Appendix L
Junction Design Report

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1 Introduction

1.1 Introduction

This report has been prepared to document the evolution of the design of key junctions along the Kimmage to City Centre Core Bus Corridor (CBC) Scheme (hereafter referred the Proposed Scheme) and is illustrated in Figure 1-1. 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.

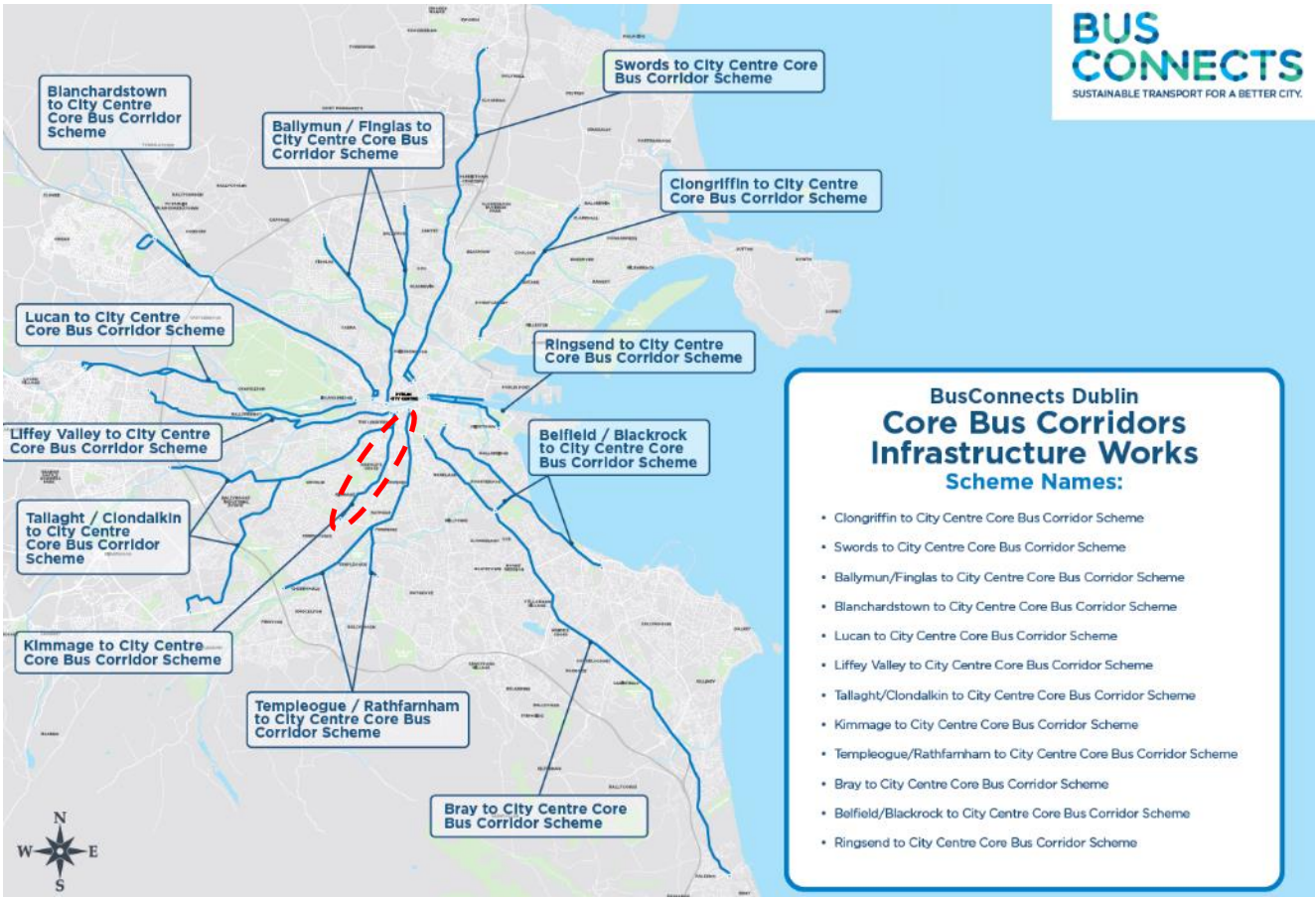


Figure 1-1: Proposed Scheme Route Overview

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 movements 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 [BCODG] document. The design guidance document sets out four typical junction arrangements that could be adopted to achieve bus priority - referred to in order of preference as Junction Types 1-4. Only Junction Type 1 is proposed on the Proposed Scheme and the other options are therefore not discussed herein.

2.1.1.1 Junction Type 1

Junction Type 1 comprises dedicated bus lanes up to the junction stop line and general traffic travelling both straight ahead and turning left is restricted to one lane.

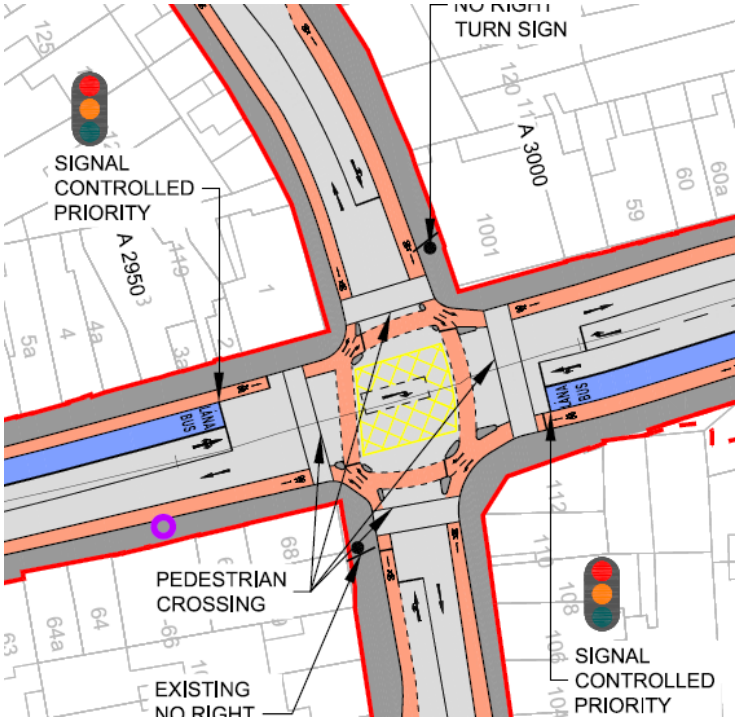


Figure 2-1: Junction Type

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 2-2.

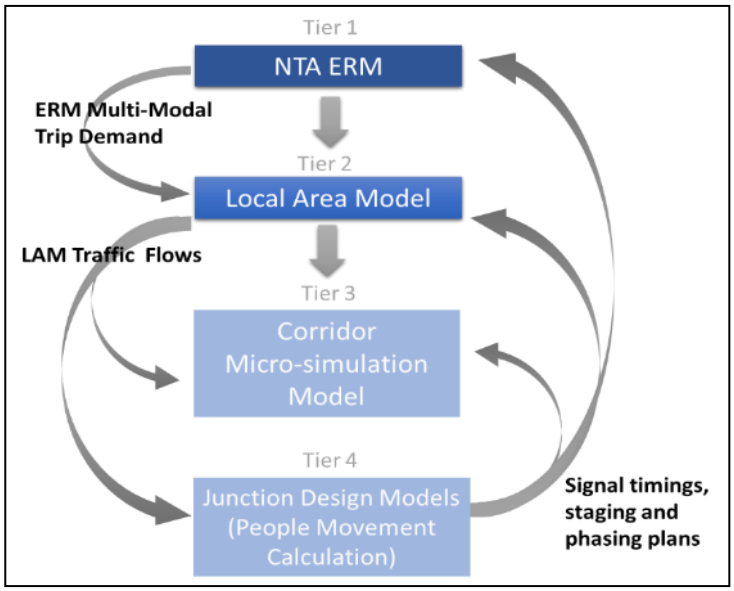


Figure 2-2: Proposed Scheme Traffic Modelling Hierarchy

As shown in Figure 2-2, 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 2-3 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 (PCUhr) – the average bus delay per direction on the Proposed Scheme per junction.

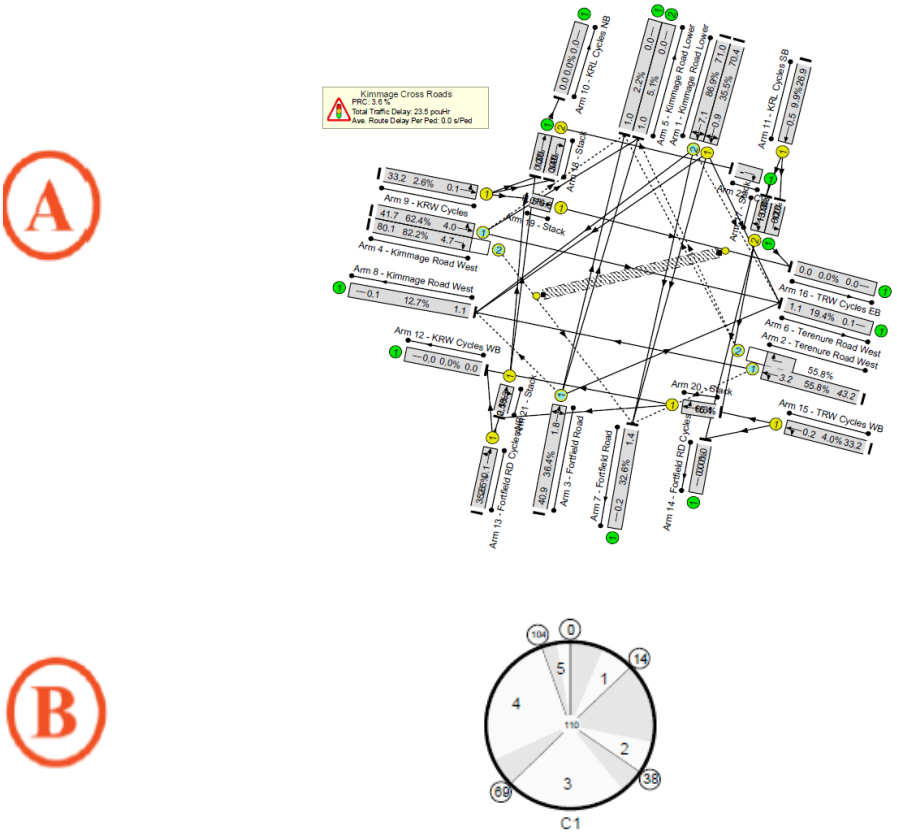


Figure 2-3 Example of the local junction modelling results in the JDR

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**).

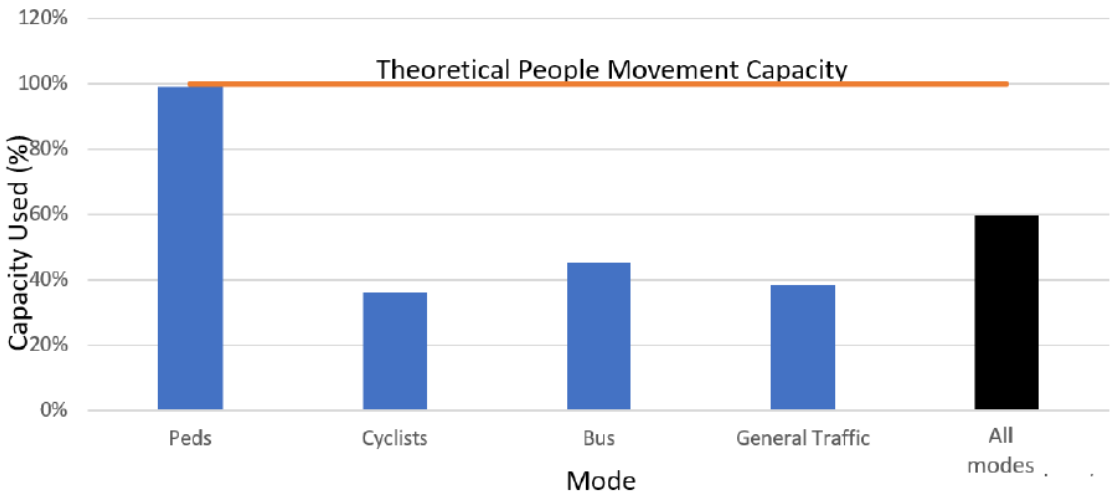


Figure 2-2 Example image of People Movement at Signals Calculator results

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 2-2, 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

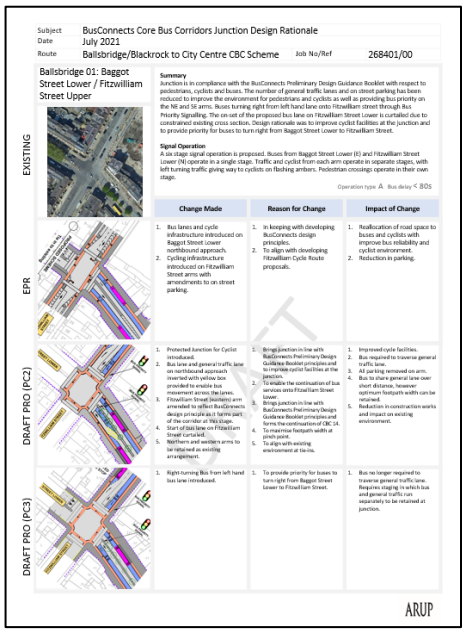
A total number of 10 junctions in the Proposed Scheme are presented in this report, which are as follows:

- Kimmage Cross Roads
- Ravensdale Park / Kimmage Road Lower
- Sundrive Cross
- Mount Argus View / Kimmage Road Lower
- Parkview Avenue / Harold's Cross Road
- Harold's Cross Road
- Grand Canal / Harold's Cross Road
- Leonard's Corner (South Circular Road / Clanbrassil Street)
- St Patrick's Street / New Street South
- Kenilworth Square / Harold's Cross Road

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

4 Junction Design and Modelling Results

Contents


Subject BusConnects Core Bus Corridors Junction Design Rationale
Date July 2021
Route Ballsbridge/Blackrock to City Centre CBC Scheme Job No/Ref 268401/00

Ballsbridge 01: Baggot Street Lower / Fitzwilliam Street Upper

EXISTING

EPR

DRAFT PRO (PC2)

DRAFT PRO (PC3)

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 has been reduced to improve the environment for pedestrians and cyclists as well as providing bus priority on the NE and SE arms. Buses turning right from left hand lane onto Fitzwilliam street through Bus Priority Signalling. The on-set of the proposed bus lane on Fitzwilliam Street Lower is curtailed due to constrained existing cross section. Design rationale was 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) operate in a single stage. Traffic and cyclist from each arm operate in separate stages, with left turning traffic giving way to cyclists on flashing ambers. Pedestrian crossings operate in their own stage.

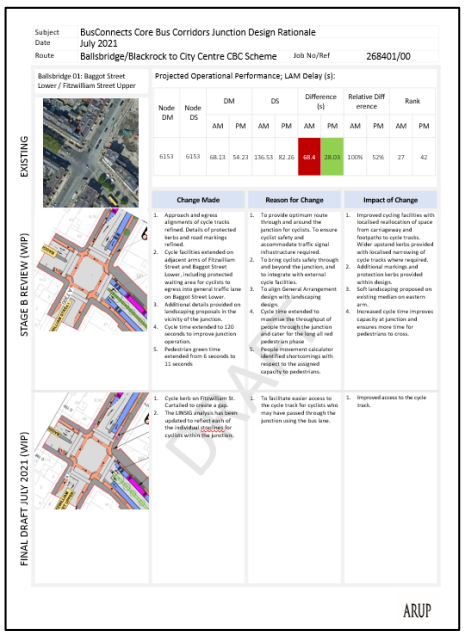
Operation type A Bus delay < 80s

Change Made	Reason for Change	Impact of Change
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.
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 (southern) 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.
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

Description of Options

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


Subject BusConnects Core Bus Corridors Junction Design Rationale
Date July 2021
Route Ballsbridge/Blackrock to City Centre CBC Scheme Job No/Ref 268401/00

Ballsbridge 01: Baggot Street Lower / Fitzwilliam Street Upper

Projected Operational Performance; LAM Delay (s):

Node DM	Node DS	DM AM	DM PM	DS AM	DS PM	Difference (s) AM	Difference (s) PM	Relative Difference AM	Relative Difference PM	Rank AM	Rank PM
6153	6153	68.13	54.23	136.53	82.26	68.4	28.03	100%	52%	27	42

EXISTING

STAGE B REVIEW (WIP)

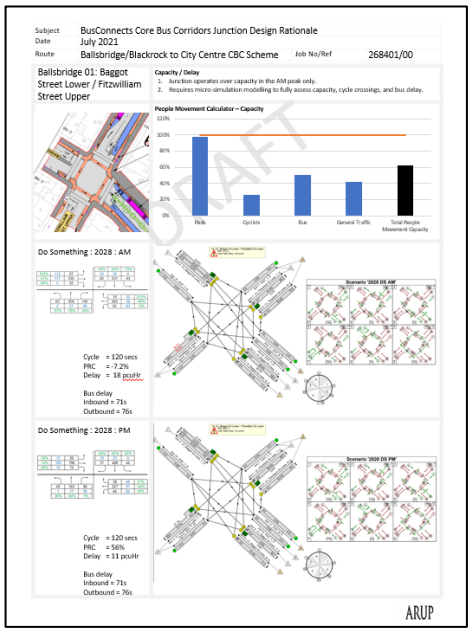
FINAL DRAFT JULY 2021 (WIP)

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.	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 designs. 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.	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.
1. Cycle kerb on Fitzwilliam St. Curtailed to create a gap. 2. The LINSIG analysis has been updated to reflect each of the individual stagings for cyclists within the junction.	1. To facilitate easier access to the cycle track for cyclists who may have passed through the junction using the bus lane.	1. Improved access to the cycle track.

ARUP

Description of Options cond.

- Interim Design Development (where relevant)
- Stage B Review
- Final Draft (Work In Progress)


Subject BusConnects Core Bus Corridors Junction Design Rationale
Date July 2021
Route Ballsbridge/Blackrock to City Centre CBC Scheme Job No/Ref 268401/00

Ballsbridge 01: Baggot Street Lower / Fitzwilliam Street Upper

Capacity / Delay
1. Junction operates over capacity in the AM peak only.
2. Requires micro-simulation modelling to fully assess capacity, cycle crossings, and bus delay.

People Movement Calculator – Capacity

Do Something : 2028 : AM

Cycle = 120 secs
PRC = -7.2%
Delay = 18 pcu/Hr

Bus delay
Inbound = 71s
Outbound = 76s

Do Something : 2028 : PM

Cycle = 120 secs
PRC = 56%
Delay = 11 pcu/Hr

Bus delay
Inbound = 71s
Outbound = 76s

ARUP

LinSig Outputs and People Movement Calculator

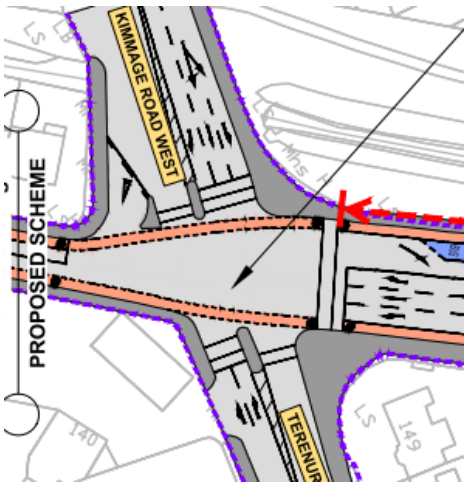
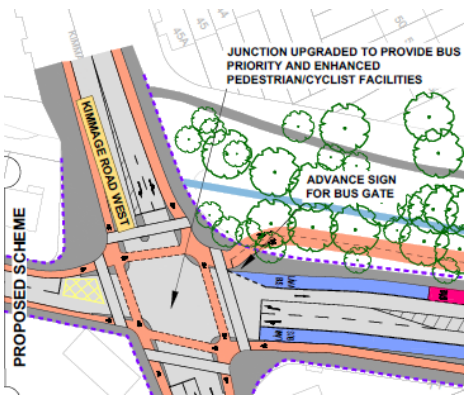
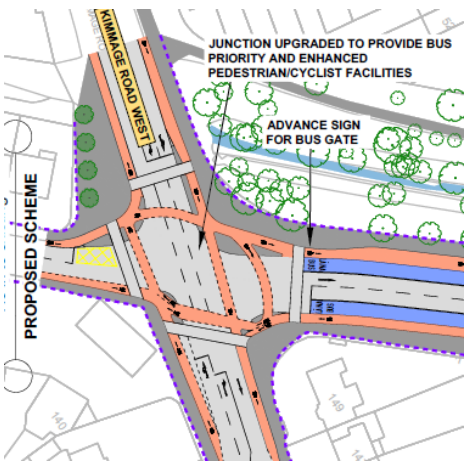
- People Movement Calculator
- Flow Diagrams
- LinSig Results

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

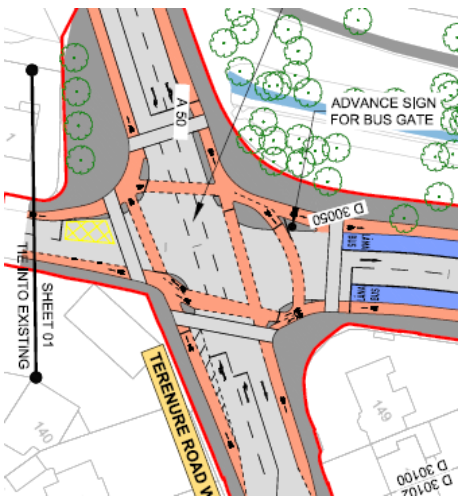
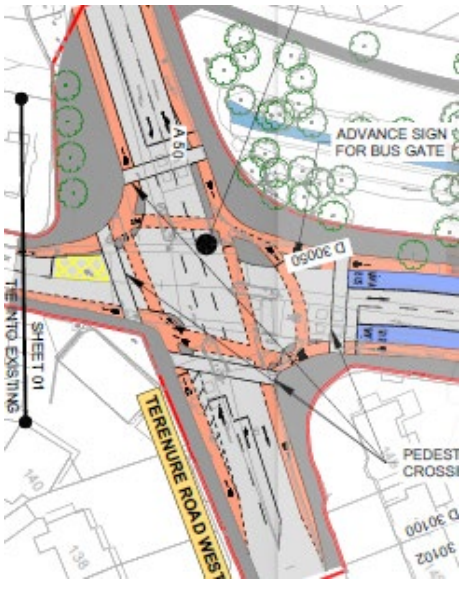
Kimmage Cross Roads

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
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.
Signal controlled priority for outbound buses.
Pedestrian crossings operate in their own stage.

		Change Made	Reason for Change	Impact of Change
EXISTING				
EPR		1. Two- way cycle track introduced in the north and south direction 2. Left slip lanes from Kimmage Road Lower and Kimmage Road West removed 3. Signalised pedestrian crossings provided 4. Northbound bus lane provided on Kimmage Road Lower	1. To provide continuous cycle infrastructure along the corridor. 2. To improve pedestrian crossing opportunities. 3. To improve pedestrian crossing facilities. 4. To improve bus provision along the corridor	1. Land acquisition required to accommodate a suitable cycle track and footpath width 2. Safer pedestrian crossing opportunities. 3. Improved pedestrian crossing facilities 4. Northbound general traffic merged to single lane
DRAFT PRO (PC2)		1. Two- way cycle track introduced through Poddle Park and Northbound cycle lane removed 2. Protected cycle infrastructure introduced 3. Left slip lane from Fortfield Road removed 4. Southbound Bus lane provided on Kimmage Road Lower	1. To maintain adequate footpath provision on Kimmage Road Lower. 2. To improve cyclist protection and safety through the junction 3. To allow for provision of pedestrian crossing 4. To improve bus provision along the corridor	1. Greenway facility provided through the park 2. Improved cyclist protection and safety through the junction 3. Improved pedestrian crossing facilities 4. Improved bus provision along the corridor
DRAFT PRO (PC3)		1. Two-way cycle track through Poddle Park removed and northbound cycle track reinstated on Kimmage Road Lower 2. Protected cycle right turn pockets and improved cycle lane alignment 3. Stop lines adjusted and central islands removed	1. To provide a dedicated northbound cycle lane within the road corridor 2. To ensure unimpeded movements by straight ahead cyclists 3. To facilitate turning manoeuvres by larger vehicles	1. No impact on Poddle Park 2. Improved cycle facilities 3. Increased intergreen times for vehicles to clear the junction

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

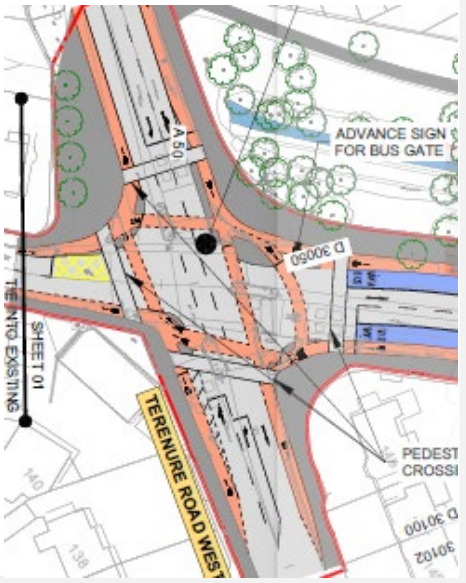
Kimmage Cross Roads			
EXISTING			
	Change Made	**Reason for Change**	**Impact of Change**
STAGE B REVIEW 	1. None	1. None	1. None
FINAL DRAFT (WIP) 	1. None	1. None	1. None

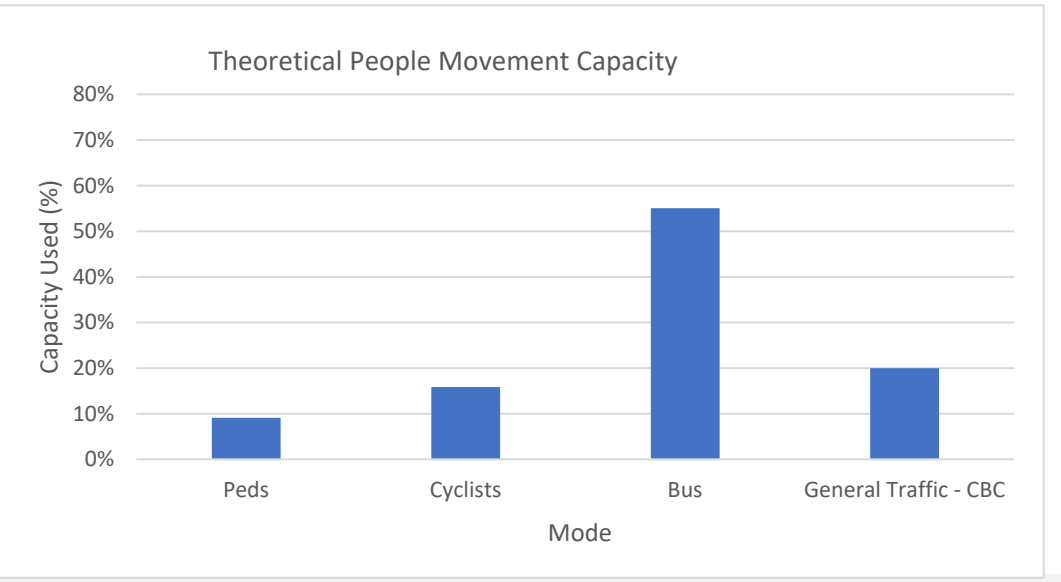
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Kimmage Cross Roads

Capacity / Delay

People Movement Calculator – Capacity

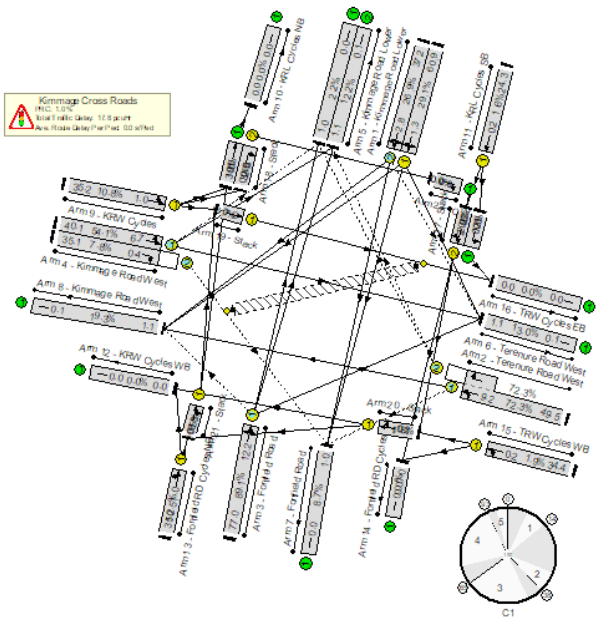


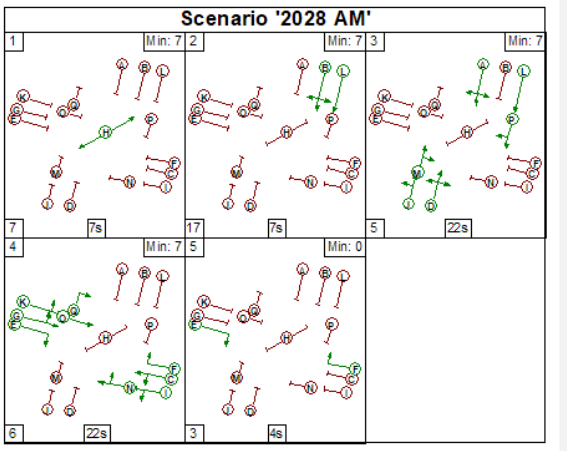


Do Something : 2028 : AM

Cycle = 100 secs
PRC = 1.0%
Delay = 17.8 pcuHr

Bus Delay
Inbound = N/A
Outbound = 1.3s

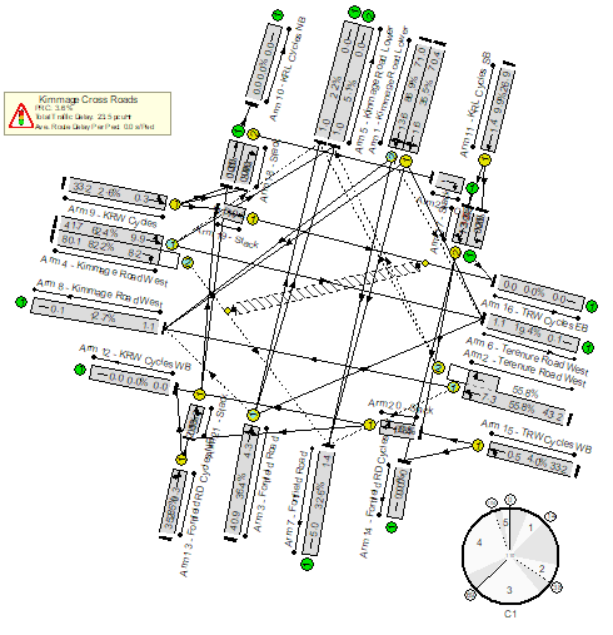


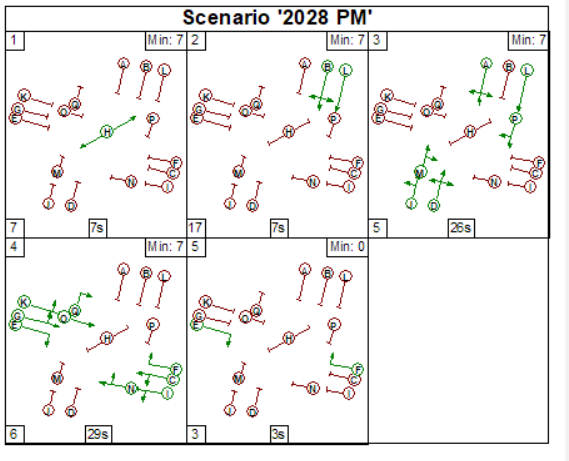


Do Something : 2028 : PM

Cycle = 110 secs
PRC = 3.6%
Delay = 23.47 pcuHr

Bus Delay
Inbound = N/A
Outbound = 1.6s



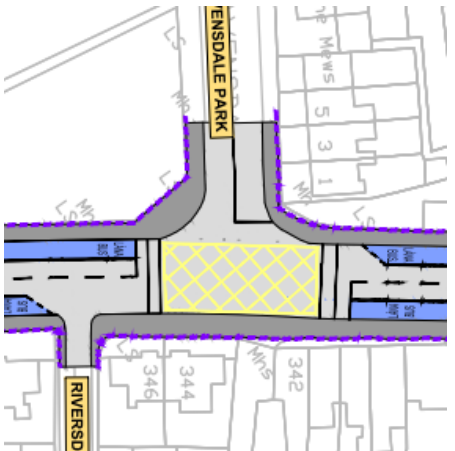
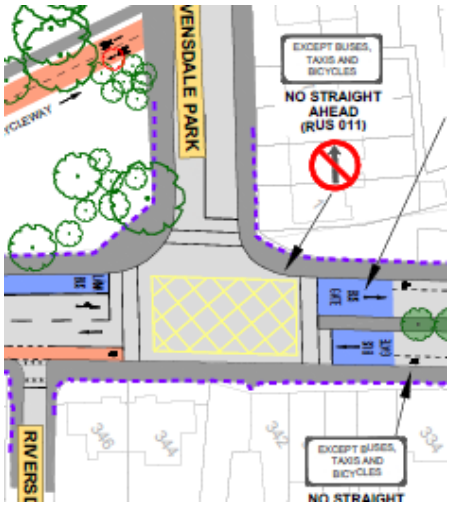
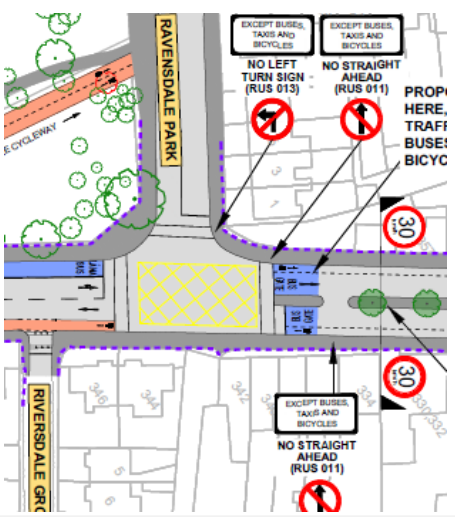


Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

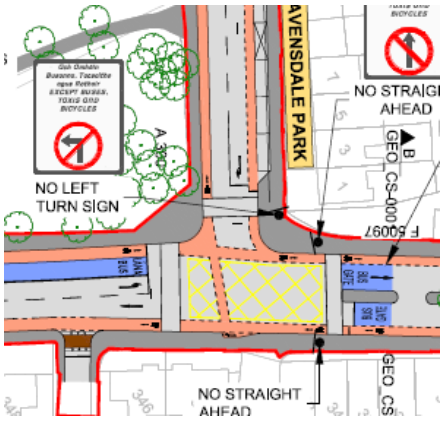
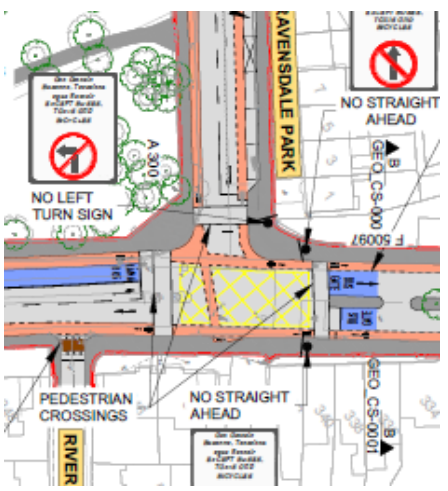
Ravensdale Park/Kimmage Road Lower

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
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.
Signal controlled priority for buses.
Pedestrian crossings operate in their own stage.

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Bus lanes added in both directions 2. Signalised crossings provided across the main arms	1. To improve the bus priority along the corridor 2. To improve pedestrian safety and infrastructure provision	1. Improved bus priority along the corridor 2. Improved pedestrian safety crossing the main corridor
DRAFT PRO (PC2)		1. Bus gate introduced on the northern arm of the junction and traffic diverted via Ravensdale Park 2. Additional signal controlled pedestrian crossing provided on minor arm 3. Southbound bus lane on southern arm replaced by southbound cycle track	1. To reduce the need for land acquisition and provide bus priority along Kimmage Road 2. To improve pedestrian safety and infrastructure provision 3. To provide segregated facilities for cyclists	1. Improved bus priority along the corridor 2. Improved pedestrian safety crossing all arms of the junction 3. Buses diverge from traffic lane further downstream where additional road space allows
DRAFT PRO (PC3)		1. None	1. None	1. None

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

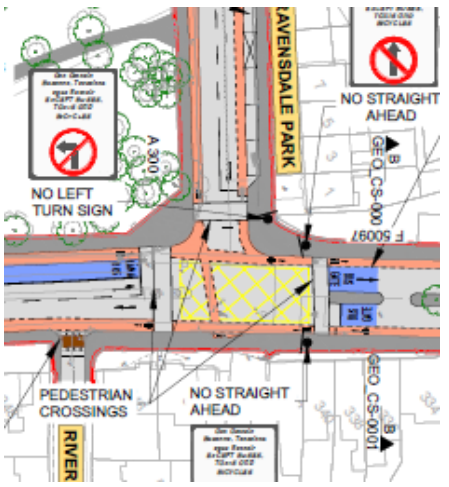
		Change Made	Reason for Change	Impact of Change
EXISTING	Ravensdale Park/Kimmage Road Lower 			
STAGE B REVIEW		1. Cycle lanes introduced along Ravensdale Park 2. Cycle right turn pockets provided and improved cycle lane alignment 3. Northbound cycle lane introduced	1. To facilitate cycle accessibility from the minor side road arms. 2. To ensure unimpeded movements by straight ahead cyclists 3. To ensure safe and direct accessibility to the cycle facilities along Kimmage Road Lower	1. Improved accessibility for cyclists to and from the minor arm 2. Improved cycle facilities 3. Safer and more direct access to the cycle facilities along Kimmage Road Lower
FINAL DRAFT (WIP)		1. None	1. None	1. None

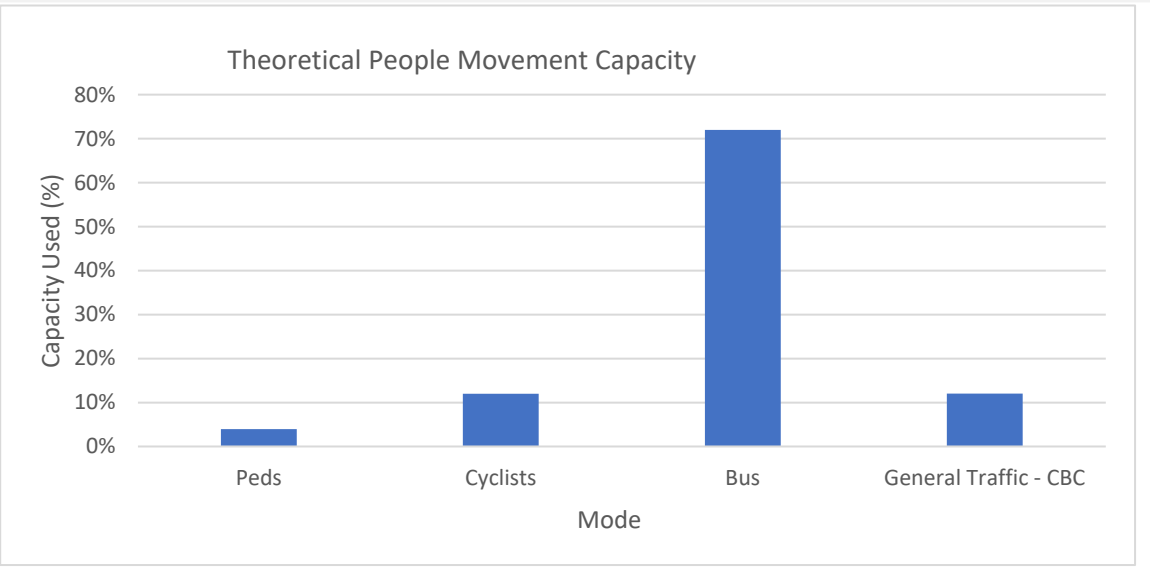
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Ravensdale Park/Kimmage Road Lower

Capacity / Delay

People Movement Calculator – Capacity

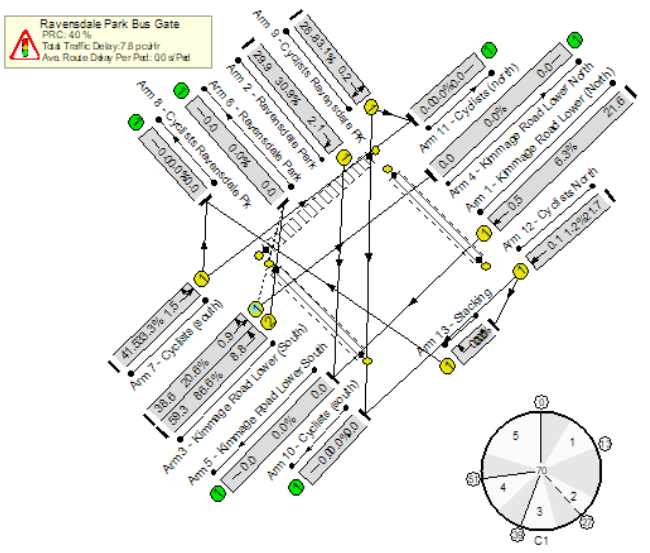


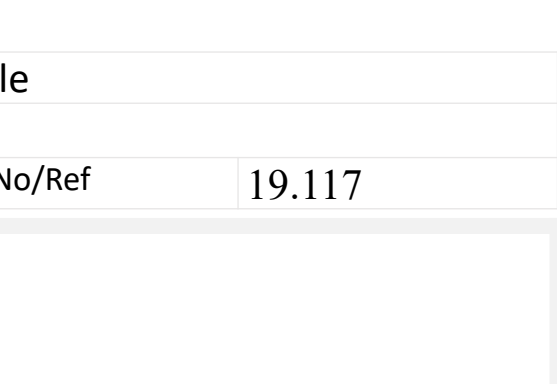


Do Something : 2028 : AM

Cycle = 70 secs
PRC = 4%
Delay = 7.8 pcuHr

Bus Delay
Inbound = 0.9
Outbound = 0.6s

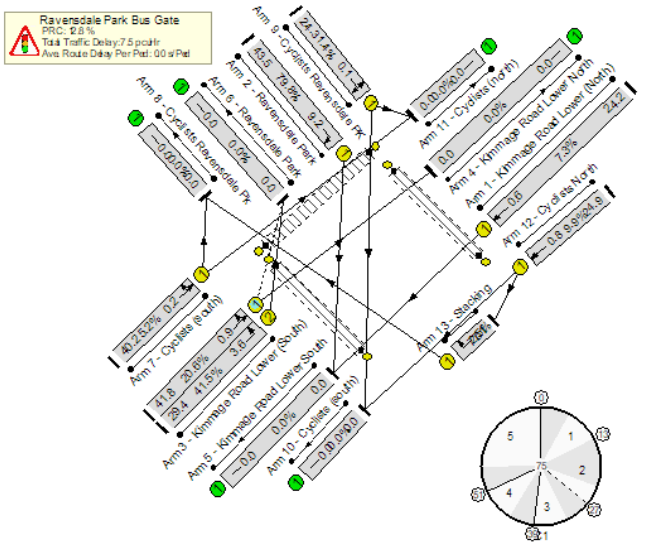


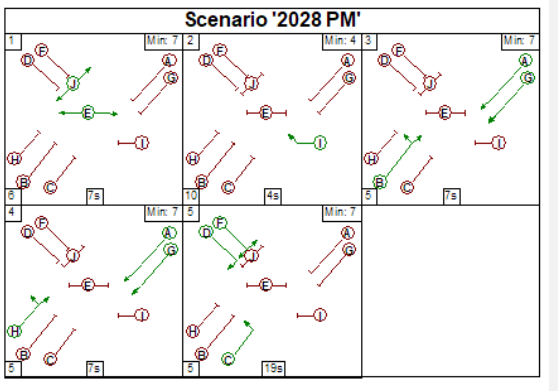


Do Something : 2028 : PM

Cycle = 75
PRC = 12.8%
Delay = 7.46 pcuHr

Bus Delay
Inbound = 0.9s
Outbound = 0.6s



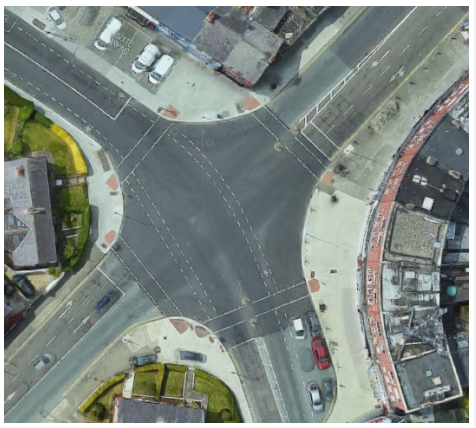
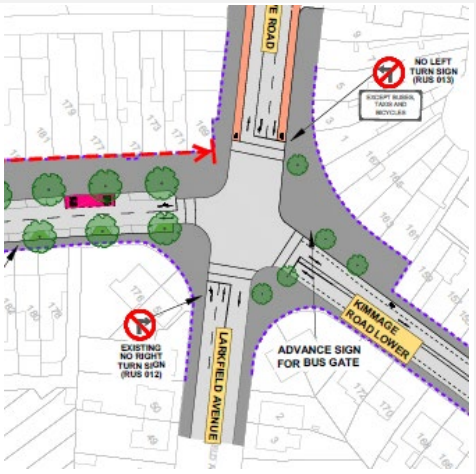
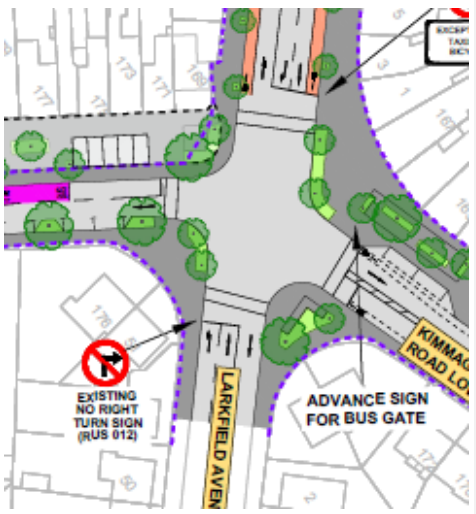


Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

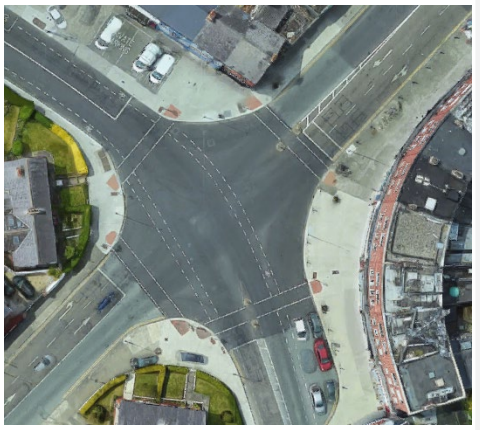
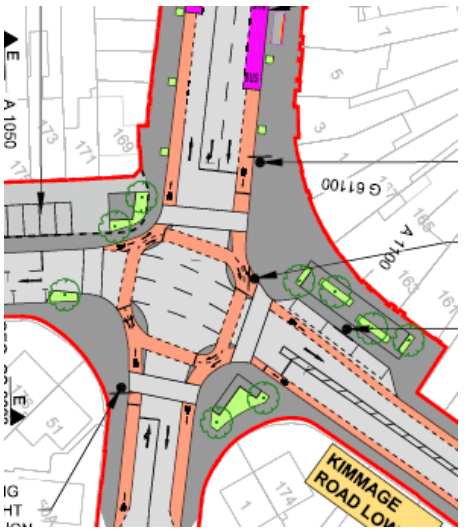
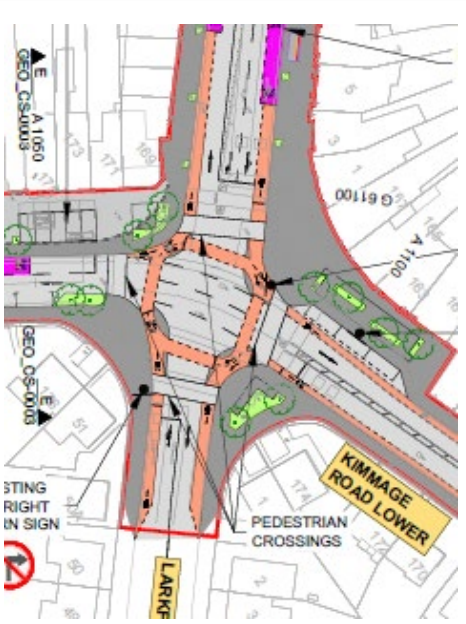
Sundrive Road/Kimmage Road Lower

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
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.
Pedestrian crossings operate in their own stage.

		Change Made	Reason for Change	Impact of Change
EXISTING				
EPR		1. Bus lanes introduced along the main corridor 2. Bus gate introduced at northern arm 3. Junction footprint reduced 4. Advisory cycle lanes removed along the main corridor	1. To improve bus priority provision along the main corridor 2. To improve bus priority provision along the main corridor 3. To slow traffic speeds through the junction and reduce pedestrian crossing distances 4. To accommodate new bus lanes	1. Significant impact to public realm area due to additional road space requirements 2. Traffic diverted via Sundrive Road or Larkfield Avenue 3. Parking removed and pedestrian crossing distances reduced 4. Cyclists required to share with buses
DRAFT PRO (PC2)		1. Cycle lanes introduced on Sundrive Road 2. Segregated bus lanes removed on Kimmage Road Lower 3. Advisory cycle lanes reinstated on Kimmage Road Lower	1. To ensure connectivity between the main corridor and the proposed Poddle Cycleway 2. Proposed bus gate at Ravensdale Park will significantly reduce traffic volumes along the corridor 3. To establish the presence of cyclists using the facility	1. Improved cycle interconnectivity between cycle routes 2. Reduced impact on the public realm area while maintaining sufficient bus priority 3. Existing cycle provision maintained.
DRAFT PRO (PC3)		1. None	1. None	1. None

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

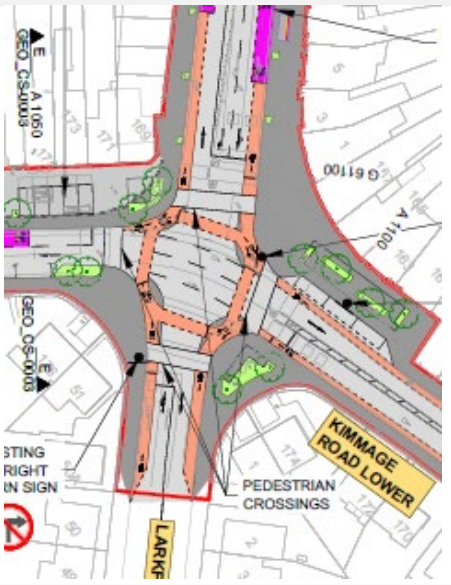
	Sundrive Road/Kimmage Road Lower			
EXISTING				
STAGE B REVIEW		**Change Made** 1. Protected cycle infrastructure and right turn pockets provided through the junction 2. Cycle lanes provided on Larkfield Avenue	**Reason for Change** 1. To improve cyclist protection through the junction and ensure unimpeded movements by straight ahead cyclists 2. To facilitate cycle accessibility from the minor side road arms.	**Impact of Change** 1. Improved cyclists safety and permeability through the junction 2. Improved cycle accessibility from minor side road arms.
FINAL DRAFT		1. None	1. None	1. None

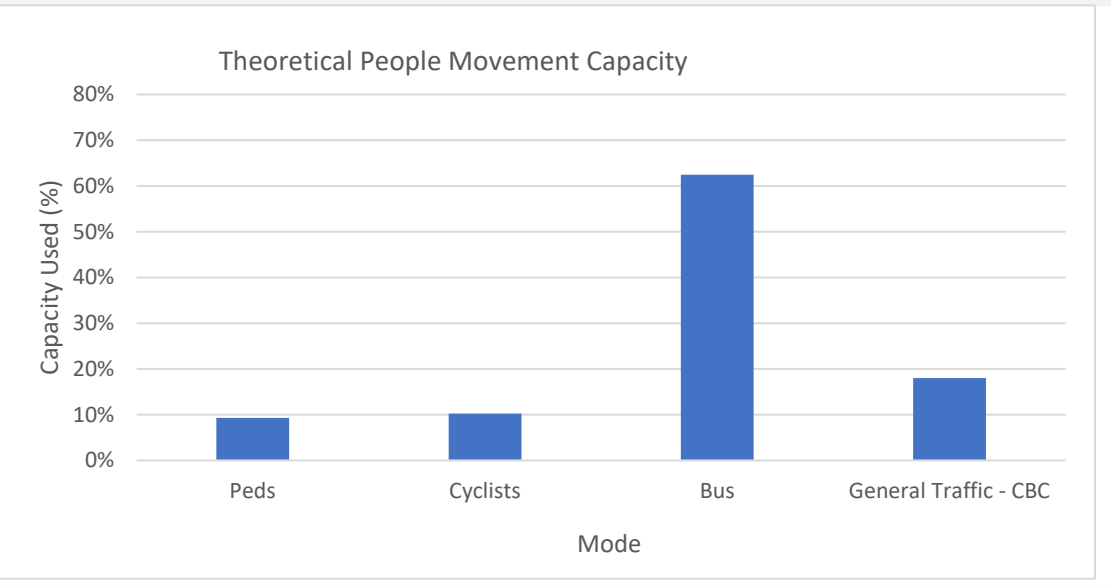
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Sundrive Road/Kimmage Road Lower

Capacity / Delay

People Movement Calculator – Capacity

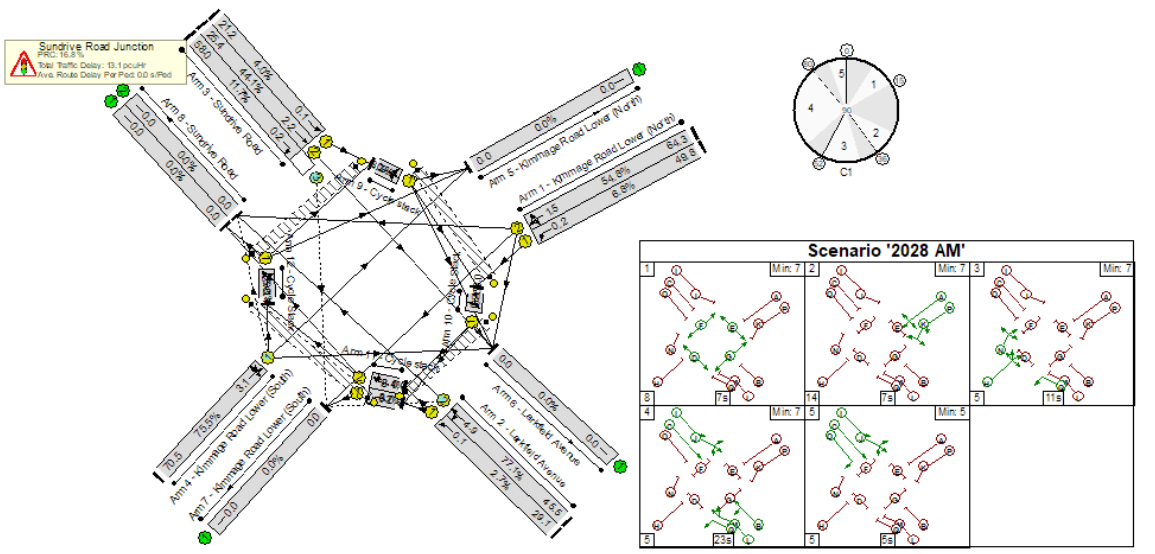




Do Something : 2028 : AM

Cycle = 90 secs
PRC = 16.8%
Delay = 13.1 pcuHr

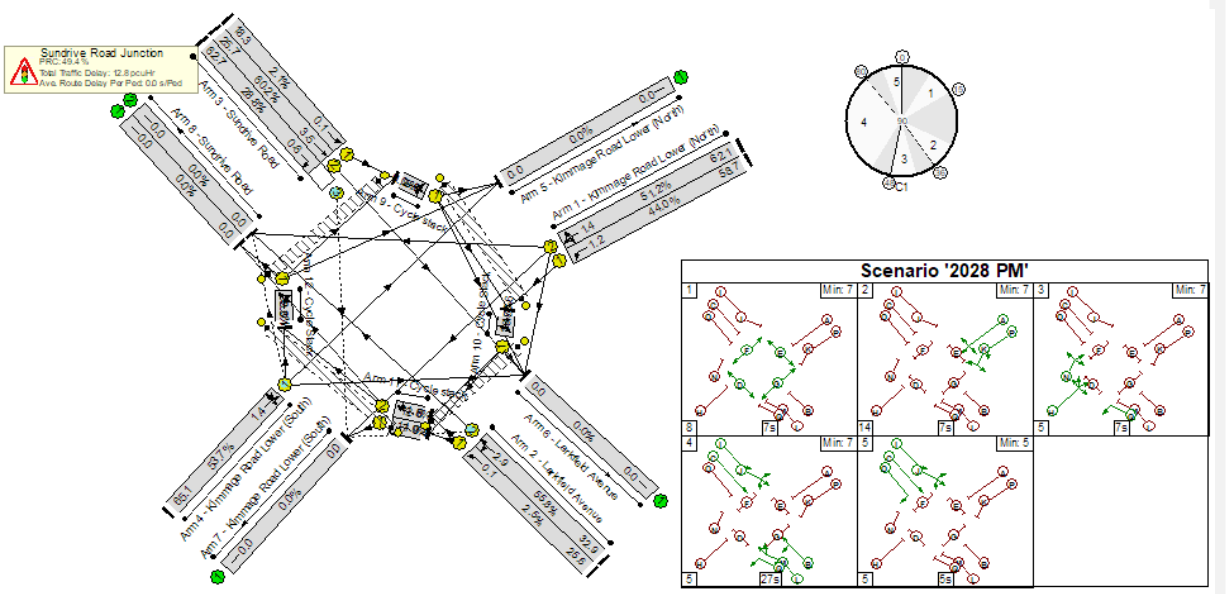
Bus Delay
Inbound = 2.7s
Outbound = 5.3s



Do Something : 2028 : PM

Cycle = 90 secs
PRC = 49.4%
Delay = 12.8 pcuHr

Bus Delay
Inbound = 2.1s
Outbound = 2.5s

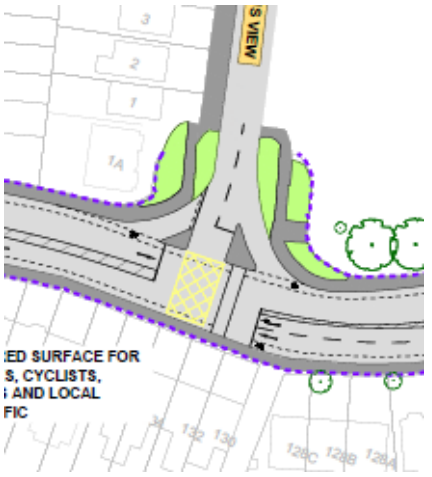
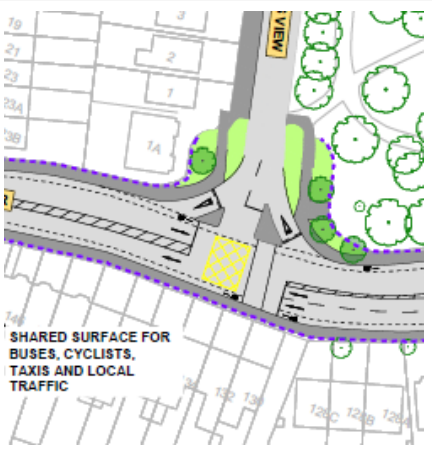


Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Mount Argus View

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
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.
Signal controlled priority for buses.
Pedestrian crossings operate in their own stage.

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Left slip lanes removed 2. Lane provision reduced 3. Advisory cycle lanes removed	1. In Keeping with DMURS principles 2. Traffic demand for turning lanes expected to reduce 3. Cyclists assumed to share with buses or to use the alternative route provided	1. Increased public realm area and opportunities for landscape enhancement 2. Increased public realm area and opportunities for landscape enhancement 3. Reduced level of service and safety for cyclists along the main corridor
DRAFT PRO (PC2)		1. Left slip lanes reintroduced 2. Lane provision reinstated 3. Advisory cycle lanes reinstated	1. To minimise the extent of construction intervention 2. To minimise the extent of construction intervention 3. To ensure cycle infrastructure is maintained along the main corridor	1. None 2. None 3. Safety and priority of cyclists maintained
DRAFT PRO (PC3)		1. None	1. None	1. None

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Mount Argus View

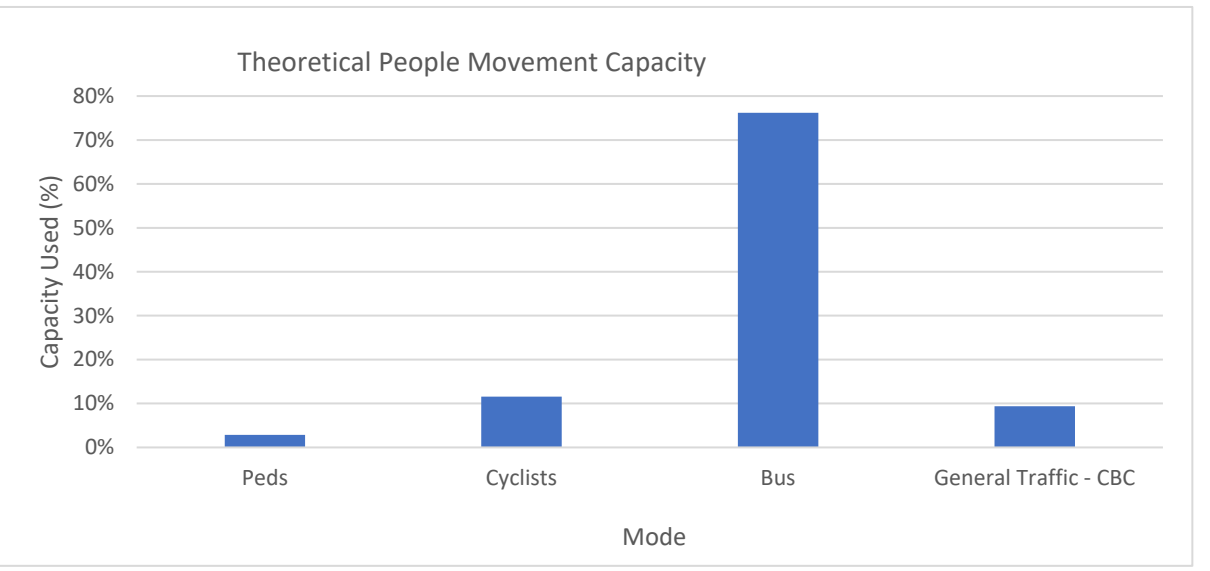
		Change Made	Reason for Change	Impact of Change
EXISTING				
STAGE B REVIEW		1. Left slip lanes removed 2. Lane provision reduced 3. Segregated inbound and outbound cycle lanes provided on all arms with right turn pocket for cyclists	1. In Keeping with DMURS principles 2. Traffic demand for turning lanes expected to reduce 3. To improve cycle infrastructure through the junction and ensure unimpeded movements by straight ahead cyclists	1. Increased public realm area and opportunities for landscape enhancement 2. Increased public realm area and opportunities for landscape enhancement 3. Improved cyclist protection and safety through the junction
FINAL DRAFT (WIP)		1. None	1. None	1. None

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Mount Argus View

Capacity / Delay

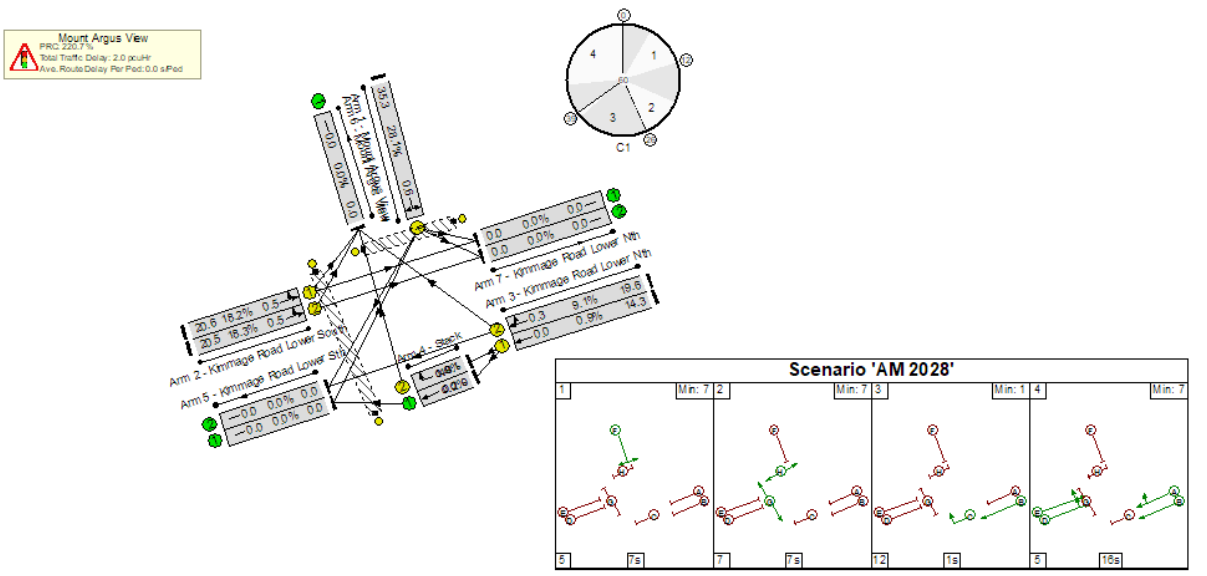
People Movement Calculator – Capacity



Do Something : 2028 : AM

Cycle = 60 secs
PRC = 220.7%
Delay = 2.0pcuHr

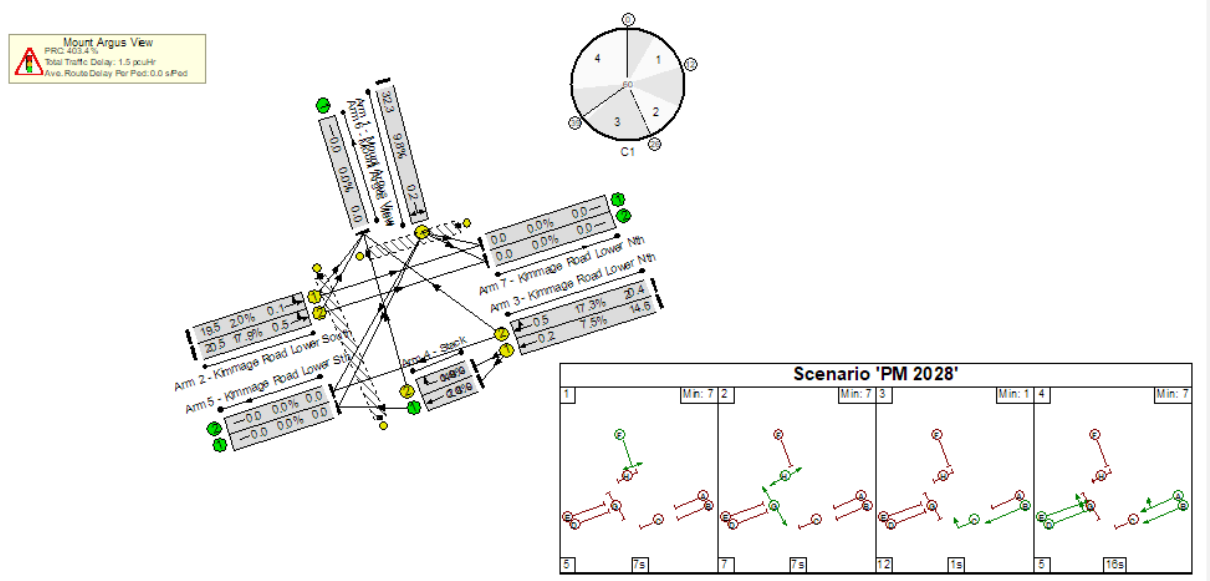
Bus Delay
Inbound = 21s
Outbound = 20s



Do Something : 2028 : PM

Cycle = 60 secs
PRC = 403.4%
Delay = 1.54pcuHr

Bus Delay
Inbound = 21s
Outbound = 20s



Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Parkview Avenue

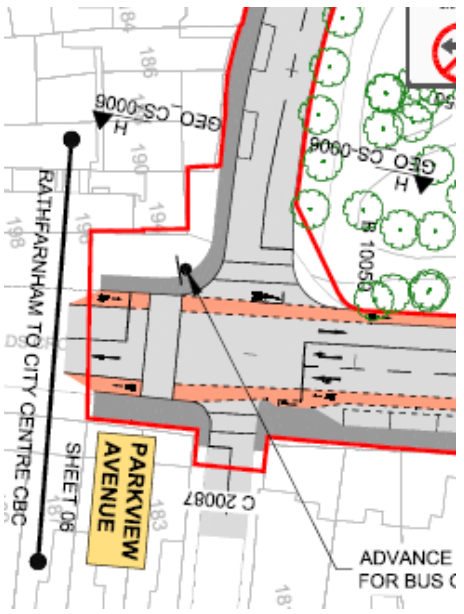
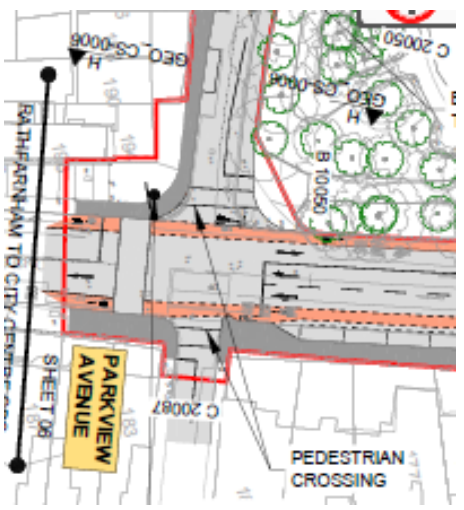
Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
The design rationale 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.
Signal controlled priority for buses.
Pedestrian crossings operate in their own stage.

	Change Made	Reason for Change	Impact of Change
EXISTING	1. None	1. None	1. None
EPR			
DRAFT PRO (PC2)			
DRAFT PRO (PC3)			

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

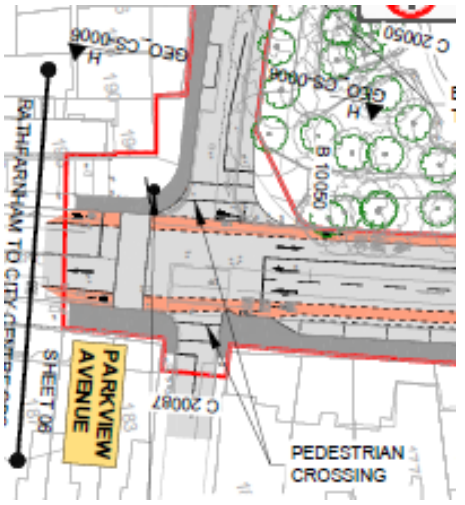
Parkview Avenue

		Change Made	Reason for Change	Impact of Change
EXISTING				
STAGE B REVIEW		1. Outbound bus lane removed 2. Inbound bus lane developed further downstream 3. Inbound and outbound cycle lanes provided	1. Bus gate provided upstream to enable priority along the route 2. To facilitate road space for dedicated cycle infrastructure 3. To improve cycle infrastructure provision	1. Road space allowance to provide a right turn lane to accommodate the Bus Gate restrictions imposed further upstream 2. Improved cycle infrastructure provision 3. Improved cycle infrastructure provision
FINAL DRAFT (WIP)		1. Nonw	1. None	1. None

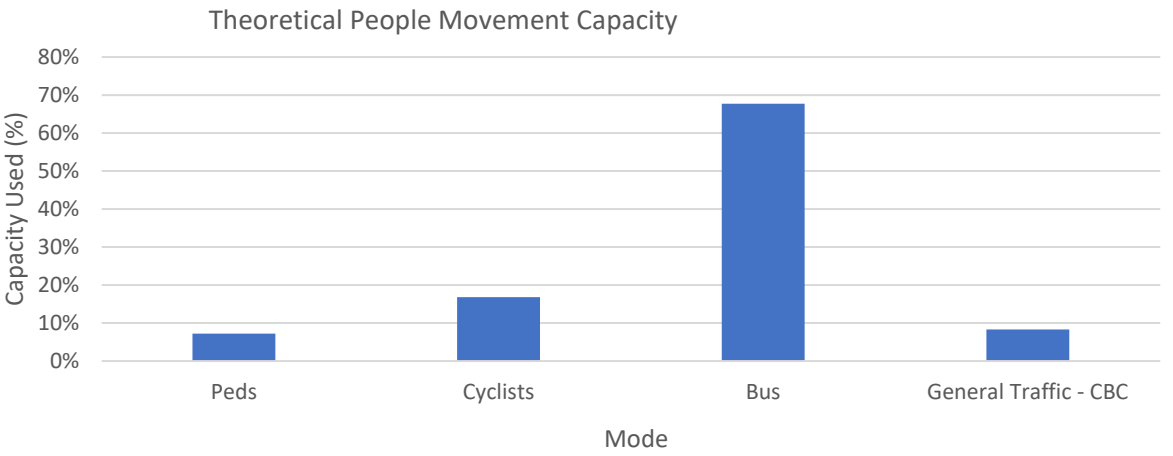
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Parkview Avenue

Capacity / Delay



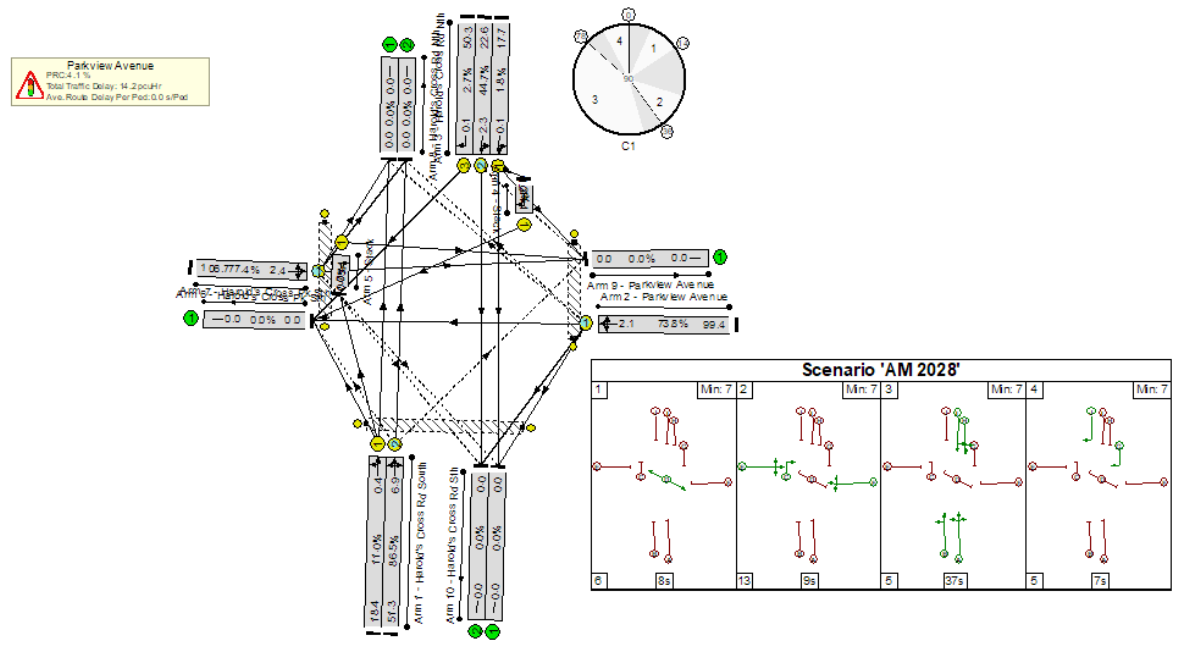
People Movement Calculator – Capacity



Do Something : 2028 : AM

Cycle = 90 secs
PRC = 4.1%
Delay = 14.2pcuHr

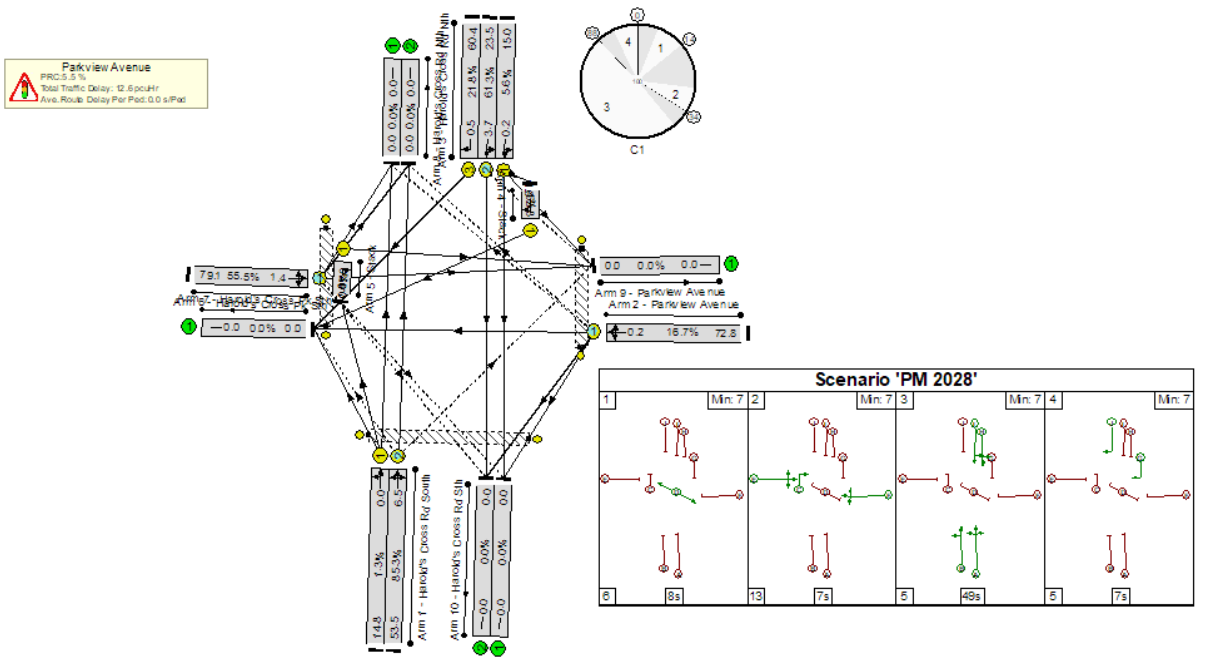
Bus Delay
Inbound = N/A
Outbound = N/A



Do Something : 2028 : PM

Cycle = 100 secs
PRC = 5.5%
Delay = 12.7pcuHr

Bus Delay
Inbound = N/A
Outbound = N/A

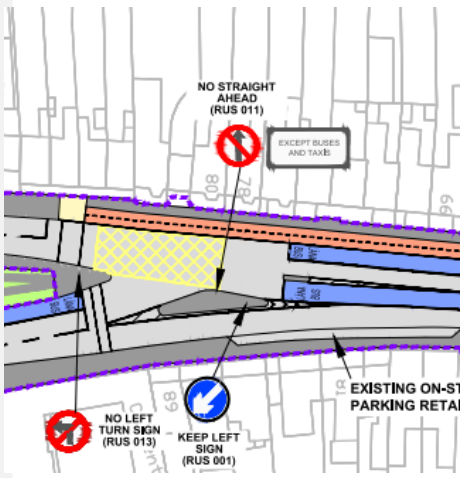
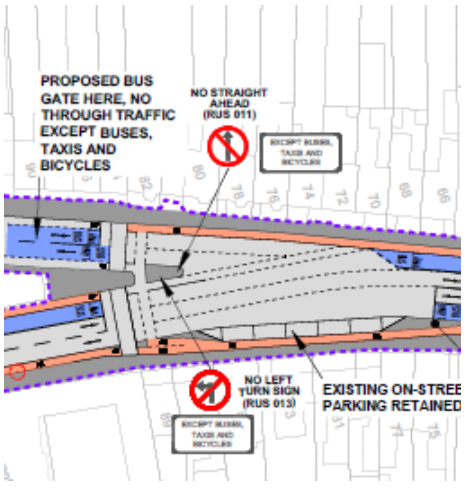
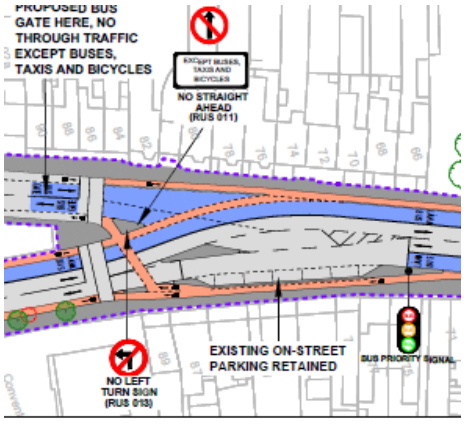


Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Harold's Cross Road

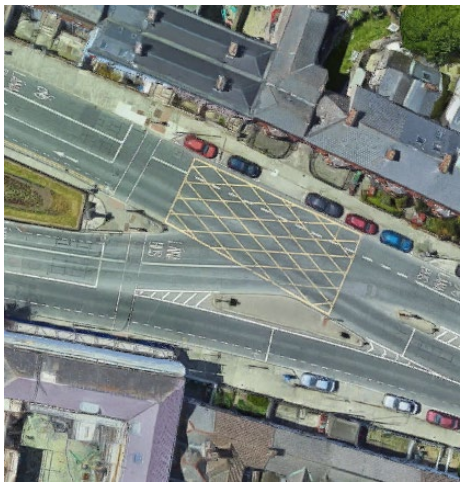
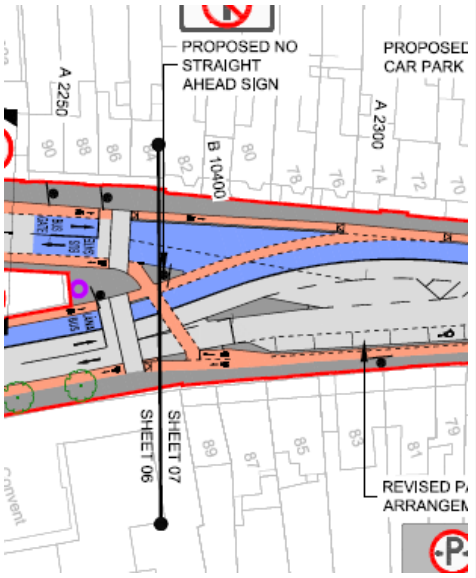
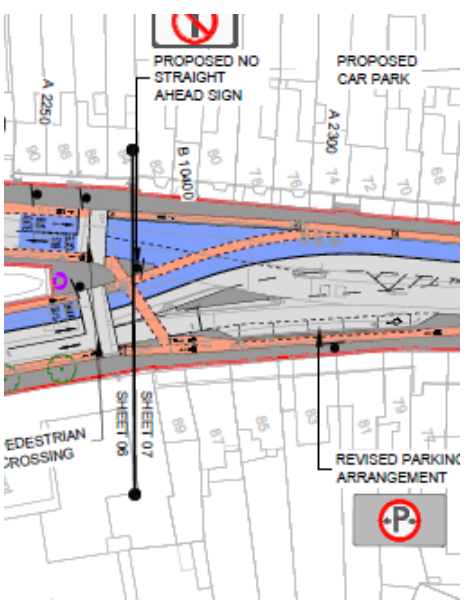
Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A three stage signal operation is proposed.
Signal controlled priority for buses.
Pedestrian crossings operate in their own stage.

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound Bus lanes introduced along the main corridor 2. Outbound Bus gate for buses along Harold's Cross Road West 3. Two-way cycle track on western side and removal of advisory lane on eastern side	1. To improve bus priority provision along the main corridor 2. To improve bus priority provision along the main corridor 3. To improve cycle infrastructure provision along the corridor	1. Improved bus priority along the corridor 2. Improved bus priority along the corridor 3. Insufficient means for cyclists to rejoin Harold's Cross Road East
DRAFT PRO (PC2)		1. Segregated inbound and outbound cycle lanes provided on all arms with right turn pocket for cyclists to Harold's Cross Road West 2. Outbound lane reallocation on northern arm	1. Improved cycle permeability through the junction to all arms.	
DRAFT PRO (PC3)		1. Improved line marking within the footprint of the junction 2. Realigned cycle lanes	1. To improve the legibility of the junction 2. To improve turning geometry for cyclists	1. None 2. None

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Harold's Cross Road

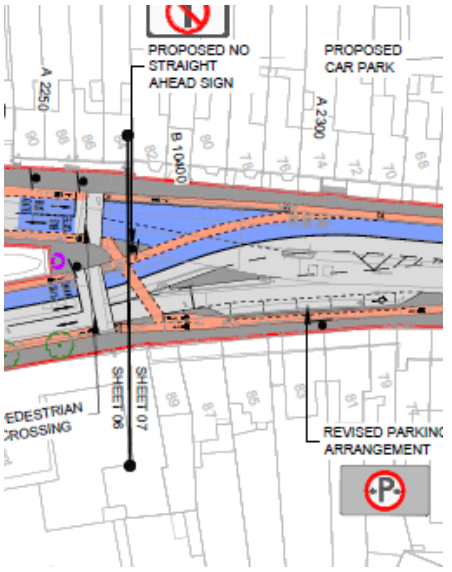
	Change Made	Reason for Change	Impact of Change
EXISTING			
			
STAGE B REVIEW	1. None	1. None	1. None
			
FINAL DRAFT (WIP)	1. None	1. None	1. None
			

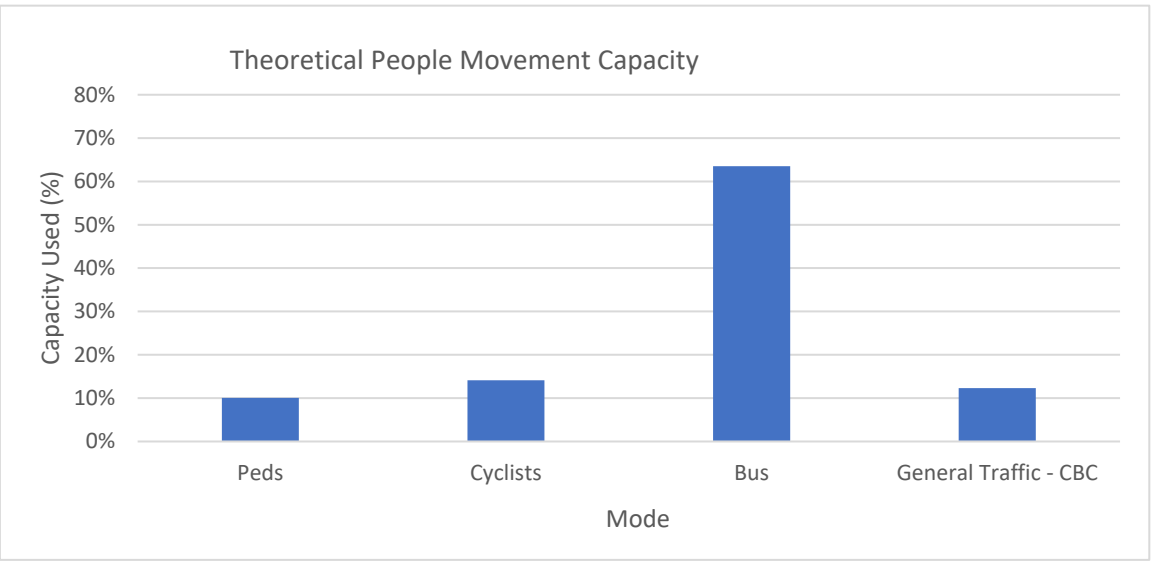
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Harold's Cross Road

Capacity / Delay

People Movement Calculator – Capacity

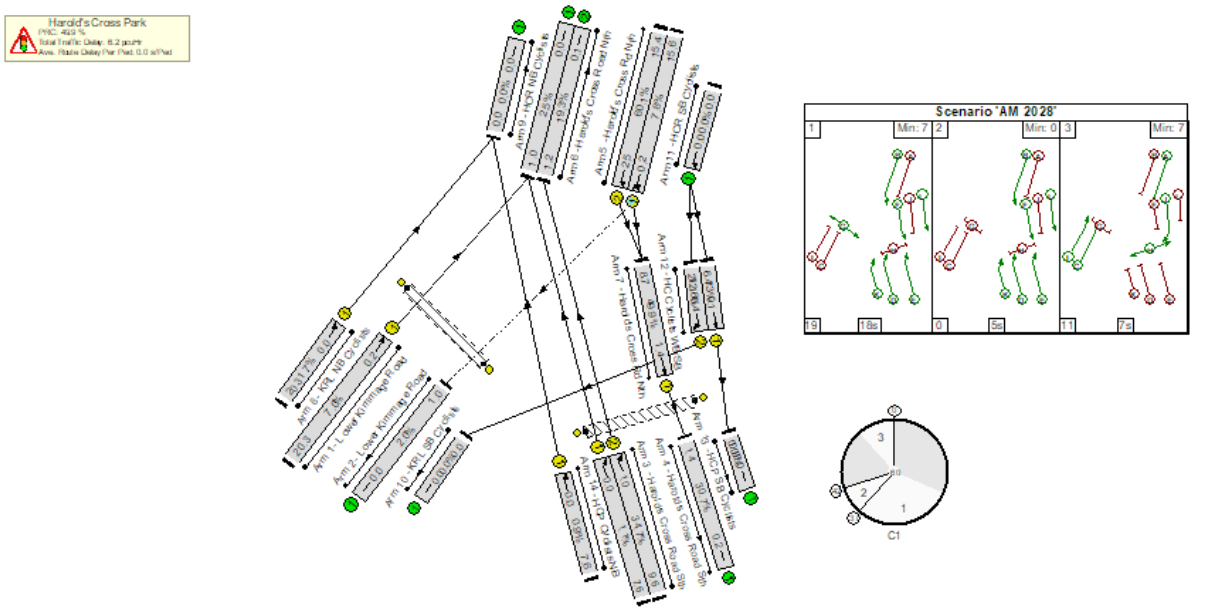




Do Something : 2028 : AM

Cycle = 60 secs
PRC = 49.9%
Delay = 6.18 pcuHr

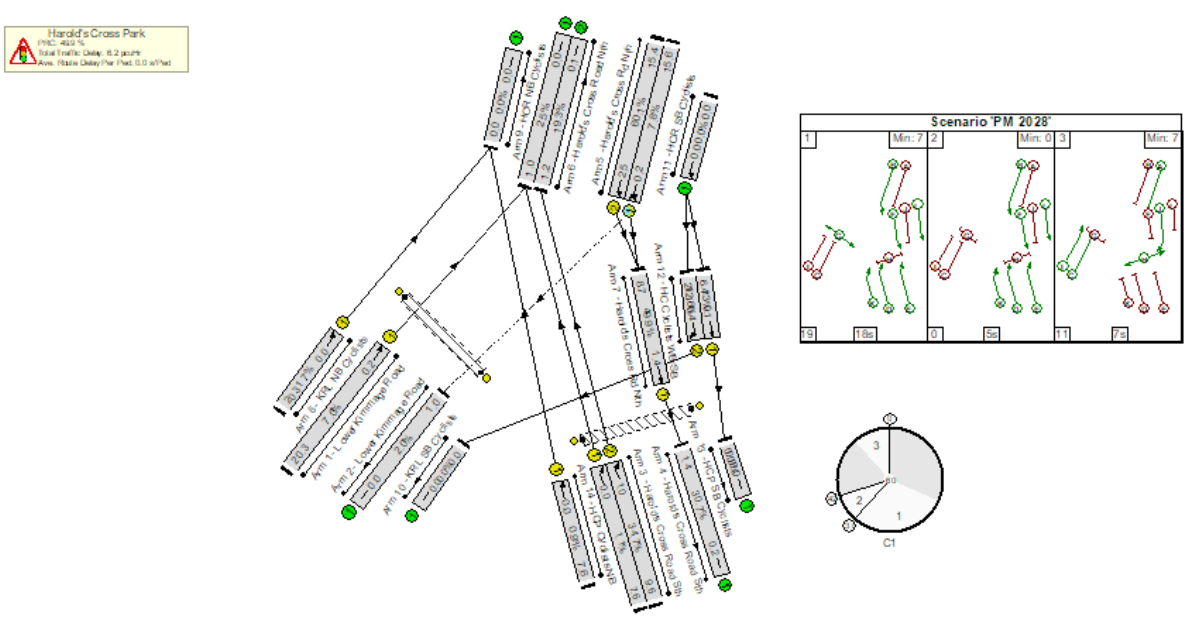
Bus Delay
Inbound = 20.3s
Outbound = 15.6s



Do Something : 2028 : PM

Cycle = 60 secs
PRC = 49.9%
Delay = 6.18 pcuHr

Bus Delay
Inbound = 20.3s
Outbound = 15.6s

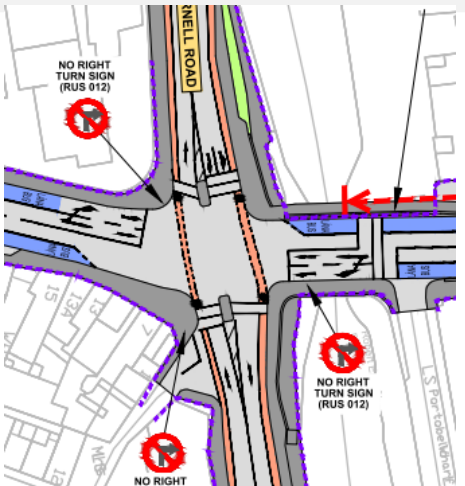
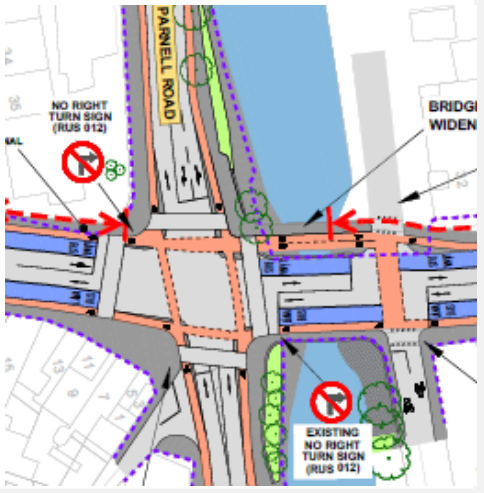
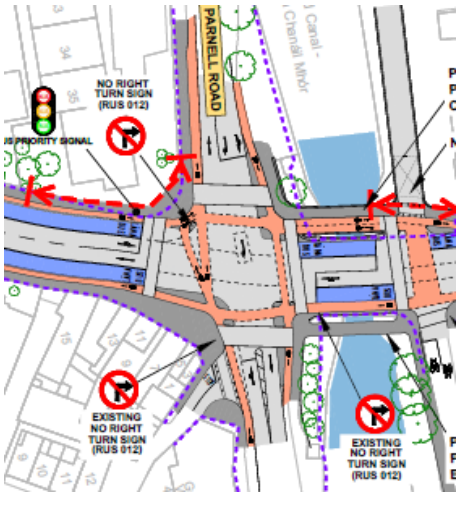


Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Harold's Cross Road/Grand Canal

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
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.
Signal controlled priority for buses.
Pedestrian crossings operate in their own stage.

	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound bus lane extended closer to the junction 2. Outbound bus lane provided. 3. Cycle ASL boxes removed along the main corridor 4. Advisory cycle lanes removed along the main corridor	1. To improve bus priority provision along the main corridor 2. To improve bus priority provision along the main corridor 3. Cyclists assumed to share with buses or to use the alternative route provided 4. Cyclists assumed to share with buses or to use the alternative route provided	1. Improved bus priority provision along the main corridor 2. Improved bus priority provision along the main corridor 3. Reduced level of service and safety for cyclists along the main corridor 4. Reduced level of service and safety for cyclists along the main corridor
DRAFT PRO (PC2)		1. Inbound and outbound bus lanes extended to the stop line 2. Segregated inbound and outbound cycle lanes provided on all arms with right turn pocket for cyclists	1. To improve bus priority provision along the main corridor 2. To improve cycle infrastructure along the main corridor and ensure unimpeded movements by straight ahead cyclists	1. Improved bus priority provision along the main corridor 2. Improved cyclist protection and safety through the junction
DRAFT PRO (PC3)		1. None	1. None	1. None

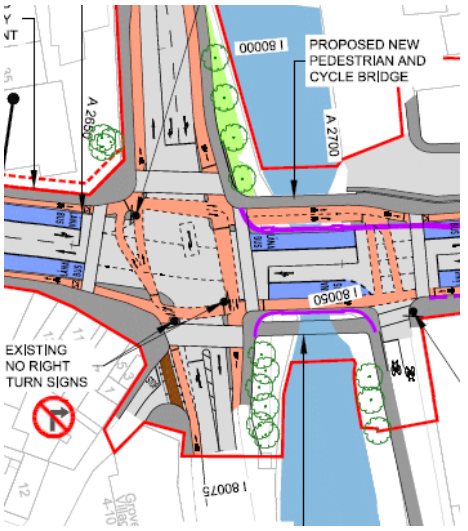
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

EXISTING

Harold's Cross Road/Grand Canal

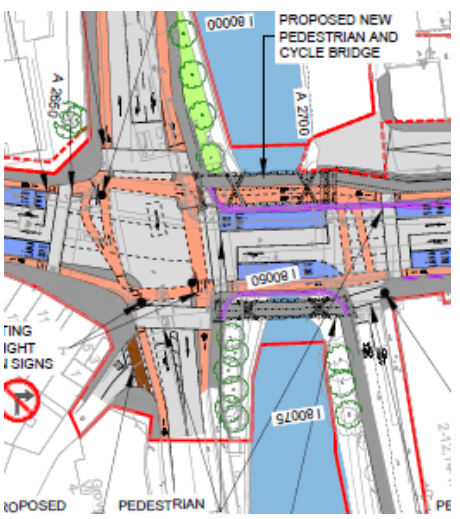
Change Made	Reason for Change	Impact of Change
1. None	1. None	1. None

STAGE B REVIEW



Change Made	Reason for Change	Impact of Change
1. None	1. None	1. None

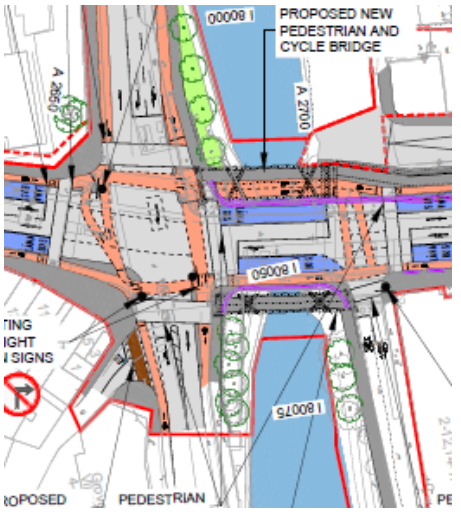
FINAL DRAFT (WIP)



Change Made	Reason for Change	Impact of Change
1. None	1. None	1. None

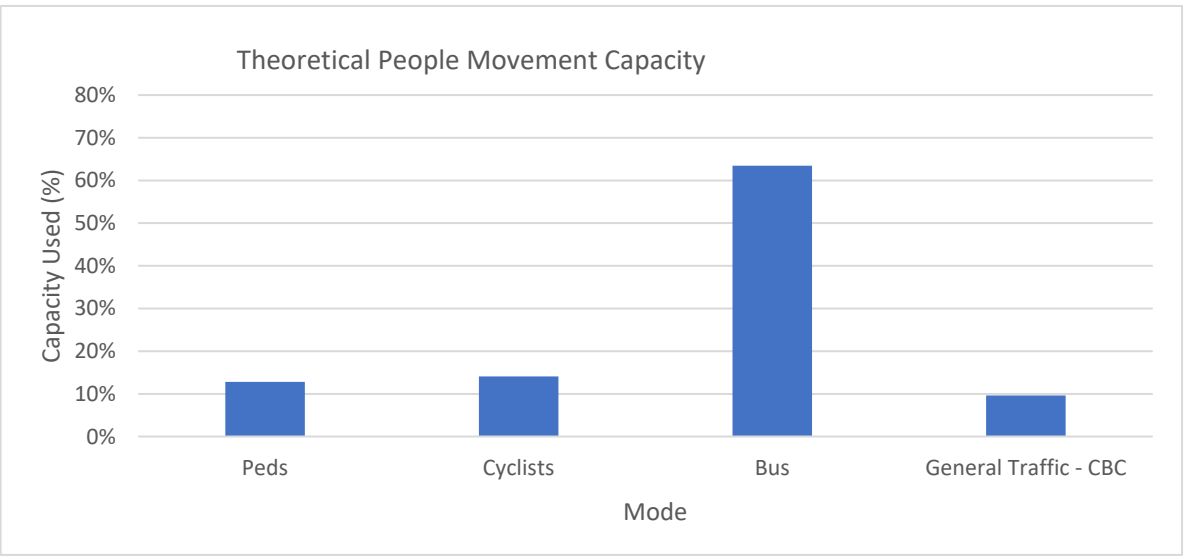
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Harold's Cross Road/Grand Canal



Capacity / Delay

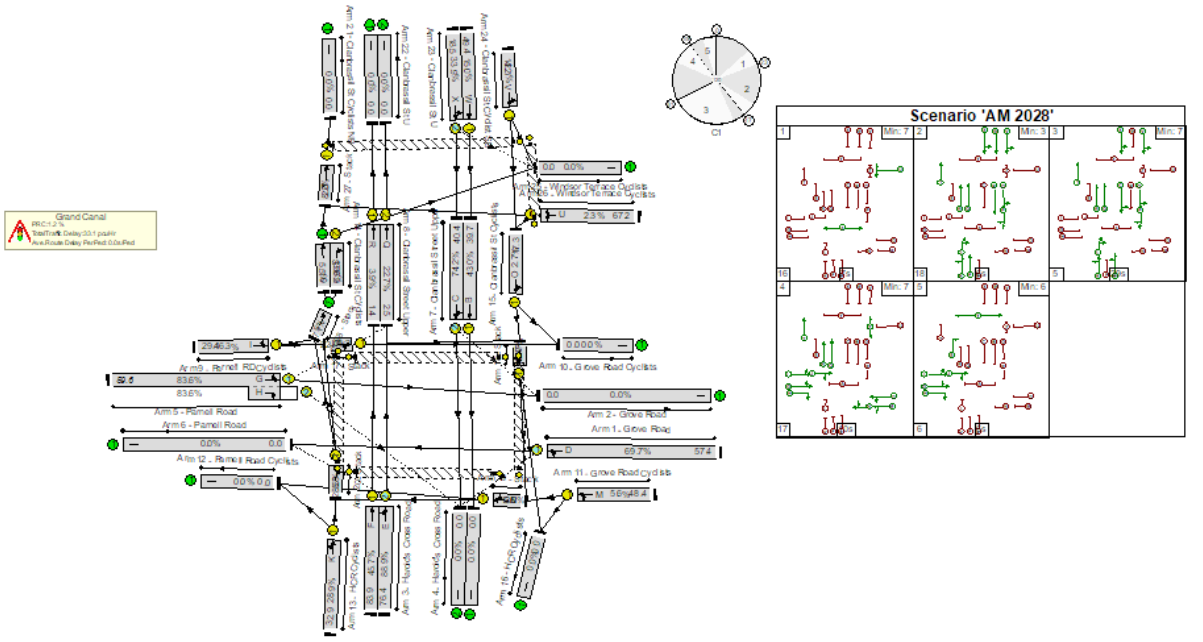
People Movement Calculator – Capacity



Do Something : 2028 : AM

Cycle = 120 secs
PRC = 1.2%
Delay = 33.1pcuHr

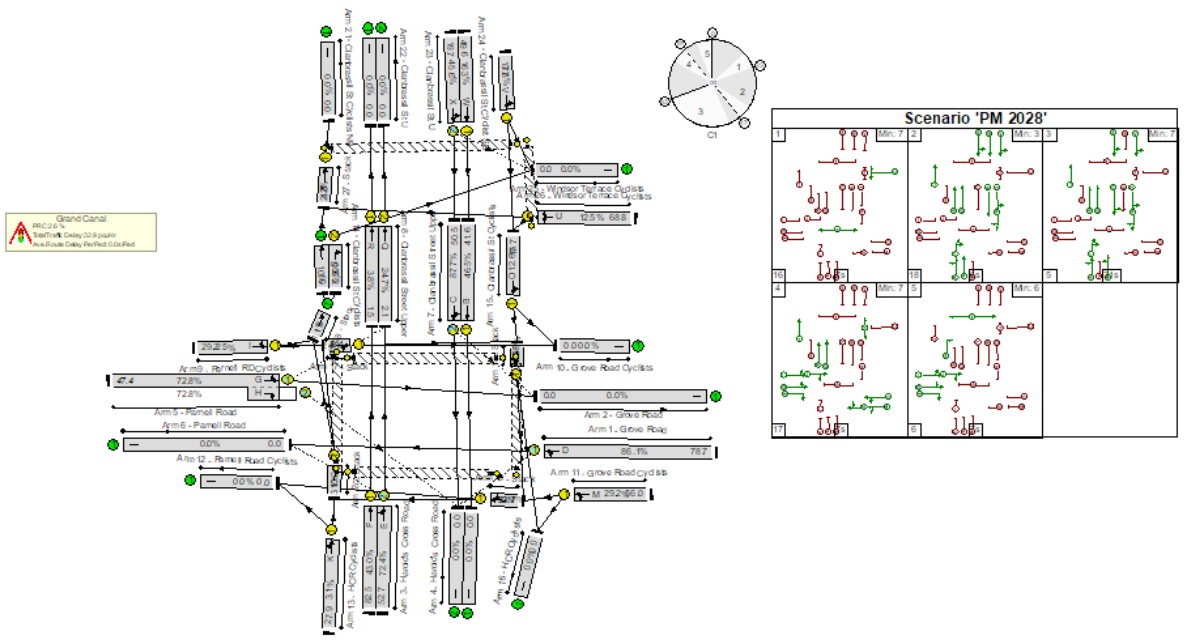
Bus Delay
Inbound = 1.2s
Outbound = 0.5s



Do Something : 2028 : PM

Cycle = 120 secs
PRC = 2.6%
Delay = 32.9pcuHr

Bus Delay
Inbound = 1.1s
Outbound = 0.6s

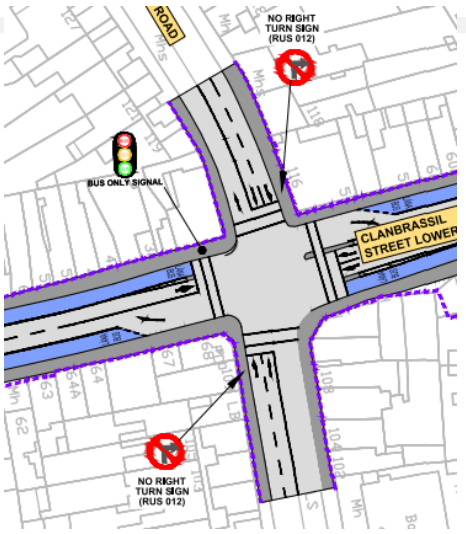
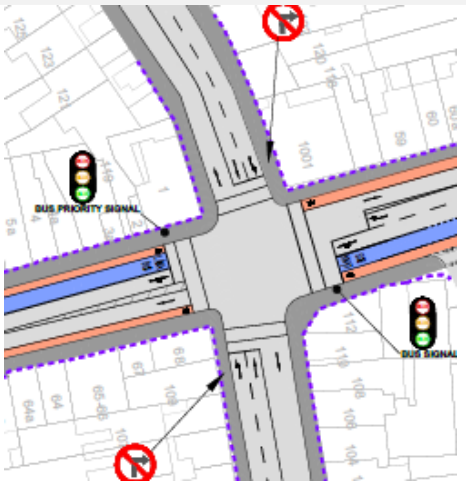
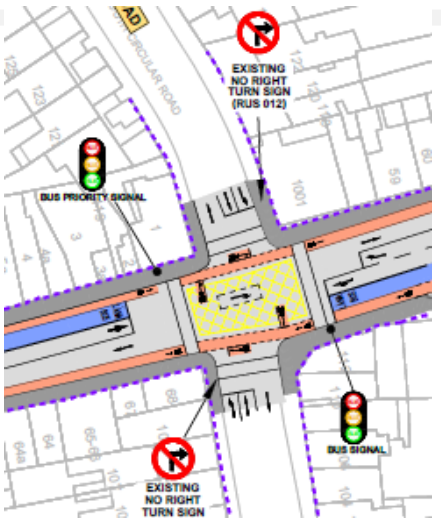


Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Leonard's Corner (South Circular Road / Clanbrassil Street)

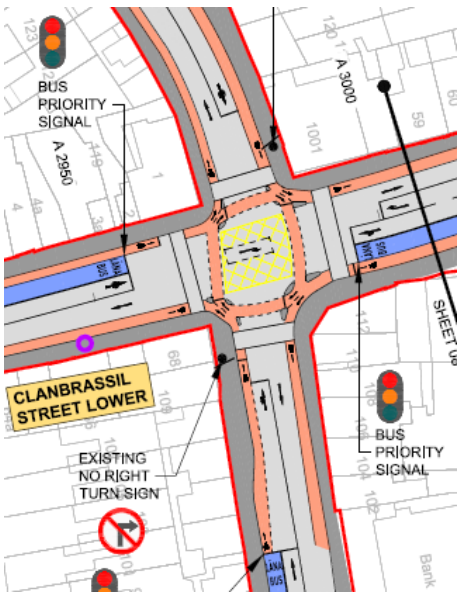
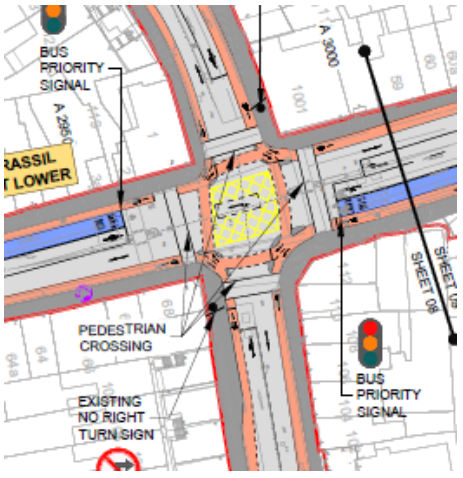
Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
The design rationale 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.
Signal controlled priority for buses.
Pedestrian crossings operate in their own stage.

		Change Made	**Reason for Change**	**Impact of Change**
EXISTING		1. Inbound and outbound bus lanes provided along the main corridor 2. Cycle lanes removed along the main corridor	1. To improve bus priority provision along the main corridor 2. Cyclists assumed to share with buses or to use the alternative route provided	1. Improved bus priority provision along the main corridor 2. Reduced level of service and safety for cyclists along the main corridor
DRAFT PRO (PC2)		1. Inbound and outbound cycle lane provided 2. Right turn lane stop line set back	1. To improve the cycling provision along the main corridor 2. To accommodate the overswing by vehicles from South Circular Road	1. Downstream bus lanes developed further down the corridor 2. Increased intergreen times
DRAFT PRO (PC3)		1. Go left to turn right cycle pockets provided within the junction 2. Right turn box provided for eastbound traffic	1. To make safe provision for right turning cyclists 2. To ensure strategic stacking and allow ahead vehicles to circulate around these stacked right turners	1. None 2. Ensures a continuous flow of traffic through the junction

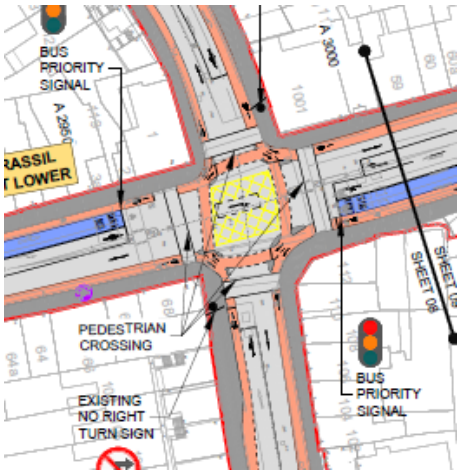
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Leonard's Corner (South Circular Road / Clanbrassil Street)

	Change Made	Reason for Change	Impact of Change
EXISTING			
STAGE B REVIEW	1. Segregated inbound and outbound cycle lanes provided on all arms with right turn pocket for cyclists 2. Bus gates introduced on South Circular Road	1. To improve cycle infrastructure along the main corridor and ensure unimpeded movements by straight ahead cyclists 2. To provide bus priority for the future orbital routes	1. Improved cyclist protection and safety through the junction 2. Reduced lane provision on approach to the junction
			
FINAL DRAFT (WIP)	1. None	1. None	1. None
			

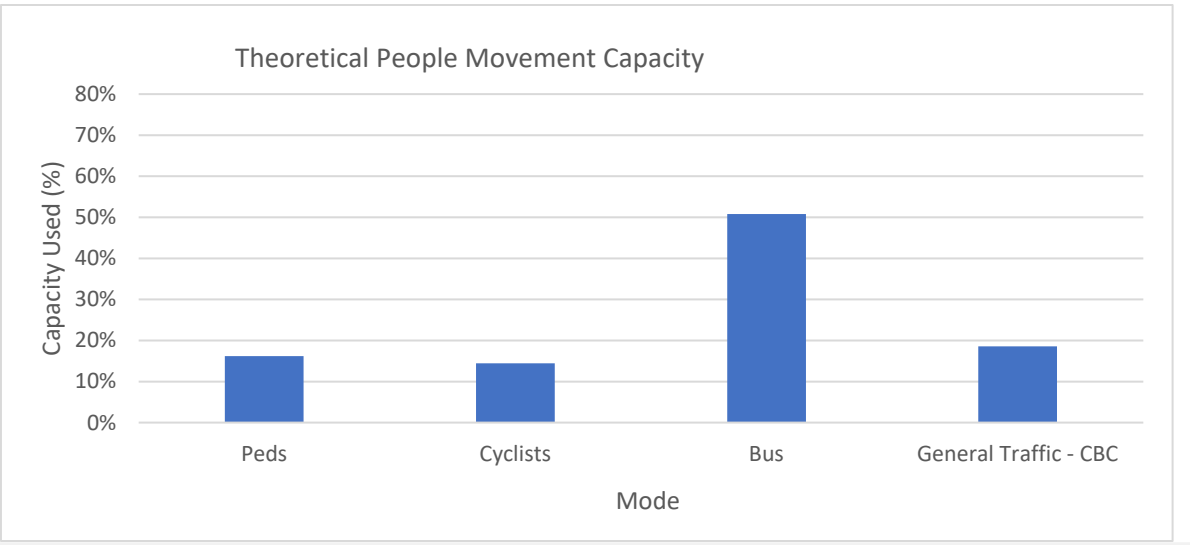
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Leonard's Corner (South Circular Road / Clanbrassil Street)



Capacity / Delay

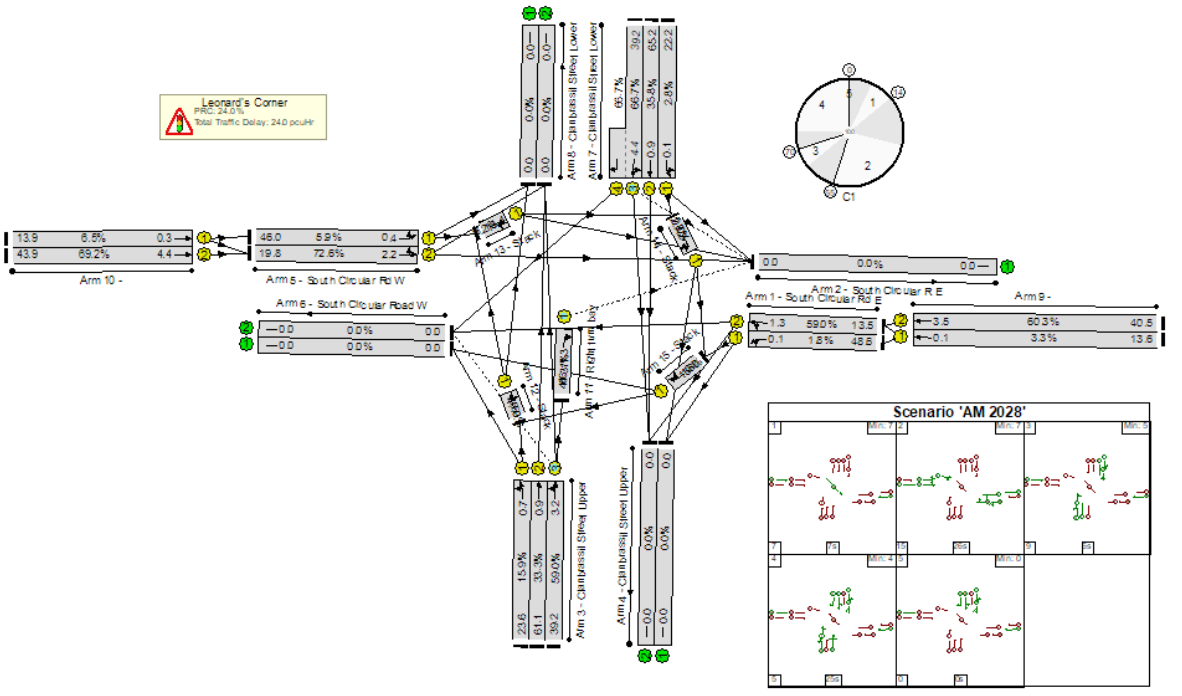
People Movement Calculator – Capacity



Do Something : 2028 : AM

Cycle = 100 secs
PRC = 24%
Delay = 24pcuHr

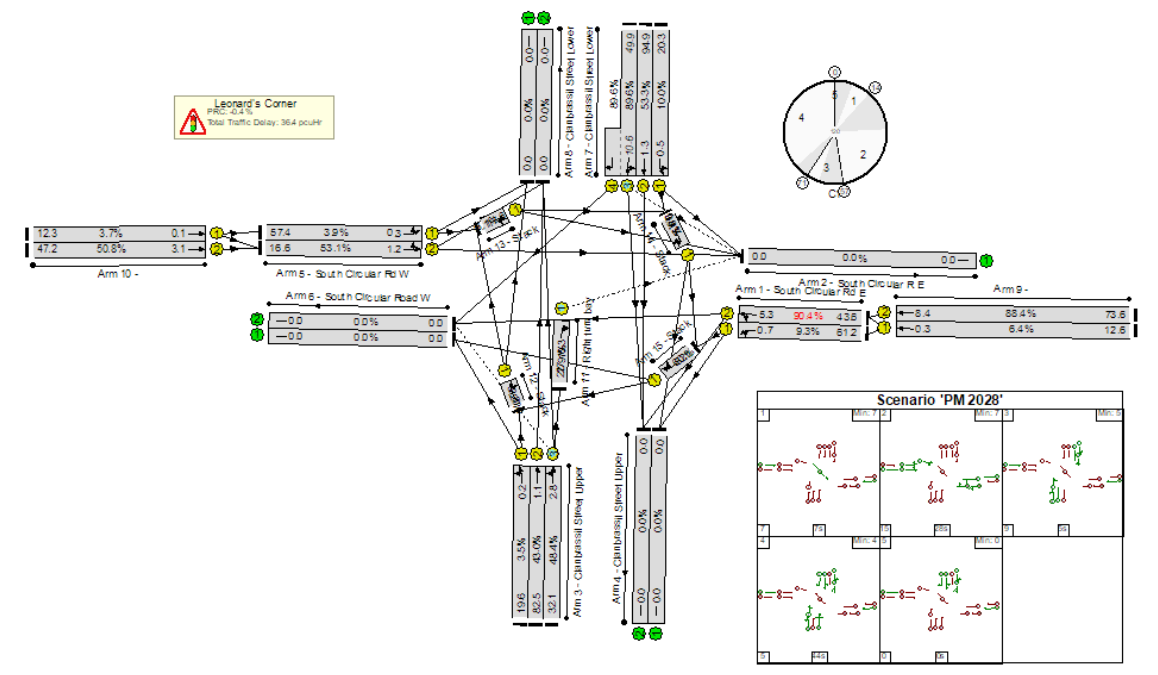
Bus Delay
Inbound = 0.9s
Outbound = 0.9s



Do Something : 2028 : PM

Cycle = 120 secs
PRC = -0.4%
Delay = 36.4pcuHr

Bus Delay
Inbound = 1.1s
Outbound = 1.3s

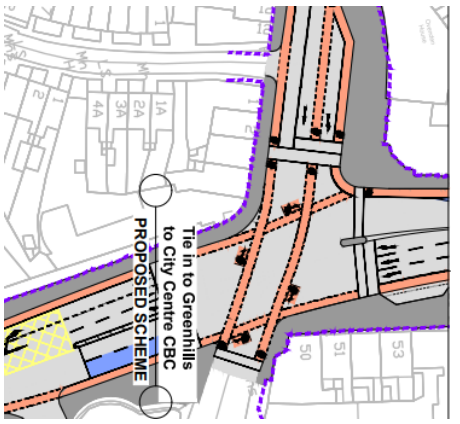
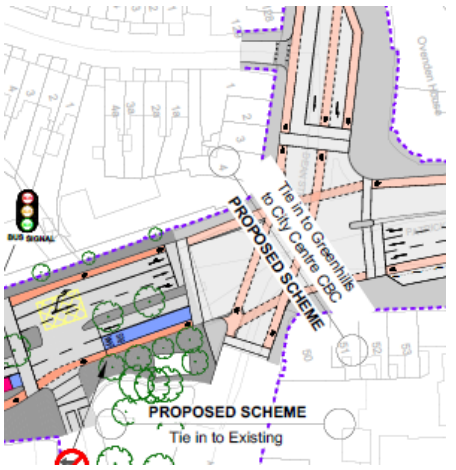
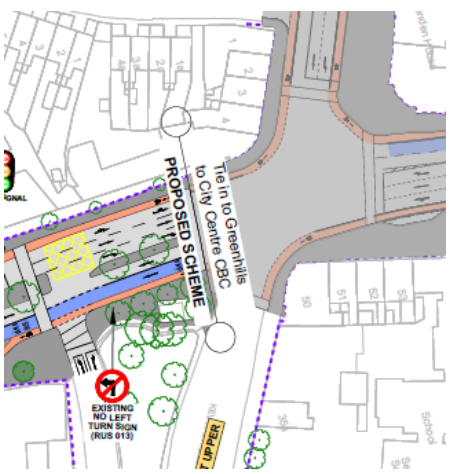


Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

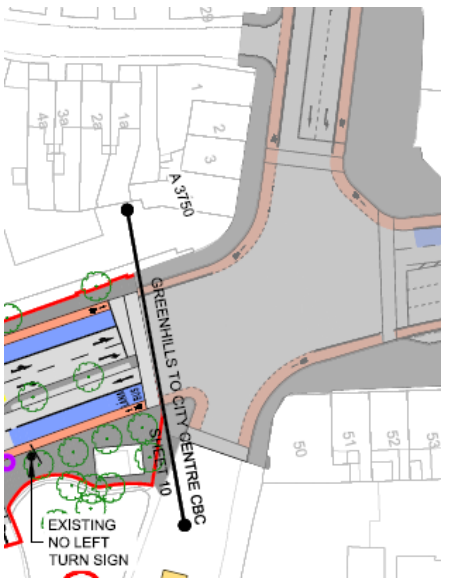
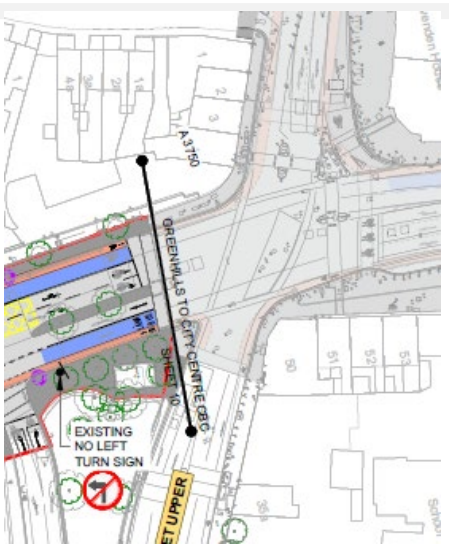
Patrick Street/New Street South

Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
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.
Signal controlled priority for buses.
Pedestrian crossings operate in their own stage.

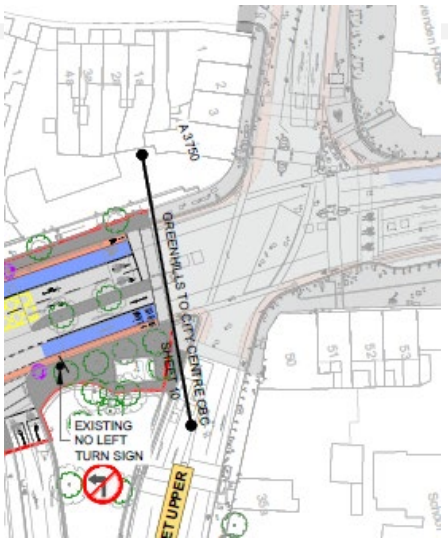
	Change Made	Reason for Change	Impact of Change
EXISTING			
EPR		1. Inbound and outbound cycle lanes provided on the main corridor 2. Cycle ASL provision removed 3. Outbound bus lane provided	1. To improve cycle infrastructure provision along the main corridor 2. In anticipation of Go left to turn right provision within the junction 3. To improve bus priority provision along the corridor	1. Improved cycle infrastructure along the main corridor 2. Reduced stacking space for cyclists when the lights are red 3. Improved bus priority provision along the corridor
DRAFT PRO (PC2)		1. None	1. None	1. None
DRAFT PRO (PC3)		1. None	1. None	1. None

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

	Patrick Street/New Street South			
EXISTING				
STAGE B REVIEW		**Change Made** 1. Inbound bus date extended to the stop line	**Reason for Change** 1. To improve inbound bus priority through the junction	**Impact of Change** 1. Improved bus priority through the junction
FINAL DRAFT (WIP)		1. None	1. None	1. None

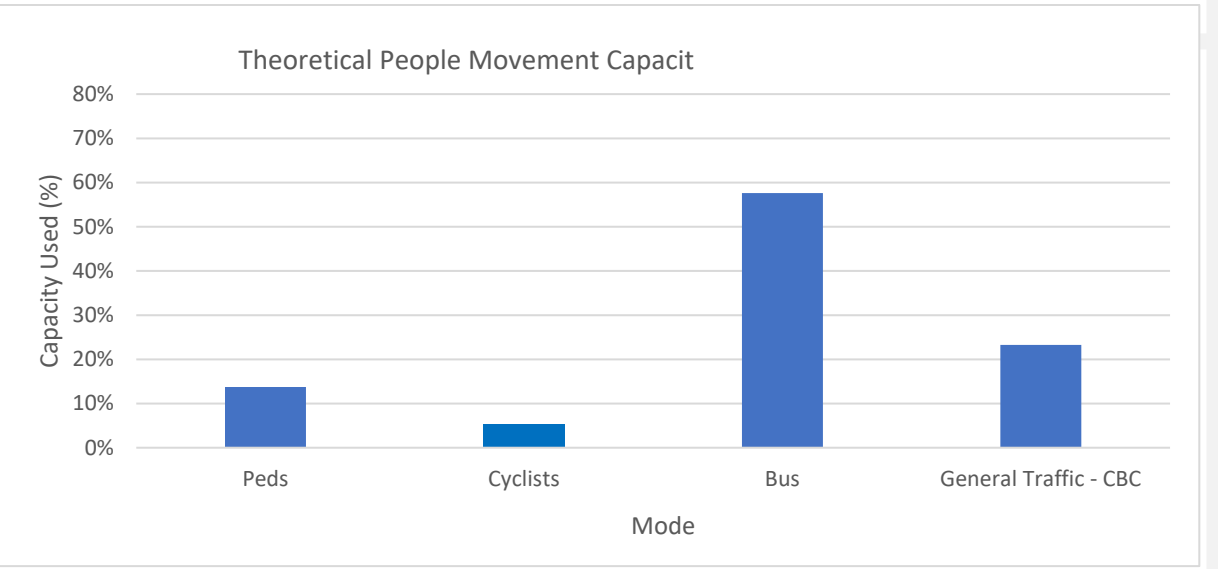
Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Patrick Street/New Street South



Capacity / Delay

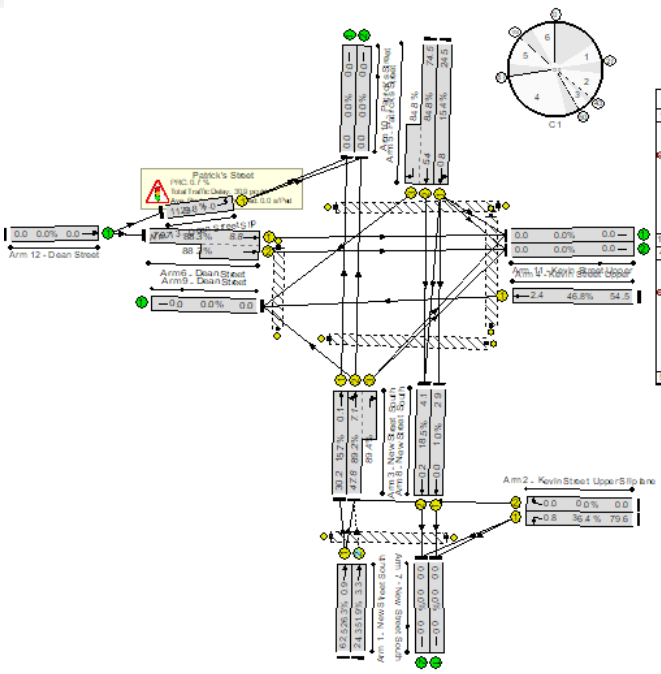
People Movement Calculator – Capacity

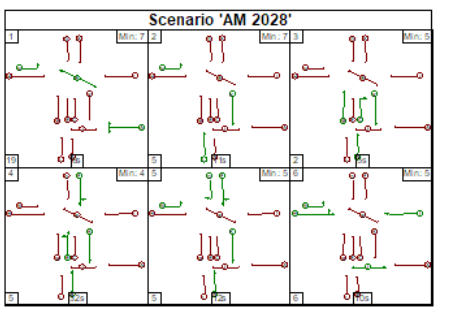


Do Something : 2028 : AM

Cycle = 120 secs
PRC = 0.7%
Delay = 30.9pcuHr

Bus Delay
Inbound = 30s
Outbound = 25s

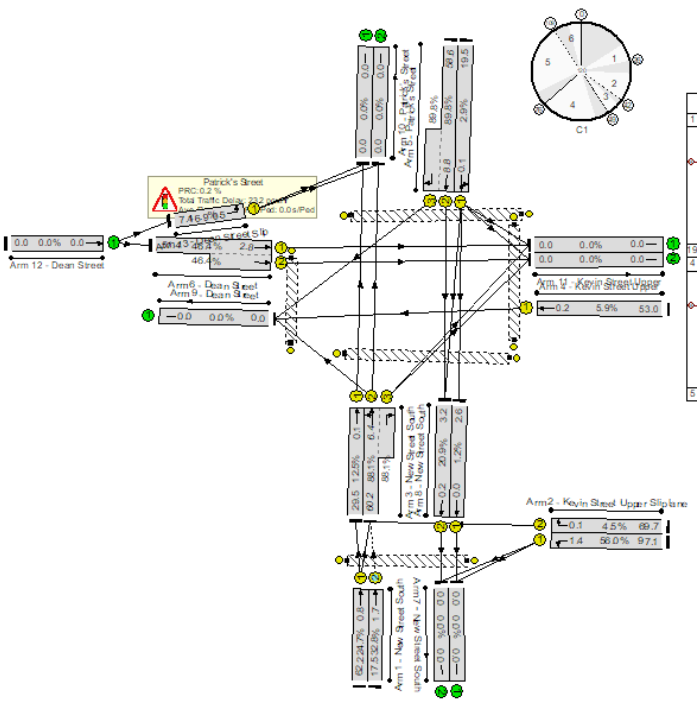


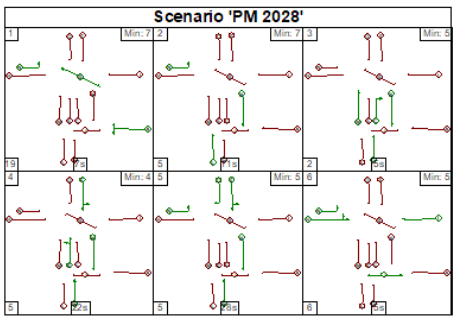


Do Something : 2028 : PM

Cycle = 120 secs
PRC = 0.2%
Delay = 23.2pcuHr

Bus Delay
Inbound = 30s
Outbound = 20s



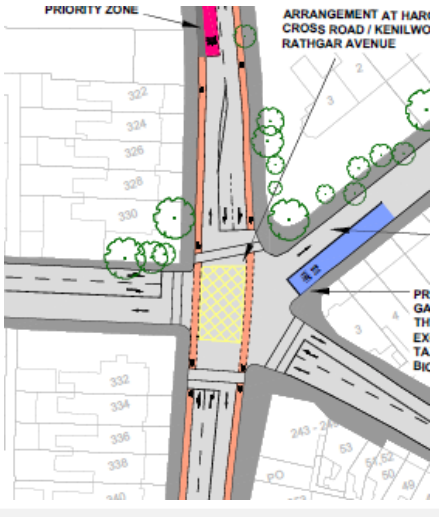
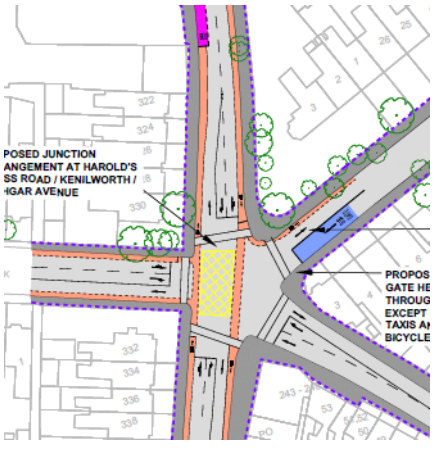


Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Kenilworth Square / Harold's Cross Road

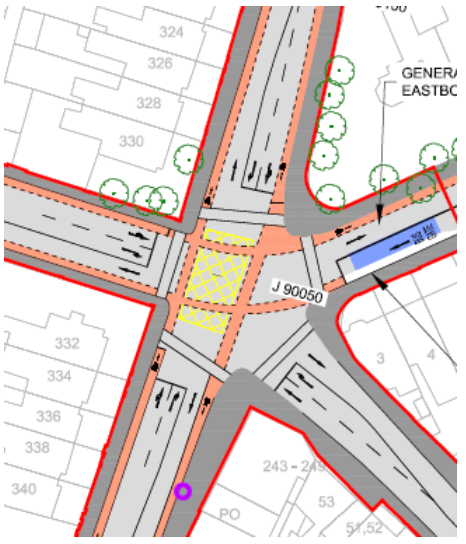
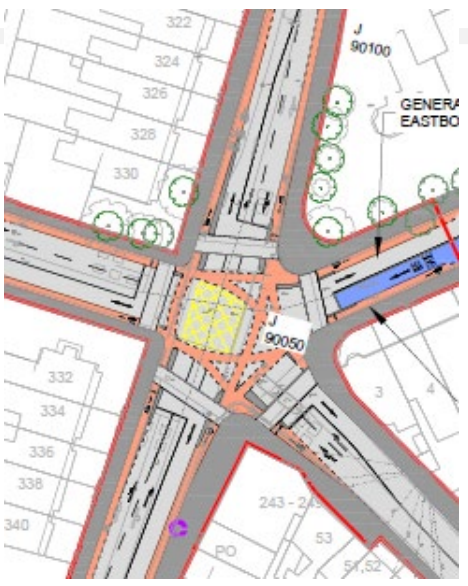
Summary
Junction is in compliance with the BusConnects Preliminary Design Guidance Booklet with respect to pedestrians, cyclists and buses.
Layout of junction updated introducing protected cycle infrastructure and new Bus lane infrastructure in the northbound and southbound direction.
The design rationale is to provide more priority to buses, enable bus priority signalling, and to improve pedestrian and cyclist safety.

Signal Operation
A seven stage signal operation is proposed.
Signal controlled priority for buses.
Pedestrian crossings operate in their own stage.

	Change Made	Reason for Change	Impact of Change
EXISTING	N/A	1. N/A	1. N/A	
DRAFT PRO (PC2)		1. Bus gate added on Kenilworth Square North 2. Right turn provision provided on Rathgar Road and Harold's Cross Road	1. ? 2. To accommodate restrictions imposed by Bus gates at Harold's Cross and on Kenilworth Square North	1. Improved bus priority provision 2. Additional signal phases required
DRAFT PRO (PC3)		1. Additional cycle lanes added on other arms of the junction	1. To improve accessibility and safety for cyclists to and from the other arms	1. Improved cycle infrastructure provision

Subject	BusConnects Core Bus Corridors Junction Design Rationale		
Date	December 2022		
Route	Kimmage to City Centre Scheme	Job No/Ref	19.117

Kenilworth Square / Harold's Cross Road

	Change Made	Reason for Change	Impact of Change
EXISTING			
STAGE B REVIEW 	1. None	1. None	1. None
FINAL DRAFT (WIP) 	1. Segregated inbound and outbound cycle lanes provided on all arms with right turn pocket for cyclists	1. To improve cycle infrastructure through the junction and ensure unimpeded movements by straight ahead cyclists	1. Improved cyclist protection and safety through the junction

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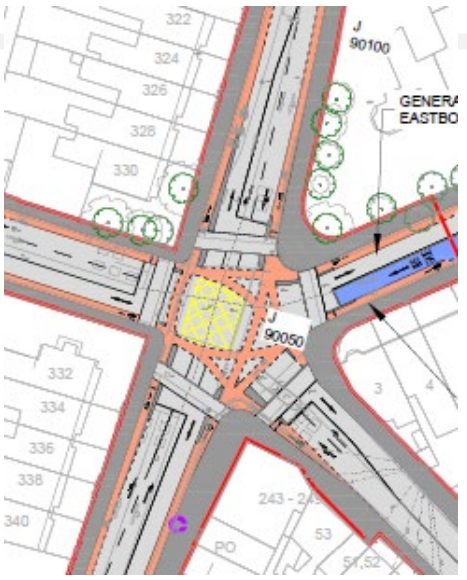
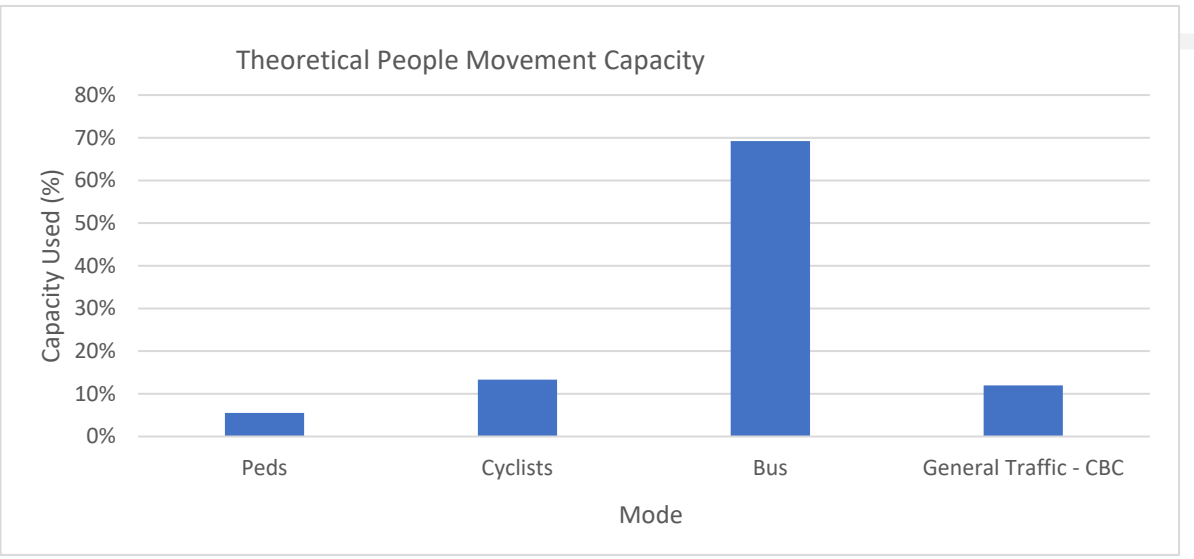


Capacity / Delay

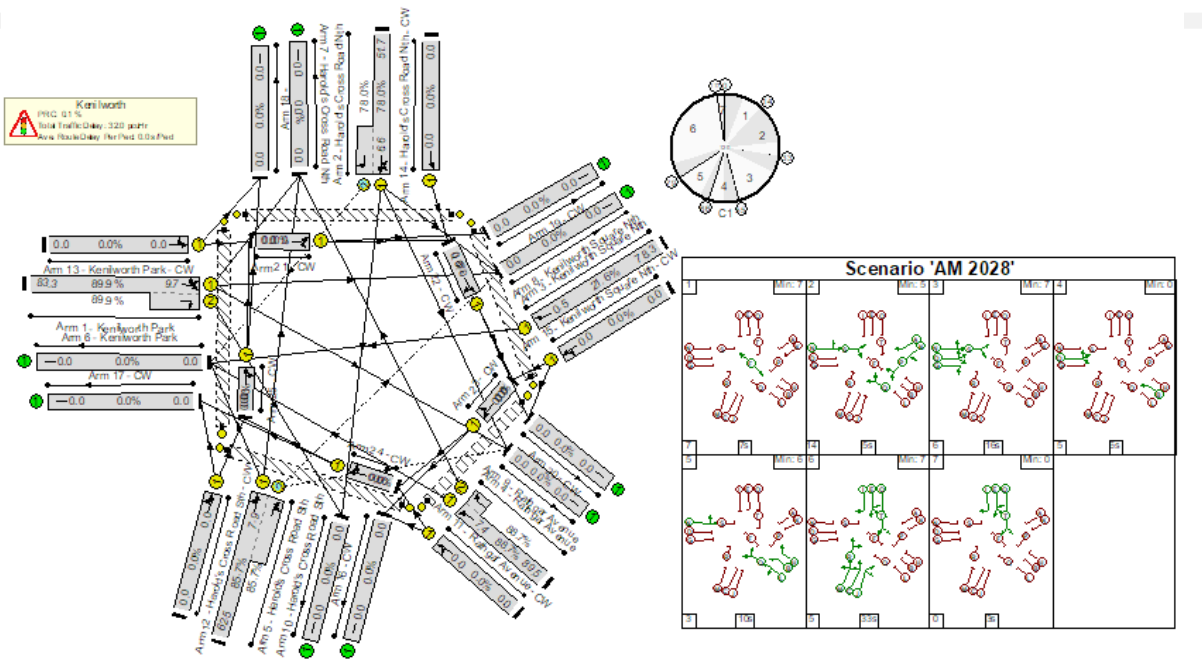
People Movement Calculator – Capacity



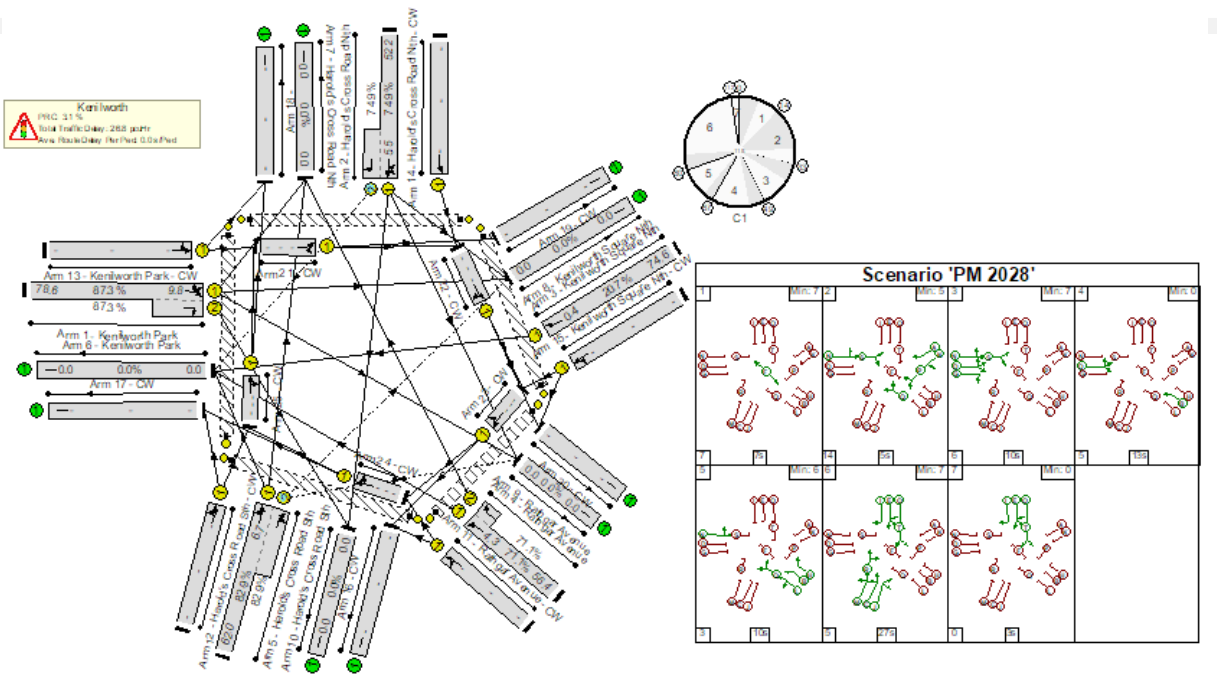
Do Something : 2028 : AM

Cycle = 120 secs
PRC = 0.1%
Delay = 32pcuHr

Bus Delay
Inbound = 78s
Outbound = N/A



Do Something : 2028 : PM

Cycle = 115 secs
PRC = 3.1%
Delay = 26.8pcuHr

Bus Delay
Inbound = 75s
Outbound = N/A