M55 Junction 3 – Investigation of cross-boundary (Fylde / Wyre) Local Plan influences

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On behalf of Highways England, CH2M has undertaken operational analysis of M55 Junction 3 with a view to considering the operational performance of the junction with the Local Plan aspirations of both Fylde and Wyre in place. The analysis seeks to determine the impact at the junction arising from the Plan proposals and seeks to define the need for measures to support the Plans with regard these impacts.

This analysis follows the principles of assessment adopted in undertaking the A585(T) evidence base study in relation to the Wyre Local Plan.

Assessment context / approach

This analysis builds upon other streams of assessment undertaken on behalf of Highways England, namely:

- Fylde Local Plan to 2032 (Emerging) Highways England Assessment Report (September 2015) [hereon referred to as 'the Fylde study']; and
- Wyre Local Plan – A585(T) corridor evidence base (April 2016) [hereon referred to as 'the Wyre study'].

The detailed approach of the assessment can be found in those study reports, with the following providing an overview.

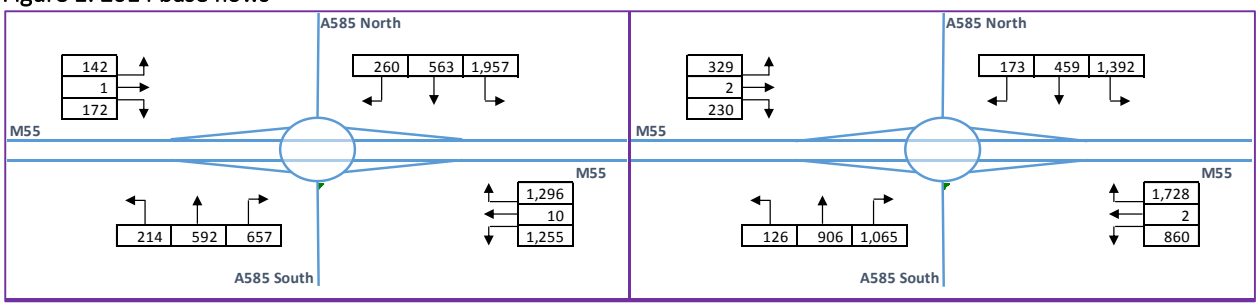
Model / base data

A Paramics model of the M55 junction 3 network was received from Mouchel which had been developed to test the reintroduction of traffic signals on the junction circulatory and relining and widening of links to provide a clear two-lane path from the M55 east to the A585(T) north.

Traffic counts for M55 junction 3 have been extracted from this model. This model's base year is 2014 and therefore the counts extracted are considered representative of traffic levels in 2014.

The 2014 base flows for M55 junction 3 are provided in Figure 1.

Figure 1: 2014 base flows



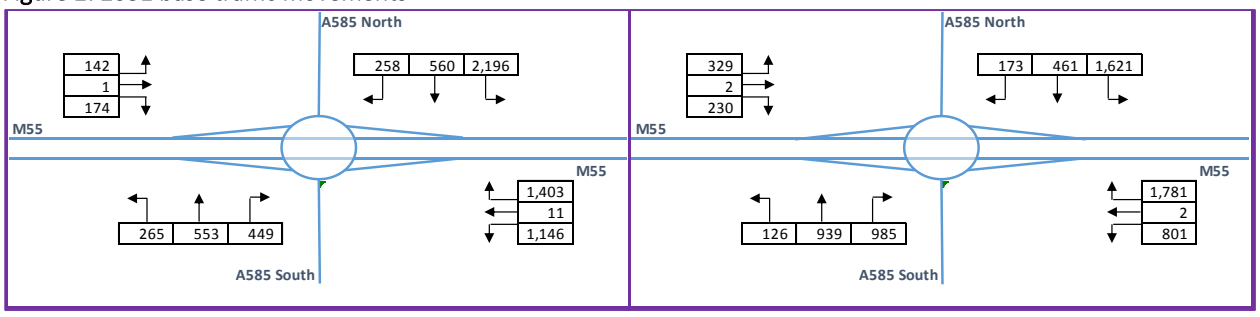
Influence on future year flows

There are two specific schemes that have required consideration in terms of their potential influence on the operation of the network:

- The influence of the *Preston Western Distributor / M55 junction 2 scheme* on traffic flows are accounted for. The rationale behind this is explained within the Wyre study report.
- The influences of the *A585(T) Windy Harbour to Skippool major improvement scheme* were considered to be marginal and therefore no specific adjustments were made. Again the rationale is explained within the Wyre study report

The effect of the above two schemes is forecast to result in a slight change in base traffic flows. The revised base traffic flows at M55 J3 are presented within Figure 2.

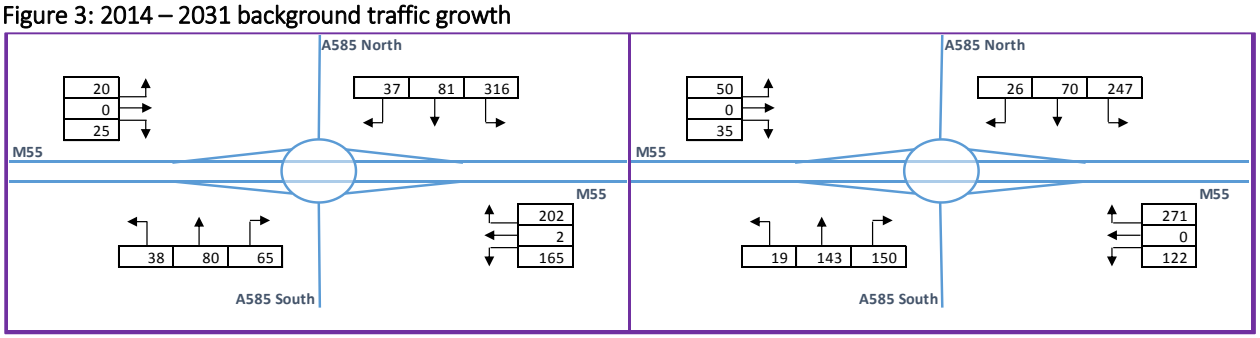
Figure 2: 2031 base traffic movements



Background traffic growth

Background traffic growth factors have been extracted from the DfT's TEMPro dataset using the 'alternative planning' assumption facility within TEMPro, whereby the Wyre and Fylde development aspirations contained within TEMPro have been removed from the TEMPro growth factor calculation. The product of the background traffic growth factors being applied to the 2014 base flows provides the absolute growth in traffic volumes between 2014 and 2031, assuming no development within Wyre and Fylde (but the M55 junction 2 and the Preston Western Bypass is constructed). This background traffic growth is presented diagrammatically within Figure 3.

Figure 3: 2014 – 2031 background traffic growth



Development trips

The traffic forecasts are based on those contained within the above named studies. Given the Fylde assessment was undertaken in September 2015, the development patterns were slightly adjusted based on revised information received from the Council.

The trips that have been forecast to be directly associated with the Plan development aspirations have been derived through use of the Highways England GraHAm tool. It is this same tool that has formed the starting point for the other evidence base workstreams that are being undertaken in relation to the Plan.

The outcomes of this process in relation to the trips that can be attributed to the Wyre and Fylde Plan developments are presented within Figure 4 and Figure 6. In addition, trip relating only to committed developments within the Fylde Plan are presented in Figure 5.

Figure 4: Full Wyre Plan development trips

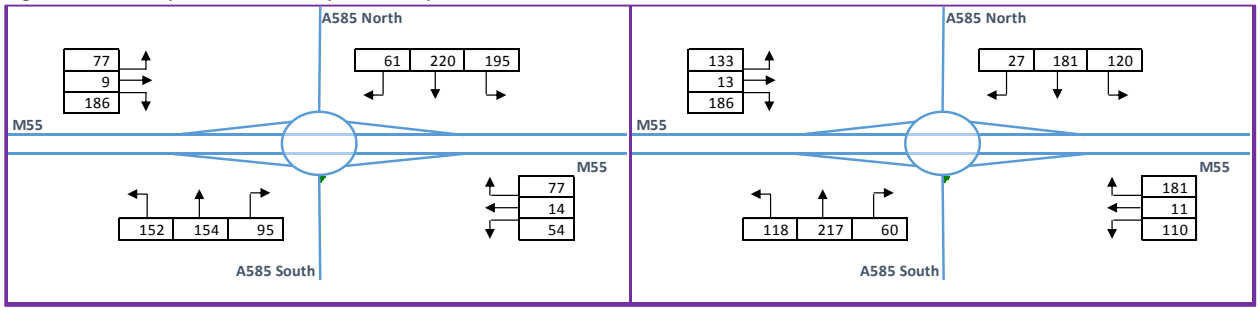


Figure 5: Committed Fylde Plan development trips

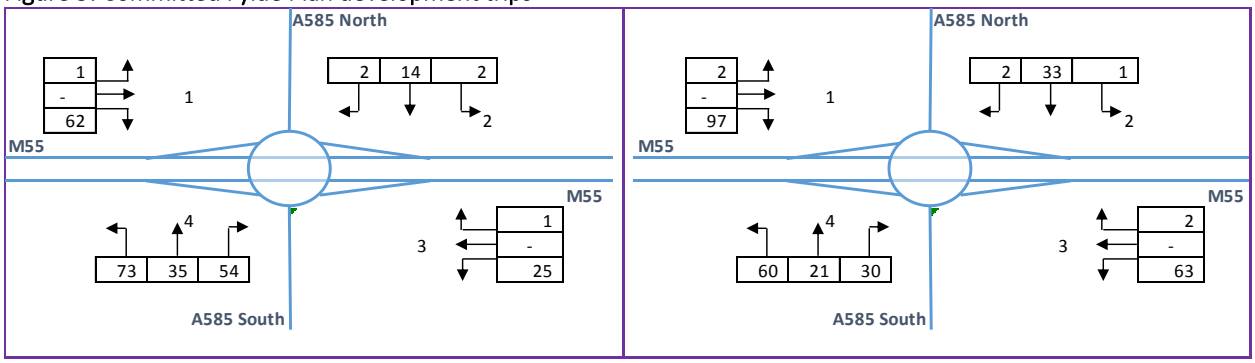
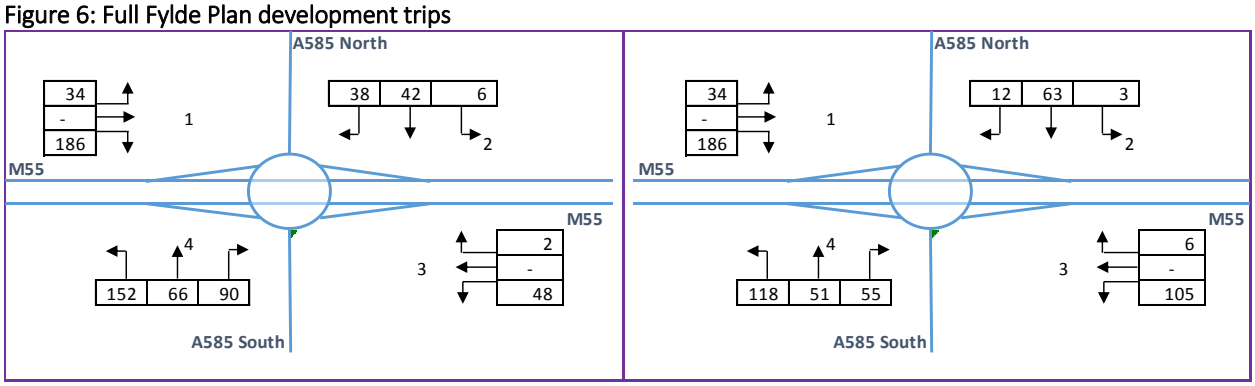


Figure 6: Full Fylde Plan development trips



2031 total trips

The combination of the Wyre and Fylde Plan trips, the Tempro background traffic and 2014 base flows provides a representation of forecast traffic levels and traffic movements within the 2031 assessment year if all the Wyre and Fylde Plan developments were to be completed. The 2031 assessment year flows containing the full Wyre and committed Fylde Plan trips are presented within Figure 7 with the full Wyre and Fylde Plan trips presented within Figure 8.

Figure 7: 2031 future assessment year trips (Full Wyre and committed Fylde Plans)

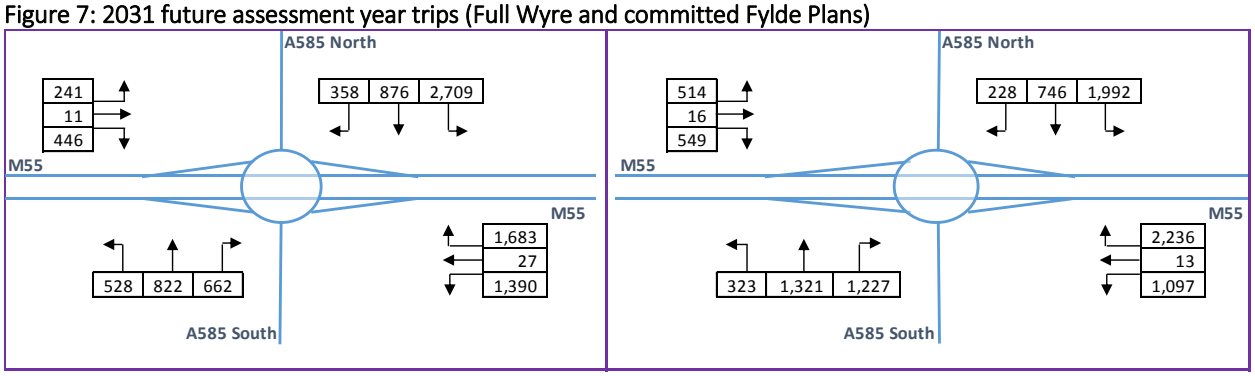
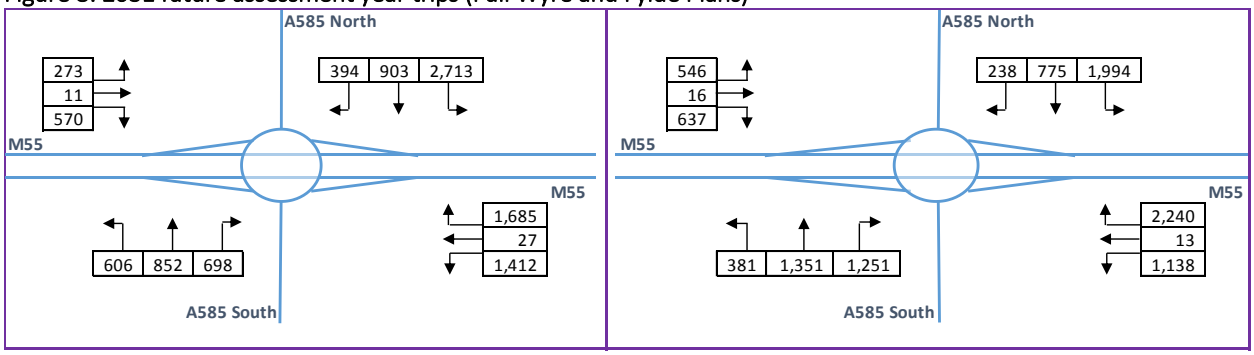


Figure 8: 2031 future assessment year trips (Full Wyre and Fylde Plans)



Assessment Outcomes

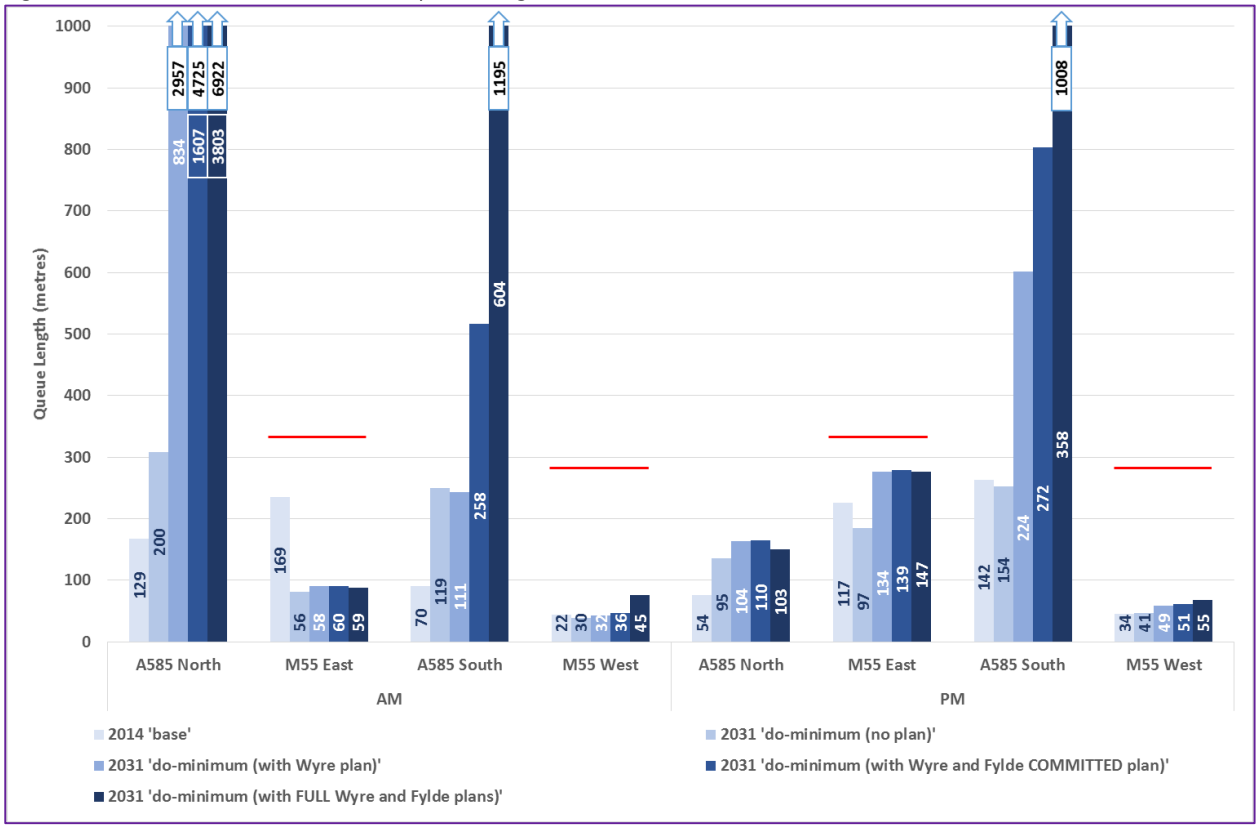
The assessment of M55 junction 3 has been completed in Paramics for both the morning and evening peaks within the 2014 'base' and 2031 'do-minimum' scenarios. Given the basis of the assessment is founded on the analysis undertaken as part of the Wyre study, the 'with Plan' outcomes are presented below for both:

- the Wyre Plan alone;
- The full Wyre and committed Fylde Plans; and,
- the combined impacts of the Full Wyre and Fylde plans.

At this location, the 2014 'base' network contains an unsignalled junction, with only a single lane on the circulatory arc between the westbound off-slip and westbound on-slip. The 2031 assessment year network contains a 'most likely' highway scheme which will see the introduction of traffic signals on the junction circulatory and relining and widening of links to provide a two-lane path from the M55 westbound off-slip to the A585(T) north.

The outputs of the Paramics modelling in terms of maximum and average queue lengths are presented in Figure 9. Note that the bar reflects the maximum length of the queue on that arm, while the numeric values shown present the average queue length for that time period. The red line shows the length of the M55 exit slip roads at junction 3. Appendix A contains queue length by each 5 minute interval modelled for the M55 East and West off-slips.

Figure 9: M55 J3 Paramics assessment queue lengths



Compared to the 2014 'base', within the 2031 'do-minimum (no Plan)' scenario, lower queues are modelled on the M55 slip road in both the morning and evening peaks and the queues remain within the length of the slip roads (as indicated by the red horizontal lines). This reflects the operational benefits to the SRN provided by the 'most likely' highway scheme highlighted above, but also indicates the operational disbenefit to the A585 North and South arms.

With the addition of Plan development trips, queue lengths increase substantially on the A585 North arm in the AM peak and A585 South arm in the evening peak from the 'no plan' to 'with Wyre Plan' scenarios. An acceptable level of congestion is however maintained on the M55 slip roads in both peak hours. It is important to acknowledge that signal timing adjustments between the 'without' and 'with' Plan scenarios designed to optimise the performance of the junction will be influencing the differences in queue lengths modelled.

With the further addition of the committed Fylde and full Fylde Plan trips within the 2031 'do-minimum scenarios, congestion increases exponentially on those arms where congestion was already noted within the 'with Wyre Plan' scenarios. Excessive congestion is now modelled on the A585 North arm within the morning peak and A585 South arm within both peak hours. In terms of the M55 exit slip roads however, congestion remains within the capacity of the slip road in both peak hours.

Although the congestion modelled above is maintained within the capacity of the M55 slip roads, this output is influenced through the adjustment of signal timings at the junction circulatory (which is a reflection of the signal adjustments which will be required in the future in order to manage changing traffic flows). Whilst these traffic signals are optimised for the benefit of the circulatory primarily and of the M55 exit slips, this is at the expense of the A585 arms, particularly the northern arm in the morning peak due to the substantial level of traffic demand during this time period.

As discussed within the Wyre study report, there are a number of influences which need to be considered when interpreting the junction assessments at M55 J3 including fixed signal timings, the potential for peak spreading and alternative routes being used which may result in the level of traffic demand and congestion to be less than what has been modelled.

As also detailed within the Wyre study report, there are a number of potential mitigation measures which could be implemented at M55 junction 3 with reference to the forecast traffic demand at the junction:

- The variability in queue length (and demand) indicates that benefit could be achieved by ensuring that the junction operates optimally with MOVA in place. This would enable increased priority to be given to the A585 arms when demand at the M55 arms is lower.
- The implementation of a segregated left turn lane between the A585 North arm and the M55 eastbound on-slip (M55 East).
- The implementation of a segregated left turn lane between the M55 East (westbound off-slip) and the A585 South.

At this time these potential mitigation measures have not been assessed in detail, but are worthy of further discussion and assessment with Highways England with a view of detailed assessments being undertaken in the future. It is assumed at this stage that the above would facilitate the support of the Plan trips in their entirety.

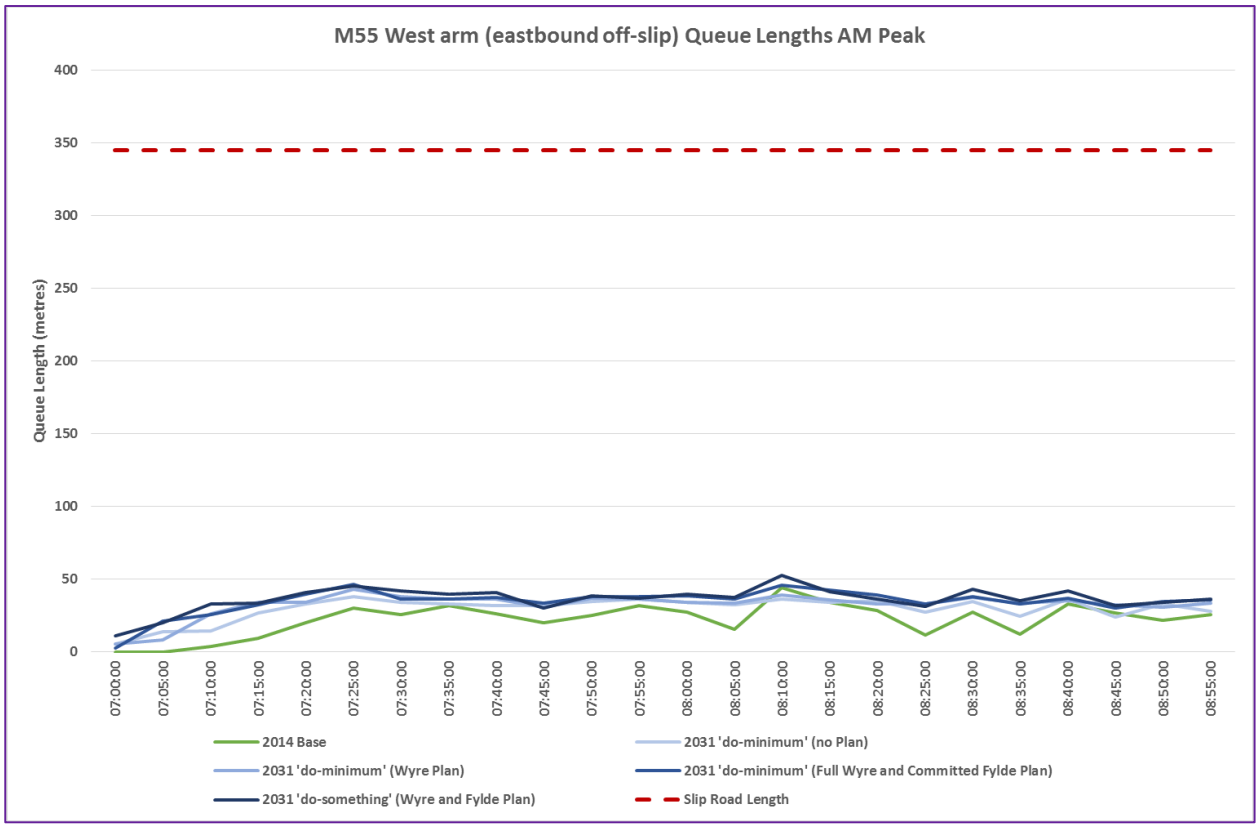
Conclusions

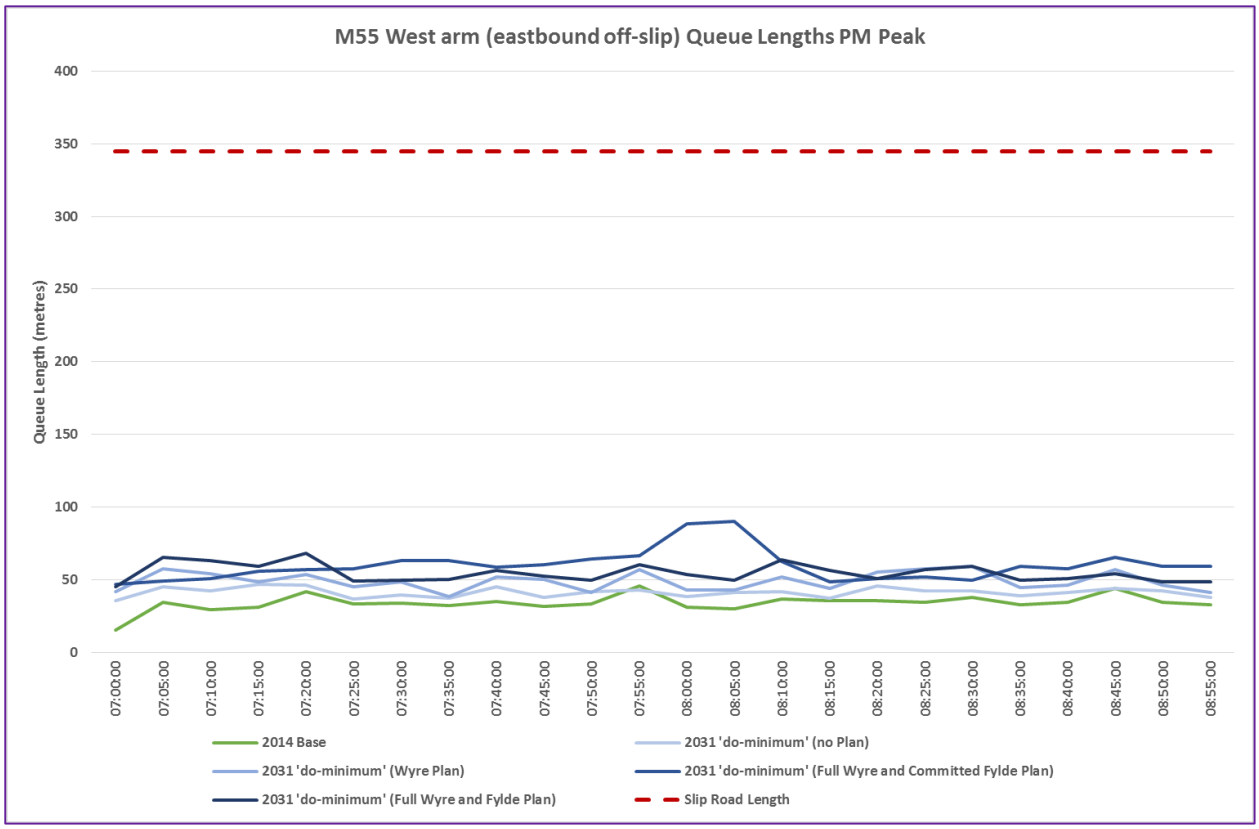
This technical note has detailed the assessment of the performance and operation of M55 junction 3 within a number of scenarios containing the Wyre and Fylde Plan aspirations and their associated traffic impact.

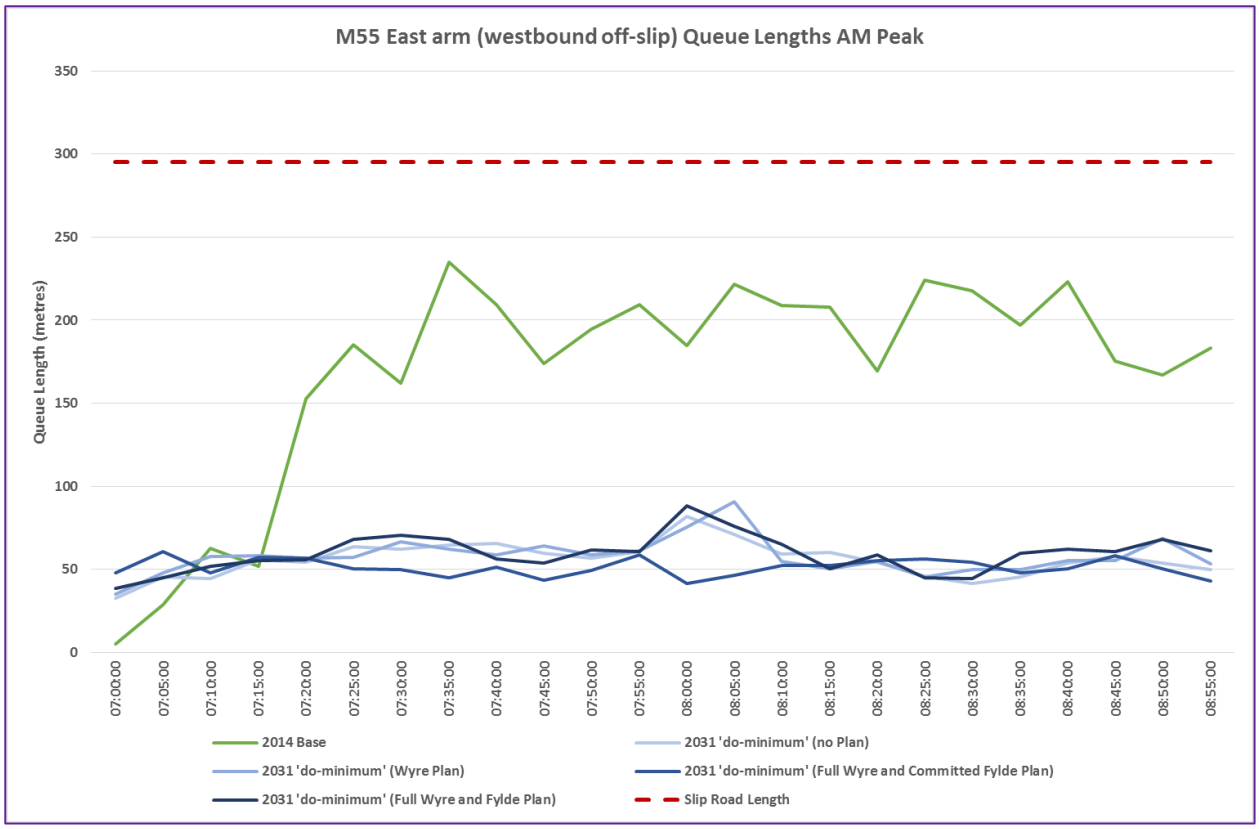
The assessments establish that without mitigation, the impact of Wyre and Fylde Plan trips would result in an unacceptable level of congestion, particularly on the A585(T) North and A585 South arms.

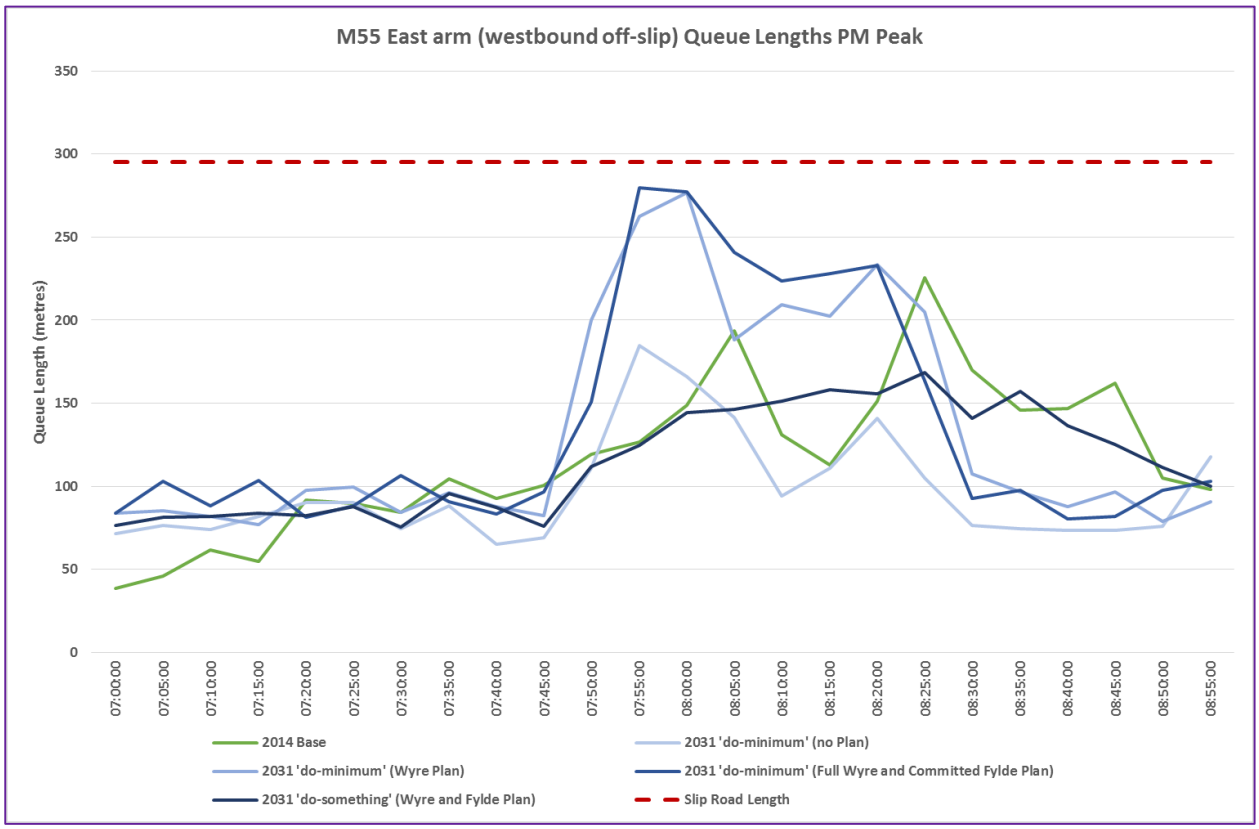
Although the signals can be adjusted to maintain the level of congestion to be within the capacity of the M55 slip roads, this is at the expense of congestion on the A585(T) North and A585 South arms. The level of congestion modelled would pose both an operational and (potential) safety risk for road users.

Appendix A


M55 West arm (eastbound off-slip) Queue Lengths AM Peak
Queue Length (metres)
400
350
300
250
200
150
100
50
0
07:00:00
07:05:00
07:10:00
07:15:00
07:20:00
07:25:00
07:30:00
07:35:00
07:40:00
07:45:00
07:50:00
07:55:00
08:00:00
08:05:00
08:10:00
08:15:00
08:20:00
08:25:00
08:30:00
08:35:00
08:40:00
08:45:00
08:50:00
08:55:00
2014 Base
2031 'do-minimum' (no Plan)
2031 'do-minimum' (Wyre Plan)
2031 'do-minimum' (Full Wyre and Committed Fylde Plan)
2031 'do-something' (Wyre and Fylde Plan)
Slip Road Length


M55 West arm (eastbound off-slip) Queue Lengths PM Peak
Queue Length (metres)
400
350
300
250
200
150
100
50
0
07:00:00
07:05:00
07:10:00
07:15:00
07:20:00
07:25:00
07:30:00
07:35:00
07:40:00
07:45:00
07:50:00
07:55:00
08:00:00
08:05:00
08:10:00
08:15:00
08:20:00
08:25:00
08:30:00
08:35:00
08:40:00
08:45:00
08:50:00
08:55:00
2014 Base
2031 'do-minimum' (no Plan)
2031 'do-minimum' (Wyre Plan)
2031 'do-minimum' (Full Wyre and Committed Fylde Plan)
2031 'do-minimum' (Full Wyre and Fylde Plan)
Slip Road Length


M55 East arm (westbound off-slip) Queue Lengths AM Peak
Queue Length (metres)
0
50
100
150
200
250
300
350
07:00:00
07:05:00
07:10:00
07:15:00
07:20:00
07:25:00
07:30:00
07:35:00
07:40:00
07:45:00
07:50:00
07:55:00
08:00:00
08:05:00
08:10:00
08:15:00
08:20:00
08:25:00
08:30:00
08:35:00
08:40:00
08:45:00
08:50:00
08:55:00
2014 Base
2031 'do-minimum' (no Plan)
2031 'do-minimum' (Wyre Plan)
2031 'do-minimum' (Full Wyre and Committed Fylde Plan)
2031 'do-minimum' (Full Wyre and Fylde Plan)
Slip Road Length


M55 East arm (westbound off-slip) Queue Lengths PM Peak
Queue Length (metres)
0
50
100
150
200
250
300
350
07:00:00
07:05:00
07:10:00
07:15:00
07:20:00
07:25:00
07:30:00
07:35:00
07:40:00
07:45:00
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08:50:00
08:55:00
2014 Base
2031 'do-minimum' (no Plan)
2031 'do-minimum' (Wyre Plan)
2031 'do-minimum' (Full Wyre and Committed Fylde Plan)
2031 'do-something' (Wyre and Fylde Plan)
Slip Road Length