3	1.2
08:00	08:05	1.0	1.0	1.1	1.0	1.1	1.1
08:15	08:20	1.0	1.0	1.2	1.3	1.3	1.2
08:20	08:25	1.0	1.1	1.3	1.2	1.3	1.3
08:25	08:30	1.0	1.2	1.1	1.3	1.3	1.4
08:30	08:35	1.0	1.1	1.0	1.1	1.1	1.1
08:40	08:45	1.0	1.3	1.3	1.3	1.2	1.3

Journey Time Analysis

5.4.13 Figure 5-5 shows the variation of maximum journey times in seconds in the southbound direction. The actual outputs used for the plot are shown in Appendix D as Table D5-1. Table 5-3 further adds context to the changes in path journey times. It shows the changes in path journey times as a growth factor compared to the journey time in the equivalent 5 minute interval for the Reference Case. The equivalent information in the northbound direction is shown in Figure 5-6 and Table 5-4, with the absolute journey times shown in Table C5-2 of Appendix D.

5.4.14 It can be seen that there are time slices where the journey times increase by a factor ranging between 20% to 32% for the 500 dwellings to 1,250 dwelling scenarios. This generally coincides with the closure of the level crossing barriers for trains to pass through. In most of the other time slices there is little variation in path journey time across the scenarios for a given time slice. It is considered that this is because most of the time, vehicles can cross the level crossing unimpeded and that the increase in journey times as a result of the barriers being down when trains pass the level crossing, is masked or averaged out by the prevailing journey times when the level crossing is open. Generally, traffic is able to clear the level crossing once the barrier is open without having to incur any further journey time increases in a given 'cycle'. In the northbound direction, there is generally very little change in path journey times reflecting the little change in demand in this direction in the AM peak.

5.4.15 It is therefore considered that journey time changes do not appear to be a good indicator of when a bridge may be required, and the queue length information is considered a more informative indicator.

5.4.16 There are instances where the journey times increase noticeably compared to the Reference Case. For example, in the southbound direction, journey times increase by a factor of 20% to 26% or the 500 to 1,250 dwelling scenarios during the time slice 07:55 to 08:00. This corresponds to an increase ranging between 32.8 seconds and 41.4 seconds over the Reference Case path journey time of 161.9 seconds.

5.4.17 Other notable increases are seen in the southbound direction during the time slice 08:25 to 08:30 where journey time increases, ranging from 40.7 seconds to 55.6 seconds over the Reference Case journey time of 171.8 seconds, are predicted between the 500 dwellings and 1,250 dwellings scenarios.

Figure 5 -5: Variation of Southbound Maximum path Journey Times (seconds) at Level Crossing by Number of Homes

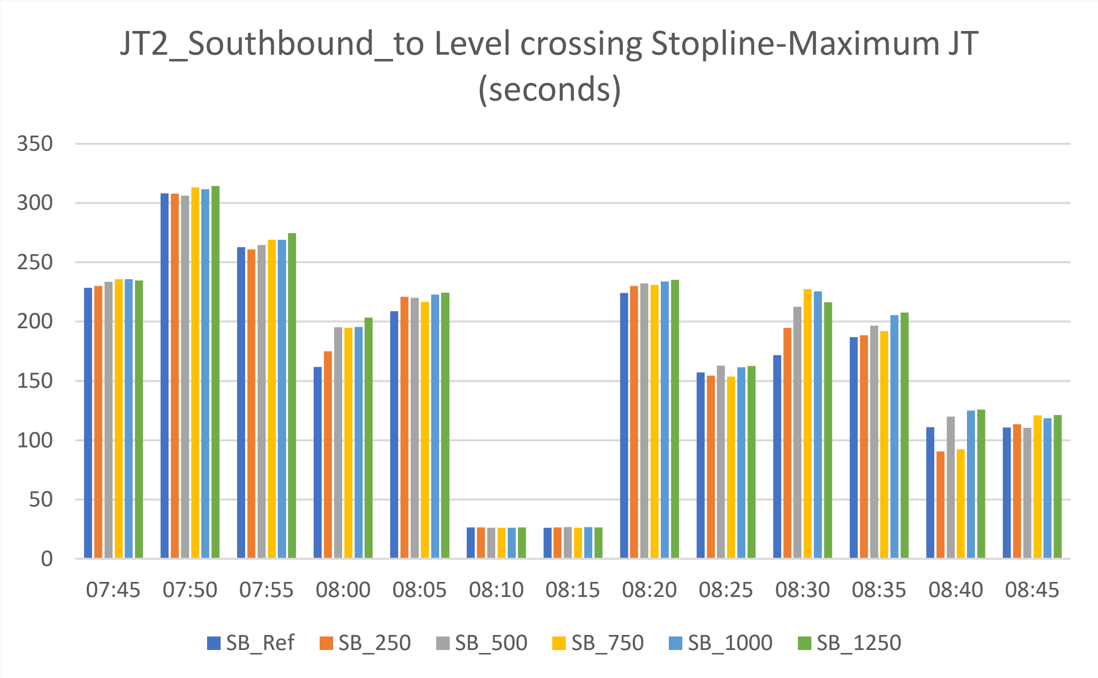


Table 5 - 3: Southbound path Journey Time growth factors compared to Reference Case

From time	To time	SB_Ref	SB_250	SB_500	SB_750	SB_1000	SB_1250
07:40	07:45	1.00	1.01	1.02	1.03	1.03	1.03
07:45	07:50	1.00	1.00	0.99	1.02	1.01	1.02
07:50	07:55	1.00	0.99	1.01	1.02	1.02	1.05
07:55	08:00	1.00	1.08	1.21	1.20	1.21	1.26
08:00	08:05	1.00	1.06	1.05	1.04	1.07	1.08
08:05	08:10	1.00	1.00	0.99	0.99	0.99	1.00
08:10	08:15	1.00	1.01	1.02	1.00	1.02	1.01
08:15	08:20	1.00	1.03	1.04	1.03	1.04	1.05
08:20	08:25	1.00	0.98	1.04	0.98	1.03	1.04
08:25	08:30	1.00	1.13	1.24	1.32	1.31	1.26
08:30	08:35	1.00	1.01	1.05	1.03	1.10	1.11
08:35	08:40	1.00	0.82	1.08	0.83	1.13	1.13
08:40	08:45	1.00	1.03	1.00	1.09	1.07	1.09

Figure 5 -6: Variation of Northbound Maximum path Journey Times (seconds) at Level Crossing by Number of Homes

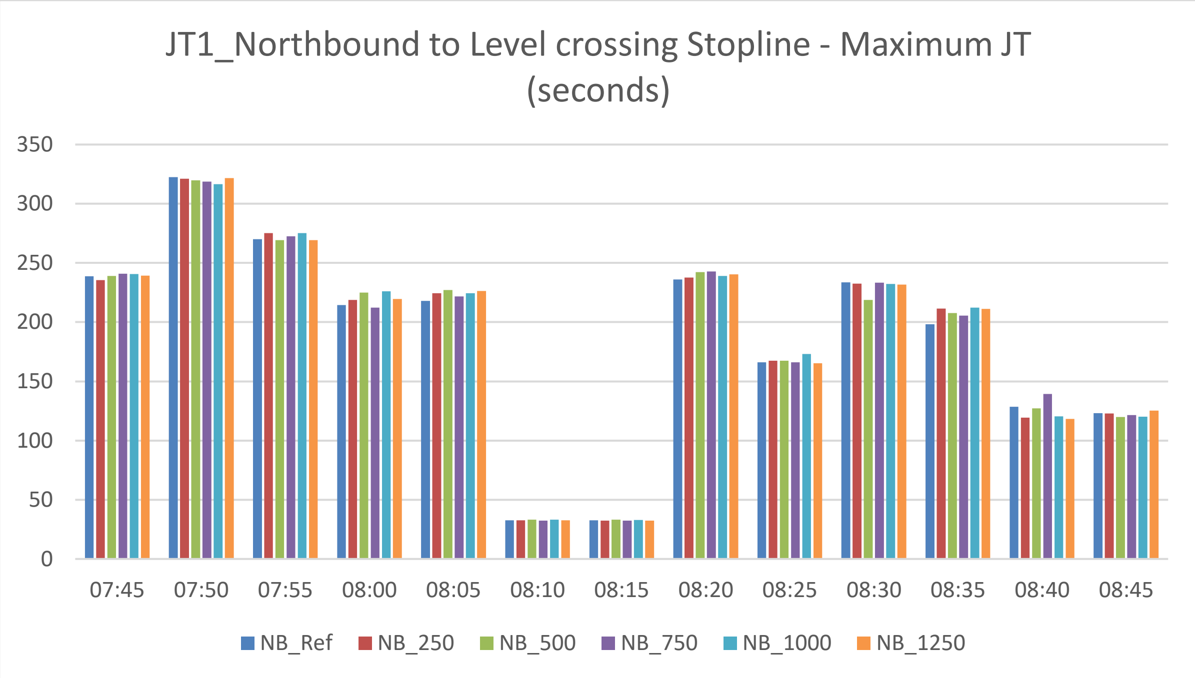


Table 5 - 4: Northbound path Journey Time growth factors compared to Reference Case

From time	To time	SB_Ref	SB_250	SB_500	SB_750	SB_1000	SB_1250
07:40	07:45	1.00	0.99	1.00	1.01	1.01	1.00
07:45	07:50	1.00	1.00	0.99	0.99	0.98	1.00
07:50	07:55	1.00	1.02	1.00	1.01	1.02	1.00
07:55	08:00	1.00	1.02	1.05	0.99	1.05	1.02
08:00	08:05	1.00	1.03	1.04	1.02	1.03	1.04
08:05	08:10	1.00	1.00	1.02	0.99	1.02	1.00
08:10	08:15	1.00	1.00	1.02	1.00	1.01	0.99
08:15	08:20	1.00	1.01	1.03	1.03	1.01	1.02
08:20	08:25	1.00	1.01	1.01	1.00	1.04	1.00
08:25	08:30	1.00	1.00	0.94	1.00	0.99	0.99
08:30	08:35	1.00	1.07	1.05	1.04	1.07	1.07
08:35	08:40	1.00	0.93	0.99	1.08	0.94	0.92
08:40	08:45	1.00	1.00	0.97	0.99	0.98	1.02

5.5 Summary

5.5.1 This section has summarised the results of a Paramics Discovery micro-simulation model to understand the potential impacts of the proposed Southbourne development on the level crossings.

5.5.2 Both visual and analytical outputs of the micro-simulation modelling were used in the assessment. It was considered that the variation in maximum queue lengths in metres provided an easily understandable parameter to inform when a bridge may be required. The analysis considered that the changes in queue length in the southbound direction were the most critical, given that in the AM peak period most trips would be leaving the development and crossing the level crossings to access the wider network via the A259 Main Road to the south of the railway line.

5.5.3 It is evident from the results that queue lengths increase noticeably in the critical southbound direction by the 500 dwellings scenario, increasing further through the 750 dwellings to the 1,250 dwelling scenarios. The results indicate that the number of time slices with queues doubling increases sharply between the 750 dwelling and 1,000 dwelling scenarios. This appears to suggest the indicative threshold is reached by the 750 dwelling scenario or by the 1,000 dwelling scenario. The outputs of this study are intended to provide an indicative trigger point for a bridge rather than to prescribe when a bridge is required and must therefore be understood in the context of the limited nature of the modelling exercise to be indicative rather than prescriptive. There may be other options available to reduce or manage car traffic during the peak period, including sustainable transport and additional local facilities in association with the new development.

5.5.4 In the context of this study, the indicative trigger for a bridge applies to both the Site A NE and Site B NW Southbourne options. The main difference is that in the Site A NE Southbourne option, the phasing indicates that about 152 dwellings are planned south of the railway line. It is considered that these dwellings do not rely on a level crossing, given their location. Therefore, with the Site A NE Southbourne option it may be possible to provide the 152 dwellings plus the limiting 750 dwellings assumed to be north of the railway line (or 902 dwellings for this option).

6 Summary and Conclusion

6.1 Summary and conclusion

6.1.1 Stantec have undertaken a baseline review of the railway level crossings at Stein Road and Inlands Road. Transport modelling has also been undertaken to gain an indication when a railway bridge maybe required in light of the Southbourne development proposals.

6.1.2 The baseline review includes a review of the All Level Crossing Risk Model (ALCRM) assessment score for the crossings, details of their existing configuration and a summary of the usage of the crossings.

6.1.3 ALCRM assessments are undertaken by National Rail (NR) at all level crossings in England, Scotland and Wales. They assess the risk associated with the level crossing in a way that is standardised and comparable across the network. The outcome of the ALCRM assessment is provided on NR's website together with contextual information including crossing's location, how much traffic (rail, road and pedestrian) it receives and the crossing's history of near misses and accidents.

6.1.1 The latest ALCRM assessment at the Stein Road crossing was carried out in February 2019. The ALCRM risk classification for the Stein Road crossing is G3, which is considered a High Risk category.

6.1.2 The latest ALCRM assessment at the Inlands Road crossing was carried out in July 2019. The ALCRM risk classification for the Inlands Road crossing is D2 and is considered a High Risk category. This suggests that Network Rail considers that both the Stein Road and Inlands Road level crossings are in the High Risk category.

6.1.3 A Paramics Discovery micro-simulation modelling has further been used to understand and indicate when a bridge over the railway line may be required when the Southbourne development is built out. The AM period was modelled and analysed as it was considered that this is when most trains crossed the level crossings in the Southbourne area and would best illustrate impacts of the proposed development on the level crossings. Vision documents were reviewed to understand phasing of both the Site A NE Southbourne development option and the Site B NW Southbourne development option. This phasing information has been used to inform development tests undertaken in the micro-simulation as follows:

- 250 dwellings which tests for a scenario below the 500 dwellings generally assumed to be delivered early in the plan period (Phase 1)
- 500 dwellings, the amount indicated by both visions as deliverable early in the plan period (Phase 1)
- 750 dwellings
- 1,000 dwellings
- 1,250 dwellings.

6.1.4 Visual and analytical outputs of the micro-simulation modelling were used to assess the model. It was considered that the variation in maximum queue lengths in metres provided an easily understandable parameter to inform when a bridge may be required. The analysis considered that the changes in queue length in the southbound direction was the most critical direction to look at given that in the AM peak period, most trips would be leaving the development and crossing the level crossings to access the wider network via the A259 Main Road to the south of the railway line.

6.1.5 It was evident from the results that queue lengths increase noticeably in the southbound direction by the 500 dwellings scenario, further increasing through the 750 dwellings to the 1,250 dwelling scenarios. The results indicate that the number of time slices with queues doubling increases sharply between the 750 dwelling and 1,000 dwelling scenarios. This appears to suggest that a bridge may be required by the 750 home scenario or by the 1,000 dwelling scenario. In the main, this outcome is consistent with the worst-case scenario that was initially undertaken and reported in the Level Crossing Baseline Safety Review, August 2020 report. This indicated that a bridge may be required in the scenario with 750 dwellings. The outputs of this study are intended to provide an indicative trigger point for a bridge rather than to prescribe when a bridge is required and must therefore be understood in the context of the limited nature of the modelling exercise to be indicative rather than being prescriptive.

6.1.6 In the context of this study, the indicative trigger for a bridge applies to both the Site A NE and Site B NW Southbourne options. The main difference is that in the Site A NE Southbourne option, the phasing indicates that about 152 dwellings are planned south of the railway line. It is considered that these dwellings do not rely on a level crossing, given their location. Therefore, with the Site A NE Southbourne option it may be possible to provide the 152 dwellings plus the limiting 750 dwellings assumed to be north of the railway line (or 902 dwellings for this option).

6.1.7 Providing a new railway bridge would significantly reduce trips on the existing level crossings potentially limiting these crossings to use by local traffic.

6.1.8 In conclusion, the study suggests that for Site A NE Southbourne option, 902 dwellings can be provided before conditions approaching the crossing reach the indicative trigger point for a bridge to be provided (750 dwellings north of the railway line plus the 152 dwellings estimated south of the railway line). Beyond this, a new railway bridge is likely to be of some benefit, if the traffic conditions cannot be otherwise mitigated by altering forecasted demand patterns.

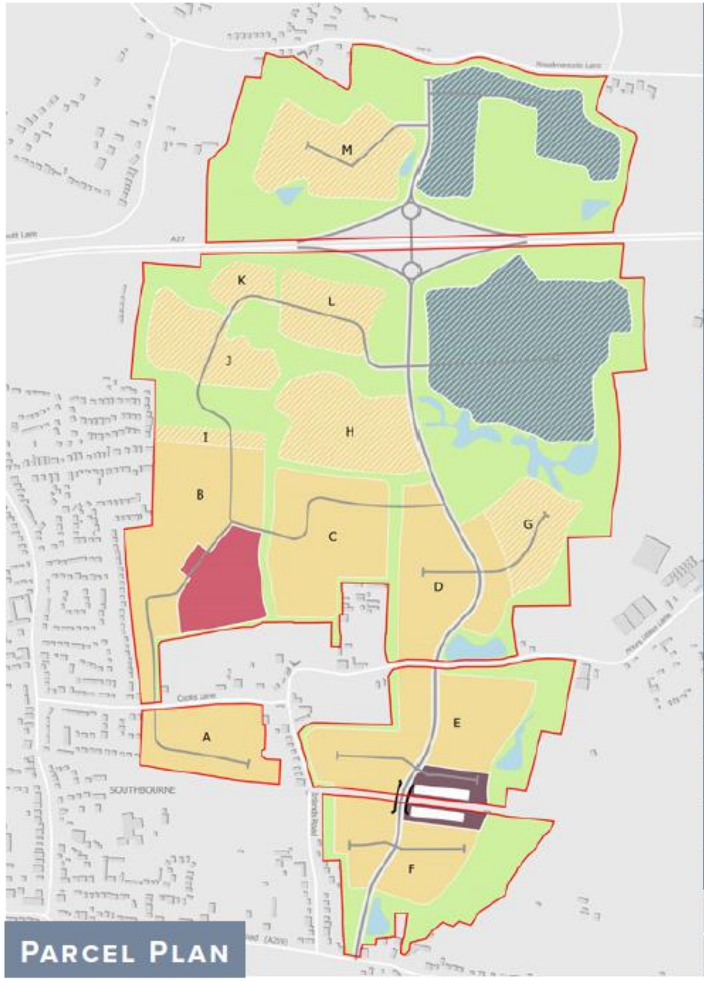
6.1.9 For Site B NW Southbourne option, 750 dwellings, all north of the railway line, can be provided before a new bridge is required. Beyond 750 dwellings, a new railway bridge is likely to be of some benefit, if the forecasted traffic conditions cannot otherwise be mitigated.

Appendix A Site Capacity and Parcels 'Barton Willmore'

Site Capacity & Parcels

The adjacent plan shows the potential development parcels for the site, and how at least 2000 homes could be accommodated on the site overall, with dedicated space retained for employment and a community hub.

- Site Boundary
- Residential Area
- Community Hub (Including Primary School and Small Scale Employment)
- Station
- Attenuation
- Infrastructure
- Open Space
- Future Potential Residential Expansion
- Future Potential Employment Expansion



Parcel Plan

Land Use	Area Approx. (ha)
Residential	37.9
Education	22.7
Employment	19.0
Station	1.8
Open Space	53.6
Other	8.9
Total	147.4
Residential Parcels	
A	4.2
B	8.2
C	7
D	6.2
E	7.6
F	4.6
G	3.1
H	5.3
I	0.9
J	3.8
K	1.1
L	3.1
M	5.4

Appendix B Policy Map Inset 1

Policies Inset Map 1

Southbourne Parish Neighbourhood Plan
Policy Map Inset 1

KEY

- Parish Boundary
- SB1 Settlement Boundary
- SB2 Land East of Southbourne Village
- SB2 Land East of Southbourne Village Development Area
- SB2 Land East of Southbourne Village Green Space
- SB10 Managing Design and Heritage in Prinsted Conservation Area
- SB11- Managing Design and Heritage in Nutbourne West

Appendix C Maximum Queue Length Results Tables in metres

Table C5 - 1: Southbound Maximum Queue Lengths (metres) at Level Crossing by Number of Homes

From time	To time	SB_Ref	SB_250	SB_500	SB_750	SB_1000	SB_1250
07:40	07:45	84.1	112.5	133.6	143.0	152.9	175.8
07:45	07:50	118.5	142.0	169.4	181.3	207.1	240.0
07:50	07:55	141.0	165.5	203.0	236.5	259.4	308.2
07:55	08:00	50.8	64.9	84.6	100.2	112.4	118.9
08:00	08:05	108.6	131.6	162.4	172.5	213.3	234.7
08:15	08:20	45.6	57.4	69.8	72.0	92.5	107.3
08:20	08:25	75.9	118.7	143.6	175.1	215.1	227.1
08:25	08:30	73.9	79.4	91.2	111.7	111.9	165.3
08:30	08:35	90.3	112.6	129.9	128.7	163.3	191.3
08:40	08:45	50.0	62.9	62.8	91.8	91.5	120.1

Table C5 - 2: Southbound Increase in Maximum Queue Lengths (metres) at Level Crossing by Number of Homes

From time	To time	SB_Ref	SB_250	SB_500	SB_750	SB_1000	SB_1250
07:40	07:45	0.0	28.4	49.5	58.9	68.8	91.7
07:45	07:50	0.0	23.5	50.9	62.8	88.6	121.5
07:50	07:55	0.0	24.5	62.0	95.5	118.4	167.2
07:55	08:00	0.0	14.1	33.8	49.4	61.6	68.1
08:00	08:05	0.0	23.0	53.8	63.9	104.7	126.1
08:15	08:20	0.0	11.8	24.2	26.4	46.9	61.7
08:20	08:25	0.0	42.8	67.7	99.2	139.2	151.2
08:25	08:30	0.0	5.5	17.3	37.8	38.0	91.4
08:30	08:35	0.0	22.3	39.6	38.4	73.0	101.0
08:40	08:45	0.0	12.9	12.8	41.8	41.5	70.1

Table C5 -3: Southbound Percentage (%) Increase in Maximum Queue Lengths (metres) at Level Crossing by Number of Homes

From time	To time	SB_Ref	SB_250	SB_500	SB_750	SB_1000	SB_1250
07:40	07:45	0%	34%	59%	70%	82%	109%
07:45	07:50	0%	20%	43%	53%	75%	103%
07:50	07:55	0%	17%	44%	68%	84%	119%
07:55	08:00	0%	28%	67%	97%	121%	134%
08:00	08:05	0%	21%	50%	59%	96%	116%
08:15	08:20	0%	26%	53%	58%	103%	135%
08:20	08:25	0%	56%	89%	131%	183%	199%
08:25	08:30	0%	7%	23%	51%	51%	124%
08:30	08:35	0%	25%	44%	42%	81%	112%
08:40	08:45	0%	26%	26%	84%	83%	140%

Table C5 -4: Northbound Maximum Queue Lengths (metres) at Level Crossing by Number of Homes

From time	To time	NB_Ref	NB_250	NB_500	NB_750	NB_1000	NB_1250
07:40	07:45	169.1	180.4	171.7	197.9	208.6	203.4
07:45	07:50	211.4	234.1	229.0	239.4	260.7	251.1
07:50	07:55	269.9	295.2	307.1	322.9	313.7	326.0
07:55	08:00	118.3	124.3	137.9	136.3	150.4	145.8
08:00	08:05	222.8	218.9	239.5	233.5	235.0	254.7
08:15	08:20	83.5	87.5	97.7	110.2	105.3	99.5
08:20	08:25	179.9	196.7	229.6	224.8	230.9	232.5
08:25	08:30	125.5	146.0	140.8	164.5	163.0	172.2
08:30	08:35	207.8	235.3	216.0	234.0	220.4	235.1
08:40	08:45	93.1	118.5	122.9	121.0	113.1	123.8

Table C5 -5: Northbound Increase in Maximum Queue Lengths (metres) at Level Crossing by Number of Homes

From time	To time	NB_Ref	NB_250	NB_500	NB_750	NB_1000	NB_1250
07:40	07:45	0.0	11.3	2.6	28.8	39.5	34.3
07:45	07:50	0.0	22.7	17.6	28.0	49.3	39.7
07:50	07:55	0.0	25.3	37.2	53.0	43.8	56.1
07:55	08:00	0.0	6.0	19.6	18.0	32.1	27.5
08:00	08:05	0.0	-3.9	16.7	10.7	12.2	31.9
08:15	08:20	0.0	4.0	14.2	26.7	21.8	16.0
08:20	08:25	0.0	16.8	49.7	44.9	51.0	52.6
08:25	08:30	0.0	20.5	15.3	39.0	37.5	46.7
08:30	08:35	0.0	27.5	8.2	26.2	12.6	27.3
08:40	08:45	0.0	25.4	29.8	27.9	20.0	30.7

Table C5 -6: Northbound Percentage (%) Increase in Maximum Queue Lengths (metres) at Level Crossing by Number of Homes

From time	To time	NB_Ref	NB_250	NB_500	NB_750	NB_1000	NB_1250
07:40	07:45	0%	7%	2%	17%	23%	20%
07:45	07:50	0%	11%	8%	13%	23%	19%
07:50	07:55	0%	9%	14%	20%	16%	21%
07:55	08:00	0%	5%	17%	15%	27%	23%
08:00	08:05	0%	-2%	8%	5%	5%	14%
08:15	08:20	0%	5%	17%	32%	26%	19%
08:20	08:25	0%	9%	28%	25%	28%	29%
08:25	08:30	0%	16%	12%	31%	30%	37%
08:30	08:35	0%	13%	4%	13%	6%	13%
08:40	08:45	0%	27%	32%	30%	21%	33%

Appendix D Maximum Path Journey Time Results Tables in seconds

Table D5 - 1: Southbound path Journey Time in seconds

From time	To time	SB_Ref	SB_250	SB_500	SB_750	SB_1000	SB_1250
07:40	07:45	228.4	230.1	233.7	235.9	235.8	234.6
07:45	07:50	308.2	307.8	306.2	313.3	311.7	314.4
07:50	07:55	262.8	260.8	264.6	269.1	268.9	274.8
07:55	08:00	161.9	174.9	195.4	194.7	195.6	203.3
08:00	08:05	208.7	221	220	216.7	222.7	224.5
08:05	08:10	26.5	26.4	26.2	26.3	26.2	26.5
08:10	08:15	26.2	26.4	26.6	26.2	26.6	26.4
08:15	08:20	224.1	230.1	232.3	231	234	235.2
08:20	08:25	157.1	154.5	162.9	153.6	161.5	162.6
08:25	08:30	171.8	194.8	212.5	227.4	225.6	216.4
08:30	08:35	187	188.5	196.5	191.9	205.5	207.6
08:35	08:40	111	90.5	119.8	92.4	125	125.9
08:40	08:45	110.7	113.5	110.4	121	118.6	121.2

Table D5 - 2: Southbound path Journey Time in seconds

From time	To time	SB_Ref	SB_250	SB_500	SB_750	SB_1000	SB_1250
07:40	07:45	239	235.5	238.9	240.8	240.7	239.2
07:45	07:50	322.5	321.1	319.9	318.7	316.5	321.8
07:50	07:55	270.1	275.2	269.4	272.6	275.3	269.2
07:55	08:00	214.4	218.7	225	212.2	226.1	219.7
08:00	08:05	217.9	224.5	227.1	221.7	224.4	226.2
08:05	08:10	32.8	32.7	33.3	32.5	33.3	32.8
08:10	08:15	32.6	32.5	33.1	32.5	32.9	32.3
08:15	08:20	236.1	237.8	242.4	242.9	239	240.5
08:20	08:25	166.1	167.5	167.4	166	173	165.4
08:25	08:30	233.5	232.5	218.8	233.4	232.2	231.6
08:30	08:35	198.2	211.4	207.6	205.4	212.2	211.3
08:35	08:40	128.5	119.5	127.1	139.4	120.4	118.3
08:40	08:45	123.2	123	120	121.4	120.2	125.3