DTPC

Report No. J570/STA
July 2015

# PROPOSED MIXED USE DEVELOPMENT
# NEW CHINA TOWN, LIVERPOOL

## STRATEGIC TRANSPORT ASSESSMENT
## JUNCTION TESTING ADDENDUM

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**NEW CHINA TOWN, LIVERPOOL**

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# JUNCTION TESTING ADDENDUM

**CONTROLLED DOCUMENT**

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| A | | |

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**C O N T E N T S**

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## 1. INTRODUCTION

DTPC has been appointed by Roman Summer Associates on behalf of China Town Development Company Limited to provide transport and highway advice for the traffic and transportation implications associated with their proposed mixed use development at New China Town, Liverpool.

The application relates to a site located on the heart of the urban area, currently occupied in part by buildings but mostly cleared and designated brownfield which will be redeveloped.

In order to advise the highway authority, a Strategic Transport Assessment (STA) was submitted setting out the setting, policy framework accessibility, history and baseline network review.

This report is an Addendum to the STA and provides information on trip rate derivation, trip generation and distribution to allow the detailed the detailed junction assessments to be undertaken of the development proposals, and forms supplementary information to assist in the determination of the planning application.

The report discusses the following issues:

- Trip rates
- Trip generation
- Network assessment with development
- Summary & Conclusions.

Scoping discussions have been held with LCC to agree the direction of the assessment/approach for the outline application.

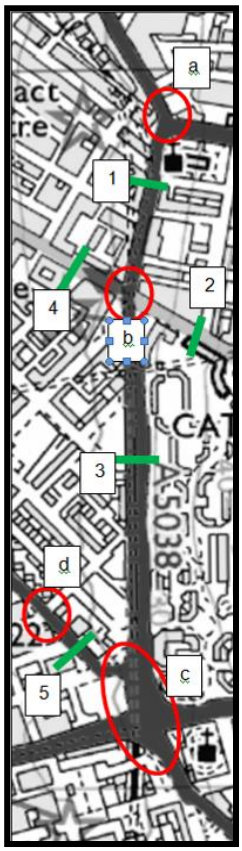
This report has been prepared solely in connection with the proposed development as stated above. As such, no responsibility is accepted to any third party for all or any part of this report, or in connection with any other development.

## 2. TRIP GENERATION AND NETWORK ASSESSMENT

### Introduction

The chapter sets out data gathered for assessing the impact of the proposed development on the local highway network. There are two areas which have been addressed, firstly the derivation of Annual Average Daily Traffic (AADT) flow on the local highway network and secondly the TRANSYT14 model prepared, along with base year analysis outputs, for the immediate local highway network adjacent the site.

### Traffic Flows Survey Data




The plan adjacent details the location of the various surveys undertaken on the local highway network

The Automatic Traffic counter locations are listed below:

1. Berry Street
2. Upper Duke Street
3. Great Georges Street
4. Duke Street
5. A561 St James Street

The junction counts are listed below:

a. Renshaw Street/Leece Street/Berry Street signalised junction
b. Upper Dukes Street/Duke Street/Great Georges Street signalised junction
c. A561St James Place/St James Street/Parliament Street/ Upper Parliament signalised junction
d. Duncan Street/Jordan Street/ St James Street crossroad junction

The Survey data is contained in Appendix A

### Study Network

In assessment terms it has been agreed with the Highway Authority that the study network will consist of the following junctions:

b. Upper Dukes Street/Duke Street/Great Georges Street signalised junction
c. A561St James Place/St James Street/Parliament Street/ Upper Parliament signalised junction
d. Duncan Street/Jordan Street/ St James Street crossroad junction

### TEMPRO Growth Factors

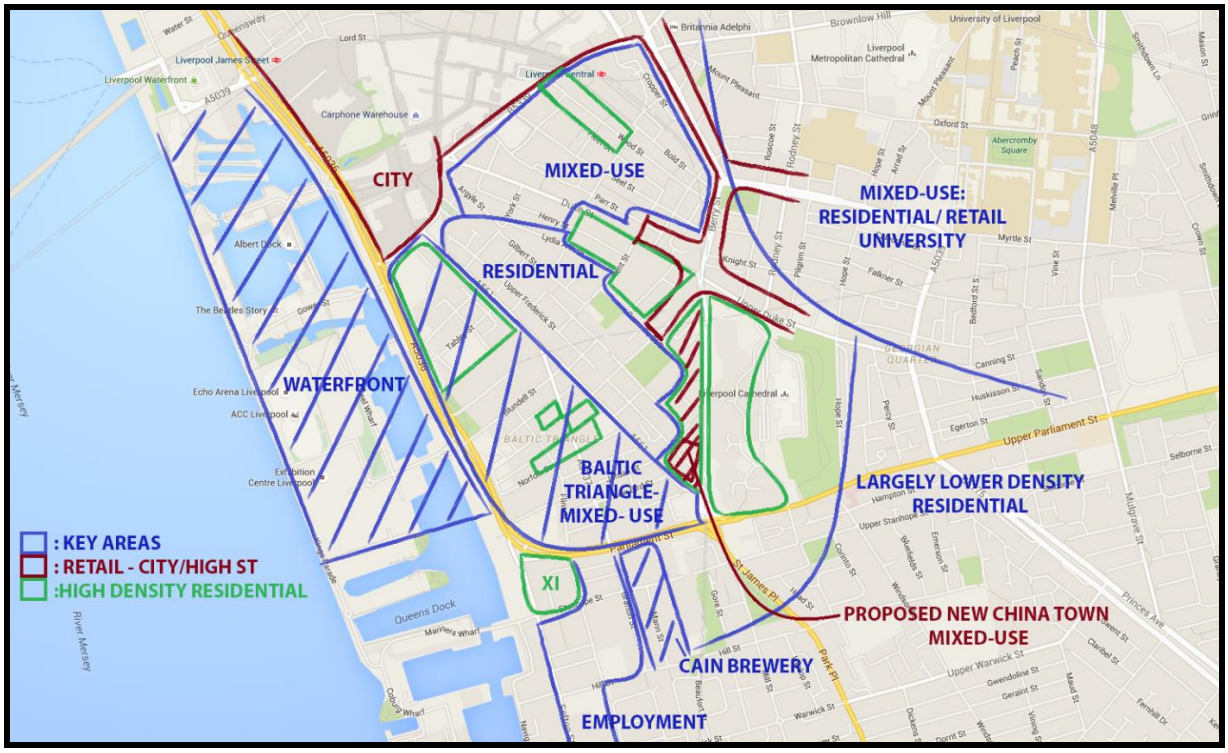
In order to growth flows to future years for network assessment purposes and Annual Average Daily Traffic (AADT) flow derivation purposes the TEMPRO database has been interrogated. TEMPRO utilises National Trip End Model (NTEM) 6.2 dataset and National Trip Model (NTM) Annual Forecasts (AF) 09. As of the 19 July 2011 the Department of Transport reaffirmed the use of the aforementioned dataset and AF09 in a circular email update.

| Level | Area | 2013 to 2015 | | | | 2015 to 2020 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Ave Weekday | Saturday | Sunday | Average | Ave Weekday | Saturday | Sunday | Average |
| Region | NW | 1.0093 | 1.0096 | 1.0100 | 1.0095 | 1.0755 | 1.0750 | 1.0758 | 1.0755 |
| County | Merseyside | 1.0062 | 1.0062 | 1.0067 | 1.0062 | 1.0623 | 1.0613 | 1.0623 | 1.0622 |
| Authority | Liverpool | 1.0102 | 1.0102 | 1.0110 | 1.0103 | 1.0740 | 1.0733 | 1.0750 | 1.0741 |
| 00BY1 | Liverpool(main) | 1.0102 | 1.0102 | 1.0110 | 1.0103 | 1.0740 | 1.0733 | 1.0750 | 1.0741 |

**TEMPRO Growth Rates**

The Liverpool area growth rates have been used to derive the AADT flows for 2013 and 2020

**Trips Rates and Generation**




The local area, as shown, has a dense residential area close by, adjacent facilities and shops, employment and excellent transport for none car use links.

These along with the limited parking offer will ensure that the trips are constrained and this is reflected in the trip levels used.

The Urban Splash scheme, located nearby, set out the use of edge of centre and centre sites to generate the trip rates for the development mix set out by use of the following methodology:

*When assessing the transport impact of proposed mixed use developments it is common practice to revise trip rates downwards slightly to reflect an element of cross-visitation between uses or the diversion of some existing trips on the local network to and from retail elements of the proposed development. The Transport Assessment has not made any reductions in respect of the trip rates associated with B1 usage, but has considered reductions particularly relevant to trips between C3 residential land use, and all other uses, namely A1 Shops and Food Retail, A3 Restaurants and Cafes, and D1 Creche. As a result, base trip rates for A1 Shops and Food Retail, A3 Restaurants and Cafes and D1 Creche uses have been revised.*

*In respect of revisions to A1, A3 and D1 land use trip rates, it is reasonable to assume that at least 25% of the vehicle trips estimated to be generated for these uses by TRICS would not occur in practice. This is especially likely given the site's city centre location and relatively high residential density and proximity to services.*

In addition:

*Transport Assessment assumes that non-residential uses would be primarily Al Shops (Food Retail). In such instances it is reasonable to assume reductions in trip rates for food retail uses, usually that 30% of the trips attracted to the development will not be new trips in their own right but will already be present on the network and will therefore be simply diverted trips. To account for this, the trip rates used in this Transport Assessment for A1 Shops (Food Retail) have been reduced by 30%.*

**Trip Rate Strategy**

As set out in the STA the location of the development is highly accessible, it lies in and adjacent to a major regeneration area with increasing density of both residential and student accommodation. The commercial, food/none retail and leisure uses lie close by to the north west direction in China Town and Berry Street corridor.

**Trip Rates**

The use of centre/edge of sites has derived the trip rates and trips for the development, Appendix B has full details for each use:

It has been set out that the key driver for the scheme is to create a complex where live work arrangements are in place for a significant number of the residents will thus own/work out of units within the New China Town development.

The following table overleaf sets out the trip rates and the use of the maximum areas/caps in the planning statement, as this is unlikely and the total known the simple approach use has to be obtain a pro rata rate for the max capped floor area against the actual floor area. The 0.681 ratio has been used to reduce the trips for the mix uses and the residential trips in a similar manner to the previous methodology.

The retail and restaurant uses are the higher trip generators for the site and could be reduced further based on the wider area shared trip potential and that the car parking ratios are reduced to 314 commercial use spaces, thus constraining the trips generated as the overspill is removed due to residents parking permits.

| 4000 | | | | |
|---|---|---|---|---|
| Time Period | Shopping centre Local Shops | | | |
| | Arr | Dep | Arr | Dep |
| 0800 to 0900 | 3.695 | 3.239 | 148 | 130 |
| 1700 to 1800 | 4.77 | 5.151 | 191 | 206 |

| 132 | | | | |
|---|---|---|---|---|
| Time Period | Hotel City Centre and Edge of Centre | | | |
| | Arr | Dep | Arr | Dep |
| 0800 to 0900 | 0.096 | 0.127 | 14 | 19 |
| 1700 to 1800 | 0.111 | 0.079 | 17 | 12 |

| 5000 | | | | |
|---|---|---|---|---|
| Time Period | B1 Office City Centre and Edge of Centre | | | |
| | Arr | Dep | Arr | Dep |
| 0800 to 0900 | 1.293 | 0.219 | 65 | 11 |
| 1700 to 1800 | 0.195 | 1.046 | 10 | 52 |

B1 used as proxy for A2

| 6000 | | | | |
|---|---|---|---|---|
| Time Period | Restaurants City Centre and Edge of Centre | | | |
| | Arr | Dep | Arr | Dep |
| 0800 to 0900 | 0 | 0 | 0 | 0 |
| 1700 to 1800 | 1.714 | 1.23 | 103 | 74 |

A3 used as proxy for A4

| | | | | |
|---|---|---|---|---|
| Max dev | 15000 | AM | 227 | 160 |
| | | PM | 320 | 344 |
| | | | | |
| Actual dev | 10217 | AM | 154 | 109 |
| pro rata | 0.681 | PM | 218 | 234 |

| 797 | | | | |
|---|---|---|---|---|
| Time Period | Flats City Centre & Edge of Centre | | | |
| | Arr | Dep | Arr | Dep |
| 0800 to 0900 | 0.056 | 0.169 | 45 | 135 |
| 1700 to 1800 | 0.134 | 0.081 | 107 | 65 |
| | | | | |
| | | AM | 30 | 92 |
| pro rata | 0.681 | PM | 73 | 44 |
| | | | | |
| Combined Trips | | AM | 185 | 200 |
| | | PM | 291 | 278 |

The previous approval for the site assessed the following trips
:

| | Trip Totals | | Trip Totals | |
|---|---|---|---|---|
| | AM Peak | | PM Peak | |
| | Arr | Dep | Arr | Dep |
| Permitted development Trips Previously Agreed | 100 | 167 | 184 | 161 |

**PERMITTED DEVELOPMENT TRIPS**

These will be added to the surveys to generate a base line trip level as shown in figures 5, 6 and 6a.. Given this the table below details the net trip increase which is considered as the additional development trips.

| | Trip Totals | | Trip Totals | |
|---|---|---|---|---|
| | AM Peak | | PM Peak | |
| | Arr | Dep | Arr | Dep |
| Derived Additional Development Flows To Be Tested on Study Network | 85 | 33 | 107 | 119 |

**NET ADDITIONAL DEVELOPMENT TRIPS**

The junctions that form the agreed study network will be tested for the above base plus agreed trips and the revised base plus net development trips.

**Distribution**

The distribution of development trips permitted or otherwise will be undertaken in accordance with

- The ins and outs of the cordon around the study network
- 1/3 and 2/3 split between the north (off Great Georges Street) and south (off St James Street) access respectively. This is a “Robust” access distribution as all of the development traffic, allocated to the southern access, will use the St James Street proposed car park access when in reality some vehicles will travel via Duncan Street located off St James Street. Below are details of a further distribution scenario which represents a realist distribution protocol.

The table below details the strategic wider cordon distribution.

| Cordon Point | AM Peak | | | | PM Peak | | | |
|---|---|---|---|---|---|---|---|---|
| | Traffic flows | | Percentage distribution of traffic flows | | Traffic flows | | Percentage distribution of traffic flows | |
| | In | Out | In | Out | In | Out | In | Out |
| Berry St | 426 | 533 | 10% | 14% | 444 | 502 | 10% | 12% |
| Upper Duke St | 263 | 225 | 6% | 6% | 249 | 356 | 6% | 8% |
| Upper Parliament St | 1059 | 640 | 26% | 16% | 703 | 1126 | 16% | 26% |
| St James Place | 1082 | 615 | 27% | 16% | 810 | 1038 | 18% | 24% |
| Parliament St | 795 | 1179 | 19% | 30% | 1382 | 871 | 31% | 20% |
| St James St | 188 | 449 | 5% | 12% | 406 | 241 | 9% | 6% |
| Duke St | 265 | 259 | 6% | 7% | 493 | 230 | 11% | 5% |
| Total | 4078 | 3900 | 100% | 100% | 4487 | 4364 | 100% | 100% |

**CORDON DISTRIBUTION RESULTS**

At the southern access a further scenario has been created for the distribution of developments flows in this local area. It is likely that some, tested as a 1/3 of, development traffic accessing St James Street will access the site via Duncan Street whilst the remainder will access the proposed car park access directly of St James Street.

**Traffic Flows Diagrams**

Utilising the survey flows and the derivation of development trips, permitted and additional, the proposed distribution based on a review of flows in and out via a cordon of the network, the following traffic flow diagrams have been prepared. Appendix C contains the traffic flow diagrams referred to below.

| Figure | Units | Title | Comment |
|---|---|---|---|
| 1 | PCU | 2015 Surveyed Traffic Movements - PCU | From surveys |
| 2 | PCU | 2020 Traffic i.e. 2015 Surveyed Growthed to 2020 using TEMPRO | Fig 1 growthed using Tempro factors |
| 3 | % | North Access Distribution In and Out | Based on cordon survey of network |
| 4 | % | South Access Distribution In and Out - Robust Scenario | Based on cordon survey of network. Robust distribution scenario assumes all traffic travelling via St James Street to enter site via new car park entrance on St James Street |
| 4a | % | South Access Distribution In and Out - Realistic Scenario | Based on Cordon survey of network. Realistic distribution scenario assumes 1/3 of all traffic travelling via St James Street to enter site via Duncan Street and 2/3 via new car park entrance on St James Street |
| 5 | PCU | North Access Extant Permitted Trips In and Out | Utilises fig 3 and 1/3 of proposed development trips |
| 6 | PCU | South Access Extant Permitted Trips In and Out - Robust Scenario Distribution | Utilises fig 4 and 2/3 of permitted development trips |
| 6a | PCU | South Access Extant Permitted Trips In and Out - Realistic Scenario Distribution | Utilises fig 4a and 2/3 of permitted development trips |
| 7 | PCU | Total Permitted Trips on the Network - 33% North Access 67% South Access - Robust Scenario Distribution | Fig 5 + 6 |
| 7a | PCU | Total Permitted Trips on the Network - 33% North Access 67% South Access - Realistic Scenario Distribution | Fig 5 + 6a |
| 8 | PCU | North Access Additional Development Trips In and Out | Utilises fig 3 and 1/3 of proposed development trips |
| 9 | PCU | South Access Extant Additional Development Trips In and Out - Robust Scenario Distribution | Utilises fig 4 and 2/3 of proposed development trips |
| 9a | PCU | South Access Extant Additional Development Trips In and Out - Realistic scenario Distribution | Utilises fig 4a and 2/3 of proposed development trips |
| 10 | PCU | Total Additional Trips on the Network - 33% North Access 67% South Access - Robust Scenario Distribution | Fig 8 + 9 |
| 10a | PCU | Total Additional Trips on the Network - 33% North Access 67% South Access - Realistic Scenario Distribution | Fig 8 + 9a |
| 11 | PCU | 2015 Survey Trips Plus Permitted Development Trips - Using Robust Distribution Scenario | Fig 1 + 7 |
| 11a | PCU | 2015 Survey Trips Plus Permitted Development Trips - Using Realistic Distribution Scenario | Fig 1 + 7a |
| 12 | PCU | 2020 Survey Trips Plus Permitted Development Trips - Using Robust Distribution Scenario | Fig 2 + 7 |

| | | | |
|---|---|---|---|
| 12a | PCU | 2020 Survey Trips Plus Permitted Development Trips - Using Realistic Distribution Scenario | Fig 2 + 7a |
| 13 | PCU | 2015 Survey Trips Plus Permitted Development Plus Additional Development Trips - Using Robust Distribution Scenario | Fig 10 + 11 |
| 13a | PCU | 2015 Survey Trips Plus Permitted Development Plus Additional Development Trips - Using Realistic Distribution Scenario | Fig 10a + 11a |
| 14 | PCU | 2020 Survey Trips Plus Permitted Development Plus Additional Development Trips - Using Robust Distribution Scenario | Fig 10 + 12 |
| 14a | PCU | 2020 Survey Trips Plus Permitted Development Plus Additional Development Trips - Using Realistic Distribution Scenario | Fig 10a + 12a |

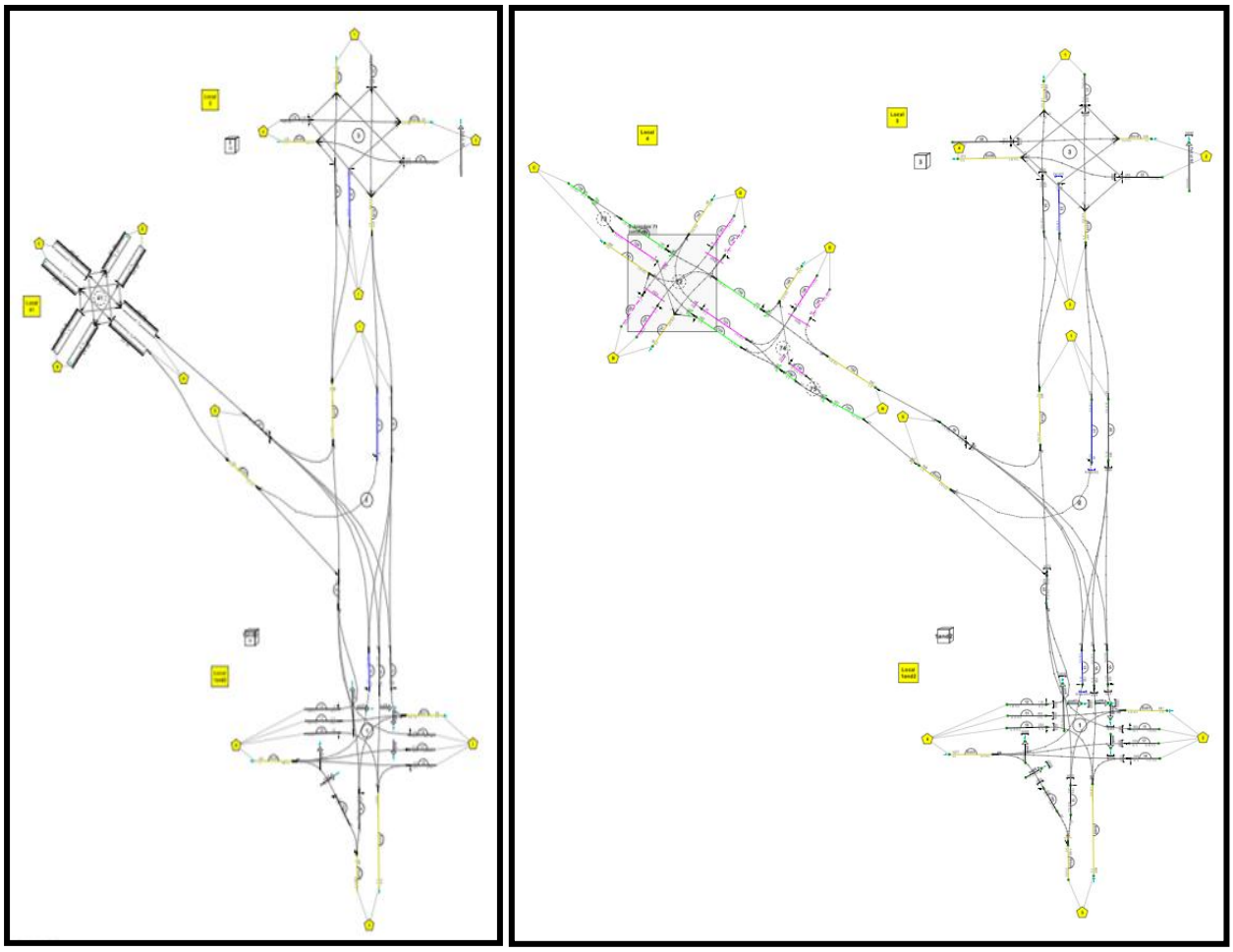
## TRAFFIC FLOW DIAGRAMS SUMMARY

### TRANSYT Model

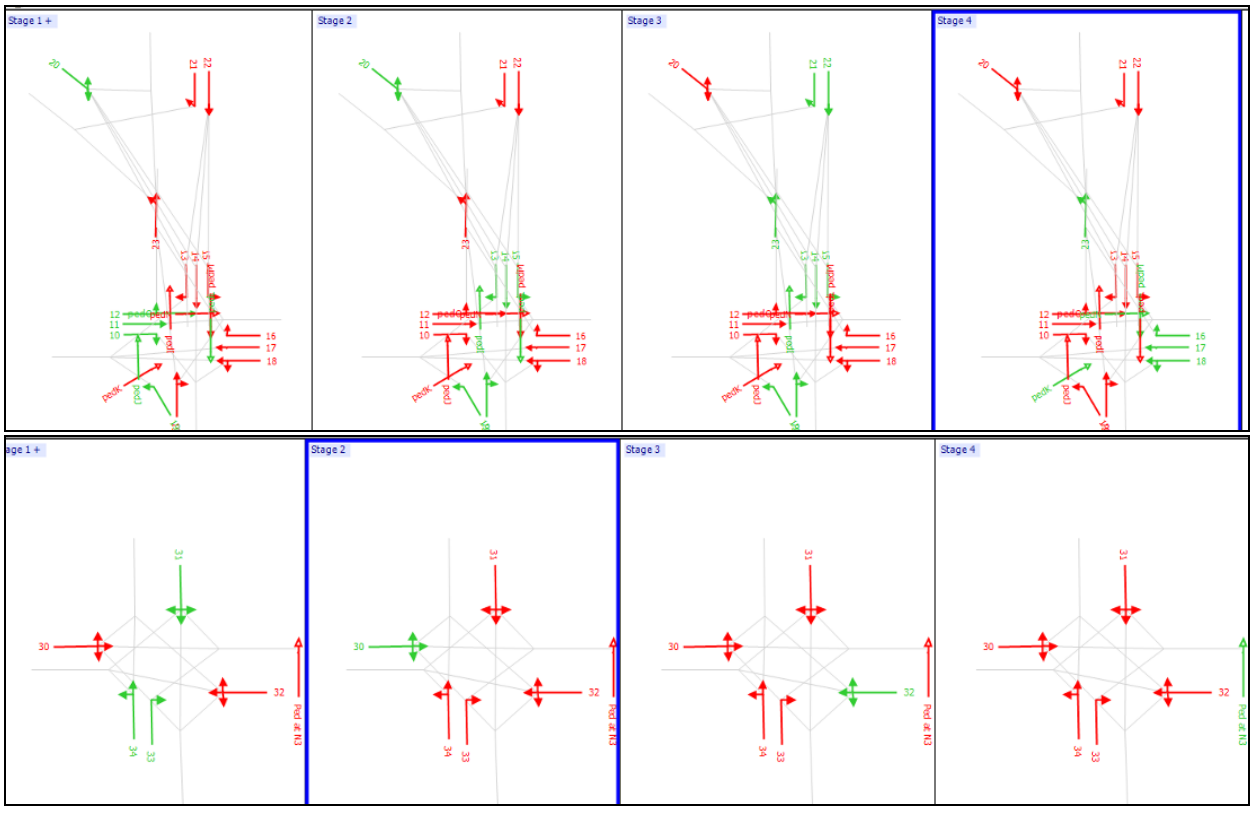
A TRANSYT 14 model of the base and the proposed network has been prepared and run using the survey base flows and the development flows. The model has been prepared using the latest signal data which has been supplied by the Highway Authority.

In addition an accepted 2007 Faber Maunsell TRANSYT model of the study network has also been reviewed as part of the building of the current model.

Below is an extract of the NetCon Models which have been exported from TRANSYT directly.



The staging arrangement for each set of signals is shown below based on the data supplied by the Highway Authority.



Utilising the flows in the previously noted flows diagrams the current and proposed network tested using the TRANSYT models created. It should be noted that for consistency a cycle time of 120 seconds has been used, which is also consistent with the previously agreed Faber Maunsell assessment, and none of the weighting, queue or otherwise, have been altered thereby allowing the model to determine the best signals timings available.

It should also be noted that the signals operate under SCOOT which is a system that optimises that minimise queuing and delay. Given this it is acknowledged in the industry that the results derived using TRANSYT can be significantly improved upon when SCOOT is in operation.

**TRANSYT Model Survey Flow Results**

All TRANSYT model outputs are contained in Appendix D.

The results of the TRANSYT run using the flows in Figures 1 and 2 are shown in the table below.

| Junction | Link | Approach | Movement | 2015 Survey Flows | | | | 2020 Survey Flows | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | | PM | | AM | | PM | |
| | | | | DoS | MMQ | DoS | MMQ | DoS | MMQ | DoS | MMQ |
| Upper Parliament St James / Great Georges Street complex Signalised Junction | 10 | Parliament Street | right | 45 | 7 | 55 | 12 | 50 | 8 | 58 | 13 |
| | 11 | Parliament Street | ahead | 39 | 12 | 46 | 20 | 43 | 14 | 49 | 22 |
| | 12 | Parliament Street | left | 17 | 2 | 12 | 2 | 19 | 3 | 13 | 2 |
| | 13 | Great Georges Street | right | 47 | 3 | 39 | 2 | 48 | 3 | 46 | 2 |
| | 14 | Great Georges Street | ahead | 29 | 4 | 52 | 8 | 29 | 4 | 56 | 9 |
| | 15 | Great Georges Street | left | 20 | 2 | 57 | 5 | 21 | 2 | 61 | 6 |
| | 16 | Upper Parliament Street | right | 45 | 8 | 32 | 4 | 50 | 8 | 35 | 4 |
| | 17 | Upper Parliament Street | ahead | 43 | 14 | 49 | 12 | 47 | 16 | 55 | 13 |
| | 18 | Upper Parliament Street | left | 43 | 7 | 49 | 6 | 47 | 7 | 54 | 6 |
| | 19 | St James Place | ahead and right | 61 | 20 | 50 | 14 | 61 | 21 | 53 | 15 |
| | 19a | St James Place | left | 37 | 7 | 25 | 4 | 39 | 8 | 26 | 4 |
| | 20 | St James Street | all movements | 27 | 5 | 44 | 10 | 30 | 5 | 47 | 11 |
| | 21 | Great Georges Street north | right | 17 | 1 | 14 | 0 | 18 | 1 | 16 | 1 |
| | 22 | Great Georges Street north | ahead | 33 | 8 | 51 | 13 | 34 | 8 | 55 | 14 |
| | 23 | Great Georges Street south | all movements | 41 | 11 | 37 | 9 | 43 | 12 | 41 | 12 |
| Duke Street/ Berry Street Junction | 30 | Duke Street | all movements | 70 | 9 | 75 | 17 | 75 | 10 | 80 | 18 |
| | 31 | Berry Street | all movements | 36 | 11 | 47 | 13 | 39 | 12 | 50 | 14 |
| | 32 | Upper Duke Street | all movements | 76 | 9 | 75 | 9 | 78 | 10 | 80 | 10 |
| | 33 | Great Georges Street | right | 14 | 1 | 16 | 1 | 15 | 1 | 17 | 1 |
| | 34 | Great Georges Street | left and ahead | 69 | 11 | 72 | 10 | 74 | 12 | 77 | 12 |
| St James street / Duncan Street / Jordan Street / Site Access Junction | 4A | St James St south east | all movements | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4B | Jordan Street | all movements | 1 | 0 | 2 | 0 | 1 | 0 | 2 | 0 |
| | 4C | St James St north west | all movements | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4D | Duncan Street | all movements | 2 | 0 | 9 | 0 | 2 | 0 | 9 | 0 |

MMQ - Mean Max Q

Dos - Degree of Saturation

P.I. - Performance Indicator

**2015 AND 2020 TRANSYT RESULTS – SURVEYED TRAFFIC FLOWS**

As it can be seen the network is predicted to operate without any significant operational or queueing issues.

**TRANSYT Model Base Flow Results**

The results of the TRANSYT run using the flows in figures 11, 11a, 12 and 12a. The suffix "a" denotes the use of the distribution that is described as "Realistic" i.e. a percentage of development traffic accessing the southern access point travelling via Duncan Street. . The TRANSYT model also reflect that there will be a right turn ghost island facility into Duncan Street and the car park access off St James Street. The TRANSYT results are shown in the tables below.

| Junction | Link | Approach | Movement | Surveys + Permitted Development with Network Improvements – Robust Distribution | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2015 – Fig 11 | | | | 2020 – Fig 12 | | | |
| | | | | AM | | PM | | AM | | PM | |
| | | | | DoS | MMQ* | DoS | MMQ* | DoS | MMQ* | DoS | MMQ* |
| Upper Parliament St James / Great Georges Street complex Signalised Junction | 10 | Parliament Street | right | 34 | 6 | 47 | 8 | 38 | 6 | 52 | 9 |
| | 11 | Parliament Street | ahead | 29 | 11 | 39 | 14 | 33 | 11 | 44 | 16 |
| | 12 | Parliament Street | left | 16 | 2 | 17 | 3 | 18 | 3 | 18 | 3 |
| | 13 | Great Georges Street | right | 54 | 3 | 48 | 2 | 63 | 3 | 50 | 3 |
| | 14 | Great Georges Street | ahead | 26 | 7 | 50 | 12 | 28 | 8 | 51 | 13 |
| | 15 | Great Georges Street | left | 22 | 3 | 61 | 7 | 23 | 3 | 62 | 7 |
| | 16 | Upper Parliament Street | right | 92 | 14 | 78 | 6 | 89 | 12 | 76 | 6 |
| | 17 | Upper Parliament Street | ahead | 79 | 19 | 97 | 19 | 77 | 17 | 96 | 19 |
| | 18 | Upper Parliament Street | left | 79 | 9 | 97 | 11 | 77 | 8 | 96 | 11 |
| | 19 | St James Place | ahead and right | 53 | 20 | 48 | 13 | 57 | 18 | 49 | 14 |
| | 19a | St James Place | left | 29 | 5 | 22 | 2 | 32 | 4 | 24 | 3 |
| | 20 | St James Street | all movements | 23 | 4 | 39 | 6 | 24 | 4 | 42 | 7 |
| | 21 | Great Georges Street north | right | 42 | 2 | 49 | 2 | 43 | 2 | 51 | 2 |
| | 22 | Great Georges Street north | ahead | 85 | 15 | 95 | 20 | 90 | 16 | 101 | 28 |
| | 23 | Great Georges Street south | all movements | 90 | 35 | 81 | 22 | 90 | 31 | 83 | 23 |
| Duke Street/ Berry Street Junction | 30 | Duke Street | all movements | 72 | 10 | 78 | 15 | 77 | 10 | 83 | 17 |
| | 31 | Berry Street | all movements | 37 | 11 | 49 | 12 | 39 | 11 | 52 | 13 |
| | 32 | Upper Duke Street | all movements | 77 | 10 | 78 | 8 | 83 | 10 | 84 | 10 |
| | 33 | Great Georges Street | right | 16 | 2 | 19 | 2 | 16 | 2 | 20 | 2 |
| | 34 | Great Georges Street | left and ahead | 74 | 14 | 78 | 10 | 77 | 10 | 83 | 11 |
| St James street / Duncan Street / Jordan Street / Site Access Junction | 723 | St James Street north | Right to Duncan Street | 3 | 0 | 4 | 0 | 3 | 0 | 4 | 0 |
| | 724 | St James Street south | Ahead and Left to Jordan Street | 28 | 0 | 14 | 0 | 30 | 0 | 15 | 0 |
| | 725 | Jordan Street | all movements | 1 | 0 | 2 | 0 | 1 | 0 | 2 | 0 |
| | 727 | St James Street north | ahead and left to Duncan Street | 10 | 0 | 23 | 0 | 11 | 0 | 25 | 0 |
| | 728 | St James Street north | Right to Jordan Street | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 743 | Duncan street | all movements | 3 | 0 | 10 | 0 | 4 | 0 | 11 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 746 | St James Street site access | all movements | 23 | 0 | 22 | 0 | 23 | 0 | 24 | 0 |
| | 748 | St James Street south | right to St James Street site access | 12 | 0 | 24 | 0 | 12 | 2 | 24 | 0 |

* Mean Max Q at End of Red Queue except for priority junction where it is MMQ

Dos - Degree of Saturation

P.I. - Performance Indicator

## 2015 and 2020 TRANSYT RESULTS - SURVEYS + PERMITTED DEVELOPMENT WITH NETWORK IMPROVEMENTS - ROBUST DISTRIBUTION SCENARIO

From the results above it can be concluded that the majority of the network is predicted to operate within satisfactory parameters. At no time do any of the Degrees of Saturation, which is ultimate threshold capacity of the link being considered, exceed 100%, although it is acknowledge a small number does exceed the desired threshold of 90%. The corresponding queues are not considered excessive in nature given the network demands. Given that the signals operate under Scoot it is considered that the permitted development trips will not be a significant issue.

The TRANSYT results in the table below reflect the use of a “Realistic” distribution of development traffic.

| Junction | Link | Approach | Movement | Surveys + Permitted Development with Network Improvements - Realistic Distribution Scenario | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2015 – Fig 11a | | | | 2020 – Fig 12a | | | |
| | | | | AM | | PM | | AM | | PM | |
| | | | | DoS | MMQ* | DoS | MMQ* | DoS | MMQ* | DoS | MMQ* |
| Upper Parliament St James / Great Georges Street complex Signalised Junction | 10 | Parliament Street | right | 34 | 9 | 47 | 8 | 38 | 6 | 52 | 9 |
| | 11 | Parliament Street | ahead | 29 | 16 | 39 | 14 | 33 | 11 | 44 | 16 |
| | 12 | Parliament Street | left | 16 | 4 | 17 | 3 | 18 | 3 | 18 | 3 |
| | 13 | Great Georges Street | right | 54 | 3 | 48 | 2 | 63 | 3 | 50 | 3 |
| | 14 | Great Georges Street | ahead | 26 | 13 | 50 | 12 | 28 | 8 | 51 | 13 |
| | 15 | Great Georges Street | left | 22 | 8 | 61 | 7 | 23 | 3 | 62 | 7 |
| | 16 | Upper Parliament Street | right | 92 | 7 | 78 | 6 | 89 | 12 | 76 | 6 |
| | 17 | Upper Parliament Street | ahead | 79 | 19 | 97 | 19 | 77 | 17 | 96 | 19 |
| | 18 | Upper Parliament Street | left | 79 | 11 | 97 | 11 | 77 | 8 | 96 | 11 |
| | 19 | St James Place | ahead and right | 53 | 14 | 48 | 13 | 57 | 18 | 49 | 14 |
| | 19a | St James Place | left | 29 | 3 | 22 | 2 | 32 | 4 | 24 | 3 |
| | 20 | St James Street | all movements | 23 | 8 | 39 | 6 | 24 | 4 | 42 | 7 |
| | 21 | Great Georges Street north | right | 42 | 3 | 49 | 2 | 43 | 2 | 51 | 2 |
| | 22 | Great Georges Street north | ahead | 85 | 27 | 95 | 20 | 90 | 16 | 101 | 28 |
| | 23 | Great Georges Street south | all movements | 90 | 27 | 81 | 22 | 90 | 31 | 83 | 23 |
| Duke Street/ Berry Street Junction | 30 | Duke Street | all movements | 72 | 18 | 78 | 15 | 77 | 10 | 83 | 17 |
| | 31 | Berry Street | all movements | 37 | 13 | 49 | 12 | 39 | 11 | 52 | 13 |
| | 32 | Upper Duke Street | all movements | 77 | 10 | 78 | 8 | 83 | 10 | 84 | 10 |
| | 33 | Great Georges Street | right | 16 | 2 | 19 | 2 | 16 | 2 | 20 | 2 |
| | 34 | Great Georges Street | left and ahead | 74 | 11 | 78 | 10 | 77 | 10 | 83 | 11 |
| an Street / Jorda n | 723 | St James Street north | Right to Duncan Street | 7 | 0 | 11 | 0 | 7 | 0 | 12 | 0 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 724 | St James Street south | Ahead and Left to Jordan Street | 27 | 0 | 14 | 0 | 29 | 0 | 15 | 0 |
| | 725 | Jordan Street | all movements | 1 | 0 | 2 | 0 | 1 | 0 | 2 | 0 |
| | 727 | St James Street north | ahead and left to Duncan Street | 10 | 0 | 23 | 0 | 11 | 0 | 25 | 0 |
| | 728 | St James Street north | Right to Jordan Street | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 743 | Duncan street | all movements | 13 | 0 | 18 | 0 | 13 | 0 | 19 | 0 |
| | 746 | St James Street site access | all movements | 15 | 0 | 15 | 0 | 15 | 0 | 15 | 0 |
| | 748 | St James Street south | right to St James Street site access | 8 | 0 | 16 | 0 | 8 | 0 | 16 | 0 |

* Mean Max Q at End of Red Queue except for priority junction where it is MMQ

Dos - Degree of Saturation

P.I. - Performance Indicator

## 2015 and 2020 TRANSYT RESULTS - SURVEYS + PERMITTED DEVELOPMENT WITH NETWORK IMPROVEMENTS - REALISTIC DISTRIBUTION SCENARIO

From a comparison of the table above and the results using the "Robust" distribution it is concluded that the small differences noted in the queues is a factor of the model reaching a slightly different solution. Therefore it is concluded that on a strategic basis the assignment of traffic to Duncan Street as opposed to access the car park directly of St James Street will only have an impact in this very local area. The predicted queues on the proposed right turn facilities do not exceed their storage capacity.

### TRANSYT Model Base Flow Plus Additional Development Flows Results

The results of the TRANSYT run using the flows in figures 13, 13a, 14 and 14a. The suffix "a" denotes the use of the distribution that is described as "Realistic" i.e. a percentage of development traffic accessing the southern access point travelling via Duncan Street. . The TRANSYT model also reflect that there will be a right turn ghost island facility into Duncan Street and the car park access off St James Street. The TRANSYT results are shown in the tables below.

| **Junction** | **Link** | **Approach** | **Movement** | **Surveys + Permitted Development + Additional Development with Network Improvements – Robust Distribution** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **2015 – Fig 13** | | | | **2020 – Fig 14** | | | |
| | | | | **AM** | | **PM** | | **AM** | | **PM** | |
| | | | | **DoS** | **MMQ*** | **DoS** | **MMQ*** | **DoS** | **MMQ*** | **DoS** | **MMQ*** |
| Upper Parliament St James / Great Georges Street complex Signalised Junction | 10 | Parliament Street | right | 35 | 5 | 48 | 8 | 39 | 6 | 54 | 9 |
| | 11 | Parliament Street | ahead | 30 | 10 | 41 | 14 | 33 | 11 | 45 | 16 |
| | 12 | Parliament Street | left | 18 | 3 | 21 | 3 | 20 | 3 | 22 | 4 |
| | 13 | Great Georges Street | right | 64 | 3 | 54 | 3 | 66 | 3 | 56 | 3 |
| | 14 | Great Georges Street | ahead | 27 | 7 | 49 | 13 | 32 | 8 | 51 | 13 |
| | 15 | Great Georges Street | left | 24 | 3 | 63 | 8 | 23 | 3 | 64 | 8 |
| | 16 | Upper Parliament Street | right | 89 | 12 | 86 | 7 | 95 | 15 | 84 | 7 |
| | 17 | Upper Parliament Street | ahead | 72 | 15 | **97** | 19 | 77 | 17 | **96** | 19 |
| | 18 | Upper Parliament Street | left | 72 | 8 | **97** | 11 | 77 | 8 | **96** | 11 |
| | 19 | St James Place | ahead and right | 56 | 17 | 46 | 13 | 57 | 18 | 48 | 14 |
| | 19a | St James Place | left | 30 | 4 | 22 | 2 | 32 | 4 | 24 | 3 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20 | St James Street | all movements | 25 | 4 | 45 | 7 | 27 | 4 | 49 | 8 |
| | 21 | Great Georges Street north | right | 54 | 2 | 67 | 3 | 56 | 2 | 69 | 3 |
| | 22 | Great Georges Street north | ahead | 86 | 14 | **100** | 26 | 92 | 18 | **100** | 27 |
| | 23 | Great Georges Street south | all movements | 89 | 30 | 88 | 26 | 92 | 32 | 87 | 27 |
| Duke Street/ Berry Street Junction | 30 | Duke Street | all movements | 73 | 9 | 79 | 16 | 79 | 10 | 85 | 18 |
| | 31 | Berry Street | all movements | 38 | 11 | 48 | 12 | 39 | 11 | 51 | 13 |
| | 32 | Upper Duke Street | all movements | 76 | 9 | 84 | 9 | 81 | 10 | 85 | 10 |
| | 33 | Great Georges Street | right | 16 | 2 | 20 | 2 | 17 | 2 | 21 | 2 |
| | 34 | Great Georges Street | left and ahead | 75 | 10 | 79 | 10 | 79 | 11 | 84 | 11 |
| St James street / Duncan Street / Jordan Street / Site Access Junction | 723 | St James Street north | Right to Duncan Street | 3 | 0 | 4 | 0 | 3 | 0 | 4 | 0 |
| | 724 | St James Street south | Ahead and Left to Jordan Street | 28 | 0 | 14 | 0 | 30 | 0 | 15 | 0 |
| | 725 | Jordan Street | all movements | 1 | 0 | 2 | 0 | 1 | 0 | 2 | 0 |
| | 727 | St James Street north | ahead and left to Duncan Street | 11 | 0 | 24 | 0 | 11 | 0 | 26 | 0 |
| | 728 | St James Street north | Right to Jordan Street | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 743 | Duncan street | all movements | 3 | 0 | 10 | 0 | 4 | 0 | 11 | 0 |
| | 746 | St James Street site access | all movements | 28 | 0 | 39 | 0 | 28 | 0 | 40 | 0 |
| | 748 | St James Street south | right to St James Street site access | 22 | 5 | 38 | 0 | 22 | 5 | 38 | 5 |

* Mean Max Q at End of Red Queue except for priority junction where it is MMQ

Dos - Degree of Saturation

P.I. - Performance Indicator

**2015 and 2020 TRANSYT RESULTS - SURVEYS + PERMITTED + ADDITIONAL DEVELOPMENT WITH NETWORK IMPROVEMENTS - ROBUST DISTRIBUTION SCENARIO**

From the table above it can be stated that only Great Georges Street north and Upper Parliament Street have a DoS greater than 90%. Given the importance, quantum of traffic on these links it is considered that the predicted queues are manageable. It should also be noted that a simplistic approach has been taken to modelling Great Georges Street north in that the model assumes that the right turn to St James Street, which has minimal flows on it - 3 vehicles per cycle, does not have any other movements associated with it, where as in reality the carriageway is signed ahead and right. Effectively the model has reduced the available capacity of this approach and therefore the results are worst case.

Comparing the results without and with the Additional development over the base case it can be stated that the increase in queuing is marginal i.e. no more than 6 vehicles on the major links. In fact on some links the queues have decreased as TRANSYT has been able to optimise signals in an alternate manner. This level of increased queues is considered unlikely to be noticeable and within the daily variation of how the signal will operate. With particular reference to the critical right turn off St James Street to the car park access it can be stated that the maximum predicted queue is 5 vehicles which there is sufficient capacity with the bay to accommodate. Given that these results represent the "Robust" distribution, i.e. all of the southern access development traffic accessing the car park directly off St James Street, it is very likely that the predicted queues will not reach this level. This hypothesis will be substantiated by the results in the following table.

Also as noted earlier the signals operate under SCOOT therefore the likelihood is that the signals will operate better than predicted.

The table below details the TRANSYT Results using the “Realistic” distribution scenario

| Junction | Link | Approach | Movement | Surveys + Permitted + Additional Development with Network Improvements - Realistic Distribution Scenario | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2015 – Fig 13a | | | | 2020 – Fig 14a | | | |
| | | | | AM | | PM | | AM | | PM | |
| | | | | DoS | MMQ* | DoS | MMQ* | DoS | MMQ* | DoS | MMQ* |
| Upper Parliament St James / Great Georges Street complex Signalised Junction | 10 | Parliament Street | right | 35 | 5 | 49 | 8 | 39 | 6 | 54 | 9 |
| | 11 | Parliament Street | ahead | 30 | 10 | 41 | 15 | 33 | 11 | 45 | 16 |
| | 12 | Parliament Street | left | 18 | 3 | 21 | 3 | 20 | 3 | 22 | 4 |
| | 13 | Great Georges Street | right | 64 | 3 | 61 | 4 | 66 | 3 | 56 | 3 |
| | 14 | Great Georges Street | ahead | 27 | 7 | 25 | 7 | 28 | 7 | 51 | 13 |
| | 15 | Great Georges Street | left | 24 | 3 | 67 | 9 | 23 | 3 | 64 | 8 |
| | 16 | Upper Parliament Street | right | 89 | 12 | 69 | 6 | 95 | 15 | 84 | 7 |
| | 17 | Upper Parliament Street | ahead | 72 | 15 | 78 | 13 | 77 | 17 | 96 | 19 |
| | 18 | Upper Parliament Street | left | 72 | 8 | 78 | 7 | 77 | 8 | 96 | 11 |
| | 19 | St James Place | ahead and right | 56 | 17 | 50 | 14 | 57 | 18 | 48 | 14 |
| | 19a | St James Place | left | 30 | 4 | 22 | 3 | 32 | 4 | 24 | 3 |
| | 20 | St James Street | all movements | 25 | 4 | 43 | 6 | 26 | 4 | 49 | 8 |
| | 21 | Great Georges Street north | right | 54 | 2 | 67 | 3 | 56 | 2 | 69 | 3 |
| | 22 | Great Georges Street north | ahead | 86 | 14 | 71 | 8 | 86 | 15 | 100 | 27 |
| | 23 | Great Georges Street south | all movements | 89 | 30 | 99 | 36 | 93 | 34 | 87 | 27 |
| Duke Street/ Berry Street Junction | 30 | Duke Street | all movements | 73 | 9 | 79 | 16 | 79 | 10 | 85 | 18 |
| | 31 | Berry Street | all movements | 38 | 11 | 48 | 12 | 39 | 11 | 51 | 13 |
| | 32 | Upper Duke Street | all movements | 76 | 9 | 84 | 9 | 81 | 10 | 85 | 10 |
| | 33 | Great Georges Street | right | 16 | 2 | 20 | 2 | 17 | 2 | 21 | 2 |
| | 34 | Great Georges Street | left and ahead | 75 | 10 | 79 | 10 | 79 | 10 | 84 | 11 |
| St James street / Duncan Street / Jordan Street / Site Access Junction | 723 | St James Street north | Right to Duncan Street | 10 | 0 | 16 | 0 | 10 | 0 | 16 | 0 |
| | 724 | St James Street south | Ahead and Left to Jordan Street | 28 | 0 | 14 | 0 | 30 | 0 | 15 | 0 |
| | 725 | Jordan Street | all movements | 1 | 0 | 2 | 0 | 1 | 0 | 2 | 0 |
| | 727 | St James Street north | ahead and left to Duncan Street | 11 | 0 | 24 | 0 | 11 | 0 | 26 | 0 |
| | 728 | St James Street north | Right to Jordan Street | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 743 | Duncan street | all movements | 12 | 0 | 24 | 0 | 16 | 1 | 25 | 0 |
| | 746 | St James Street site access | all movements | 18 | 0 | 27 | 0 | 19 | 0 | 28 | 0 |
| | 748 | St James Street south | right to St James Street site access | 15 | 0 | 26 | 2 | 15 | 0 | 26 | 1 |

* Mean Max Q at End of Red Queue except for priority junction where it is MMQ

Dos - Degree of Saturation

P.I. - Performance Indicator

## 2015 and 2020 TRANSYT RESULTS - SURVEYS + PERMITTED + ADDITIONAL DEVELOPMENT WITH NETWORK IMPROVEMENTS - REALISTIC DISTRIBUTION SCENARIO

Using a “Realistic” distribution scenario the predicted right turn queues into either Duncan Street or the car park directly off St James Street is within a reasonable allowance whereby the storage capacity of the proposed right turn bay is not exceeded.

**Trip Generation Sensitivity Assessment**

A sensitivity test for assessing if a further reduction in the trips generated has been undertaken based on the standard and proposed parking number ratio reduction that has also been undertaken as part of the development proposals since this will ultimately dictate the number of vehicles able to access the site has also been considered.

| Use | GFA / Quantum of Development / Comment | Car Parking Provision Standards | Car parking Spaces to be provided Based |
|---|---|---|---|
| Shops | 4,000sqm | 1 space per 22sqm | 182 |
| Hotel | 150 rooms | 1 per room | 150 |
| Restaurants | Based on 60% of floor space as public access 3,600sqm | 1 space per 8sqm | 450 |
| office | 5,00sqm | 1 space per 36sqm | 139 |
| Total | | | 921 |

**CAR PARKING RATIO TABLE**

The actual spaces on site are 314 therefore the derived ratio is 0.34. This shown overleaf.

The adjusted trips are:

| 4000 | | | | |
|---|---|---|---|---|
| **Time Period** | **Shopping centre Local Shops** | | | |
| | **Arr** | **Dep** | **Arr** | **Dep** |
| 0800 to 0900 | 3.695 | 3.239 | 148 | 130 |
| 1700 to 1800 | 4.77 | 5.151 | 191 | 206 |
| | | | | |
| 132 | | | | |
| **Time Period** | **Hotel City Centre and Edge of Centre** | | | |
| | **Arr** | **Dep** | **Arr** | **Dep** |
| 0800 to 0900 | 0.096 | 0.127 | 14 | 19 |
| 1700 to 1800 | 0.111 | 0.079 | 17 | 12 |
| | | | | |
| 5000 | | | | |
| **Time Period** | **B1 Office City Centre and Edge of Centre** | | | |
| | **Arr** | **Dep** | **Arr** | **Dep** |
| 0800 to 0900 | 1.293 | 0.219 | 65 | 11 |
| 1700 to 1800 | 0.195 | 1.046 | 10 | 52 |
| B1 used as proxy for A2 | | | | |
| | | | | |
| 6000 | | | | |
| **Time Period** | **Restaurants City Centre and Edge of Centre** | | | |
| | Arr | Dep | **Arr** | **Dep** |
| 0800 to 0900 | 0 | 0 | 0 | 0 |
| 1700 to 1800 | 1.714 | 1.23 | 103 | 74 |
| A3 used as proxy for A4 | | | | |
| | | | | |
| Max dev | 15000 | AM | 227 | 160 |
| | | PM | 320 | 344 |
| | | | | |
| Actual dev | 10217 | AM | 77 | 54 |
| pro rata | 0.34 | PM | 109 | 117 |
| | | | | |
| 797 | | | | |
| **Time Period** | **Flats City Centre & Edge of Centre** | | | |
| | Arr | Dep | **Arr** | **Dep** |
| 0800 to 0900 | 0.056 | 0.169 | 45 | 135 |
| 1700 to 1800 | 0.134 | 0.081 | 107 | 65 |
| | | | | |
| | | AM | 15 | 46 |
| pro rata | 0.34 | PM | 36 | 22 |
| | | | | |
| **Combined Trips** | | **AM** | **92** | **100** |
| | | **PM** | **145** | **139** |

These have also been compared to the previously accepted trips in the Urban Splash scheme.

| | Trip Totals | | Trip Totals | |
|---|---|---|---|---|
| | AM Peak | | PM Peak | |
| | Arr | Dep | Arr | Dep |
| Permitted development Trips Previously Agreed | 100 | 167 | 184 | 161 |

**PERMITTED DEVELOPMENT TRIPS**

Comparing the table above would therefore derived net trip decrease which, for terminology reasons, can be considered as the additional development trips.

| | Trip Totals | | Trip Totals | |
|---|---|---|---|---|
| | AM Peak | | PM Peak | |
| | Arr | Dep | Arr | Dep |
| Derived Additional Development Flows To Be Tested on Study Network | -8 | -67 | -39 | -22 |

**SENSITIVITY TEST BASED ON CAR PARKING RATIO - NET ADDITIONAL DEVELOPMENT TRIPS**

Clearly the parking constrained trips are lower than the previous scheme where the junction assessment required no additional mitigation or changes.

**AADT Flows**

Using the traffic survey data noted above the following AADT flows have been derived in the table below. The previous year of 2013, which forms a base scenario, and the future year of 2020 have been derived by using TEMPRO Growth rates

| Link Name | Average Percentage of HGVs including Buses and Coaches | Derived AADT Base Flows | | | Total Permitted Trips on the Network - 33% North Access 67% South Access | Total Additional Trips on the Network - 33% North Access 67% South Access |
|---|---|---|---|---|---|---|
| | | 2015 | 2013 | 2020 | | |
| Renshaw Street | 13% | 12789 | 12658 | 13736 | 665 | 358 |
| Leece Street | 17% | 5093 | 5041 | 5471 | 665 | 358 |
| Berry Street | 3% | 11793 | 11673 | 12667 | 665 | 358 |
| Upper Duke Street | 2% | 8827 | 8737 | 9480 | 375 | 219 |
| Great George Street | 3% | 11284 | 11169 | 12120 | 2430 | 1363 |
| Duke Street | 3% | 9727 | 9628 | 10447 | 440 | 245 |
| A562 east | 1% | 24305 | 24056 | 26105 | 1792 | 1022 |
| A561 St James Place | 3% | 23783 | 23540 | 25544 | 1182 | 716 |
| A562 west | 2% | 29148 | 28850 | 31306 | 1176 | 712 |
| A561 St James Street | 5% | 7434 | 7358 | 7984 | 4034 | 2256 |

## SUMMARY

The operational assessment shows that the increase in flows over that previously accepted for the site has little or no impact on the network taking a robust view of the access locations, sensitivity tests show that the use of the three access points reduce the queues further at the access points.

In addition the car park constraint modelling shows that the trips tested are unlikely to occur as over spill parking is controlled.