Appendix L
Junction Design Report

National Transport Authority

Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Junction Design and Modelling Report

Issue | 4 March 2022

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Contents

1 Introduction

This report has been prepared to document the evolution of the design of key junctions along the Belfield / Blackrock to City Centre Core Bus Corridor (CBC) 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.

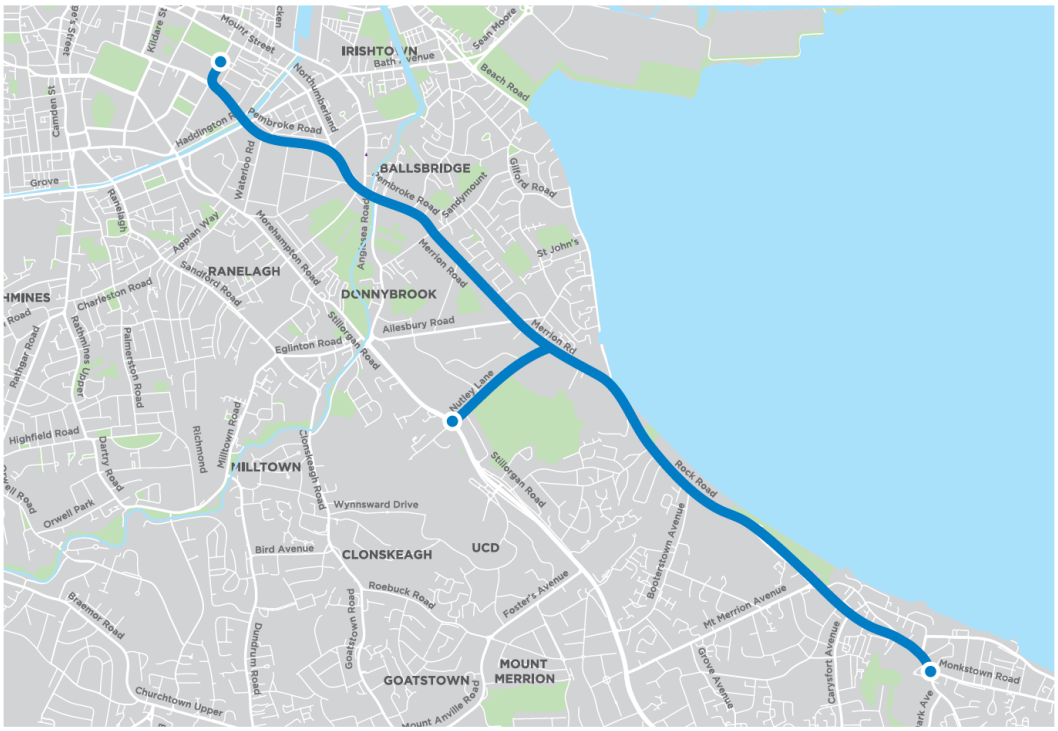


Figure 1: Belfield/Blackrock to City Centre Core Bus Corridor Scheme

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.

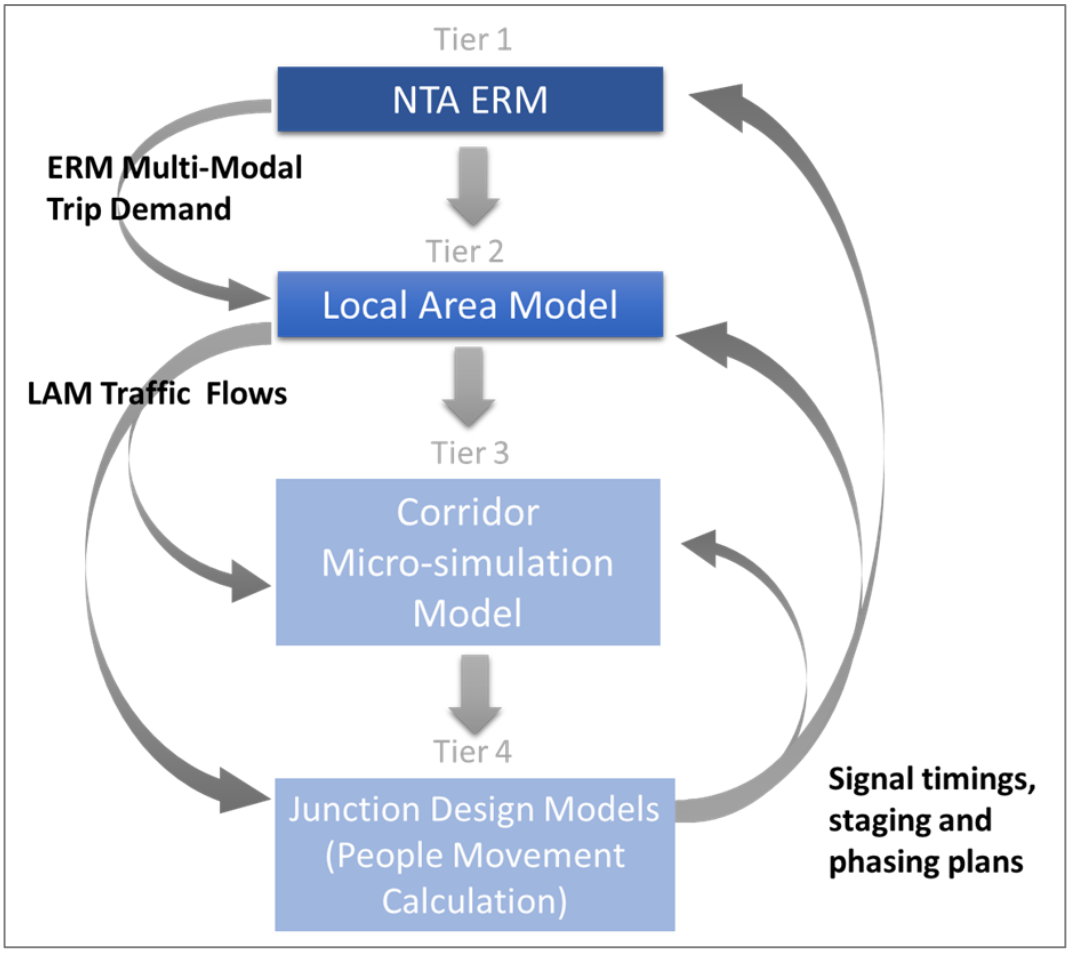


Figure 2: Transport Modelling Methodology and Information Flow

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.

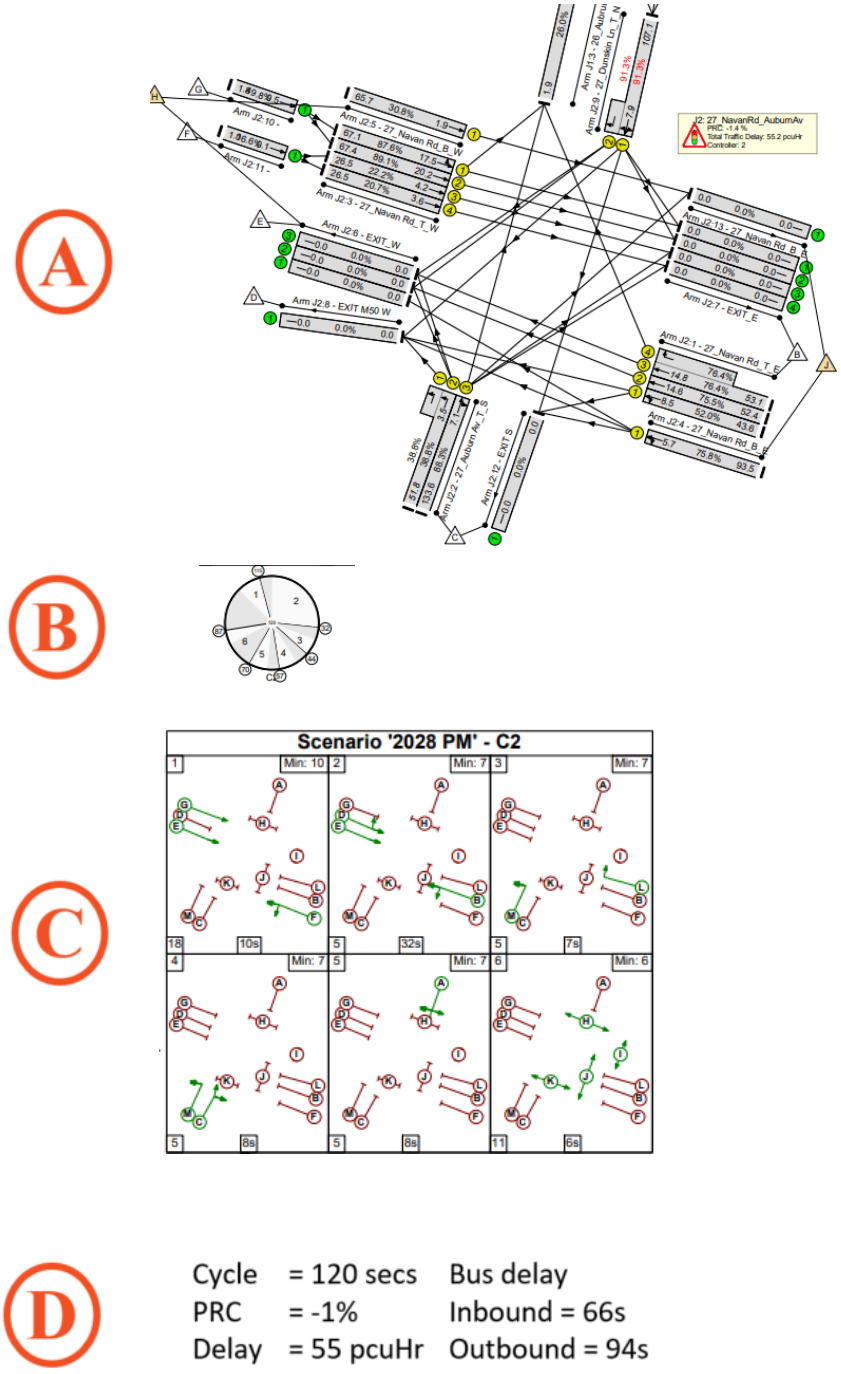


Figure 3: An example of the local junction modelling results in the JDR

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**).

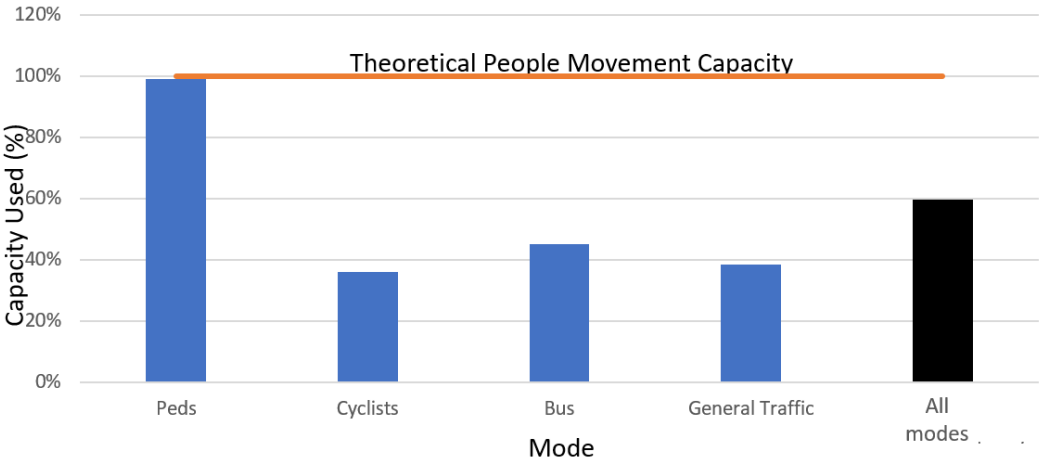


Figure 4: Example image of People Movement at Signals Calculator results

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

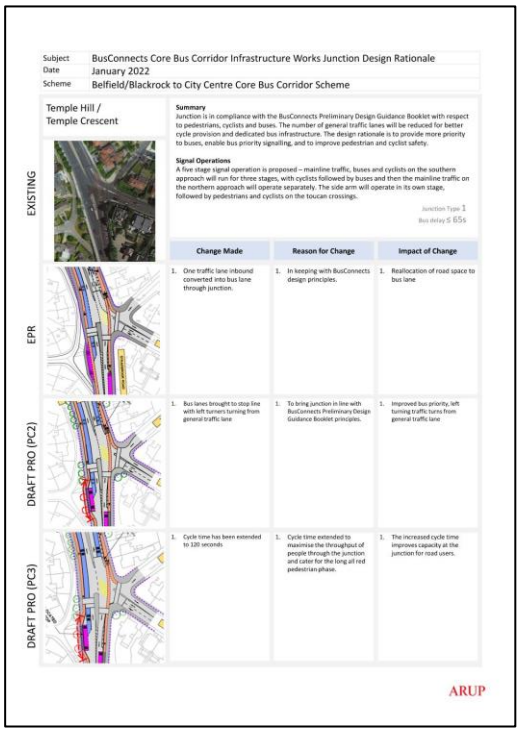
A total number of 27 junctions in the Proposed Scheme are presented in this report, which are as follows:

- Temple Hill / Temple Crescent.
- Temple Hill / Newtown Avenue;
- Frascati Road / Temple Road;
- Frascati Road / Carysfort Avenue;
- Rock Road / Rock Hill;
- Rock Road / Mount Merrion Avenue;
- Rock Road / Emmet Square;
- Rock Road / Booterstown Avenue;
- Rock Road / Trimleston Avenue;
- Merrion Road / Elmpark Green;
- Merrion Road / Strand Road;
- Merrion Road / St. Vincent's University Hospital;
- Merrion Road / Nutley Lane;
- Merrion Road / Ailesbury Road;
- Merrion Road / Shrewsbury Road;
- Merrion Road / Sandymount Road;
- Merrion Road / Serpentine Avenue;
- Pembroke Road / Anglesea Road;
- Pembroke Road / Shelbourne Road;
- Pembroke Road / Northumberland Road;
- Baggot Street Upper / Waterloo Road;
- Baggot Street Upper / Haddington Road;
- Baggot Street Lower / Herbert Place;
- Baggot Street Lower / Fitzwilliam Street Upper;
- Fitzwilliam Street Lower / Merrion Square E;
- Stillorgan Road / Nutley Lane; and
- Nutley Lane / St. Vincent's University Hospital.

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

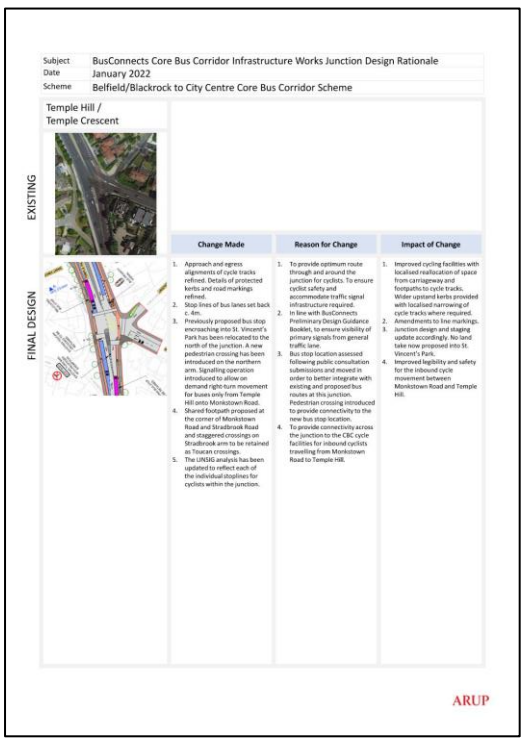
4 Junction Design and Modelling Results

Overview of Information Presented for Each Junction



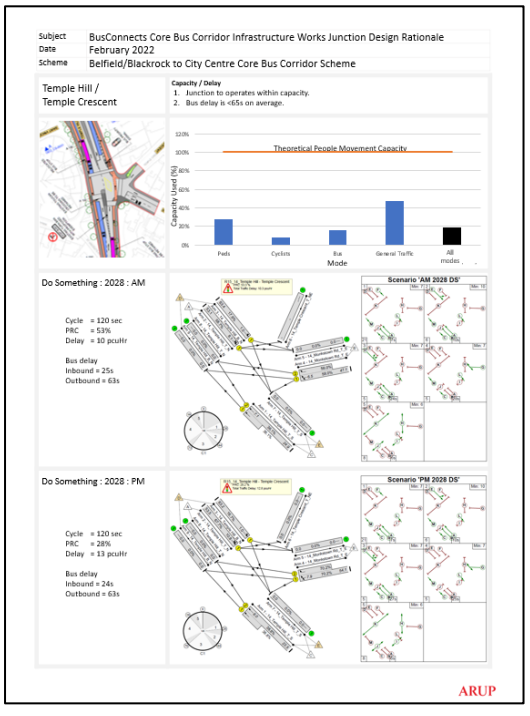
Page 1: Junction Design Evolution

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



Page 2: Junction Design Evolution (contd.)

- Other design iterations if applicable
- Final Design



Page 3: Junction Modelling Results

- People Movement Calculator Outputs
- LinSig Traffic Modelling Results

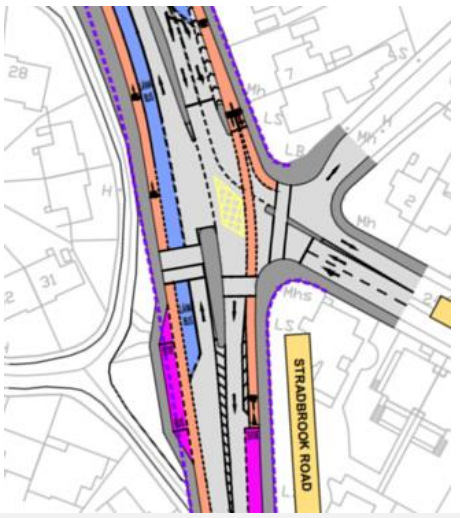
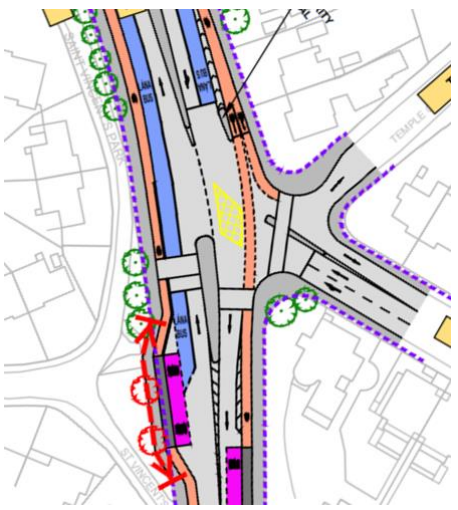
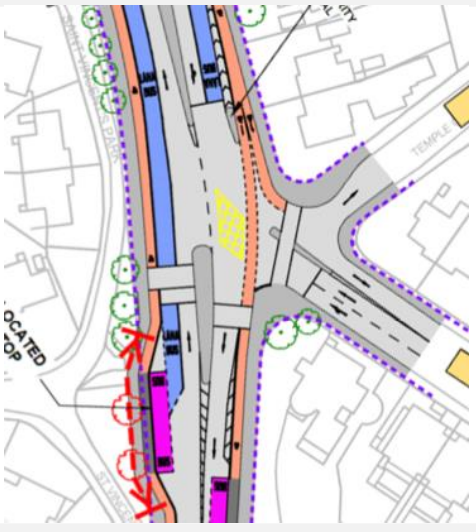
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Temple Hill / Temple Crescent

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.
A dedicated on-demand right turn phase for buses only onto Monkstown Road, with detection from northbound general traffic lane will be provided. This Intelligent Transport Systems (ITS) solution proposed for right turning buses is already being employed by Dublin City Council.

Signal Operations
A five stage signal operation is proposed – mainline traffic, buses and cyclists on the southern approach will run for three stages, with cyclists followed by buses and then the mainline traffic on the northern approach will operate separately. The side arm will operate in its own stage, followed by pedestrians and cyclists on the toucan crossings.

Junction Type 1 Bus delay ≤ 65s

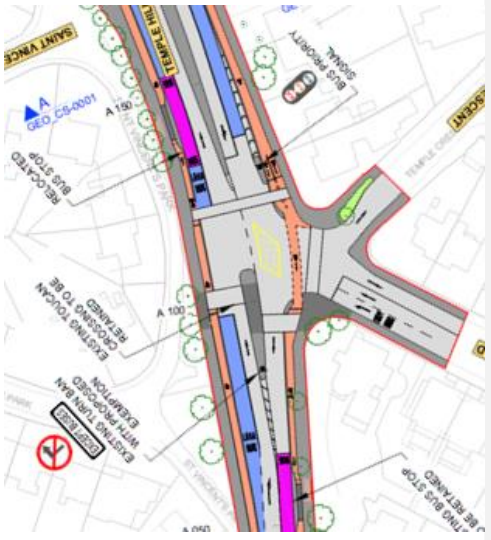
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. One traffic lane inbound converted into bus lane through junction.	1. In keeping with BusConnects design principles.	1. Reallocation of road space to bus lane
DRAFT PRO (PC2)		1. Bus lanes brought to stop line with left turners turning from general traffic lane	1. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles.	1. Improved bus priority, left turning traffic turns from general traffic lane
DRAFT PRO (PC3)		1. Cycle time has been extended to 120 seconds	1. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. The increased cycle time improves capacity at the junction for road users.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Temple Hill / Temple Crescent

EXISTING

FINAL DESIGN



Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Stop lines of bus lanes set back c. 4m. 3. Previously proposed bus stop encroaching into St. Vincent's Park has been relocated to the north of the junction. A new pedestrian crossing has been introduced on the northern arm. Signalling operation introduced to allow on demand right-turn movement for buses only from Temple Hill onto Monkstown Road. 4. Shared footpath proposed at the corner of Monkstown Road and Stradbrook Road and staggered crossings on Stradbrook arm to be retained as Toucan crossings. 5. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 3. Bus stop location assessed following public consultation submissions and moved in order to better integrate with existing and proposed bus routes at this junction. Pedestrian crossing introduced to provide connectivity to the new bus stop location. 4. To provide connectivity across the junction to the CBC cycle facilities for inbound cyclists travelling from Monkstown Road to Temple Hill.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Amendments to line markings. 3. Junction design and staging update accordingly. No land take now proposed into St. Vincent's Park. 4. Improved legibility and safety for the inbound cycle movement between Monkstown Road and Temple Hill.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
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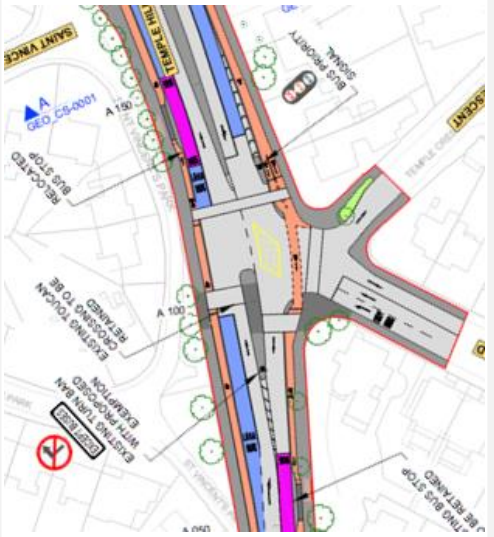
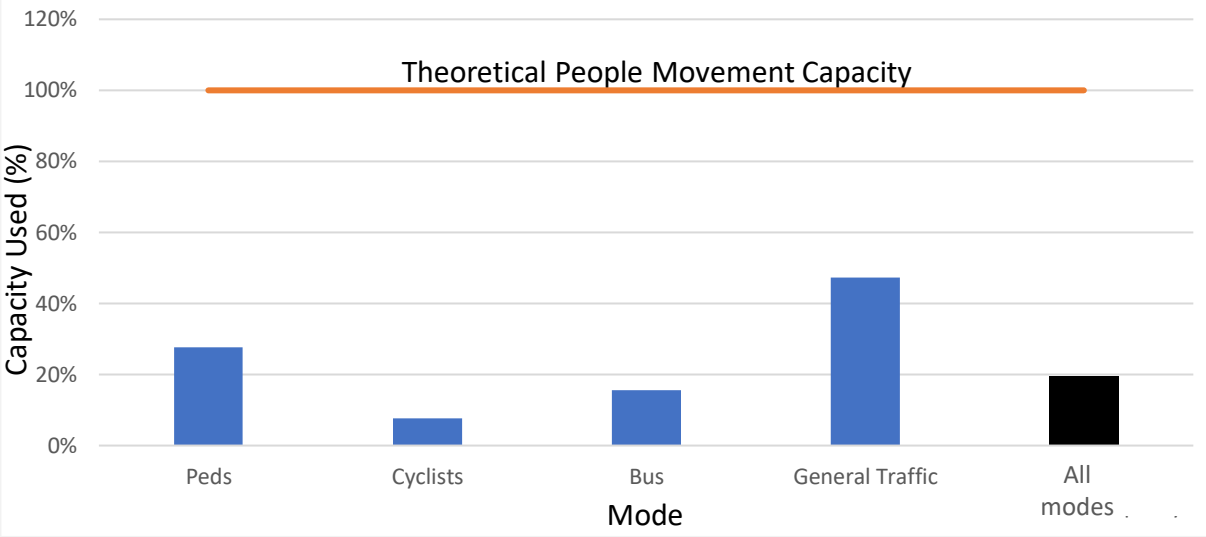
Temple Hill / Temple Crescent

Capacity / Delay

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

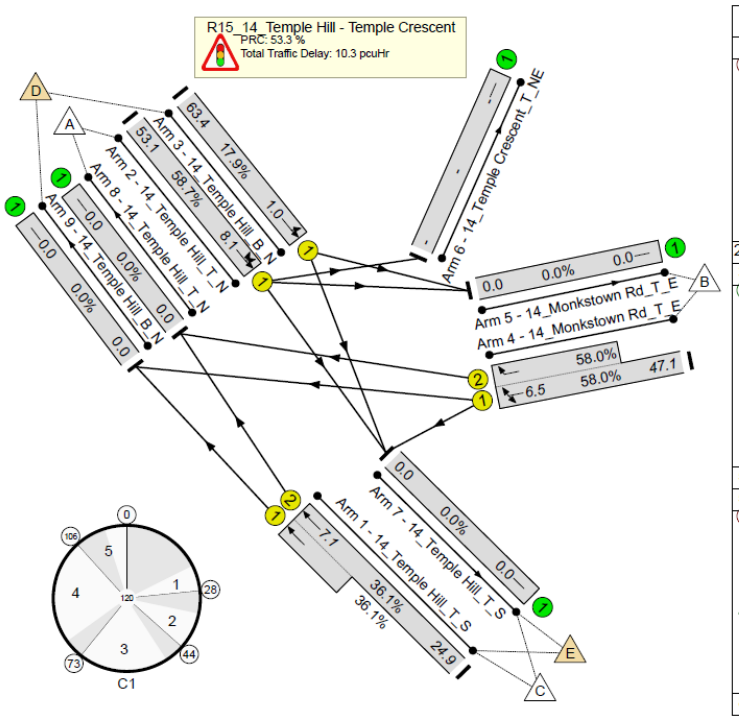


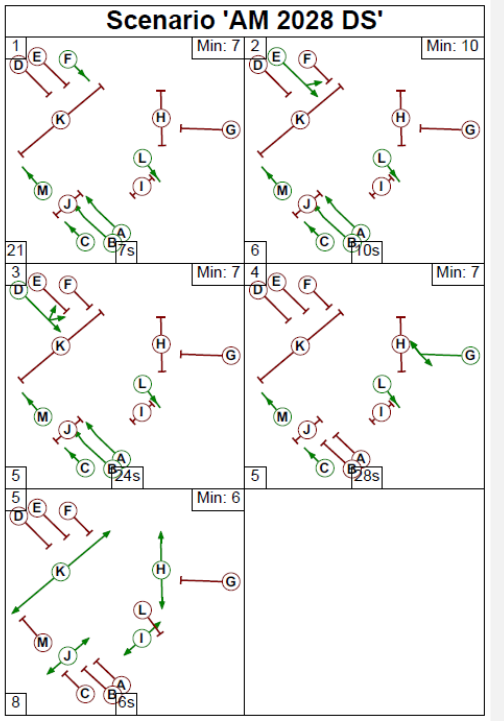


Do Something : 2028 : AM

Cycle = 120 sec
PRC = 53%
Delay = 10 pcuHr

Bus delay
Inbound = 25s
Outbound = 63s

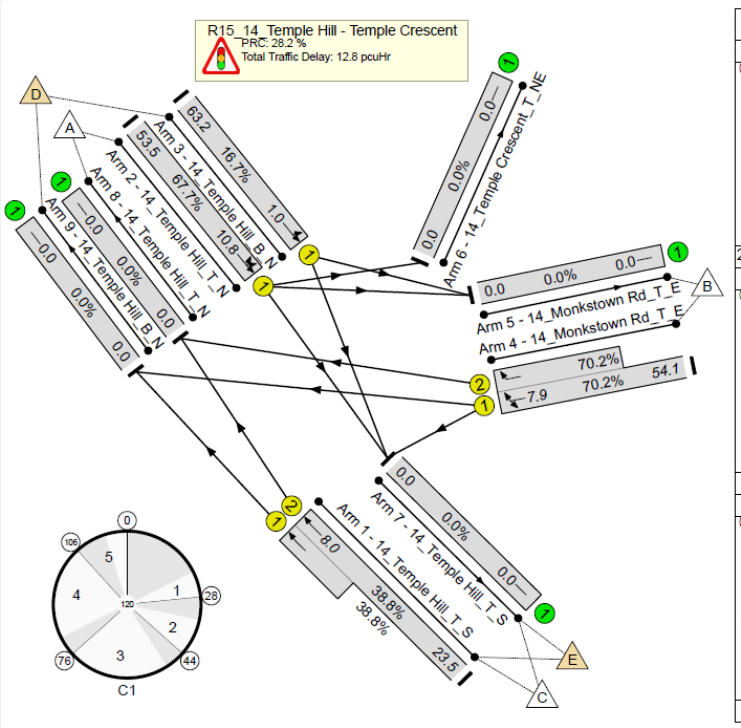


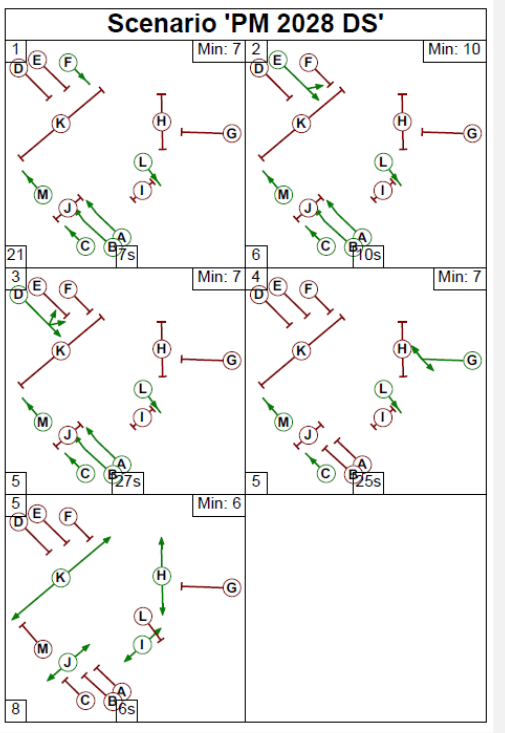


Do Something : 2028 : PM

Cycle = 120 sec
PRC = 28%
Delay = 13 pcuHr

Bus delay
Inbound = 24s
Outbound = 63s





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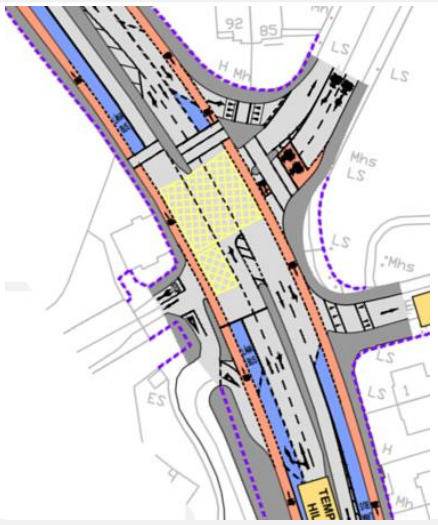
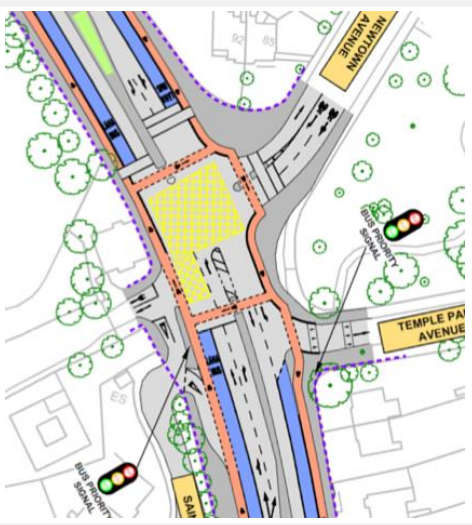
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Temple Hill / Newtown Avenue

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The segregated left turn lane will be removed to simplify the pedestrian movements. The pedestrian crossing on the western arm will be retained as a staggered crossing; however, the orientation will be reversed from existing. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A six stage signal operation is proposed. Buses and cyclists will operate in the same stage as mainline straight-ahead traffic on the southern arm. Buses and straight-ahead traffic will continue on the southern arm with the right turning traffic into Newtown Avenue to run unopposed. The northern arm mainline traffic will require its own stage due to left turning traffic conflicting with buses. The side roads will operate in separate stages, followed by pedestrians and cyclists turning right towards the side roads.

Junction Type 1 Bus delay ≤ 65s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. One traffic lane in each directions converted into bus lane through junction.	1. In keeping with BusConnects design principles.	1. Reallocation of road space to bus lane
DRAFT PRO (PC2)		1. Left Turn slip lane to Newtown Avenue removed. 2. Stagger crossing on western arm converted to single straight across crossing 3. Protected Junction for cyclists introduced with dedicated crossings on all arms. 4. Bus lanes brought to stop line with left turners turning from general traffic lane	1. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. 2. To reduce overall crossing width per single crossing for pedestrians and offer the opportunity to cross in separate stages. 3. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. 4. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles.	1. Improved cyclist safety at the junction. 2. Improved pedestrian safety and junction operation 3. Improved cyclist safety at the junction. 4. Improved bus priority, left turning traffic turns from general traffic lane
DRAFT PRO (PC3)		1. Pedestrian crossing on the western arm was converted to a staggered crossing, yet in the revered orientation compared to the existing. 2. Cycle time has been extended to 120 seconds to match the requirements of the entire Rock Road corridor.	1. To reduce overall crossing width per single crossing for pedestrians and to make use of wide median as refuge area due to expected level of pedestrians crossing. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. Reduced queuing length on eastbound approach with improved pedestrian environment 2. Outbound cycle phase split between two stages, rearrangement possible by placing stage 3 in front of Stage 1. Existing right turning lane from Temple Hill into Newtown matches the existing length, there will be a requirement to extend the green time for this movement as the right turn lane does not have sufficient capacity

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Temple Hill / Newtown Avenue

EXISTING

FINAL DESIGN

Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Stop lines of bus lanes set back c. 4m. 4. Shared table-top entry treatment arrangement introduced at the entrance to St. Vincent's Park. 5. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 4. Current pedestrian provision is below standard, i.e. the desire line for pedestrians across the entrance to St. Vincent's Park lacks any pedestrian priority.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within the public realm at the junction. 3. Amendments to line markings. 4. Traffic calming introduced at pedestrian desire line and improvement to overall pedestrian safety.

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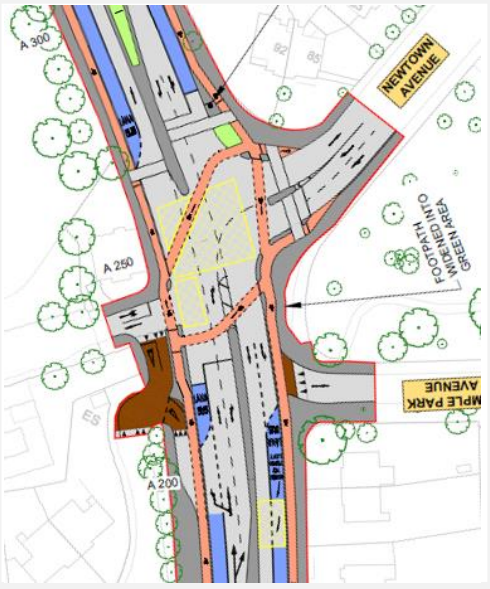
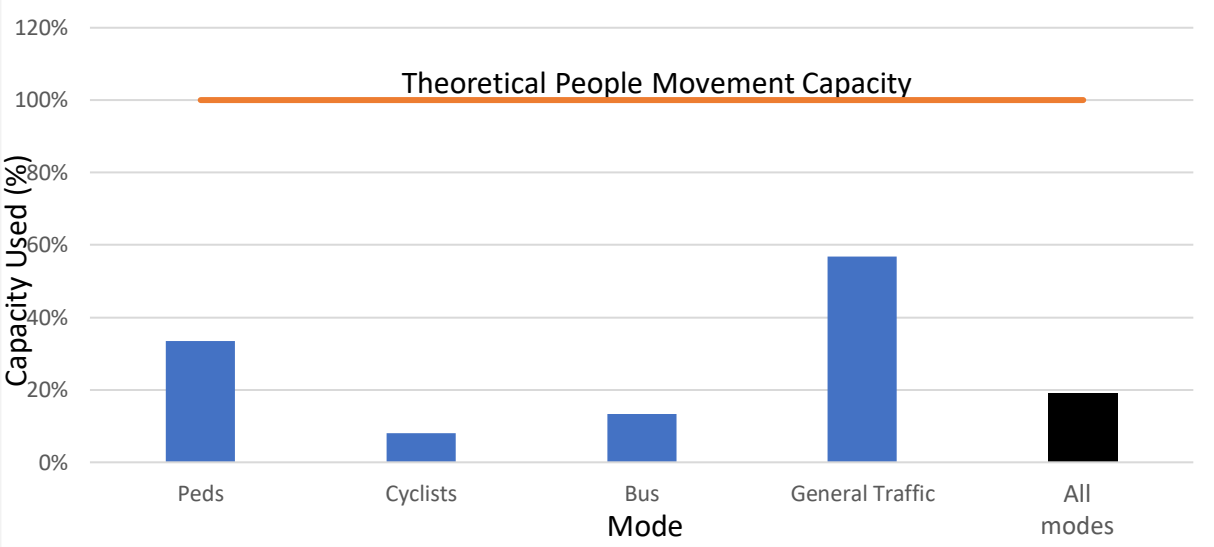
Temple Hill / Newtown Avenue

Capacity / Delay

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

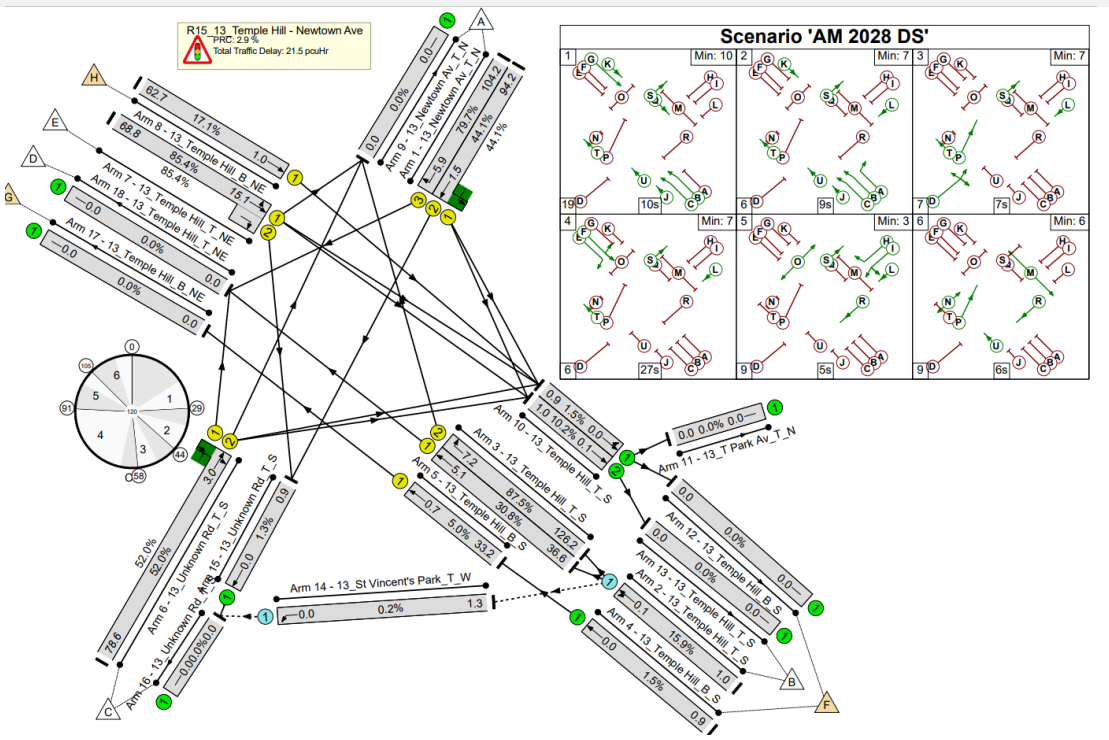




Do Something : 2028 : AM

Cycle = 120 sec
PRC = 3%
Delay = 22 pcuHr

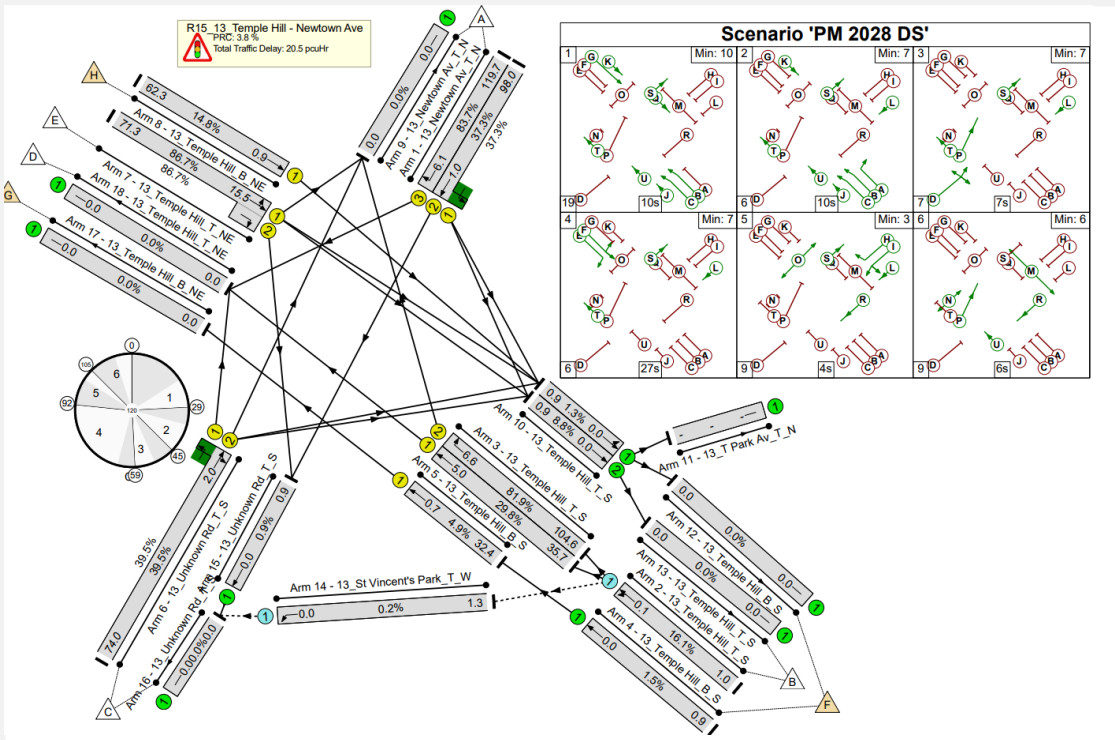
Bus delay
Inbound = 1s
Outbound = 63s



Do Something : 2028 : PM

Cycle = 120 sec
PRC = 4%
Delay = 21 pcuHr

Bus delay
Inbound = 1s
Outbound = 62s



ARUP

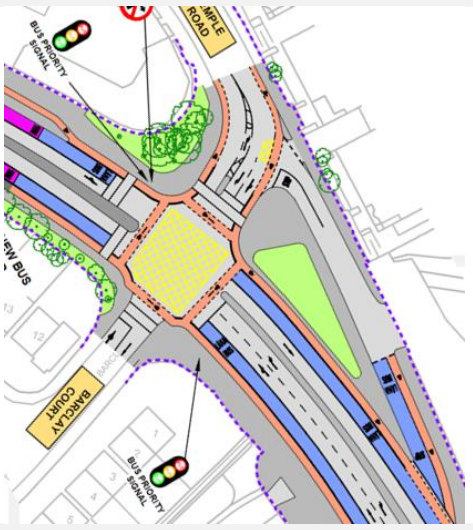
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Frascati Road / Temple Road

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety. The pedestrian crossing on the western arm will be retained as a staggered crossing to align with the existing situation with particular 3D geometrical constraints.

Signal Operation
A six stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction. Mainline straight-ahead and left-turning traffic, and cyclists will operate together, with left turning traffic to give way to cyclists on flashing ambers. Right turning traffic into Temple Road will run unopposed. The side roads will operate separately, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings to operate in their own stage.

Junction Type 1 Bus delay ≤ 65s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. One traffic lane in each directions converted into bus lane through junction. 2. Cycle facilities introduced on Temple Road and through the junction	1. In keeping with BusConnects design principles. 2. In keeping with BusConnects design principles.	1. Reallocation of road space to bus lane 2. Improved cycle provision
DRAFT PRO (PC2)		1. Protected Junction for cyclists introduced with dedicated crossings on all arms. 2. Bus lanes brought to stop line with left turners turning from general traffic lane	1. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. 2. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles.	1. Improved cyclist safety at the junction. 2. Improved bus priority, left turning traffic turns from general traffic lane
DRAFT PRO (PC3)		1. No significant changes	1. N/A	1. N/A

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Frascati Road / Temple Road

EXISTING

FINAL DESIGN

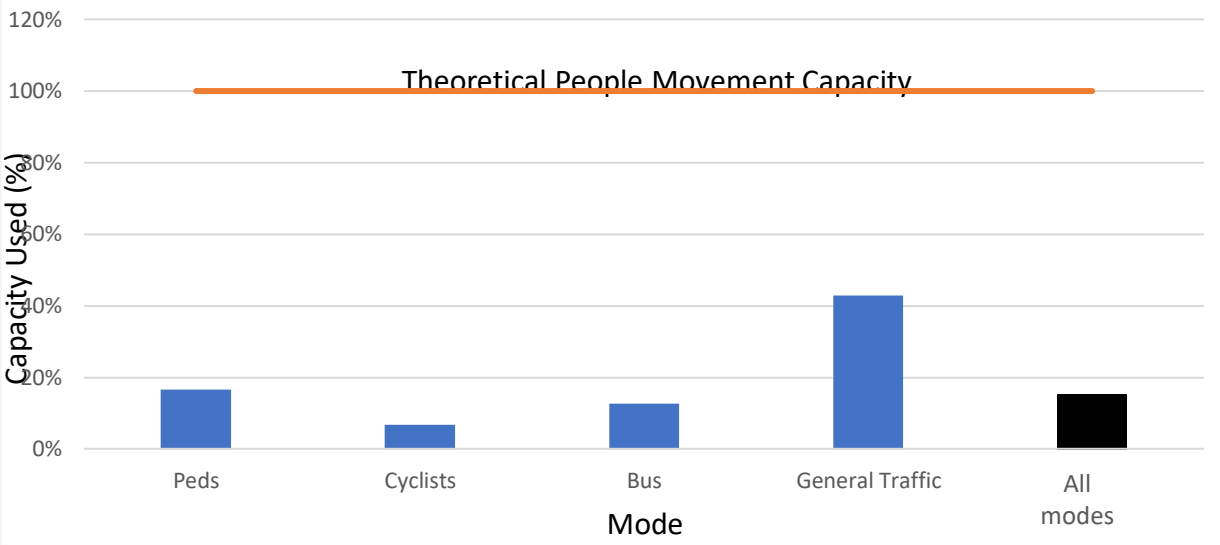
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Cycle track at north west corner of the junction to remain on road. 3. Cycle time has been extended to 120 seconds to match the requirements of the entire Rock Road corridor. 4. Staggered orientation on outbound arm reversed 5. Exit from Temple Road onto junction with Frascati Road (northern arm) reduced from 2 lanes to one shared, all-movements lane. 6. Advance Stacking Location (ASL) for cyclists provided on Barclay Court arm. 7. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. Swept path analysis carried out required proposed kerb alignment. 3. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase. 4. To match existing arrangement with consideration for 3D alignment constraints. 5. Provides more flexibility for swept path of left turners from Frascati Road to temple Road. 6. No space available to provide cycle lane on approach to junction.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Right turning cyclists from Barclay Court to wait on road. Central median on Temple Road arm removed. 3. The increased cycle time improves capacity at the junction for road users. 4. Reduction in extent of reconstruction required at the median. 5. Enables the introduction of protection kerb on the north-western corner of junction. 6. Enables the competent cyclists from the side arm to position themselves ahead of the vehicular traffic and cycle through the junction.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Frascati Road / Temple Road

Capacity / Delay

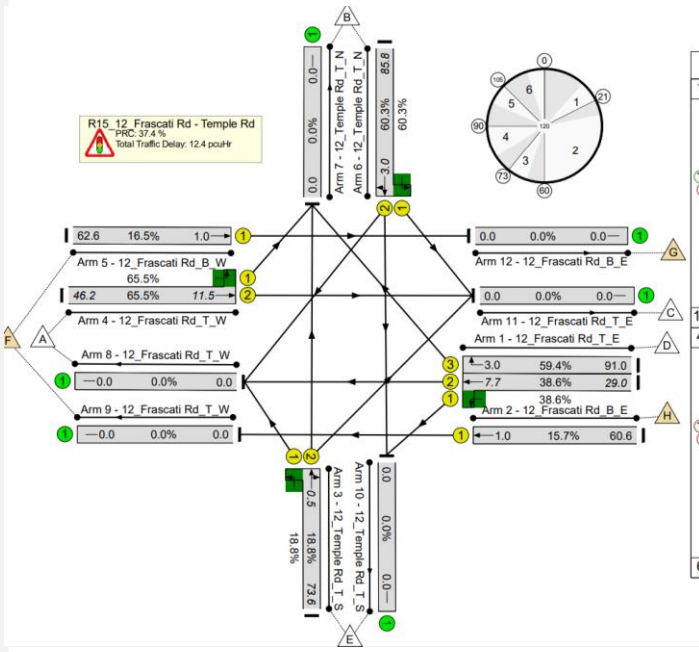
1. Junction operates within capacity.
2. Bus delay is <65s on average.

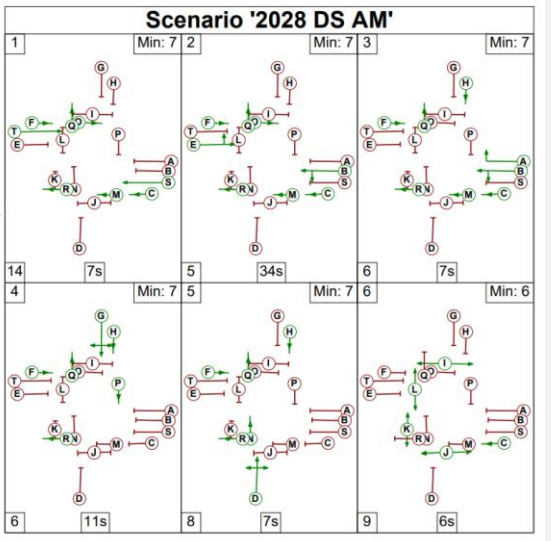


Do Something : 2028 : AM

Cycle = 120 sec
PRC = 37%
Delay = 12 pcuHr

Bus delay
Inbound = 61s
Outbound = 63s

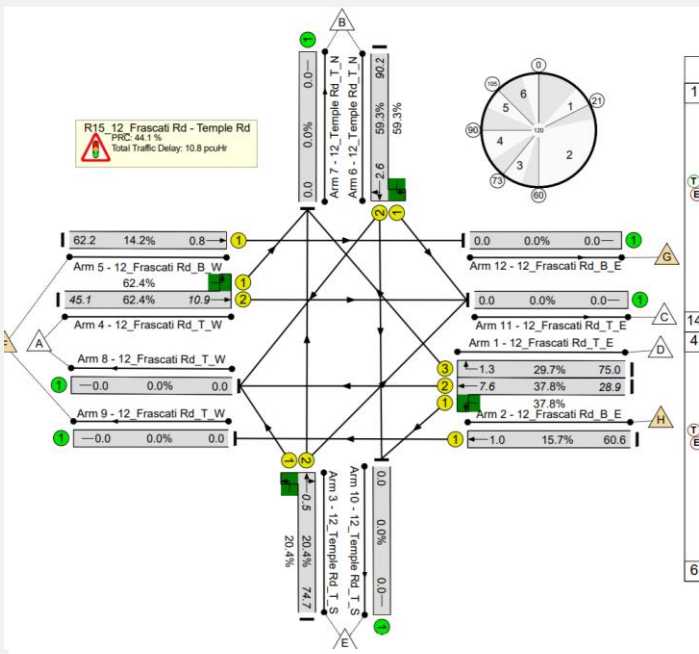


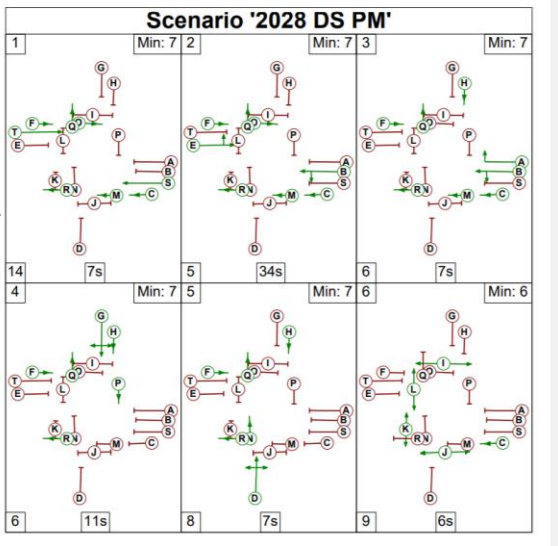


Do Something : 2028 : PM

Cycle = 120 sec
PRC = 44%
Delay = 11 pcuHr

Bus delay
Inbound = 61s
Outbound = 62s





ARUP

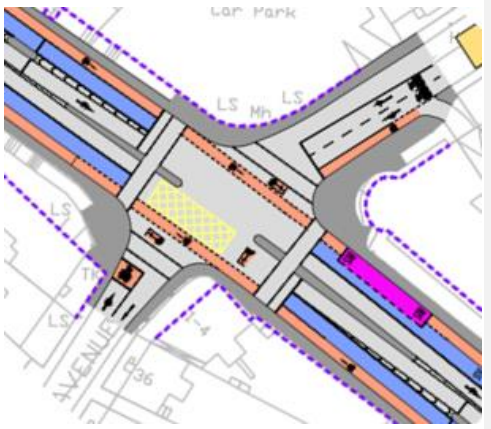
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Frascati Road / Carysfort Avenue

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A five stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction. This will be followed by mainline straight-ahead and left-turning traffic and cyclists operating together, with left turning traffic to give way to cyclists on flashing ambers. The side roads will operate separately, with left turning traffic to give way to cyclists on flashing ambers. 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. One traffic lane in each directions converted into bus lane through junction.	1. In keeping with BusConnects design principles.	1. Reallocation of road space to bus lane
DRAFT PRO (PC2)		1. Protected Junction for cyclists introduced with dedicated crossings on all arms. 2. Bus lanes brought to stop line with left turners turning from general traffic lane 3. Road marking on outbound arm updated to reflect right turn ban onto Carysfort Avenue	1. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. 2. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. 3. To reflect existing allowable traffic movements	1. Improved cyclist safety at the junction. 2. Improved bus priority, left turning traffic turns from general traffic lane 3. Road markings updated
DRAFT PRO (PC3)		1. No significant changes	1. N/A	1. N/A

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Frascati Rd / Carysfort Avenue

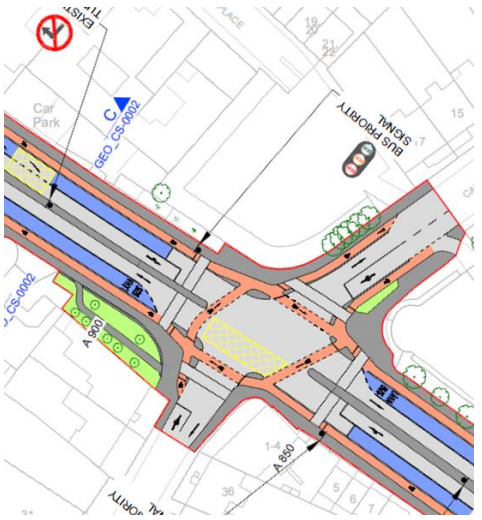
	Change Made	Reason for Change	Impact of Change
EXISTING			
FINAL DESIGN	1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Cycle time has been extended to 120 seconds to match the requirements of the entire Rock Road corridor. 3. Exit from Carysfort Avenue (north-east) onto junction with Frascati Road reduced from 2 lanes to one shared, all-movements lane. 4. Advance Stacking Location (ASL) for cyclists provided on Carysfort Avenue (south-west) arm. 5. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase. 3. Provides more space for a cycle track from junction into side arm and flexibility for swept path of left turners from Frascati Road. 4. No space available to provide cycle lane on approach to junction.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. The increased cycle time improves capacity at the junction for road users. 3. Improves cycle provision to and from side arm and improves the protection kerb on that corner of junction. 4. Enables the competent cyclists from the side arm to position themselves ahead of the vehicular traffic and cycle through the junction.

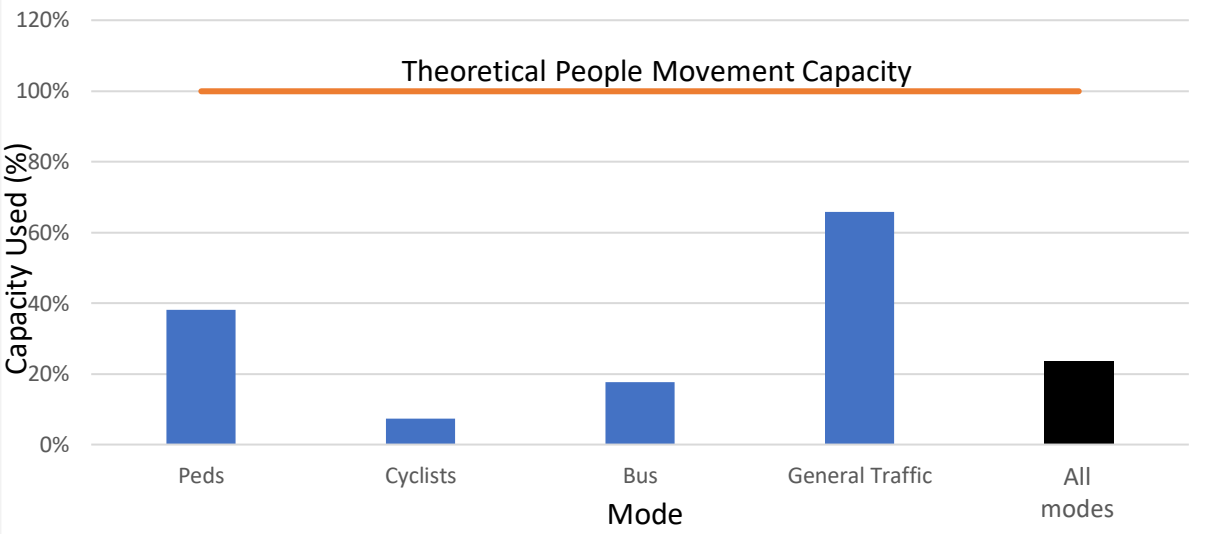
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Frascati Road / Carysfort Avenue

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <90s on average.

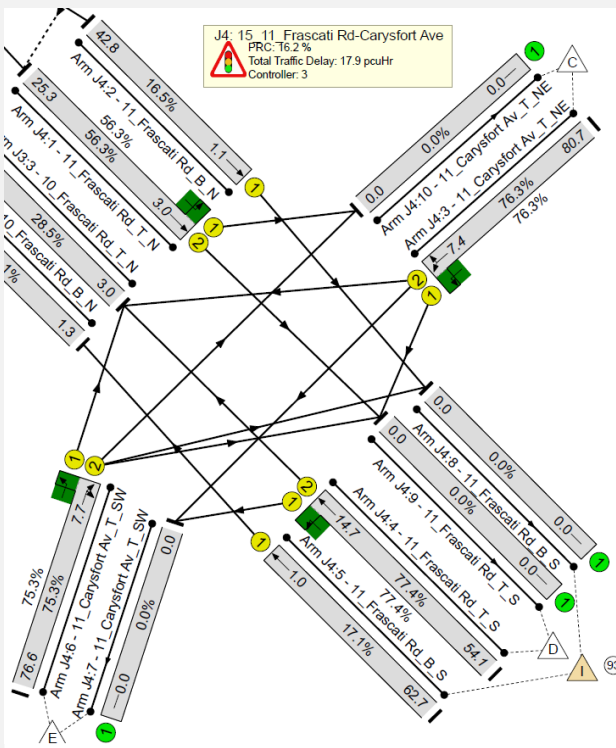


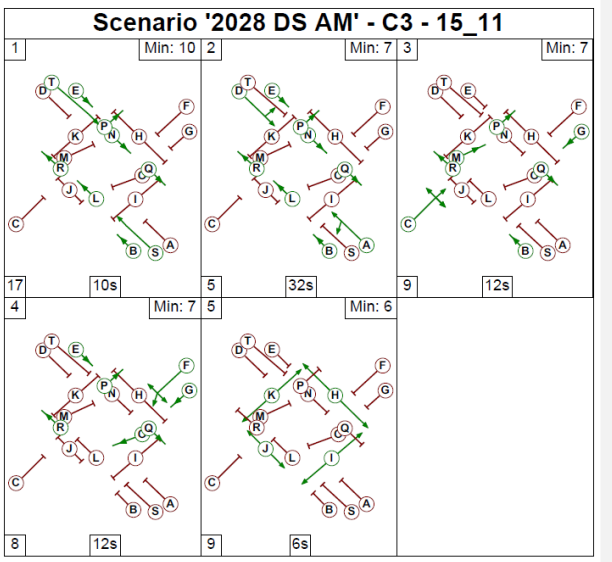


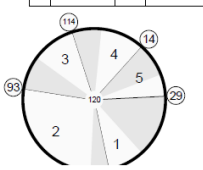
Do Something : 2028 : AM

Cycle = 120 sec
PRC = 16%
Delay = 18 pcuHr

Bus delay
Inbound = 62s
Outbound = 43s



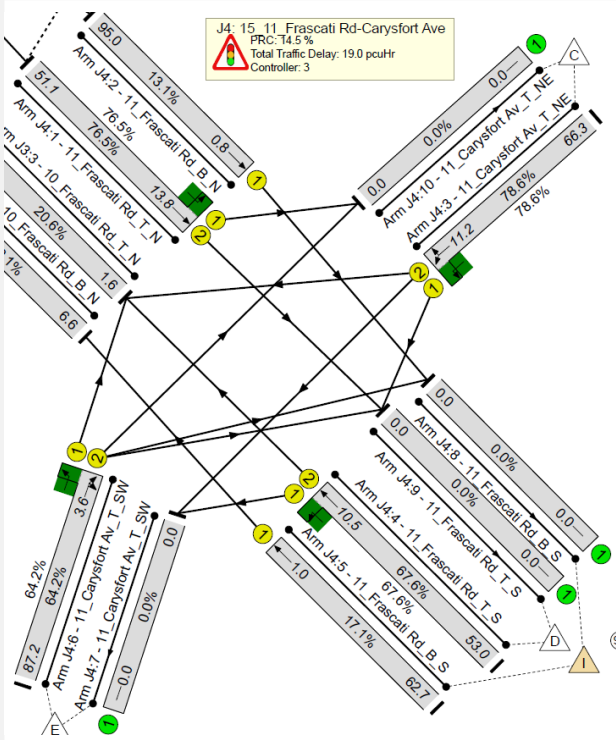


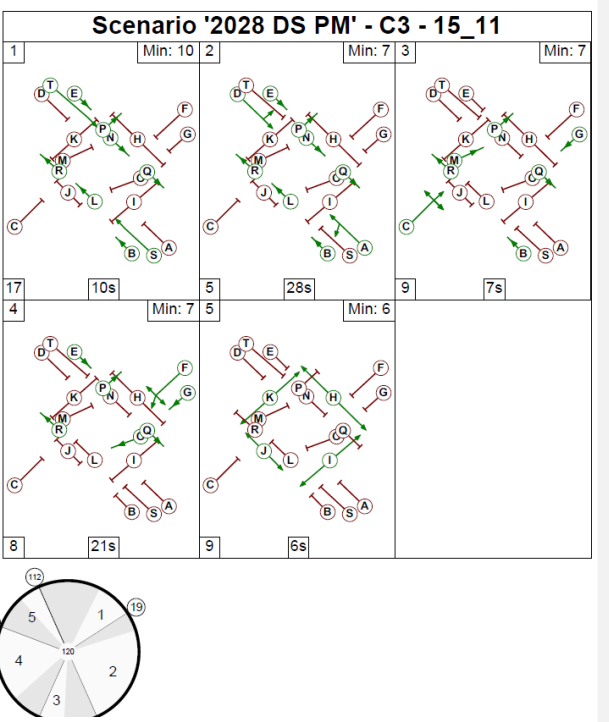


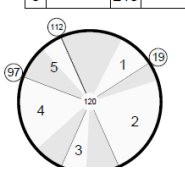
Do Something : 2028 : PM

Cycle = 120 s
PRC = 15%
Delay = 19 pcuHr

Bus delay
Inbound = 63s
Outbound = 95s







ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Rock Hill

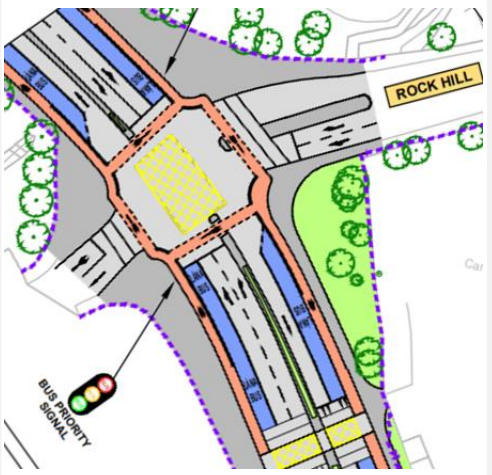
Summary

Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of left turn lanes and flared entries into the junction. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety. Following review of consultation submissions and existing arrangement, the egress from Frascati Shopping Centre will be amended to two exit lanes and an existing left turn ban into Frascati Shopping Centre from Rock Road will be included.

Signal Operation

A six stage signal operation is proposed. Mainline buses and cyclists in both directions, and straight-ahead traffic on the southern approach will operate within the same stage through the junction. The southern approach will continue with right turning traffic to run unopposed. Mainline traffic from the northern approach will operate in its own stage and the side roads to operate separately, with left turning traffic to give way to cyclists on flashing ambers. 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. One traffic lane in each directions converted into bus lane through junction.	1. In keeping with BusConnects design principles.	1. Reallocation of road space to bus lane
DRAFT PRO (PC2)		1. Left Turn slip lane to Rock Hill removed. 2. Protected Junction for cyclists introduced with dedicated crossings on all arms. 3. Bus lanes brought to stop line with left turners turning from general traffic lane	1. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. 2. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. 3. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles.	1. Improved cyclist safety at the junction. 2. Improved cyclist safety at the junction. 3. Improved bus priority, left turning traffic turns from general traffic lane
DRAFT PRO (PC3)		1. Egress from Frascati Shopping Centre amended to two exit lanes and existing left turn ban from Rock Road introduced	1. Following Public Consultation Submission to accurately reflect existing situation.	1. Additional egress lane added to arm (and defunct exit further south on Frascati Road removed)

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Rock Hill

EXISTING

FINAL DESIGN

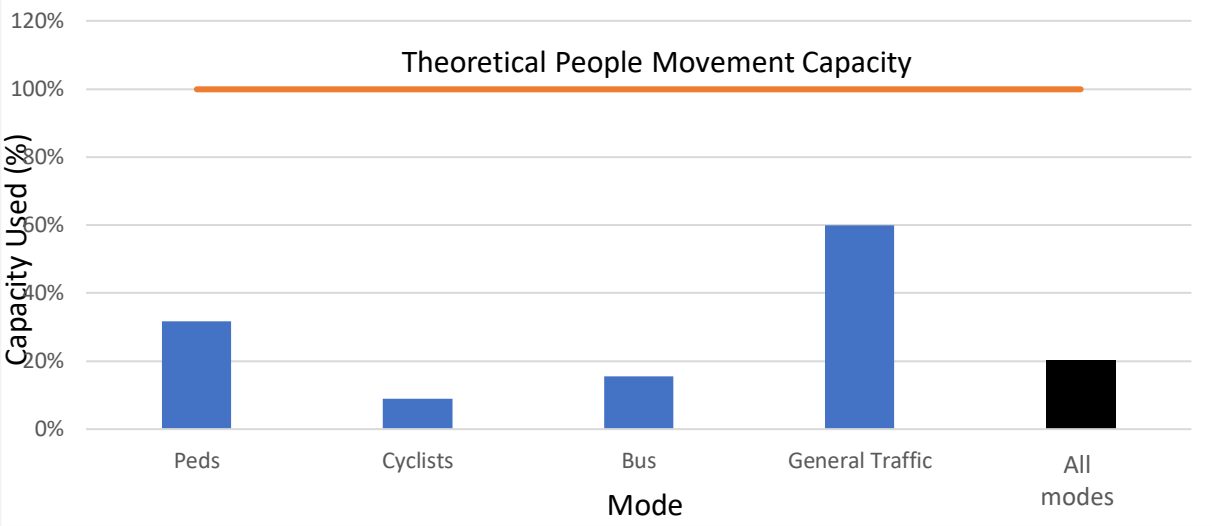
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Cycle time has been extended to 120 seconds to match the requirements of the entire Rock Road corridor. 3. Additional details provided on landscaping proposals in the vicinity of the junction. 4. Stop line of inbound bus lanes set back c. 4m. 5. New Advanced Stacking Location (ASL) from shopping centre arm. 6. Reduction in approach lanes to junction on Rock Hill Road from 2 lanes to one shared, all-movements lane and the provision of cycle stub lanes. 7. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase. 3. To align General Arrangement design with landscaping design. 4. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 5. No space available to provide cycle lane on approach to junction. 6. Better manage cycle movements to and from the side arm.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. The increased cycle time improves capacity at the junction for road users. 3. Soft landscaping proposed within the public realm at the junction. 4. Amendments to line markings. 5. Enables the competent cyclists from the side arm to position themselves ahead of the vehicular traffic and cycle through the junction. 6. Improved cycle provision. 7. Some redistribution of traffic locally onto Stillorgan Park Road, Frascati Park and Sidney Avenue.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Rd / Rock Hill

Capacity / Delay

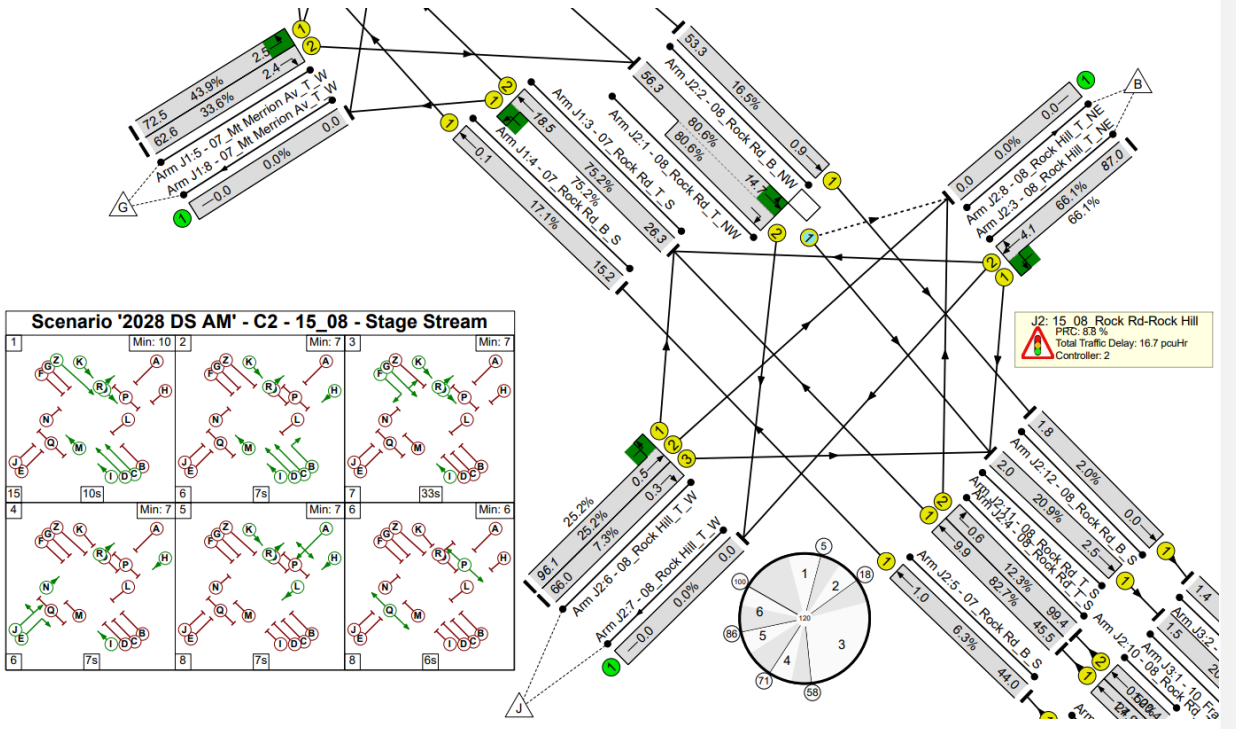
1. Junction operates within capacity.
2. Bus delay is <60s on average.



Do Something : 2028 : AM

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

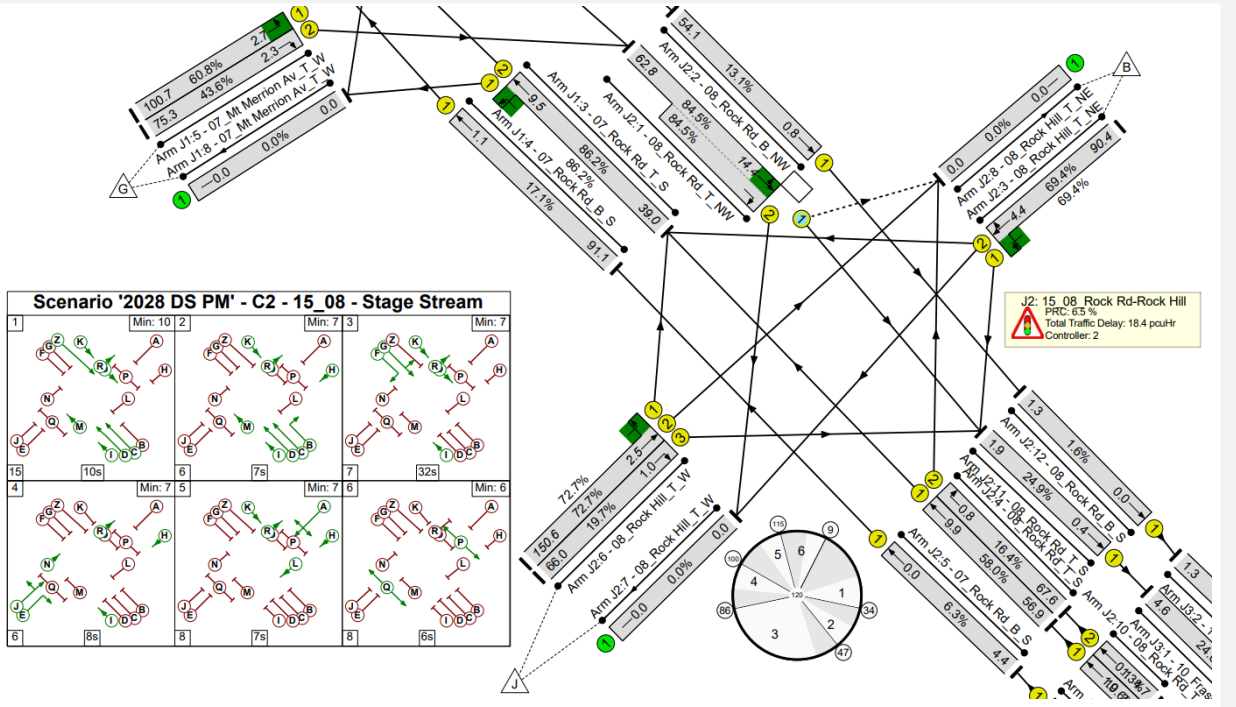
Bus delay
Inbound = 44s
Outbound = 53s



Do Something : 2028 : PM

Cycle = 120 s
PRC = 7%
Delay = 18 pcuHr

Bus delay
Inbound = 4s
Outbound = 54s



ARUP

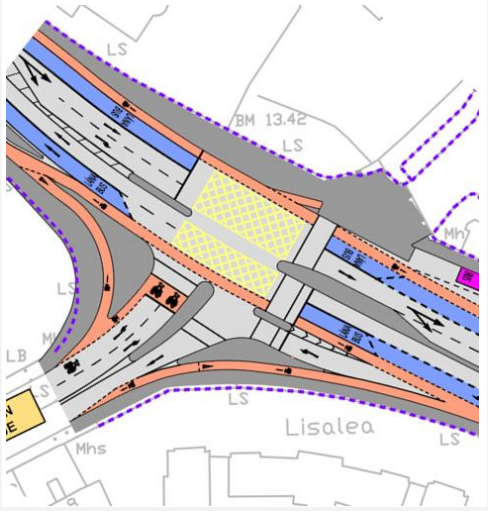
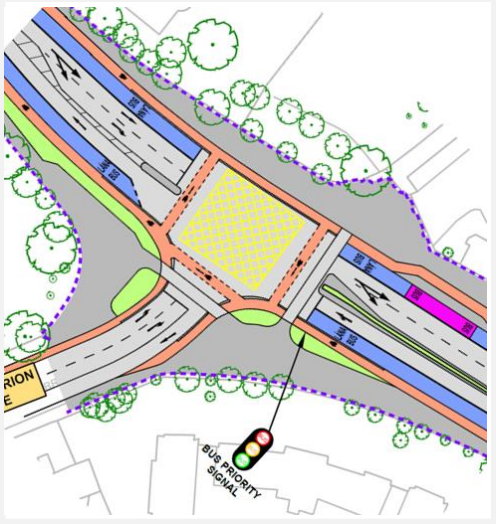
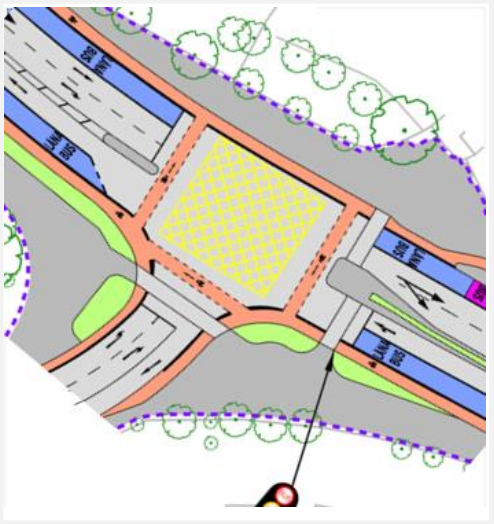
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Mount Merrion Avenue

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic lanes will be reduced and the segregated left turn cycle lanes will be brought tighter into the junction for better cycle provision and dedicated bus infrastructure. The central island on Mount Merrion Avenue approach will be removed along with the left turn slip lane to Mount Merrion Avenue. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety. Subsequently the pedestrian crossing on the western arm will be converted to a staggered crossing.

Signal Operation
A five stage signal operation is proposed. Buses and cyclists will operate in the same stage as mainline straight-ahead traffic on the northern arm. The southern arm mainline traffic will require its own stage due to left turning traffic conflicting with buses. Buses and straight-ahead traffic will continue on the northern arm with the right turning traffic. The side road will operate separately, with left turning traffic to give way to cyclists on flashing ambers, followed by pedestrians and cyclists turning right towards the side road.

Junction Type 1 Bus delay <90s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. One traffic lane in each directions converted into bus lane through junction.	1. In keeping with BusConnects design principles.	1. Reallocation of road space to bus lane. The right turn lanes are generally in line with existing and are expected to be of sufficient length to accommodate the projected level of queuing.
DRAFT PRO (PC2)		1. Central Island on Mount Merrion Avenue approach removed. 2. Left Turn slip lane to Mount Merrion Avenue removed. 3. Protected Junction for cyclists introduced with dedicated crossings on all arms. 4. Bus lanes brought to stop line with left turners turning from general traffic lane.	1. To minimise pedestrian crossing length and maximise space available for public realm. 2. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. 3. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. 4. To bring junction in line with BusConnects Preliminary Design Guidance Booklet principles.	1. Improved pedestrian and cyclist safety at the junction and improved public realm. 2. Improved cyclist safety at the junction. 3. Improved cyclist safety at the junction. 4. Improved bus priority, left turning traffic turns from general traffic lane
DRAFT PRO (PC3)		1. Pedestrian crossing on eastern arm staggered with refuge provided. 2. Cycle time has been extended to 120 seconds to match the requirements of the entire Rock Road corridor.	1. To reduce overall crossing width per single crossing for pedestrians and to make use of wide median as refuge area due to expected level of pedestrians crossing. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. Reduced queuing length on westbound approach with improved pedestrian environment. 2. The increased cycle time improves capacity at the junction for road users.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Mount Merrion Avenue

EXISTING

FINAL DESIGN

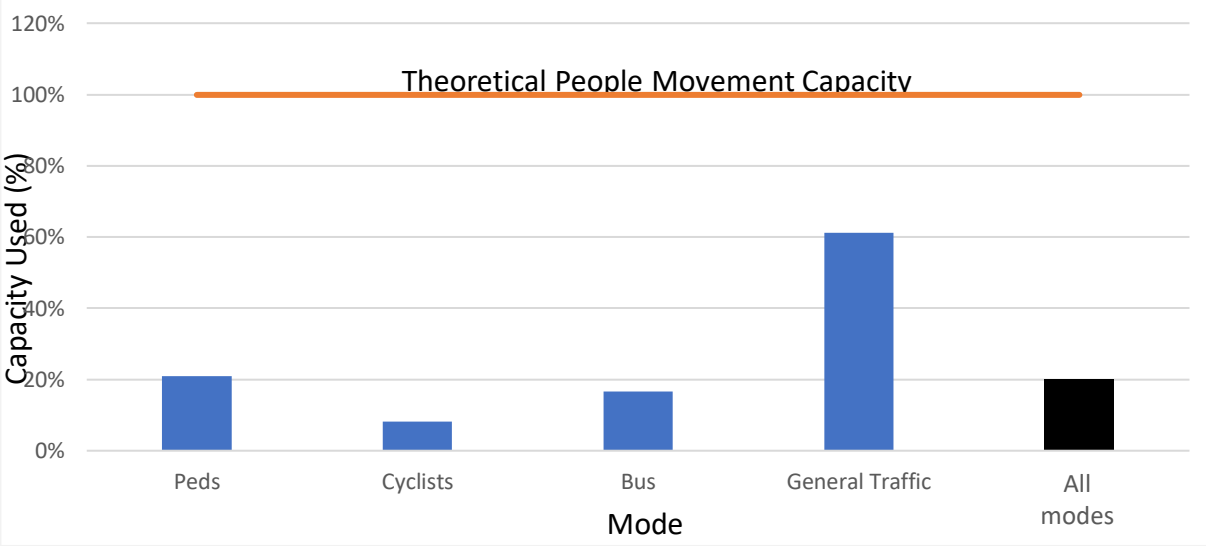
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Stop lines of bus lanes set back c. 4m. 4. The provision of an additional pedestrian crossing on Rock Road. 5. Localised widening of upstand kerb between outbound cycle track and junction as well as dwell zone. 6. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 4. To enhance facilities for pedestrians. 5. Provision for right turning cyclists to Mount Merrion Avenue.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within the public realm at the junction. 3. Amendments to line markings. 4. Better pedestrian accessibility across all arms or junction. 5. Improved junction infrastructure for right turning cyclists.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Mount Merrion Avenue

Capacity / Delay

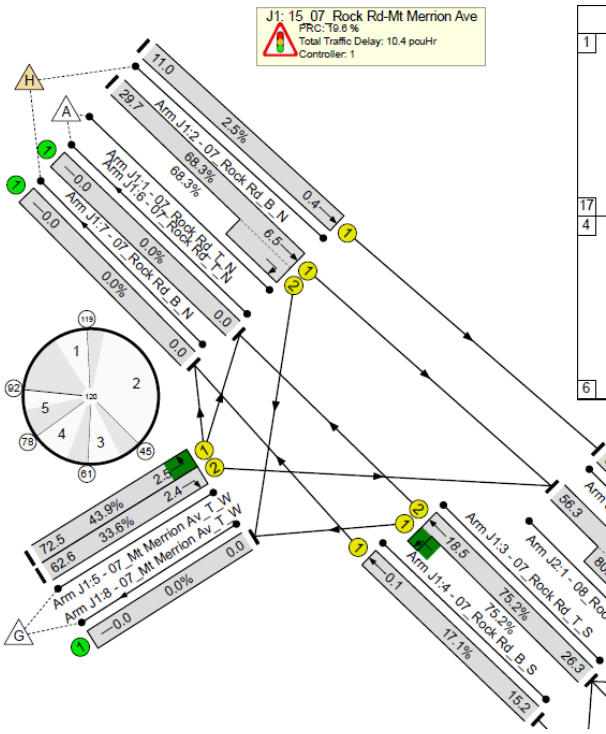
1. Junction operates within capacity.
2. Bus delay is <90s on average.

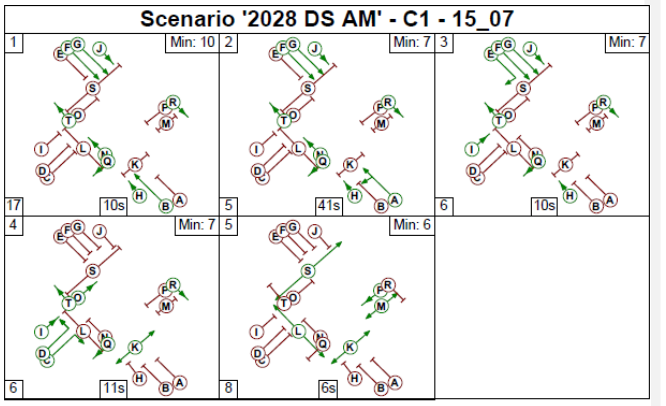


Do Something : 2028 : AM

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

Bus delay
Inbound = 15s
Outbound = 11s

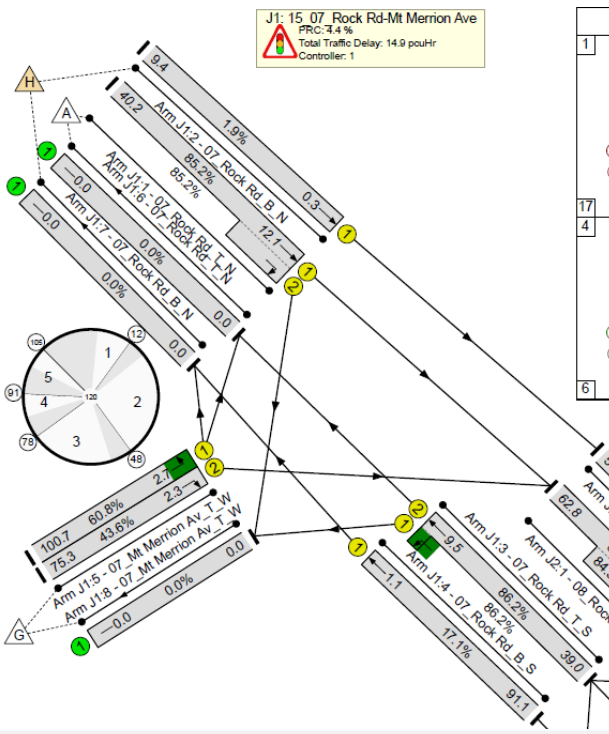


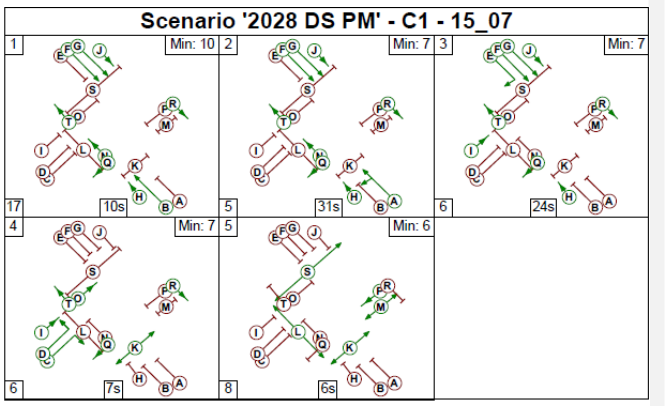


Do Something : 2028 : PM

Cycle = 120 s
PRC = 4%
Delay = 15 pcuHr

Bus delay
Inbound = 91s
Outbound = 9s





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Emmet Square

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The right turn lane into Blackrock Clinic introduced in EPR has been removed in the PRO with all movements from straight ahead lane. The island and hatching on eastern arm has also been removed. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety, as well as reducing land take into adjacent property.

Signal Operation
A five stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction. Mainline traffic and cyclists will operate together, with turning traffic to give way to cyclists on flashing ambers. The side arms will operate separately, followed by pedestrians and cyclists on the toucan crossings.

Junction Type 1 Bus delay ≤ 65s

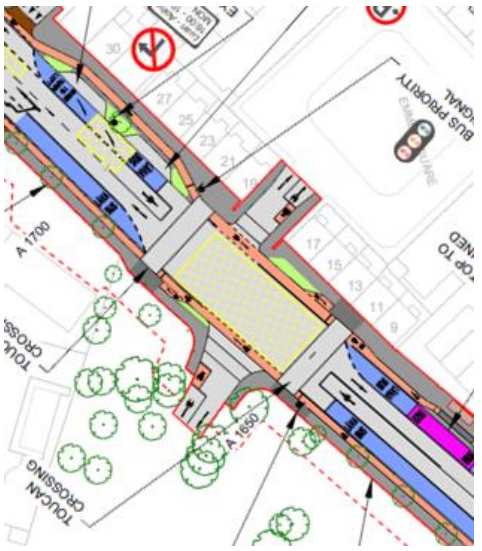
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Cycle facilities introduced inbound/outbound through the junction including two-way cycle track on the eastern side. 2. Dedicated right turn lane into Blackrock Clinic introduced on western arm 3. Single vehicular egress lane provided exiting the clinic	1. In keeping with developing BusConnects design principles regarding cycle infrastructure and to align with strategic cycle route. 2. Improve vehicular accessibility to hospital 3. Consolidate cross section on Clinic arm.	1. To improve cyclist safety through the junction. 2. Wider cross section at junction with associated landtake - with improved vehicular accessibility 3. Reduced impact on adjacent lands with reduced vehicular capacity of egress arm.
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced and dedicated cycle crossings introduced on all arms 2. Bus lanes brought to stop line with left turners turning from general traffic lane 3. Dedicated right turn lane to Blackrock Clinic removed with right turning into both Blackrock Clinic and Emmet Square from general traffic lane. 4. Traffic Island and hatching on eastern arm removed.	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. In line with developing BusConnects Preliminary Design Guidance Booklet principles 3. To reflect existing turning movements and operations, maximising space available for pedestrians and reducing landtake 4. Reducing the junction cross section - maximising space available for pedestrians and reducing landtake	1. Improved cyclist safety and connectivity. 2. Improved bus priority, left turning traffic turns from general traffic lane 3. Improved junction safety and operation and reduced landtake 4. Improved junction safety and operation and reduced landtake
DRAFT PRO (PC3)		1. Cycle time has been extended to 120 seconds to match the requirements of the entire Rock Road corridor.	1. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. The increased cycle time improves capacity at the junction for road users.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Emmet Square

EXISTING

FINAL DESIGN



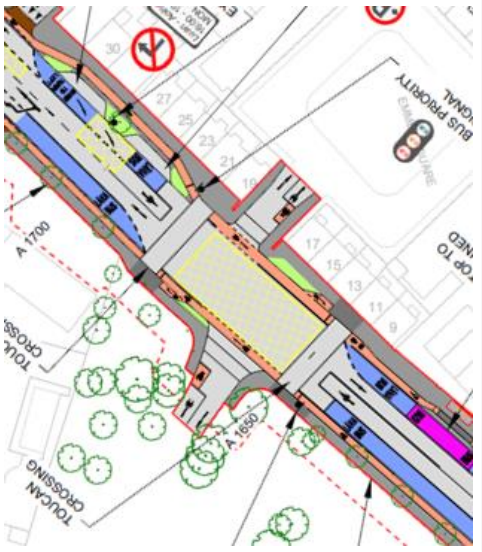
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Stop lines of bus lanes set back c. 4m. 4. New Toucan crossings on mainline and Advanced Stacking Locations (ASLs) from side arms. 5. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 4. No space available to provide cycle lanes on approach to junction from the side arms and due to junciton stagger cyclists crossing the mainline cannot run with the side roads.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within the public realm at the junction. 3. Amendments to line markings. 4. Facility for novice cyclists to use Toucan crossings to get to and from the side arms and competent cyclists to use ASLs to advance through junction.

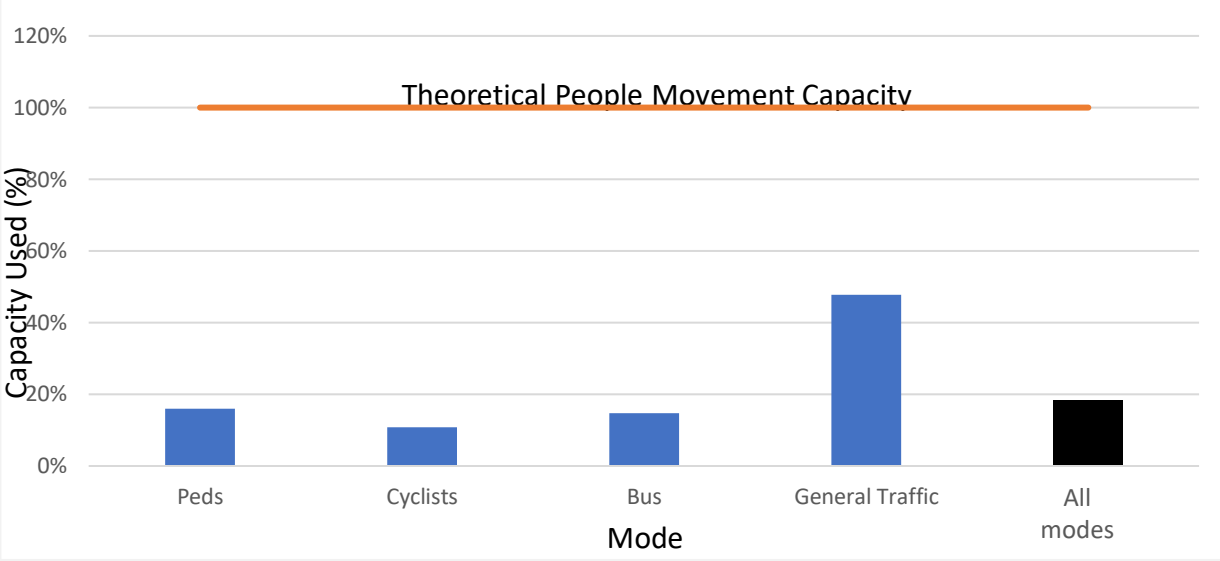
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Emmet Square

Capacity / Delay

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

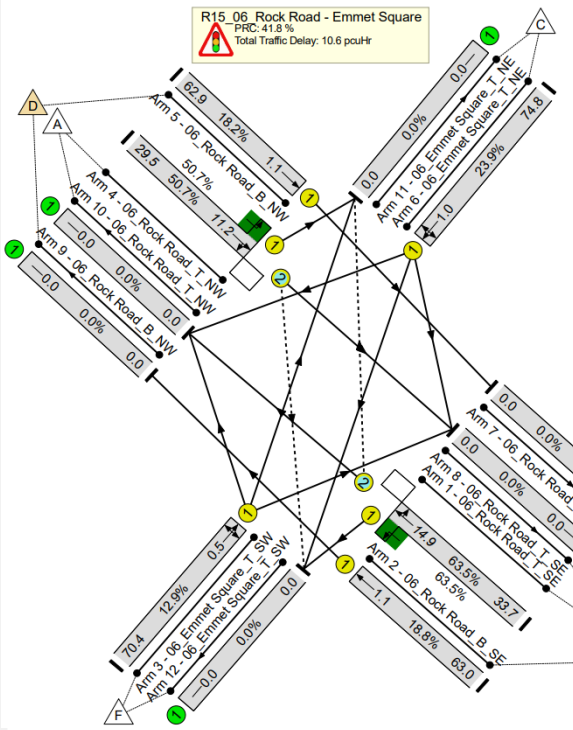


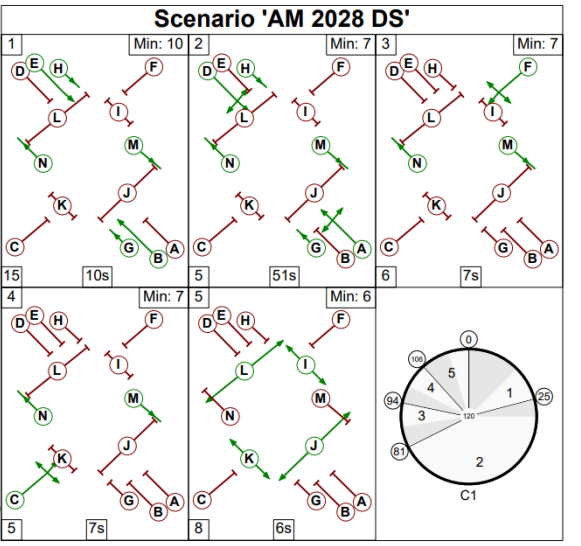


Do Something : 2028 : AM

Cycle = 120 sec
PRC = 42%
Delay = 11 pcuHr

Bus delay
Inbound = 63s
Outbound = 63s

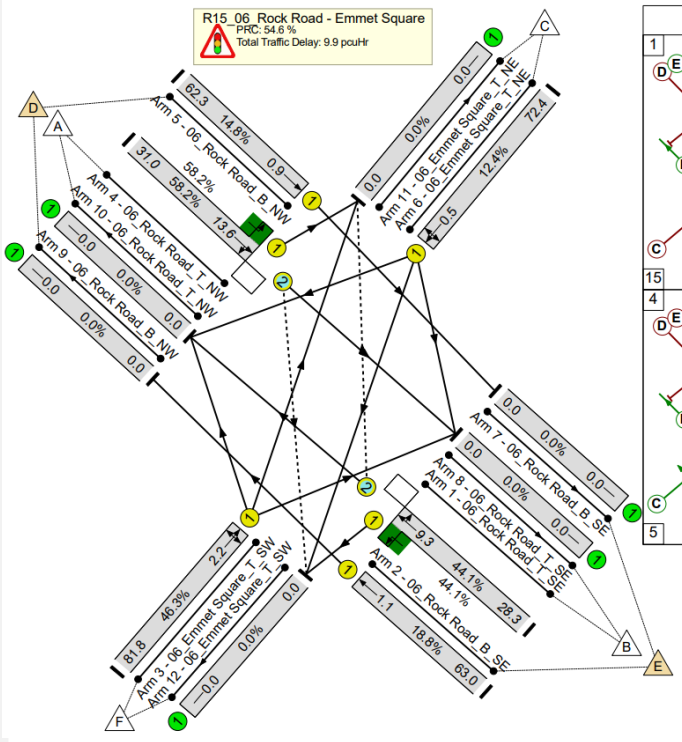


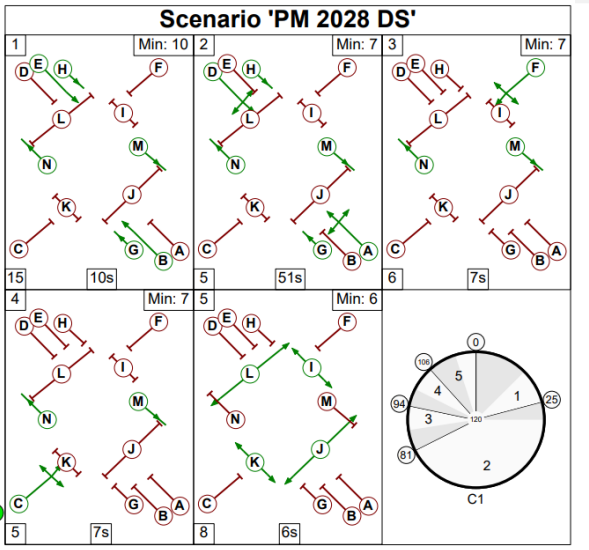


Do Something : 2028 : PM

Cycle = 120 sec
PRC = 55%
Delay = 10 pcuHr

Bus delay
Inbound = 63s
Outbound = 62s





ARUP

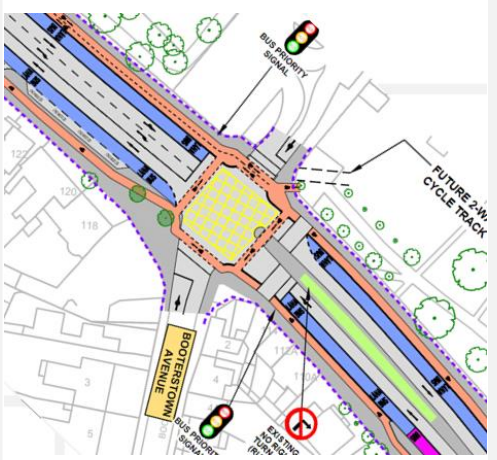
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Booterstown Avenue

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic lanes will be reduced for better cycle provision and dedicated bus infrastructure. The right turn lane to Booterstown Dart Station which was introduced at EPR stage was removed in the development of the PRO – the rationale being to improve junction operation and to reintroduce the pedestrian crossing on this arm, noting that this movement is currently banned. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety. Subsequently the pedestrian crossing on the eastern arm has been reverted back to a staggered crossing to match the existing arrangement.

Signal Operation
A six stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction, followed by mainline straight-ahead and left-turning traffic. Right turning traffic into Booterstown Avenue will run unopposed. The side roads will operate separately, with left turning traffic to give way to cyclists on flashing ambers. 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. Bus lanes introduced on Rock Road arms in place of one general traffic lane in each direction 2. Cycle facilities introduced inbound/outbound through the junction including toucan crossing for the two-way cycle track on the eastern side and Staggered crossing on eastern arm converted to toucan crossing. 3. Dedicated right turn lane added on inbound arm.	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure and to align with strategic cycle route. 3. To allow motorists to turn right into Booterstown DART Station from this approach	1. To improve bus priority through the junction with reduced vehicular capacity 2. To improve cyclist safety through and at the junction and improve cycling connectivity 3. Additional staging requirements and reduced footpath widths, with improved accessibility of train station
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced and dedicated cycle crossings introduced to connect the inbound cycle track with the two cycle track and enable right turning movements. Dedicated two-way crossing on DART Station arm in place of toucan crossing. 2. Inbound bus lane brought to stop line with left turners turning from general traffic lane 3. Right turn lane to Booterstown Dart Station removed. 4. Staggered Pedestrian Crossing across Rock Road re-introduced.	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. In line with developing BusConnects Preliminary Design Guidance Booklet principles 3. To improve junction operation and maximise space available for pedestrians 4. To reduce overall crossing width per single crossing for pedestrians and to make use of existing wide median as refuge area due to expected level of pedestrians crossing.	1. Improved cyclist safety and connectivity. 2. Improved bus priority, left turning traffic turns from general traffic lane 3. Improved junction safety and operation, and additional landscaping opportunities on median. 4. Reduced queuing length on westbound approach with improved pedestrian environment
DRAFT PRO (PC3)		1. No significant changes	1. N/A	1. N/A

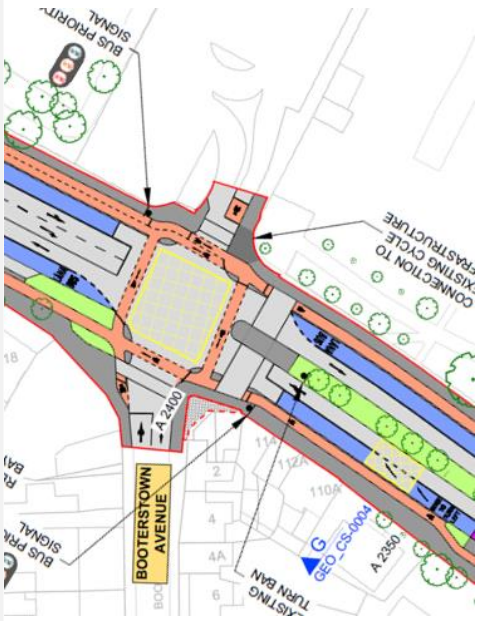
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Booterstown Avenue

EXISTING

FINAL DESIGN



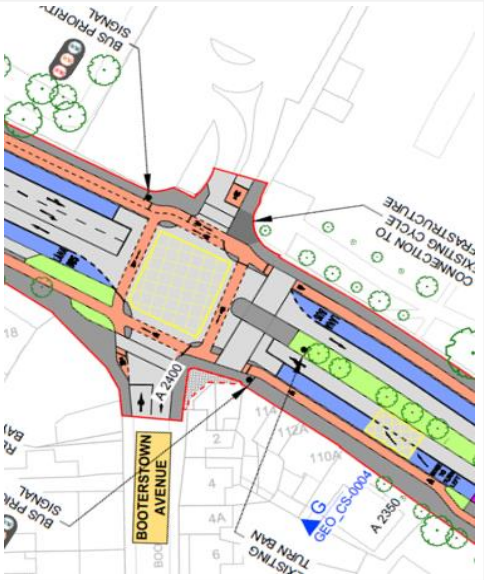
Change Made	Reason for Change	Impact of Change
1. Cycle time has been extended to 120 seconds to match the requirements of the entire Merrion Road corridor and improve junction operation. 2. Connection to the recently introduced Blackrock Park two-way cycle track refined. 3. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 4. Additional details provided on landscaping proposals in the vicinity of the junction. 5. New Advanced Stacking Locations (ASLs) from side arms. 6. Staggered pedestrian crossing replaced with a straight crossing. 7. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase. 2. Improved balance of provision for pedestrians. 3. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 4. To align General Arrangement design with landscaping design. 5. No space available to provide cycle lane on approach to junction. 6. Crossing runs in a single stage	1. The increased cycle time improves capacity at the junction for road users. 2. Improved pedestrian environment. 3. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 4. Soft landscaping proposed within the public realm at the junction. 5. Enables the competent cyclists from the side arm to position themselves ahead of the vehicular traffic and cycle through the junction. 6. Ease of movement for large ped volumes. 7. Change in junction type has resulted in some traffic diverting to alternative routes.

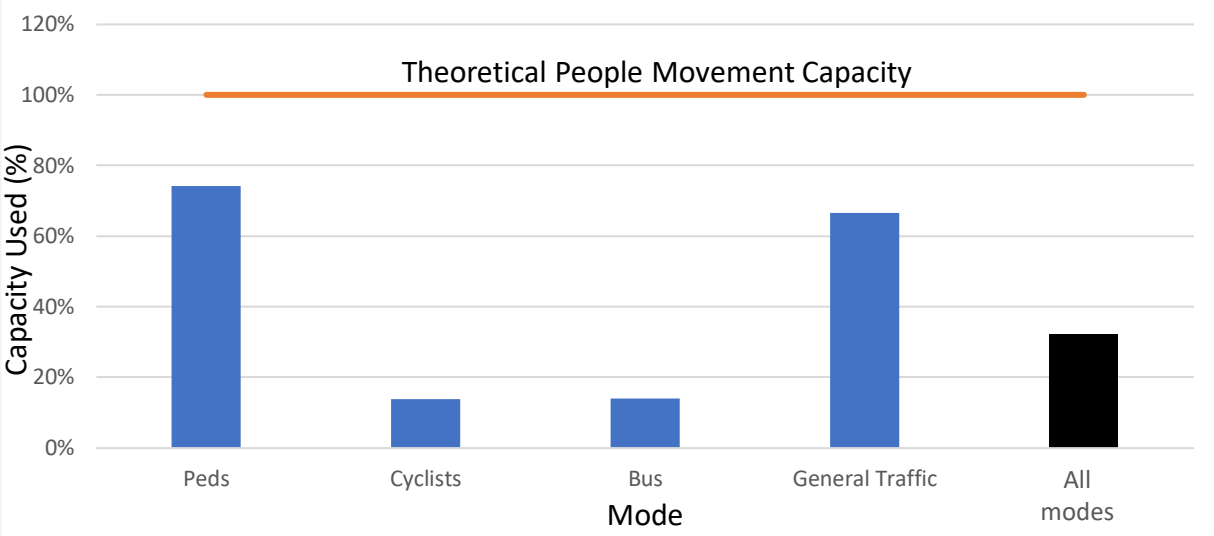
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Booterstown Avenue

Capacity / Delay

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

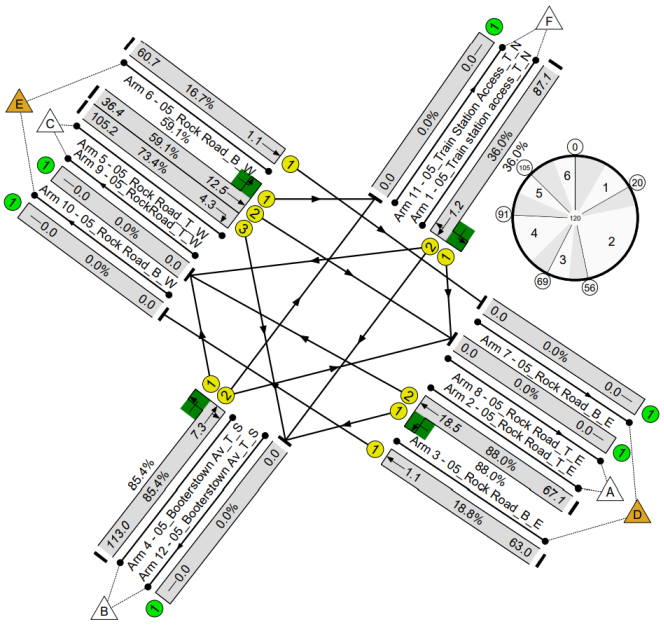


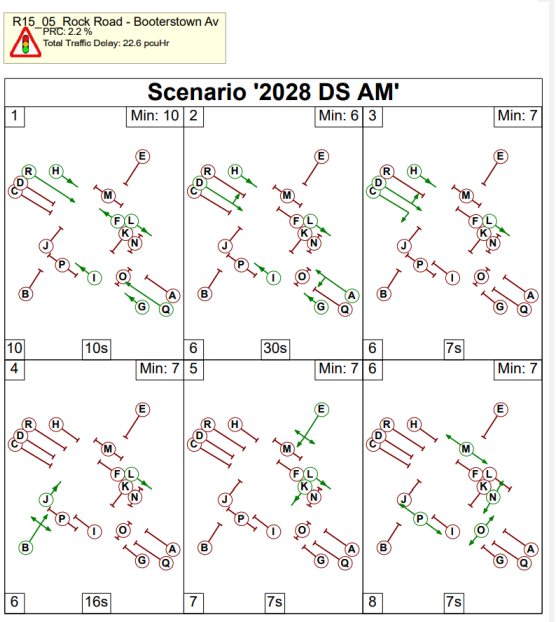


Do Something : 2028 : AM

Cycle = 120 sec
PRC = 2%
Delay = 23 pcuHr

Bus delay
Inbound = 63s
Outbound = 61s

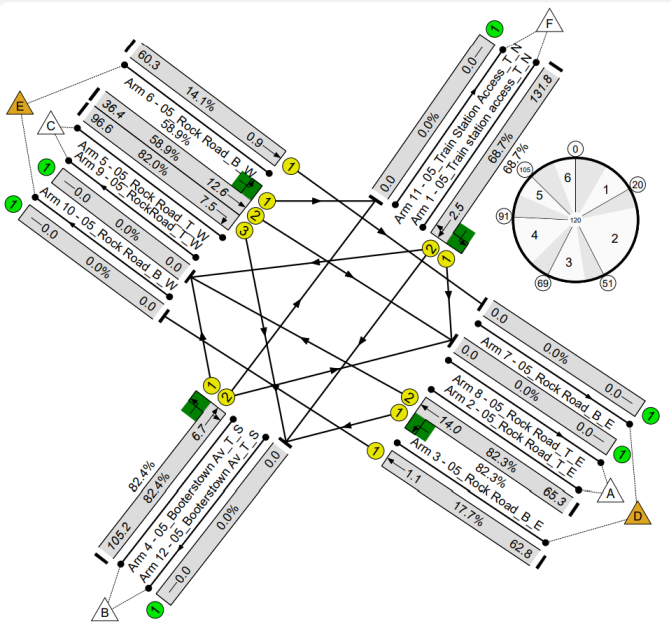


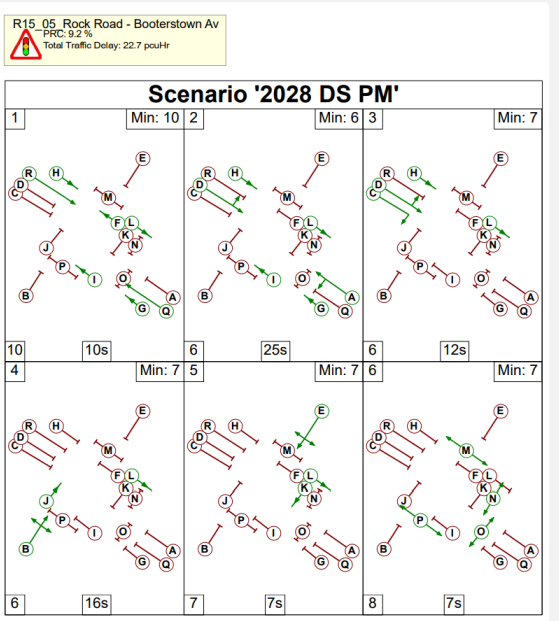


Do Something : 2028 : PM

Cycle = 120 sec
PRC = 9%
Delay = 23 pcuHr

Bus delay
Inbound = 63s
Outbound = 60s





ARUP

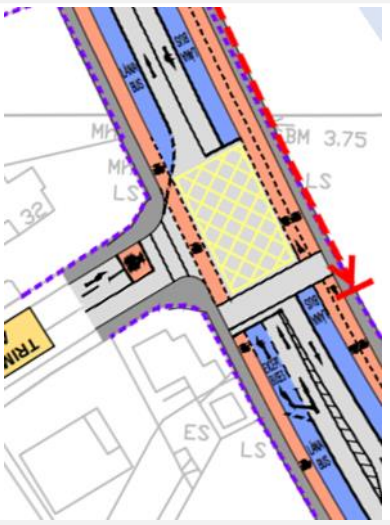
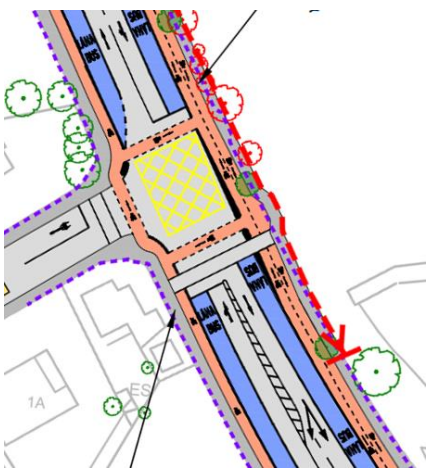
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Trimleston Avenue

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic will be reduced for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A four stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction. Outbound buses will be able to continue with the mainline traffic in both directions. Trimleston Avenue will operate on its own without a flashing amber due to high-left turning flow. Pedestrians and cyclists turning right to and from the side road will operate together.

Junction Type 1 Bus delay ≤ 65s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Rock Road arms in place of one general traffic lane in each direction 2. Cycle facilities introduced inbound/outbound through the junction including two-way cycle track on the eastern side.	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure and to align with strategic cycle route.	1. To improve bus priority through the junction with reduced vehicular capacity 2. Improved cyclist safety at the junction
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced and dedicated cycle crossings introduced to connect the inbound cycle track with the two cycle track and enable right turning into Trimleston Avenue. 2. Inbound bus lane brought to stop line with left turners turning from general traffic lane	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. In line with developing BusConnects Preliminary Design Guidance Booklet principles	1. Improved cyclist safety. 2. Improved bus priority, left turning traffic turns from general traffic lane
DRAFT PRO (PC3)		1. No significant changes	1. N/A	1. N/A

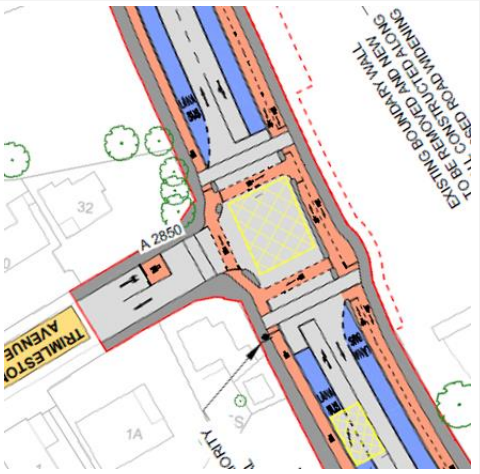
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Trimleston Avenue

EXISTING

FINAL DESIGN



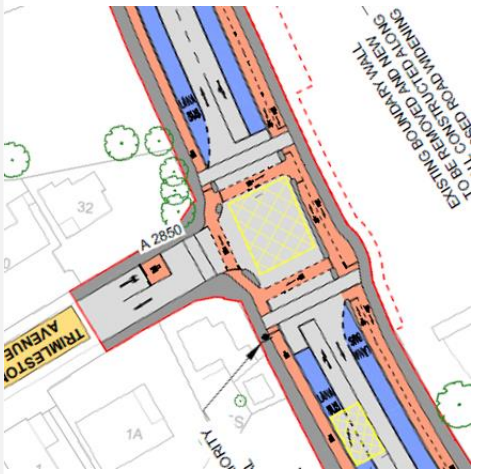
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Stop line of outbound bus lane set back c. 4m. 3. Cycle time has been extended to 120 seconds to match the requirements of the entire Rock Road corridor. 4. Additional pedestrian crossing provided on Merrion Road. 5. New Advanced Stacking Location (ASL) from Trimleston Avenue. 6. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 3. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase. 4. To enhance facilities for pedestrians. 5. No space available to provide cycle lane on approach to junction.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Amendments to line markings. 3. The increased cycle time improves capacity at the junction for road users. 4. Better pedestrian accessibility across all arms of the junction. 5. Enables the competent cyclists from the side arm to position themselves ahead of the vehicular traffic and cycle through the junction.

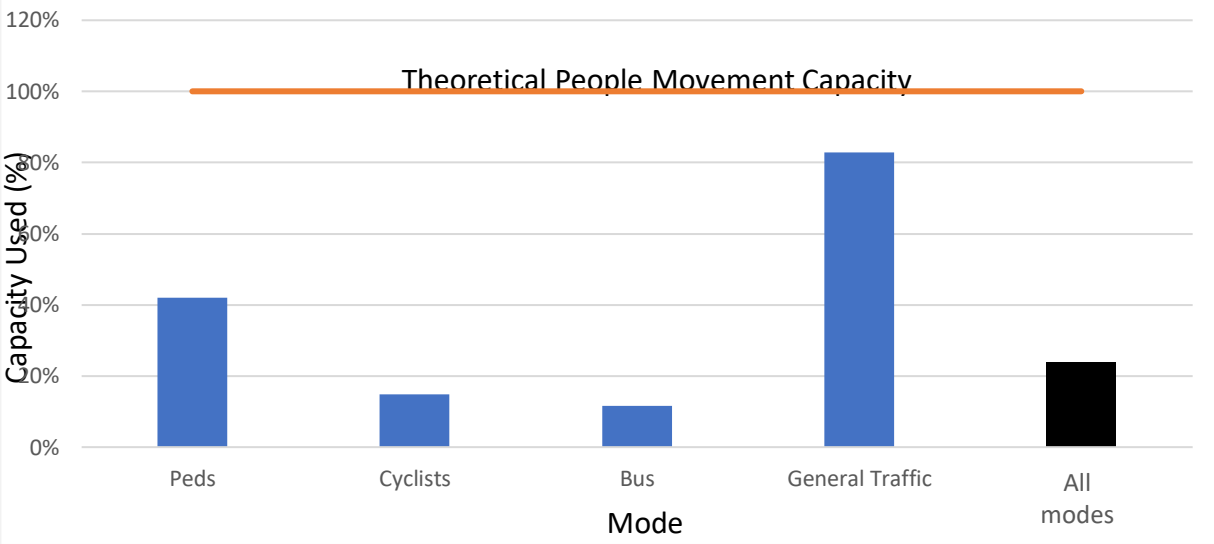
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Rock Road / Trimleston Avenue

Capacity / Delay

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

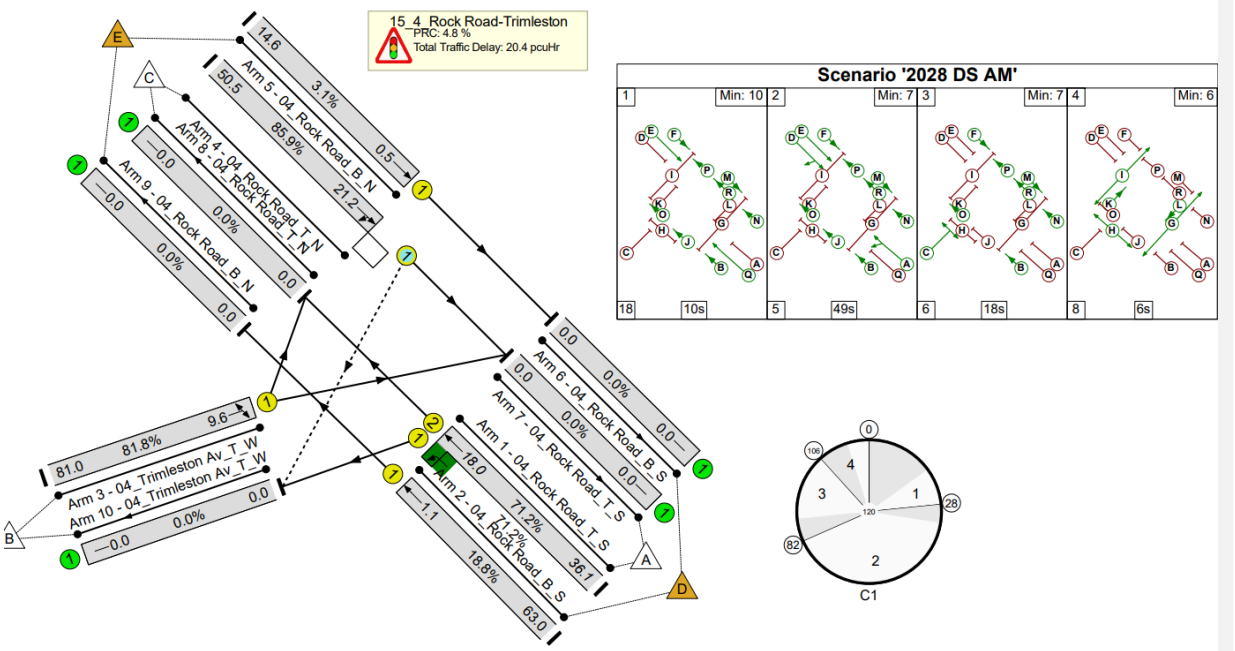




Do Something : 2028 : AM

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

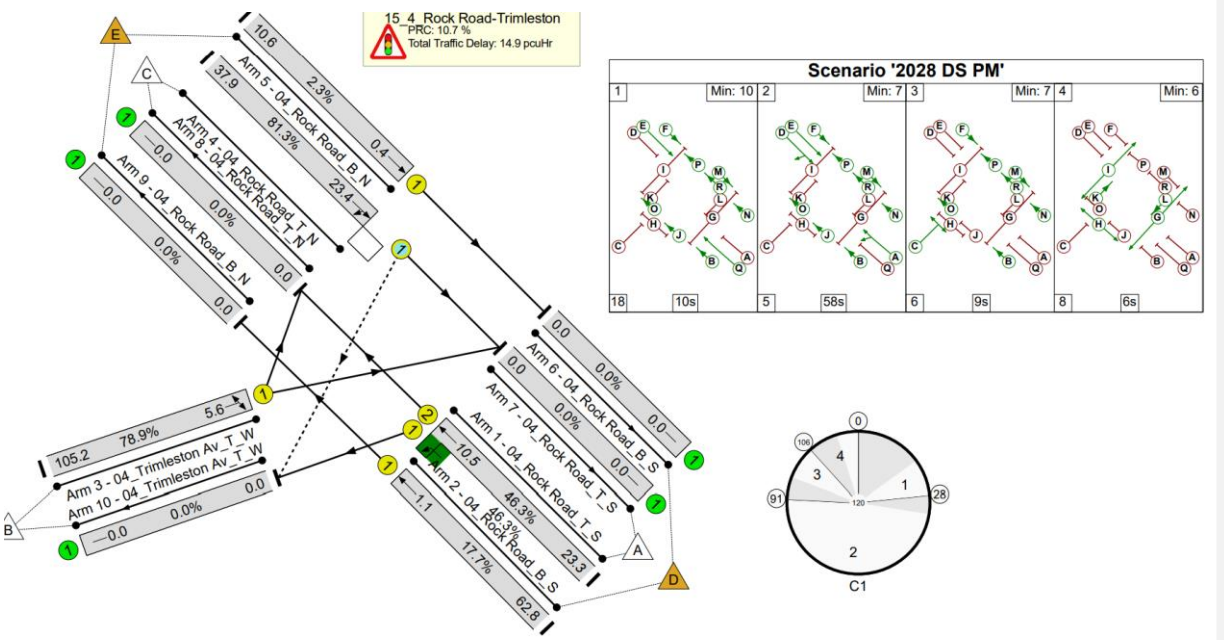
Bus delay
Inbound = 63s
Outbound = 15s



Do Something : 2028 : PM

Cycle = 120 sec
PRC = 11%
Delay = 15 pcuHr

Bus delay
Inbound = 63s
Outbound = 11s



ARUP

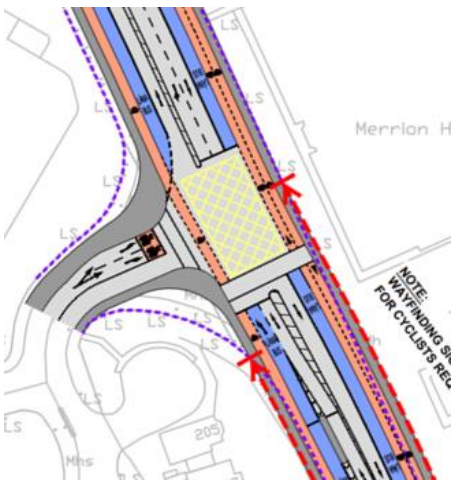
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Elmpark Green

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of left turn lanes and their associated splitter islands. Subsequently the proposed traffic island housing Bus Priority Traffic Signal (BPTS) and ghost island hatching on eastern arm will be removed and the approach arms will be realigned. The design rationale was to remove landtake into Landaff Terrace and the impact on the operation of the internal access road.

Signal Operation
A five stage signal operation is proposed. Buses and cyclists will operate in the same stage as mainline straight-ahead traffic on the northern arm. The southern arm mainline will operate separately from the buses, with left-turning traffic to give way to cyclists on flashing ambers. Buses and straight-ahead traffic will continue on the northern arm with the right turning traffic into Elmpark Green. The side road will operate separately, with left turning traffic to give way to cyclists on flashing ambers, followed by pedestrians and cyclists turning right into the side road.

Junction Type 1 Bus delay ≤65s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Merrion Road arms in place of one general traffic lane inbound 2. Cycle facilities introduced inbound/outbound through the junction including two-way cycle track on the eastern side. 3. Left turn slip lanes into and out of Elmpark Green arm	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure and to align with strategic cycle route. 3. Consolidation of junction movements and improved cyclist safety	1. To improve bus priority through the junction with reduced vehicular capacity. The right turn lane now serving Elmpark is 50 metres which is sufficient to accommodate any projected queueing and is a significant reduction form the existing which is around 150 metres. 2. To improve cyclist safety through the junction. 3. Improved cyclist safety at the junction
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced and two-way crossing introduced to connect the inbound cycle track with the two cycle track and enable right turning into Elmpark Green. 2. Traffic island brought to junction stop line	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. To ensure bus priority and remove left turning cars from bus lane.	1. Improved cyclist safety. 2. Improved bus priority, left turning traffic turns from general traffic lane
DRAFT PRO (PC3)		1. Removal of traffic island and ghost island hatching on eastern arm. Approach arms realigned and landtake into Landaff Terrace removed. 2. Cycle time has been extended to 120 seconds to match the requirements of the entire Merrion Road corridor. [*Note: printing error resulted in pedestrian crossing on Elmpark Green arm not being indicated on PC3 drawings published. Design intent was to provide such crossing*]	1. Removes landtake and associated impact to operation of Landaff Terrace. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. Realigned kerbline and lane arrangement. Traffic signals will likely need to be via cantilever traffic pole. Potential landtake necessity removed. 2. The increased cycle time improves capacity at the junction for road users.

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Rd / Elmpark Green

EXISTING

FINAL DESIGN

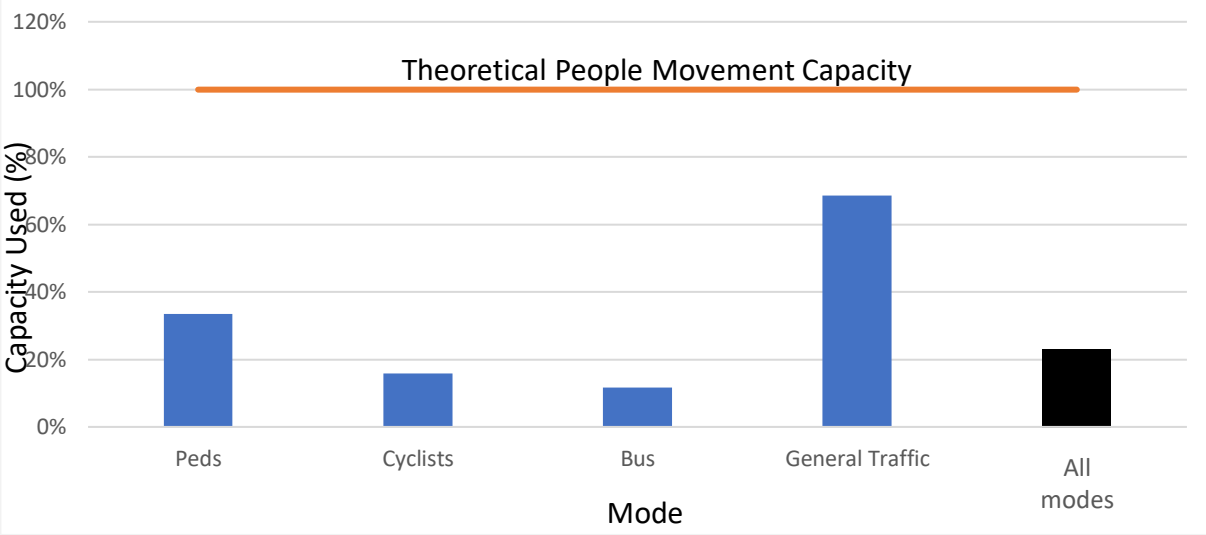
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Stop lines of bus lanes set back c. 4m. 4. Pedestrian crossing confirmed which was omitted from PC3 drawing in error. 5. Cycle lane stubs provided at Elmpark Green arm. 6. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 4. To demonstrate provision of pedestrian crossing. 5. Better manage cycle movements to and from the side arm.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within the public realm at the junction. 3. Amendments to line markings. 4. Line marking added to drawing. 5. Improved cycle provision. Side arm pedestrian crossing increases slightly in length.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Elmpark Green

Capacity / Delay

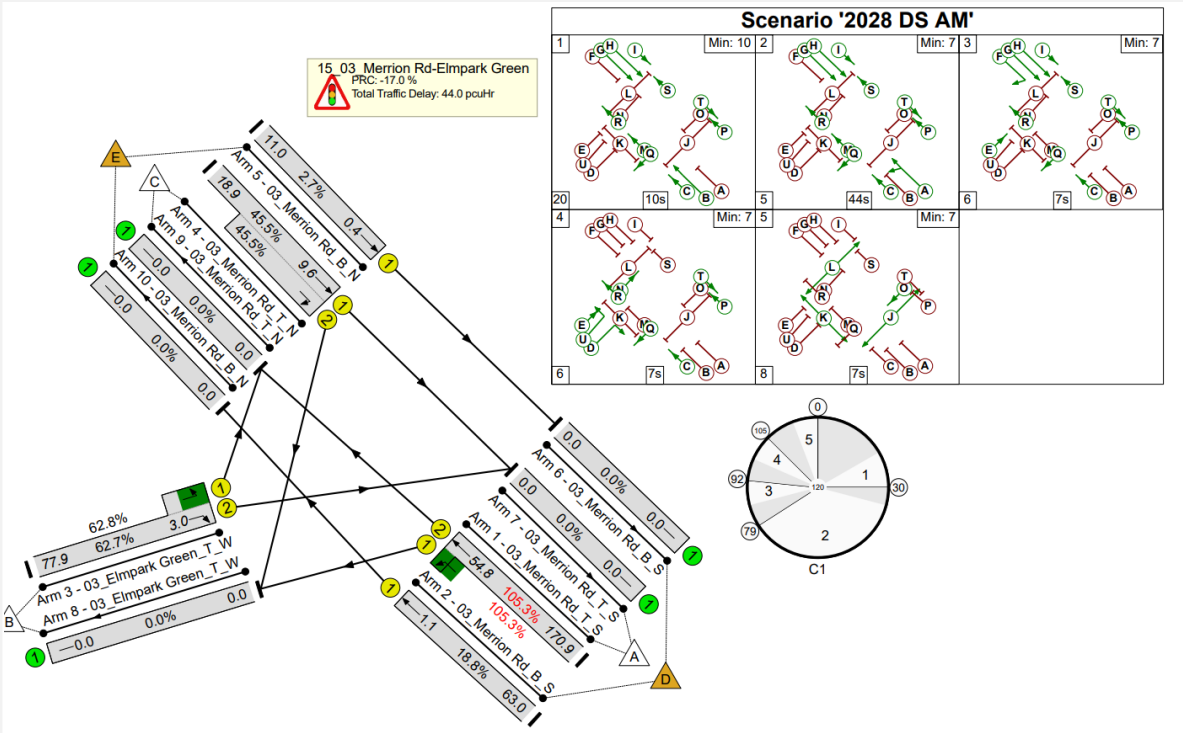
1. Junction operates over capacity in the AM peak.



Do Something : 2028 : AM

Cycle = 120 sec
PRC = -17%
Delay = 44 pcuHr

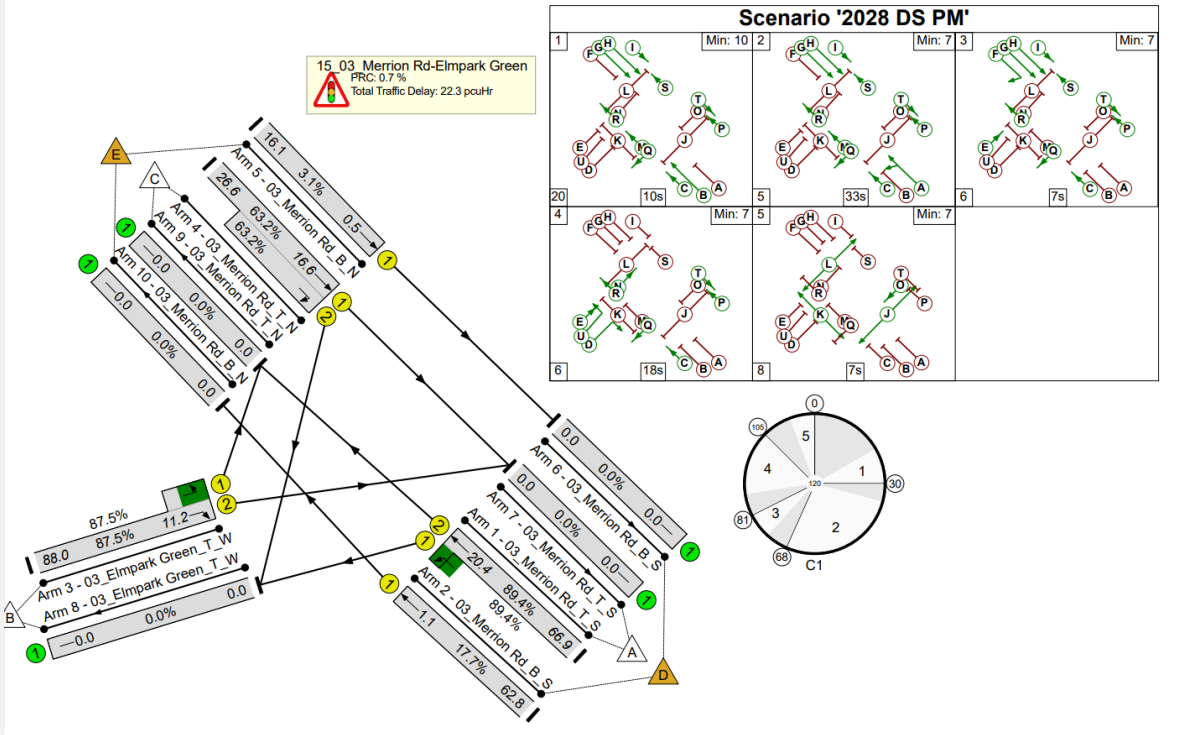
Bus delay
Inbound = 63s
Outbound = 11s



Do Something : 2028 : PM

Cycle = 120 sec
PRC = 1%
Delay = 22 pcuHr

Bus delay
Inbound = 63s
Outbound = 16s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Strand Road

Summary

The Merrion Gates junction will be altered to a consolidated T-junction with improved cycle facilities and to facilitate Signal Controlled Priority inbound. It should be noted that this junction is integrated with the DART level crossing on the Strand Road arm. This junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The design rationale was to improve cyclist facilities and safety at the junction and to improve the safety of vehicles crossing the level crossing by signalising the junction.

Signal Operation

An adaptive signal operation is proposed, to allow priority for buses with the level crossing, and a bonus green offered after the train. Outbound traffic and bus movements will operate with inbound buses and cyclists. All mainline straight ahead traffic and cyclists, and the pedestrian crossing on the side road, will operate while the train gates are closed. Once the gates are open, the left-turn into Strand Road will operate to prevent blocking the outbound bus movement. This is followed by the right-turning traffic into Strand Road and left-turn only from Strand Road.

Junction Type
1 (inbound)
3 (outbound)

Bus delay <60s

	Change Made	Reason for Change	Impact of Change
EXISTING	1. Cycle facilities introduced inbound/outbound through the junction 2. Left turn pocket lane into SVUH introduced	1. In keeping with developing BusConnects design principles regarding cycle infrastructure. 2. To enable left turning without impeding bus priority	1. To improve cyclist safety through the junction. 2. Landtake into adjacent property
DRAFT PRO (PC2)	1. Improved protected connectivity between the inbound cycle track on the southern side of Merrion Road and the two-way cycle track on the northern side including the installation of a two-way cycle crossing in addition to the pedestrian crossing and a right turning cycle lane from Merrion Road. 2. Signalisation of the Strand Road arm of the junction. Removal of the slip/stacking lane for vehicles coming from Strand Road.	1. To improve cyclist facilities and safety at the junction. 2. To improve the safety of vehicles crossing the level crossing by signalising the junction.	1. Increased safety for all road users with additional potential landtake in adjacent property 2. To control the vehicle movements at the level crossing
DRAFT PRO (PC3)	1. Pedestrian crossing on the western arm was converted to a staggered crossing	1. To reduce overall crossing width per single crossing for pedestrians and offer the opportunity to cross in separate stages.	1. Reduced queuing length on eastbound approach with improved pedestrian environment

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Rd / Strand Road

EXISTING

FINAL DESIGN

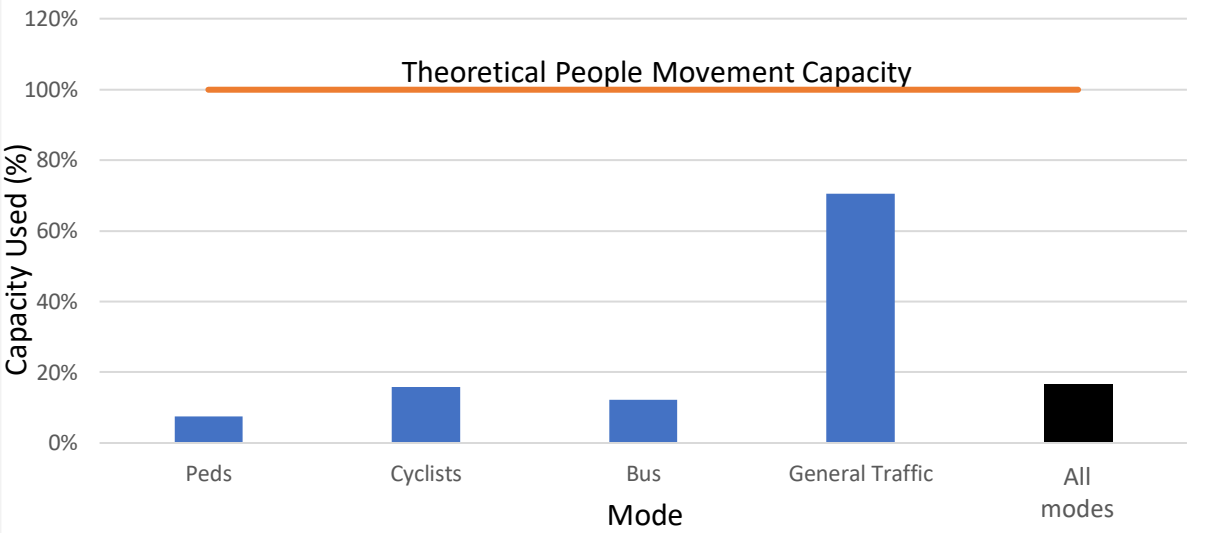
Change Made	Reason for Change	Impact of Change
1. Outbound bus lane terminated in advance of the stop lines to allow left turning vehicles to merge with the bus lane over a short distance (c.50m). Yellow box allows straight ahead bus merge into general traffic lane if required. Inbound arm operation remains unchanged. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Cycle time has been extended to 120 seconds to match the requirements of the entire Merrion Road corridor. 4. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To minimise delays at the junction for all modes and maximise the green time for buses. Applied on outbound arm due to level crossing which – despite expected left turning volume being low - has the potential to cause delay to left turning cars which cannot be controlled through junction operation. Buses therefore may need to enter main traffic lane via yellow box. Inbound arm to operate general traffic and buses separately due to controlled priority requirement. 2. To align General Arrangement design with landscaping design. 3. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. Improved junction capacity and bus journey time reliability. 2. Soft landscaping proposed within the public realm at the junction. 3. The increased cycle time improves capacity at the junction for road users.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Strand Road

Capacity / Delay

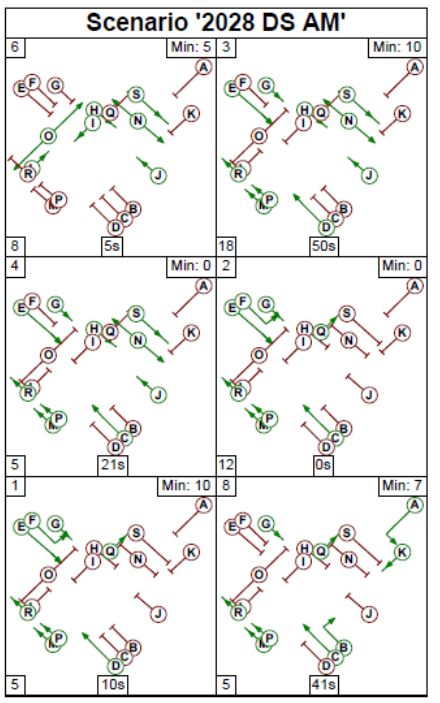
1. Junction operates over capacity.

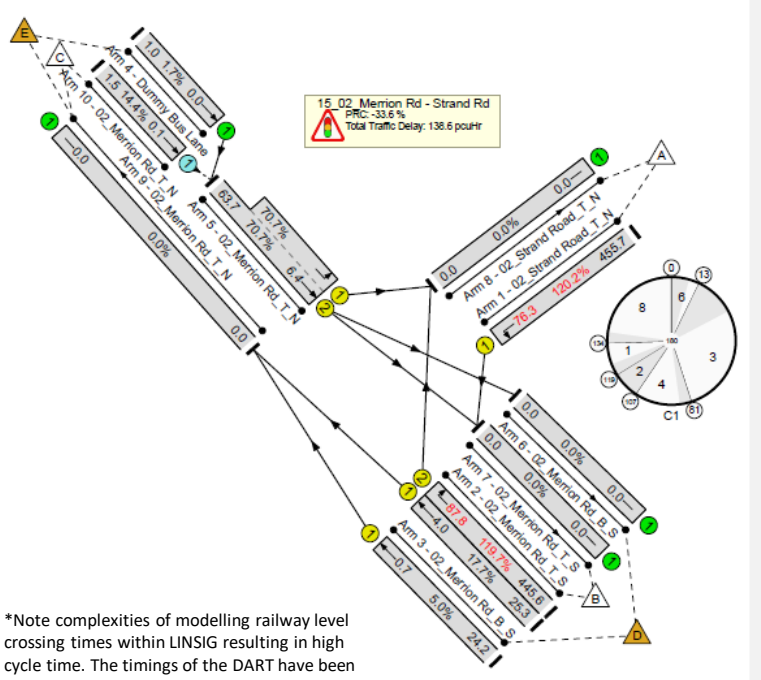


Do Something : 2028 : AM

Cycle = 180 sec*
PRC = -34%
Delay = 139 pcuHr

Bus delay
Inbound = 24s
Outbound = 64s



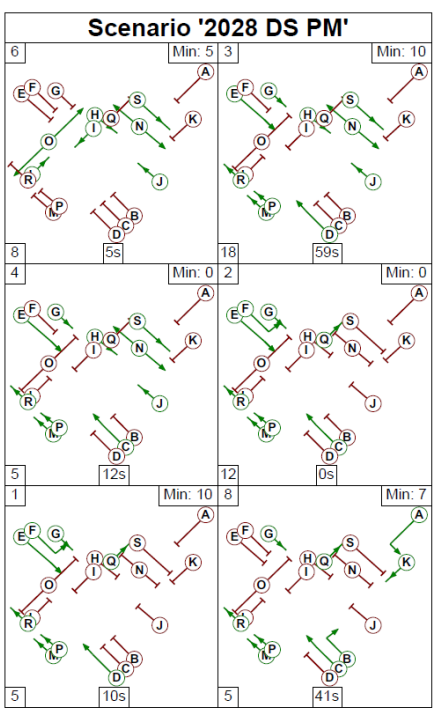


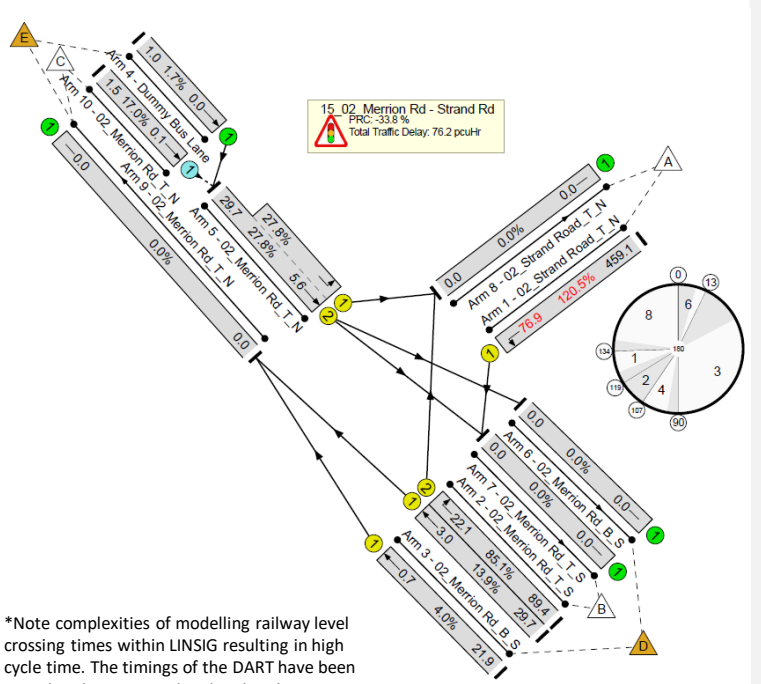
*Note complexities of modelling railway level crossing times within LINSIG resulting in high cycle time. The timings of the DART have been considered in greater detail within the micro-simulation model.

Do Something : 2028 : PM

Cycle = 180 sec*
PRC = -34%
Delay = 76 pcuHr

Bus delay
Inbound = 22s
Outbound = 30s





*Note complexities of modelling railway level crossing times within LINSIG resulting in high cycle time. The timings of the DART have been considered in greater detail within the micro-simulation model.

ARUP

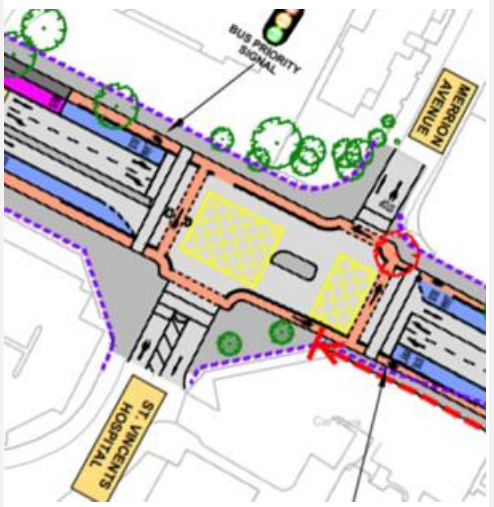
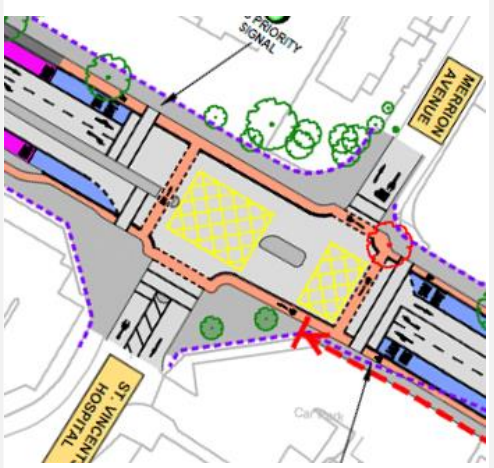
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Rd / St Vincent's University Hospital

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of left turn lanes and flared entries into the junction. In the development of the PRO, a pedestrian crossing is to be introduced on the eastern arm, to replace a mid-block crossing in the EPR. The left turn slip lane into St. Vincent's University Hospital (SVUH) in the EPR was also removed. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety. Subsequently the dedicated right turn lane into Merrion Avenue from the eastern arm of the junction was removed from the design and the cross section of the arm reduced, with right turning vehicles turning from general traffic lane.

Signal Operation
A five stage signal operation is proposed. Straight-ahead and left-turning mainline traffic and buses will operate in the same stage, with left turning vehicles to cross the bus lane path at a distance of 20m from the junction and giving way to cyclists on flashing ambers. This will maximise green time for buses and minimise delay. The right-turning movement from Merrion Rd to SVUH will run unopposed. The side roads will operate in separate stages, with flashing ambers for left-turning traffic. The pedestrian crossings will operate in their own stage.

Junction Type 3 Bus delay ≤ 45s

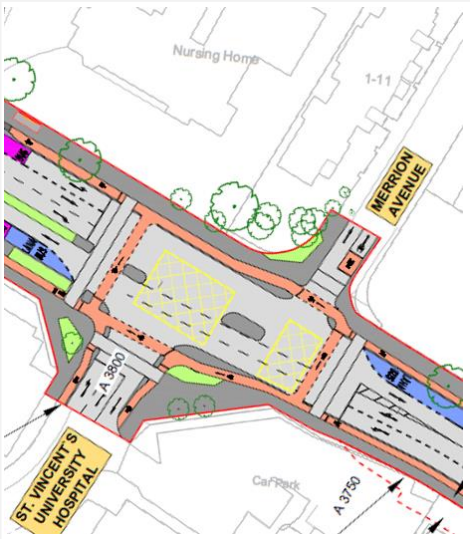
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Merrion Road arms in place of one general traffic lane inbound 2. Cycle facilities introduced inbound/outbound through the junction 3. Left turn pocket lane into SVUH introduced	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure. 3. To enable left turning without impeding bus priority	1. To improve bus priority through the junction with reduced vehicular capacity. 2. To improve cyclist safety through the junction. 3. Landtake into adjacent property
DRAFT PRO (PC2)		1. Junction converted into an all movements signalised staggered junction with Merrion Avenue 2. Protected junction for cyclist introduced including crossing introduced on Merrion Road arms. 3. Inbound/outbound bus lanes brought to stop line with left turners turning from general traffic lane, including removal of left turn pocket into SVUH	1. Rationalise junction operation and inclusion of pedestrian crossings on all arms 2. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 3. In line with developing BusConnects Preliminary Design Guidance Booklet principles	1. Improved junction operation and pedestrian safety 2. Improved cyclist safety. 3. Improved bus priority, left turning traffic turns from general traffic lane and reduced potential landtake into adjacent property.
DRAFT PRO (PC3)		1. Pedestrian crossing on the western arm was converted to a staggered crossing	1. To reduce overall crossing width per single crossing for pedestrians and offer the opportunity to cross in separate stages.	1. Reduced queuing length on eastbound approach with improved pedestrian environment

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Rd / St Vincent's University Hospital

EXISTING

FINAL DESIGN



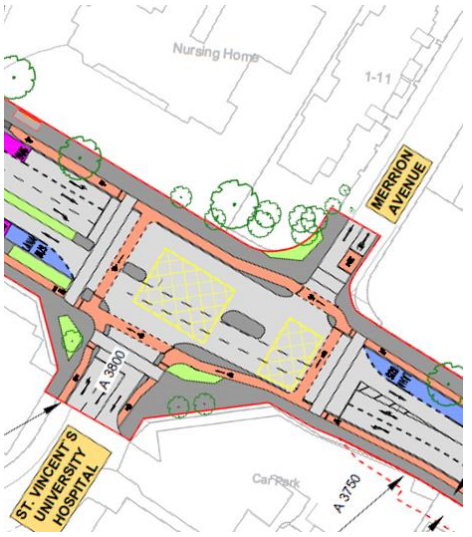
Change Made	Reason for Change	Impact of Change
1. Bus lanes terminated in advance of the stop lines to allow left turning vehicles to merge with the bus lane over a short distance (c.20m). 2. Cycle time has been extended to 120 seconds to match the requirements of the entire Merrion Road corridor. 3. Pedestrian crossing previously amended to a staggered crossing reverted to straight across crossing. 4. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 5. Additional details provided on landscaping proposals in the vicinity of the junction. 6. Segment of cycle facilities provided into SVUH on the southern arm. 7. Removal of dedicated right turn lane into Merrion Avenue on eastern arm and associated realignment. 8. New Advanced Stacking Location (ASL) from Merrion Avenue. 9. Tie in to existing two exit lanes and cycle lanes on St Vincent's University Hospital arm. 10. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To minimise delays at the junction for all modes and maximise the green time for buses. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase. 3. Staging includes all green phase for pedestrian and therefore there is no requirement for separating each crossing portion in a staggered arrangement 4. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 5. To align General Arrangement design with landscaping design. 6. To provide cycle connection into and through the campus. 7. Ongoing discussions with SVUH (in relation to recently installed COVID-19 modular building), Gas Networks Ireland (in relation to existing archway and adjacent above ground installation), and ESB (in relation to existing sub-station), resulting in the requirement to minimise road widening on the southern edge at this location. 8. No space available to provide cycle lane on approach to junction. 9. Recently installed by SVUH who wish to retain.	1. Improved junction capacity and bus journey time reliability. 2. The increased cycle time improves capacity at the junction for road users. 3. Removed requirement for additional street furniture required for staggered arrangement and increased queuing length on eastbound arm. 4. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 5. Soft landscaping proposed within the public realm at the junction. 6. Reallocation of space from carriageway to cycle tracks with removal of central median and ghost island. 7. Right turners into Merrion Avenue to turn from main traffic lane. Junction design and staging amended accordingly. 8. Enables the competent cyclists from the side arm to position themselves ahead of the vehicular traffic and cycle through the junction. 9. Junction arm increases in width to match existing.

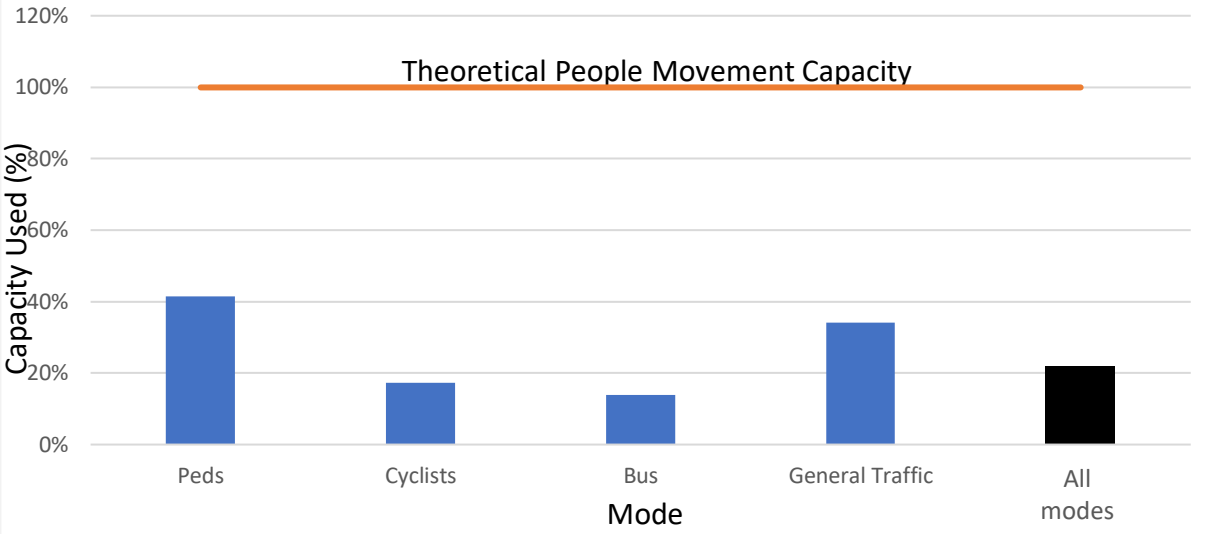
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Rd / St Vincent's University Hospital

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <45s on average.

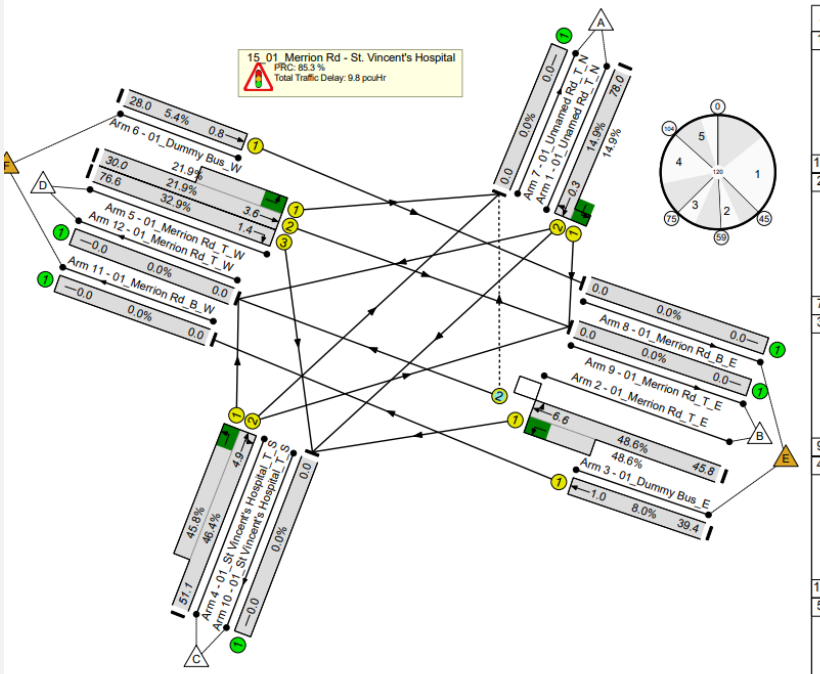


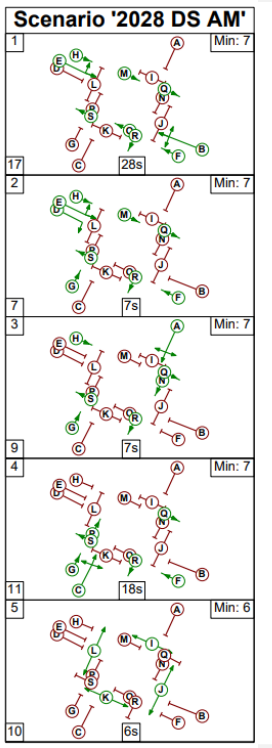


Do Something : 2028 : AM

Cycle = 120 sec
PRC = 85%
Delay = 10 pcuHr

Bus delay
Inbound = 39s
Outbound = 28s

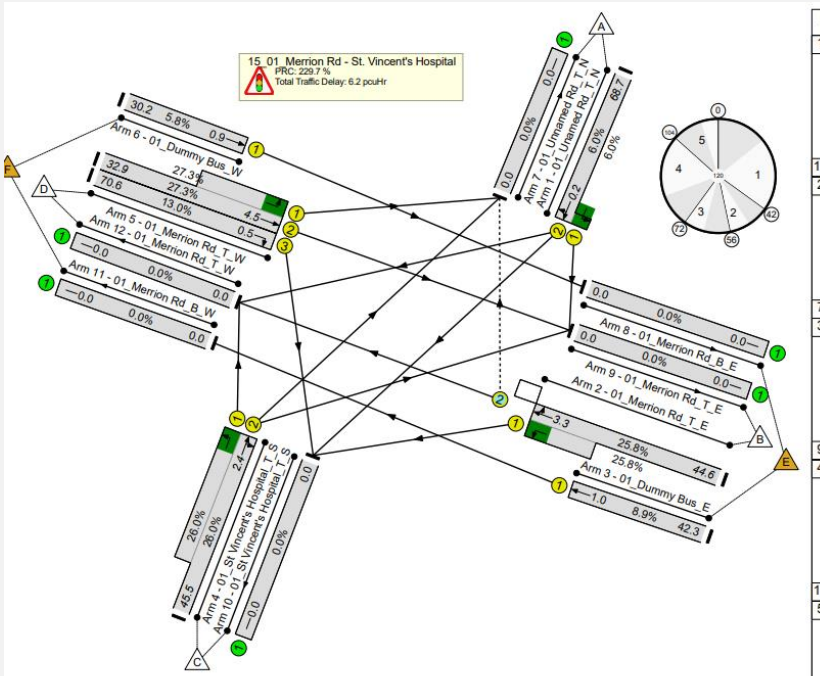


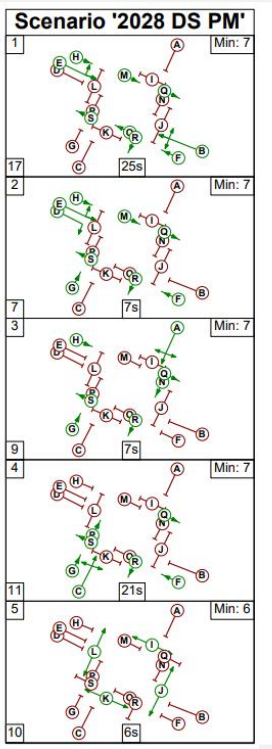


Do Something : 2028 : PM

Cycle = 120 sec
PRC = 230%
Delay = 6 pcuHr

Bus delay
Inbound = 42s
Outbound = 30s





ARUP

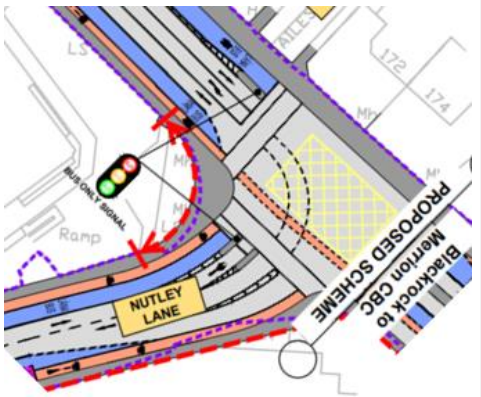
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Nutley Lane

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of left turn lanes flared entries into the junction. The PRO introduced the continuation of outbound cycle lane along Merrion Road, along with a single lane exit from Nutley Lane. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A five stage signal operation is proposed. Straight-ahead and left-turning mainline traffic and buses will operate in the same stage, with left turning vehicles to cross the bus lane path at a distance of 20m from the junction and giving way to cyclists on flashing ambers. This will maximise green time for buses and minimise delay. The right-turning movement from Merrion Road to Nutley Lane will run unopposed. The pedestrian crossings will operate with right-turning cyclists to and from the side road. This will then be followed by traffic from Nutley Lane, followed by buses. Traffic from the side road will not operate with a flashing amber due to high-left turning flow.

Junction Type 3 Bus delay <45s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Nutley Lane arm 2. Cycle facilities introduced inbound/outbound through the junction 3. Traffic island introduced on eastbound Merrion Road arm	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure. 3. To enable right turning and straight ahead buses from bus lane	1. To improve bus priority through the junction. 2. To improve cyclist safety through the junction. 3. Increase of existing cross section on arm
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced including continuation of cycle track eastbound on Merrion Road and crossings on each arm 2. Inbound/outbound bus lanes brought to stop line with left turners turning from general traffic lane, and removal of left turn slip lane 3. Arrangement of eastbound arm amended so that right turning buses turn from right turn lane	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. In line with developing BusConnects Preliminary Design Guidance Booklet principles 3. Improved junction operation and signalling, as the bus detection may not distinguish a right turning from an outbound bus and hence potentially halt inbound buses unnecessarily.	1. Improved cyclist safety. 2. Improved bus priority, left turning traffic turns from general traffic lane and improved cyclist safety 3. Bus priority signalling at mid-block pedestrian crossing west of the junction to enable right turning bus move into right turn lane, with cross section of approach arm and receiving arm narrowed - significantly improving space available for pedestrians and cyclists and reducing land take. The signal have been arranged to ensure this movement (and any buses) are cleared in every cycle.
DRAFT PRO (PC3)		1. Cycle time has been extended to 120 seconds to match the requirements of the entire Merrion Road corridor.	1. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. In terms of operation this junction will be stand alone and there is no requirement for particular offsets to neighbouring junctions.

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Nutley Lane

EXISTING

FINAL DESIGN

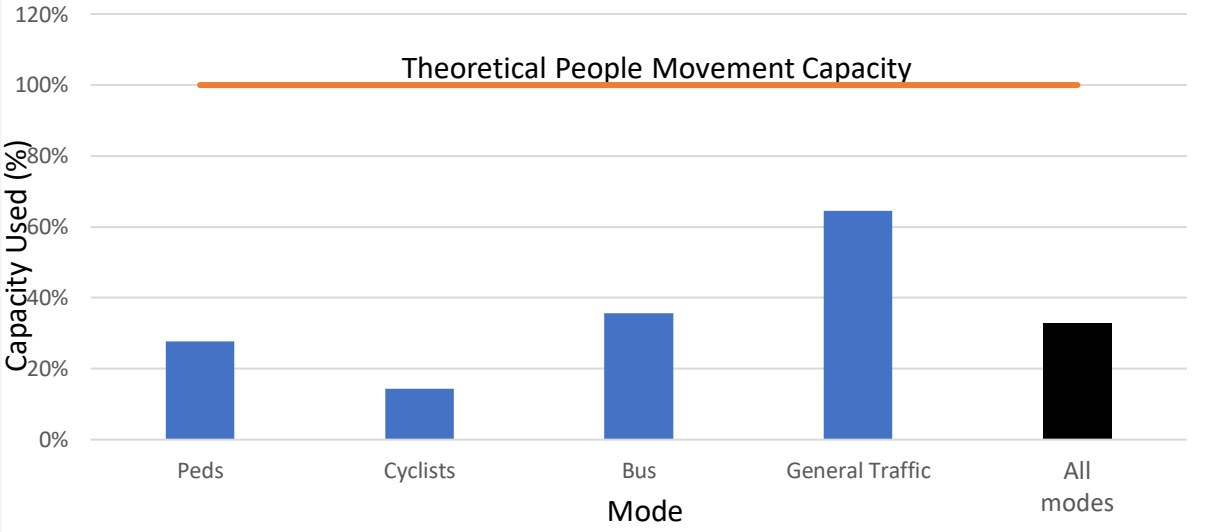
Change Made	Reason for Change	Impact of Change
1. Bus lanes terminated in advance of the stop lines on inbound Merrion Road arm to allow left turning vehicles to merge with the bus lane over a short distance (c.20m) [retention of separate staging on the outbound Merrion Road arm - due to the T-junction arrangement allowing general traffic and buses to run in same stage; and Nutley Lane arm due to high number of left turning vehicles]. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Stop line of outbound bus lanes set back c. 4m. 4. Shared space provided between junction and Ailesbury Park. 5. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To minimise delays at the junction for all modes and maximise the green time for buses. Expected left turning traffic on Merrion Road is low. 2. To align General Arrangement design with landscaping design. 3. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 4. To provide cyclist connectivity.	1. Improved junction capacity and bus journey time reliability. 2. Soft landscaping proposed within the public realm at the junction. 3. Amendments to line markings. 4. Improved cycle provision.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Nutley Lane

Capacity / Delay

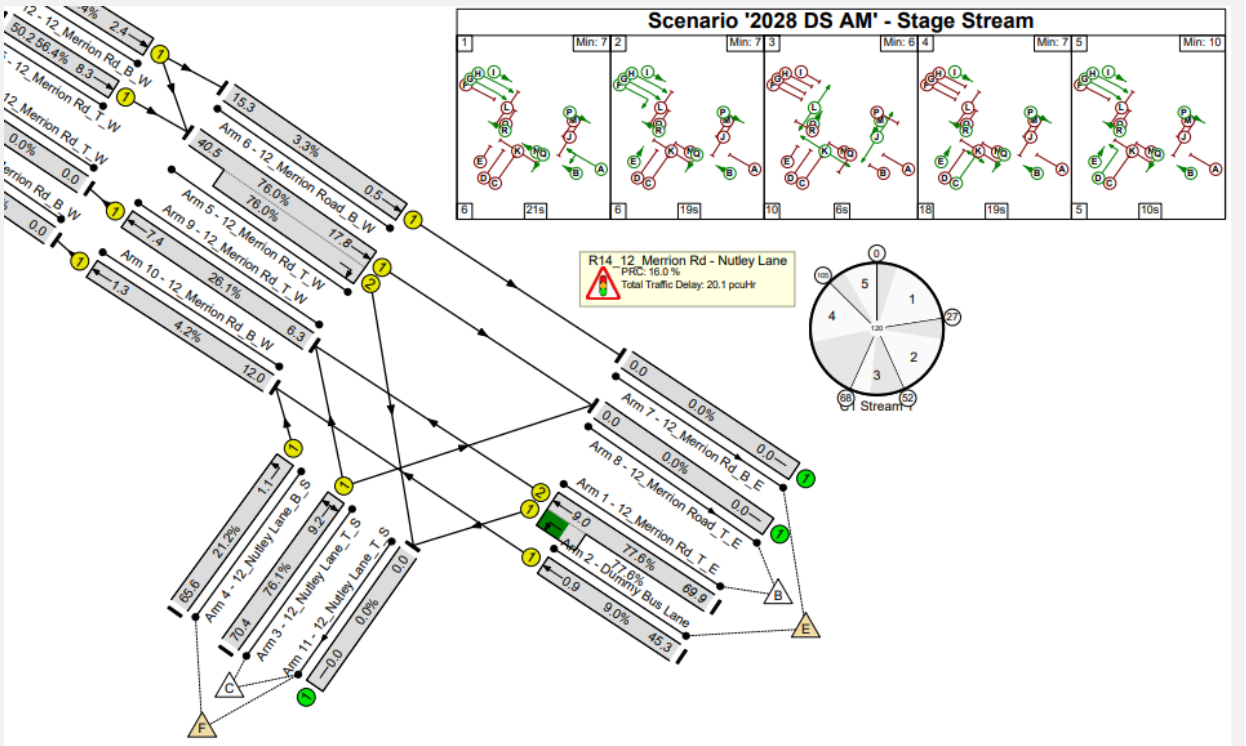
1. Junction operates within capacity.
2. Bus delay is <45s on average.



Do Something : 2028 : AM

Cycle = 120 sec
PRC = 16%
Delay = 20 pcuHr

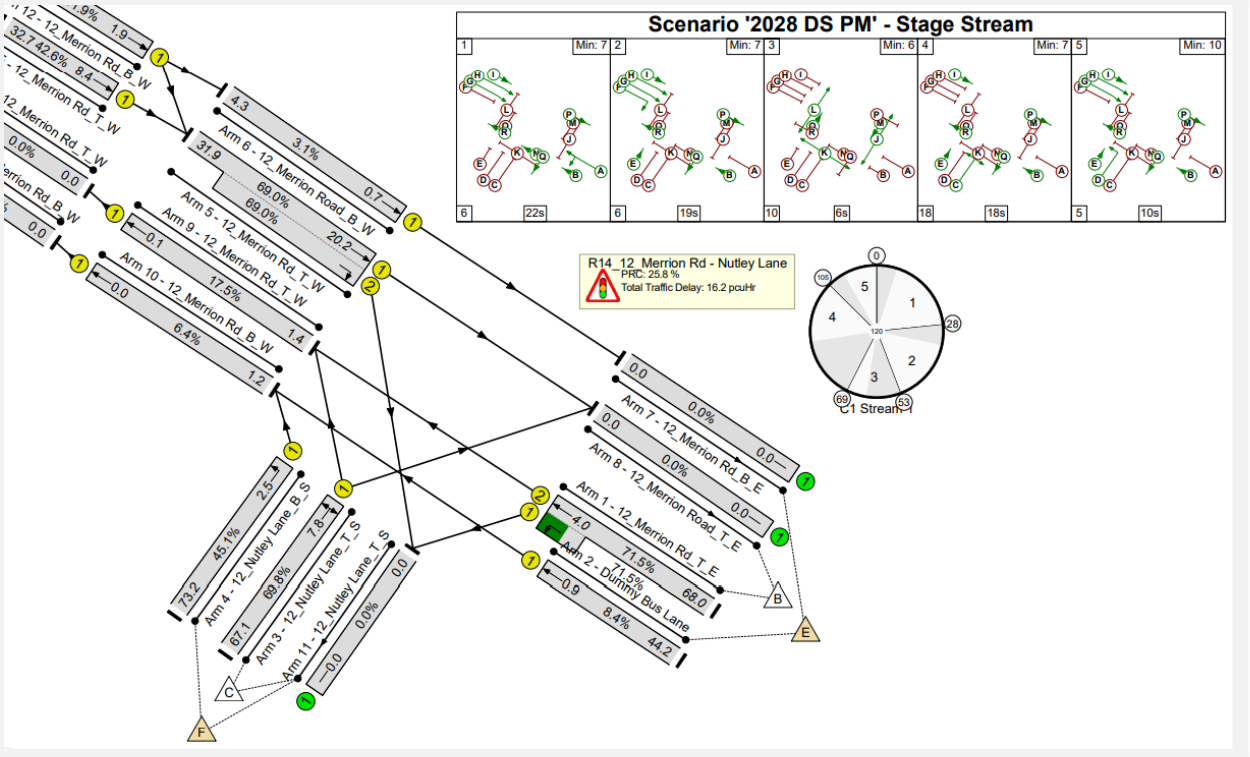
Bus delay
Inbound = 45s
Outbound = 18s



Do Something : 2028 : PM

Cycle = 120 sec
PRC = 26%
Delay = 16 pcuHr

Bus delay
Inbound = 44s
Outbound = 29s



ARUP

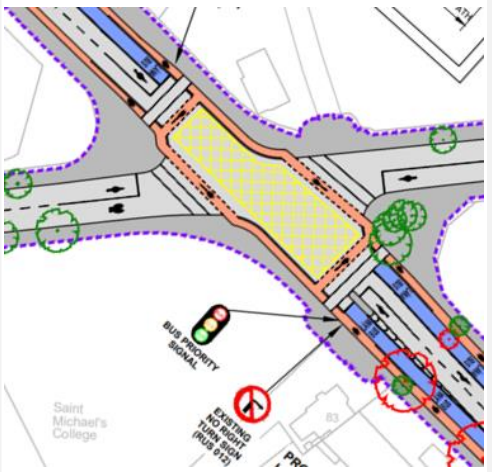
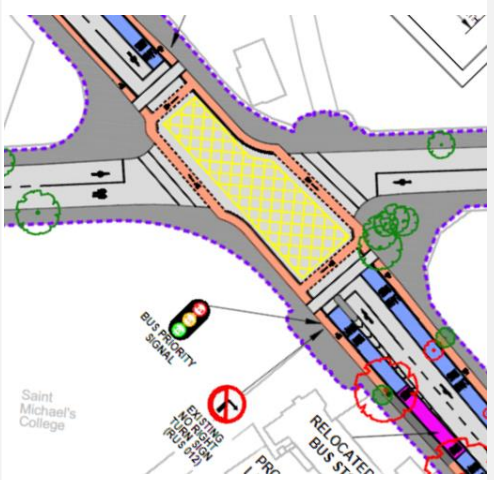
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Ailesbury Road

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of the segregated left turn lanes and flared entries into the junction. Signal Controlled Priority will be introduced to enable the traffic management measures on Merrion Road between this junction and Shrewsbury Road. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A four stage signal operation is proposed. Buses and cyclists will operate within the same stage through the junction. This will be followed by mainline traffic and cyclists, with the traffic to give way to cyclists using flashing ambers. The side roads will operate together, with traffic turning north to give way to cyclists using flashing ambers. Traffic turning south will not operate with a flashing amber due to high-left turning flow. The pedestrian crossings will operate in their own stage, with cyclists from Merrion Road (E).

Junction Type 1 Bus delay >80s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Merrion Road arms 2. Cycle facilities introduced inbound/outbound through the junction 3. Left turn slip lanes removed	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure. 3. Consolidation of junction movements and improved cyclist safety	1. To improve bus priority through the junction. 2. To improve cyclist safety through the junction. 3. One all movement lane in eastbound arm, with improved cyclist safety at the junction
DRAFT PRO (PC2)		1. Inbound arm realigned 2. Protected junction for cyclist introduced with crossings included across Merrion Road arms 3. Inbound/outbound bus lanes brought to stop line with left turners turning from general traffic lane 4. Traffic island introduced on the inbound bus lane	1. To remove potential landtake on adjacent property 2. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 3. In line with developing BusConnects Preliminary Design Guidance Booklet principles 4. To enable and control the provision of signal controlled priority required for the traffic management on Merrion Road	1. Reallocation of footpath widths 2. Improved cyclist safety. 3. Improved bus priority, left turning traffic turns from general traffic lane. 4. Improved bus priority
DRAFT PRO (PC3)		1. Minor amendments to line marking of cycle symbols on Merrion Road arms 2. Cycle time has been extended to 120 seconds	1. Correcting minor drafting error 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. Line marking amendments 2. Queue detection will be required in the inbound direction to provide the required priority for buses. Inbound general traffic will be restricted in terms of green time to provide for this bus priority. Left turning traffic from Ailesbury Road (West) and right turning from Ailesbury Road (East) is low and will not impact significantly on managing queues inbound at this location.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Ailesbury Road

EXISTING

FINAL DESIGN

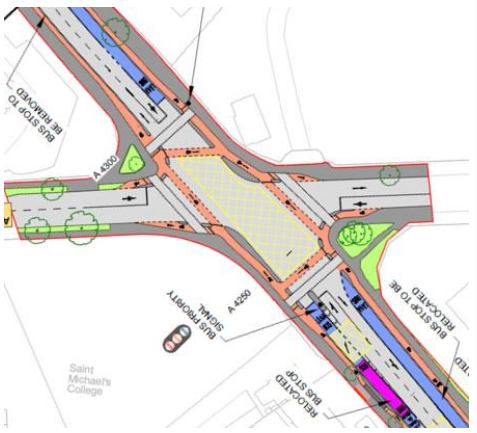
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Stop line of outbound bus lane set back c. 4m. 4. Provision of cycle lane stubs on both side arms. 5. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 4. Better managed cycle movements to and from the side arm.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within the public realm at the junction. 3. Amendments to line markings. Improved environment for cyclists. Side arm pedestrian crossings increase slightly in length.

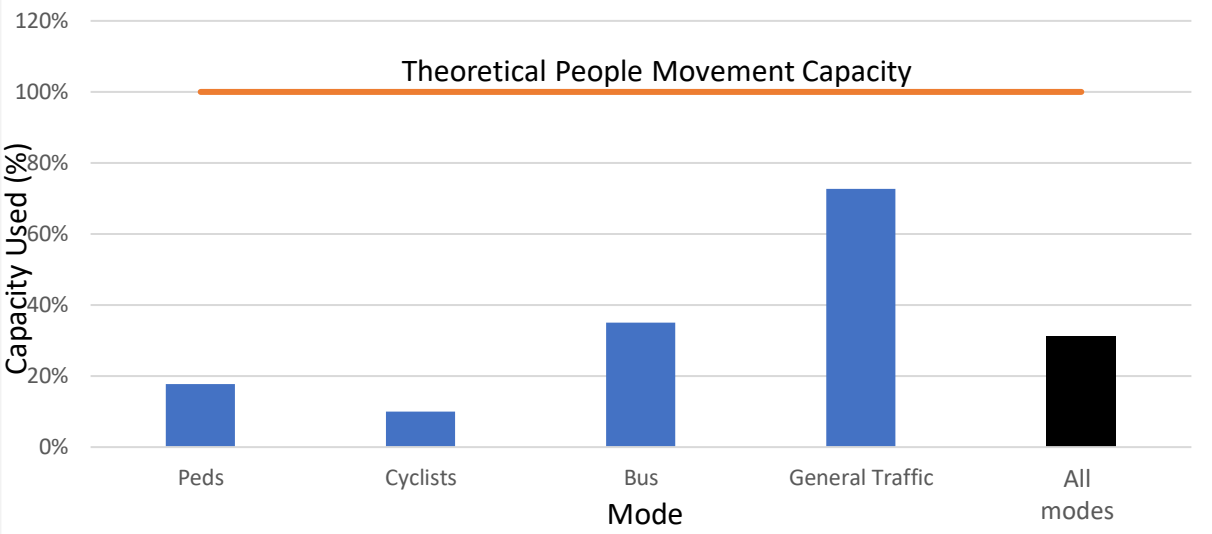
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Ailesbury Road

Capacity / Delay

1. Junction operates over capacity in the AM peak only.

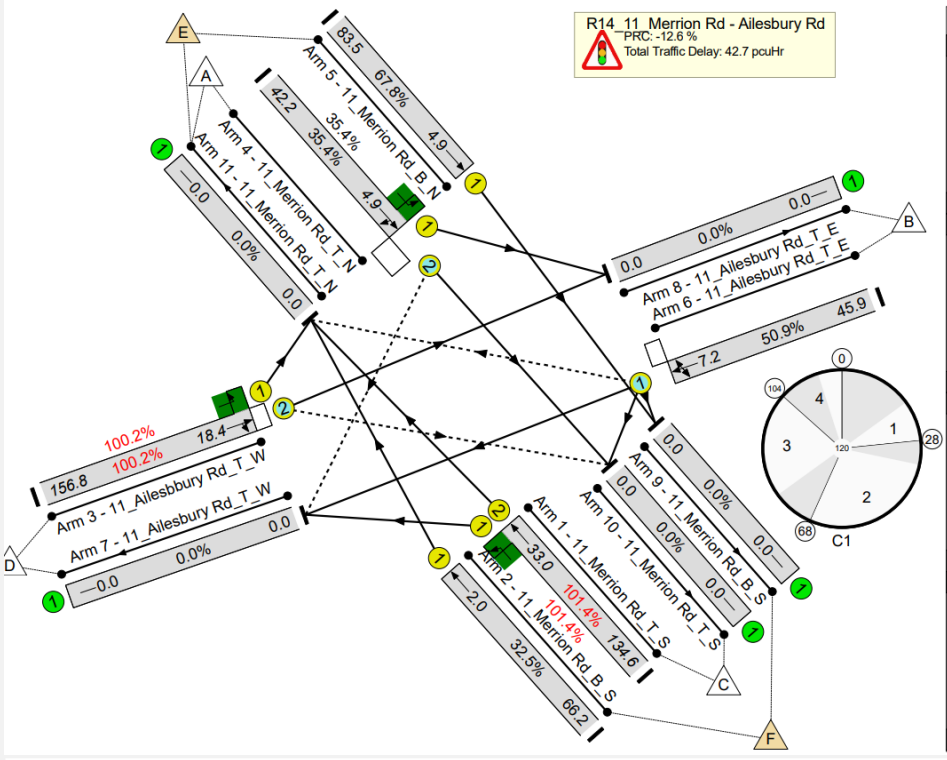


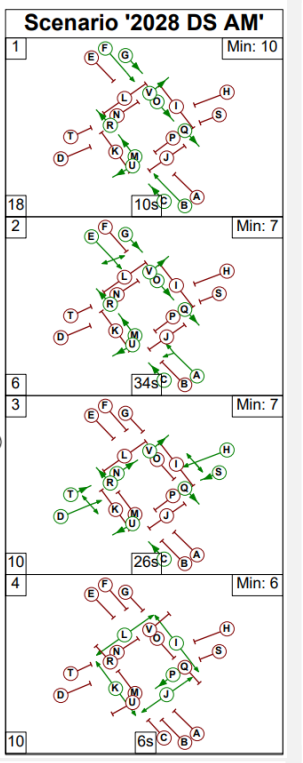


Do Something : 2028 : AM

Cycle = 120 sec
PRC = -13%
Delay = 43 pcuHr

Bus delay
Inbound = 66s
Outbound = 84s

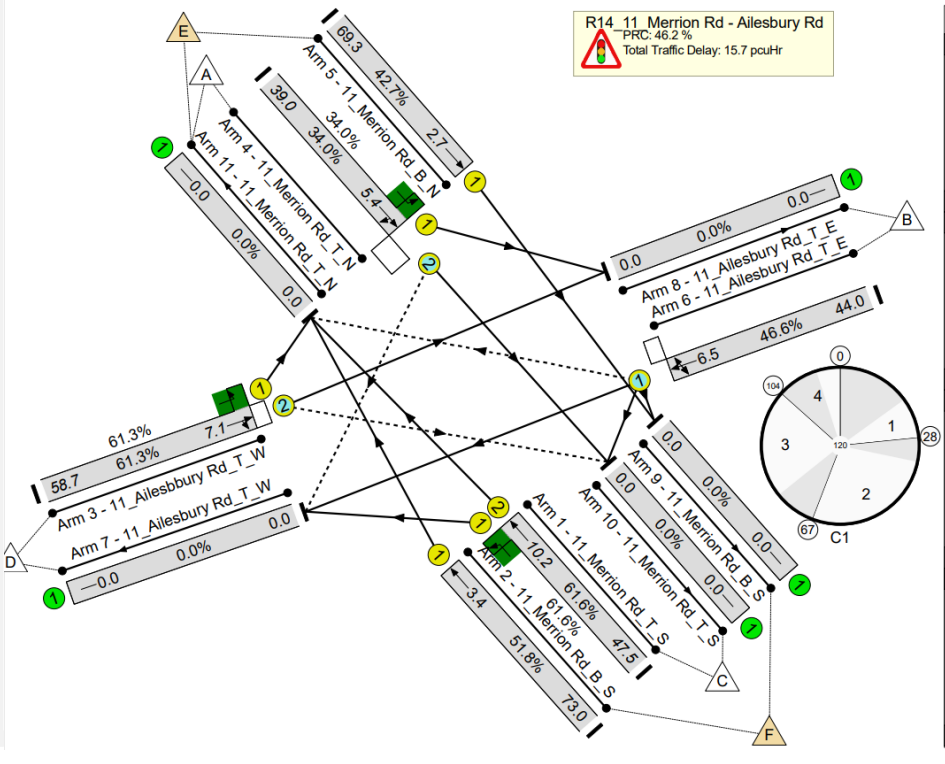


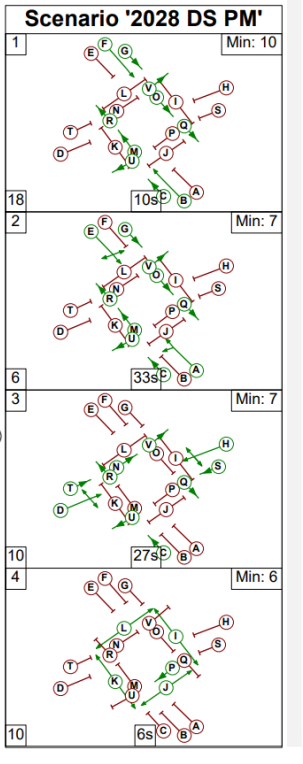


Do Something : 2028 : PM

Cycle = 120 sec
PRC = 46%
Delay = 16 pcuHr

Bus delay
Inbound = 73s
Outbound = 69s





ARUP

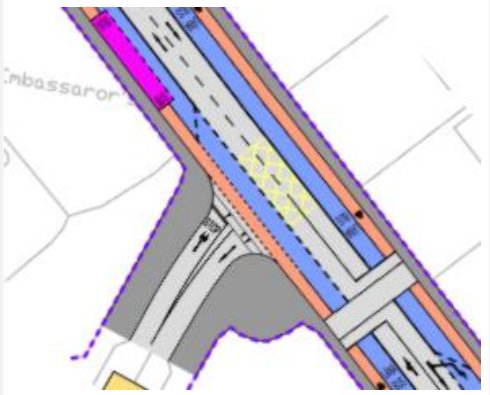
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Shrewsbury Road

Summary
This junction is currently a priority T-junction, however Signal Controlled Priority is to be implemented to enable the traffic management measures on Merrion Road between this junction and Ailesbury Road. Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. Existing right turn ban onto Shelbourne Road will be maintained. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A four stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction, followed by mainline traffic. The side road will operate in its own stage with left turning traffic to give way to cyclists on flashing ambers, followed by pedestrians and right-turning cyclists.

Junction Type 1 Bus delay ≤80s

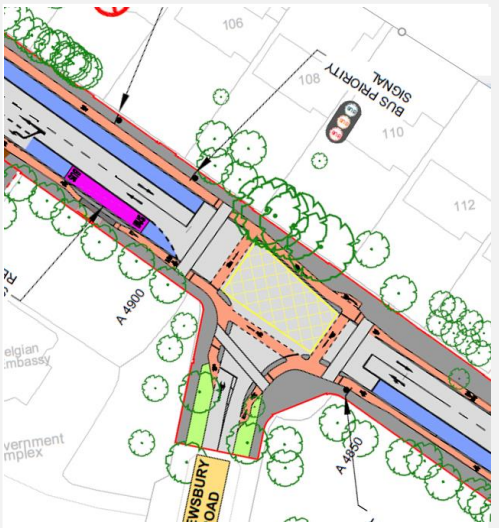
EXISTING			
EPR		**Junction remained as Priority Junction** 1. Bus lanes introduced on Merrion Road arms 2. Cycle facilities introduced inbound/outbound through the junction	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure.	1. To improve bus priority through the junction. 2. To improve cyclist safety through the junction.
DRAFT PRO (PC2)		1. Upgrade junction to signalised junction. 2. Protected junction for cyclist introduced . 3. Inbound/outbound bus lanes brought to stop line with left turners turning from general traffic lane	1. To enable and control the provision of signal controlled priority required for the traffic management on Merrion Road 2. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 3. In line with developing BusConnects Preliminary Design Guidance Booklet principles	1. Improved bus priority 2. Improved cyclist safety. 3. Improved bus priority, left turning traffic turns from general traffic lane.
DRAFT PRO (PC3)		1. Cycle time extended to 120 to match the cycle time along the Merrion Road Corridor.	1. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. Queue detection will be required in the outbound direction to provide the required priority for buses. Outbound general traffic will be restricted in terms of green time to provide for this bus priority. Traffic is low turning out right from Shrewsbury Road and will not impact the management of queues on Merrion Road outbound.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Shrewsbury Road

EXISTING

FINAL DESIGN



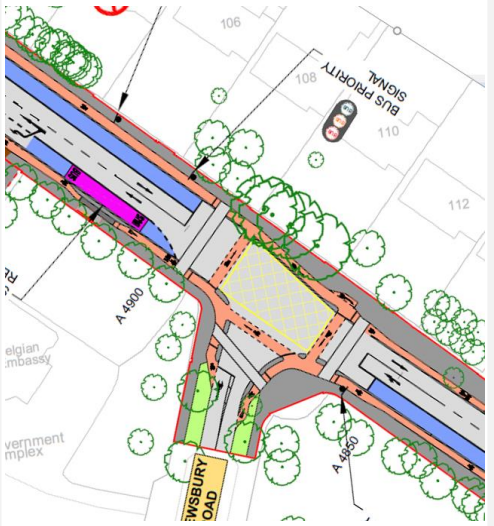
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Stop lines of bus lanes set back c. 4m. 4. Provision of cycle lane stubs on Shrewsbury Road. 5. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. Despite being a T-junction, which general does not require this arrangement, this arm runs with general traffic and buses separately due to shared receiving lane and signal controlled priority. 4. Better managed cycle movements to and from the side arm.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within the public realm at the junction. 3. Amendments to line markings. 4. Improved cycle provision. Side arm pedestrian crossing increases slightly in length.

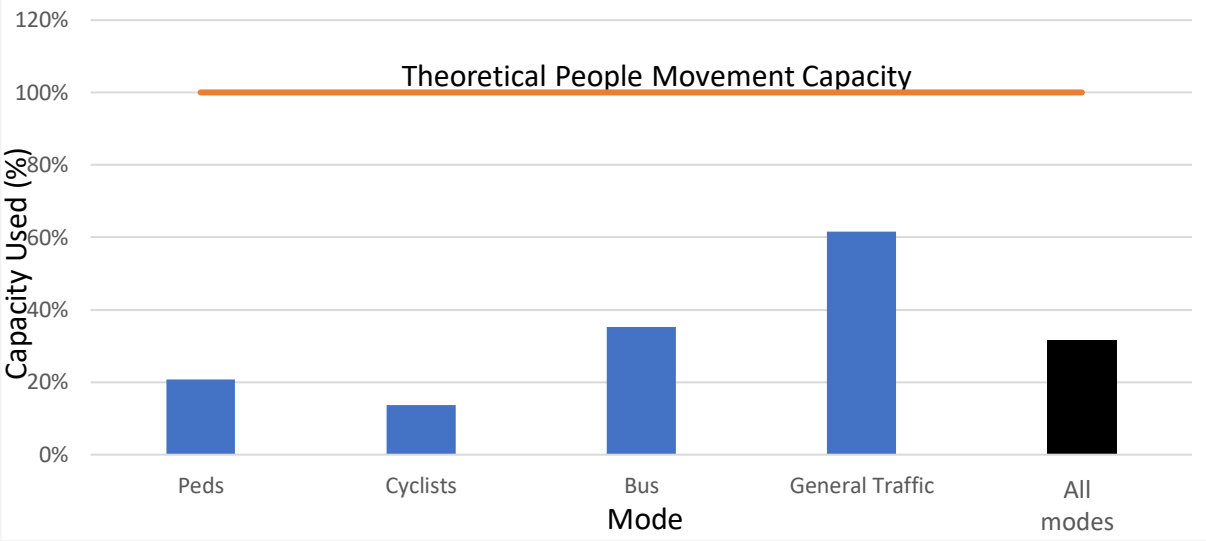
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Shrewsbury Road

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <80s on average.

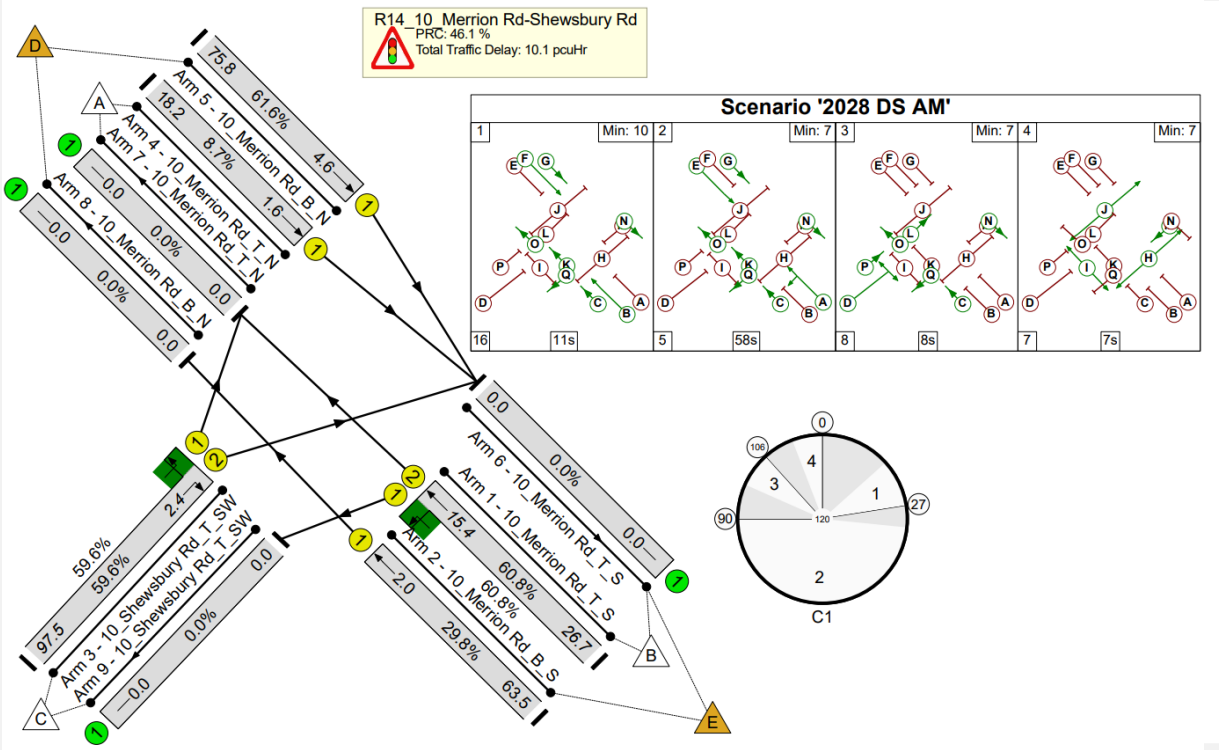




Do Something : 2028 : AM

Cycle = 120 sec
PRC = 46%
Delay = 10 pcuHr

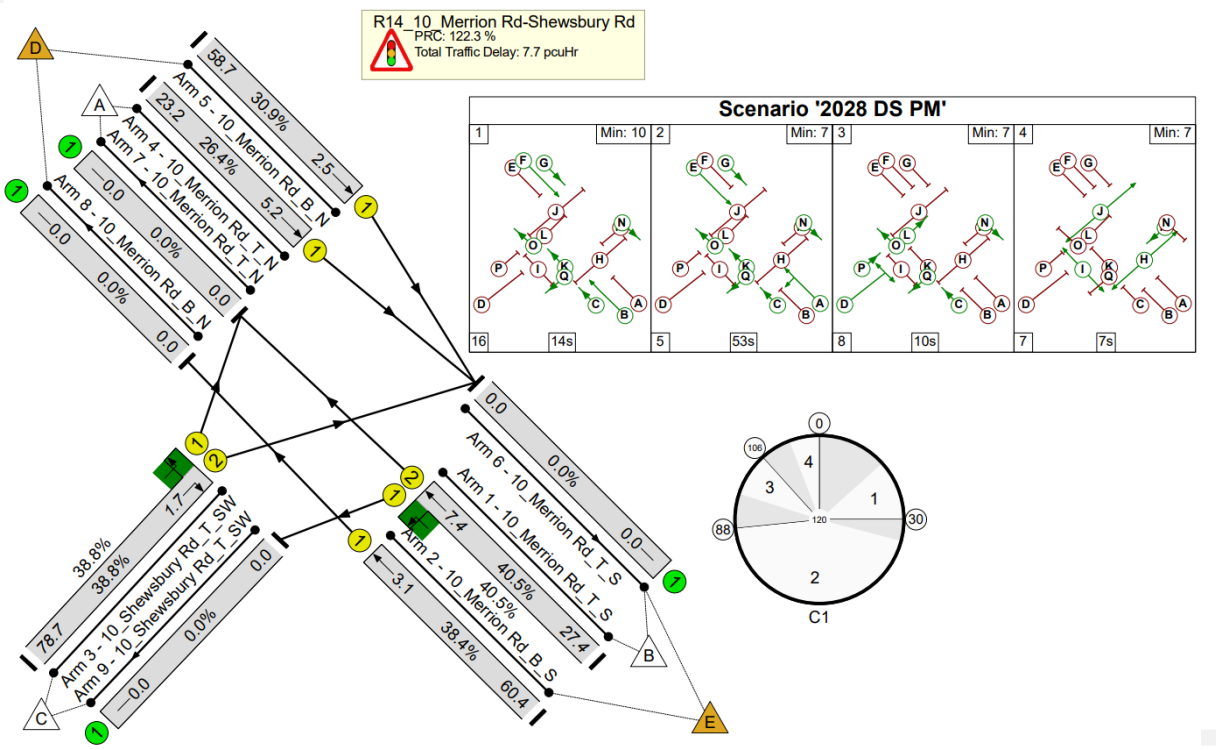
Bus delay
Inbound = 64s
Outbound = 76s



Do Something : 2028 : PM

Cycle = 120 sec
PRC = 122%
Delay = 8 pcuHr

Bus delay
Inbound = 60s
Outbound = 59s



ARUP

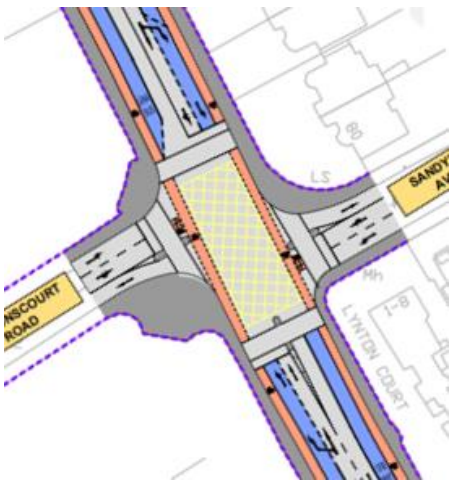
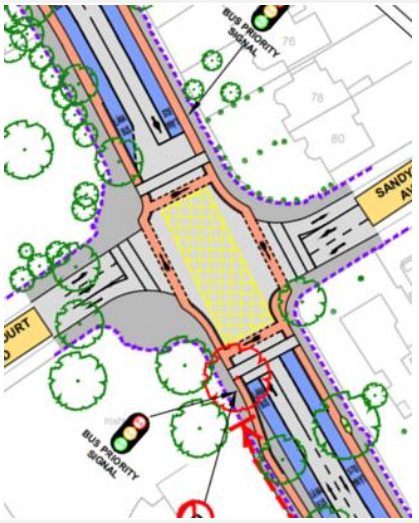
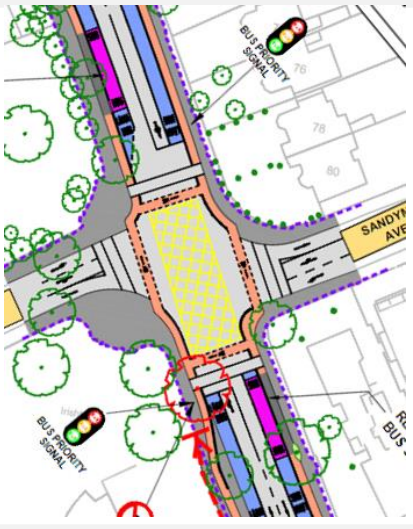
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Sandymount Avenue

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic lanes will be reduced to improve the environment for pedestrians and cyclists as well as to provide bus priority through the junction, yet with left-turning vehicles to be allowed to turn from the bus lane.

Signal Operation
A five stage signal operation is proposed. Mainline traffic and buses will operate in the same stage, with left turning vehicles will be crossing the bus lane paths at a distance of 20m from the junction. This will maximise green time for buses and minimise delay. Traffic will give way to cyclists on flashing ambers. A right turn indicative arrow will facilitate the traffic flow into Simmonscourt Road. The side roads will operate in separate stages, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings will operate in their own stage.

Junction Type 3 Bus delay <30s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Merrion Road arms 2. Cycle facilities introduced inbound/outbound through the junction	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure.	1. To improve bus priority through the junction. 2. To improve cyclist safety through the junction.
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced . 2. Inbound/outbound bus lanes brought to stop line with left turners turning from general traffic lane	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. In line with developing BusConnects Preliminary Design Guidance Booklet principles	1. Improved cyclist safety. 2. Improved bus priority, left turning traffic turns from general traffic lane.
DRAFT PRO (PC3)		1. No significant changes	1. N/A	1. N/A

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Sandymount Avenue

EXISTING

FINAL DESIGN

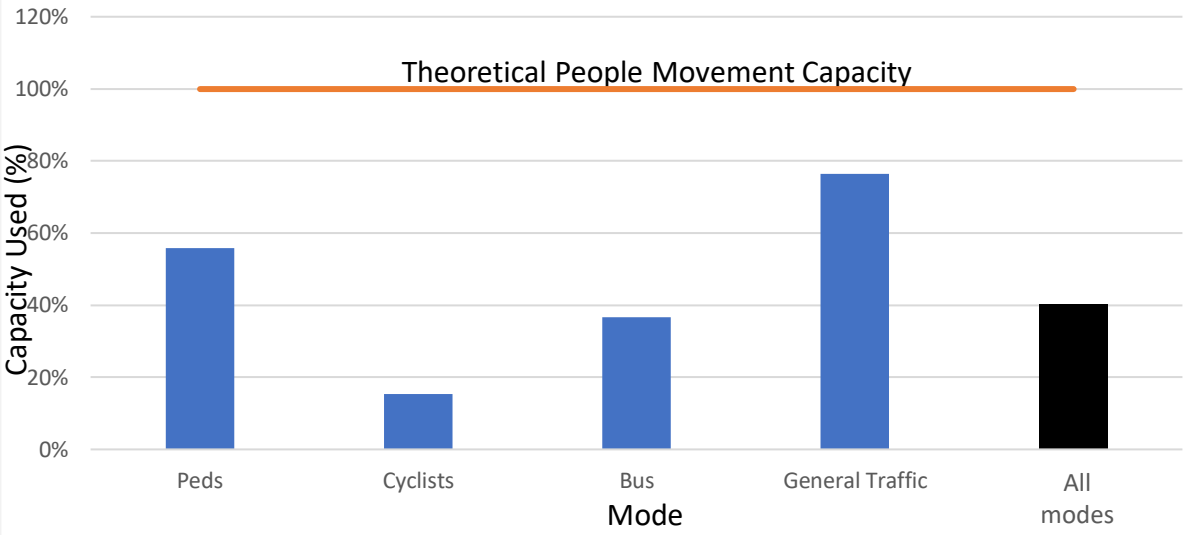
Change Made	Reason for Change	Impact of Change
1. Bus lanes terminated in advance of the stop lines to allow left turning vehicles to merge with the bus lane over a short distance (c.20m). 2. Cycle time extended to 120 seconds. 3. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 4. Additional details provided on landscaping proposals in the vicinity of the junction. 5. Reduction in approach lanes to junction on both side arms from 2 lanes to one shared, all-movements lane and the provision of cycle stub lanes. 6. Cycle crossings on Merrion Road realigned. 7. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To minimise delays at the junction for all modes and maximise the green time for buses. Expected left turning traffic on Merrion Road is low. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase. 3. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 4. To align General Arrangement design with landscaping design. 5. Better manage cycle movements to and from the side arms. 6. To improve the provision for the cyclist desire line.	1. Improved junction capacity and bus journey time reliability. 2. The increased cycle time improves capacity at the junction for road users. 3. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 4. Soft landscaping proposed within the public realm at the junction. 5. Improved cycle provision 6. Improved cycle provision

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Sandymount Avenue

Capacity / Delay

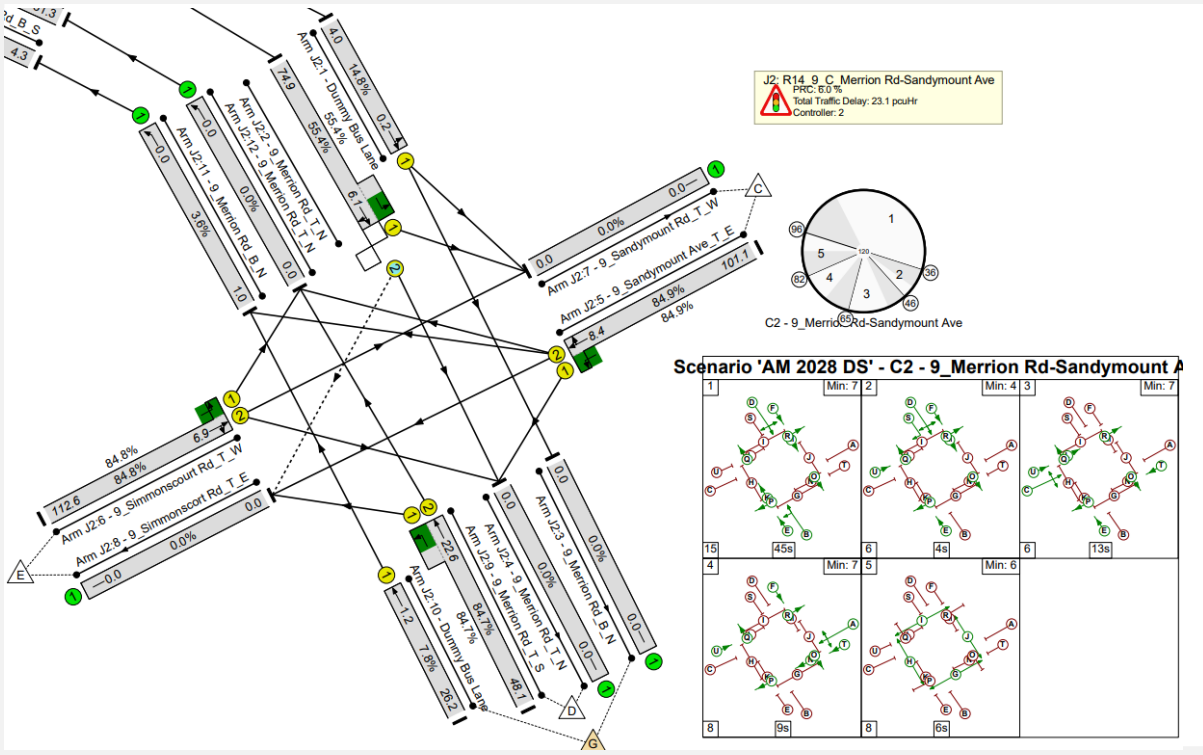
1. Junction operates within capacity.
2. Bus delay is <30s on average.



Do Something : 2028 : AM

Cycle = 120 sec
PRC = 6%
Delay = 23 pcuHr

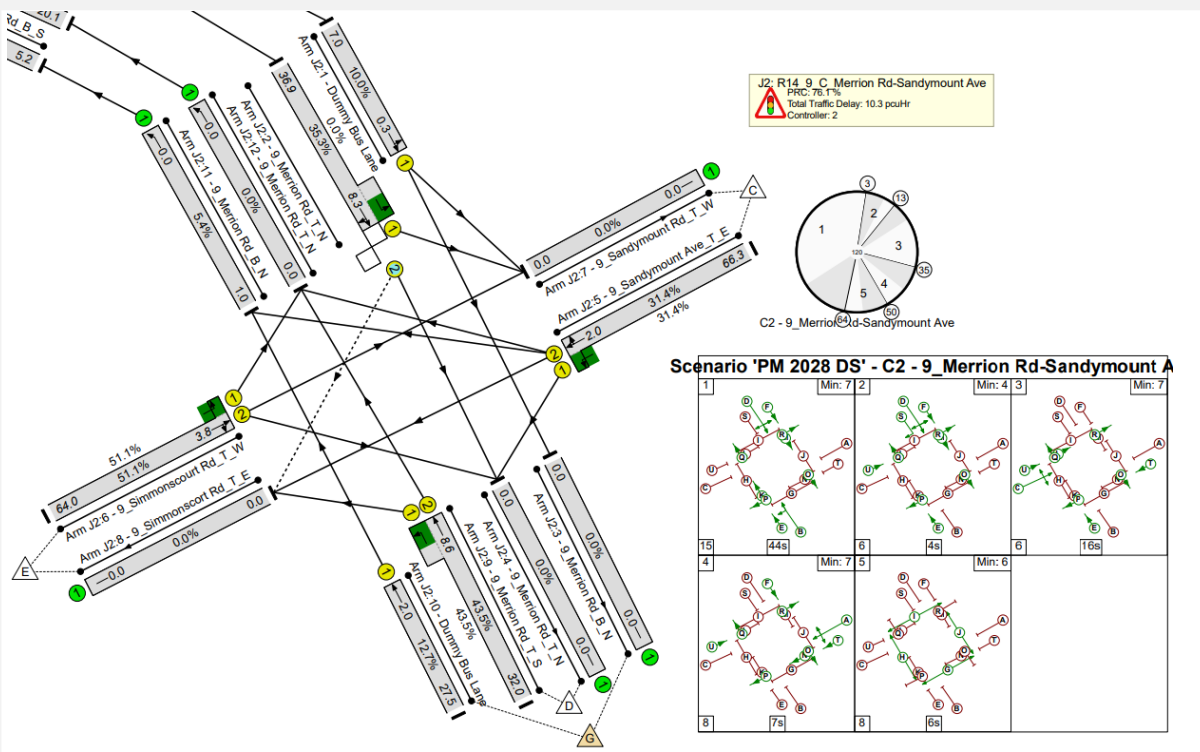
Bus delay
Inbound = 26s
Outbound = 4s



Do Something : 2028 : PM

Cycle = 120 sec
PRC = 76%
Delay = 10 pcuHr

Bus delay
Inbound = 28s
Outbound = 7s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Serpentine Avenue

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of left turn lanes and flared entries into the junction. The design rationale was to provide more priority to buses and to improve cyclist safety. Subsequently the traffic islands will be removed on the Merrion Road arms and southern footpath will be widened. The design rationale was to improve the pedestrian environment in an area of occasional high pedestrian activity (RDS events).

Signal Operation
A four stage signal operation is proposed. Mainline traffic and buses will operate in the same stage, with left turning vehicles to cross the bus lane path at a distance of 20m from the junction. This will maximise green time for buses and minimises delay. Traffic will give way to cyclists on flashing ambers. A right turn indicative arrow will facilitate the heavy traffic flow into Serpentine Avenue. The side road will operate in its own stage with flashing ambers, followed by pedestrians and right-turning cyclists.

Junction Type 3 Bus delay <45s

	Change Made	Reason for Change	Impact of Change
EXISTING	1. Bus lanes introduced on Merrion Road arms. 2. Cycle facilities introduced inbound/outbound through the junction.	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure.	1. To improve bus priority through the junction. 2. To improve cyclist safety through the junction.
EPR			
DRAFT PRO (PC2)	1. Protected junction for cyclist introduced . 2. Inbound/outbound bus lanes brought to stop line with left turners turning from general traffic lane .	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. In line with developing BusConnects Preliminary Design Guidance Booklet principles.	1. Improved cyclist safety. 2. Improved bus priority, left turning traffic turns from general traffic lane.
DRAFT PRO (PC3)	1. Traffic islands removed on Merrion Road arms and southern footpath widened.	1. To improve pedestrian environment and reduce impact to existing trees.	1. Wider footpaths in front of RDS with retention of a number of existing trees. Traffic signals will all need to be on road edge.

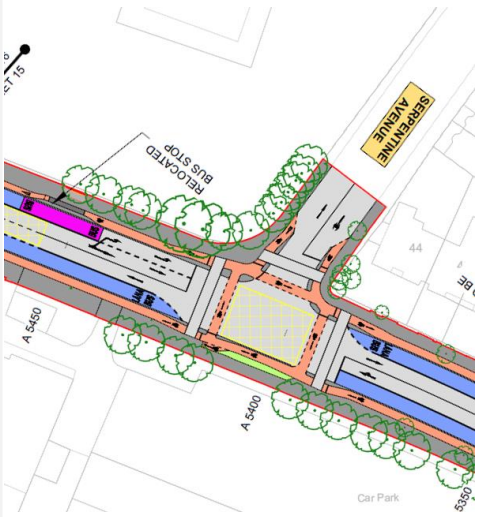
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Serpentine Avenue

EXISTING

FINAL DESIGN



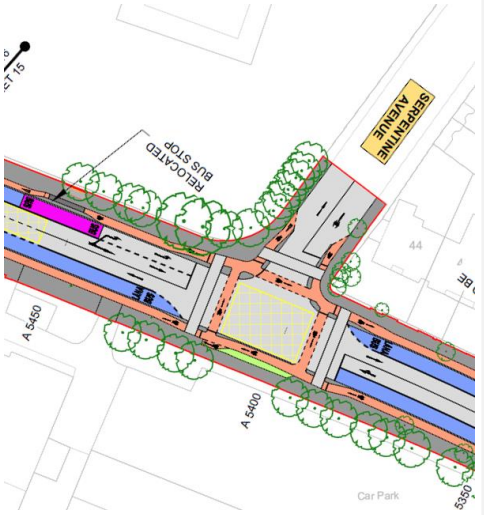
Change Made	Reason for Change	Impact of Change
1. Outbound bus lane terminated in advance of the stop lines to allow left turning vehicles to merge with the bus lane over a short distance (c.20m). No change to inbound bus lane. 2. Cycle time extended to 120 seconds. 3. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 4. Stop line of inbound bus lane set back c. 4m. 5. Reduction in approach lanes to junction on Serpentine Avenue from 2 lanes to one shared, all-movements lane and the provision of cycle stub lanes on Serpentine Avenue. 6. The cycle crossing points realigned across Merrion Road. 7. Right turning cyclists from Merrion Road permitted to cross at the same time as the pedestrians across Merrion Road; all pedestrian/ cycle conflicts to be controlled. 8. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To minimise delays at the junction for all modes and maximise the green time for buses. Expected left turning traffic outbound on Merrion Road is low. Inbound bus and traffic can run at same time due to T-junction arrangement, as such no change required. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase. 3. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 4. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 5. Better manage cycle movements to and from the side arm. 6. To improve provision for desire line of right turning cyclists. 7. To remove the need for a separate cycle stage to serve this single cycle movement.	1. Improved junction capacity and bus journey time reliability. 2. The increased cycle time improves capacity at the junction for road users. 3. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 4. Amendments to line markings. 5. Improved cycle provision. 6. Improved cycle provision. 7. No impact on junction performance, there is a requirement to control cyclists exiting the junction to avoid conflict with crossing pedestrians.

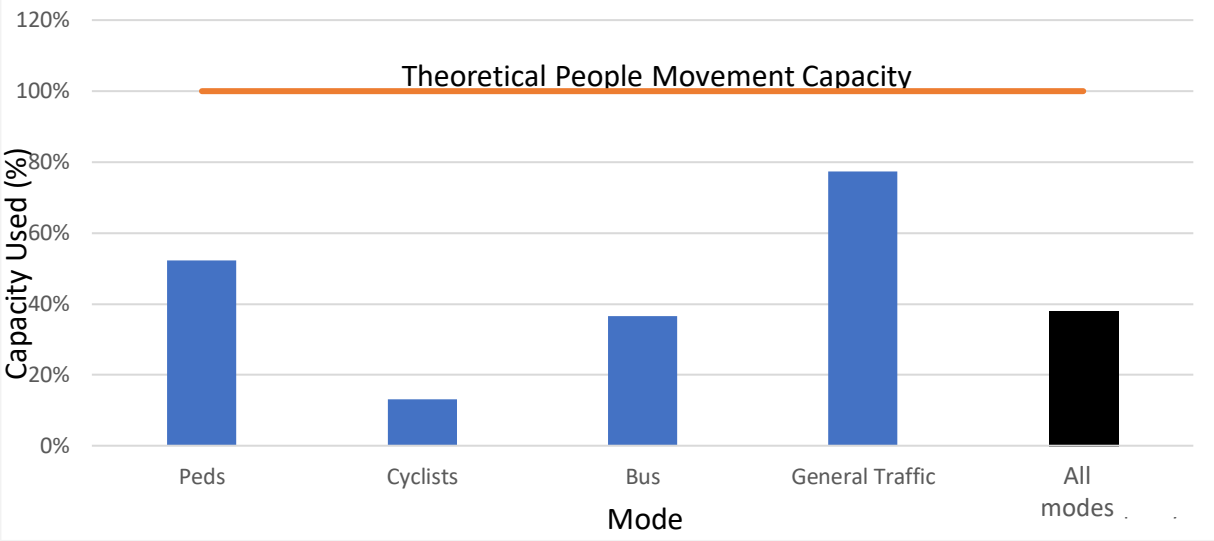
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Merrion Road / Serpentine Avenue

Capacity / Delay

1. Junction operates within capacity.
2. Bus delay is <45s on average.

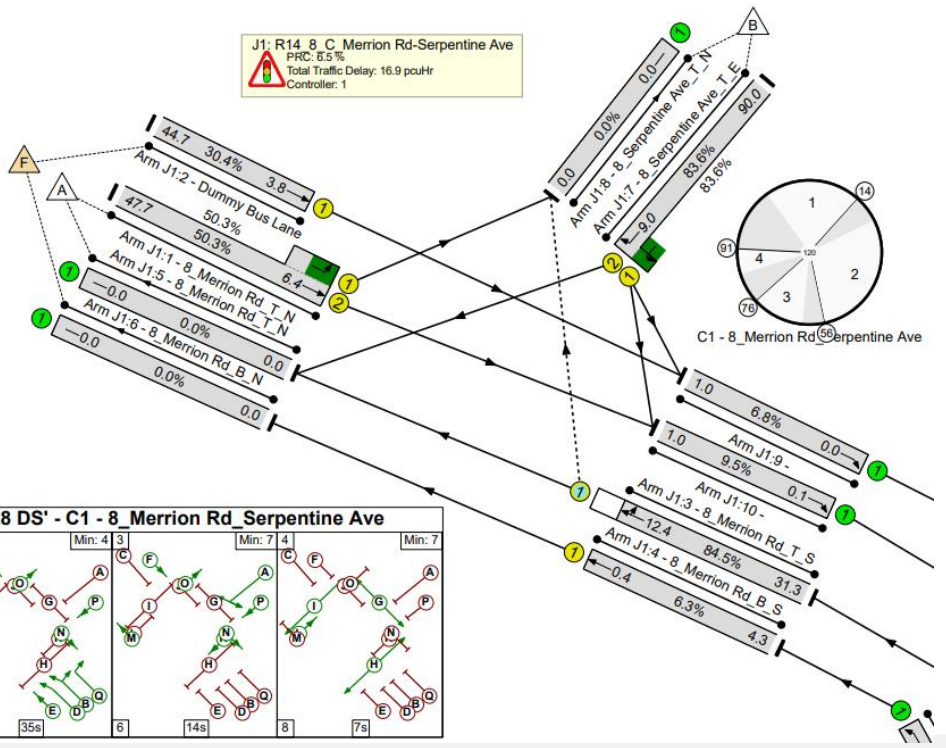


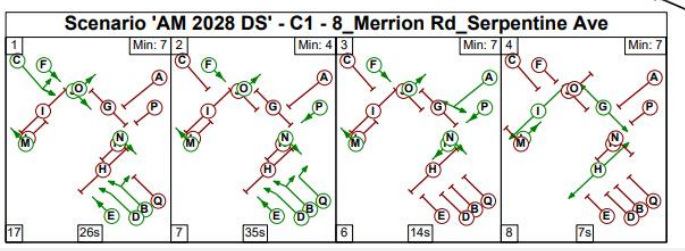


Do Something : 2028 : AM

Cycle = 120 sec
PRC = 7%
Delay = 17 pcuHr

Bus delay
Inbound = 4s
Outbound = 45s

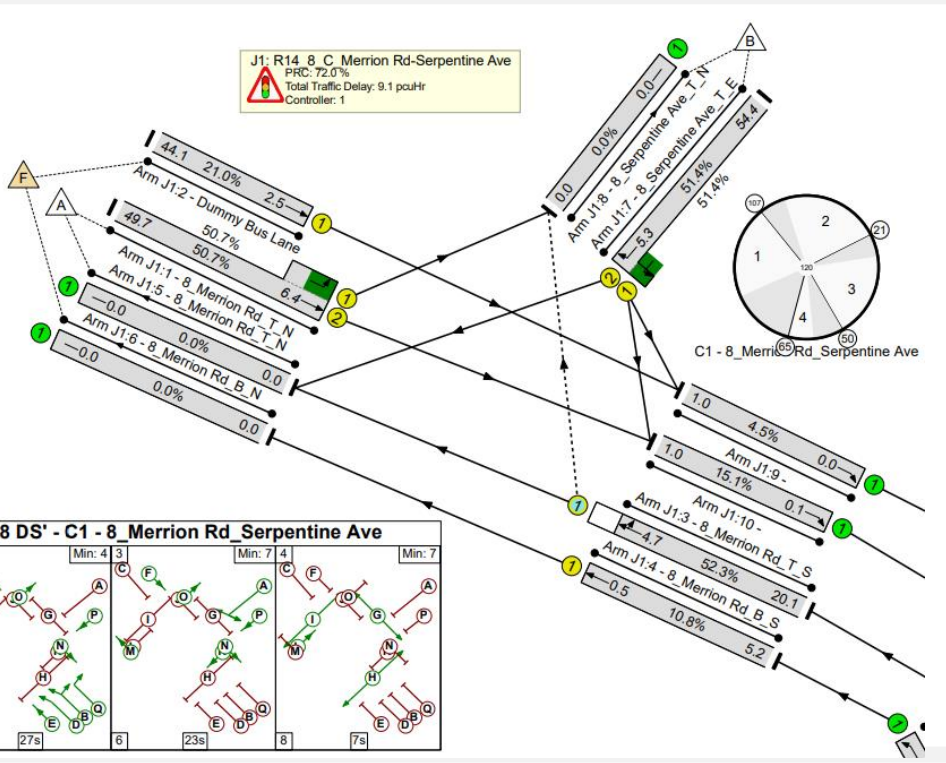


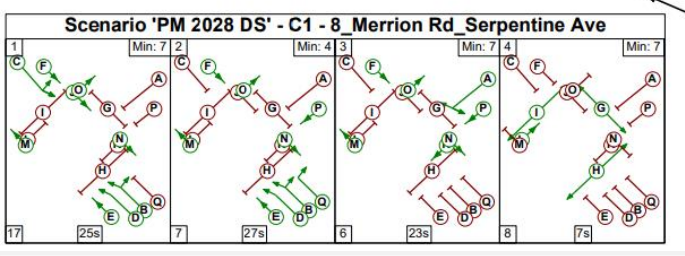


Do Something : 2028 : PM

Cycle = 120 sec
PRC = 72%
Delay = 9 pcuHr

Bus delay
Inbound = 5s
Outbound = 44s





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Pembroke Road / Anglesea Road

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The junction will be reduced in size to improve the environment for pedestrians and cyclists including the removal of splitter islands and flared entries into the staggered junction. A Toucan Crossing is proposed to connect the Dodder Cycle Route across Merrion Road, along with the removal of the left slip from Merrion Road to Anglesea Road. The design rationale was to allow cyclists to safely cross Merrion Road when cycling on the Dodder Cycleway and improve cyclist safety. The proposed access to City of Dublin Education and Training Board (CDETB) from Anglesea Road arm will be relocated to minimise the impact on the historic railings.

Signal Operation
A five stage signal operation is proposed. Mainline buses and cyclists in both directions will operate within the same stage through the junction. Mainline straight ahead traffic in both directions will operate in the same stage, with right turning traffic into Anglesea Road giving way to oncoming traffic. Straight-ahead traffic stops to allow priority to right turning traffic into Anglesea Road, which will operate with right turning traffic into Ballsbridge Park and left-turning traffic out of Anglesea Road. Traffic and cyclists from Ballsbridge Park will operate together, with left turning traffic to give way to cyclists on flashing ambers. 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. Bus lanes introduced on Merrion Road arms	1. In keeping with developing BusConnects design principles regarding bus infrastructure.	1. To improve bus priority through the junction.
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced. 2. Toucan Crossing Proposed to connect the Dodder Cycle Route across Merrion Road. 3. Removal of left slip from Merrion Road to Anglesea Road. 4. Inbound/outbound bus lanes brought to stop line with left turners turning from general traffic lane.	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. To allow cyclists to safely cross Merrion Road when cycling on the Dodder Cycleway. 3. Improved cyclist safety and rationalisation of movements. 4. In line with developing BusConnects Preliminary Design Guidance Booklet principles	1. Improved cyclist safety. 2. Improved cyclist safety with reallocation of footpath space to two way cycle track. 3. Improved cyclist safety, with the vehicular access to CDETB needing to be relocated. 4. Improved bus priority, left turning traffic turns from general traffic lane.
DRAFT PRO (PC3)		1. Access to City of Dublin Education and Training Board (CDETB) from Anglesea Road arm relocated. 2. Cycle time extended to 120 seconds.	1. Minimise impact on historic railings. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. Access relocated. Road markings and kerb lines amended. 2. The increased cycle time improves capacity at the junction for road users.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Pembroke Road / Anglesea Road

EXISTING

FINAL DESIGN

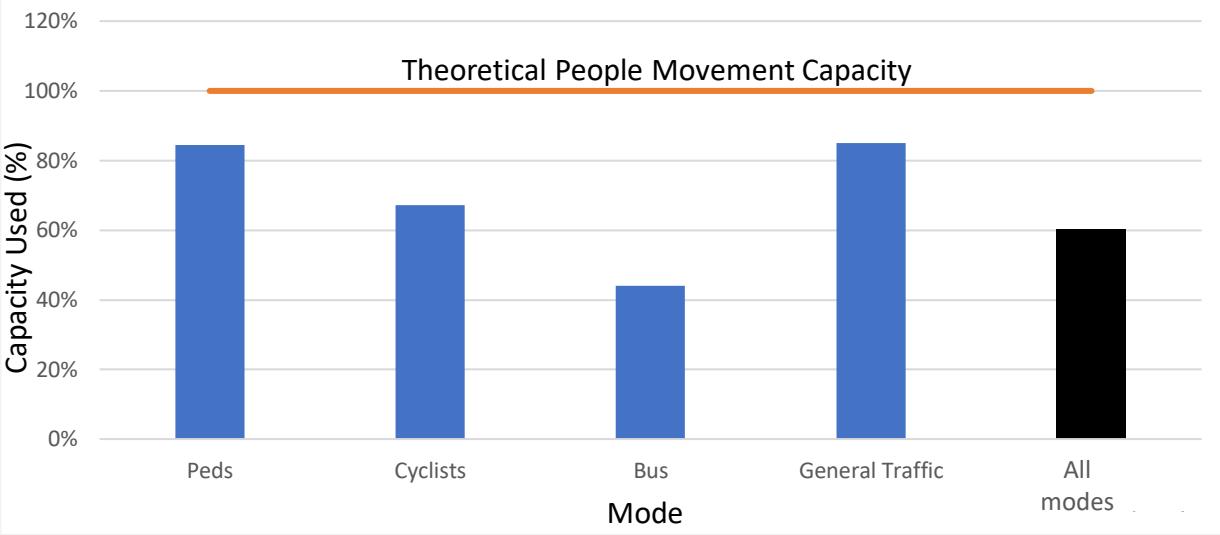
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Central median on inner crossing between Anglesea Road and Ballsbridge Avenue extended to form 4m wide pedestrian refuge. 4. Stop lines of bus lanes set back c. 4m. 5. Right turn lane serving Anglesea Road from Merrion Road has been reduced in length. 6. The provision of cycle stub lanes on Ballsbridge Avenue. 7. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. Opportunity to create sufficiently wide refuge area with no realignment of carriageway. 4. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 5. To provide an improved environment for pedestrians over the adjacent Ballsbridge. 6. Better manage cycle movements to and from the side arm.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within the public realm at the junction. 3. Provides a 4m wide refuge with new opportunity for landscaping within the median. 4. Amendments to line markings. 5. Improved pedestrian facilities within the centre of Ballsbridge. 6. Improved cycle provision. 7. Some redistribution of inbound traffic as less green time assigned to the inbound movement along Merrion Road (to assist the management of queuing outbound). This results in some increase in traffic using Serpentine Avenue and Anglesea Road.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Pembroke Road / Anglesea Road

Capacity / Delay

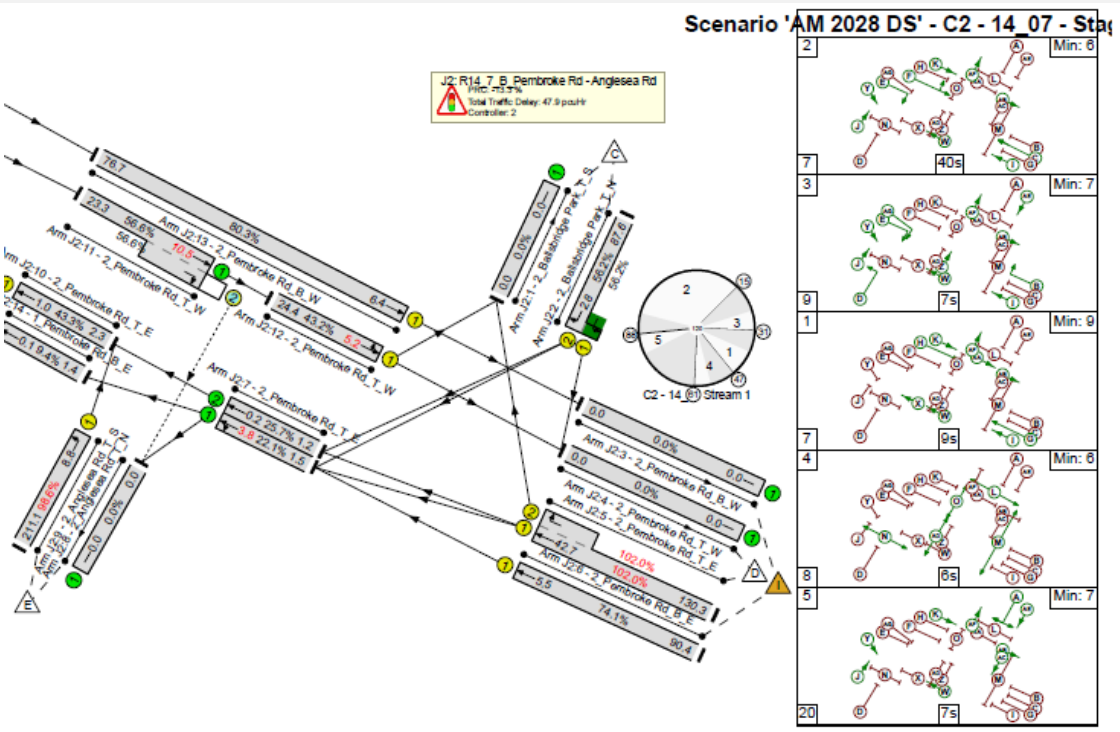
1. Junction operates over capacity in AM peak.



Do Something : 2028 : AM

Cycle = 120 sec
PRC = -13%
Delay = 48 pcuHr

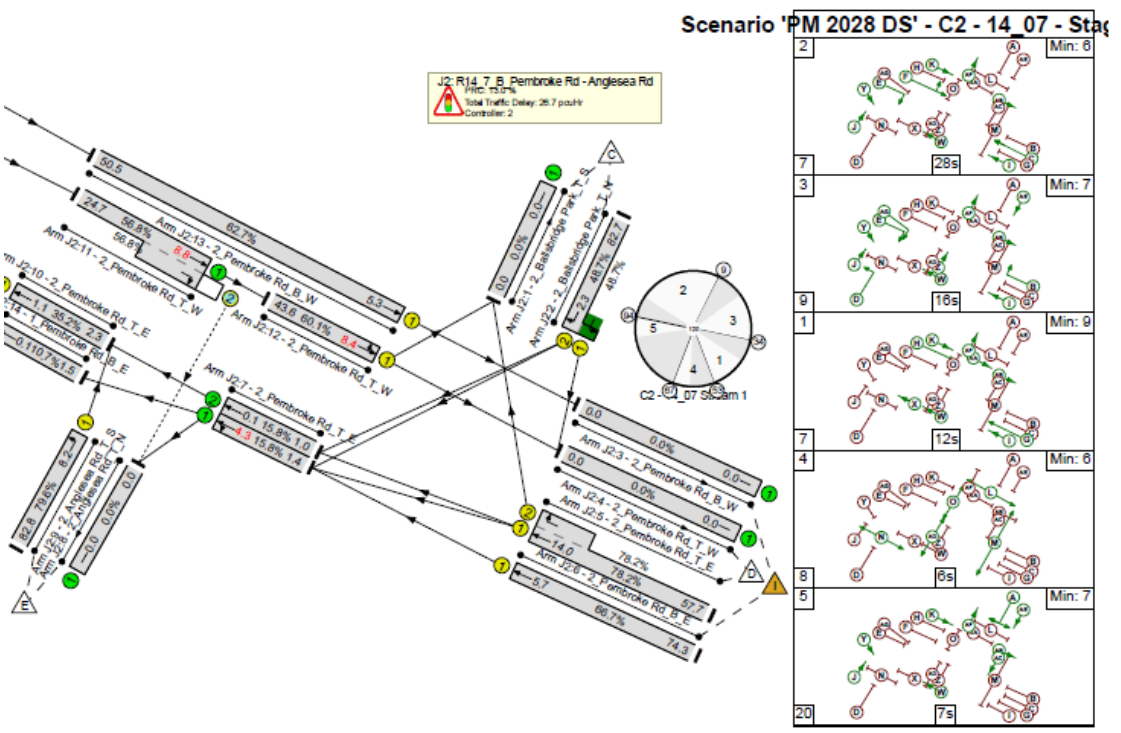
Bus delay
Inbound = 90s
Outbound = 77s



Do Something : 2028 : PM

Cycle = 120 sec
PRC = 13%
Delay = 27 pcuHr

Bus delay
Inbound = 74s
Outbound = 51s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Pembroke Road / Shelbourne Road

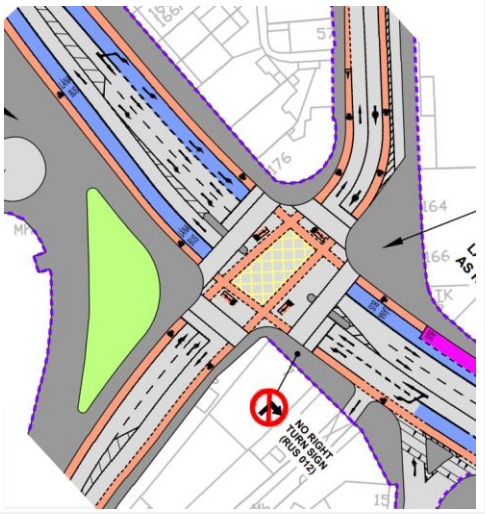
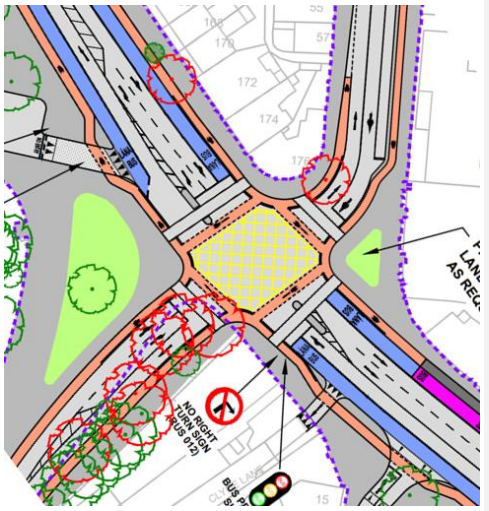
Summary

Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The junction will be rationalised and reduced in size to improve the environment for pedestrians and cyclists. The northbound right-turning lane into Shelbourne Rd will be removed and relocated to the junction of Pembroke Rd and Lansdowne Rd. The design will also include a right turn on to Herbert Park. The design rationale was to ensure buses will have more priority at the junction and to reduce potential impacts on local access to Elgin Rd and surrounding areas.

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 a distance of 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 from Pembroke Rd to Herbert Park will 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 <30s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Junction converted into an all movements signalised cross roads with bus and cycle infrastructure introduced. 2. Removal of the northbound right-turning lane into Shelbourne Road, which would be relocated to the junction of Pembroke Road and Lansdowne Road. 3. Elgin Road converted to a cul-de-sac at the Pembroke Road end.	1. In keeping with developing BusConnects design principles. 2. To maximise pedestrian space in confined area and to improve operation of the junction. 3. To rationalise movements at the junction.	1. Rationalisation of the junction with reallocation of space, with additional public realm opportunities and improved pedestrian crossing facilities. 2. Traffic to be diverted along Pembroke Road onto Lansdowne Road. 3. To access Pembroke Road, drivers on Elgin Road would be directed to Raglan Road and back on to Pembroke Road.
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced . 2. Inbound bus lanes brought to stop line 3. Left turn into Elgin Road reintroduced	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. In line with BusConnects Preliminary Design Guidance Booklet principles 3. To improve local accessibility	1. Improved cyclist safety. 2. Improved bus priority, left turning traffic turns from general traffic lane. 3. Improved local access with inbound cycle track now crossing left turn traffic lane into Elgin Road
DRAFT PRO (PC3)		1. Realigned south western arm (Herbert Park Road) on approach to the junction. 2. The pedestrian crossing on the western arm was converted to a staggered crossing	1. Minimise Impact on Property on Clyde Lane D04XH74. Provide protection for more trees in green area 2. To reduce overall crossing width per single crossing for pedestrians and offer the opportunity to cross in separate stages.	1. Retention of a number of trees on the eastern side of the arm. Reduction in size of public realm area between Herbert Park Road and Elgin Road 2. Improve pedestrian safety at the junction but with reduced queuing length on eastbound approach.

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Pembroke Road / Shelbourne Road

EXISTING

FINAL DESIGN

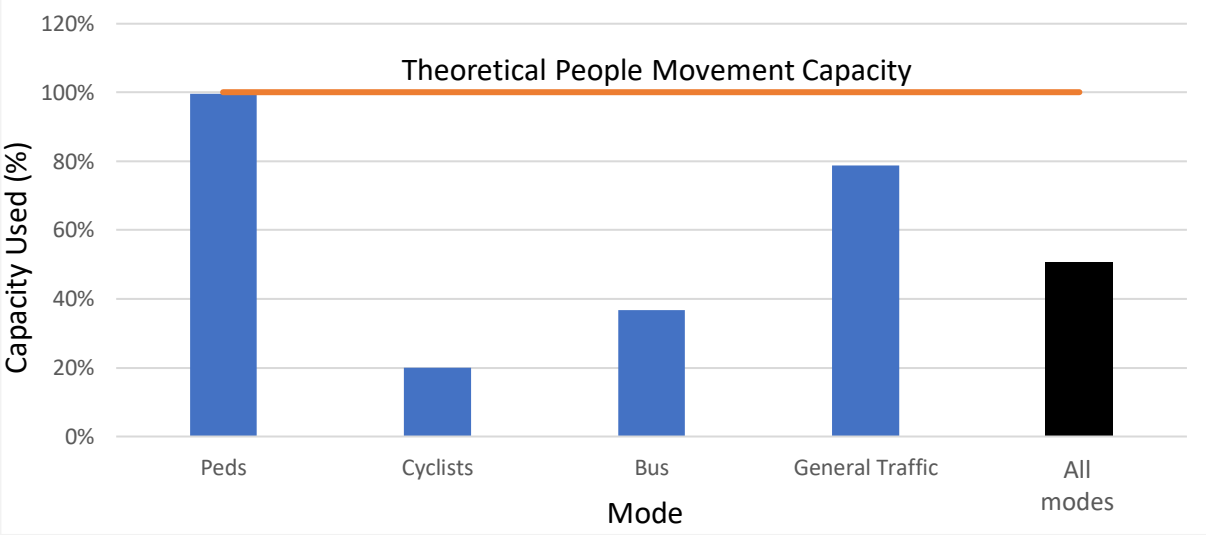
Change Made	Reason for Change	Impact of Change
1. Bus lanes terminated in advance of the stop lines to allow left turning vehicles to merge with the bus lane over a short distance (c.20m). 2. A cycle time of 120 seconds has been provided at this location to ensure all stages of the traffic signal can be carried out safely. 3. Approach and egress alignments of cycle tracks refined, and additional space provided within cycle waiting areas. Details of protected kerbs and road markings refined. Additional details provided on landscaping proposals in the vicinity of the junction. 4. Additional details provided on landscaping proposals in the vicinity of the junction. 5. Pedestrian crossing on Pembroke Road arm converted to straight-crossing in place of staggered. 6. Central island on Ballsbridge arm of the junction removed. 7. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To minimise delays at the junction for all modes and maximise the green time for buses. Expected left turning traffic on Pembroke Road is low. 2. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase. 3. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. To align General Arrangement design with landscaping design. 4. To align General Arrangement design with landscaping design. 5. Staging includes all green phase for pedestrian and therefore there is no requirement for separating each crossing portion in a staggered arrangement 6. The reduction in the length of the right turn lane to Anglesea Road over Ballsbridge removes the need for this island.	1. Improved junction capacity and bus journey time reliability. 2. The increased cycle time improves capacity at the junction for road users. 3. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 4. Soft landscaping proposed within the public realm at the junction. 5. Removed requirement for additional street furniture required for staggered arrangement and increased queuing length on eastbound arm. 6. A shorter overall crossing distance for pedestrians crossing this road.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Pembroke Road / Shelbourne Road

Capacity / Delay

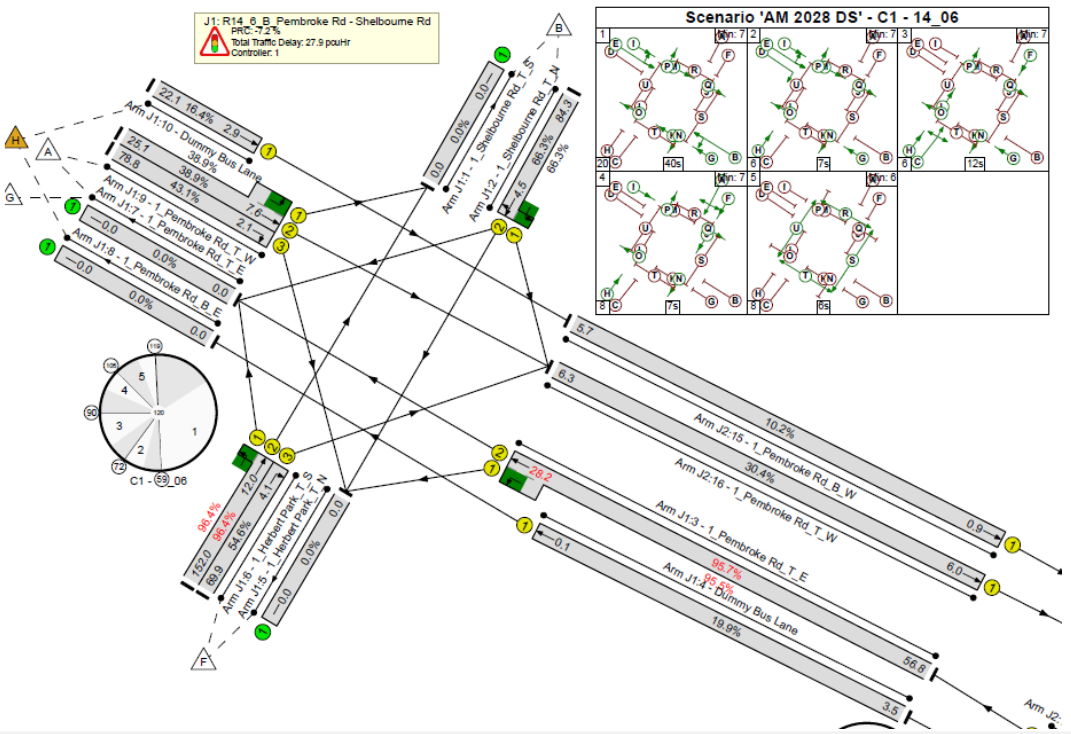
1. Junction operates over capacity in AM peak.



Do Something : 2028 : AM

Cycle = 120 sec
PRC = -7%
Delay = 28 pcuHr

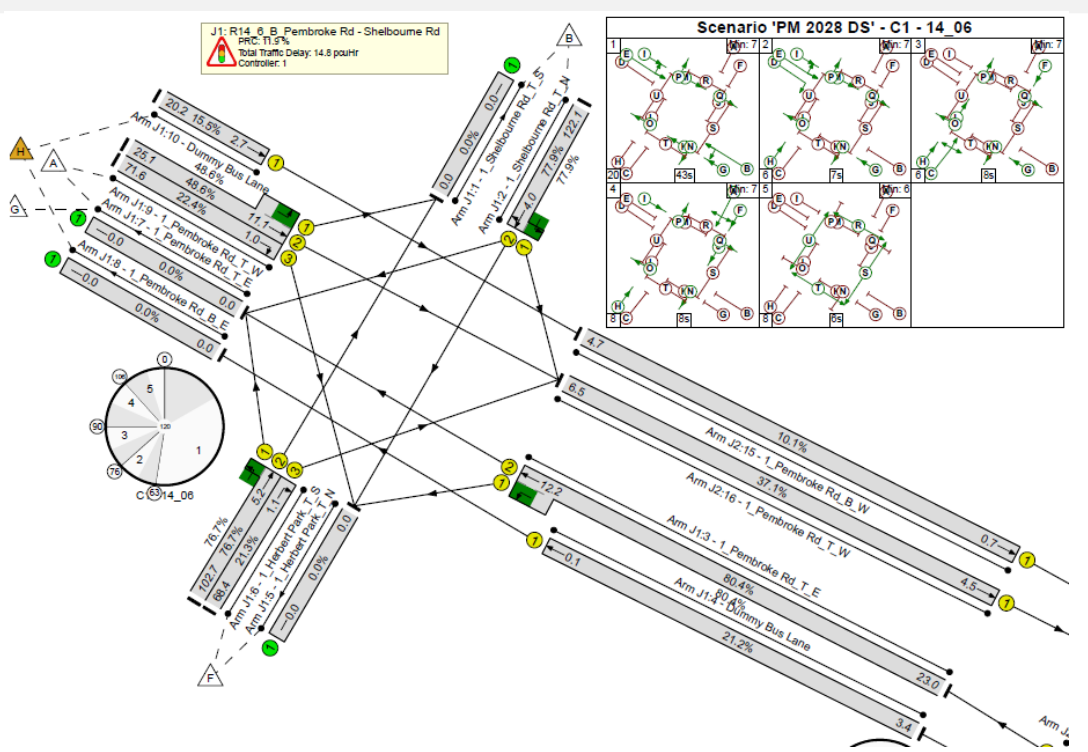
Bus delay
Inbound = 4s
Outbound = 22s



Do Something : 2028 : PM

Cycle = 120 sec
PRC = 12%
Delay = 15 pcuHr

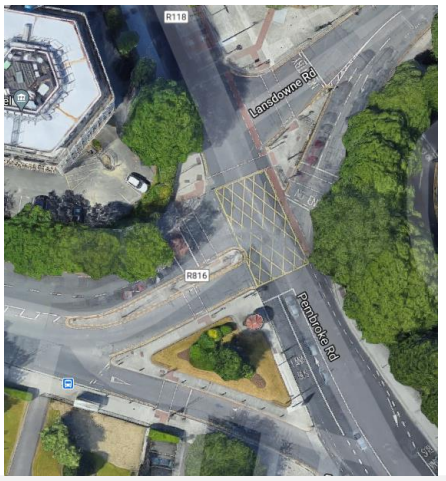
Bus delay
Inbound = 3s
Outbound = 20s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Pembroke Road / Northumberland Road



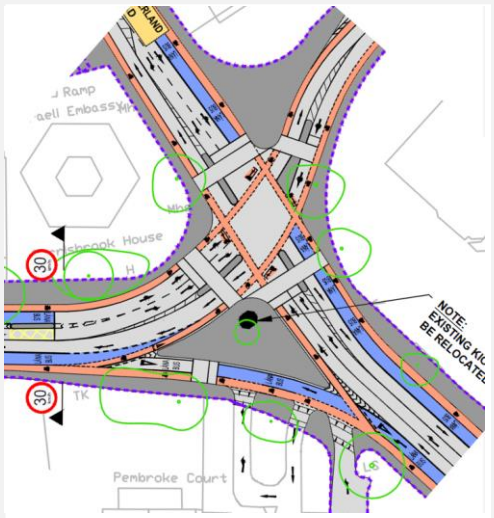
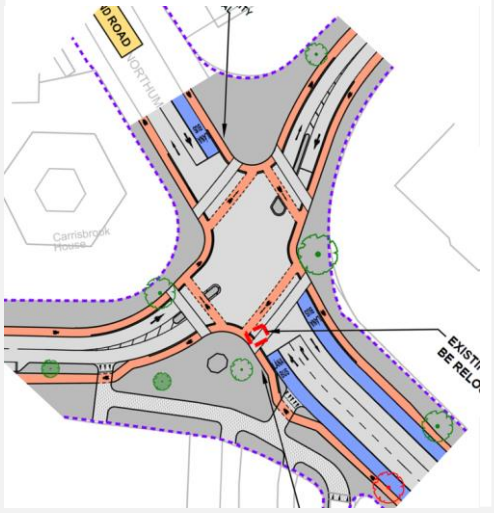
Summary

Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. A right turn lane will be introduced from Pembroke Road onto Lansdowne Road to replace the movement at Ballsbridge Junction (Pembroke Road / Shelbourne Road) that will be removed. The western approach to the junction will be reduced from two lanes to one lane. Bus lane will be brought up to the junction rather than bypassing it via slip lane to Pembroke Road. The Design Rationale was to improve pedestrian and cyclist safety at the junction, integrate with the traffic management proposals on Pembroke Road, and provide improved bus priority. As there will be a receiving bus lane proposed on the Northumberland Road arm, and there may be both left-turning and straight through buses approaching from the southern arm, this southern arm will not be able to allow buses and general traffic run in the same stage.

Signal Operation

A six stage signal operation is proposed. Buses on the southern arm and buses and cyclists on the northern arm will operate in a single stage. Mainline traffic and northbound cyclists will operate together, with left turning traffic to give way to cyclists on flashing ambers. A right turn indicative arrow from Pembroke Road into Lansdowne Road is proposed. The side road traffic and cyclists will operate separately with flashing ambers, followed by pedestrian crossings in their own stage.

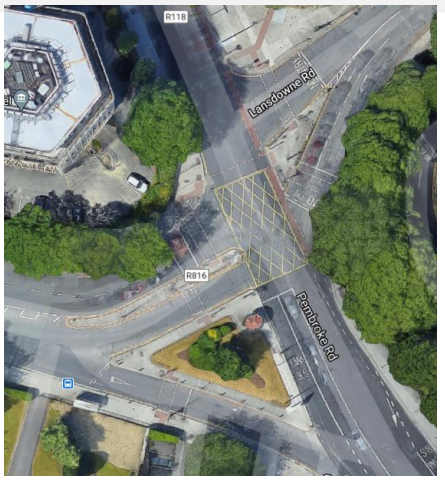
Junction Type 1 Bus delay <90s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Junction converted into an all movements signalised cross roads with bus and cycle infrastructure introduced. 2. Right turn lane introduced from Pembroke Road onto Lansdowne Road to replace removed movement at Ballsbridge Junction.	1. In keeping with developing BusConnects design principles. 2. Forms part of rationalisation of Ballsbridge Junction, additional space available in cross section to enable right turn lane onto Lansdowne Road. Right turn lane on Pembroke Road replaces that currently at Shelbourne Road and is of equivalent length.	1. Reallocation of space, with reduction in footpath widths in parts and additional public realm in others. 2. Restructuring of junction's arms to enable right turn.
DRAFT PRO (PC2)		1. Western approach to the junction reduced from two lanes to one lane. 2. Central median removed from eastern arm and arm realigned 3. Bus lane now run up to the junction rather than bypassing it to Pembroke Road. 4. Protected Junction for cyclists to be provided.	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles. Aligns with reduced traffic on Pembroke Road as a result of traffic management. 2. To avoid land take to adjacent property following topographical survey review 3. Bring junction in line with BusConnects Preliminary Design Guidance Booklet principles. Also enables straight ahead bus movement onto Northumberland Road. 4. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles.	1. Traffic reduced on Pembroke Road. 2. Removes impact to adjacent property and enables footpath widths to be maintained. 3. Increased space for public realm interventions. Removes conflict point of bus and cyclist. 4. Improved cyclist safety. Cyclists removed from conflict at this junction.
DRAFT PRO (PC3)		1. Alignment of cycle crossings amended. 2. Alignment of pedestrian crossings amended. 3. Cycle crossing at side roads on approach amended. 4. A cycle time of 120 seconds has been provided at this location to ensure all stages of the traffic signal can be carried out safely.	1. To improve cycle movements and quality of service 2. Improve crossing alignments on the desire line. 3. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles. 4. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. Line markings and kerb locations amended. 2. Line markings and kerb locations amended. 3. Line markings and kerb locations amended. 4. The increased cycle time improves capacity at the junction for road users.

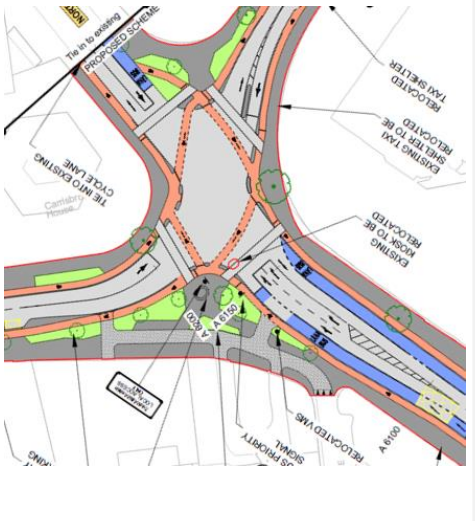
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Pembroke Road / Northumberland Road

EXISTING



FINAL DESIGN



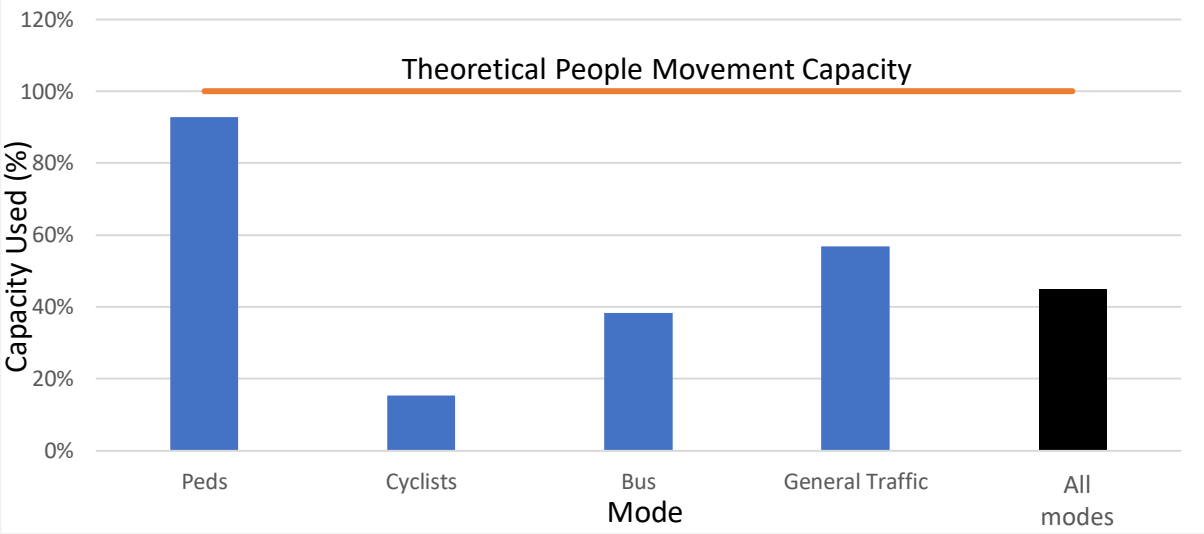
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Alignments of cycle track across the junction refined and pedestrian crossings realigned. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Central medians removed / reduced in scale. 4. Buses and general traffic required to run in separate staging. 5. North-south cyclists and general traffic run in the same stage, as opposed to with bus movements. 6. Stop lines of bus lanes set back c. 4m. 7. Signal operations modified to phase separate buses and cyclists approaching from Pembroke Road to remove conflict between a high number of left turn bus movements and cyclist. 8. The right turn lane on Pembroke Road serving Lansdowne Road has been reduced in length. 9. Gaps created in cycle kerb to facilitate right turning cyclists during Stage 6. 10. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To optimise the layout to suit likely cyclist desire lines in all movements. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. Swept path analysis indicated conflicts which have now been designed out. 4. Existing and proposed bus networks include services travelling north through the junction – as such with no receiving bus lane on Northumberland Road proposed in the design, these movements cannot safely run at the same stage. 5. The projected number of left turn vehicles from the main traffic lane is of an acceptably low level, and consideration give to the bespoke arrangement at this junction whereby dominant bus movement on the CBC is a left turn onto Pembroke Road inbound. 6. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 7. The length of projected queuing at this location did not warrant such a long turn lane and resulted in reducing impacts on existing trees. 8. The skew of the junction creates a long route for some right turning cyclists.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Marking and kerbs amended, as well as pedestrian crossing widths minimised where practicable. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within the public realm at the junction. 3. Reduced risk of conflict between turning vehicles and physical infrastructure. 4. Junction to be developed as Type A. 5. General traffic to make left turn from central lane with a flashing amber while cyclists continue through junction. 6. Amendments to line markings. 7. Positive impact on existing trees and footpath width. 8. Some cyclists will be able to take a more direct route through the junction during Stage 6.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Pembroke Road / Northumberland Road

Capacity / Delay

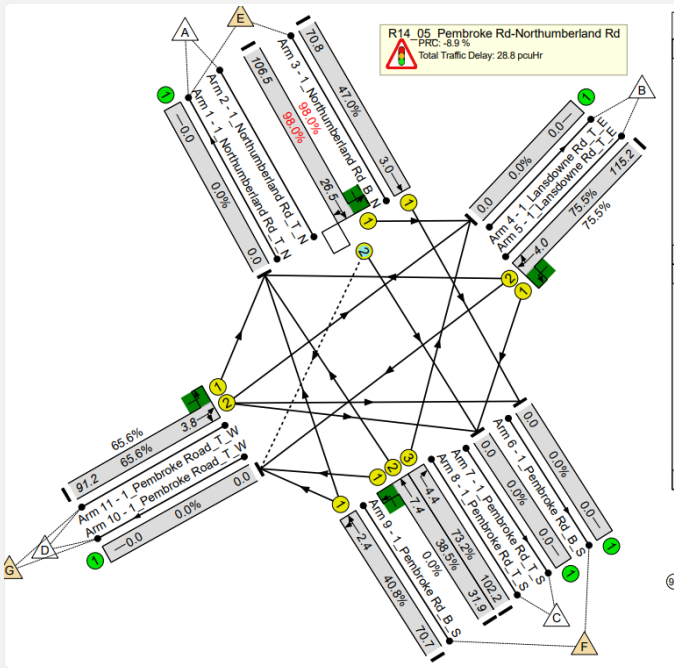
1. Junction operates within capacity.
2. Bus delay is <90s on average.

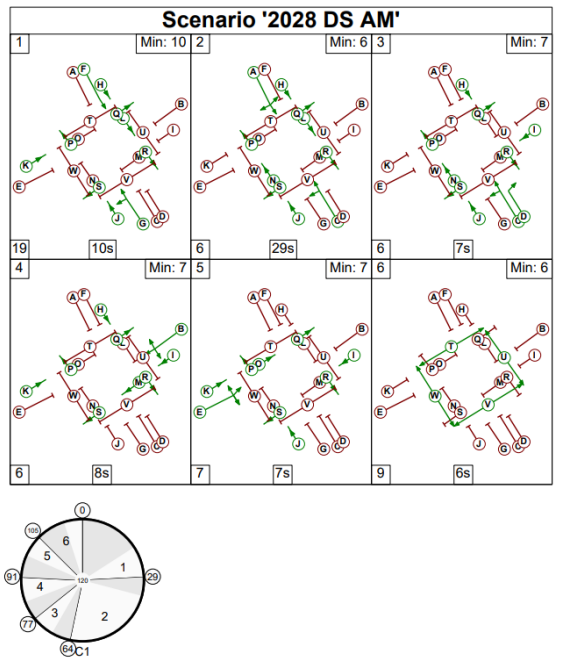


Do Something : 2028 : AM

Cycle = 120 sec
PRC = -9%
Delay = 29 pcuHr

Bus delay
Inbound = 71s
Outbound = 71s

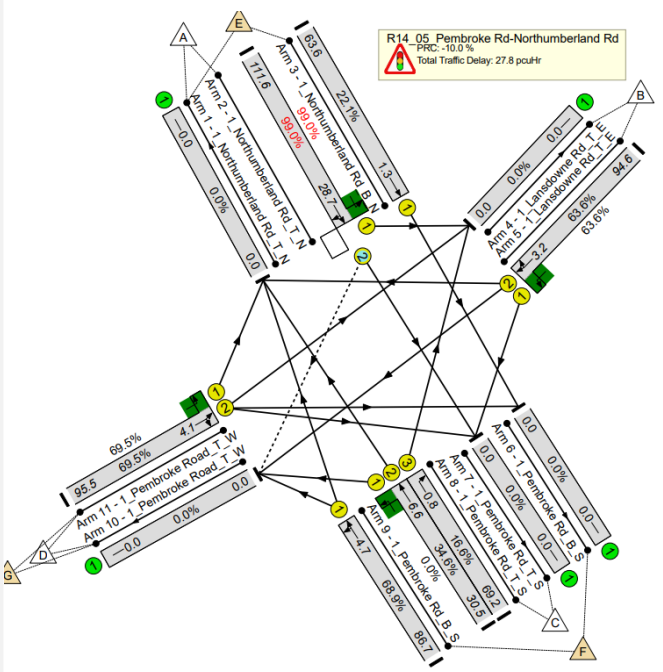


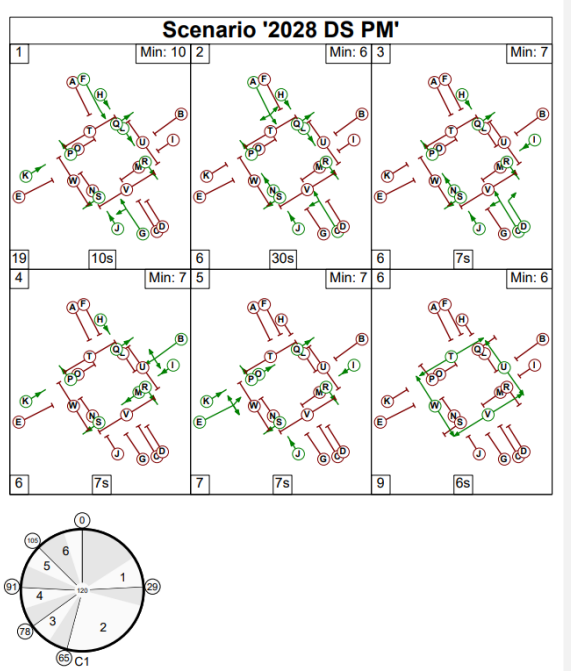


Do Something : 2028 : PM

Cycle = 120 sec
PRC = 10%
Delay = 28 pcuHr

Bus delay
Inbound = 87s
Outbound = 64s





ARUP

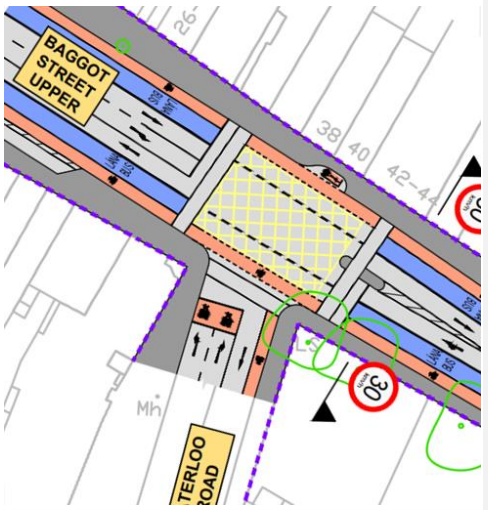
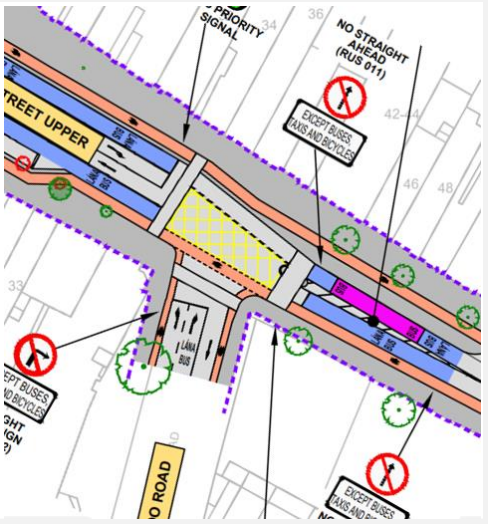
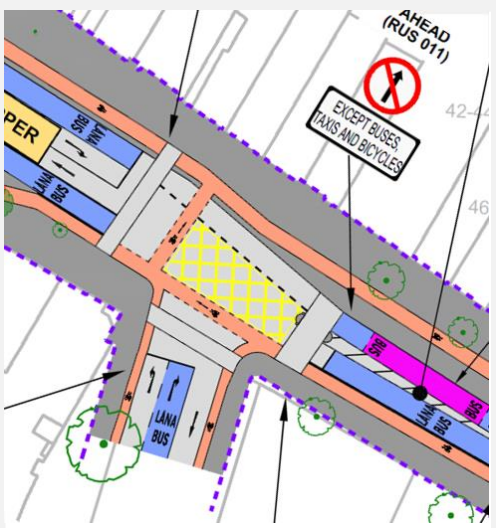
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Upper / Waterloo Road

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic lanes and on street parking will be reduced to improve the environment for pedestrians and cyclists as well as providing bus priority. A bus gate is proposed on Pembroke Road at the junction of Waterloo Road, eliminating land acquisition along this section and allowing trees to be retained. Design rationale was to cater for the extremely high volumes of pedestrians in this area, provide space for trading purposes on Baggot St while protecting bus priority through this area and improving the public realm of the Baggot Street Village area. This arrangement will also reduce traffic on Pembroke Road and will give more priority to buses.

Signal Operations
A four stage signal operation is proposed. Mainline buses and cyclists will operate within the same stage through the junction, with left turning traffic to give way to cyclists on flashing ambers. Mainline traffic, buses, and cyclists turning right will go with side arm traffic turning left. The bus lane from the side road will operate when called. Pedestrians and cyclists turning right from the side road will operate together.

Junction Type 1 Bus delay <35s

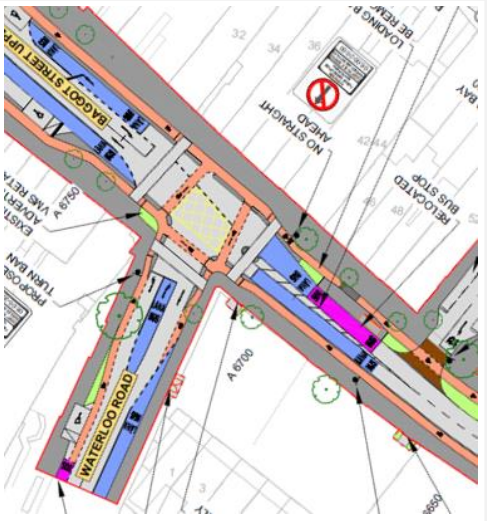
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Baggot Street Upper and Pembroke Road arms 2. Cycle facilities introduced inbound/outbound through the junction including a jug turn area provided for right turning cyclists.	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure.	1. To improve bus priority through the junction. 2. To improve cyclist safety through the junction.
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced . 2. Bus Only Access to and from Pembroke Road at this junction due to bus gate. Removal of one vehicle lane on Baggot Street Upper outbound. 3. Toucan crossing provided on Pembroke Road arm. 4. Cycle lanes provided on both sides of Waterloo Road arm.	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles. 2. Reduce impacts on Pembroke Road (traffic, land take, footpath widths) and give more priority to Buses. 3. To cater for right turning cyclists. 4. To improve cyclist facilities at the junction.	1. Improved cyclist safety. 2. Drivers can no longer access or exit from Pembroke Road at this junction, however wider footpaths provided with further public realm opportunities. 3. Removes the requirement for jug turn. 4. Improved cyclist environment with minor reduction in lane widths and footpath widths.
DRAFT PRO (PC3)		1. Additional cycle crossing introduced on Baggot Street Upper arm. 2. A cycle time of 90 seconds has been retained at this busy pedestrian location.	1. To cater for right turning cyclists from Waterloo Road. 2. To ensure pedestrians and cyclists are provided with shorter wait times travelling through the junction.	1. Improved cyclist facilities with line marking amendments. 2. Increasing the cycle time would increase the capacity of the junction for general traffic.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Upper / Waterloo Road

EXISTING

FINAL DESIGN



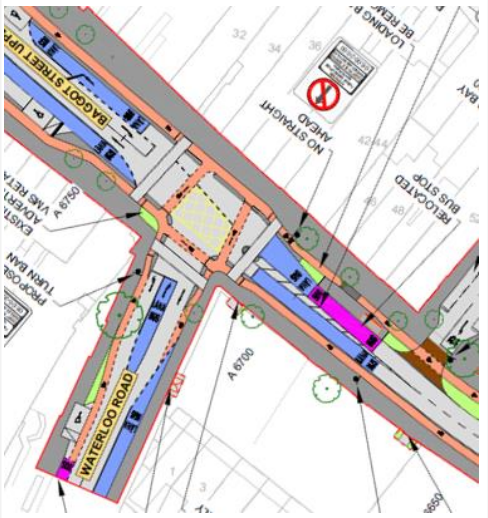
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Additional cycle crossing introduced on Pembroke Road arm in place of previously proposed toucan crossing. 4. Length of right turning bus lane from Waterloo Road to Pembroke Road reduced. 5. Stop line of outbound bus lane set back c. 4m. 6. Right turning cyclists from Waterloo Road permitted to cross at the same time as the pedestrians across Baggot Street. 7. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. To cater for right turning cyclists to Waterloo Road in dedicated movement. 4. Curtailment required due to provision of new disabled parking bay on Waterloo Road and associated impact on alignment. 5. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 6. To remove the need for a separate cycle stage to serve this single movement.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within the public realm at the junction. 3. Improved cyclist facilities with line marking and kerb amendments, adjacent pedestrian crossing retained and narrowed to appropriate width. 4. Reduced stacking length in right turn bus lane, with minimal impact on throughput of buses. 5. Amendments to line markings. 6. No impact on junction performance, there is a requirement to control cyclists exiting the junction to avoid conflict with crossing pedestrians.

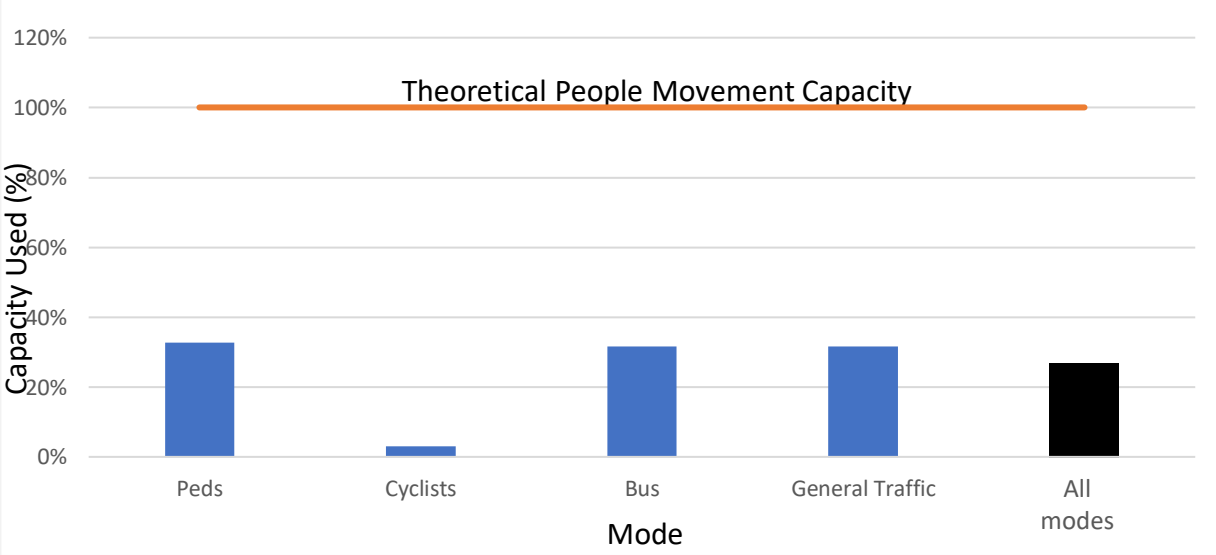
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Upper / Waterloo Road

Capacity / Delay

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

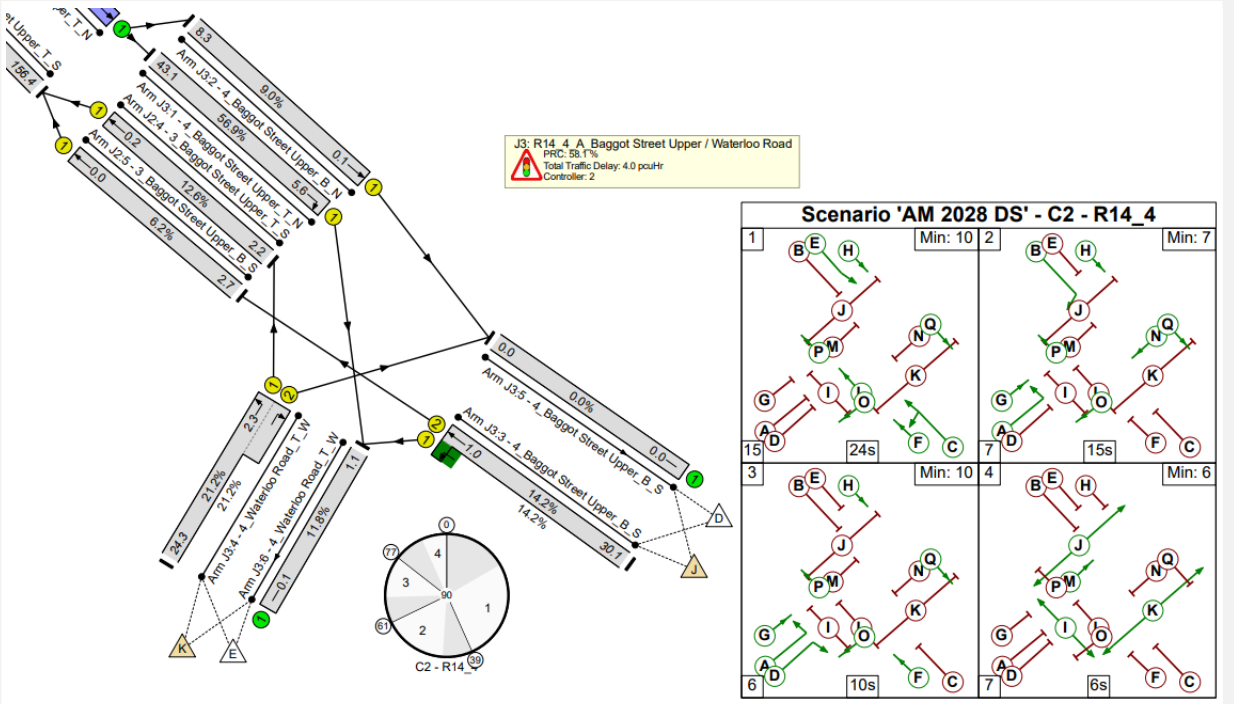




Do Something : 2028 : AM

Cycle = 90 sec
PRC = 58%
Delay = 4 pcuHr

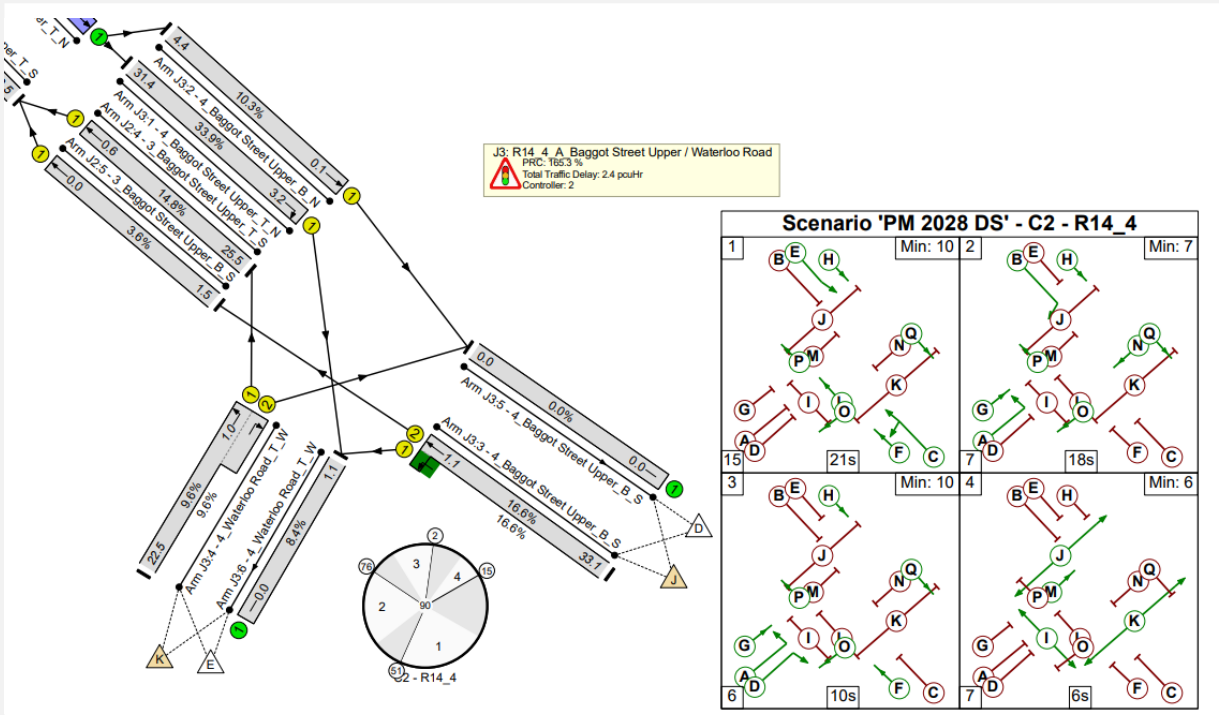
Bus delay
Inbound = 30s
Outbound = 8s



Do Something : 2028 : PM

Cycle = 90 sec
PRC = 165%
Delay = 2 pcuHr

Bus delay
Inbound = 33s
Outbound = 4s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Upper / Haddington Road

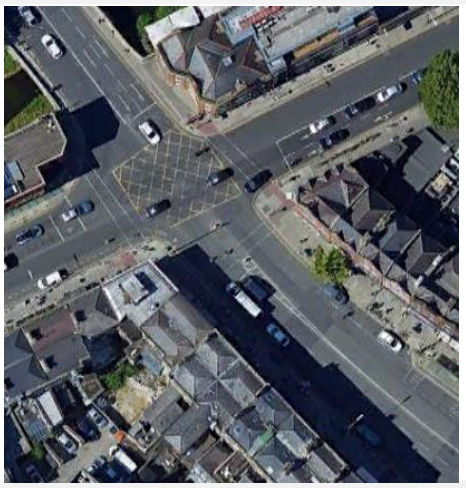
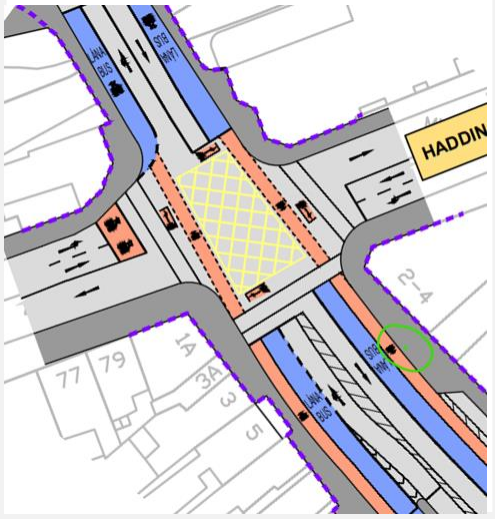
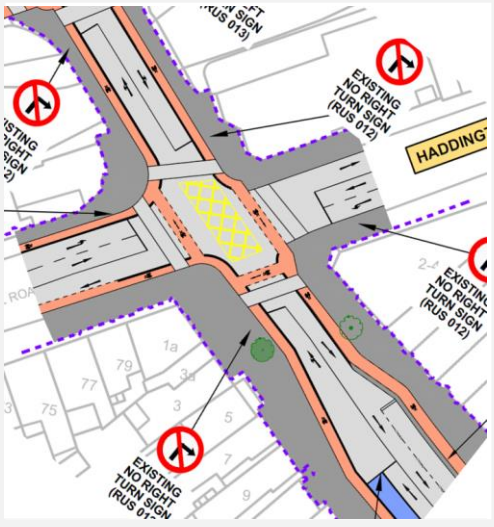
Summary

Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians and cyclists. Bus lanes through the junction will be removed since the EPR enabled by bus priority signal on Baggot Street Upper approach and same at Baggot St Upper / Herbert Place junction outbound. No right turn from Mespil Road onto Baggot Street Upper will be introduced to assist in junction operation. Additional pedestrian crossing will be included on bridge arm of the junction. Existing advisory cycle lanes on Mespil Road will be upgraded to cycle tracks. Design rationale was to cater for the extremely high volumes of pedestrians in this area, provide space for trading purposes on Baggot St while protecting bus priority from Baggot Street Upper to Lower and vice versa, and improving the public realm of the Baggot Street Village area.

Signal Operations

A three stage signal operation is proposed, for mainline traffic and cyclist to operate in the same stage, with left turning traffic to give way to cyclists on flashing ambers. The side roads will operate together, though Mespil Road will not operate with a flashing amber due to high-left turning flow. Cyclists from Mespil Road will operate with pedestrians.

Junction Type 1 Bus delay ≥ 120s

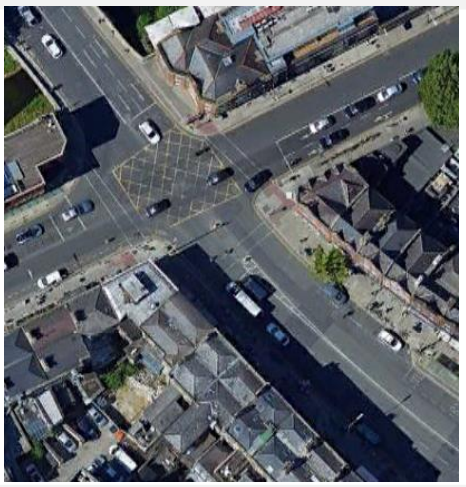
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Baggot Street Upper and Baggot Bridge arms 2. Cycle facilities introduced inbound/outbound through the junction and on the Baggot Street Upper arm.	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure.	1. To improve bus priority through the junction. 2. To improve cyclist safety through the junction.
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced . 2. As in Baggot St Upper / Herbert Place, physical bus lanes removed from the Baggot Bridge arm, enabled by signal controlled priority, and introduction of cycle tracks and widening of footpath. 3. Physical bus lanes removed from the Baggot Street Upper arm, enabled by signal controlled priority, with associated widening of footpath. 4. No right turn from Mespil Road onto Baggot Street Upper	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles and to improve cyclist facilities at the junction. 2. To improve pedestrians and cyclist facilities at the junction. 3. To avoid a pinch point in the built form and improve public realm opportunities. 4. To prevent blocking of the junction from vehicles onto Baggot Street Upper from Mespil Road and provide bus priority from Baggot Street Upper to Lower and vice versa.	1. Improved cycle facilities. 2. Improved pedestrian and cyclist environment with virtual priority provided for buses. 3. Removed impact to existing built form at pinch point and enhanced pedestrian environment. 4. Improved junction operation with detouring required for southbound general traffic on Mespil Road.
DRAFT PRO (PC3)		1. Additional pedestrian crossing included on bridge arm of the junction. 2. Existing advisory cycle lanes on Mespil Road upgraded to cycle tracks. 3. Cycle track deflections reviewed and refined. 4. A cycle time of 90 seconds has been retained at this busy pedestrian location 5. Length of bus lane assessed and coordinated with modelling exercises.	1. To improve pedestrian facilities at the junction. 2. To improve cycle facilities at the junction. 3. To improve cycle movements and quality of service 4. To ensure pedestrians and cyclists are provided with shorter wait times travelling through the junction. 5. Available length of bus lane dictated by existing constraints in the physical environment.	1. Improved pedestrian environment with minorly reduced vehicular storage capacity on Baggot Street Bridge 2. Improved cyclist environment with minor reduction in lane widths and footpath widths. 3. Minor realignment of kerbs 4. Using a 90 second cycle time reduces the overall capacity of the junction for general traffic, though does manage the extent of queuing on Baggot Street Upper approach to the junction.

ARUP

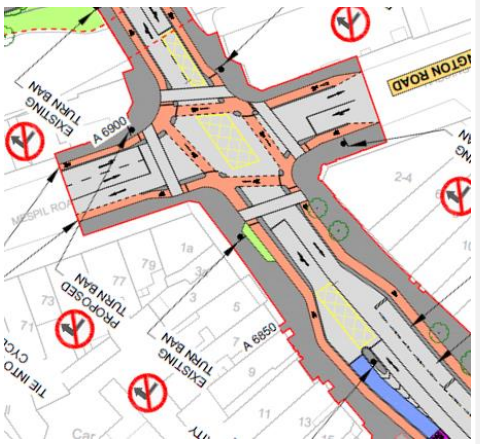
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Upper / Haddington Rd

EXISTING



FINAL DESIGN



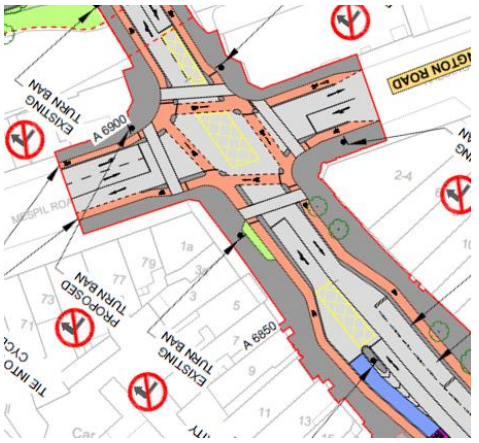
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. New cycle crossing introduced on Baggot Bridge arm. 4. Dedicated left turn lane on Haddington Road removed, with combined left and straight lane provided. 5. Yellow box provided on Baggot Bridge with reduced stacking length for southbound traffic. 6. Yellow box added at merging of northbound bus lane and general traffic lane on Baggot Street Upper. 7. Green time for pedestrian increased to 14 seconds. 8. Cyclists travelling eastbound on Mespil Road are phase separated from general traffic and run in the same stage as the pedestrian crossing. 9. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. To improve cyclist facilities at and through the junction. 4. Modelling showed this could be accommodated and it enabled cycle facilities to be extended from the junction. 5. Required due to swept path analysis of left turning vehicles from Mespil Road onto Baggot Bridge. Buses make this left turn in existing network and network redesign. 6. Additional physical measure to mitigate against cars impeding bus entering shared section subject to signal controlled priority. 7. People movement calculator identified shortcomings with respect to the assigned capacity to pedestrians. 8. There is a high left turn from Mespil Road (West) to Baggort Street (North) and the current design standards require phase separation of cyclists and left turning traffic	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed within public realm at junction. 3. Improved cycling environment with minorly reduced vehicular storage capacity on Baggot Street Bridge. 4. Reallocation of space from vehicular carriageway to cycle provision, with reduction in vehicular capacity. 5. Reduced potential for conflict between turning buses and waiting vehicles, with reduced stacking capacity on the bridge. 6. Line marking added to drawing. 7. Improved environment for cyclists

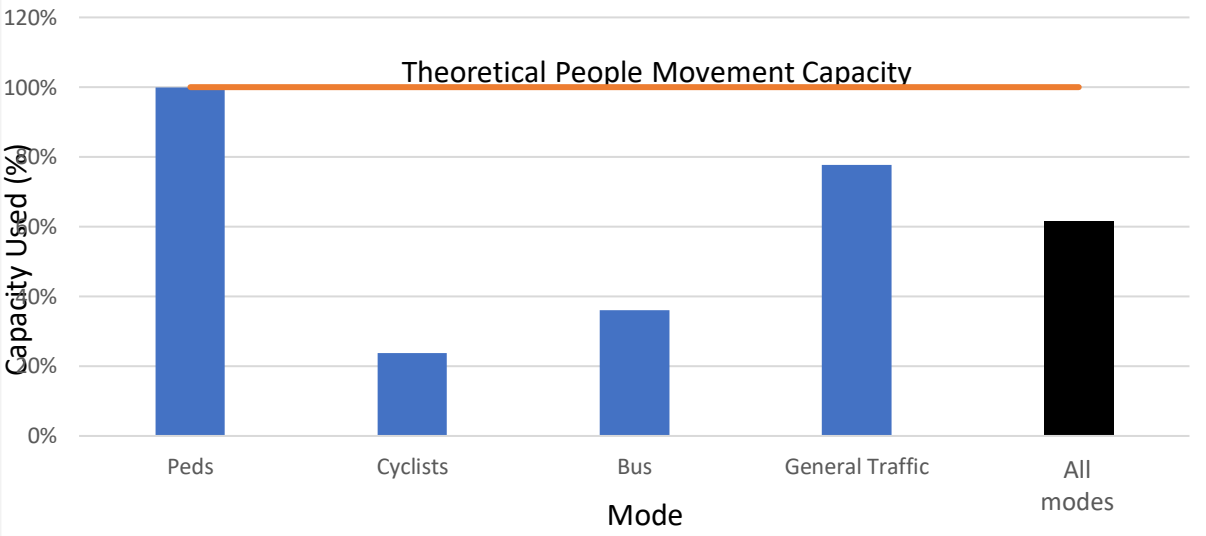
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Upper / Haddington Road

Capacity / Delay

1. Junction operates over capacity in the AM peak only.

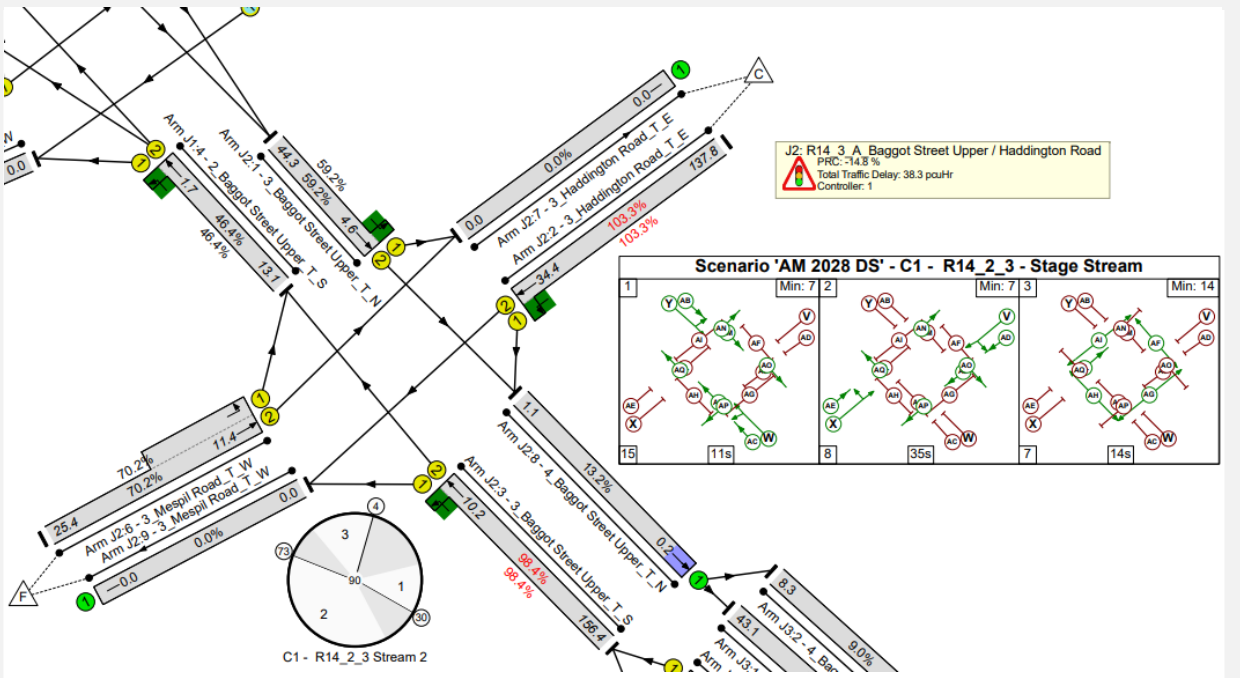




Do Something : 2028 : AM

Cycle = 90 sec
PRC = -15%
Delay = 38 pcuHr

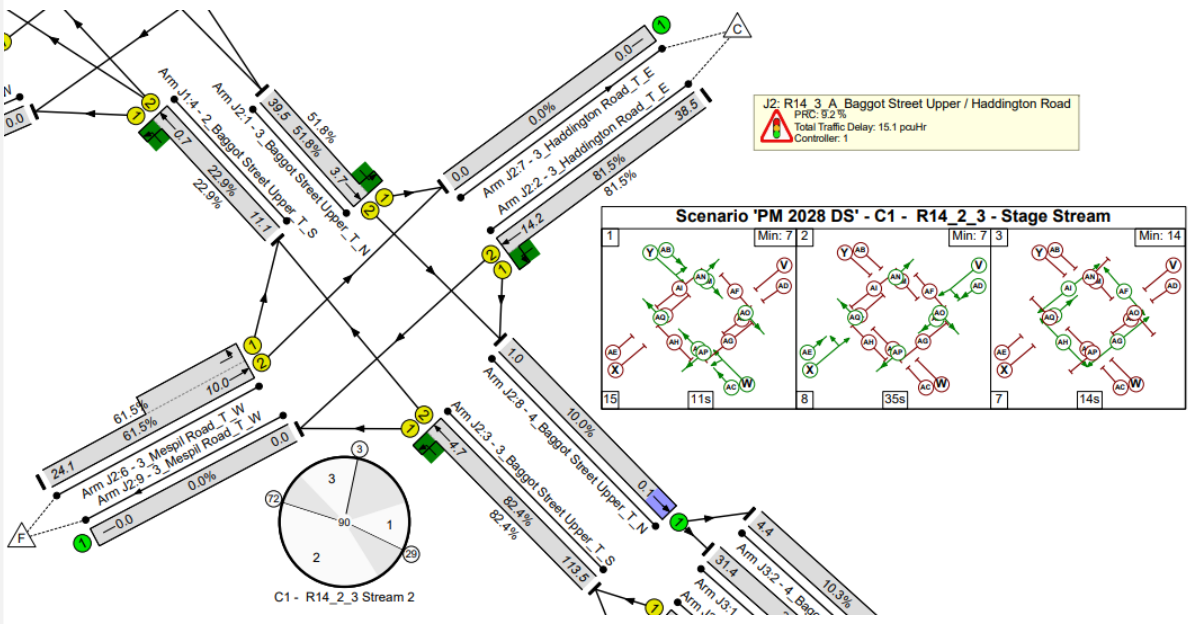
Bus delay
Inbound = 156s
Outbound = 44s



Do Something : 2028 : PM

Cycle = 90 sec
PRC = 9%
Delay = 15 pcuHr

Bus delay
Inbound = 114s
Outbound = 40s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Stureet Lower / Herbert Place

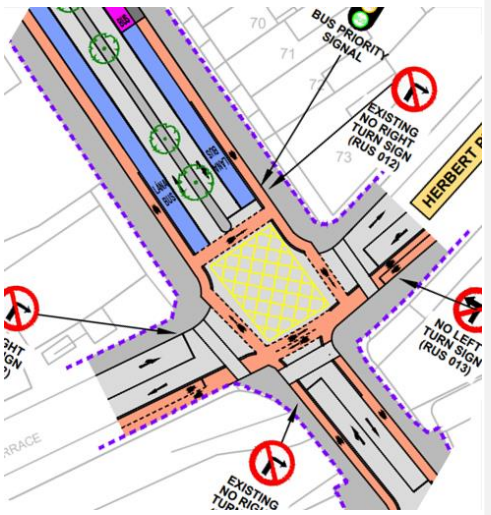
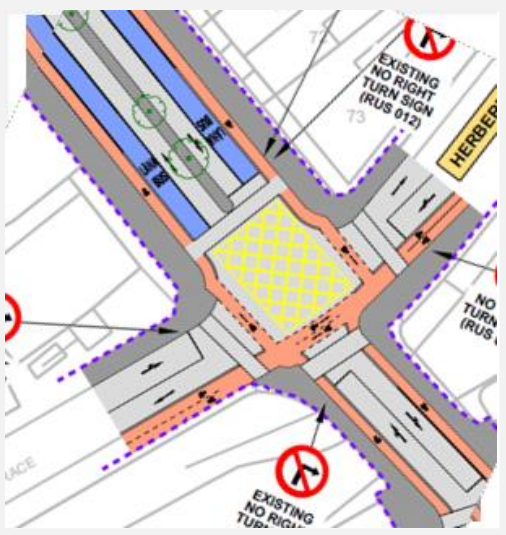
Summary

BusConnects Preliminary Design Guidance Booklet with respect to pedestrians and cyclists have been used. Vehicles turning from Herbert Place onto the bridge will be removed. Pedestrian crossing on the Baggot Street Lower Arm of the junction will be retained. Right-turn from the bridge onto Herbert Place will be removed. There will be bus priority signal on Baggot Street Lower approach and on inbound approach to the Baggot Street Upper / Haddington Road junction. Design rationale was to improve pedestrians and cyclist facilities and prevent blocking of the junction from vehicles onto the bridge from Herbert Place and provide bus priority from Baggot Street Upper to Lower and vice versa.

Signal Operation

A four stage signal operation is proposed. Buses on the northern arm, mainline traffic on the southern arm, and mainline cyclists in both directions will operate in the same stage, with left turning traffic to give way to cyclists on flashing ambers. This will be followed by mainline traffic on both the southern and northern arms. Side arm traffic and cyclists will operate in the same stage. The pedestrian crossings will operate within their own stage.

Junction Type 1 Bus delay < 40s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Baggot Street Lower and Baggot Bridge arms 2. Cycle facilities introduced inbound/outbound through the junction and on the Baggot Street Lower arm.	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure.	1. To improve bus priority through the junction. 2. To improve cyclist safety through the junction.
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced . 2. As in Baggot Street Upper / Haddington Road, physical bus lanes removed from the Baggot Bridge arm, enabled by signal controlled priority, and introduction of cycle tracks and widening of footpath. 3. Banning of turning movements from Wilton Terrace and Herbert Place onto Baggot Bridge, as well as banning of right turn from Baggot Bridge onto Herbert Place. 4. Pedestrian crossing on northern arm replaced by cycle crossing.	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles and to improve cyclist facilities at the junction. 2. To improve pedestrians and cyclist facilities at the junction. 3. To prevent blocking of the junction from vehicles onto the bridge from Herbert Place and provide bus priority from Baggot Street Upper to Lower and vice versa. 4. To improve cyclist safety at the junction	1. Improved cycle facilities. 2. Improved pedestrian and cyclist environment with virtual priority provided for buses. 3. Improved junction operation with detouring required for southbound general traffic on Wilton Terrace and Herbert Place. Enables the two-way cycle crossing to run in same stage as east-west general traffic. 4. Improved cyclist environment. Additional crossings required for east/westbound pedestrians on northern side of the road.
DRAFT PRO (PC3)		1. Pedestrian crossing introduced on north western arm of the junction, in place of previously proposed dedicated cycle crossing (note two-way cycle crossing on south eastern arm retained). 2. A cycle time of 90 seconds has been retained at this busy pedestrian location.	1. Improved balance of provision for pedestrians. 2. To ensure pedestrians and cyclists are provided with shorter wait times travelling through the junction.	1. Improved pedestrian environment, while east/westbound cyclists to cross at two-way crossing on Baggot Bridge arm. 2. Using a 90 second cycle time reduces the capacity of the junction for general traffic.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Lower / Herbert Place

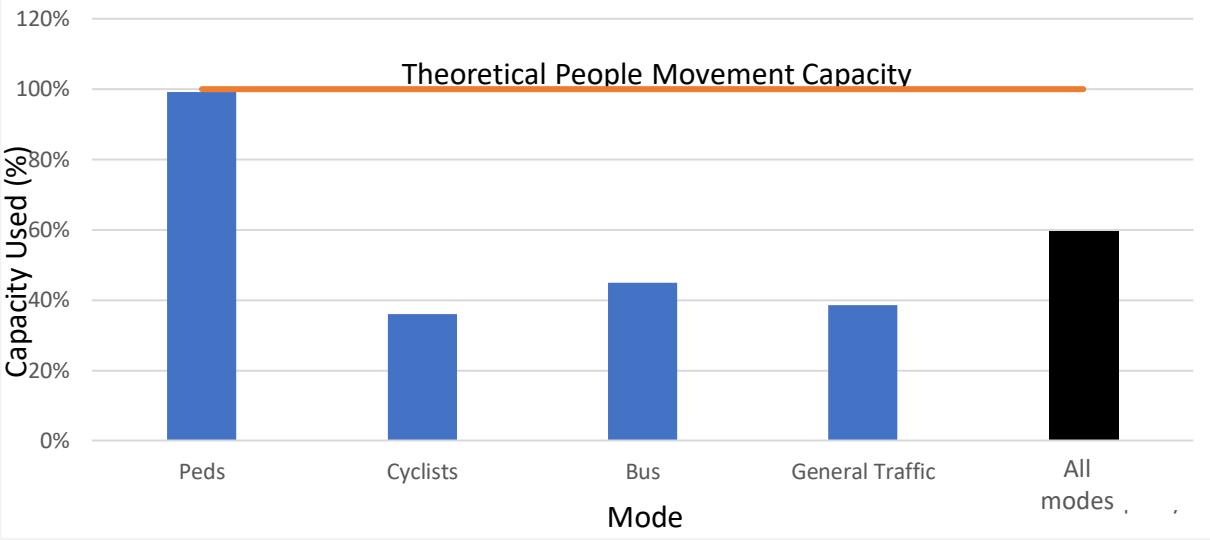
	Change Made	Reason for Change	Impact of Change
EXISTING			
FINAL DESIGN	1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. Stop line of outbound bus lane set back c. 4m. 4. Pedestrian Green Time extended to 10 seconds from 6 seconds. 5. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To align General Arrangement design with landscaping design. 3. In line with BusConnects Preliminary Design Guidance Booklet, to ensure visibility of primary signals from general traffic lane. 4. People movement calculator identified shortcomings with respect to the assigned capacity to pedestrians.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Soft landscaping proposed on existing median on western arm. 3. Amendments to line markings.

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Lower / Herbert Place

Capacity / Delay

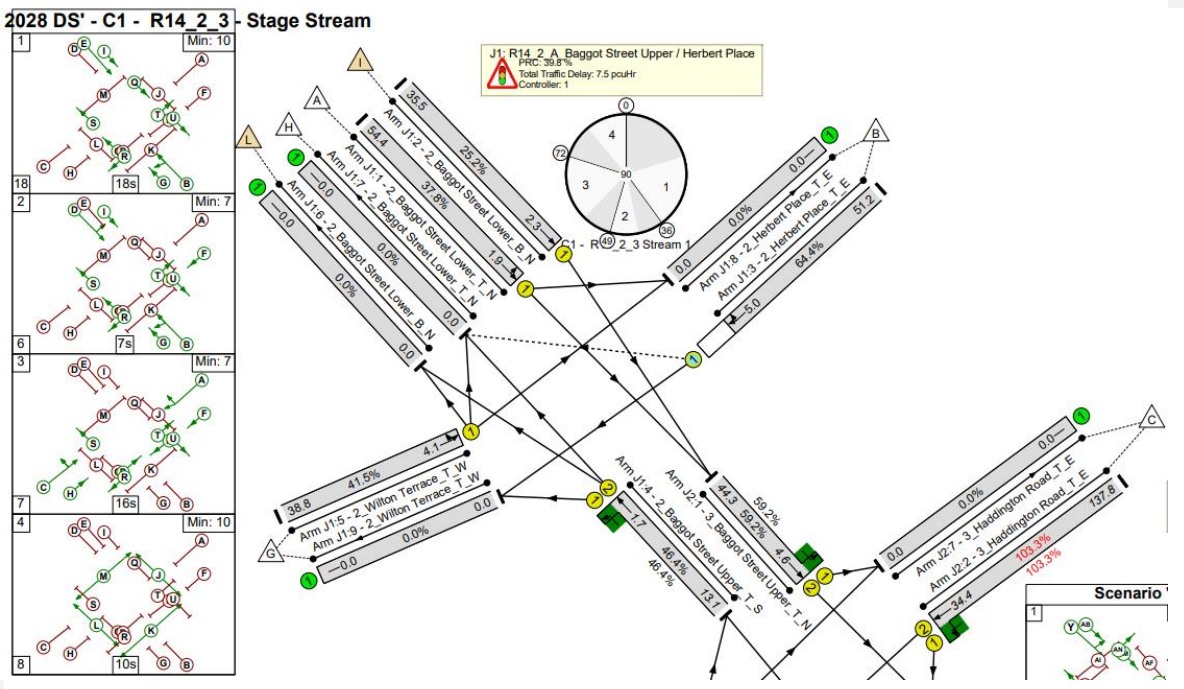
1. Junction operates within capacity.
2. Bus delay is <40s on average.



Do Something : 2028 : AM

Cycle = 90 sec
PRC = 40%
Delay = 8 pcuHr

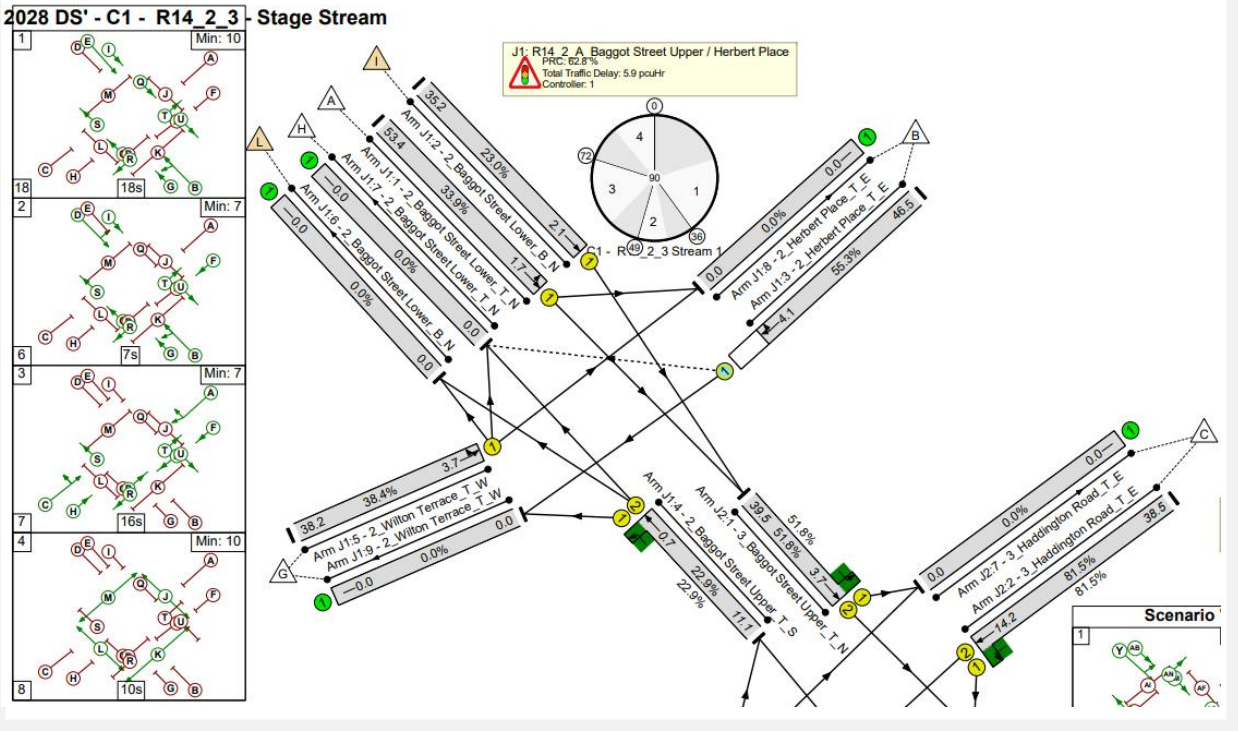
Bus delay
Inbound = 13s
Outbound = 36s



Do Something : 2028 : PM

Cycle = 90 sec
PRC = 63%
Delay = 6 pcuHr

Bus delay
Inbound = 11s
Outbound = 35s



ARUP

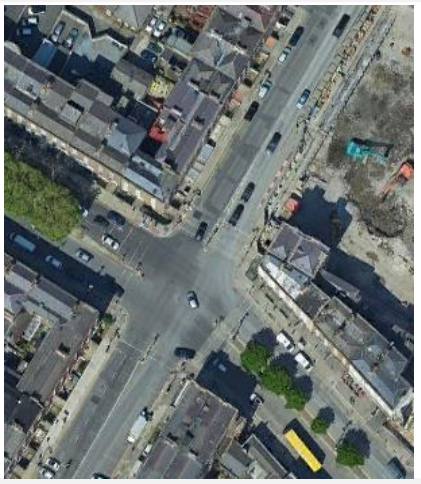
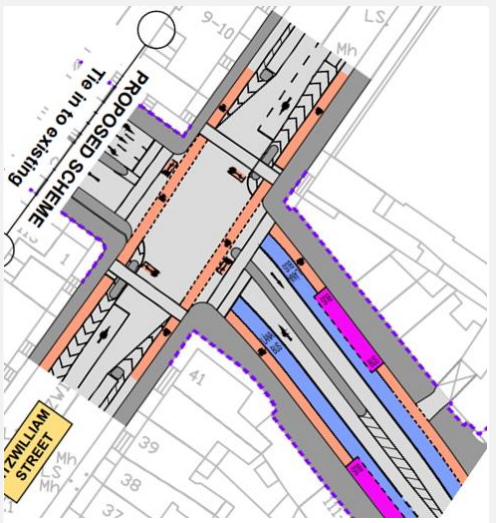
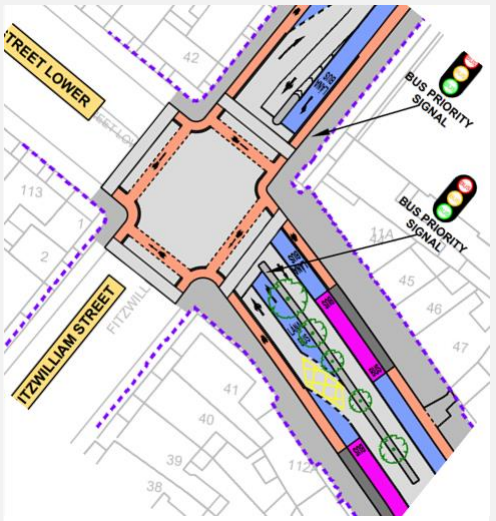
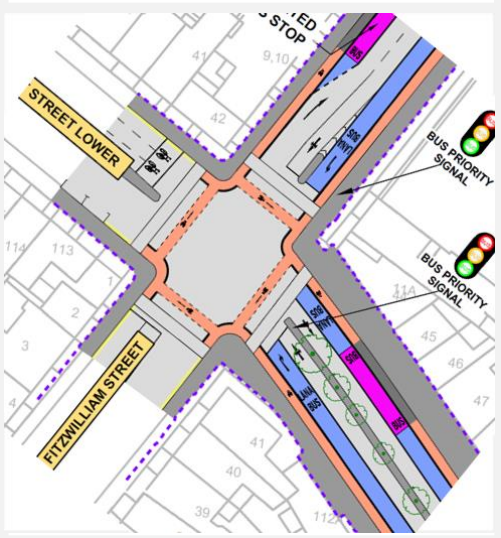
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Lower / Fitzwilliam Street Upper

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The number of general traffic lanes and on street parking will be reduced to improve the environment for pedestrians and cyclists as well as the provision of bus priority on the NE and SE arms. Buses turning right from left hand lane onto Fitzwilliam street will be through bus priority signalling. The on-set of the proposed bus lane on Fitzwilliam Street Lower will be curtailed due to constrained existing cross section. Design rationale is to improve cyclist facilities at the junction and to provide priority for buses to turn right from Baggot Street Lower to Fitzwilliam Street.

Signal Operation
A six stage signal operation is proposed. Buses from Baggot Street Lower (E) and Fitzwilliam Street Lower (N) will operate in a single stage. Traffic and cyclist from each arm will operate in separate stages, with left turning traffic to give way to cyclists on flashing ambers. Pedestrian crossings will operate in their own stage.

Junction Type 1 Bus delay < 80s

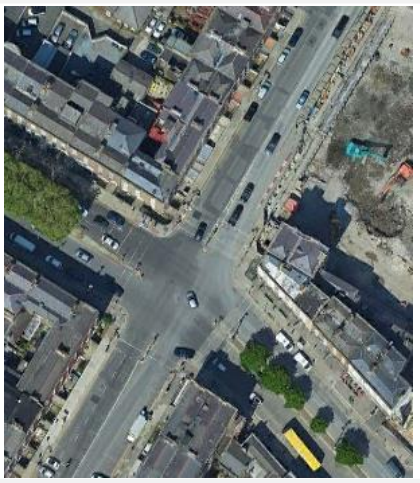
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes and cycle infrastructure introduced on Baggot Street Lower northbound approach. 2. Cycling infrastructure introduced on Fitzwilliam Street arms with amendments to on street parking.	1. In keeping with developing BusConnects design principles. 2. To align with developing Fitzwilliam Cycle Route proposals.	1. Reallocation of road space to buses and cyclists with improve bus reliability and cyclist environment. 2. Reduction in parking.
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced . 2. Bus lane and general traffic lane on northbound approach inverted with yellow box provided to enable bus movement across the lanes. 3. Fitzwilliam Street (eastern) arm amended to reflect BusConnects design principle as it forms part of the corridor at this stage. 4. Start of bus lane on Fitzwilliam Street curtailed. 5. Northern and western arms to be retained as existing arrangement.	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles and to improve cyclist facilities at the junction. 2. To enable the continuation of bus services onto Fitzwilliam Street Lower. 3. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles and forms the continuation of CBC 14. 4. To maximise footpath width at pinch point. 5. To align with existing environment at tie-ins.	1. Improved cycle facilities. 2. Bus required to traverse general traffic lane. 3. All parking removed on arm. 4. Bus to share general lane over short distance, however optimum footpath width can be retained. 5. Reduction in construction works and impact on existing environment.
DRAFT PRO (PC3)		1. Right-turning bus from left hand bus lane introduced.	1. To provide priority for buses to turn right from Baggot Street Lower to Fitzwilliam Street.	1. Bus no longer required to traverse general traffic lane. Requires staging in which bus and general traffic run separately to be retained at junction.

ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Lower / Fitzwilliam Street Upper

EXISTING



FINAL DESIGN

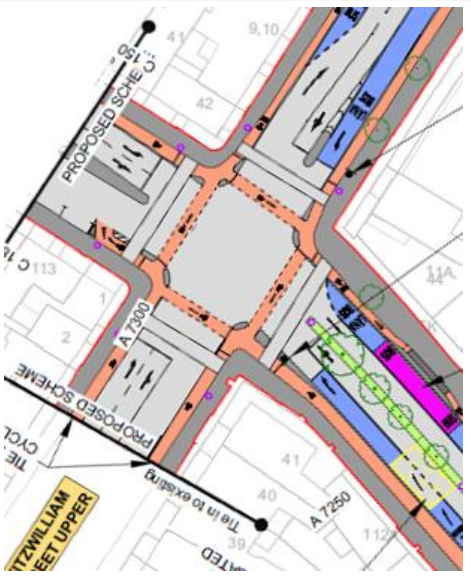
Change Made	Reason for Change	Impact of Change
1. Approach and egress alignments of cycle tracks refined. Details of protected kerbs and road markings refined. 2. Cycle facilities extended on adjacent arms of Fitzwilliam Street and Baggot Street Lower, including protected waiting area for cyclists to egress into general traffic lane on Baggot Street Lower. 3. Additional details provided on landscaping proposals in the vicinity of the junction. 4. Cycle time extended to 120 seconds to improve junction operation. 5. Pedestrian green time extended from 6 seconds to 11 seconds 6. Cycle kerb on Fitzwilliam St. Curtailed to create a gap. 7. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. To provide optimum route through and around the junction for cyclists. To ensure cyclist safety and accommodate traffic signal infrastructure required. 2. To bring cyclists safely through and beyond the junction, and to integrate with external cycle facilities. 3. To align General Arrangement design with landscaping design. 4. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase 5. People movement calculator identified shortcomings with respect to the assigned capacity to pedestrians. 6. To facilitate easier access to the cycle track for cyclists who may have passed through the junction using the bus lane.	1. Improved cycling facilities with localised reallocation of space from carriageway and footpaths to cycle tracks. Wider upstand kerbs provided with localised narrowing of cycle tracks where required. 2. Additional markings and protection kerbs provided within design. 3. Soft landscaping proposed on existing median on eastern arm. 4. Increased cycle time improves capacity at junction and ensures more time for pedestrians to cross. 5. Improved access to the cycle track.

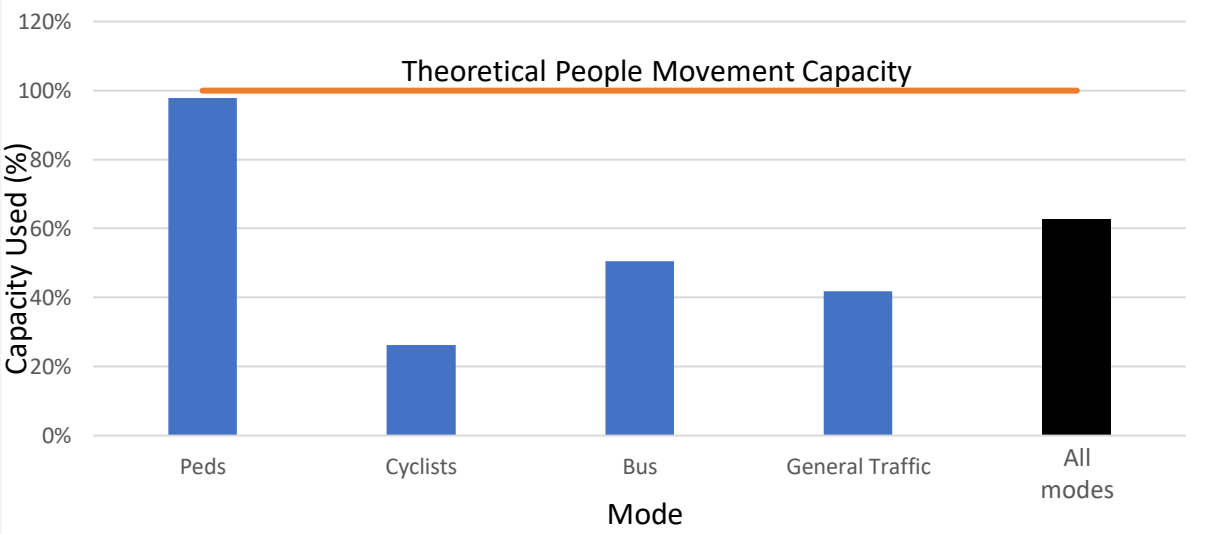
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Baggot Street Lower / Fitzwilliam Street Upper

Capacity / Delay

1. Junction operates over capacity in the AM peak only.

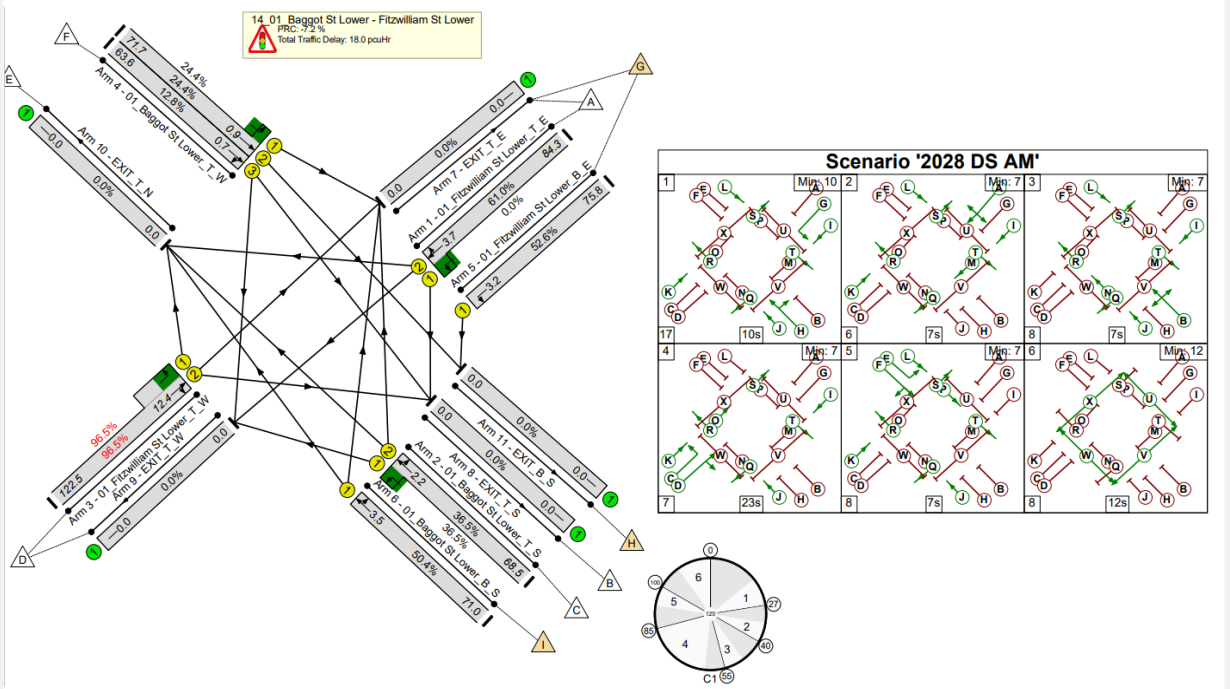




Do Something : 2028 : AM

Cycle = 120 secs
PRC = -7%
Delay = 18 pcuHr

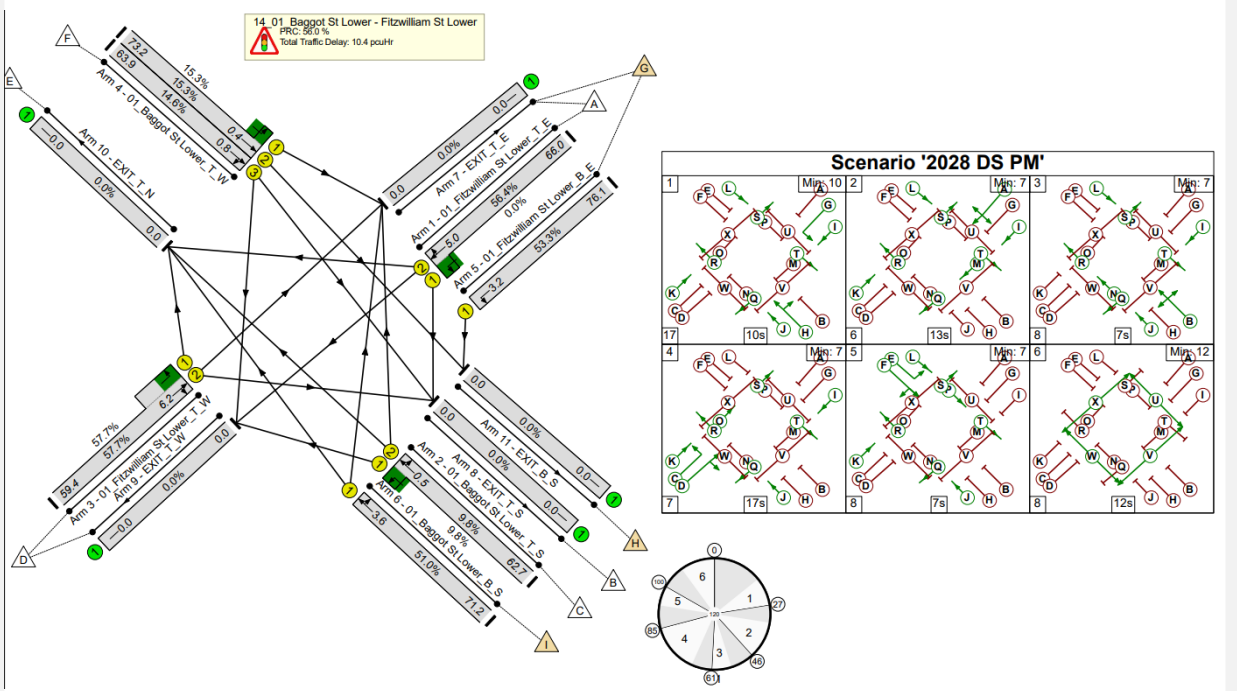
Bus delay
Inbound = 71s
Outbound = 76s



Do Something : 2028 : PM

Cycle = 120 secs
PRC = 56%
Delay = 11 pcuHr

Bus delay
Inbound = 71s
Outbound = 76s

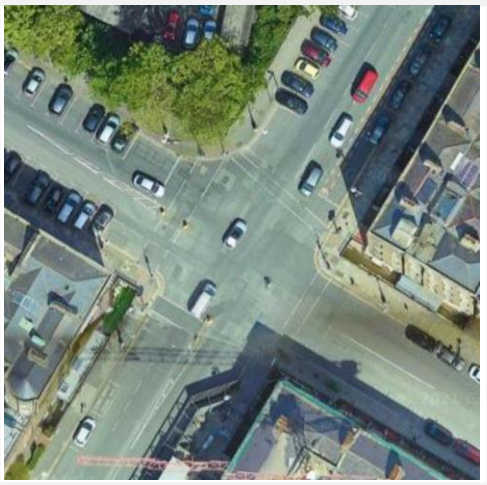


ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

EXISTING

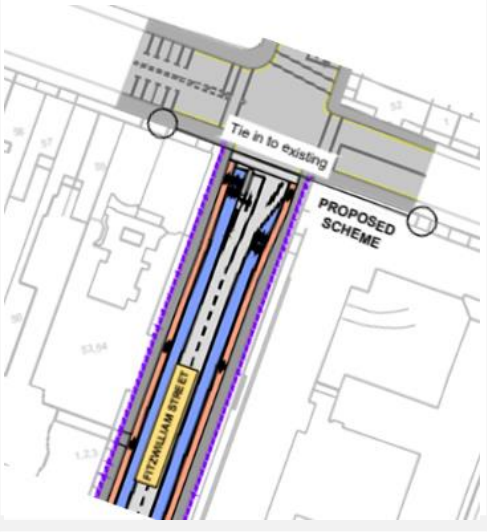
Fitzwilliam Street Lower / Merrion Square E



Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. This is where the proposed scheme ends and ties in with Merrion Square and Mount Street Upper. The parking spaces on Fitzwilliam Street Lower will be removed for better cycle provision and dedicated bus infrastructure. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A five stage signal operation is proposed. The bus lane from Fitzwilliam Street Lower will operate in its own stage. Traffic from Fitzwilliam Street Lower and Merrion Square E will operate together. Traffic from Mount Street Upper and Merrion Square S will operate together. The pedestrian crossings will operate in their own stage, as well as the cycle lane from Fitzwilliam Street Lower.

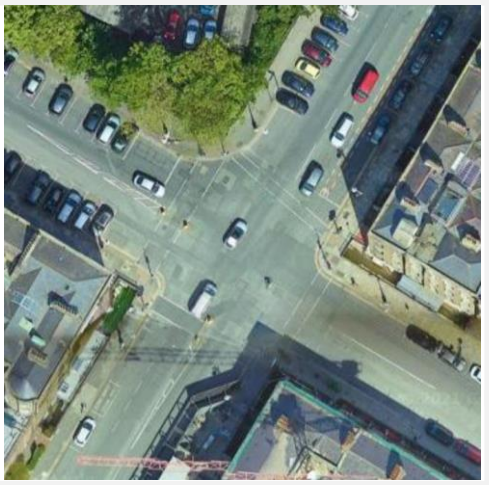
Junction Type 1 Bus delay < 110s

	Change Made	Reason for Change	Impact of Change
EPR	This junction was not part of the EPR	1. N/A	1. N/A	1. N/A
DRAFT PRO (PC2)		1. Scheme extended along Fitzwilliam Street to Merrion Square.	1. Extend the route along B Spine	Change of layout on Fitzwilliam Street approaching Merrion Square and Bus Priority brought up to junction. Change to Staging arrangement to incorporate bus priority.
DRAFT PRO (PC3)		1. N/A	1. N/A	N/A

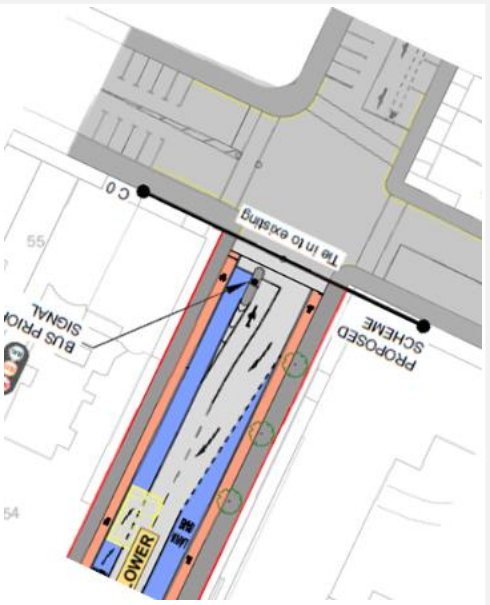
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Fitzwilliam Street Lower / Merrion Square E

EXISTING



FINAL DESIGN



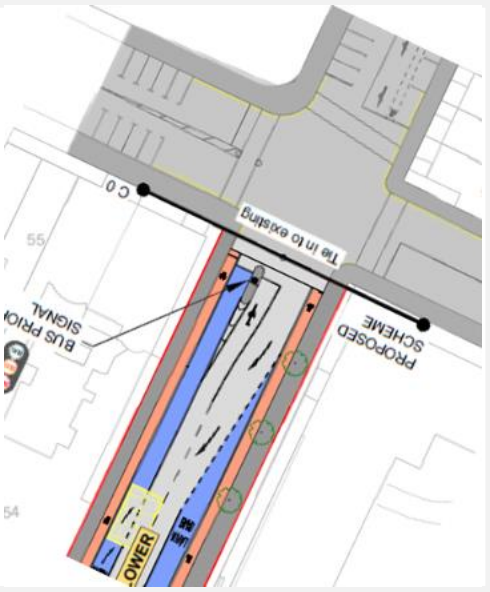
Change Made	Reason for Change	Impact of Change
1. Start taper for bus lane on Fitzwilliam amended.	1. To comply with TSM	1. N/A

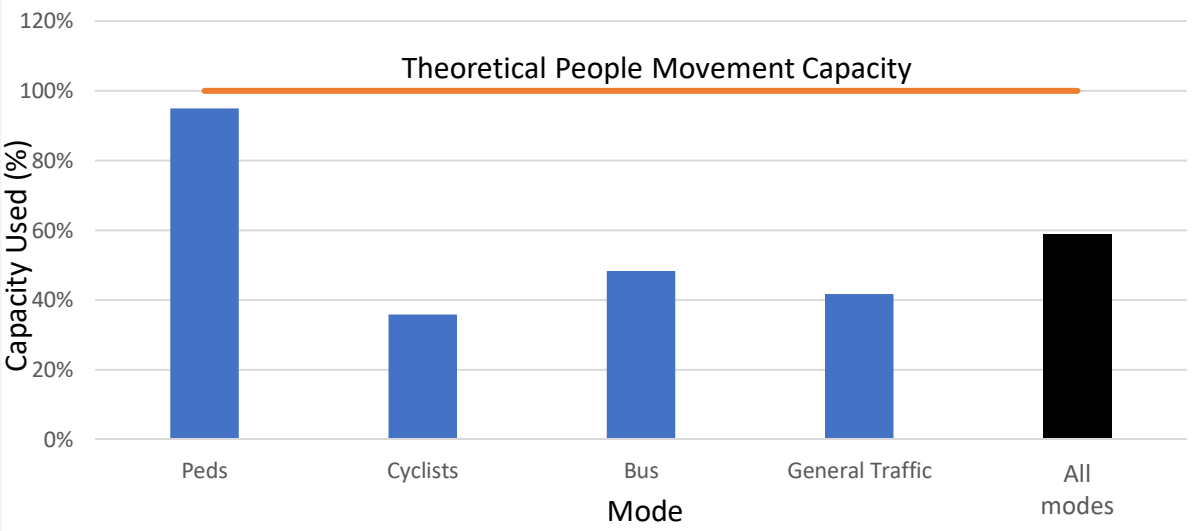
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Fitzwilliam Street Lower / Merrion Square E

Capacity / Delay

1. Junction operates over capacity.

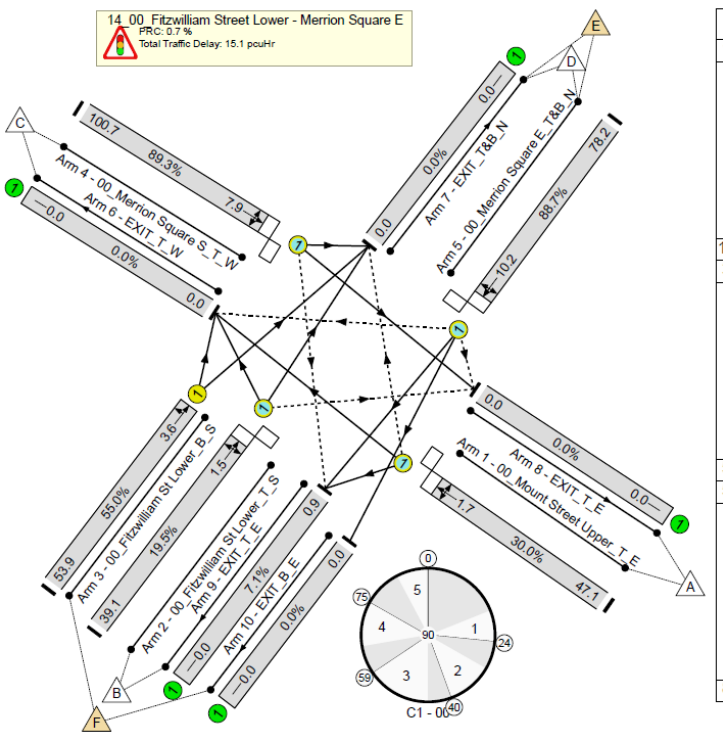


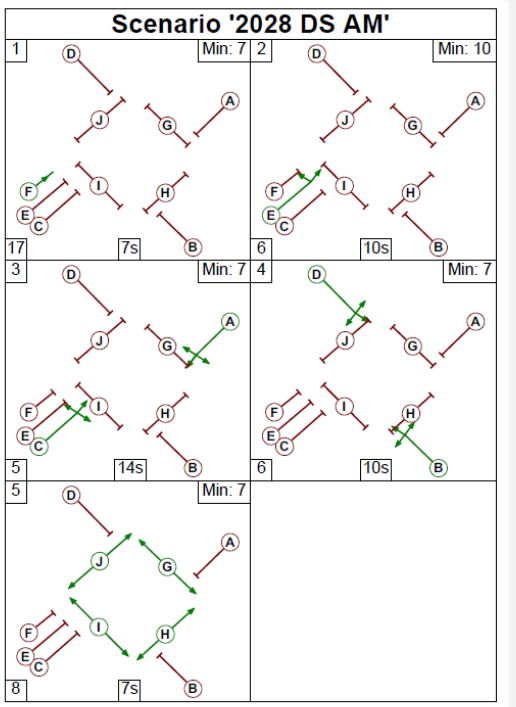


Do Something : 2028 : AM

Cycle = 90 secs
PRC = 1%
Delay = 15 pcuHr

Bus delay
Inbound = 54s
Outbound = 78s

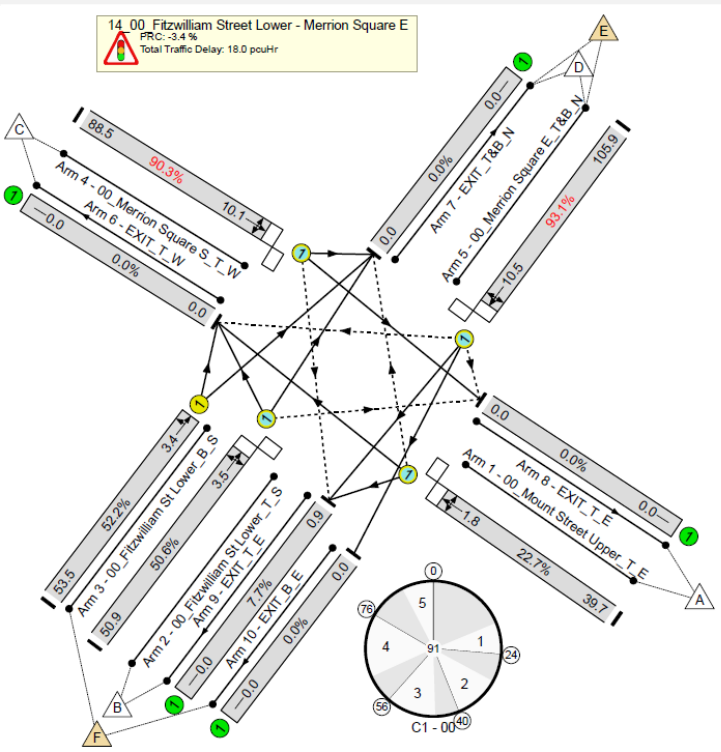


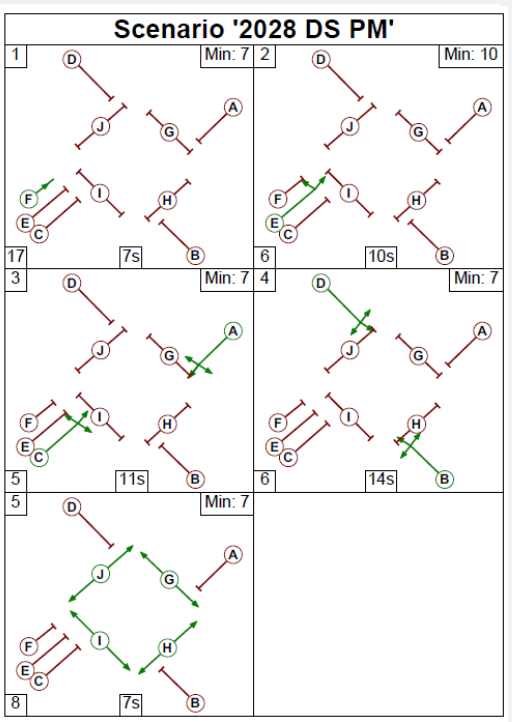


Do Something : 2028 : PM

Cycle = 90 secs
PRC = -3%
Delay = 18 pcuHr

Bus delay
Inbound = 54s
Outbound = 106s





ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Stillorgan Road / Nutley Lane

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. This is where the proposed scheme starts and ties in with Bray to City Centre Scheme and ensures both schemes can be completed independently as well as being compatible when both schemes are constructed. The design will include the incorporation of a two-way cycle crossing on southern arm of Stillorgan Road for better cycle provision and the introduction of controlled pedestrian crossing across Nutley Lane. Left turning vehicles from Nutley Lane will share the bus lane on approach to the junction as the left turn slip lane will be removed. The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A five stage signal operation is proposed. Straight-ahead and left-turning mainline traffic and buses will operate in the same stage, with left turning vehicles into Greenfield Park to give way to cyclists on flashing ambers. Northbound mainline movements will continue with the right turn into and left turn out of Nutley Lane. Northbound movements will stop to allow the right turn into Greenfield Park. Nutley Lane and Greenfield Park will operate together. The two-way cycle movement across Stillorgan Lane will operate in their own stage.

Junction Type 1 Bus delay < 80s

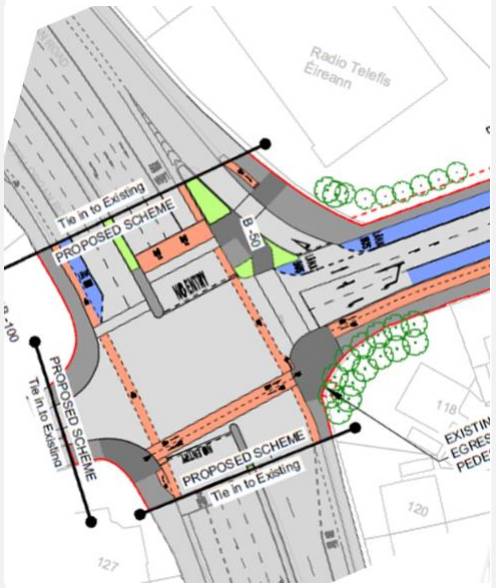
	Change Made	Reason for Change	Impact of Change
EXISTING		1. N/A	1. N/A	1. N/A
EPR		1. N/A	1. N/A	1. N/A
DRAFT PRO (PC2)	This junction design was not published in PC2	1. Junction was removed from this scheme	1. Junction and Stillorgan Road were entirely incorporated into the Bray to City Centre Scheme	1. Removal from Belfield / Blackrock to City Centre Scheme
DRAFT PRO (PC3)	This junction design was not published in PC3			

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Stillorgan Road / Nutley Lane

EXISTING

FINAL DESIGN



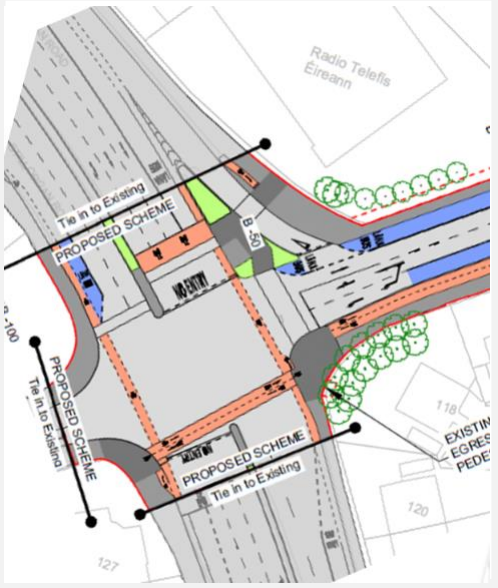
Change Made	Reason for Change	Impact of Change
1. Scheme extended and junction re-incorporated into Belfield / Blackrock to City Centre Scheme. 2. Incorporation of two-way cycle crossing on southern arm of Stillorgan Road. 3. Left turning vehicles from Nutley Lane share the bus lane on approach to the junction. 4. Extents of the Scheme extended north on Stillorgan Road. 5. Introduction of controlled pedestrian crossing across Nutley Lane.	1. Revised Interface with Bray to City Centre Scheme. 2. Ensure both Schemes can operate independently and also together. 3. Permit left turners from Nutley to run simultaneously with right turners from Stillorgan Road, 4. Incorporate the island between Stillorgan Road and Nutley Lane into the Scheme boundary.	1. Extension of Scheme. 2. Inclusion of additional land acquisition. 3. Reduced delay for buses turning right from Stillorgan Road to Nutley Lane.

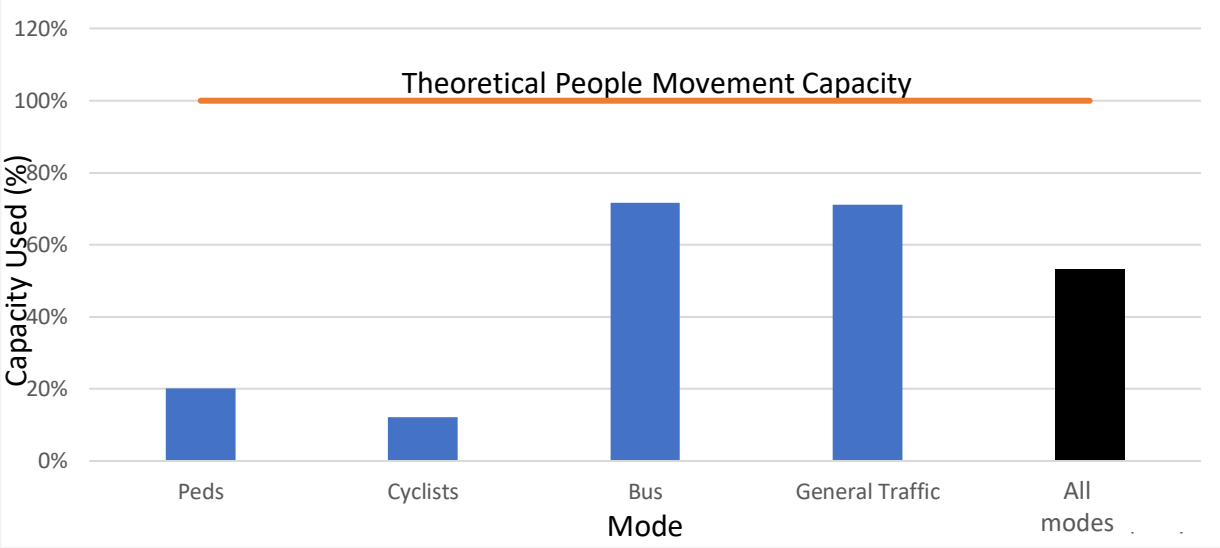
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Stillorgan Road / Nutley Lane

Capacity / Delay

1. Junction operates over capacity in the AM peak only.

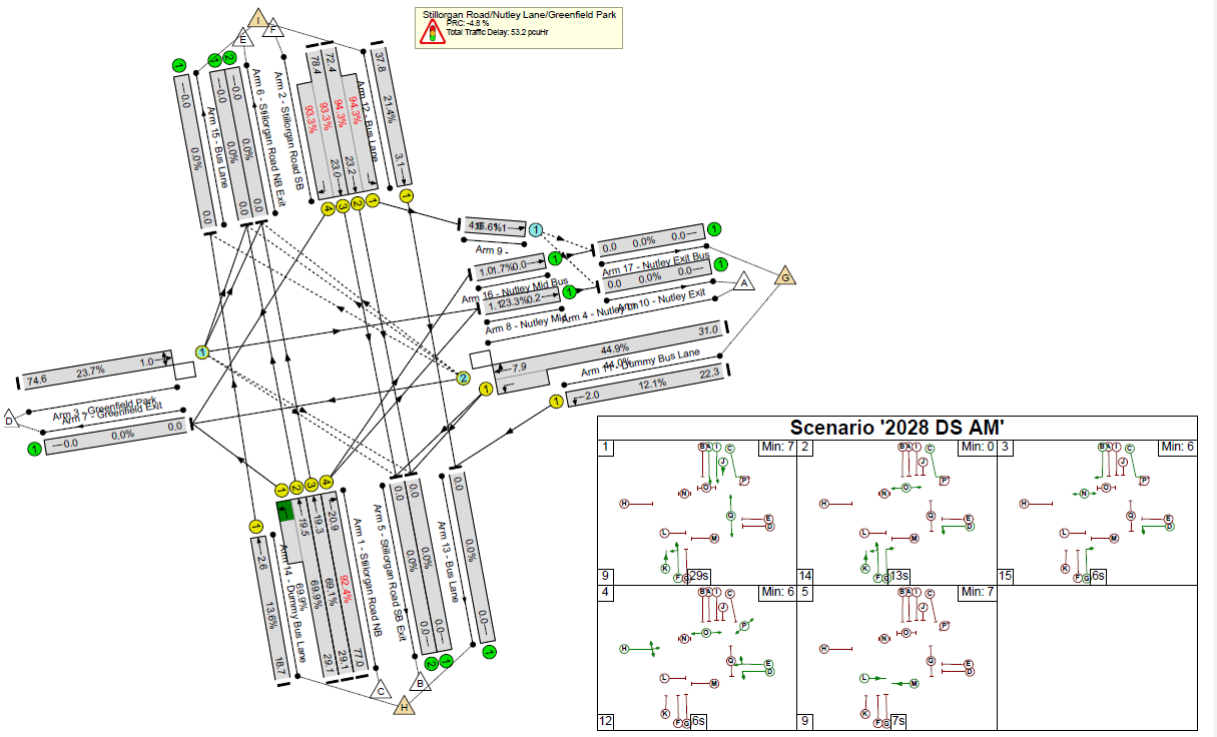




Do Something : 2028 : AM

Cycle = 120 secs
PRC = -5%
Delay = 53 pcuHr

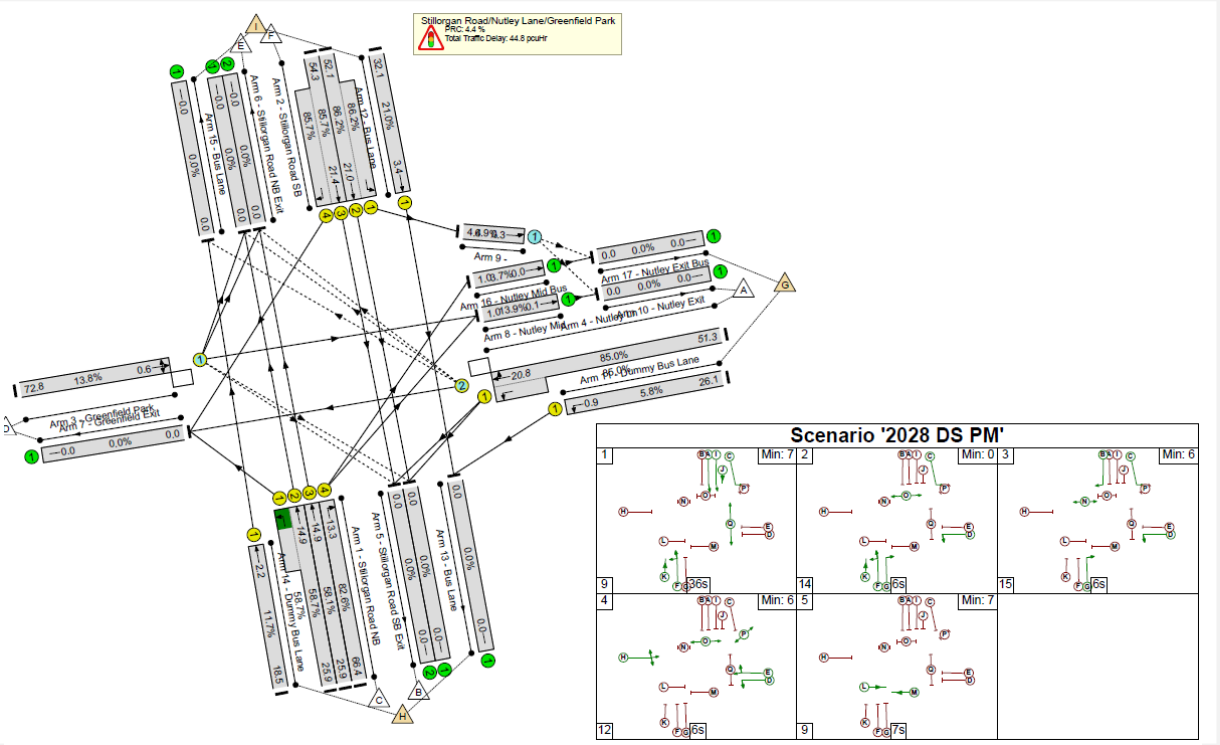
Bus delay
Inbound = 77s
Outbound = 22s



Do Something : 2028 : PM

Cycle = 120 secs
PRC = 56%
Delay = 11 pcuHr

Bus delay
Inbound = 66s
Outbound = 26s



ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Nutley Lane / St Vincent's University Hospital

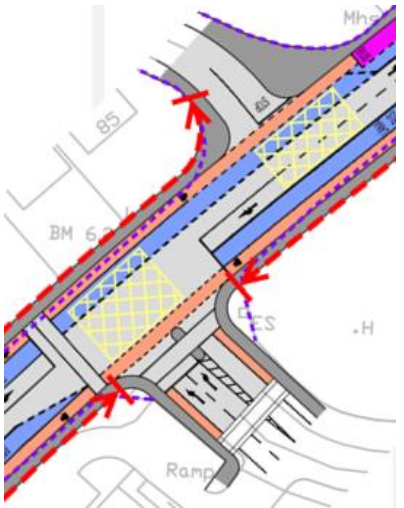
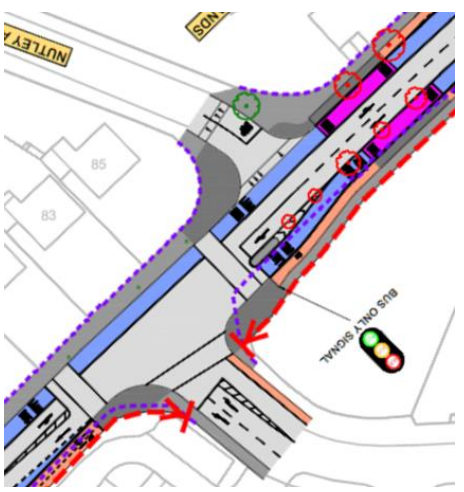
Summary

Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses. The junction will be reduced in size by removing flare on entry to the junction in order to maximise the provision for pedestrians and cyclists. Toucan crossings will be introduced on the northern and eastern arms to enable the transition from the two-way cycle track to the two single cycle facilities. The southbound bus lane on the southern arm will be curtailed, with bus priority to be enabled through priority signalling, in order to minimise the impact of landtake on the adjacent property. With consideration for granted planning permission for the junction, a right turn lane is proposed from Nutley Lane into St. Vincent's University Hospital (SVUH).

Signal Operation

A five stage signal operation is proposed, for buses on both arms and straight-ahead traffic on the western approach to operate within the same stage through the junction. The western approach will continue as traffic on the eastern approach starts, to be followed by right turning mainline traffic running unopposed. The side arm traffic will operate in its own stage, followed by pedestrians and cyclists on the toucan crossings.

Junction Type 1 Bus delay <75s

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes introduced on Merrion Road arms 2. Cycle facilities introduced inbound/outbound through the junction	1. In keeping with developing BusConnects design principles regarding bus infrastructure. 2. In keeping with developing BusConnects design principles regarding cycle infrastructure.	1. To improve bus priority through the junction. 2. To improve cyclist safety through the junction.
DRAFT PRO (PC2)		1. Protected junction for cyclist introduced . 2. Traffic island introduced on northern arm to enable signal controlled priority due to curtailment of the received bus lane on the southern arm 3. Toucan crossings introduced on all arms.	1. Brings junction in line with BusConnects Preliminary Design Guidance Booklet principles 2. To ensure bus priority while reducing potential landtake of adjacent landowner 3. To facilitate two-way cycle track on south west side of Nutley Lane.	1. Improved cyclist safety. 2. Increased land acquisition on St. Vincent's on the northern side, with reduced on the southern side, and removed necessity for land acquisition on residential side. 3. Improved pedestrian and cyclist safety with minorly reduced vehicular storage capacity on southbound approach Cyclists are required to use a toucan crossing to cross in front of the Hospital as it is a two-way facility to the west of the Hospital.
DRAFT PRO (PC3)		1. Cycle time has been extended to 120 seconds to match the cycle time at the junction of Merrion Road / Nutley Lane.	1. Cycle time extended to maximise the throughput of people through the junction and cater for the long all red pedestrian phase.	1. The increased cycle time improves capacity at the junction for road users.

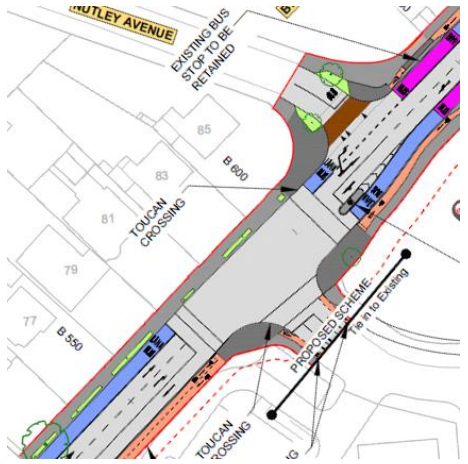
ARUP

Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Nutley Lane / St Vincent's university Hospital

EXISTING

FINAL DESIGN



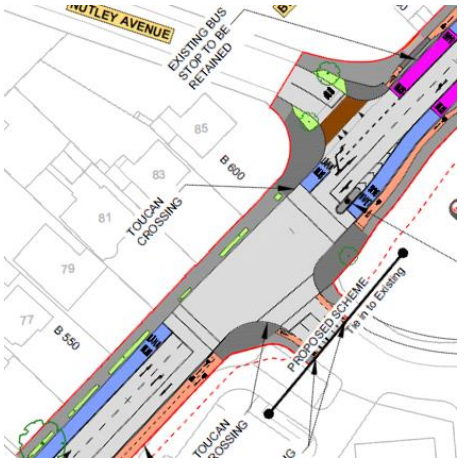
Change Made	Reason for Change	Impact of Change
1. A right turn lane from Nutley Lane into St. Vincent's University Hospital (SVUH) has been introduced into the design and cross-section on internal SVUH arm. 2. Additional details provided on landscaping proposals in the vicinity of the junction. 3. The LINSIG analysis has been updated to reflect each of the individual stoplines for cyclists within the junction.	1. Following discussions with SVUH and consideration for planning permission for the development of the National Maternity Hospital (NMH) at SVUH (granted by An Bord Pleanála) which included provision of right-turn lane. 2. To align General Arrangement design with landscaping design.	1. Junction arrangement updated and incorporated into staging. On-set of southbound bus lane curtailed to a greater extent with signal controlled priority provided stop line. Increased extent of potential land take has been discussed with SVUH with minor impact on operation of internal roadway. 2. Soft landscaping proposed within the public realm at the junction.

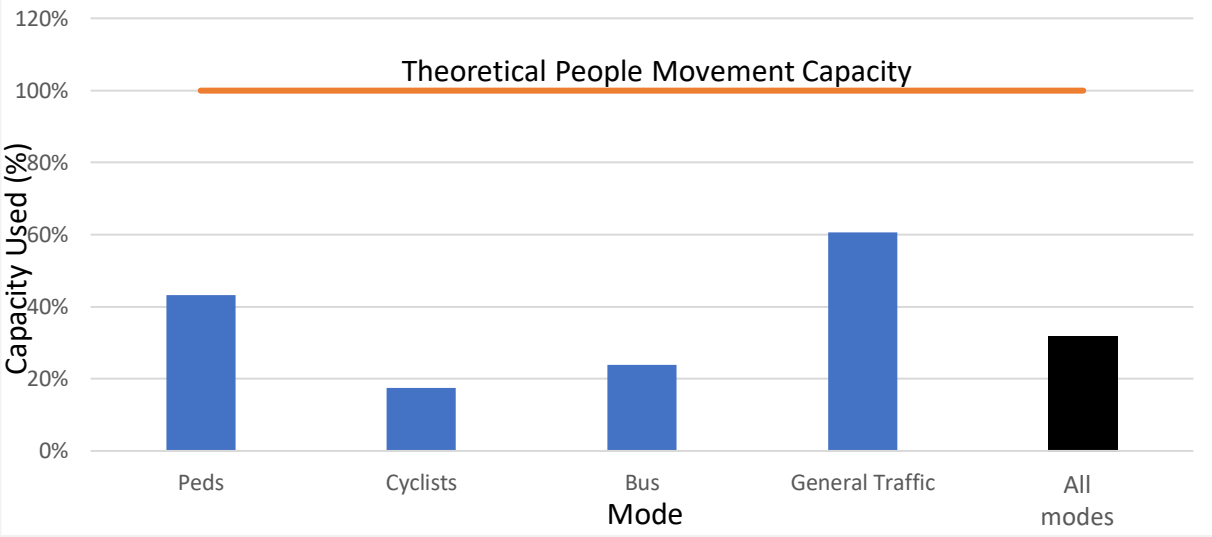
Subject	BusConnects Core Bus Corridor Junction Design
Date	March 2022
Scheme	Belfield/Blackrock to City Centre Core Bus Corridor Scheme

Nutley Lane / St Vincent's University Hospital

Capacity / Delay

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

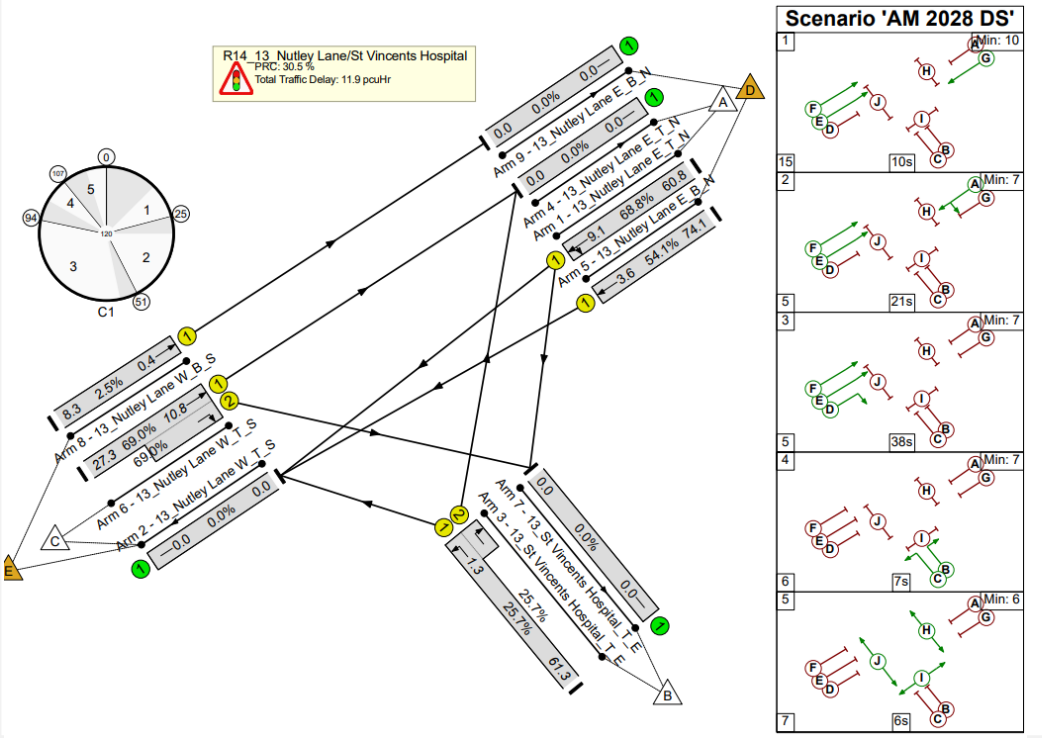




Do Something : 2028 : AM

Cycle = 120 sec
PRC = 31%
Delay = 12 pcuHr

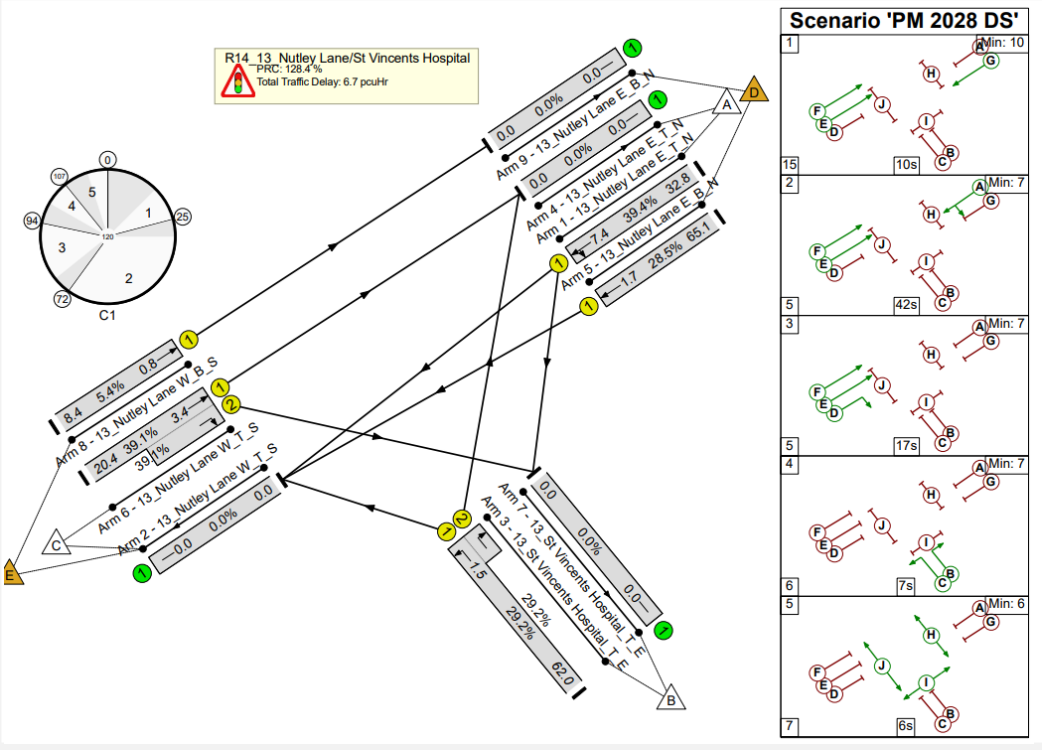
Bus delay
Inbound = 8s
Outbound = 74s



Do Something : 2028 : PM

Cycle = 120 sec
PRC = 129%
Delay = 7 pcuHr

Bus delay
Inbound = 65s
Outbound = 8s



ARUP