

## TECHNICAL NOTE

**Job Name:** PT18/6450/O Land West of Park Farm, Thornbury  
**Job No:** 39209  
**Note No:** TN006  
**Date:** 31<sup>st</sup> March 2020  
**Prepared By:** K. Stock  
**Subject:** **M5 Junction 14 VISSIM Forecast Modelling Note - Update**

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### 1. Introduction

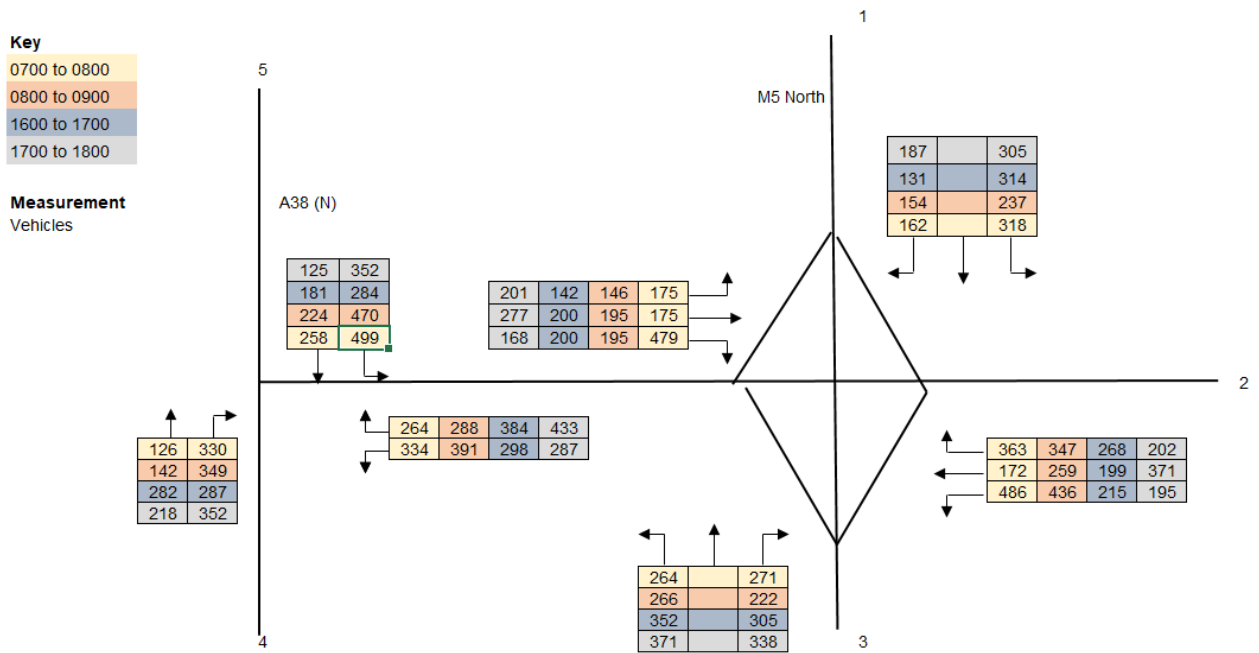
- 1.1. Stantec has been commissioned by Barwood Development Securities Ltd & North West Thornbury Landowner Consortium (the Developer) to provide highway and transport advice in support of a mixed use residential-led development on Land West of Park Farm, Thornbury.
- 1.2. The development proposals comprise up to 595 dwellings and land for a primary school. However, for the purpose of the assessment of the strategic road network (SRN), the development flows within the model are unchanged (from the previous proposals of 630 dwellings and no school) and the model therefore reflects an overestimate of development impacts at Junction 14 and the A38. The assessment is therefore robust.
- 1.3. Following submission of the planning application, Highways England (HE) confirmed that mitigation is required to address the increase in queuing on the M5 northbound off-slip. Discussions have been ongoing with HE to confirm the mitigation required.
- 1.4. Stantec Technical Note '39209-STN-ZZ-XX-RP-T-0001\_M5J14ForecastNote' (dated January 2020) sets out the proposed mitigation scheme to extend the length of two lanes on the M5 northbound off-slip. HE has confirmed that, in terms of design, the mitigation scheme proposed as part of the Land West of Gloucester Road scheme is considered to be suitable in principle, subject to a Stage 1 Road Safety Audit (RSA). However, HE identified additional queuing within the model on the A38, which is within the control of South Gloucestershire Council (SGC) as local highway authority, as a result of the proposed mitigation.
- 1.5. Stantec have since reviewed the modelling assumptions with HE's consultants, Jacobs, and identified discrepancies in the traffic flows between the 2016 validated model and the 2017 HE traffic surveys at the A38 / B4059 junction.
- 1.6. This Technical Note has been prepared to present updated modelling results and to set out additional proposed mitigation at the A38 junction for agreement with SGC and HE.

### 2. Modelled Traffic Flows

- 2.1. The VISSIM model provided to Stantec by Jacobs includes 2016 baseline flows and has been validated and verified using these flows. The validation and calibration statistics are summarised within the CH2M (now Jacobs) report '679475 ST 16 14 05\_M5 J14 VISSIM Nov 2016 Update LMV\_Mar2017\_V5'. The flows are shown below in **Figure 2.1**.

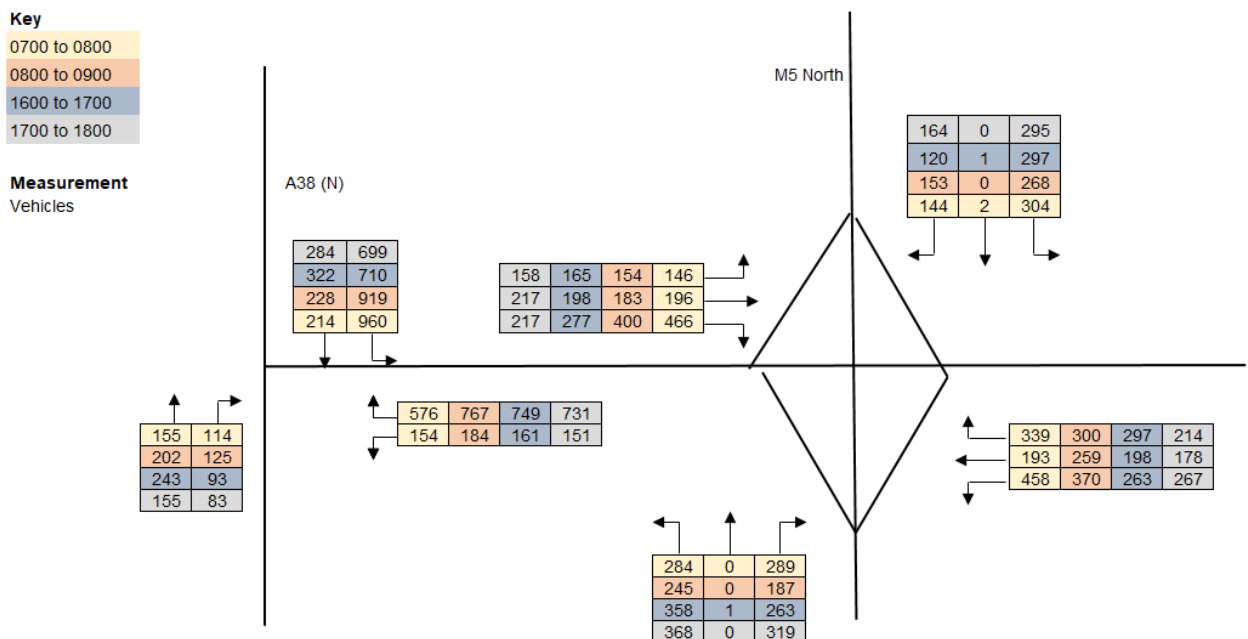
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Figure 2.1: 2016 Baseline (validated model) Flows



2.2. During the course of pre-application discussions with HE, a spreadsheet called “M5 J14 - Dev Tracker (Issued) v.3 final” was provided to Stantec. This included committed development flows and background traffic growth through the junctions and a tab setting out 2017 baseline flows. These are shown in **Figure 2.2** below.

Figure 2.2: 2017 baseline flows (from M5 J14 – Dev Tracker spreadsheet)

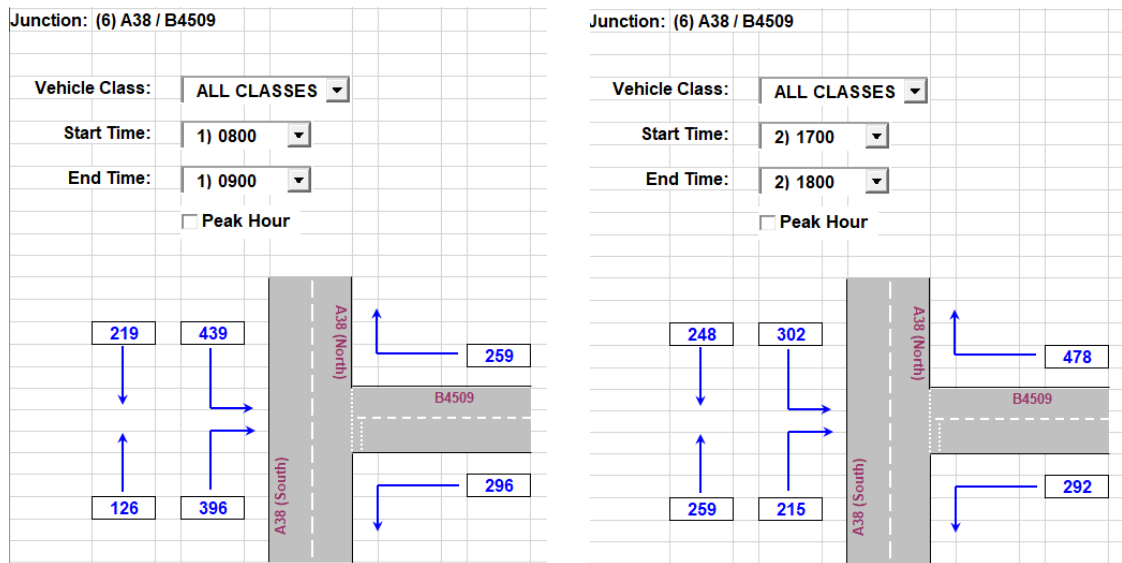


2.3. The flows in **Figure 2.2** were used to create the 2021 forecast year assessments reported in the previous Technical Notes provided as part of the planning submission. As can be seen from the above extracts, whilst the traffic flows at M5 J14 are broadly similar, the flows to and from the A38 North are significantly higher in the 2017 scenario than those included within the validated VISSIM model.

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- 2.4. The 2016 validated flows are also comparable to those recorded by an independent surveyor on behalf of the West of Park Farm application in November 2017, as shown in **Figure 2.3** below.

Figure 2.3: Recorded Traffic Flows at A38/B4509 Junction



- 2.5. The use of the 2016 flows in assessing the existing and forecast operation of the A38 junction is therefore considered to be most appropriate and an updated model run including these flows has been undertaken to provide an assessment of the impact of the development.
- 2.6. Other than the changes to the baseline flows, there have been no further changes made to the previously agreed VISSIM model. The traffic growth, committed development and development traffic flows therefore remain the same as the previous assessment.

### 3. Updated Modelling Results – Reference and Test Case

#### Overview

- 3.1. This section provides a summary of the revised Queue results for the AM and PM peak periods for the 2021 Reference Case and Development Scenarios using the validated 2016 flows across the junction.
- 3.2. The analysis focusses on the 2021 assessment year as the development opening year, in line with the DfT Circular 02/2013 The Strategic Road Network and the Delivery of Sustainable Development. A 2028 test period, as 10 years after opening, has previously been considered for SGC's purposes for those junctions in close proximity to the development site. During the course of the planning application, it was agreed that growth at local junctions should only include committed development growth, and not TEMPro. Therefore, the 2021 assessment set out within this TN is considered to provide a robust assessment for SGC's purposes as it includes both committed development and TEMPro growth in this location.
- 3.3. As with the previous assessment, to inform the modelling outputs, each model was run for a total of 20 iterations starting at a random seed of 42 with an increment of 1 after each run.

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### Queues

- 3.4. Queue counters have been positioned within the network at give way lines or at signal stop lines. In VISSIM queues are counted from this point upstream until the end of the queue or link, whichever is greater. The locations of these have not been amended and have been retained from the base model, as developed by Jacobs. **Table 3.1** and **Table 3.2** summarise the average maximum queue lengths for each scenario for the AM and PM peak hours respectively.

Table 3.1: AM Peak Ave. Maximum Queue Length (metres)

Location	Reference Case	Development	Difference from Reference Case
A38 SB to B4509 EB	993	1000	7
A38 SB Ahead	355	410	55
B4509 WB Junction with A38	56	58	2
A38 NB Ahead	329	535	206
A38 NB to B4509 EB	463	652	189
M5 SB Off-Slip	25	28	3
M5 NB Off-Slip	1184	1187	3

- 3.5. In the AM the largest predicted increase in the maximum queue length between the reference case and with development is 206m (36 PCUs) on the A38 NB Ahead. The next largest increases are on the A38 NB to B4509 EB with an increase of up to 189 metres (33 PCUs).
- 3.6. Queuing on the SB off-slip is not forecast to extend beyond the extent of the slip road in the either scenario.

Table 3.2: PM Peak Ave. Maximum Queue Length (metres)

Location	Reference Case	Development	Difference from Reference Case
A38 SB to B4509 EB	37	38	1
A38 SB Ahead	32	33	1
B4509 WB Junction with A38	101	99	-2
A38 NB Ahead	41	56	15
A38 NB to B4509 EB	72	90	18
M5 SB Off-Slip to B4509 EB	87	91	4
M5 NB Off-Slip	123	132	9

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- 3.7. In the PM peak, the maximum queue length between the reference case and with development is not predicted to change significantly, with a maximum increase of 3 PCUs on the A38 Northbound.
- 3.8. The above results confirm that in the PM peak, queuing on all approaches, including the M5 NB and SB off slips and A38, will not be significantly affected by the proposed development. Queuing on both the NB and SB off-slips is not forecast to extend beyond the extent of the slip road in the reference case or with development scenarios.

### 4. Proposed Mitigation

#### Overview

- 4.1. The modelling outputs as reported in the PBA Technical Note 5519-PBA-ZZ-XX-RPTP-0002, and reviewed by Highway England's consultants, Jacobs, indicated that a scheme to mitigate the impact of the development at Thornbury on the northbound off-slip would be required.
- 4.2. The updated modelling outputs set out in Section 3 above also suggest that mitigation will be required on the A38 northbound approach to the junction.
- 4.3. The following section outlines the proposed mitigation that has been put forward and tested within the model.

#### The Schemes

##### M5 Northbound Off-Slip

- 4.4. It is proposed to lengthen the two lanes on the off-slip to a total of 350m. A drawing of the scheme is provided within **Appendix A**.
- 4.5. HE has confirmed that, in terms of design, the mitigation scheme is believed to be suitable in principle, subject to a Stage 1 Road Safety Audit (RSA).

##### A38 Northbound

- 4.6. The updated modelling suggests that queuing on the A38 northbound will increase as a result of the proposed development. Discussions with SGC have also indicated that this is an existing issue with vehicles mounting the verge to pass queuing right turning traffic.
- 4.7. It is therefore proposed to lengthen the two-lane approach to the junction with the B4509. The two-lanes will extend from the existing stop line to the Sundayshill Lane junction. The existing bus layby will be converted to an on-carriageway bus cage. Existing right turn lanes will be unchanged as a result of the proposals.
- 4.8. A drawing of the scheme is provided within **Appendix B**.

### 5. Updated Modelling Results – Mitigation

#### Overview

- 5.1. This section provides a summary of the revised Queue results for the AM peak period, as the most congested peak, for the with mitigation Scenario using the validated 2016 base flows across the junction.
- 5.2. **Table 5.1** and **Table 5.2** summarise the average maximum queue lengths for each scenario for the AM and PM peak hours respectively.

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Table 5.1: AM Peak Ave. Maximum Queue Length (metres) – With M5 NB and A38 NB mitigation

Location	Reference Case	Development	Difference from Reference Case	Development with Mitigation	Difference from Reference Case
A38 SB to B4509 EB	993	1000	7	1014	21
A38 SB Ahead	355	410	55	390	35
B4509 WB Junction with A38	56	58	2	64	8
A38 NB Ahead	329	535	206	364	35
A38 NB to B4509 EB	463	652	189	474	11
M5 SB Off-Slip	25	28	3	33	8
M5 NB Off-Slip	1184	1187	3	839	-345

- 5.3. In the AM peak with the proposed mitigation in place, queuing on the M5 SB off slip will increase by around one PCU when compared to the reference case which is not considered to be material.
- 5.4. With the mitigation schemes in place, queueing on the A38 NB lanes will increase by up to six PCUs when compared to the reference case. The mitigation proposed has a significant beneficial impact on queues on this approach, reducing queues to the same region as the reference case.
- 5.5. The mitigation schemes result in an increase of 35m on the A38 SB Ahead compared to the reference case; this equates to a reduction of 20 metres when compared to the with development scenario. This equates to around 6 PCUs and is therefore not considered to be material.
- 5.6. The above results confirm that the proposed mitigation schemes reduce the overall queue on the NB off-slip by 348m from the 2021 AM Test (no mitigation) scenario, and therefore more than mitigates the impact of the proposed development. Furthermore, the scheme represents a benefit of 345 metres when compared to the reference case and therefore over-mitigates the development impacts. The mitigation scheme will therefore reduce the length of mainline queuing on the northbound carriageway in the AM peak.

## 6. Conclusions

### Overview

- 6.1. The model utilises PTV VISSIM 8 micro-simulation software which includes connections with PC MOVA for signal operation and includes both AM (07:00 to 09:00) and PM (16:00 to 18:00) peak periods.
- 6.2. This note summarises the impact on the A38 and M5 J14 using the validated 2016 baseline flows included in the VISSIM model and the proposed mitigation schemes proposed on the M5 northbound off-slip and A38 northbound approach.

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- 6.3. Given the resultant reductions in traffic generation as a result of the revised development proposals, the development traffic flows included in the model reflect an overestimate of development impacts and therefore a robust assessment.

### Results

- 6.4. The results demonstrate the mitigation scheme, which includes the lengthening of the M5 J14 northbound two lane off-slip section to a total of 350m, adequately mitigates the forecast queues associated with the development at West of Park Farm, Thornbury. The mitigation scheme is shown to significantly reduce the queue lengths to levels seen in the reference case, more so in the AM peak, which is identified to be the peak period most affected by queuing at this location.
- 6.5. It has been demonstrated that the net impact of the development following mitigation on the A38 NB is immaterial and therefore that there is no severe impact on the operation of the local highway network in this location. The mitigation scheme proposes to extend the length of two lanes on the approach to the junction.
- 6.6. As such it is deemed that the mitigation agreed in principle with HE is sufficient to offset the impact of the proposed development on the northbound off-slip. Agreement with SGC is sought on the A38 mitigation proposals.
- 6.7. It is therefore concluded that there are no adverse impacts on M5 Junction 14 and that the impact of development can be mitigated at the A38 junction with the B4509. The proposed mitigation will provide a betterment to the operational performance of the combined junction as a whole, most significantly in the AM peak hour on the northbound off-slip. We therefore suggest that HE and SGC should be in a position to offer no objection to the proposals, subject to the proposed mitigation scheme for the M5 J14 northbound off-slip and A38 NB being secured.

### DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
39209/5571/TN006	-	31.03.2020	KS	NT	KS	NT

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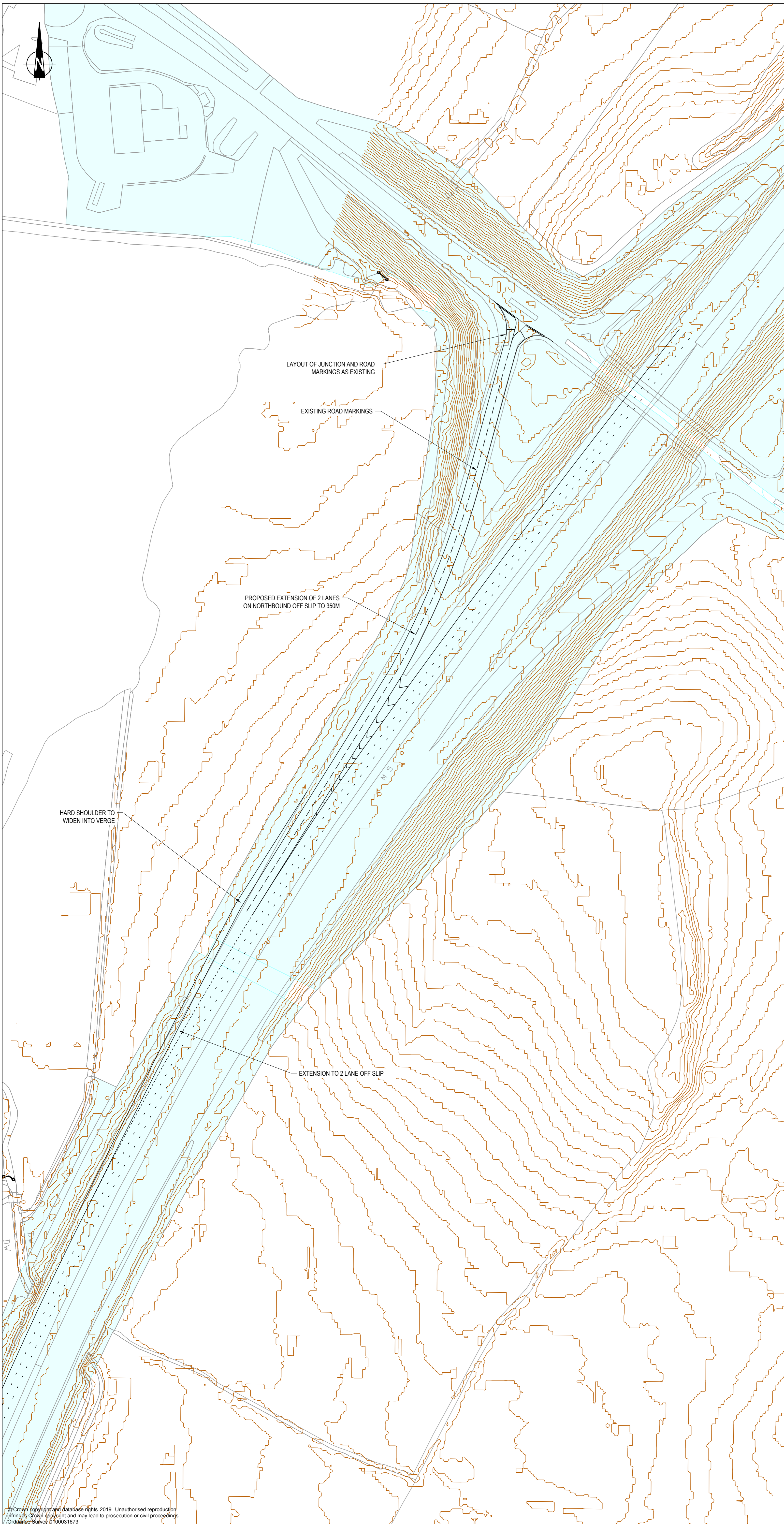
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## APPENDIX A





**NOTES:**

1. THE LAYOUT IS SUBJECT TO DETAILED DESIGN, CAPACITY TESTING, GROUND INVESTIGATIONS RESULTS & EARTHWORKS MODELLING, UTILITIES & SERVICES AND CONFIRMATION OF LAND OWNERSHIP;
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 HIGHWAYS ENGLAND LAND OWNERSHIP TAKEN FROM DATA.GOV.UK. DERIVED FROM LAND REGISTER CADASTRAL PARCEL. LAST UPDATED AUGUST 2019  
 0.5M CONTOURS DERIVED FROM LIDAR INFORMATION TAKEN FROM ESRI DATABASE OCTOBER 2019

Mark	Revision	Date	Drawn	Chkd	Appd

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Drawing Issue Status **FOR INFORMATION**

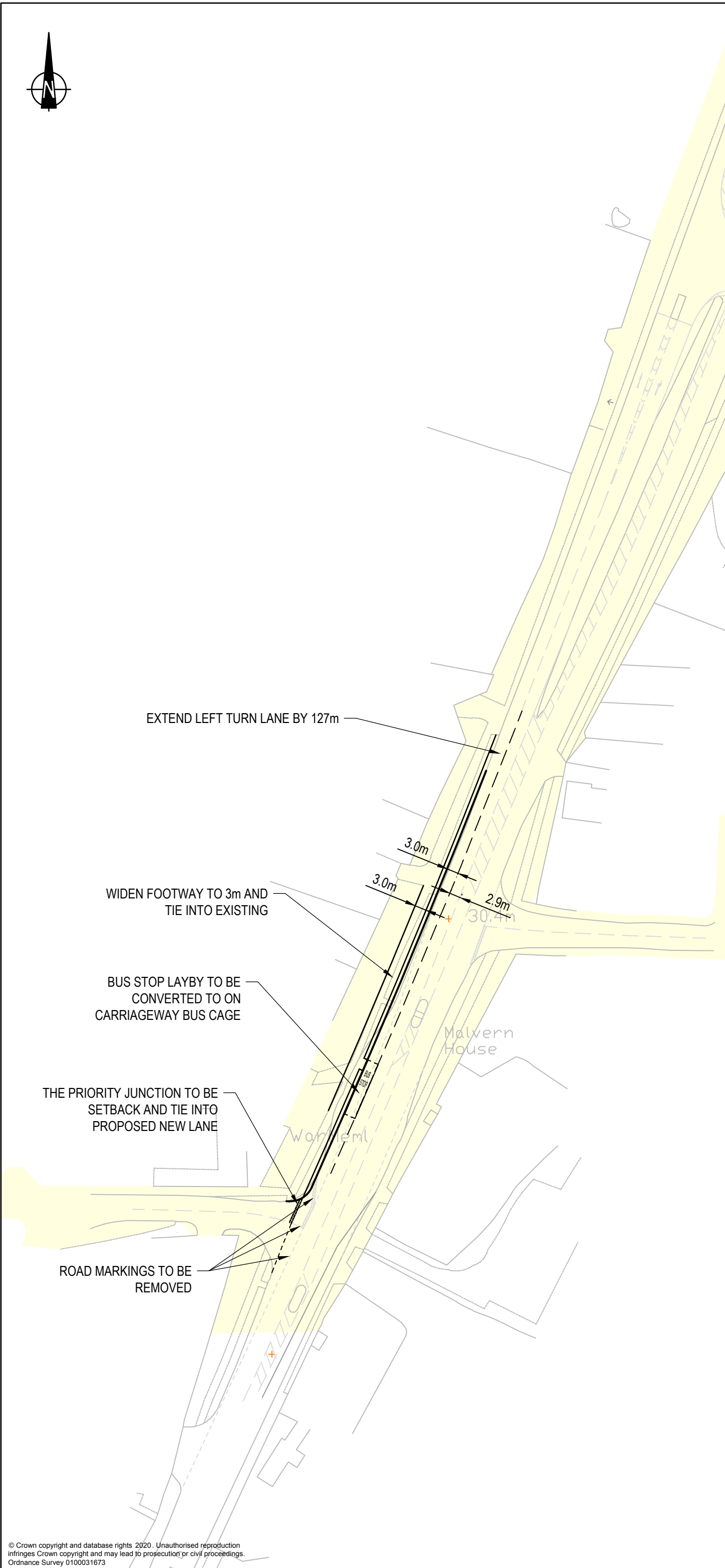
**LAND TO THE WEST OF PARK FARM  
 THORNBURY  
 M5 JUNCTION 14 MITIGATION SCHEME  
 350m 2 LANE N/B OFFSLIP**

Client <b>BARWOOD DEVELOPMENT SECURITIES</b>	
Date of 1st Issue 08.11.19	Designed JHo
A1 Scale 1:500	Checked -
Drawn JHo	Approved -
Drawing Number <b>39209/5501/SK31</b>	Revision -

  
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## APPENDIX B



**NOTES:**

1. THE LAYOUT IS SUBJECT TO DETAILED DESIGN, CAPACITY TESTING, GROUND INVESTIGATIONS RESULTS & EARTHWORKS MODELLING, UTILITIES & SERVICES AND CONFIRMATION OF LAND OWNERSHIP;
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**KEY:**

HIGHWAY BOUNDARY INFORMATION RECEIVED FROM SGC 22.09.2015 AND INTERPRETED BY STANTEC

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Drawing Issue Status: **CONCEPT**

WEST OF PARK FARM, THORNBURY

A38 B4509 JUNCTION MITIGATION  
 EXTENDED N/B FLARE BY 127m

Client  
**BARWOOD DEVELOPMENT SECURITIES LTD**



Date of 1st Issue: 19.03.2020  
 Designed: JHo  
 Drawn: JHo

A3 Scale: 1:1000  
 Checked: KS  
 Approved: -

Drawing Number: **39209/5501/SK37**  
 Revision: -

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