City of York Council

City of York Local Transport Plan Modelling

Transport Impact Assessment Report

Wood Group UK Limited – June 2022~~May 2022~~

Draft - see disclaimer

Report for

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Document revisions

No.	Details	Date
1	Draft	24/02/2022
2	Draft Final	06/05/2022

Contents

1. Introduction

1.1 Purpose of the Report

The purpose of this report is to analyse the transport impacts of York's Local Plan on the strategic and local highway network. The report summarises key findings from two forecast years 2025, 2033 and 2040.

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The traffic forecasts have been developed in accordance with the Department of Transport's (DfT) Transport Analysis Guidance (TAG) unit M4.

1.2 Background

City of York Council issued a tender in October 2021 requiring the services of a professional consultancy to model and assess the transport impacts of the Council's emerging local plan (2017 – 2032/33) in the form of a Transport Impact Assessment Report. The overarching aim of this work was to demonstrate deliverability and viability of the emerging local plan at Examination in Spring/Summer 2022.

The work involved updating the existing CYC Local Plan evidence base using the new Strategic Highway and Public Transport Visum model (2019).

In 2018, the council submitted its Regulation 19 Local Plan for examination to the Planning Inspectorate. The submission was supported by a transport evidence base that was assessed using the council's Saturn model with a 2016 Base Year.

The modelling and assessment work which forms this commission will take account of the following updates and changes to the existing evidence base:

- An updated housing development trajectory (base date 1st April 2020)
- Outline approval for A1237 Phase 1 dualling between A19 Shipton Road and Little Hopgrove.
- Sensitivity test with A1237 Phase 2 dualling from B1224 Wetherby Road to A19 Shipton Road.

This was a joint commission between City of York Councils Transport, Highways and Environment Team and Strategic Planning Policy Team.

Wood Group UK Limited was appointed to undertake this work.

1.3 Document Structure

The following chapters are included in the report:

- Chapter 2- Summary of Base Year Traffic Model;
- Chapter 3- Forecast Years and Uncertainty Log;

- Chapter 4- Forecast Year Demand;
- Chapter 5- Forecast Year Supply;
- Chapter 6- Assignment Results; and
- Chapter 7- Summary and Conclusions.

2. Summary of Base Year Traffic Model

2.1 Introduction

This chapter provides a summary of the Local Model Validation Report (Doc Ref. 42294-WOOD-XX-XX-RP-OT-0003_A_P04, February 2021).

The STEP base year traffic model has been used as a basis to prepare the Local Transport Plan forecast traffic models. The forecast traffic models has been built in compliance with TAG Unit M4 (November 2014).

2.2 Model Structure and Time Periods

The STEP strategic transport modelling toolkit consists of the following VISUM models:

- Highway Assignment Model (HAM); and
- Public Transport Assignment Model (PTAM).

The sub-models are coded into the same Visum file, supporting both ~~the~~ model run times and data transparency. The time periods modelled are presented in Table 2.1.

Table 2.1 Modelled Time Periods

Time Period	Modelled Period
AM	08:00 – 09:00
IP	Average of 10:00 – 16:00
PM	17:00 - 18:00

2.3 Fit for Purpose

The Local Model Validation Report (February 2021) demonstrated that the highway and public transport assignment models are TAG compliant.

The highway model showed a very good level of link and screenline flow calibration and validation for both the Prior and Post models in all three time periods. The overall level of journey time route validation meets TAG criteria. The model is also proven to be stable with outstanding convergence statistics despite significant queuing at the outer ring road intersections and city centre locations.

3. Forecast Scenarios and Uncertainty Log

3.1 Introduction

As agreed with CYC forecast traffic models were developed for 2025, 2033 and 2040. Table 3.1 presents details of the forecast modelled scenarios.

Table 3.1 Forecast Scenarios

Scenario Number	Scenario Name	Description
1	2040 Full build out of ST15 & Local Plan	Committed Housing and Office Developments & Local Plan Developments Committed Transport Schemes (including YORR Phase 1). ST15 Access 100% access via Elvington Lane
2	2040 Full build out of ST15 & Local Plan	Committed Housing and Office Developments & Local Plan Developments Committed Transport Schemes (including YORR Phase 1). ST15 Access 100% via new A65 GSJ
3	2040 Full build out of ST15 & Local Plan	Committed Housing and Office Developments & Local Plan Developments Committed Transport Schemes (including YORR Phase 1). ST15 Access 70% via new A64 GSJ & 30% via Elvington Lane
4	2033 DM	Committed Housing and Office Developments Committed Transport Schemes (including YORR Phase 1).
5	2033 Local Plan	Committed Housing and Office Developments & Local Plan Developments Committed Transport Schemes (including YORR Phase 1). ST15 (partial build out) access 70% via new A65 GSJ & 30% via Elvington Lane.
6	2040 Full build out of ST15 Alternative & Local Plan	Committed Housing and Office Developments & Local Plan Developments Committed Transport Schemes (including YORR Phase 1) ST15 (4000 houses developer proposal) Access preferred option access 70% via new A65 GSJ & 30% via Elvington Lane.
7	2025 DM	Committed Housing and Office Developments Committed Transport Schemes (including YORR Phase 1)
8	2025 Local Plan	Committed Housing and Office Developments & Local Plan Developments Committed Transport Schemes (including YORR Phase 1) Development Site ST15 – access via Elvington Lane
9	2040 Full build out of ST15 & Local Plan Phase 2 YORR	Committed Housing and Office Developments & Local Plan Developments Committed Transport Schemes (including YORR Phase 2) ST15 Access preferred option

3.2 Demand Forecasting for Specific Developments

City of York Council provided the uncertainty log, which lists potential residential and employment development sites in York. The log provided the following details for each potential development:

- location;
- class and quantum of development;
- expected implementation;
- uncertainty status; and
- trip generation (person / cars / public transport) in each time period.

The uncertainty status indicates how likely it is that a development will happen. The uncertainty status and expected implementation, determined whether a development should be included in a forecast modelling scenario. Table 3.2~~Table 3.2~~ presents the definition of uncertainty as per the TAG unit M4.

Outside of the detailed study area, local planning data is less significant. Transport growth has been constrained to TEMPro growth. The uncertainty log is shown in Appendix A.

Table 3.2 Uncertainty Definitions

Uncertainty Classification	Definition of Uncertainty	Status
Near certain	The outcome will happen or there is a high probability that it will happen.	• Intent announced by proponent to regulatory agencies • Approved development proposals • Projects under construction
More than likely	The outcome is likely to happen but there is some uncertainty.	• Submission of planning consent imminent • Development application within consent process
Reasonably foreseeable	The outcome may happen, but there is significant uncertainty.	• Identification within a development plan • No directly associated with the transport strategy, but may occur is the strategy/scheme is implemented • Development conditional upon the transport strategy/scheme proceeding • A committed policy goal, subject to tests (e.g. of deliverability) whose outcomes are subject to significant uncertainty
Hypothetical	There is considerable uncertainty whether the outcome will ever happen	• Conjecture based upon currently available information • Discussed on a conceptual basis • One of a number of possible inputs in an initial consultation process • A policy aspiration

The Do-Minimum scenario included all the Near Certain sites.

The Local Plan Scenarios included Local Plan allocations and all Near Certain and More Than Likely sites.

Based on the above classification, the summary of total developments included in each of the forecast scenario as per uncertainty log is provided in Table 3.3~~Table 3.3~~.

Table 3.3 Total Developments in each forecast scenario

Forecast Scenario	Number of Local Developments
2040 DS (LP)	141
2033 DS (LP)	135
2033 DM	96
2025 DS (LP)	132
2025 DM	95

Developments completed before 2020 have already been included in the base year models.

Proposed network improvements which are likely to be in place by each of the modelled forecast years (2025, 2033 and 2040) are included in the Do-Minimum and Do-Something (Local Plan) network scenarios.

4. Forecast Year Demand

4.1 Overview of Demand Forecasting Procedure

This section details the approach used to produce future year demand matrices. The following datasets were used to produce the forecast~~s~~ matrices:

- Base year traffic model matrices (2019);
- National Trip End Model (NTEM);
- Uncertainty Log; and
- Road Traffic Forecasts (RTF).

The following steps were undertaken to produce demand forecasts:

1. The NTEM planning dataset was used to derive the number of households and jobs at an MSOA level for York for the forecast years. The households and jobs from the local developments were derived from the uncertainty log for the forecast years and forecast scenarios.
2. Growth factors were developed by creating alternative assumptions in TEMPro. The alternative assumptions were based on NTEM household and jobs information and the local developments from uncertainty log. Household and workplace numbers have been removed from TEMPro forecast to get background growth only without the committed schemes.
3. Weighted average growth factors were derived for each user class (Car-Commute, Car-Employer Business and Car-Other). Initial forecast demand was calculated by multiplying base year matrices by average growth factors. The initial forecast demand was then furnessed (doubly constrained) at the STEP zoning level.
4. Scaling factors were used to constrain the initial forecast demand established in Step 3 to TEMPro forecasts. These factors were evaluated separately, one for all trip movements excluding the external-external trip movements which incorporated local development trips from the uncertainty log, while another factor for external-external trip movement excluding the local development trips. This approach was considered reasonable as the local development trips will not be affecting the external-external movement.
5. Trips generated from the local developments were then added to the TEMPro constrained forecast matrices.
6. For fixed assignments without using the bespoke STEP variable demand model, the fuel and income level adjustment factors as per TAG databook were then multiplied to produce the overall car-based matrices.
7. The freight matrices (LGV and HGV) were calculated using the RTF factors for each forecast year.

8. The public transport demand was updated using TEMPro growth factors for bus demand.

Figure 4.1 summarises the matrix development process in a simplified flowchart.

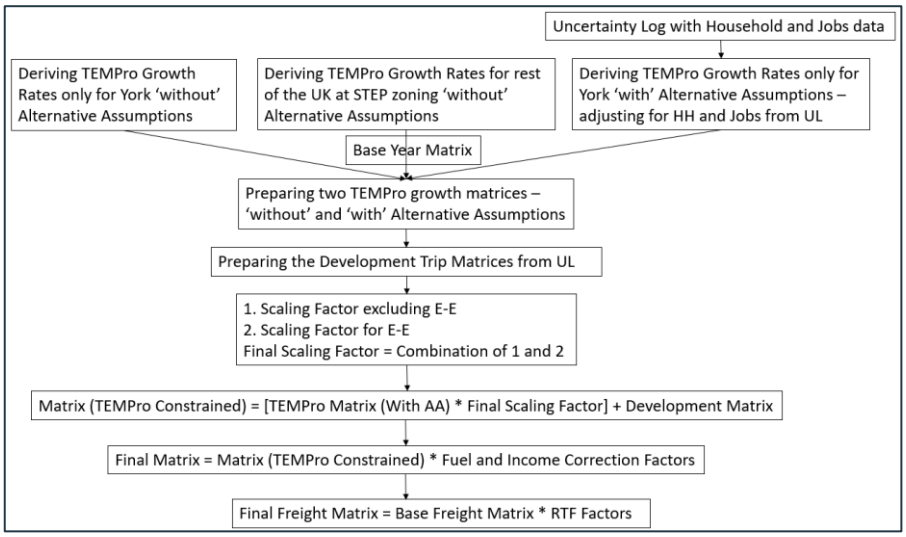


Figure 4.1: Forecast Matrix Development Process

4.2 National Trip End Model

The National Trip End Model (NTEM) provides predictions for the growth of car ownership and traffic, influenced by planning data projections. The predictions are a forecast of vehicle movements and not of personal travel. The latest NTEM V7.2 datasets accessed through the TEMPro v7.2 program have been used to calculate the forecast growth matrices.

4.3 Demand Forecast for Specific Developments

All local developments were assigned to the existing base year traffic model zones (2019) to retain a similar travel characteristic as the base year traffic model. However, for a few of the local developments with high trips and particular access points, it was deemed suitable to add specific shared connectors to the existing base year traffic zones. This process was carried out in consultation with CYC.

4.4 Forecast Trip Generation

The forecast trips generated from local developments were identified in the uncertainty log.

4.5 Development of Freight Matrices

The freight vehicle growth (LGV and HGV) was updated using the latest RTF 2018, which was released in July 2018. The RTF factors were extracted for the York and Humber region. This is in accordance with the guidance provided in TAG unit M4, which states "usually, simpler methods, such as applying single growth factor for the whole matrix will suffice". The RTF factors were evaluated for York & Humber and Rest of the UK. It is to be noted that the external freight trips were multiplied with the Rest of the UK RTF factor. Table 4.1~~Table 4.1~~ presents the RTF factors used for the development of the forecast freight matrices.

Table 4.1 RTF Factors for Freight Matrices

Vehicle Type	Area	2025	2033	2040
LGV	York & Humber	1.0750	1.1810	1.2898
	Rest of the UK	1.0726	1.1786	1.2888
HGV	York & Humber	0.9929	0.9972	1.0045
	Rest of the UK	1.0026	1.0233	1.0509

4.6 Forecast Matrices

The final forecast matrix totals for highway and public transport for the 2025, 2033 and 2040 scenarios are presented in Table 4.2~~Table 4.2~~ and Table 4.3~~Table 4.3~~ respectively.

Table 4.2 Forecast Matrix totals (Highway)

User Class	Matrix Totals				% Difference from Base Matrix		
	Base	2025	2033	2040	2025	2033	2040
				AM			
Commuting	14,538	15,868	17,264	18,217	9%	19%	25%
Business	5,088	5,539	5,944	6,393	9%	17%	26%
Other	16,834	18,141	19,609	21,280	8%	16%	26%
LGV	1,006	1,080	1,187	1,297	7%	18%	29%
HGV	1,734	1,729	1,749	1,777	0%	1%	2%
				IP			
Commuting	3,923	4,067	4,341	4,619	4%	11%	18%
Business	6,660	6,897	7,377	7,873	4%	11%	18%

Other	23,159	24,869	27,028	29,114	7%	17%	26%
LGV	1,238	1,329	1,460	1,596	7%	18%	29%
HGV	1,407	1,403	1,419	1,441	0%	1%	2%
			PM				
Commuting	13,968	15,499	16,040	17,736	11%	15%	27%
Business	4,396	4,775	4,938	5,477	9%	12%	25%
Other	21,681	23,786	24,608	27,664	10%	13%	28%
LGV	880	945	1,039	1,135	7%	18%	29%
HGV	1,227	1,225	1,242	1,266	0%	1%	3%

Table 4.3 Forecast Matrix totals (Public Transport)

User Class	**Matrix Totals**				**% Difference from Base Matrix**		
	Base	**2025**	**2033**	**2040**	**2025**	**2033**	**2040**
			AM				
Commuting	3,067	2,987	2,942	2,828	-3%	-4%	-8%
Business	1,710	1,653	1,633	1,558	-3%	-5%	-9%
Other	3,416	3,400	3,418	3,497	-1%	0%	2%
			IP				
Commuting	2,012	1,945	1,913	1,864	-3%	-5%	-7%
Business	2,478	2,433	2,400	2,331	-2%	-3%	-6%
Other	4,064	3,973	4,015	4,044	-2%	-1%	0%
			PM				
Commuting	3,489	3,247	3,142	3,067	-7%	-10%	-12%
Business	2,087	1,966	1,887	1,849	-6%	-10%	-11%
Other	5,025	4,865	4,870	4,935	-3%	-3%	-2%

5. Forecast Year Supply

5.1 Infrastructure

Committed changes to transport infrastructure are included in the Do-Minimum network and the Do-Something (Local Plan) scenarios. All the committed transport network infrastructure development information was provided by the City of York Council as follows:

1. York Outer Ring Road (YORR) Scheme Dualling (Phase 1);
2. Castle Gateway St. George's Field Multi Story Car Park Scheme;
3. A64/A1237 Askham Bryan junction congestion relief scheme;
4. A64 / Askham Bryan. The right turn from the westbound diverge into Manor Heath (to the south of the junction) will be prohibited;
5. Wigginton Road / Crichton Avenue Signal Refurbishment;
6. York Central Development and York Central Road;
7. York Station Front Change;
8. Groves Low Traffic Neighbourhood; and
9. York Civil Service Housing Development Signalised Junction on A59 near A1237.

The above schemes were coded in the forecast year 2025 and 2040 models in Visum to represent the forecast year transport network for 2025, 2033 and 2040. The details on each of these schemes are presented in the following section.

5.2 Network Changes

York Outer Ring Road Scheme Dualling

Phase 1 of the York Outer Ring Road dualling covers the area between the A19 Shipton Road/A1237 Roundabout till A1237 Little Hopgrove Roundabout as shown in Figure 5.1.

Figure 5.1: York Outer Ring Road Scheme Dualling – Phase 1

The Phase 2 of the York Outer Ring Road dualling begins at the B1224 Wetherby Road Roundabout to A19 Shipton Road/A1237 Roundabout as shown in Figure 5.2. This is not a committed scheme.

Figure 5.2: York Outer Ring Road Scheme Dualling – Phase 2

Castle Gateway St. George's Field Multi Story Car Park Layout

Figure 5.3 presents the new Castle Gateway St. George's Field Multi Story Car Park layout.

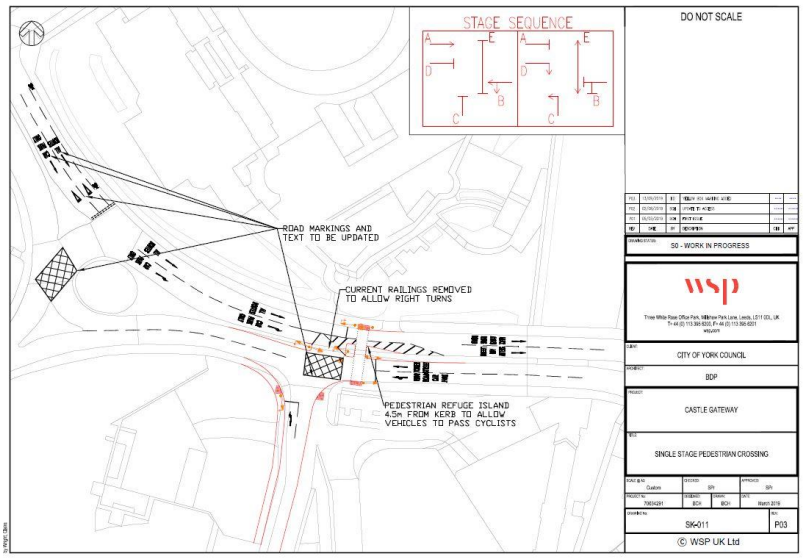
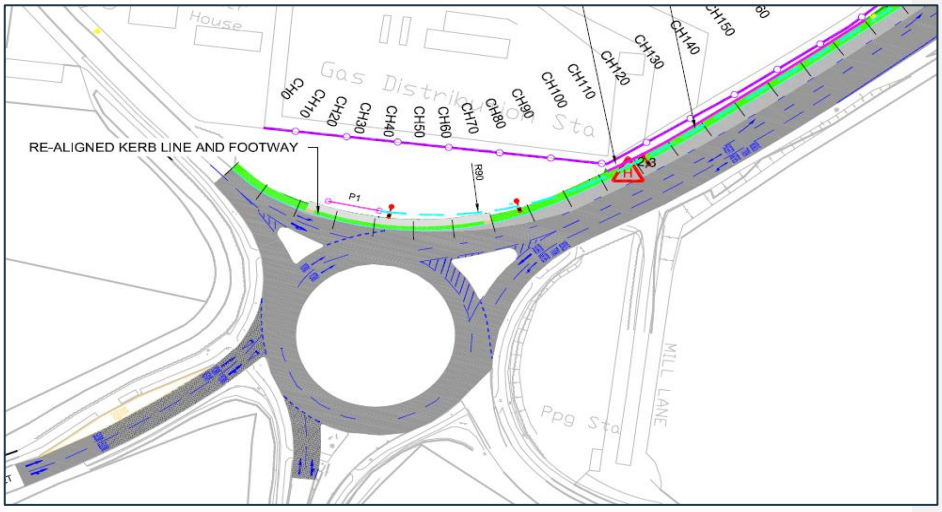


Figure 5.3: Castle Gateway St. George's Field Multi Story Car Park

A64/A1237 Askham Bryan junction congestion relief scheme

The A64/A1237 Askham Bryan junction congestion relief scheme is presented in Figure 5.4~~Figure 5.4~~.

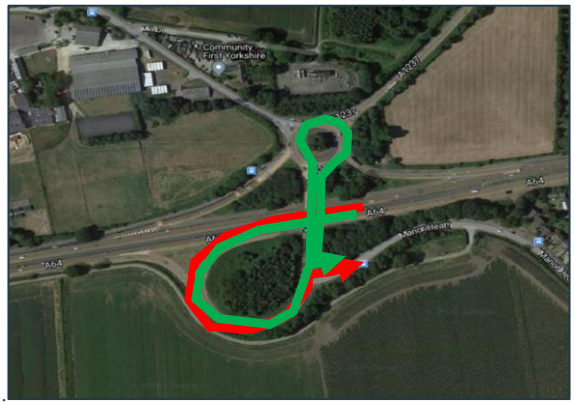


Source: Committed_Schemes.xlsx

Figure 5.4 A64/A1237 Askham Bryan junction congestion relief scheme

A64 / Askham Bryan

The right turn from the westbound diverge into Manor Heath (to the south of the junction) will be prohibited (Red banned / Green new route) as presented in Figure 5.5~~Figure 5.5~~.

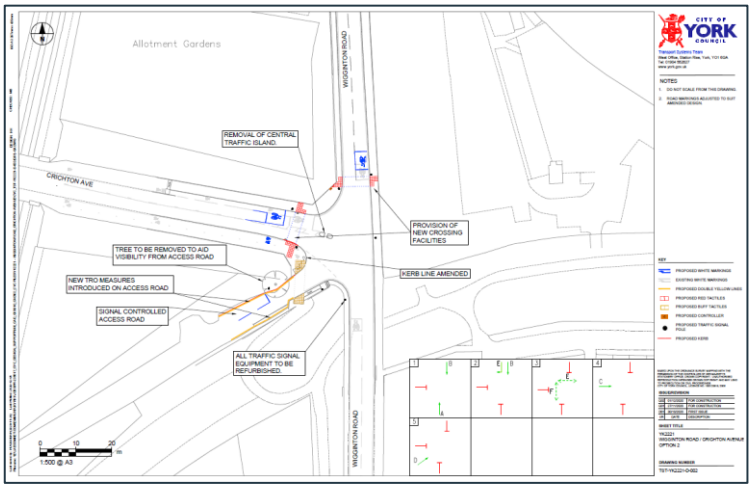


Source: Committed_Schemes.xlsx

Figure 5.5 A64/A1237 Askham Bryan junction right turn prohibition

Wigginton Road / Crichton Avenue Signal Refurbishment

The network update required as part of this scheme involves the provision of a new pedestrian crossing and changes in the signal timings as presented in Figure 5.6~~Figure 5.6~~.



Source: CYC_TST-YK2221-D-002(Q02)-GA-YK2221.pdf

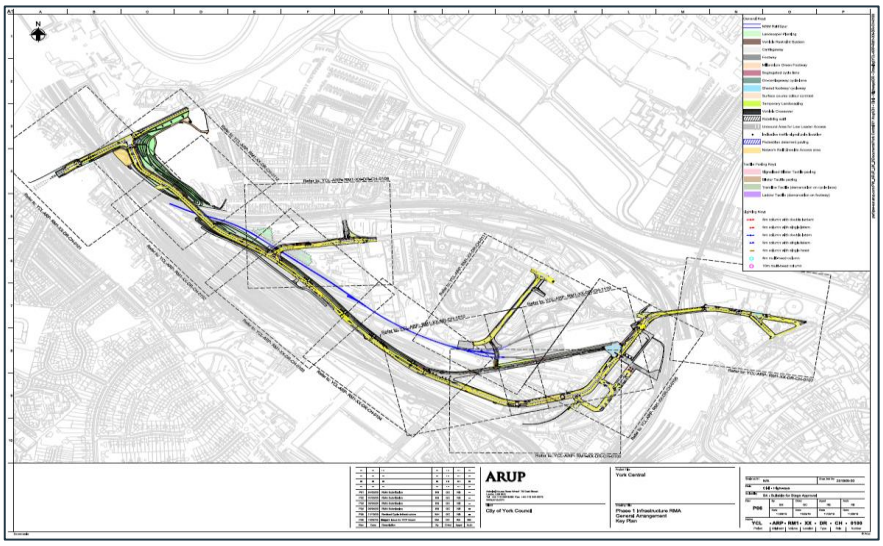
Figure 5.6 Wigginton Road/ Crichton Avenue

York Central Development and York Central Road

The network changes as part of this scheme include a new access road indicated in ~~'blue'~~ Yellow' alignment in Figure 5.7~~Figure 5.7~~. This incorporates a new signal-controlled junction on Water End and link to Leeman Road. Speeds of 31 kph (AM and PM peaks) and link saturation flows of 1800 PCU/h are applied consistently along the links to reflect the proposed highway scheme.

Along with the proposed access road, there are amendments to Leeman Road to include signal-controlled 'shuttle running' through Marble Arch.

There is also the closure of a short stretch of Leeman Road to enable the expansion of the National Railway Museum (west of the link road). This closes the existing route via Salisbury terrace to through-traffic.

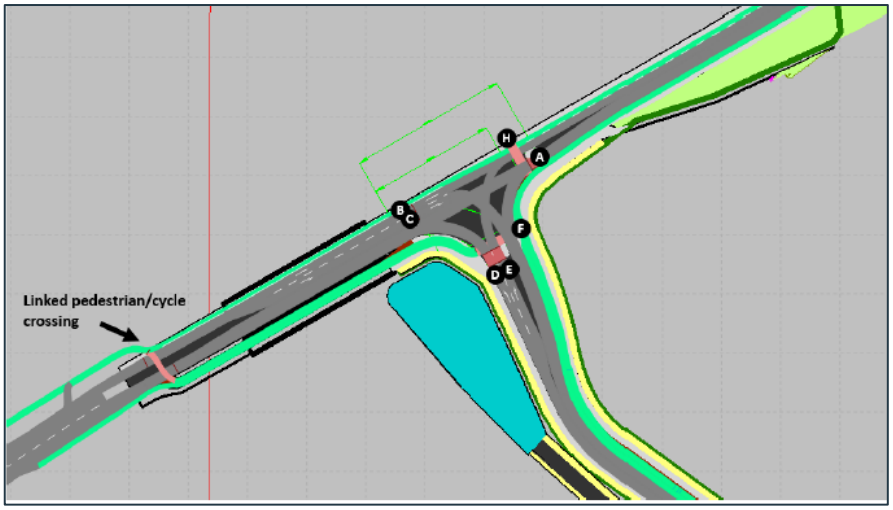


Source: YCL-ARP-RM1-XX-DR-CH-0100.pdf

Figure 5.7 York Central Access Road scheme

The bus stops on the Leeman Road were replaced with new bus stop locations on the York Central Access Road which were coded in the model in line with the scheme drawings provided by ~~the~~ CYC (Ref: YCL-ARP-RM1-XX-DR-CH-0100.pdf).

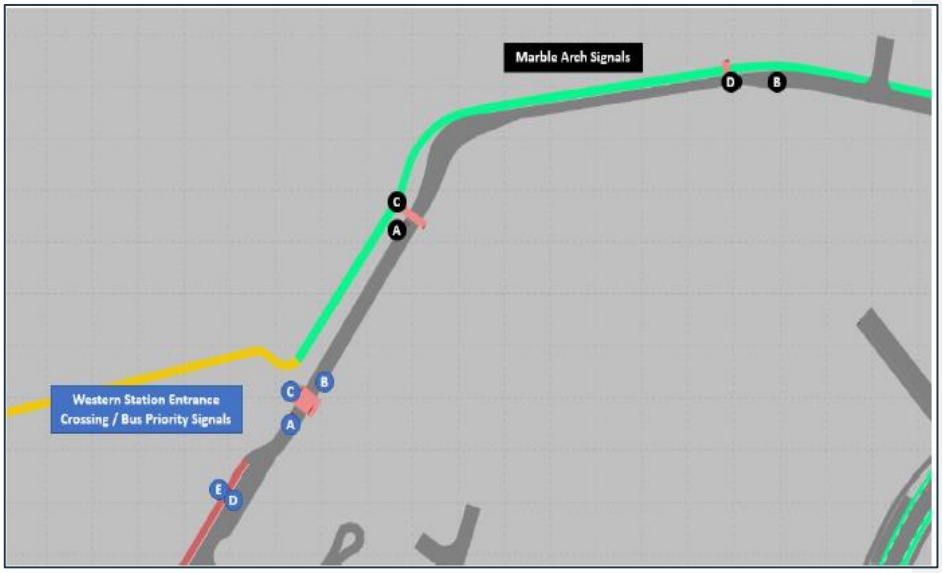
The Water End / Access Road Junction and Marble Arch / Western Station Entrance junction arrangements are presented in Figure 5.8~~Figure 5.8~~.



Source: 2020-10-06 York Central Access Road Signals.pdf

Figure 5.8 Water End/Access Road Junction

The Water End / Access Road Junction and Marble Arch / Western Station Entrance junction arrangements are presented in Figure 5.9~~Figure 5.9~~.

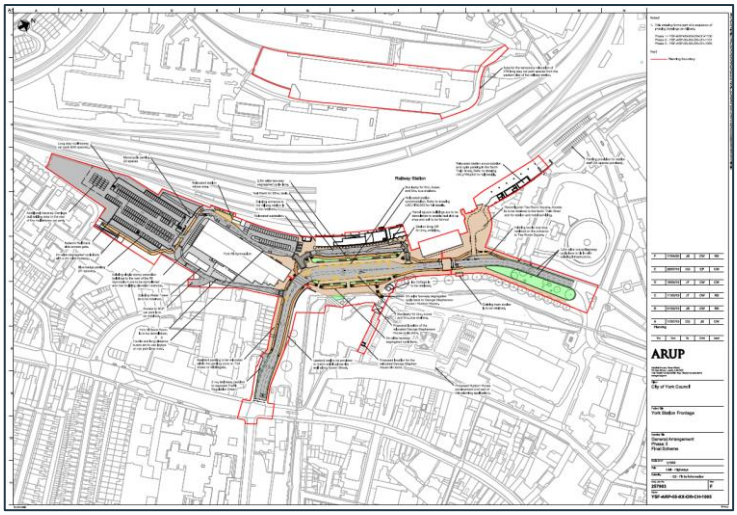


Source: 2020-10-06 York Central Access Road Signals.pdf

Figure 5.9 Marble Arch/Western Station Entrance

York Station Front Change

The proposed York Station Road Front scheme ~~comprises of~~removes ~~the~~ Queen Street Bridge to enable re-grading and realignment of the carriageway and revised access and parking proposals. In addition, Parcel Square, immediately south of the Portico, will be removed to provide additional space for the scheme. The proposed scheme comprises reorganisation of existing infrastructure for pedestrians, cyclists, public transport users as well as provision for taxi and private vehicle drop-off and pick-up and station car parking. In addition, requirements for service vehicle and station operational uses are included. Figure 5.10~~Figure 5.10~~ presents the York Central Road Front scheme.



Source: YSF-ARP-00-XX-DR-CH-1005 Phase 3 Planning GA Rev E_.pdf

Figure 5.10 York Station Road Front

The new bus stop locations on the Station Road were identified and moved accordingly in the forecast model.

Groves Low Traffic Neighbourhood

CYC ~~currently have a trial closure for traffic for~~have implemented a Low Traffic Neighbourhood ~~re~~in a residential area called the Groves. ~~which is likely to become permanent.~~ As such the links highlighted in Figure 5.11~~Figure 5.11~~ were closed for general traffic except for buses and pedestrians while the Brownlow Street was coded as one-way as shown in Figure 5.12~~Figure 5.12~~.

Figure 5.11 Groves Link Closures

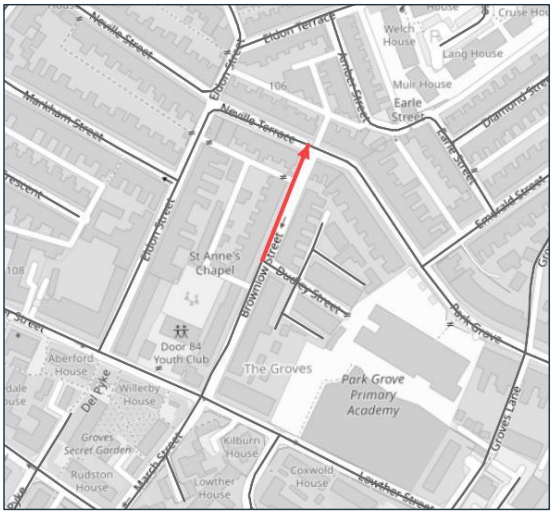
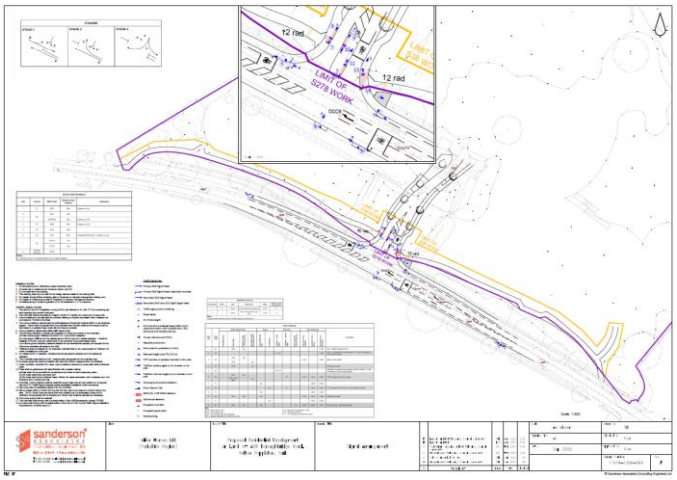


Figure 5.12 Brownlow Street – One-way

York Civil Service Housing Development Signalised Junction on A59 near A1237

The York Civil Service Housing Development junction on A59 near A1237 was changed to a signalised junction with a 120 second cycle time with 7 seconds green time for Stage 1 (Housing Site) presented in Figure 5.13~~Figure 5.13~~.



Source: 11578-1200-003F _ Signal Layout.pdf

Figure 5.13 York Civil Service Housing Development Signalised Junction

6. Assignment Methodology and Convergence Results

6.1 Highway Assignment Procedure

The assignment procedure adopted in PTV Visum for the highway model is based on an equilibrium assignment using Bi-conjugate Frank Wolfe (BFW) (Figure 6.1) assignment with ICA for a typical hour in the morning and evening peaks as well as in the interpeak period, operating within the constraints of the convergence criteria set out in this report.

The Equilibrium assignment Bi-conjugate Frank Wolfe (BFW) is a further development of the method Frank Wolfe (FW). In Visum, the Equilibrium_Lohse assignment becomes a variant of FW if impedances are not smoothed. In this case, the volume is moved towards the shortest paths with a fixed step size. The assignment procedure BFW was implemented based on the publication of Mitradjieva, Lindberg et al (2013). Compared to the Equilibrium_Lohse assignment, convergence is enhanced through the relative gap with the same number of iterations, typically by approx. one to two orders of magnitude, i.e. instead of 1e-003, values of 1e-004 or 1e-005 are obtained. The procedure, as well as the Equilibrium_Lohse assignment, were parallelized and scaled based on the number of cores used, so that runtimes could be significantly reduced using better hardware.

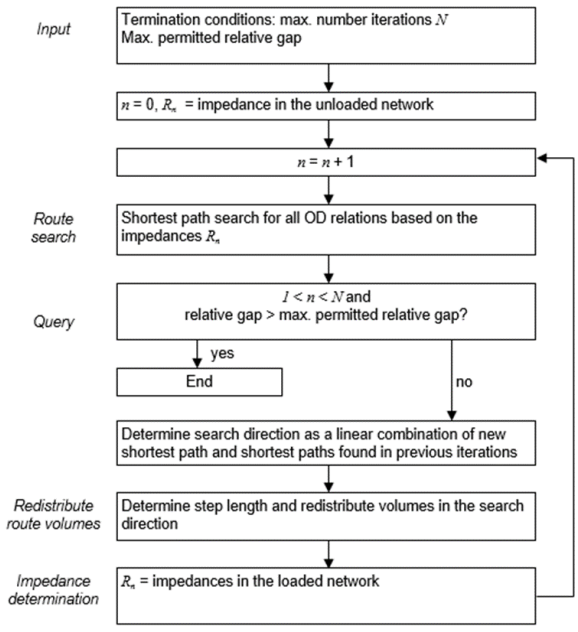


Figure 6.1 Bi-conjugate Frank Wolfe

6.2 PT Assignment Procedure

The public transport assignment methodology used in the STEP model is a timetable-based assignment. This type of approach loads demand onto the actual services based also on the quality of connections rather than a more simplified frequency-based approach which only uses service runtimes and headways. It is used successfully in the UK by Wales and the West Midlands and has been used by German Rail and many other European Rail Operators extensively for many years. Crowding however has not been modelled, this would require additional data regarding the capacities and crowding of current services, would take longer to run and calibrate and would need to be included in the VDM loop.

Timetable-Based Assignment

A search method is called timetable-based if all services of PT lines are considered with their precise departure and arrival times. Timetable-based methods are suitable for assignments and the calculation of indicators when a line network plan and a detailed timetable are available for the PT supply analysed. They take the coordination of the timetable into account and thus ensure very precise results of the indicator data calculation.

The timetable-based method calculates connections for each OD pair. In the search it is assumed that the passengers have timetable information available and choose their access time according to the departure on the first PT line. During the search, the user can influence the kind of connections found in different ways by means of search impedance. For the connection search, two variants (branch & bound search and shortest path search) are offered that represent the different compromises between the number of alternatives on the one hand and the memory and computing time requirements on the other.

During preselection of connections, the connections yielded by the search algorithm are re-analysed by means of general criteria as to whether some of them are of a significantly lower quality and can thus be deleted. During the choice, the demand is distributed to the remaining alternatives based on one of the models described above. The independence of connections can be taken into account if required.

Stochastic Approach

In stochastic assignments, the total demand distributed across these alternatives. This procedure uses alternative routes from origin zone to destination zone and the PT assignment procedure provides alternative connections (routes with detailed departure times).

A distribution model determines the share of demand which is assigned to a certain route. This portion depends on the impedance of a route. In all cases, percentage Pia, of route i, is determined based on the demand of an OD pair within time interval a, so that impedance Ria is applied in a distribution function, allowing the program to calculate utility U_i^a of the route. For this distribution function the Kirchhoff model is used, and the following approach applies to all models:

1. Impedance Ria is converted to the utility Uia of route i in the time interval a:

$$U_i^a = f(R_i^a)$$

2. From this utility Uia the percentage of demand Pia is calculated (where n is the total number of routes).

$$P_i^a = \frac{U_i^a}{\sum_{j=1}^{n} U_i^a}$$

6.3 Generalised Cost Formulations and Parameter Values

For Highway Assignment

PTV Visum can be set to consider route costs as a "generalised cost" which is a combination of time, distance and monetary charges e.g. tolls. The Generalised cost parameter was taken from the TAG data book (October 2019). The formula used is as follows:

C = PPM*T + PPK*D + M

Where:

- C = Generalised Cost;
- PPK = Pence per Kilometre – converts distances into generalised costs;
- PPM = Pence per Minute – converts times into generalised costs;
- T is time in units of minutes;
- D is distance in kilometres; and
- M is monetary charge in pence.

The generalised cost formulations i.e. value of time (VOT) and vehicle operating costs (VOC) were derived using the DfT's latest TAG Databook (July 2020 version). Table 6.1~~Table 6.1~~ presents the values of VOT and VOC used in the STEP traffic model.

Table 6.1 Generalised Cost Formulations

Trip Purpose	2025		2033		2040	
	VOT (pence per minute)	VOC (pence per km)	VOT (pence per minute)	VOC (pence per km)	VOT (pence per minute)	VOC (pence per km)
Car Commute	19.67	5.81	22.65	5.75	25.93	5.70
Car Employer Business	29.37	12.26	33.83	11.70	38.73	11.66
Car Other	8.97	5.81	10.33	5.75	11.84	5.70
LGV	24.73	29.67	28.50	29.74	32.62	29.85
HGV	57.03	41.99	65.73	43.76	75.22	44.61

For Public Transport Assignment

In PTV Visum travellers by public transport mode assess route choice by their utility expressed in terms of a generalised cost. For public transport, the generalised cost is calculated from the access/egress time, fares, in-vehicle time, waiting times and interchange penalty. Generalised costs are measured in units of time. Standard DfT values of time were used to convert the cost of travel into time.

PT generalised cost is defined as:

$$G_{PT} = t_{walk} * v_{walktime} + t_{wait} * v_{waittime} + t_{ride} + \frac{c_{fare}}{VOT} + c_{interchange}$$

where:

- twalk is the total walking time to and from the service;
- twait is the total waiting time for all services used on the journey;
- vwalktime and vwaittime are the weights applied to time spent walking and waiting;
- cfare is the fare;
- cinterchange is the time penalty arising from transferring from one service to another; and
- t_ride is in-vehicle time.

The access/egress time, total wait time, in-vehicle times and the total number of interchanges are extracted from a public transport assignment. The interchange penalty, walking and waiting time weights are based on the TAG recommended values.

The public transport demand is assigned using a timetable-based assignment. Timetable-based methods of assignment are suitable for assignments when a network plan and a detailed timetable are available for the public transport supply. This was considered to be the best approach for assigning public transport demand in the STEP model.

6.4 Convergence Criteria and Standards

The convergence criteria for the model has been set to match those set out in Table 4 of the guidelines (TAG Unit 3.19). The PTV Visum software platform provides output from the model assignment run in the form of %GAP and the % change in link or turning flows over consecutive assignments in the form of a GEH statistic. This GEH statistic is adapted to represent the same standards as set out in the guidance.

Table 6.2 summarises the most appropriate convergence measures as per TAG Unit M3.1 of proximity and stability and the values generally considered acceptable for the use in establishing base model.

Table 6.2 Convergence Criteria

Measure of Convergence	Type	Base Model Acceptable Values
Delta and %GAP	Proximity	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) < 1%	Stability	Four consecutive iterations greater than 98%
Percentage of links with cost change (P2) < 1%		Four consecutive iterations greater than 98%
Percentage change in total user costs (V)		Four consecutive iterations less than 0.1% (SUE only)

Convergence Results

The convergence statistics are included in Table 6.3 to Table 6.5 for the core growth scenario for AM, Inter-peak and PM peak respectively. The convergence results for all the other scenarios (2025, 2033, 2040 Alternative ST15 and 2040 YORR Phase 2) are presented in Appendix B.

Table 6.3 Convergence Statistics – 2040 DS (LP) Scenario 3 – AM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	8.15%	82.96%	81.18%	89.19569	0.001796	354	20.376	0.52
2	5.80%	85.13%	88.69%	12.46923	0.024956	254	16.569	0.799
3	3.29%	86.81%	91.69%	5.277299	0.011835	18	5.717	0.875
4	2.53%	89.31%	94.91%	2.086335	0.004936	3	1.889	0.956
5	2.22%	91.75%	96.45%	1.189054	0.002782	1	1.083	0.983
6	1.82%	92.56%	97.03%	0.976723	0.002363	5	0.929	0.99
7	1.59%	92.86%	97.17%	0.911042	0.002061	1	0.837	0.992
8	1.34%	93.64%	97.51%	0.768753	0.001837	4	0.843	0.995
9	1.09%	94.64%	97.78%	0.759491	0.001786	1	0.565	0.994

10	0.92%	94.49%	97.91%	0.675576	0.001592	0	0.504	0.996
11	5.96%	83.78%	88.57%	9.208024	0.021753	119	6.972	0.781
12	5.49%	88.83%	93.25%	2.954409	0.007057	34	3.206	0.917
13	5.69%	92.64%	95.63%	1.69458	0.004149	8	1.643	0.963
14	3.14%	85.11%	90.57%	5.842108	0.01386	8	4.162	0.843
15	2.42%	88.87%	94.17%	2.196597	0.005388	1	1.917	0.946
16	5.61%	84.53%	90.22%	5.941854	0.014115	19	4.331	0.837
17	5.57%	90.75%	94.62%	2.32046	0.005867	12	2.289	0.946
18	5.48%	92.07%	95.98%	1.671263	0.004233	13	1.482	0.962
19	5.55%	92.55%	95.84%	1.748969	0.004324	3	1.609	0.964
20	5.44%	93.44%	95.98%	1.721535	0.004253	1	1.15	0.966
21	5.58%	93.82%	96.25%	1.478342	0.003765	8	1.365	0.968
22	5.61%	93.09%	96.11%	1.704665	0.004536	9	1.516	0.965
23	5.79%	92.46%	95.48%	1.974749	0.004782	3	1.751	0.961
24	5.76%	93.60%	95.85%	1.886557	0.004741	0	1.832	0.959
25	5.61%	94.07%	96.26%	1.535833	0.00385	0	1.577	0.967
26	3.09%	84.64%	89.96%	6.683465	0.01599	1	4.369	0.825
27	5.17%	84.82%	89.64%	6.894361	0.016638	4	4.46	0.821
28	2.90%	84.98%	90.03%	6.412185	0.014684	4	4.258	0.829
29	3.00%	85.24%	90.89%	5.086521	0.012268	5	2.43	0.855
30	5.52%	84.89%	90.78%	5.644372	0.013486	12	4.229	0.853
31	5.58%	89.50%	93.69%	2.935135	0.007238	6	2.614	0.926
32	2.45%	84.26%	89.50%	7.335352	0.017232	1	4.184	0.81
33	4.96%	84.24%	89.29%	7.606709	0.018269	2	3.885	0.808
34	2.38%	84.04%	89.33%	7.458219	0.017214	0	4.01	0.811
35	5.24%	84.04%	89.36%	7.47834	0.017641	0	3.927	0.808
36	5.19%	90.94%	95.15%	1.927268	0.004527	1	1.53	0.958
37	2.60%	84.65%	89.97%	6.579619	0.015984	0	3.049	0.831
38	2.05%	87.27%	93.30%	3.085721	0.007634	0	1.771	0.926

39	2.15%	88.17%	93.74%	2.762021	0.007136	1	1.427	0.934
40	5.66%	84.25%	89.18%	7.647666	0.018125	25	4.97	0.809
41	2.21%	84.16%	88.92%	8.042338	0.019019	1	4.88	0.804
42	1.43%	89.80%	94.95%	1.940817	0.004843	2	1.389	0.957
43	1.16%	92.87%	97.04%	0.966251	0.002411	0	0.677	0.991
44	1.06%	93.49%	97.10%	0.957679	0.002426	0	0.576	0.989
45	0.93%	93.40%	97.28%	0.956915	0.002541	0	0.705	0.989
46	0.77%	95.38%	98.01%	0.70459	0.001851	0	0.493	0.995
47	0.67%	96.18%	98.37%	0.53126	0.001279	0	0.407	0.999
48	0.66%	94.51%	97.59%	0.850234	0.002058	1	0.689	0.991
49	0.56%	96.36%	98.31%	0.57194	0.00136	0	0.488	0.995
50	0.53%	97.03%	98.70%	0.466748	0.001091	0	0.443	0.998
51	0.46%	96.95%	98.57%	0.502685	0.00118	0	0.53	0.997
52	0.39%	97.59%	98.94%	0.384239	0.000897	0	0.324	0.999
53	0.35%	97.69%	98.99%	0.359113	0.000843	0	0.291	0.999
54	0.32%	97.40%	98.75%	0.412254	0.000969	0	0.319	0.998
55	0.29%	95.95%	98.17%	0.561396	0.001401	0	0.293	0.995
56	0.29%	95.74%	98.19%	0.622289	0.001532	0	0.478	0.994
57	0.24%	97.44%	98.82%	0.415747	0.000994	0	0.372	0.998
58	0.22%	97.29%	98.71%	0.402833	0.000985	0	0.285	0.998

Table 6.4 Convergence Statistics – 2040 DS (LP) Scenario 3 – Inter-Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	7.74%	84.48%	81.97%	73.58848	0.001998	245	17.922	0.528
2	3.12%	86.91%	90.40%	8.273593	0.019742	128	14.14	0.845
3	2.10%	89.51%	94.51%	2.730047	0.006803	7	3.684	0.934

4	1.72%	93.98%	97.15%	0.918233	0.002412	0	0.965	0.985
5	1.42%	93.72%	97.49%	0.790939	0.001936	1	1.049	0.993
6	1.19%	95.31%	97.95%	0.640874	0.001594	1	0.647	0.993
7	0.98%	95.68%	98.19%	0.578439	0.001384	2	0.847	0.996
8	0.86%	96.38%	98.46%	0.49546	0.001162	1	0.629	0.996
9	0.76%	97.47%	98.86%	0.379453	0.000948	4	0.598	0.998
10	0.74%	96.54%	98.55%	0.542931	0.001365	2	0.942	0.994
11	0.70%	96.19%	98.44%	0.604289	0.001416	1	1.054	0.995
12	0.60%	95.96%	98.22%	0.627982	0.001551	1	0.918	0.992
13	0.51%	97.17%	98.75%	0.399281	0.001015	0	0.439	0.998
14	0.45%	96.84%	98.77%	0.431347	0.001153	0	0.346	0.997
15	0.36%	95.85%	98.13%	0.622488	0.001683	1	0.372	0.992
16	0.31%	96.45%	98.53%	0.513697	0.001365	0	0.418	0.995
17	0.25%	98.32%	99.23%	0.256736	0.000644	0	0.286	1
18	0.22%	98.34%	99.38%	0.260081	0.000624	0	0.259	0.999
19	0.19%	98.25%	99.23%	0.276599	0.000708	0	0.259	0.999

Table 6.5 Convergence Statistics – 2040 DS (LP) Scenario 3 – PM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	9.72%	82.45%	80.83%	95.37425	0.002614	339	20.279	0.52
2	6.51%	84.86%	88.06%	14.58187	0.027991	289	18.642	0.785
3	4.09%	86.71%	91.34%	4.916172	0.010563	36	5.128	0.884
4	3.64%	90.71%	95.66%	1.646717	0.003784	7	1.393	0.974
5	3.15%	91.40%	96.30%	1.31145	0.003124	3	1.15	0.979
6	2.77%	92.70%	96.70%	1.11867	0.002481	6	0.892	0.986
7	2.48%	94.30%	97.50%	0.79136	0.001842	5	0.648	0.994

8	2.17%	94.62%	97.65%	0.759543	0.0017	4	0.583	0.995
9	1.95%	94.72%	97.83%	0.702927	0.001568	1	0.67	0.995
10	1.64%	95.23%	97.90%	0.695888	0.001575	0	0.657	0.994
11	1.42%	95.47%	98.05%	0.645557	0.001441	0	0.571	0.995
12	1.27%	95.82%	98.19%	0.591271	0.001344	5	0.514	0.997
13	1.10%	95.60%	98.24%	0.570009	0.001333	3	0.43	0.997
14	1.01%	95.96%	98.32%	0.538909	0.001242	0	0.436	0.998
15	0.85%	96.07%	98.26%	0.563343	0.001321	2	0.46	0.996
16	0.79%	94.69%	97.70%	0.774127	0.001885	3	0.507	0.991
17	0.71%	95.68%	98.08%	0.66347	0.001601	1	0.343	0.993
18	0.57%	96.55%	98.48%	0.519658	0.001217	1	0.336	0.998
19	0.52%	96.84%	98.46%	0.498922	0.001193	2	0.281	0.997
20	0.47%	97.04%	98.71%	0.458341	0.001045	2	0.335	0.998
21	0.39%	97.23%	98.72%	0.433215	0.00098	0	0.295	0.998
22	0.35%	97.26%	98.87%	0.400149	0.000945	4	0.302	0.998
23	0.31%	97.18%	98.82%	0.419737	0.000955	1	0.327	0.998
24	0.28%	96.77%	98.62%	0.471797	0.001069	4	0.353	0.998
25	0.26%	96.89%	98.66%	0.472466	0.00109	0	0.355	0.997
26	0.25%	97.06%	98.73%	0.416482	0.000984	1	0.354	0.999

It is observed that all three peak periods (AM, IP and PM) of 2040 DS (LP) Scenario 3 as well as 2040 Alternative ST15, 2040 YORR Phase 2, 2025 and 2033 scenarios (Appendix B) converge in line with the TAG unit M3.1 criteria on percentage of links with cost (impedance) change. The process of 'Assignment with ICA' was essentially split into two stages, an inner (subordinate) assignment and an outer assignment ('Assignment with ICA'). The subordinate assignment calculated approximate demand volumes and journey times for links and turns based on the previous outer iteration, and these were subsequently adjusted by blocking back and ICA. This process was iterated until acceptable convergence was reached.

7. Model Results

7.1 Traffic Flow Difference Plots

Figure 7.1 and
Figure 7.2 ~~Figure 7.2~~ show examples of flow difference (vehicles per hour) plots comparing the DS (LP) and DM scenarios (DS (LP) – DM) for 2025 and 2033 in the AM, respectively.

Figure 7.1 Flow Difference Plot: 2025 AM DS (LP) (Scenario 8) – 2025 AM DM (Scenario 7)

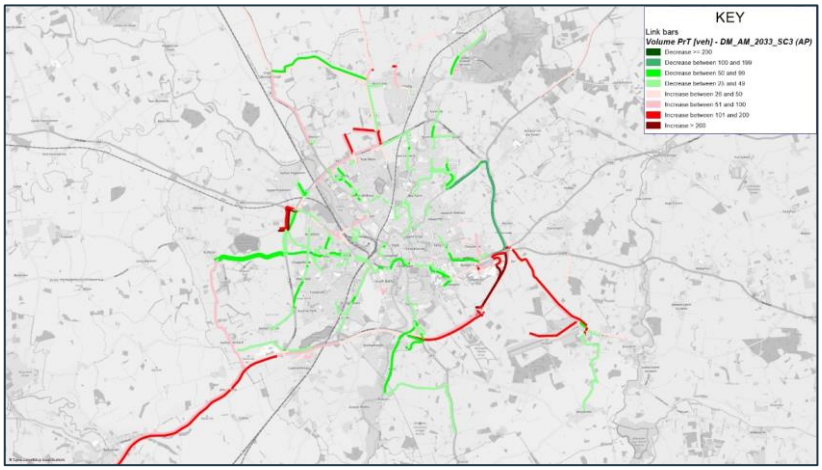


Figure 7.2 Flow Difference Plot: 2033 AM DS (LP) (Scenario 5) – 2033 AM DM (Scenario 4)

The shades of red colour indicate an increase in traffic flows while the shades of green colour indicate a decrease in traffic flows.

In addition to the flow difference plots presented above, similar flow difference plots were prepared for the following scenarios:

- Between 2033 DS (LP) and 2025 DS (LP)
- Between 2040 DS (LP) and 2033 DS (LP)
- Between 2040 DS (LP) and 2033 DS (LP)
- Between 2040 DS (LP) Scenario 3 and
    - 2040 DS (LP) Scenario 1;
    - 2040 DS (LP) Scenario 2;
    - 2040 Alternative ST15 site access DS (LP) Scenario 6; and
    - 2040 Phase 2 YORR Scenario 9.

All traffic flow difference plots are included in the document 807952_CoY Local Plan Modelling Outputs.docx.

7.2 Traffic Flow Volume Plots

Figure 7.3 and Figure 7.4 below show examples of traffic flow plots which illustrate the volume of traffic (vehicles per hour) on the road network for 2025 DS (LP) and 2033 DS (LP) respectively in the AM peak. The darker shades indicate a higher level of traffic on the links while lighter shades correspond to lower level of traffic. All remaining traffic flow plots are included in the document 807952_CoY Local Plan Modelling Outputs.docx.

Figure 7.3 Traffic flow plots – 2025 DS (LP) – AM peak

Figure 7.4 Traffic flow volume plots – 2033 DS (LP) – AM peak

Traffic flow volumes have also been extracted for all critical links on the network and are presented in a tabular format (vehicles per hour) in the document 807952_CoY Local Plan Modelling Outputs.docx.

7.3 Queue Length Plots

Queue length plots have been produced for four critical junctions on the A64:

- A64/A1237 junction;
- A64/A19 Fulford roundabout;
- A64/Hull Road Grimston Bar roundabout;
- A64/A1237 Hopgrove roundabout.

Figure 7.5 and Figure 7.6 show examples of queue length plots at the A64/A19 Fulford Roundabout in the AM peak for the 2025 DS (LP) and 2033 DS (LP) scenarios, respectively.

Figure 7.5 Queue Length Plots – 2025 DS (LP) – AM peak

Figure 7.6 Queue Length Plots – 2033 DS (LP) – AM peak

Similar queue length plots have been produced for all critical junctions on the A64 for all relevant scenarios. These are included in the document 807952_CoY Local Plan Modelling Outputs.docx.

7.4 Journey Times

Figure 7.7 presents the 16 journey time routes analysed for each of the modelling scenarios.

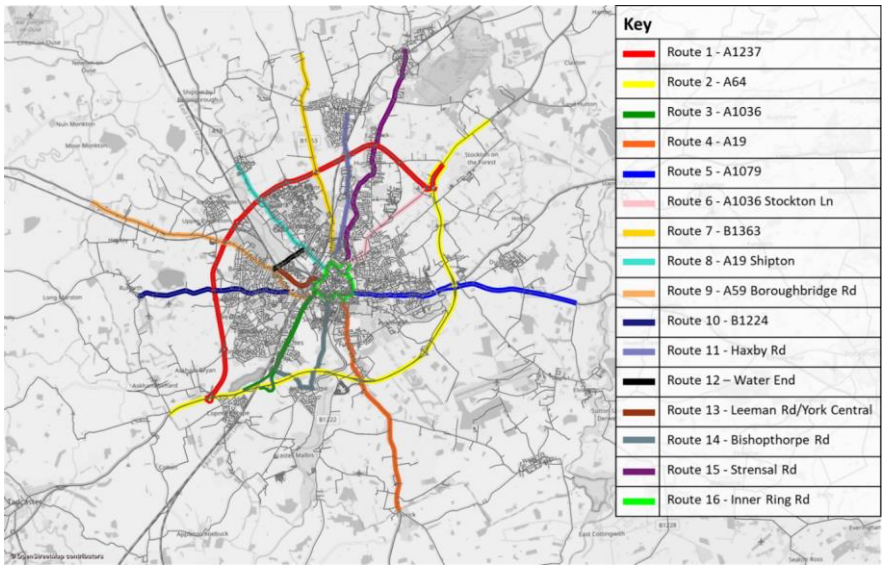
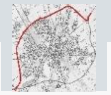
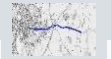


Figure 7.7 Journey Time Routes

~~The j~~Journey time~~s~~ results for the 2019 Base, 2025 DS (LP), 2033 DS (LP) and 2040 DS (LP) Scenario 3 for each time period are presented in Table 7.1. The journey times for the remaining scenarios 2025 DM, 2033 DM, 2040 DS (LP) Alternative Scenario and 2040 DS (LP) Phase 2 are presented in Appendix C.

Table 7.1 Journey Times (mm:ss) – 2019 Base, 2025 DS (LP), 2033 DS (LP) and 2040 DS (LP) Scenario 3

Route ID	Route Number	Direction	Route Name	Route Location	2019			2025 DS (LP)			2033 DS (LP)			2040 DS (LP)		
					AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
1	Route 1	NB	A1237 NB		27:44	23:23	34:57	31:22	22:25	34:42	33:49	25:31	35:52	33:13	27:05	40:59
2	Route 1	SB	A1237 SB		27:48	23:06	31:45	30:44	21:47	34:42	33:15	25:08	35:43	34:13	26:39	38:53
3	Route 2	NB	A64 NB		17:27	15:31	16:45	17:55	15:41	17:19	18:14	15:55	17:31	18:33	16:08	17:47
4	Route 2	SB	A64 SB		16:40	15:19	16:36	17:10	15:32	16:58	17:23	15:44	17:04	17:39	15:57	17:22
7	Route 3	NB	A1036 Inbound		18:27	13:39	17:01	21:17	14:59	17:31	20:12	15:28	18:06	21:31	16:35	19:21
8	Route 3	SB	A1036 Outbound		14:44	13:44	15:55	15:58	13:56	16:36	16:30	14:12	17:04	17:18	14:30	19:22
9	Route 4	NB	A19 Inbound		20:07	12:18	14:36	20:38	12:24	16:14	21:52	13:01	16:36	24:11	13:51	19:08
10	Route 4	SB	A19 outbound		11:46	12:07	15:59	12:01	12:09	17:00	12:20	12:27	18:11	13:34	13:02	23:12
11	Route 5	WB	A1079 Inbound		18:32	17:07	16:09	19:09	15:34	17:06	20:53	17:40	19:00	21:39	20:19	21:57
12	Route 5	EB	A1079 Outbound		13:59	13:43	16:40	14:35	14:23	18:15	15:55	15:09	20:02	17:32	16:55	24:35
13	Route 6	SB	A1036 Inbound		09:37	07:51	10:19	09:45	08:08	10:41	11:09	08:12	10:27	12:08	08:25	11:42

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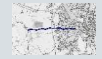
Route ID	Route Number	Direction	Route Name	Route Location	2019			2025 DS (LP)			2033 DS (LP)			2040 DS (LP)		
					AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
14	Route 6	NB	A1036 Outbound		08:19	08:07	09:00	09:07	08:50	09:46	09:34	09:02	09:47	10:03	09:25	11:13
15	Route 7	SB	B1363 Inbound		16:55	13:22	15:37	16:27	13:30	14:34	18:17	14:03	15:26	19:24	14:37	16:59
16	Route 7	NB	B1363 Outbound		13:18	13:16	14:55	13:41	13:02	14:55	14:01	13:13	15:13	14:09	13:17	16:22
17	Route 8	SB	A19 Shipton Inbound		17:23	10:31	14:49	17:11	10:21	12:17	19:58	10:32	13:01	21:01	11:24	15:48
18	Route 8	NB	A19 Shipton Outbound		11:38	10:37	12:40	11:50	10:51	13:15	12:34	10:59	13:29	12:42	11:10	15:38
19	Route 9	EB	A59 BB Road Inbound		15:54	14:20	15:25	15:56	14:25	15:41	17:21	14:43	16:40	21:43	14:58	16:14
20	Route 9	WB	A59 BB Outbound		15:02	14:12	14:38	15:33	14:28	14:45	16:56	14:44	14:53	21:31	14:57	15:19
21	Route 10	EB	B1224 Inbound		11:06	10:11	11:29	11:19	10:13	11:59	11:41	10:16	11:59	11:52	10:28	12:44
22	Route 10	WB	B1224 Outbound		10:15	09:23	10:09	10:24	09:25	10:13	10:34	09:29	10:13	11:06	09:36	10:18
23	Route 11	SB	Haxby RD Inbound		15:38	15:33	14:06	16:04	16:20	15:27	16:52	17:11	16:16	17:17	18:08	17:06

Route ID	Route Number	Direction	Route Name	Route Location	2019			2025 DS (LP)			2033 DS (LP)			2040 DS (LP)		
					AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
24	Route 11	NB	Haxby RD outbound		13:58	13:33	14:56	14:13	14:19	15:48	14:24	14:29	15:47	14:30	14:42	16:27
25	Route 12	NB	Waterend to northeast		03:39	03:24	04:00	05:01	03:42	04:20	05:39	03:50	04:27	05:45	03:58	04:44
26	Route 12	SB	Waterend to southwest		06:35	03:34	03:53	06:52	03:53	06:10	06:53	04:01	06:31	08:16	04:06	09:35
27	Route 13	EB	LeemanRD / YorkCentral Inbound		-	-	-	05:11	04:57	05:01	05:11	05:03	05:05	05:18	05:11	05:18
28	Route 13	WB	Leeman Road / York Central Outbound		-	-	-	07:22	07:05	06:50	08:06	07:21	06:58	10:35	07:38	07:21
29	Route 14	NB	Bishopthorpe RD Inbound		15:17	11:34	14:32	18:20	14:19	17:35	18:51	14:38	17:28	19:06	14:48	17:48
30	Route 14	SB	Bishopthorpe RD Outbound		12:02	11:19	12:42	12:27	11:50	13:34	12:43	11:58	13:54	13:05	12:06	15:02
31	Route 15	SB	Strensal Road Inbound		20:19	17:11	17:54	20:37	17:36	18:26	21:04	18:10	18:16	21:20	18:30	19:02
32	Route 15	NB	Strensal RD Outbound		16:36	16:06	17:18	17:04	16:40	18:23	17:22	16:59	18:14	17:39	17:27	19:36

Route ID	Route Number	Direction	Route Name	Route Location	2019			2025 DS (LP)			2033 DS (LP)			2040 DS (LP)		
					AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
33	Route 16	Clockwise	Inner Ring Road Clockwise		21:53	21:40	24:12	22:38	24:01	27:31	24:52	26:30	28:42	25:59	29:22	33:44
34	Route 16	Anti-Clockwise	Inner Ring Road Anti-Clockwise		23:02	20:19	25:11	24:48	27:08	28:35	25:37	27:46	28:55	26:12	29:36	32:00

- Route 13 in the Base model does not have the new Leeman road route.

8. Summary and Conclusions

Based on the network performance analysis between the 2040 DS (LP) Scenario 1 (ST15 access 100% via Elvington Lane), 2040 DS (LP) Scenario 2 (ST15 access 100% via new A64 Grimston Bar junction) and 2040 DS (LP) Scenario 3 (ST15 access 70% via new A64 Grimston Bar junction and 30% via Elvington Lane), it was concluded that the 2040 DS (LP) Scenario 3 is the preferred option.

The analysis of the journey times shows that in general, there is an increase in journey times between the base model and forecast year models (2025, 2033 and 2040).

The journey time comparison between the 2025 DM and 2025 DS (LP) scenarios indicated a modest variation between 0-1 minutes while between the 2033 DM and 2033 DS (LP) scenarios, a variation between 0-3 minutes.

The journey time comparison between the Base 2019 and 2025 DS (LP) models indicated that the variation in the journey time ranges between 0 – 3.5 minutes. The most notable increase in the journey time is observed on Route 1 (A1237) in the AM peak and on Route 16 (Inner Ring Road) in the PM peak.

The journey time comparison between the 2025 DS (LP) and 2033 DS (LP) scenarios indicated that the variation ranges from 0 – 3 minutes with the most notable increase on Route 8 (A19 Shipton Road), while between the 2033 DS (LP) and 2040 DS (LP) scenarios, it ranges from 0 – 5 minutes with the most notable increase on Route 1 (A1237).

Appendix A
Uncertainty Log

Table A.1 Uncertainty Log Developments

Ref	Alloc Ref	Development	Land Use	Status of Proposal	A1 (incl. A2) (non-food)	A1 (incl. A2) (food)	A3 (incl. A4, A5)	B1	B2	B8	C1 (incl. C2)	C3 (Houses)	C3 (Flats)	D1 & D2
					(GFA m^2)	(GFA m^2)	(GFA m^2)	(GFA m^2)	(GFA m^2)	(GFA m^2)	(GFA m^2)	(No. of Dwelling)	(No. of Dwelling)	(GFA m^2)
1	ST1	British Sugar	Residential	Near Certain								1,200		
2	ST2	Civil Service Sports Ground	Residential	Near Certain								266		
3	ST4	Land adj Hull Road	Residential	More than Likely								211		
4	ST5	York Central	Residential	Near Certain								2,500		
5	ST7	Land East of Metcalfe Lane	Residential	Reasonably Foreseeable								845		
6	ST8	Land North of Monks Cross	Residential	Near Certain								970		
7	ST9	Land North of Haxby	Residential	Reasonably Foreseeable								735		

8	ST14	Land to West of Wigginton Road	Residential	Reasonably Foreseeable	1,348	
9	ST15	Land to west of Elvington Lane	Residential	Reasonably Foreseeable	3,339	
10	ST16	Terry's Phase 1,2,3	Residential	More than Likely	227	90
11	ST17	Nestle	Residential	Near Certain	704	
12	ST31	Land South of Tadcaster Rd Copmanthorpe	Residential	More than Likely	158	
13	ST32	Hungate (Phases 5+)	Residential	More than Likely		375
14	ST33	Station Yard, Wheldrake	Residential	More than Likely	147	
15	H1	Former gas works, 24 Heworth Green	Residential	Near Certain	607	
16	H3	Burnholme School	Residential	Near Certain	72	
17	H5	Lowfield School	Residential	Near Certain	165	
18	H6	Land R/O The Square	Residential	Near Certain	16	
19	H7	Bootham Crescent	Residential	Near Certain	93	
20	H8	Askham Bar Park and Ride Site	Residential	Reasonably Foreseeable	60	
21	H20	Oakhaven EPH	Residential	Reasonably Foreseeable	56	

22	H22	Heworth Lighthouse	Residential	Near Certain			15
23	H23	Grove House EPH	Residential	Near Certain			29
24	H29	Land at Moor Lane, Copmanthorpe	Residential	More than Likely			88
25	H31	Eastfield Lane Dunnington	Residential	Near Certain			76
26	H38	Land RO Rufforth Primary School	Residential	Reasonably Foreseeable			33
27	H39	North of Church Lane Elvington	Residential	Reasonably Foreseeable			32
28	H46	Land to North of Willow Bank and E Haxby Rd	Residential	More than Likely			104
29	H10	The Barbican	Mixed	Near Certain	373		187
30	H56	Land at Hull Road	Residential	More than Likely			69
31	H55	Land at Layerthorpe	Residential	Near Certain			20
32	H52	Willow House EPH	Residential	Reasonably Foreseeable			15
33	H53	Land at Knapton Village	Residential	Reasonably Foreseeable			4
34	ST5	York Central	Employment	Near Certain		70,000	
35	ST27	University of York	Employment	Reasonably Foreseeable		21,500	

36	ST26	Land South of Elvington Airfield	Employment	Reasonably Foreseeable	9,080	8,000	8,000			
37	ST19	Northminster Business Park	Employment	Reasonably Foreseeable	19,800	14,850	14,850			
38		Vacant Site Eboracum Way	Residential	Near Certain						62
39		Frederick House Fulford Road	Residential	Near Certain						232
40	E8	Wheldrake Industrial Estate	Employment	Reasonably Foreseeable	495	495	495			
41	E9	Elvington Industrial Estate	Employment	Reasonably Foreseeable	1,100	1,100	1,100			
42	E10	Chessingham Park, Dunnington	Employment	Reasonably Foreseeable	300	246	246			
43	E11	Annamine Nurseries	Employment	Reasonably Foreseeable	1,150	1,150	1,000			
44	E16	Poppleton Garden Centre	Employment	Reasonably Foreseeable	3,080	3,080	3,080			
45	ST32	Hungate Development Site (Blocks D, F, G & H)	Residential	Near Certain						101
46		Northern House Rougier Street	Residential	Near Certain						58
48	ST22	Germany Beck Site East of Fordlands Road	Residential	Near Certain					579	76
50		(Phase 3 & 4) Land to West of Metcalfe Lane Osbaldwick	Residential	Near Certain					211	43

51		Former Terrys Factory Bishopthorpe Road Phase II	Residential	Hypothetical				97	145	
54		Former Terrys Factory Bishopthorpe Road Phase III	Mixed	Near Certain					163	
55		Hudson House Toft Green	Residential	Near Certain					127	
71		OS Field 2424, Wisker Lane, Earswick	Employment	Near Certain		437			-	
91		Monks Cross Shopping Park Trust Monks Cross Drive Huntington York YO32 9GX	Employment	Near Certain	4,434				73	
104		"Peter Slights Car Sales Pigeon Cote Garage Julia Avenue Huntington York YO32 9JR	Employment	Near Certain	700					
110		Huntington Stadium Jockey Lane Huntington York YO32 9JS	Employment	Near Certain	5324	1493				21793
279		Proposed Leisure Units York Community Stadium Kathryn Avenue Huntington York YO32 9AF	Employment	Near Certain						5382
129	ST36	Imphal Barracks Fulford Road	Residential	Reasonably Foreseeable				769		

		York YO10 4HD										
131		Stonebow House The Stonebow York YO1 7NY	Employment	Near Certain								900
134		Rosti Automotive Stamford Bridge Ltd The Warehouse Stamford Bridge Road Dunnington York YO19 5LN	Employment	Near Certain				1380	-			
135		The Guildhall Coney Street York YO1 9QN	Employment	Near Certain	698	66						
137		Red Lodge Haxby Road York	Employment	Near Certain					8,984			
138		Mack & Lawler Builders Ltd 2A Low Ousegate York YO1 9QU	Employment	Near Certain							5	
141	E18	Towthorpe Lines	Employment	Reasonably Foreseeable		4,400	4,400	4,400			-	
185		P And T Contracts Westfields Hull Road Dunnington	Employment	Near Certain		330						

	York YO19 5LP							
186	Arabesque House Monks Cross Drive Huntington York	Employment	Reasonably Foreseeable				56	
189	Bootham School 51 Bootham York YO30 7BT	Employment	Near Certain			432		
190	Hudson House Toft Green York YO1 6JT	Employment	Near Certain	465	4252			
192	Hall Farm Strensall Road York YO32 9SW	Employment	Near Certain					1913
193	Aviva Yorkshire House 2 Rougier Street York YO1 6HZ	Employment	Near Certain			10,240		
195	Former Saxon House Hotel 71 -73 Fulford Road York YO10 4BD	Employment	Reasonably Foreseeable				10	
198	Burnholme Community Hub Bad Bargain Lane	Employment	Near Certain			3,904		

	York YO31 0GW							
205	Fiesta Latina 14 Clifford Street York YO1 9RD	Employment	Near Certain					10
206	The Kilima Hotel 129 Holgate Road York YO24 4AZ	Employment	Near Certain				432	
207	23 Piccadilly York	Employment	Near Certain					24
209	The Former Liquor Store Bishopthorpe Road York	Employment	Near Certain	42	196			
216	Hungate Development Site Hungate York	Employment	Near Certain	150	150			
218	Ryedale House 58 - 60 Piccadilly York	Employment	Near Certain					77
219	Wolseley Uk Ltd James Street York YO10 3WW	Employment	Near Certain	1,753				
225	Gem Construction & Shopfitting Ltd North Lodge Clifton Park Avenue	Employment	Near Certain					14

	York YO30 5YX											
227	Burton Stone Community Centre Evelyn Crescent York YO30 6DR	Employment	Near Certain						2,773			
228	90 The Mount York	Employment	Near Certain									
230	Bathurst House 86 Micklegate York YO1 6LQ	Employment	Near Certain							1		
233	Newsham House Main Street Holtby York YO19 5UD	Employment	Near Certain							4		
235	23 Piccadilly York YO1 9PG	Employment	Near Certain	85	85	85	85					
236	Environment Agency Coverdale House Aviator Court York YO30 4GZ	Employment	Near Certain									750
238	Savills (Uk) Limited 48 Bootham York YO30 7WZ	Employment	Near Certain								13	

243	Proposed Sports Pitch Development To The South East Of 235 Tadcaster Road Dringhouses York	Employment	Near Certain				299
245	Quickslide Windows Direct 1 Redeness Street York YO31 7UU	Employment	Near Certain			32	
246	AMX Ltd Unit C Auster Road York YO30 4XA	Employment	Near Certain				
247	York Dance Works 11 Redeness Street York YO31 7UU	Employment	Near Certain			98	
248	Lincoln Court Ascot Way York	Employment	Near Certain	450			
251	Land To The South Of Field Lane Heslington York	Employment	Near Certain				52,738
252	Windsor House 22 Ascot Way York YO24 4QZ	Residential	Near Certain			35	

253	Rosevale Private Residential Home 33 The Village Wigginton York YO32 2PR	Employment	Near Certain				100		
255	Pavers Ltd Catherine House Northminster Business Park Harwood Road Upper Poppleton York YO26 6QU	Employment	Near Certain	159		4,135			
256	Acomb Bowling Club Front Street York YO24 3BZ	Employment	Near Certain						122
257	Abbeyfield House Regency Mews York	Employment	Near Certain				2,416		
261	Industrial Property Investment Fund Unit 9 Seafire Close York YO30 4UU	Employment	Near Certain		670				
264	Macmillan Cancer Relief Hamilton House 3 Fawcett Street York YO10 4AH	Employment	Hypothetical					9	

265	Proposed Hotel 46 - 50 Piccadilly York YO1 9NX	Employment	Near Certain			5,343		
266	Land To North Of Units 1 - 9 Evans Business Centre Rose Avenue Nether Poppleton York	Employment	Near Certain	998				
267	Former Del Monte Site Skelton Park Trading Estate Shipton Road Skelton York YO30 1XH	Employment	Near Certain				77	
269	R S Cockerill York Limited Stamford Bridge Road Dunnington York YO19 5AE	Employment	Near Certain		288			
270	Rosevale Private Residential Home 33 The Village Wigginton York YO32 2PR	Employment	Near Certain			40		
272	York St John University Lord Mayors Walk York YO31 7EX	Employment	Near Certain					3,411

273	Land To The South Of Northminster Business Park Harwood Road Upper Poppleton York	Employment	Near Certain		1,145	2,004	2,578		
274	Land To The West Of Redwood House Northminster Business Park Hackness Road Upper Poppleton York	Employment	Near Certain		200	160	1,200		
275	Vale Engineering (York) Limited Rufforth Approach Farm Wetherby Road Rufforth York YO23 3QF	Employment	Near Certain		677				
276	Bank Of Scotland 6 Nessgate York YO1 9NP	Employment	Near Certain					18	
277	Monks Cross Shopping Park Trust Unit 10 Monks Cross Shopping Park Monks Cross Drive Huntington York YO32 9GX	Employment	Near Certain	1,523					

278	The Clock Tower Bishopthorpe Road York	Employment	Near Certain							22
280	Land Lying To The South Of Elvington Airfield Network Elvington York	Employment	Near Certain		670	1,560	1,560			
281	Woodlands Respite Care Centre 120 Thief Lane York YO10 3HU	Employment	Near Certain					804		
282	York Elite Ltd Unit 3 Bentley Park Osbaldwick Link Road Osbaldwick York YO10 3JA	Employment	Near Certain		64		193			
284	York St John University Playing Fields Windmill Lane York	Employment	Near Certain						69	
285	Bishops Hotel 135 Holgate Road York YO24 4DF	Employment	Reasonably Foreseeable							7
286	Club Salvation George Hudson Street York YO1 6JL	Employment	Near Certain	695				840		

287	Burton Roofing Merchants Millfield Lane Nether Poppleton York YO26 6PF	Employment	Near Certain	50				
288	Stone Connections Units 2 And 3 Millfield Industrial Estate Wheldrake York YO19 6NA	Employment	Near Certain		275			
289	The Gardens Malton Road Stockton On The Forest York YO32 9TN	Employment	Reasonably Foreseeable	838	978			
291	Fishers Catering Ltd Unit 4 Thorn Hill Stamford Bridge Road Dunnington York YO19 5HE	Employment	Near Certain				2	
292	Hotel Noir Ltd 3 - 5 Clifton Green York YO30 6LH	Residential	Near Certain					10
293	Whitehall Grange Wigginton Road York YO32 2RJ	Employment	Near Certain	3,131		903		

294	Poppleton Bar Park And Ride Northfield Lane Upper Poppleton York YO26 6QF	Employment	Near Certain		38		
295	Monks Cross Park And Ride Martello Way Huntington York YO32 9JU	Employment	Near Certain		58		
297	Inspire 2 Independence (I2i) Ltd Independence House Millfield Lane Nether Poppleton York YO26 6PH	Employment	Near Certain	156			
298	York St John University Sports Centre Haxby Road York YO31 8TA	Employment	Near Certain				1,834
299	Office World Foss Islands Road York YO31 7UP	Employment	Near Certain				1,345
300	Principal York Station Road York YO24 1AY	Employment	Near Certain			1,950	

302	Rougier House 5 Rougier Street York	Employment	Near Certain						10	
303	Northern House Rougier Street York	Employment	Near Certain						58	
304	Smith And Nephew Plc Research Centre Innovation Way Heslington York YO10 5DF	Education	Near Certain							
305	Os Field 5070 Hull Road Dunnington York	Employment	Near Certain				29			
306	Land At Cocoa West Wigginton Road York	Employment	Near Certain	200	1,000					600
307	Evans Business Centre Rose Avenue Nether Poppleton York	Employment	Near Certain			470				
308	Proposed Research Centre Lakeside Way Heslington York	Employment	Near Certain		3,275					
309	Murton Grange Bad Bargain Lane	Employment	Near Certain					5		

		York YO19 5XB									
310		Lindum Group Limited York Road Elvington York YO41 4EP	Employment	Near Certain		800	800	1,098			
311		Unit 6 Arabesque House Monks Cross Drive Huntington York YO32 9GW	Employment	Near Certain							556
312		Archbishop Holgates School Hull Road York YO10 5ZA	Employment	Near Certain							
313		The Cocoa Works Haxby Road York YO31 8TA	Employment	Near Certain	429						239
315		Shepherd Engineering Services Mill Mount York YO24 1BH	Employment	Near Certain						21	
316	ST20	Castle Mills	Residential	near certain						106	
317		South of Northminster Business Park	Employment	Near Certain				5,374			

318	Former Carpetright, Layerthorpe	Employment	Near Certain			6,417		
319	South of the Residence, Bishopthorpe Rd (Former Terrys)	Employment	Near Certain			4,835		
320	Bootham Park Hospital	Residential	More than Likely					170
321	Saint Nicholas Business Park	Employment	Hypothetical	25,083	6,503			
322	Designer Outlet Expansion (exclude trips are on Saturday)	Employment	Hypothetical					
323	Huntington South Moor	Residential	Hypothetical				300	

Appendix B
Convergence Results

Table B.1 Convergence Statistics – 2025 DM Scenario – AM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	6.62%	83.91%	81.69%	81.89861	0.00157	215	17.805	0.523
2	4.27%	86.41%	89.53%	9.664233	0.019972	150	16.369	0.817
3	2.28%	87.35%	92.71%	4.175177	0.009746	13	5.526	0.894
4	1.82%	91.68%	96.13%	1.395388	0.003567	6	1.824	0.972
5	1.52%	93.31%	97.36%	0.904501	0.00223	1	1.055	0.991
6	1.23%	94.17%	97.51%	0.805989	0.001903	2	1.176	0.994
7	1.01%	94.81%	98.02%	0.68441	0.001548	0	0.897	0.996
8	0.88%	95.82%	98.32%	0.540444	0.001335	0	0.646	0.996
9	0.73%	95.61%	98.40%	0.565999	0.001349	0	0.51	0.996
10	0.63%	96.75%	98.73%	0.455922	0.001087	0	0.428	0.997
11	0.49%	96.45%	98.61%	0.499673	0.001204	0	0.539	0.998
12	0.42%	96.43%	98.60%	0.500577	0.001284	0	0.387	0.997
13	0.34%	97.67%	99.05%	0.369537	0.000872	1	0.332	0.999
14	0.26%	97.26%	98.85%	0.431619	0.001029	0	0.501	0.997
15	0.20%	96.34%	98.60%	0.509971	0.001238	1	0.356	0.997
16	0.16%	98.35%	99.18%	0.328172	0.00079	0	0.294	0.998

Table B.2 Convergence Statistics – 2025 DM Scenario – Inter-Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links	Average absolute link queue difference	Share of links with acceptable GEH of volumes

						with queue		between assignment
1	4.72%	85.48%	82.53%	64.62819	0.001648	144	16.759	0.533
2	1.59%	87.82%	91.53%	5.70436	0.014213	55	12.517	0.868
3	1.13%	92.20%	96.30%	1.624308	0.003969	0	2.347	0.963
4	0.93%	95.73%	98.03%	0.661921	0.001752	1	1.027	0.991
5	0.75%	96.22%	98.51%	0.518659	0.001275	1	1.15	0.996
6	0.60%	96.44%	98.76%	0.461586	0.001139	2	0.983	0.998
7	0.50%	96.39%	98.56%	0.470247	0.00114	1	0.821	0.996
8	0.43%	96.82%	98.75%	0.441237	0.001139	0	0.421	0.997
9	0.39%	97.06%	98.77%	0.457777	0.001234	0	0.39	0.996
10	0.32%	97.84%	99.25%	0.289091	0.000713	0	0.483	1
11	0.30%	97.78%	99.19%	0.300056	0.000799	0	0.463	0.998
12	0.26%	98.26%	99.31%	0.265079	0.000655	0	0.362	0.999
13	0.23%	98.38%	99.31%	0.250554	0.000657	0	0.263	0.999
14	0.20%	98.01%	99.13%	0.30038	0.000811	0	0.307	0.999

Table B.3 Convergence Statistics – 2025 DM Scenario – PM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	8.46%	83.40%	81.44%	85.58103	0.002252	209	21.736	0.523
2	5.32%	85.50%	88.70%	12.2465	0.025267	180	19.994	0.804
3	3.44%	87.47%	92.52%	4.078519	0.009038	13	6.427	0.901
4	2.86%	90.46%	95.83%	1.55127	0.003402	3	1.863	0.972
5	2.46%	92.46%	97.11%	0.996128	0.002172	1	1.465	0.991
6	2.06%	94.15%	97.79%	0.837828	0.001889	0	0.949	0.993
7	1.72%	94.77%	98.02%	0.721432	0.001583	1	0.803	0.996
8	1.45%	95.23%	98.00%	0.679255	0.001497	1	0.738	0.998

9	1.24%	96.20%	98.32%	0.563689	0.001232	1	0.756	0.997
10	1.02%	95.62%	98.24%	0.624179	0.001332	0	0.866	0.998
11	0.86%	96.27%	98.49%	0.535619	0.001129	2	0.861	0.998
12	0.73%	96.75%	98.66%	0.508977	0.001117	0	0.538	0.998
13	0.63%	97.38%	98.70%	0.469883	0.000968	2	0.529	0.997
14	0.55%	97.31%	98.83%	0.425754	0.000931	1	0.393	0.999
15	0.49%	97.91%	99.06%	0.362137	0.000788	1	0.433	0.999
16	0.41%	97.21%	98.76%	0.427018	0.001018	2	0.523	0.998
17	0.35%	97.67%	98.92%	0.367091	0.000848	2	0.396	0.998
18	0.31%	98.67%	99.40%	0.262091	0.000583	0	0.357	1
19	0.28%	98.21%	99.06%	0.347371	0.000756	0	0.397	0.999
20	0.25%	97.90%	99.11%	0.342759	0.000775	0	0.419	0.998
21	0.22%	98.38%	99.28%	0.313985	0.000673	0	0.444	0.999

Table B.4 Convergence Statistics – 2025 DS (LP) Scenario – AM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	6.68%	83.91%	81.73%	81.59351	0.001527	208	18.748	0.523
2	4.13%	86.29%	89.49%	9.79671	0.020534	151	16.958	0.818
3	2.23%	87.45%	92.80%	4.096793	0.00964	9	5.532	0.895
4	1.75%	91.23%	96.03%	1.457188	0.003692	5	1.664	0.972
5	1.48%	93.57%	97.45%	0.828169	0.002114	1	1.066	0.993
6	1.17%	93.56%	97.51%	0.823486	0.001931	1	1.188	0.995
7	1.01%	94.94%	98.03%	0.657704	0.001554	2	0.84	0.997
8	0.84%	95.55%	98.32%	0.587823	0.001374	1	0.857	0.997
9	0.70%	95.59%	98.37%	0.576161	0.001415	0	0.555	0.996
10	0.55%	96.68%	98.69%	0.464535	0.001114	0	0.588	0.999

11	0.48%	96.41%	98.53%	0.505226	0.001172	0	0.352	0.997
12	0.39%	96.90%	98.85%	0.416418	0.001	0	0.38	0.998
13	0.30%	96.35%	98.50%	0.538341	0.001255	1	0.649	0.997
14	0.25%	97.20%	98.80%	0.421963	0.001028	0	0.531	0.997
15	0.20%	98.02%	99.20%	0.324348	0.000792	0	0.38	0.999

Table B.5 Convergence Statistics – 2025 DS (LP) Scenario – Inter-Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	4.80%	85.47%	82.55%	64.58374	0.001623	151	16.163	0.532
2	1.55%	87.79%	91.53%	5.776988	0.014339	54	12.244	0.868
3	1.10%	92.00%	96.15%	1.670119	0.0043	0	2.132	0.961
4	0.89%	95.80%	98.04%	0.628742	0.001653	1	0.98	0.992
5	0.71%	96.18%	98.58%	0.478378	0.001202	0	0.951	0.996
6	0.57%	96.25%	98.54%	0.516376	0.001262	1	0.957	0.996
7	0.49%	96.57%	98.67%	0.458027	0.001178	2	0.674	0.996
8	0.42%	96.84%	98.72%	0.448776	0.001143	0	0.433	0.997
9	0.38%	98.14%	99.24%	0.263983	0.000692	0	0.3	0.997
10	0.32%	98.27%	99.30%	0.261761	0.000657	0	0.357	0.999
11	0.31%	97.96%	99.08%	0.348024	0.00094	0	0.454	0.997
12	0.26%	97.73%	99.13%	0.319562	0.0008	0	0.332	0.998
13	0.22%	98.55%	99.37%	0.246118	0.000634	0	0.296	0.999
14	0.19%	98.45%	99.40%	0.235391	0.000564	0	0.182	0.999

Table B.6 Convergence Statistics – 2025 DS (LP) Scenario – PM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links	Average absolute link	Share of links with acceptable GEH of

						with queue	queue difference	volumes between assignment
1	8.14%	83.42%	81.42%	85.7054	0.002217	203	21.729	0.522
2	5.25%	85.54%	88.78%	12.1957	0.02473	185	19.891	0.802
3	3.34%	87.82%	92.74%	3.900821	0.008756	12	6.138	0.908
4	2.84%	91.24%	96.14%	1.386059	0.003102	0	1.762	0.975
5	2.43%	93.00%	97.20%	0.941993	0.002126	2	1.203	0.993
6	2.02%	93.53%	97.55%	0.881393	0.001993	1	1.057	0.993
7	1.68%	94.27%	97.81%	0.788294	0.001761	0	0.968	0.996
8	1.45%	95.48%	98.28%	0.622459	0.001364	1	0.685	0.999
9	1.26%	96.36%	98.46%	0.562905	0.001204	1	0.713	0.997
10	1.02%	95.84%	98.25%	0.617203	0.001306	0	0.992	0.997
11	0.86%	96.51%	98.50%	0.542261	0.001146	0	0.651	0.998
12	0.74%	96.95%	98.77%	0.501685	0.00108	1	0.691	0.999
13	0.65%	96.49%	98.64%	0.504835	0.001176	0	0.422	0.997
14	0.56%	97.39%	99.03%	0.404145	0.000967	2	0.37	0.999
15	0.49%	96.44%	98.47%	0.533594	0.001281	2	0.563	0.995
16	0.42%	96.34%	98.50%	0.533051	0.001302	0	0.52	0.995
17	0.39%	97.79%	99.00%	0.359462	0.000786	1	0.587	0.998
18	0.33%	97.96%	99.10%	0.331718	0.000781	0	0.444	0.999
19	0.29%	98.16%	99.14%	0.301054	0.000712	2	0.447	1
20	0.28%	98.11%	99.15%	0.327976	0.000699	2	0.65	0.999
21	0.23%	97.09%	98.62%	0.554676	0.001253	0	0.538	0.996

Table B.7 Convergence Statistics – 2033 DM Scenario – AM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment

1	7.53%	83.49%	81.35%	86.74403	0.00178	295	17.681	0.521
2	5.80%	85.68%	88.89%	11.39424	0.022647	226	16.131	0.804
3	3.12%	87.09%	91.86%	5.053648	0.011537	13	5.293	0.874
4	2.41%	90.74%	95.62%	1.598063	0.003691	5	1.839	0.968
5	2.04%	91.82%	96.68%	1.194275	0.00278	2	1.189	0.985
6	1.71%	93.65%	97.29%	0.829277	0.001948	0	0.705	0.995
7	1.45%	93.47%	97.38%	0.868904	0.002036	1	0.799	0.992
8	1.31%	94.51%	97.77%	0.781123	0.00177	1	0.913	0.993
9	1.18%	94.84%	97.61%	0.784766	0.001796	1	0.821	0.99
10	0.99%	94.54%	97.64%	0.737569	0.001741	1	0.45	0.994
11	0.81%	95.99%	98.23%	0.583131	0.00135	3	0.556	0.996
12	0.66%	96.37%	98.53%	0.514784	0.001142	0	0.46	0.999
13	0.56%	97.11%	98.68%	0.436463	0.000993	0	0.425	0.999
14	0.48%	96.33%	98.42%	0.527084	0.001221	0	0.299	0.997
15	0.42%	97.18%	98.76%	0.422057	0.000982	1	0.333	0.998
16	0.34%	97.24%	98.85%	0.412038	0.00093	0	0.314	0.998
17	0.31%	96.18%	98.33%	0.53928	0.001277	0	0.382	0.996
18	0.25%	96.95%	98.64%	0.482033	0.001156	0	0.273	0.997
19	0.23%	96.98%	98.72%	0.426985	0.001073	0	0.23	0.998
20	0.22%	97.63%	98.90%	0.431071	0.00093	0	0.425	0.998

Table B.8 Convergence Statistics – 2033 DM Scenario – Inter-Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	5.27%	84.94%	82.19%	69.34432	0.001882	186	16.011	0.531
2	2.26%	87.33%	91.18%	6.763922	0.016086	91	12.252	0.861
3	1.60%	91.25%	95.54%	2.062437	0.005187	4	2.474	0.952

4	1.32%	94.53%	97.70%	0.835813	0.002051	1	1.194	0.987
5	1.08%	95.47%	98.19%	0.598709	0.001446	0	1.101	0.995
6	0.90%	96.87%	98.59%	0.465973	0.001124	0	0.706	0.997
7	0.73%	96.83%	98.72%	0.452814	0.001076	0	0.784	0.998
8	0.63%	97.19%	98.77%	0.389558	0.000932	0	0.552	0.998
9	0.60%	96.15%	98.37%	0.609722	0.001603	1	1	0.99
10	0.54%	95.75%	98.04%	0.721122	0.001838	1	0.974	0.99
11	0.44%	96.89%	98.77%	0.417889	0.001084	1	0.544	0.996
12	0.36%	96.50%	98.54%	0.516382	0.001331	1	0.505	0.996
13	0.29%	97.51%	99.03%	0.332482	0.000849	0	0.326	0.999
14	0.27%	97.96%	99.21%	0.295879	0.000815	1	0.293	0.998
15	0.22%	98.67%	99.37%	0.22535	0.000565	0	0.323	1

Table B.9 Convergence Statistics – 2033 DM Scenario – PM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	8.55%	83.25%	81.27%	88.18369	0.002433	252	19.932	0.523
2	5.50%	85.33%	88.53%	12.69417	0.025282	206	18.732	0.8
3	3.61%	87.16%	92.11%	4.506615	0.010075	29	5.927	0.889
4	3.11%	90.34%	95.79%	1.540204	0.003501	5	1.602	0.971
5	2.65%	93.04%	96.99%	1.04042	0.002216	0	1.166	0.989
6	2.24%	93.81%	97.67%	0.859795	0.001816	0	0.921	0.994
7	1.91%	94.24%	97.70%	0.804311	0.001766	0	0.718	0.995
8	1.63%	94.92%	97.86%	0.792309	0.001689	1	0.637	0.996
9	1.41%	95.28%	98.04%	0.706399	0.00157	0	0.591	0.996
10	1.16%	95.59%	98.36%	0.620395	0.001398	1	0.593	0.997
11	0.99%	96.27%	98.53%	0.530577	0.001167	3	0.511	0.997

12	0.81%	96.45%	98.45%	0.55087	0.001236	2	0.531	0.998
13	0.69%	97.35%	98.77%	0.44491	0.000995	3	0.583	0.998
14	0.61%	97.04%	98.71%	0.465861	0.001005	1	0.553	0.998
15	0.55%	97.44%	98.88%	0.39272	0.000882	0	0.626	0.999
16	0.47%	97.52%	98.82%	0.425975	0.000913	3	0.522	0.999
17	0.41%	97.95%	98.89%	0.415366	0.000864	0	0.343	0.998
18	0.37%	97.45%	98.82%	0.426154	0.000902	0	0.484	0.998
19	0.40%	97.00%	98.40%	0.59584	0.001347	1	0.641	0.991
20	0.35%	96.92%	98.54%	0.468683	0.0011	0	0.434	0.996
21	0.29%	97.95%	99.03%	0.317024	0.000724	0	0.356	1
22	0.26%	98.00%	99.01%	0.337182	0.000767	1	0.296	1
23	0.24%	97.97%	99.05%	0.345357	0.000769	0	0.284	1

Table B.10 Convergence Statistics – 2033 DS (LP) Scenario – AM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	7.47%	83.43%	81.41%	86.16352	0.001679	288	18.287	0.52
2	4.94%	85.83%	89.24%	11.07859	0.022391	205	17	0.812
3	2.70%	87.23%	92.19%	4.606577	0.010573	12	5.235	0.885
4	2.16%	90.87%	95.78%	1.488438	0.003507	4	1.627	0.973
5	1.82%	91.62%	96.52%	1.246357	0.00279	1	1.272	0.984
6	1.51%	91.68%	96.61%	1.158098	0.002769	1	1.331	0.986
7	1.30%	94.26%	97.71%	0.749528	0.001732	0	0.833	0.995
8	1.09%	94.41%	97.73%	0.679991	0.001629	0	0.855	0.996
9	0.91%	95.11%	97.90%	0.680946	0.001613	0	0.56	0.996
10	0.75%	95.20%	98.10%	0.65385	0.001548	2	0.502	0.996
11	0.63%	96.28%	98.56%	0.502737	0.001195	0	0.335	0.997

12	0.52%	97.12%	98.85%	0.439854	0.000999	2	0.575	1
13	0.43%	96.60%	98.70%	0.464019	0.001048	0	0.5	0.999
14	0.36%	96.56%	98.68%	0.481764	0.001092	1	0.452	0.997
15	0.32%	96.75%	98.75%	0.453094	0.001076	0	0.537	0.998
16	0.28%	97.18%	98.87%	0.42211	0.001011	0	0.519	0.998
17	0.23%	98.36%	99.20%	0.2982	0.000699	2	0.382	0.999
18	0.20%	97.70%	99.04%	0.370504	0.0009	0	0.33	0.998

Table B.11 Convergence Statistics – 2033 DS (LP) Scenario – Inter-Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	5.91%	84.82%	82.20%	69.43801	0.001828	185	17.085	0.53
2	2.24%	87.17%	90.97%	6.989898	0.017175	85	13.712	0.859
3	1.47%	90.62%	95.21%	2.314042	0.005785	6	2.786	0.947
4	1.21%	94.03%	97.45%	0.924358	0.002332	1	1.293	0.987
5	0.99%	95.71%	98.34%	0.54944	0.001352	0	0.964	0.996
6	0.81%	96.60%	98.57%	0.471187	0.001149	0	0.716	0.997
7	0.67%	96.93%	98.80%	0.42133	0.001016	0	0.732	0.999
8	0.56%	97.21%	98.90%	0.382859	0.000931	0	0.499	0.999
9	0.56%	96.41%	98.49%	0.544372	0.001441	0	0.863	0.994
10	0.53%	95.87%	98.13%	0.731283	0.001842	2	1.077	0.992
11	0.41%	96.24%	98.51%	0.528588	0.00133	0	0.706	0.995
12	0.33%	97.69%	98.92%	0.363538	0.000927	0	0.349	0.996
13	0.28%	98.23%	99.23%	0.293623	0.000755	1	0.33	0.998
14	0.25%	98.41%	99.28%	0.257481	0.000666	1	0.333	0.999
15	0.20%	98.17%	99.23%	0.270193	0.000678	0	0.388	0.999

Table B.12 Convergence Statistics – 2033 DS (LP) Scenario – PM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	8.38%	83.15%	81.28%	88.4552	0.002349	214	21.749	0.522
2	5.50%	85.68%	88.60%	13.02918	0.02591	227	20.387	0.798
3	3.48%	87.65%	92.18%	4.341373	0.009536	16	6.393	0.897
4	2.93%	91.06%	95.83%	1.550131	0.00359	2	1.837	0.97
5	2.55%	92.80%	97.17%	1.007823	0.0022	0	1.193	0.989
6	2.15%	93.84%	97.64%	0.836024	0.001903	1	0.917	0.995
7	1.82%	94.49%	97.66%	0.767643	0.00167	0	0.747	0.996
8	1.52%	95.33%	98.10%	0.625621	0.001451	1	0.708	0.997
9	1.27%	95.64%	98.22%	0.611874	0.001447	1	0.601	0.996
10	1.07%	95.98%	98.47%	0.587524	0.001335	3	0.744	0.996
11	0.91%	96.11%	98.24%	0.587384	0.001361	0	0.54	0.996
12	0.77%	97.30%	98.81%	0.425889	0.000995	1	0.428	0.999
13	0.66%	97.37%	98.86%	0.407583	0.000899	0	0.487	0.999
14	0.56%	97.75%	98.92%	0.404673	0.000883	4	0.501	0.999
15	0.49%	96.98%	98.68%	0.463336	0.001025	3	0.527	0.998
16	0.44%	98.03%	98.98%	0.358003	0.000814	1	0.592	0.998
17	0.39%	96.37%	98.46%	0.536749	0.00125	0	0.43	0.996
18	0.35%	96.68%	98.62%	0.51112	0.001233	0	0.525	0.995
19	0.31%	98.11%	99.08%	0.337182	0.000776	1	0.384	0.999
20	0.27%	98.27%	99.12%	0.336863	0.000831	0	0.387	0.998
21	0.26%	97.66%	98.98%	0.376529	0.000846	0	0.382	0.999
22	0.20%	97.74%	99.04%	0.365006	0.000812	0	0.43	0.999

Table B.13 Convergence Statistics – 2040 Alternative ST15 Scenario – AM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	8.11%	82.97%	81.21%	89.03381	0.001781	360	20.23	0.52
2	5.72%	85.22%	88.80%	12.30247	0.024658	252	16.462	0.801
3	3.20%	86.59%	91.58%	5.212013	0.012061	19	5.352	0.873
4	2.63%	89.66%	95.42%	1.86409	0.004205	3	1.763	0.964
5	2.20%	90.99%	96.15%	1.39122	0.003165	2	1.387	0.978
6	1.84%	92.81%	97.13%	0.967137	0.002343	1	0.762	0.991
7	1.55%	92.87%	97.34%	0.877772	0.002024	3	0.915	0.994
8	1.32%	94.02%	97.51%	0.806244	0.001889	3	0.674	0.994
9	1.10%	94.76%	97.79%	0.663039	0.001629	3	0.631	0.997
10	0.92%	95.46%	98.16%	0.608896	0.001445	0	0.526	0.998
11	0.76%	96.25%	98.40%	0.540155	0.001283	2	0.512	0.998
12	0.66%	95.94%	98.20%	0.572189	0.00128	2	0.497	0.997
13	0.56%	96.27%	98.74%	0.488383	0.001175	1	0.478	0.999
14	0.52%	96.44%	98.57%	0.526129	0.00125	0	0.459	0.999
15	0.44%	96.20%	98.59%	0.513134	0.001293	0	0.568	0.998
16	0.42%	96.77%	98.45%	0.512015	0.001138	0	0.721	0.996
17	0.38%	97.13%	98.60%	0.475323	0.001069	0	0.555	0.998
18	0.33%	96.97%	98.62%	0.466523	0.001063	1	0.488	0.999
19	0.30%	96.85%	98.66%	0.503932	0.001165	1	0.534	0.997
20	0.31%	97.36%	98.77%	0.441898	0.001016	1	0.457	0.998
21	0.23%	97.79%	99.00%	0.383944	0.000892	0	0.398	0.999
22	0.21%	97.34%	98.94%	0.406203	0.000966	0	0.36	0.999
23	0.19%	97.43%	98.82%	0.431884	0.000989	0	0.345	0.999

Table B.14 Convergence Statistics – 2040 Alternative ST15 Scenario – Inter-Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	7.93%	84.51%	81.99%	73.553	0.001981	249	17.969	0.529
2	3.14%	86.95%	90.41%	8.268788	0.019731	124	14.137	0.847
3	2.21%	89.50%	94.45%	2.750306	0.006821	7	3.759	0.934
4	1.82%	93.85%	97.15%	0.943566	0.002499	0	0.985	0.986
5	1.49%	94.14%	97.62%	0.760333	0.001859	3	1.007	0.992
6	1.22%	95.18%	97.80%	0.681939	0.001679	2	0.898	0.992
7	1.01%	96.05%	98.30%	0.534727	0.001268	4	0.776	0.997
8	0.88%	96.42%	98.39%	0.47988	0.001201	2	0.725	0.997
9	0.77%	97.46%	98.98%	0.376105	0.000921	2	0.464	0.999
10	0.77%	96.71%	98.55%	0.510724	0.001288	0	0.937	0.995
11	0.70%	96.56%	98.44%	0.571227	0.001316	1	0.919	0.995
12	0.58%	96.26%	98.35%	0.561808	0.001414	1	0.873	0.993
13	0.51%	96.90%	98.81%	0.409247	0.001047	0	0.483	0.998
14	0.45%	96.59%	98.44%	0.528547	0.001433	0	0.432	0.993
15	0.36%	96.51%	98.38%	0.548344	0.001445	1	0.34	0.993
16	0.30%	97.52%	98.81%	0.403289	0.001105	0	0.31	0.996
17	0.25%	98.30%	99.28%	0.272208	0.00064	0	0.303	0.999
18	0.22%	99.02%	99.36%	0.208758	0.000504	0	0.193	1
19	0.19%	98.76%	99.46%	0.206794	0.000525	0	0.213	1

Table B.15 Convergence Statistics – 2040 Alternative ST15 Scenario – PM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes

								between assignment
1	9.71%	82.45%	80.85%	95.32811	0.002597	335	20.562	0.52
2	6.39%	84.95%	88.11%	14.53602	0.028037	293	18.447	0.785
3	4.02%	86.49%	91.32%	4.928084	0.010777	39	4.936	0.883
4	3.53%	90.71%	95.72%	1.599087	0.003677	4	1.298	0.973
5	3.13%	91.40%	96.20%	1.3268	0.003136	4	1.161	0.977
6	2.75%	93.20%	97.01%	1.007915	0.002275	5	0.704	0.989
7	2.40%	93.82%	97.43%	0.849724	0.001919	3	0.709	0.993
8	2.15%	94.00%	97.59%	0.794632	0.001737	4	0.793	0.994
9	1.96%	95.03%	97.99%	0.695835	0.001515	1	0.499	0.996
10	1.62%	94.67%	97.75%	0.761726	0.001746	1	0.717	0.994
11	1.44%	95.00%	97.86%	0.702655	0.001614	1	0.56	0.993
12	1.25%	95.68%	98.10%	0.585223	0.001367	3	0.455	0.996
13	1.11%	95.58%	98.12%	0.619951	0.001507	5	0.342	0.996
14	0.97%	96.23%	98.35%	0.528354	0.001259	1	0.414	0.997
15	0.84%	96.30%	98.46%	0.490888	0.00118	2	0.462	0.998
16	0.73%	96.71%	98.66%	0.476441	0.001092	0	0.407	0.998
17	0.67%	96.64%	98.61%	0.489212	0.001176	1	0.37	0.998
18	0.60%	96.99%	98.69%	0.432305	0.001044	0	0.295	0.999
19	0.53%	97.13%	98.66%	0.429492	0.00107	3	0.23	0.998
20	0.48%	97.71%	98.95%	0.410519	0.000963	1	0.22	0.998
21	0.38%	96.80%	98.81%	0.45341	0.001023	2	0.341	0.999
22	0.37%	97.31%	98.77%	0.434582	0.000972	0	0.316	0.999
23	0.32%	97.39%	98.95%	0.398482	0.000932	1	0.318	0.999
24	0.29%	96.32%	98.48%	0.526237	0.001251	1	0.344	0.996
25	0.27%	97.06%	98.76%	0.447064	0.001062	1	0.217	0.998
26	0.24%	98.11%	99.03%	0.341291	0.000777	0	0.21	0.999

Table B.16 Convergence Statistics – 2040 Phase 2 YORR Scenario – AM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	8.04%	83.11%	81.28%	89.27979	0.001655	342	20.504	0.521
2	7.29%	85.11%	88.49%	14.39238	0.026206	264	18.207	0.789
3	4.05%	86.01%	91.23%	5.976751	0.013272	17	6.488	0.86
4	3.42%	89.51%	94.81%	2.194418	0.004956	5	2.093	0.951
5	2.97%	90.57%	95.99%	1.450632	0.003229	4	1.7	0.979
6	2.62%	92.18%	96.88%	1.068234	0.002566	5	1.083	0.987
7	2.23%	92.83%	97.10%	0.959837	0.002173	2	0.873	0.992
8	1.94%	94.68%	97.83%	0.676232	0.001622	1	0.639	0.997
9	1.69%	94.25%	97.84%	0.704462	0.001696	2	0.725	0.997
10	1.50%	95.54%	98.15%	0.619485	0.001454	4	0.473	0.998
11	1.35%	95.75%	98.32%	0.581178	0.001352	1	0.601	0.997
12	1.22%	95.95%	98.33%	0.585571	0.001348	2	0.589	0.997
13	1.11%	96.16%	98.46%	0.508261	0.001138	0	0.502	0.999
14	1.05%	95.73%	98.26%	0.631524	0.001429	2	0.771	0.996
15	0.96%	96.25%	98.54%	0.482475	0.001176	0	0.552	0.998
16	0.86%	96.36%	98.49%	0.54959	0.00124	0	0.615	0.998
17	0.78%	96.20%	98.44%	0.52557	0.001203	0	0.542	0.997
18	0.69%	96.25%	98.53%	0.491288	0.001155	2	0.433	0.998
19	0.65%	96.75%	98.55%	0.505901	0.001128	0	0.358	0.997
20	0.57%	96.98%	98.68%	0.480525	0.001107	1	0.397	0.997
21	0.52%	96.55%	98.61%	0.481961	0.001176	1	0.444	0.997
22	0.46%	96.65%	98.62%	0.496413	0.001168	0	0.229	0.998
23	0.42%	96.18%	98.47%	0.515019	0.001272	0	0.412	0.998
24	0.37%	97.44%	98.98%	0.376258	0.00089	0	0.208	1

25	0.33%	97.94%	99.01%	0.349865	0.000799	0	0.239	0.999
26	0.28%	97.31%	98.94%	0.398708	0.000987	0	0.254	0.999
27	0.26%	97.32%	98.95%	0.416044	0.000988	0	0.289	0.999
28	0.23%	96.82%	98.61%	0.496777	0.001194	1	0.373	0.998

Table B.17 Convergence Statistics – 2040 Phase 2 YORR Scenario – Inter-Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	7.56%	84.65%	82.02%	73.41057	0.002062	231	18.244	0.529
2	3.59%	86.58%	89.98%	9.26478	0.020889	133	16.096	0.831
3	2.43%	88.80%	94.02%	3.067347	0.007878	8	4.01	0.925
4	1.93%	92.46%	96.60%	1.249232	0.002958	0	1.41	0.976
5	1.53%	93.65%	97.59%	0.818304	0.001863	0	0.934	0.994
6	1.26%	94.82%	98.08%	0.64231	0.001468	1	0.745	0.997
7	1.06%	95.48%	98.27%	0.592835	0.001346	0	0.87	0.998
8	0.91%	96.14%	98.39%	0.52986	0.001241	1	0.612	0.997
9	0.87%	95.99%	98.36%	0.618109	0.001571	3	0.915	0.992
10	0.68%	96.01%	98.30%	0.554396	0.001349	0	0.772	0.995
11	0.60%	97.27%	98.78%	0.38871	0.000934	0	0.485	0.998
12	0.51%	97.87%	99.05%	0.322058	0.000793	2	0.415	1
13	0.44%	98.28%	99.23%	0.27459	0.000643	2	0.308	1
14	0.39%	97.73%	98.91%	0.365875	0.000912	0	0.372	0.999
15	0.33%	97.77%	99.01%	0.345621	0.000873	0	0.379	0.998
16	0.29%	98.15%	99.19%	0.299354	0.000714	0	0.33	1
17	0.26%	98.73%	99.33%	0.248689	0.000588	0	0.248	1
18	0.23%	98.62%	99.42%	0.236456	0.000569	0	0.229	0.999

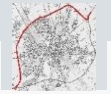
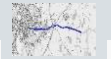
Table B.18 Convergence Statistics – 2040 Phase 2 YORR Scenario – PM Peak

Iteration	GAP	Relative Difference in Volume	Relative difference in Impedance	Mean absolute volume difference	Mean relative volume difference	No. of new links with queue	Average absolute link queue difference	Share of links with acceptable GEH of volumes between assignment
1	9.93%	82.53%	80.87%	95.343	0.002482	322	20.722	0.522
2	8.83%	84.45%	87.61%	17.37534	0.030951	368	19.414	0.771
3	5.56%	85.77%	90.91%	6.061987	0.013112	29	6.714	0.862
4	4.75%	89.31%	94.40%	2.422898	0.005756	13	3.251	0.949
5	4.13%	90.57%	95.77%	1.683291	0.003412	6	2.282	0.975
6	3.67%	92.01%	96.51%	1.234897	0.002971	7	1.089	0.983
7	3.33%	93.12%	96.88%	0.972626	0.002213	6	0.94	0.991
8	3.06%	93.33%	97.15%	0.896682	0.001969	3	0.661	0.991
9	2.70%	93.95%	97.20%	0.872443	0.001971	4	0.79	0.993
10	2.48%	94.99%	97.66%	0.785633	0.001779	1	0.569	0.993
11	2.21%	94.51%	97.66%	0.766202	0.001704	4	0.62	0.993
12	2.00%	94.60%	97.82%	0.722517	0.001691	1	0.505	0.994
13	1.91%	94.67%	97.88%	0.695645	0.001658	4	0.57	0.996
14	1.71%	94.84%	97.81%	0.694278	0.00164	3	0.504	0.997
15	1.64%	95.98%	98.31%	0.596544	0.001365	12	0.48	0.996
16	1.40%	95.01%	97.70%	0.792216	0.001761	1	0.843	0.993
17	1.27%	95.34%	97.86%	0.68104	0.001557	0	0.498	0.996
18	1.13%	95.84%	98.24%	0.588751	0.001379	0	0.341	0.998
19	1.06%	96.14%	98.40%	0.554687	0.001349	1	0.45	0.997
20	0.96%	94.93%	98.08%	0.658128	0.001565	3	0.435	0.996
21	0.89%	95.63%	98.25%	0.600754	0.001443	2	0.367	0.997
22	0.78%	95.07%	98.10%	0.660848	0.001497	4	0.74	0.996
23	0.64%	95.88%	98.14%	0.644089	0.001511	0	0.622	0.993
24	0.54%	96.95%	98.60%	0.499675	0.001161	0	0.501	0.996

25	0.49%	96.77%	98.56%	0.489372	0.001176	1	0.296	0.999
26	0.45%	96.26%	98.44%	0.531489	0.001248	1	0.545	0.998
27	0.38%	96.27%	98.48%	0.532151	0.001318	1	0.304	0.998
28	0.35%	97.49%	98.77%	0.419458	0.001059	0	0.268	0.999
29	0.39%	96.66%	98.23%	0.573597	0.001359	0	0.387	0.995
30	0.33%	96.01%	98.23%	0.579361	0.001466	0	0.37	0.995
31	0.30%	96.23%	98.32%	0.570934	0.001434	4	0.471	0.995
32	0.28%	96.19%	98.17%	0.671315	0.001688	0	0.413	0.991
33	0.24%	96.61%	98.47%	0.527994	0.001292	2	0.34	0.996
34	0.24%	95.64%	98.03%	0.702967	0.001829	2	0.268	0.99
35	0.22%	96.42%	98.35%	0.550069	0.001365	0	0.345	0.997
36	0.20%	96.93%	98.44%	0.498438	0.001231	1	0.207	0.995
37	0.18%	96.96%	98.50%	0.486564	0.001186	0	0.246	0.996
38	0.17%	97.04%	98.68%	0.449058	0.001143	0	0.214	0.996

Appendix C Journey Time Results

Table C.1 Journey Time Results – 2025 DM, 2033 DM, 2040 Alternative ST15 and 2040 Phase 2

Route ID	Route Number	Direction	Route Name	Route Location	2025 DM			2033 DM			2040 Alternative ST15			2040 Phase 2		
					AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
1	Route 1	NB	A1237 NB		31:11	22:24	34:29	33:50	25:06	36:15	35:06	27:03	40:45	36:37	27:35	42:20
2	Route 1	SB	A1237 SB		29:56	21:39	34:26	32:18	24:55	36:10	33:23	26:39	38:49	32:49	24:46	39:41
3	Route 2	NB	A64 NB		17:56	15:41	17:19	18:13	15:53	17:27	18:32	16:08	17:47	18:27	16:02	17:31
4	Route 2	SB	A64 SB		17:10	15:32	16:58	17:20	15:44	17:09	17:39	15:56	17:22	17:37	15:57	17:21
7	Route 3	NB	A1036 Inbound		21:24	14:57	17:29	20:17	15:31	18:34	21:25	15:58	19:16	22:16	16:06	20:54
8	Route 3	SB	A1036 Outbound		16:03	14:00	16:48	16:43	14:11	17:31	17:11	14:32	19:30	16:50	14:34	22:27
9	Route 4	NB	A19 Inbound		20:29	12:23	16:19	23:04	12:57	17:11	24:38	13:55	19:06	24:32	12:45	18:30
10	Route 4	SB	A19 outbound		12:00	12:09	17:11	12:24	12:31	18:32	13:53	13:01	23:30	13:56	13:07	24:30
11	Route 5	WB	A1079 Inbound		19:16	15:23	17:12	21:05	17:30	18:19	22:09	20:35	22:11	21:32	20:13	19:49
12	Route 5	EB	A1079 Outbound		14:19	14:21	18:23	15:09	14:53	19:00	17:41	17:00	25:06	17:25	17:33	29:09

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Route ID	Route Number	Direction	Route Name	Route Location	2025 DM			2033 DM			2040 Alternative ST15			2040 Phase 2		
					AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
13	Route 6	SB	A1036 Inbound		09:56	08:09	10:23	12:43	08:12	11:42	11:39	08:28	11:22	11:25	08:43	11:23
14	Route 6	NB	A1036 Outbound		09:05	08:47	09:40	09:51	08:57	09:26	10:03	09:28	11:12	10:04	13:16	16:53
15	Route 7	SB	B1363 Inbound		16:31	13:25	14:46	18:01	13:59	15:29	18:53	14:37	16:53	19:07	14:39	16:44
16	Route 7	NB	B1363 Outbound		13:40	12:59	14:39	14:09	13:06	15:04	14:07	13:17	16:16	14:10	14:35	19:02
17	Route 8	SB	A19 Shipton Inbound		18:07	10:24	12:20	20:38	10:33	12:44	20:56	11:14	15:23	21:14	10:47	14:51
18	Route 8	NB	A19 Shipton Outbound		11:51	10:52	13:16	12:48	11:00	13:50	12:33	11:10	15:30	13:11	11:23	17:13
19	Route 9	EB	A59 BB Road Inbound		16:06	14:25	15:39	19:57	14:46	15:49	22:12	14:56	16:12	22:44	15:01	16:38
20	Route 9	WB	A59 BB Outbound		15:23	14:30	14:49	19:48	14:47	14:59	21:54	14:57	15:21	23:16	16:03	17:00
21	Route 10	EB	B1224 Inbound		11:35	10:16	12:06	12:15	10:23	12:08	11:50	10:27	12:42	12:00	10:35	12:24
22	Route 10	WB	B1224 Outbound		10:26	09:26	10:14	10:44	09:31	10:17	11:03	09:36	10:18	11:08	09:39	10:22
23	Route 11	SB	Haxby RD Inbound		16:16	16:23	15:29	17:22	17:15	15:35	17:01	17:33	17:07	17:27	15:27	15:21

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Route ID	Route Number	Direction	Route Name	Route Location	2025 DM			2033 DM			2040 Alternative ST15			2040 Phase 2		
					AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
24	Route 11	NB	Haxby RD outbound		14:19	14:20	15:51	14:40	14:33	15:57	14:27	14:43	16:26	14:28	14:38	16:41
25	Route 12	NB	Waterend to northeast		05:01	03:42	04:20	05:40	03:51	04:30	05:50	03:58	04:42	06:01	03:56	04:40
26	Route 12	SB	Waterend to southwest		06:51	03:54	06:25	07:00	04:01	07:30	06:52	04:06	08:31	06:44	04:08	09:06
27	Route 13	EB	LeemanRD / YorkCentral Inbound		05:10	04:58	05:02	05:13	05:05	05:12	05:17	05:11	05:18	05:16	05:11	05:34
28	Route 13	WB	Leeman Road / York Central Outbound		07:24	07:06	06:51	08:13	07:24	07:01	09:40	07:39	07:19	09:55	07:39	10:22
29	Route 14	NB	Bishopthorpe RD Inbound		18:21	14:19	17:31	18:40	14:32	17:41	19:04	14:49	17:46	19:06	14:40	17:27
30	Route 14	SB	Bishopthorpe RD Outbound		12:24	11:52	13:32	12:43	12:00	13:49	13:02	12:06	15:02	12:59	12:11	16:05
31	Route 15	SB	Strensal Road Inbound		20:53	17:39	18:33	21:38	18:16	18:34	21:12	18:32	19:01	21:24	18:34	19:41
32	Route 15	NB	Strensal RD Outbound		17:08	16:42	18:13	17:37	17:01	18:29	17:34	17:24	19:45	17:38	17:57	22:10

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Route ID	Route Number	Direction	Route Name	Route Location	2025 DM			2033 DM			2040 Alternative ST15			2040 Phase 2		
					AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
33	Route 16	Clockwise	Inner Ring Road Clockwise		22:59	24:10	28:28	25:32	26:51	29:49	25:37	29:44	33:39	24:52	27:15	32:06
34	Route 16	Anti-Clockwise	Inner Ring Road Anti-Clockwise		24:42	27:09	28:27	26:42	28:26	29:25	26:12	29:42	31:49	24:50	28:50	27:46

wood.