TECHNICAL MEMORANDUM

CH2M Barry

Stage 2 – CBC 1 Clongriffin to City – Options Development - Junctions

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Options Development - Junctions

The technical note describes the approach and methodology for the junction development for CBC 1 - Clongriffin to City Centre (Custom House) and development and assessment of the design development options for the major junctions.

The general approach for junctions could be divided into three sections. The objective is to maintain consistency in the approach to junction design/ treatment and to avoid major variations, within each section.

- Main Street (Clongriffin Terminus to new junction at Malahide Road)
- Malahide Road (Junction with R139 to Fairview/ Marino Mart Junction)
- North Strand Road (Fairview/ Marino Mart Junction to Custom House)

Main Street (Clongriffin Terminus to the new junction at Malahide Road)

This section commences at the Clongriffin Terminus and runs through the Main Street and section of partially completed road and some parts of not yet completed section. Along the Main Street, it would be considered to adopt the current approach at the existing junctions and the new junctions forming part of the unfinished section.

The general approach for junction is as per **Sketch Option 1** i.e. maintain existing layout

- Single traffic lane and bus lane with cycle lane and footpath until the junction with Hole in the Wall Road and no cycle lane further on until junction with Malahide road.
- The single traffic lane combined with right turning traffic at the junction
- The left turning traffic merging into the bus lane and yellow box
- The left turning traffic change lane to the bus lane and provide an island at the cross-over of lane.
- The other roads at the junction as per existing

The junction at Malahide Road with the new junction forming part of unfinished section is described in detail in further sections.

Malahide Road (Junction with R139 to Fairview/ Marino Mart Junction)

This section commences at the junction with R139 and runs through the Malahide Road until the junction at Fairview/ Marino Mart.

The general approach for this section is to maintain online cycle lane along Malahide Road through all junctions. Online cycle lane will be maintained at the two roundabouts – Darndale Roundabout and Artane Roundabout.

The general approach for majority of the junctions along this section is to maintain a right turning lane and remove any free-flow left slip lane to comply with DMURS. This could be achieved by treating the left turning traffic at the signal with following option:

Where the left turning traffic volume is low and where there is land take constraint, the left turning traffic treated with the straight ahead lane, **as per Sketch Option 2.**

Where the left turning traffic volume is high and no land take constraint, provide left turning lane on the outside of the bus lane. The left turning traffic will change lane through the bus lane, yellow box and possibly traffic island provided, **as per Sketch Option 3.**

Where the left turning traffic volume is high and no land take constraint, provide left turning lane on the inside of the bus lane, **as per Sketch Option 4.** The bus lane will taper smoothly to the outer lane and will be given pre-signal. In a similar scenario, where left turning traffic is low, the left turning traffic could be given a flashing amber at the signal while bus is on green. This option has been discounted for further design.

However, in any particular junction if it is not possible to accommodate the above 2 options, then left turning traffic will be merged into the bus lane and maintain a right turning pocket where possible, **as per Sketch Option 1 or Option 5**. E.g. the following junction follows

The following junctions are considered in further detail in further sections:

1. Malahide Road/ R139 and the new junction with Main Road
2. Malahide Road junction with Clare Hall Shopping Centre
3. Malahide Road – Darndale Roundabout
4. Malahide Road – Artane Roundabout
5. Malahide Road – Fairview/ Marino Mart junction

North Strand Road (Fairview/ Marino Mart Junction to Custom House)

This section commences at the Malahide Road – Fairview/ Marino Mart junction and runs through Annesley Bridge, North Strand Road to the Custom House. Along this stretch it would be considered to adopt the current approach at the existing junctions. Also, majority of the junctions along this stretch are priority junctions and will be treated as existing. Most of the signalised junctions will follow the Sketch option 1, i.e. the left turning traffic merging into the bus lane or Sketch 5 i.e right turning lane and left turning traffic merging into the bus lane.

Options Development and Assessment – Major Junctions

The following junctions are considered in detail for further options development and assessment:

1. Malahide Road/ R139 and the new junction with Main Road
2. Malahide Road junction with Clare Hall Shopping Centre
3. Malahide Road – Darndale Roundabout
4. Malahide Road – Artane Roundabout
5. Malahide Road – Fairview/ Marino Mart junction

The section explains the advantages and disadvantages of each option, and recommends a preferred option.

Malahide Road/ R139 and the new junction with Main Road

Table 1: Junction Options and Recommendation

No	Option Description	Advantages	Disadvantages	Pass/Fail
1.	Bus on left side lane and bus gets a pre-signal at the first junction with R139 and enters the right turning lane onto the next junction with the Main Street. Layout as per Concept Design	Bus does not have to weave through traffic lanes. Bus lane separated from traffic lanes and so not delayed by traffic queues. Bus maintains left most lane and does not interfere with the left turning and/ or straight ahead traffic. Bus lane on the right lane at approach to the new junction with Main Street will give better junction efficiency.	Separate traffic signal phase required at Malahide Road/R139 junction for bus movements. 2 northbound traffic lanes narrowing to 1 lane at Malahide Rd/R139 junction may cause traffic congestion.	Pass (decision on modelling result)
2.	Bus moves on to the Right lane in advance of the first junction with R139 and subsequently enters the right turning lane onto the next junction with Main Street.	Less traffic signal phasing at Malahide Rd/R139 junction. Bus lane separated from traffic lanes at junctions.	Bus required to weave through traffic lanes and so may be delayed by traffic queuing at the junction ahead, unless a traffic signal is provided for the bus change lane. 2 northbound traffic lanes narrowing to 1 lane at Malahide Rd/R139 junction may cause traffic congestion.	Pass (decision on modelling result)
3.	Bus on left side lane and bus gets a pre-signal at the first junction. Dedicated bus lane (two way) at approach to the new junction with Main Street.	Bus does not have to weave through traffic lanes. Bus lane separated from traffic lanes and so not delayed by traffic queues.	Much greater costs for off-road bus lanes additional land take. Northbound bus lane diagonally crosses Malahide Road/R139 junction which may adversely impact the efficiency of the junction. Additional conflicts for cyclists and pedestrians.	Fail
4.	Bus on left side/ outside lane at the first junction with R139. Further on dedicated bus	Bus does not have to weave through traffic lanes.	Northbound bus lane diagonally crosses New Junction with Main Street which may adversely	Fail

No	Option Description	Advantages	Disadvantages	Pass/Fail
	lane on the left side/ outside lane and bus gets a signal at approach to the new junction.	Bus lane separated from traffic lanes and so not delayed by traffic queues.	impact the efficiency of the junction. Additional conflicts for cyclists and pedestrians.	

It is recommended that Option 1 is the preferred option. This option allows for a continuous dedicated bus lane, whilst allowing for minimal impact to the signalised junctions and cyclists and pedestrians.

Clare Hall Shopping Centre Junction Options

Table 2: Junction Options and Recommendation

No	Option	Advantages	Disadvantages	Pass/Fail
1.	Move the bus lane into the left turning pocket and the left turning lane inside of the bus lane. Bus and traffic (left and straight ahead) lanes to be controlled by traffic signals.	Bus and left turning traffic will be fully separated and there will be no conflict. Allows for buses to have priority at the junction. Improved crossing facility for cyclists and pedestrians.	Additional costs for removal of existing traffic island. Possible delays for left turning traffic.	Fail
2.	Maintain the left turning lane by realigning the slip lane to head straight to the STOP line at the signal. Left turning traffic will have signal control at the junction. Introduce left turning cycle lane and maintain the straight ahead cycle lane between the left turning lane and bus lane. Layout as per Concept Design	Improved crossing facility for cyclists and pedestrians. Cost effective, as minimal changes are required to the existing kerblines.	Left turning traffic will require lane change and could impact on bus traffic. Allowing for bus priority will be slightly reduced as traffic flows across the bus lane.	Pass
3.	Do nothing – maintain existing layout and introduce and signal at the left turning slip..	Cost effective, as no changes are required to the existing kerb lines. Free-flow traffic lane for left turning manoeuvres is maintained.	Lack of priority for buses. Left turning traffic could impact on bus traffic. Lack of cycle crossing facilities.	Fail

It is recommended that Option 2 is the preferred option. This option allows for the maximum bus priority at the junction as well as allowing for improved cycle facilities.

Fairview Marino Mart Junction Options

Table 3: Junction Options and Recommendation

No	Option	Advantages	Disadvantages	Pass/Fail
1.	In the northbound direction keep dedicated bus lane, and left turning and straight ahead in separate traffic lanes. Buses (going left to Malahide Road and straight to Clontarf Road) will be given a pre-signal at the junction. Southbound direction, one traffic lane and bus lane Cyclists will be diverted through Haverty Road and Brian Road.	Allows buses maximum priority at the junction. Left turning lane will cater 825 peak hour volume Straight ahead lane will cater 1417 peak hour volume, which is within the limits of lane capacity (1,600)	Additional costs for removal of existing traffic island. Possible delays for left turning traffic. Additional delays due to pre-signal for buses could impact overall efficiency of the junction	Fail
2.	As option 1, but bus will move into right most lane for straight ahead direction. Cyclists will be diverted through Haverty Road and Brian Road. Layout as per Concept Design	Improved crossing facility for cyclists and pedestrians. Cost effective, as minimal changes are required to the existing kerblines. Straight Bus movement as per existing	Left turning traffic could impact on bus traffic. Allowing for bus priority will be more difficult as traffic flows across the bus lane.	Pass
3.	As option 1, but traffic lanes will be left turning and straight ahead in left lane and straight ahead only in right lane. Cyclists will be diverted through Haverty Road and Brian Road.	Cost effective, as no changes are required to the existing kerblines. Free-flow traffic lane for left turning manoeuvres is maintained.	Lack of priority for buses. Left turning traffic could impact on bus traffic. Considering the traffic volumes, the left turning merged with 50% straight turning traffic will close the capacity of a single lane (expected 1540 peak volume close to 1,600)	Fail

It is recommended that Option 2 is the preferred option. This option allows for the maximum bus priority at the junction as well as allowing for improved cycle facilities.

Darndale Roundabout

Various design options have been explored for the Artane Roundabout and the preferred junction treatment has been adopted for the Darndale Roundabout to maintain consistency.

- Provide left turning lane on the inside of the bus lane, **as per Sketch Option 3.**
- Provide conventional on-road cycle lane through the junction.
- Maintain the existing off-road cycle lane and provide a link to connect to the off-road cycle crossing at the junction.

This option allows for optimum cycle and pedestrian facilities, whilst allowing for efficient BRT running through the junction. It also provides a clear and understandable junction layout.

Artane Junction

Table 4: Junction Options and Recommendation

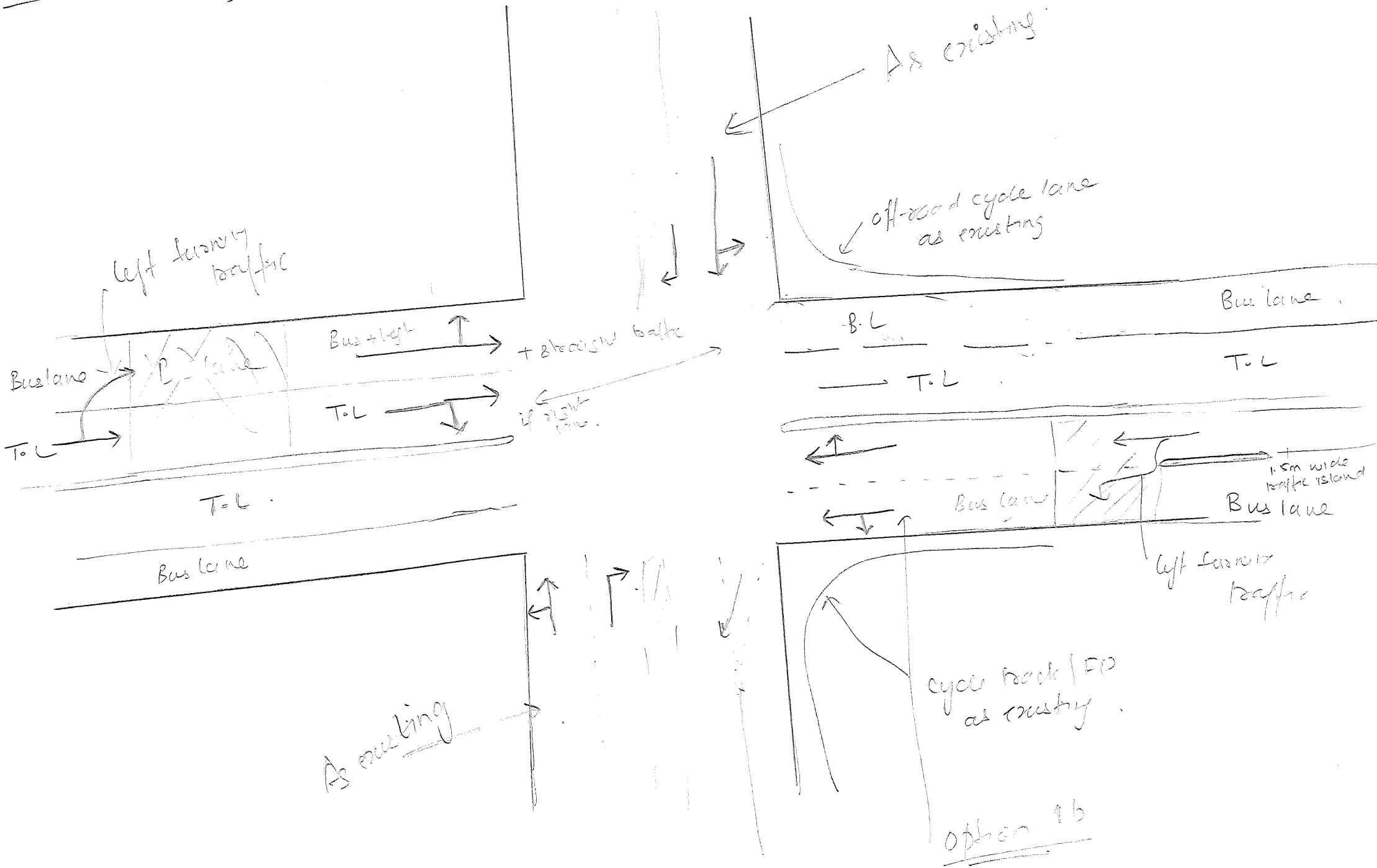
No	Option	Advantages	Disadvantages	Pass/Fail
1.	Signalised Junction – approach is to avoid left turning traffic conflict with the bus. Malahide Road Northbound - The left turning traffic going Northbound will be treated the signal - 3 lanes at the signal (left turning, straight and right turning) Malahide Road Southbound - The left turning traffic going Southbound will be treated the signal - 3 lanes at the signal (left turning, straight and right turning) Conventional On-road Cycle facilities Also maintain the off-road existing cycle lane and footpath Layout as per Concept Design	Allows for most efficient junction for road traffic and dealing with the left turning traffic thus giving bus priority. On road cycle tracks. Basic cycle and pedestrian crossing facilities. Separate cycle tracks for left turning cyclists follow the existing and like for like.	On-road cycle tracks provide segregation from road traffic but not BRT. Additional costs. Pedestrian and cyclist phases required for junction signalisation will make the junction less efficient for road traffic.	Pass
2.	Signalised Junction – approach is to avoid left turning traffic conflict with the bus. Malahide Road Northbound - The left turning traffic going Northbound will be treated the signal - 3 lanes at the signal (left turning, straight and right turning). Malahide Road Southbound - The left turning traffic going Southbound will be treated the signal - 3 lanes at the signal (left turning, straight and right turning) Off-road Cycle track with Zebra Crossings at the minor roads (Ardlea and Gracefield) and maintain the off-road existing cycle lane and footpath	Allows for most efficient junction for road traffic and dealing with the left turning traffic thus giving bus priority. Cyclists are fully segregated from vehicular traffic on Malahide Road. Reduced conflicts with BRT. Separate cycle tracks for left turning cyclists follow the existing and like for like.	Additional costs. Zebra crossings are not as safe as Toucan crossings for cyclists and pedestrians Zebra crossings located a short distance from signalised junction may cause confusion for vehicular traffic and unsafe for the pedestrians/ cyclists.	Fail
3.	Signalised Junction – approach is to avoid left turning traffic conflict with the bus. Malahide Road Northbound - The left turning traffic going Northbound will be treated the signal - 3 lanes at the signal (left turning, straight and right turning). Malahide Road Southbound - The left turning traffic going Southbound will be treated the signal - 3 lanes at the signal (left turning, straight and right turning) Off-road Cycle track with Toucan Crossings at the minor roads (Ardlea and Gracefield), close to the STOP line and integrated with the main signal at the junction.	Allows for most efficient junction for road traffic and dealing with the left turning traffic thus giving bus priority. Lower costs. Cyclists are fully segregated from vehicular traffic on Malahide Road. Reduced conflicts with BRT. Toucan phase can run concurrently with BRT phase if called. Separate cycle tracks for left turning cyclists follow	Additional costs. Pedestrian and cyclist phases required for junction signalisation will make the junction less efficient for road traffic.	Fail

No	Option	Advantages	Disadvantages	Pass/Fail
	Also maintain the off-road existing cycle lane and footpath	the existing and like for like.		
4.	Gyratory junction with BRT stop in middle of junction	Allows BRT optimum priority of other road users.	Least safe option for cyclists. Most expensive option. BRT stop in middle of gyratory provides awkward access for pedestrians.	Fail

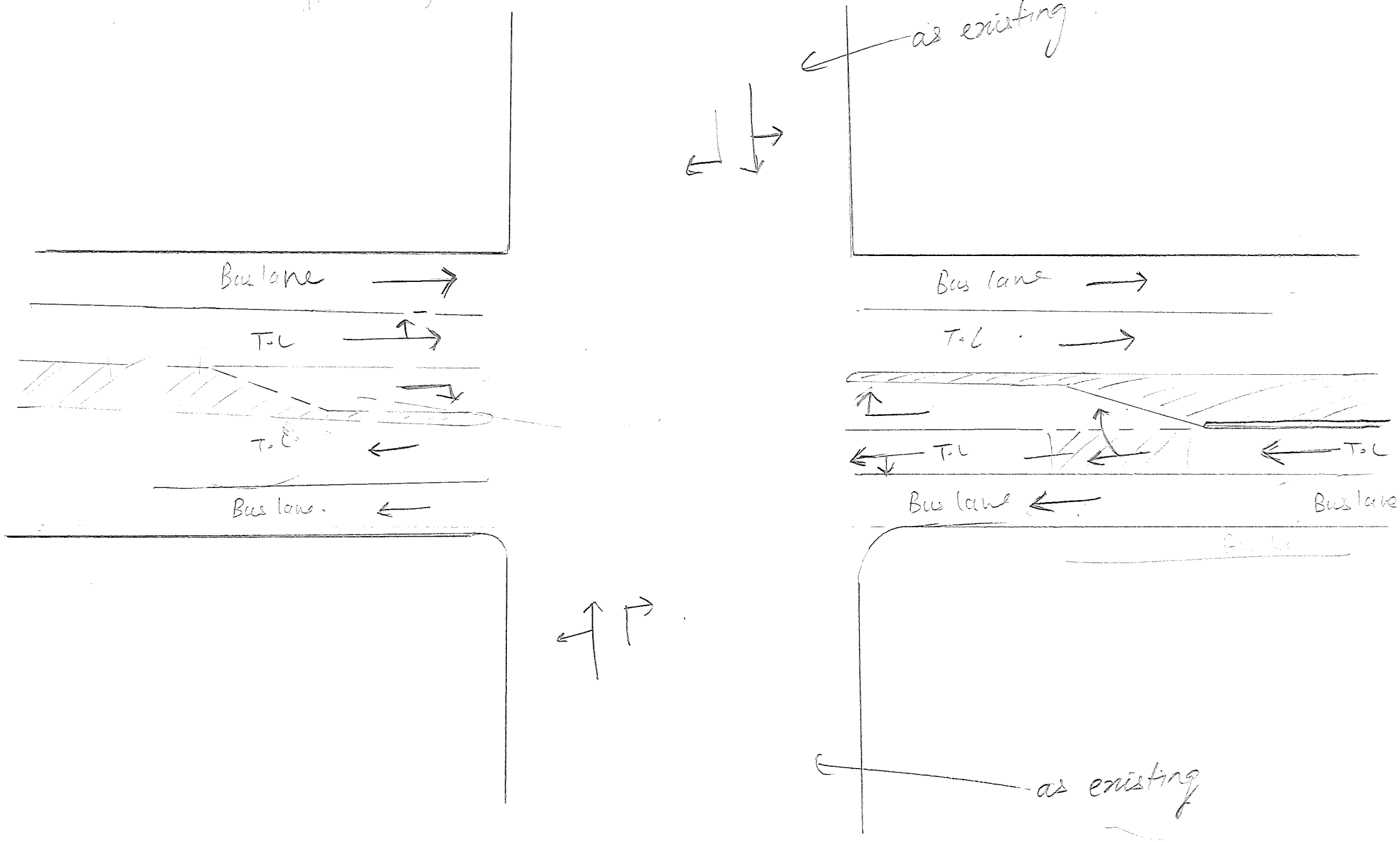
It is recommended that Option 1 is the preferred option. This option allows for optimum cycle and pedestrian facilities, whilst allowing for efficient BRT running through the junction. It also provides a clear and understandable junction layout.

Appendix A – Standard Sketches

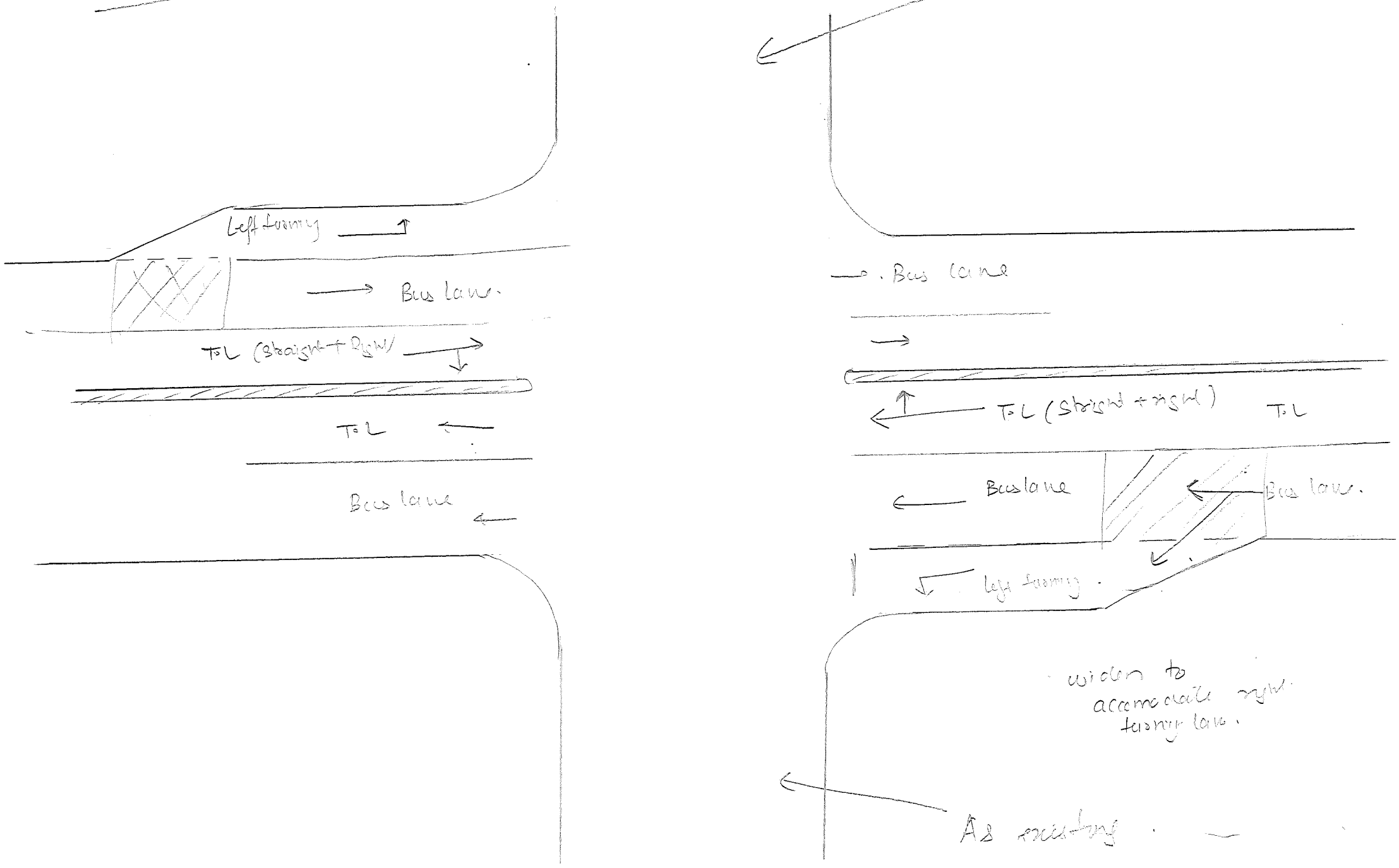
Option 1 : - Single traffic lane with right turning traffic
- Bus lane with left turning traffic



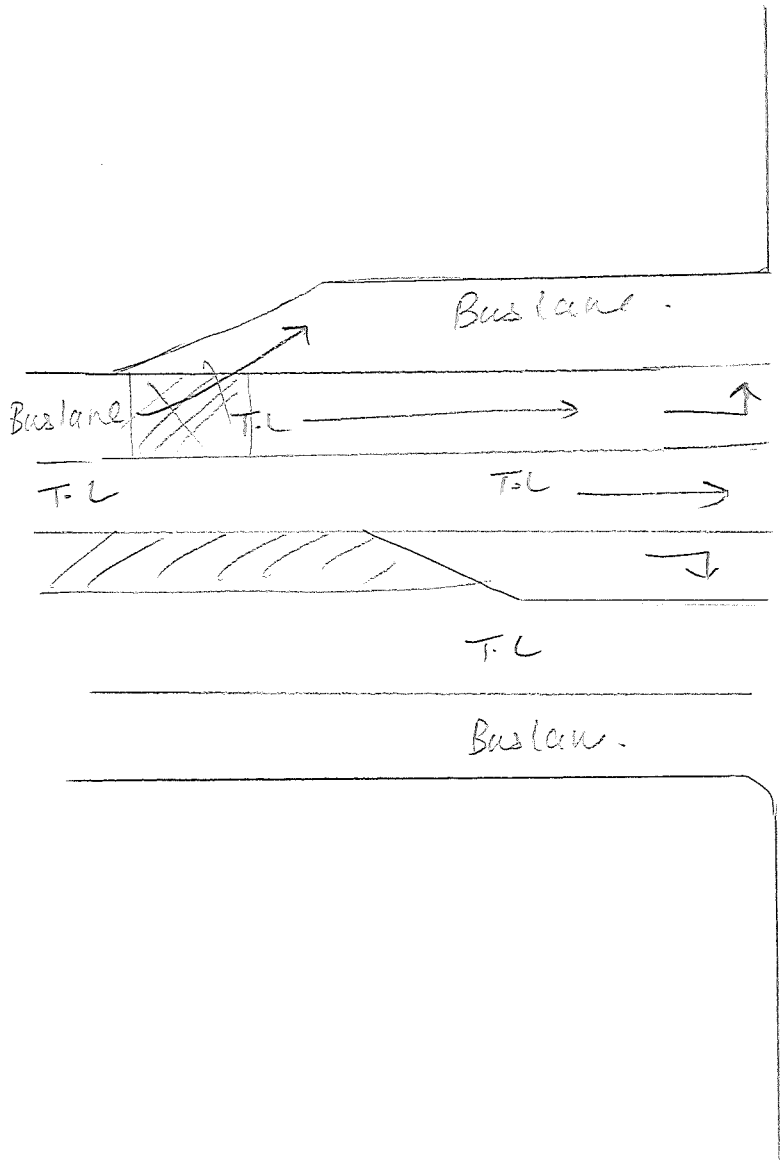
Option 2 : Single traffic lane + Bus Lane
- Right turning pocket
- left turning traffic with straight ahead lane at Signals

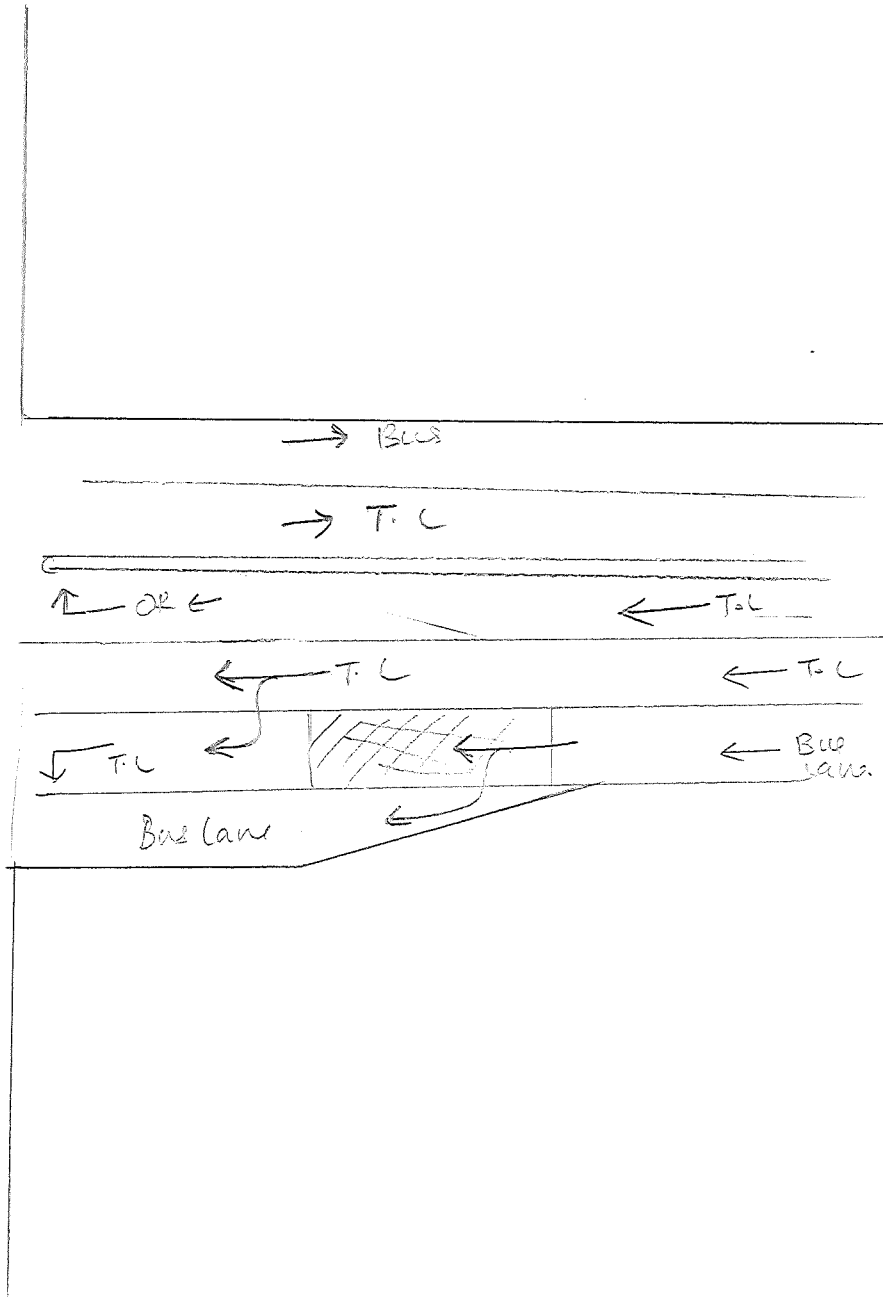


Option 3 : with left turning lane to be dealt at signal.

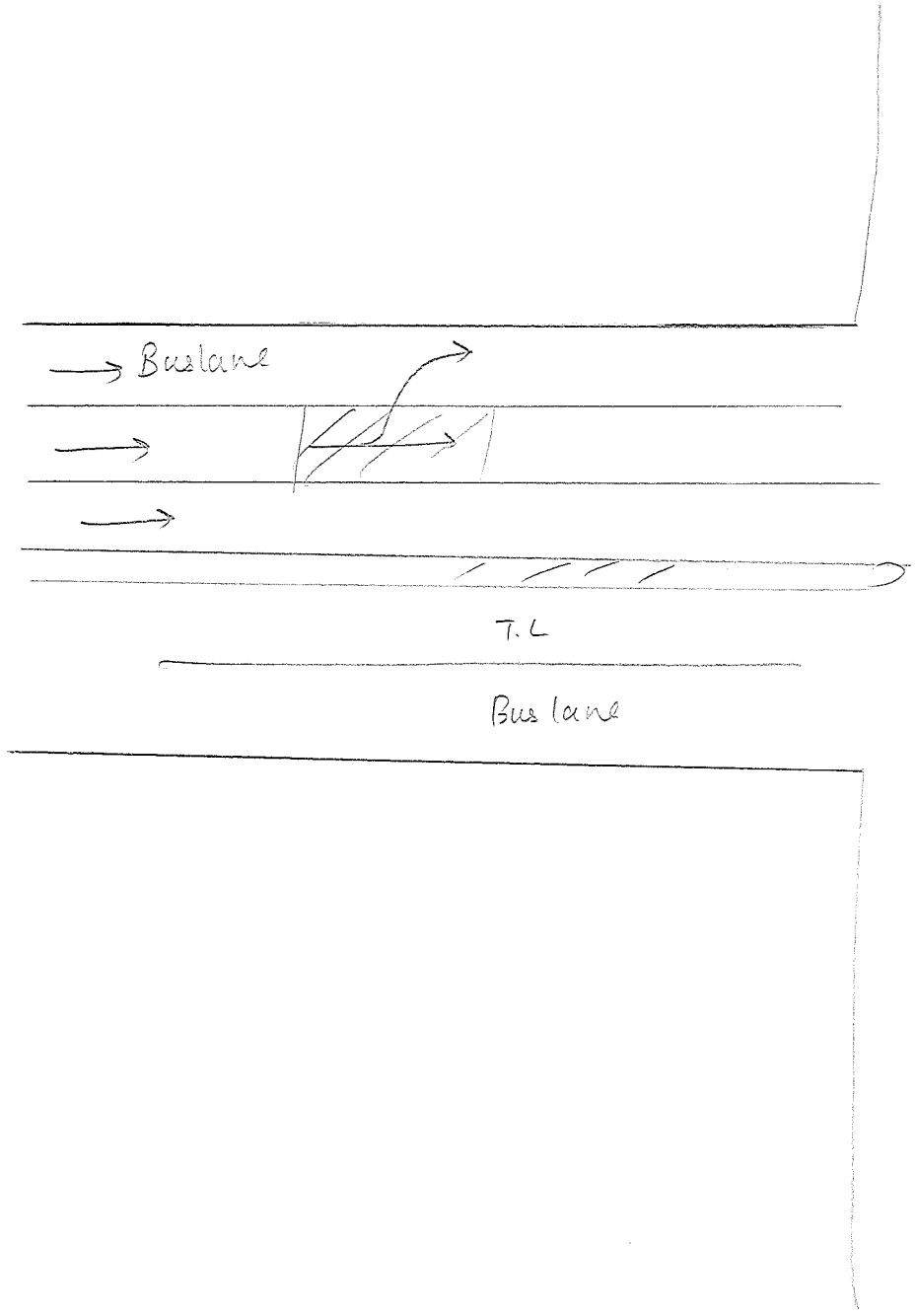


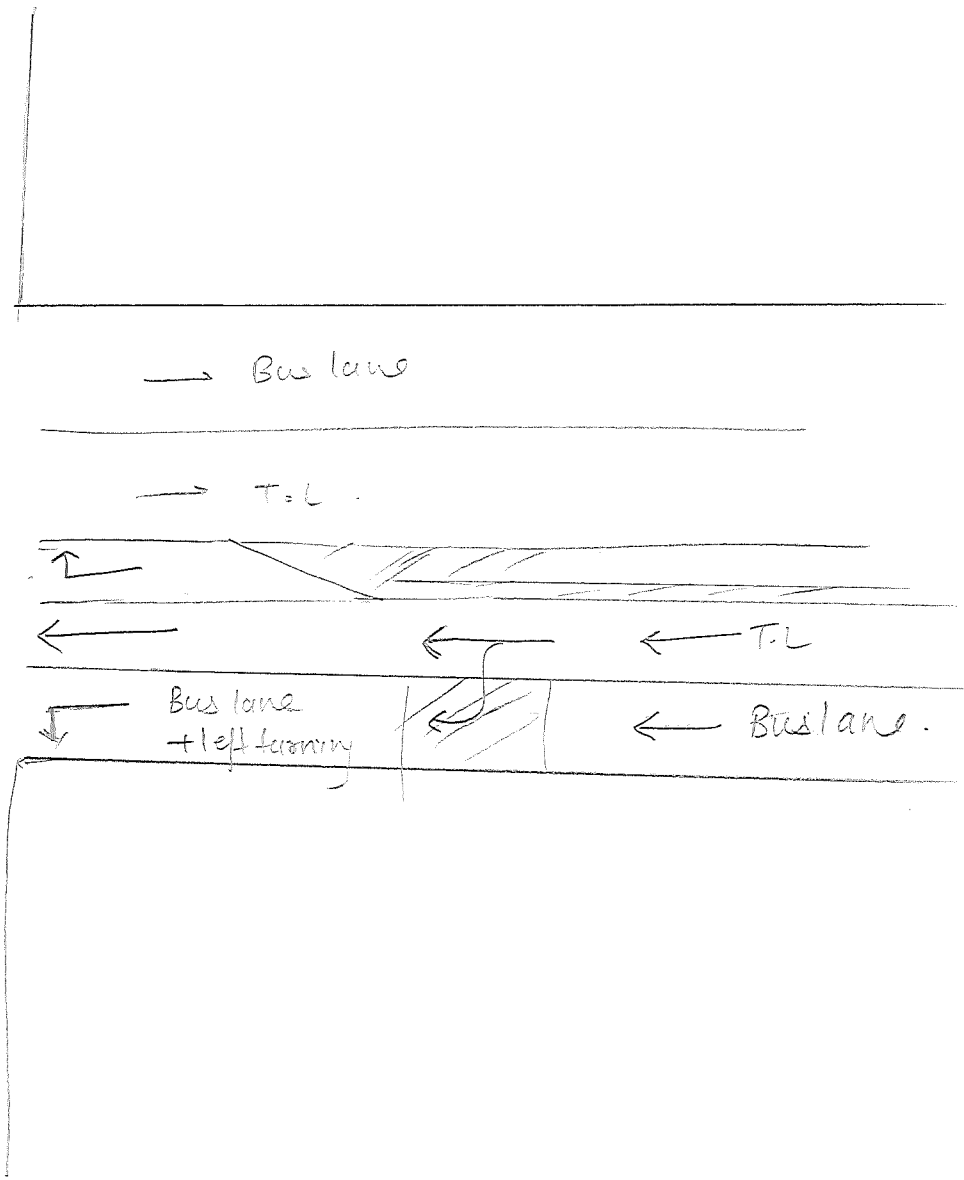
Option 4: Moving bus lane on the outside lane & left turning traffic on the inside lane



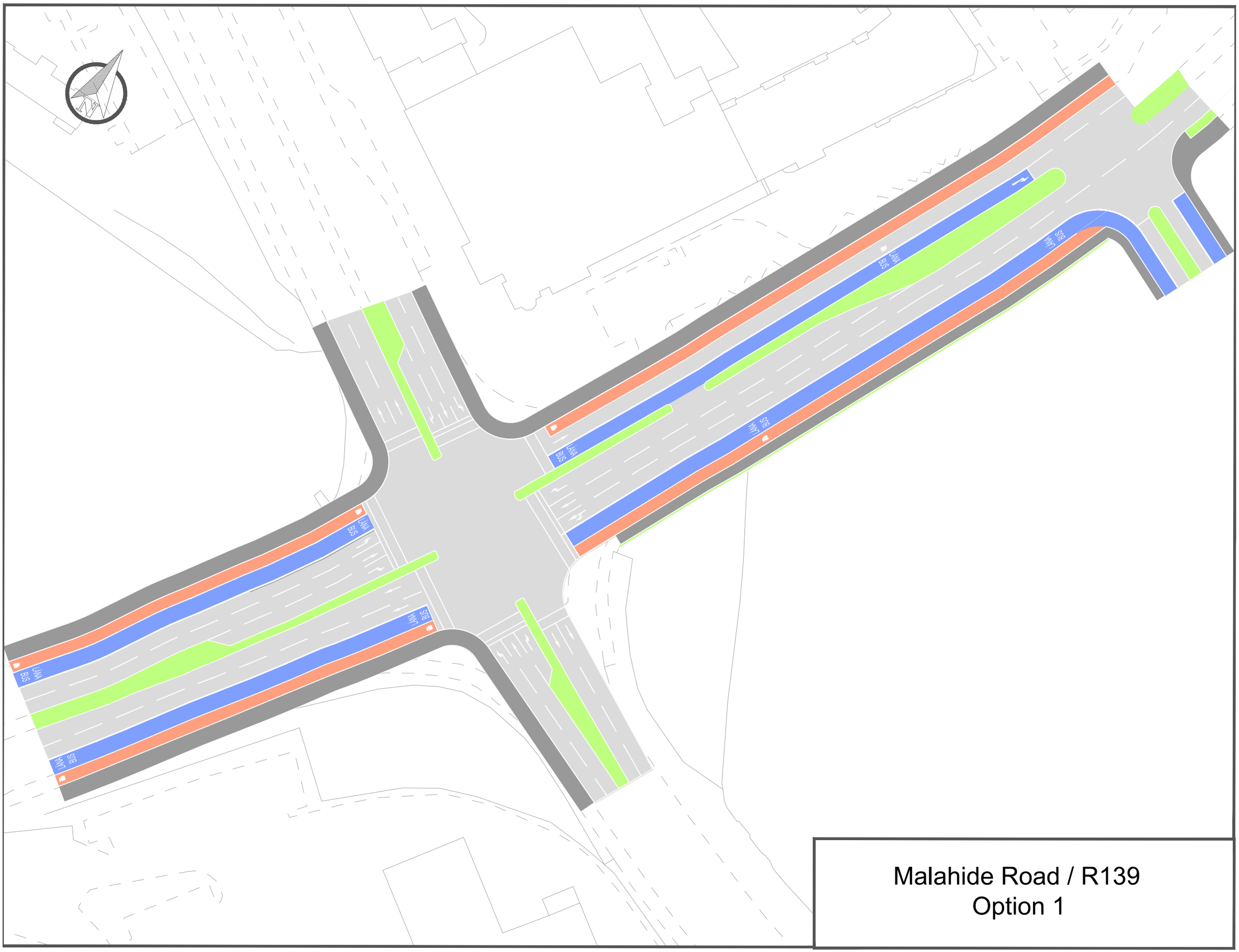


Option 5: Merging left turning baffle with bus lane (space constraint)
+ right turning pocket.

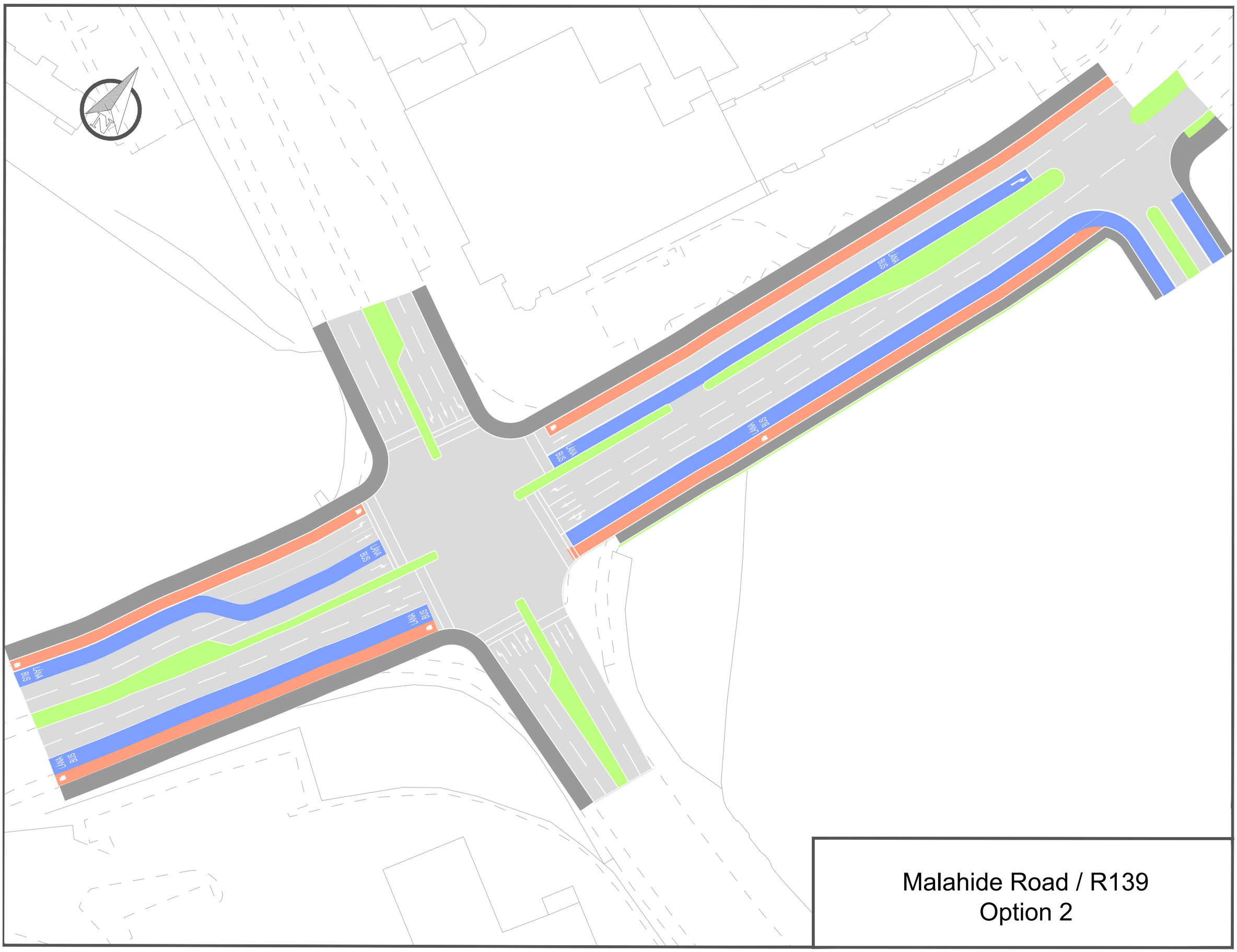




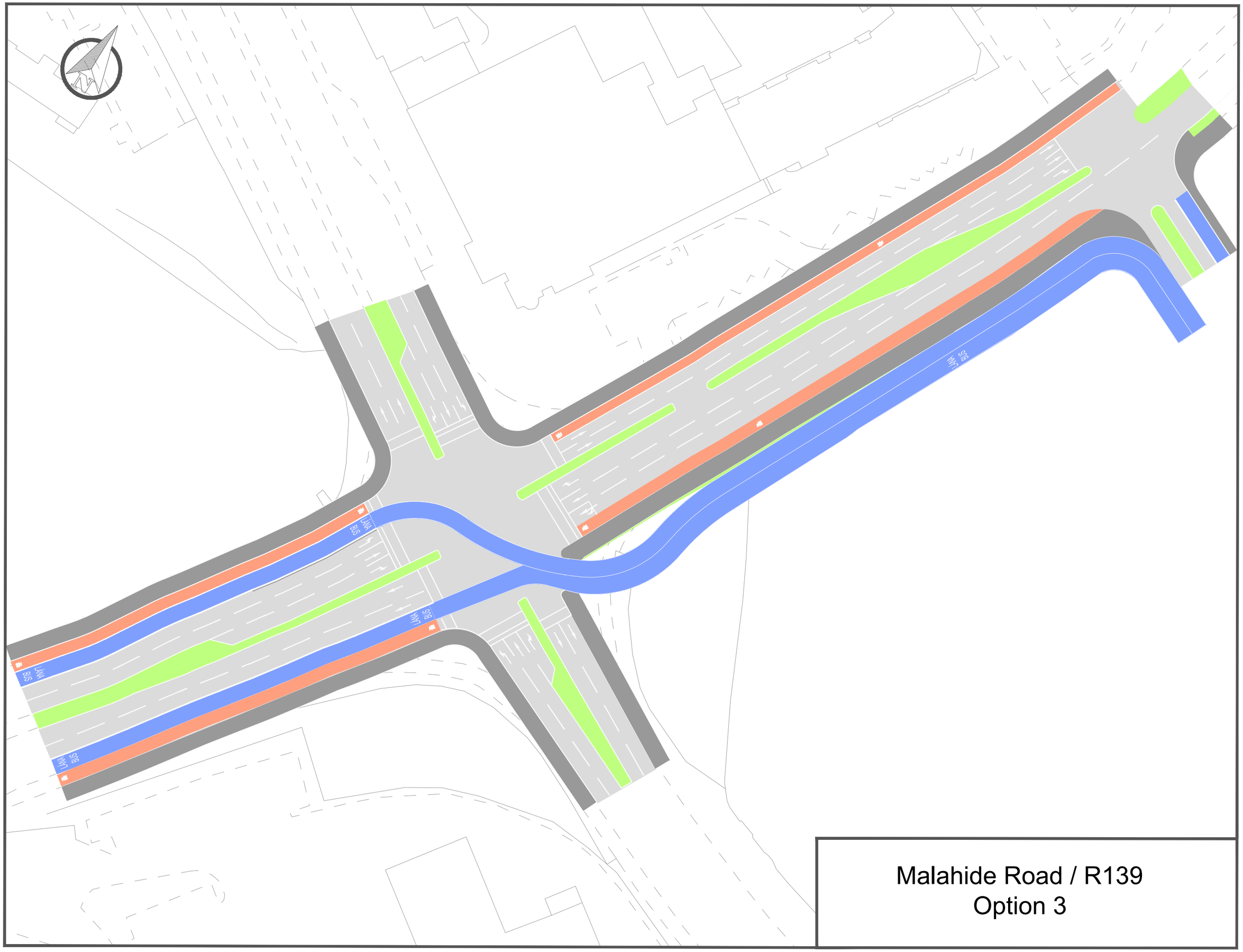
Appendix B – Design Layout for Major Junctions



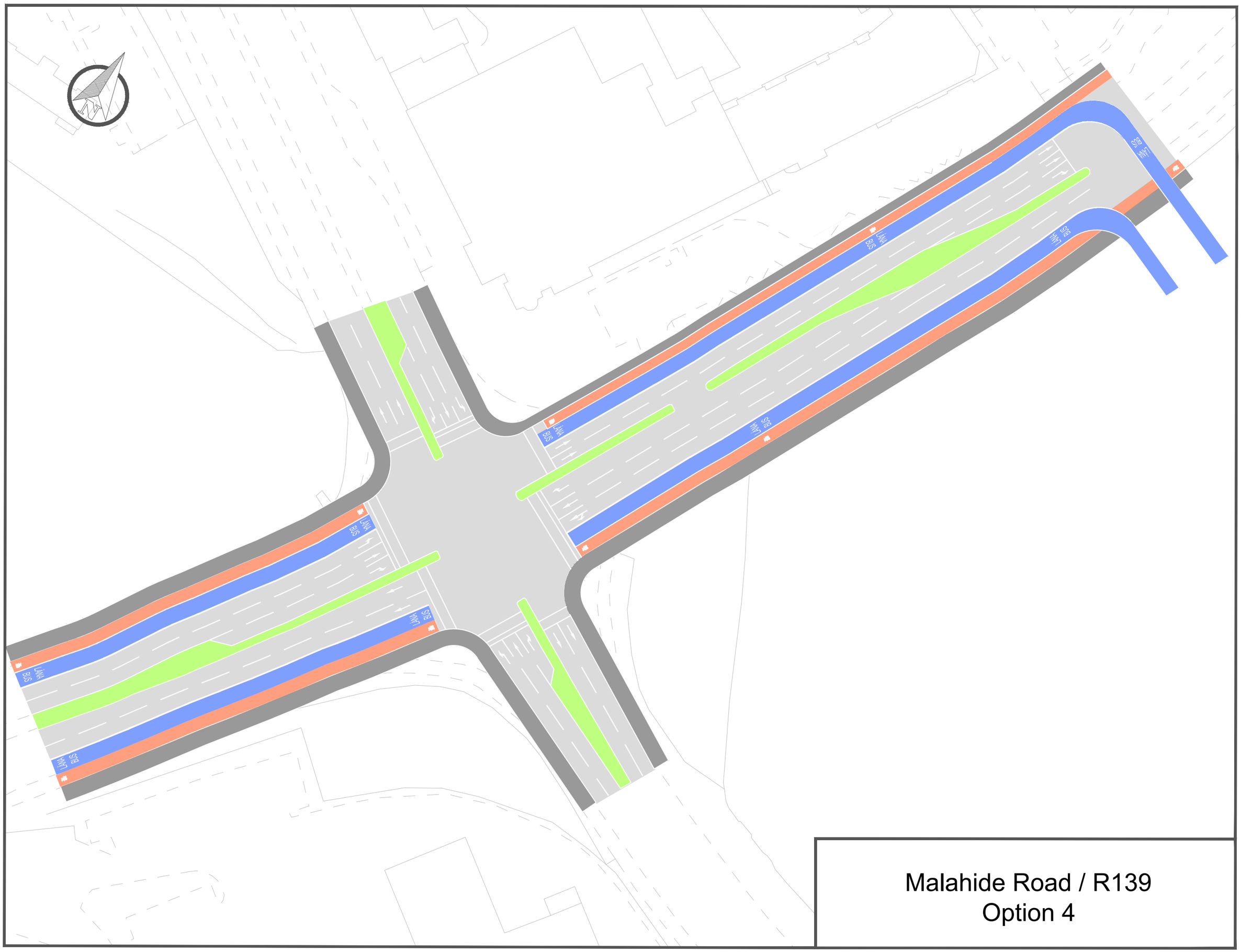
Malahide Road / R139
Option 1



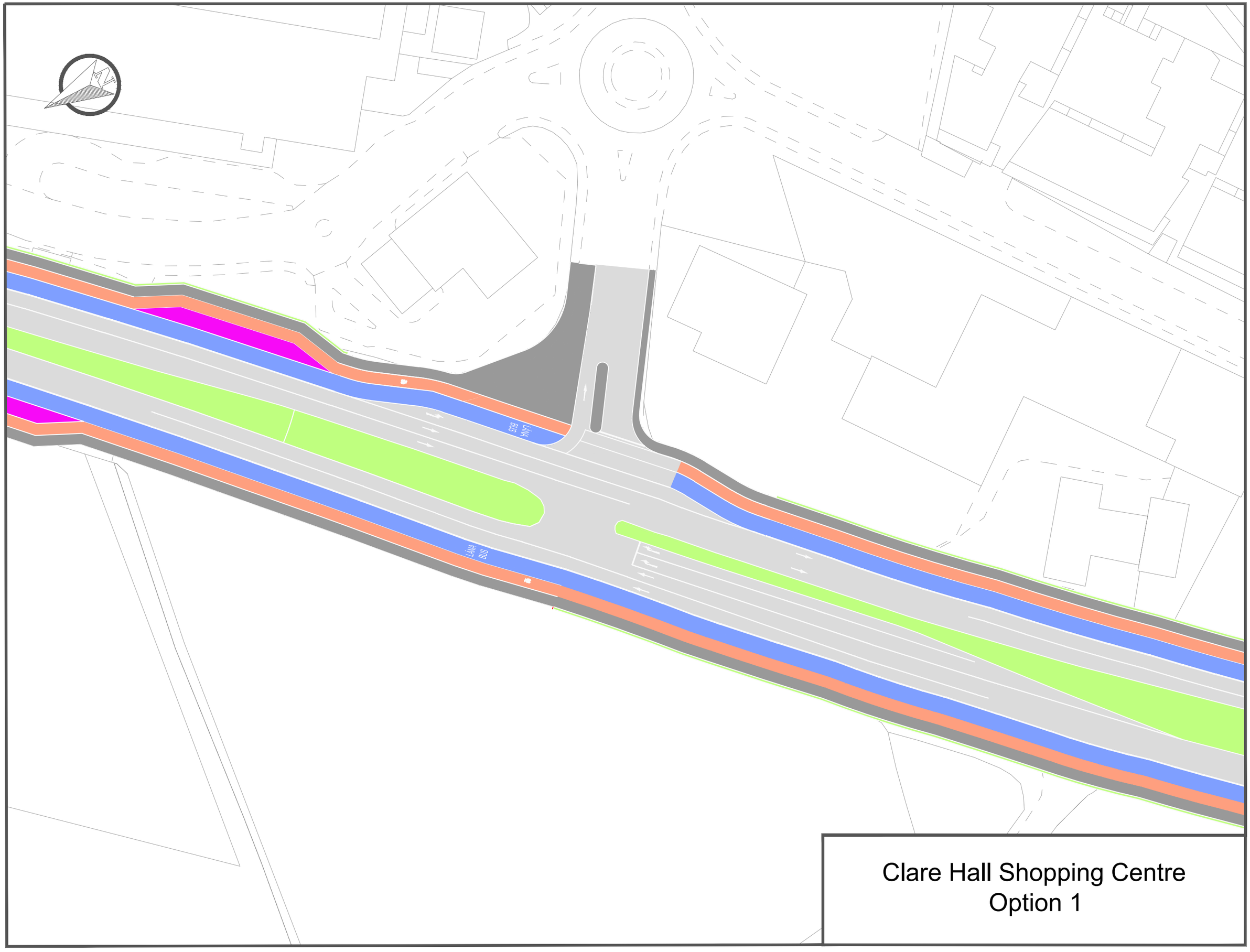
Malahide Road / R139
Option 2



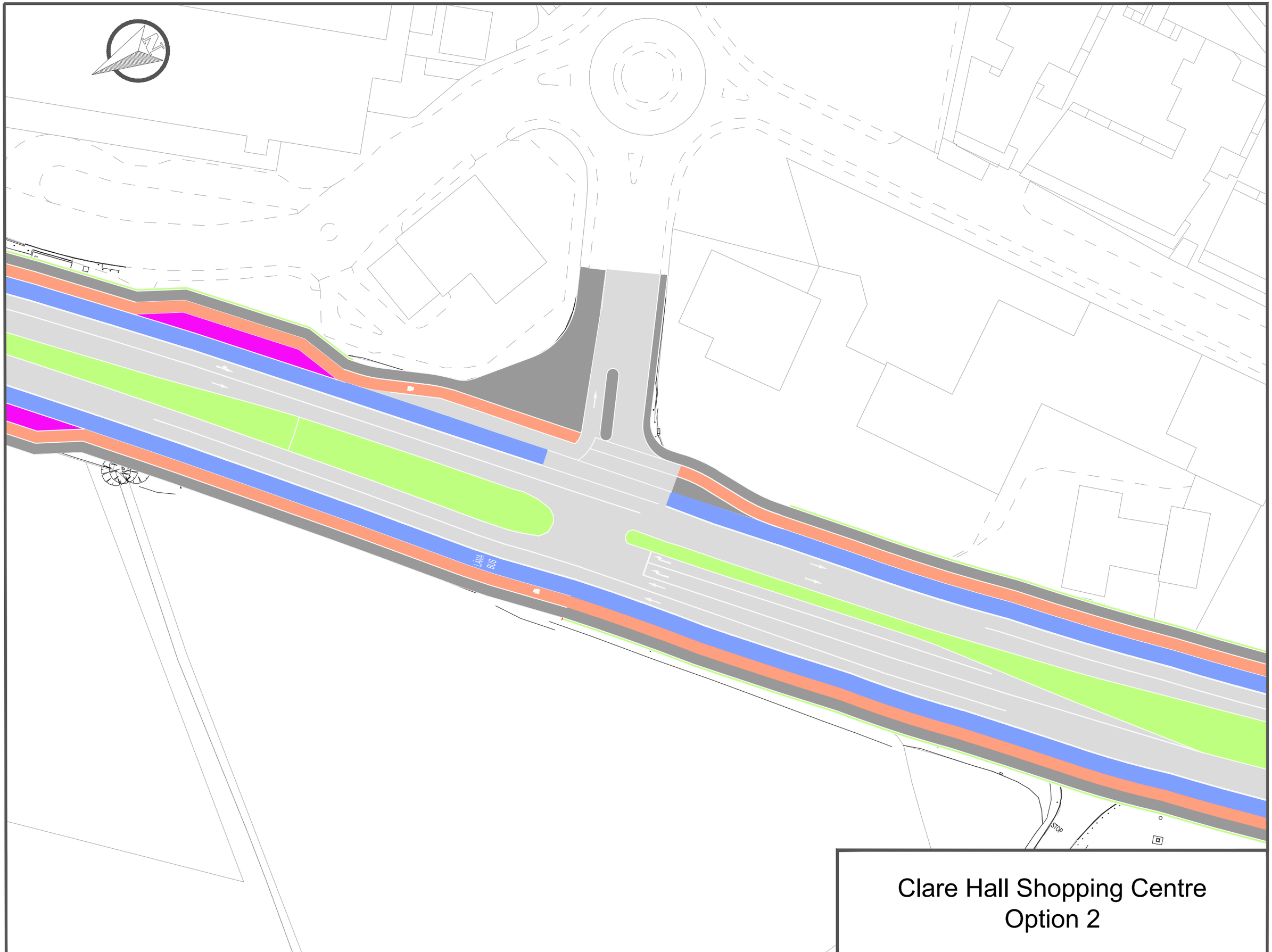
Malahide Road / R139
Option 3



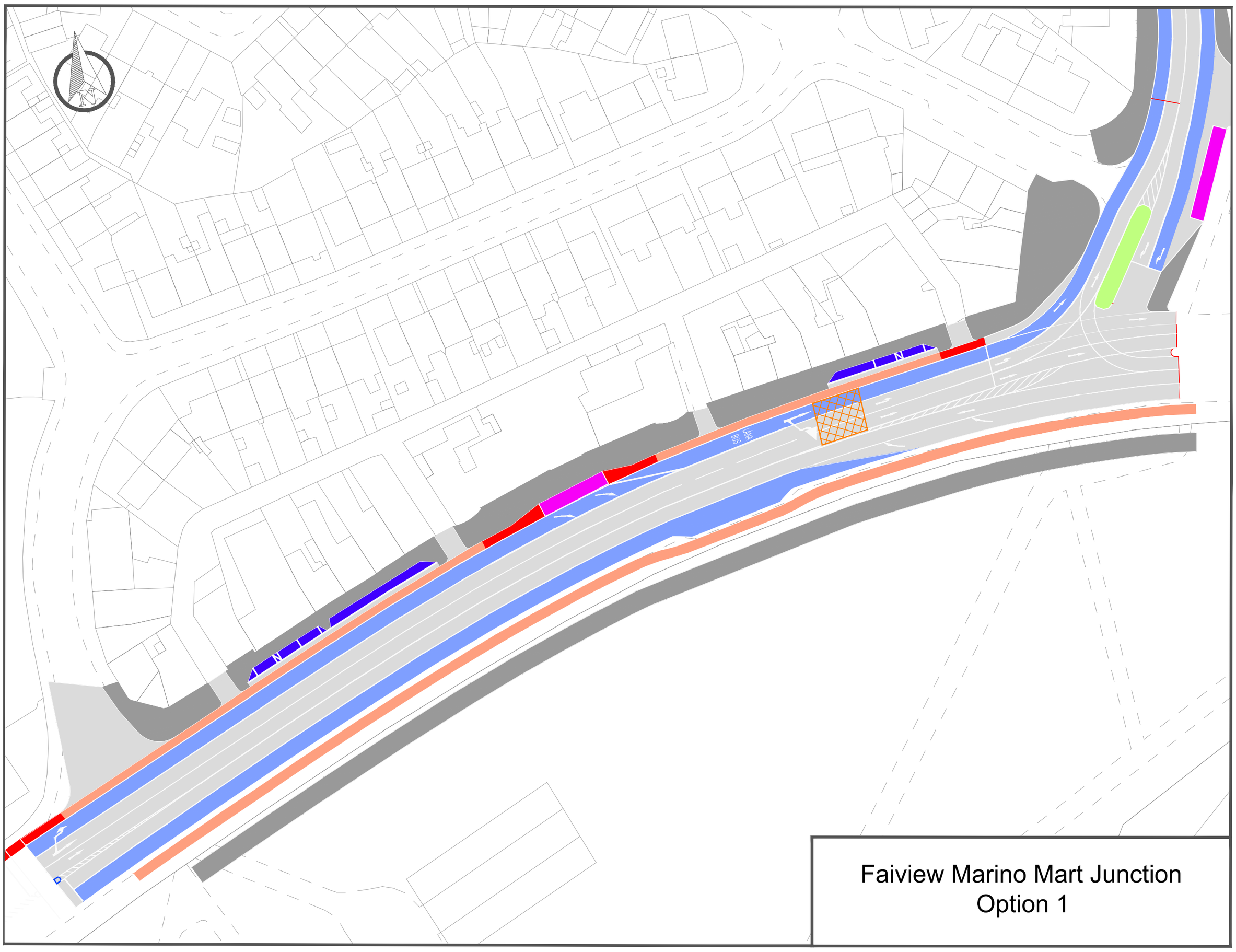
Malahide Road / R139
Option 4



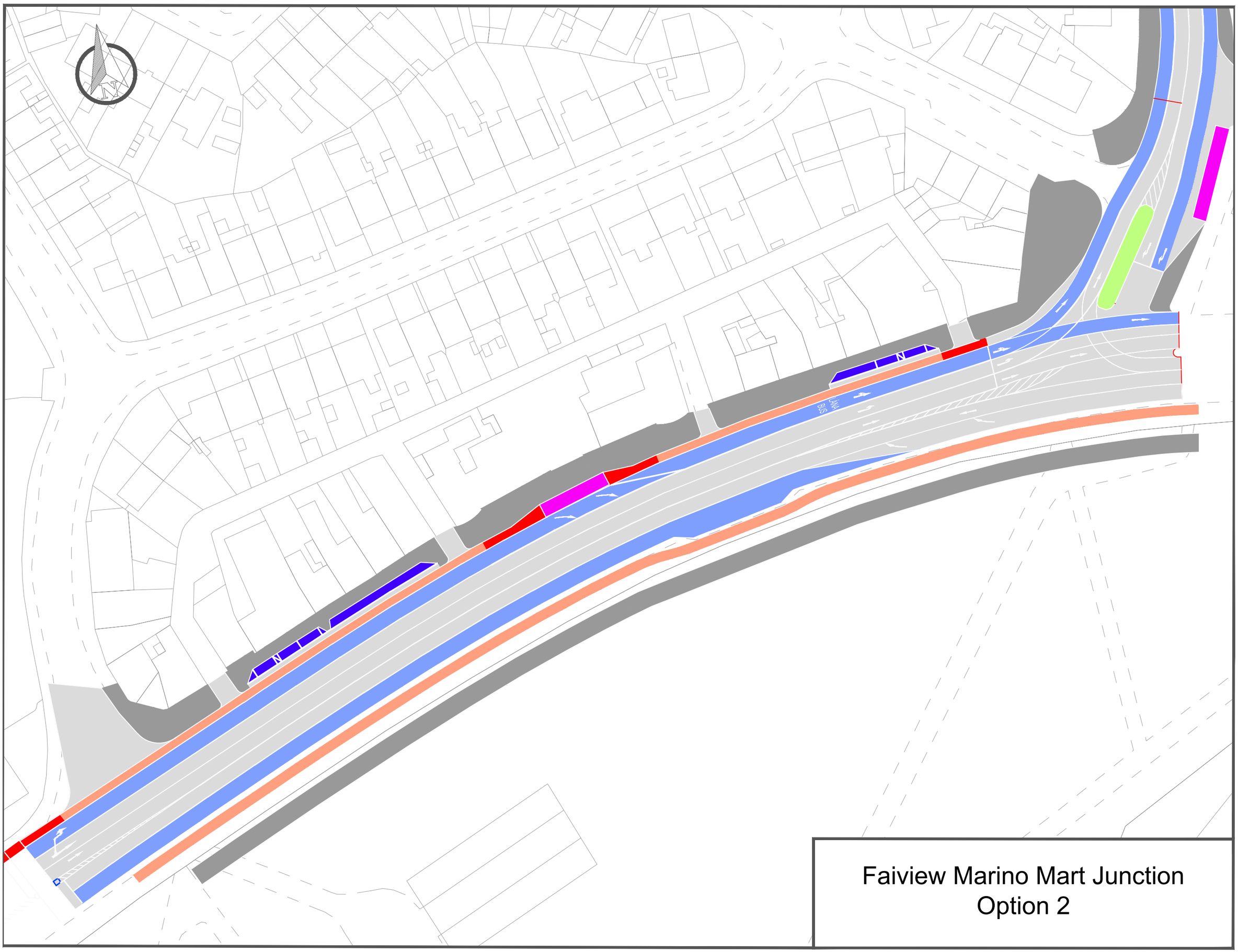
Clare Hall Shopping Centre
Option 1



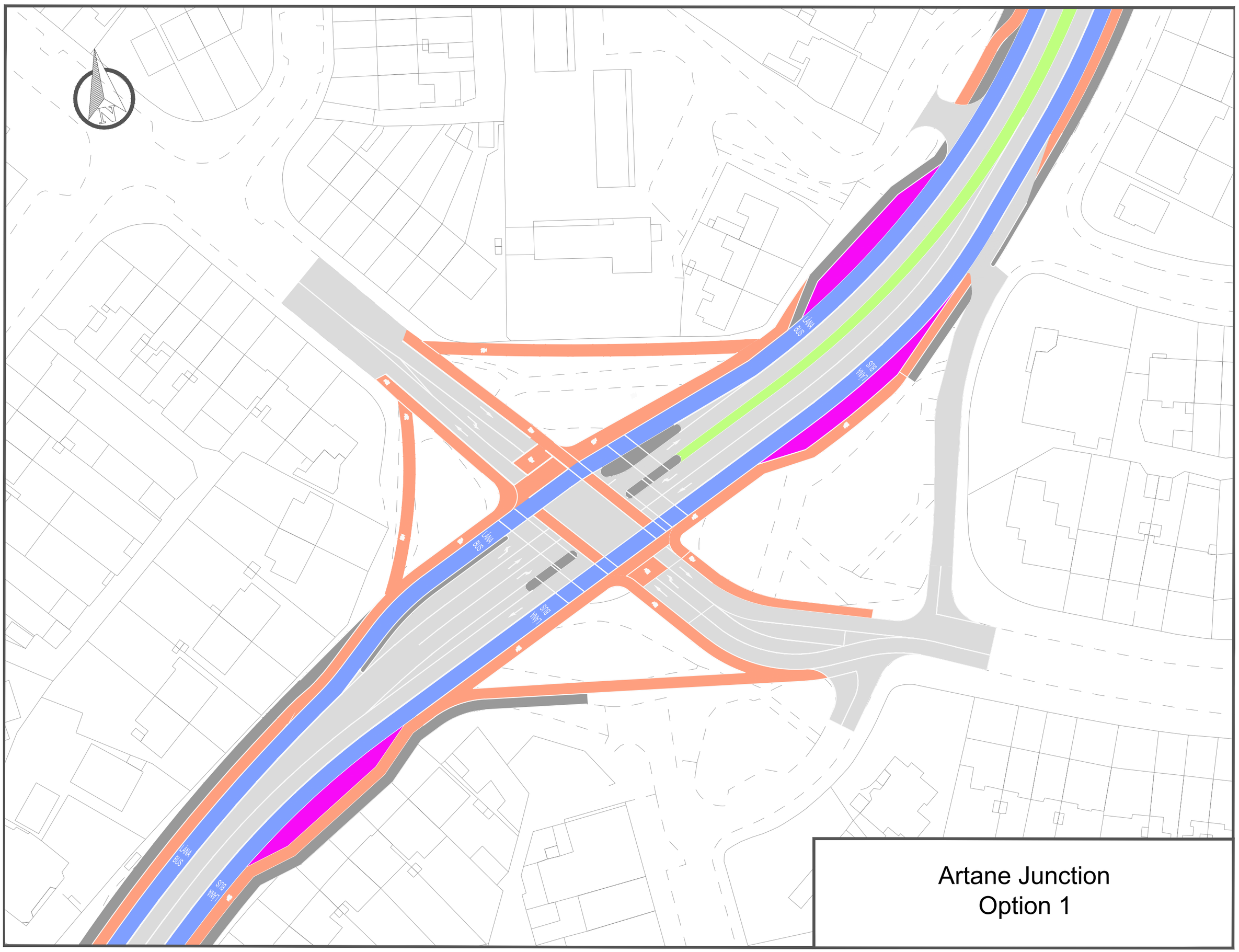
Clare Hall Shopping Centre
Option 2



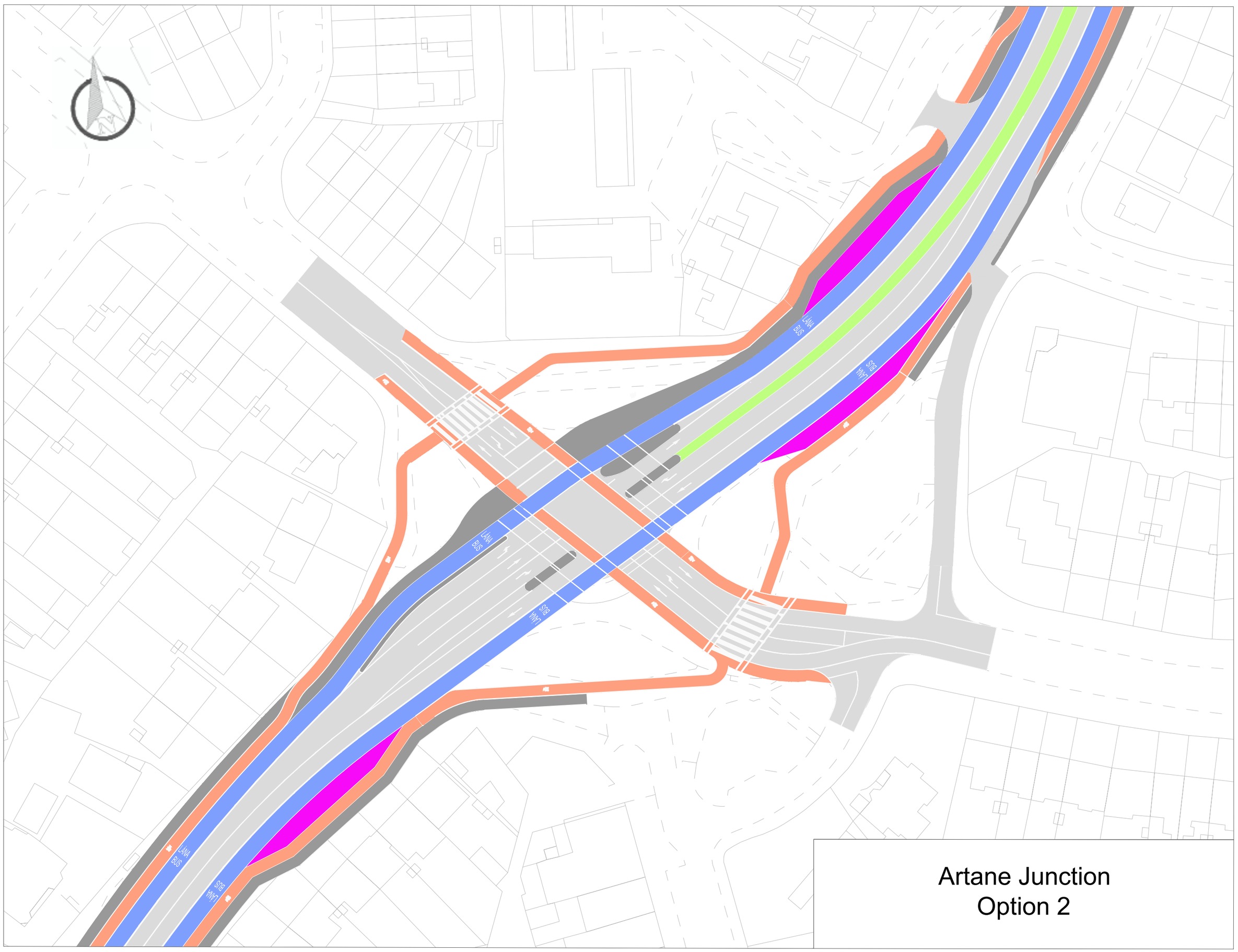
Faiview Marino Mart Junction
Option 1



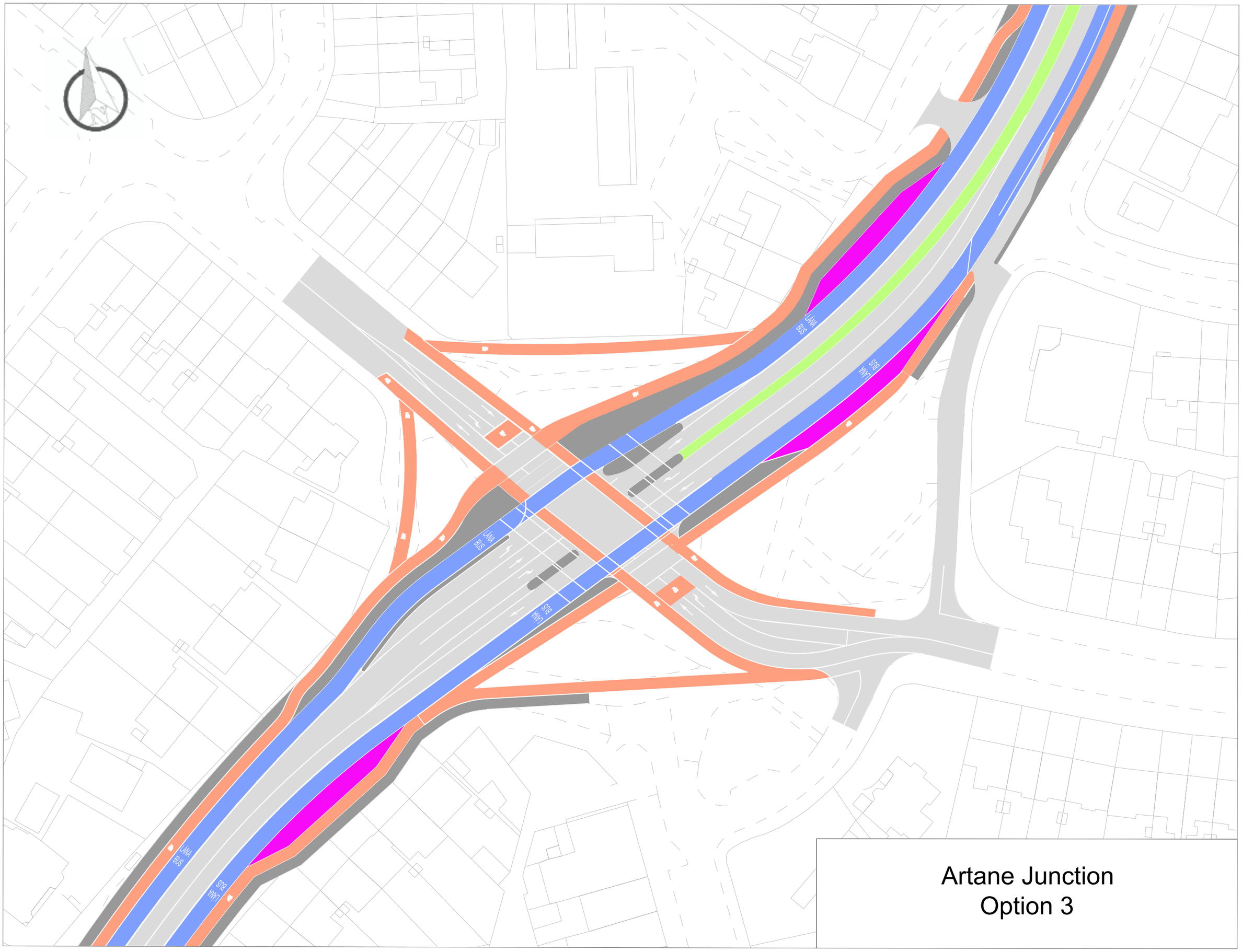
Faiview Marino Mart Junction
Option 2



Artane Junction
Option 1



Artane Junction
Option 2



Artane Junction
Option 3