APPENDIX D
Responses to HE comments

AECOM

Lutterworth East Development

Responses to Comments from Highways England – Dated 7th December 2016

1. Background

AECOM (Chesterfield/Manchester) working on behalf of Leicestershire County Council has received comments from Highways England's (HE) Spatial Planning Consultants AECOM (Birmingham) in regards of the Lutterworth East development.

This paper addresses the various comments and concerns raised by HE. Each comment has been reproduced and followed by our response.

2. Detailed Traffic Forecasts

Comment 2.1

Thank you for clarifying the purpose of the work you have done so far, we now understand that it is in support of the Local Plan process.

We have reviewed the diagram and the trip generation tables attached to your email (sent on 22nd November 2016), which are related to the design case with the A426 northern access in place.

In our previous email, dated 3rd November 2016, we raised some concerns about the large number of internalised trips resulting from the analysis of the flow diagrams contained in the Appendix D of the draft TA. These diagrams did not include flows along Gilmorton Road to the north east of the development area, which were assumed to account for a 15% of the total trips. Under this assumption, the internalised trips were calculated to be 25% in the AM and 30% in the PM peak, which is considered quite high.

The diagram recently submitted includes traffic flows along Gilmorton Road north east to the site and also a more detailed estimation of the internal trips between the 6 different zones of the development. We note that this trip generation has been derived from LLITM. The analysis of the figures provided shows that the internal trips would be approximately 6-7 % of the total flows, for both the AM and PM peak periods. We find these percentages appropriate and reasonably distributed between the internal zones accordingly to their use, with the greatest number of trips associated with the employment and services areas.

Response 2.1

Noted.

Comment 2.2

The trip generation tables include intra-zonal and external trips. They show two-way trips which are close to the values of 3,214 AM and 3,123 PM trips shown in Table 4.3 of the draft TA. With reference to these matrices, it is noted that when calculating the

total flows adding up the external and internal ones, the internal trips seem to be duplicated. Therefore, we would expect the amount of total trips to be 3,162 during the AM peak and 3,079 in the PM peak.

Response 2.2

AECOM (Chesterfield/Manchester) has produced a revised version corresponding with the comment, which was issued to HE on 12th December 2016 and is attached to this document in **Appendix A**.

3. Non-Development Traffic Use of the Spine Road

Comment 3.1

In our last email we sought confirmation of the amount of non-development traffic that would route via the development using the proposed northern link. Since the submitted diagram solely refers to the development trips, the above request is still pending. We expect to see a diagram taking into account the non-development flows and the northern link in place.

Response 3.1

AECOM (Chesterfield/Manchester) has recently (January 2017) responded to similar comments raised by Harborough District Council (HDC). Please refer to the comments and responses in Section 4 Effectiveness of the Relief Road of the responses to HDC dated January 2017.

4. Development Phasing and Trigger Points

Comment 4.1

We also advise you to provide an update on the current phasing details, which have been under review, as stated in your email dated 25th July 2016.

Moreover, the identification of trigger points should be provided and the interim improvements should be further investigated, so as to allow determining the development impact on the SRN during the different development phases. We would also expect, for each trigger point identified, the provision of diagrams of both the development and non-development flows.

Response 4.1

AECOM (Chesterfield/Manchester) has recently (January 2017) responded to similar comments raised by HDC. Please refer to the comments and responses in Section 3 Deliverability of the Relief Road of the responses to HDC dated January 2017.

5. Updated TA

Comment 5.1

From your last email we understand that, since the submission of the draft STA in February 2016, some of the development parameters, associated trip generation and off-site junction improvement have been refined. Could you please provide us with an

update of the latest development proposals, associated trip generation and of-site junction improvements?

We are aware that you are currently undertaking a cumulative impact assessment, including committed and other potential development sites in the vicinity of the site for the determination of forecast traffic and mitigation measures. Could you please provide further details on this?

Response 5.1

In our email to you dated 12th December 2016, we attached our July 2016 response to HDC which covered the updated development parameters, cumulative development, updated traffic forecasts and associated off-site junction improvement modifications. Please also refer to the latest response to HDC, dated January 2017.

6. LLITM

Comment 6.1

Finally, just mentioning that current LLITM model does not validate very well in many areas. However, as you might already be aware, the LLITM model is being updated and a new version will be soon ready for use. Therefore, it may be useful to consider this update for the assessment of your proposal.

Response

Noted. However, we understand the new model version will not be available for use within the timescale of end of January 2017 set by HDC to resolve outstanding planning and transport issues.

7. VISSIM Model

Comment 7.1

In order to achieve an agreement in principle for the development to be included within the Local Plan and secure that SRN continues to operate suitably, once all the outstanding issues have been addressed and the trip generation and assignment are agreed for each of the trigger points, we will be more than happy to check the VISSIM models for each assessment scenario.

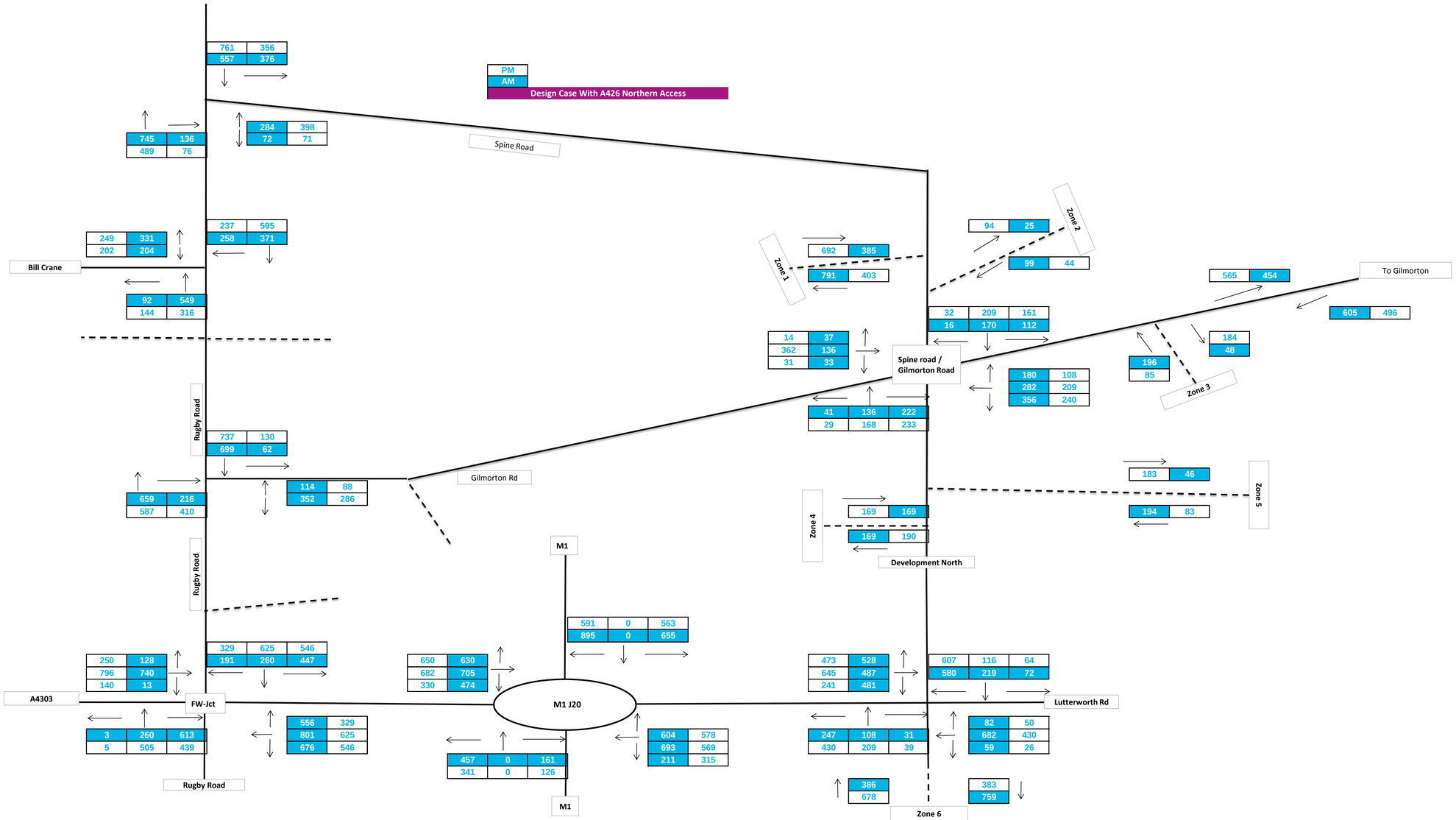
Response 7.1

Noted

The VISSIM model has not been updated with the latest changes. We suggest that this is undertaken once all outstanding planning and transport issues are agreed with HE and HDC.

AECOM

APPENDIX A



Intra-Zonal Trips (Lutterworth East)

AM

	1	2	3	4	5	6	Internal	External	Total
1	0	1	1	3	1	21	27	358	385
2	3	0	0	1	0	4	8	91	99
3	6	0	0	2	0	8	16	180	196
4	5	0	1	0	1	6	13	156	169
5	6	0	0	2	0	9	17	177	194
6	17	1	1	3	2	0	24	362	386
Internal	37	2	3	11	4	48	105	1324	1429
External	754	23	45	158	42	711	1733	3057	-
Total	791	25	48	169	46	759	1838	-	3162

PM

	1	2	3	4	5	6	Internal	External	Total
1	0	3	6	6	5	17	37	655	692
2	1	0	0	0	0	2	3	41	44
3	2	0	0	1	1	3	7	78	85
4	4	1	2	0	2	4	13	156	169
5	2	0	1	1	0	3	7	76	83
6	14	4	8	7	9	0	42	636	678
Internal	23	8	17	15	17	29	109	1642	1751
External	380	86	167	175	166	354	1328	2970	-
Total	403	94	184	190	183	383	1437	-	3079

2-way Total
1 way Total

Lutterworth East SDA – Comments & Responses, 15th June 2016

HE Comments are in red
AECOM response is in black

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Trip Generation

TA Section 4.5 Trip Generation – Residential does not detail the proposed trip generation of the residential element of the site. It does detail the methodology adopted in order to determine population, which has been calculated using the information from LLITM for Lutterworth. At this stage it appears reasonable to assume population per dwelling at Lutterworth will be representative of the new site. However, adopting LLITM data for trip generation in Lutterworth is not considered to accurately represent the new site, for reasons previously highlighted regarding accessibility via sustainable transport modes. The methodology proposed for determining residential trip generation should be stated.

Section 4.6 *Trip Generation – Employment* states that trip generation has been calculated for both employment zones 1 and 6, totalling 20ha and that this is detailed in table 4.2. Table 4.2 however only shows trip generation for 10ha. The assumptions made in table 4.2 are said to be based on statistics from the Homes and Community Agency, adopted for determining likely trip generation from the employment zones. From review of similar sites these assumptions appear reasonable although the supporting information should be provided.

The methodology adopted for determining employment trip generation is acceptable at this stage, however it should be clarified whether or not *Table 4.3: Trip Generation Totals (PCUs)* accounts for the full 20ha of employment land. With the prediction of 6,800 jobs, plus a further 40 at the school and 265 at local centres, predicted 2-way trips of 3,214 in the AM peak and 3,123 in the PM peak appear low, reflecting a modal split for private motor vehicles of just 45% for the Lutterworth East employment trips.

Section 4.7 *Total Trip Generation and Comparison with TRICS* does not include comparison with TRICS. This section also states that *Table 4.3: Trip Generation Totals (PCUs)* includes both total employment and residential trips. With the site totalling 2,500 dwellings and 7,105 jobs these trips (discussed above) appear very low.

We have done some further analysis on the trip rates, including providing the comparison with TRICS. The table below shows the trip generation used within the model broken down into each of its constituent zones. The totals match Table 4.3 from the TA.

Table 1: Total Vehicular Trips for development as modelled in LLITM

Zone	Components	AM Peak Hour		PM Peak Hour	
		Arrivals	Departures	Arrivals	Departures
Zone 1	10Ha	761	384	378	669
Zone 2	400	23	97	93	43
Zone 3	800	47	195	185	86
Zone 4	500+school	147	162	176	155
Zone 5	800	47	195	185	86
Zone 6	10Ha	770	386	384	683
Total		**1,795**	**1,419**	**1,402**	**1,721**

	Two-Way	**3,214**	**3,123**

The table below shows the equivalent trip rates:

Table 2: Trip Rates for development as modelled in LLITM

Components	**Trip Rate Basis**	**AM Peak Hour**		**PM Peak Hour**	
		Arrivals	**Departures**	**Arrivals**	**Departures**
Residential	per dwelling	0.059	0.244	0.231	0.108
Employment	per employee (6,800)*	0.225	0.113	0.112	0.199
Residential (Avg)	2,500 dwellings	148	610	578	270
Employment (Avg)	6,800 Employees	1,530	768	762	1,353
Two-way Total		**3,056**		**2,963**	
* - Note, this does not include school or local centre to allow comparison with table 3					

The table below shows TRICS data. For residential sites, surveys in the Republic of Ireland and Greater London have been removed, and only "Edge of Town" locations have been selected. Given the size of the site, average trip rates have been extracted from TRICS, since for large numbers of housing, trip rates could be expected to 'average' out. For the employment uses, a combined B1 (office), B2 (industrial units), B8 (warehousing) trip rate has been calculated. This has been weighted by the number of jobs shown in Table 4.2 of the TA. Again, sites from the Republic of Ireland and Greater London have been removed, and only "Edge of Town" (or free standing) locations have been selected.

Table 3: TRICS data

Components	**Trip Rate Basis**	**AM Peak Hour**		**PM Peak Hour**	
		Arrivals	**Departures**	**Arrivals**	**Departures**
Residential (Avg)	per dwelling	0.171	0.383	0.363	0.181
Employment (Avg)	per employee (6,800)*	0.310	0.048	0.023	0.288
Residential (Avg)	per dwelling	428	958	908	453
Employment (Avg)	per employee (6,800)*	2108	326	156	1958
Total	Two Way	**3,820**		**3,475**	

Both employment and residential trip patterns are lower in LLITM than average TRICS rates. However, further analysis of TRICS data (Figure 1) does indicate that, as residential size of development increases, so trip rates decrease.

Figure 1: Reducing residential trip rate as development size increases

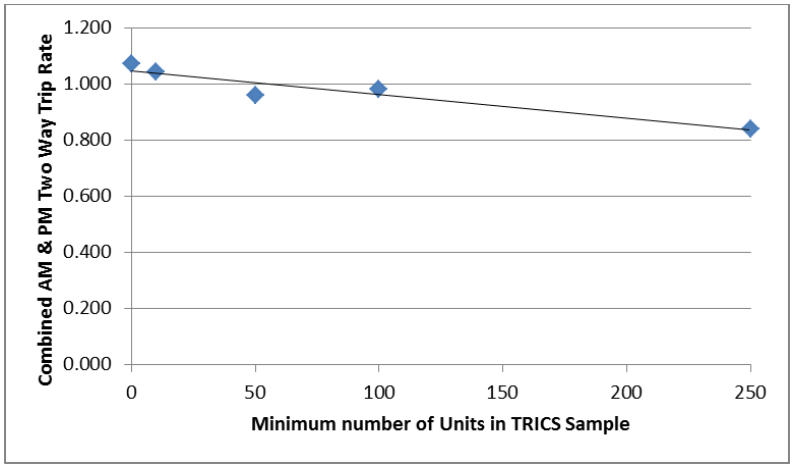
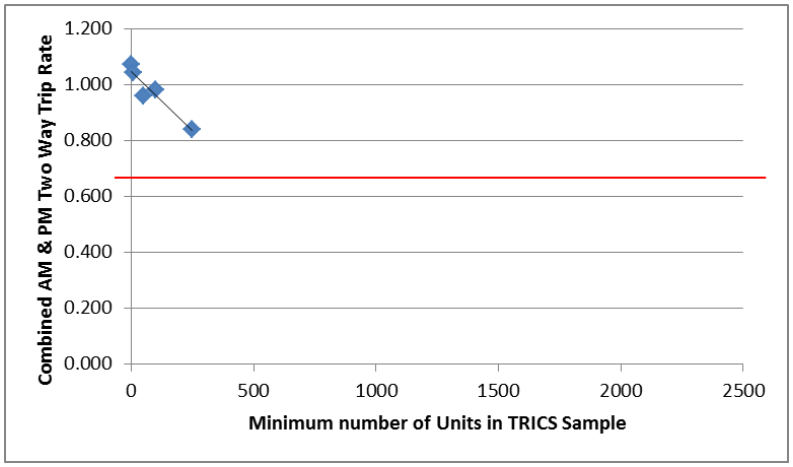


Figure 1 shows that as the minimum number of dwellings in the TRICS sample is increased (i.e. selecting all sites with dwellings greater than X), the trip rate decreases. Unfortunately, the maximum number of dwellings contained within the TRICS sample is some way short of the 2,500 proposed here. Logically, however, a reducing trip rate with increased housing numbers makes sense: especially when considering that large developments would support their own employment, education and local shops. This is because the potential for internalised traffic is increased as development size (i.e. model zones) increases.

Figure 2 shows the data in Figure 1 with the 'x' axis extended to 2,500 dwellings and a red line added to show the combined AM and PM two-way trip rate from LLITM. *Clearly, the trip rate would need to level off at some point, and the relationship would not be linear*.

Figure 2: Reducing trip rate as development size increases



We would also note that LLITM was developed, in part, to help assess the impact of development on the highway network.

LLITM uses the DfT's National Trip-End model software (version 6.2) to forecast trip-ends based on the planning data inputs. This software contains assumptions on trip rates to apply for different trip purposes based on a limited number of geographical definitions. The software may not therefore represent local variations in these trip rates due to specific types of development. The CTripEnd software forecasts personal travel as a result of the proposed land-use.

The trip rate information used in LLITM is therefore based on robust data sources (NTEM / TEMPRO); though is lower than TRICS. It is important to note, however, that if the number of dwellings in a given area is multiplied by TRICS rates, then it would generate far more traffic than is witnessed on the highway network. If the same exercise is undertaken using LLITM data, then approximately the correct amount of traffic would be generated.

Modelling

It is proposed that the LLITM is used for modelling the traffic impacts of the development, by creation of the following scenarios:

- 2031 Reference Case
- 2031 Design Case (with development, without access from A426 north of Lutterworth)
- 2031 Design Case (with development, with access from A426 north of Lutterworth)

These assessment scenarios appear suitable considering the scale of development.
Noted

The TA includes assessment of the A4304 main site access and the potential new A426 / development access junction to the north of Lutterworth, assessed as roundabouts in ARCADY and as signalised junctions in LINSIG. The network surrounding M1 J20 has also been assessed using a VISSIM model supplied by Highways England.

From review of the traffic flow diagrams provided in Appendix D, the development site generates significantly more traffic in the scenario with new access over the M1 north of Lutterworth. The provision of a new link should not result in a net increase in traffic generation from a site, but redistribution of traffic from other areas of the network (in this case the main access from the A4304). Yes, total trip generation remains the same; there is, however, re-assignment away from Lutterworth town centre etc., and differences with respect to assignment via Gilmorton Road.

The traffic generated by the development as presented in the flow diagrams is summarised below:

LLITM Predicted Development Trips (PCUs)				
	Without A426 northern site access link		With A426 northern site access link	
	AM	PM	AM	PM
Arrivals	715	705	1,230	1,164
Departures	850	716	1,227	1,256
2-way	1,565	1,421	2,457	2,420

The values above are considerably lower than those presented in TA table 4.3, which have already been identified as appearing very low considering the scale of the development. No, this is a misnomer: under *both* scenarios (i.e. with or without a link to the A326, north of Lutterworth) traffic can also route via Gilmorton Road, as per Section 6.2 of the TA. Comparison cannot be made therefore with just the flows at the two new access points – one of the issues picked up in the report is large increases on Gilmorton Road.

As the modelling assessments conducted adopt the Appendix D flows, the LINSIG and ARCADY model output files have not been reviewed in detail. It is considered that the concerns raised regarding the suitability of traffic flows initially be addressed as it is possible this may prompt the revision of junction designs. Noted, but see discussion above.

Mitigation requirements

TA Section 6.6 lists the likely highway infrastructure required in order to facilitate the development. From review of the information provided, we would agree with the locations identified for capacity improvement, although this does not include the proposals made in Section 5 *Encouraging Environmental Sustainability* regarding NMU travel via a pedestrian bridge to the north of Gilmorton Road linking into Central Park (a road within the industrial estate).

Also, due to the concerns already raised regarding development trip generation, the scale of the infrastructure improvements are to be investigated further. Noted, but see discussion above.

Recommendations

- Provide details regarding the proposed method for determining trip generation from the residential element.
- Information supporting the assumptions made in table 4.2 for determining likely trip generation from the employment zones should be provided.
- Clarify whether *Table 4.3: Trip Generation Totals (PCUs)* represents either 10ha or 20ha of employment trips, and includes residential trips or not. Table 4.3 reflects the full development (i.e. includes 20Ha of employment land).
- The LLITM development traffic as presented in the Appendix D flow diagrams shows considerably lower generation than that proposed in TA table 4.3. The table 4.3 values have already been identified as appearing very low, and so this should be clarified. Clarification is provided above.
- For NMUs, access to Lutterworth centre via M1 J20 from the nearest residential area (Zone 4) is approximately 1 mile, and via the new link road to the north from the nearest residential area (Zone 2) is approximately 1.7 miles. It should be taken into consideration that 2km is the upper threshold given by the Chartered Institution for Highways and Transportation (CIHT) when considering the accessibility of a site on foot, and therefore the vast majority of residents would fall outside this walking catchment. (Continued below) Noted.
- The TA indicated the possibility to either pedestrianise the existing Gilmorton Road overbridge, add a suitable pavement, or construct a separate pedestrianised bridge for NMUs. This would significantly improve the site's accessibility for sustainable transport, connecting the proposed site to Lutterworth and should be investigated further to address the concern regarding the high proportion of private motor vehicle use expected. As per Section 7, the TA recommends a new bridge connecting to Central Park.
- Improvement options for M1 J20 should be detailed and VISSIM results provided for review. These can be provided.
- We would also recommend that in order to best support the progress of these development proposals, the model files be provided for review in advance of any meeting such that we can be suitably informed and thus enabling productive discussions to take place. These can be provided.

Posford, Clive

From: Posford, Clive
Sent: 25 July 2016 13:08
To: Law, Daniel
Cc: 'Samantha.Pinnock@highwaysengland.co.uk'; O'Toole, Aoife; Janna.Walker@leics.gov.uk; Andrew Winnington (Andrew.Winnington@leics.gov.uk); Bernard Evans (Bernard.Evans@leics.gov.uk); Godfrey, Daniel
Subject: RE: Lutterworth East
Attachments: V3-Through Movements Diagram.JPG

Daniel,

Thank you for meeting with us on Thursday 14th July 2016 to discuss the proposed Lutterworth East development and for your further comments.

We have reviewed your further comments and provide our responses as follows.

Q1. Trip generation has been checked and based on the existing proposals and level of detail regarding likely use classes, appears reasonable.

A1. Noted.

Q2. Although site trip generation presented in Appendix D is shown to be greater than previously thought (shown in the table, above), this is still significantly lower than that proposed in TA table 4.3 (3,214 AM and 3,123 PM) and the significant difference in comparing the above table columns with/without A426 access should not exist.

A2. Flows in Appendix D cannot be compared with the traffic generation estimates provided in Table 4.3 for the following reasons:

- The development site has been modelled in LLITM as six zones and there is a small amount of internal travel between zones, e.g. housing zones to employment zones.
- Around 10% to 15% of development traffic is forecasts to travel to/from Gilmorton Road to the north east of the development area.
- Appendix D does not show the flows along Gilmorton Road north east the development area. Traffic travelling to/from areas such as Gilmorton, Kimcote and Bruntingthorpe currently uses Gimorton Road to access Lutterworth and the M1 via Junction 20. With the Spine Road, some of this traffic will transfer to travel through the development area to access the motorway and other areas.
- Analysis of the LLITM model shows there will be some through-traffic movements, e.g.
  - A426 north of Lutterworth via the Spine Road to Gilmorton Road north east of the development area
  - A426 north of Lutterworth via the Spine Road to M1/J20
  - A426 north of Lutterworth via the Spine Road to A4304 Lutterworth Road East
  - Gilmorton Road north east of the development area to Lutterworth
  - Gilmorton Road north east of the development area to M1/J20
  - Lutterworth to A4304 Lutterworth Road East via Gilmorton Road and Spine Road
- The flows on Gilmorton Road at the junction with A426 also include traffic travelling to/from residences, businesses and facilities with access onto Gilmorton Road as well as accessing via the side roads of Gladstone Street and Boundary Road.

The attached diagram also shows the above movements. If needed, we can provide further details on the forecast traffic flows and turning movements within the development area.

Q3. The potential to either pedestrianise the existing Gilmorton Road overbridge, add a suitable pavement, or construct a separate pedestrianised bridge for NMUs should be further investigated to determine the likely total site trip generation adjustments.

A3. Agreed. Consideration is being given to the potential future role of the Gilmorton Road overbridge and the need for strong pedestrian, cycle and bus links between the development area and Lutterworth.

Q4. Please confirm the VISSIM version used and if possible, allow for the model to be run in VISSIM version 7.00-13.

A4. The model has been developed using the latest 8.0 version of VISSIM. Unfortunately it cannot be saved and run as a lower version such as 7.00-13. We suggest you either run the model using version 8.0 or we arrange a meeting for us to demonstrate the model.

Q5. Source data for development of VISSIM matrices and the methodology adopted to derive the final traffic demands in the model (including clarity on the use of scale factors) should be provided.

A5. The VISSIM model matrices and user classes were derived from cordoning the LLITM runs. As such they are directly comparable with LLITM 'demand' flows. LLITM represents one hour in the morning peak and one hour in the evening peak. We have taken these one hour matrices and produced four 15 minute matrices to model each peak, with an additional 15 minute 'warm-up' and 15 minute 'cool-down' set of matrices. We have applied scaling factors based on observed traffic count data as the demand profile through each 1½ hour modelled period will not be flat.

The scaling factors for each ¼ hour during the main modelled periods are as follows:

	CAR	LGV	HGV
AM	0.25	0.22	0.32
	0.25	0.28	0.15
	0.27	0.19	0.32
	0.24	0.30	0.21
PM	0.24	0.25	0.33
	0.24	0.31	0.38
	0.26	0.28	0.10
	0.26	0.16	0.19

Q6. We would expect the final TA to provide a thorough analysis of the operation of M1 J20, allowing junction capacity, mitigation requirements and appropriate stage for delivery of the mitigation to be determined.

A6. Appendix E provides the results of detailed modelling using Linsig covering both the M1/J20 junction and southern access junction. As we discussed in the meeting, the proposed phasing of developed and associated highway infrastructure is currently under review.

If you have any further questions or comments, please contact Daniel and me.

Thank you.

Regards,

Clive

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From: Law, Daniel
Sent: 14 July 2016 13:03
To: Posford, Clive; Janna.Walker@leics.gov.uk
Cc: O'Toole, Aoife
Subject: FW: Lutterworth East

Clive, Janna,

It was good meeting you today.

As discussed, please see the below email in response to the *Lutterworth HE response* document attached and VISSIM model which Highways England received mid-June.

If the development proposal has progressed regarding use classes and phasing of the development / highway infrastructure, if you could send this through it would be very useful.

Thanks.

Regards,

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From: Law, Daniel
Sent: 05 July 2016 14:13
To: 'Samantha.Pinnock@highwaysengland.co.uk'
Cc: HE instructions
Subject: FW: Lutterworth East

Sam,

In our email of 9th May 2016 we provided comments on the draft Transport Assessment (TA) for the development of land immediately to the east of the M1 at Junction 20 for mixed-use development comprising housing and employment. It is proposed that the site will consist of 2,500 dwellings, a school and local centres, and 20ha of employment equally split between use classes B1 (office), B2 (general) and B8 (warehousing/distribution).

We have reviewed the response (attached) to our May email which aims address the points raised.

Trip Generation

In our May email we were dissatisfied with the trip generations because:

- No residential trip generation had been stated.
- Employment trip generation only appeared to account for 10ha of the total 20ha of employment land.
- No evidence provided for how the total 2-way trip generation of 3,214 in the AM peak and 3,123 in the PM peak was calculated as presented in TA Table 4.3.

The above concerns have been addressed in the response of mid-June 2016, document titled *The Lutterworth HE Response*, within which Table 1 details the proposed trip generation of each of the site's elements.

Having confirmed development size, comparison against TRICS shows the trip rates proposed to be suitable.

Traffic Flows

In our May email we were dissatisfied with the proposed traffic flows because:

- Traffic flow diagrams (TA Appendix D) show that the development generates significantly more traffic in the scenario with new access over the M1 north of Lutterworth. A new link should not result in increased traffic generation, but redistribution of traffic from other areas of the network.
- Traffic Flows shown in Appendix D are considerably lower than trip generation presented in TA Table 4.3.

The response to the above agrees that the total development traffic should not change when network changes are made, and indicates that differences in flows on Gilmorton Road should be considered.

The table presented in the May email should have included the difference between flows on Gilmorton Road when comparing the 'with development' and 'without development' flow diagrams, as this difference can be assumed to mostly be development flows.

Acknowledging this miscalculation, the table summing the total trip generation as shown in Appendix D has been updated to account for the traffic on Gilmorton Road. This is shown below, with adjusted traffic flows shown in bold.

Table 1: Corrections made to table in email of 9th May 2016 accounting for Gilmorton Road flows

LLITM Predicted Development Trips (PCUs)				
	Without A426 northern site access link		With A426 northern site access link	
	AM	PM	AM	PM
Arrivals	715**+245**	705**+139**	1,230**-2**	1,164**+36**
Departures	850**+143**	726**+180**	1,227**+31**	1,256**+14**
2-way	**1,953**	**1,750**	**2,486**	**2,470**

Although calculating site trip generation based on the flows presented in Appendix D is shown to be greater than previously thought:

a) this is still significantly lower than that proposed in TA Table 4.3,
b) the significant difference in comparing columns with/without A426 access should not exist,
c) the difference between the Table 4.3 trip generation totals and the trip generation in the 'With A426 northern site access link' column would suggest a significant 25% internalised trips. No supporting evidence regarding internalisation of trips within a mixed use development has been provided.

Therefore, the original concern is still considered relevant.

VISSIM Modelling

The mitigation schemes incorporated in the VISSIM model, which include the existing A4303 / A426 roundabout, M1 J20, and the proposed site access, consist of:

- Reconfiguration of the A4303 / A426 roundabout to signalised crossroads
- Signalisation and widening at M1 J20 consisting of:
    - Full entry signalisation
    - Eastern circulatory widened to 3 lanes
    - M1 SB off-slip flared to 3 lanes
- New signalised crossroads forming site access east of M1 J20

Only a high level review of the VISSIM model has been carried out as unfortunately due to model file errors, detailed checks of the network elements cannot be conducted. It would be appreciated if the applicant could confirm the VISSIM version used and if possible, enable the model to run in VISSIM version 7.00-13.

The VISSIM traffic flow matrices have been provided in 15 minute intervals for Cars, LGVs and HGVs, with varying scale factors applied. To check the suitability against Appendix D flow diagrams and site trip generation proposals, these VISSIM matrices have been converted to hourly PCU matrices.

The TA states "We have modified the HE VISSIM model to take account of the LLITM 'with development' forecast traffic flows and added a flow-profile based on traffic survey data for the A4304 (at the point of the proposed access and undertaken in fifteen minute intervals). This modelling work has shown that the junctions operate satisfactorily in both the AM and PM peak hours." From a spot check of the VISSIM matrices, these appear to correspond relatively well to the Appendix D flows. However with no supporting text provided alongside the model, it is unclear how the proposed development trips of 3,214 AM and 3,123 PM peak hour two-way PCUs have been incorporated. It would be appreciated if source data can be provided to clarify the suitability of the traffic demands in the model.

Conclusions

- Trip generation has been checked and based on the existing proposals and level of detail regarding likely use classes, appears reasonable.
- Although site trip generation presented in Appendix D is shown to be greater than previously thought (shown in the table, above), this is still significantly lower than that proposed in TA table 4.3 (3,214 AM and 3,123 PM) and the significant difference in comparing the above table columns with/without A426 access should not exist.
- The potential to either pedestrianise the existing Gilmorton Road overbridge, add a suitable pavement, or construct a separate pedestrianised bridge for NMUs should be further investigated to determine the likely total site trip generation adjustments.
- Please confirm the VISSIM version used and if possible, allow for the model to be run in VISSIM version 7.00-13.
- Source data for development of VISSIM matrices and the methodology adopted to derive the final traffic demands in the model (including clarity on the use of scale factors) should be provided.
- We would expect the final TA to provide a thorough analysis of the operation of M1 J20, allowing junction capacity, mitigation requirements and appropriate stage for delivery of the mitigation to be determined.

Please get in touch if you wish to discuss any of the above in further detail.

Regards,

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From: Pinnock, Samantha [mailto:Samantha.Pinnock@highwaysengland.co.uk]
Sent: 20 June 2016 12:08
To: HE instructions
Cc: Smith, Peter (Area 7)
Subject: Lutterworth East

Good afternoon,

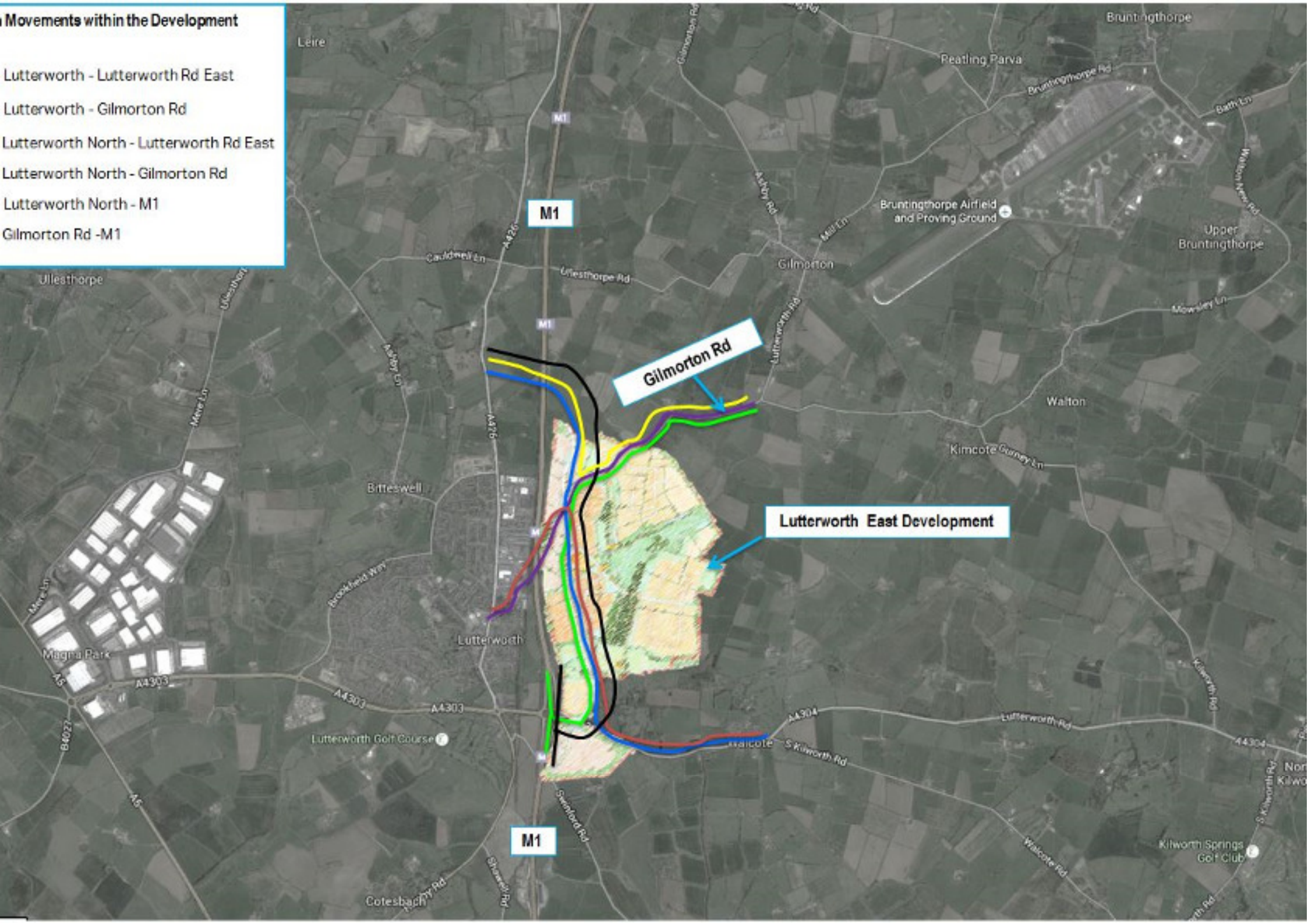
Please review the attached note and VISSIM files in relation to the response provided by Aecom for Lutterworth East.

May I request a response by 5th July please. A meeting has also been requested to discuss the project, therefore representation from Aecom will also be required, but I will advise in due course.

Many Thanks

Samantha

SAMANTHA PINNOCK | ASSET MANAGER| Midlands Operations Directorate| Highways England | The Cube| 199 Wharfside Street| Birmingham | B1 1RN | 07990 760 893 | 0300 470 3298|


Movements within the Development
Lutterworth - Lutterworth Rd East
Lutterworth - Gilmorton Rd
Lutterworth North - Lutterworth Rd East
Lutterworth North - Gilmorton Rd
Lutterworth North - M1
Gilmorton Rd -M1
M1
Gilmorton Rd
Lutterworth East Development
Leire
Bruntingthorpe
Peatling Parva
Bruntingthorpe Airfield and Proving Ground
Upper Bruntingthorpe
Gilmorton
Ullesthorpe
Walton
Kimcote
Misterton
Lutterworth
Magna Park
Lutterworth Golf Course
Walcote
Kilworth Springs Golf Club
Cotesbach
A426
A4303
A4304
A5
B4027

APPENDIX E
Technical Note on Gilmorton Road Improvements

Lutterworth East Development

Gilmorton Road Bridge Improvements

1. Background

As part of the Lutterworth East Strategic Development Area (SDA) transport infrastructure it is proposed to convert Gilmorton Road bridge to a sustainable transport corridor. The objectives of the scheme are:

- to provide direct bus, walking and cycling connections between the SDA and town centre; and
- to prohibit general road traffic so as not to overload junctions and to relieve traffic within the town centre.

2. Existing Bridge

The existing bridge currently has crash barriers on the footways on either side to protect the bridge parapets. On the west side of the bridge there are no footways extending into the town. Improvements are therefore needed to provide a continuous footway across the bridge to the town centre. Within the town, there is a footway on the north side of Gilmorton Road to the edge of the built up area. However, it does not extent up the ramp to the motorway bridge and pedestrians have to walk on a narrow grass verge between the kerb and hedge or in the road.

A site visit was undertaken whereby measurements of cross-sections were made and photographs taken. The measurements are summarised in **Figure 1**.

3. Scheme Options

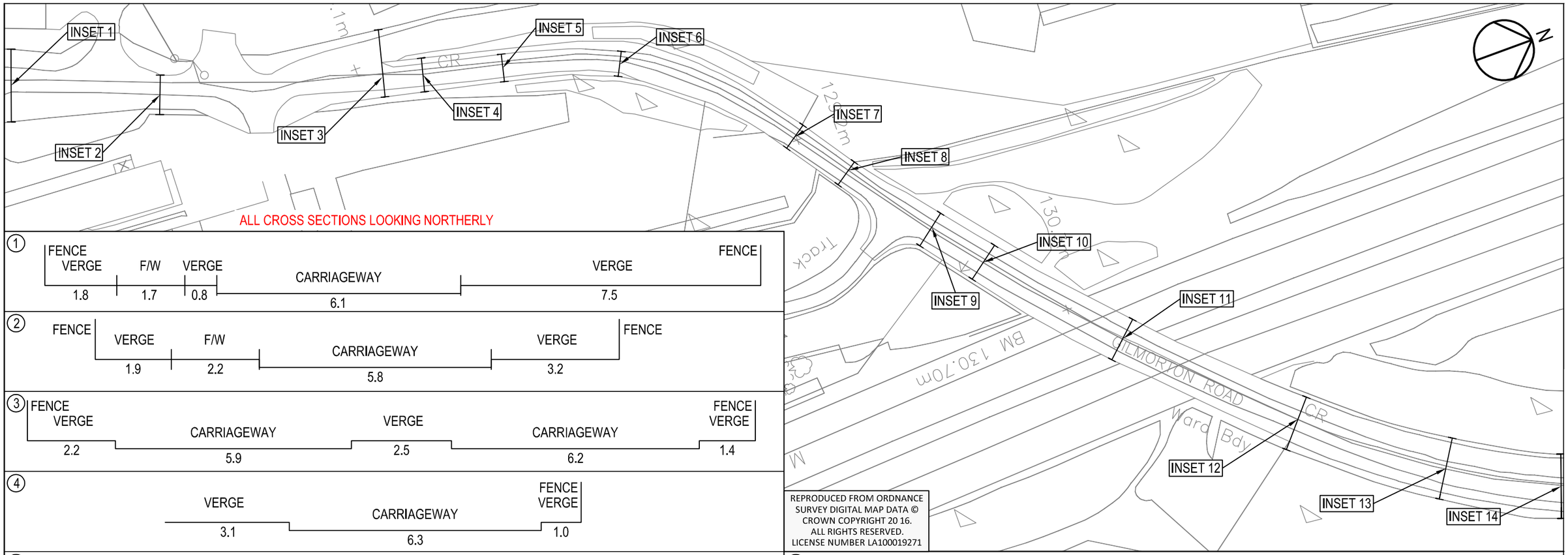
To provide for a continuous footway, cycle and bus-only link with associated lighting and signage, there are several options which could be further investigated:

- Option 1 Realign the carriageway to the south, while maintaining a minimum road width of 6.1m and provide a continuous footway on the north side and move the crash barrier towards the kerb and remove the hedge to provide minimum footway width of 2m. Buses and cycles would use the carriageway with a 20 or 30mph speed limit.
- Option 2 Narrow the carriageway, while maintaining a minimum road width of 3m and provide a continuous footway on either the north side or south side, and move the crash barrier towards the kerb and remove the hedge to provide a minimum shared footway and cycle width of 4.5m. Buses to be scheduled so that eastbound and westbound buses do not use the bridge at the same time (i.e. shuttle working), with traffic signals and detectors at both ends to ensure safety. Buses would use the carriageway and cycles would share the footway. The length of the single carriageway for shuttle working would be around 250m including the ramp on the west side to/from the bridge and the bridge itself. The road section would have a 20 or 30mph speed limit. If the shared footway/cycleway is on the south side, this

would also require extension of the existing footway on the south side of the road within the town along the grass verge to connect up.

- Option 3 Convert the carriageway and footways to a wide shared surface with a 20mph speed limit.

AECOM proposes the above options are first discussed with the local planning and highway authorities before proceeding to design the preferred option.



ALL CROSS SECTIONS LOOKING NORTHERLY

① FENCE | VERGE 1.8 | F/W 1.7 | VERGE 0.8 | CARRIAGEWAY 6.1 | VERGE 7.5 | FENCE

② FENCE | VERGE 1.9 | F/W 2.2 | CARRIAGEWAY 5.8 | VERGE 3.2 | FENCE

③ FENCE | VERGE 2.2 | CARRIAGEWAY 5.9 | VERGE 2.5 | CARRIAGEWAY 6.2 | FENCE VERGE 1.4

④ VERGE 3.1 | CARRIAGEWAY 6.3 | FENCE VERGE 1.0

⑤ VERGE 2.5 | CARRIAGEWAY 6.0 | FENCE VERGE 0.7

⑥ VERGE 2.6 | CARRIAGEWAY 6.35 | VERGE 0.45

⑦ FENCE | VERGE 1.7 | CARRIAGEWAY 6.1 | VERGE 0.9 | FENCE

⑧ PARAPET | VERGE 1.65 | CARRIAGEWAY 5.5 | VERGE 1.6 | PARAPET

⑨ WALL | SB | F/W 1.0 | F/W 1.5 | CARRIAGEWAY 5.6 | F/W 1.8 | F/W 1.1 | SB | WALL

⑩ WALL | SB | F/W 1.5 | F/W 1.2 | CARRIAGEWAY 5.7 | SB | F/W 1.6 | F/W 1.3 | END OF WALL

⑪ PARAPET | SB | F/W 1.8 | F/W 1.2 | CARRIAGEWAY 5.9 | SB | F/W 1.7 | F/W 1.3 | PARAPET

⑫ PARAPET | SB | F/W 1.8 | F/W 1.2 | CARRIAGEWAY 5.8 | SB | F/W 1.7 | F/W 1.3 | PARAPET

⑬ SB | VERGE 3.2 | CARRIAGEWAY 6.5 | SB | VERGE 1.5 | VERGE 2.2 | SB

⑭ SB | VERGE 3.4 | CARRIAGEWAY 6.6 | VERGE 4.2 | SB

Project Title: GILMORTON ROAD, LUTTERWORTH

Client: LEICESTERSHIRE COUNTY COUNCIL

Drawing Title: SITE LAYOUT & GENERAL SECTIONS

Purpose of issue: FOR INFORMATION

Designed	Drawn	Checked	Approved	Date
JPH	JPH			

AECOM Internal Project No. 60472967

Suitability

Scale @ A3: PLAN - 1:1000 / SECTIONS 1:100

Zone / Mileage

Drawing Number: 60472967/SK/001

Rev: -

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Plot Date : 23 January 2017 17:16:32
File Name : L:\MK_TRANSPORTATION\D117149 - LUTTERWORTH ROAD\5_DRAWINGS\60472967-SK-001

APPENDIX F
Technical Note on Final Model Runs and Junction Assessment

Lutterworth East Development

Technical Note: Final Model Runs and Junction Assessment

Leicestershire County Council

Project Number: 60472967

January 2017

Quality information

Prepared by	Checked by	Approved by
Mohamad Jamous Transport Planner	Clive Posford Technical Director	Clive Posford Technical Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position

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Table of Contents

Figures

Tables

1. Introduction

1.1 Scope

1.1.1 AECOM was asked by Leicestershire County Council (LCC) to assess the impact of closing Gilmorton Road bridge for vehicular traffic, apart from buses. Converting Gilmorton Road bridge to a sustainable transport corridor is discussed in different Technical Note.

1.1.2 This Technical Note therefore summarises the land-use assumptions, the final SATURN model forecasts, and the operational capacity junction assessments.

2. Modelling and Traffic Forecast

2.1 Modelling Assumptions

2.1.1 AECOM has conducted final model runs of the LLITM SATURN model with the following assumptions:

- Land-use assumptions for Lutterworth East Development to be 2,950 dwellings and 23 Hectares of employment;
- Modification all the off-site junction mitigation measures to include the latest junction schemes that have been reported previously; and
- Gilmorton Road bridge to be closed in both directions for vehicular traffic apart from buses.

2.2 SATURN Modelling

2.2.1 The previous SATURN modelling exercise undertaken in July 2016 required updating to reflect the latest junction layouts and the closure of Gilmorton Road bridge.

2.2.2 AECOM has modified the main development access to a staggered junction. **Figure 2.1** shows the junction arrangements.

2.2.3 The updated off-site mitigation measures include:

- M1 Junction 20, **Figure 2.2** shows the junction arrangement.
- Frank Whittle Junction, **Figure 2.3** shows the junction arrangement
- A426 Lutterworth /Bill Crane junction **Figure 2.4** shows the junction arrangement

2.2.4 These junctions have been coded all with signal control arrangement. The timings were coded differently for both AM and PM peak hours which were taken from the latest LINSIG models.

2.2.5 The closure of Gilmorton Road bridge was modelled by implementing a bus only coding.

Figure 2.1 Development Main Access (Staggered)

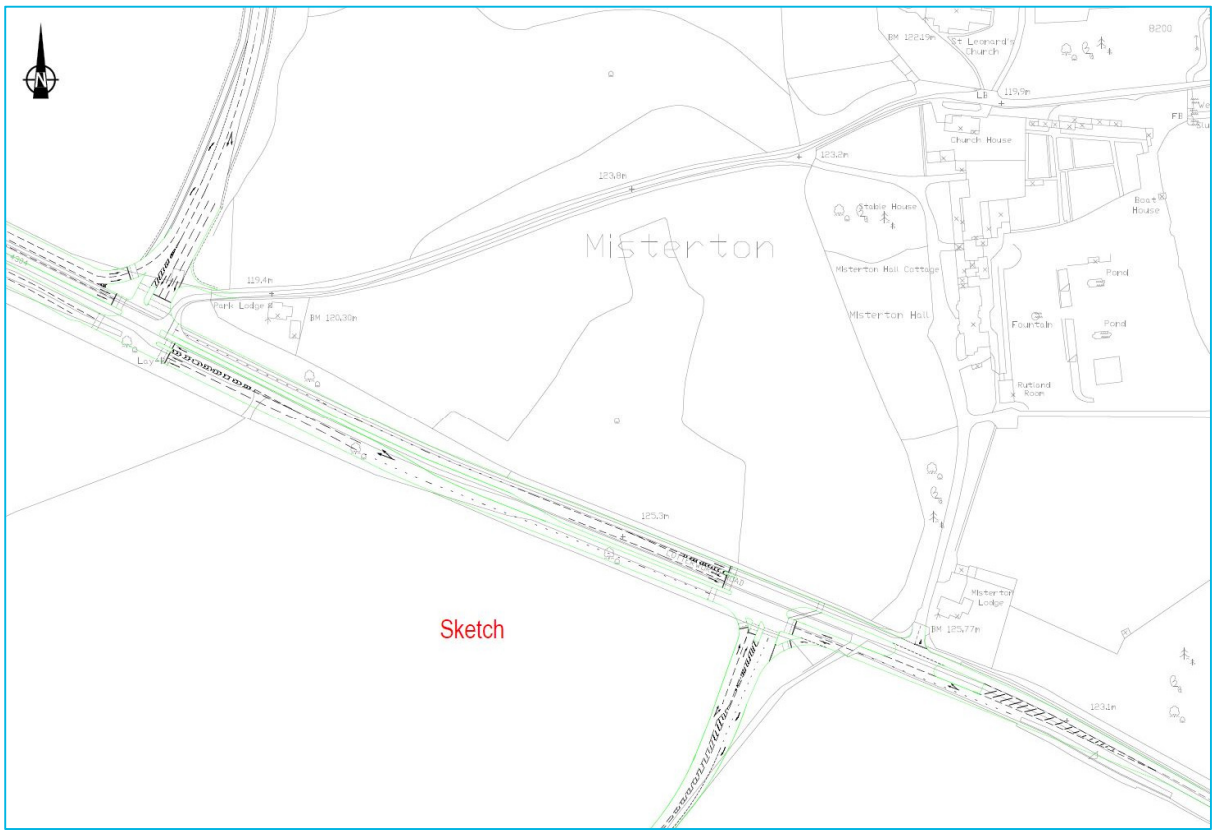


Figure 2.2 M1-Junction 20 Arrangement

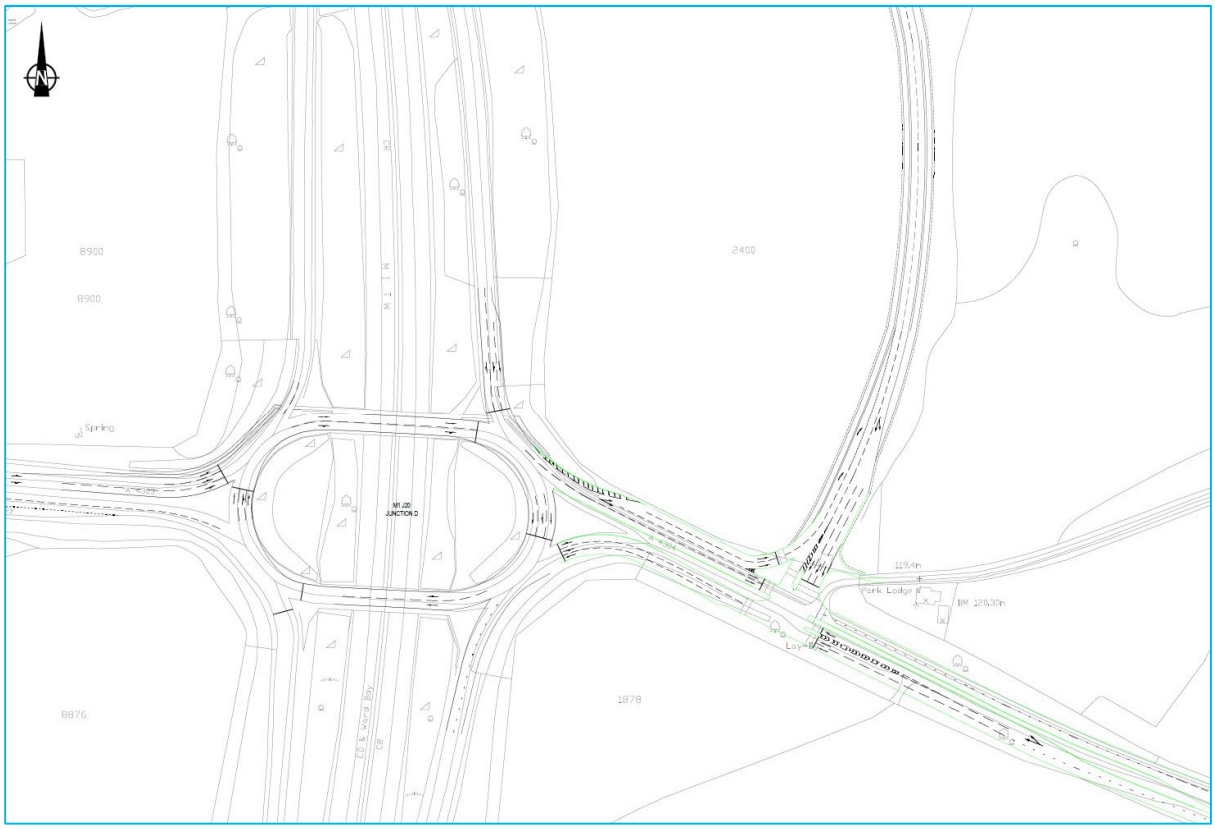


Figure 2.3 Frank Whittle Junction Arrangement

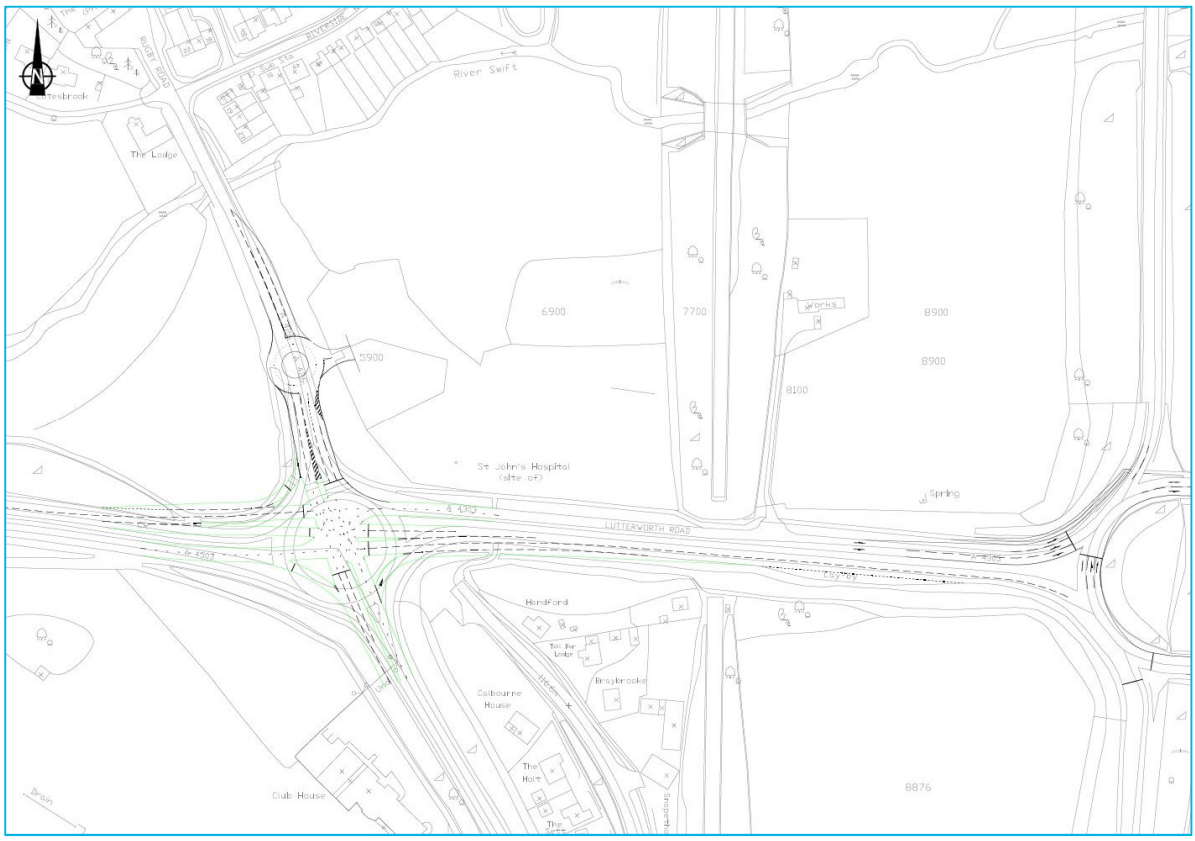


Figure 2.4 Bill Crane Way Junction Arrangement

2.3 Traffic Forecast

2.3.1 The 2031 Reference Case traffic forecasts are shown in **Figure 2.5**.

2.3.2 The 2031 'with development' forecasts are shown in **Figure 2.6**; the modelling included all the SDA development, the latest junction layouts and the closure of Gilmorton Road bridge.

2.3.3 **Figure 2.7** shows the traffic associated with the external development traffic and **Figure 2.8** shows the final traffic forecast.

2.3.4 To add the external development on top of the modelling outcomes, these additional commited developments were reported in July 2016. (*Transport Input to Harborough District Council Comments, July 2016)*

2.3.5 AECOM believes that adding the additional development on top of the model forecast and applying the mentioned land-use assumptions, would demonstrate 'resilience' in the highway proposals and off-site mitigation measures, especially since the master plan is still evolving.

Figure 2.5. 2031 Reference Case Traffic Forecast

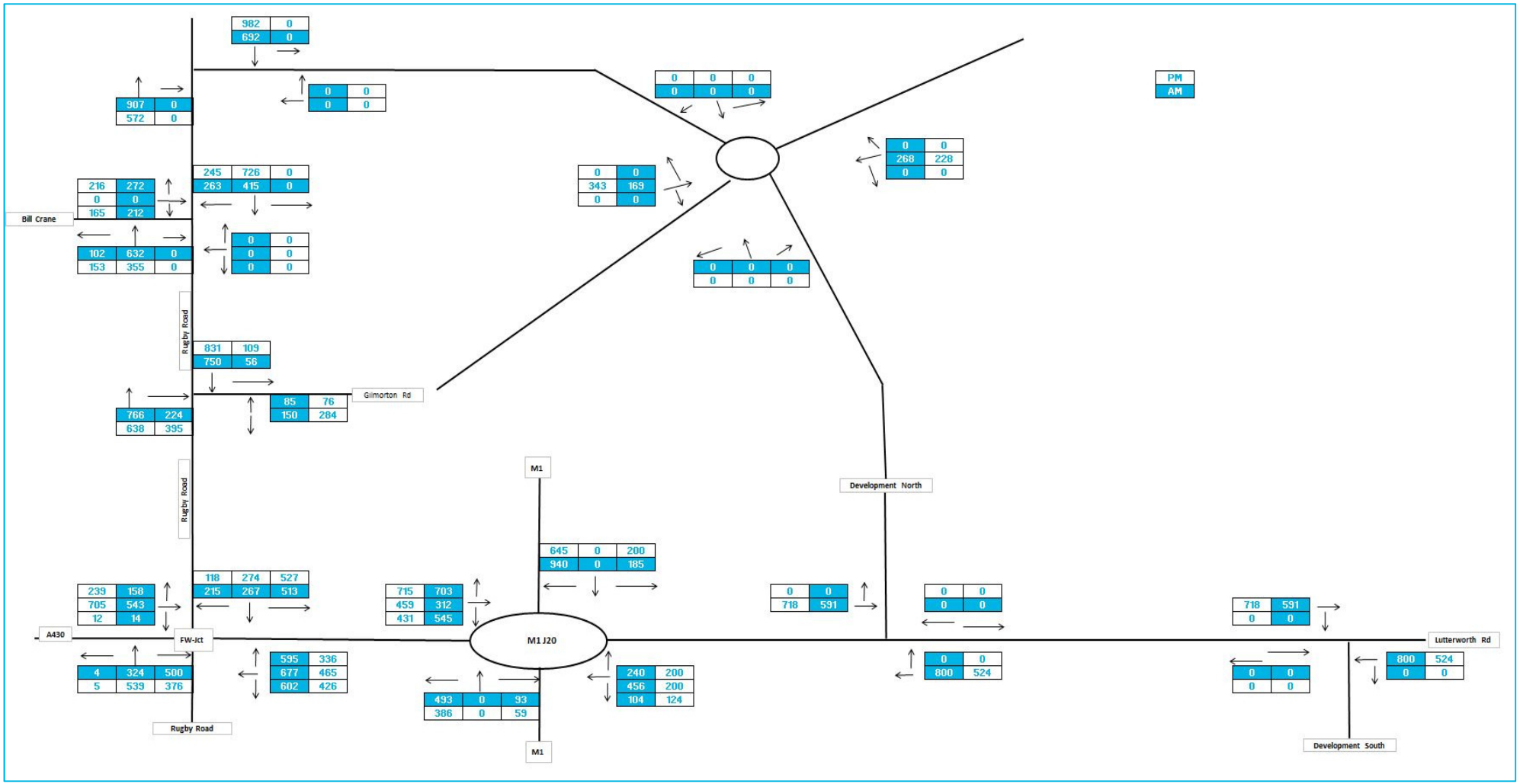


Figure 2.6 'with development' SATURN 2031 Traffic Forecast

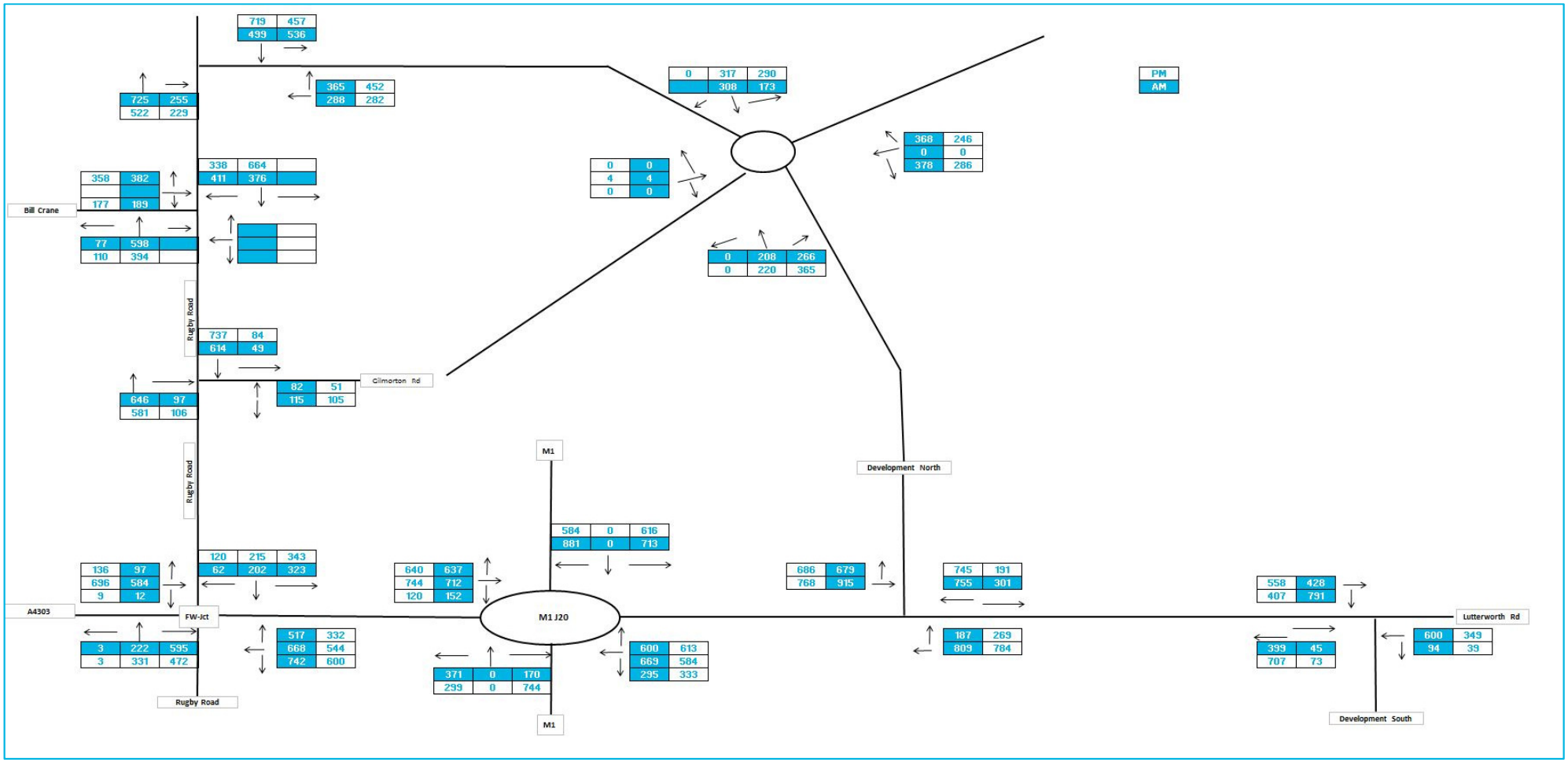


Figure 2.7 External Development Traffic

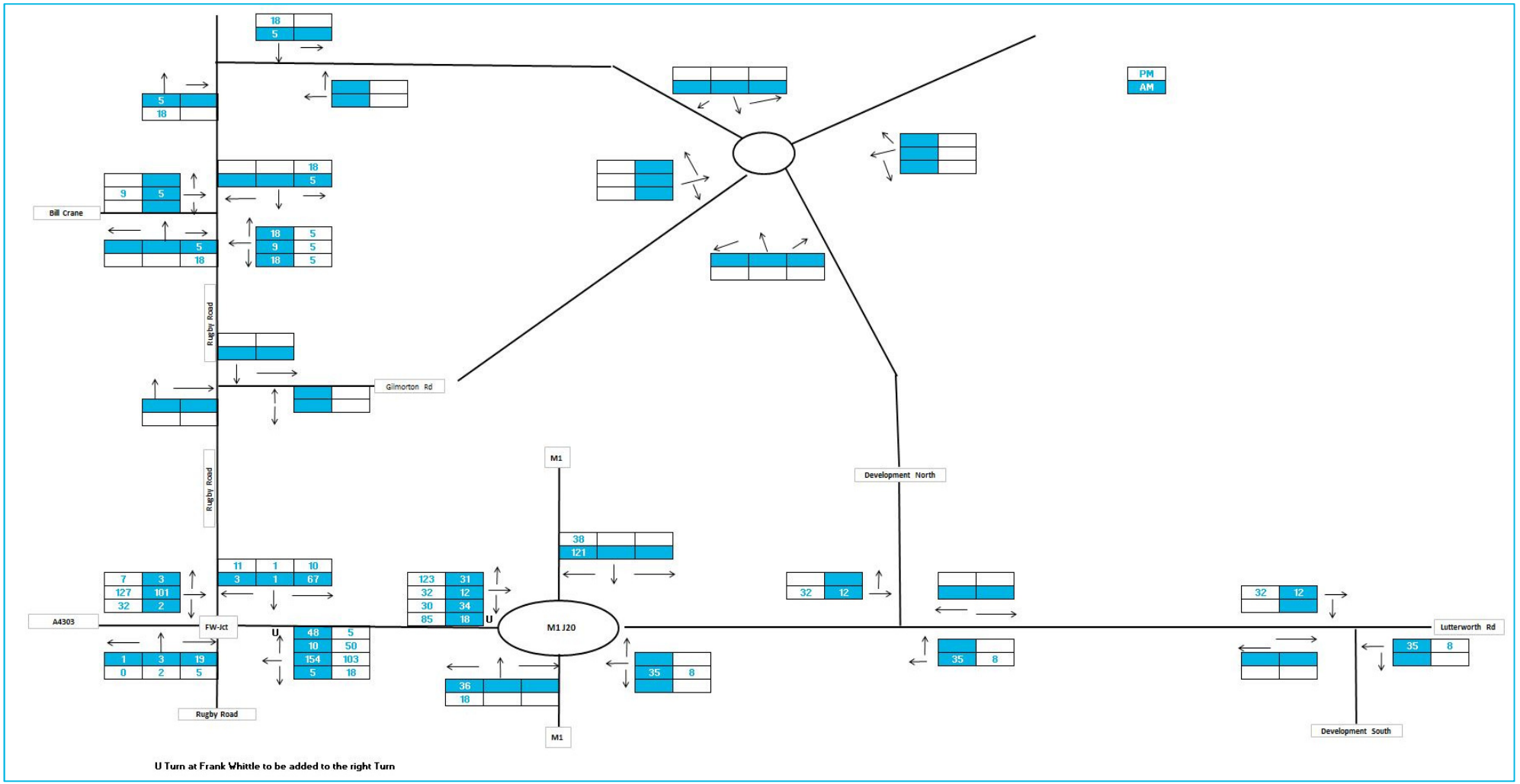
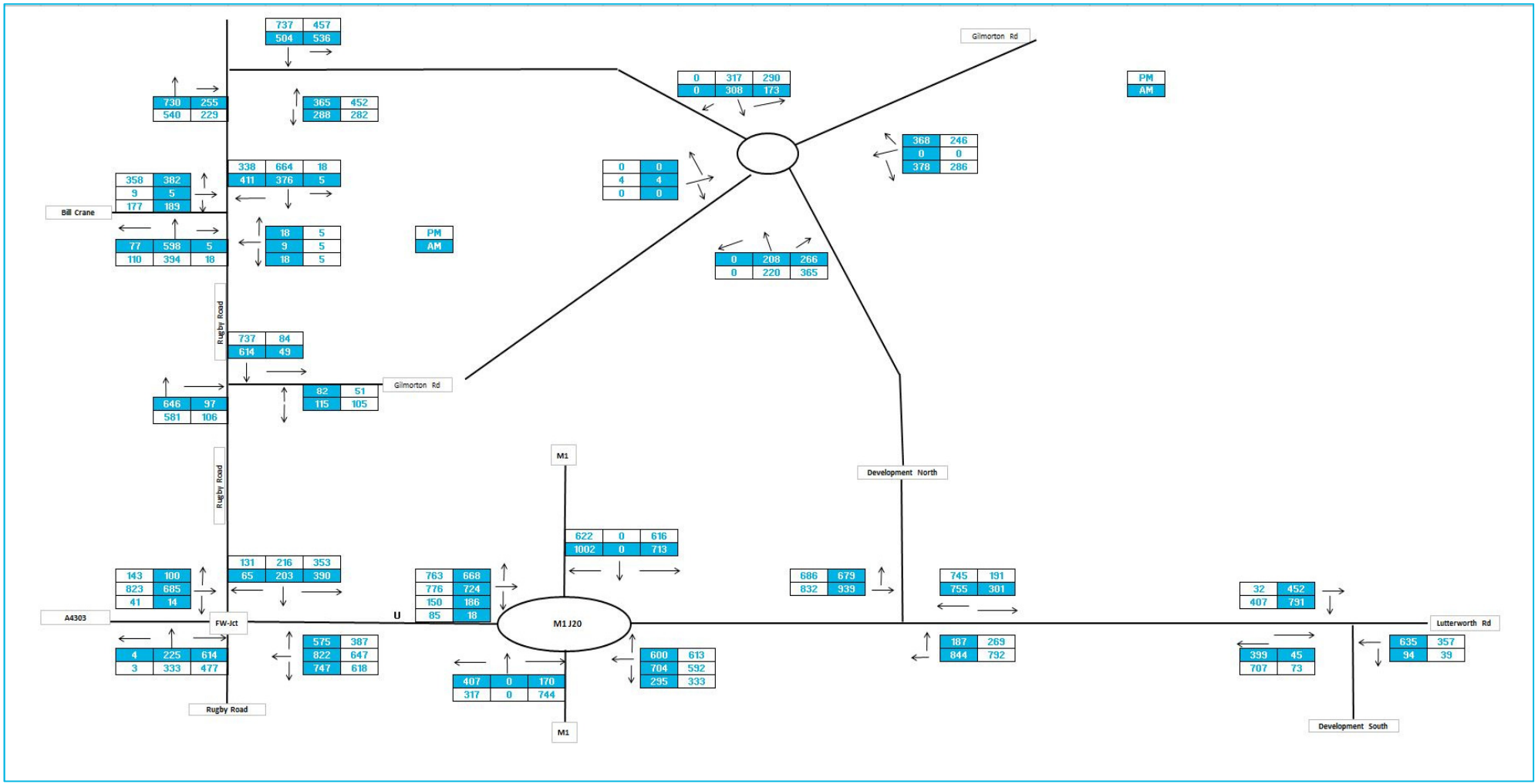


Figure 2.8 Final Traffic Forecast



3. Operational Junction assessment

3.1 Introduction

3.1.1 The aim of this section is to assess the impact of the development traffic and the impacts of Gilmorton Road bridge being closed for vehicular traffic apart from buses.

3.1.2 The operational capacity analysis was undertaken for each of the following junctions:

- The main development access junctions on the A4304 Lutterworth Road;
- M1 Junction 20;
- Frank Whittle Junction;
- Travelodge Roundabout;
- A426 Leicester Road /Gilmorton Road Junction;
- A426 Leicester Road / Bill Crane Way Junction; and
- A426 Leicester Road / Spine Road Junction.

3.1.3 Tests were undertaken using the software; ARCADY, PICADY, and LINSIG for roundabouts, priority junctions and signalised junctions respectively.

3.1.4 For both ARCADY and PICADY the operational capacity results are expressed by:

- **Ratio of Flow to Capacity (RFC)**: the optimum value is less than 0.85, and any value over 0.85 will lead to queuing; and
- **Queue:** is the number of queued vehicles.

3.1.5 For the LINSIG, factors which will be assessed are:

- **DoS (Degree Of saturation):** recommended value of DoS is less than 90%, where values above 90% can lead to queues and delays;
- **Mean Max Queue (MMQ):** is the number of queued vehicles; and
- **Practical Reserve Capacity (RFC):** positive values means a junction will have spare capacity, whereas negative values indicate queuing.

3.2 Main Access(s)

3.2.1 The assessment was undertaken for both parts of the staggered junction, the north development and south access junction, as shown in **Figure 2.1**.

3.2.2 The results are shown in **Table 3.1** for Development North Access junction, and **Table 3.2** for Development South Access Junction.

Table 3.1 North Development Access LINSIG Results

	AM		PM	
ARM	DOS %	MMQ	DOS %	MMQ
Development North	75	11	54	8
A4304 East	73	13	65	7
A4304 West	53	11	48	6
PRC % (Junction)	+21		+39	

Table 3.2 South Development Access LINSIG Results

	AM		PM	
ARM	DOS %	MMQ	DOS %	MMQ
Development South	36	5	56	8
A4304 East	66	10	50	5
A4304 West	66	7	32	4
PRC % (Junction)	+36		+61	

3.2.3 The results indicate that the junction(s) would operate within their capacity with a large practical reserve capacity in both morning and evening peak.

3.3 M1 Junction 20

3.3.1 This junction was tested for its final layout, as shown in Figure 2. The results are shown in **Table 3.3.**

Table 3.3 M1 Junction 20 LINSIG Results

	AM		PM	
ARM	DOS %	MMQ	DOS %	MMQ
A4304 Lutterworth Road – East	68	9	50	7
Opposing Gyratory	63	3	56	3
M1 NB Off-Slip	75	5	68	5
Opposing Gyratory	80	12	63	7
A4303 West	75	9	67	8
Opposing Gyratory	58	3	47	3
M1 SB Off-Slip	79	9	63	6
Opposing Gyratory	80	11	42	4
PRC % (Junction)	+12		+33	

3.3.2 The results indicate that the motorway junction would operate within its capacity.

3.4 Frank Whittle Junction

3.4.1 The junction was tested as a signalised junction. The results are shown in **Table 3.4**

Table 3.4 Frank Whittle LINSIG Results

	AM		PM	
ARM	DOS %	MMQ	DOS %	MMQ
A4303 West	56	10	70	10
Rugby Road North	78	9	73	9
A4303 East	78	15	71	10
Rugby Road South	76	11	69	8
PRC % (Junction)	+15		+22	

3.4.2 The results indicate that the junction would operate within its capacity.

3.5 A426 Leicester Road / Gilmorton Road Junction

3.5.1 This junction was tested with the existing priority T-junction layout. The results are shown in **Table 3.5.**

Table 3.5 A426 Leicester Road / Gilmorton Road PICADY Results

	AM		PM	
ARM	RFC	Queue	RFC	Queue
Gilmorton Rd – A426 North	0.21	0	0.289	0
Gilmorton Rd – A426 South	0.286	0	0.346	1
A426 South – Gilmorton Rd	0.181	0	0.289	0

3.5.2 However, the junction would operate within its capacity as a priority junction, same as its existing layout.

3.6 A426 Leicester Road / Bill Crane Way Junction

3.6.1 This junction was tested as a 4-arms staggered priority junction with the addition of the arm associated with new development (Royal Housing Lutterworth) to the east of the junction. The results are shown in **Table 3.6**.

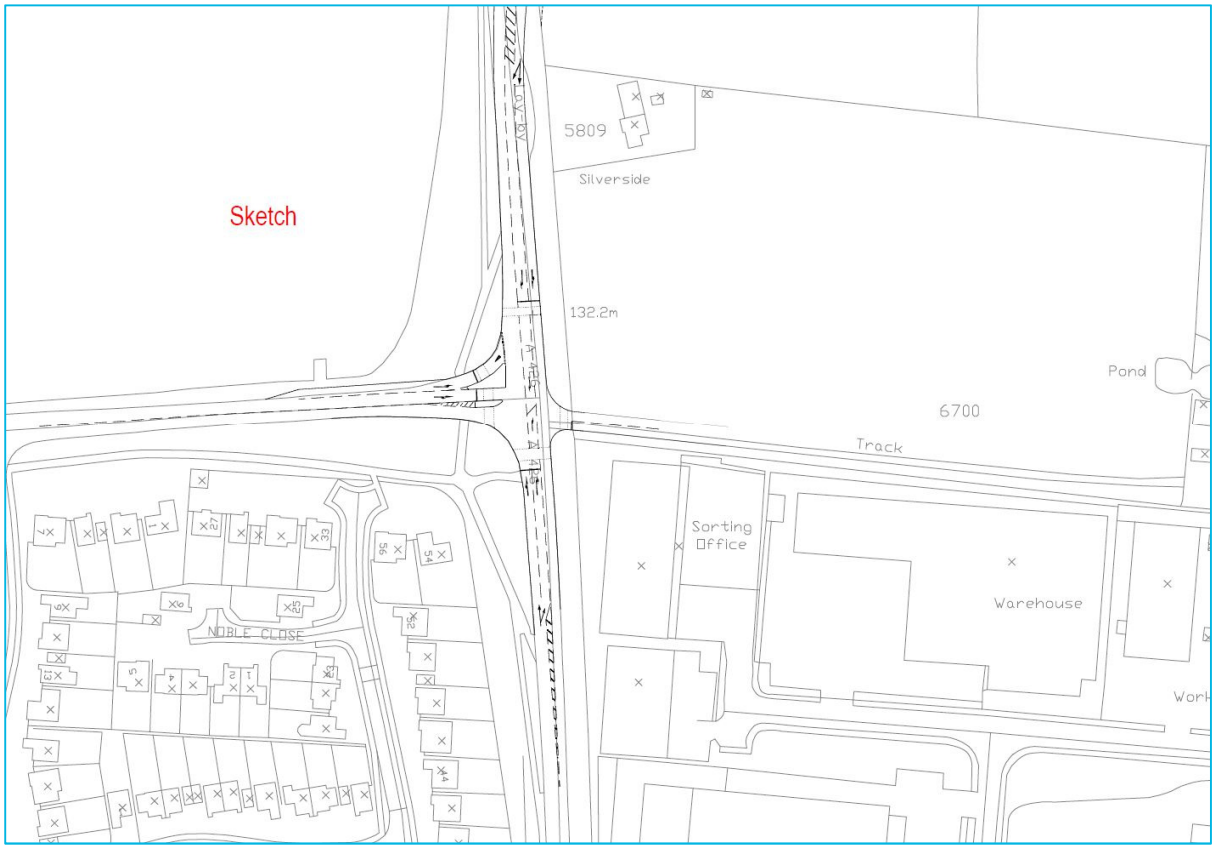
Table 3.6 A426 Leicester Road / Bill Crane Way Junction LINSIG Results

	AM		PM	
ARM	DOS %	MMQ	DOS %	MMQ
Leicester Rd South	92.6	21	75	13
Bill Crane	107	40	82	12
Leicester Rod North	104	35	82	15
Royal Housing	26.1	2	8.7	1
PRC % (Junction)	-20		+9.7	

3.6.2 The results indicate that the junction would operate over its capacity. Therefore, AECOM has carried out further analysis, and the analysis showed that in order for the junction to operate within its capacity, a slight modification of the junction layout is required.

3.6.3 **Figure 3.1** shows the new junction arrangement sketch which was assessed.

Figure 3.1 Bill Crane Way Junction New Arrangement



3.6.4 The changes included adding a splitter island on the approach from Bill Crane Way to separate the traffic which run on different stages and phases within the traffic signal arrangement.

3.6.5 **Table 3.7** shows the results for the LINSIG analysis.

Table 3.7 A426 Leicester Road / Bill Crane Way Junction LINSIG Results – Without Pedestrian Phase

	AM		PM	
ARM	**DOS %**	**MMQ**	**DOS %**	**MMQ**
Leicester Rd South	70	14	54	9
Bill Crane	82	7	66	5
Leicester Rod North	81	6	66	10
Royal Housing	26	2	9	0
PRC % (Junction)	+10		+35.6	

3.6.6 The results indicate that the junction would operate at its capacity when the pedestrian phase is running.

3.6.7 The modelled traffic signals arrangement which was adapted to this junctions, is to have an ‘’ all-red” pedestrian phase which would be on demand.

3.6.8 The analysis method to analysis this signal included undertaking the modelling for two scenarios; one without the pedestrian phase and one with it.

3.6.9 The operational capacity of the junction therefore would be between the two sets of results, since the pedestrian phase would be called in only on demand and would not be operating at each cycle.

3.6.10 **Table 3.9** shows the results for the Bill the junction LINSIG outcomes.

Table 3.8 A426 Leicester Road / Bill Crane Way Junction LINSIG Results – With Pedestrian Phase

	AM		PM	
ARM	DOS %	MMQ	DOS %	MMQ
Leicester Rd South	92	21	62	10
Bill Crane	100	17	78	6
Leicester Rod North	99	23	80	15
Royal Housing	26	2	9	0
PRC % (Junction)	-11		+12.7	

3.6.11 The results indicate that the junction would operate at its capacity when the pedestrian phase is running.

3.6.12 However, the two sets of results showed that the junction signals arrangement would operate within its capacity.

3.7 A426 Leicester Road / Spine Road

3.7.1 **Table 3.10** Shows the results of the junction ARCADY results.

Table 3.9 A426 Leicester Road / Spine Road ARCADY Results

	AM		PM	
ARM	RFC	Queue	RFC	Queue
Leicester Rd North	0.721	3	0.818	4
Spine Road	0.607	2	0.797	4
Leicester Rod South	0.888	7	0.728	3

3.7.2 The results indicate that the junction would operate within its capacity.

4. Relief to Lutterworth Town Centre

4.1.1 One of the key points is to investigate whether the completion of the Spine Road and converting the Gilmorton Road bridge to a sustainable transport corridor would provide relief to A426 Leicester Road within Lutterworth town centre.

4.1.2 Further analysis was undertaken to determine whether this would be case.

4.1.3 **Figure 4.1** shows a comparison between the Reference Case and final traffic forecasts, which include the latest junction layouts and the closure of Gilmorton road for vehicular traffic apart from buses.

4.1.4 The key finding of the comparison analysis are:

- A significant reduction of the traffic along A426 Rugby Road, between Frank Whittle junction and the junction of the A426 and with Gilmorton Road;
- Less traffic on A426 Leicester Road on the section between Gilmorton Road and Bill Crane Way;
- Less traffic southbound and northbound on the A426 Rugby Road north of Bill Crane Way junction; and
- More traffic on the Bill Crane Way turning left (north).

4.1.5 **Table 4.1** summarise the key figure of the relief on the Lutterworth town centre.

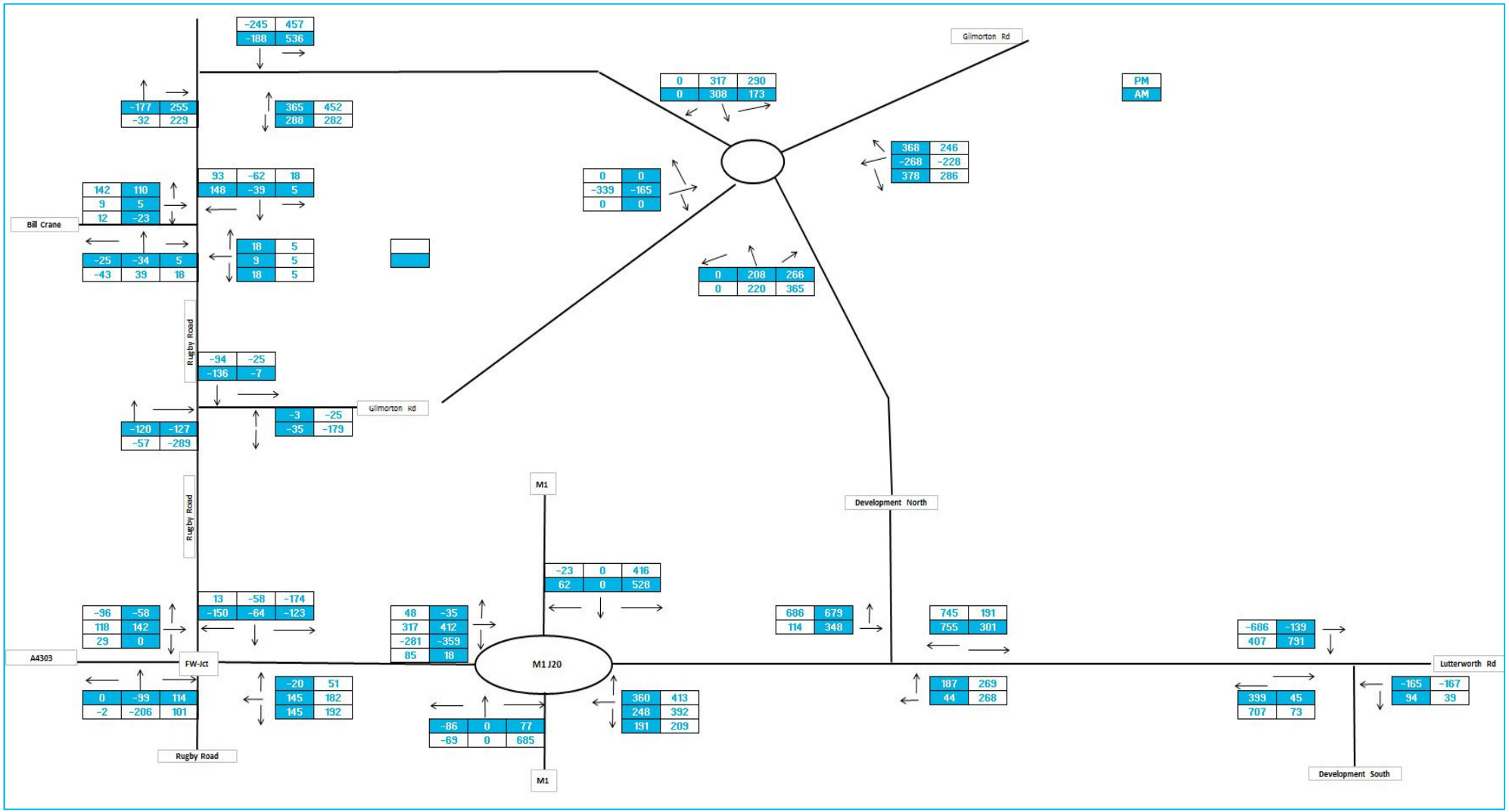
Table 4.1 AM- Relief to Lutterworth Town Centre Summary

Link	Direction	AM			
		Forecast		Difference	
		Ref	Final	Traffic	%
A426 Lutterworth Road – North of Gilmorton Road	NB	734	680	-54	-8%
	SB	806	663	-143	-18%
A426 Lutterworth Road – South of Gilmorton Road	NB	990	743	-247	-25%
	SB	995	658	-337	-34%

Table 4.2 PM- Relief to Lutterworth Town Centre Summary

Link	Direction	PM			
		Forecast		Difference	
		Ref	Final	Traffic	%
A426 Lutterworth Road – North of Gilmorton Road	NB	508	522	+14	+3%
	SB	940	821	-119	-13%
A426 Lutterworth Road – South of Gilmorton Road	NB	1,033	687	-346	-34%
	SB	919	700	-219	-24%

Figure 4.1 Reference Vs Final Traffic Forecast Comparison



5. Summary and Key Findings

5.1 Summary

5.1.1 As was advised by LCC in regards to the land-use assumptions for the full development was assumed to be at 2,950 dwellings and 23 hectares of employment in addition of the local centre the school, as was reported in (*Transport Input to Harborough District Council Comments, July 2016*)

5.1.2 The latest development main access(s) arrangement was coded within the SATURN LLITM model. In addition of all the off-site mitigation measures this included:

- M1 Junction 20;
- Fran Whittle Junction; and
- Bill Crane Way Junction.

5.1.3 The closure of Gilmorton Road bridge for vehicular traffic, apart from buses, was also coded.

5.1.4 All the other adjacent development traffic forecast, which was reported previously in *(Transport Input to Harborough District Council Comments, July 2016),* were added on top of the latest model runs forecast.

5.1.5 Full operational junction capacity assessments were carried out for the associated junctions with Lutterworth East development.

5.1.6 It was noted the closure of the Gilmorton Road bridge would shift traffic from Lutterworth town centre. Some of the traffic would re-distribute to use the Spine Road, and some others would re-distribute to use A5, Brookfield Way/Bitteswell Rd, which put more traffic on the Bill Crane Way junction.

5.2 Key Findings

5.2.1 The operational junction capacity assessment showed that all of the main development access(s), M1 Junction 20, Frank Whittle Junction, A426 / Spine Road Rd junction would operate within its capacity, and showed a good amount of spare capacity.

5.2.2 Bill Crane Way junction layout would need to be slightly modified, as mentioned before to add a split island on the Bill Crane Way arm, in order to segregate the traffic which would need to run on separate stages.

5.2.3 Based on the assumptions mentioned above, and the junction operational capacity assessment results, AECOM believes that this shows a strong ‘resilience’ in the highway proposals and off-site mitigation measures, especially since the master plan is still evolving, and more changes/modification may be introduced.

5.2.4 It was concluded the converting the Gilmorton Road bridge into sustainable transport corridor along with the completion of the spine road would introduce a significant relief on the Lutterworth town centre.

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APPENDIX G
Technical Note on Trigger Points for Off-Site Junction Improvements

Lutterworth East Development

Technical Note: Off-Site Mitigation Trigger Points

Leicestershire County Council

Project Number: 60472967

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Quality information

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1. Introduction

1.1 Scope

1.1.1 AECOM was asked by Leicestershire County Council (LCC) to assess the off-site measures trigger points for when the off-site junction improvements would be needed.

1.1.2 This technical note discusses the traffic forecasts which would trigger the need for the mitigation measures. The structure of this technical note is junctions based, with each junction assessed separately.

1.1.3 The junctions included in this assessment are:

- M1 Junction 20;
- Frank Whittle Junction; and
- Bill Crane Way / A426 Lutterworth road.

1.2 Assessment Assumptions

1.2.1 The assessment would starts from the 2031 traffic forecast:

- Reference Case;
- Reference Case + committed adjacent development which was reported in (*Transport Input to Harborough District Council Comments, July 2016); and*
- Lutterworth East Development traffic gradually loaded.

1.2.2 **Figure 1.1** shows the 2031 Reference Case Traffic forecast, and **Figure 1.2** shows the external additional development traffic forecast.

1.2.3 For both ARCADY and PICADY the operational capacity results are expressed by:

- **Ratio of Flow to Capacity (RFC)**: the optimum value is less than 0.85, and any value over 0.85 will lead to queuing.
- **Queue:** is the number of queued vehicles.

Figure 1.1 2031 Reference Case Traffic Forecast

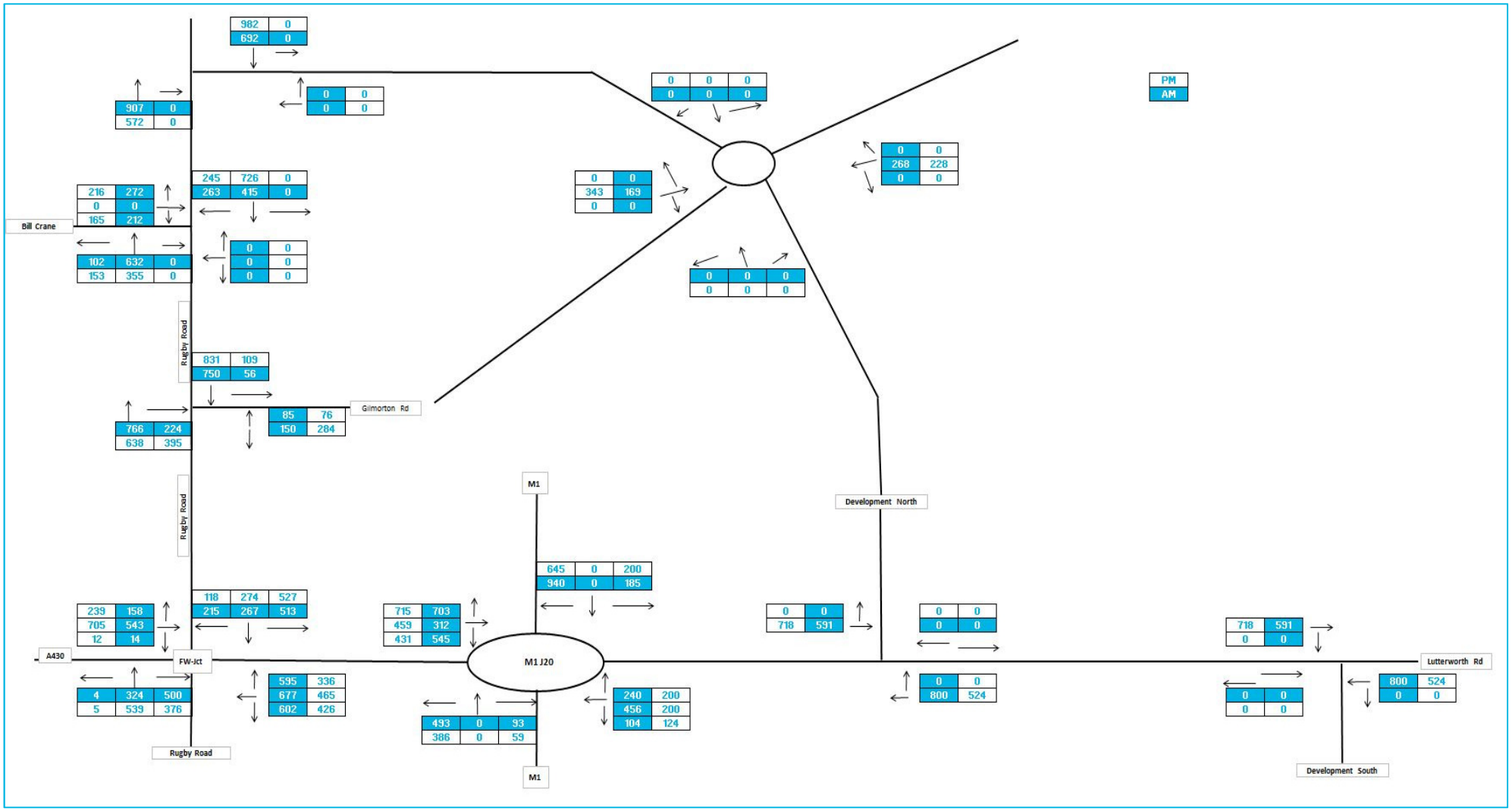
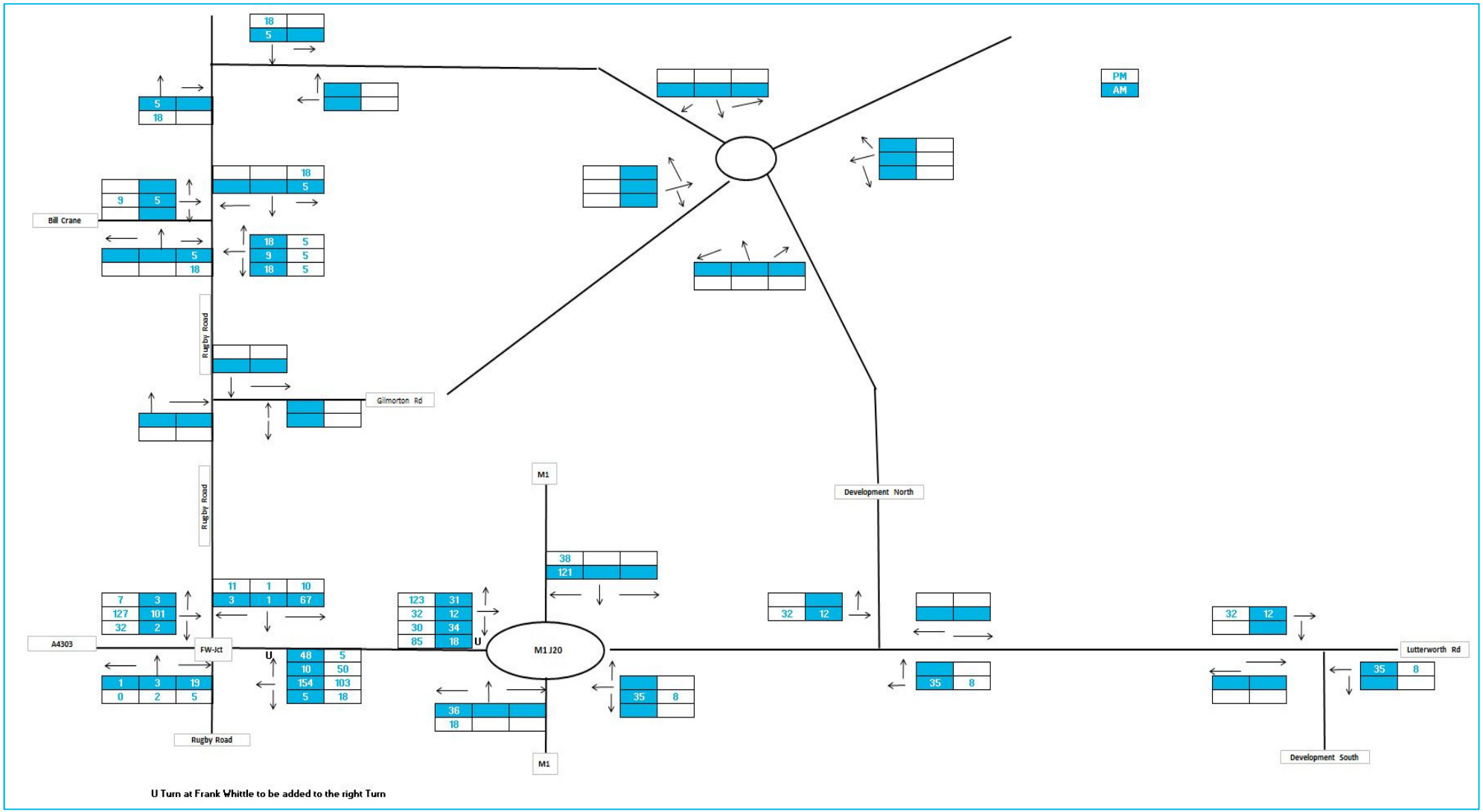


Figure 1.2 External Development Traffic



2. M1 Junction 20

2.1 Operational capacity Assessment

2.1.1 The assessment is for the existing junction layout, which is currently a priority roundabout. **Table 2.1** shows the Reference Case traffic applied to the existing junction layout.

Table 2.1 M1 Junction 20 ARCADY - Reference Case

	AM		PM	
ARM	RFC	Queue	RFC	Queue
M1 SB Off-Slip	0.685	2	0.458	1
A4304 Lutterworth Rd East	0.926	8	0.440	1
M1 NB Off-Slip	0.427	1	0.219	0
A4303 Lutterworth Rd West	0.877	6	0.842	5

2.1.2 The results show that the junction would operate close to its capacity in the AM morning peak hour.

2.1.3 **Table 2.2** shows the results of the ARCADY assessment for the Reference Case with adding the committed external development.

Table 2.2 M1 Junction 20 ARCADY - Reference + External Development

	AM		PM	
ARM	RFC	Queue	RFC	Queue
M1 SB Off-Slip	0.687	3	0.489	1
A4304 Lutterworth Rd East	0.930	10	0.460	1
M1 NB Off-Slip	0.430	1	0.242	1
A4303 Lutterworth Rd West	0.878	7	0.940	13

2.1.4 The results indicate that the junction would operate closer to its capacity, and any additional traffic would trigger the proposed improvements.

2.1.5 As a sensitivity test, AECOM has tested the junction with 10% of the traffic associated within the early phases of the SDA development. The early phases of the development was reported in, Technical Note: Early Phases Traffic Assessment, October 2016.

2.1.6 The rough estimate of the 10% of the early phases' traffic would consist of 125 dwellings and 1.4 hectares of employment land.

2.1.7 **Table 2.3** shows the results for the sensitivity test.

Table 2.3 M1 Junction 20 Sensitivity Test

	AM		PM	
ARM	RFC	Queue	RFC	Queue
M1 SB Off-Slip	0.725	3	0.515	2
A4304 Lutterworth Rd East	1.000	16	0.542	2
M1 NB Off-Slip	0.440	1	0.253	1
A4303 Lutterworth Rd West	0.913	9	0.975	17

2.1.8 The results indicate the junction would operate over its capacity for the approaches from A4304 and A4303.

2.1.9 It is however, important to note that the approaches from the M1 slip roads have ample spare capacity.

3. Frank Whittle Junction

3.1 Operational Capacity Assessment

3.1.1 The assessment is for the existing priority roundabout. **Table 3.1** shows the results for the capacity assessment for the Reference Case.

Table 3.1 Frank Whittle Junction ARCADY - Reference Case

	AM		PM	
ARM	RFC	Queue	RFC	Queue
A4303 West	0.552	2	0.729	3
Rugby Road North	1.071	48	1.065	25
A4303 East	0.933	12	0.592	2
Rugby Road South	1.284	105	0.983	14

3.1.2 The results indicate that the junction would operate over its capacity with the Reference Case of traffic flow. Therefore, any other additional traffic would trigger the proposed junction improvements.

4. Bill Crane Way Junction

4.1 4.1 Operational Capacity Assessment

4.1.1 The assessment is for the existing priority staggered junction. **Table 4.1** shows the results for the capacity assessment for the Reference Case.

Table 4.1 Bill Crane Way Junction PICADY – Reference Case

	AM		PM	
ARM	RFC	Queue	RFC	Queue
Leicester Rd South	0.013	0	0.040	0
Bill Crane	1.795	60	1.210	21
Leicester Rod North	0.650	2	0.401	1
Royal Housing	0.191	0	0.047	0

4.1.2 The results indicate that the junction would operate over its capacity with the Reference Case traffic forecast. Therefore, any other additional traffic would trigger the proposed junction improvements.

5. Further Analysis

5.1 Scope

5.1.1 The results of the junction operational assessment for the off-site junctions showed that the junctions need to be improved in advance of starting the Lutterworth East development.

5.1.2 Some junctions, such as Bill Crane Way and Frank Whittle junctions would operate over their capacity by applying the Reference Case 2031 traffic forecast. In other words, nothing related to Lutterworth East development.

5.1.3 M1 junction 20, would operate within its capacity at the Reference Case, however, when the external developments traffic have been added, the junction would operate at its maximum capacity, and any additional traffic would require junction improvement.

5.1.4 Therefore, AECOM has undertaken a further analysis in order to determine the Lutterworth East development traffic ‘’ share’’ on the road network.

5.2 Break down of Development Traffic

5.2.1 AECOM has carried out further analysis for both AM morning and PM evening peak hours for development traffic forecast to use:

- M1 Junction 20; and
- Frank Whittle Junction

5.2.2 The developments traffic breakdown of the M1 Junction 20 is summarised in **Table 5.1**, where it shows the percentage of the SDA development traffic against the other adjacent reported developments.

Table 5.1 M1 Junction 20 - Development Traffic Breakdown

	M1 – Junction 20		
Description	**AM**	**PM**	**AM + PM**
Lutterworth East 2-way Traffic	1,809	1,725	3,534
External developments 2-way traffic	312	446	758
Total Development Traffic	2,121	2,171	4,292
Lutterworth East % Traffic	85%	80%	82%
External Developments % Traffic	15%	20%	18%

5.2.3 **Table 5.2** shows the developments traffic breakdown for the Frank Whittle junction, where it shows the percentage of the SDA development traffic against the other adjacent reported developments.

Table 5.2 Frank Whittle Junction - Development Traffic Breakdown

	M1 – Junction 20		
Description	**AM**	**PM**	**AM + PM**
Lutterworth East 2-way Traffic	824	779	1,603
External developments 2-way traffic	312	446	758
Total Development Traffic	1,136	1,225	2,361
Lutterworth East % Traffic	72%	64%	68%
External Developments % Traffic	28%	36%	32%

5.2.4 **Table 5.1** and **Table 5.2** could provide a basis possible basis for determining finical contribution for the respective improvements.

6. Summary and Key Findings

6.1 Summary

6.1.1 Leicestershire County Council (LCC) has asked AECOM to investigate the trigger points for the off-junction improvements

6.1.2 AECOM has carried out junction operational capacity assessment for:

- M1 Junction 20;
- Frank Whittle Junction; and
- Bill Crane Way / A426 Lutterworth road.

6.1.3 The traffic forecast which was used is the 2031 Reference Case, and the additional development traffic to see whether the junctions would still have spare capacity before adding the Lutterworth East development traffic.

6.2 Key Findings

6.2.1 The analysis showed that both of Frank Whittle junction and Bill Crane Way junction would work over their capacity with the Reference Case traffic forecast. Therefore any additional traffic would trigger the proposed junctions improvements.

6.2.2 M1 Junction 20 results showed that the junction would operate close to its capacity with the Reference Case traffic forecast. However, when the external additional traffic added on top, the results showed that the junction would operate closer to its capacity, and any additional traffic therefore would trigger the junction improvements.

6.2.3 A sensitivity test were carried out for the M1 Junction 20, with some of the Lutterworth East development, and the results showed that the junction would operate over its capacity with 125 houses and 1.4 hectares of employment land.

6.2.4 As a conclusion, most of the off-site mitigation needs to be implemented in advance of Lutterworth East development starting to generate traffic. It may, however be possible to build some of the SDA development before requiring improvements to the M1 Junction 20.

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