TIA Appendix 2
Junction Design Report

Contents

1 Introduction

This report has been prepared to document the evolution of the design of key junctions along the Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme (hereafter referred the Proposed Scheme) and is illustrated in Figure 1. In addition, the report presents the junction assessment results for the final scheme design which demonstrates the expected operation of the junction. Finally, a theoretical assessment has been carried out to demonstrate the theoretical capacity of the junctions for all modes. The methodology adopted is elaborated upon in the following sections.

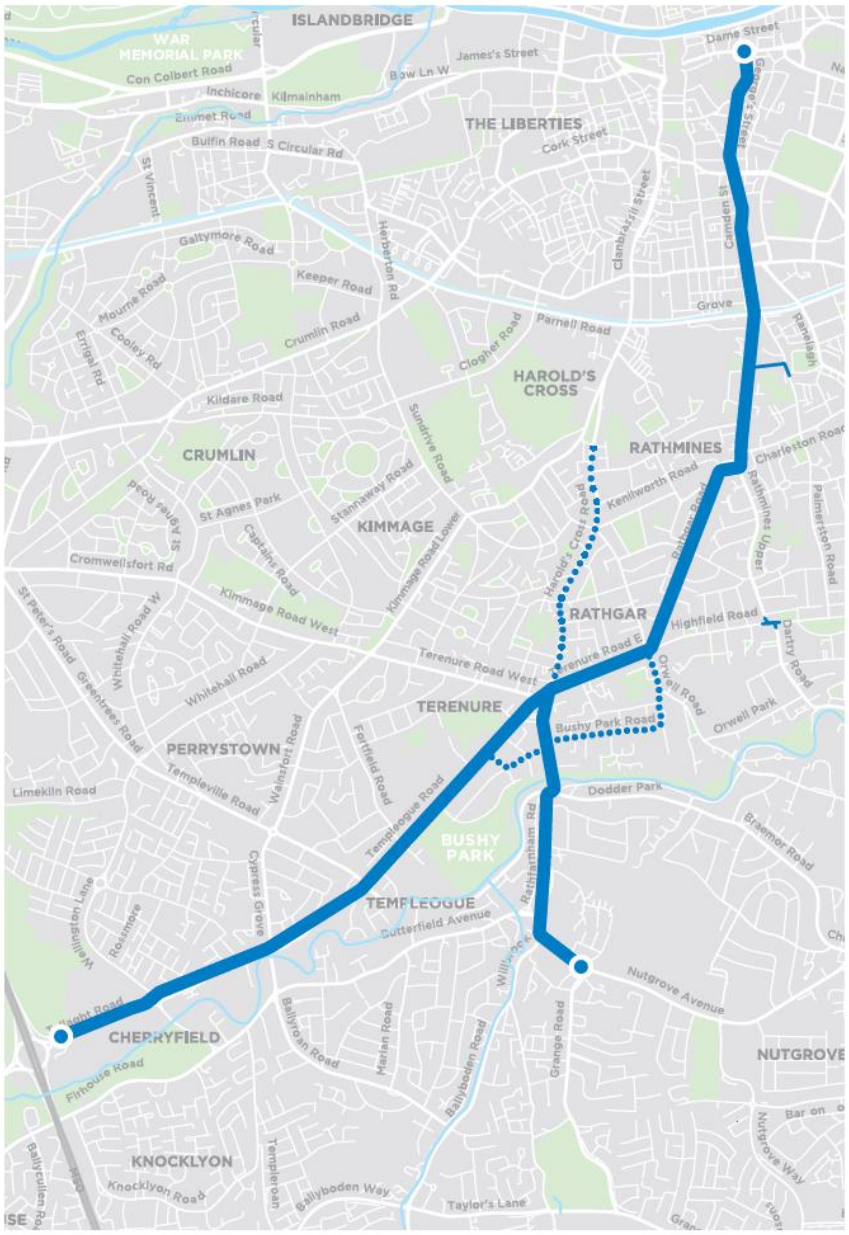


Figure 1: Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

2 Methodology

2.1 Junction Design Evolution

The Proposed Scheme has been designed over the course of a number of years, and during this period the design principles have evolved to improve the movement of people through the junctions for all modes. The final design principles which guided the junction design are documented in the *BusConnects Preliminary Design Guidance Booklet* document. This document sets out the four typical junction arrangements adopted on the project as follows:

- **Junction Type 1** – Both bus lanes are dedicated lanes up to the junction stop line and general straight ahead and left-turning traffic is restricted to one lane;
- **Junction Type 2** – As per Junction Type 1 but with left turning traffic crossing the bus lane into a dedicated left turn lane in advance of the stopline;
- **Junction Type 3** – Bus lanes are terminated just short of the junction to allow left-turners to turn left from a short left-turn pocket in front of the bus lane. Buses can continue straight ahead from this pocket where a receiving bus lane is proposed; and
- **Junction Type 4** – This junction arrangement is similar to a 'CYCLOPS' junction (used in Manchester, UK) where cycle facilities are provided outside the pedestrian crossings at the junction as opposed to inside the pedestrian crossings as is the case for junction types 1-3 (i.e. cycle track is located between the pedestrian crossing landing area and the footpath); however, this version of the CYCLOPS proposes signalised pedestrian crossings across the cycle tracks to allow the pedestrian to cross from the footpath to the pedestrian crossing landing areas, thus avoiding any uncontrolled pedestrian-cyclist conflict. Bus lanes are terminated just short of the junction to allow left turners to turn left from a short left-turn pocket in front of the bus lane. Buses can continue straight ahead from this pocket where a receiving bus lane is proposed.

In addition to the evolution of the design principles, the design has been positively influenced through engagement with the public at various points in the process. The evolution of the design is documented in this report with a clear rationale provided for the changes at key points in the project as follows:

- Emerging Preferred Routes (EPR);
- Second Public Consultation (PC2);
- Third Public Consultation (PC3); and
- Final Proposed Scheme.

2.2 Transport Modelling

Transport modelling has been a key input to the scheme design throughout the project. Given the complexity of the scheme proposals and changes to existing traffic regimes, the design went through an iterative process which was incorporated in the multi-tiered transport modelling approach consisting of strategic, local, and microsimulation modelling. The overall modelling methodology and information flow is summarised in Figure 2.

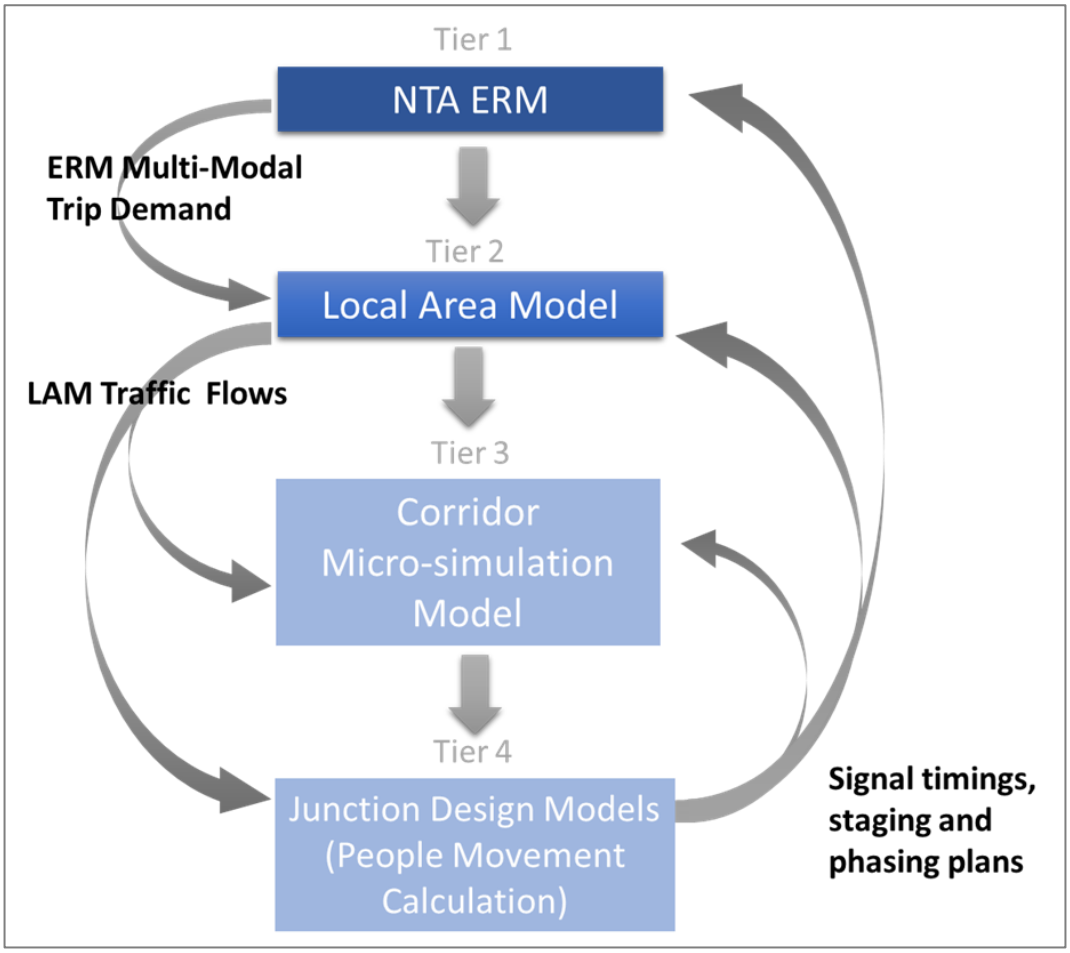


Figure 2: Transport Modelling Methodology and Information Flow

As shown in Figure 2, there are four tiers in the transport modelling hierarchy that were used for the purposes of assessing the Proposed Scheme:

- **East Regional Model** (ERM): the primary tool that provides the strategic multi-modal demand outputs for the proposed forecast.
- **Local Area Model** (LAM): a more refined road network model used to provide consistent road-based outputs to inform the TIA, EIAR, microsimulation model, junction design models and traffic management plan testing.
- **Microsimulation Model**: represents the end-to-end corridor model Proposed Scheme to assist in the operational validation of proposed designs with the visualisation of the potential Proposed Scheme impacts and benefits.

- **Local Junction Models**: each junction along the Proposed Scheme were developed to support local junction design development.

For the purposes of the Junction Design Report (JDR), results from the local junction models were extracted, which used LinSig, an industry-standard software that provides comprehensive assessment and design of a junction or a network of junctions.

The local junction models were used to inform junction design considerations and 'proof of concept' demonstration of the Proposed Scheme. The signal staging, timing and phasing from LinSig were incorporated into the three tiers of transport modelling hierarchy and it should be noted that this was an iterative approach throughout the design process.

This report presents the results of the local junction modelling which was the primary tool used by the design team to design and refine junction layouts. The 2028 scenario modelling results are presented in this report which represent an assessment of the junction designs for the opening year.

Figure 3 presents an example of the local junction modelling results from LinSig presented in this report. A description of the images follows.

A shows the junction layout in LinSig and the results per lane, which are the following:

- **Average Delay per PCU** (sec) – this is the number located at the back of the lane in Figure 3 and is the average delay for each PCU per lane;
- **Degree of Saturation** (%) – this is the number located in the middle of the lane in Figure 3 and is the ratio of Flow to Capacity per lane. The theoretical capacity of a junction is 90% and anything less than this assumes that the junction is within capacity; and
- **Mean Max Queue** (PCU) – this is the number located at the front of the lane in Figure 3 and is maximum queue (per lane) within a typical cycle.

B is the Timing Dial that shows an overview of signal times for all Stage Streams.

C is the Stage Diagram that shows the staging, phasing and timings of the junction.

D shows the following Network Summary Results:

- **Cycle** (seconds) **–** Cycle time in seconds;
- **PRC** (%) **–** Practical Reserve Capacity, which is the available spare capacity at a junction (i.e. negative PRC = over-capacity; positive PRC = spare capacity);
- **Delay** (PCUhr) – the total aggregate delay on all lanes controlled by each Stage Stream; and
- **Bus delay** (seconds) – the average bus delay per direction on the Proposed Scheme per junction.

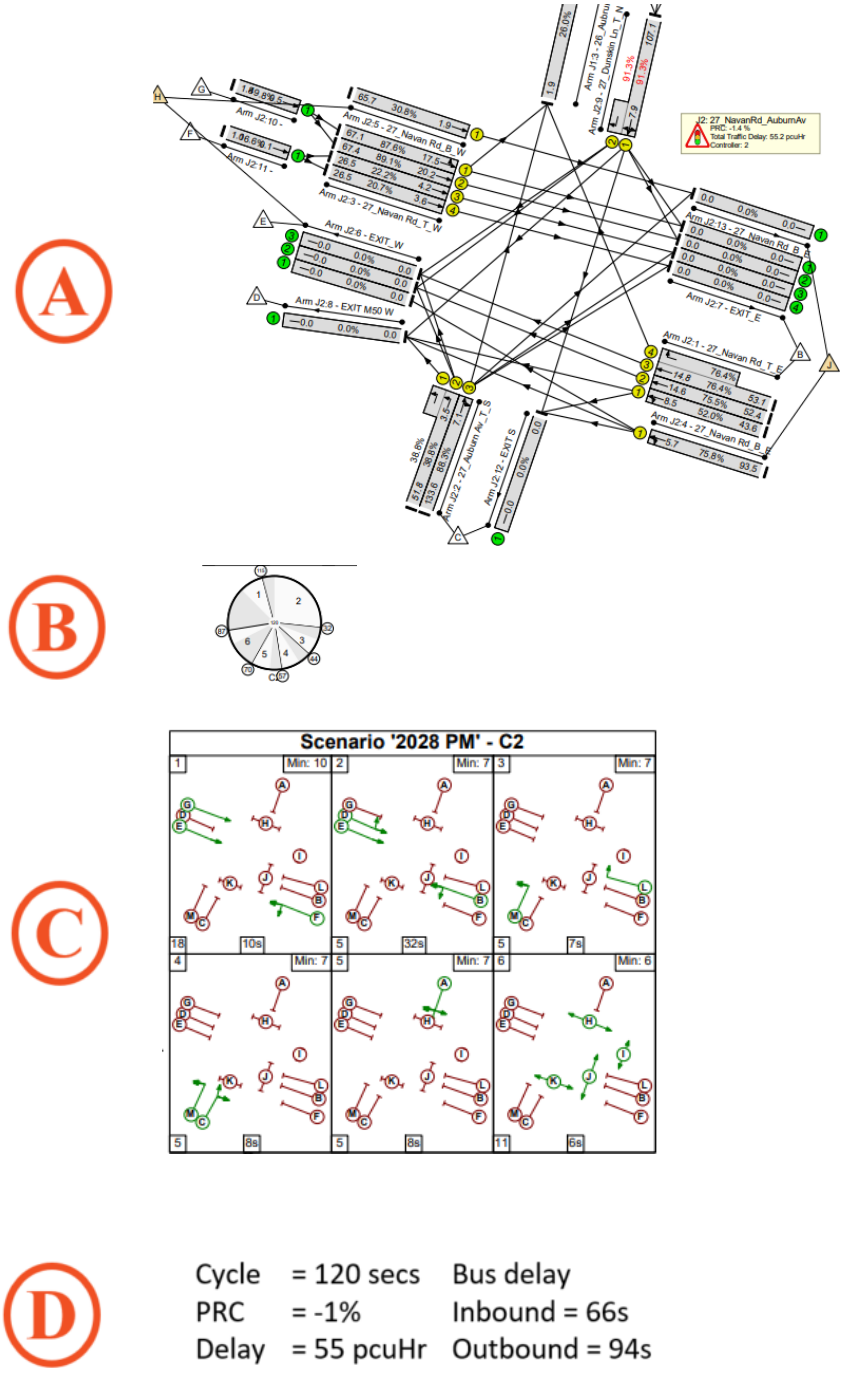


Figure 3: An example of the local junction modelling results in the JDR

It should be noted that modelling bus priority signals is not possible in LinSig due to its dynamic nature. However, this was modelled in the microsimulation model and is reported in the *Transport Impact Assessment Report* and *Transport Modelling Report*.

2.3 People Movement at Signals Calculator

The prioritisation of people movement and maximising the throughput of sustainable modes (i.e. walking, cycling and bus modes) in advance of the

consideration and management of general vehicular traffic (private car) movements at junctions were the policy led approach to the junction design for the Proposed Scheme. Therefore, in order to quantify this for the purposes of supporting this policy led approach, the People Movement at Signals (PMS) Calculator was developed. The PMS Calculator was used to validate the design and the assertion that the proposal would result in greater throughput of people.

The PMS Calculator provided an initial estimate of green time allocation for all movements at a 'typical' junction on the basis that sustainable mode movements should be accommodated foremost to maximise people movement, with the remaining green time allocated to general traffic movements. The PMS calculator was also set up to cater for the four junction types as proposed in the *BusConnects Preliminary Design Guidance Booklet*.

The information used for the purposes of PMS Calculator include the following:

- Number of buses required to be accommodated along the corridor (informed from the network re-design proposals);
- Estimated cycling demand (from early stage runs of the ERM);
- Pedestrian crossing width and resultant crossing timing requirements; and
- Vehicular capacity at each junction (derived by LinSig).

The bus demand and vehicular capacity per hour were converted to number of persons in order to calculate the total number of people (including pedestrians and cyclists) that can be accommodated at each junction in the Proposed Scheme per hour.

It should be noted that the PMS Calculator is based on theoretical capacity of the design and would generally be different from the local junction modelling results in LinSig, which is based on operational capacity or Practical Reserve Capacity (PRC) and future transport demands. Therefore the PMS Calculator results are shown in the JDR, in tandem with the LinSig results, to display both the movement of people (relative to the available capacity) and vehicles along the Proposed Scheme.

Additionally, the vehicular capacity per arm for each junction (as marked in the image below) is the capacity calculated in LinSig, which factors in parameters such as geometry and red time. Therefore, the vehicular capacity is dependent on each junction design. These vehicular capacities were directly extracted from LinSig for each traffic lane of all junctions and applied in the PMS Calculator.

The vehicular capacities were then converted to number of people using an assumed occupancy factor of 1.2 per vehicle.

Therefore, the percentage displayed in the Junction Design Report for General Traffic is the volume/capacity of people per junction. It should be noted that the capacity used for general traffic is based on the total volume and capacity for the junction overall (i.e. total of all arms) and therefore does not directly reflect the PRC results in LinSig, which reflects the maximum degree of saturation on the worst lane.

Below is an example image of PMS Calculator results, which shows the capacity used by mode (**blue**), as well as the combined capacity used for all modes (**black**).

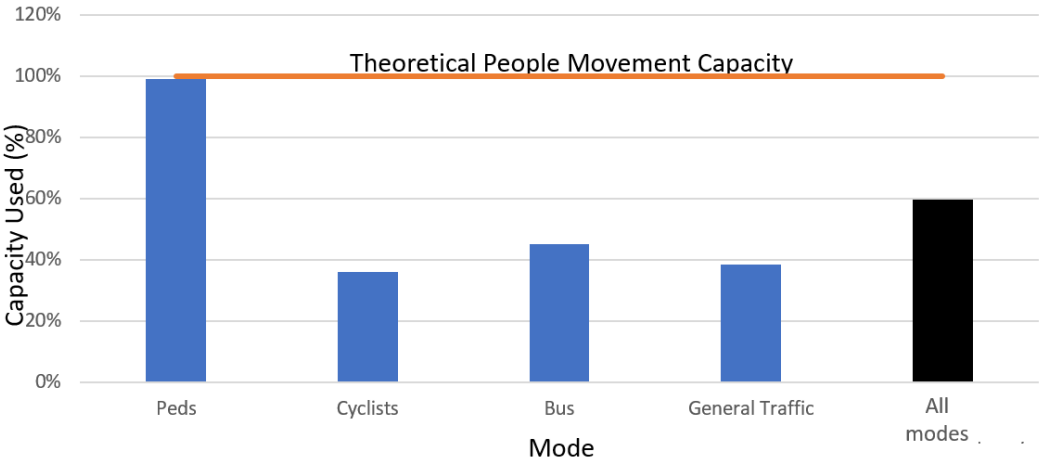


Figure 4: Example image of People Movement at Signals Calculator results

Each junction has a certain theoretical capacity for each mode based on green time and has been examined as to how this green time can cater for the anticipated demand through the junction. In the scenario described within Figure 4, due to high pedestrian volumes the junction has reached its theoretical capacity for pedestrians, as no additional green time can be applied to pedestrian phases. However, it is also the case in this example scenario that the volumes of cyclists, buses, and general traffic are below the theoretical capacity. As such, if there were an increased demand for any or all of these modes the junction could continue to cater for such a demand (up to the theoretical capacity for the relevant mode and/or the overall theoretical capacity for all modes).

3 Junctions Assessed

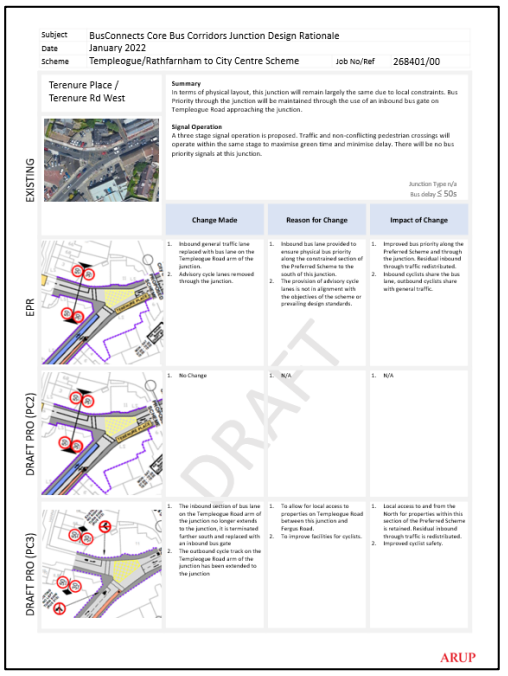
A total number of 32 junctions in the Proposed Scheme are presented in this report, which are as follows:

- Grange Road / Rathfarnham Wood;
- Grange Road / Willbrook Road;
- Rathfarnham Road / Butterfield Avenue;
- Rathfarnham Road / Castleside Drive;
- Rathfarnham Road / Dodder Park Road;
- Rathfarnham Road / Rathdown Park and Rathfarnham Road / Bushy Park Road (combined in one model);
- Rathfarnham Road / Terenure Road N / Templeogue Rd and Terenure Road W / Terenure Place (combined in one model);
- Rathgar Road / Terenure Road and Rathgar Road / Highfield Road (combined in one model);
- Rathgar Road / Leicester Avenue;
- Rathgar Road / Grosvenor Road;
- Rathmines Road Lower / Rathmines Road Upper;
- Rathmines Road Lower / Castlewood Avenue;
- Rathmines Road Lower / Leinster Road;
- Richmond Street S / Grove Road and Richmond Street S / Charlemont Mall (combined in one model);
- Camden Street / Harrington Street / Richmond Street S;
- Camden Street / Charlotte Way;
- Kevin Street Lower / Wexford Street;
- South Great George Street / Longford Street Lower;
- South Great George Street / Stephen Street;
- South Great George Street / Dame Street;
- Harold's Cross Road / Rathgar Avenue;
- Harold's Cross Road / Leinster Road;
- Orwell Road / Zion Road;
- Highfield Road / Rathmines Road Upper;
- Templeogue Road / Wellington Lane;
- Templeogue Road / Cypress Grove Road;
- Templeogue Road / Templeville Road; and
- Templeogue Road / Fortfield Road.

The junctions design and modelling commentary and results are presented in similar order as above in the next section.

4 Junction Design and Modelling Results

Overview of Information Presented for Each Junction


Subject BusConnects Core Bus Corridors Junction Design Rationale
Date January 2022
Scheme Templeogue/Rathfarnham to City Centre Scheme Job No/Ref 268401/00
Terenure Place / Terenure Rd West
EXISTING
EPR
DRAFT PRO (PC2)
DRAFT PRO (PC3)
Summary
In terms of physical layout, this junction will remain largely the same due to local constraints. Bus Priority through the junction will be maintained through the use of an inbound bus gate on Templeogue Road approaching the junction.
Signal Operation
A three stage signal operation is proposed. Traffic and non-conflicting pedestrian crossings will operate within the same stage to maximise green time and minimise delay. There will be no bus priority signals at this junction.
Junction Type n/a
Bus delay ≤ 50s
Change Made | Reason for Change | Impact of Change
1. Inbound general traffic lane replaced with bus lane on the Templeogue Road arm of the junction.
2. Advisory cycle lanes removed through the junction.
1. Inbound bus lane provided to ensure physical bus priority along the constrained section of the Preferred Scheme to the south of this junction.
2. The provision of advisory cycle lanes is not in alignment with the objectives of the scheme or prevailing design standards.
1. Improved bus priority along the Preferred Scheme and through the junction. Residual inbound through traffic redistributed.
2. Inbound cyclists share the bus lane, outbound cyclists share with general traffic.
1. No Change
1. N/A
1. N/A
1. The inbound section of bus lane on the Templeogue Road arm of the junction no longer extends to the junction, it is terminated further south and replaced with an inbound bus gate
2. The outbound cycle track on the Templeogue Road arm of the junction has been extended to the junction
1. To allow for local access to properties on Templeogue Road between this junction and Fergus Road.
2. To improve facilities for cyclists.
1. Local access to and from the North for properties within this section of the Preferred Scheme is retained. Residual inbound through traffic is redistributed.
2. Improved cyclist safety.
DRAFT
ARUP

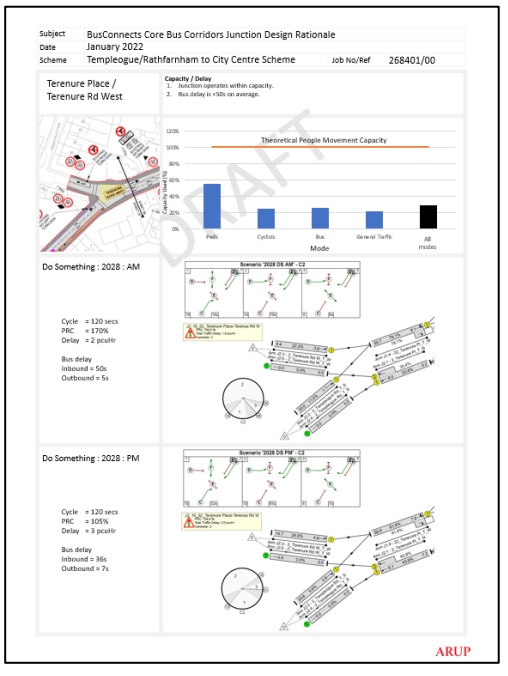
Page 1: Junction Design Evolution

- Summary
- EPR
- Draft PRO PC2
- Draft PRO PC3


Subject BusConnects Core Bus Corridors Junction Design Rationale
Date January 2022
Scheme Templeogue/Rathfarnham to City Centre Scheme Job No/Ref 268401/00
Terenure Place / Terenure Rd West
EXISTING
FINAL DESIGN
Change Made | Reason for Change | Impact of Change
1. No Change
1. N/A
1. N/A
DRAFT
ARUP

Page 2: Junction Design Evolution (contd.)

- Other design iterations if applicable
- Final Design


Subject BusConnects Core Bus Corridors Junction Design Rationale
Date January 2022
Scheme Templeogue/Rathfarnham to City Centre Scheme Job No/Ref 268401/00
Terenure Place / Terenure Rd West
Capacity / Delay
1. Junction operates within capacity.
2. Bus delay is <50s on average.
Theoretical People Movement Capacity
Mode
Peds
Cyclists
Bus
General Traffic
All modes
Do Something : 2028 : AM
Cycle = 120 secs
PRC = 170%
Delay = 2 pcuHr
Bus delay
Inbound = 50s
Outbound = 5s
Do Something : 2028 : PM
Cycle = 120 secs
PRC = 105%
Delay = 3 pcuHr
Bus delay
Inbound = 36s
Outbound = 7s
DRAFT
ARUP

Page 3: Junction Modelling Results

- People Movement Calculator Outputs
- LinSig Traffic Modelling Results

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Grange Rd / Rathfarnham Wood

Summary
Junction is proposed to be upgraded to provide bus lanes and cycle tracks in both directions on Grange Road western approach tying into existing facilities on the eastern approach. A fully protected junction is also proposed to improve cyclist safety.

Signal Operation
A six stage signal operation is proposed. Mainline inbound buses and cyclists will operate with outbound straight-ahead and left general traffic. The outbound straight-ahead and left general traffic will continue with inbound traffic, to be followed by the right-turning outbound traffic and left-turning traffic from Grange Road. Mainline outbound cyclists will operate with left-turning traffic from Grange Road, to be followed by all traffic from both side roads. The pedestrian crossings will operate in a stage with cyclists turning right to and from the side roads.

Junction Type 1 Bus delay ≤ 65s

		Change Made	Reason for Change	Impact of Change
EXISTING				
EPR		1. Bus lanes are provided in both directions on the western approach 2. Cycle facilities along the Preferred Scheme route are provided 3. Dedicated left turn slip lane provided on southern approach	1. To provide bus priority 2. To improve cycle facilities 3. To provide bus priority for buses turning left	1. Improved bus priority 2. Improved cycle safety 3. Improved bus priority for buses turning left from Grange Road southern approach
DRAFT PRO (PC2)		1. Removal of left turn slip lane for buses	1. To provide safer facilities for pedestrians and cyclists	1. Reduced priority for buses making this movement but limited gain in previous proposal anyway. Improved safety for pedestrian and cyclists.
DRAFT PRO (PC3)		1. Cycle facilities enhanced to provide protected cycle infrastructure through the junction	1. To improve facilities for cyclists consistent with BusConnects design guidance.	1. Need for additional land take but significantly improved safety for cyclists.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Grange Rd / Rathfarnham Wood

EXISTING

FINAL DESIGN

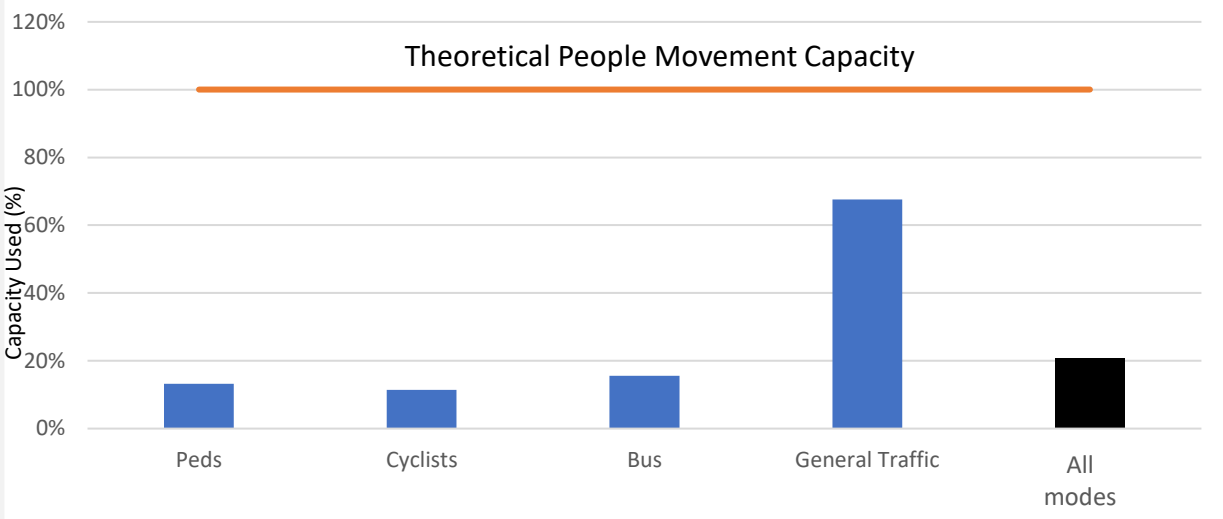
Change Made	Reason for Change	Impact of Change
1. Eastern extents of the scheme extended on Nutgrove Avenue. 2. Bus lane stop lines set back at the junction. 3. Right turn lane from Grange Road west to Grange Road south reintroduced.	1. To tie in with existing cycle track and bus lane in this location. 2. To improve visibility for left turning vehicles of cyclists a t the junction. 3. To maintain existing lane arrangement for general traffic.	1. Improved cyclist provision and bus priority to the junction. 2. Improved cyclist safety. 3. Improved traffic flow.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Grange Rd / Rathfarnham Wood

Capacity / Delay

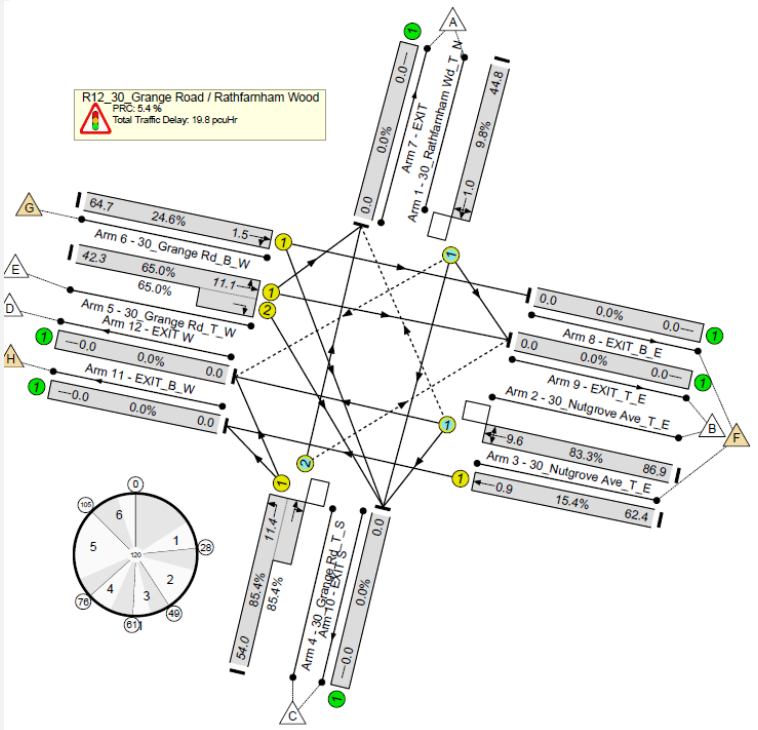
1. Junction operates within capacity in both peaks.
2. Bus delay is <65s on average.

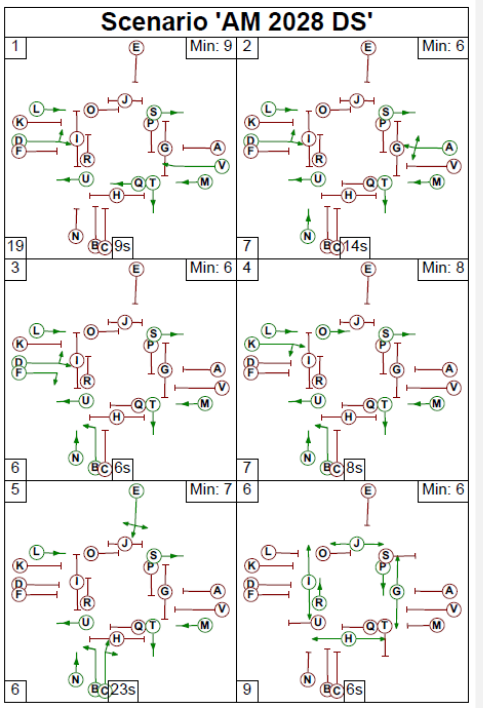


Do Something : 2028 : AM

Cycle = 120 secs
PRC = 5%
Delay = 20 pcuHr

Bus delay
Inbound = 62s
Outbound = 65s

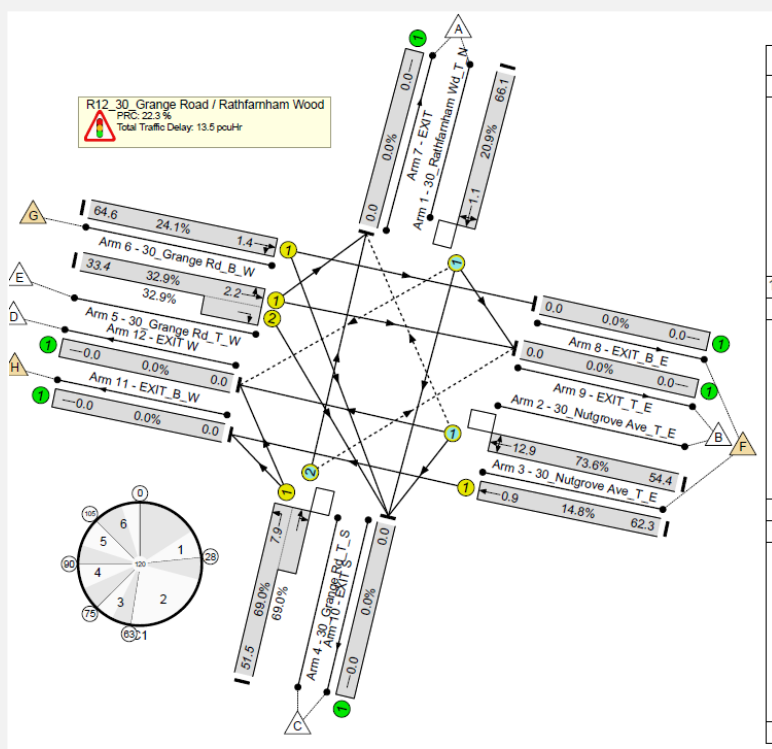


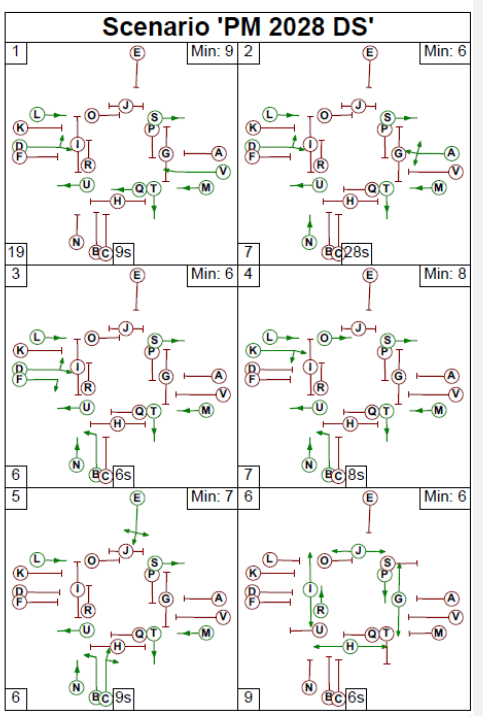


Do Something : 2028 : PM

Cycle = 120secs
PRC = 22%
Delay = 14 pcuHr

Bus delay
Inbound = 62s
Outbound = 65s





ARUP

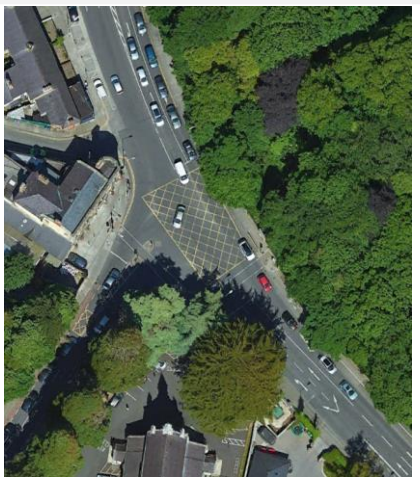
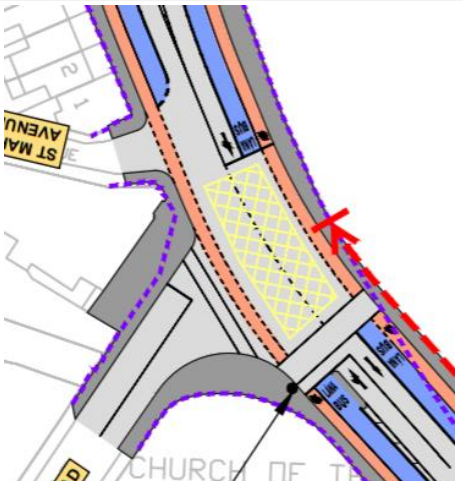
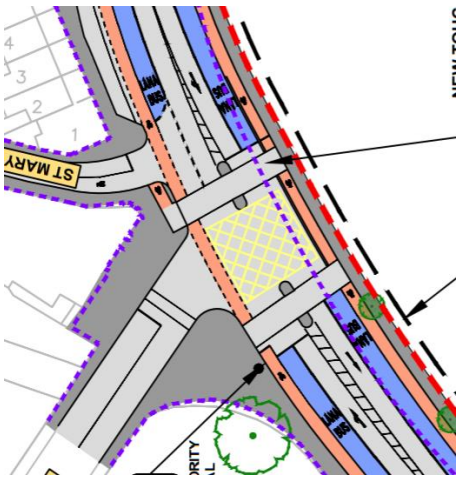
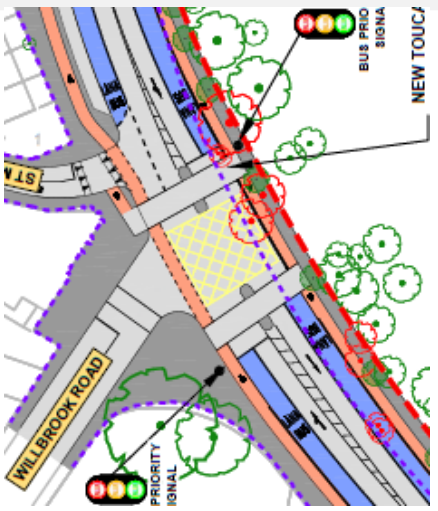
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Grange Rd / Willbrook Rd

Summary
This junction is proposed to be upgraded to provide bus lanes and cycle tracks in each direction through the junction. A fully protected junction is also proposed to improve cyclist safety.

Signal Operation
A five stage signal operation is proposed. Mainline buses and cyclists will operate in the same stage through the junction. Outbound buses and cyclists will continue with mainline traffic in both directions, followed by a right turn indicative arrow to facilitate the heavy traffic flow into Willbrook Road. The side road traffic and cyclists will operate in their own stage with flashing ambers, to be followed by pedestrians and right turning cyclists.

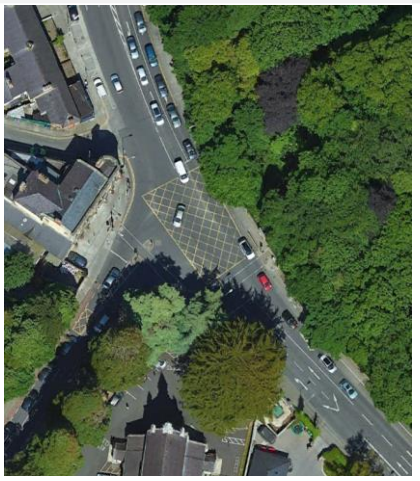
Junction Type 1
Bus delay ≤ 65s

		Change Made	Reason for Change	Impact of Change
EXISTING				
EPR		1. Bus lanes are provided in both directions through the junction. 2. Cycle facilities along the Preferred Scheme route are provided, and cycle and pedestrian crossing facilities	1. To provide improved bus priority 2. To improve cycle facilities	1. Improved bus priority. Removal of left turn lane on southern approach means traffic would need to turn from middle lane (in separate signal stage to buses) 2. Improved cyclist safety. Land take required to provide increased cross-sectional width.
DRAFT PRO (PC2)		1. Additional crossing provided on northern approach	1. To provide better connectivity from start of alternative cycle route on St. Marys Avenue and the core corridor on Rathfarnham Road	1. Increased land take from Rathfarnham Castle lands (also linked to maintaining car parking on western side of the northern approach)
DRAFT PRO (PC3)		1. No material changes	1. N/A	1. N/A

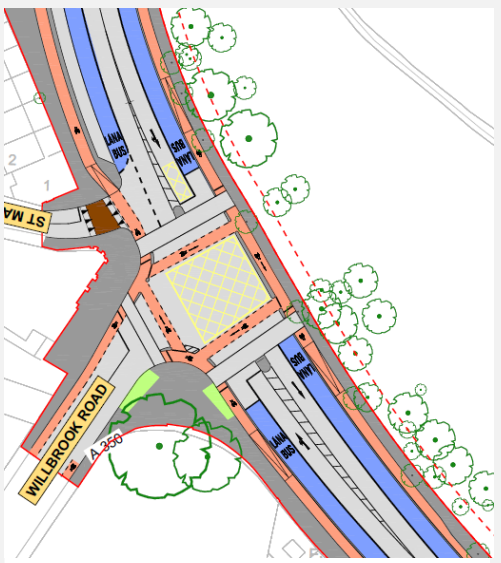
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Grange Rd / Willbrook Rd

EXISTING



FINAL DESIGN



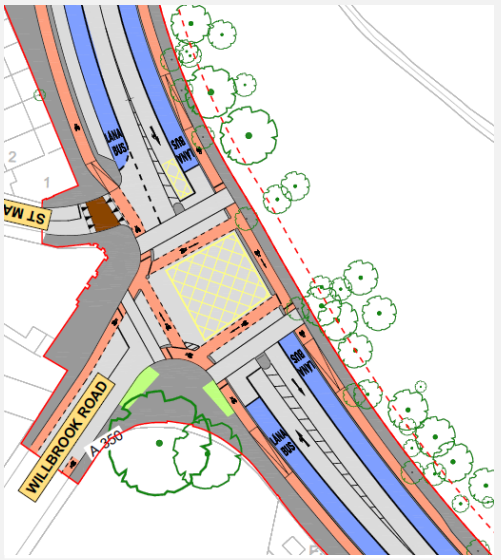
Change Made	Reason for Change	Impact of Change
1. Conventional Signalised junction converted to protected junction. 2. Bus lane stop lines set back at the junction. 3. Contraflow cyclist link to St Mary's Avenue removed from the scheme.	1. To provide enhanced facilities for pedestrians and cyclists. 2. To improve visibility for left turning vehicles of cyclists at the junction. 3. The alternative cycle route, linking to the Dodder Greenway, no longer forms part of the scheme.	1. Improved pedestrian and cyclist safety. 2. Improved cyclist safety. 3. Increased space for pedestrians on this corner of the junction.

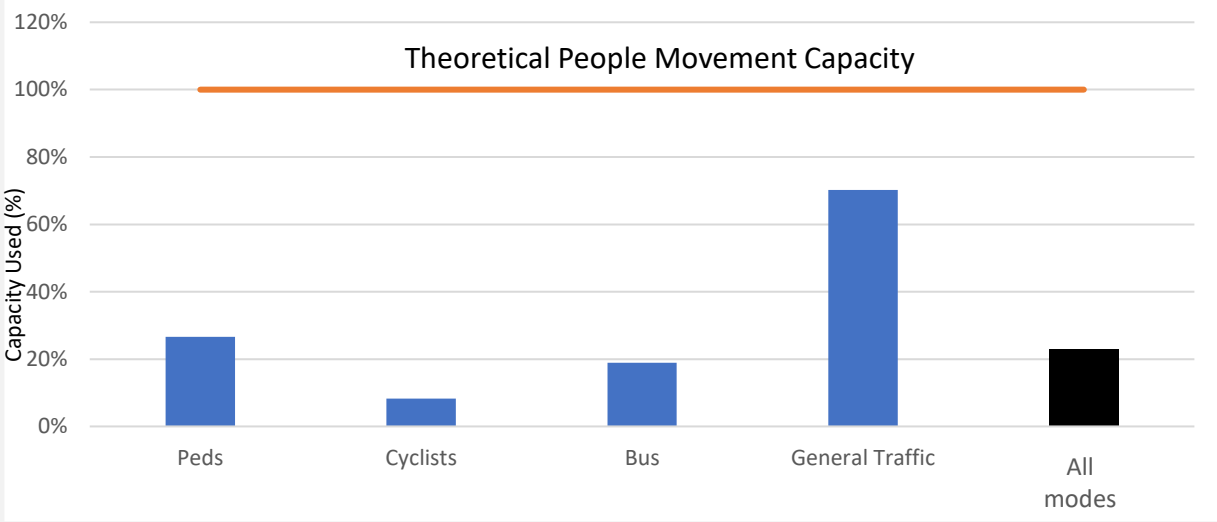
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Grange Rd / Willbrook Rd

Capacity / Delay

1. Junction operates within capacity in both peaks.
2. Bus delay is <65s on average.

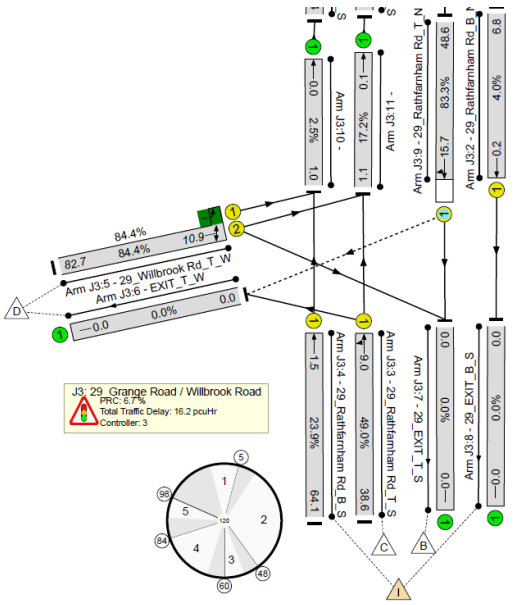


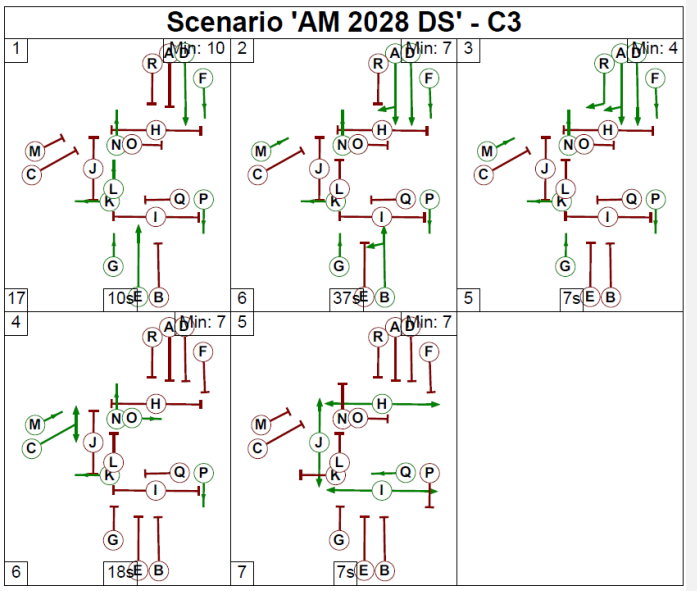


Do Something : 2028 : AM

Cycle = 120 secs
PRC = 7%
Delay = 16 pcuHr

Bus delay
Inbound = 64s
Outbound = 7s

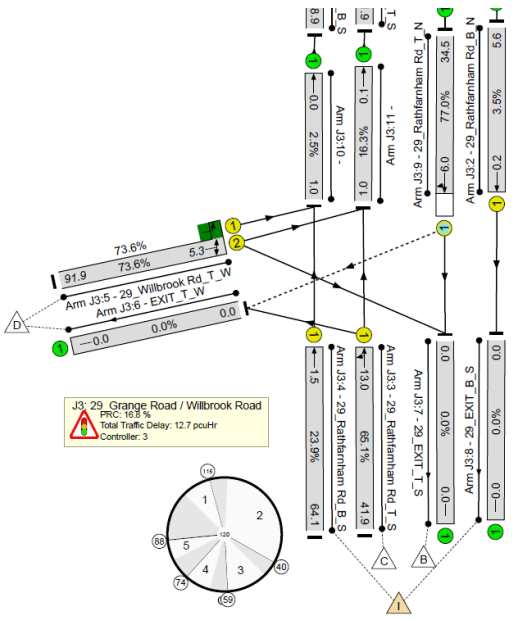


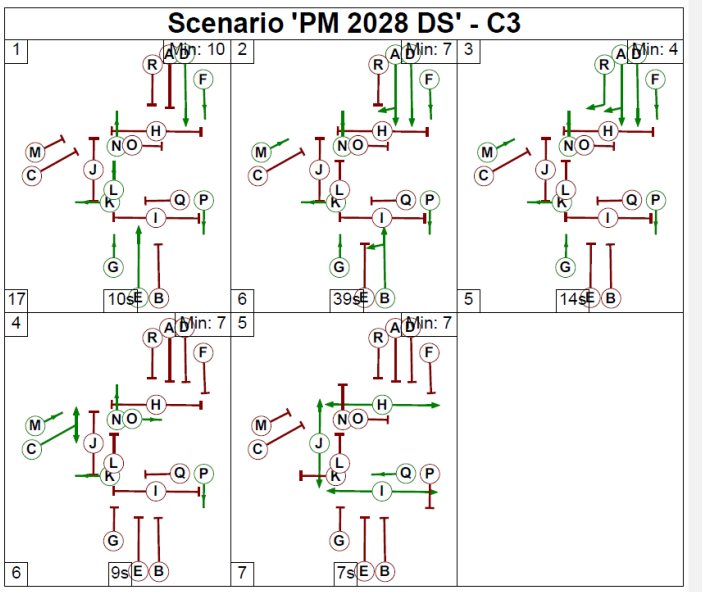


Do Something : 2028 : PM

Cycle = 120 secs
PRC = 17%
Delay = 13 pcuHr

Bus delay
Inbound = 64s
Outbound = 6s





ARUP

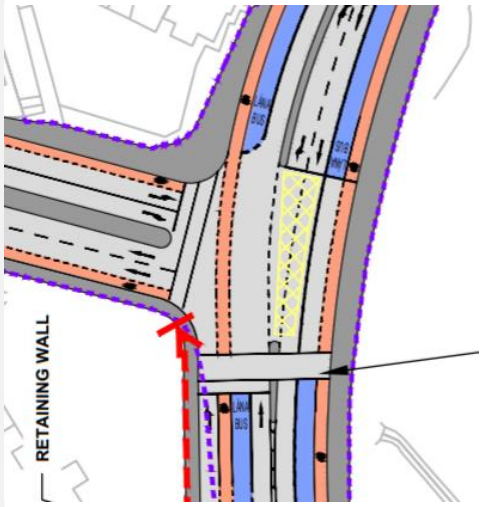
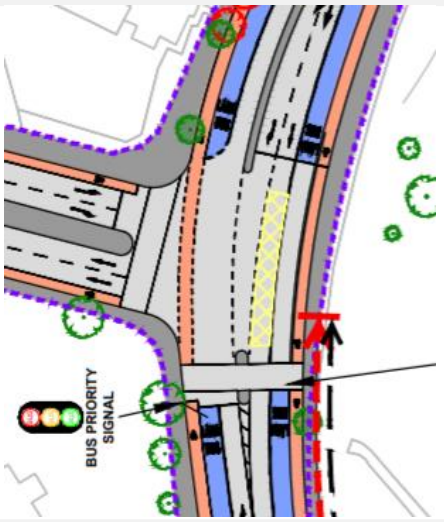
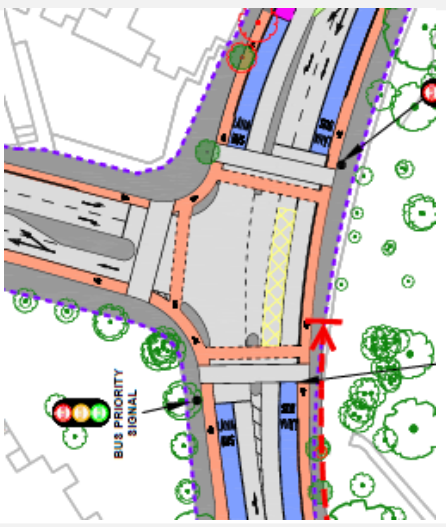
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Butterfield Ave

Summary
Junction is proposed to be updated to provide bus lanes and cycle tracks in each direction. A fully protected junction is also proposed to improve cyclist safety.

Signal Operation
A five stage signal operation is proposed. Outbound buses, cyclists, and straight-ahead traffic will operate with inbound straight and left-turning buses. Outbound movements will then continue with inbound traffic. Mainline outbound traffic and cyclists turning right will go with side arm traffic turning left, to be followed by all traffic movements from the side road. Pedestrians will operate with inbound cyclists and cyclists turning right from the side road.

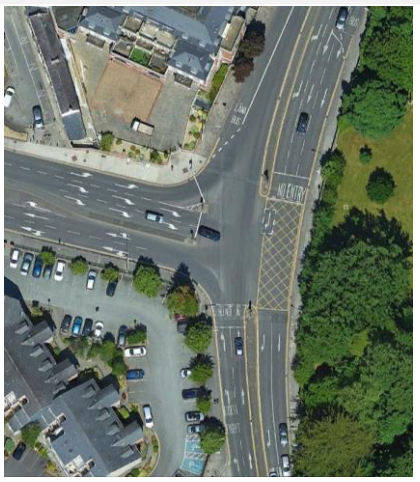
Junction Type 1
Bus delay ≤ 40s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Outbound bus lane on northern approach extended to stop line 2. Bus lane provided in inbound direction 3. Cycle tracks provided in each direction	1. To provide improved bus priority 2. To provide bus priority in inbound direction 3. To improve cycle facilities	1. Improved bus priority. 2. Improved bus priority. Land take required from Village Court apartment complex 3. Improved cyclist safety
DRAFT PRO (PC2)		1. Left turn lane from Rathfarnham Road on Butterfield Road removed. Left turners to turn from middle lane 2. Realignment of road requiring land take from Rathfarnham Castle	1. To reduce land-take 2. Aligns with changes further south to better apportion land take along this section (land take from Rathfarnham Castle for 300m south of this)	1. Reduced quantum of land-take required 2. Reduction in number of individual properties impacted along length. No material impact on operation of junction
DRAFT PRO (PC3)		1. Cycle facilities enhanced to provide protected cycle infrastructure through the junction 2. Reduction in number of lanes on Butterfield Avenue exit	1. To improve facilities for cyclists consistent with BusConnects design guidance. 2. To facilitate improved cycle facilities and shorten crossing distance for pedestrians and cyclists	1. Improved cyclist safety. 2. Improved pedestrian and cycle facilities. No material impact on operation of junction

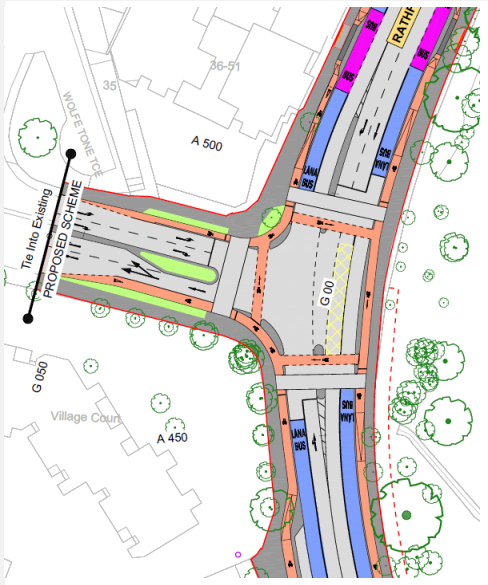
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Butterfield Ave

EXISTING



FINAL DESIGN



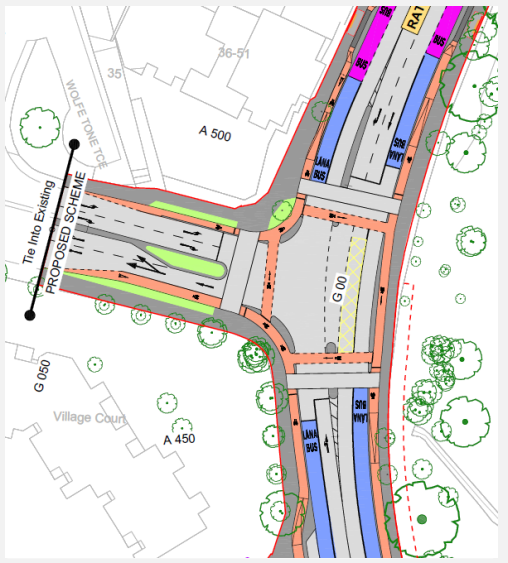
Change Made	Reason for Change	Impact of Change
1. Bus lane stop line set back at the junction. 2. Configuration on Butterfield Avenue amended slightly to match revised extents of scheme (due to removal of alternative cycle route)	1. To improve visibility for left turning vehicles of cyclists at the junction. 2. Removal of alternative cycle route removes the need to connect Rathfarnham Road to the alternative cycle route via Butterfield Avenue.	1. To improve cyclist safety. 2. Reduced scheme extents.

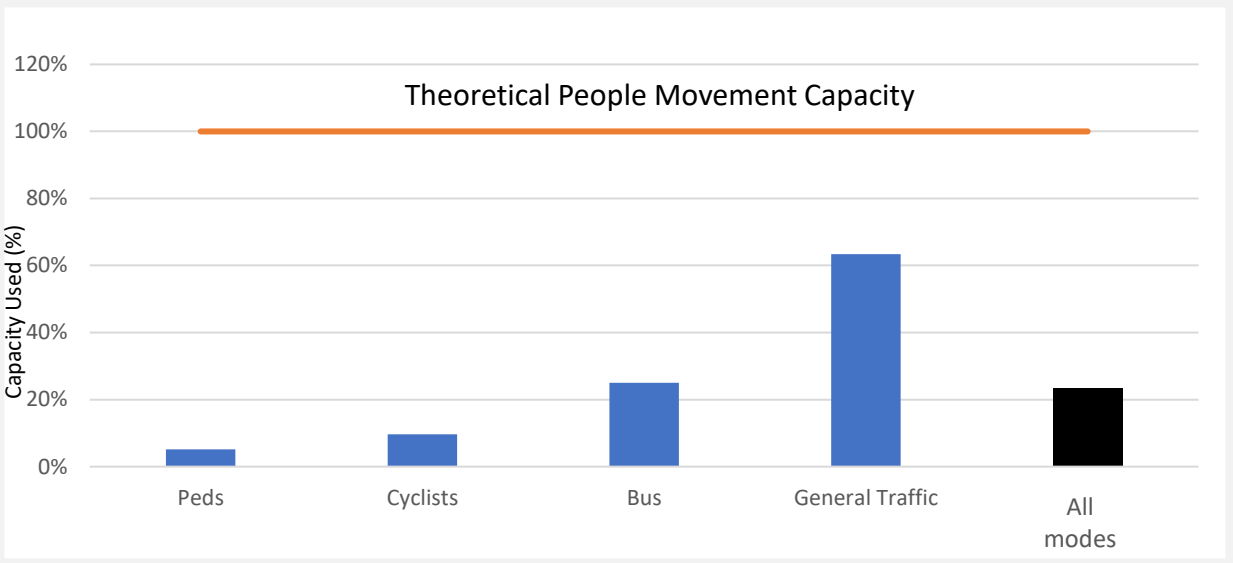
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Butterfield Ave

Capacity / Delay

1. Junction operates within capacity in both peaks
2. Bus delay is <40s on average

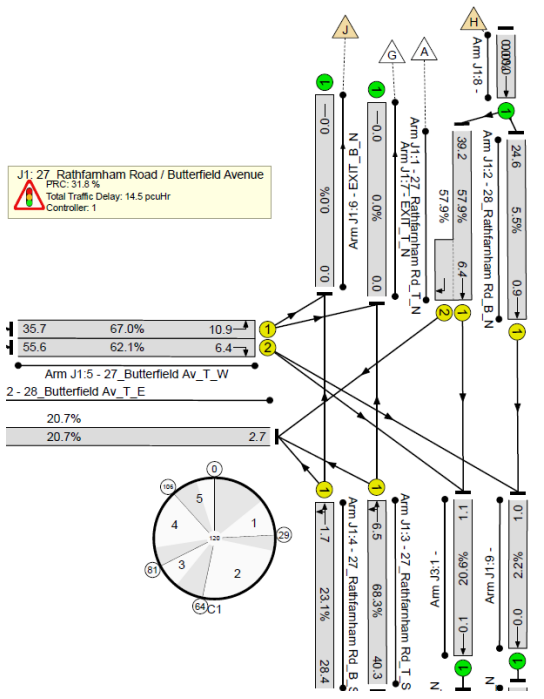


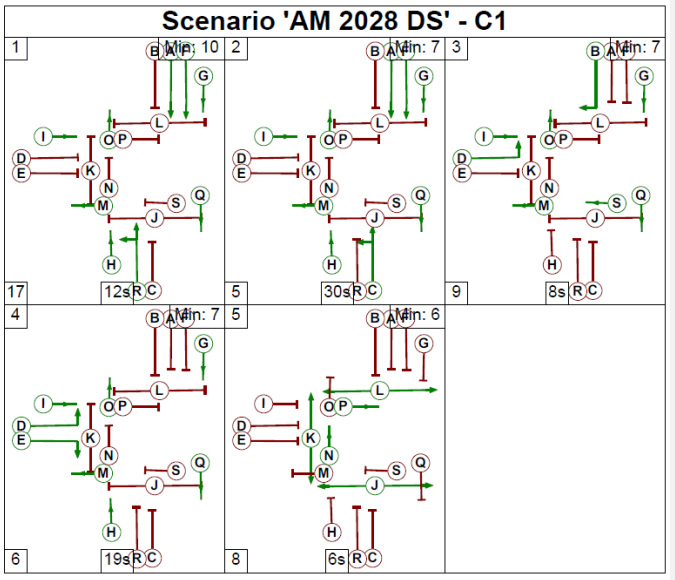


Do Something : 2028 : AM

Cycle = 120secs
PRC = 32%
Delay = 15 pcuHr

Bus delay
Inbound = 28s
Outbound = 25s

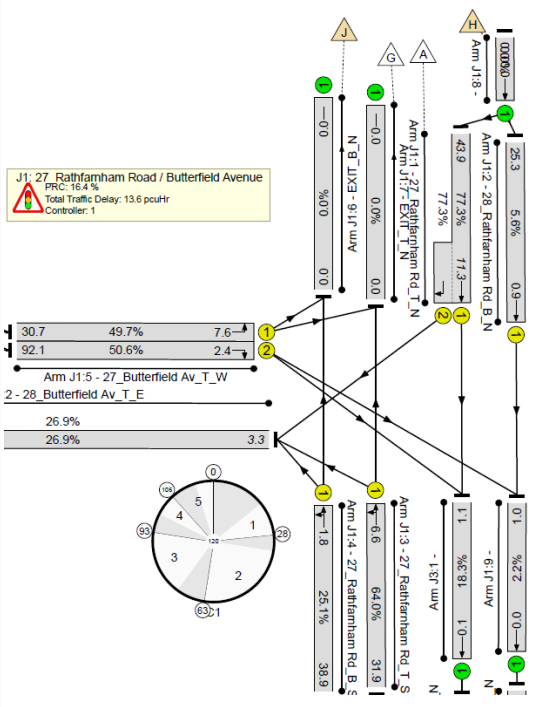


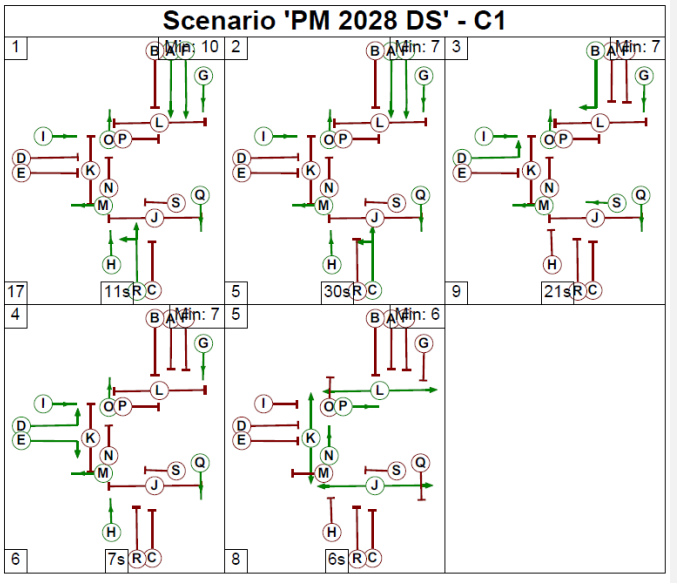


Do Something : 2028 : PM

Cycle = 120secs
PRC = 16%
Delay = 14 pcuHr

Bus delay
Inbound = 39s
Outbound = 25s





ARUP

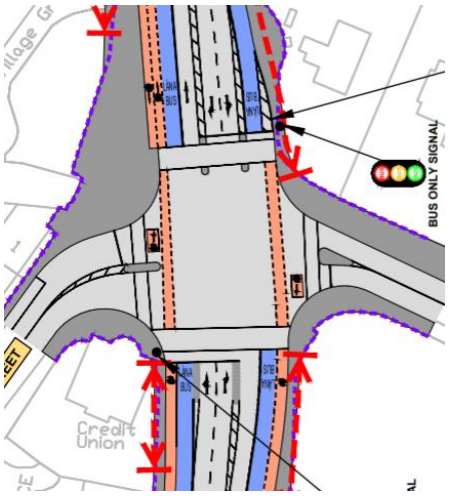
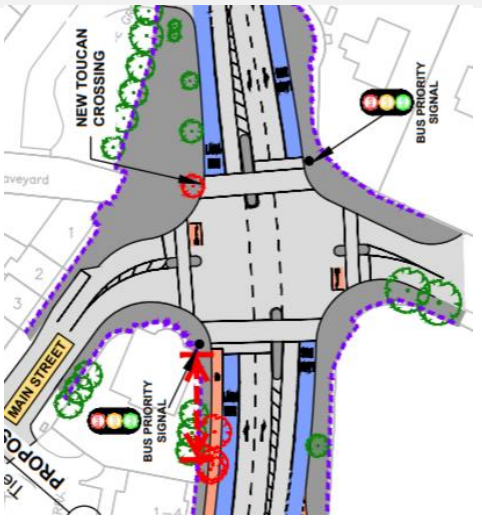
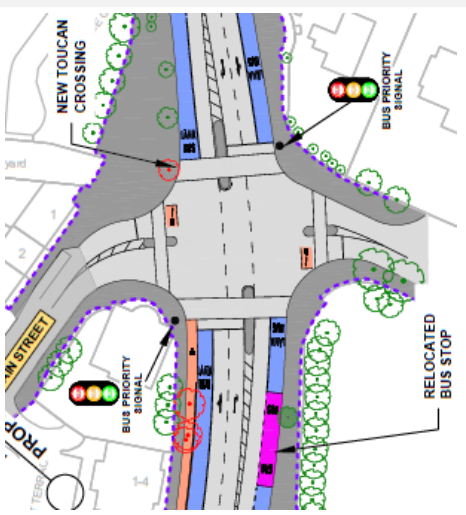
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Castleside Drive

Summary
The existing junction is proposed to be altered by providing bus lanes and cycle tracks in each direction on the northern and southern approaches, except for southbound on approach to the junction where no bus lane is provided. A fully protected junction is also proposed to improve cyclist safety.

Signal Operation
A five stage signal operation is proposed. Mainline straight and left turning traffic and buses will operate in the same stage, with left turning vehicles to cross the bus lane paths at 20m from the junction and to give way to cyclists on flashing ambers. This will maximise green time for buses and minimise delay. Right turning mainline traffic in both directions will then operate unopposed. The side roads will operate in separate stages, with left turning traffic to give way to cyclists on flashing ambers. The pedestrian crossings will operate in their own stage.

Junction Type 3
Bus delay ≤ 65s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound bus lane on southern approach extended to stop line 2. Introduction of new bus lane outbound on southern approach 3. Bus lane provided in each direction on northern approach 4. Two-way cycle track provided on western side of northern approach 5. Cycle track provided in each direction on southern approach	1. To provide improved bus priority 2. To provide bus priority 3. To provide bus priority 4. To improve cycle facilities 5. To improve cycle facilities	1. Improved bus priority. Removal of left turn lane required but left turners can turn from middle lane (in a separate stage to buses) 2. Improved bus priority 3. Improved bus priority. Removal of left turn lane required but left turners can turn from middle lane (in a separate stage to buses) 4. Improved cyclist safety 5. Improved cyclist safety
DRAFT PRO (PC2)		1. Two way cycle track north of the junction removed 2. Outbound cycle track removed on southern approach 3. Removal of traffic island adjacent to inbound bus lane on southern approach	1. To minimise land take and align with strategy to provide alternative cycle route further west. 2. Insufficient space to accommodate this and no cycle facility provided upstream. 3. To minimise land take and impact on trees. Traffic island was considered superfluous to junction operation.	1. Reduced land-take 2. Minimised land-take 3. Reduced land-take
DRAFT PRO (PC3)		1. Minor alterations to alignment on southern approach	1. To remove land take from property to the west of southern approach	1. Reduced land take

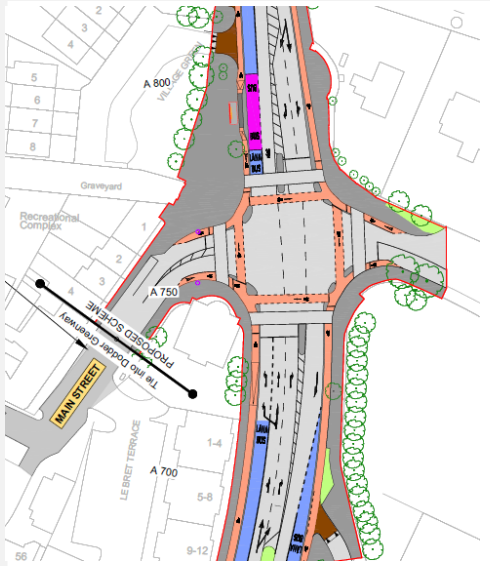
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Castleside Drive

EXISTING

FINAL DESIGN



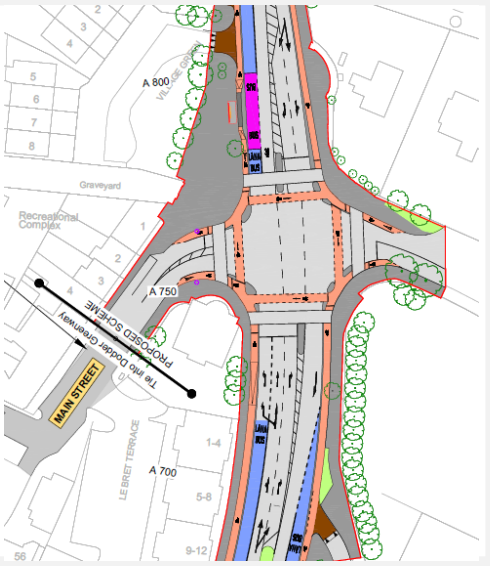
Change Made	Reason for Change	Impact of Change
1. Conventional Signalised junction converted to protected junction. 2. Short sections of cycle lane provided on the eastern and western arms of the junction. 3. Outbound bus lane removed from the northern arm of the junction, and cycle tracks provided in both directions.	1. To provide enhanced facilities for pedestrians and cyclists. 2. To facilitate cyclists entering and existing the junction from these side road arms 3. To provide online cycle facilities along the Preferred Scheme in this location.	1. Improved pedestrian and cyclist safety. 2. Improved cyclist safety. 3. Improved cyclist safety. Outbound bus priority north of the junction managed through bus priority traffic signals.

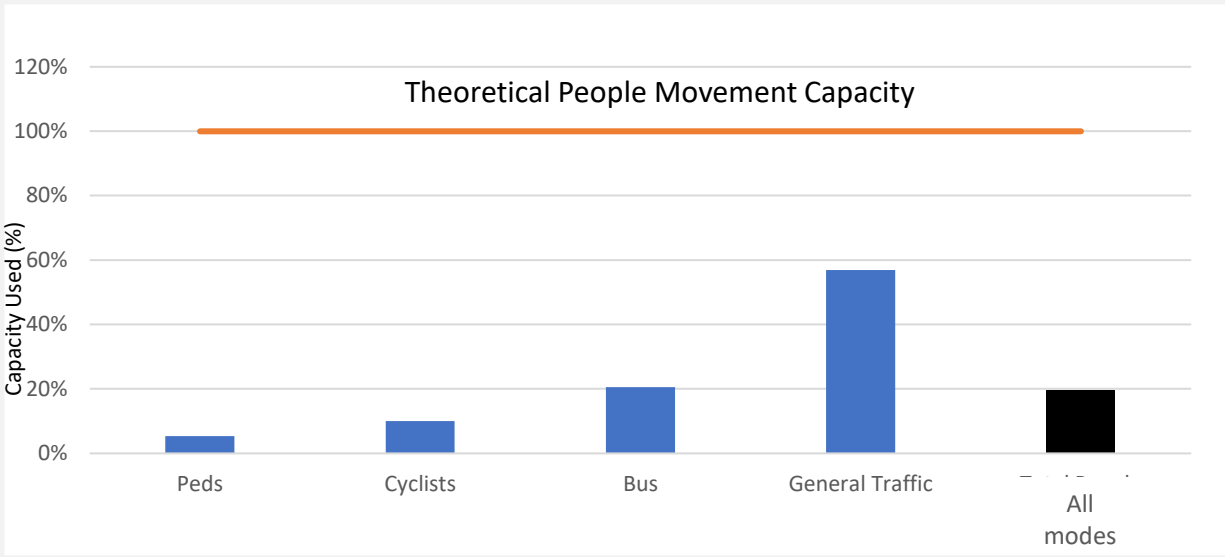
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Castleside Drive

Capacity / Delay

1. Junction operates over capacity in the PM peak
2. Bus delay is <65s on average

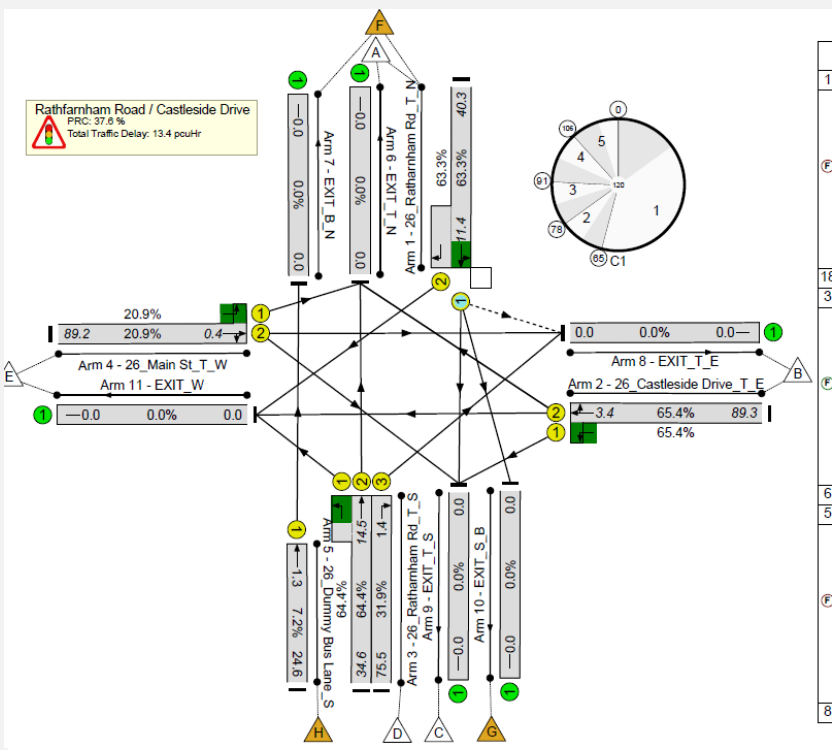


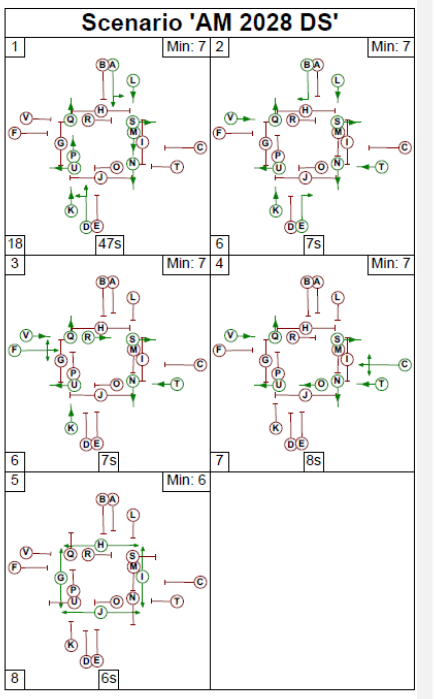


Do Something : 2028 : AM

Cycle = 120secs
PRC = 38%
Delay = 13 pcuHr

Bus delay
Inbound = 25s
Outbound = 40s

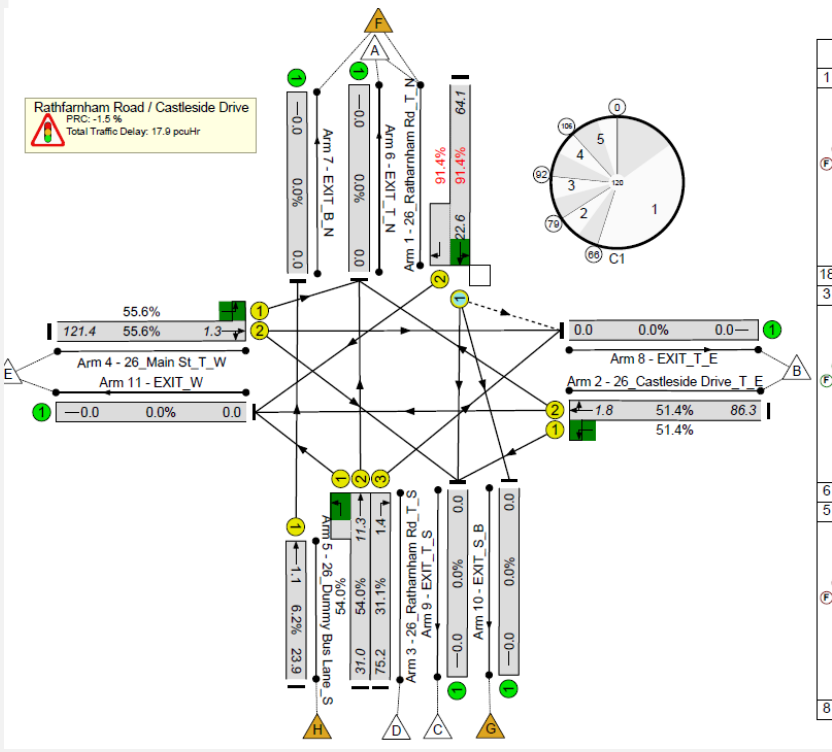


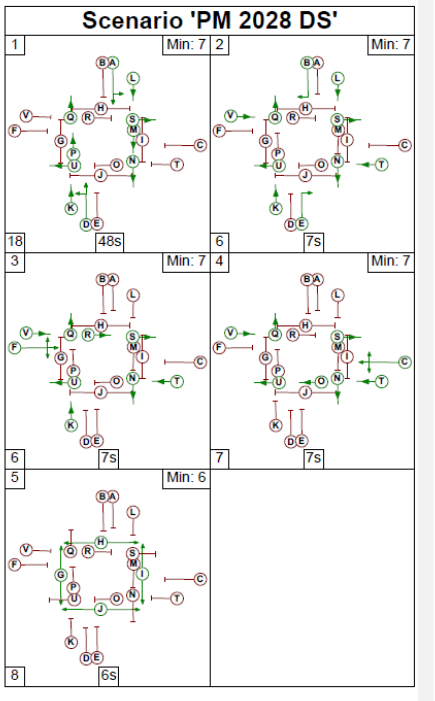


Do Something : 2028 : PM

Cycle = 120secs
PRC = -2%
Delay = 18 pcuHr

Bus delay
Inbound = 24s
Outbound = 64s





ARUP

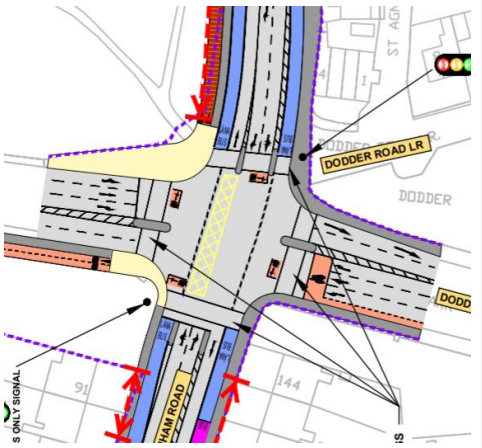
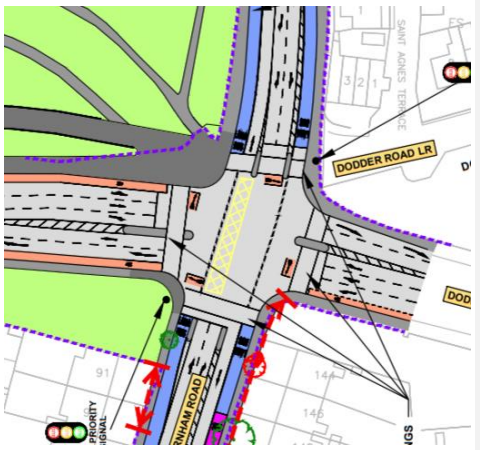
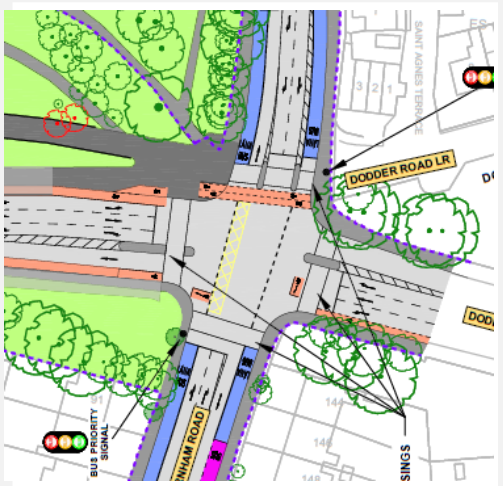
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Dodder Park Rd

Summary
The existing junction is proposed to be altered by providing bus lanes in each direction on the northern and southern approaches as well as conversion of the junction to a protected junction for cyclists. No inbound bus lane is proposed north of the junction and no outbound bus lane is provided south of the junction with priority maintained in these locations using bus priority signals.

Signal Operation
A four stage signal operation is proposed. Mainline buses and cyclists will operate in the same stage through the junction, to be followed by mainline traffic in both directions. Traffic from side roads will operate together. Cyclists crossing from the side roads will operate with pedestrians due to the high volume of left turning traffic.

Junction Type 1
Bus delay ≤ 70s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes provided in each direction on northern and southern approaches. 2. Dedicated left turn lanes removed from northern and southern approaches 3. Two-way cycle track provided on western side of northern approach and southern side of western approach (linking to alternative cycle route on Brookvale Road)	1. To provide improved bus prio rity 2. To facilitate introduction of dedicated bus lanes 3. To improve cycle facilities	1. Improved bus priority 2. Left turners will need to turn from middle lane (in a separate stage to buses) 3. Improved cyclist safety
DRAFT PRO (PC2)		1. Two-way cycle track provided on western side of northern approach removed. 2. Two-way cycle track on western approach replaced with a one-way cycle track in each direction on each side of the road	1. Alternative cycle facility being provided further to the west to minimise land take and impact on driveway gradients further north 2. To better tie into existing and proposed facilities along Dodder Park	1. No cycle facilities on Rathfarnham Road but cyclists catered for on alternative route 2. Better integration with existing and proposed facilities along Dodder Park Road
DRAFT PRO (PC3)		1. Removal of traffic island adjacent to inbound bus lane on southern approach 2. Two-way cycle crossing provided on northern approach 3. Removal of merge lane on Dodder Park Road on eastern and western exits from the junction	1. To minimise land take and impact on trees. Traffic island was considered superfluous to junction operation. 2. To tie in better with Dodder Greenway proposals 3. To shorten pedestrian crossing lengths. Merge lane unnecessary as only one lane feeding exit.	1. Reduced land take 2. Better integration with Dodder Greenway proposals 3. Improved pedestrian facilities.

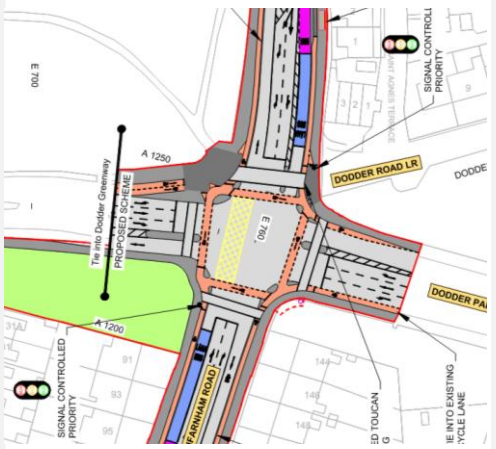
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Dodder Park Rd

EXISTING

FINAL DESIGN



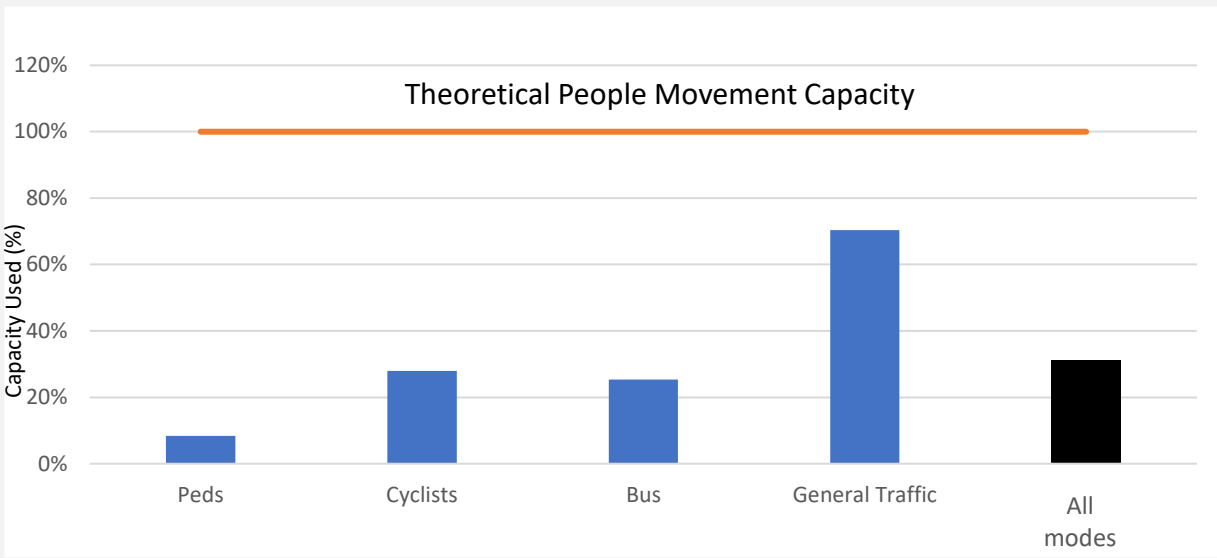
Change Made	Reason for Change	Impact of Change
1. Conventional Signalised junction converted to protected junction. 2. Two-way cycle crossing on the northern arm of the junction accommodated by proposed toucan crossing on this arm. 3. Inbound bus lane removed from the northern arm of the junction, and cycle tracks provided in both directions. 4. Outbound bus lane removed from the southern arm of the junction, and cycle tracks provided in both directions.	1. To provide enhanced facilities for pedestrians and cyclists. 2. To better tie in with proposals under the Dodder Greenway Scheme. 3. To provide online cycle facilities along the Preferred Scheme in this location. 4. To provide online cycle facilities along the Preferred Scheme in this location.	1. Improved pedestrian and cyclist safety. 2. Improved connectivity with surrounding proposed cyclist facilities. 3. Improved cyclist safety. Inbound bus priority north of the junction managed through bus priority traffic signals. 4. Improved cyclist safety. Outbound bus priority north of the junction managed through bus priority traffic signals.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Dodder Park Rd

Capacity / Delay

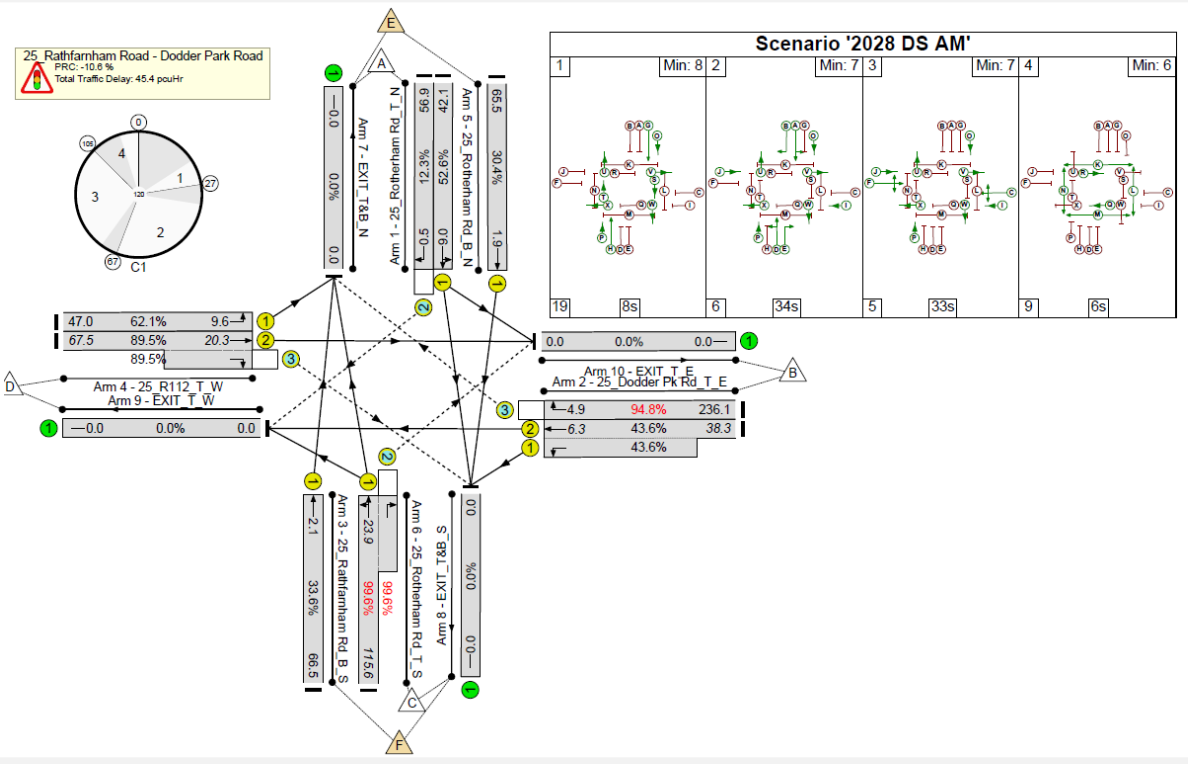
1. Junction operates over capacity in the AM peak only
2. Bus delay is <70s on average



Do Something : 2028 : AM

Cycle = 120secs
PRC = -11%
Delay = 45 pcuHr

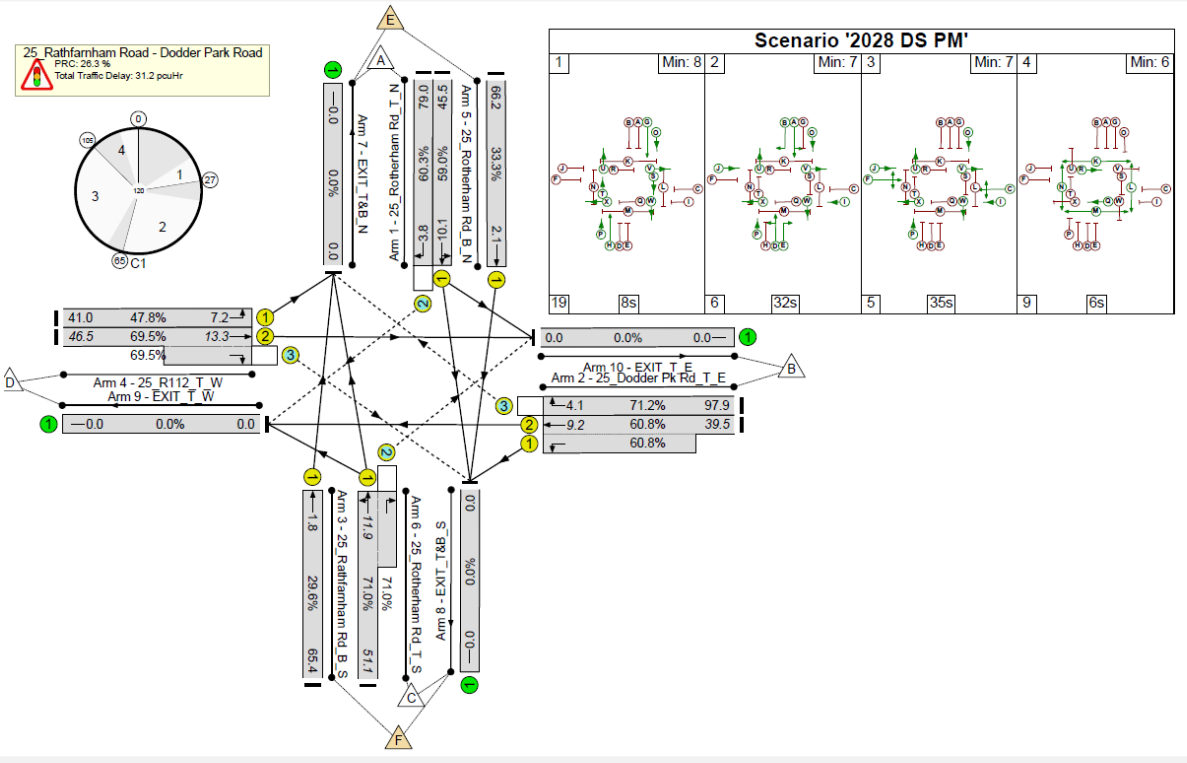
Bus delay
Inbound = 67s
Outbound = 66s



Do Something : 2028 : PM

Cycle = 120secs
PRC = 27%
Delay = 31 pcuHr

Bus delay
Inbound = 65s
Outbound = 66s



ARUP

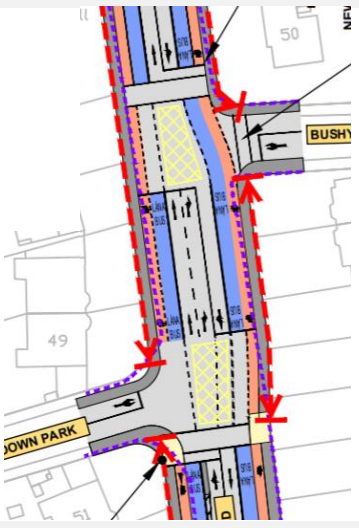
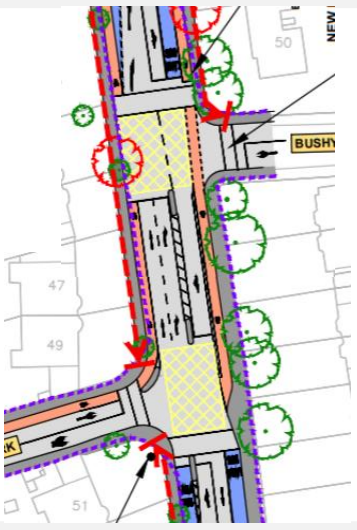
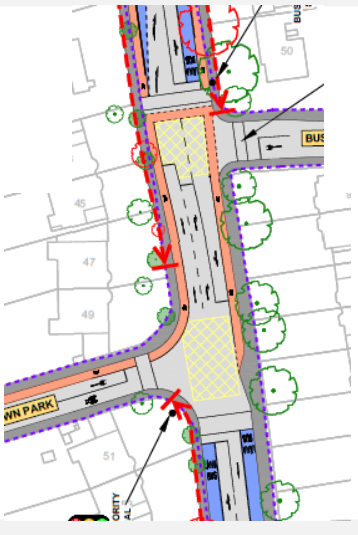
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Bushy Park Rd / Rathdown Park

Summary
The existing junction is proposed to be altered by providing dedicated cycle tracks in each direction as well as provision of a protected junction for cyclist at Rathdown Park. A bus lane is to be provided on the northern and southern approaches.

Signal Operation
A five stage signal operation is proposed. The inbound and outbound bus and cycle lanes will operate at the same time, followed by the inbound and outbound straight and left general traffic lanes. The outbound movements will stop to allow right-turning traffic into Bushy Park Road to operate unopposed. Traffic will be released from the side roads at the same time, followed by the pedestrian crossings in their own stage. Dynamic staging can be used to ensure buses maintain priority through the junction.

Junction Type 1
Bus delay ≤ 70s

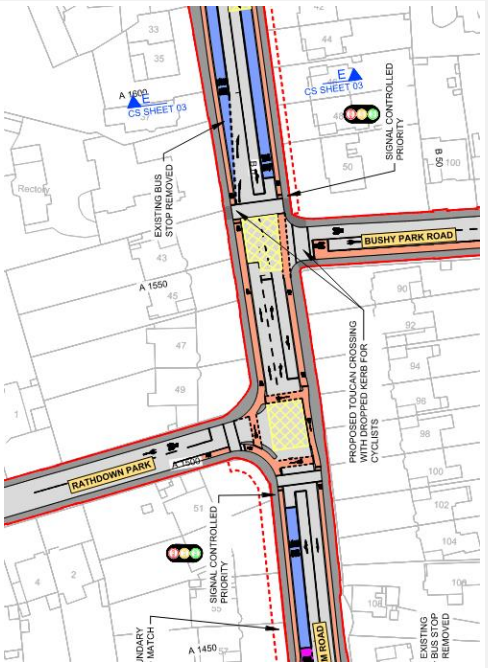
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes provided in each direction on northern and southern approaches. 2. Cycle facilities provided in each direction on northern and southern approaches.	1. To provide improved bus priority 2. To improve cycle facilities	1. Improved bus priority 2. Improved cyclist safety
DRAFT PRO (PC2)		1. Bus Lanes through junction removed with bus priority to be managed through use of bus priority signals. 2. Cycle tracks in each direction removed from southern approach 3. Dedicated cycle track provided in eastbound direction on western approach with westbound cyclists provided on shared street.	1. To minimise land take and impact on trees. 2. To minimise land take. Aligns with strategy to provide alternative offline cycle facility south of Rathdown Park. 3. To provide alternative offline cycle facility via Rathdown Park.	1. Reduced land-take / reduced impact on trees on properties adjacent the junction without negatively impacting bus priority (managed through bus priority signals) 2. Reduced land-take / reduced impact on trees on properties to the south west of the junction. Alternative cycle route provided. 3. Provision of alternative cycle route.
DRAFT PRO (PC3)		1. Minor alterations to alignment approaches 2. Removal of corner protection adjacent cycle track exiting from Rathdown Park	1. To minimise land-take 2. To maintain access to driveway at this location	1. Reduced land-take 2. Access maintained for residents

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

EXISTING

FINAL DESIGN

Rathfarnham Rd / Bushy Park Rd / Rathdown Park



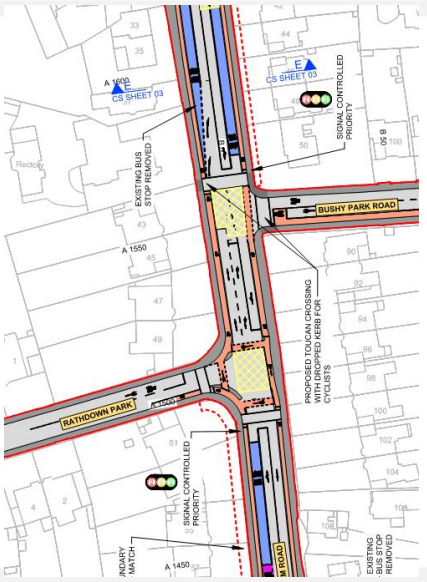
Change Made	Reason for Change	Impact of Change
1. Minor alterations to alignment of the carriageway through the junction. 2. Cycle tracks on the northern arm of the junction reduced to 1.5m wide. 3. Toucan Crossings provided in place of existing pedestrian crossings at the junction, with ramps provided for cyclists to access toucan crossings. 4. Westbound cycle lane proposed on the Bushy Park Road arm of the junction. 5. Advanced Stacking Location provided on the Bushy Park Road arm of the junction 6. Bus lane stop line set back on the southern arm of the junction. 7. Outbound bus lane removed from the southern arm of the junction, and cycle tracks provided in both directions. 8. Conventional Signalised junction converted to protected junction. 9. Short section of westbound cycle lane provided on Rathdown Park in lieu of previous proposal for an eastbound cycle lane.	1. To minimise landtake. 2. To minimise landtake. 3. To facilitate right turning cy clist movements. 4. To provide enhanced facilities for cyclists the junction from the alternative cycle facility on Bushy Park Road 5. To allow cyclists to take a prominent road position and wait in clear view of traffic when making a right turn. 6. To improve visibility for left turning vehicles of cyclists at the junction. 7. To provide online cycle facilities along the Preferred Scheme in this location. 8. To provide enhanced facilities for pedestrians and cyclists. 9. To provide enhanced facilities for cyclists exiting the protected junction.	1. Reduced land-take from properties on Rathfarnham Road. 2. Reduced land-take from properties on Rathfarnham Road. 3. Improved cyclist safety. 4. Improved cyclist safety. 5. Improved cyclist safety. 6. Improved cyclist safety. 7. Improved cyclist safety. Outbound bus priority south of the junction managed through bus priority traffic signals. 8. Improved pedestrian and cyclist safety. 9. Improved cyclist safety.

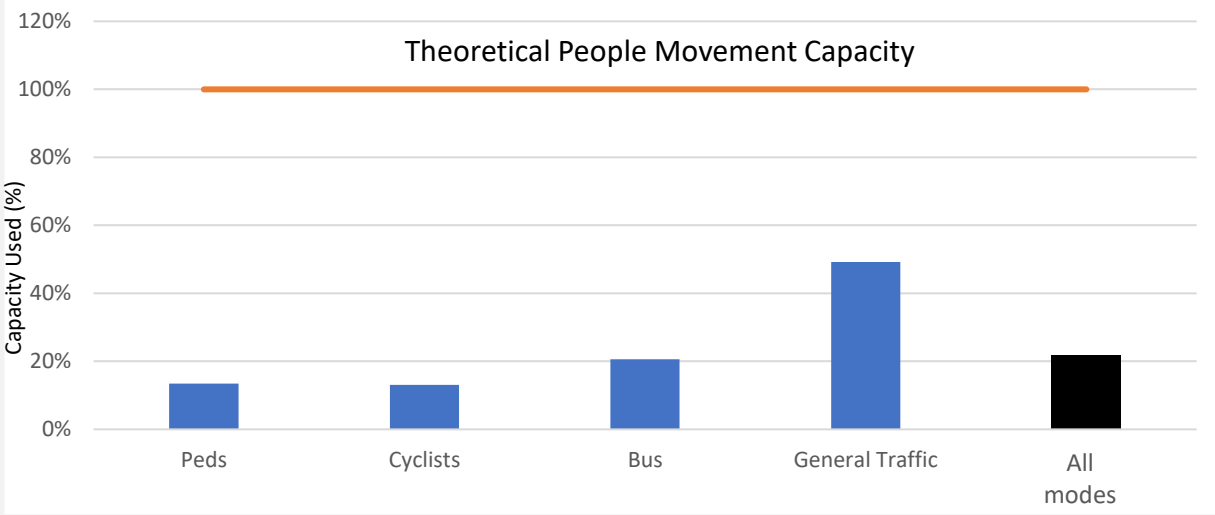
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Bushy Park Rd / Rathdown Park

Capacity / Delay

1. Junction operates within capacity in both peaks.
2. Bus delay is <70s on average.

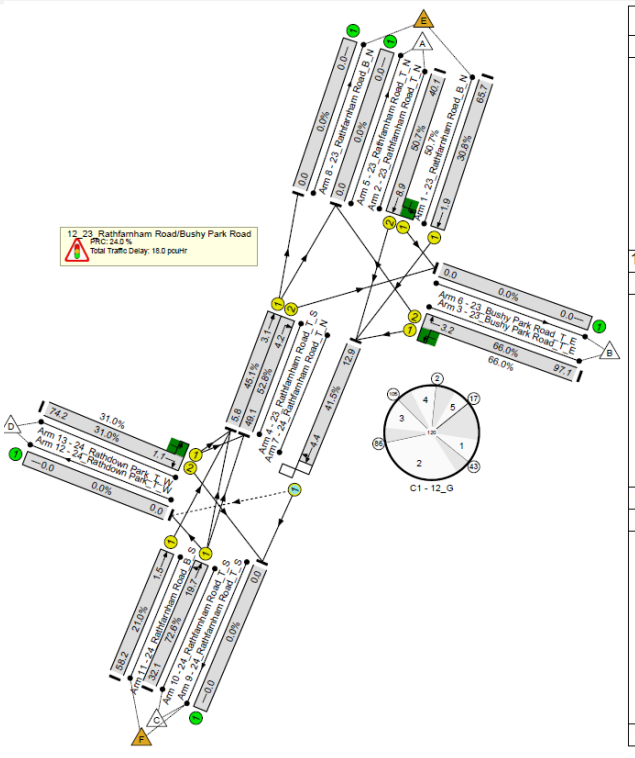


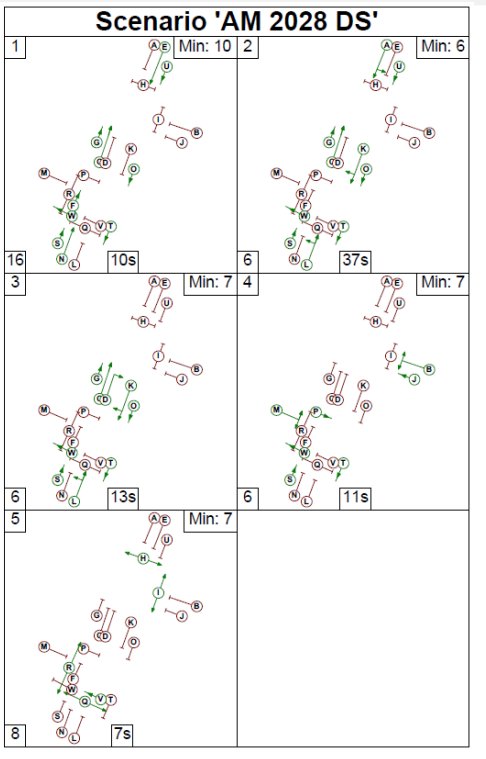


Do Something : 2028 : AM

Cycle = 120secs
PRC = 24%
Delay = 18 pcuHr

Bus delay
Inbound = 58s
Outbound = 66s

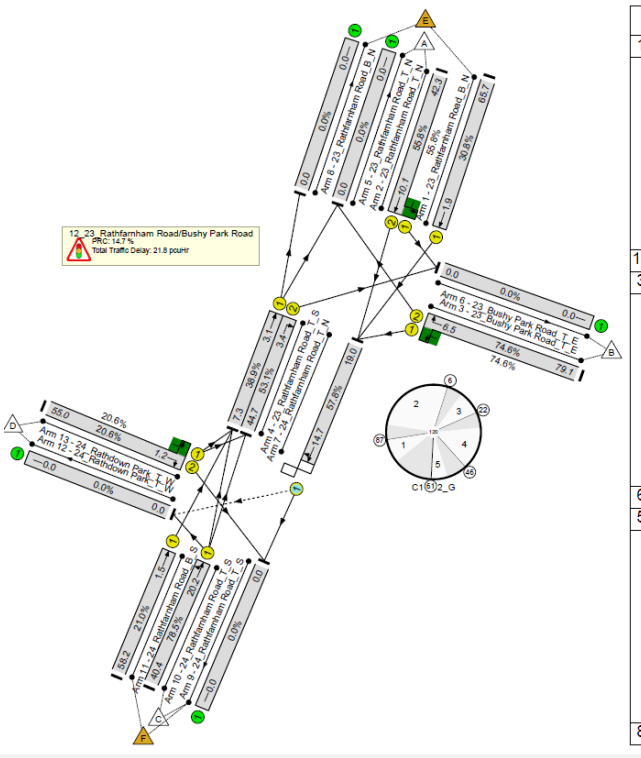


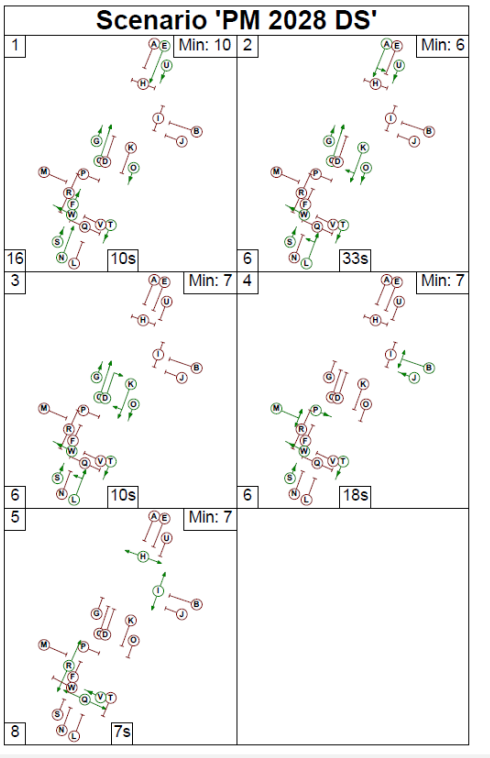


Do Something : 2028 : PM

Cycle = 120secs
PRC = 15%
Delay = 22 pcuHr

Bus delay
Inbound = 58s
Outbound = 66s





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Terenure Rd / Templeogue Rd

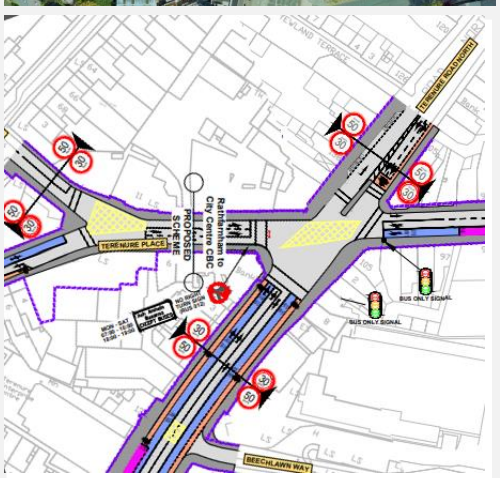
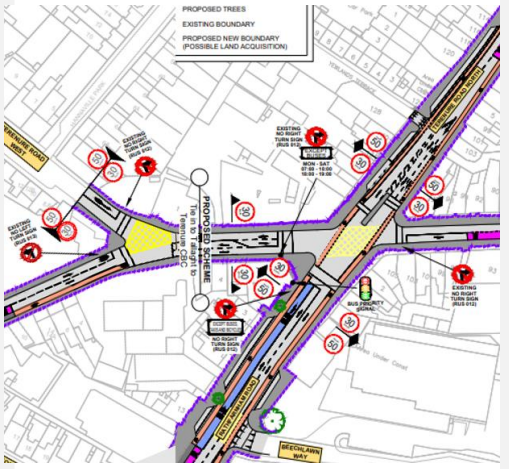
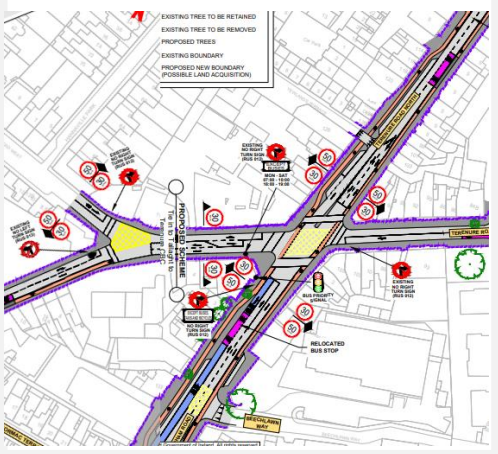
Summary

The existing junction is proposed to be altered by providing a bus lane on the southern approach and providing dedicated cycle facilities along Rathfarnham Road and Terenure Road North. The existing slip lane for traffic turning left from Rathfarnham Road will be removed to improve pedestrian facilities in the village centre. Bus Priority through the junction will be maintained through an inbound bus gate on Templeogue Road approaching the junction and a bus priority signal on Terenure Road East.

Signal Operation

A five stage signal operation is proposed. The bus lane on Rathfarnham Road will operate in its own stage due to the presence of right and left-turning buses. The mainline cycle tracks and general traffic lanes will operate together, with turning traffic to give way to cyclists on flashing amber. The inbound movement will then stop to allow right-turning traffic into Terenure Place to operate unopposed. The side roads will then run together, with right turners from Terenure Place (only permitted outside of peak hour for general traffic) to run in gaps. The pedestrian crossings will operate in their own stage.

Junction Type 1 Bus delay < 60s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound bus lane on Rathfarnham Rd extended to stop line. 2. Inbound general traffic lane replaced with bus lane on Templeogue Rd. 3. Outbound bus lane provided on southern approach. 4. Bus lane provided on eastern approach. 5. Provision of dedicated cycle tracks on northern and southern approaches (with exception of northbound direction on northern approach). 6. Advisory cycle lanes removed through the Templeogue Rd junction.	1. To provide Improved bus priority. 2. Inbound bus lane provided to ensure physical bus priority along the constrained section of the Preferred Scheme to the south of this junction. 3. To provide Improved bus priority. 4. To provide improved bus priority. 5. To improve cycle facilities. 6. The provision of advisory cycle lanes is not in alignment with the objectives of the scheme or prevailing design standards.	1. Improved bus priority. Left turn traffic to turn from middle lane. 2. Improved bus priority along the Preferred Scheme and through the junction. Residual inbound through traffic redistributed. 3. Improved bus priority. 4. Improved bus priority. 5. Improved cyclist safety. 6. Inbound cyclists share the bus lane, outbound cyclists share with general traffic.
DRAFT PRO (PC2)		1. Outbound bus lane on southern approach removed. 2. Bus lane on eastern approach removed. 3. Cycle track provided northbound on northern approach. 4. The inbound section of bus lane on the Templeogue Road arm of the junction no longer extends to the junction, it is terminated further south and replaced with an inbound bus gate. 5. The outbound cycle track on the Templeogue Road arm of the junction has been extended to the junction.	1. Topographical survey indicated that there was not as much space available as originally thought and reduced cross-section was required. Bus priority maintained through use of bus priority signals 2. Topographical survey indicated that there was not as much space available as originally thought and reduced cross-section was required. Bus priority to be maintained through use of bus priority signals. 3. To improve cycle facilities. 4. To allow for local access to properties on Templeogue Road between this junction and Fergus Road. 5. To improve facilities for cyclists.	1. Reduced physical bus priority but mitigated through use of bus priority signals. 2. Reduced physical bus priority but mitigated through use of bus priority signals. 3. Improved cyclists safety. 4. Local access to and from the North for properties within this section of the Preferred Scheme is retained. Residual inbound through traffic is redistributed. 5. Improved cyclist safety.
DRAFT PRO (PC3)		1. Toucan Crossings provided on all arms of the junction, with ramps provided for cyclists to access toucan crossings.	1. To facilitate right turning cyclist movements.	1. Improved cyclist safety.

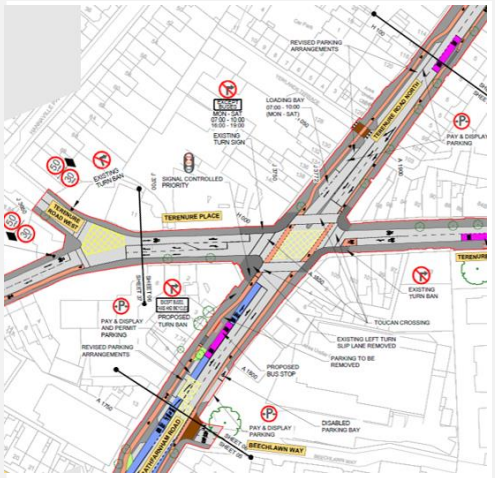
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Terenure Rd / Templeogue Rd

EXISTING

FINAL DESIGN



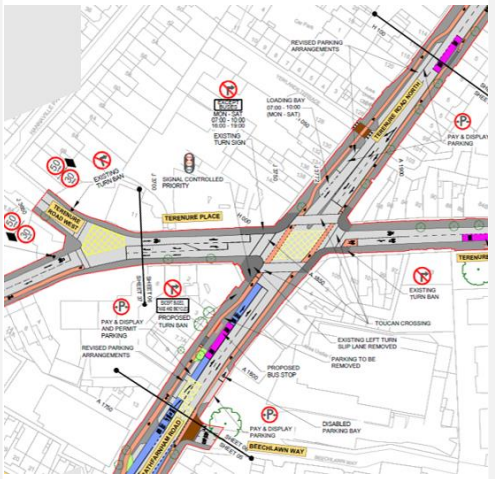
Change Made	Reason for Change	Impact of Change
1. Advanced Stacking Location provided on the Terenure Road East arm of the junction.	1. To allow cyclists to make a prominent road position and wait in clear view of traffic when making a right turn.	1. Improved cyclist safety.

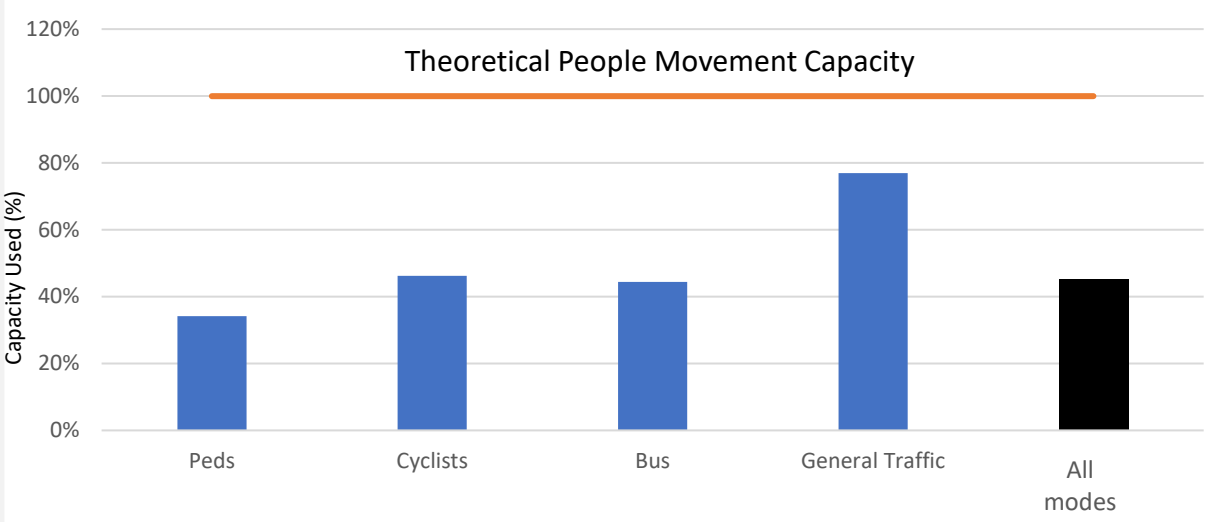
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathfarnham Rd / Terenure Rd / Templeogue Rd

Capacity / Delay

1. Junction operates over capacity.
2. Bus delay is <60s on average.

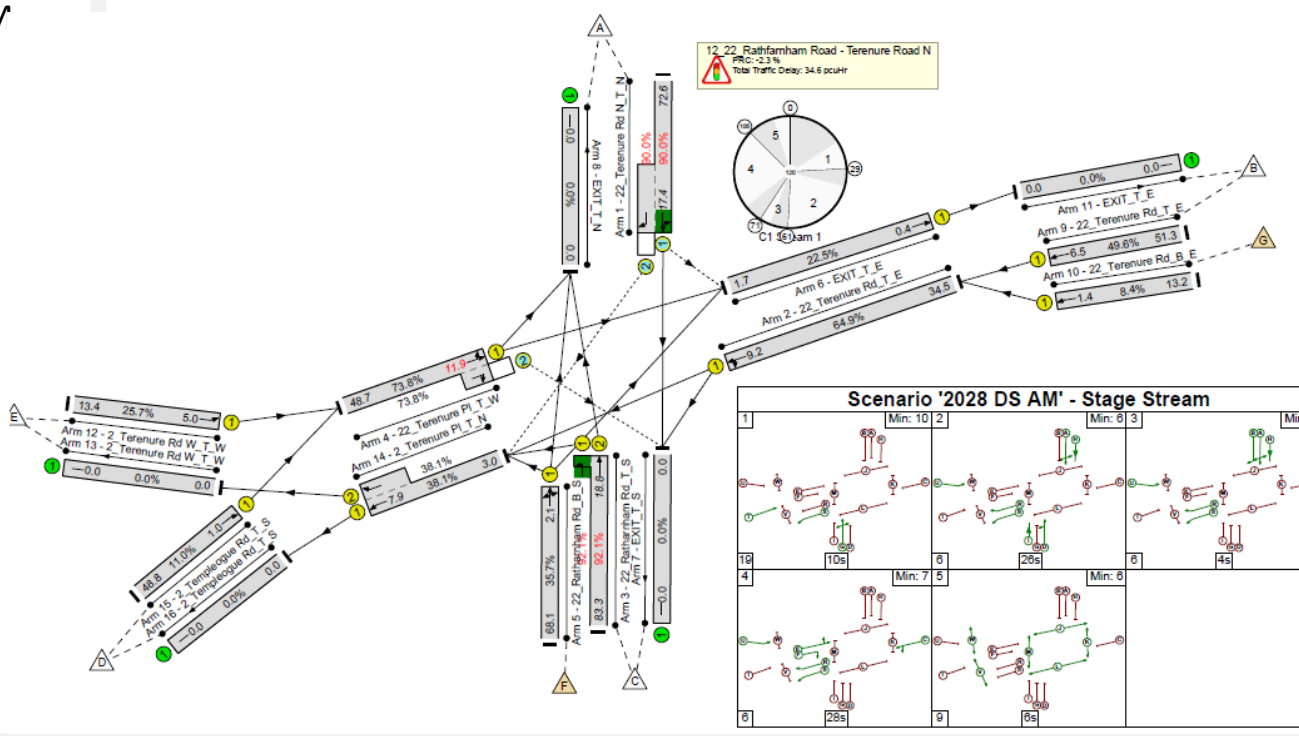




Do Something : 2028 : AM

Cycle = 120 secs
PRC = -2%
Delay = 35 pcuHr

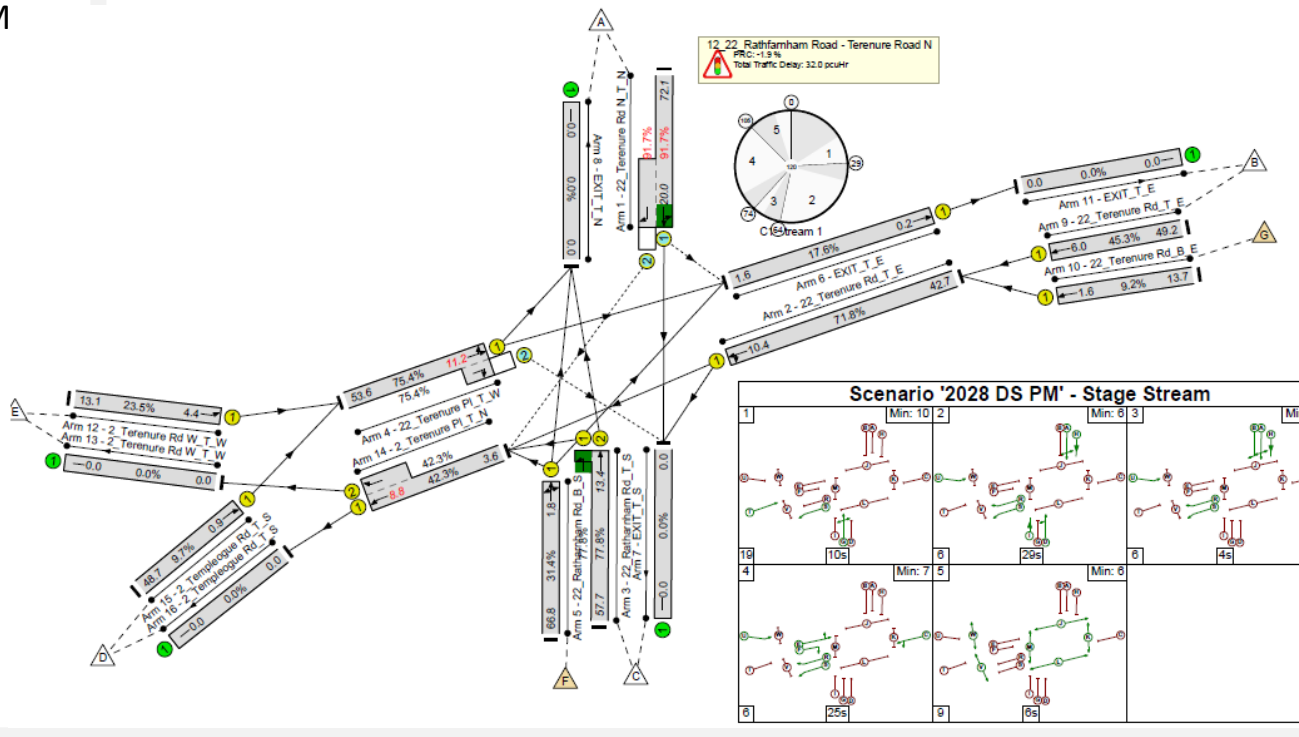
Bus delay
Inbound = 68s
Outbound = 35s



Do Something : 2028 : PM

Cycle = 120 secs
PRC = -2%
Delay = 32 pcuHr

Bus delay
Inbound = 67s
Outbound = 43s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathgar Rd / Highfield Rd / Terenure Rd

Summary

The existing junction is proposed to be altered by the provision of cycle tracks in each direction through the junction and Advanced Stacking Locations on Highfield Road and Orwell Road. New toucan crossings are proposed across all arms of the junction to improve pedestrian facilities and turning movements for cyclists.

Signal Operation

A five stage signal operation is proposed. The inbound and outbound bus lanes will operate at the same time as the cycle lanes. The bus lanes will be stopped, to allow inbound general traffic and right turners into Highfield Road. Orwell Road will operate in a separate stage, with left-turning traffic to give way to cyclists on a flashing amber. Highfield Road and Rathgar Avenue will operate together. The pedestrian crossings will operate in their own stage.

Junction Type 1

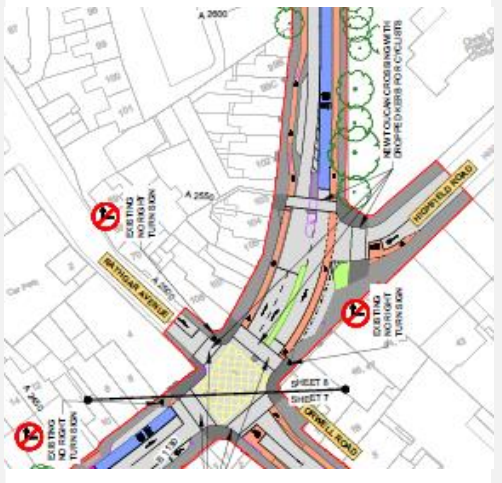
Bus delay ≤ 75s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR	1. Provision of outbound bus lane to stop line resulting in removal of left turn lane. 2. Inbound bus lane extended to stop line. Left turners required to turn from adjacent lane. 3. Cycle facilities provided in outbound direction. 4. Provision of cycle facilities on western approach in inbound direction	1. To provide bus priority. 2. To improve bus priority. 3. To improve facilities for cyclists. 4. To improve facilities for cyclists.	1. Improved bus priority. 2. Improved bus priority. 3. Improved cyclist safety. 4. Improved cyclist safety.
DRAFT PRO (PC2)	1. Outbound traffic lane on Rathgar Road removed. 2. All approaches to junction signalised. 3. Inbound bus lane proposed to start further north. 4. Removal of cycle track on western approach. 5. Removal of outbound bus lane on western approach. 6. Removal of outbound bus lane on eastern approach.	1. To facilitate physical bus priority in each direction on Rathgar Road. 2. To allow safe right turn from Highfield Rd and facilitate access to Rathgar Rd (turn currently banned). Signalisation also facilitates bus priority signal on approach to Orwell Rd junction. 3. To maintain existing parking just north of Highfield Road. 4. Decision made to remove cycle facilities on Terenure Road East to reduce impact on heritage properties. 5. Bus lane on western approach no longer required as priority can be managed through signals at adjacent Highfield Road junction. 6. Outbound bus lane commences 40m after junction as per existing arrangement. Change allows existing car parking to be maintained.	1. Improved bus priority. Land take and tree removal no longer required from church grounds. 2. Improved access to Rathgar Road upon introduction of one-way for general traffic. Improved bus priority. 3. Some car parking maintained for village centre. 4. No dedicated facility provided on Terenure Road. East. Alternative cycle facility provided along Terenure Road North. 5. Improved public realm in village centre without any compromise on bus priority. 6. Existing car parking maintained without any compromise on bus priority.
DRAFT PRO (PC3)	1. Cycle tracks provided on Orwell Road approach to junction. 2. Removal of traffic lane on Orwell Road.	1. To improve cycle facilities on Orwell Road (linking into alternative east-west cycle route). 2. To provided dedicated cycle tracks on Orwell Road.	1. Improved cycle safety. 2. Improved cycle safety.

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathgar Rd / Highfield Rd / Terenure Rd

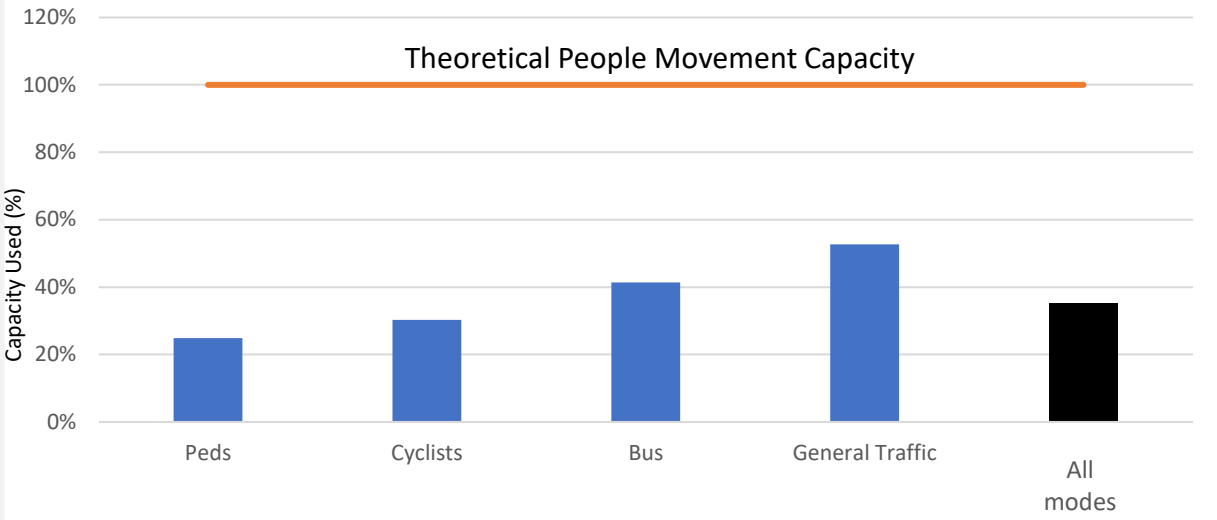
		Change Made	Reason for Change	Impact of Change
EXISTING				
FINAL DESIGN		1. Toucan Crossings provided in place of existing pedestrian crossings at the junction, in addition to a new toucan crossing on the northern arm, with ramps provided for cyclists to access toucan crossings. 2. Modifications made to the corner radius between Highfield Road and Rathgar Road. 3. Advanced Stacking Location provided on the Highfield Road arm of the junction. 4. Advanced Stacking Location provided on the Orwell Road arm of the junction.	1. To facilitate right turning cyclist movements and improve crossing facilities for pedestrians. 2. To facilitate access for larger vehicles to the loading bay immediately south of the junction. 3. To allow cyclists to take a prominent road position and wait in clear view of traffic when making a right turn. 4. To allow cyclists to take a prominent road position and wait in clear view of traffic when making a right turn.	1. Improved pedestrian and cyclist safety. 2. Access to this loading bay retained for larger vehicles. 3. Improved cyclist safety. 4. Improved cyclist safety.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathgar Rd / Highfield Rd / Terenure Rd

Capacity / Delay

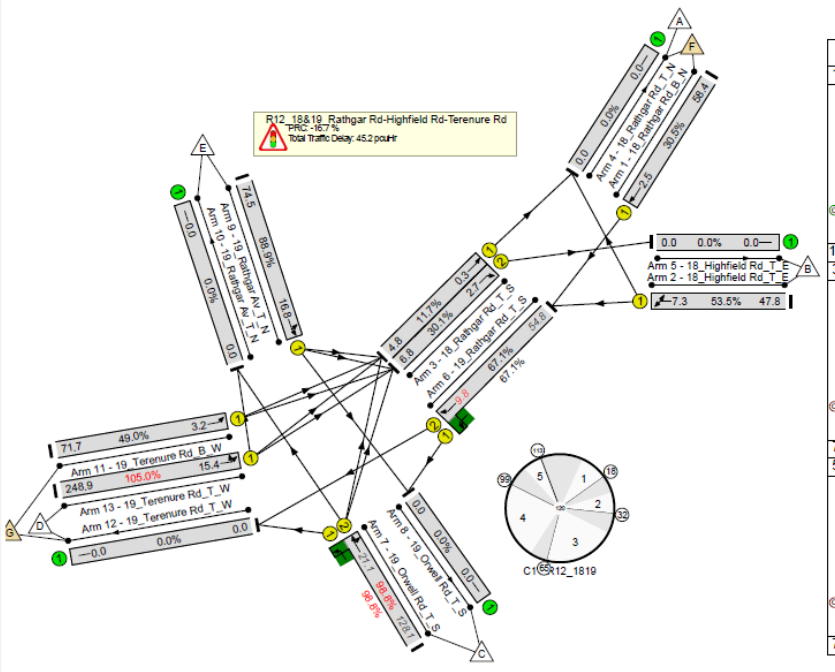
1. Junction operates over capacity.
2. Bus delay is <75s on average.

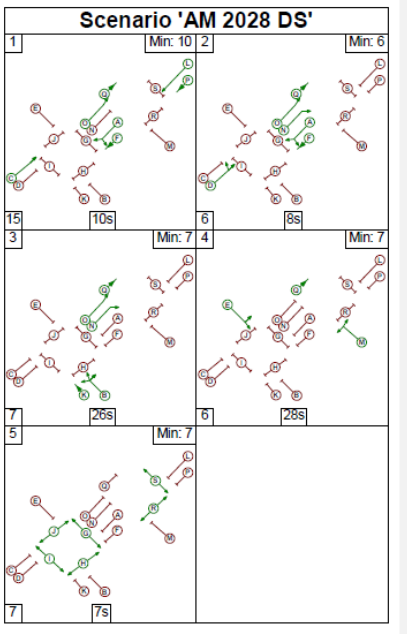


Do Something : 2028 : AM

Cycle = 120 secs
PRC = -17%
Delay = 45 pcuHr

Bus delay
Inbound = 72s
Outbound = 58s

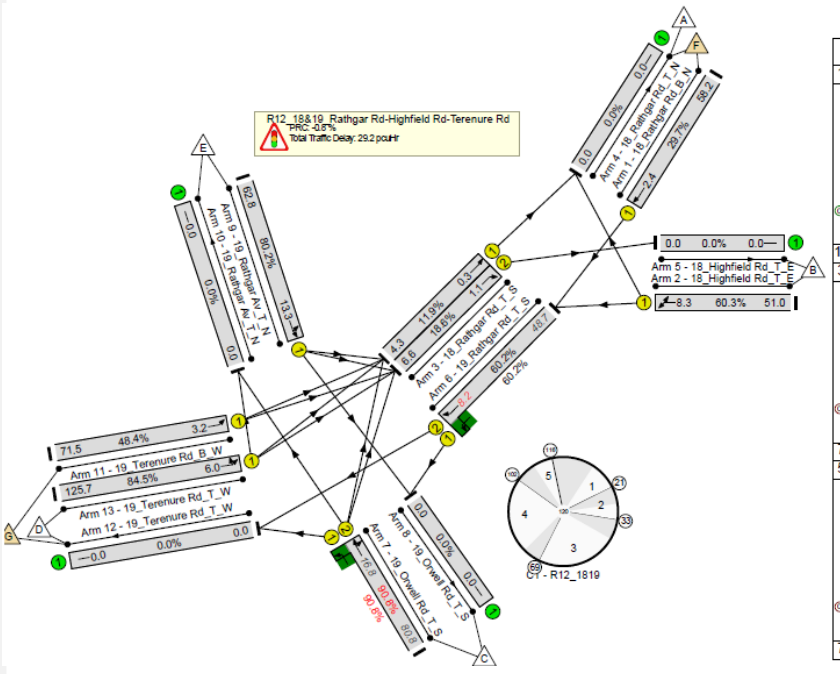


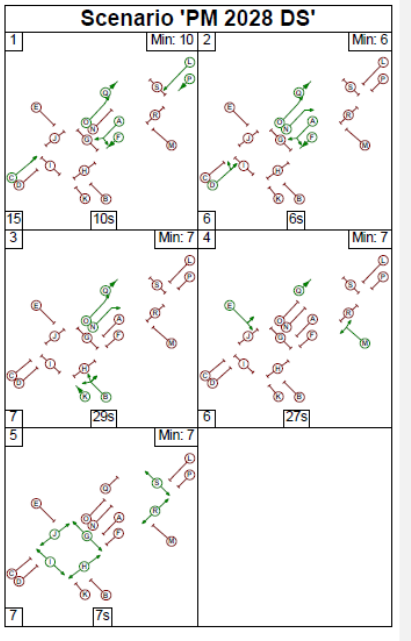


Do Something : 2028 : PM

Cycle = 120 secs
PRC = -1%
Delay = 29 pcuHr

Bus delay
Inbound = 72s
Outbound = 58s





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathgar Rd / Leicester Ave

Summary
The existing junction is proposed to be altered by the provision of bus lane in each direction through the junction as well as cycle facilities on each approach. Outbound traffic lane is proposed to be removed.

Signal Operation
A four stage signal operation is proposed. Mainline buses and cyclists will operate together, followed by the inbound general traffic lane. This will maximise green time for buses and minimise delay. The side roads will operate together, with the pedestrian crossings to operate in their own stage.

Junction Type 1
Bus delay ≤ 50s

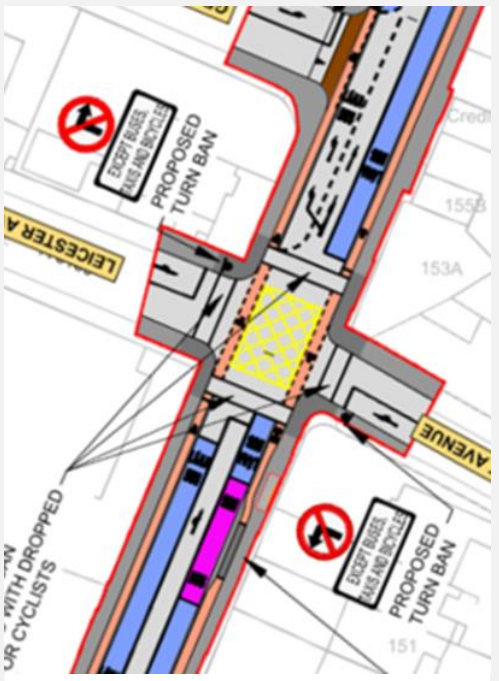
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lane provided in outbound direction 2. One inbound traffic lane removed on southern approach 3. Cycle tracks provided on southern approach	1. To provide bus priority in inbound direction 2. To facilitate outbound bus lane 3. To improve facilities for cyclists.	1. Improved bus priority 2. Improved bus priority 3. Improved cyclist safety.
DRAFT PRO (PC2)		1. Outbound traffic lane on Rathgar Road removed 2. Inbound bus lane provided through the junction	1. To facilitate physical bus priority in each direction 2. To provide bus priority in inbound direction	1. Improved bus priority 2. Improved bus priority
DRAFT PRO (PC3)		1. No change	1. N/A	1. N/A

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathgar Rd / Leicester Ave

EXISTING

FINAL DESIGN



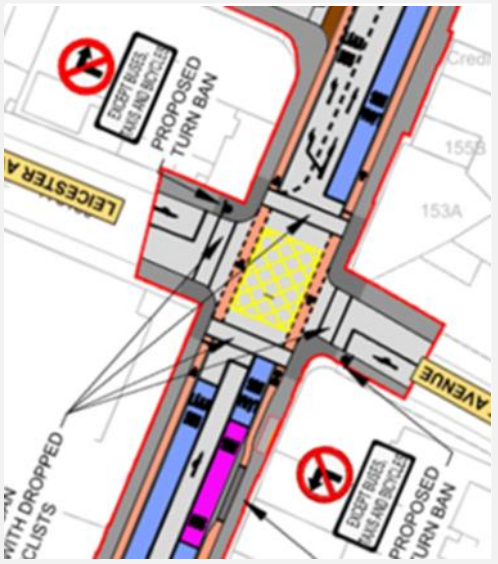
Change Made	Reason for Change	Impact of Change
1. Toucan Crossings provided on all arms of the junction, with ramps provided for cyclists to access toucan crossings.	1. To facilitate right turning cyclist movements.	1. Improved cyclist safety.

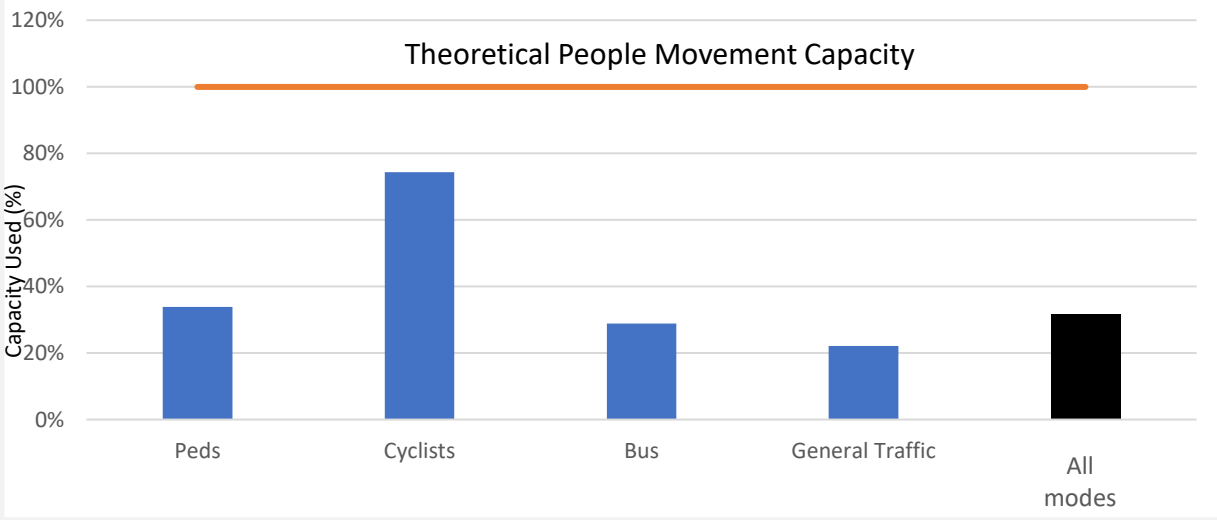
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathgar Rd / Leicester Ave

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <50s on average.

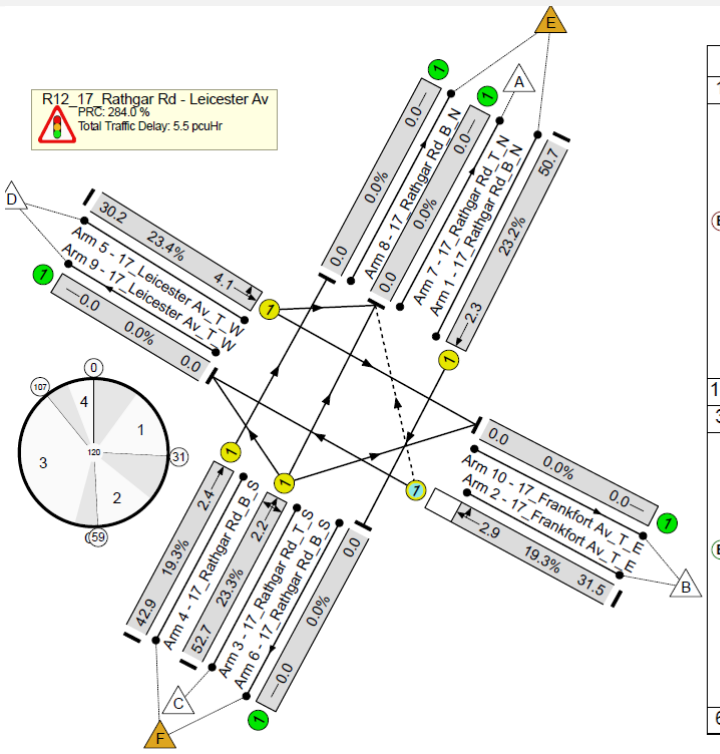


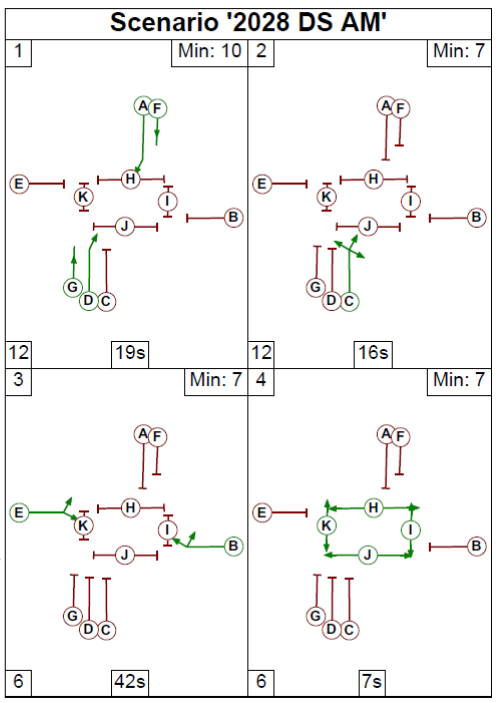


Do Something : 2028 : AM

Cycle = 120 secs
PRC = 284%
Delay = 6 pcuHr

Bus delay
Inbound = 43s
Outbound = 51s

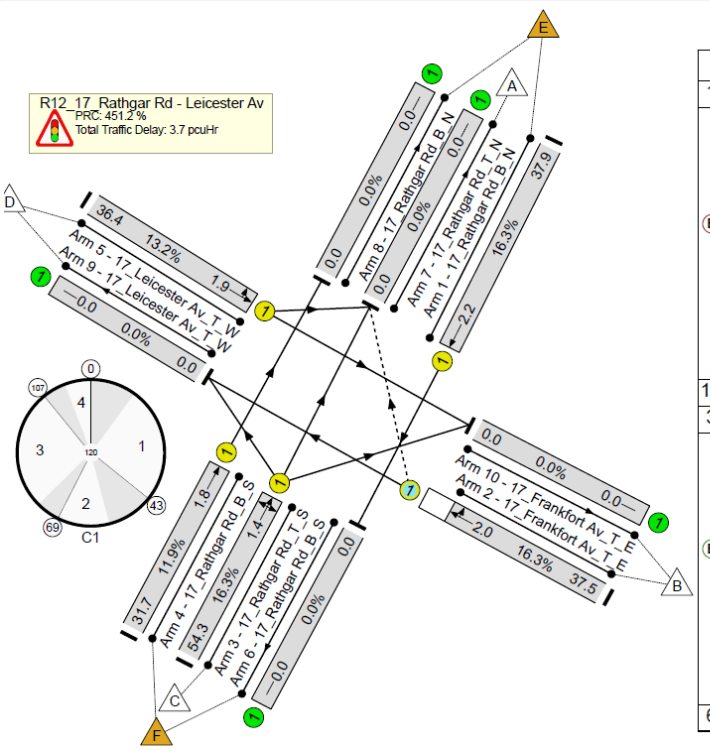


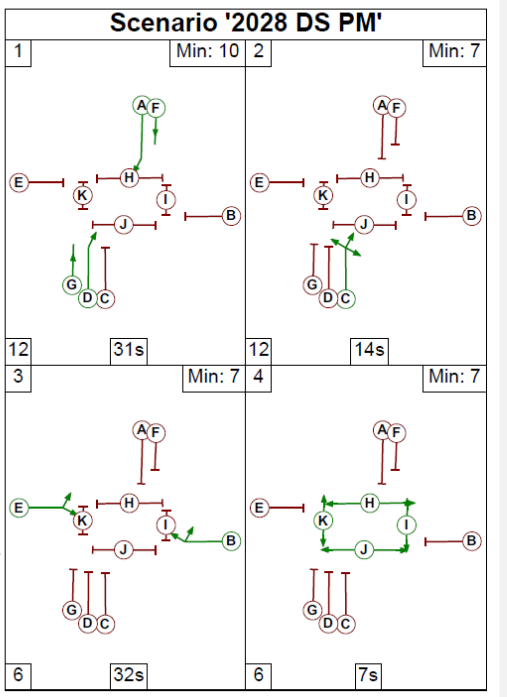


Do Something : 2028 : PM

Cycle = 120 secs
PRC = 451%
Delay = 4 pcuHr

Bus delay
Inbound = 32s
Outbound = 38s





ARUP

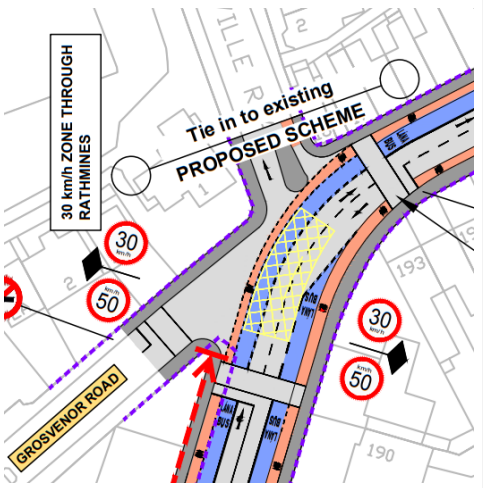
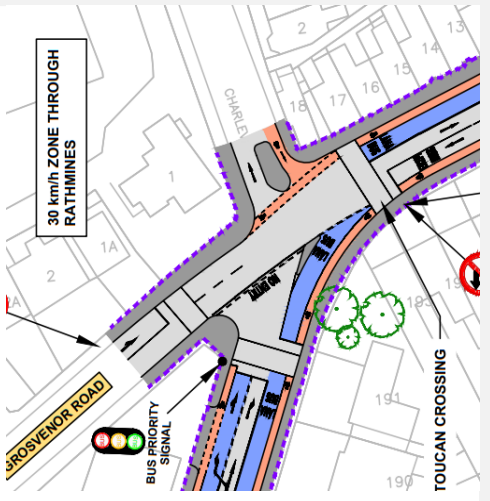
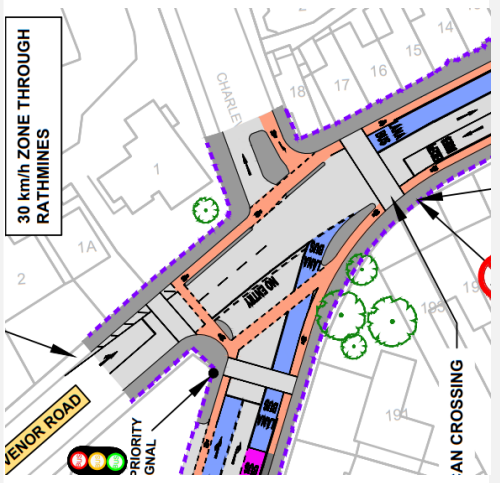
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathgar Rd / Grosvenor Rd

Summary
The existing junction is proposed to be altered by the provision of an inbound bus lane through the junction, as well as protected cycle facilities on each approach.

Signal Operation
A four stage signal operation is proposed. Cycle tracks will operate at the same time as the inbound bus lane, followed by the inbound general traffic lane. The outbound traffic lane will operate at the same time as Grosvenor Road, with turning traffic to give way to cyclists on a flashing amber. The pedestrian crossings will operate in their own stage.

Junction Type 1
Bus delay ≤ 50s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lane provided on southern approach 2. Cycle facilities provided in each direction along Rathgar Road 3. Outbound traffic lane removed from eastern approach 4. New pedestrian crossing across eastern and western approaches	1. To provide improved bus priority 2. To improve facilities for cyclists. 3. To facilitate cycle tracks in each direction 4. To improve pedestrian facilities	1. Improved bus priority 2. Improved cyclist safety 3. Improved cyclist safety 4. Improved pedestrian safety
DRAFT PRO (PC2)		1. Outbound traffic lane on Rathgar Road removed 2. Left turning traffic on southern approach permitted to turn from bus lane	1. To align with proposal to make Rathgar Road inbound for general traffic only 2. To provide more efficient junction layout	1. Improved bus priority 2. Improved junction operation. Low left turn volume not expected to interfere with bus progression
DRAFT PRO (PC3)		1. Cycle facilities enhanced to provide protected cycle infrastructure through the junction	1. To improve facilities for cyclists consistent with BusConnects design guidance.	1. Improved cyclist safety.

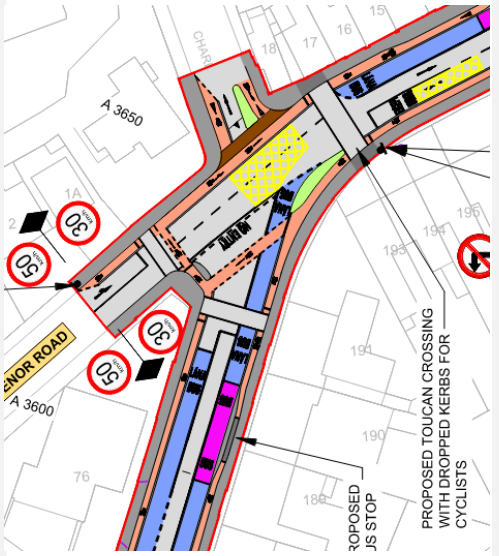
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathgar Rd / Grosvenor Rd

EXISTING

FINAL DESIGN



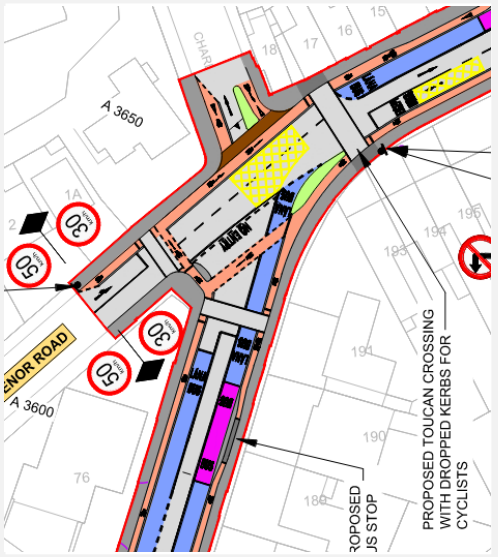
Change Made	Reason for Change	Impact of Change
1. Additional protected cycle facilities provided on the Grosvenor Road and Charleville Road arms the junction. 2. Bus lane stop line set back on the southern arm of the junction.	1. To provide improved facilities for cyclists entering and exiting the junction. 2. To improve visibility for left turning vehicles to cyclists at the junction.	1. Improved cyclist safety. 2. Improved cyclist safety.

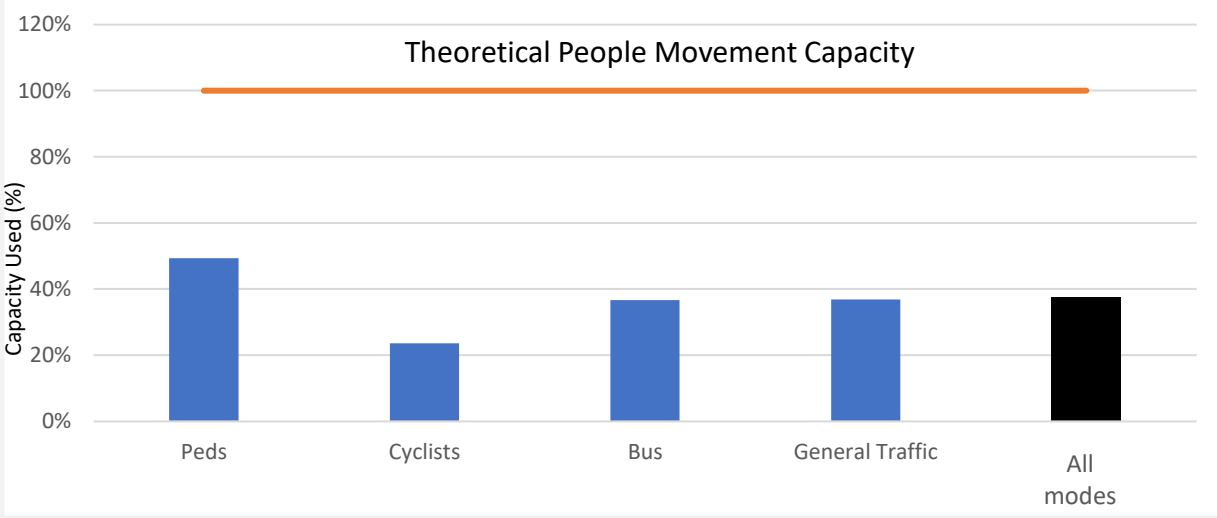
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathgar Rd / Grosvenor Rd

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <50s on average.

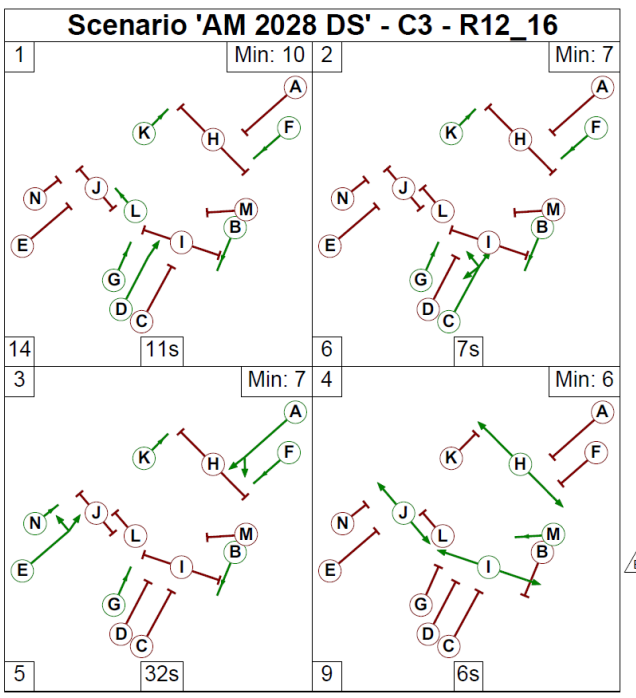


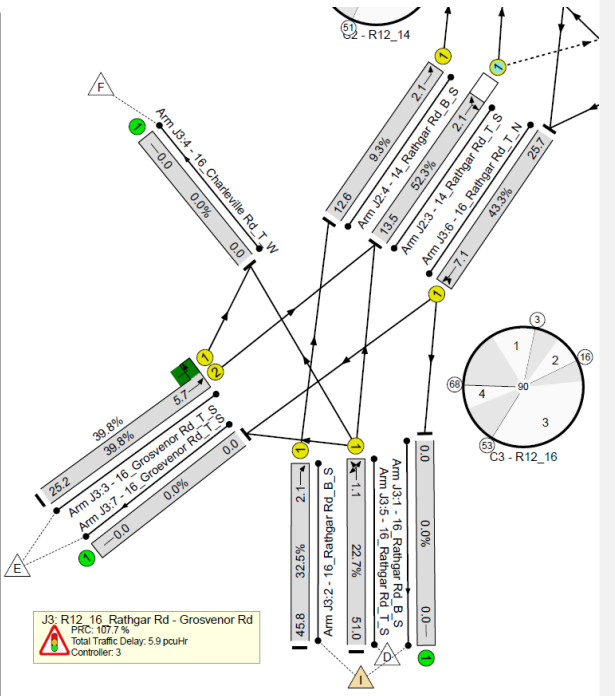


Do Something : 2028 : AM

Cycle = 90 secs
PRC = 108%
Delay = 6 pcuHr

Bus delay
Inbound = 46s
Outbound = 26s

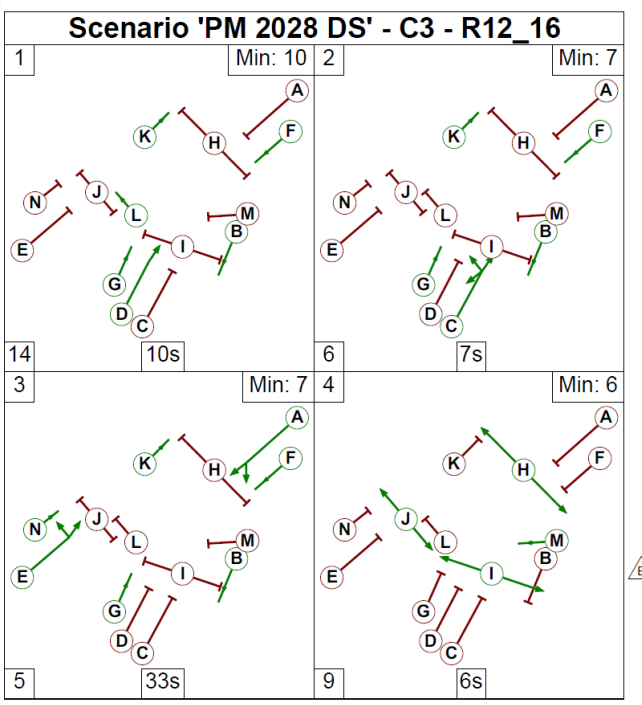


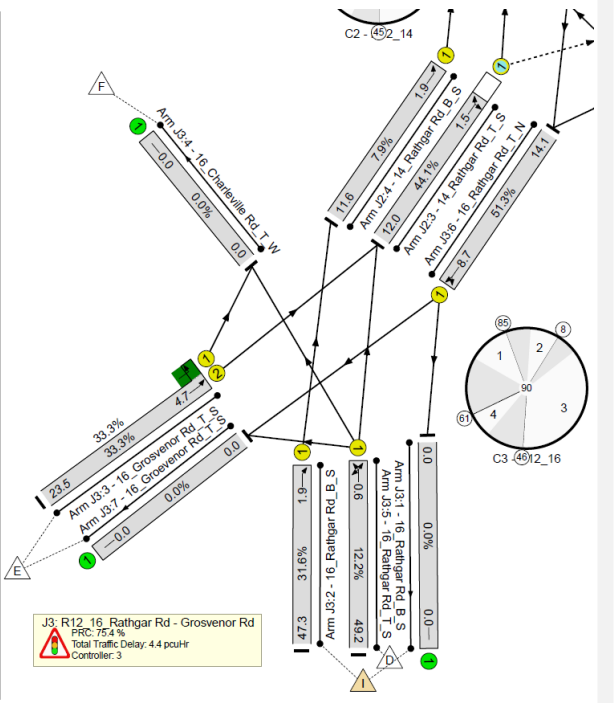


Do Something : 2028 : PM

Cycle = 90 secs
PRC = 75%
Delay = 4 pcuHr

Bus delay
Inbound = 47s
Outbound = 14s





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathmines Rd Lower / Rathmines Rd Upper

Summary
The existing junction is proposed to be altered by the provision of an inbound bus lane through the junction, as well as protected cycle facilities on each approach.

Signal Operation
A three stage signal operation is proposed. The inbound bus lane, traffic, and cycle lane will operate together with outbound traffic. The side road traffic and cyclists will operate together, with left turning traffic giving way to cyclists on a flashing amber. Pedestrians, outbound cyclists, and cyclists turning right to the side road will operate together.

Junction Type 1
Bus delay ≤ 25s

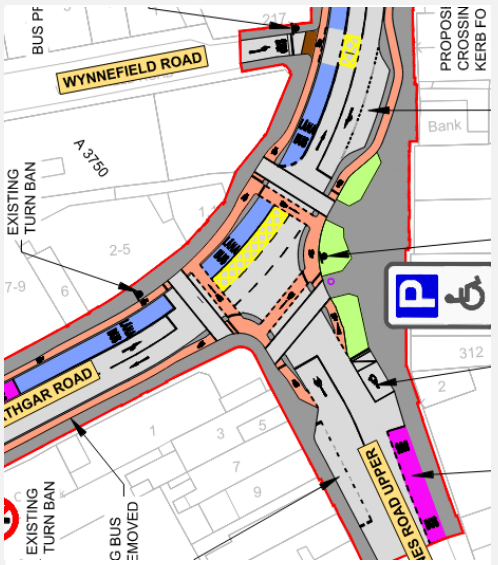
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound traffic lane on southern approach removed and replaced with a bus lane 2. Advisory cycle lanes removed and replaced with dedicated cycle tracks	1. To provide improved bus priority 2. To improve facilities for cyclists.	1. Improved bus priority 2. Improved cyclist safety.
DRAFT PRO (PC2)		1. Cycle facilities were further enhanced to provide protected cycle infrastructure through the junction	1. To improve facilities for cyclists consistent with BusConnects design guidance.	1. Improved cyclist safety.
DRAFT PRO (PC3)		1. Minor alterations to alignment of southbound pedestrian and cycle crossing across Rathmines Road Lower to better align it with desire line	1. To improve facilities for cyclists and pedestrians	1. Improved pedestrian and cyclist safety.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathmines Rd Lower / Rathmines Rd Upper

EXISTING

FINAL DESIGN



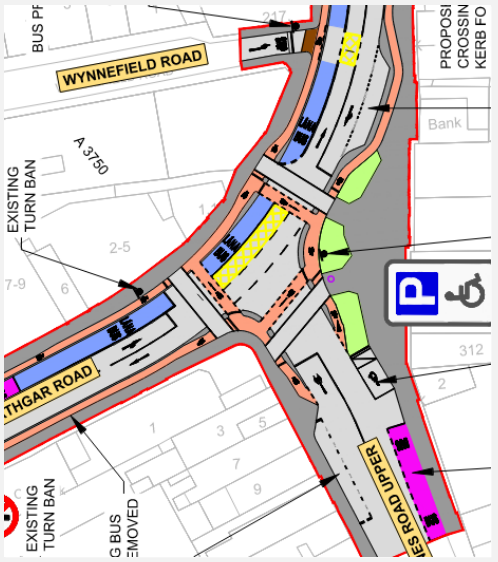
Change Made	Reason for Change	Impact of Change
1. N/A	1. N/A	1. N/A

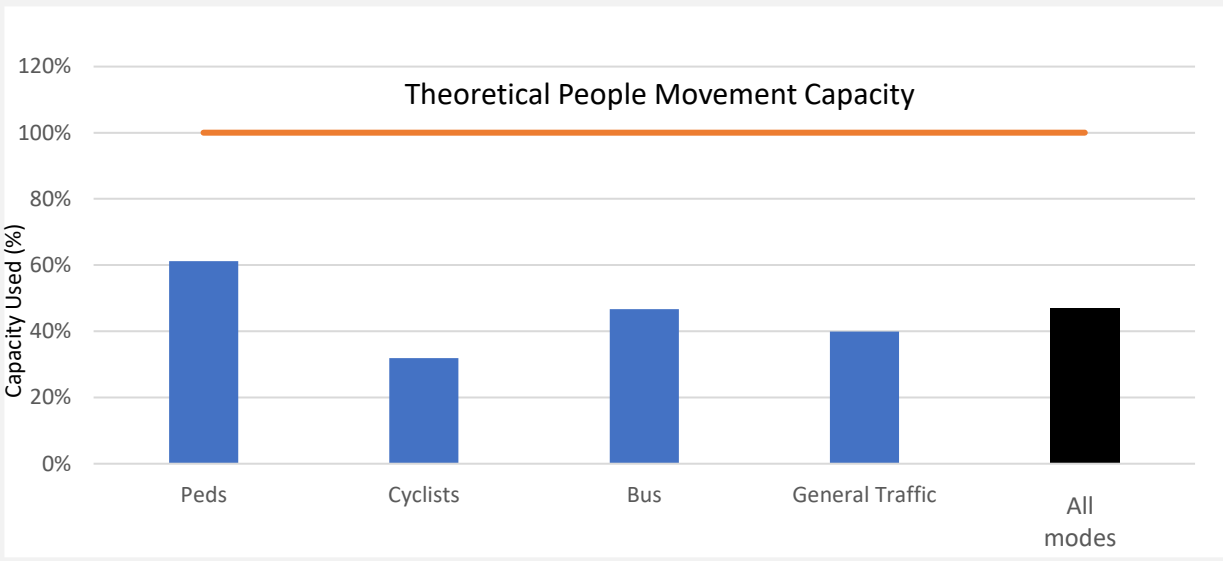
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathmines Rd Lower / Rathmines Rd Upper

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <25s on average.

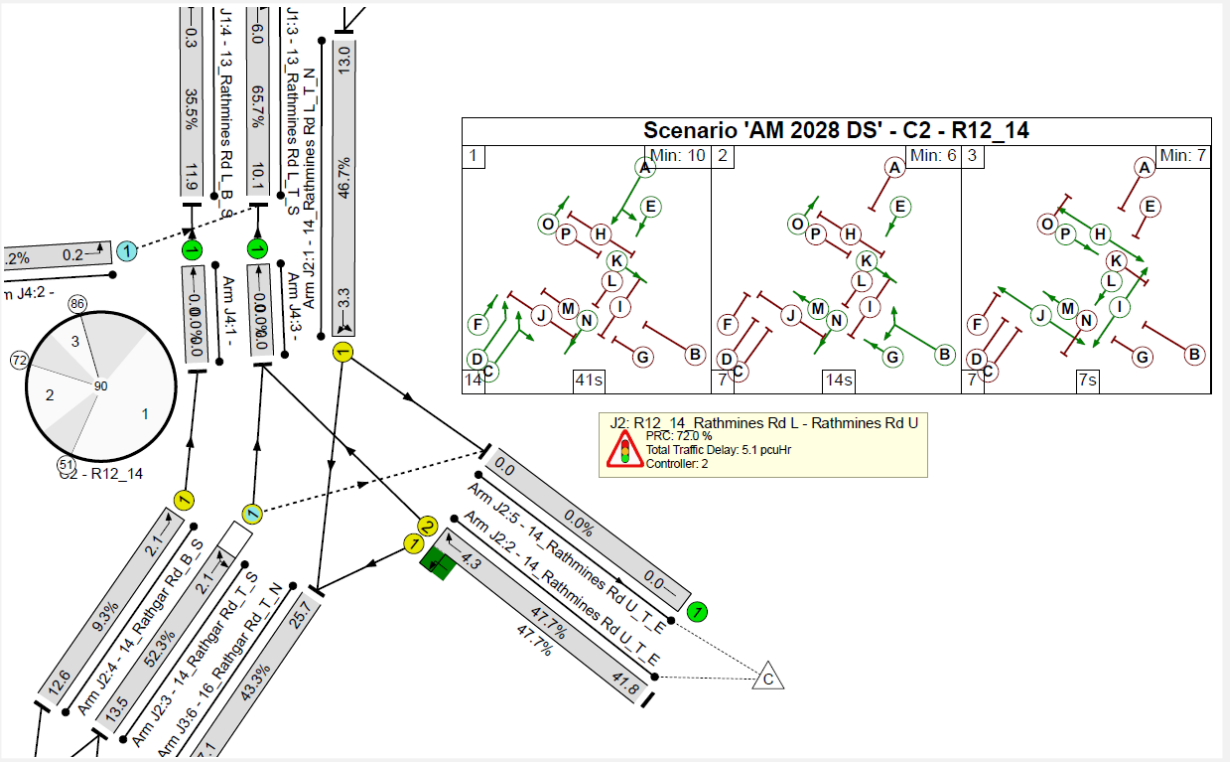




Do Something : 2028 : AM

Cycle = 90 secs
PRC = 72%
Delay = 5 pcuHr

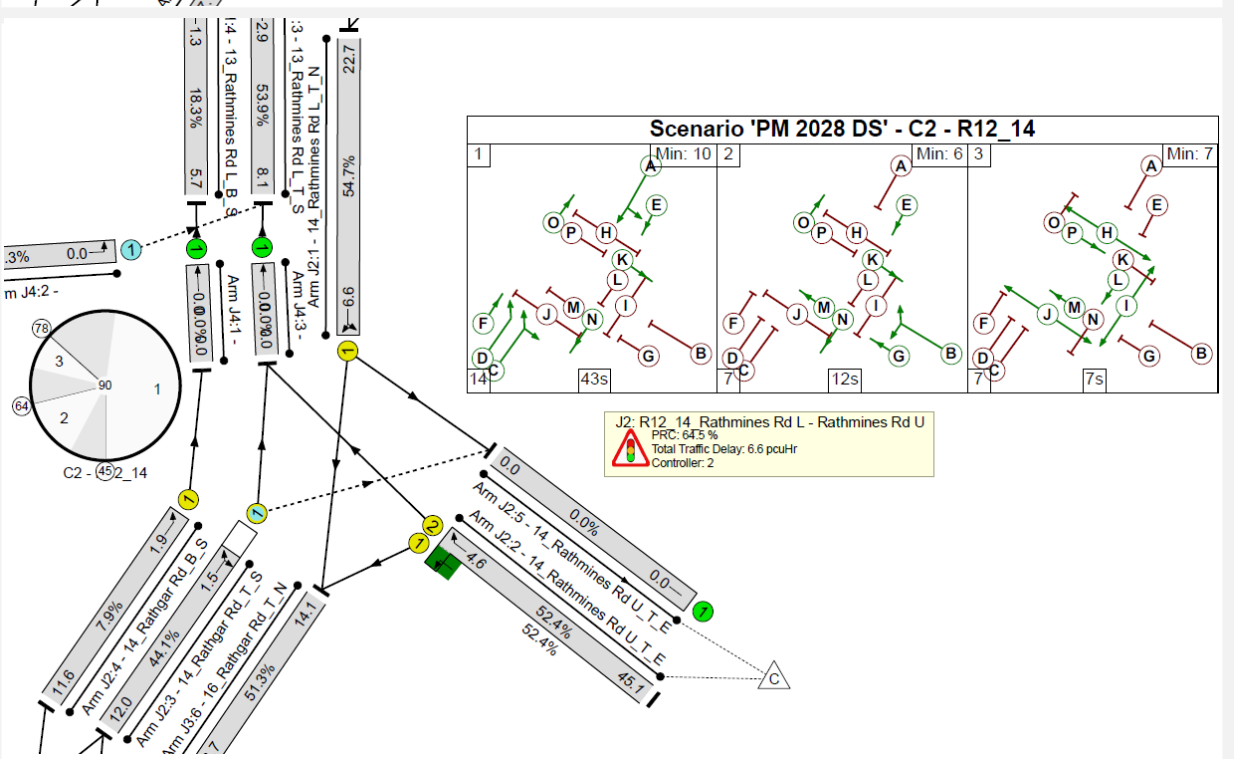
Bus delay
Inbound = 13s
Outbound = 13s



Do Something : 2028 : PM

Cycle = 90 secs
PRC = 65%
Delay = 7 pcuHr

Bus delay
Inbound = 12s
Outbound = 23s



ARUP

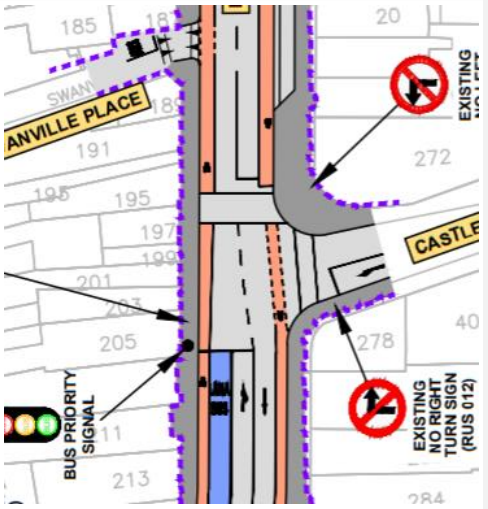
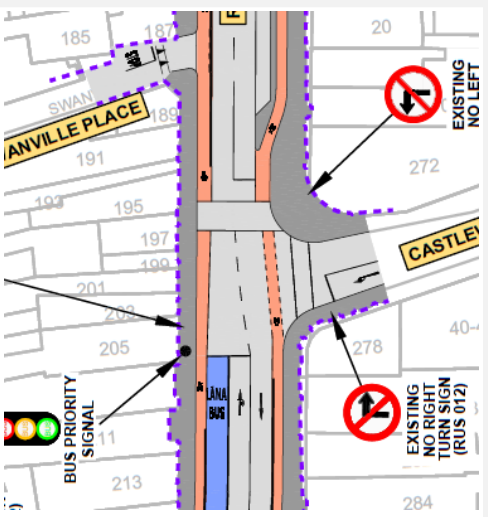
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathmines Rd Lower / Castlewood Ave

Summary
The existing junction is proposed to be altered by the provision of improved cycle tracks, as well as a bus priority signal on approach from the south. Improvement to pedestrian facilities will also be provided with pedestrian crossings proposed across each arm.

Signal Operation
A three stage signal operation is proposed. Cycle tracks will operate at the same time as the inbound bus lane and outbound general traffic lane. The inbound cycle track will then continue with the inbound general traffic lane and left-only side road running together to maximise green time and minimise delay. The pedestrian crossings will operate in their own stage.

Junction Type 1
Bus delay ≤ 55s

		Change Made	Reason for Change	Impact of Change
EXISTING				
EPR		1. Inbound traffic lane removed from the northern arm of the junction. 2. Cycle tracks added on the Rathmines Road Lower arms of the junction. 3. Inbound Bus Lane added on the southern arm of the junction. 4. Inbound and outbound bus lanes added on the northern arm of the junction. 5. Cyclist bypass from the north onto Castlewood avenue removed.	1. To align with the wider scheme proposals to make Rathmines Road Lower one way for general traffic. 2. To improve facilities for cyclists. 3. To improve bus priority through the junction. 4. To improve bus priority through the junction. 5. To improve pedestrian facilities at the junction.	1. Inbound general traffic redirected to Castlewood Avenue. 2. Improved cyclist safety. 3. Improved bus priority. 4. Improved bus priority. 5. Improved pedestrian safety.
DRAFT PRO (PC2)		1. Inbound and outbound bus lanes removed from the northern arm of the junction. 2. Cycle tracks widened to 2m on the northern arm of the junction	1. A bus gate is proposed north of this junction within Rathmines Village, providing bus priority without the requirement for bus lanes. 2. To improve facilities for cyclists on high demand corridor.	1. Improved facilities for cyclists and improved public realm within Rathmines Village. 2. Improved cyclist safety and capacity.
DRAFT PRO (PC3)		1. No Change	1. N/A	1. N/A

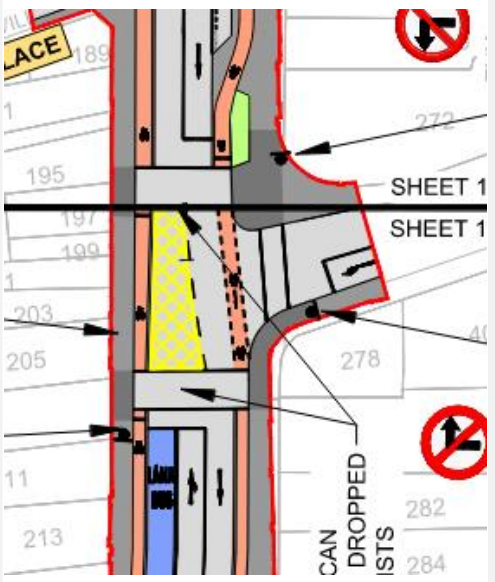
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathmines Rd Lower / Castlewood Ave

EXISTING

FINAL DESIGN



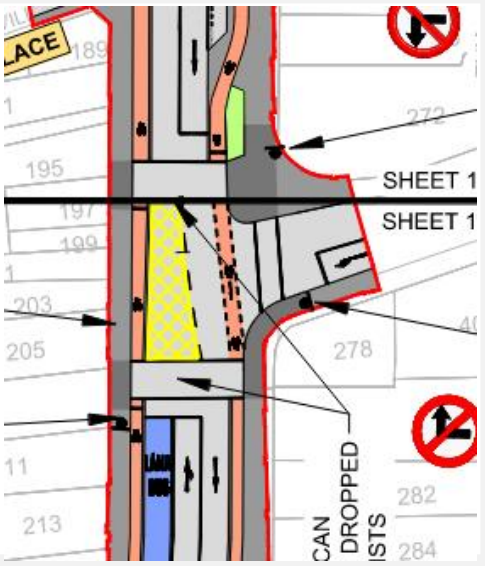
Change Made	Reason for Change	Impact of Change
1. Toucan Crossings provided on all arms of the junction, including a new crossing on the southern arm, with ramps provided for cyclists to access toucan crossings.	1. To facilitate right turning cy clist movements and improve crossing facilities for pedestrians.	1. Improved pedestrian and cyclist safety.

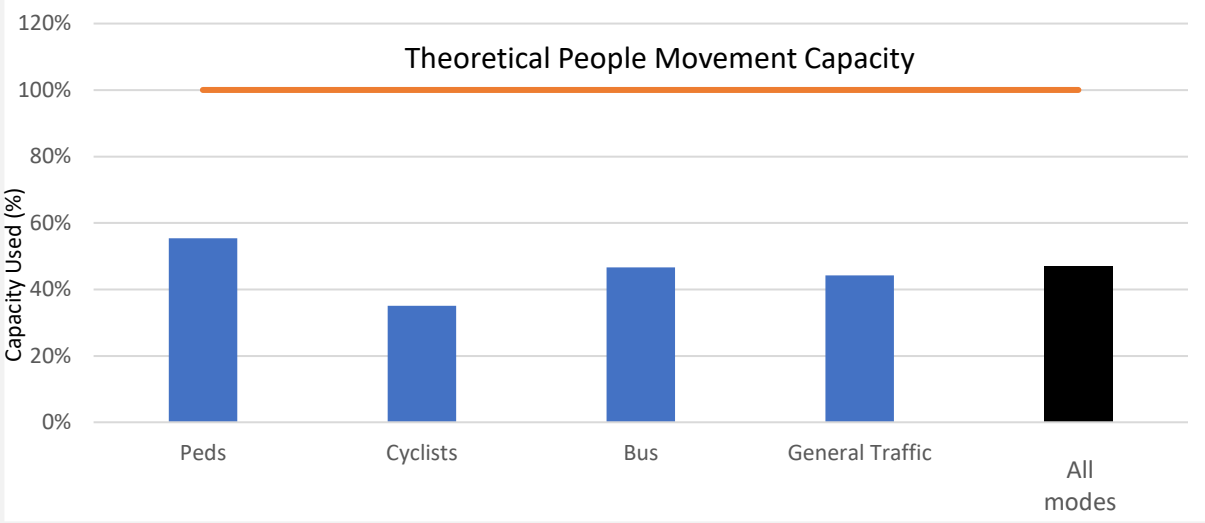
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathmines Rd Lower / Castlewood Ave

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <55s on average.

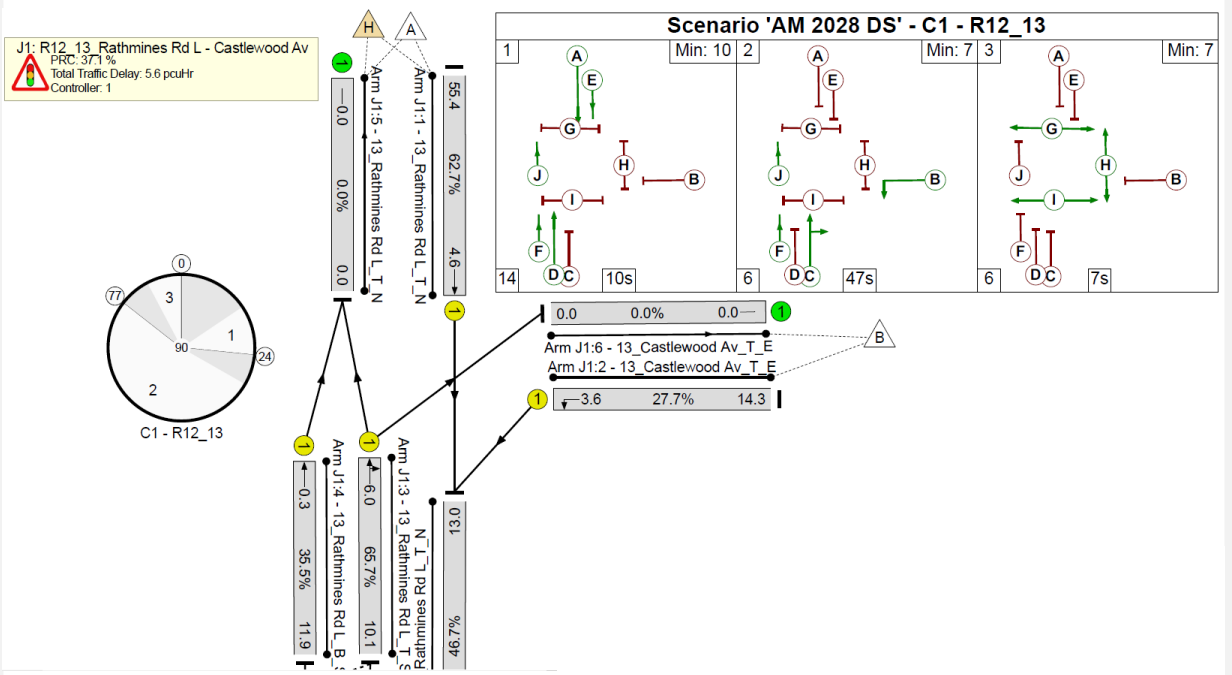




Do Something : 2028 : AM

Cycle = 90 secs
PRC = 37%
Delay = 6 pcuHr

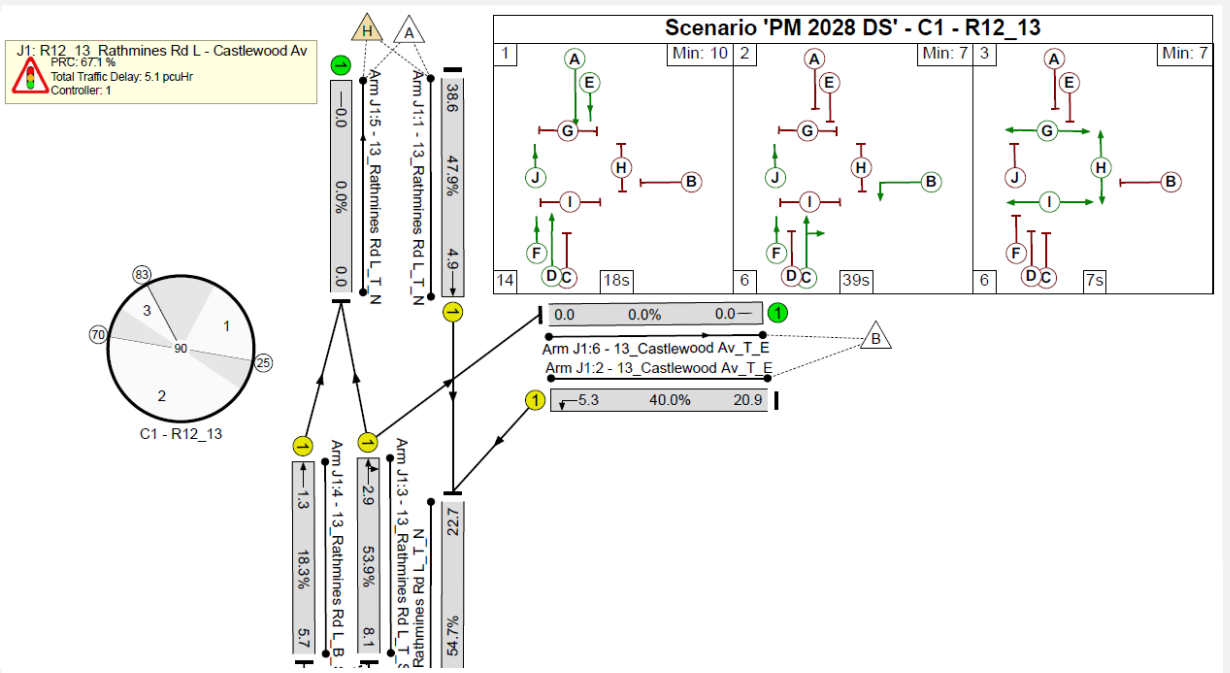
Bus delay
Inbound = 12s
Outbound = 55s



Do Something : 2028 : PM

Cycle = 90 secs
PRC = 67%
Delay = 5 pcuHr

Bus delay
Inbound = 6s
Outbound = 39s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

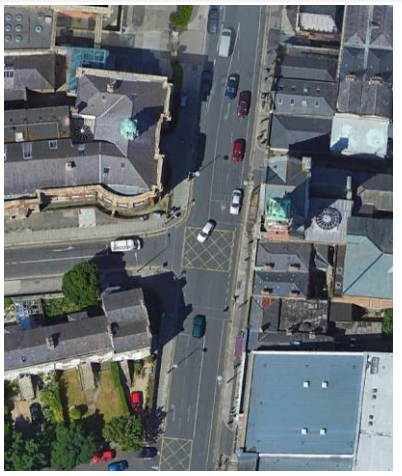
Rathmines Rd Lower / Leinster Rd

Summary
The existing junction is proposed to be altered by the provision cycle tracks, as well as the removal of general traffic turning lanes.

Signal Operation
A three stage signal operation is proposed. Cycle tracks will operate at the same time as the mainline traffic stages to maximise green time and minimise delay, with turning traffic to give way to cyclists on flashing amber. The side road traffic will operate separately, to be followed by pedestrian crossings in their own stage. There will be no bus priority at this junction.

Junction Type n/a

Bus delay ≤ 20s

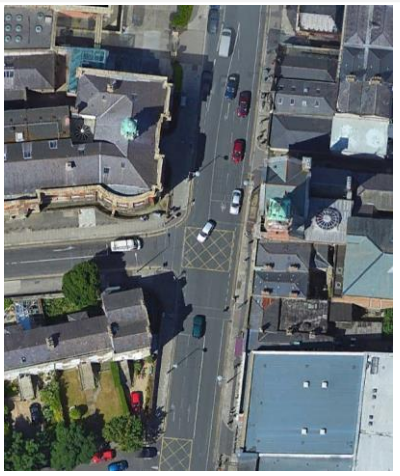
		Change Made	Reason for Change	Impact of Change
EXISTING				
EPR		1. Inbound and outbound bus lanes provided on the Rathmines Road Lower arms of the junction. 2. Cycle tracks added on the Rathmines Road Lower arms of the junction. 3. Inbound traffic lanes removed from the Rathmines Road Lower arms of the junction. 4. Additional pedestrian crossing added to the northern arm of the junction.	1. To improve bus priority through the junction. 2. To improve facilities for cyclists. 3. To align with the wider scheme proposals to make Rathmines Road Lower one way for general traffic. 4. Improved pedestrian crossing facilities.	1. Improved bus priority. 2. Improved cyclist safety. 3. Improved bus priority and cyclist safety. 4. Improved pedestrian safety.
DRAFT PRO (PC2)		1. Bus lanes removed through the junction. 2. Cycle tracks widened to 2m. 3. Inbound traffic lane reintroduced on the Rathmines Road Lower arms of the junction.	1. A bus gate is proposed north of this junction within Rathmines Village, providing bus priority without the requirement for bus lanes. 2. To improve facilities for cyclists for high demand corridor. 3. To improve local access to the area south of this junction.	1. Improved facilities for cyclists and improved public realm within Rathmines Village. 2. Improved cyclist safety and capacity. 3. Improved local access.
DRAFT PRO (PC3)		1. No Change	1. N/A	1. N/A

ARUP

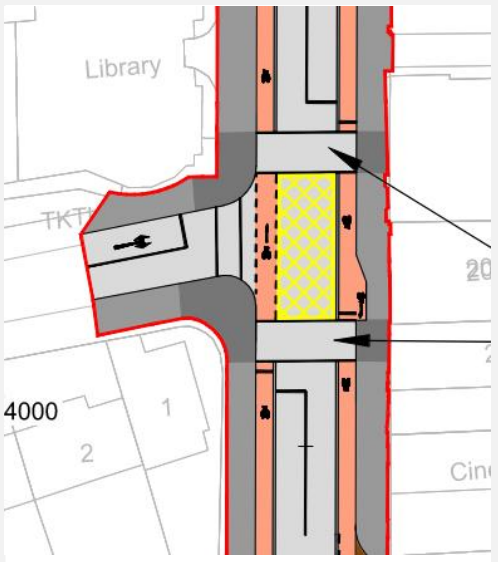
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathmines Rd Lower / Leinster Rd

EXISTING



FINAL DESIGN



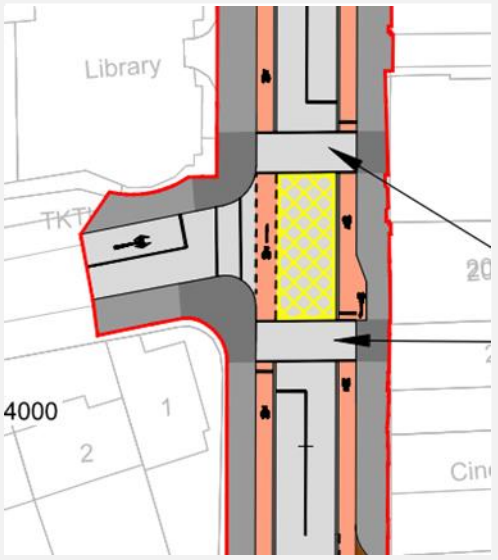
Change Made	Reason for Change	Impact of Change
1. Toucan Crossings provided in place of previously proposed pedestrian crossings, with ramps provided for cyclists to access toucan crossings.	1. To facilitate right turning cyclist movements.	1. Improved cyclist safety.

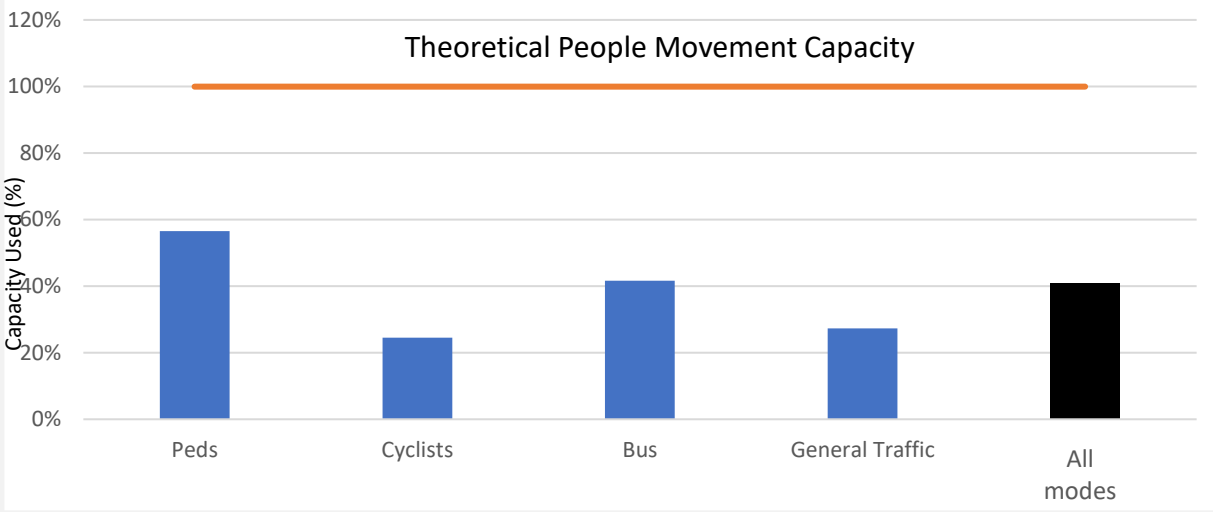
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Rathmines Rd Lower / Leinster Rd

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <20s on average.

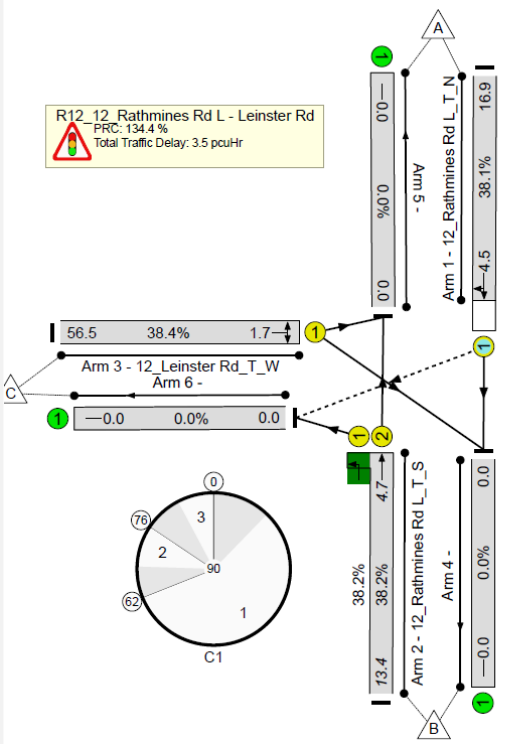


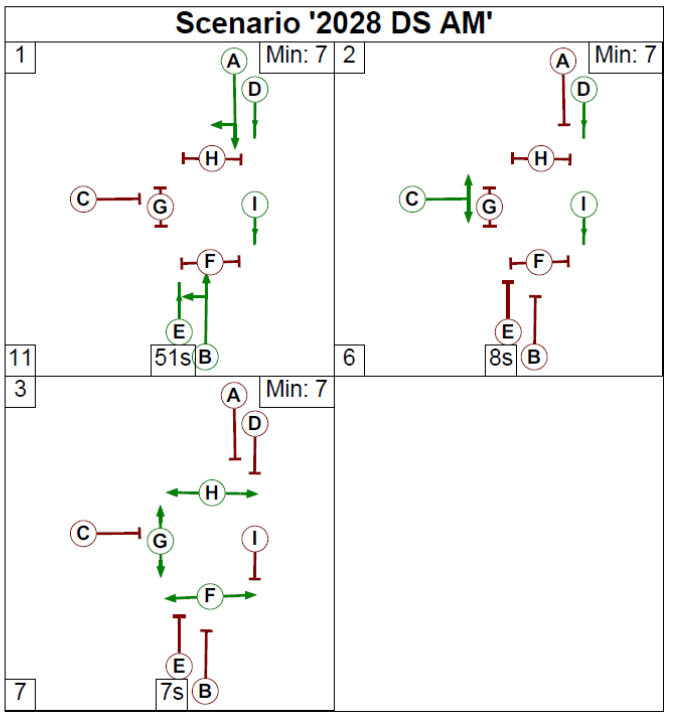


Do Something : 2028 : AM

Cycle = 90 secs
PRC = 134%
Delay = 4 pcuHr

Bus delay
Inbound = 13s
Outbound = 17s

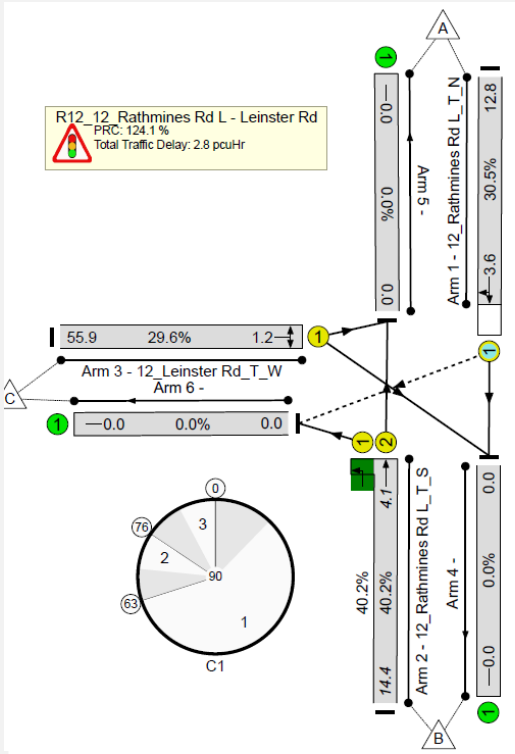


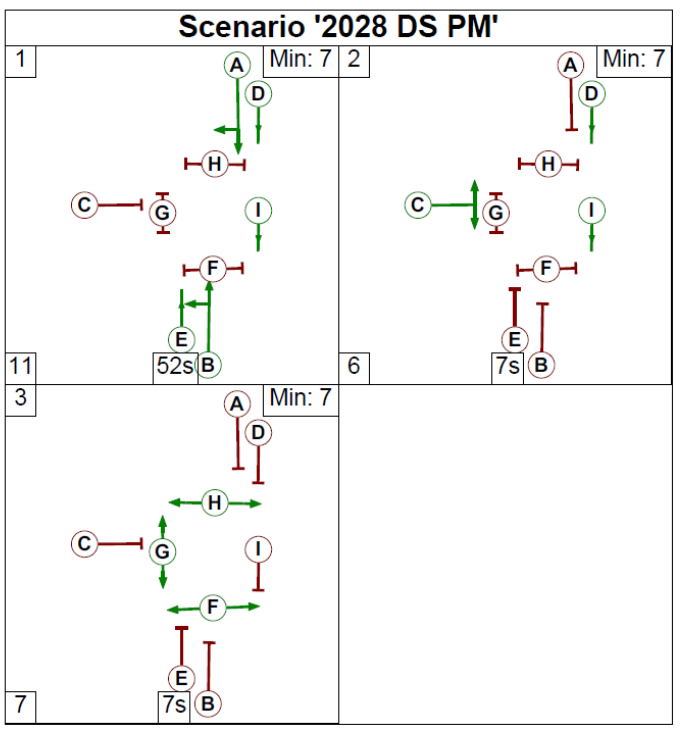


Do Something : 2028 : PM

Cycle = 90 secs
PRC = 124%
Delay = 3 pcuHr

Bus delay
Inbound = 14s
Outbound = 13s





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Richmond St S / Charlemont Mall / Grove Rd

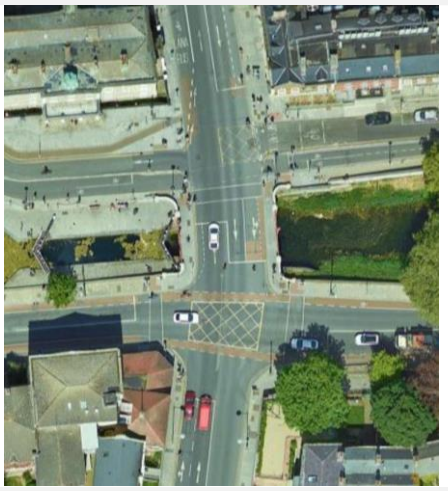
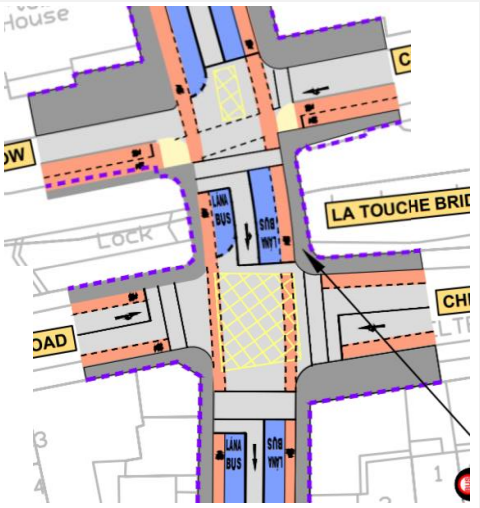
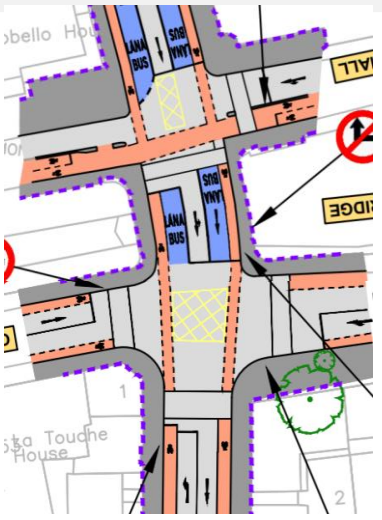
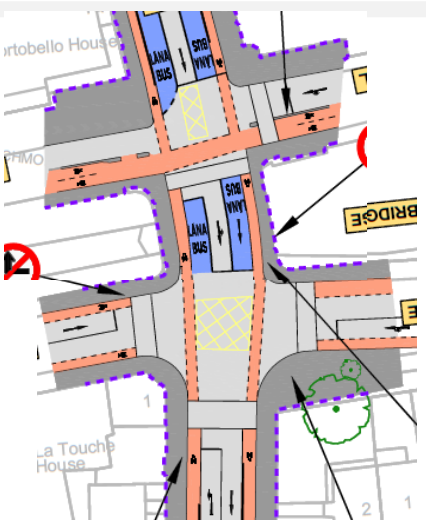
Summary

The existing junction is proposed to be reconfigured to provide a dedicated bus lane inbound, a shared bus/traffic lane outbound, as well as the removal of left turn general traffic lanes and the inbound general traffic lane on La Touche bridge. A cycle track in each direction is proposed, plus a dedicated turn pocket for cyclists turning from La Touche Bridge onto the canal cycle track which is expected to be a busy movement.

Signal Operation

A five stage signal operation is proposed. The two-way cycle track on Charlemont Mall and Richmond Row will operate unopposed, at the same time as traffic movements on Grove Road and Canal Road. Traffic from Charlemont Mall will operate unopposed, followed by the pedestrian crossings which will operate in their own stage. Inbound bus, left turning traffic, and cyclists will operate together, at the same time as outbound traffic, buses, and cyclists, with turning traffic giving way to cyclists on flashing ambers. Traffic will be stopped for right turning cyclists into Charlemont Mall to operate unopposed.

Junction Type **1** Bus delay ≤ 40s

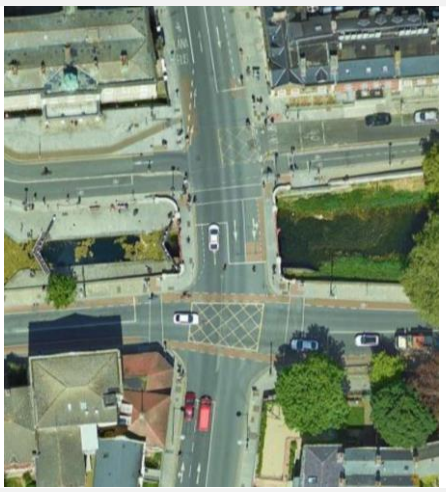
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound Traffic lane on Richmond Street South and La Touche Bridge arms of the junction removed. 2. Bus lanes provided on Richmond Street South and La Touche Bridge arms of the junction. 3. Cycle tracks provided on Richmond Street South and La Touche Bridge arms of the junction.	1. To align with scheme proposals to make Richmond Street South one-way outbound for general traffic. 2. To improve bus priority through the junction. 3. To improve facilities for cyclists.	1. Improved bus priority. 2. Improved bus priority. 3. Improved cyclist safety.
DRAFT PRO (PC2)		1. Bus Lanes removed on the Rathmines Road Lower arm of the junction. 2. Inbound general traffic lane added on the Rathmines Road Lower arm of the junction. 3. Cycle tracks on the Rathmines Road Lower arm of the junction widened to 2m. 4. Alignment modified and cycle tracks narrowed slightly on the Richmond Street South arm.	1. A bus gate is proposed south of this junction within Rathmines Village, providing bus priority without the requirement for bus lanes. 2. To improve local access to the area south of this junction. 3. To improve facilities for cyclists. 4. To avoid impact on a low level access to Portobello House.	1. Improved facilities for cyclists and improved public realm within Rathmines Village. 2. Improved local access. 3. Improved cyclist safety. 4. Avoidance of a physical constraint, (low level access to Portobello House).
DRAFT PRO (PC3)		1. Cheltenham Place arm of the junction realigned slightly.	1. To provide an improved alignment through the junction in the east-west direction.	1. Improved road user safety.

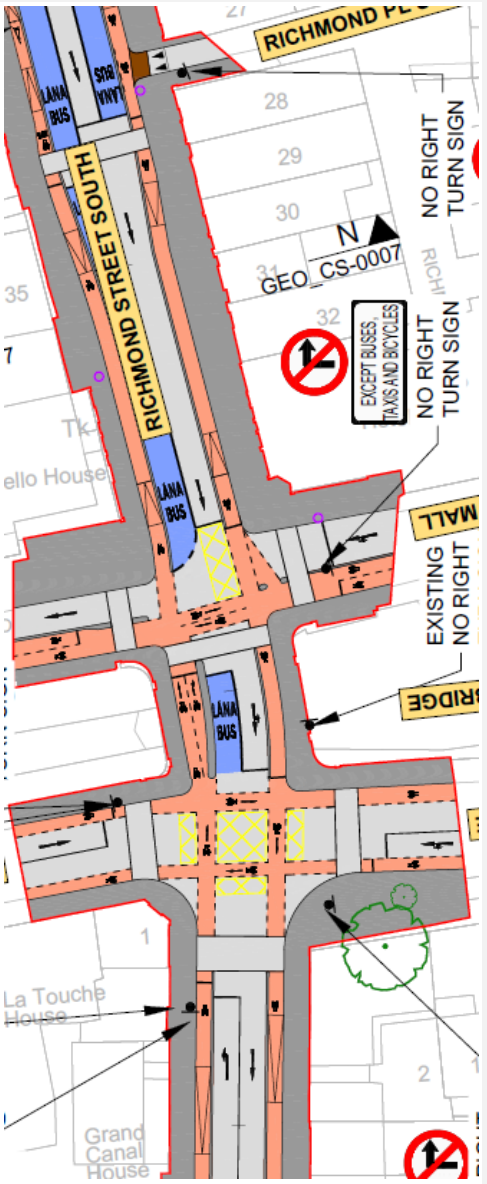
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

EXISTING

FINAL DESIGN

Richmond St S / Charlemont Mall / Grove Rd





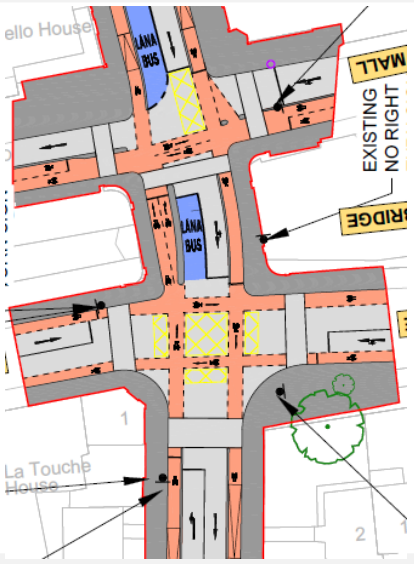
Change Made	Reason for Change	Impact of Change
1. Outbound bus lane removed through the junction (La Touche Bridge). Space reallocated to dedicated right-turn facility for inbound cyclists accessing the Grand Canal Cycleway as well as widened footpaths. 2. Minor amendments to line markings and kerb islands to facilitate a protected right-turn movement for outbound cyclists accessing the Grand Canal Cycleway. 3. East/West cycle lane markings provided through the junction.	1. To provide improved facilities for cyclists interchanging between the Preferred Scheme and the Grand Canal Cycleway. 2. To provide improved facilities for cyclists interchanging between the Preferred Scheme and the Grand Canal Cycleway. 3. To provide enhanced cyclist priority through the junction.	1. Improved pedestrian and cyclist safety. Outbound bus priority provided by a bus priority signal located north of the junction on Richmond Street South. No material impact on traffic movement or bus priority identified. 2. Improved cyclist safety. 3. Improved cyclist safety.

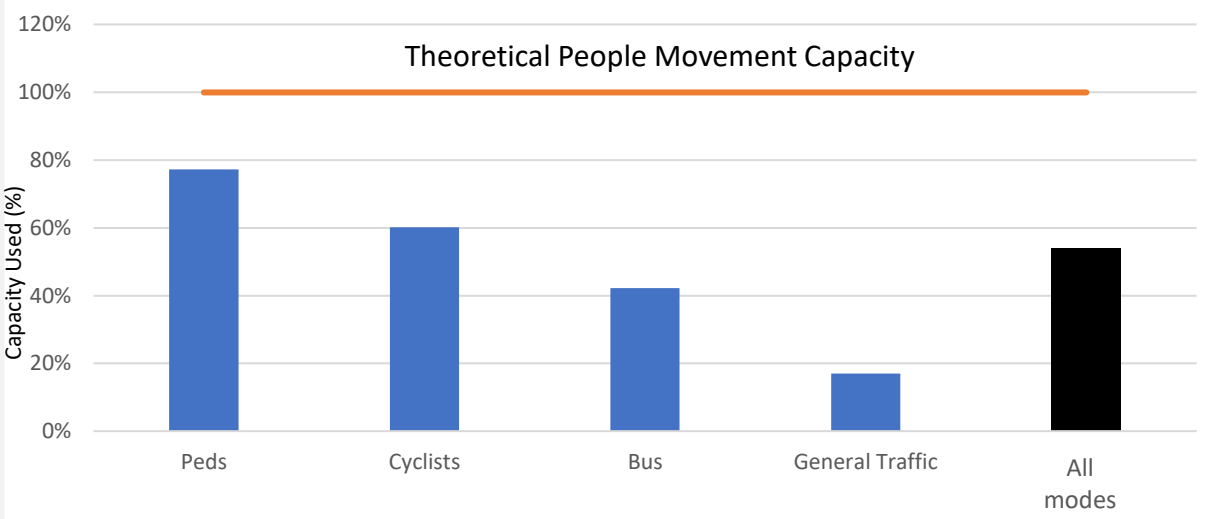
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Richmond St S / Charlemont Mall / Grove Rd

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <40s on average.

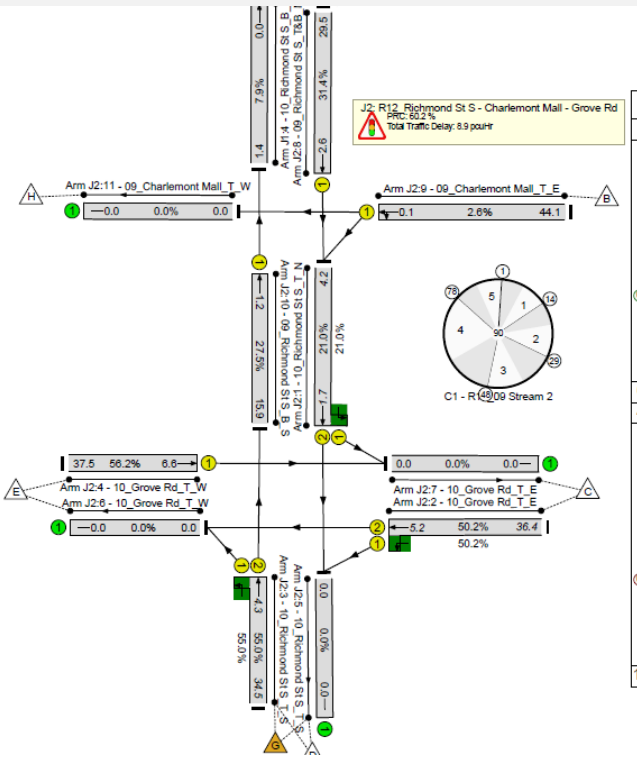


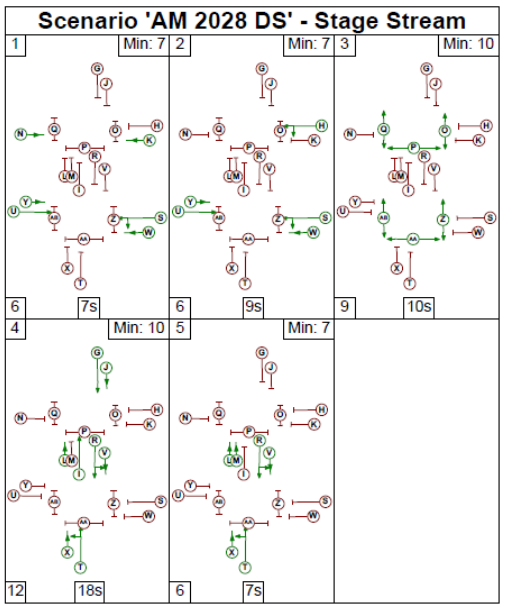


Do Something : 2028 : AM

Cycle = 90 secs
PRC = 60%
Delay = 9 pcuHr

Bus delay
Inbound = 35s
Outbound = 30s

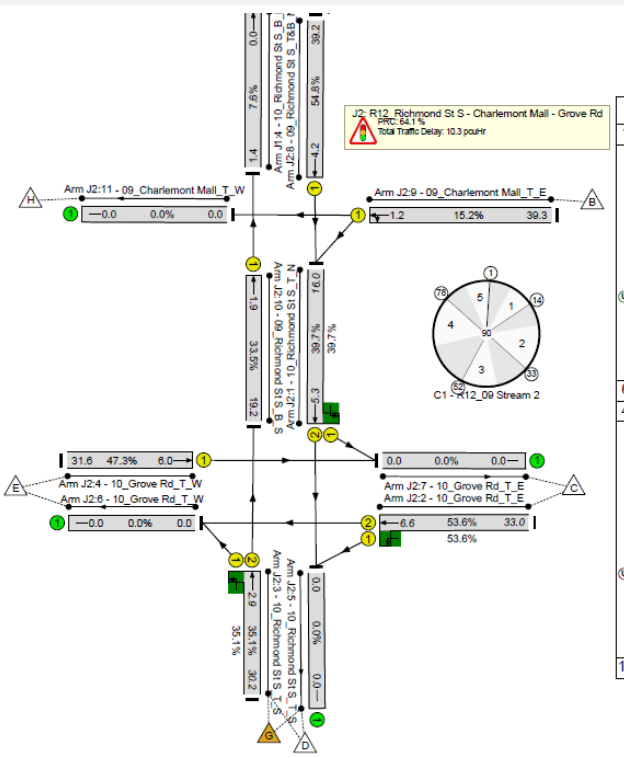


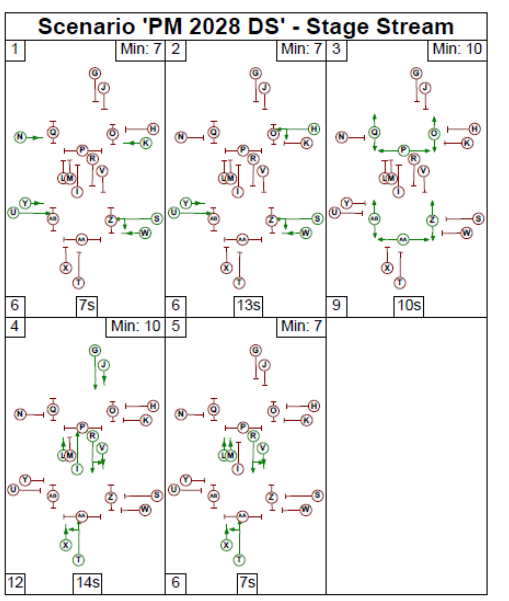


Do Something : 2028 : PM

Cycle = 90 secs
PRC = 64%
Delay = 10 pcuHr

Bus delay
Inbound = 30s
Outbound = 39s





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Camden St / Harrington St / Richmond St S

Summary

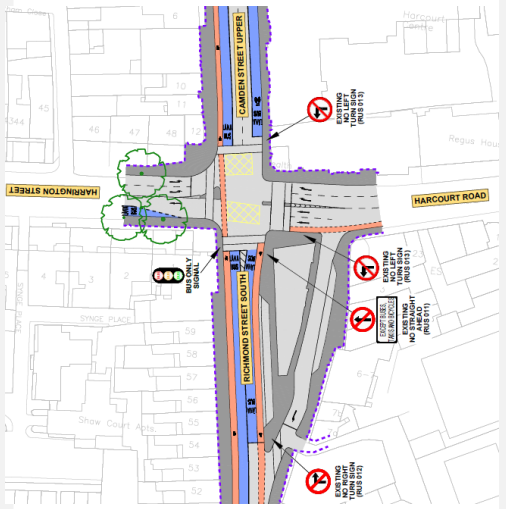
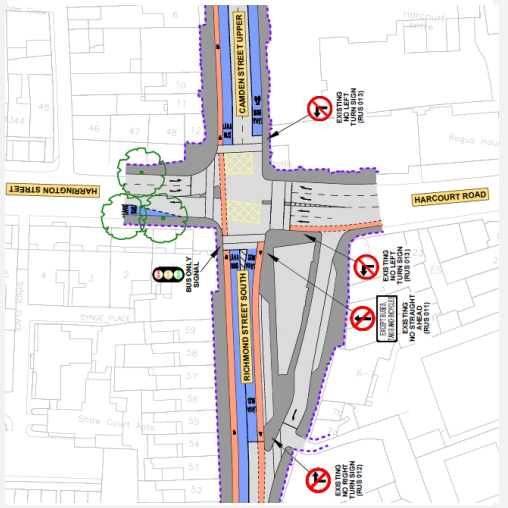
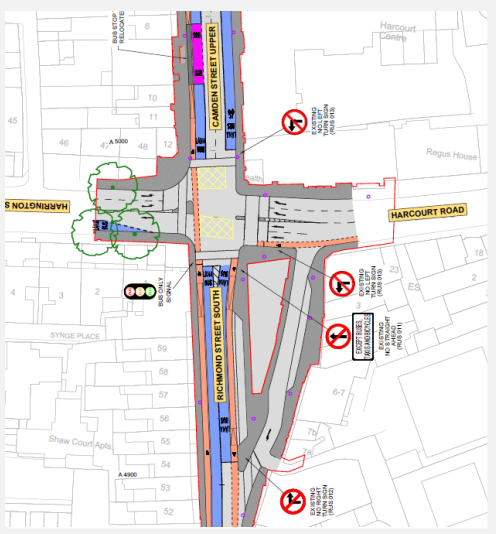
The existing junction is proposed to be altered by the provision of an inbound bus lane through the junction as well as the removal of inbound general traffic lanes on the Richmond Street South arm of the junction. The junction will be upgraded to include full protection for cyclists through the junction.

Signal Operation

A five stage signal operation is proposed. The inbound and outbound bus and cycle lanes will operate in the same stage, with the pedestrian crossing on Richmond Street S. The left bus and traffic movements from Harrington Street operate in separate stages, both with the ahead and left movements from Harcourt Road, with turning traffic from Harcourt Road to give way to cyclists on a flashing amber. Cyclists crossing from Harrington Street will be unable to operate with traffic due to the high volume of left turners. Right turning traffic from Harcourt Road to operate unopposed. The pedestrian crossings will operate in a stage with the cyclists from Harrington Street.

Junction Type **1**

Bus delay < 70s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR	 1. Inbound bus lane added to the Camden Street and Richmond Street South arms of this junction. 2. Inbound general traffic lanes removed on the Richmond Street South arm of this junction. 3. Outbound cycle track provided on the Richmond Street South arm of the junction.	1. To improve bus priority through the junction. 2. To align with scheme proposals to make Richmond Street South one-way outbound for general traffic and improve bus priority through the junction. 3. To improve cyclist safety at the junction.	1. Improved bus priority. 2. Improved bus priority, inbound through traffic redistributed. 3. Improved cyclist safety.
DRAFT PRO (PC2)	 1. No Change	1. N/A	1. N/A
DRAFT PRO (PC3)	 1. Stop line on minor road arm relocated.	1. To better reflect the existing layout.	1. N/A

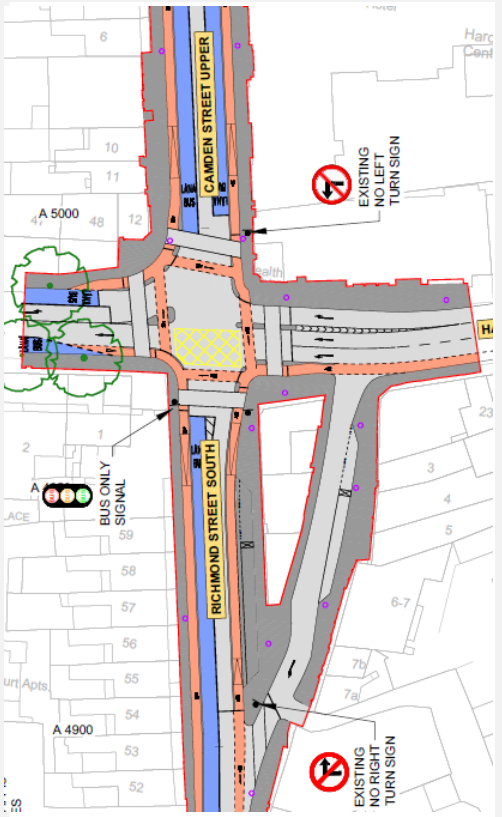
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Camden St / Harrington St / Richmond St S

EXISTING

FINAL DESIGN



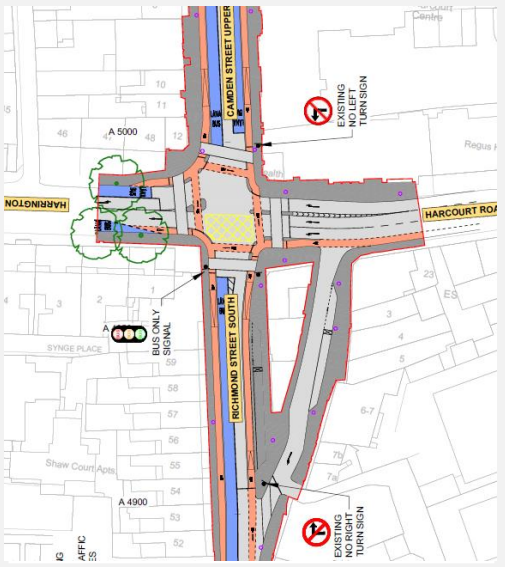
Change Made	Reason for Change	Impact of Change
1. Conventional Signalised junction converted to protected junction. 2. Bus lane extended to the stop line on the western arm of the junction. 3. Right turning traffic lane removed from the eastern arm of the junction. 4. Outbound bus lane on southern arm of the junction replaced with a shared bus / traffic lane. 5. Left turn from Harcourt Road onto Richmond Street South introduced. 6. Inbound general traffic lane removed from the northern arm of the junction.	1. To provide enhanced facilities for pedestrians and cyclists. 2. To provide enhanced bus priority for orbital bus services on Harrington Street. 3. To facilitate the provision of a protected junction. 4. To maintain access to existing parking and loading bays on Richmond Street South. 5. To maintain access to existing parking and loading bays on Richmond Street South. 6. To provide improved cyclist and pedestrian facilities on Camden Street Upper.	1. Improved pedestrian and cyclist safety. 2. Improved bus priority. 3. Improved pedestrian and cyclist safety. No material impact on traffic identified. 4. Access to existing parking and loading maintained. No material impact on traffic or bus priority identified. 5. Access to existing parking and loading maintained. No material impact on traffic identified. 6. Improved pedestrian and cyclist safety.

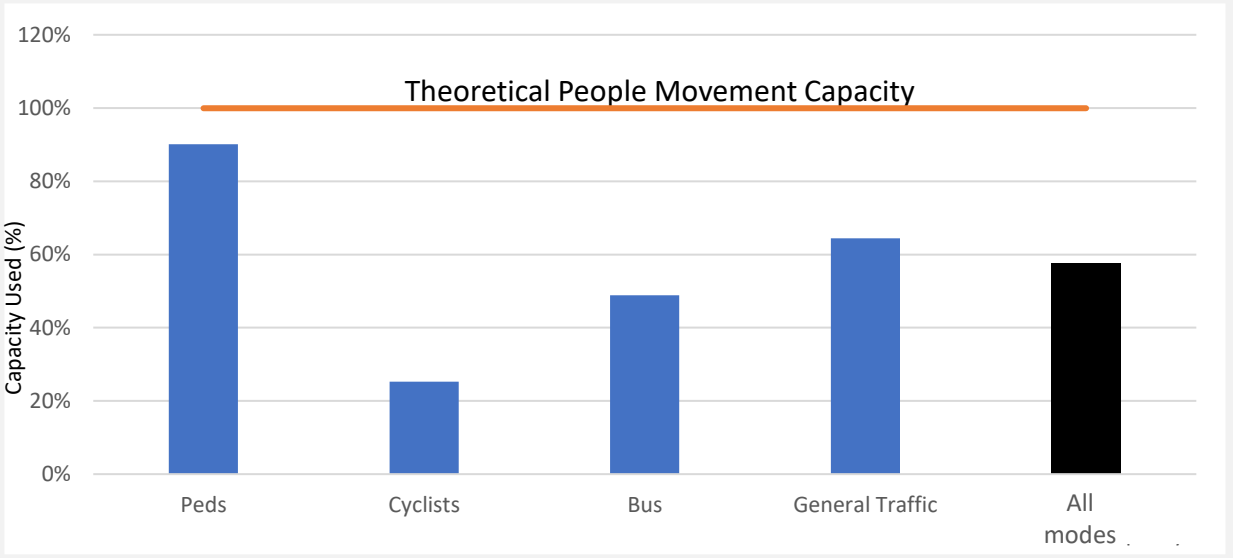
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Camden St / Harrington St / Richmond St S

Capacity / Delay

1. Junction operates over capacity in both peaks.

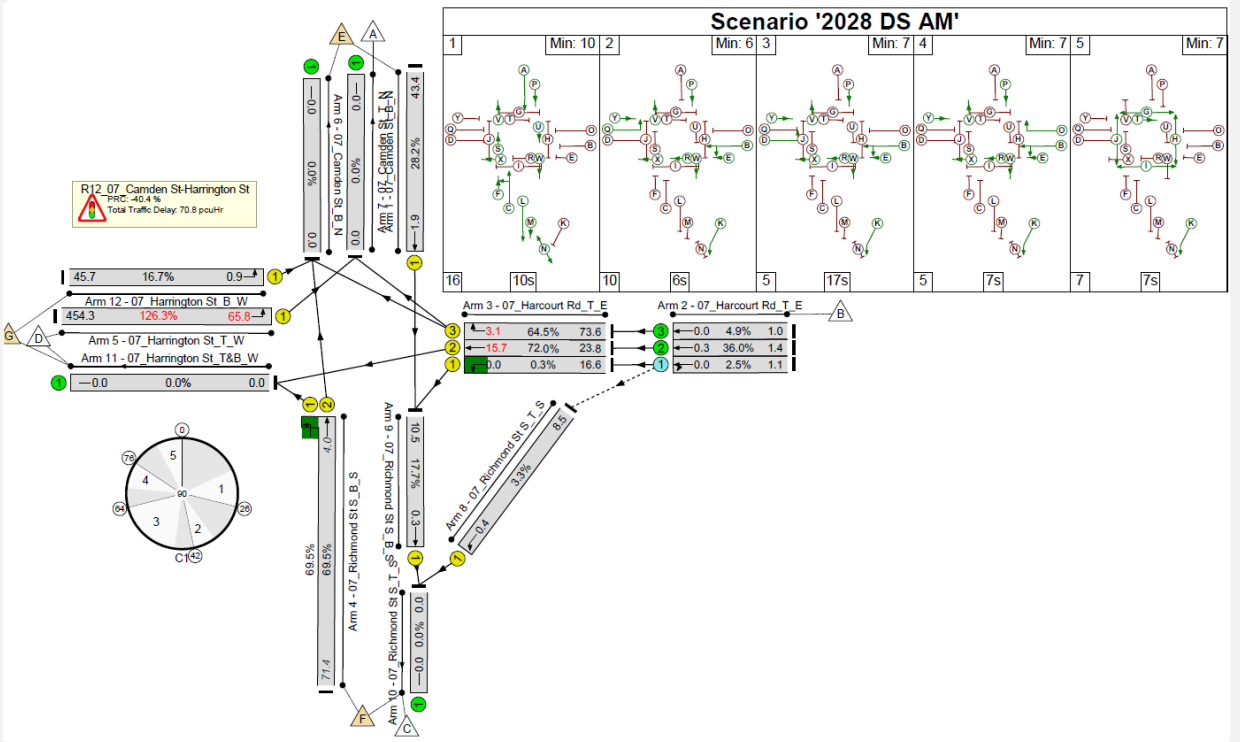




Do Something : 2028 : AM

Cycle = 90 secs
PRC = -40%
Delay = 71 pcuHr

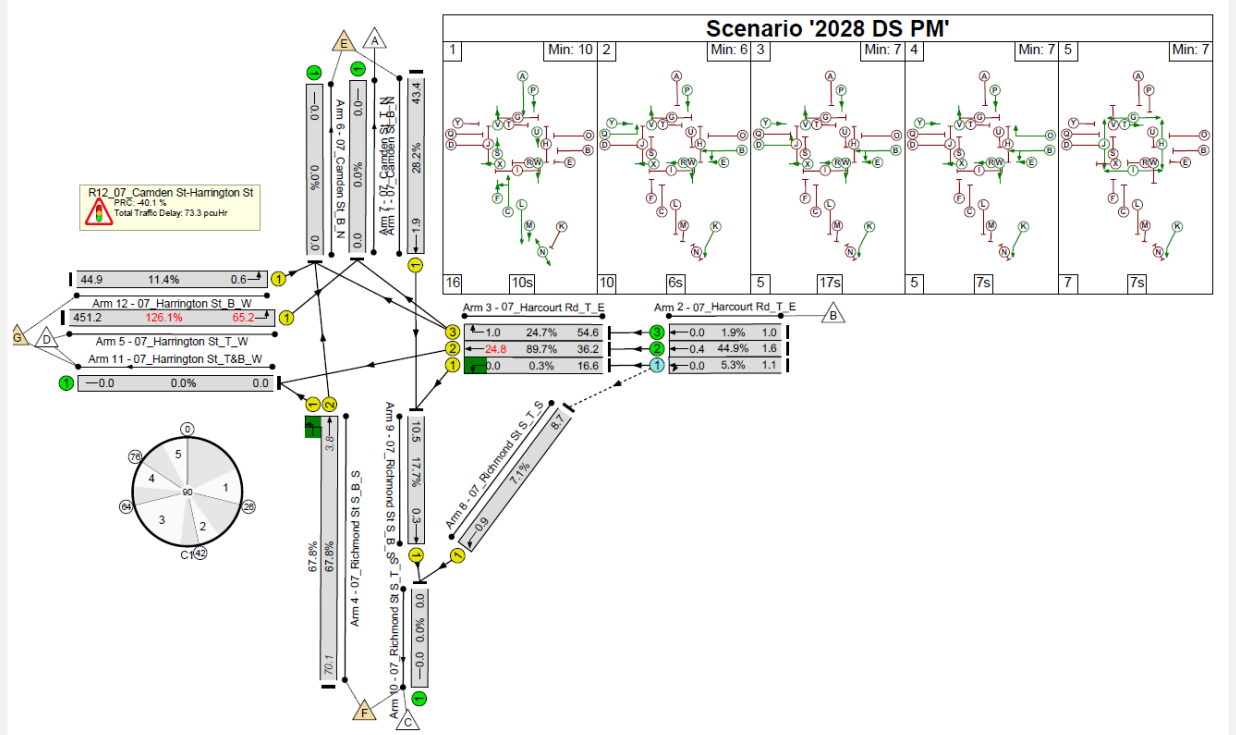
Bus delay
Inbound = 71s
Outbound = 43s



Do Something : 2028 : PM

Cycle = 90 secs
PRC = -40%
Delay = 73 pcuHr

Bus delay
Inbound = 70s
Outbound = 43s



ARUP

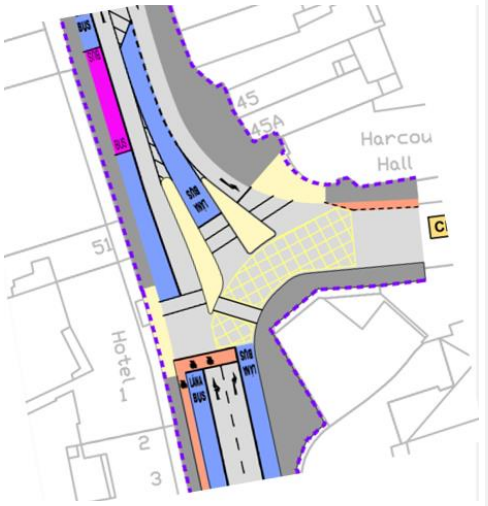
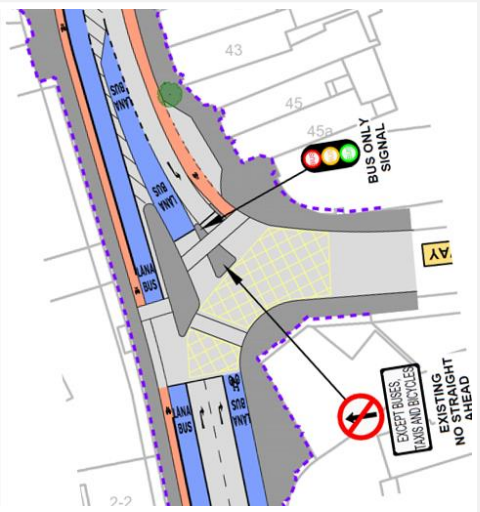
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Camden St / Charlotte Way

Summary
The existing junction is proposed to be altered by the removal of the inbound traffic lane on the Camden street arm of the junction and the provision of an inbound bus lane through the junction. Continuous cycle tracks will also be provided in each direction.

Signal Operation
A four stage signal operation is proposed. Inbound bus and cyclists will operate at the same time as outbound buses and traffic. The outbound traffic will stop to allow for outbound cyclists to operate unconflicted. All outbound movements will stop to allow for right turning traffic into Charlotte Way. A pedestrian only phase is also proposed due to the high volume of pedestrians at this junction.

Junction Type 1
Bus delay ≤ 50s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound bus lane provided through the junction. 2. Inbound cycle lane removed on the Camden street arm of the junction.	1. To improve bus priority through the junction. 2. To facilitate the provision of an inbound bus lane in this location.	1. Improved bus priority 2. Improved bus priority
DRAFT PRO (PC2)		1. Inbound and outbound cycle tracks provided on the Camden street arm of the junction. 2. Inbound traffic lane removed on the Camden street arm of the junction.	1. To improve facilities for cyclists through the junction. 2. To align with the scheme proposals to provide one-way outbound traffic on Camden street, to improve facilities for cyclists.	1. Improved cyclist safety. 2. Improved cyclist safety, inbound through traffic redistributed.
DRAFT PRO (PC3)		1. No Change	1. N/A	1. N/A

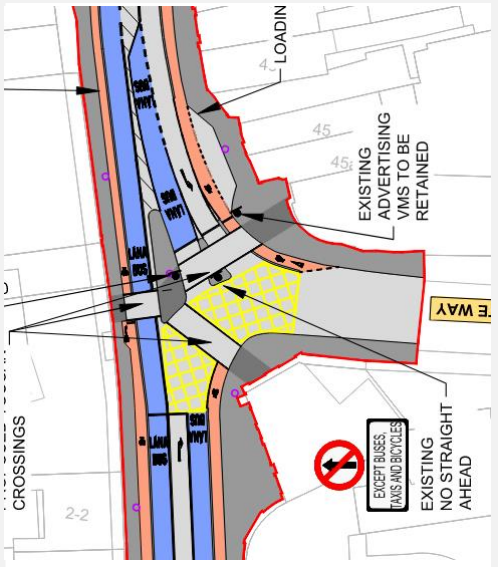
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Camden St / Charlotte Way

EXISTING

FINAL DESIGN



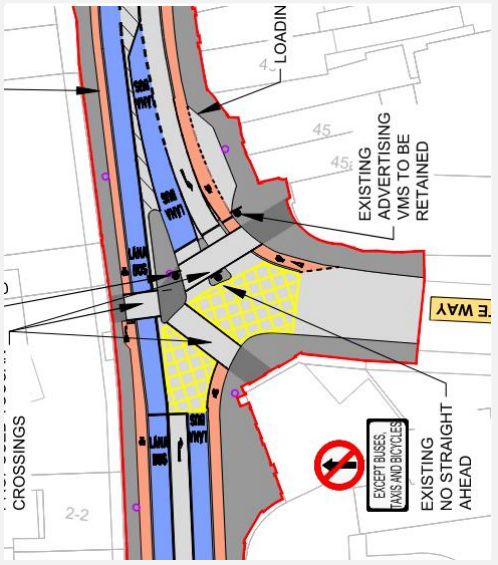
Change Made	Reason for Change	Impact of Change
1. Inbound traffic lane removed on the southern arm of the junction and the space reallocated to an outbound cycle track and a wider inbound cycle track and footpaths. 2. Toucan Crossings provided in place of previously proposed pedestrian crossings, with waiting areas for right turning cyclists provided. 3. Short section of cycle lane provided on Charlotte Way exiting the junction.	1. To provide enhanced pedestrian and cycle facilities on Camden Street Upper. 2. To facilitate right turning cyclist movements. 3. To provide a facility for cyclists existing the junction onto this arm.	1. Improved pedestrian and cyclist safety. No material impact on traffic identified. 2. Improved cyclist safety. 3. Improved cyclist safety.

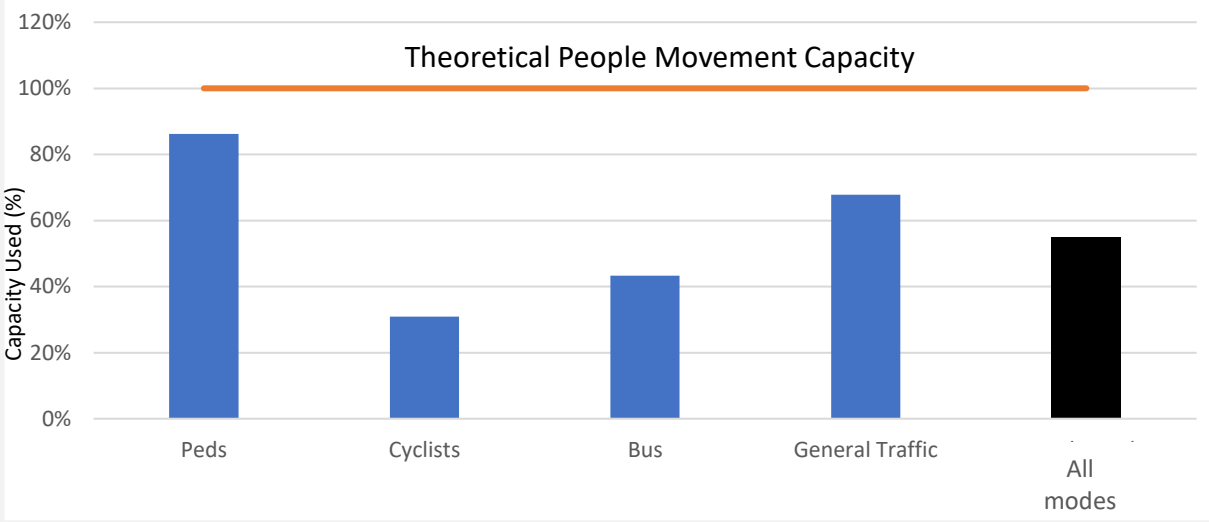
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Camden St / Charlotte Way

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <50s on average.

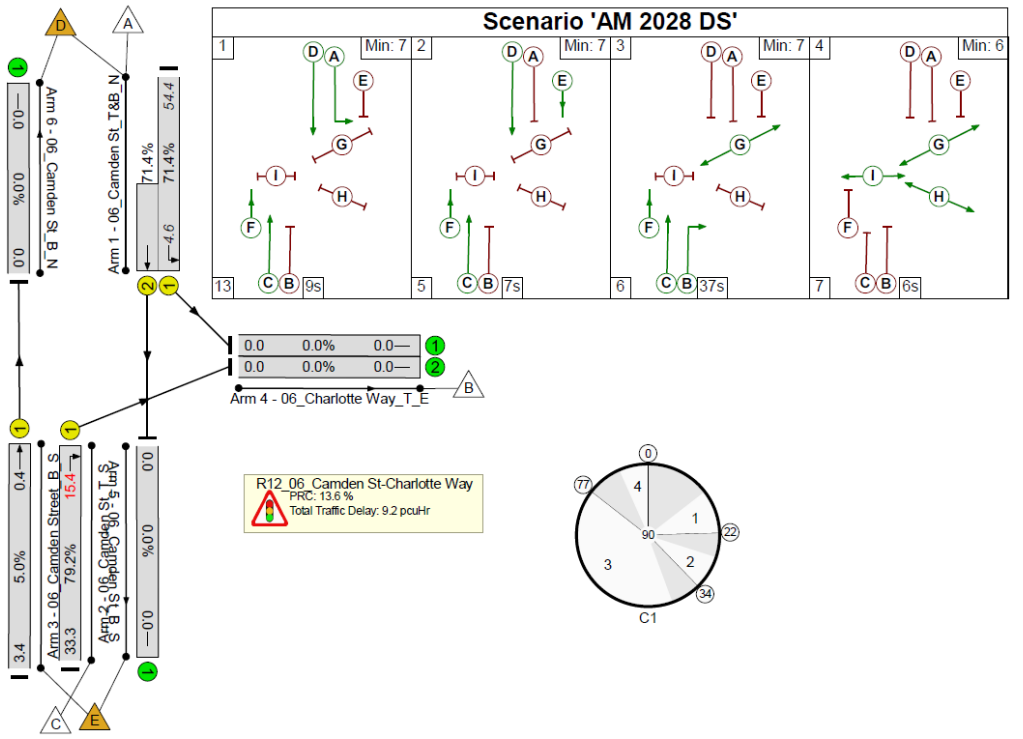




Do Something : 2028 : AM

Cycle = 90 secs
PRC = 14%
Delay = 9 pcuHr

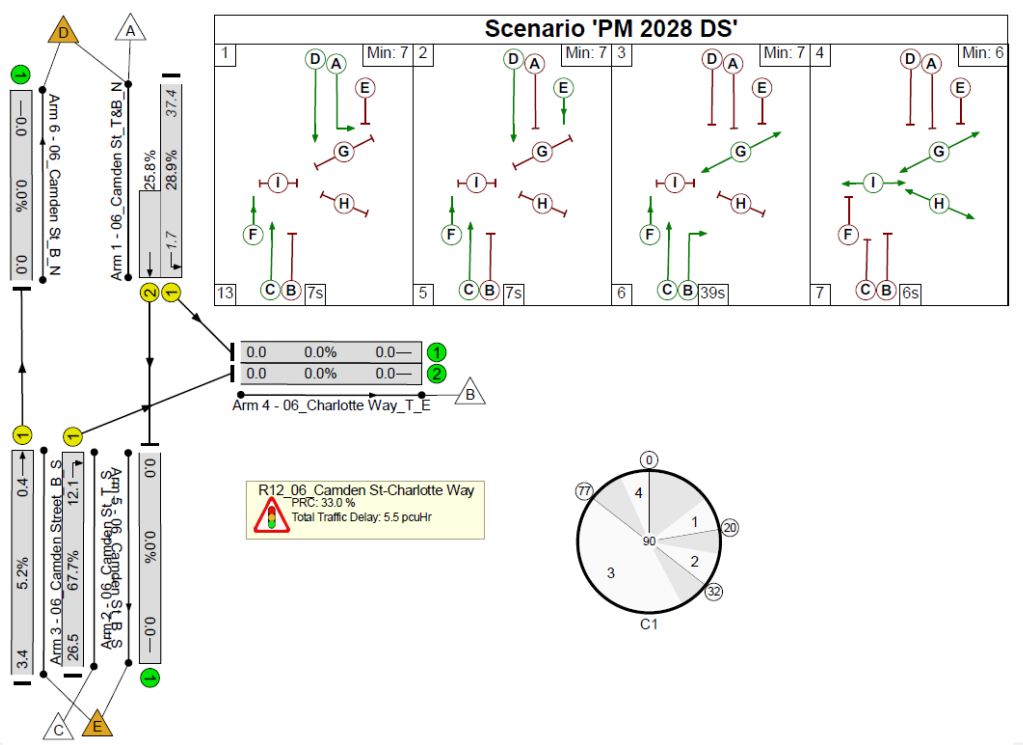
Bus delay
Inbound = 3s
Outbound = 54s



Do Something : 2028 : PM

Cycle = 90 secs
PRC = 33%
Delay = 6 pcuHr

Bus delay
Inbound = 3s
Outbound = 37s



ARUP

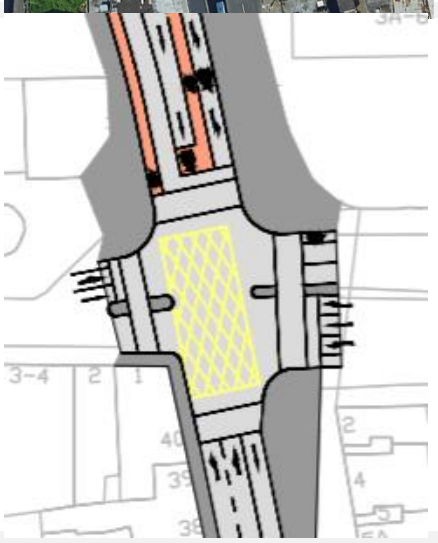
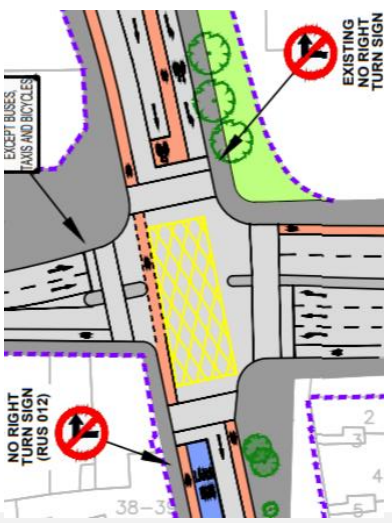
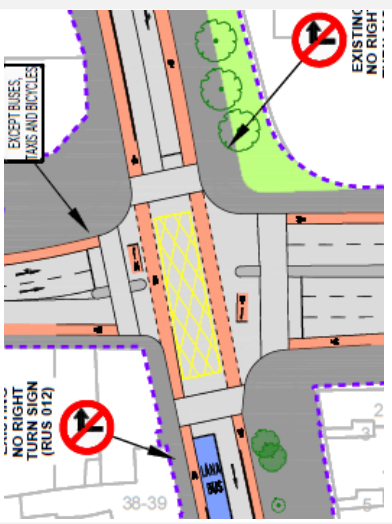
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Kevin St Lower / Wexford St

Summary
The existing junction is proposed to be altered by the replacement of the inbound traffic lane on the Wexford Street arm with a bus lane. It is also proposed to remove the existing general traffic slip lanes and provide inbound and outbound cycle tracks on the side arms thereby providing a fully protected junction for cyclists.

Signal Operation
A four stage signal operation is proposed. Mainline cycle tracks operate at the same time as the outbound traffic and inbound bus lane to maximise green time and minimise delay, with left turning traffic to give way to cyclists on a flashing amber. The side roads straight and left traffic and cyclists operate together, with flashing ambers, to be followed by the side road right turn traffic. The pedestrian crossings will operate in their own stage.

Junction Type 1
Bus delay > 90s

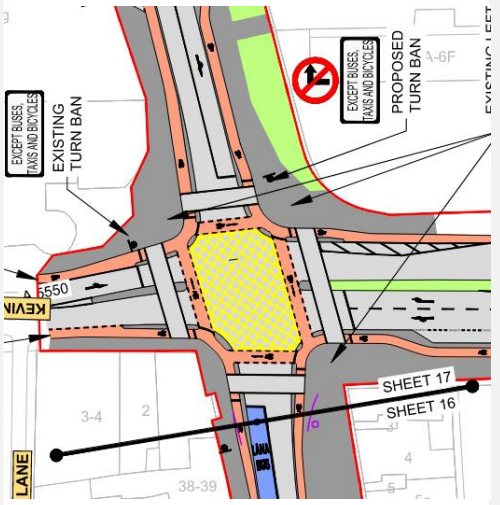
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. General traffic slip lanes removed from the mainline arms of the junction. 2. Dedicated left turn lane introduced on the Kevin street lower arm of the junction. 3. Outbound bus lane removed from the Redmond's Hill arm of the junction.	1. To improve safety for pedestrians and cyclists. 2. To minimise delays at the junction. 3. No bus lane is provided on Kevin street lower north of this point.	1. Improved pedestrian and cyclist safety. 2. Improved junction capacity. 3. Junction aligns with the scheme proposals north of the junction.
DRAFT PRO (PC2)		1. Inbound traffic lanes on Wexford Street arm of the junction replaced with a Bus lane and inbound and outbound cycle tracks.	1. To align with the proposals to make Wexford Street one-way for traffic, providing improved cycling facilities.	1. Improved cyclist safety. Inbound general through traffic redistributed.
DRAFT PRO (PC3)		1. Dedicated left-turn lane on the nearside of the cycle track removed from the side arm of the junction. 2. Box turn facilities provided for cyclists.	1. To improve safety for cyclists. 2. To provide a right-turning facility for cyclists.	1. Improved cyclist safety. 2. Improved right-turning facilities for cyclists.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Kevin St Lower / Wexford St

EXISTING

FINAL DESIGN



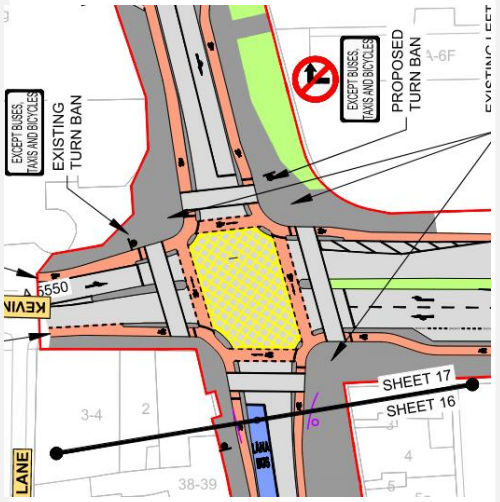
Change Made	Reason for Change	Impact of Change
1. Conventional Signalised junction converted to protected junction. 2. A single traffic lane removed at the stop line on both the eastern arm and the western arm of the junction. 3. Signage updated to note that right turn from Redmond's Hill to Kevin Street Lower is to be allowed for buses only.	1. To provide enhanced facilities for pedestrians and cyclists. 2. To facilitate the provision of a protected junction. 3. To facilitate proposals under the New Dublin Area Bus Network.	1. Improved pedestrian and cyclist safety. 2. No material impact on traffic identified. 3. Scheme proposals better reflect the requirements of the New Dublin Area Bus Network.

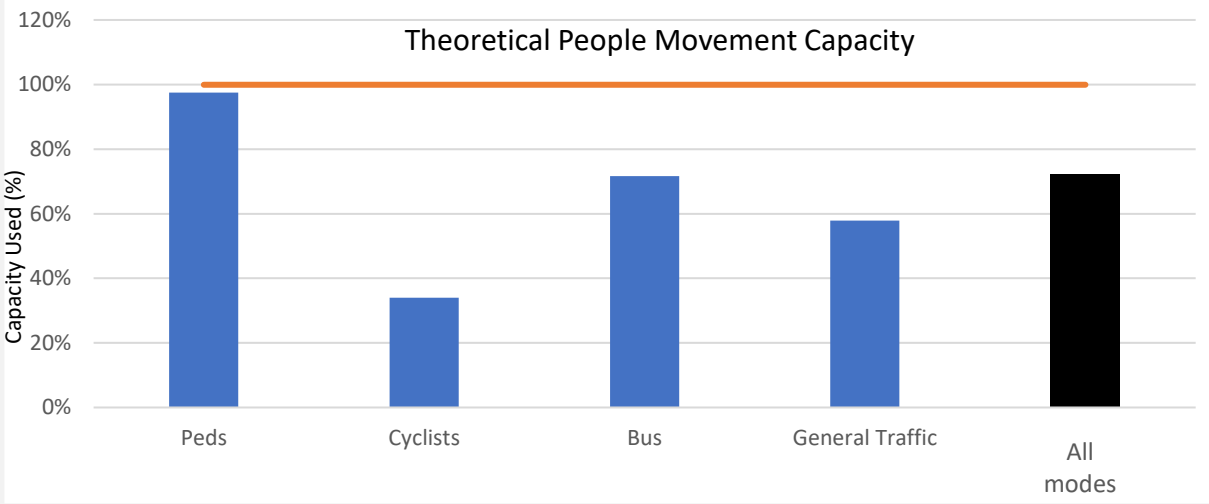
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Kevin St Lower / Wexford St

Capacity / Delay

1. Junction operates over capacity in the AM peak.

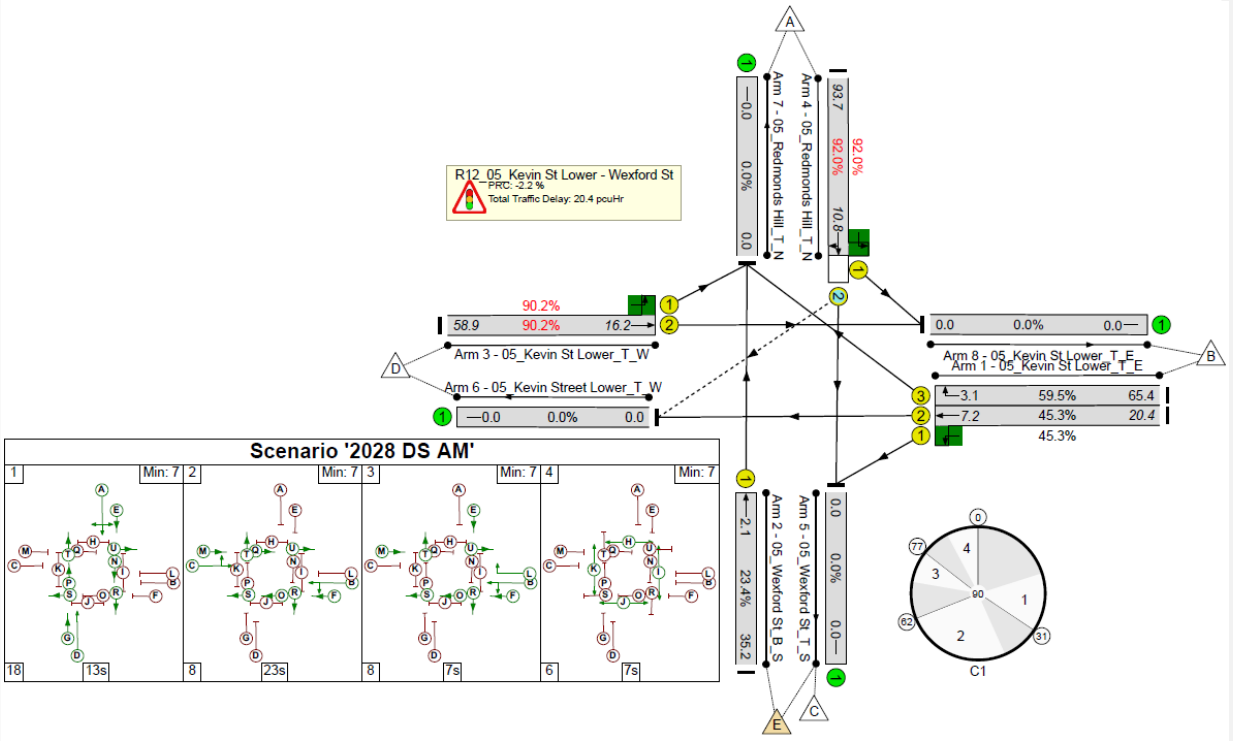




Do Something : 2028 : AM

Cycle = 90secs
PRC = -2%
Delay = 20 pcuHr

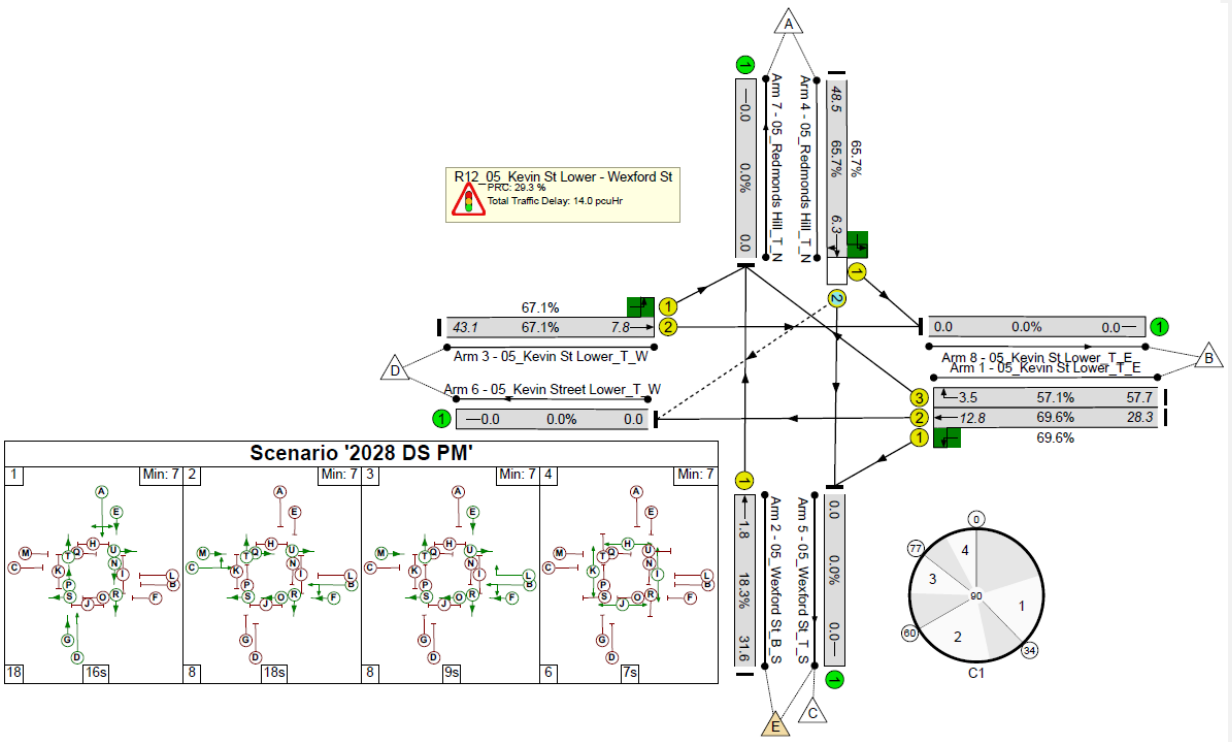
Bus delay
Inbound = 35s
Outbound = 94s



Do Something : 2028 : PM

Cycle = 90 secs
PRC = 29%
Delay = 14 pcuHr

Bus delay
Inbound = 32s
Outbound = 49s



ARUP

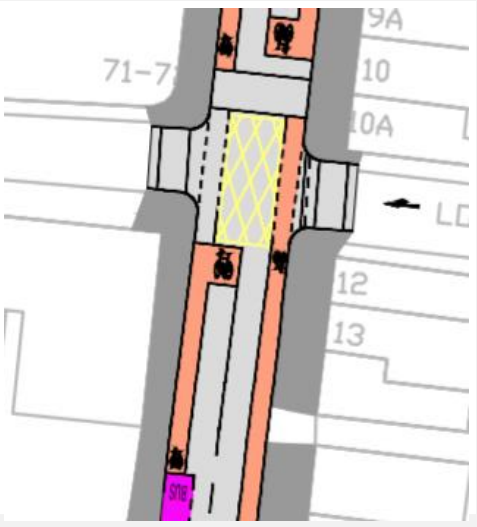
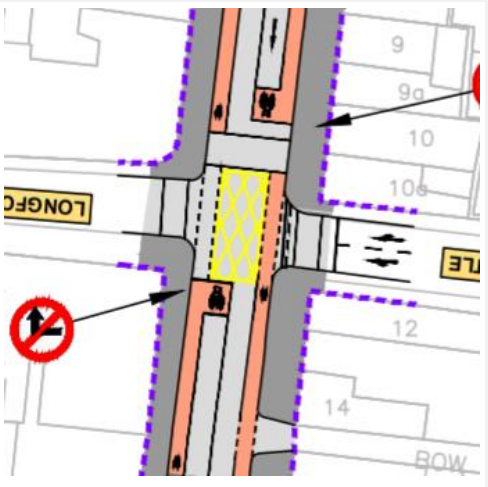
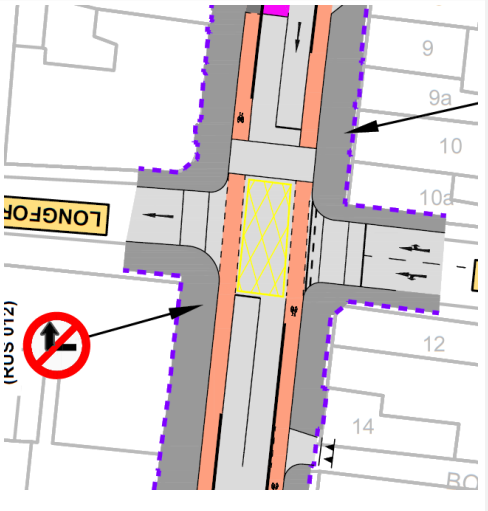
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

South Great George St / Longford St Lower

Summary
The existing junction is proposed to be altered by the provision of cycle tracks on approach to the junction on the South Great George Street arms. The existing outbound bus lane on the southern arm of the junction is proposed to be removed.

Signal Operation
A three stage signal operation is proposed. Cycle tracks will operate at the same time as the mainline traffic stages, with left turning traffic to give way to cyclists on a flashing amber, to maximise green time and minimise delay. The side road will operate on its own, to be followed by the pedestrian crossings. There will be no bus priority at this junction.

Junction Type n/a
Bus delay ≤ 35s

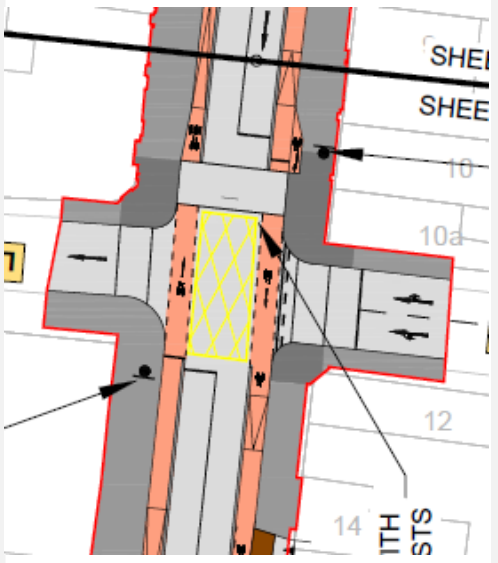
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound and outbound cycle South Great George Street arms of the junction. 2. Outbound bus lane on the southern arm of the junction removed.	1. To improve safety for cyclists. 2. To facilitate the provision of cycle tracks.	1. Improved cyclist safety. 2. Improved cyclist safety. Reduced traffic volumes negate the need for bus lane – no additional delays to buses expected.
DRAFT PRO (PC2)		1. Two traffic lanes shown on Longford Street Lower.	1. To reflect the existing arrangement on Longford Street Lower.	1. N/A
DRAFT PRO (PC3)		1. Advanced Stacking Locations for cyclists removed.	1. No right turns permitted at this junction.	1. To better reflect existing traffic management measures at the junction.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

South Great George St / Longford St Lower

EXISTING

FINAL DESIGN



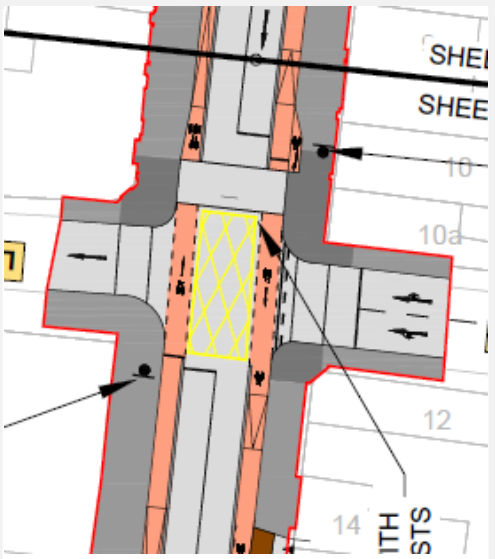
Change Made	Reason for Change	Impact of Change
1. Toucan Crossings provided in place of previously proposed pedestrian crossings, with ramps provided for cyclists to access toucan crossings.	1. To facilitate right turning cyclist movements.	1. Improved cyclist safety.

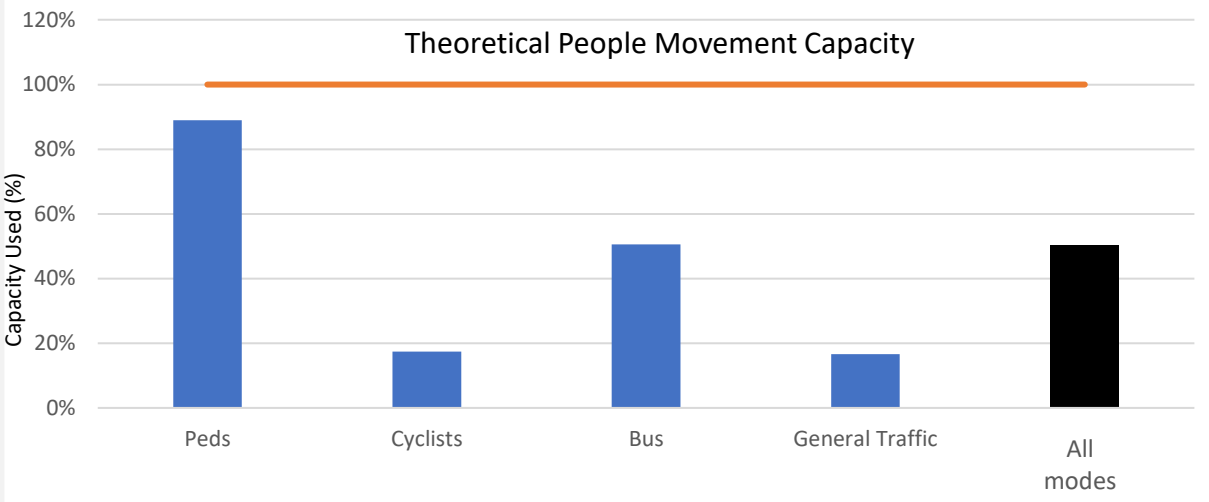
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

South Great George St / Longford St Lower

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <35s on average.

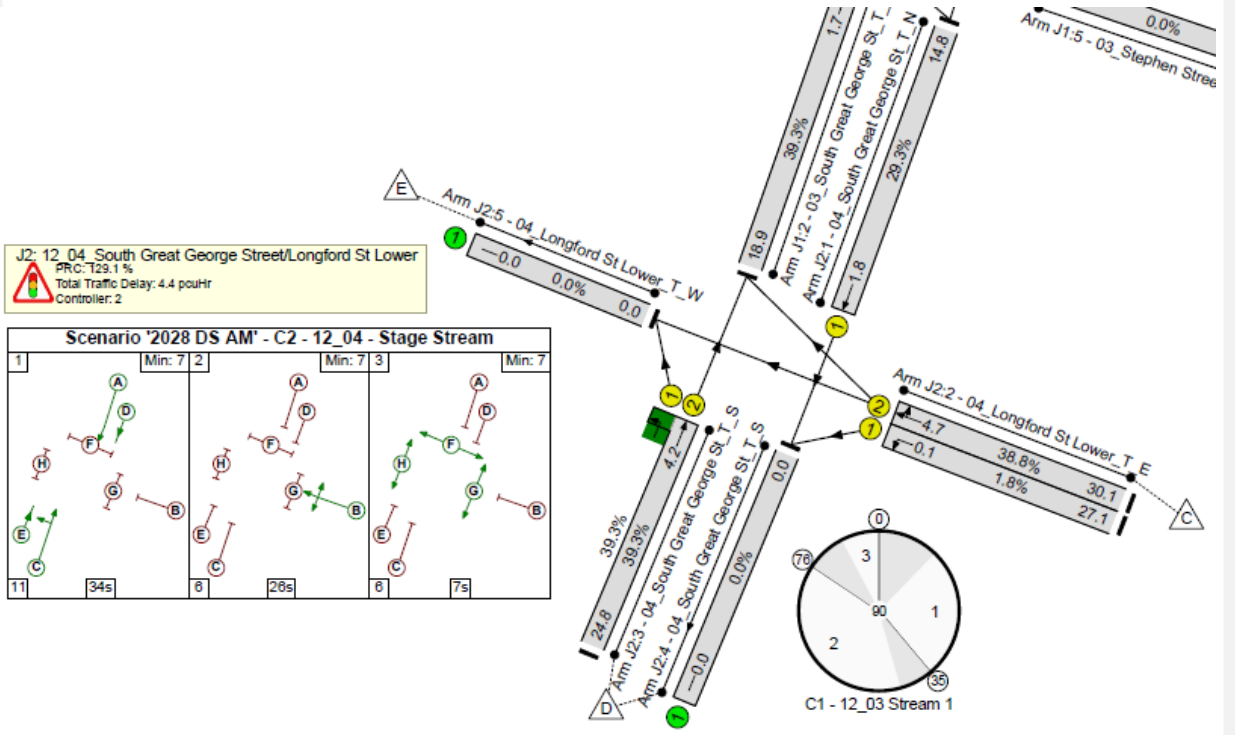




Do Something : 2028 : AM

Cycle = 90 secs
PRC = 129%
Delay = 4 pcuHr

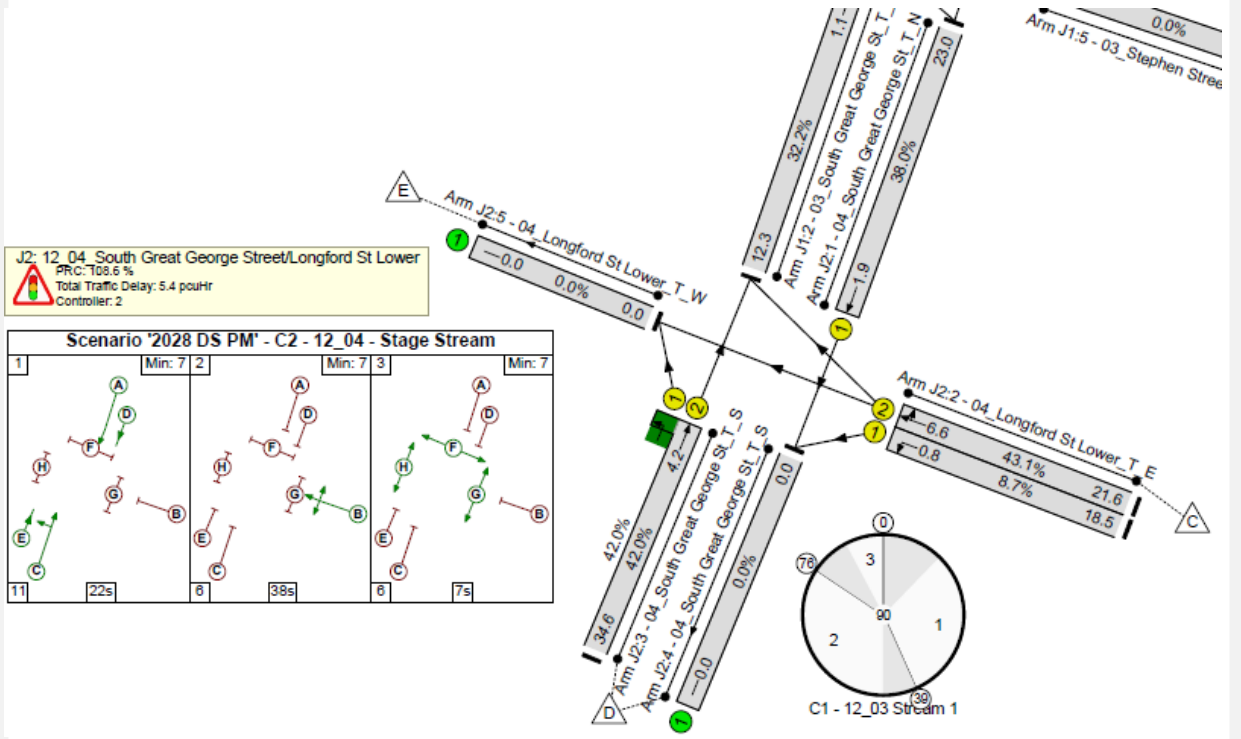
Bus delay
Inbound = 25s
Outbound = 15s



Do Something : 2028 : PM

Cycle = 90 secs
PRC = 109%
Delay = 5 pcuHr

Bus delay
Inbound = 35s
Outbound = 23s



ARUP

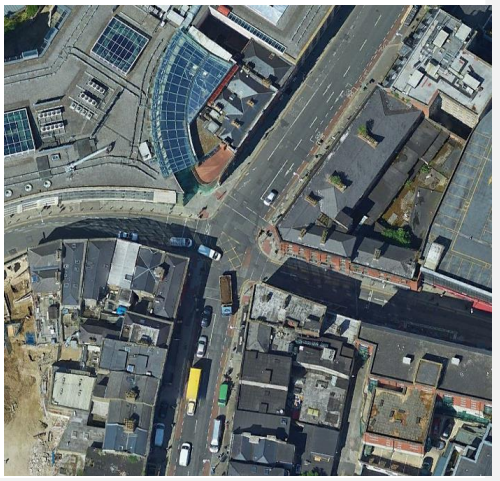
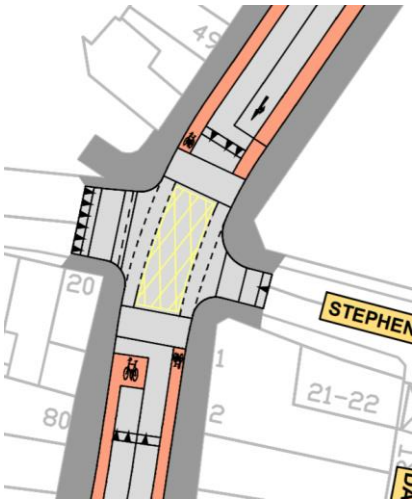
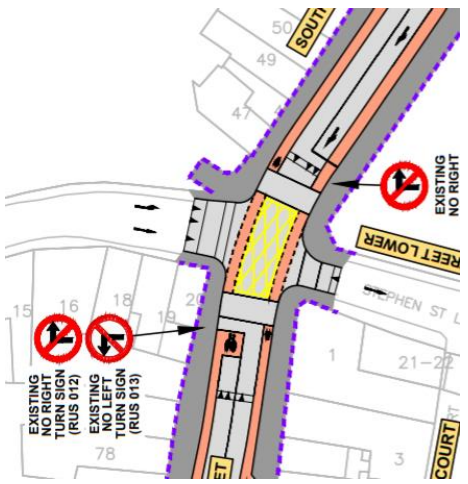
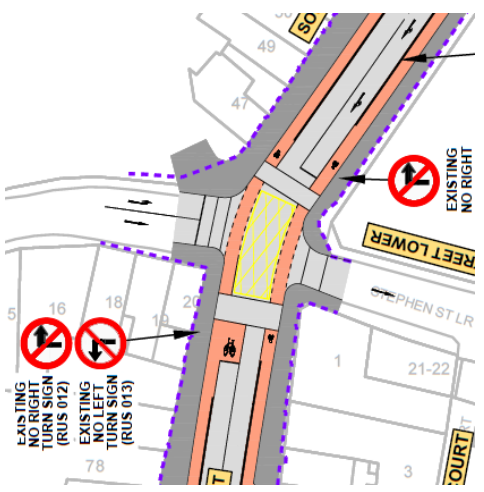
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

South Great George St / Stephen St Upper

Summary
The existing junction is proposed to be altered by the removal of the existing inbound bus lane on the South Great George's Street arm of the junction and the provision of inbound and outbound cycle tracks.

Signal Operation
A three stage signal operation is proposed. Cycle tracks will operate at the same time as the mainline traffic stages, with left turning traffic to give way to cyclists on a flashing amber, to maximise green time and minimise delay. The side road will operate on its own, to be followed by the pedestrian crossings. There will be no bus priority at this junction.

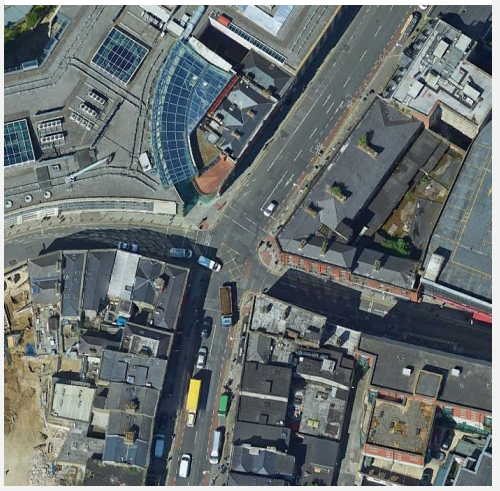
Junction Type n/a
Bus delay ≤ 35s

		Change Made	Reason for Change	Impact of Change
EXISTING				
EPR		1. Cycle tracks provided on Aungier Street and South Great George's Street arms of the junction. 2. Inbound bus lane removed on the South Great George's Street arm of the junction, to provide cycle tracks on this arm.	1. To improve safety for cyclists. 2. To allow for the provision of cycle tracks on this arm.	1. Improved cyclist safety. 2. Improved cyclist safety. Reduced traffic volumes negate the need for bus lane – no additional delays to buses expected.
DRAFT PRO (PC2)		1. No Change	1. N/A	1. N/A
DRAFT PRO (PC3)		1. No Change	1. N/A	1. N/A

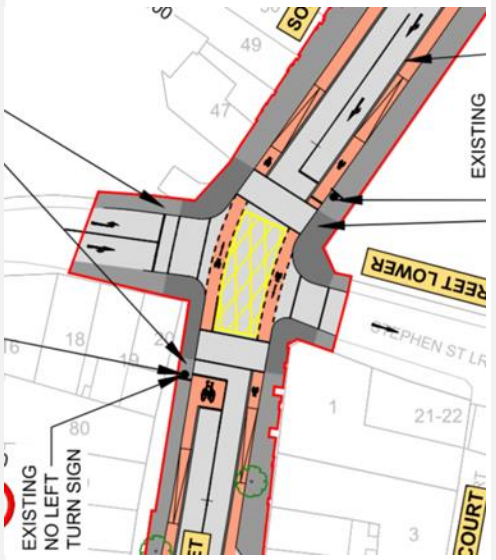
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

South Great George St / Stephen St Upper

EXISTING



FINAL DESIGN



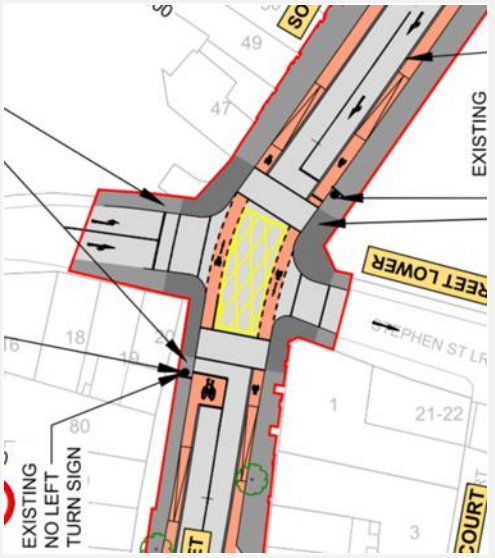
Change Made	Reason for Change	Impact of Change
1. Carriageway alignment on the southern arm of the junction realigned slightly. 2. Toucan Crossings provided on all arms of the junction with ramps provided for cyclists to access toucan crossings.	1. To avoid impact on Private Landings on Aungier Street. 2. To facilitate right turning cyclist movements.	1. Revised alignment through the junction. No impact on private landings on Aungier Street. 2. Improved cyclist safety.

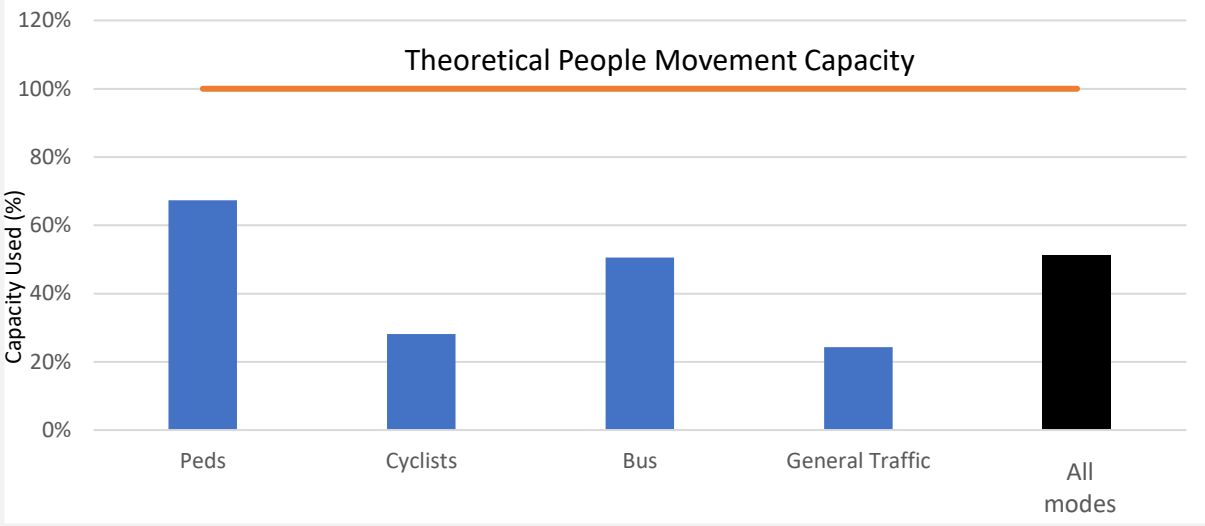
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

South Great George St / Stephen St Upper

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <35s on average.

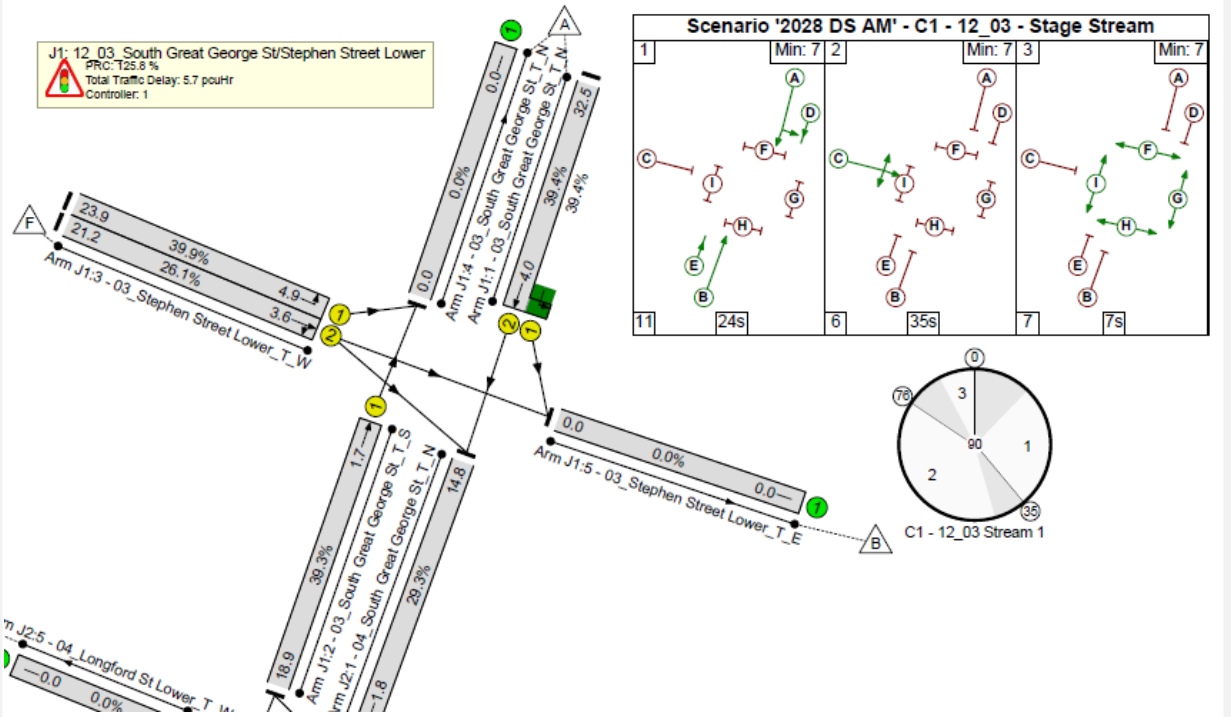




Do Something : 2028 : AM

Cycle = 90 secs
PRC = 126%
Delay = 6 pcuHr

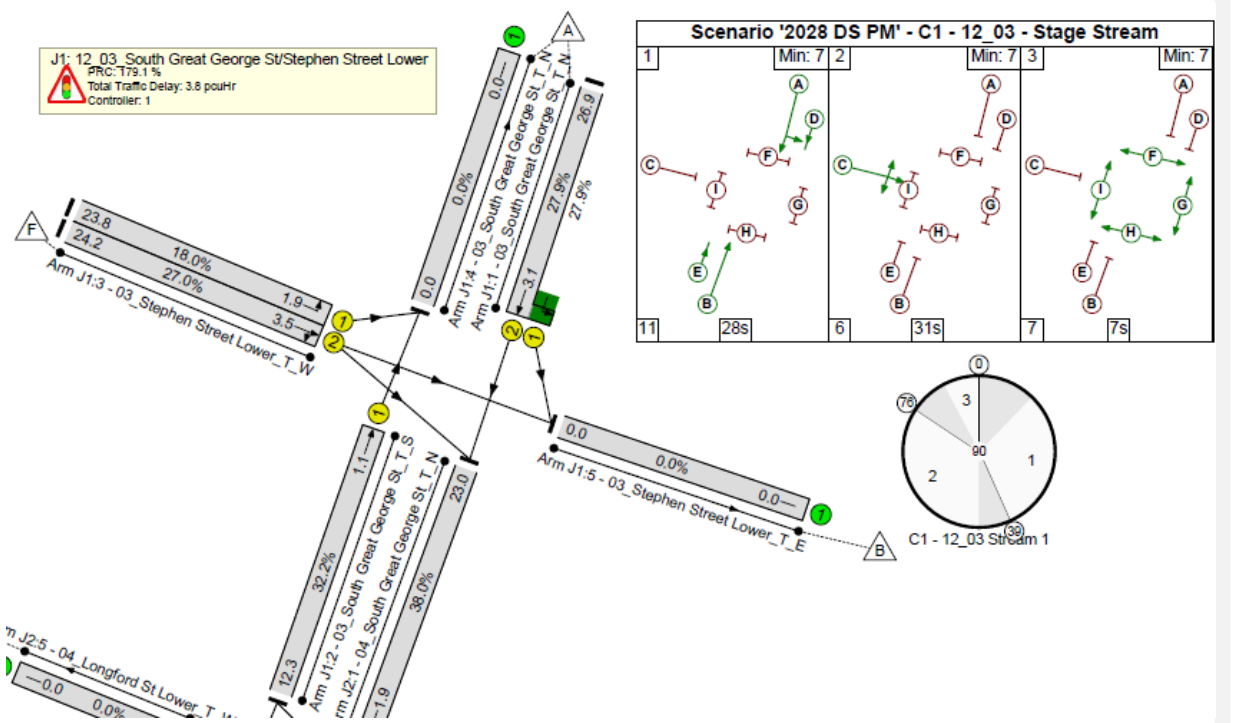
Bus delay
Inbound = 19s
Outbound = 33s



Do Something : 2028 : PM

Cycle = 90 secs
PRC = 179%
Delay = 4 pcuHr

Bus delay
Inbound = 13s
Outbound = 27s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

South Great George St / Dame St

Summary
The existing junction is proposed to be upgraded to accommodate the provision of inbound and outbound cycle tracks along South George's Street.

Signal Operation
A four stage signal operation is proposed. Traffic and cyclists on Dame Street will operate together, to be followed by traffic only from South Great George's Street. The cycle track from South Great George's Street will operate in its own stage due to limited room for segregated infrastructure through the junction. The pedestrian crossings will operate in their own stage. There will be no bus priority at this junction.

Junction Type n/a
Bus delay ≤ 40s

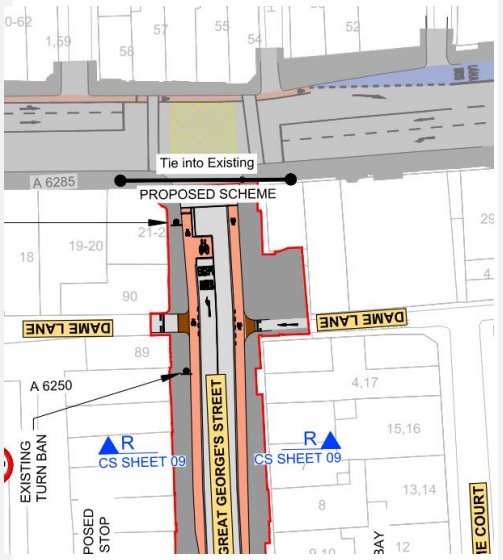
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR	1. Cycle tracks provided on South Great George's Street arm of the junction. 2. Inbound Bus lane removed on South Great George's Street arm of the junction.	1. To improve safety for cyclists. 2. To allow for the provision of cycle tracks on this arm.	1. Improved cyclist safety. 2. Improved cyclist safety.
DRAFT PRO (PC2)	1. Drawings updated to include the Dame Street arms of the junction.	1. To reflect the existing arrangement on Dame Street.	1. N/A
DRAFT PRO (PC3)	1. Cycle lane shown on the Dame Street arm of the junction.	1. To reflect the existing arrangement.	1. N/A

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

South Great George St / Dame St

EXISTING

FINAL DESIGN



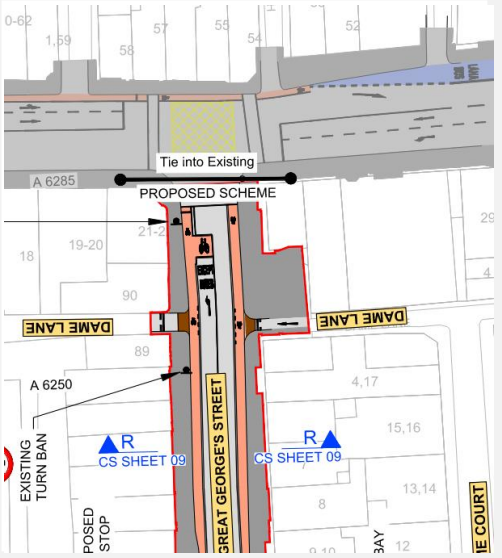
Change Made	Reason for Change	Impact of Change
1. Advance Stacking Location provided for cyclists on the southern arm of the junction.	1. To allow cyclists to take a prominent road position and wait in clear view of traffic when making a right turn – this is an alternative to waiting for the dedicated cycle stage.	1. Improved safety for cyclists.

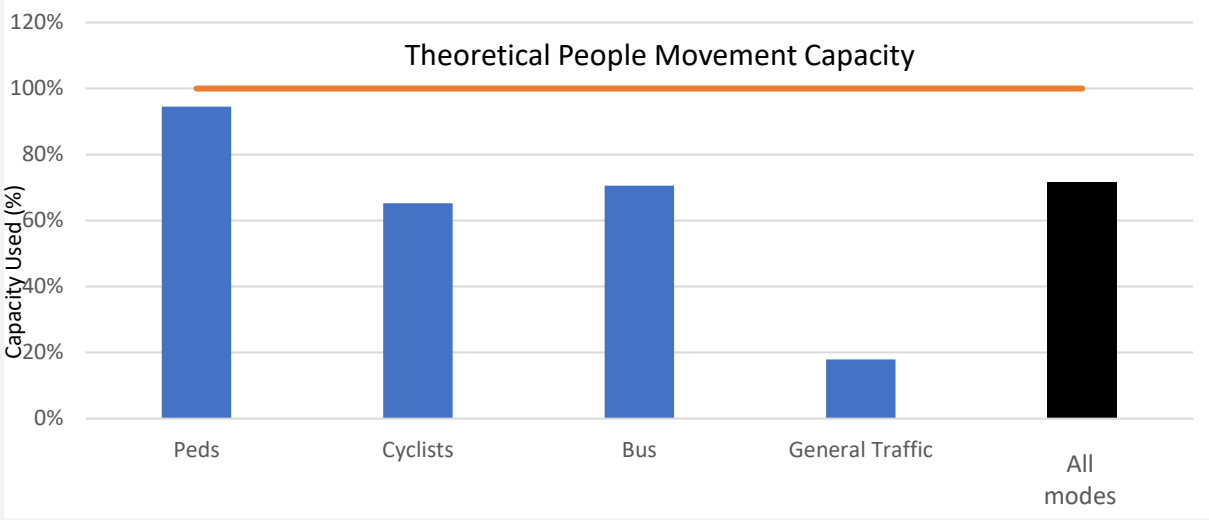
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

South Great George St / Dame St

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <40s on average.

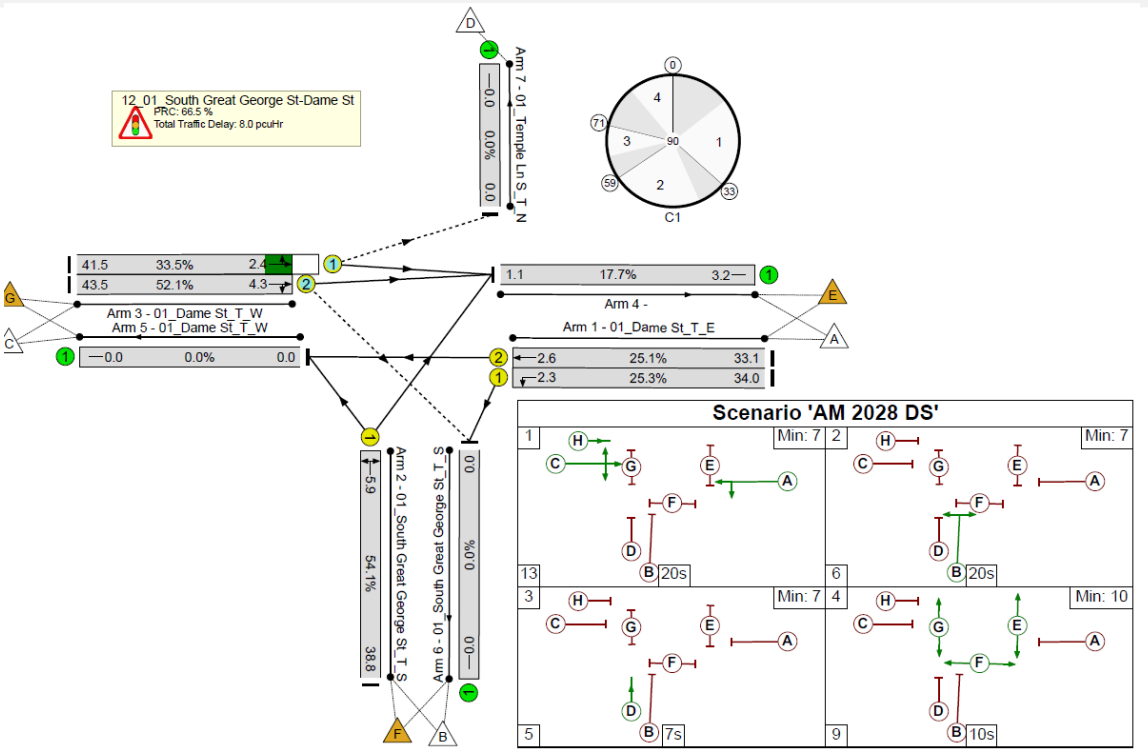




Do Something : 2028 : AM

Cycle = 90 secs
PRC = 67%
Delay = 8 pcuHr

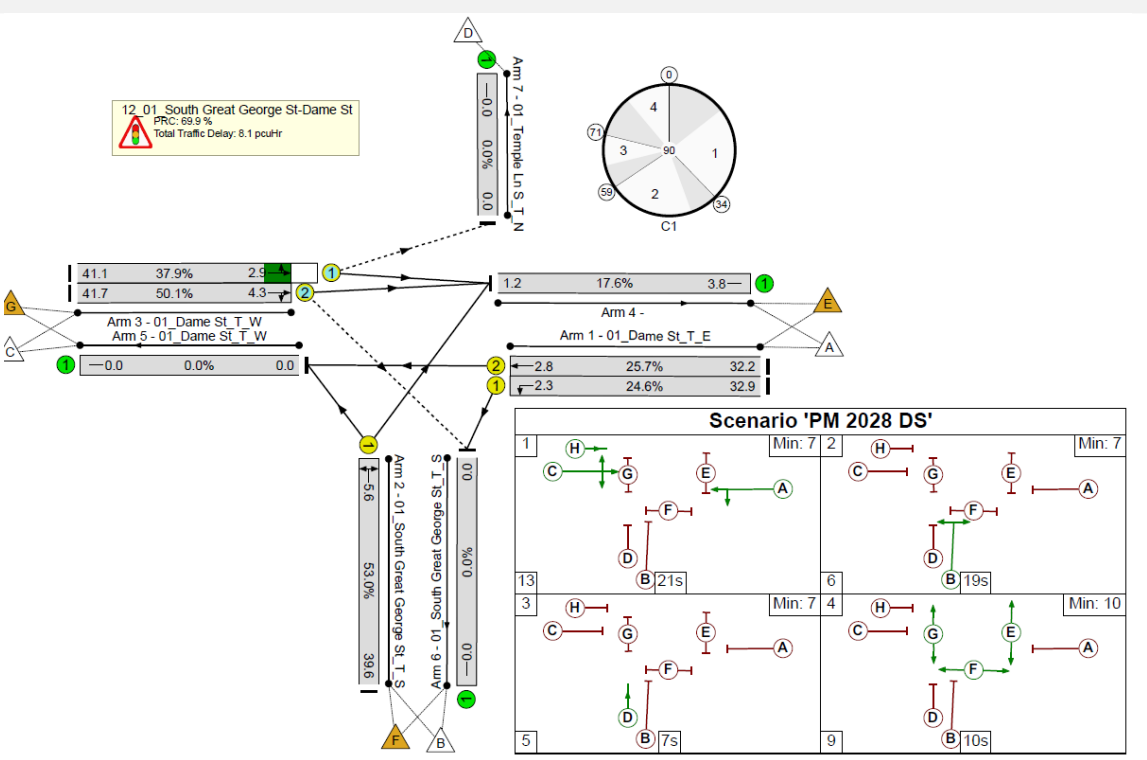
Bus delay
Inbound = 39s
Outbound = 34s



Do Something : 2028 : PM

Cycle = 90 secs
PRC = 70%
Delay = 8 pcuHr

Bus delay
Inbound = 40s
Outbound = 33s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

EXISTING

Harold's Cross Rd / Rathgar Ave

Summary
The existing junction is proposed to be altered by providing dedicated cycle tracks in each direction. The proposed layout will be compatible with the Kimmage to City Centre scheme.

Signal Operation
A four stage signal operation is proposed. Cycle tracks will operate at the same time as the mainline traffic stages on Harold's Cross Road to maximise green time and minimise delay, to be followed by Kenilworth Square N separately, then Kenilworth Park and Rathgar Ave together. The pedestrian crossings will operate in their own stage. There will be no bus priority at this junction.

Junction Type n/a

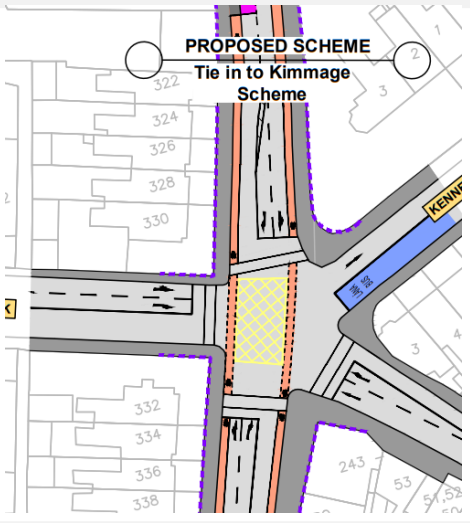
Bus delay n/a

EPR

Change Made	Reason for Change	Impact of Change
1. N/A	1. N/A	1. N/A

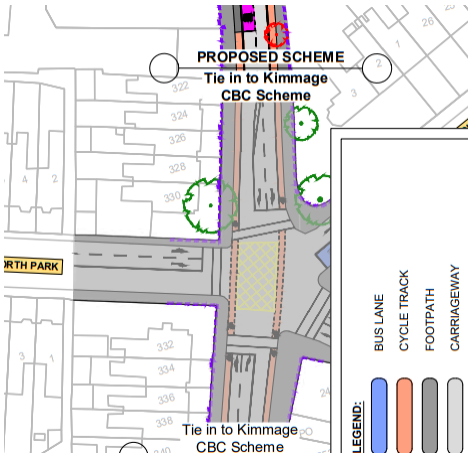
Alternative cycle route was not part of the EPR

DRAFT PRO (PC2)



1. Dedicated cycle tracks provided in each direction. 2. Preferred Scheme11 proposals at this junction incorporated.	1. To improve cycle facilities. 2. For the purposes of public consultation, to allow the public to see how the junction would look with the implementation of both Preferred Scheme12 and Preferred Scheme11 proposals.	1. Improved cyclist safety. 2. N/A

DRAFT PRO (PC3)



1. No change	1. N/A	1. N/A

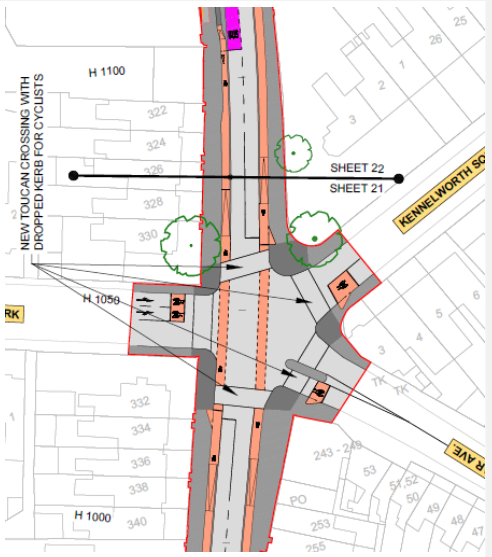
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Harold's Cross Rd / Rathgar Ave

EXISTING

FINAL DESIGN



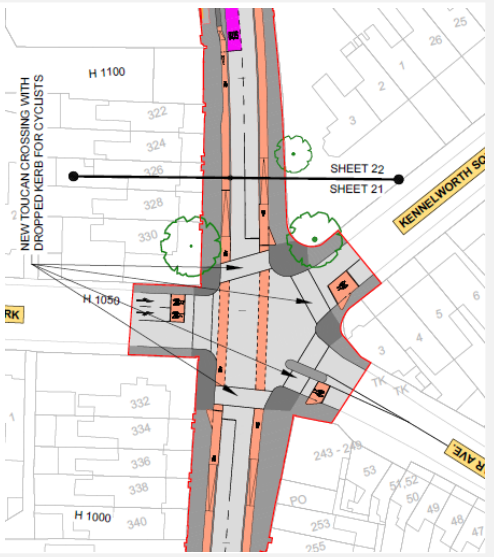
Change Made	Reason for Change	Impact of Change
1. Toucan Crossings provided on all arms of the junction, with ramps provided for cyclists to access toucan crossings. 2. Advanced Stacking Location provided on the Kenilworth Park arm of the junction.	1. To facilitate right turning cyclist movements. 2. To allow cyclists to take a prominent road position and wait in clear view of traffic when making a right turn.	1. Improved cyclist safety. 2. Improved cyclist safety.

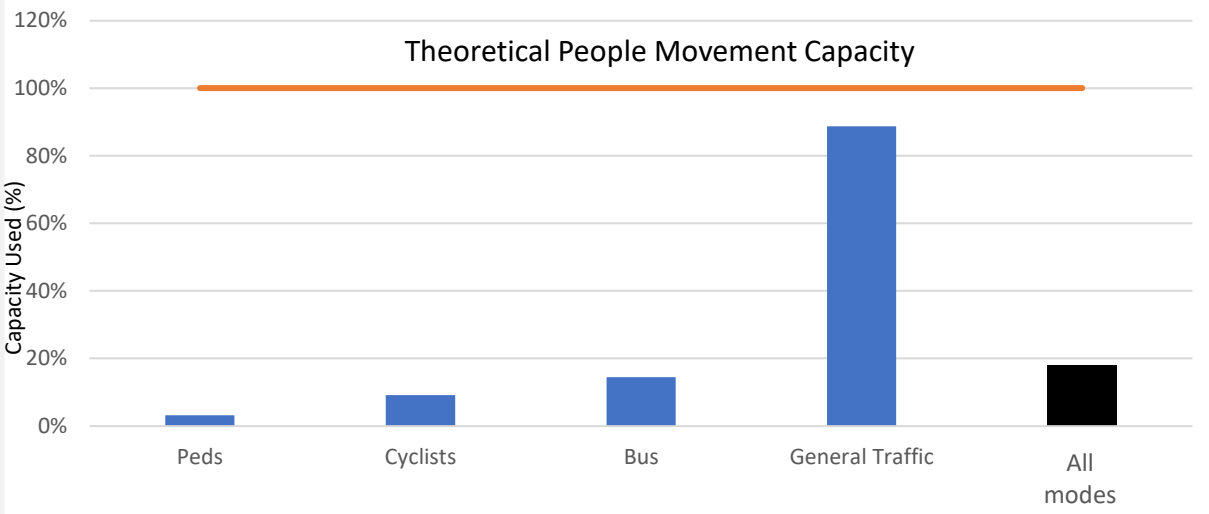
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Harold's Cross Rd / Rathgar Ave

Capacity / Delay

1. Junction operates over capacity .

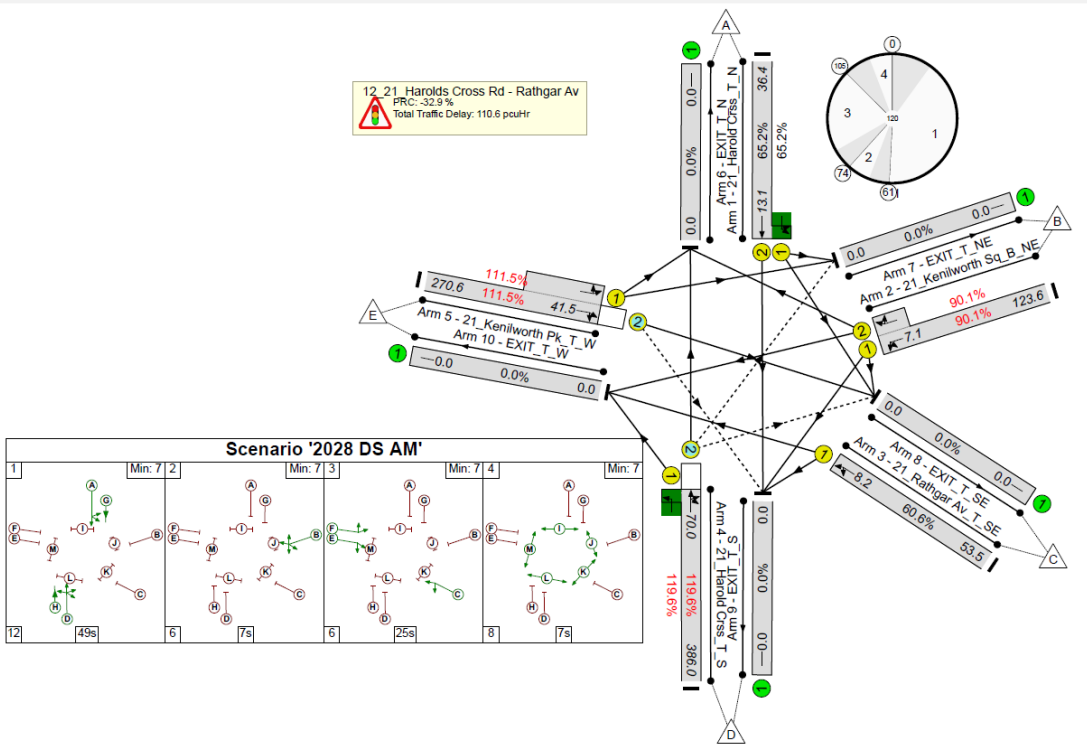




Do Something : 2028 : AM

Cycle = 120 secs
PRC = -33%
Delay = 111 pcuHr

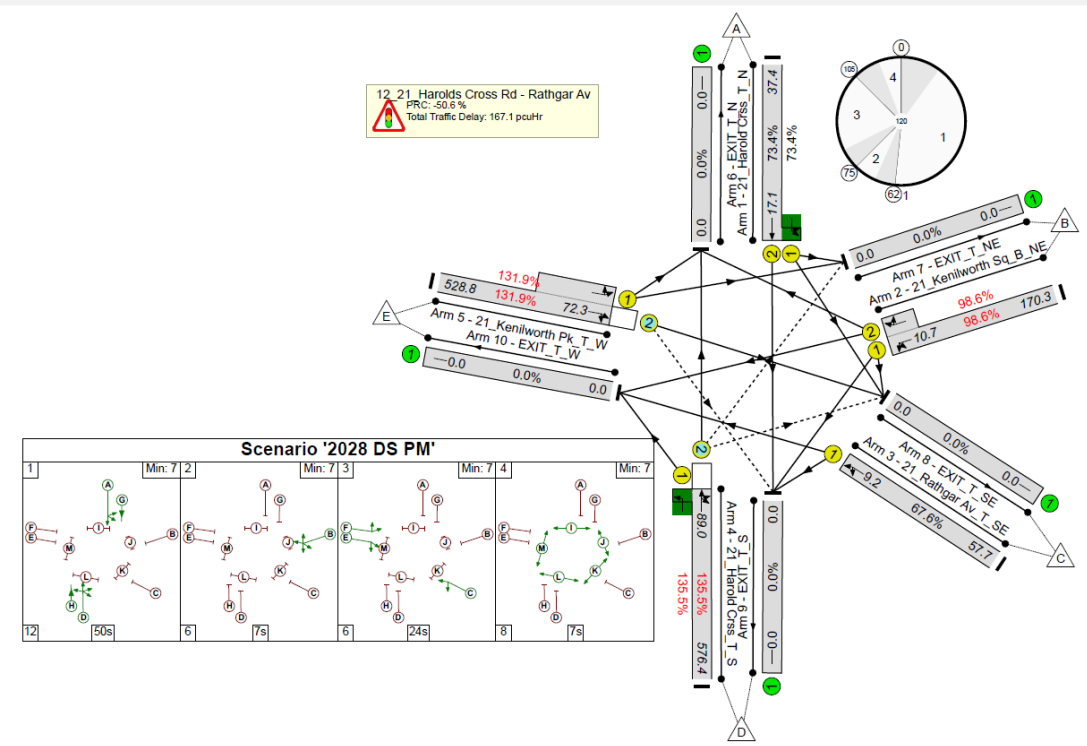
Bus delay
Inbound = n/a
Outbound = n/a



Do Something : 2028 : PM

Cycle = 120 secs
PRC = -51%
Delay = 167 pcuHr

Bus delay
Inbound = n/a
Outbound = n/a



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

EXISTING

Harold's Cross Rd / Leinster Rd

Summary
The existing junction is proposed to be altered by providing dedicated cycle tracks in each direction and toucan crossings on all arms.

Signal Operation
A three stage signal operation is proposed. Cycle tracks will operate at the same time as the mainline traffic stages to maximise green time and minimise delay, to be followed by the side road and then the pedestrian crossings will operate in their own stage. There will be no bus priority at this junction.

Junction Type n/a

Bus delay n/a

EPR

	Change Made	Reason for Change	Impact of Change
Alternative cycle route was not part of the EPR	1. N/A	1. N/A	1. N/A
DRAFT PRO (PC2) 	1. Dedicated cycle tracks provided in each direction 2. Pedestrian crossings provided on all approaches	1. To improve cycle facilities 2. To improve pedestrian facilities	1. Improved cyclist safety. 2. Improved pedestrian safety.
DRAFT PRO (PC3) 	1. No change	1. N/A	1. N/A

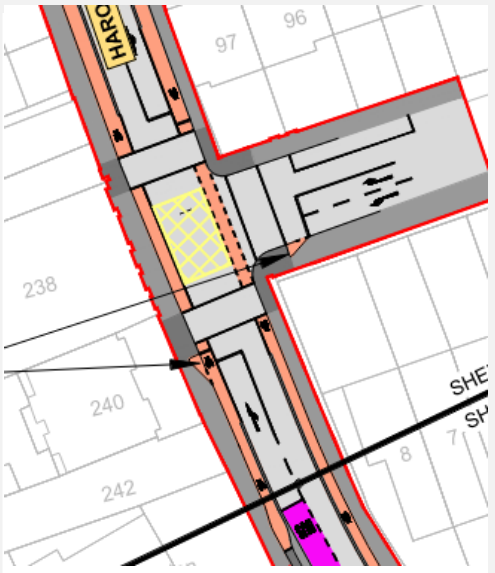
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

EXISTING

FINAL DESIGN

Harold's Cross Rd / Leinster Rd



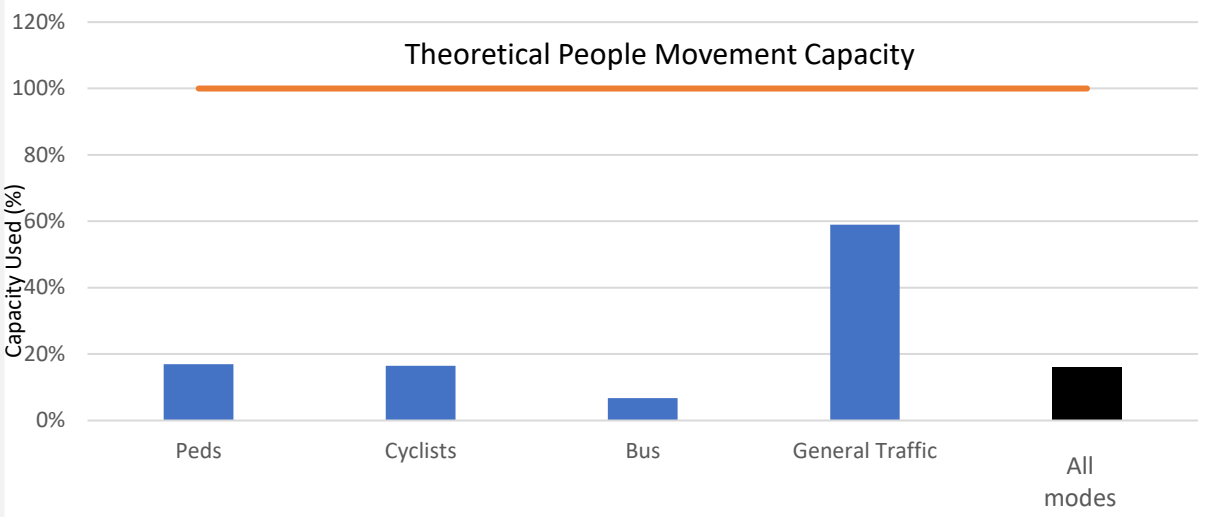
Change Made	Reason for Change	Impact of Change
1. Toucan Crossings provided on all arms of the junction, with ramps provided for cyclists to access toucan crossings.	1. To facilitate right turning cyclist movements.	1. Improved cyclist safety.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Harold's Cross Rd / Leinster Rd

Capacity / Delay

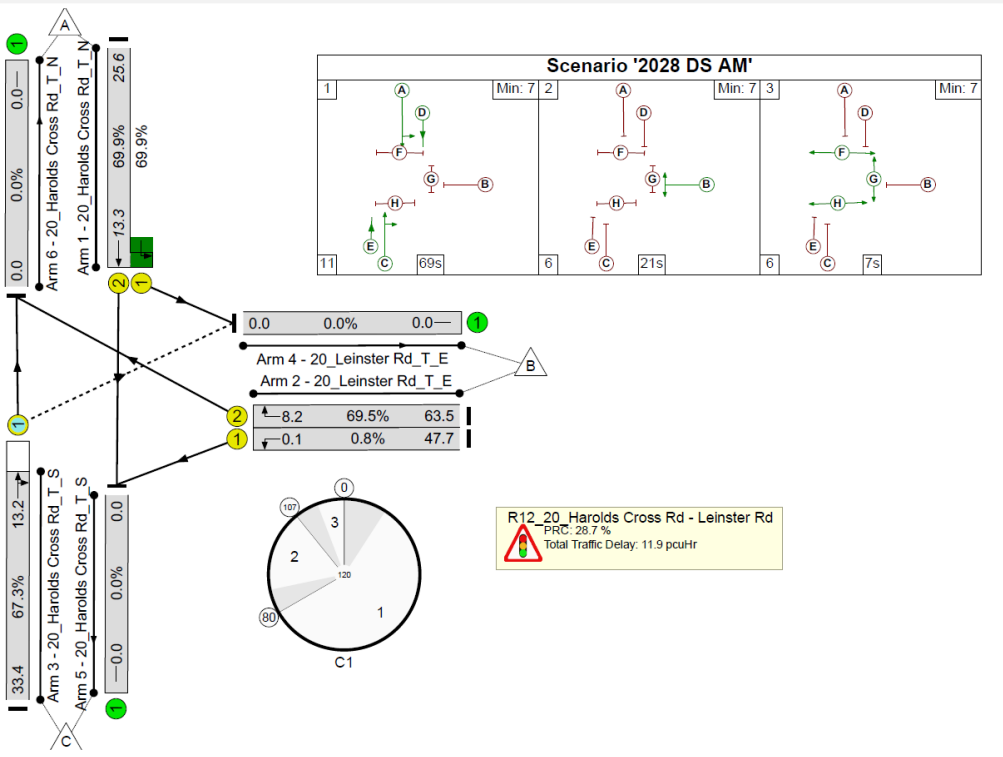
1. Junction operates within capacity for both peaks.



Do Something : 2028 : AM

Cycle = 120 secs
PRC = 29%
Delay = 12 pcuHr

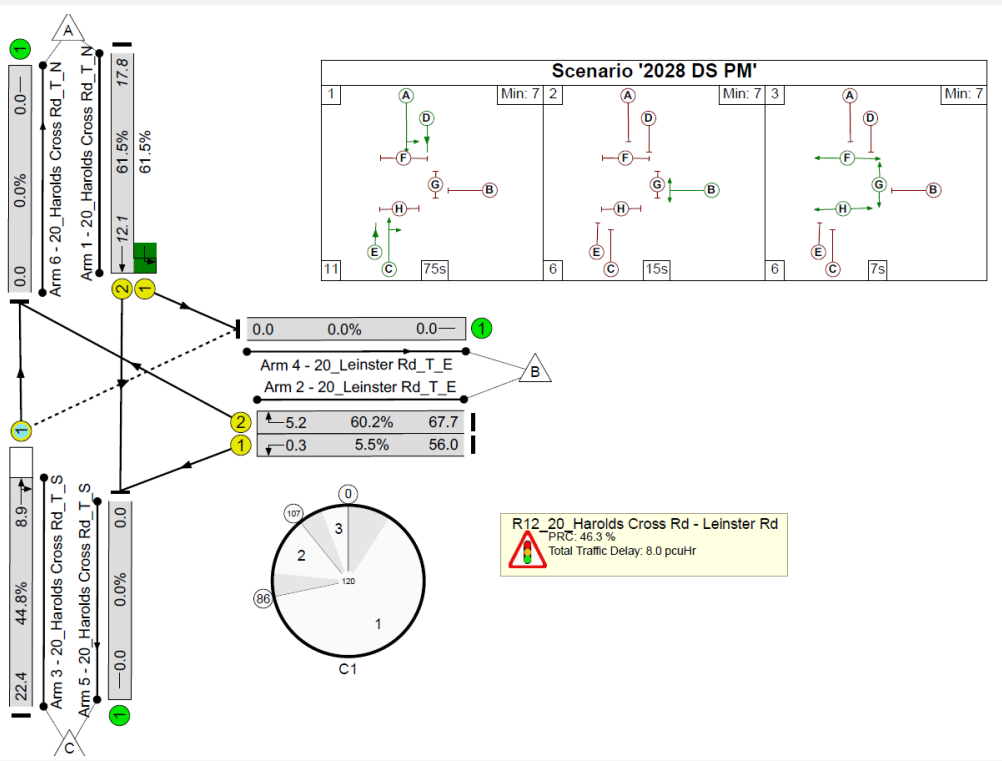
Bus delay
Inbound = n/a
Outbound = n/a



Do Something : 2028 : PM

Cycle = 120 secs
PRC = 46%
Delay = 8 pcuHr

Bus delay
Inbound = n/a
Outbound = n/a



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Orwell Road / Zion Road

Summary
The existing junction is proposed to be upgraded to accommodate the provision of inbound and outbound cycle tracks along Orwell Road. Additionally it is proposed to remove the slip lane from Zion Road to Orwell Road.

Signal Operation
A three stage signal operation is proposed. The outbound track will operate at the same time as the mainline traffic stages to maximise green time and minimise delay. The side road traffic will operate separately, with left turning traffic to give way to cyclists on flashing amber, to be followed by pedestrian crossings in their own stage. There will be no bus priority at this junction.

Junction Type n/a
Bus delay n/a

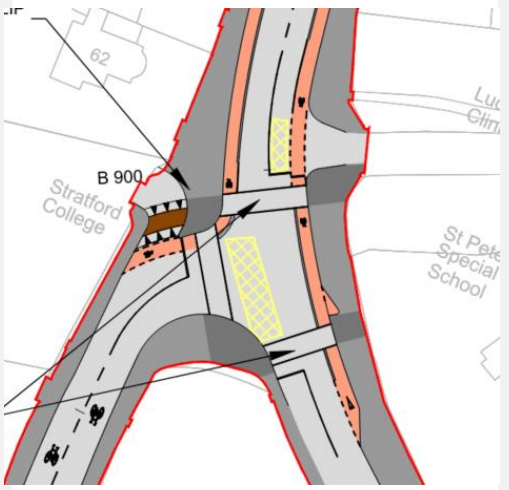
	Change Made	Reason for Change	Impact of Change
EXISTING	1. N/A	1. N/A	1. N/A
EPR	This junction was not part of the EPR		
DRAFT PRO (PC2)	This junction design was not published in PC2		
DRAFT PRO (PC3)		1. Dedicated cycle tracks provided on the northern arm of the junction. 2. Quiet Street Treatment provided on Zion Road. 3. Left turn slip lane from Zion Road to Orwell Road removed. 4. Right turn general traffic lane removed from northern approach to the junction. 5. Corner radii have been reduced.	1. To improve cycle facilities. 2. To improve cycle facilities. 3. To improve vulnerable road user safety. 4. To allow for the provision of dedicated cycling facilities. 5. To improve vulnerable road user safety.	1. Improved cycling facilities. 2. Improved cycling facilities. 3. Improved vulnerable road user safety. 4. Improved cycling facilities. 5. Improved vulnerable road user safety.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Orwell Road / Zion Road

EXISTING

FINAL DESIGN



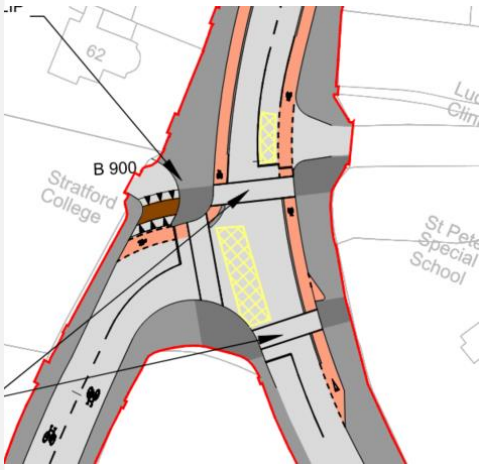
Change Made	Reason for Change	Impact of Change
1. Toucan Crossings provided, with ramps provided for cyclists to access toucan crossings.	1. To facilitate right turn cyclist movements.	1. Improved cycling facilities.

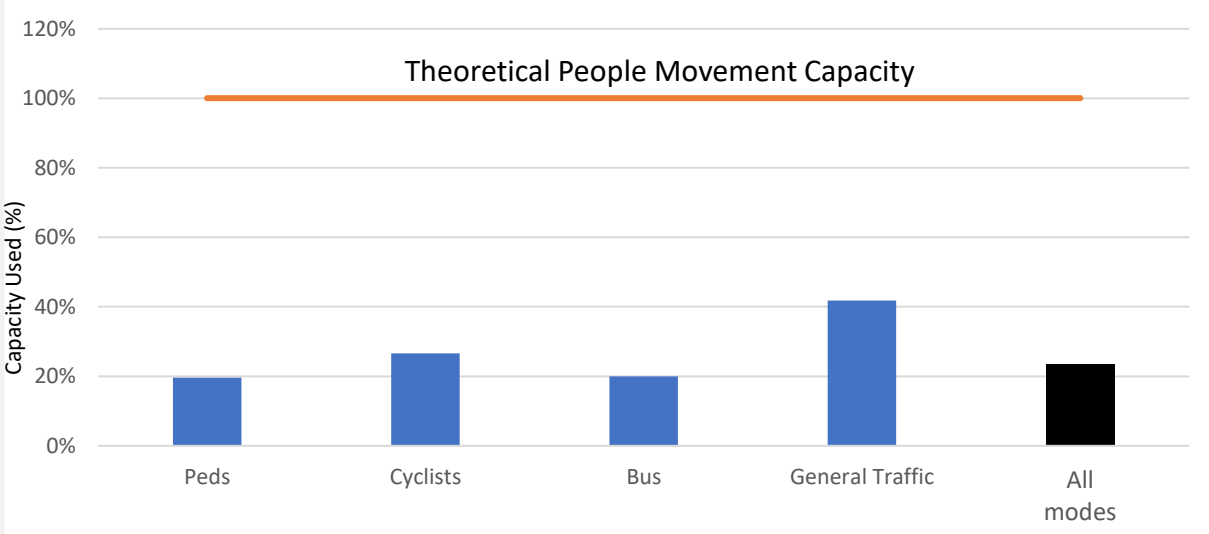
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Orwell Road / Zion Road

Capacity / Delay

1. Junction operates within capacity in both peaks.

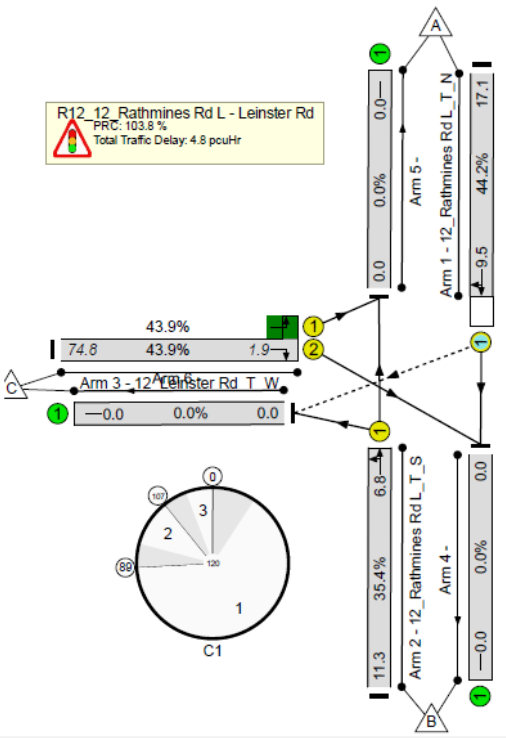


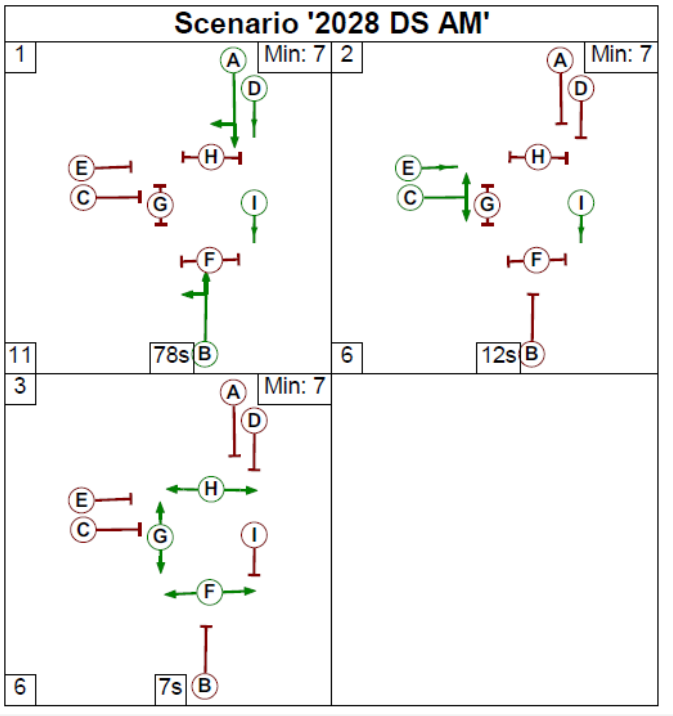


Do Something : 2028 : AM

Cycle = 120 secs
PRC = 104%
Delay = 5 pcuHr

Bus delay
Inbound = n/a
Outbound = n/a

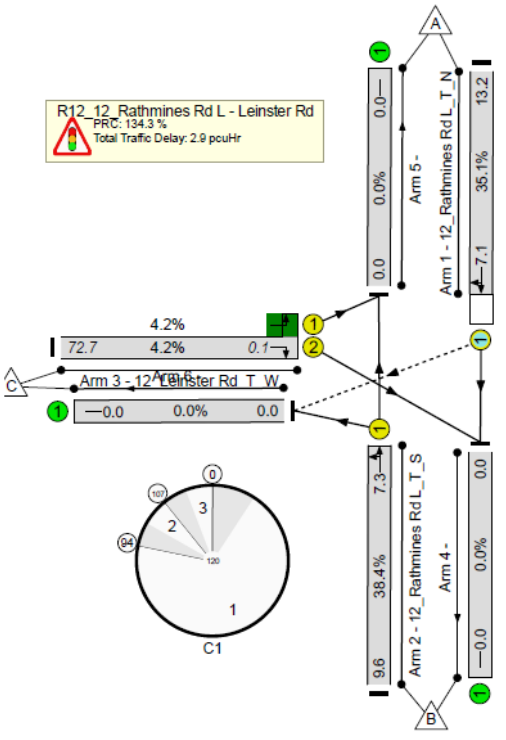


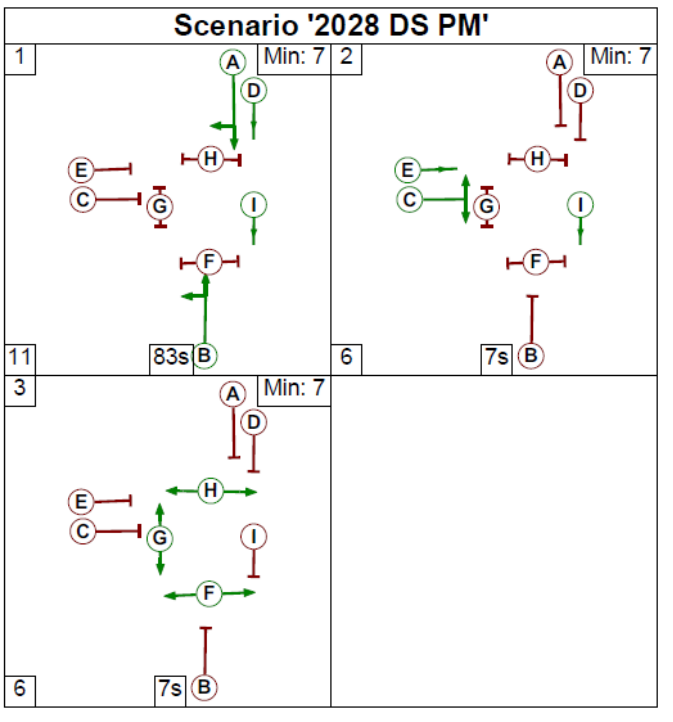


Do Something : 2028 : PM

Cycle = 120 secs
PRC = 134%
Delay = 3 pcuHr

Bus delay
Inbound = n/a
Outbound = n/a





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Highfield Road / Rathmines Road Upper

Summary

Junction is proposed to be upgraded to facilitate the reintroduction of the right turn from Rathmines Road Upper to Highfield Road. This right turn will be required to facilitate outbound general traffic, primarily with a destination on Rathgar Road, due to the proposal to make Rathgar Road one-way inbound for general traffic.

Signal Operation

A five stage signal operation is proposed. Straight ahead and right turning movements along Highfield Road and Palmerston Park will operate together with right turning traffic giving way. A right turn indicative arrow will facilitate the heavy traffic flow into Dartry Road. The left turn movement from Palmerston Park will operate continuously with a flashing amber, to give way to all other traffic movements and will stop when pedestrians are allowed to cross. Left turning movements from Highfield Road will operate with right turning movements from Rathmines Road Upper and Dartry Road. Straight ahead and left turning movements from Rathmines Road Upper and Dartry Road will operate together. The pedestrian crossings will operate in their own stage.

Junction Type n/a

Bus delay n/a

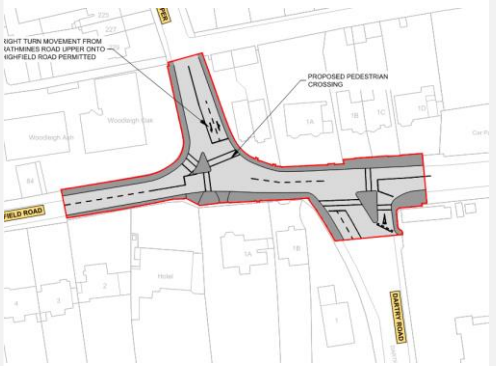
	Change Made	Reason for Change	Impact of Change
EXISTING	1. N/A	1. N/A	1. N/A
EPR	This junction was not part of the EPR		
DRAFT PRO (PC2)	This junction design was not published in PC2		
DRAFT PRO (PC3)	This junction design was not published in PC3		

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Highfield Road / Rathmines Road Upper

EXISTING

FINAL DESIGN



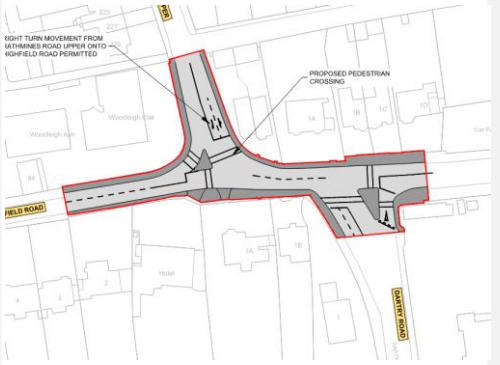
Change Made	Reason for Change	Impact of Change
1. Right turn from Rathmines Road Upper to Highfield Road reintroduced. 2. New pedestrian crossing proposed on the Rathmines Road Upper arm of the junction.	1. To facilitate outbound general traffic due to the proposal to make Rathgar Road one-way inbound for general traffic. 2. To improve pedestrian safety.	1. Outbound general traffic movements facilitated. 2. Improved pedestrian safety.

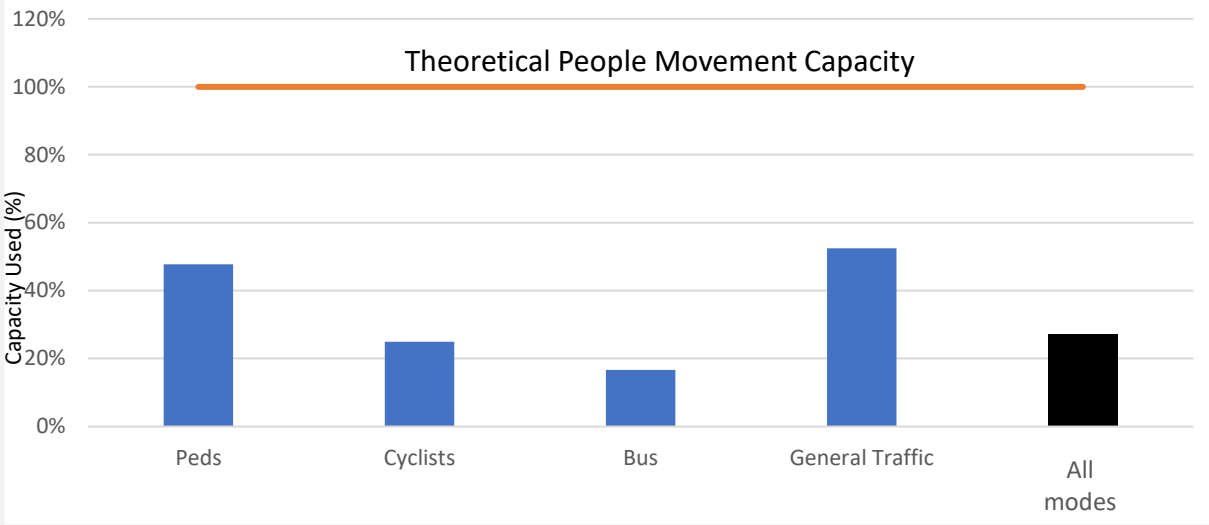
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Highfield Road / Rathmines Road Upper

Capacity / Delay

1. Junction operates within capacity in both peaks.

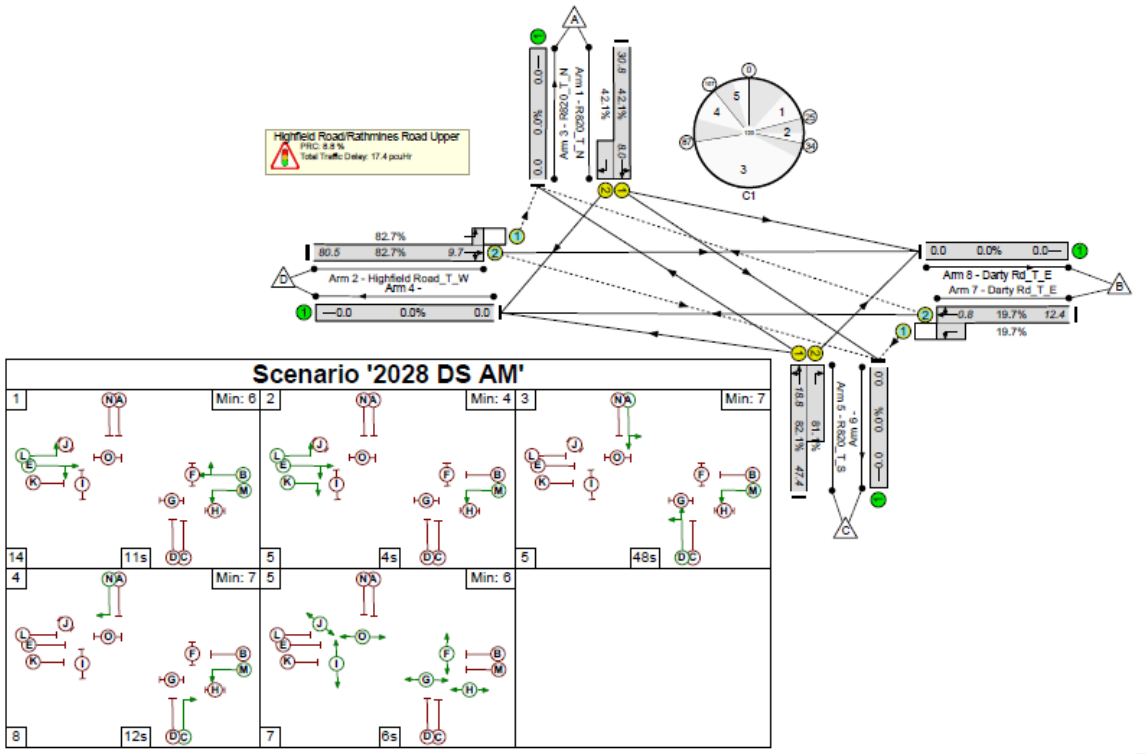




Do Something : 2028 : AM

Cycle = 120 secs
PRC = 9%
Delay = 17 pcuHr

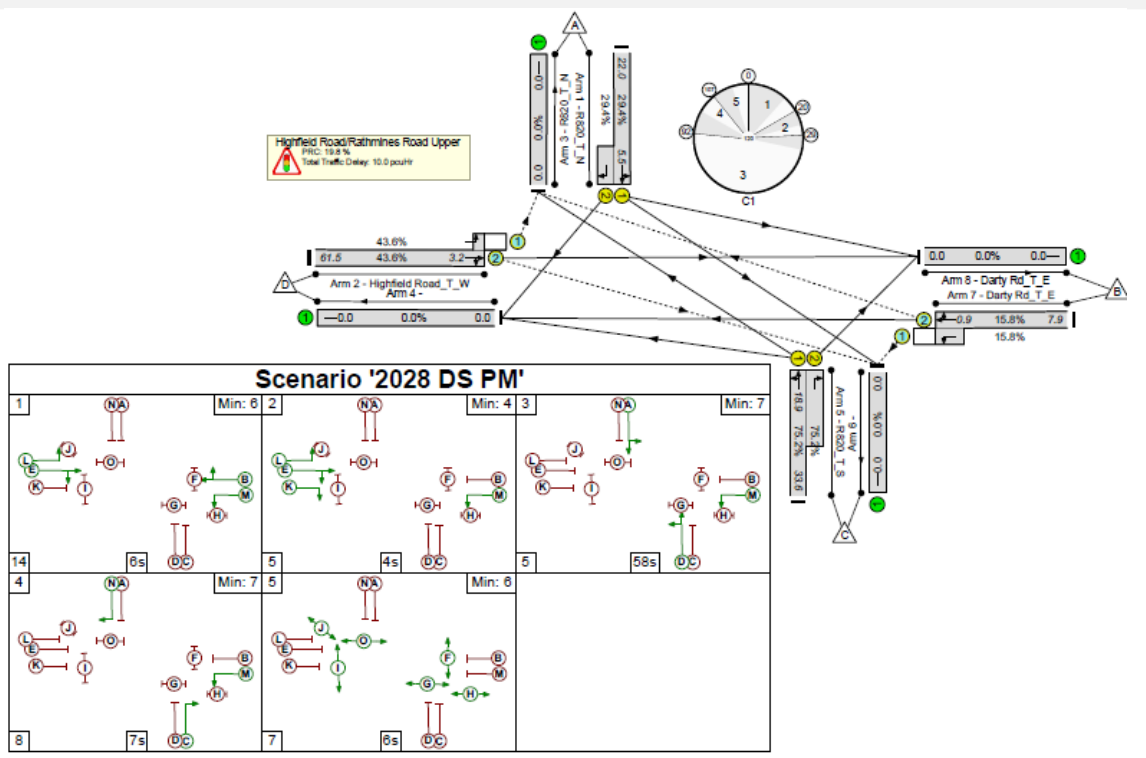
Bus delay
Inbound = n/a
Outbound = n/a



Do Something : 2028 : PM

Cycle = 120 secs
PRC = 20%
Delay = 10 pcuHr

Bus delay
Inbound = n/a
Outbound = n/a



ARUP

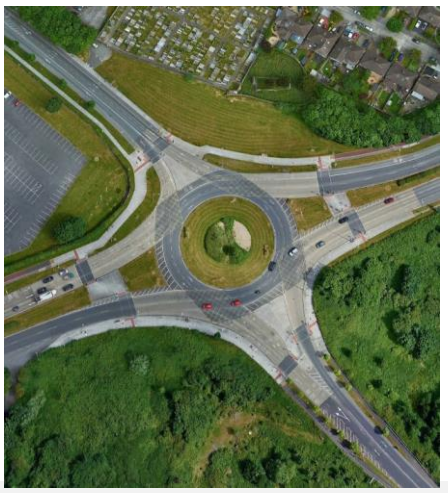
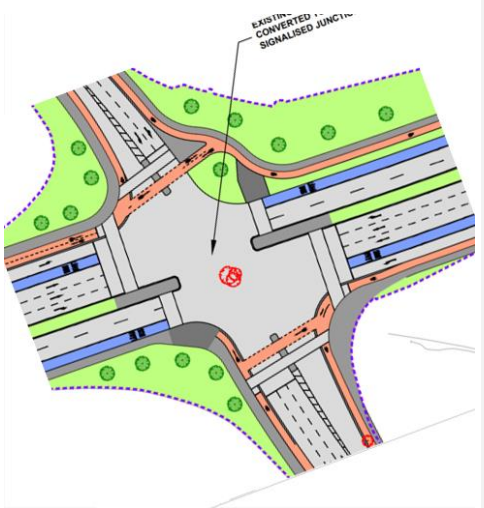
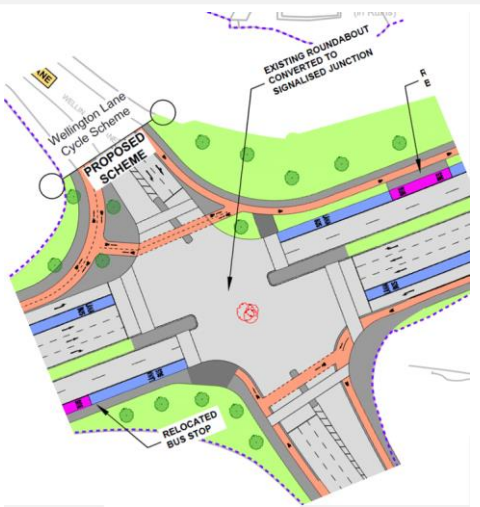
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Wellington Ln

Summary
The existing roundabout junction is proposed to be replaced by a signalised junction with protection for cyclists. The proposed scheme will be compatible with the proposed Wellington Lane cycle scheme.

Signal Operation
A six stage signal operation is proposed. As there are dedicated left turn lanes on the mainline, there will be no requirement for a dedicated bus stage. Mainline inbound buses and traffic in all directions will operate together. The right turning traffic movement into the southern arm will stop to allow outbound straight-ahead and left movements to operate with the inbound straight-ahead and left, with buses in both directions. Inbound movements will then stop to allow the outbound right-turning to the northern arm. The side roads that will operate separately, with non-conflicting pedestrian crossings. The remaining pedestrian crossings will operate with the orbital cycle track through the junction.

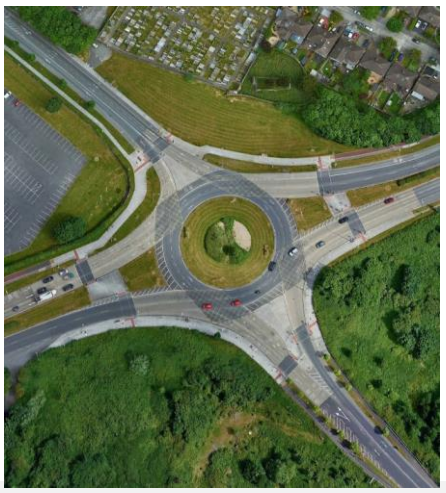
Junction Type 4 Bus delay ≤ 60s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound and outbound bus lanes extended closer to the junction. Hatching within roundabout converted to outbound bus lane.	1. To improve bus priority through the junction.	1. Improved bus priority through the junction.
DRAFT PRO (PC2)		1. Roundabout converted to signalised junction with protected kerbs for cyclists. 2. Left-turn lanes provided on the nearside of the bus lanes.	1. To improve safety for pedestrians and cyclists. 2. To improve junction operation.	1. Improved pedestrian and cyclist safety. 2. Improved junction operation with reduced delays to buses
DRAFT PRO (PC3)		1. Changes made to the alignment of cycle tracks on the Wellington Lane arm of the junction.	1. To better tie in with the Wellington Lane cycle scheme proposals and to improve facilities for cyclists.	1. Better integration with the Wellington Lane cycle scheme and improved facilities for cyclists.

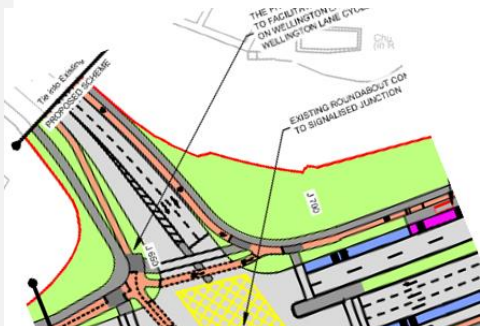
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Wellington Ln

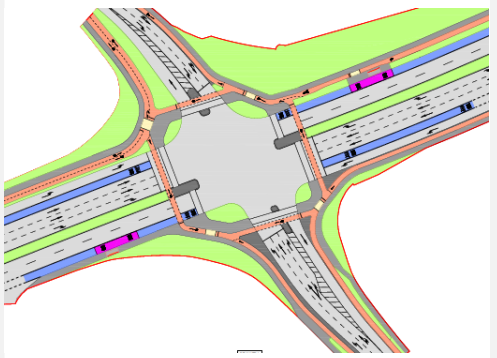
EXISTING



FINAL DESIGN



Change Made	Reason for Change	Impact of Change
1. North/South two-way cycle facility proposed crossing the eastern arm of the junction. 2. East/West one-way cycle facility proposed cros sing the northern arm of the junction. 3. Controlled crossing points provided in all locations where pedestrians are required to cross a cycle track. 4. Inbound Left turn filter lane on the western approach arm extended by approx. 30m. 5. Scheme amended to tie into existing situation on Wellington Lane (i.e. one-way cycle track on western side) but to be compatible with the future Wellington Lane Scheme.	1. To better connect the future Wellington Lane Cycle Scheme to the existing two-way cycle track on the Spawell arm of the junction. 2. The provision of the North/South two-way cycle facility removes the need to provide a two-way east west crossing the northern arm of the junction. 3. To remove uncontrolled cyc list and pedestrian conflicts at the junction. 4. Modelling indicated that significant queuing on this arm would cause delay to the bus without extending this left turn lane. 5. To tie into existing situation in case Wellington Lane scheme is not progressed.	1. Improved connectivity with surrounding existing and proposed cycle facilities. 2. Improved connectivity with surrounding existing and proposed cycle facilities. 3. Improved pedestrian and cy clist safety. 4. Improved bus priority through the junction. 5. Improved integration with existing layout



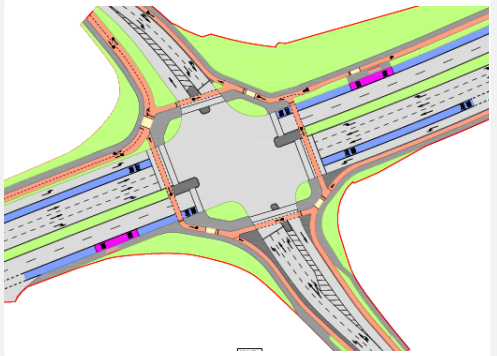
1. Junction revised to junction type 4.	1. To better tie in with proposals under the approved Dodder Greenway Phase 6 scheme to the south of the junction.	1. Better integration with surrounding schemes.

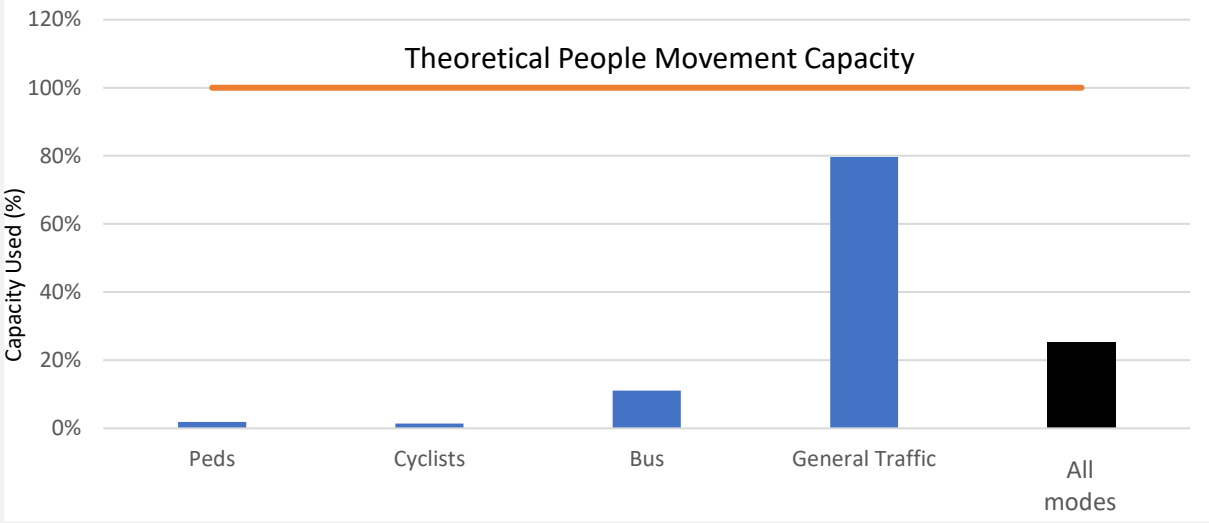
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Wellington Ln

Capacity / Delay

1. Junction operates over capacity in both peaks.

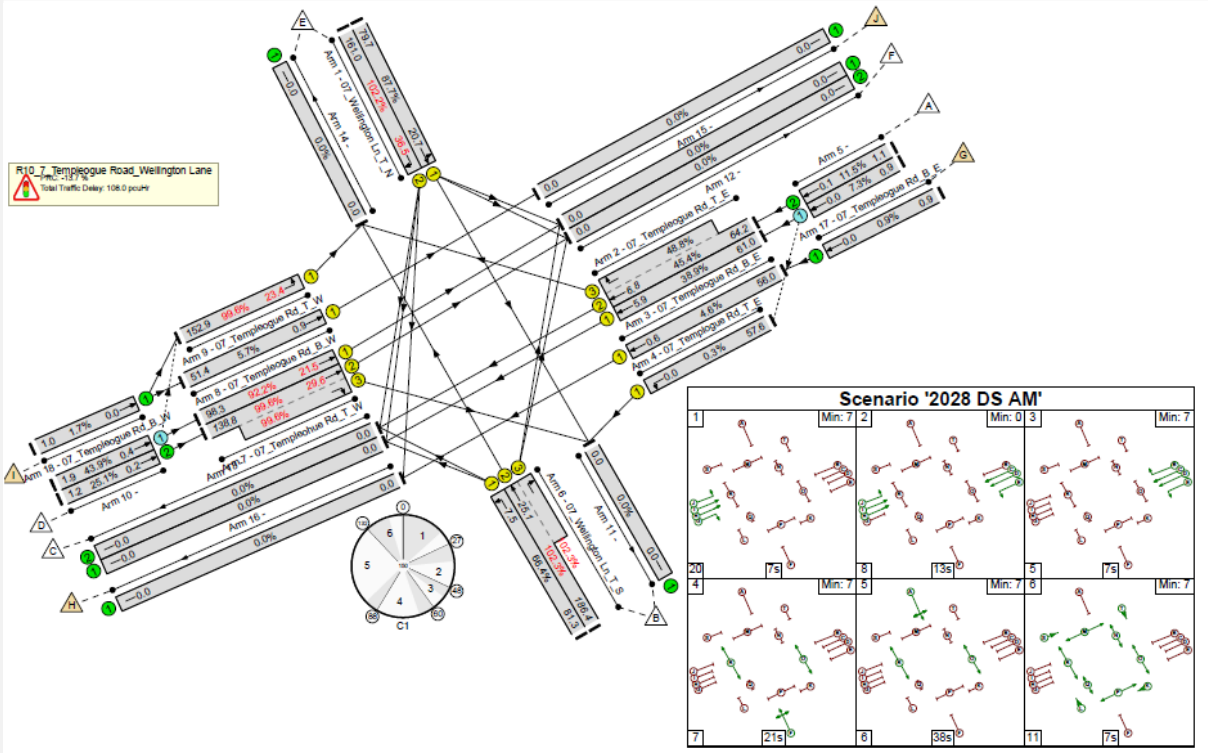




Do Something : 2028 : AM

Cycle = 150 secs
PRC = -14%
Delay = 108 pcuHr

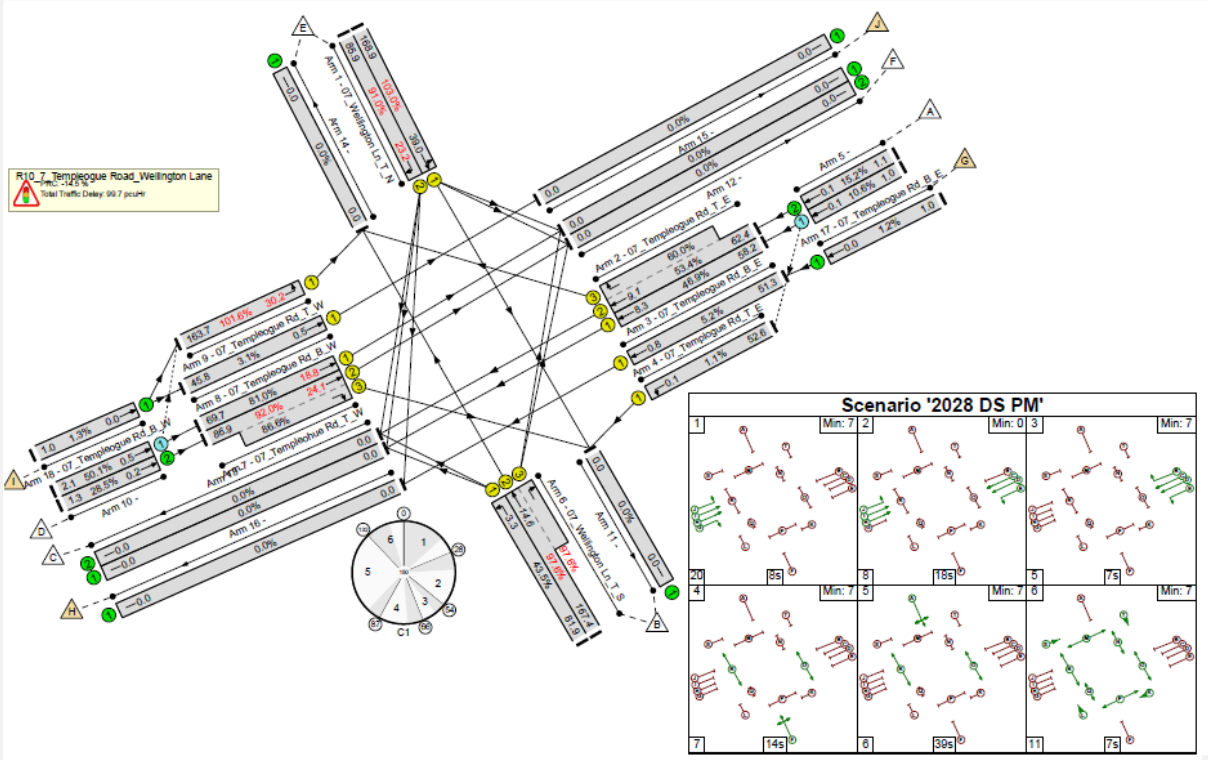
Bus delay
Inbound = 51s
Outbound = 56s



Do Something : 2028 : PM

Cycle = 150 secs
PRC = -14%
Delay = 100 pcuHr

Bus delay
Inbound = 46s
Outbound = 51s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

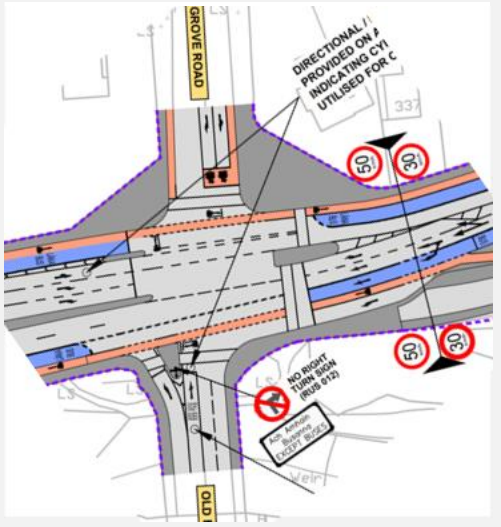
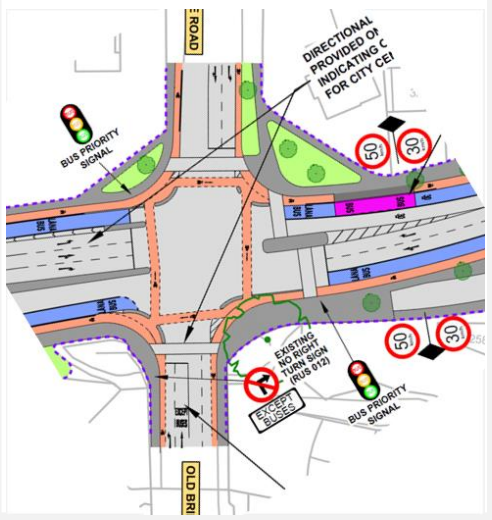
Templeogue Rd / Cypress Grove Rd

Summary
Bus lanes and cycle tracks provided through the junction to facilitate bus priority and improved cyclist safety. Junction will be converted to protected junction type in accordance with BusConnects Design Guidelines to further improve cyclist safety.

Signal Operation
A five stage signal operation is proposed. Due to left-turning buses, they will operate in their own stage to avoid conflict with traffic and cyclists. Mainline traffic will have a dedicated stage in each direction, with the outbound left turn to operate with cyclists on a flashing amber. The inbound mainline traffic arm will operate without a flashing amber due to high left turning flow. The side roads will operate together, without cyclists due to high left turning flow. Pedestrians and the remaining cycle phases will operate together.

Junction Type 1

Bus delay ≤ 65s

		Change Made	Reason for Change	Impact of Change
EXISTING				
EPR		1. Inbound and outbound bus lanes provided through the junction. 2. Inbound and outbound cycle tracks provided through the junction.	1. To provide bus priority through the junction. 2. To improve safety for pedestrians and cyclists.	1. Improved bus priority through the junction. 2. Improved cyclist and pedestrian safety at the junction.
DRAFT PRO (PC2)		1. Conventional Signalised junction converted to protected junction. 2. Slip Lane removed from Old Bridge Road onto Templeogue Road. 3. Left turn lane on the nearside of the outbound bus lane removed.	1. To improve safety for pedestrians and cyclists. 2. To improve safety for pedestrians and cyclists. 3. To improve bus priority through the junction and improve pedestrian and cyclist safety.	1. Improved cyclist and pedestrian safety at the junction. 2. Improved cyclist and pedestrian safety at the junction. 3. Improved bus priority at the junction as well as improved cyclist and pedestrian safety.
DRAFT PRO (PC3)		1. No Change	1. N/A	1. N/A

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Cypress Grove Rd

EXISTING

FINAL DESIGN

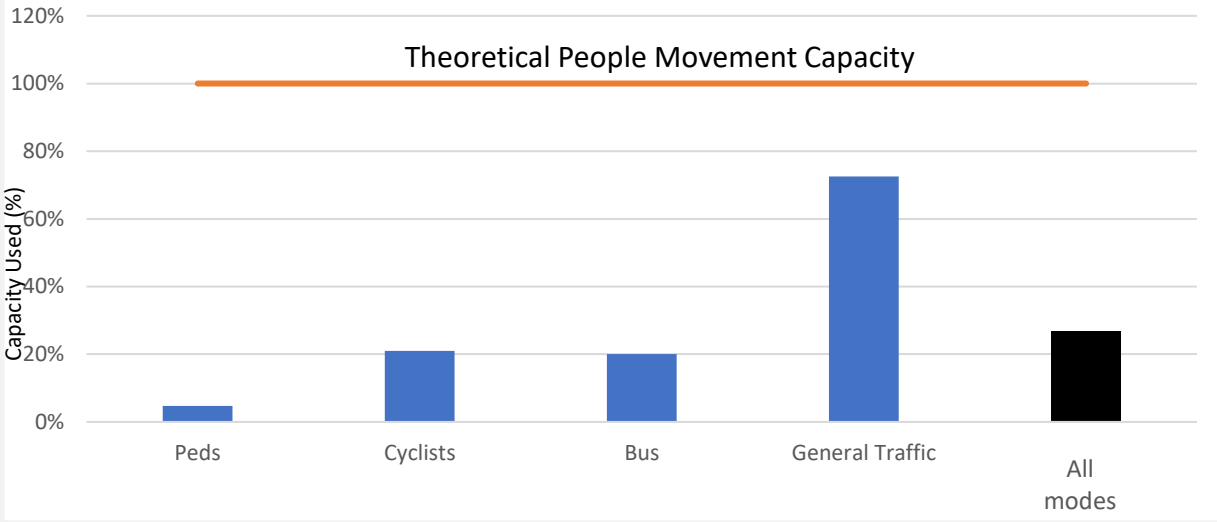
Change Made	Reason for Change	Impact of Change
1. Bus lane stop lines set back at the junction. 2. Southbound cycle lane on Old Bridge Road terminated south of the junction. Cyclists to be held at stop line within the junction while vehicles turn right from Templeogue Road onto Old Bridge Road. 3. Hatching on Cypress Grove Road arm of the junction converted to physical islands. 4. Right turn pocket catering for turners from Templeogue Road to Cypress Grove Road extended by c.40m and converted to shared straight/right turn lane.	1. To improve visibility for left turning vehicles of cyclists at the junction. 2. To ensure citybound right turning vehicles from Templeogue Road do not conflict with cyclists exiting the junction onto Old Bridge Road. 3. To provide further segregation for cyclists at the junction. 4. To minimise extent of land required from properties on northern side of Templeogue Road.	1. Improved cyclist safety. 2. Improved cyclist safety. 3. Improved cyclist safety. 4. Reduced land acquisition from properties on northern side of Templeogue Road.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Cypress Grove Rd

Capacity / Delay

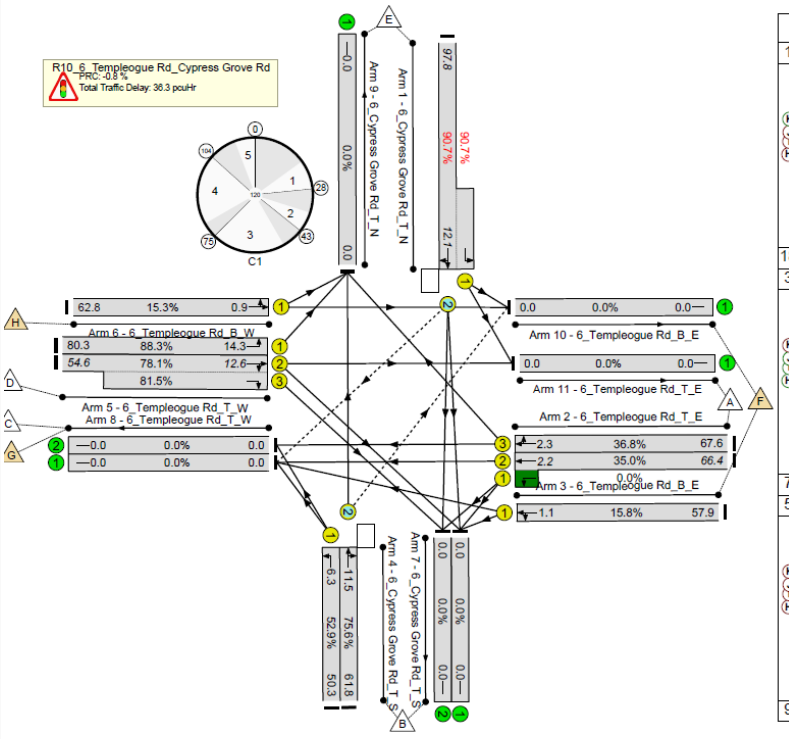
1. Junction operates at or over capacity.

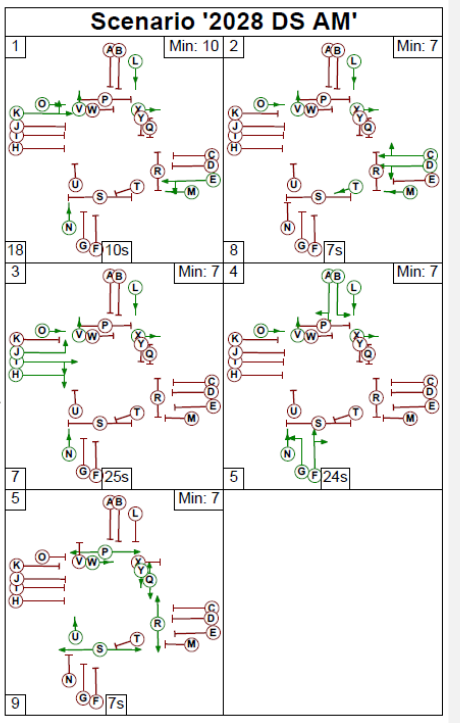


Do Something : 2028 : AM

Cycle = 120 secs
PRC = -1%
Delay = 36 pcuHr

Bus delay
Inbound = 63s
Outbound = 58s

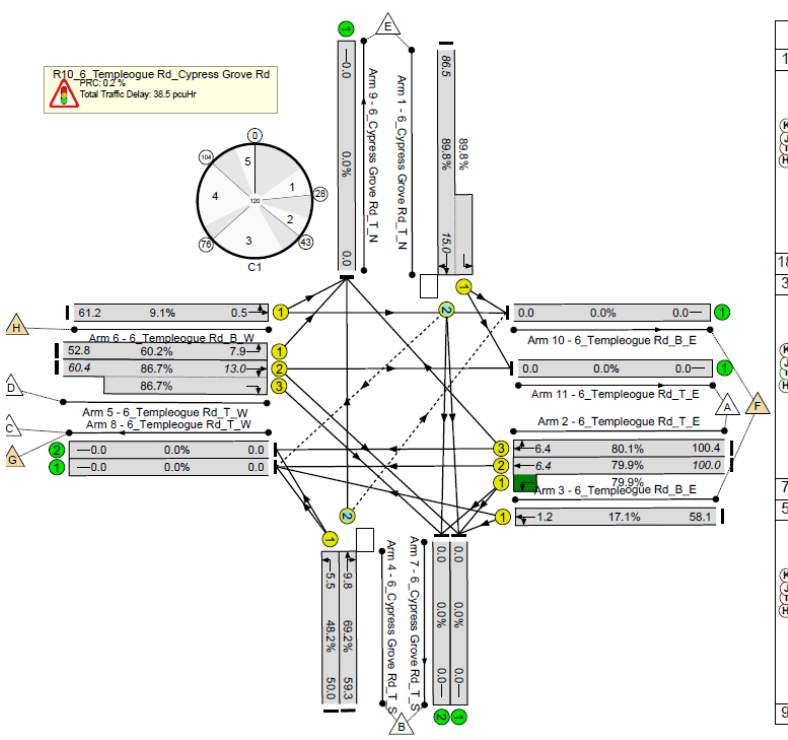


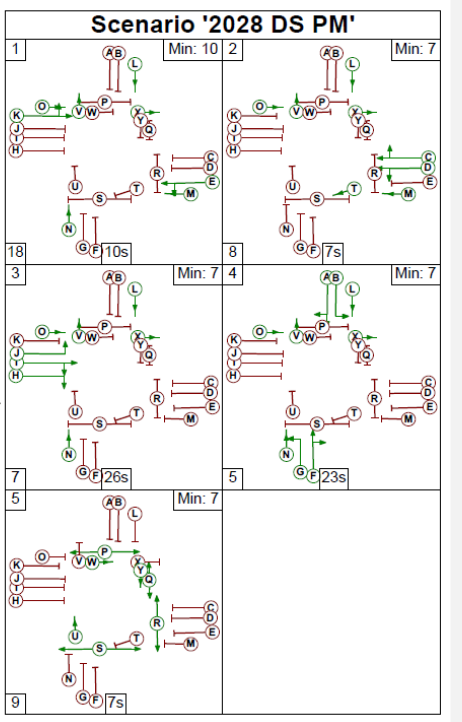


Do Something : 2028 : PM

Cycle = 120 secs
PRC = 0%
Delay = 39 pcuHr

Bus delay
Inbound = 61s
Outbound = 58s





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Templeville Rd

Summary
Bus lanes and cycle tracks provided through the junction to facilitate bus priority and improved cyclist safety. Junction converted to protected junction type in accordance with BusConnects Design Guidelines to further improve cyclist safety.

Signal Operation
A four stage signal operation is proposed. Mainline buses and cyclists will operate in the same stage through the junction, to be followed by mainline traffic in both directions. The side roads will operate together, with turning traffic to give way to cyclists on flashing ambers. The pedestrian crossings will operate in their own stage.

Junction Type 1
Bus delay < 65s

		Change Made	Reason for Change	Impact of Change
EXISTING				
EPR		1. Traffic slip lanes on the Springfield Avenue arm removed and replaced with cyclist bypasses. 2. Inbound and outbound bus lanes provided through the junction. 3. Inbound and outbound cycle tracks provided through the junction. 4. Right turn from Templeogue Rd to Springfield Ave allowed	1. To improve safety for pedestrians and cyclists. 2. To provide bus priority through the junction. 3. To improve safety for cyclists. 4. To provide alternative route for traffic blocked off by bus gate further north	1. Improved pedestrian and cyclist safety. 2. Improved bus priority through the junction. 3. Improved cyclist safety. 4. Alternative route provided for traffic
DRAFT PRO (PC2)		1. Conventional Signalised junction converted to protected junction. 2. Pedestrian crossings converted to single stage crossings. 3. Cycle lane bypasses removed. 4. Left turn lanes on the nearside of the bus lane removed.	1. To improve safety for pedestrians and cyclists. 2. To minimise waiting time for pedestrians at the junction. 3. To control pedestrian/cyclist conflicts and to increase the space available for planting. 4. To provide for improved bus priority through the junction	1. Improved pedestrian and cyclist safety. 2. Improved pedestrian facilities. 3. Increased space for planting and improved safer pedestrian facilities. 4. Improved bus priority through the junction. Impact on property on the north-eastern corner of the junction removed.
DRAFT PRO (PC3)		1. No Change	1. N/A	1. N/A

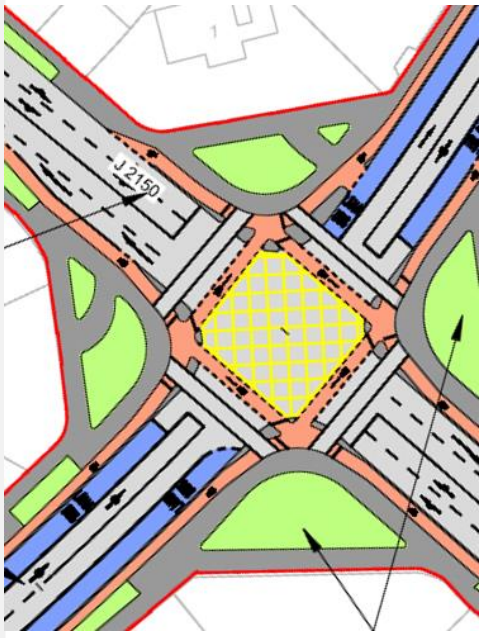
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Templeville Rd

EXISTING

FINAL DESIGN



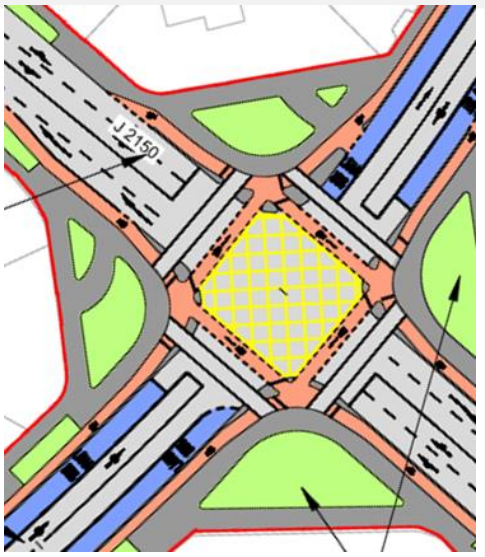
Change Made	Reason for Change	Impact of Change
1. Bus lane stop lines set back at the junction. 2. Minor amendments to alignment of north-eastern approach to the junction.	1. To improve visibility for left turning vehicles of cyclists at the junction. 2. To minimise impact on private property.	1. Improved cyclist safety. 2. No requirement to acquire land from properties on north-eastern approach to the junction.

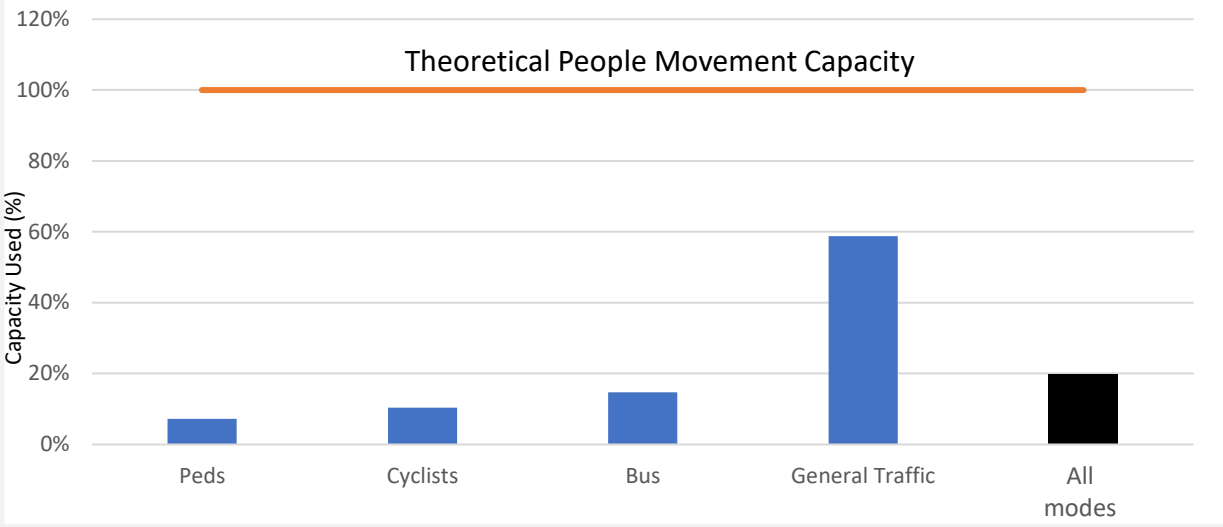
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Templeville Rd

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <65s on average.

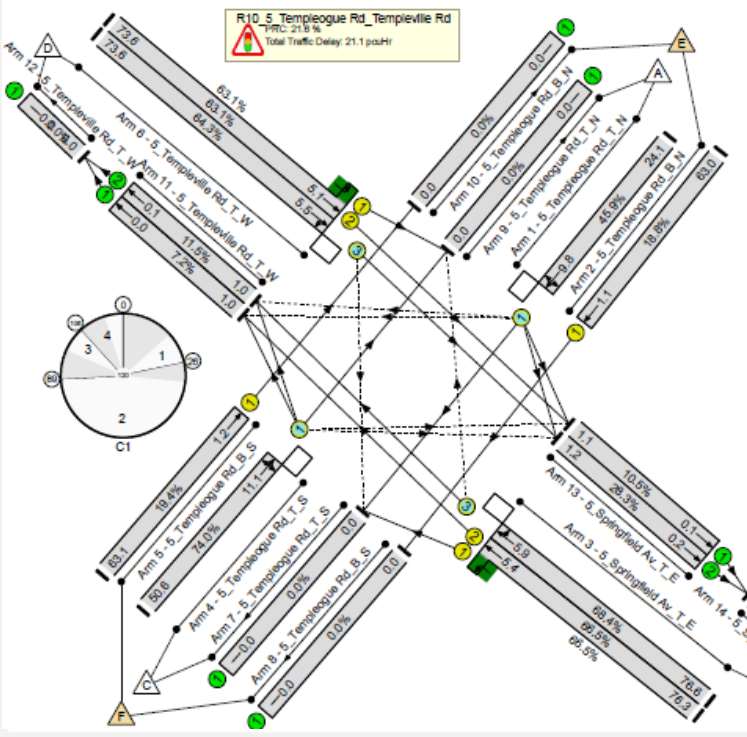


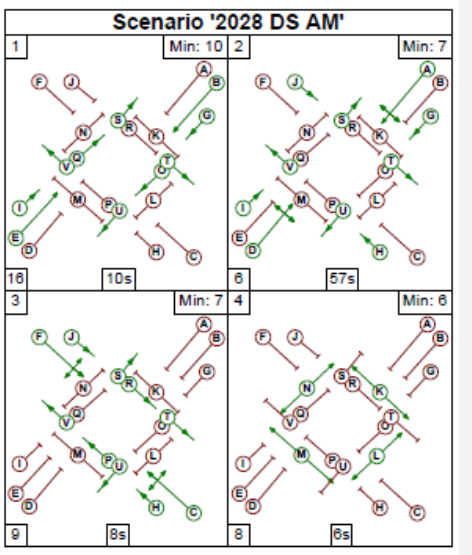


Do Something : 2028 : AM

Cycle = 120 secs
PRC = 22%
Delay = 21 pcuHr

Bus delay
Inbound = 63s
Outbound = 63s

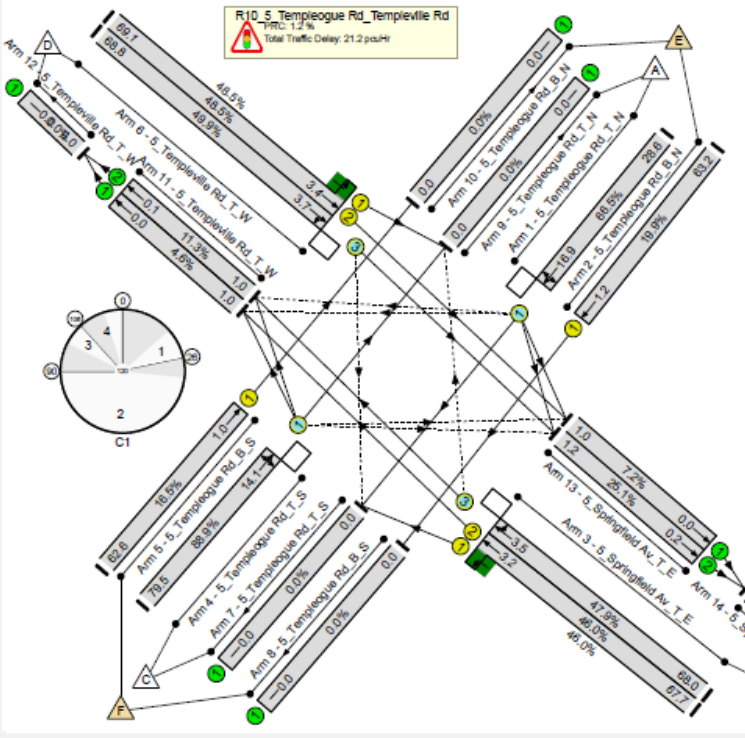


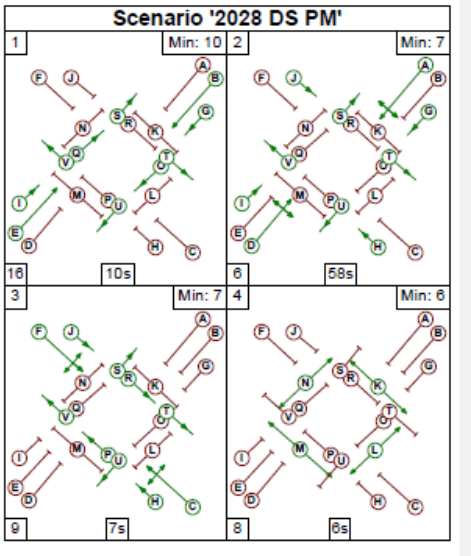


Do Something : 2028 : PM

Cycle = 120 secs
PRC = 1%
Delay = 21 pcuHr

Bus delay
Inbound = 63s
Outbound = 63s





ARUP

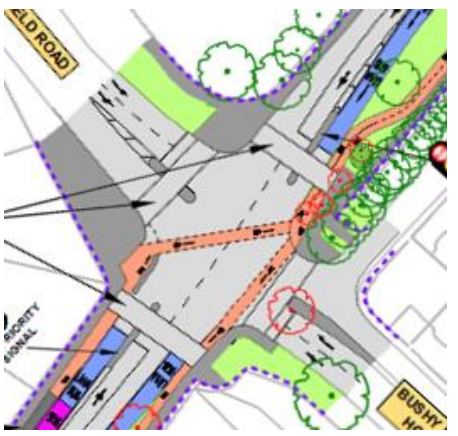
Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Fortfield Rd

Summary
Junction modifications are proposed to provide bus lanes in both directions at the junction, with the exception of the inbound direction exiting the junction. Cycle tracks are also proposed at the junction, linking to a two-way facility in Bushy Park to the north-east.

Signal Operation
A five stage signal operation is proposed. Mainline buses and outbound cyclists will operate in the same stage, to be followed by mainline traffic in both directions. The side roads will operate separately. The pedestrian crossings will operate with the inbound cycle track diagonally through the junction.

Junction Type 1
Bus delay ≤ 65s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound and outbound bus lanes extended to the junction on the south-western arm of the junction. Outbound bus lane introduced on the north-eastern arm of the junction. 2. Cycle tracks provided on approach to the junction, linking to two-way cycle track in Bushy Park.	1. To provide bus priority through the junction. 2. To provide improved cyclist facilities through the junction.	1. Improved reliability for bus movements. 2. Improved cyclist safety.
DRAFT PRO (PC2)		1. Conventional Signalised junction converted to protected junction. 2. Direct single stage cycle crossing provided to connect inbound cyclists to two-way cycle track at Bushy Park.	1. To provide enhanced pedestrian and cycle facilities. 2. To provide enhanced pedestrian and cycle facilities.	1. Improved pedestrian and cyclist safety. 2. Improved pedestrian and cyclist safety.
DRAFT PRO (PC3)		1. No change	1. N/A	1. N/A

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

EXISTING

FINAL DESIGN

Templeogue Rd / Fortfield Rd

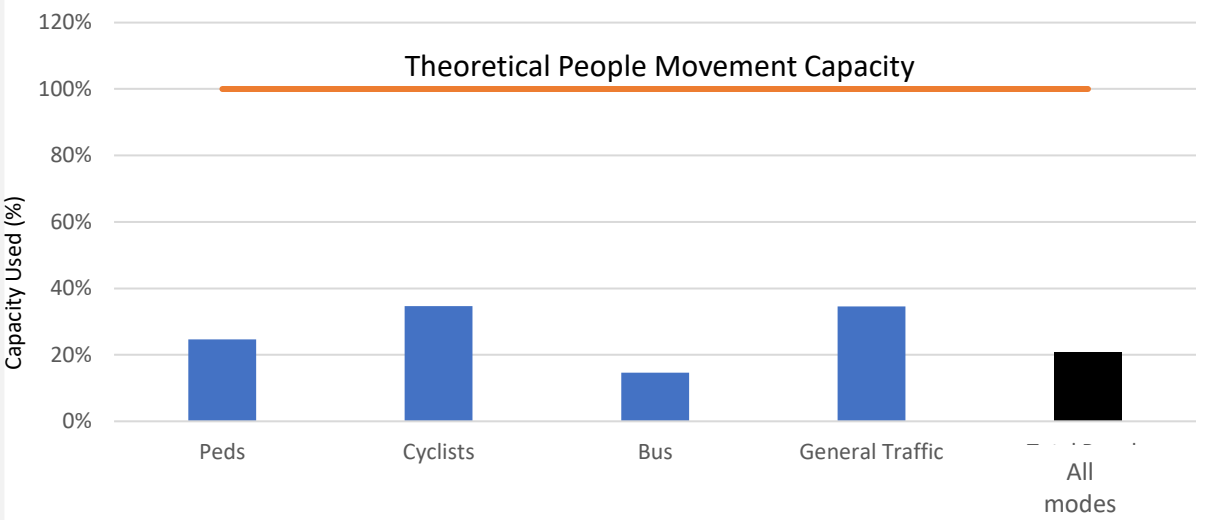
Change Made	Reason for Change	Impact of Change
1. Toucan Crossings provided on all arms of the junction with waiting areas for right turning cyclists provided. 2. Minor amendments made to the alignment of the carriageway through the junction, including the removal of central hatching. 3. Bus lane stop lines set back at the junction.	1. To facilitate right turning cyclist movements. 2. To improve the alignment of the carriageway through the junction and remove any impact on private lands within Bushy Park House. 3. To improve visibility for left turning vehicles of cyclists at the junction.	1. Improved cyclist safety. 2. Improved traffic alignment through the junction. No impact on private lands within Bushy Park House. 3. Improved cyclist safety.

Subject	BusConnects Core Bus Corridor Junction Design
Date	January 2023
Scheme	Templeogue/Rathfarnham to City Centre Core Bus Corridor Scheme

Templeogue Rd / Fortfield Rd

Capacity / Delay

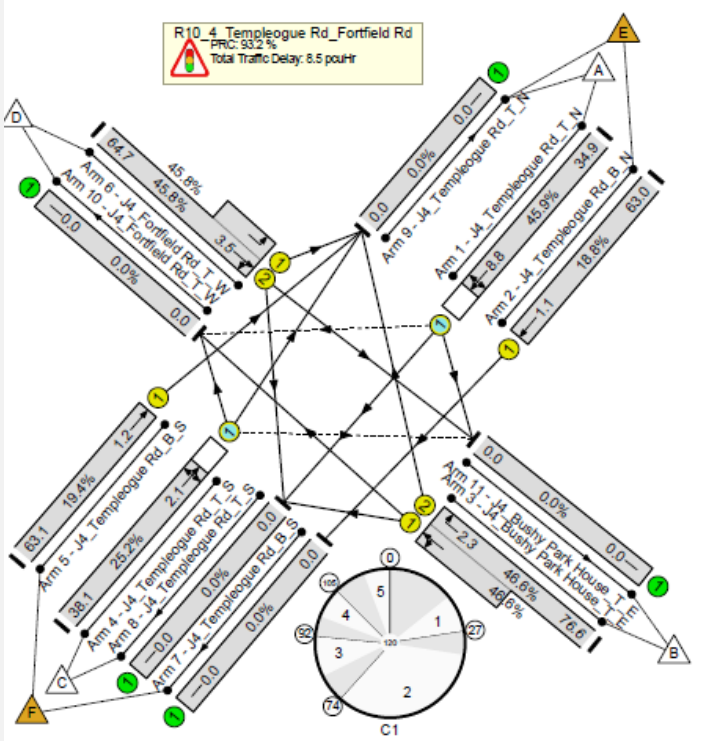
1. Junction operates within capacity.
2. Bus delay is <65s on average.

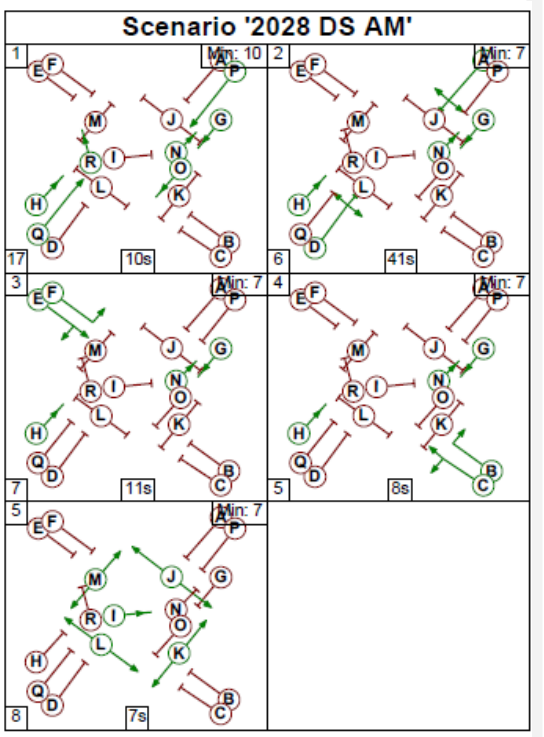


Do Something : 2028 : AM

Cycle = 120 secs
PRC = 93%
Delay = 9 pcuHr

Bus delay
Inbound = 63s
Outbound = 63s

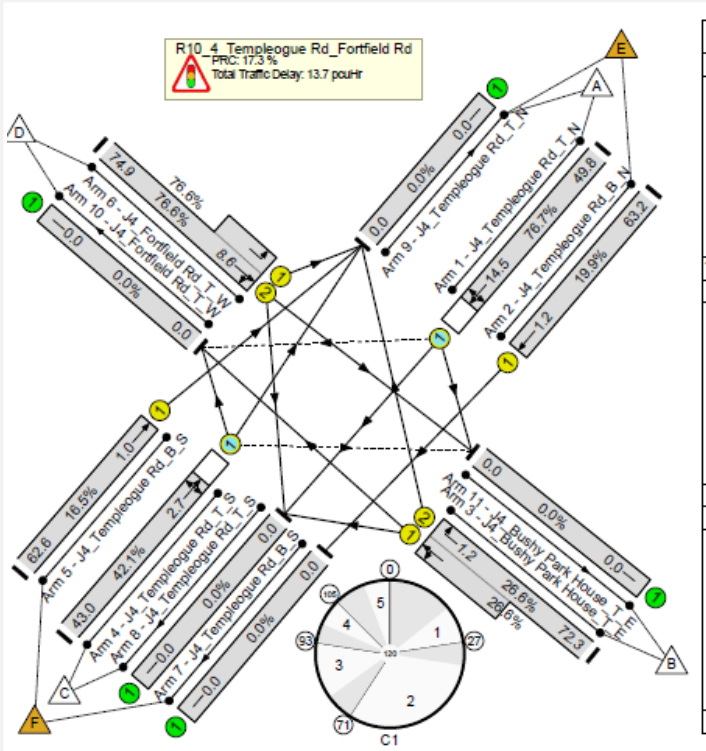


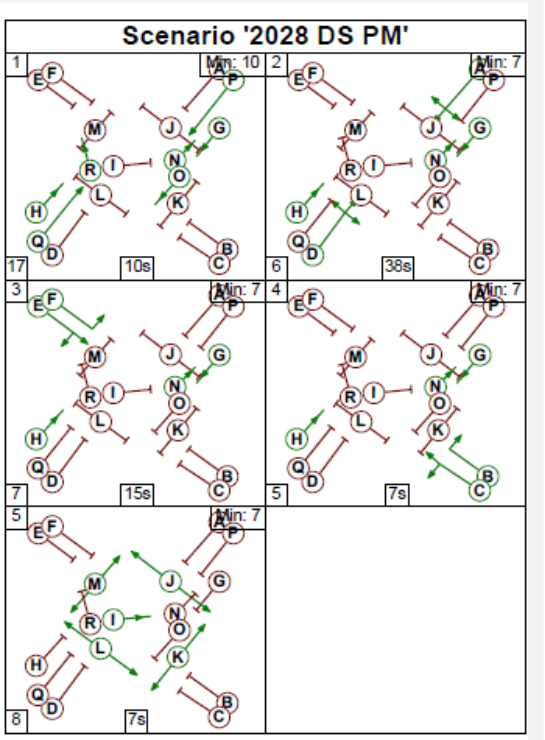


Do Something : 2028 : PM

Cycle = 120 secs
PRC = 17%
Delay = 14 pcuHr

Bus delay
Inbound = 63s
Outbound = 63s





ARUP