York Central Partnership

York Central

Access Options Study

Appendix B Transport Appendices

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B1 Transport Modelling Note

B1.1 Introduction

B1.1.1 Project Background

Ove Arup and Partners has been commissioned by York Central Partnership to undertake a York Central Access Options Study. This modelling note provides further detail regarding the approach undertake to assessing shortlisted Option A (Water End to York Central) and Option E (Popplegate Road East to York Central).

In terms of the transport assessment of options, modelling of the scheme within the CYC Strategic traffic model has been undertaken. The results of the assessment are provided within the main Access Options Study. This Appendix provides further technical detail in relation to the modelling. This Appendix details the model updates undertaken and impacts associated with the shortlisted access options.

B1.2 Modelling Methodology

B1.2.1 Overview

This section details the approach and assumptions adopted for updating the York Central model to assess the impacts of the shortlisted access options.

The York Central SATURN model provided by City of York Council (CYC) forms the basis for the access options appraisal. The model was developed for a base year of 2015 and represents an average weekday. The modelled time periods are the AM peak hour (08:00-09:00hrs) and the PM Peak hour (17:00-18:00hrs).

The model includes the following five vehicle type and trip purposes:

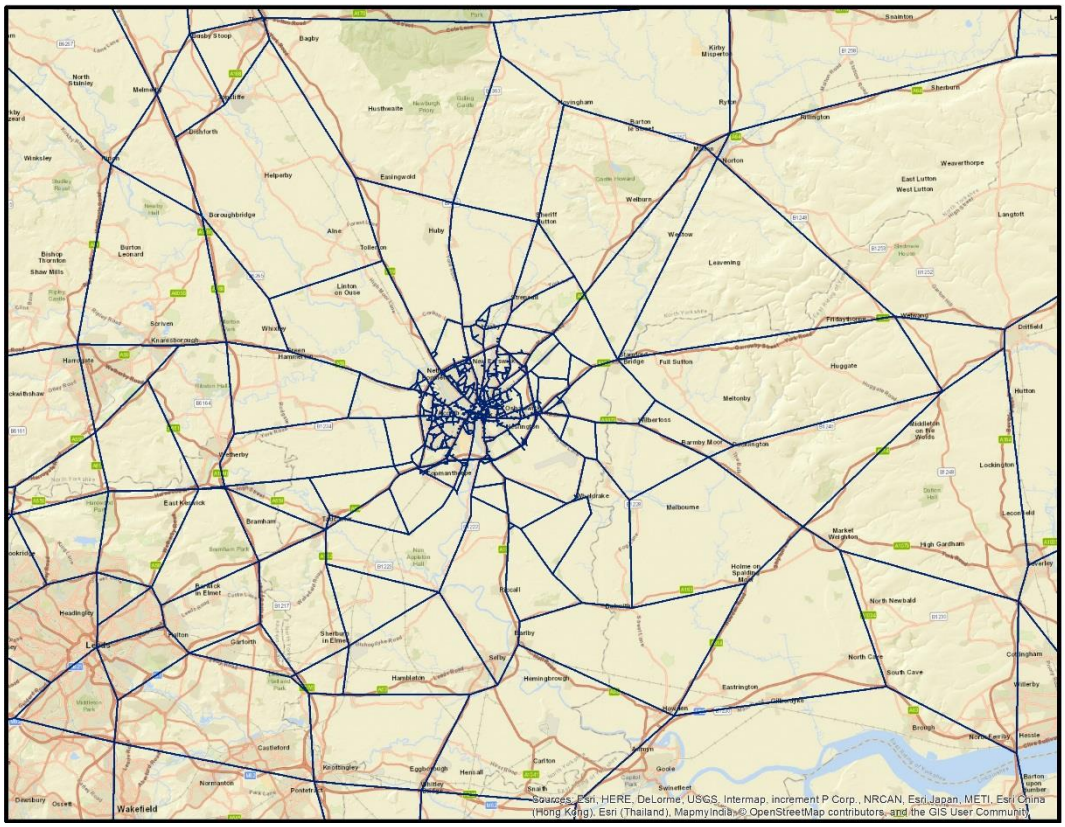
- Car – Commuting.
- Car- Employer's Business.
- Car-Other trips.
- Light Goods Vehicles (LGV).
- Heavy Goods Vehicles (HGV).

The forecast models are developed for 2021 and 2031 both with and without the York Central development scenario. The Do- Minimum models incorporate background traffic growth and committed developments and the Do-Something models include background traffic growth and the proposed York Central development traffic and highway access options for the two shortlisted access options (Option A: Water End to York Central and Option E: Poppleton Road (East) to York Central).

B1.2.2 Model Extent

To inform the appraisal the York Central SATURN model (provided by CYC) has been utilised. The extent of the York Central model covers the city of York in the Fully Modelled Area and areas further afield in the buffer network. Figure D1 shows the extent of the York Central model.

Figure D1: Location Plan



B1.2.3 Modelling Methodology

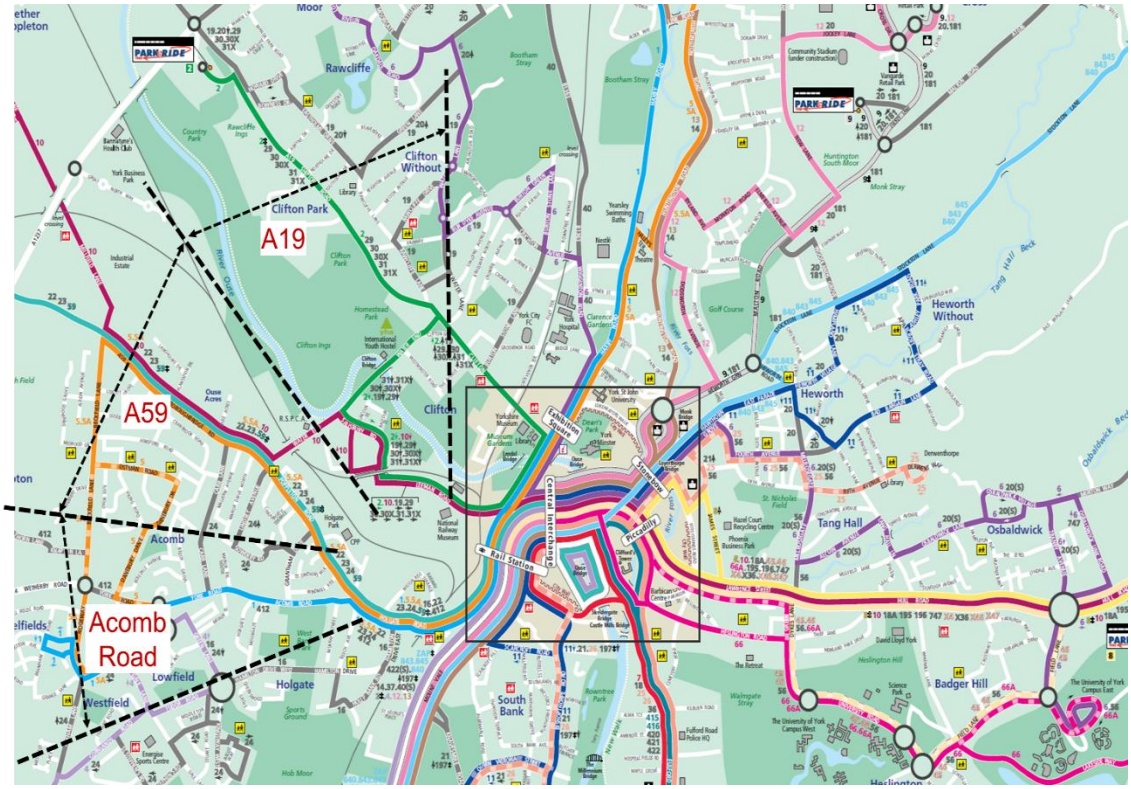
This section provides the methodology adopted to update the York Central model to test the impacts of the proposed development quantum, closure of Leeman Road and the access road options. In addition, the model is also updated to reflect assumptions relating to the rationalisation of car park and the rerouting of bus services to improve public transport connectivity, for the purposes of this assessment only. No firm decisions have been made regarding car parking rationalisation and re-routing by YCP. This will be appropriately considered as part of a future planning application.

B1.2.3.1 Public Transport (Bus) Routing

With the closure of Leeman Road and the prospective change of land use and traffic levels in the area, it is essential to review and enhance the public transport connectivity to ensure ease of connectivity with the surrounding area.

A bus map of York is available at the York itravel website (https://www.itravelyork.info/uploads/York_Bus_Route_Map.pdf). It should be noted that the routes are identified based on an initial high level assessment of suitability for re-routing and further work will be required to assess the wider impacts of the routing and transport network.

Figure D2: Extract from York Bus Map showing segments of city under consideration



Re-routing of Buses

The potential public transport re-routing assessed is shown in Figure D2. Public transport routing has been assumed to be same for Do-Minimum and Do-Something scenarios except for the routes identified in table D1. The bus services re-routed as part of this study is summarised in Table D1.

Table D1: Re-routing of bus services

Segment	Bus Route	Service Frequency (per hour, peak)	Option	
			A	E
Acomb Road Segment	1	6	No Change	New Road
	412	1	No Change	
A59 Segment	5	2	No Change	New Road
	5A	1	No Change	New Road
	22	1	No Change	
	24	1	No Change	
	59 P&R	6	New Road	New Road
A19 Segment	2	6	New Road	Salisbury Rd – Leeman Rd – York Central – Leeman Rd
	10	2	New Road	Salisbury Rd – Leeman Rd – York Central – Leeman Rd
	19	1	New Road	Salisbury Rd – Leeman Rd – York Central – Leeman Rd
	30	1	Salisbury Rd – Leeman Rd – York Central – Leeman Rd	
	30X	1	Salisbury Rd – Leeman Rd – York Central – Leeman Rd	
	31	1	Salisbury Rd – Leeman Rd – York Central – Leeman Rd	
	31X	1	Salisbury Rd – Leeman Rd – York Central – Leeman Rd	

In order to assess the impact on bus journey times in the immediate vicinity of the scheme, a cordon has been identified as shown in Figure 3. The difference in cordon journey time between Do-Something and Do-Minimum for buses re-routed through the proposed new access road for each option will be extracted from the York Central Model. It is anticipated that the re-routing of buses through the new access road will have an impact on journey times as a result of buses travelling through the new bus lane in Option E, re-routing through the shortest route due to closure of Leeman Road in Option A and travelling through less congested route for services that will have to travel through the section in front of the station otherwise.

B1.2.3.2 Rationalisation of Car Park

The location of the various car parks to the west of the station are considered to be rationalised into a future single multi storey car park (MSCP - Saturn zone number 523) as shown in Figure D3, for the purpose of this exercise. Due to the proposed changes to the location of access and egress from the site car parks as well as the ROC and Unipart, all trips from these zones were redistributed to the MSCP.

The quantum of rail station car parking to the east of the station is not altered and the modelling assumes that this remains as per the current situation. No decisions regarding future provision have been made by YCP at this stage, but these

assumptions have been applied to provide a robust analysis for the access options study.

Figure D34: Location of MSCP

B1.2.3.3 York Central Trip Generation

This section sets out the potential phasing of development and the assumptions on which the proposed York Central trip generation has been estimated. The forecast matrices have been updated for the Do-Something scenario to reflect the revised trip generation estimates.

Development Quantum

The proposed development comprise residential, employment and other retail and community uses. For the purposes of this assessment, the phasing and development quantum of the proposed York Central development site is provided in Table D2. This has been calculated based on estimated build out rates provided by Savills in April 2017. Based on the quantum and potential phasing, the new access would be required by 2021 to enable development to continue unconstrained by the highway access capacity.

The phasing and development quantum of the proposed York Central development site for assessment purposes is provided in Table D2.

Table D2: Phasing of York Central Development

Land Use	Forecast Year	
	2021	2031
Residential (no. of dwellings)	425	1,685

Employment (GEA sq.m)	18,580	61,060

Trip Rates

Site specific trip rates were derived for residential developments based on traffic count data collected for the Aldborough Way and Bishopfields residential areas which includes a mixture of terraced houses and multi-storey apartments.

Vehicle trip rates of employment land use has been based on TRICS assessment which includes the following criteria:

- Town Centre sites;
- Sites excluding London, Ireland, Wales and Scotland; and
- Sites surveyed no earlier than 2010.

The vehicle trip rates from this previous assessment has been applied to the proposed York Central development and is presented in Table D3.

Table D29: Vehicle Trip Rates

Vehicle Trip Rates				
Land Use	Time Period			
	AM peak		PM peak	
	Arrivals	Departures	Arrivals	Departures
Residential(no. of dwellings)	0.070	0.152	0.176	0.118
Employment (per 100 sq.m)	0.575	0.042	0.026	0.561

Trip Generation

The following key points relate to trip generation estimates for residential and employment uses:

- The assumed residential vehicle trip generation represents a low car mode share, based on the premise that York Central is located immediately adjacent to York Railway Station and within walking distance of the city centre. It is assumed that York Central residents will tend to adopt sustainable means of travel such as walking, cycling and use of public transport, and that this will be actively encouraged through the design of the development. The residential vehicle trip rates have been derived from surveys of neighbouring developments (Bishopfields and Kingsland Terrace) that are considered to form suitable precedents.
- The assumed employment vehicle trip generation has been calculated using the TRICS database for city centre sites in England (excluding London) surveyed in 2010 or later. This is considered to represent a suitable precedent for York Central, given its location and proximity to the city centre of York.

Vehicular trips generated by the proposed development have been estimated for each forecast year and time period by applying the above trip rates to each land

use and the quantum of proposed development and the results are presented in table D4.

In addition to the residential and employment uses on site, the development will comprise other uses including retail, hotel and community uses. Details of these have not been confirmed at this stage. It is considered that these uses will not generate significant trips in the peak hours. Therefore, to account for trips from these other land uses, 10% of the total residential and employment trips has been assumed. It is noted that for the purposes of this assessment, linked trips and on-site containment has not considered.

Table D4: York Central Trip Generation

Land Use	2021				2031			
	AM peak		PM peak		AM peak		PM peak	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Residential	30	65	75	50	118	256	296	198
Employment	107	8	5	104	351	26	16	342
Total	137	72	80	154	469	282	312	541
Total+10%	150	80	88	170	516	310	343	595

The number of trips generated in 2021 represents the partial build out and in 2031 represents the full build out of the York Central development. It is estimated that phase 1 of York Central development would result in 230 and 257 additional vehicle trips in AM and PM peak hour respectively in 2021. The forecast York Central development vehicle trips by 2031 are 826 and 938 in AM and PM peak hour respectively.

B1.2.3.4 Forecast Matrices

The Do-Minimum matrices were obtained from CYC. Since the proposed development quantum and phasing of development is different from the Stage 1 Transport Appraisal work, the Do-Something matrices provided by CYC have been factored accordingly to match the revised trip generation from the York Central Development. The development trips were distributed across the model using the same trip distribution as in the parent matrix. Also car parks to the west of the station have been rationalised within the MSCP. The resulting forecast matrices taking into account the proposed development quantum are shown in table D5.

Table D5: Forecast Matrix Totals

User Class	Mode/Trip Purpose	2021				2031			
		AM		PM		AM		PM	
		DM	DS	DM	DS	DM	DS	DM	DS
1	Car Commuting	16,708	16,862	16,222	16,367	17,421	17,979	16,860	17,392
2	Car Employer's Business	2,584	2,595	3,060	3,082	2,653	2,695	3,172	3,247

3	Car Other	9,810	9,845	13,513	13,573	10,173	10,308	14,115	14,343
4	LGV	3,316	3,334	2,320	2,343	3,381	3,448	2,375	2,453
5	HGV	2,058	2,064	896	903	2,052	2,073	901	923
Total		34,476	34,700	36,011	36,267	35,680	36,502	37,423	38,358

The mode share modelled for each forecast year and time period is shown in table D6.

Table D6: Mode Share

User Class	Mode/Trip Purpose	2021				2031			
		AM		PM		AM		PM	
		DM	DS	DM	DS	DM	DS	DM	DS
1	Car Commuting	48%	49%	45%	45%	49%	49%	45%	45%
2	Car Employer's Business	7%	7%	8%	8%	7%	7%	8%	8%
3	Car Other	28%	28%	38%	37%	29%	28%	38%	37%
4	LGV	10%	10%	6%	6%	9%	9%	6%	6%
5	HGV	6%	6%	2%	2%	6%	6%	2%	2%

B1.2.4 Leeman Road

In both Do-Something options, the section of the Leeman Road through National Railway Museum is closed for vehicular traffic.

B1.2.4.1 Access Options

Two shortlisted highway access options for York Central have been assessed:

Access Option A: Water End to York Central

Access Option A comprises a new access road from Water End, comprising:

- Creation of a new signalised junction at the eastern end of the existing Water End road bridge over the ECML;
- A section of new road linking the signalised junction with a bridge over the ECML;
- Provision of a new bridge over the ECML and embankment to take the road down to grade within the York Central site;
- A new road through the York Central site to link the bridge over the ECML to the western entrance to York Station and on to Leeman Road. A further link is provided to connect with the western end of Leeman Road.

Access Option E: Poppleton Road (East) to York Central

Access Option E comprises a new access road from the A59 Holgate, comprising:

- A new bridge over the FAL, originating from Holgate Road, running broadly parallel to Chancery Rise;
- A new road through the York Central site to link with the western end of Leeman Road;
- A new link road to connect with the western entrance to York Station and the eastern side of Leeman Road.

B1.2.5 Model Scenarios

To assess the impact of the York Central development on the transport network, the following three scenarios are considered:

- Do-Minimum – includes traffic growth and all committed developments, but no York Central development.
- Do-Something Option A – includes all committed developments, Leeman Road closed, two way bus gate at Leeman Road underpass, York Central development and highway network configuration for Access Option A.
- Do-Something Option E – includes all committed developments, Leeman Road closed, two way bus gate at Leeman Road underpass, York Central development and highway network configuration for access option E.

The future year scenarios are modelled in both 2021 and 2031.

B1.2.6 Derivation of AADT and AAWT Factors

Modelled peak hour traffic flows needs to be converted to AADT and AAWT flows for environmental assessment purposes. The noise and air quality assessments have focussed on the 24hour Annual Average Daily Traffic (AADT) and 18hour Annual Average Weekly Traffic (AAWT). These factors are derived based on 2013 count data along A59 Borough Bridge Road. The formula used to convert modelled flows is provided below:

- 24hr AADT = (2.96*AM modelled flow+2.82*PM modelled flow)*2.28
- 18hr AAWT = ((2.96*AM modelled flow+2.82*PM modelled flow)*2.32

The peak hour modelled flows have been converted to 24hr AADT and 18hr AAWT using these factors.

B1.3 Forecasting Outputs

B1.3.1 Overview

The traffic impacts of the shortlisted access options for York Central have been assessed by comparing the Do-Minimum and Do-Something scenarios for each access option and by forecast year. This section sets out the headline indicators for the without scheme and with scheme scenarios in the 2021 and 2031 forecast years.

The impact of the shortlisted access options has been analysed based on:

- Network wide traffic performance;
- Change in traffic flows on links;
- Junction performance - change in junction delay;
- Impact on bus journey times.

B1.3.2 Network Wide Performance

The impact of the shortlisted access options on the wider network performance is summarised by the following statistics:

- Total delay (PCU hours) – measured as the difference between congested and free flow travel time on the modelled highway network;
- Total distance travelled (PCU kms) – total distance travelled on modelled highway network;
- Total travel time (PCU hours) – total time spent on the highway network including link and junction times.

Table D7 provides the network summary statistics for the highway network for each forecast scenario, year and time period.

B1.3.2.1 Total Delay

Table D30: Network wide change in delay

Option A	**2021**		**2031**	
	AM	**PM**	**AM**	**PM**
DM Total Network Delay (PCU Hrs)	186.8	201.0	205.5	218.7
DS Total Network Delay (PCU Hrs)	197.2	210.6	223.7	231.6
Change in Total Network Delay (PCU Hrs)	10.4	9.6	18.2	12.9
Change in Annual Delay PCU Hrs (300 days)	6,000		9,330	
Option E	**2021**		**2031**	
	AM	**PM**	**AM**	**PM**
DM Total Network Delay (PCU Hrs)	186.8	201.0	205.5	218.7

DS Total Network Delay (PCU Hrs)	189	205.9	216.9	225.4
Change in Total Network Delay (PCU Hrs)	2.2	4.9	11.4	6.7
Change in Annual Delay PCU Hrs (300 days)	2,130		5,430	

Tables 7 demonstrates that for Option A, in 2021 there will be increase in network delay by 6% and 5% AM and PM peak hours respectively. By 2031, the increase in delay in the Do-Something scenario compared to Do-Minimum scenario are 9% and 6% in the AM and PM peak hours respectively.

For Option E, there will be 1% and 2% increase in network delay in the AM and PM peak hours in 2021 and by 2031 the increase in delay is 6% and 3% in the AM and PM peak hours respectively.

B1.3.2.2 Total Travel Time

Table D7: Network wide change in travel time

Option A	**2021**		**2031**	
	AM	**PM**	**AM**	**PM**
DM Total Network Travel Time (PCU Hrs)	8,561	8,759	9,010	9,473
DS Total Network Travel Time (PCU Hrs)	8,795	8,965	9,638	9,717
Change in Total Network Travel Time (PCU Hrs)	234	205	628	244
Option E	**2021**		**2031**	
	AM	**PM**	**AM**	**PM**
DM Total Network Travel Time (PCU Hrs)	8,561	8,759	9,010	9,473
DS Total Network Travel Time (PCU Hrs)	8,722	8,905	9,485	9,655
Change in Total Network Travel Time (PCU Hrs)	161	146	475	181

The predicted increase in network wide travel time (Do-Something scenario compared to Do-Minimum scenario) in 2031 for Option A is 7% and 3% in the AM and PM peak hours respectively. For Option E it is expected that the travel time will increase by 5% and 2% in the AM and PM peak hours respectively by 2031.

B1.3.2.3 Total Travel Distance

Table D8: Network wide change in travel distance

Option A	**2021**		**2031**	
	AM	**PM**	**AM**	**PM**
DM Total Network Travel Distance (PCU Kms)	352,838	358,848	365,665	373,847
DS Total Network Travel Distance (PCU Kms)	357,697	363,112	376,856	385,134
Change in Total Network Travel Distance (PCU Kms)	4,858	4,264	11,191	11,288
Option E	**2021**		**2031**	
	AM	**PM**	**AM**	**PM**

DM Total Network Travel Distance (PCU Kms)	352,838	358,848	365,665	373,847
DS Total Network Travel Distance (PCU Kms)	356,308	362,252	374,610	384,100
Change in Total Network Travel Distance (PCU Kms)	3,470	3,404	8,945	10,253

For Option A, total network travel distances are predicted to increase by 1% in both the AM and PM peak hours in 2021 and by 3% in both the AM and PM peak hours in 2031.

For Option E, total network travel distances are predicted to increase by 1% in both the AM and PM peak hours in 2021 and by 2% and 3% in the AM and PM peak hours respectively in 2031.

B1.3.2.4 Summary

Comparison of the network performance between the Do–Minimum and Do-Something scenarios for each shortlisted access option shows an increase in congestion as demonstrated by each metric owing to the additional trips generated from the York Central development.

Total travel time and delay is predicted to increase in both Do-Something scenarios showing a general deterioration in highway conditions and indicating increasing levels of congestion in all time periods.

The percentage increase in travel time and delay for Option A are higher compared to Option E. For Option A in 2031, the predicted increase in delay is 9% and 6% in the AM and PM peak hours. For Option E it is 6% and 3% respectively. The results show a similar pattern for travel time increases. For Option A in 2031 the increase is 7% and 3% for the AM and PM peak hours respectively. For Option E it is 5% and 2% respectively.

However, the overall increase compared to the Do-Minimum scenario is proportionately low.

B1.3.3 Link Flows

The forecast models have been analysed to understand the traffic flow impacts of the proposed development in the wider network and on local roads in the vicinity of the scheme. The changes in link flows are analysed as follows:

- Link flow difference plots for 2031 by scenario and time period across the wider network;
- Two way link flows for key links in the immediate vicinity of the scheme.

B1.3.3.1 Flow Difference on the Wider Network

Figure D4 to figure D7 show the change in traffic flows in the 2031 forecast year between the Do-minimum and Do-Something scenarios by each access option, and time period. Green bands represent an increase in flow and blue bands indicate a reduction in flow in the Do-Something compared to the Do-Minimum. The width of the band represents the magnitude of change in flow. All flow

difference plots are based on total vehicle flows comprising of the five user classes.

Figure D4: Link Flow Difference between DM and Option A – 2031 AM peak hour

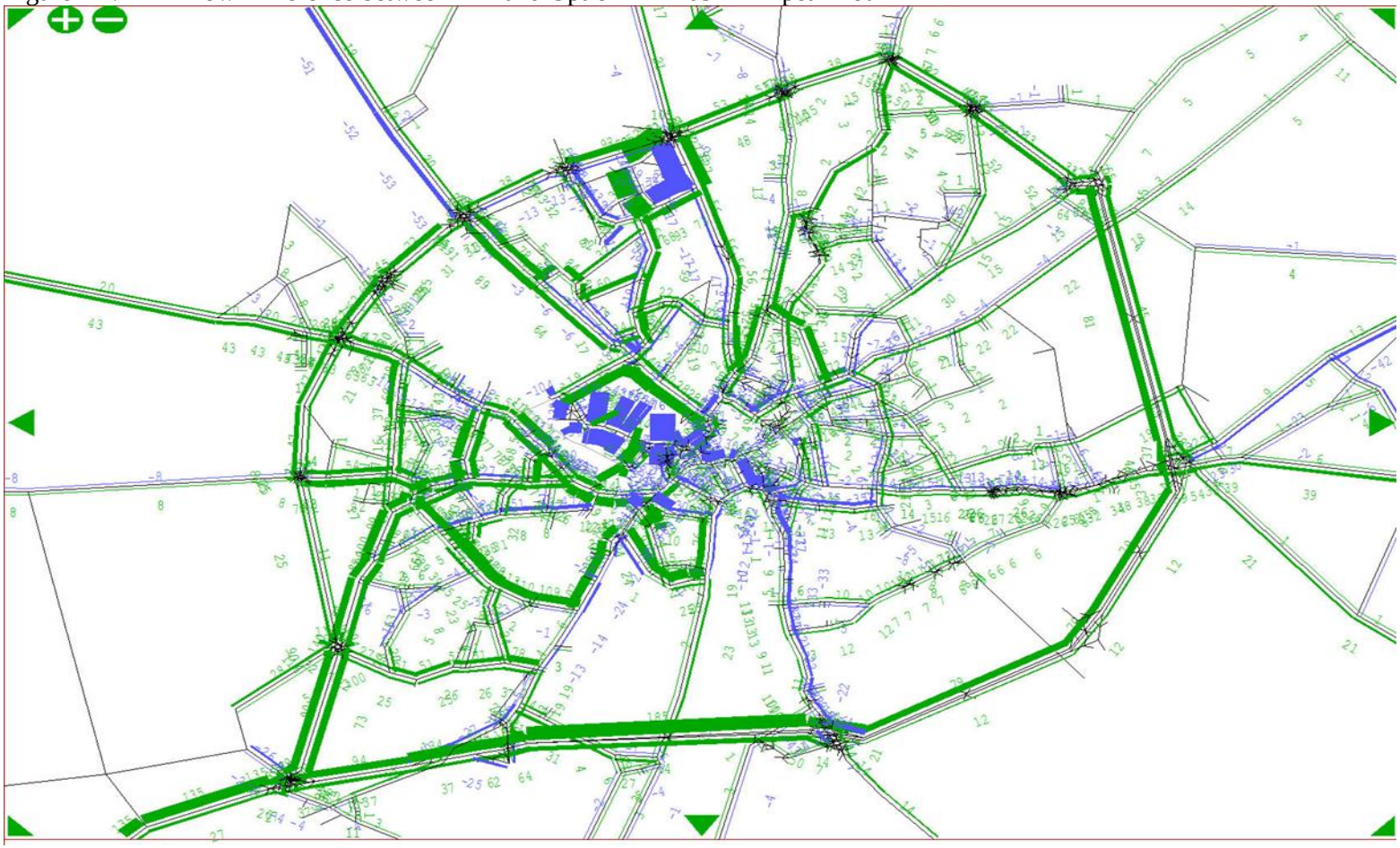


Figure D5: Link Flow Difference between DM and Option A – 2031 PM peak hour

Figure D6: Link Flow Difference between DM and Option E – 2031 AM peak hour

Figure D7: Link Flow Difference between DM and Option E – 2031 PM peak hour

In the wider network, traffic flows in the Do-Something scenario are consistently higher than the Do-Minimum scenario along the major corridors in the study area. The most significant increase in flow occurs on the outer ring road and the radial routes connecting the city centre as these are the major corridors that take traffic to/from the development. In general, increase in traffic flows are predicted along the A59, A64, A1079, A166, A19 and A1036 as a result of the development. There are a few instances of some decrease in traffic flows in the immediate vicinity of the scheme as indicated by Figure D4 to Figure D7. Principally these are Leeman Road, as a result of its closure as a through route for general traffic and the A59 in Option E, as a result of traffic re-routing to less congested routes.

The analysis has shown that the additional development trips do not have an overly significant impact compared to the Do-Minimum scenario. Increase in flow is mainly observed along the outer ring road and the radial routes during peak hours. Flow changes remain relatively insignificant in other parts of the network and this implies that the proposed development will not lead to re-routing of trips beyond the immediate vicinity of the development site.

At a network wide level, the traffic flow differences show negligible variation between Access Options A and E.

B1.3.3.2 Flow Difference on the local network

Forecast flows on the proposed York Central access option links as well as on key links in the vicinity of the scheme in the 2031 future year are shown in Figure D8 to Figure D11 respectively. These key links are assessed on an individual basis for the AM and PM peak hours based on the changes in two way flows between the Do-Minimum and Do-Something scenarios.

Figure D8: Link Flow Difference between DM and Option A – 2031 AM peak hour

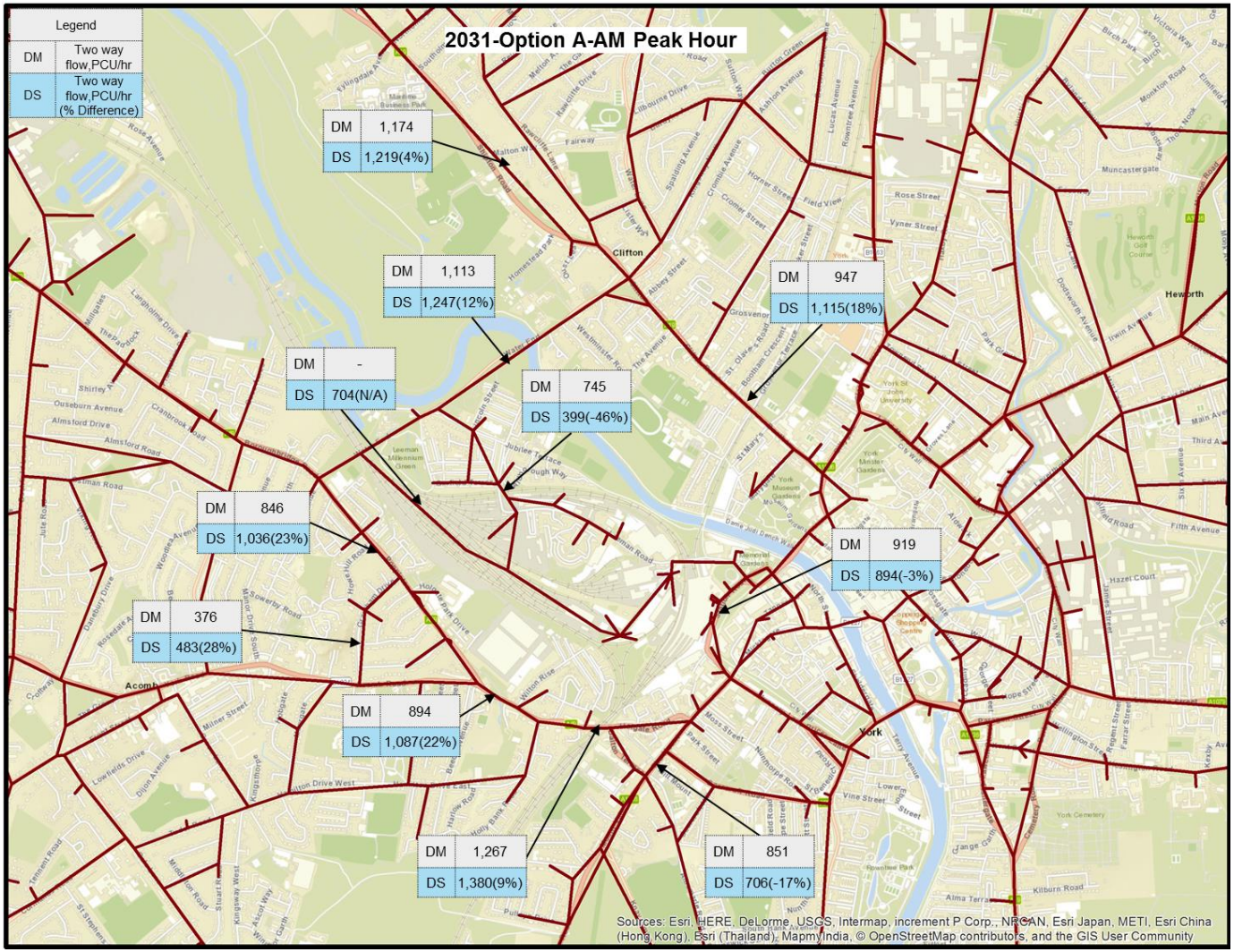


Figure D9: Link Flow Difference between DM and Option A – 2031 PM peak hour

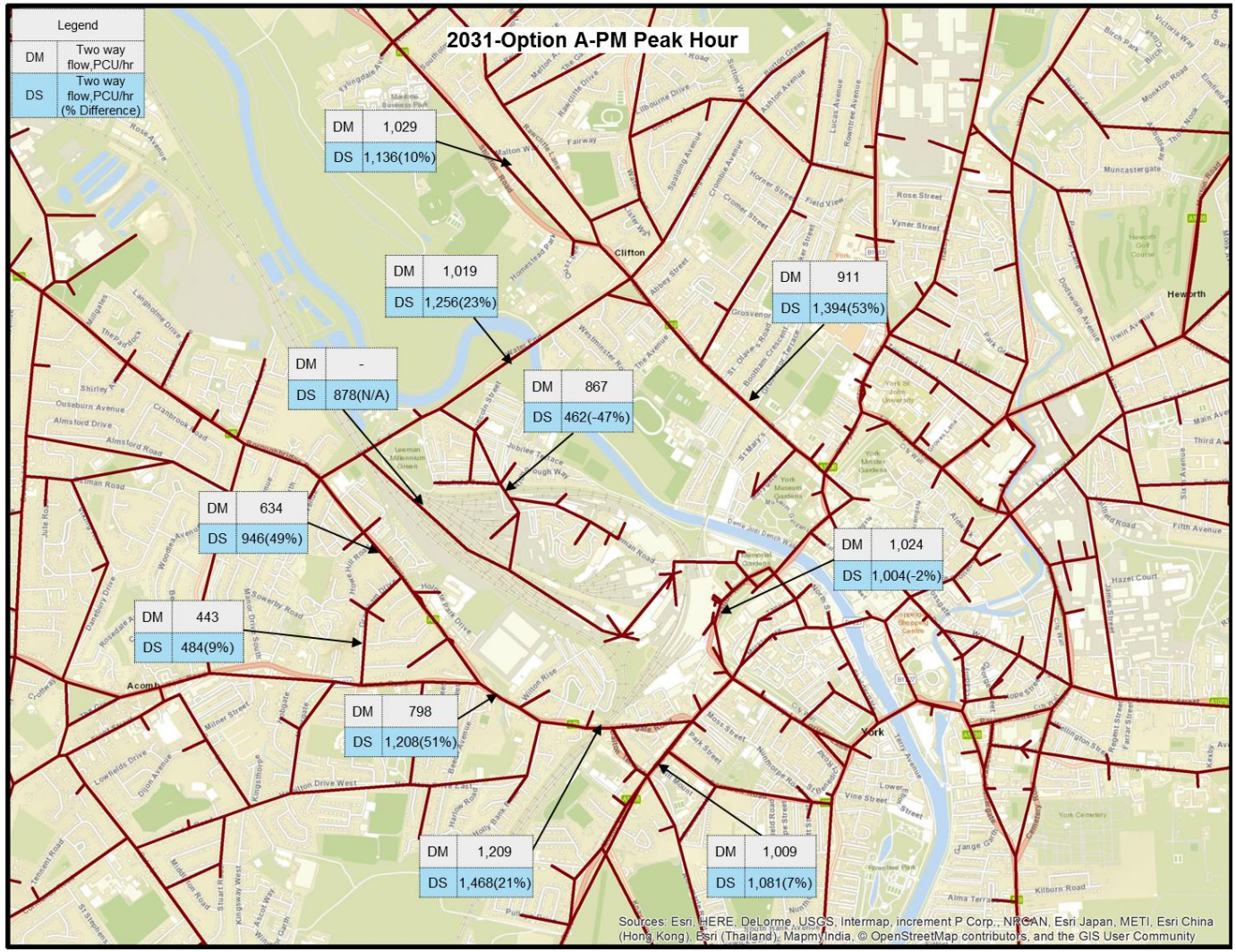


Figure D10: Link Flow Difference between DM and Option E – 2031 AM peak hour

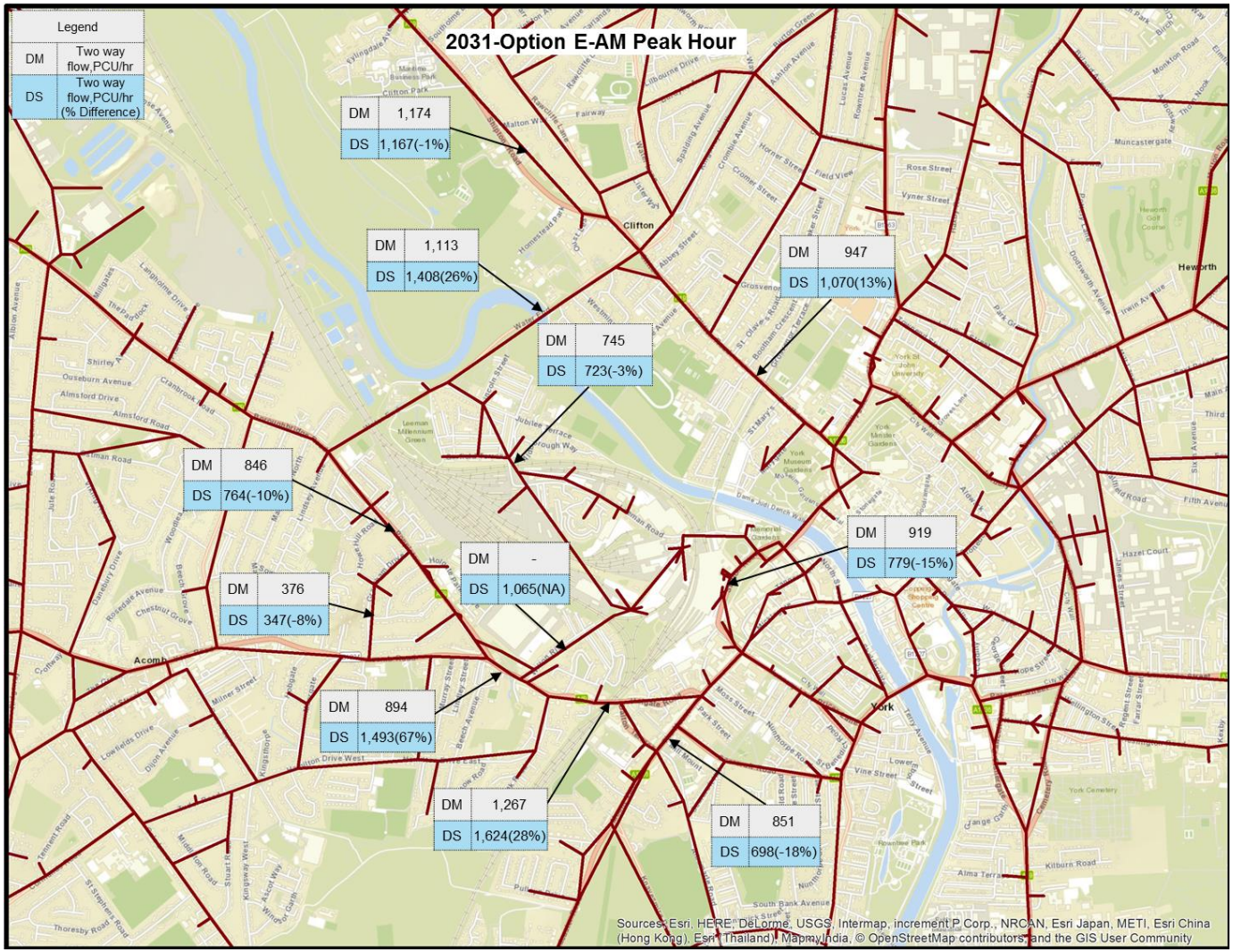
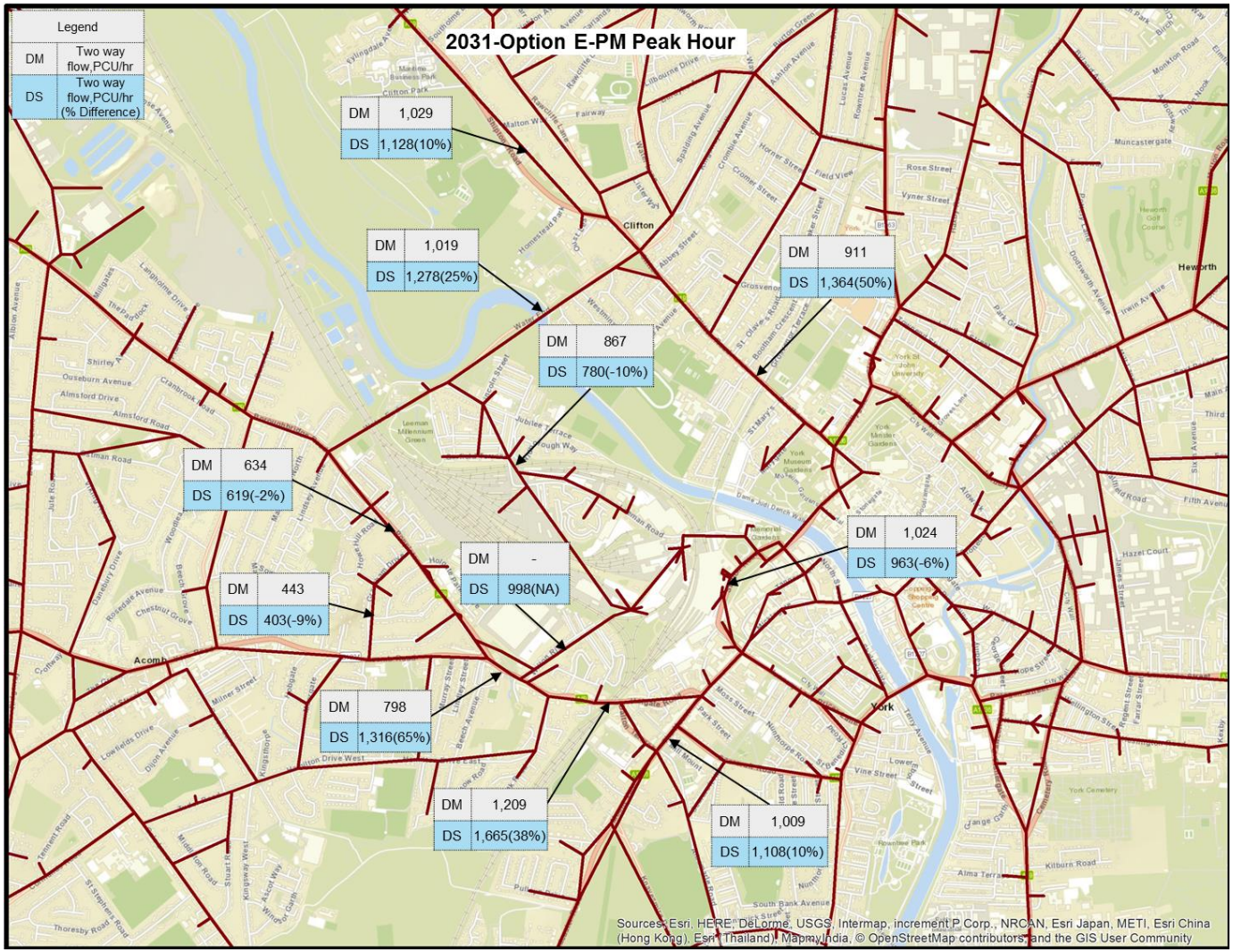


Figure D11: Link Flow Difference between DM and Option E – 2031 PM peak hour



The additional trips generated from the shortlisted access options generally lead to traffic growth on the local road network, particularly along routes such as A19 Clifton, Water End and A59.

In Option A in the AM peak hour there is a moderate increase in traffic flows on A19 (18%) and Water End (12%) with a more significant increase of traffic flows on the A59 corridor (22%, 23% and 28%). There is a forecast reduction in traffic flows on routes to the east of the station including A1036 (-17%) and Queen Street (-3%). The results are similar but more significant for the PM peak hour with an increase of 23% at Water End, 53% on A19 and approx. 50% on A59 links. There is a modest increase in traffic flows in A1036 (7%) and slight reduction on Queen Street (-2%). In general there are traffic flow increases on routes surrounding the site, A19, A59 and Water End and a reduction or minor increase in traffic flows on routes to the east of the station, A1036 and Queen Street.

In Option E the traffic flow changes show more variation. In the AM peak hour there are predicted to be moderate increases on the A19 (13%) and Water End (26%). On the A59 to the north west of the new access road there are forecast to be some reduction in traffic flows (-10% and -8%) with significant increases in flows from Acomb Road and to the south east (67% and 28%). There is a reduction in flows on A1036 (-18%) and Queen Street (-15%). A similar pattern results in the PM peak hour with increases in traffic flows on Water End (25%) and A19 (50%), some reduction on A59 to the north west (-2% and -9%) and increases on A59 to the south west (65% and 38%). There is a modest increase in traffic flows in A1036 (10%) and slight reduction on Queen Street (-6%). Option E traffic appears to route trips away from the A59 to the northwest of the new access road but a significant number of trips are attracted to the new route from Acomb Road and the south east. The A59 is known to have significant delays in the Do-Minimum scenario near its junction with Water End. As such an increase in traffic flow could be limited due to constraints associated with the capacity.

B1.4 Junction Performance

The forecast models were compared for junction performance, based on changes in junction delay, to analyse the impact of the proposed York Central development. Figures D12 to D15 show the junction delay for the Do-Minimum scenario and each access option by time period in 2031 which represents the worst case scenario.

Figure D12: Junction Delay – Do-Minimum – 2031 AM peak hour

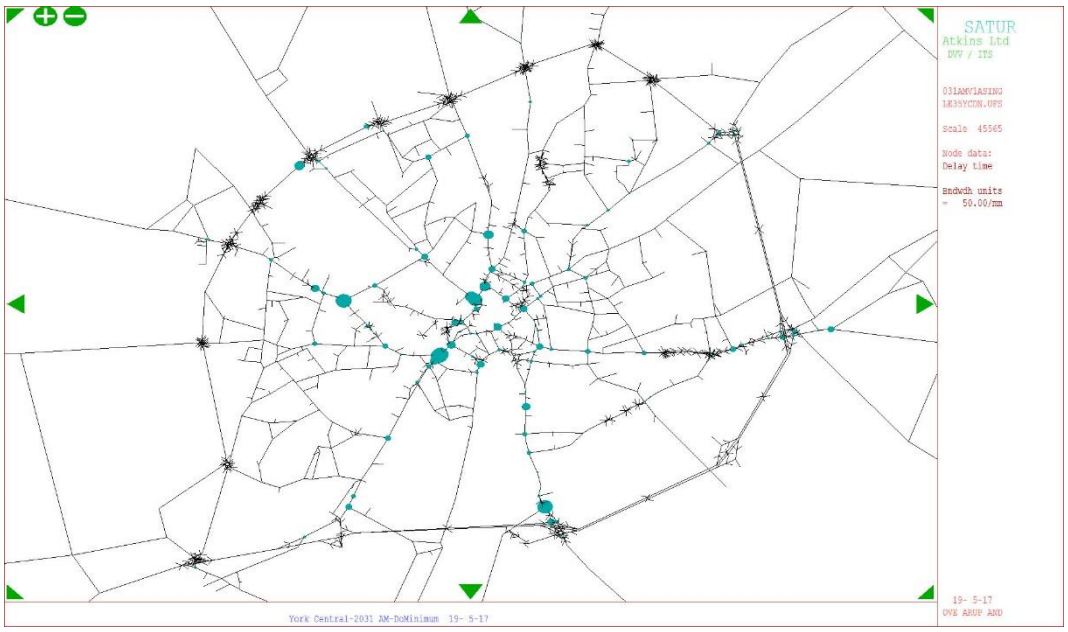


Figure D13: Junction Delay – Do-Something Option A – 2031 AM peak hour

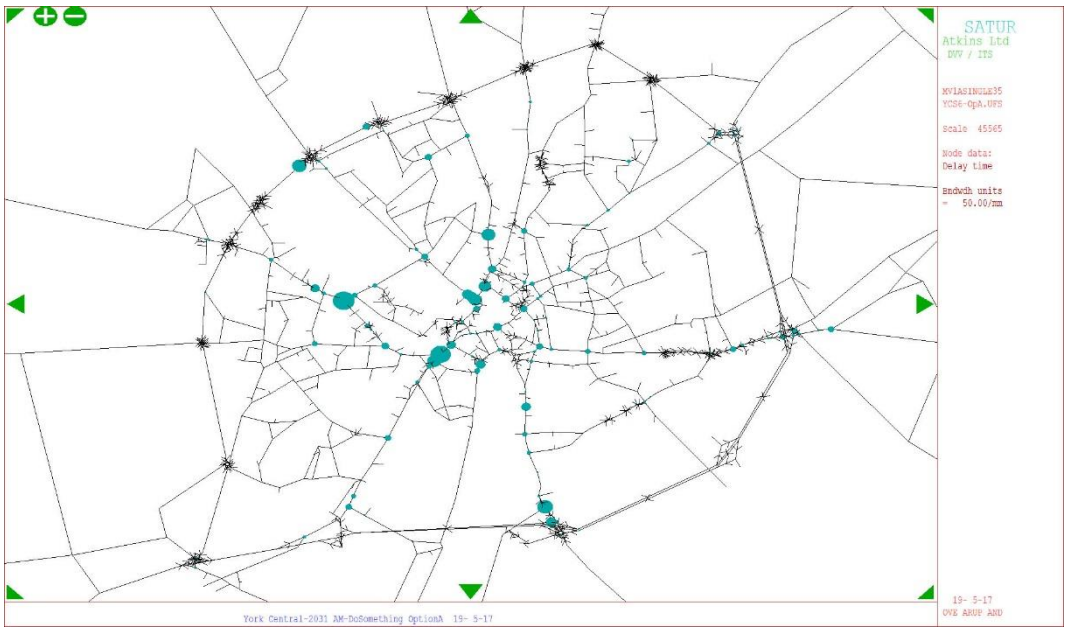


Figure D14: Junction Delay – Do-Something Option E – 2031 AM peak hour

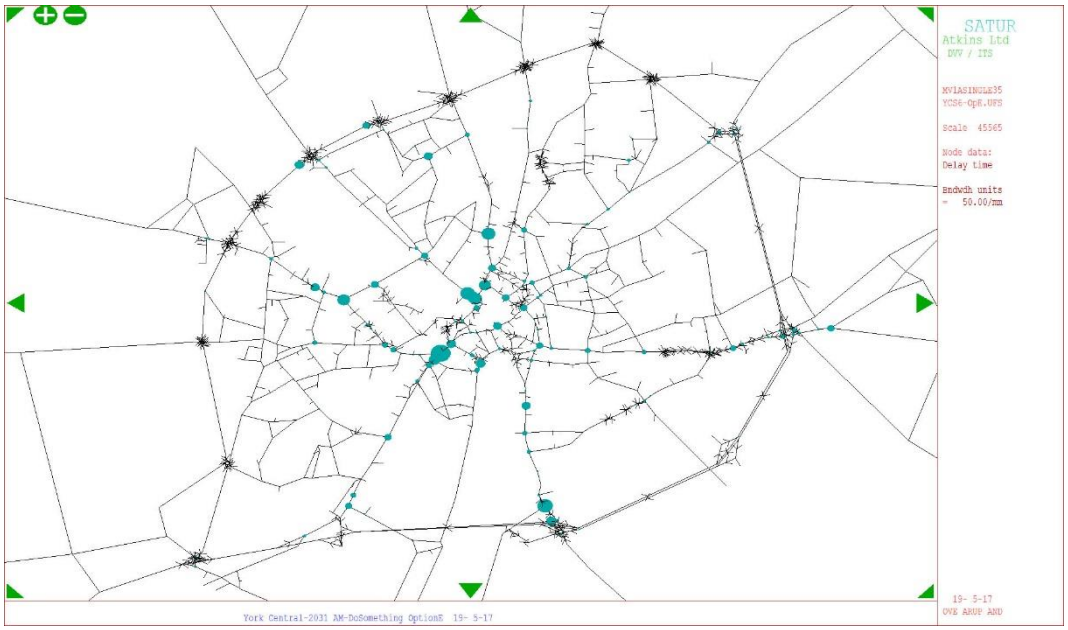


Figure D15: Junction Delay – Do-Minimum – 2031 PM peak hour

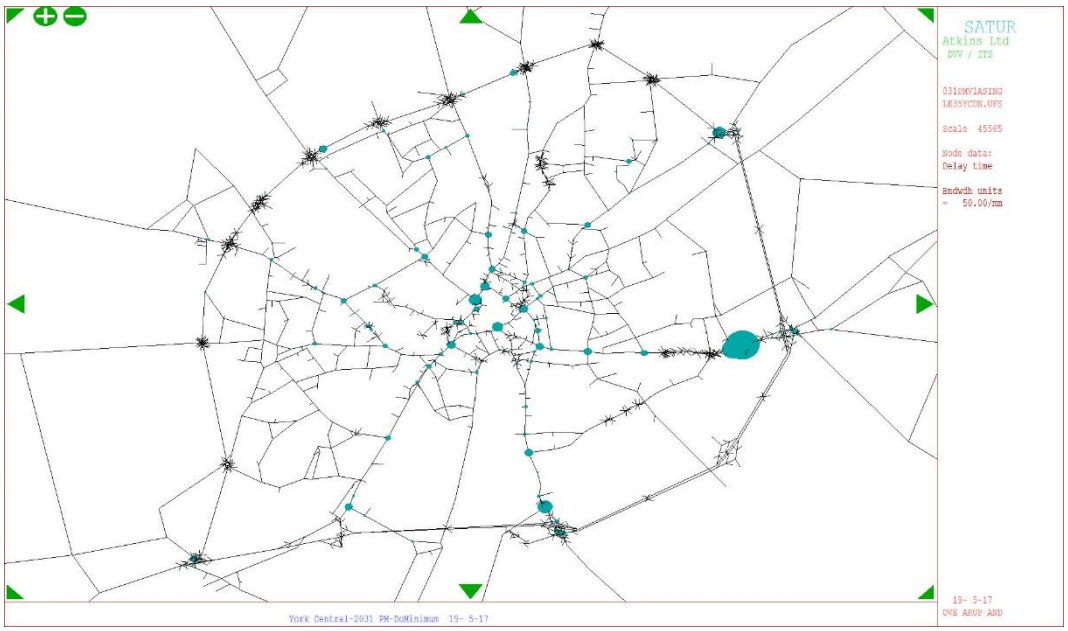


Figure D16: Junction Delay – Do-Something Option A – 2031 PM peak hour

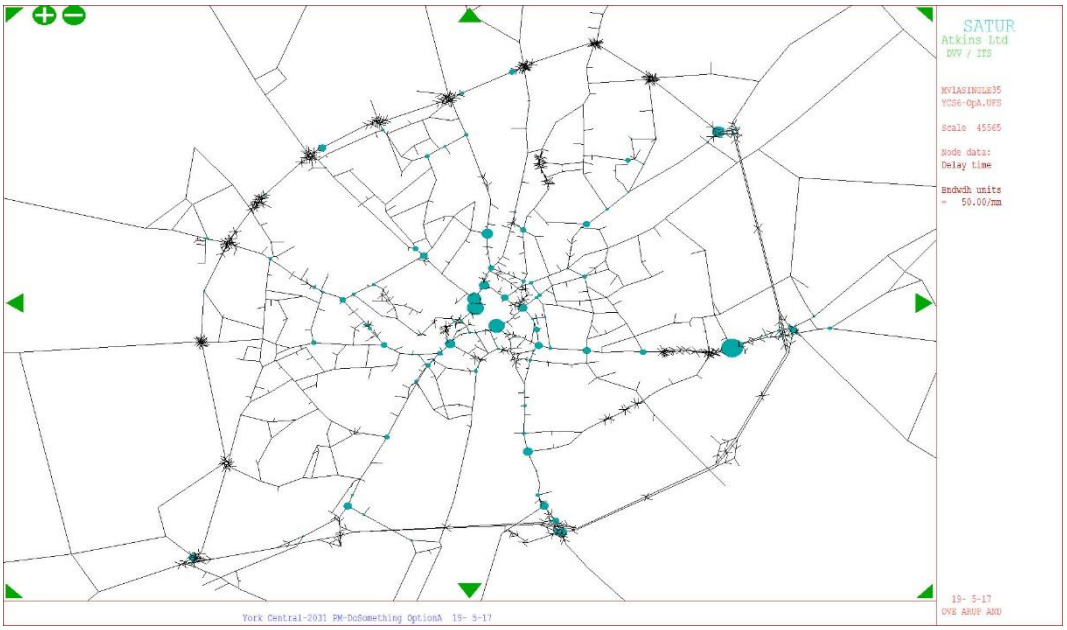
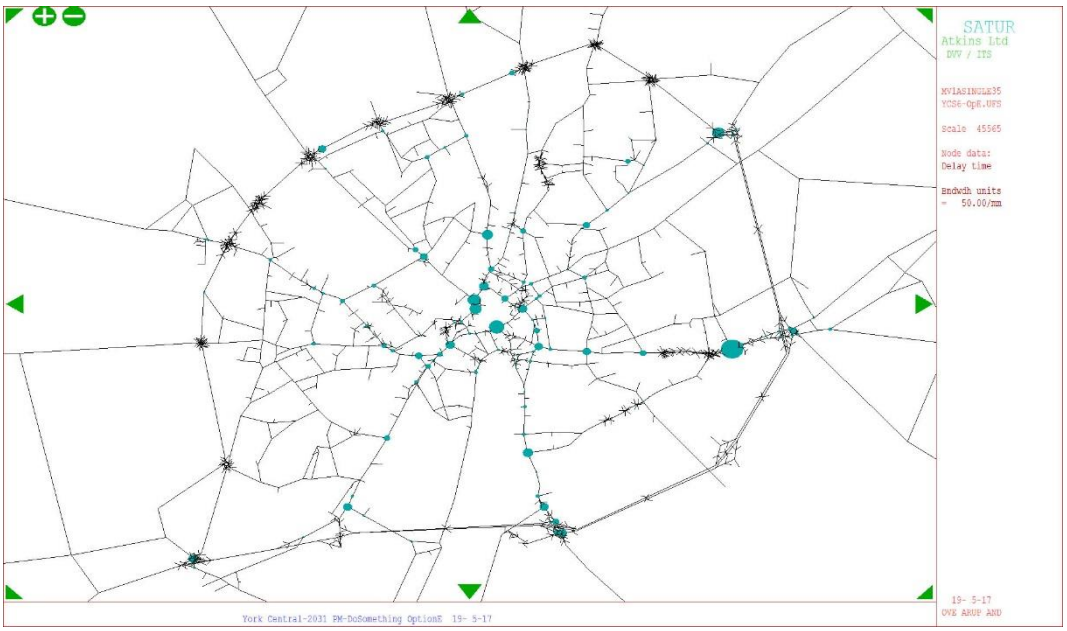


Figure D17: Junction Delay – Do-Something Option E – 2031 PM peak hour



The increase in traffic associated with the proposed development has led to increase in junction delay at some locations identified. However for the majority of the locations, the proposed development has negligible impact on delay. The apparent delay at junctions can be attributed to existing pinch points rather than the development trips.

B1.4.1.1 Junction Assessment Criteria

The junctions with the highest delay impacts as a result of the York Central development have been analysed in more detail. The filtering criteria applied to select the junctions (nodes) are given below:

- Junction with Do-Minimum delay greater than 50 seconds.
- Change in delay between Do-Minimum and Do-Something is greater than 10seconds.

The filtering process has been applied to the junction delay results for both Option A and Option E scenarios. This process has been applied to identify where junctions experience delay and where the York Central development is likely to have an impact. On this basis, it is assumed that junction mitigation measures may be required. This has been undertaken for the Access Options study, further more detailed assessment will be required to confirm impacts and potential highway mitigation.

Junction Assessment – Option A

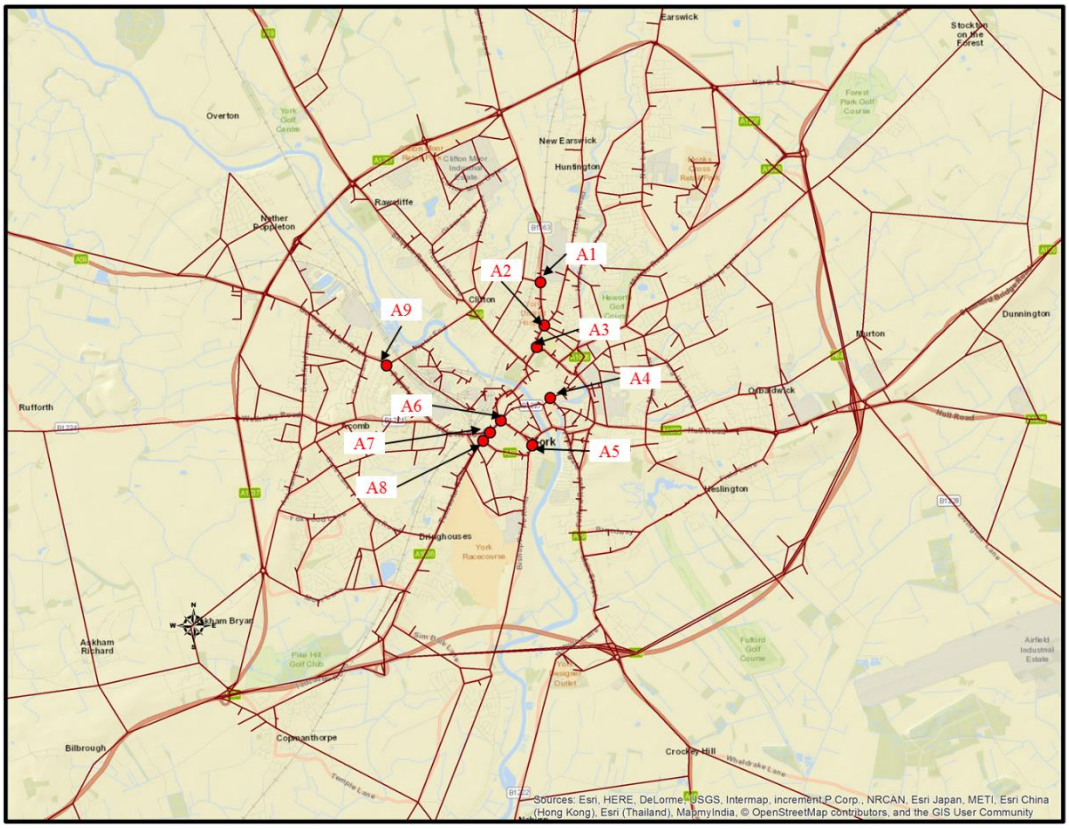
There are nine junctions identified for option A in both AM and PM peak hour or either of them by applying the above filtering criteria. The location of these junctions is shown in Figure 18. The key junctions in the network that are affected by junction delay in 2031 are detailed below:

- A1-B1363 Wigginton Road/Crichton Avenue
- A2-B1363 /Haxby Road
- A3-B1363/A1036
- A4-Piccadilly/Pavement/Coppergate
- A5-A1036 Bishopthorpe Road/Nunnery Lane
- A6-A1036 Blossom Street/Nunnery Lane
- A7-A1036 Blossom Street/A59 Holgate Road
- A8-A1036 The Mount/Scarcroft Road
- A9-A59 Boroughbridge Road/Water End

Most of the junctions are located along the B1363 and A1036 corridors. The delays could be attributed to traffic coming into the city centre and predicted to experience more congestion in 2031. In particular B1363 Wigginton Road/Crichton Avenue junction is predicted to experience congestion in both peak hour and part of it is related to the proposed York Central development.

Junction performance issues at other locations are due to the combined effect of increase in background traffic growth and the proposed development. Even though slight delays are forecast to occur, these are generally confined to local network in the vicinity of the scheme.

Figure D18: Junction Performance Assessment- Comparing Option A with Do-Minimum

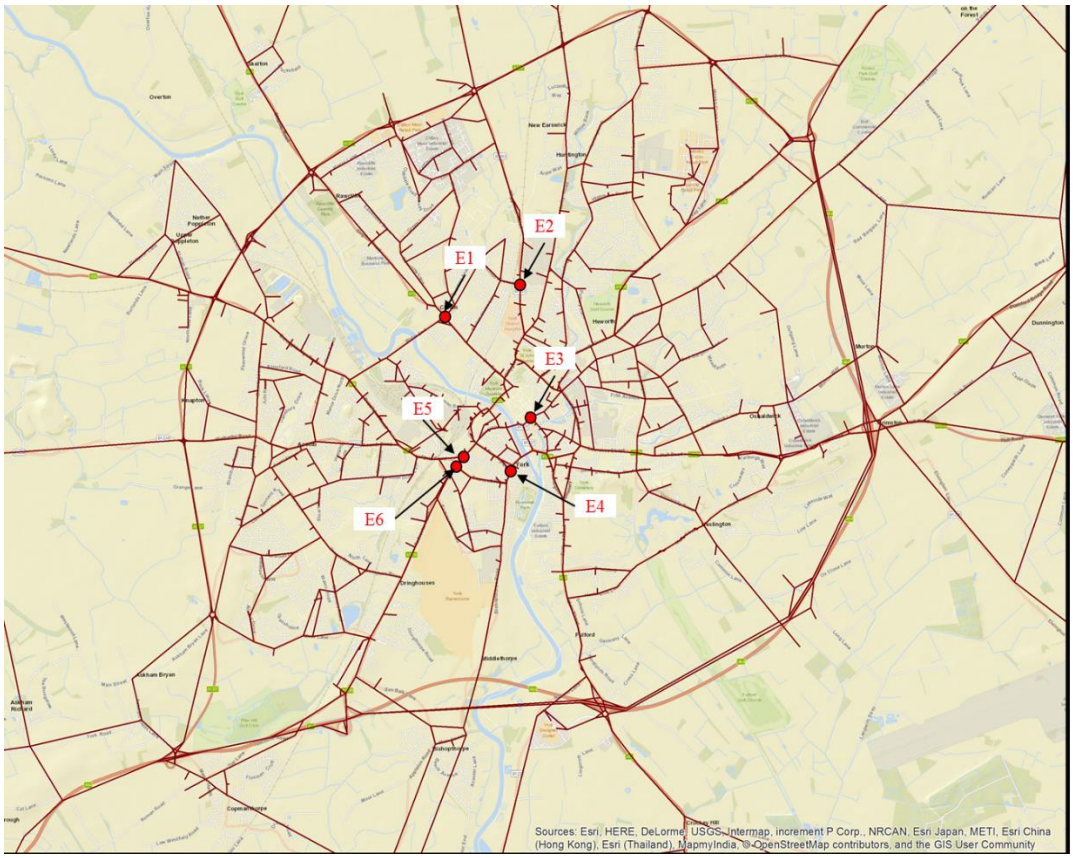


Junction Assessment – Option E

Based on the assessment criteria above, six junctions have been identified to have potential congestion issues with option E. The location of these junctions are detailed below and shown in Figure D19:

- E1-Water End/Clifton Green
- E2-B1363 Wigginton Road/Crichton Avenue
- E3-Piccadilly/Pavement/Coppergate
- E4-A1036 Bishopthorpe Road/Nunnery Lane
- E5-A1036 Blossom Street/A59 Holgate Road
- E6-A1036 The Mount/Scarcroft Road

Figure D19: Junction Performance Assessment- Comparing Option E with Do-Minimum



As with Option A, the majority of the junction performance changes are located along the B1363 and A1036 corridors and could be attributed to traffic coming into the city centre and predicted to experience more congestion in 2031. In particular B1363 Wigginton Road/Crichton Avenue junction is predicted to experience congestion in both peak hours.

A mitigation assessment has not been undertaken as part of this study. Further analysis needs to be carried out at these junctions with detailed junction modelling to understand the issues and potential mitigation measures required to alleviate congestion. This would form part of the future scoping of the Transport Assessment to accompany any planning application.

B1.4.2 Bus journey time on the wider network

An initial assessment of the changes in bus journey time on the wider network has been undertaken by comparing the bus summary statistics for each route identified in Table D1. This involves tracing each bus route and summing total travel times and distance, based on the number of buses using each route. The changes in bus journey time across the wider network is presented in Table D10 and Table D11.

Table D10: Change in city wide bus journey time between Do-Something and Do-Minimum -2021

Route Name	Total Time (minutes)					
	2021-AM			2021-PM		
	DM	DS-Option A	DS-Option E	DM	DS-Option A	DS-Option E
1	42	44	36	35	36	34
59 P&R	48	40	38	45	37	38
2	25	24	23	28	27	27
10	47	47	48	48	49	49
19	24	24	23	23	25	24
30	43	49	51	44	47	47
30X	10	19	20	-	-	-
5	39	42	33	33	34	32
31	-	-	-	66	68	68
31X	32	31	31	31	33	33
Change in JT (minutes)	**-**	**9**	**-7**	**-**	**4**	**-1**

Table D11: Change in city wide bus journey time between Do-Something and Do-Minimum -2031

Route Name	Total Time (minutes)					
	2031-AM			2031-PM		
	DM	DS-OptionA	DS-OptionE	DM	DS-OptionA	DS-OptionE
1	43	46	36	35	37	34
59 P&R	49	44	39	46	38	38
2	25	25	24	28	28	26
10	49	50	52	49	52	52
19	24	24	23	23	26	25
30	43	49	52	44	48	48
30X	10	19	22	-	-	-
5	40	43	34	33	35	32
31	-	-	-	66	69	70
31X	32	31	31	31	34	33
Change in JT (minutes)	**-**	**16**	**-4**	**-**	**11**	**5**

Initial results indicate that Option A will result in a cumulative increase of 16 and 11 minutes for the routes under consideration in AM and PM peak hours in 2031. However the cumulative change in city wide journey time for option E is negligible for the routes under consideration. Routes 1, 5 and 59 Park & Ride have significant savings in journey time in Option E as they are re-routed through the new access road. These results provide an indication of city wide impact on bus journey time and further analysis is required to model passenger demand and identify any mitigation measures required.

Routes through Leeman Road have a slight increase in journey time as a result of the closure of Leeman Road and re-routing via Salisbury Road-Leeman Road-York Central-Leeman Road in the Do-Something scenario which partially contributes to the increase in journey time.

B1.4.3 Summary

This appendix outlines the methodology and assumptions used in developing the highway model for the shortlisted access option appraisal. York Central Saturn model provided by City of York Council forms the basis of this appraisal. The forecast travel demand has been factored to take into account the proposed phasing of development and the revised development quantum.

The Do-Minimum model is based on the base model and including committed developments in the study area. The Do-Something model is based on the Do-Minimum scenario and includes the proposed access options, closure of Leeman road and the revised travel demand from proposed phasing and quantum of development for each forecast year.

Forecast highway models were developed by assigning the forecast demand to the Do-Minimum and Do-Something highway network to assess the impact of the proposed York Central development (quantum and rate of development assumed for the purposes of the Access Options Study only). The assessment has indicated that the proposed development will result in slight increase in delay across the wider network due to the additional traffic generated. However, this will not result in any re-routing of trips in the wider network. Flows on the network in the immediate vicinity of the proposed development site will increase slightly.

Comparison of the network performance between do –minimum and do-something for each option shows an increase in congestion as demonstrated by each metric owing to the additional trips generated from York Central.

The additional traffic generated from the site will lead to increase in flow along the outer ring road and radial routes. No new junction issues were identified to be solely associated with the scheme, however they will exacerbate the condition in the without scheme scenario.

The junction impact assessment provides a broad overview of the potential locations that are likely to be congested in the forecast year (2031) with the full development in place. Further assessment will be required to assess in more detail the impact of land use and the changes in highway network.

Initial assessment of city wide impact on bus journey times has indicated that Option A will result in a slight increase in journey time for the routes considered. The impact on city wide journey time for Option E is marginal.