Clifton Scannell Emerson & Associates

Liffey Valley to City Centre Core Bus Corridor

Desktop Safety Review

P·M·C·E

November 2018

Clifton Scannell Emerson & Associates

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Desktop Safety Review

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1.0	PJM	NB	PJM	2nd Nov. 2018	Draft Report

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1 Introduction

1.1 General

This report results from a Desktop Safety Review of the proposed Liffey Valley to City Centre Core Bus Corridor carried out at the request of Mr Geoff Emerson of Clifton Scannell Emerson & Associates.

The members of the Safety Review Team are independent of the design team, and include: -

Mr. Peter Monahan
(BE MSc CEng FIEI RSACert)
Safety Review Team Leader

Mr. Norman Bruton
(BE RSACert CEng FIEI MSoRSA)
Safety Review Team Member

The Desktop Safety Review took place during November 2018 and comprised an examination of the documents provided by the designers (see Appendix B).

Where problems are relevant to specific locations these are shown on drawing extracts within the main body of the report. Where problems are general to the proposals sample drawing extracts are included within the main body of the report where considered necessary.

This review has been carried out broadly following the requirements for a Stage F (Part 2) Road Safety Audit as set out in the document “Road Safety Audit” (Ref: GE-STY-01024), contained on the Transport Infrastructure Ireland (TII) Publications website. However, no site visit was undertaken as part of this safety review.

The scheme has been examined and this report compiled in respect of the consideration of those matters that have an adverse effect on road safety and considers the perspective of all road users. It has not been examined or verified for compliance with any other standards or criteria. The problems identified in this report are considered to require action in order to improve the safety of the scheme and minimise collision occurrence.

2 Project Description

The proposed Core Bus Corridor (CBC) commences on Ballyowen Road at its junction with Willsbrook Road, and extends eastwards to the junction of High Street & Nicholas Street at Christchurch Cathedral, and extends along the: -

- Ballyowen Road;
- St Lomans Road;
- Liffey Valley distributor roads;
- Coldcut Road;
- Ballyfermot Road;
- Sarsfield Road;
- Emmet Road;
- Old Kilmainham Road;
- Thomas Street; and
- High Street.

The proposed improvements generally consist of the provision of bus lanes and cycle facilities in both directions over the route length.

3 Main Report

3.1 General

3.1.1 Problem

Location: *Throughout the Project*

Summary: *Impact of change in traffic flows and removal of currently permitted manoeuvres along route and on adjacent road network could give rise to safety issues*

The proposals, including the removal of currently permitted turning manoeuvres (e.g. from Davitt Road to Grattan Crescent), the introduction of proposed bus gates (e.g. on Coldcut Road and old Kilmainham Road) and the removal of roadside parking (e.g. along Ballyfermot Road), will result in significant changes to traffic capacity, traffic flows & patterns along the proposed route extending for some distance into the surrounding area. In addition, the provision of a high-quality public transport corridor may attract additional parking to the adjacent road network.

No details have been provided to the Review Team of an assessment of the likely effects on traffic along the route and on the surrounding road network. Some of these effects could have safety implications (e.g. where unsafe parking takes place, or where capacity issues arise leading to driver frustration, unsafe manoeuvres and/or rat-running within residential areas where there are high volumes of vulnerable road users).

There is a particular concern about the likely increase in traffic along Kilmainham Lane & Bow Lane, where no improvements are proposed and where significant additional traffic volumes are likely to arise as a result of the proposals giving rise to significant safety risks due to the poor horizontal & vertical alignment of the existing roads coupled with a narrow cross section & significant on-street parking.

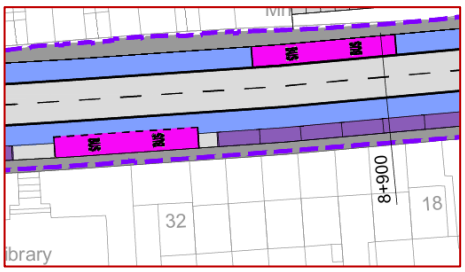
Recommendation

Undertake an assessment of the effects of the proposals on traffic and parking along the route and on the adjacent road network. Where necessary incorporate measures to address any issues which may arise as a result of the proposals, including any safety measures which may be necessary.

3.1.2 Problem

Location: *Throughout the Project*

Summary: *Unclear if adequate footpath width is proposed at all locations along the route, and in particular at proposed bus stop locations.*



It is unclear from the information provided whether adequate footpath width is proposed at all locations along the route. In particular at proposed bus stop locations where waiting bus passengers, bus shelters and signage (e.g. RTPI signs) may reduce the effective footpath width.

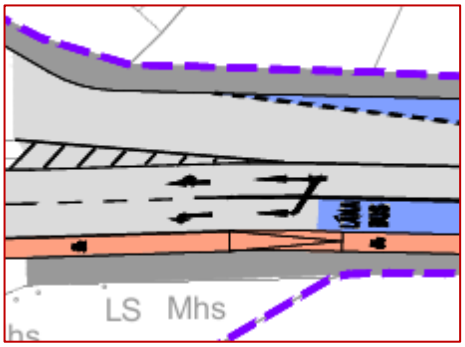
Recommendation

Ensure that adequate footpath with has been provided at all locations along the route to cater for the expected volumes of pedestrians and taking account of the likely items of roadside furniture to be provided (e.g. bus shelters, signage, etc.).

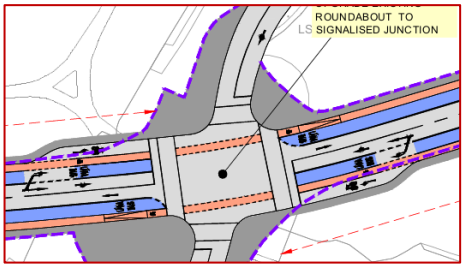
3.1.3 Problem

Location: *Throughout the Project*

Summary: *Inconsistent junction treatment for left-turning manoeuvres could result in inappropriate, or unsafe, manoeuvres resulting in collisions between vehicles and cyclists.*



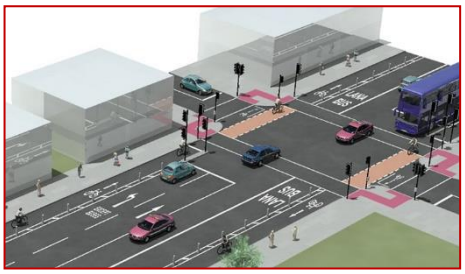
Two different junction treatments are proposed throughout the project to cater for left-turning vehicles. One of the proposed arrangements consists of developing a dedicated left-turn lane on the nearside of the straight-ahead cycle lane, with left-turning cyclists and vehicles sharing this lane.



The alternative arrangement consists of left-turning drivers turning across the cycle lane from the bus lane. This proposed layout presents a particular risk to cyclists wishing to proceed straight-ahead or turn right at the junction.

The lack of consistency in the junction layouts along the bus corridor route could lead to inappropriate, or unsafe, manoeuvres by left-turning drivers, in particular those unfamiliar with the route.

Recommendation



Adopt and implement a consistent layout at the junctions along the route. Should the chosen layout consist of left-turning vehicles crossing the straight-ahead cycle lane then measures will be required to ensure that cyclists are not put at risk of being struck by turning vehicles. Some guidance is available in Section 4.5 of the National Cycle Manual.

3.1.4 Problem

Location: *Throughout the Project*

Summary: *Absence of provision for right-turning cyclists at junctions.*

No measures have been indicated to cater for cyclists wishing to turn right at the many of the junctions along the route. A failure to cater for right-turns by cyclists will lead to cyclists undertaking precarious manoeuvres as they leave/join the route and a consequent increased risk of these vulnerable road users being struck by a vehicle.

Recommendation

Amend the proposals to include measures to cater for right-turning cyclists at the junctions along the route. Some guidance is available in Section 4.6 of the National Cycle Manual.

3.2 Problems at Specific Locations

3.2.1 Problem

Location: *Drawing Sheet 1 - Ballyowen Road*

Summary: *Proposed location of bus stop may impede visibility for drivers exiting from nearby side road and/or impede visibility for drivers approaching the signalised pedestrian crossing immediately downstream.*

A bus stop is proposed on the northern side of the Ballyowen Road, east of Ballyowen Drive. There is a risk that stationary buses at this bus stop could impede visibility to the left for drivers exiting from Ballyowen Drive, resulting in unsafe exiting manoeuvres and side-on collisions.

In addition, stationary buses at this bus stop may impede visibility of eastbound drivers in the adjacent traffic lane towards the signals at the pedestrian crossing immediately downstream, resulting in approaching drivers being unaware of the need to stop, leading to a failure to stop and overshoot into the crossing resulting in possible vehicular/pedestrian collisions.

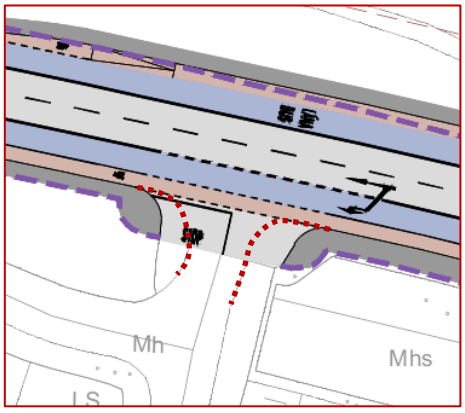
Recommendation

Relocate the proposed bus stop.

3.2.2 Problem

Location: *Drawing Sheet 1 - Ballyowen Road & Larkfield Avenue Junction*

Summary: *Wide junction mouth results in lengthy crossing for pedestrians without pedestrian refuge, and lack of continuity of footpath at junction.*



The proposed layout of the junction of Larkfield Avenue with the Ballyowen Road will result in pedestrians travelling east/west along the Ballyowen Road undertaking a lengthy carriageway crossing at the junction mouth increasing their exposure to vehicles, and consequently increase the risk of vehicular/pedestrian collisions.

In addition, the proposed layout does not tie in with the existing footpaths on Larkfield Avenue, which will require pedestrians to enter the carriageway as they travel to/from Larkfield Avenue and the Ballyowen Road.

Recommendation

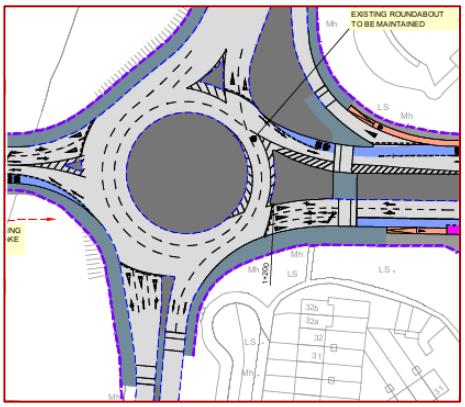
Amend the proposed road layout to reduce the width of the junction mouth and to provide connectivity between the footpath on Larkfield Avenue and the proposed footpath on the Ballyowen Road.

3.2.3 Problem

Location: *Drawing Sheets 4, 5, 6 & 7 – Roundabout Junctions*

Summary: *Proposed retention & modification of existing roundabout junctions will increase junction complexity for all road users leading to an increased likelihood of collisions, in particular between vehicles and vulnerable road users.*

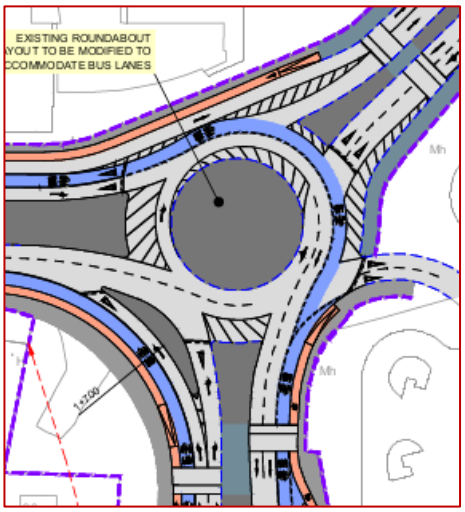
The proposed layouts of the series of roundabout junctions along the route between the Fonthill Road and the Coldcut Road will be difficult to navigate for vulnerable road users, in particular cyclists.



In order to progress along the route cyclists will have to undertake lengthy detours in order to access the proposed signalised crossings on the roundabout arms, where these are provided.

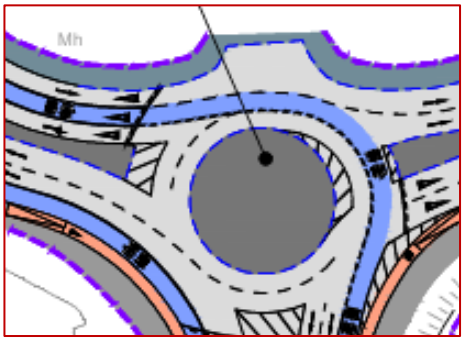
Many cyclists may choose to try to navigate the multi-lane roundabout circulating carriageways rather than undertake these lengthy detours placing them at significant risk of being struck by a vehicle.

Where signalised crossings are not proposed on the arms of these roundabouts cyclists will have to enter the circulating carriageway and attempt navigate the roundabout alongside vehicles, and pedestrians must undertake uncontrolled crossings.



The introduction of a third lane, e.g. bus lane, on existing two-lane roundabouts also increases the complexity for drivers with a resulting increased likelihood of inappropriate or unsafe lane-change manoeuvres on the entry or exit of these roundabouts leading to side-swipe collisions with vehicles in the adjacent lane.

Where the addition of the bus lane consists of a right-turn through the junction the resulting complex road layout may not be readily understood by many, indeed most, drivers resulting in driver hesitation and shunt collisions or driver confusion and inappropriate or late manoeuvres leading to side-swipe collisions.



The proposed location of pedestrian or toucan signalised crossings immediately downstream from the roundabout exits could result in drivers, particularly those on dedicated left-turn lanes at the roundabouts, being insufficiently aware of the upcoming crossing as their attention would have been focused on other traffic as they exit the roundabout, leading to a failure to stop, overshoot incidents and possible collisions with crossing pedestrians.

In addition, the retention of these roundabout junctions is inconsistent with the proposed treatment elsewhere along the route, both to the west and east, where existing roundabouts are proposed to be replaced by signalised junctions.

Recommendation

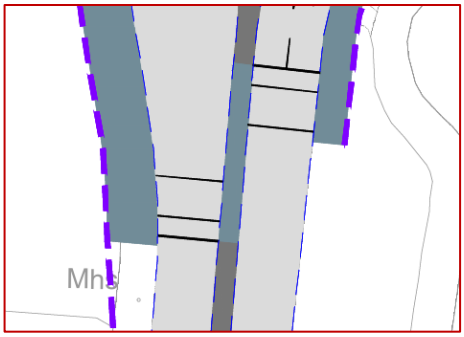
Provide signalised junctions at these locations.

3.2.4 Problem

Location: *Drawing Sheet 4 - Fonthill Road*

Summary: *Unclear if refuge island within the signalised crossing is of adequate width to cater for the likely volumes of pedestrians/cyclists at this location.*

A signalised crossing, presumably a toucan crossing, has been indicated on the Fonthill Road south of its junction with the Ballyowen Road.



It is unclear if the refuge island within this crossing is of adequate width to cater for the likely volumes of pedestrians and to/or cyclists likely to use this crossing, in particular when items of roadside furniture had been placed within the island.

Insufficient width of refuge can increase the likelihood of pedestrians or cyclists within the refuge being struck by part of a passing vehicle.

Recommendation

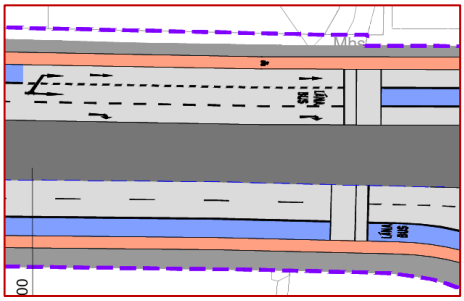
Ensure that adequate width is provided within refuges proposed as part of the project.

3.2.5 Problem

Location: *Drawing Sheet 5*

Summary: *Continuous cycle track indicated at signalised pedestrian crossing.*

The cycletracks on the road to the west of the roundabout are indicated as being continuous through the signalised pedestrian crossing, which could result in collisions between cyclists and pedestrians waiting to cross at this location.



Recommendation

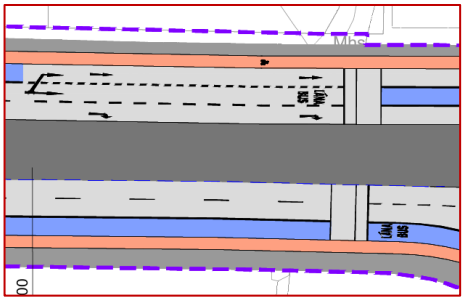
Either provide a discontinuity in the cycletrack at this location, with cyclists required to stop on a red signal, or create a shared surface to facilitate cyclists and pedestrians mixing along this section of road.

3.2.6 Problem

Location: *Drawing Sheet 5*

Summary: *Proposed weaving length on the immediate approach to signalised crossing could result in overshoot incidents and vehicular/pedestrian collisions.*

A weaving length has been indicated on the eastbound approach to the signalised pedestrian crossing, where buses must move right in order to turn right at the roundabout further downstream, and where traffic wishing to proceed straight-ahead at the roundabout must move left.



The length of this weaving section is relatively short, and it is located on the immediate approach to a pedestrian crossing.

Drivers undertaking weaving manoeuvres may be insufficiently aware of the status of the signals at the pedestrian crossing, resulting in a failure to stop leading to overshoot incidents and collisions with crossing pedestrians.

In addition, many drivers may not be aware of the need to move left in order to proceed straight-ahead at the upcoming roundabout junction, resulting in late lane-change manoeuvres on the immediate approach to the signalised pedestrian crossing and possible side-swipe collisions.

Recommendation

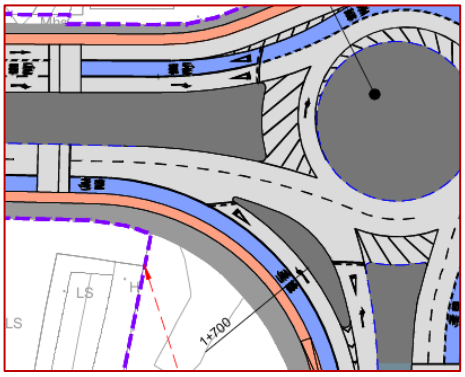
Relocate the weaving length to a point further upstream of the signalised crossing so that all lane change manoeuvres are completed well in advance of the crossing. During the design development ensure that adequate signage & roadmarkings are provided to clearly advise drivers of the lane to adopt in order to achieve their intended destination.

3.2.7 Problem

Location: *Drawing Sheet 5*

Summary: *Signalised pedestrian crossing indicated immediately downstream of dedicated left-turning lane resulting in possible overshoot by left-turning vehicles into the crossing.*

A signalised pedestrian crossing has been indicated immediately downstream of a dedicated left-turn lane at the roundabout.



Drivers exiting from the left-turning lane will have their focus primarily to the right, towards other vehicles exiting from the nearby roundabout, and may be insufficiently aware of the status of the signals at the pedestrian crossing resulting in a failure to stop and overshoot into the crossing, leading to vehicular/pedestrian collisions.

Recommendation

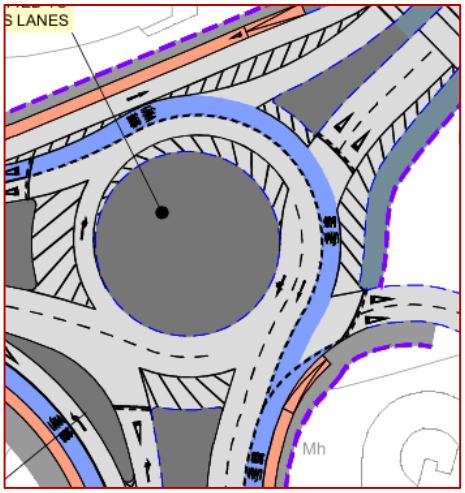
Either relocate the signalised pedestrian crossing so that there is a greater distance between the left-turning lane and the crossing to allow drivers sufficient distance/time to the sufficiently aware of the crossing, or replace the proposed roundabout junction with a signalised junction with the pedestrian crossings incorporated into it.

3.2.8 Problem

Location: *Drawing Sheet 5*

Summary: *Hatched roadmarkings at roundabout junction will fade over time rendering the layout indistinct leading to unsafe manoeuvres and collisions.*

A significant amount of hatched roadmarkings are proposed at the roundabout junction to guide drivers.



These hatched markings will fade/wear-off over time, and the layout may become indistinct and insufficiently clear, resulting in unsafe manoeuvres and side-swipe collisions.

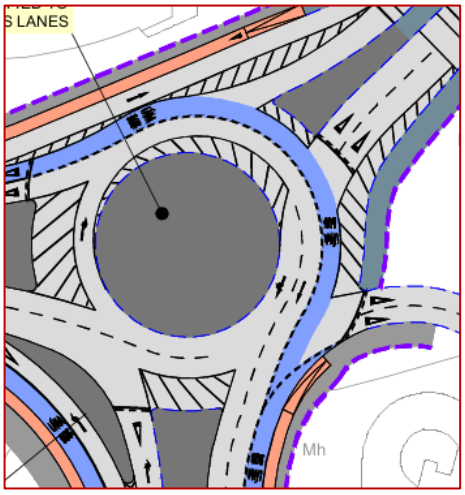
Recommendation

Amend the proposed junction layout to replace at roadmarkings with kerbed build-outs/islands.

3.2.9 Problem

Location: *Drawing Sheet 5*

Summary: *Complex roundabout junction layout may lead to delays resulting in rash/unsafe manoeuvres and collisions.*



The proposed roundabout layout is complex and some of the entry arms may encounter significant delays (e.g. exit from car park), leading to lengthy queues forming.

These queues may, in turn, lead to driver frustration and rash/unsafe manoeuvres resulting in collisions.

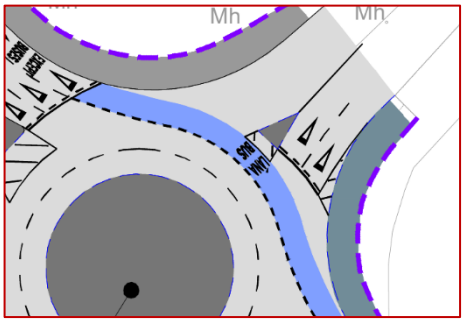
Recommendation

Signalise this junction.

3.2.10 Problem

Location: *Drawing Sheet*

Summary: *Resulting size of splitter island likely to be insufficient to act as a pedestrian refuge while accommodating the required signage.*



In order to include the proposed bus lane within the existing roundabout the splitter islands on the arms to the north-east and south-west have been curtailed.

The resulting size of these splitter islands are unlikely to be sufficient to act as a pedestrian refuge while accommodating necessary signage.

Insufficient size of refuge can increase the likelihood of pedestrians or cyclists within the refuge being struck by part of a passing vehicle.

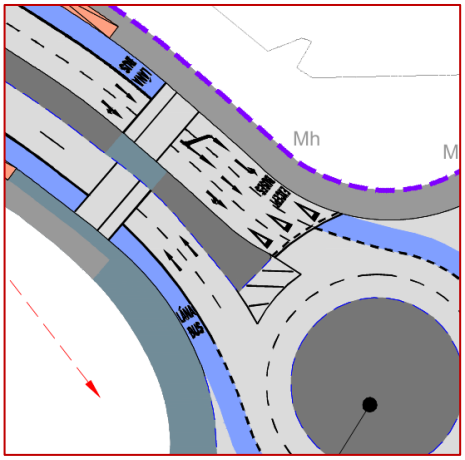
Recommendation

During the design development ensure that the splitter islands at all of the roundabout junctions are capable of functioning as a pedestrian refuge while accommodating all of the required signage.

3.2.11 Problem

Location: *Drawing Sheets 5 & 6*

Summary: *Queues forming at signalised crossings located immediately downstream of roundabout exits may extend upstream into the roundabout circulating carriageway creating congestion, leading to driver frustration and resulting in rash manoeuvres.*



Signalised pedestrian crossings have been indicated immediately downstream of a number of roundabouts within the Liffey Valley area.

The proximity of these signalised crossings to the roundabouts could result in queues at the signalised crossings extending back into the upstream circulating carriageway, leading to congestion and obstructions to drivers attempting to enter the roundabout from the other arms. This could lead to driver frustration and rash/unsafe manoeuvres.

Recommendation

If the signalised pedestrian crossings were located to points further downstream of the roundabout exits, this could address this issue, but the crossings may then no longer be on the likely pedestrian desire line resulting in unsafe pedestrian crossing.

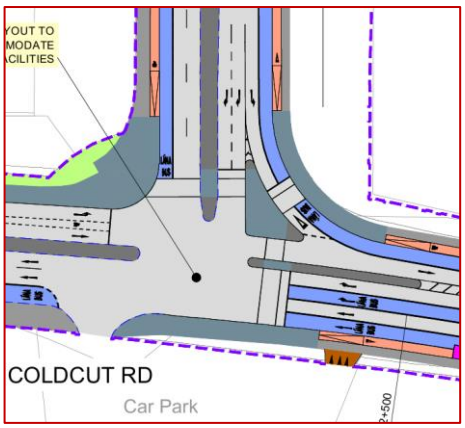
Therefore, it is recommended that the roundabouts be replaced by signalised junctions with pedestrian crossings incorporated within them.

3.2.12 Problem

Location: *Drawing Sheet 8*

Summary: *Absence of facilities to cater for right-turning cyclists at signalised junction increases the risk of vehicular/cyclist collisions.*

No measures are proposed to facilitate cyclists wishing to turn right at the Liffey Valley/Coldcut Road junction.



This will result in cyclists having to mingle with vehicular traffic, and in some cases weave across multiple traffic lanes, in order to turn right placing them at an increased risk of being struck by a vehicle.

Recommendation

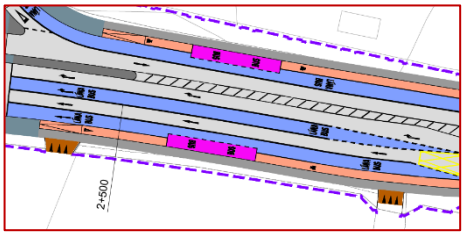
Amend the proposed junction layout to include measures to facilitate right-turning cyclists.

3.2.13 Problem

Location: *Drawing Sheet 8 – Coldcut Road*

Summary: *Development of numerous lanes over short distance may lead to late lane-change manoeuvres and side-swipe collisions.*

The proposed road layout on Coldcut Road is relatively complex, and includes the development of a number of lanes over short distance west of the M50 Overbridge on the approach to the signalised junction with Liffey Valley.



The number of different lanes developed over this short section is likely to lead to driver confusion and late lane-change manoeuvres resulting in possible side-swipe collisions.

Recommendation

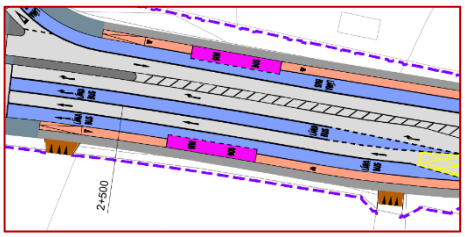
Rationalise the number of lanes being developed over this short section of road to minimise driver confusion and promote compliance with the road layout.

3.2.14 Problem

Location: *Drawing Sheet 8 – Coldcut Road*

Summary: *Unsafe manoeuvres arising from driver frustration showed queuing vehicles from signalised junction block straight-ahead traffic.*

The proposed road layout on Coldcut Road is relatively complex, and includes the development of a number of lanes over short distance west of the M50 Overbridge on the approach to the signalised junction with Liffey Valley.



Queuing vehicles at the signalised junction may extend back to the overbridge and block access to the straight-ahead lanes, which could give rise to straight-ahead drivers entering the adjacent cycle track or placing two wheels on the kerb in order to pass queuing vehicles in order to enter the straight-ahead lanes.

These manoeuvres could result in collisions with vulnerable road users on the adjacent footpath, shared-use path or cycle track.

Recommendation

During the design development ensure that the signal phasing does not result in lengthy queues forming.

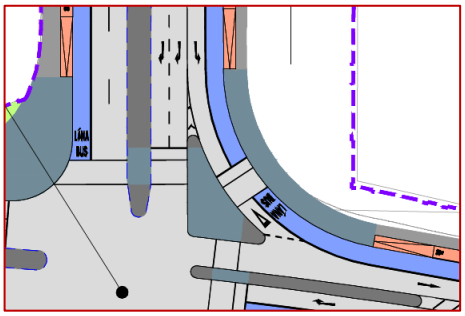
The provision of a queue-length detector loop may be required which would trigger a signal phase to dissipate excessive queues.

It may also be necessary to coordinate the signals at this junction with the bus-gate signals either side of the M50 Overbridge, and possibly with the signals at the Cloverhill Road junction to the east of the overbridge, to limit the number of vehicles permitted to travel west so that excessive queues are not formed at the Coldcut Road/Liffey Valley junction.

3.2.15 Problem

Location: *Drawing Sheet 8 – Coldcut Road/Liffey Valley Junction*

Summary: *Unclear if adequate lane width provided where two lanes turn left to accommodate the swept path of large vehicles.*



Two lanes are indicated turning left from Liffey Valley onto the Coldcut Road eastbound. It is unclear if any lane widening has been provided within these two left turning lanes.

Should no lane widening be provided there is a risk that the lanes will be insufficient to accommodate the swept path of large vehicles/buses, resulting in encroachment into the adjacent lane and possible side-swipe collisions with vehicles in the adjacent lane.

Recommendation

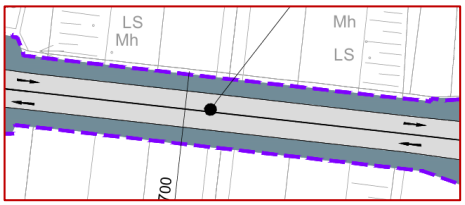
During the design development undertake a swept-path analysis of the turning movements at this junction and ensure that adequate lane widths are provided to accommodate the swept path of large vehicles/buses turning left.

3.2.16 Problem

Location: *Drawing Sheet 8 – Coldcut Road*

Summary: *Unclear if existing bridge parapets are adequate to restrain an errant bus or cyclist.*

It is unclear if the existing parapets on the Coldcut Road overbridge, which crosses over the M50, are adequate for the amended road layout/use, for example capable of restraining an errant bus or of a height to restrain an errant cyclist.



Recommendation

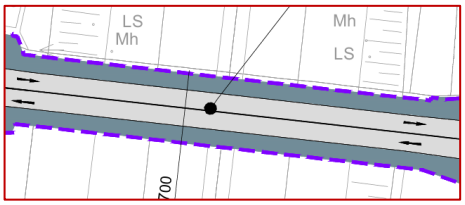
These should be reviewed during the design development and if necessary replaced with appropriate parapets.

3.2.17 Problem

Location: *Drawing Sheet 8 – Coldcut Road*

Summary: *Unclear if sufficient width is available on the existing Coldcut Road overbridge for the proposed shared-use paths.*

It is unclear if the existing Coldcut Road overbridge is of adequate width to accommodate the proposed road layout, in particular the shared-use paths on either side of the bridge, once the existing/future road side furniture (e.g. public lighting columns) is taken into account.



Insufficient width of this shared-use path could result in cyclists choosing to remain within the relatively narrow traffic lanes on the carriageway, with a resulting increased risk of being struck by a vehicle.

Recommendation

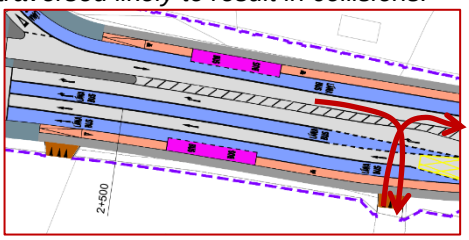
Ensure that adequate effective width of shared-use paths is provided.

3.2.18 Problem

Location: *Drawing Sheet 8 – Coldcut Road*

Summary: *Right-turning manoeuvres requiring multiple lanes to be traversed likely to result in collisions.*

Two private accesses have been indicated on the southern side of the Coldcut Road where a relatively complex road layout is proposed. Vehicles attempting to turn right into, or right out of, these accesses will have to cross a cycle lane, two bus lanes & two traffic lanes.



These manoeuvres would be difficult to complete due to the number of different traffic streams a right-turning driver would have to be aware of, and take account of, in order to complete this manoeuvre safely.

It is considered likely that right-turns into, or out of, these accesses would result in side-on collisions.

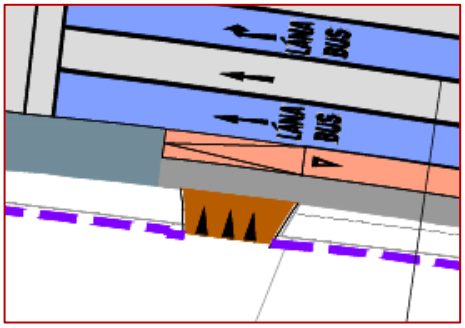
Recommendation

Replace the proposed hatching between opposing traffic directions on this section of Coldcut Road with a solid island, and limit access/egress to/from these private accesses to left-in or left-out only.

3.2.19 Problem

Location: *Drawing Sheet 8 – Coldcut Road*

Summary: *Private access indicated at same location as transition from on-road cycle lane to off-road shared-use path.*



A private access has been indicated at the same location where a proposed cycle facility transitions from an on-road cycle lane to an off-road shared-use facility, immediately east of the Liffey Valley/Coldcut Road junction. This will result in vehicles entering/exiting from this private access traversing a section of carriageway with varying height kerbs.

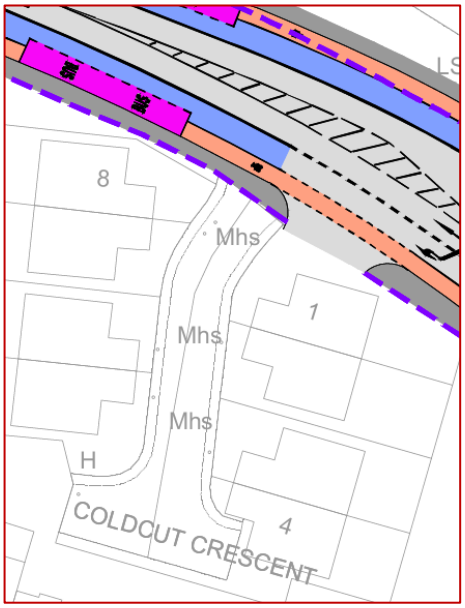
Recommendation

Either relocate the proposed access or relocate the cycle lane transition.

3.2.20 Problem

Location: *Drawing Sheet 9 - Coldcut Road/Coldcut Crescent Junction*

Summary: *Stationary buses at proposed bus-stop may block visibility for exiting side road drivers resulting in unsafe exiting manoeuvres and side-on collisions stop*



The access to Coldcut Crescent is shown incorrectly on the drawings provided. When this junction location is corrected, presumably during subsequent design development phases, the location of the proposed bus stop could result in stationary buses at the bus stop blocking visibility for drivers exiting from Coldcut Crescent and wishing to turn right onto Coldcut Road, leading to unsafe exit manoeuvres and possible side-on collisions.

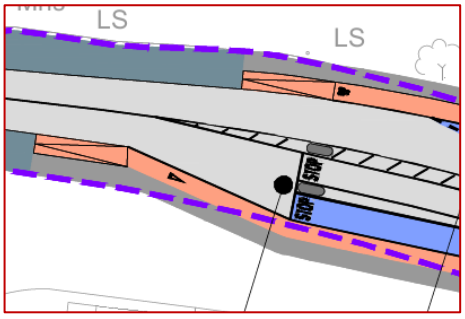
Recommendation

Ensure that adequate visibility is available for exiting side road drivers from Coldcut Crescent, and that it is not obstructed by stationary buses at the proposed bus-stop.

3.2.21 Problem

Location: *Drawing Sheet 9 - Coldcut Road*

Summary: *Buses encroaching into cycle lane will present hazards to cyclists.*



A transition from an on-road cycle lane to an off-road shared-use path is shown immediately downstream (west) of the bus gate on Coldcut Road.

There is a risk that buses proceeding west from the bus gate may cut across the corner at this transition, encroaching into the cycle facility and presenting a hazard to cyclists.

Recommendation

Amend the proposed road layout to bring cyclists off the carriageway upstream of the bus gate. Undertake a swept-path analysis to ensure that the proposed road layout can accommodate westbound buses at this location without encroachment into either the cycle facility or the opposing traffic lane.

3.2.22 Problem

Location: *Drawing Sheet 9 - Coldcut Road/Cloverhill Road Junction*

Summary: *Lengthy pedestrian crossing may result in pedestrians being stranded mid-crossing and having to complete the crossing manoeuvre outside of the dedicated pedestrian phase, with a resulting increased risk of being struck by a vehicle or cyclist.*

The pedestrian crossing on the eastern side of the Coldcut Road/Cloverhill Road junction is lengthy, and it appears that it is to be completed in a single crossing. The length of the crossing is such that pedestrians could become stranded mid-crossing.

The splitter island at this location would appear to be insufficient to act as a pedestrian refuge, with a resulting risk of pedestrians within the island at risk of being struck by passing vehicles.

Pedestrians could become stranded mid-crossing may attempt to complete the crossing outside of the dedicated pedestrian phase, with a resulting risk of being struck by a vehicle or cyclist.

Recommendation

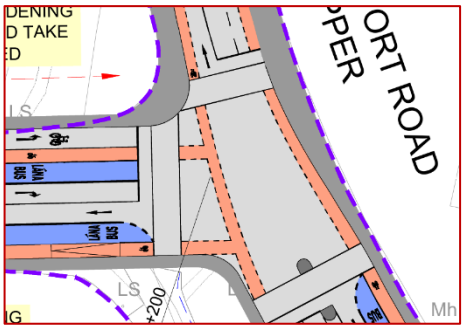
Provide a two-stage pedestrian crossing with a pedestrian refuge of adequate width/size and a push button located within the pedestrian refuge to enable pedestrians to call a subsequent crossing phase.

3.2.23 Problem

Location: *Drawing Sheet 10 - Kennelsfort Road Upper/Coldcut Road Junction*

Summary:

Two right-turning lanes are indicated from Coldcut Road onto Ballyfermot Road. It is unclear if the proposed junction layout can accommodate the swept-path of two turning traffic lanes at this location. If insufficient space exists within the junction layout to accommodate two traffic streams turning simultaneously this could lead to side swipe collisions.



An absence of guidance markings for these right-turning lanes could result in some drivers drifting into the adjacent lane leading to side hyphens five collisions.

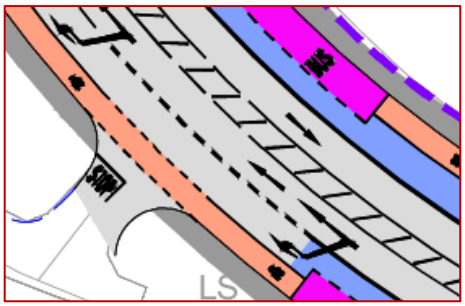
Recommendation

Undertake a swept-path analysis to ensure that adequate space is available to accommodate two-turning traffic streams at this location. Include guidance markings to assist right-turning drivers from Coldcut Road.

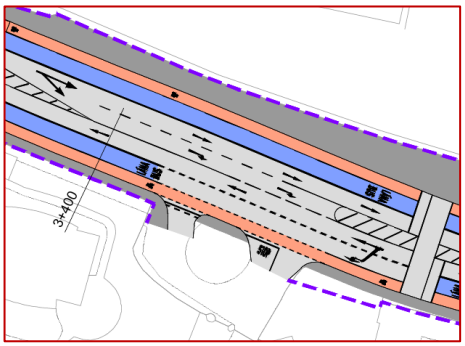
3.2.24 Problem

Location: *Drawing Sheet 10*

Summary: *Right-turning manoeuvres from priority junctions where drivers are required to cross multiple bus, traffic & cycle lanes could result in unsafe exiting manoeuvres and side-on collisions.*



It is proposed to retain existing uncontrolled (priority) junctions at two locations on Ballyfermot Road south-west of the junction with Coldcut Road (e.g. service road and hospital entrance).



Drivers exiting from these side roads wishing to turn right will have to cross multiple lanes, including cycle lanes. It will be difficult for right-turning drivers to identify safe gaps in the approaching traffic in order to complete a right-turning manoeuvre, possibly leading to unsafe manoeuvres and side-on collisions.

In addition, exiting drivers from the hospital entrance wish to turn right may be insufficiently aware of the status of the signals at the signalised pedestrian crossing immediately downstream of the entrance, resulting in overshoot into the crossing and possible collisions with pedestrians.

Recommendation

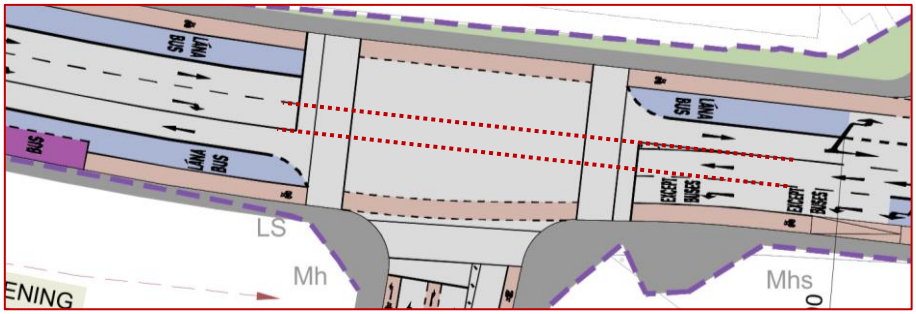
Amend the permitted manoeuvres at the service road junction to be left-in/left-out only.

Signalise the hospital entrance and incorporate the pedestrian crossing into the junction arrangement.

3.2.25 Problem

Location: *Drawing Sheet 11 -*

Summary:



The straight-ahead lane on Ballyfermot Road westbound at the junction with the entrance to Cherry Orchard Hospital is in line with the eastbound right-turning lane. This could result in westbound drivers inadvertently entering the opposing right-turn lane leading to late correction manoeuvres and side-swipe collisions, or to log-speed head-on collisions with oncoming vehicles.

Recommendation

Amend the junction layout to ensure that traffic lanes on the approach to, and at, the junction are not aligned with opposing traffic lanes.

3.2.26 Problem

Location: *Drawing Sheets 12 & 13*

Summary: *Removal of existing traffic calming measures may lead to increased speeds and increased likelihood of collisions or increased injury severity outcomes for collisions occur.*

It is proposed to remove the existing traffic calming measures along Ballyfermot Road. It is unclear if the removal of these measures will lead to increased speeds. Should vehicle speeds increase there is an increased likelihood of collisions, or an increased injury severity outcome when collisions occur.

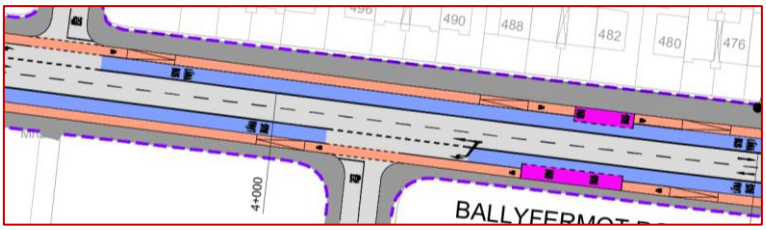
Recommendation

During the design development assess the likelihood of increased speeds following removal of existing traffic calming measures. Should increased speeds be considered likely then measures to ensure adherence to speed limits should be included in the proposals.

3.2.27 Problem

Location: *Drawing Sheet 12*

Summary: *Absence of controlled pedestrian crossing at location where likely pedestrian desire line across Ballyfermot Road will exist could lead to uncontrolled crossings and vehicular/pedestrian collisions.*



No pedestrian crossing has been indicated in the vicinity of the Ballyfermot Road/Blackditch Road junction. There is a likely pedestrian desire line to cross Ballyfermot Road at this location, given the proximity of the side roads to the north and south of Ballyfermot Road and the proposed bus stops nearby.

The absence of a signalised pedestrian crossing could result in uncontrolled pedestrian crossing manoeuvres, with pedestrian crossing two traffic lanes, two bus lanes and two cycle lanes, with a resulting increased risk of vehicular/pedestrian collisions.

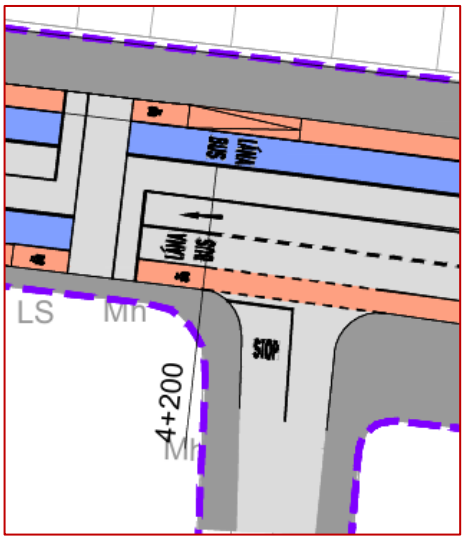
Recommendation

Provide signalised pedestrian crossing at this location. (The inclusion of an additional signalised crossing at this location may assist in moderating vehicle speeds)

3.2.28 Problem

Location: *Drawing Sheet 12 - Ballyfermot Road/Blackditch Drive Junction*

Summary: *Proximity of signalised pedestrian crossing to priority junction may result in left-turning side road drivers being insufficiently aware of the status of the signals resulting in overshoot into the crossing and vehicular/pedestrian collisions.*



The proximity of the signalised pedestrian crossing to the west of the priority junction between Blackditch Drive and Ballyfermot Road may result in left-turning drivers exiting Blackditch Drive being insufficiently aware of the status of the signals resulting in overshoot into the crossing and vehicular/pedestrian collisions.

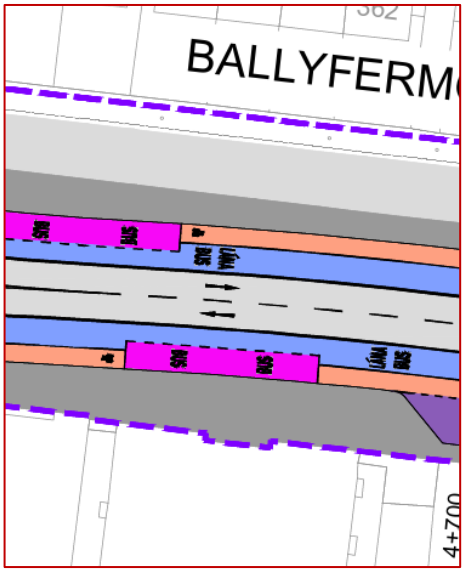
Recommendation

Relocate the signalised pedestrian crossing away from the priority junction, or signalise this junction and incorporate the pedestrian crossing into the junction layout.

3.2.29 Problem

Location: *Drawing Sheet 14*

Summary: *Absence of controlled pedestrian crossing at location where likely pedestrian desire line will exist across Ballyfermot Road could lead to uncontrolled crossings and vehicular/pedestrian collisions.*



No pedestrian crossing has been indicated in the vicinity of the proposed bus stops on Ballyfermot Road near the old Gala Cinema. There is an existing signalised pedestrian crossing at this location at present.

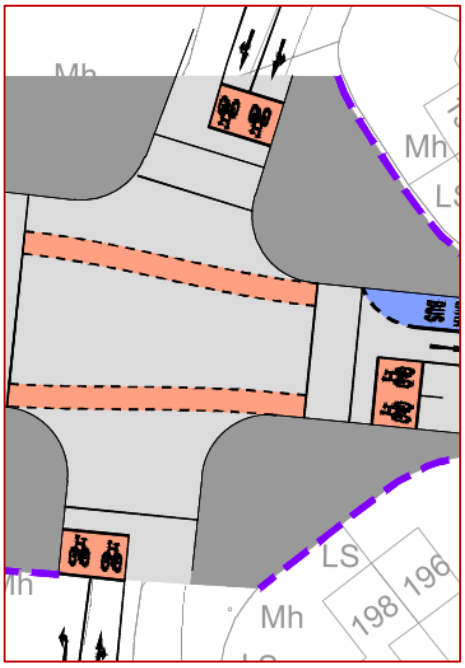
There is a likely pedestrian desire line across Ballyfermot Road at this location to/from the proposed bus stops on either side of Ballyfermot Road and to/from the retail/shopping on the southern side of the road and the residential areas on the northern side of the road.

The absence of a signalised pedestrian crossing could result in uncontrolled pedestrian crossing manoeuvres, with pedestrian crossing two traffic lanes, two bus lanes and two cycle lanes, with a resulting increased risk of vehicular/pedestrian collisions.

Recommendation

Provide signalised pedestrian crossing at this location.

3.2.30 Problem



Location: *Drawing Sheet 14 - Ballyfermot Road/Le Fanu Road Junction*

Summary: *Side-swipe collisions arising from two southbound straight-ahead lanes entering junction, but only a single traffic lane on the exit.*

Two straight-ahead lanes have been indicated on Le Fanu Road southbound approach to its junction with Ballyfermot Road, however only a single traffic lane is provided on the Le Fanu Road southbound exit from the junction.

This could result in side-swipe collisions as two traffic lanes attempting to merge into a single traffic lane on the exit from the junction.

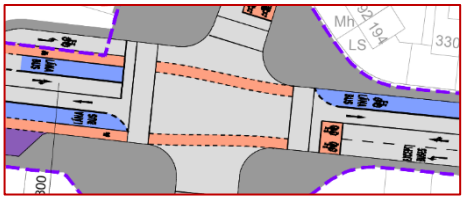
Recommendation

Amend the proposed road layout to provide a single southbound straight-ahead lane on Le Fanu Road entering its junction with Ballyfermot Road.

3.2.31 Problem

Location: *Drawing Sheet*

Summary:



Straight-ahead and right-turning manoeuvres are permitted from the same lane on the east & westbound Ballyfermot Road approaches to its junction with Le Fanu Road.

Right-turning vehicles on either approach will impede straight-ahead traffic, resulting in straight-ahead traffic entering the adjacent left-turning or bus lane leading to possible side-swipe collisions.

In addition, right-turning drivers will now need to identify a gap in multiple approach lanes (e.g. westbound right-turning traffic will need to identify gaps in the opposing straight-ahead traffic lane, bus lane, cycle lane and left-turning lane). This may prove difficult to achieve, leading to driver frustration and rash manoeuvres resulting in side-on collisions.

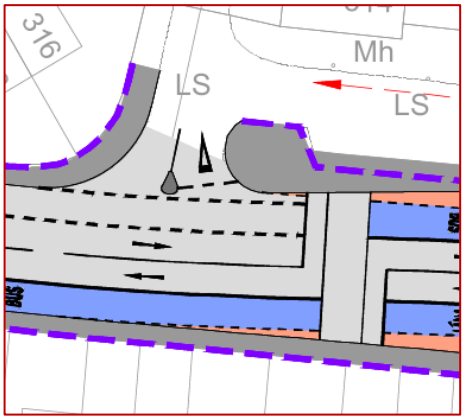
Recommendation

During the design development ensure that the signal phasing at this junction permits right-turning vehicles to proceed unopposed.

3.2.32 Problem

Location: *Drawing Sheet 14 – Colepark Road*

Summary: *Proximity of signalised pedestrian crossing to priority junction may result in left-turning side road drivers being insufficiently aware of the status of the signals resulting in overshoot into the crossing and vehicular/pedestrian collisions.*



The proximity of the signalised pedestrian crossing to the east of the priority junction between Colepark Road and Ballyfermot Road may result in left-turning drivers exiting Colepark Road being insufficiently aware of the status of the signals resulting in overshoot into the crossing and vehicular/pedestrian collisions.

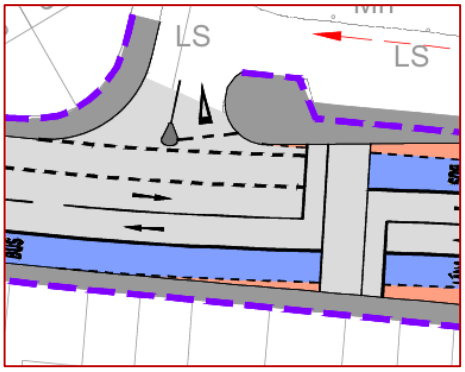
Recommendation

Relocate the signalised pedestrian crossing away from the priority junction, or signalise this junction and incorporate the pedestrian crossing into the junction layout.

3.2.33 Problem

Location: *Drawing Sheet 14 – Colepark Road*

Summary: *Right-turning manoeuvres from priority junction where drivers are required to cross multiple lanes could result in unsafe turning manoeuvres and side-on collisions.*



It is proposed to remove the existing island at the junction of Colepark Road and Ballyfermot Road, which prohibits right-turning manoeuvres out of Colepark Road.

Drivers exiting from Colepark Road and wishing to turn right will have to cross multiple lanes. It will be difficult for right-turning drivers to identify safe gaps in the approaching traffic lanes in order to turn right, possibly leading to unsafe manoeuvres and side-on collisions.

Recommendation

Either amend the permitted manoeuvres at the Colepark Road junction to be left-in/left-out only, or signalise the junction and incorporate the pedestrian crossing into the junction arrangement.

3.2.34 Problem

Location: *Drawing Sheet 14*

Summary: *Possible bus/cyclist collisions where eastbound cycle lane ends on Ballyfermot Road downstream of Ballyfermot Parade junction.*

The proposed arrangement where the eastbound cycle lane on Ballyfermot Road ends, west of the Ballyfermot Parade junction, with a gradual taper could result in cyclists being struck by buses.

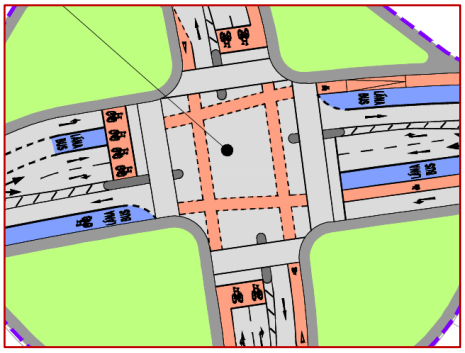
Recommendation

Amend the proposed layout at the termination of the cycle track to remove the risk of cyclists being struck by buses. This may require terminating the cycle track at a point further upstream and bringing cyclists into the bus lane at a well-defined transition.

3.2.35 Problem

Location: *Drawing Sheet 15 - Kylemore Road Junction*

Summary: *Absence of measures for right-turning cyclists will result in cyclists mingling with traffic and crossing multiple traffic lanes in order to turn right, with a resulting increased risk of being struck by a vehicle.*



No measures have been indicated to facilitate right-turns by cyclists at the Kylemore Road junction. Advance stop lines have been indicated on three of the four arms at the junction, however these do not readily cater for right-turning cyclists who approach when the signals are green.

In the absence of measures catering for right-turning cyclists, cyclists may attempt to weave across multiple traffic lanes in order to enter the right-turning lane where they are at increased risk of being struck by a vehicle.

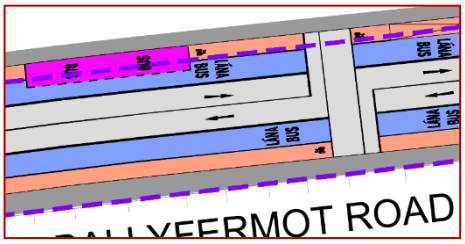
Recommendation

Provide “box-turns” to cater for right-turning cyclists at this junction.

3.2.36 Problem

Location: *Drawing Sheet 16*

Summary: *Proposed location of bus stop may impede visibility for drivers approaching the signalised pedestrian crossing immediately downstream.*



A bus stop is proposed on the northern side of the Ballyfermot Road, east of the Kylemore Road junction. There is a risk that stationary buses at this bus stop could impede visibility for eastbound drivers in the adjacent traffic lane towards the signals at the pedestrian crossing immediately downstream, resulting in approaching drivers being unaware of the need to stop, leading to a failure to stop and overshoot into the crossing resulting in possible vehicular/pedestrian collisions.

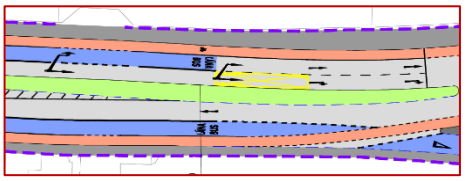
Recommendation

Relocate the proposed bus stop or pedestrian crossing and ensure that adequate forward visibility to the signals is available for approaching drivers on all lanes.

3.2.37 Problem

Location: *Drawing Sheet 20 – Sarsfield Road Junction*

Summary: *Road layout which requires straight-ahead drivers to change lane on the immediate approach to signalised junction may not be readily understood, leading to late lane-change manoeuvres and side-swipe collisions.*



The eastbound traffic lane on Sarsfield Road becomes a right-turn only lane at the Sarsfield Road signalised junction. Drivers wishing to proceed straight-ahead, towards the N4, must move left into the trafficked lane created following the termination of bus lane.

The requirement to move left in order to proceed straight-ahead may not be obvious to some drivers, in particular those unfamiliar with this route, leading to late lane-change manoeuvres and possible side-swipe collisions.

Recommendation

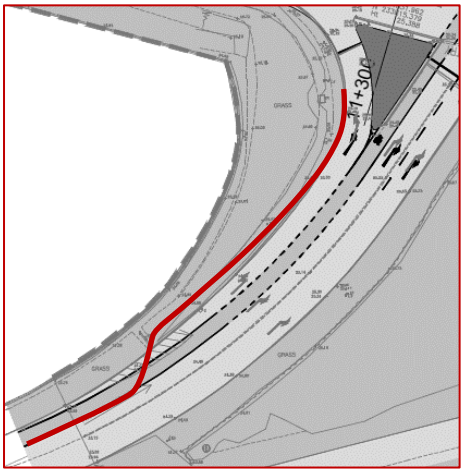
Amend the proposed road layout on the eastbound approach to the Sarsfield Road junction so that straight-ahead drivers can remain in the same lane on the approach to the junction, and drivers wishing to turn right must move right to turn right.

3.2.38 Problem

Location: *Drawing Sheet 20 – Con Colbert Road Junction*

Summary: *Lengthy taper for development of left-turn lane will result in stationary left-turning vehicles encroaching into cycle lane.*

The proposed layout of the dedicated left-turning lane on Con Colbert Road on the approach to its junction with the N4 Chapelizod Bypass is such that left-turning vehicles will cross the cycle lane at a shallow angle, increasing the distance over which they will interact with the cycle lane.



Similarly, the full width of the left-turning lane does not appear to be provided until closer to the splitter island, with the result that vehicles in the left-turning lane may protrude into the adjacent cycle lane and present an obstruction to cyclists who may move into the adjacent traffic lane in order to pass with a resulting increased risk of being struck by a vehicle.

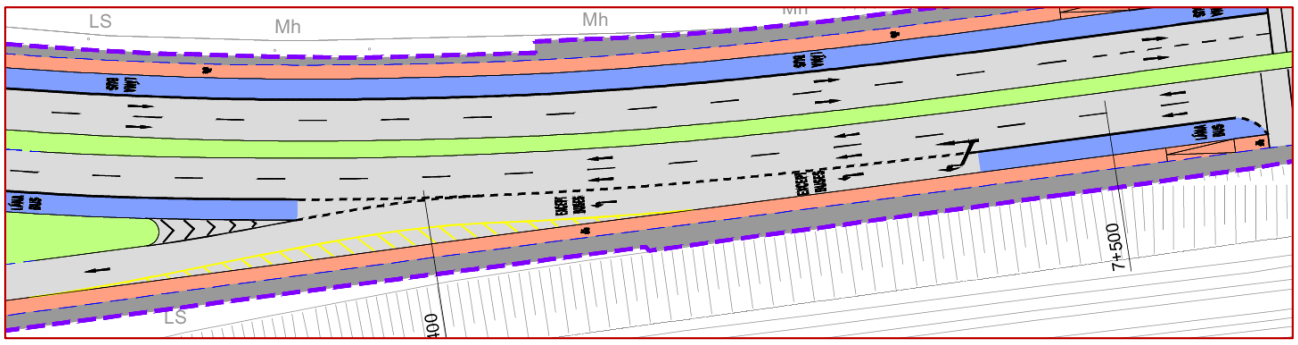
Recommendation

Provide a left-turning lane with a shorter, more well defined, entry taper and with a full lane width over its extents beyond the taper such that left-turning traffic will not protrude into the adjacent cycle lane.

3.2.39 Problem

Location: *Drawing Sheet 21*

Summary: *Increased injury severity outcomes likely should collisions occur between vehicles and cyclists due to higher speeds by left-turning/diverging westbound vehicles at junction of Con Colbert Road & Chapelizod Bypass.*



The proposed arrangement for westbound diverging traffic at the Con Colbert Road junction with the Chapelizod Bypass could give rise to high speeds for exiting traffic. The provision of the proposed hatched roadmarkings adjacent to the cycle lane are unlikely to be observed by all drivers, placing cyclists in close proximity to high-speed vehicles with a resulting increased risk of serious injuries should a collision occur.

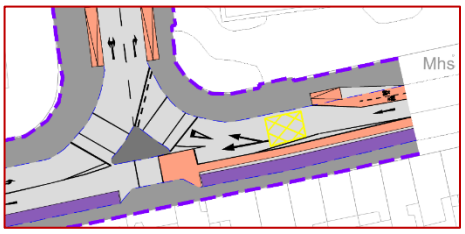
Recommendation

Retain the existing layout at this location.

3.2.40 Problem

Location: *Drawing Sheet 21*

Summary: *Cyclists weaving across traffic lane are an increased risk of being struck on the Inchicore Road westbound approach to the Memorial Road junction.*



There is an existing two-way cycle track along the northern side of the Inchicore Road between Kilmainham and Memorial Road. It is unclear how westbound cyclists on this two-way cycle track are intended to access the westbound cycle track indicated on the southern side of Inchicore Road on its approach to the Memorial Road junction.

A failure to provide an adequate and safe means for cyclists to travel between the two cycle facilities on Inchicore Road will result in cyclists having to weave across vehicular traffic with an increased risk of being struck.

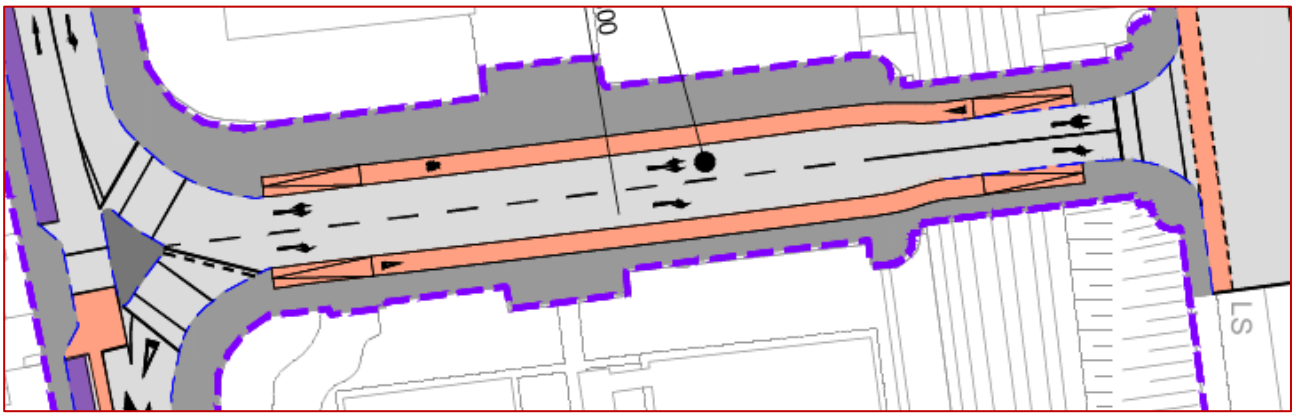
Recommendation

Amend the proposed road layout to provide a safe route for westbound cyclists on Inchicore Road approaching, and at, the Memorial Road junction.

3.2.41 Problem

Location: *Drawing Sheet 21*

Summary: *Proposed cycle facilities on Memorial Road do not adequately interface/integration with cycle facilities on the adjacent road network leading to unsafe manoeuvres by cyclists.*



It is unclear how the proposed cycle lanes on Memorial Road interface with the cycle lanes on the adjacent road network, and in particular, how cyclists travel to/from the cycle facilities on the adjacent roads and those on Memorial Road.

Given the permitted vehicular turning movements at the northern end of Memorial Road, at its junction with Con Colbert Road, it is unclear how cyclists, in particular right-turning cyclists, can complete the manoeuvre safely. It is considered likely that cyclists will opt to remain within the traffic lane on approach to this junction, increasing the risk of vehicular/cyclist collisions.

Recommendation

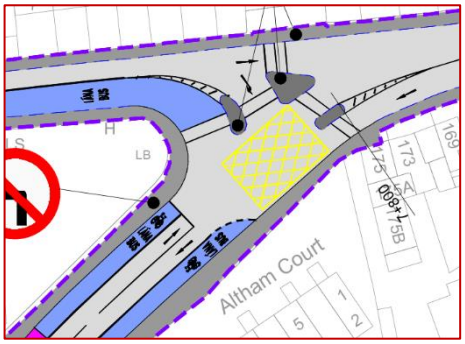
Review the proposed cycle facilities on Memorial Road.

It may be preferable to provide a two-way cycle facility along the eastern side of Memorial Road which connects with the existing two-way cycle track on Inchicore Road along with toucan crossings and advanced stop lines to facilitate cyclists at the Con Colbert Road junction.

3.2.42 Problem

Location: *Drawing Sheet 21*

Summary: *Absence of signalised pedestrian crossing of Grattan Crescent along likely pedestrian desire line may result in uncontrolled, and unsafe, pedestrian crossings.*



The route for pedestrians wishing to cross Grattan Crescent immediately west of its junction with Sarsfield Road & Inchicore Road is lengthy and may not coincide with the pedestrian desire line at this location.

This could result in pedestrians undertaking uncontrolled crossings of Grattan Crescent with a resulting increased risk of vehicular/pedestrian collisions. This issue is exacerbated by the proximity of the nearby national school, with high numbers of schoolchildren expected to cross at this location.

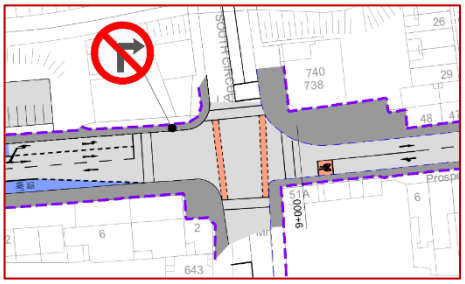
Recommendation

Provide a signalised crossing of Grattan Crescent at the junction with Sarsfield Road & Inchicore Road.

3.2.43 Problem

Location: *Drawing Sheet 24*

Summary:



It is proposed to provide a bus gate on Old Kilmainham Road which will significantly alter the existing turning volumes at the South Circular Road junction with Emmet Road & Old Kilmainham Road.

In particular it is likely that the majority of traffic on Emmet Road will now turn left onto the South Circular Road, however the length of the left-turn lane at this location appears relatively short. This could result in significant queues forming, possibly extending into the bus lane thus negating the benefit of the bus lane provision.

Eastbound buses on Emmet Road are likely to wish to proceed straight ahead at the South Circular Road junction, onto Old Kilmainham Road. To do this they must change lane from the bus lane into the straight-ahead lane on the immediate approach to the junction, a manoeuvre that is likely to be compromised should extensive queues form within the left-turning lane on this approach.

This could result in weaving manoeuvres concentrated within a short distance on the immediate approach to the signalised junction with a resulting increased risk of side-swipe collisions.

Recommendation

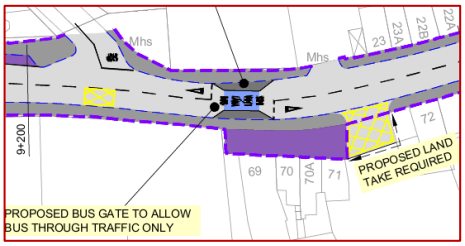
Amend the proposed road layout on the Emmet Road eastbound approach to the junction with the South Circular Road to better reflect the expected turning volumes at the junction.

3.2.44 Problem

Location: *Drawing Sheet 25*

Summary: *Absence of u-turn facilities at bus gate on Old Kilmainham Road could result in unsafe u-turn manoeuvres, in particular by large vehicles, with a resulting risk of collisions with other road users.*

It is proposed to provide a bus gate on Old Kilmainham Road. No measures have been indicated to facilitate u-turn manoeuvres by vehicles, in particular large vehicles, who inadvertently travel along Old Kilmainham Road as far as the bus gate.



This could result in unsafe u-turn manoeuvres with resulting risks to other road users, and in particular to vulnerable road users.

Recommendation

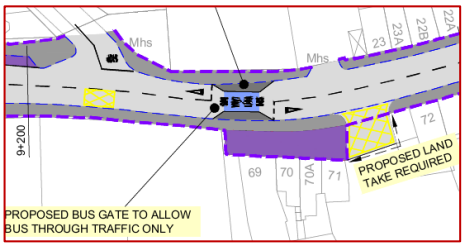
Either provide facilities catering for u-turn manoeuvres at this location, or during the design development ensure that adequate signs and markings are provided advising all drivers, in particular those entering Old Kilmainham Road from side roads, that there is no through-route in the direction of the proposed bus gate.

3.2.45 Problem

Location: *Drawing Sheet 25 - Old Kilmainham Road*

Summary: *Absence of cycle route through proposed bus gate could lead to bus/cyclist collisions.*

It is proposed to provide a bus gate on Old Kilmainham Road. No measures have been indicated to facilitate cyclists proceeding eastbound for westbound through the bus gate.



This could result in cyclists entering the bus gate when it is unsafe to do so resulting in them being struck by a bus travelling in either the same direction as the cyclist, or in the opposing direction.

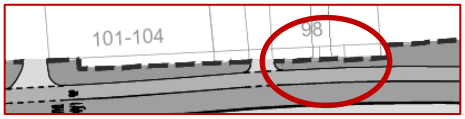
Recommendation

Provide a cyclist “bypass” of the bus gate in both directions.

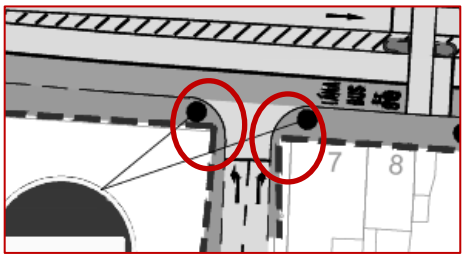
3.2.46 Problem

Location: *Drawing Sheet 28 & 29 – Thomas Street*

Summary: *Insufficient width of footpaths could result in pedestrians stepping into the carriageway and being struck by a passing cyclist or vehicle.*



The proposed footpath widths at a number of locations along Thomas Street are narrow and may not be of sufficient width to cater for the expected volumes of pedestrians at these locations. This could result in pedestrians stepping into the adjacent cycle lane/bus lane and being struck by a passing cyclist or vehicle.



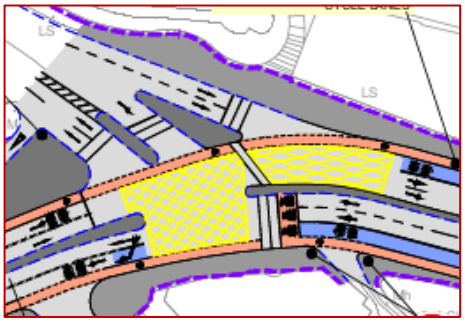
Recommendation

Ensure that adequate width of footpath is provided at all locations along the route.

3.2.47 Problem

Location: *Drawing Sheet 30 - Bridge Street/High Street Junction*

Summary: *Possible side-swipe collisions where two lanes turn right.*



Two lanes turn right from High Street onto Bridge Street. There is a risk of drivers in one of the right turning lanes drifting into the adjacent lane while turning resulting in side-swipe collisions.

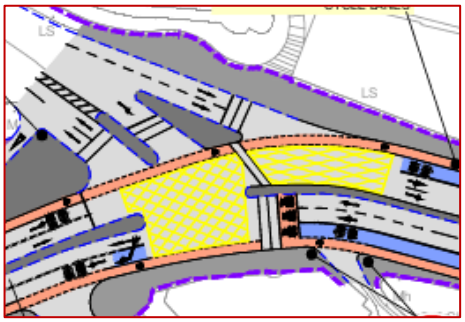
Recommendation

Provide guidance roadmarkings through the junction for the two right-turning lanes at this location.

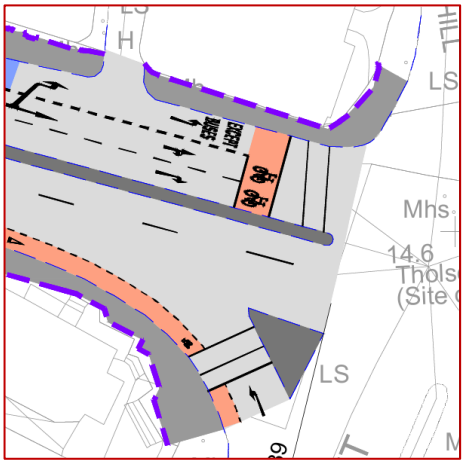
3.2.48 Problem

Location: *Drawing Sheet 30 - Bridge Street/High Street Junction and High Street/Nicolas Street Junction*

Summary: *Absence of measures for right-turning cyclists will result in cyclists mingling with traffic and crossing multiple traffic lanes in order to turn right, with a resulting increased risk of being struck by a vehicle.*



No measures have been indicated to facilitate right-turns by westbound cyclists on High Street at the Bridge Street junction or for eastbound cyclists wishing to turn right from High Street onto Nicolas Street.



Advance stop lines have been indicated on these approaches to the junctions, however these do not readily cater for right-turning cyclists who approach when the signals are green.

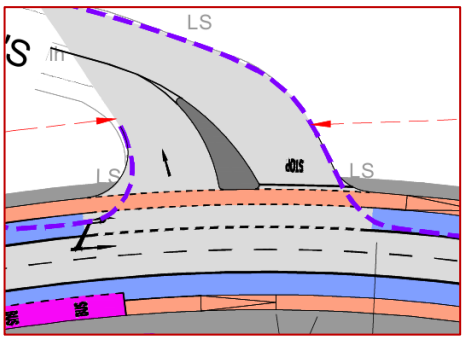
In the absence of measures catering for right-turning cyclists, cyclists may attempt to weave across multiple traffic lanes in order to enter the right-turning lane(s) where they are at increased risk of being struck by a vehicle. This is exacerbated by the provision of two right turning lanes at these locations.

Recommendation

Amend the proposed junction layout to provide measures catering for right-turning cyclists at this junction.

4 Observations

5.1 The proposed road layout on St Laurence's Road at its junction with Ballyfermot Road appears to be incorrect, as it does not tie in with the existing carriageway edges and does not show the existing footpaths which it is assumed are to be retained.



It has been assumed that this is a draughting error which will be corrected during subsequent design phases.

Should this assumption be incorrect the Audit Team should be advised, and the audit report amended.

5 Road Safety Review Team Statement

We certify that we have examined the drawings referred to in this report. The examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified in order to improve the safety of the scheme.

The problems identified have been noted in this report together with associated safety improvement suggestions, which we would recommend should be studied for implementation.

No one on the Road Safety Review Team has been involved with the design of the scheme.

ROAD SAFETY AUDIT TEAM LEADER

Peter Monahan Signed: _____

Dated: _____

ROAD SAFETY AUDIT TEAM MEMBER

Norman Bruton Signed: _____

Dated: _____

Appendix A – Documents Submitted to the Road Safety Review Team

DOCUMENT/DRAWING TITLE	DOCUMENT/DRAWING NO.	REVISION
Liffey Valley to City Centre	Key Plan	-
Liffey Valley to City Centre	Sheet 1 of 30	-
Liffey Valley to City Centre	Sheet 2 of 30	-
Liffey Valley to City Centre	Sheet 3 of 30	-
Liffey Valley to City Centre	Sheet 4 of 30	-
Liffey Valley to City Centre	Sheet 5 of 30	-
Liffey Valley to City Centre	Sheet 6 of 30	-
Liffey Valley to City Centre	Sheet 7 of 30	-
Liffey Valley to City Centre	Sheet 8 of 30	-
Liffey Valley to City Centre	Sheet 9 of 30	-
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Liffey Valley to City Centre	Sheet 26 of 30	-
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Liffey Valley to City Centre	Sheet 28 of 30	-
Liffey Valley to City Centre	Sheet 29 of 30	-
Liffey Valley to City Centre	Sheet 30 of 30	-