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Comhairle Contae Chill Dara
Kildare County Council

M4 Eastbound Bus Priority Measures Pilot Project

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Part 8 Report

October 2022

Comhairle Contae
Átha Cliath Theas
South Dublin County Council

NTA
Údarás Náisiúnta Iompair
National Transport Authority

TII
Bonneagar Iompair Éireann
Transport Infrastructure Ireland

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Kildare County Council

M4 Eastbound Bus Priority Measures Pilot Project

Part 8 Planning Report

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1 Introduction

1.1 Background

Kildare County Council is seeking Part 8 planning approval for the provision of bus priority measures on the M4/N4 corridor. The project is referred to as the *M4 Eastbound Bus Priority Measures Pilot* project. The terms of reference for the Pilot project targets the provision of bus priority measures in the eastbound direction that can be used by buses and coaches to avoid congested traffic lanes. Arup has been commissioned by Kildare County Council to prepare Part 8 planning documentation.

1.1.1 Accompanying Information

This report should be read in conjunction with the following drawings which form part of this Planning Application:

- Part 8 Planning Site Location Map (272691-ARUP-07-CF-DR-CH-000050-000053) contained in Appendix A;
- Part 8 Planning General Arrangement Drawings (272691-ARUP-07-CF-DR-CH-000060 to 272691-ARUP-07-CF-DR-CH-000066) contained in Appendix B;
- Part 8 Planning Typical Cross Section Drawings (272691-ARUP-07-CF-DR-CH-000052 and 272691-ARUP-07-CF-DR-CH-000053) contained in Appendix B; and
- Part 8 Planning Typical Cross Section Graphics (272691-ARUP-07-CF-DR-CH-000055 and 272691-ARUP-07-CF-DR-CH-000056) also contained in Appendix B.

Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) Screening reports have also been prepared as part of this application process.

2 Site Context

2.1 Location and Context

The proposed development extends from Junction 7 Maynooth to Junction 5 Leixlip/Junction 4A in the eastbound direction. Refer to Figure 2.1 for the proposed development boundary. Refer also to the Part 8 Planning Site Location Map in Appendix A.

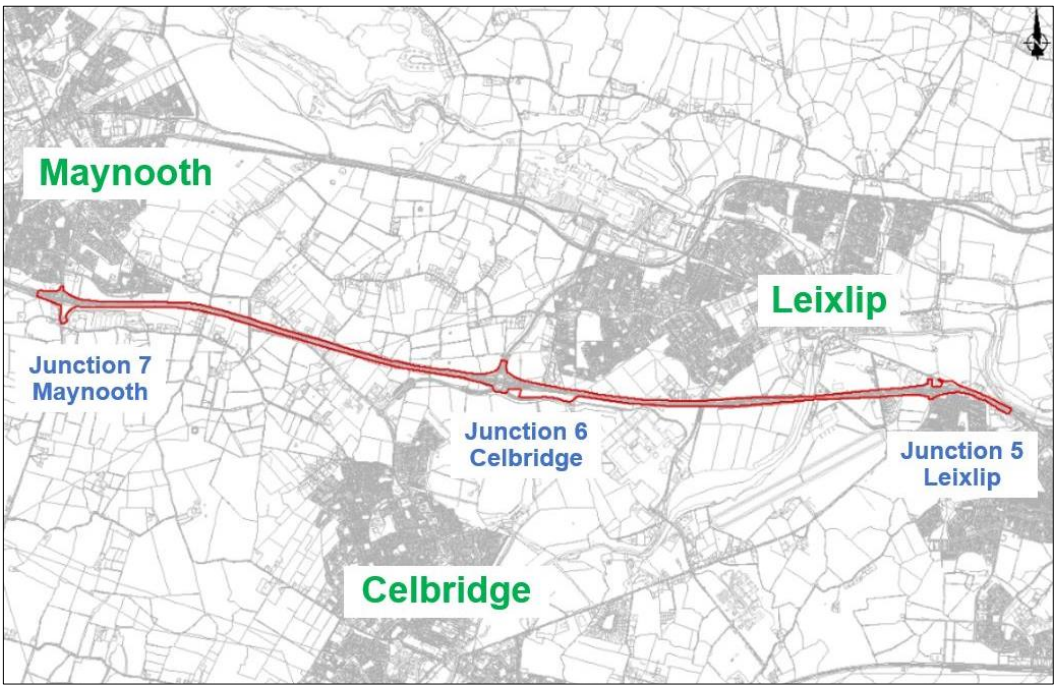


Figure 2.1: Proposed Development Boundary (© Google Map Data ©2021 Tele Atlas)

The proposed development is specifically focused on the existing M4/N4 as a basis for assessing bus priority measures. In general, piloting eastbound bus priority measures would have the greater potential commuter benefits and ability to promote a modal shift in the first instance in comparison to a westbound only service.

The proposed development will aim to identify a practicable and safe means of implementing priority for bus movement within the existing road constraints to the largest extent possible.

Within the context of sustainability in transport, measures should be investigated to encourage a modal shift from car reliance to public transport. Therefore, TII decided to examine the introduction of bus priority measures on one of the main Dublin arterial routes as a pilot project in the advancement of this principle. The NTA's *Draft Transport Strategy for the Greater Dublin Area 2022 – 2042* identifies six regional bus corridors forming part of a Core Bus Network for the overall region. This project aims to deliver a pilot along one of these regional corridors, the M4/N4 between Maynooth and Leixlip, and deliver upon the NTA Transport Strategy for the Greater Dublin Area (refer to Section 2.2). The project is being developed in conjunction with the National Transport Authority (NTA).

2.2 GDA Strategy

The NTA's *Draft Transport Strategy for the Greater Dublin Area 2022 – 2042* (hereafter, the *GDA Strategy*) identifies six regional bus corridors forming part of a Core Bus Network for the overall region. This core network is intended to serve significant origins and destinations within the Greater Dublin Area (GDA), particularly those that are not directly served by heavy rail and light rail. The Core Bus Network will also provide greater opportunity for reliable and convenient interchange with other transport modes. As outlined in the *GDA Strategy*, in order to develop an efficient, reliable, and effective bus system, the Core Bus Network should be developed to achieve:

- Continuous priority for bus movement on the portions of the Core Bus Network;
- Enhanced bus priority provision on these corridors; and
- Removal of current delays on the bus network, enabling the bus to provide a faster alternative to car traffic along these routes.

A more efficient core bus system with faster bus journeys means that more people can be moved with the same level of vehicles and driver resources.

2.3 Existing Road Network

The M4/N4 network forms part of the Trans-European Transport Network (TEN-T) comprehensive network.

The hard shoulder bus priority measures commence at Junction 7 Maynooth as eastbound peak time congestion can extend to this location. Additionally, the Annual Average Daily Traffic (AADT) between Junction 7 and Junction 5 is between 59,000 and 70,000. The AADT west of Junction 7 is significantly lower at 46,000.

Level of Service D for a wide motorway divided 2+2 is 55,500 AADT as per Table 6.1 of TII Publication DN-GEO-03031. DN-GEO-03031 further states that, at Level of Service D, speeds begin to reduce with slight increase in traffic volume and density. Freedom to manoeuvre within the traffic stream is restricted and the driver experiences reduced comfort levels. With observed AADT's of >55,500 east of Junction 7, it provides a justification for commencing the hard shoulder bus priority measures at this location.

2.4 Mainline Cross Section

The existing M4/N4 cross section varies minimally over the length of the proposed development. As a motorway, the cross section should, as a minimum, comply with the requirement of TII detail CC-SCD-00008 as presented in Figure 2.2.

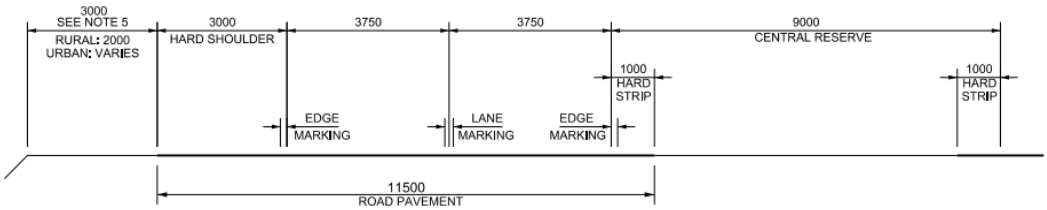


Figure 2.2: Wide Dual Carriageway Motorway (D2M) (TII Publications)

Initial investigation indicates that the M4/N4 cross section comprises of the above TII detail with a central reserve of 7m in some areas reduced from the nominated 9m as per CC-SCD-00008 and lane widths between 3.65m and 3.75m.

2.5 Existing Junctions and Accesses

There are three junctions within the proposed development boundary.

2.5.1 Junction 7 – Maynooth

Junction 7 Maynooth is a grade separated junction located towards the west of the proposed development boundary. A schematic is shown in Figure 2.3 and an aerial view shown in Figure 2.4. It serves Maynooth to the north via the R406 and Straffan to the south, also via the R406.

The westbound diverge is a standard 1 lane slip road connecting to the Straffan Road Roundabout. The westbound merge, eastbound merge and eastbound diverge are all a standard 1 lane slip road. The overbridge incorporates 1 No. northbound lane, 1 No. southbound lane, 1 No. right-turn lane and 2 No. footways.

The Straffan Road Roundabout also incorporates access to Maynooth Business Campus to the east and a number of local businesses to the west.

Site observations indicate high volumes of vulnerable road users accessing Maynooth Business Park to the south of the junction from Maynooth town. These users need to navigate through the junction where they will interface with traffic using the slip roads and the Straffan Road Roundabout.

Observed driver behaviour onsite also noted, as a result of congestion at peak times, drivers using the eastbound diverge planning to turning right towards Straffan had reduced opportunities for cross the junction and some turned left at the top of the slip road and undertook a U-turn at Barton Transport to proceed towards Straffan.

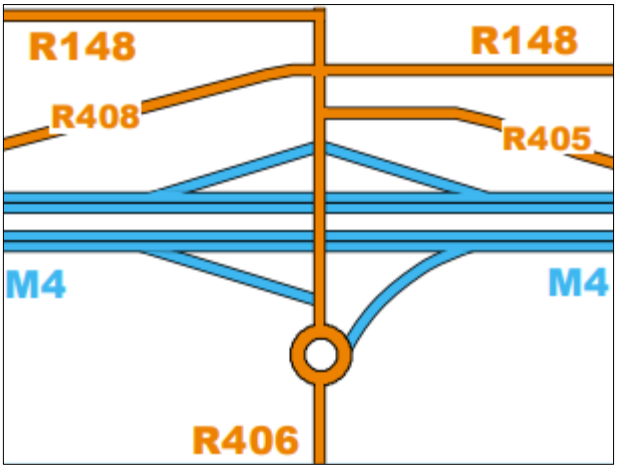


Figure 2.3: Junction 7 Maynooth – Schematic (www.tii.ie/tii-library/Network_Management/Junction%20Layout%20Maps/M4-Junctions.pdf)

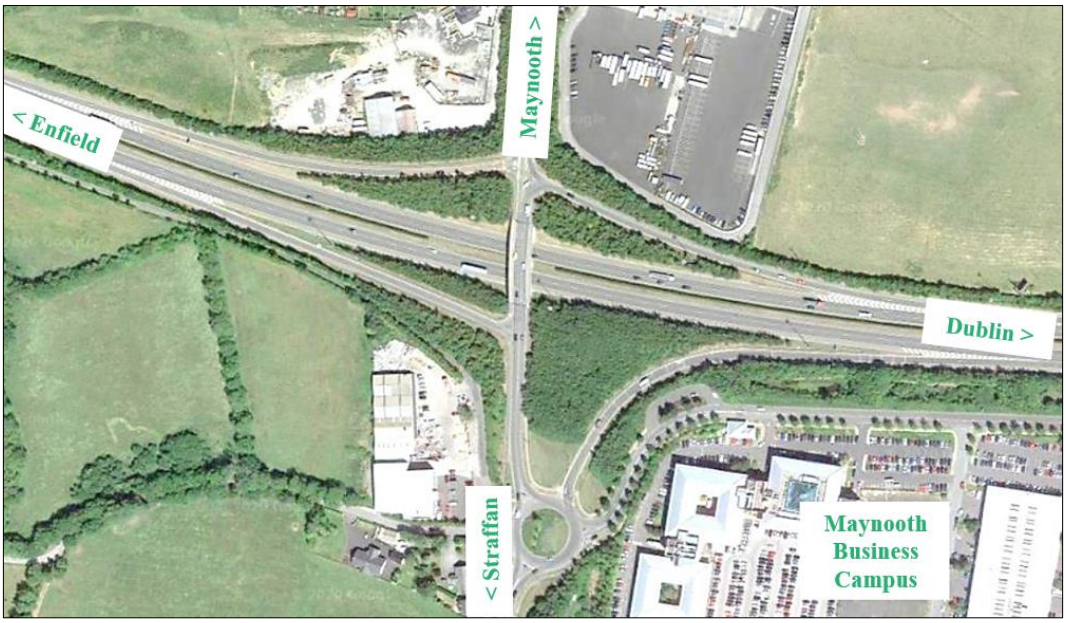


Figure 2.4: Junction 7 Maynooth – Aerial (© Google Imagery ©2021 DigitalGlobe)

2.5.2 Junction 6 – Celbridge

Junction 6 Celbridge is located centrally within the proposed development boundary. A schematic is shown in Figure 2.5 and an aerial view shown in Figure 2.6.

It serves Intel Ireland, located west of Leixlip town and north of Junction 6 via the R449 and Celbridge and the Liffey Business Campus to the south via the R449 and an access road respectively. It is a grade separated 2 lane rotary junction with a roundabout to the north.

The rotary overbridge incorporates 2 No. traffic lanes throughout. The R449 Leixlip Road to the north of the junction incorporates 2 No. traffic lanes, footway, and cycleway in each direction along the entire length to the R148. There is a free-flow slip-road from the R449 to the M4 eastbound.

The R449 Celbridge Road to the south of the junction incorporates 1 No. traffic lane, footway, and cycleway in each direction along the entire length to the R405. The Liffey Business Campus access road to the south of the junction incorporates 1 No. traffic lane, footway, and cycleway in each direction along the entire length to the campus site.

The westbound merge is a standard 1 lane slip road. The eastbound merge incorporates 2 No. traffic lanes at the start and immediately prior the nose of the slip road, the left-hand slip lanes merges into one lane. From here the slip road is a typical standard 1 lane slip road. The westbound diverge incorporates 2 No. traffic lanes with a left-hand slip road to the Liffey Business Campus. The eastbound diverge incorporates 2 No. traffic lanes.

The junction also makes provision for vulnerable road users with footpaths, cycle facilities and uncontrolled crossing points to allow vulnerable road users traverse the junction.

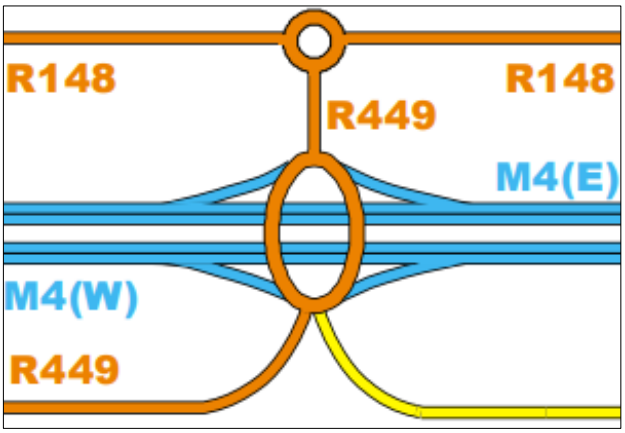


Figure 2.5: Junction 6 Celbridge – Schematic (www.tii.ie/tii-library/Network_Management/Junction%20Layout%20Maps/M4-Junctions.pdf)

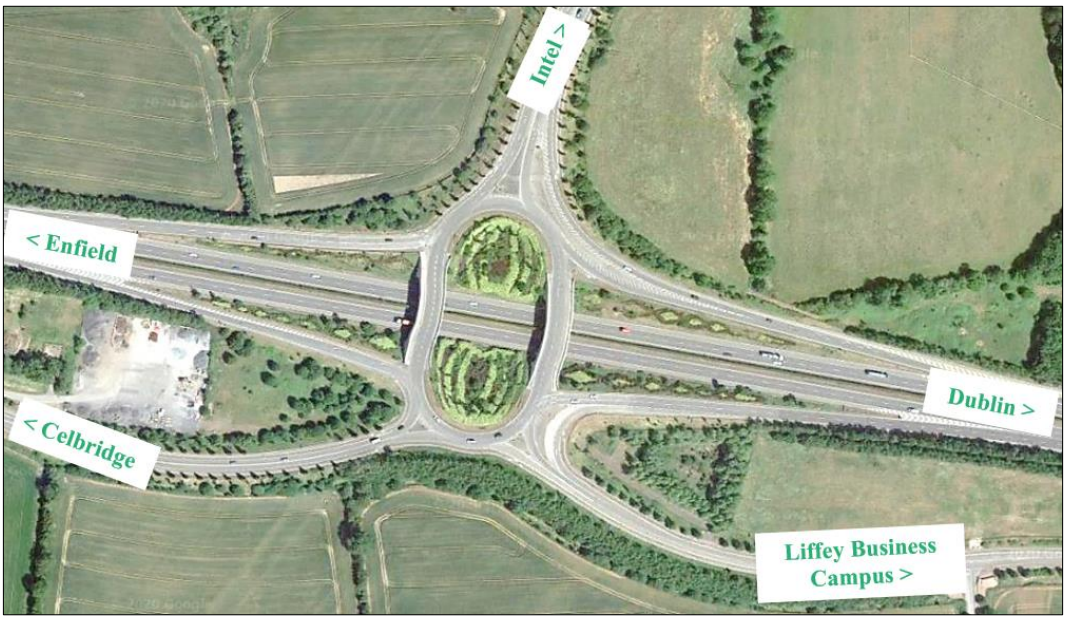


Figure 2.6: Junction 6 Celbridge – Aerial (© Google Imagery ©2021 DigitalGlobe)

2.5.3 Junction 5 – Leixlip

Junction 5 Leixlip is located towards the east of the proposed development boundary. A schematic is shown in Figure 2.7 and an aerial view shown in Figure 2.8. It serves Leixlip to the north via the R148 and Celbridge to the south via the R403. It is a grade separated junction with a dumbbell roundabout to the north and signalised junction to the south.

The eastbound diverge and westbound merge are both standard 1 lane slip roads. The eastbound merge is unorthodox and is a 2-way road from the roundabout for a length of 100m to accommodate 2 No. private dwelling houses. From here to the M4/N4 eastbound mainline, it incorporates 1 No. traffic lane, 1 number bus lane, and a footway. The westbound diverge incorporates a footway, on-road cycleway and 2 No. traffic lanes. The overbridge incorporates 1 No. northbound lane, 1 No. southbound lane, 1 No. right-turn lane and 2 No. footways.

The junction is also located close to busy urban environments and provides direct access from the M4/N4 to Leixlip, Celbridge and Weston Airport.

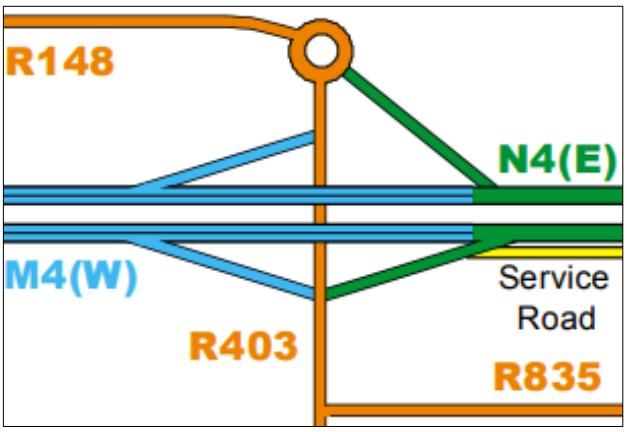


Figure 2.7: Junction 5 Leixlip – Schematic (www.tii.ie/tii-library/Network_Management/Junction%20Layout%20Maps/M4-Junctions.pdf)

Figure 2.8: Junction 5 Leixlip – Aerial (© Google Imagery ©2021 DigitalGlobe)

2.6 Existing Structures

There are a number of existing structures located within the M4/N4 corridor between Junction 7 Maynooth and Junction 5 Leixlip, comprising a river crossing, a footbridge, road overbridges and gantries. The structure locations are shown in Figure 2.9 and listed in Table 2.1.

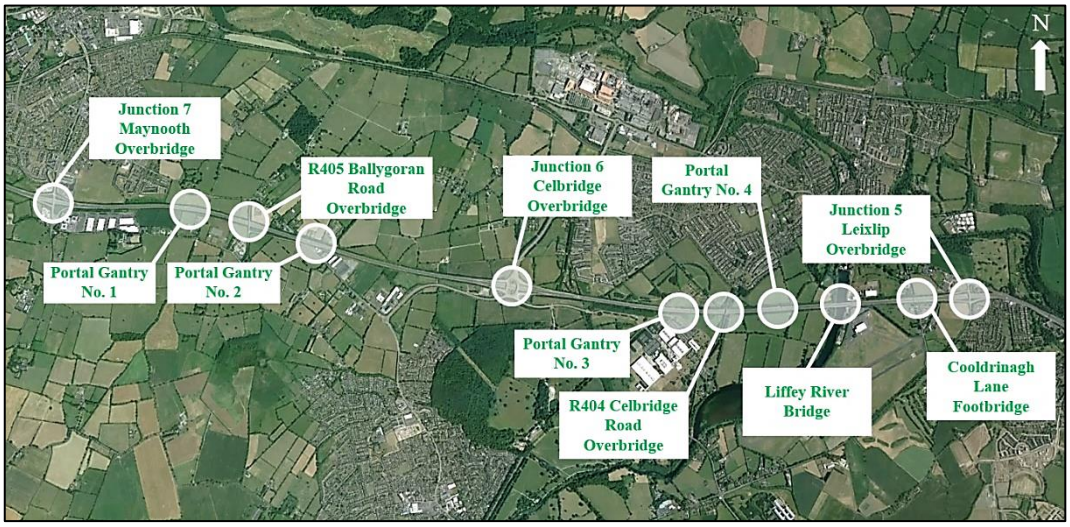


Figure 2.9: Structure Locations (© Google Imagery ©2021 DigitalGlobe)

Structure Reference Number	Structure Name	Structural Form	Year of Construction	Span 1 (m)	Span 2 (m)	Span 3 (m)
KE-M04-033.00	Ballygoran Road Bridge	Two Span Overbridge	1992	26.5	26.5	N/A
KE-M04-034.00	Celbridge Interchange West	Single Span Overbridge	2002	42.7	N/A	N/A
KE-M04-035.00	Celbridge Interchange East	Single Span Overbridge	2002	42.7	N/A	N/A
KE-M04-036.00	Celbridge Road Overbridge	Two Span Overbridge	1994 (2009 reconstruction)	25.9	26.1	N/A
KE-M04-037.10	Liffey Bridge North	Three Span River Bridge	1994	5.5	83.0	5.6
SD-M04-001.00	Cooldrinagh Lane Footbridge	Three Span Footbridge	1993	11.4	40.5	11.3
SD-M04-002.00	Celbridge Road Weston Park Bridge (Junction 5 Leixlip)	Two Span Overbridge	1993	22.5	22.5	NA

Table 2.1: Existing Structures within Proposed Development Boundary

In addition to the bridges identified above, there are four portal gantry structures and two cantilever gantry structures within the proposed development boundary.

A review of the latest Eirspan inspection reports was carried out for the existing bridges along this route.

All bridges appear to be in a good condition overall with no deterioration identified which would impact on the introduction of bus priority measures.

2.7 Existing Bus Usage on M4/N4 and Surrounding Area

The population centres within the proposed development boundary are reliant on the bus network to a considerable degree with a variety of routes served by Dublin Bus, Bus Eireann, Go Ahead and private operators.

- **Dublin Bus Route 66:** Operates from Merrion Square to Maynooth Straffan road via Parkgate Street, Chapelizod, Lucan Village and Leixlip Village with frequency up to every 30 minutes.
- **Dublin Bus Route 66a:** Operates from Merrion Square to Leixlip Captains Hill via O Connell Bridge, Parkgate Street, Chapelizod, Liffey Valley Shopping Centre and Lucan Village with frequency up to every hour.
- **Dublin Bus Route 66b:** Operates from Merrion Square to Castletown (Hewlett Packard) via O Connell Bridge, Parkgate Street, Chapelizod, Liffey Valley Shopping Centre, Lucan Village and Leixlip Village with frequency up to every hour.
- **Dublin Bus Route 66e:** Operates from Merrion Square to Maynooth via Parkgate Street, Chapelizod, Liffey, Lucan Village and Leixlip Village five services during the weekdays only.
- **Dublin Bus Route 66x:** Operates from UCD Belfield to Maynooth Straffan Road with three services during weekdays only. Operates from UCD Belfield to Captains Hill or Castletown Rd one service each during the weekdays only. Operates from Westmoreland Street to Straffan Road two services during weekdays only.
- **Dublin Bus Route 67:** Operates from Merrion Square to Maynooth Straffan road via O'Connell Bridge, Parkgate Street, Chapelizod, Liffey Valley Shopping Centre, Lucan Village and Celbridge with frequency up to every 30 minutes. Last service of the day departs from Westmoreland Street.
- **Dublin Bus Route 67x:** Operates from UCD Belfield to Maynooth (via Aghards Road) through Celbridge Salesian College with four services during the weekdays only. Operates from UCD Belfield to Maynooth (via Celbridge Main Street) through Celbridge Salesian College, with two services during the weekdays only. Operates from Westmoreland Street to Maynooth (via Celbridge Main Street) through Celbridge Salesian College with two services during the weekdays only. Operates from Merrion Square to Maynooth (via Celbridge Main Street) through Celbridge Salesian College with one service during the weekdays only. Operates from Merrion Square to Maynooth (via Aghards Road) through Celbridge Salesian College with one service during the weekdays only.

- **Dublin Bus 66n:** Operates from Westmoreland Street to Leixlip Louisa Bridge via Glen Easton. Night bus with 5 services on Friday and Saturday night only.
- **Dublin Bus 67n:** Operates from Westmoreland Street to Celbridge/Maynooth. Night bus with 4 services on Friday and Saturday night only.
- **Bus Eireann 20:** Operates from Dublin Airport to Galway, with five services through Maynooth daily.
- **Bus Eireann 22:** Operates from Dublin Airport/Dublin Busarus to Ballina with seven services through Maynooth daily.
- **Bus Eireann 23:** Operates from Dublin Airport/Dublin Busarus to Sligo with two to three services through Maynooth daily.
- **Bus Eireann 115:** Operates from Dublin Connolly to Mullingar via Maynooth with service frequencies of 30 minutes.
- **Bus Eireann 115C:** Operates from Kilcock to Mullingar with one service through Maynooth daily.
- **Go Ahead 120:** Operates from Dublin Connolly to Edenderry via Celbridge with service frequencies of 30 minutes.
- **JJ Kavanagh & Sons 139:** Operates from Blanchardstown IT to Naas via Leixlip and Maynooth.
- **Kearns:** 847 Operates from Portumna to Dublin Cathal Brugha Street with two service through Maynooth during the weekdays and 2-4 services on the weekend. Kearns NUM02 Operates during college term only from Birr to Maynooth.
- **Airport Hopper 767:** Operates from Maynooth to Dublin Airport via Leixlip with service frequencies of 30 minutes.
- **Maynooth TAL02:** Operates from Maynooth to IT Tallaght via Leixlip and Celbridge.

The bus services which use this section of the M4/N4 are shown in Table 2.2.

Bus Provider	Route Description
Bus Eireann	115: Kilcock_ Abbeyfield Estate to Custom House Quay (Jurys Inn)
Bus Eireann	115: Mullingar_ Outside Train Station to Custom House Quay (Jurys Inn)
Bus Eireann	120: Clane (Esso Garage) to Dublin (St Stephens Green)
Bus Eireann	20: Eyre Square_ Galway Bus Station to Dublin Airport
Bus Eireann	22: Ballina_ Ballina Bus Station to Dublin Airport
Bus Eireann	23: Sligo_ Sligo Bus Station to Busáras
Bus Eireann	845: Birr_ Birr Square to Leeson St. Lr. Stephens Hall Hotel
Kearns Transport	845: Enfield_ Main Street to Leeson St. Lr. Stephens Hall Hotel
Go Bus	Galway Bus Station to Dublin Airport
Citylink	Galway Bus Station to Dublin Airport

Table 2.2: Bus Services utilising the M4/N4

2.7.1 BusConnects

BusConnects is an extensive programme of priority investment for public transport which plans to fundamentally transform Dublin's bus system. The objective of BusConnects is to develop the radial and orbital bus corridors as identified in the NTA Transport Strategy for the Greater Dublin Area 2022 – 2042, so that each will have continuous bus priority.

BusConnects seeks the development of a more attractive and convenient bus service with greater scope for interconnection between routes, where connecting passengers do not necessarily have to travel to Dublin City Centre. The proposed bus network for the west region is shown in Figure 2.10.

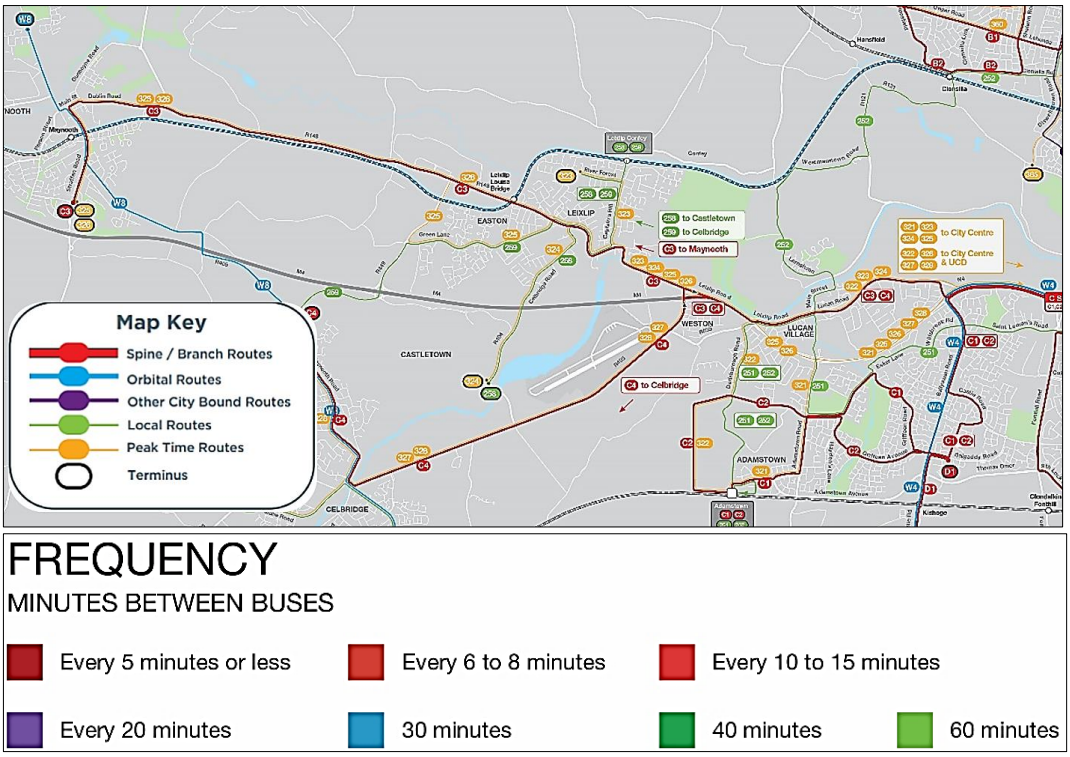


Figure 2.10: Proposed Bus Network for Overall West Region (https://busconnects.ie/)

The proposed bus network for Maynooth, Leixlip and Celbridge is shown in Figure 2.11

2.7.1.1 BusConnects Proposal for Maynooth and Leixlip

The BusConnects proposal for weekday midday frequencies for Maynooth and Leixlip are as follows:

- Bus service every 20 to 25 minutes for Maynooth;
- Orbital bus service every 30 minutes for both Maynooth and Leixlip; and
- Bus service every 10 to 15 minutes for Leixlip. This is comprised of 2 No. 20 to 25-minute services

These locations are also served by commuter rail service every 30 minutes.

2.7.1.2 BusConnects Proposal for Celbridge

The BusConnects proposal for weekday midday frequencies for Celbridge is as follows:

- Bus service every 20 to 25 minutes; and
- Orbital bus services every 30 minutes.

This location also has a rail service greater than 30-minute frequencies.

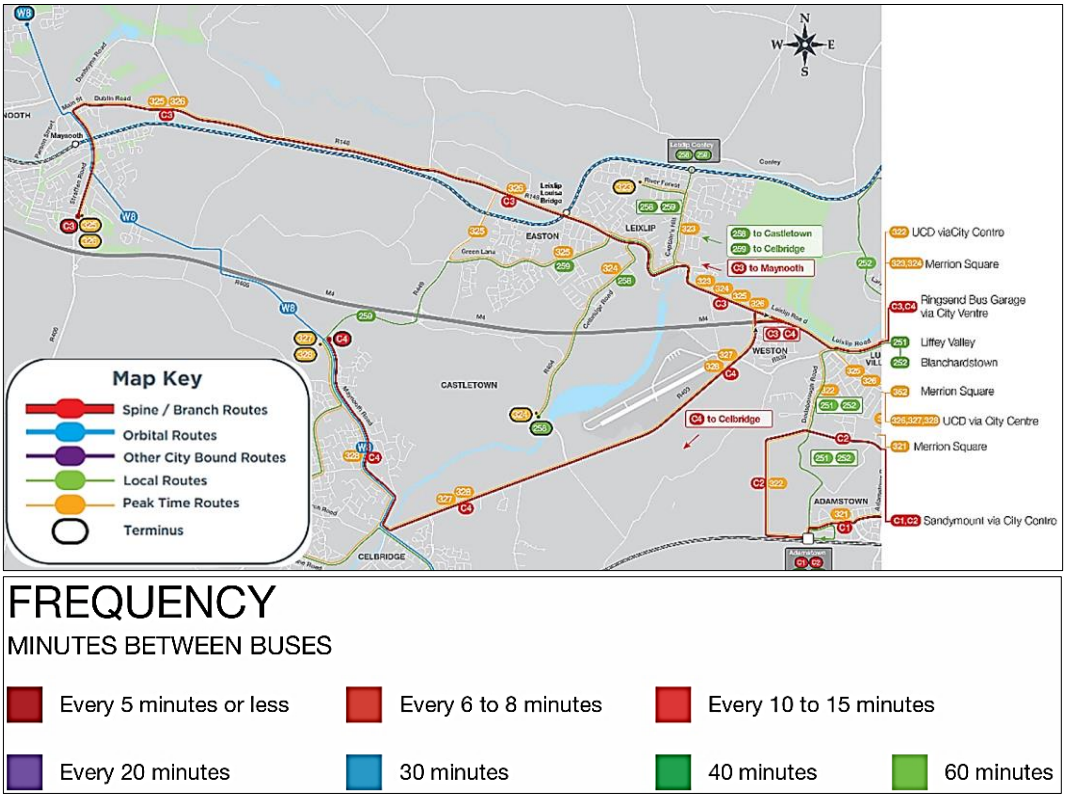


Figure 2.11: Proposed Bus Network for Maynooth, Leixlip and Celbridge (https://busconnects.ie/)

3 Planning and Legislative Context

3.1 National Planning Policy

3.1.1 National Development Plan 2021-2030

The National Development Plan 2021-2030 was published by the Government of Ireland on the 4th of October 2021. This sets out an investment plan for Ireland for a ten-year period whereby there are various national strategic outcomes including:

- *National Strategic Outcome 2: "Enhanced Regional Accessibility"*, which seeks to strengthen public transport connectivity between cities and large growth towns in Ireland.
- *National Strategic Outcome 4: "Sustainable Mobility"* outlines that environmentally sustainable public transport systems will enable growth and change, meet the significant increase in travel demand and urban congestion while also contributing to our national policy vision of a low-carbon economy. In relation to public transport, it is an objective to deliver key bus-based projects for cities and towns.
- National Strategic Outcome 8 ''*Transit to a Climate-Neutral and Climate Resilient Society*" has a cross-sectoral aim to address climate change via agriculture, renewable energy and more specifically to this project by providing a comprehensive integrated public transport network which will connect more people to more places.

Section 4.3 and National Policy Objective 7 of the National Planning Framework (NPF) states that, in relation to planning for Ireland's growth, there is a need to address the legacy of rapid unplanned growth in expanded commuter settlements of all sizes, including by facilitating improved sustainable transport links to the cities.

In addition to the above, the National Development Plan states for national roads protection and renewal to *"maintain and ensure the resilience of existing national road assets. This will be augmented by retrofitting/improving some national road assets, for example to provide for greater use by public transport (e.g., bus lanes)"*. The M4 Eastbound Bus Priority Measures Pilot Project aligns with this policy and will improve the resilience of the existing M4/N4 national road asset.

3.1.2 National Investment Framework for Transport in Ireland

In March 2021, the Department of Transport launched a public consultation on the draft Future Land Transport Investment Framework which is the Department's new high-level strategic framework for prioritising future investment in the land transport network. This public consultation concluded in May 2021.

The draft framework has been developed to ensure that the transport sectoral strategy is underpinned by and supports the achievement of the National Strategic Objectives set out in the National Planning Framework.

To be considered for funding, future transport projects would be required to align with four specific investment priorities established by the draft framework, namely:

- Decarbonisation;
- Protection and Renewal;
- Enhanced Regional and Rural Connectivity; and
- Mobility of People and Goods in Urban Areas.

To ensure that transport investment is delivered in a sustainable manner, the four investment priorities are supplemented by modal and intervention hierarchies, aimed at identifying solutions which are preferred from an environmental and cost-effectiveness perspective, as illustrated in Figure 3.1**Error! Reference source not found.** and Figure 3.2 below.

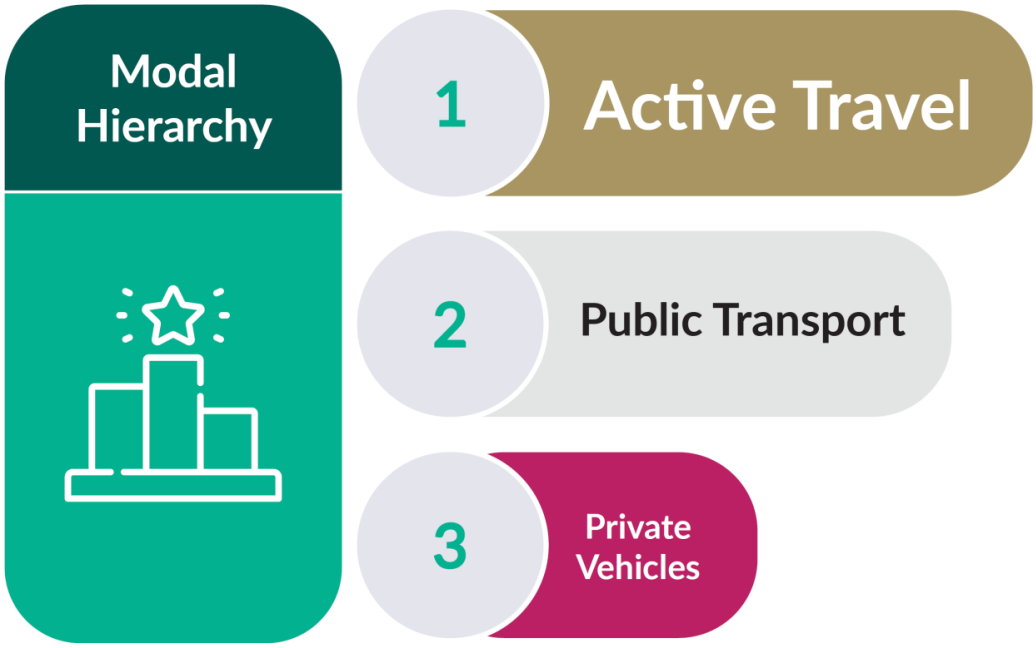


Figure 3.1: Future Land Transport Investment Framework Modal Hierarchy

The M4 Eastbound Bus Priority Measures Pilot Project will align with this modal hierarchy as it will provide a bus facility on the existing road network. This will aim to incentivise an increase in modal shift from private cars to public transport.

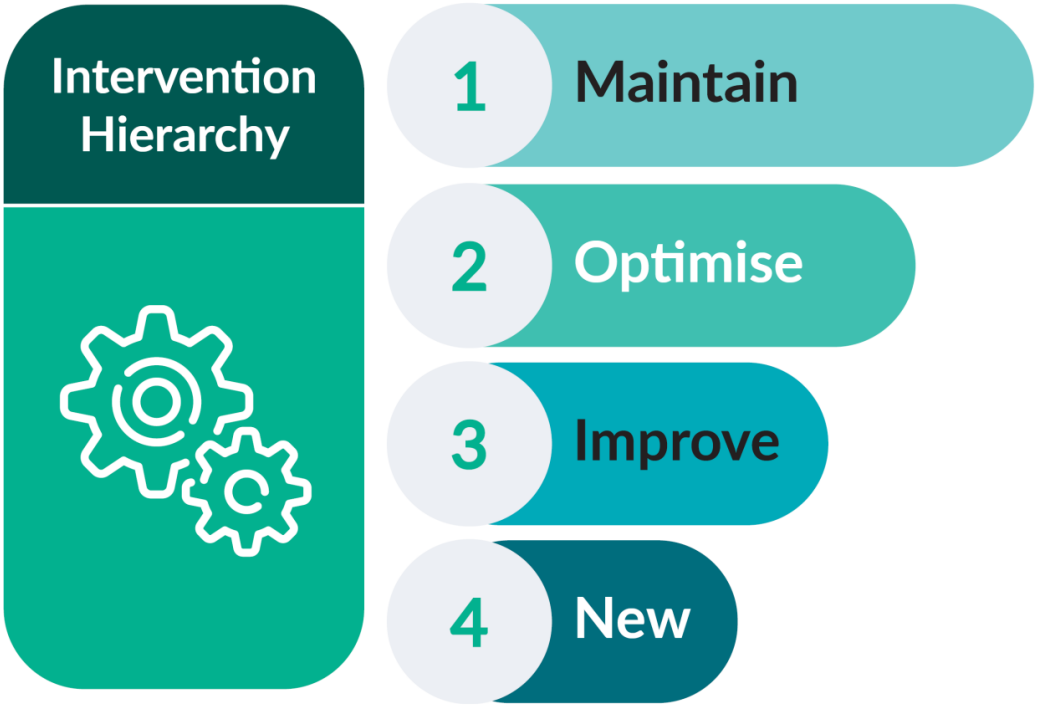


Figure 3.2: Future Land Transport Investment Framework Intervention Hierarchy

The modal hierarchy prioritises sustainable transport modes (i.e. active travel and public transport) over less sustainable modes such as the private car, whilst acknowledging that certain modes may not be conducive to all travel needs, for example, interurban travel in rural areas. The modal hierarchy seeks to encourage a shift from private transport to alternative modes in a manner that supports the investment priorities and the objectives of the Climate Action Plan.

The hierarchy of intervention aims to ensure that transport investment is proportionate to the problem identified, that the value of existing assets is maximised, and that more efficient behaviour and sustainable use of the existing network is encouraged.

The M4 Eastbound Bus Priority Measures Pilot Project will align with this intervention hierarchy as it will seek to optimise the value of the existing asset. The Pilot project will provide a public transport facility which will increase the people carrying capacity of the existing asset.

3.1.3 Smarter Travel 2009 – 2020

This transport policy document recognises the vital importance of continued investment in transport to ensure that people choose more sustainable transport modes such as walking, cycling and public transport.

- *Action 4* seeks to promote ‘‘*the delivery of public transport, cycling and promotion of more sustainable travel patterns’’* by preparing plans to retrofit urban areas.
- *Action 12* aims to ‘‘*implement more radical bus priority and traffic management measures to improve the punctuality and reliability of bus services and to support more efficient use of bus fleets*.’’

- *Action 13* sets out to ‘‘*offer a reliable urban bus service in significant urban areas’’* which requires a ‘‘*major overhaul of existing bus routes, a transparent contract system and the provision of additional buses.*’’

3.1.4 Climate Action Plan

The Government of Ireland’s Climate Action Plan 2021 was published in November 2021. The plan sets out a detailed sectoral roadmap to deliver a cumulative reduction in emissions.

The Climate Action and Low Carbon Development (Amendment) Act 2021 was published by government in July 2021. The Act sets out the national objective of transitioning to a low carbon, climate resilient and environmentally sustainable economy in the period up to 2050. The Act provides for the preparation of Sectoral Plans which will specify policies to reduce greenhouse gas emissions for each sector.

On the 14th of July 2021, the European Commission adopted a series of legislative proposals setting out how it intends to achieve climate neutrality in the EU by 2050, including the intermediate target of at least 55% net reduction in greenhouse gas emissions by 2030. The package of proposals includes revisions to the legislation put forward as part of the Climate and Energy Framework 2021-2030. Ireland’s new 2030 target is to achieve a 40% reduction of non-Emissions Trading Scheme (ETS) sector emissions on 2005 levels with annual binding limits set for each year over the period 2021-2030.

3.1.5 Spatial Planning and National Roads 2012

The Spatial Planning and National Roads: Guidelines for Planning Authorities, builds on the objective of the Smarter Travel document and sets out to achieve and maintain a safe and efficient national road network which will enhance economic growth and sustainable development across Ireland. In terms of providing for public transport, the guidelines state ‘‘effective provision for public transport modes on the road network is an important consideration in road planning”. This could entail providing appropriate capacity to cater for ‘‘road-based public transport or by incorporating specific public transport measures to ensure that the journey times of public transport vehicles are maintained notwithstanding other traffic conditions, such as bus priority and management strategies which give preference to public transport at appropriate locations.’’

3.2 Regional Planning Policy

3.2.1 Regional Spatial and Economic Strategy 2019

The Regional Spatial and Economic Strategy (RSES) 2019 – 2031 for the Eastern and Midland Regional Assembly includes 12 local authorities across nine counties, including Kildare and South County Dublin.

There are a number of regional policy objectives (RPO) supported by RSES relevant to this project, as set out below:

- *RPO 8.9 Bus Infrastructure* – The ‘‘delivery of the bus projects set out in table 8.3 subject to the outcome of appropriate environmental assessment and the planning process.’’ It is stated in Section 8.4 of the RSES that outside the Dublin area, the focus for investment in bus services will be on improving connectivity between regional settlements, including Dublin. In addition, Table 8.3 of the RSES specifically references the delivery of *Regional Bus Corridors connecting the major regional settlements to Dublin.*
- *RPO 4.33 Maynooth Key Town* – RSES states that it will ‘‘support the continued development of Maynooth, co-ordinated with the delivery of strategic infrastructure.’’
- *RPO 8.7 Mobility Management and Travel Plans* – ‘‘To promote the use of mobility management and travel plans to bring about behaviour change and more sustainable transport use.’’

3.2.2 Kildare County Development Plan 2017

The Kildare County Development Plan 2017 is the current Development Plan for County Kildare in which Maynooth and Leixlip are considered ‘‘*Large Growth Town II’’.* In chapter 6 ‘‘*Movement and Transport’’* it states that commuting patterns in Kildare heavily rely on the private car; 66% of commuters use private car transport, 18% of commuters use bus and/or rail for their daily commute and 16% of commuters walk or cycle to work, school or college. There are several policies and objectives in the Development Plan which support the proposed bus priority project between Maynooth and Leixlip.

- *SO1 Settlement Strategy* – Kildare County Council ‘*‘support the sustainable long-term growth of the Metropolitan Area towns of Leixlip, Maynooth, Celbridge and Kilcock and zone additional lands, where appropriate, to meet the requirements of the Core Strategy and Settlement Hierarchy of this Plan.”*
- *SO12 Settlement Strategy* – ‘‘*The future growth strategy for Leixlip should be consistent with emerging regional and national spatial planning policy, represent efficient use of public investment in infrastructure and facilities (transport, water, waste-water and roads) and seek to minimise impacts on the environment.’’*
- *MT8 Movement and Transport* – ‘‘*Seek to address urban congestion with particular emphasis on facilitating improved bus transport movement and reliability and improved links to bus and railway stations.*’’
- *RS 9 Road and Street Network – ‘‘Co-operate with adjoining authorities and other public authorities to secure new and/or improved road infrastructure at towns bordering the county boundary including Blessington, Kilcock, Maynooth and Leixlip.’’*

3.2.3 South Dublin County Council Development Plan 2016

Maynooth, Leixlip and Celbridge are considered prime commuter locations as they provide quick access due to their proximity to South Dublin. For example, Lucan (South County Dublin) is a 3.6 kilometre or 6-minute drive to Leixlip (County Kildare). Lucan to Celbridge is a 7.4 kilometre or 11-minute drive and Lucan to Maynooth is a 13 kilometre or 13-minute drive. The eastern part of the Maynooth to Leixlip Bus Priority Project is also located in the Kildare County Council jurisdiction as well as the South Dublin County Council jurisdiction. Both of these Councils are committed to reducing car dependency and promoting sustainable transport options. It is therefore necessary to also examine the South Dublin County Council Development Plan 2016 – 2022 to identify the relevant planning policies and objectives to the proposed Bus Priority Project.

- *Transport and Mobility (TM) Policy 2 Public Transport – '' It is the policy of the Council to promote the sustainable development of the County by supporting and guiding national agencies in delivering major improvements to the public transport network and to ensure existing and planned public transport services provide an attractive and convenient alternative to the car.''*
- *TM POLICY 5 Traffic and Transport Management – ''It is the policy of Council to effectively manage and minimise the impacts of traffic within the County.''*
- *TM5 SLO 1 Traffic and Transport Management – ''To seek to reconfigure the road layout and traffic management arrangements so as to improve flow around Lucan Village Green, including at the junctions of Lucan/Celbridge Road with Adamstown Road and Main Street.''*

3.3 Local Planning Policy

3.3.1 Maynooth Local Area Plan 2013

The Maynooth Local Area Plan 2013 – 2019 states that in 2011, Maynooth had a total population of 12,510 persons. This increased by 16.8% to 14,585 persons according to the 2016 census. Maynooth is defined as a ''Core Economic Area'' that is prioritised for both local and regional enterprise. It is therefore of regional importance.

One of the biggest threats to the ''*success of Maynooth as an attractive urban centre''* is traffic congestion and there is a clear need for sustainable transportation infrastructure improvements. ''*The enhancement of the linkages between Maynooth and the nearby towns in the metropolitan area and the movement into and out of Maynooth from these towns and the remainder of the Greater Dublin Area will ensure the sustainable development of the town.*'' The policies and objectives set out in the Plan such as those listed below will encourage such enhancements.

- PT4 Public Transport – ''*To provide greater opportunities for modal shift to public transport through the appropriate management of development.''*

- PT5 Public Transport – ‘*‘To improve bus transport facilities throughout the town and to seek to ensure the provision of parking facilities to support tourist related uses where appropriate including bus stops and shelters. The Council will seek the provision of termini close to the town centre with appropriate timetable information.’’*
- TRO 6 Roads – *‘‘To ensure that the objectives of the Maynooth Traffic Management Plan (once adopted) are delivered.’’*

3.3.2 Leixlip Local Area Plan 2020

The Leixlip Local Area Plan 2020 – 2023 states that the 2016 Census indicates that Leixlip has a total population of 15,504 persons. This was a slight increase of 52 (0.3%) persons in comparison to the 2011 Census. There is significant growth projected for the area which includes a target of 3,315 units (10.2% of the County’s growth) set out for the Leixlip area as per the Kildare Development Plan, whilst the RSES recognises that Leixlip is within a ‘Strategic Development Corridor.’ The area has drawn many international companies and it is therefore considered a significant employment hub. In particular, Intel currently employs more than 4,500 people at its Leixlip site. The Local Area Plan also seeks to ‘‘promote and facilitate a sustainable transport system for Leixlip.’’ A Strategic Transportation Assessment was undertaken which highlighted that ‘‘bus priority will be critical to the success of sustainable transportation modes.’’ The policies set out below will help to achieve this.

- *MT2 Public Transport – ‘‘It is the policy of the Council to promote the sustainable development of Leixlip by supporting and guiding the relevant national agencies in delivering improvements to the public transport network and to public transport services.’’*
- *MT 3 Roads – “To maintain, improve and extend the local road network in and around Leixlip to ensure a high standard of connectivity and safety for all road users.’’*
- *Policy 15 Pollution and Environmental Services – ‘‘To protect environmental quality in Leixlip through the implementation of European, national and regional policy and legislation relating to air quality, greenhouse gases, climate change, light pollution, noise pollution and waste management.’’*

3.3.3 Celbridge Local Area Plan 2017

In the Celbridge Local Area Plan 2017 – 2023 it states that the 2016 Census recorded a total population of 20,288 persons for Celbridge. This was an increase of 751 or 3.7% in comparison to the 2011 Census.
Celbridge is considered a ‘‘moderate sustainable town’’ which has ‘‘strong district service centres with high quality linkages.’’ It is also considered a prime commuter location due to its proximity to the Metropolitan area of Dublin and the Primary Economic Growth Towns of Maynooth and Leixlip. Therefore, the Plan states ‘‘growth needs to be based on and related to the capacity of high-quality public transport connections and the capacity of social infrastructure.’’ The relevant policies are set out below.

- *Policy ED1 Enterprise and Economic Development – ''to support sustainable economic development in Celbridge, optimising on the town's location in the North Kildare Economic Cluster and the Metropolitan Area of Dublin and its potential as a heritage and tourism destination.''*
- *EDO1.3 Enterprise and Economic Development Objective – ''To promote linkages with major national institutions and companies such as Maynooth University, Intel, Hewlett Packard and the State Laboratories at Backweston.''*
- *Policy MT2 Public Transport – ''To support improvements to the public transport network serving Celbridge.''*
- *MT02.5 Public Transport Objective – 'To work with all agencies to improve and develop public transport facilities in the area and to link such facilities with Celbridge Town Centre and other nearby towns and to ensure that developments are carried out in accordance with the requirements of this Plan and relevant legislation.''*
- *Policy MT3 Roads – ''It is the policy of the Council to support improvements to the road and street network in Celbridge.''*

3.4 Legislation

Current motorway legislation prohibits buses or traffic from using the hard shoulder as a running lane. This legislation will need to be reviewed and amended as necessary to allow for the M4 Eastbound Bus Priority Measures Pilot project to be implemented and legally enforced. This is currently being progressed by the project team.

4 Objectives

The Project's Objectives can be divided into:

- Scheme Objectives; and
- Pilot Objectives.

4.1 Scheme Objectives

The Scheme Objectives include the following:

- Deliver a practicable solution to support the *GDA Transport Strategy* in the provision of continuous bus priority between Junction 7 and Junction 5;
- Encourage modal shift to more sustainable transport modes;
- Increase the people carrying capacity of the M4/N4;
- The M4/N4 currently serves both strategic traffic and also local GDA traffic which is impacting on the M4/N4 capacity to act as a strategic route. Mitigating the local GDA traffic by providing quality bus services will assist in the M4/N4 performing its primary function as a strategic route; and
- Support reduced journey times for buses, more reliability for timetables and schedules, opportunities for schedule improvements and associated environmental benefits.

4.2 Pilot Objectives

Deliver effective bus priority measures from a safety and operational perspective in a motorway environment.

The objectives can be further sub-divided:

4.2.1 Safety

- Deliver measures which are clearly delineated and understood by general road users and bus drivers in a motorway environment; and
- Deliver measures which cater for the safe use of the motorway and merges/ diverges by general traffic and buses.

4.2.2 Operational

- Continuous bus priority designed to cater for relevant private and public bus operators and strategic and local bus services;
- Continuous bus priority measures designed to support reduced journey times for buses, more reliability for timetables and schedules, opportunities for schedule improvements and associated environmental benefits; and
- Provision of a transport solution that allows public transport to move more efficiently during peak times.

5 Options Assessment

5.1 Overview

The Chapter outlines the different options considered and how they were assessed via a stepped process to determine a preferred option.

5.2 Step 1 - Concept

The options considered are summarised in Table 5.1.

Option	Concept Taken Forward	Comments
Option 1 – Bus Priority Measures in Nearside Hard Shoulder with Widening	Yes	Carried forward for feasibility and option selection process
Option 2 – Bus Priority Measures in Nearside Hard Shoulder with No Widening	Yes	Carried forward for feasibility and option selection process
Bus Priority Measures in Central Reserve	No	• Potential safety issues at commencement and termination points • Not consistent with current N4 bus lane • Layout not in current draft TII Standard • Not carried forward for feasibility and option selection

Table 5.1: Options Considered Summary

Option 1 and Option 2 were taken forward for development, assessment and option selection.

5.3 Step 2 – Feasibility

As part of Step 2 – Feasibility, the following items were reviewed.

5.3.1 Type of Bus Priority Measure

The proposed development is intended to deliver a non-physically segregated permanent full-time hard shoulder bus priority measure that can be used by buses and coaches by utilising the hard shoulder. It is envisaged that the bus priority measure would use the hard shoulder and that the hard shoulder would remain at all times and be accessible to vehicles which may become disabled or required to leave the mainline in an emergency.

5.3.2 Design Standards and Criteria

The geometric assessment undertaken has taken cognisance of the TII Bus Priority Measures Interim Advice Note.

The motorway cross-sections as included in DN-GEO-3036 with a design speed of 100km/h has been used for the geometric design and modifications to junction merges and diverges.

5.3.3 Cross Section

Two options were designed:

Option 1

This includes widening of the existing pavement. In some locations, there is widening into the central reserve. However, in other locations it is necessary to widen into both the central reserve and the verge.

Option 2

This option fits within the existing pavement width. There is no widening into the central reserve or the verge.

5.3.4 Junction Treatment

Through Junction Running (TJR) is adopted therefore no bus priority is provided along the slip roads and no stops are proposed at the junctions. The fork diverge is the preferred diverge junction treatment and is used at Junction 5 and Junction 6. The parallel auxiliary lane merge treatment is the preferred merge junction treatment and is used at Junction 5 and Junction 6 in Option 1 (not available at Junction 5 for Option 2).

5.3.5 Existing Constraints

Engineering and environmental constraints were identified and appraised under a number of engineering and environmental headings. It was anticipated that there would be no likely significant effects from the proposed development (either with or without mitigation measures).

5.3.6 Engineering

Engineering was assessed under the headings of structures, pavement, drainage, earthworks, road safety, vehicle restraint systems, utilities, traffic signs, road markings, and road lighting.

It is anticipated that works would be required under the above headings. For both options, it is anticipated there would be no likely significant impacts on engineering constraints and therefore the bus priority measures are feasible from an engineering perspective.

5.3.7 Construction

Construction impacts were assessed under the headings of traffic management, construction phasing, construction materials sourcing, construction traffic, construction compounds and waste.

The widening option has a greater impact than the option with no widening. This is due to more extensive works envisaged for the widening option. For both options, it was anticipated that there would be no likely significant effects and therefore the bus priority measures are feasible from a construction perspective.

5.3.8 Operation

For both options, at each merge and diverge, the hard shoulder bus priority measure would essentially double-up as an auxiliary lane for general traffic manoeuvring through the junction.

5.3.9 Summary

The option feasibility assessment is summarised in Table 5.2.

Option	Option Feasibility
Option 1 - Bus Priority Measures in Nearside Hard Shoulder with Widening	Pass
Option 2 - Bus Priority Measures in Nearside Hard Shoulder with No Widening	Pass

Table 5.2: Option Feasibility Summary

Option 1 and Option 2 both passed the feasibility assessment and were taken forward for identification of a preferred option.

5.4 Step 3 - Preferred Option

The Project Appraisal Balance Sheet (PABS) is summarised in Table 5.3.

Criteria	Option 1	Option 2	Comments
Economy	Preferred		Option 2 (No Widening) is the least expensive option; however it fails to meet key project objectives including continuous bus priority, efficiency, effectiveness and overall transport reliability. Therefore Option 1 (Widening) is preferred from an economical perspective.
Safety	Preferred		Option 2 (No Widening) includes a number of geometric departures and would require buses to merge with lane 1 prior to the Junction 5 eastbound merge, which may result in potential operational issues. Therefore Option 1 (Widening) is preferred.

Criteria	Option 1	Option 2	Comments
Environmental		Preferred	Option 1 (Widening) would include more works, compared to Option 2 (No Widening). Therefore Option 2 (No Widening) is marginally preferred.
Accessibility and Social Inclusion	Neutral		This criteria is considered to be neutral for both options
Integration	Preferred		Option 2 (No Widening) would require buses to merge with lane 1 prior to the Junction 5 eastbound merge. This is not the case with Option 1 (Widening) and thus integrates more effectively with the existing transport network. Therefore Option 1 (Widening) is preferred.
Physical Activity	Neutral		This criteria is considered to be neutral for both options

Table 5.3: Preferred Option Feasibility Summary

Option 1 was preferred under Economy, Safety and Integration. Option 2 was marginally preferred under Environment.

Overall, Option 1 was the preferred option.

5.5 Overall Summary

The overall summary of the Options Selection is shown in Table 5.4.

Option	Step 1 – Concept	Step 2 - Feasibility	Step 3 – Preferred Option
Option 1	Pass	Pass	**Preferred**
Option 2	Pass	Pass	2nd
Bus Priority Measures in Central Reserve	Not Carried Forward	N/A	N/A

Table 5.4: Overall Summary

6 Proposed Development

6.1 Overview

This Chapter describes the proposed development under a number of different headings from an engineering and construction perspective.

6.2 Bus Priority Measure Type

The type of bus priority measure is particularly important given the following:

- It will dictate the desired cross section of the road and therefore the space requirement;
- It will influence the treatment at junctions;
- It will dictate the operational regime such as design speeds, ITS requirements etc.; and
- It will influence the type of bus journeys (i.e. the bus service pattern) which can be accommodated.

The proposed development will provide a non-physically segregated permanent hard shoulder bus priority measure that can be used by buses and coaches to avoid congested traffic lanes. Furthermore, it will primarily accommodate long-distance point-to-point services, primarily coaches, commensurate with the delivery of a core bus corridor as envisaged within the *GDA Strategy*.

The existing hard shoulder will remain as a hard shoulder at all times and be accessible to any vehicle which becomes disabled or requires to leave the mainline in an emergency.

6.3 Cross Section

The existing and proposed cross section are illustrated in Figure 6.1 and Figure 6.2 respectfully.

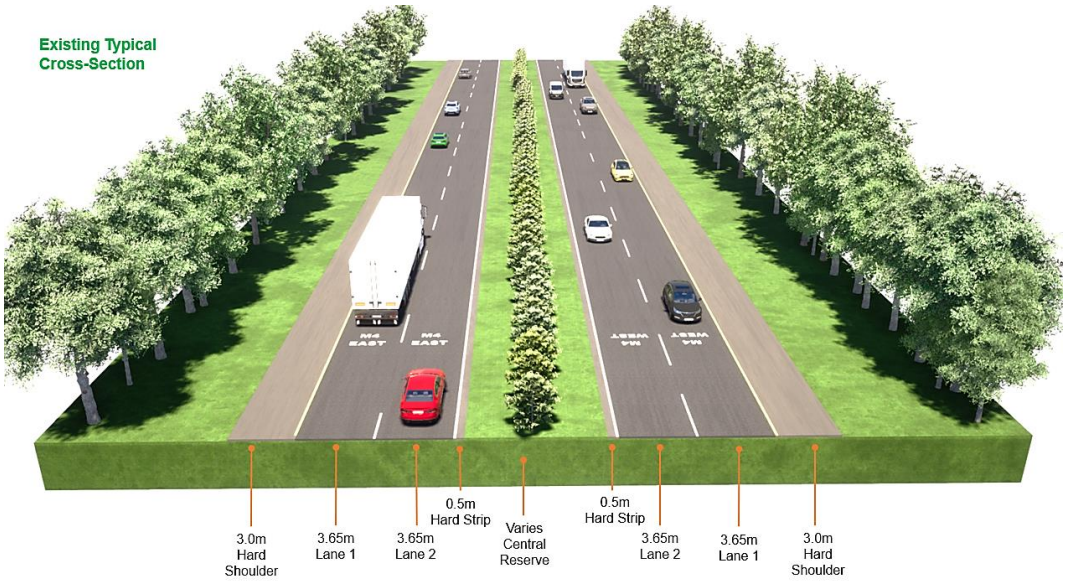


Figure 6.1: Existing Cross Section (©Arup)

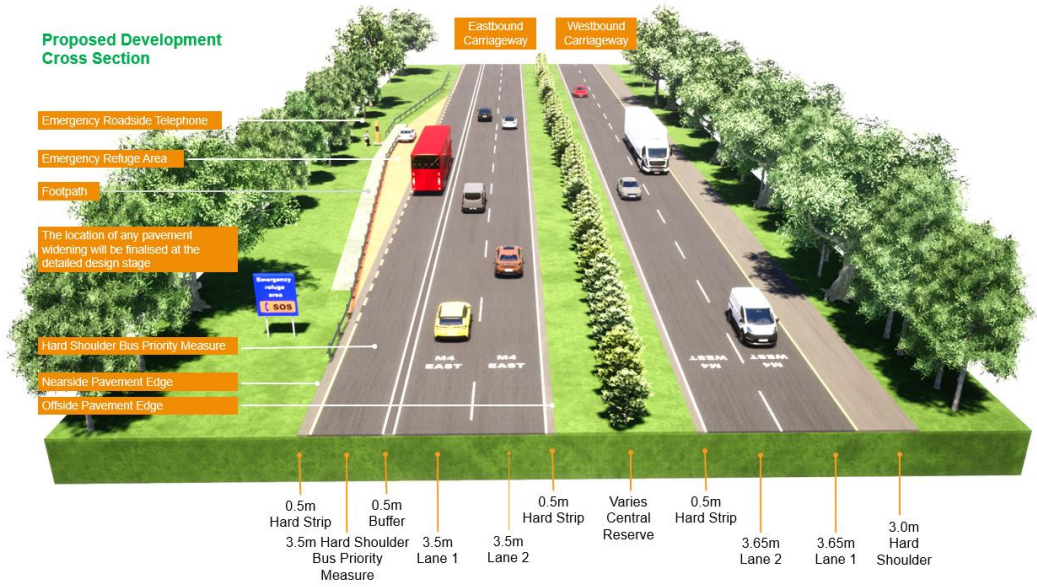


Figure 6.2: Proposed Cross Section (©Arup)

6.4 Alignment

The proposed development will utilise the hard shoulder on the M4/N4 eastbound carriageway, delivering a practicable sustainable transport solution. The existing M4/N4 horizontal and vertical geometry will be largely retained, with pavement widening occurring as an extension of the existing crossfall. In addition, the existing access and route provision will also be retained.

Widening required to accommodate the hard shoulder bus priority measure is generally provided as follows:

- Widening into the central reserve where possible, with the design to match the existing nearside pavement edge. This is due to the generally wide existing median of circa 7m, and constrained corridor on the nearside of the existing M4/N4. It also has the potential to minimise the extent of works at junctions/accesses.
- Central reserve widening may not always be achievable as there may be instances whereby widening beyond the nearside pavement edge is required due to visibility requirements or other localised constraints.
- Widening on both sides of the existing carriageway. This generally occurs at junction merges and diverges or areas where widening is transitioning to/from being on the central reserve side to/from the nearside.

General Layout and Typical Cross Section drawings are included in **Appendix B.**

6.5 Junction Treatment

Continuous bus priority is to be provided on as much of the M4/N4 eastbound corridor between Junction 7 and Junction 5 as is practically feasible to cater for an envisaged long-distance point-to-point coach service. Accordingly, there is no requirement for the provision of bus stops at junctions along the corridor.

The proposed junction arrangement is Through Junction Running (TJR). This approach involves transitioning the hard shoulder bus priority measure into the merge/diverge running lane and extending the lane ‘through’ the junctions. TJR avoids the need for the bus to exit and re-enter the mainline at the junction.

The alternative of a non-TJR treatment, which involves diverging the hard shoulder bus priority measure off the mainline and then re-merging onto the mainline following the junction, which is not consistent with the Project Objectives.

Refer to Figure 6.3 and Figure 6.4.

Figure 6.3: TJR Treatment (© Google Imagery ©2021 DigitalGlobe)

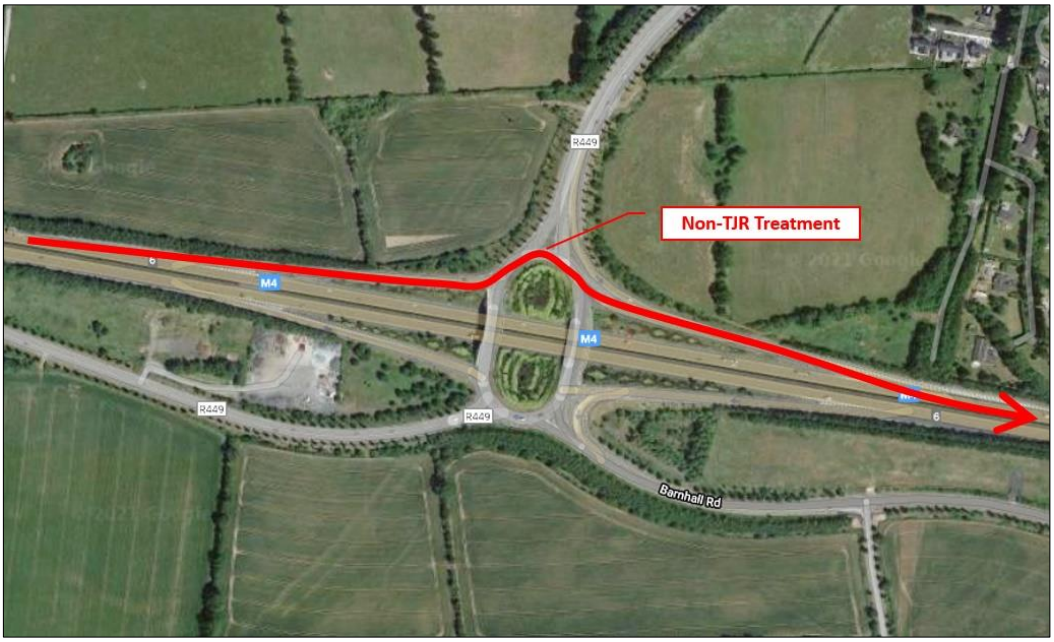


Figure 6.4: Non TJR Treatment (© Google Imagery ©2021 DigitalGlobe)

The proposed treatments for the junction merges and diverges are listed below and discussed further in Sections 6.5.1 and 6.5.2.

- Diverges – TJR Fork Diverge Treatment; and
- Merges – TJR Parallel Merge Treatment.

6.5.1 Diverges – TJR Fork Diverge Treatment

The fork diverge treatment involves the hard shoulder bus priority measure interacting with the diverge lane traffic and then merging back onto the hard shoulder via a fork manoeuvre upstream of the existing nose. The proposed treatment is illustrated schematically in Figure 6.5.

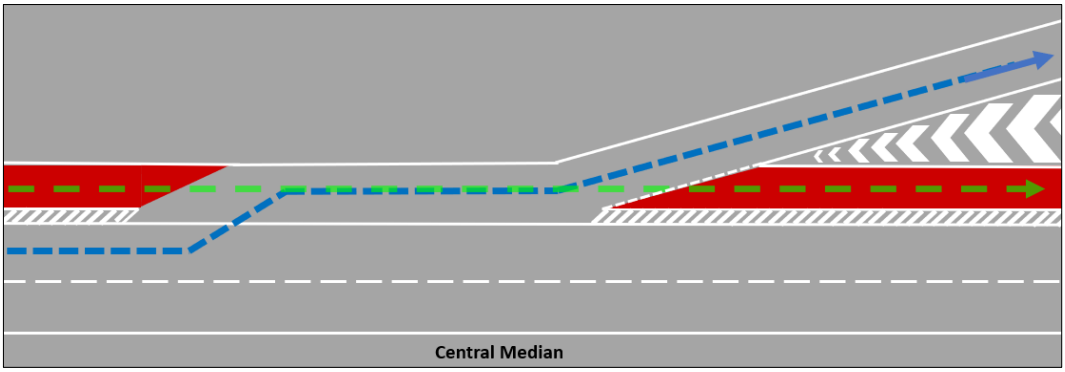


Figure 6.5: Proposed TJR Fork Diverge Treatment

Under this arrangement, general vehicular traffic undertake the diverge manoeuvre as per normal, and the 0.5m buffer will allow the bus to continue through the junction and maintain priority in line with the project objectives. There is also a reduced risk of general vehicular traffic incorrectly entering the hard shoulder bus priority measure under this arrangement.

6.5.2 Merges – TJR Extended Merge Treatments

The continuation of the hard shoulder bus priority measure using the TJR layout requires that traffic joining from the slip road must first merge with the hard shoulder bus priority measure traffic before subsequently merging with mainline traffic.

The proposed TJR parallel merge treatment comprises of a parallel auxiliary merging lane to assist traffic merging from the slip road on to the hard shoulder bus priority measure, and subsequently an extended shared hard shoulder bus priority measure/merging lane to assist traffic to merge onto the nearside mainline lane. The proposed treatment is illustrated schematically in Figure 6.6.

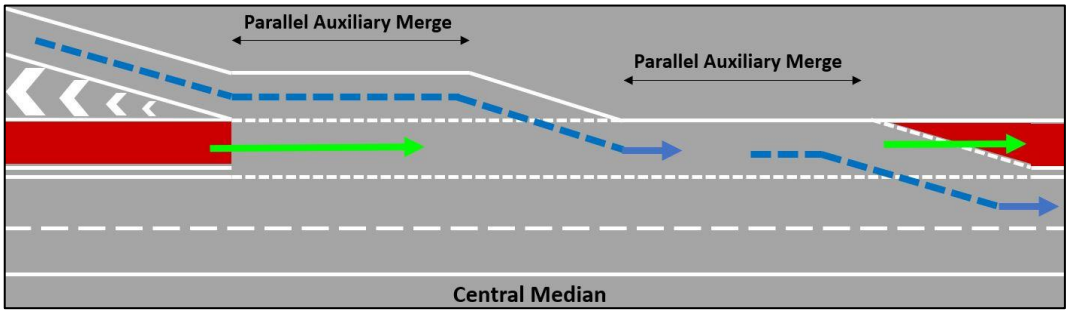


Figure 6.6: Proposed TJR Parallel Merge Treatment

This arrangement provides increased separation between the slip road merge traffic and the hard shoulder bus priority measure. The provision of a parallel auxiliary lane for all merging movements is also consistent with the permissible merge treatments within TII Publication DN-GEO-03060.

6.6 Design Speed and Stopping Sight Distance

Motorways and dual carriageways are typically designed in relatively flat terrain, with generous curvature affording good levels of visibility commensurate with high operational speeds. In accordance with TII Publication DN-GEO-03031 (Rural Road Link Design), the required stopping sight distances for the road design speeds in question are as outlined in Table 6.1.

Design Speed (km/h)	Motorway (100km/h)	Interchange Link/National Road/Bus Priority Measure (85km/h)	Slip Road (70km/h)
Desirable Minimum Stopping Sight Distance (m)	215	160	120
One Step Below Desirable Minimum (m)	160	120	90
Two Steps Below Desirable Minimum (m)	120	90	70

Table 6.1: Stopping Sight Distance Parameters

The existing operating speed for the M4 motorway is 120km/h. The motorway ends immediately east of the Junction 5 Leixlip diverge and then reduces to 80km/h and transitions to the N4 dual carriageway. It is proposed to reduce the speed limit to 100km/h along the M4 from Junction 7 Maynooth and design for a 100km/h motorway. As this road is congested at peak times, the reduction in design speed and changes to the diverge/merge slips roads should assist in reducing the overall speed of road users. The differential speed between the hard shoulder bus priority measure and traffic lanes will be reduced, and this will allow for safer interaction at the junctions between the different road users. Reducing the speed limit from Junction 7 gives a stepped reduction in speed as you approach Junction 5 and allows a smoother transition between the change from motorway to dual carriageway at Junction 5. As this is an accident-prone area, this smooth transition should assist in reducing the number of conflicts.

A collision cluster within the immediate Junction 5 area, in the eastbound direction, was identified through collision investigation. A large proportion of the collisions within this cluster were classified as rear-end shunt type collisions, which are indicative of congested roads and sudden braking. Within this area the speed limit is reduced from 120km/h to 80km/h, correlating with a collision type associated with sudden braking.

A stepped reduction (120-100-80km/h) in speed limit at this area may improve the driver experience and reduce the risk of collisions based on a gradual speed limit reduction on the mainline rather than a more abrupt 40km/h speed limit change.

The same design speeds as listed in Table 6.1 above shall apply to the M4/N4 route following the addition of the hard shoulder bus priority measure. The implication of this is that stopping sight distances provision along the route should strive to match the desirable minimum values (design speed) listed above for the 100km/h motorway (in the case of the M4 motorway) and 85km/h national road (in the case of the N4 national road) where possible.

This shall apply only to the general (i.e. all-purpose) traffic lanes and not the new hard shoulder bus priority measure. The design speed and corresponding stopping sight distances provision applied to the geometric design of the hard shoulder bus priority measure is discussed in Section 6.6.1 below.

6.6.1 Bus Priority Measure Design Speed

The proposed speed limit on the hard shoulder bus priority measure will be 80km/h or less. This speed limit essentially dictates the visibility requirements for the hard shoulder bus priority measure. Achieving appropriate levels of stopping sight distance on the hard shoulder bus priority measure remains a key requirement for its safe operation.

In the case of the general traffic lanes, visibility around horizontal curves can be maintained over the width of the adjacent hard shoulder, which is acceptable practice under the design standards. However, the hard shoulder bus priority measure will be operating without the additional width of the hard shoulder, meaning visibility would be restricted if the hard shoulder bus priority measure operating speed reflected that of the mainline, hence it is appropriate that the operating speed and visibility provision for the hard shoulder bus priority measure is lower than the traffic lanes on the M4/N4.

Furthermore, as the bus priority measure will occupy the (widened) hard shoulder, the bus drivers eye position will be closer to fixed obstructions to forward visibility, such as bridge piers/abutments, cut slopes, traffic signs and boundary features.

At junction merges and diverges, the hard shoulder bus priority measure will double-up as an auxiliary lane for general traffic.

A design speed of 85km/h shall apply to the hard shoulder bus priority measure. This design speed will set the stopping sight distances requirements to be achieved. In most instances, the visibility achieved from the hard shoulder bus priority measure will exceed the standard required for 85km/h, as the hard shoulder bus priority measure geometry will align with that of the mainline.

6.7 Structures

The proposed developed will retain existing structures.

6.8 Junctions and Accesses

The proposed development will retain existing accesses.

6.9 Emergency Refuge Areas

As part of the proposed development, emergency refuge areas will be provided at a spacing of circa 500m, depending on site constraints. There will be a total of eight emergency refuge areas over the extent of the proposed development. It may be possible to reduce the size of these refuge areas subject to appropriate risk assessment.

The purpose of these emergency refuge areas is to provide an additional safe refuge for vehicles which may become disabled or required to leave the mainline in an emergency. The hard shoulder will also remain accessible for all vehicles which may become disabled or required to leave the mainline in an emergency.

6.10 Pavement

6.10.1 Overview

The introduction of the hard shoulder bus priority measure on the M4/N4 will require pavement works. The extent of works will depend on the following design parameters:

- Changes in overall carriageway geometry;
- Subgrade condition;
- Traffic loads;
- Existing pavement construction build up; and
- Existing pavement condition.

The existing hard shoulder, emergency refuge areas and widening areas will require full depth reconstruction. Resurfacing along the entire eastbound carriageway to cater for the revised road marking arrangement will also be required.

6.10.2 Other Considerations

Other considerations include sub-grade condition, traffic loading, location of longitudinal joints, impact of relocation of traffic path (i.e. wheel track), existing pavement build up and condition. Further investigations will be required under these headings during the detailed design phase.

6.11 Drainage

The drainage design elements affected by the proposed development shall be upgraded to account for Climate Change (refer to Table 6.2).

6.11.1 Drainage Design Standards and Guidance

The following inputs sourced mainly from Met Éireann, DN-DNG-03022 Drainage Systems for National Roads (including Amendment No. 1 dated June 2015) and RE-CPI-07001 Drainage Design for National Road Schemes - Sustainable Drainage Options are used in the development of the drainage design. Rainfall design criteria variables are shown in Table 6.2.

Variable	Value
Region	Scotland/Ireland
Return Period	Drainage Network: 1 in 1 no surcharge

Variable	Value
(DN-DNG-03022 Drainage Systems for National Roads (including Amendment No. 1 dated June 2015))	Drainage System: 1 in 5 no flooding, surcharge up to the sub-base level Drainage Network: 1 in 50 no surcharge for transverse pipe only
M5-60 (Met Eireann. Return Period Rainfall Depths for sliding Durations. Irish Grid: Easting 300368, Northing: 235165. Values derived from a Depth Duration Frequency Model)	16.3
Ratio R (Met Eireann. Return Period Rainfall Depths for sliding Durations. Irish Grid: Easting 300368, Northing: 235165. Values derived from a Depth Duration Frequency Model)	0.277
Minimum Global Time of Entry	4 minutes
Max. Rainfall	50 mm/hr
Max. Time of Concentration (Wallingford Procedure States the Modified Rational Method has only been tested for time of concentration not greater than 30 minutes)	30 minutes
Climate Change (DN-DNG-03022 Drainage Systems for National Roads (including Amendment No. 1 dated June 2015))	20%

Table 6.2: Rainfall Design Criteria

The permeability factors used in the design are summarised in Table 6.3.

Location	Value
Grassed Areas (Based on Dublin Soil Type 2)	0.3
Paved	1

Table 6.3: Runoff Permeability Factors

Soil Standard Percentage Runoff (SPR) values are summarised in Table 6.4.

Soil	SPR Value
Type 1	0.1
Type 2	0.3
Type 3	0.37
Type 4	0.47
Type 5	0.53

Table 6.4: Soil SPR Values

Based on the location of the site and Greenfield runoff rate estimation tools by HR Wallingford Soil Type 2 has been used for the calculation of Q_{Bar}.

Typical values of Q_{Bar} per hectare for the typical SAAR (Standard Average Annual Rainfall) value for the Greater Dublin region of 750mm for Soil Type 2 are shown in Table 6.5.

	Soil Type 2
QBar/ha (l/s/ha)	2.0

Table 6.5: Q_{BAR} Values

The following parameters were set for initial drainage design:

- Maximum diameter of filter drain is 450mm diameter; and
- Roughness (ks) for Carrier drain is 0.6 and for filter drains is 1.5.

6.11.2 Proposed Drainage Network

Please note the proposed bus priority measures commence at Ch 2+000.

The proposed outfall locations are as follows:

- Existing surface water manhole at Ch 1+638 Surveyed IL:60.39m;
- Existing surface water manhole at Ch 8+015 Surveyed IL:45.27m;
- Existing surface water manhole at Ch 9+234 Surveyed IL:36.74m; and
- Existing surface water manhole at Ch 9+745 Surveyed IL:37.84m.

The allowable discharge rate/outfall locations for the impermeable areas are shown in Table 6.6.

Chainage		Outfall	Allowable Discharge Rate (l/s)
From	To		
1+875	3+060	1+638	167.71
3+060	8+080	8+015	810.41
8+080	9+250	9+234	245.64
9+250	9+700	9+745	44.33

Table 6.6: Allowable Discharge Rate - Impermeable Areas (l/s)

The allowable discharge rate/outfall locations for the permeable areas are shown in Table 6.7.

Table 6.7: Allowable Discharge Rate - Impermeable Areas (l/s)

Chainage		Outfall	Allowable Discharge Rate (l/s)
From	To		
1+875	3+060	1+638	20.30
3+060	8+100	8+015	287.80
8+300	9+500	9+234	62.6
9+500	9+740	9+745	4.7

Table 6.7: Allowable Discharge Rate - Impermeable Areas (l/s)

TII Standard DN-DNG-03022 Drainage Systems for National Roads (including Amendment No. 1 dated June 2015) require the inclusion of the following as part of the proposed bus priority measures:

- Proposed sediment pond with oil separator at Ch 1+875 north of the eastbound carriageway. Proposed maintenance access will be from the R406 Straffan Road; and
- Proposed oil separator at Ch 8+000, located in the ERA (Emergency Refuge Area) to provide access for maintenance proposes.

While the proposed works will involve a small amount of increased paved area, the design does not change the profile of the existing road. Petrol interceptors have not been proposed between Ch 8+100 and Ch 9+720 as space constraints would make maintenance unfeasible.

As above, please note the proposed bus priority measures commence at Ch 2+000.

6.11.3 Documentation for Agreement prior to Commencement of Works

The following will be submitted for agreement prior to the commencement of works:

- Construction Management Plan;
- Temporary Traffic Management Plan;
- Surface water / storm water details; and
- Construction Phase Surface Water Management Plan in accordance with Inland Fisheries Ireland (IFI) guidance

6.12 Road Restraint Systems

Many of the road restraint systems (safety barriers and bridge parapets) in-situ on the existing M4/N4 would appear not to be compliant with current TII standards.

Non-compliant central reserve barriers will be replaced where:

- There is widening into the central reserve; and
- Where the central reserve widening/works would impact on an existing barrier.

Both of the above scenarios will need to be present to trigger the replacement of a central reserve barrier.

An assessment as per Appendix C of The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges (DN-REQ-03034) was carried out to determine the road restraint system requirements in the eastbound verge. This assessment highlighted that road restraint systems would be required in circa 60% of the verge protecting linear and fixed point hazards.

A summary of this assessment is as follows:

- Overall Length of Barrier Required – 4.4km;
- Total Number of Barrier Lengths – 12; and
- Total Terminals Required – 24

This is a high level assessment and does take cognisance of existing barriers. The existing road restraint systems in place in various sections of the verge and its suitablility will be assessed at the detailed design phase.

6.13 Utilities

6.13.1 General

The infrastructure of a number of utility providers may be impacted by the proposed works. The construction works will ensure there are no permanent disruptions to services and that temporary disruptions be kept to a minimum and existing infrastructure protected, as necessary. Where utility diversions are required, all design works, and construction works will be carried out in coordination with the relevant statutory bodies and service providers.

During future design development, detailed design and construction of the proposed development, the appointed contractor will consult and comply with the requirements of the relevant authorities/service providers with respect to service realignments and diversions necessitated by the project.

Interaction and coordination with adjacent projects will be carried out during the Detailed Design Phase, including the completion of a Pre-Connection Enquiry (PCE), as required.

Ground-penetrating radar (GPR) surveys and slit trench investigations will be carried out during the Detailed Design Phase to verify the exact location of services. This information will then be included in tender and contract documents.

6.13.2 Gas Networks Ireland

Topographical survey information highlights medium pressure gas lines crossing the M4 motorway east of the R405 Ballygoran Road Overbridge and east of Junction 5 Leixlip. Additionally, there are numerous crossings utilising the various overbridges although these should not have a significant impact on the proposed development

6.13.3 Electricity

Topographical survey information highlights that there are ten crossings of electrical utilities between Junction 7 Maynooth and Junction 5 Leixlip/Junction 4A. Additionally, there are numerous crossings utilising the various overbridges along the length of the project although these should not have a significant impact on the proposed development.

6.13.4 Telecommunications

Topographical survey information highlights 1 No. EIR telecommunications crossing east of R405 Ballygoran Road Overbridge, 1 No. EIR Telecommunications crossing adjacent to R404 Celbridge Road Overbridge along with 2 No. additional EIR telecommunication crossings east of Junction 5 Leixlip.

Topographical survey information highlights 1 No. UPC telecommunications crossing east of Junction 5 Leixlip.

Additionally, there are numerous crossings utilising the various overbridges along the length of the project although these should not have a significant impact on the proposed development.

6.13.5 Sanitary and Water Services – Kildare County Council & South Dublin County Council

Protection, diversion, or relocation of sanitary and water services would be made in agreement with the relevant departments within the county councils of Kildare and South Dublin.

Topographical survey information highlights storm water drainage adjacent to the verge and also within the median along the majority of the project. Storm water drainage is also highlighted running across the M4 at Junction 7 Maynooth, east of the R405 Ballygoran Road Overbridge, east of Junction 6 Celbridge, east of the R404 Celbridge Road Overbridge, west of the River Liffey Overbridge and east of Junction 6 Celbridge.

Topographical survey information highlights watermains running across the M4/N4 in numerous locations within the proposed development boundary.

Topographical survey information highlights a gravity fed sewer pipe crossing the M4 west of the Liffey River Bridge.

Additionally, there are numerous crossings utilising the various overbridges along the length of the project although these should not have a significant impact on the proposed development.

6.14 Pedestrians and Cyclists

The impacts of the proposed development on pedestrians and cyclists between the Junction 5 eastbound merge and the Junction 4A diverge have been assessed. As a designated motorway west of Junction 5, pedestrians and cyclists are prohibited from accessing the M4 in this area.

Improved active travel infrastructure is proposed along Junction 5 merge, refer to Appendix B drawings for further details.

6.15 Signage and Road Markings

The impacts associated with ancillary design elements are comparatively minor relative to mainline widening impacts.

As such, it is proposed that assessments of traffic signs be completed during the next design phase, however, the following should be noted at this stage.

6.15.1 Existing Signage

The following approach was used to assess the impact of the proposed development on existing signage:

- Where large signage gantries/cantilever supports are found in the median side/verge side, the revised barrier design would seek to retain the large signs at their current location. New barriers will be tapered to accommodate adequate working width from the sign supports;
- Impacts to smaller frangible signs are to be assessed in future design development and it is expected that there may be a number of smaller signs along the corridor which may need to be further setback to cater for the widening requirements of the proposed development.

6.15.2 Proposed Signage

Proposed signage will be as follows:

- Advanced warning signs at the start of each merge, informing road users of the hard shoulder bus priority measure arrangement;
- Warning signs at merges and diverges to inform road users of bus traffic sharing the merge/diverge areas;
- Start and End signs at the commencement and termination points of the hard shoulder bus priority measure;
- Confirmation signage on the mainline outlining the permitted hard shoulder usage, at a likely spacing of 1km to 1.5km; and
- Signage associated with the emergency refuge areas.

6.15.3 Road Markings

Road markings will be removed or modified along the M4/N4 corridor to accommodate the hard shoulder bus priority measure. In addition to the widened sections, it is envisaged that the full carriageway width will be resurfaced to accommodate the changes to horizontal geometry and lane lines along the corridor.

Solid white lines hatching will be provided for the separation buffer between the hard shoulder bus priority measure and lane 1. Where continuous edge lines are used, drainage gaps will be included to prevent surface water ponding and the risk of localised ice formation.

6.15.4 Road Lighting

There is existing road lighting at Junction 5, Junction 6 and Junction 7 and the surrounding environs.

There is high mast lighting at Junction 5 and Junction 7 and standard lighting columns at Junction 6. Road lighting assets impacted by the proposed works will be reinstalled and relocated.

6.16 Noise Barriers

A total length of 2.3km of noise barriers will be provided as part of the proposed development for the eastbound carriageway (to the north of the M4/N4). A total length of 1.4km of noise barriers will be provided as part of the proposed development for the westbound carriageway (to the south of the M4/N4). The total combined length of noise barriers to be provided as part of the proposed development will be 3.7km.

Noise barriers are not required as a mitigation measure as there will be no perceptible increase in noise levels as a result of the operation of the proposed development. However, the implementation of these noise barriers will reduce noise levels at a number of receptors in the vicinity of the M4/N4 which will result in a positive impact

6.17 Transportation

6.17.1 Context

It should be noted that public transport is more heavily influenced by human behaviour (as opposed to private vehicle usage), which is more difficult to account for in transport modelling. These limitations of transport modelling should be considered when interpreting results herein.

6.17.2 Overview

Currently this section of the M4/N4 consists of two-lanes of general traffic and a hard shoulder in each direction plus a generally wide central reserve of approximately 7m to 9m.

A transportation assessment, using the NTA's Eastern Regional Model (ERM), has been undertaken to assess the inclusion of an eastbound hard shoulder bus priority measure on this section of the M4/N4 while maintaining two lanes of general traffic.

Prior to carrying out the ERM full model runs, the bus services which use this section of the M4/N4 were reviewed to ensure all existing services were represented correctly. The services identified are shown in Table 6.8.

Bus Provider	Route Description
Bus Eireann	115: Kilcock_ Abbeyfield Estate to Custom House Quay (Jurys Inn)
Bus Eireann	115: Mullingar_ Outside Train Station to Custom House Quay (Jurys Inn)
Bus Eireann	120: Clane (Esso Garage) to Dublin (St Stephens Green)
Bus Eireann	20: Eyre Square_ Galway Bus Station to Dublin Airport

Bus Provider	Route Description
Bus Eireann	22: Ballina_ Ballina Bus Station to Dublin Airport
Bus Eireann	23: Sligo_ Sligo Bus Station to Busáras
Bus Eireann	845: Birr_ Birr Square to Leeson St. Lr. Stephens Hall Hotel
Kearns Transport	845: Enfield_ Main Street to Leeson St. Lr. Stephens Hall Hotel
Go Bus	Galway Bus Station to Dublin Airport
Citylink	Galway Bus Station to Dublin Airport

Table 6.8: Bus Services utilising the M4/N4

6.17.3 Existing Constraints

Typical constraints from a transport modelling perspective may include not having a sufficiently calibrated model in which to test Options, or the presence of a model which is too coarse or inappropriate to provide refined results from. No such constraints were identified following the assessment undertaken.

6.17.4 Assessment of Proposed Development

6.17.4.1 Model Parameters

The model parameters used to carry out the assessment of the proposed development include bus speeds, journey times and reliability, mode share, bus patronage and forecast traffic flows. Mode share is determined by the Eastern Regional Model, which considers the generalised cost of travel when assigning trips. Mode shift occurs when one mode has a comparative advantage, in terms of generalised cost, over another.

6.17.4.2 Overview

The proposed development is intended to form part of a wider series of public transport infrastructure and service enhancements throughout the Greater Dublin Area. Central to these are the BusConnects proposals which are currently under development.

BusConnects is the National Transport Authority's programme to greatly improve bus services in Irish cities. It is a key part of the Government's policy to improve public transport and address climate change in Dublin and other cities across Ireland. BusConnects Dublin includes the Network Redesign and the Core Bus Corridors.

BusConnects is included within a number of Government policy strategies including the National Development Plan 2021 – 2030, Transport Strategy for the Greater Dublin Area 2022 – 2042 and the Climate Action Plan 2021. The full programme for BusConnects Dublin includes a range of interlinked and compulsory proposals including:

- **Management Elements:** Redesigning the network to increase the number of homes, jobs and services with coverage, improving orbital accessibility and restructuring radial routes into spines;
- **Technological Elements:** Introducing new ticketing systems to improve convenience and reduce dwell time at bus stops;
- **Fleet Elements:** Replacing the bus fleet with low emission vehicles, introducing branding and livery to give a new "look and feel";
- **Policy Elements:** Introducing a 90-minute ticket to remove the financial penalty for interchanging between buses or changing mode during trips; and
- **Infrastructure Elements:** Creating infrastructure to separate buses and cyclists from other traffic to make sustainable travel a faster, safer and more reliable choice. Developing interchange hubs. Improving pedestrian facilities around bus stops.

A Future Year (2030) modelling assessment of the proposed development has been undertaken to determine the cumulative impacts of the overall bus priority measures (BusConnects plus the M4 Eastbound Bus Priority Measures Pilot) on the M4/N4 corridor.

To assess the proposals, a future year (2030) reference case, "Do-Minimum", Scenario model was developed to represent the likely demand and transport network scenario in 2030.

Building on this, a 2030 Do-Something Scenario was developed which involved adding eastbound bus priority measures to the M4/N4 between Junction 7 Maynooth and Junction 5 Leixlip as well as the BusConnects proposals summarised above.

6.17.4.3 Results

Results from the future year model runs carried out indicated the following:

Bus Speeds, Journey Times and Reliability

The proposals will result in improved bus speeds on this section of the M4/N4, with eastbound bus speeds in the Do-Something Scenario 34% faster than the Do-Minimum Scenario in the AM peak. Thus, this will also equate to reduced journey times and improved bus services reliability.

Mode Share

The Do-Minimum and Do-Something AM peak mode share for Maynooth, Leixlip, Kilcock and Celbridge are shown in Table 6.9.

This shows that, following the implementation of the BusConnects proposals in conjunction with the eastbound bus priority measures on the M4/N4, car use in these towns is reduced by between 1 and 3%. With Leixlip experiencing the largest decrease in car usage of 3.4%. In absolute terms, this analysis indicates:

- A total reduction of circa 70 car trips from Kilcock during the AM peak;

- A total reduction of circa 130 car trips from Maynooth during the AM peak;
- A total reduction of circa 230 car trips from Celbridge during the AM peak; and
- A total reduction of circa 330 car trips from Leixlip during the AM peak.

Area	Do-Minimum			Do-Something		
	Car	PT	Active	Car	PT	Active
Kilcock	76.2%	6.4%	17.4%	74.9%	7.7%	17.4%
Maynooth	73.4%	9.9%	16.6%	72.1%	11.5%	16.4%
Leixlip	74.4%	12.2%	13.4%	71.0%	15.9%	13.2%
Celbridge	76.5%	8.3%	15.1%	75.0%	10.2%	14.8%

Table 6.9: Future Year (2030) Do-Minimum and Do-Something AM Peak Mode Share

Bus Patronage

On average, the Do-Something proposals will result in an increase of circa 12% in the number of passengers using the bus services on this section of the M4/N4 which include:

- Bus Eireann Route 115;
- Bus Eireann Route 120;
- Bus Eireann Route 20;
- Bus Eireann Route 22;
- Bus Eireann Route 23; and
- Kearns Transport Route 845.

Forecast Traffic Flows

As a result of the shift to public transport highlighted above, traffic flows along this section of the M4/N4 are reduced in the Do-Something Scenario. Forecast AADT values for the Do-Minimum and Do-Something Scenarios are shown in Table 6.10. These indicate that the proposals will result in a circa 5% reduction in traffic on this section of the M4/N4 in the Do-Something Scenario.

Location	Do-Minimum		Do-Something	
	AADT	HGV %	AADT	HGV %
Between Junction 7 & Junction 6	72,522	10%	69,187	10%
Between Junction 6 & Junction 5	84,693	8%	81,603	9%

Table 6.10: Future Year (2030) Forecast AADT values for the Do-Minimum and Do-Something Scenarios

6.17.5 Conclusion

The Future Year (2030) modelling analysis which assessed the cumulative impact of the proposed development, in conjunction with the BusConnects proposals, found that it will:

- Increase bus speeds along this section by up to 34%;
- Reduce car mode share by 1 to 3% in towns located close to this section of the M4/N4;
- Reduce car traffic between Junction 5 and Junction 7 of the M4/N4 by up to 5%; and
- Lead to a 12% increase in bus passengers on existing routes that use this section of the M4/N4.

6.18 Construction

6.18.1 Construction Duration and Phasing

The proposed development will take circa nine to twelve months to construct. The design of the project lends itself to staged construction in the following sections:

- Junction 7 Maynooth to Junction 6 Celbridge; and
- Junction 6 Celbridge to Junction 5 Leixlip/Junction 4A.

6.18.2 Construction Methodology

The proposed development will involve works under the following headings; site clearance, pavement, drainage, earthworks, vehicle restraint systems, utilities, traffic signs, road markings and road lighting.

Initially, a construction compound will be established. The works will be carried out in a phased manner. Firstly, temporary traffic management will be installed. Initial works would be site clearance, which will include removal of the existing vehicle restraint systems, signage, and other obstacles. Drainage and earthworks will then be carried out whereby existing drainage filter drain stone will be removed and the existing verge will be removed to enable the pavement widening to take place. Works on utility infrastructure, if required, will also be carried out.

Pavement works will then take place, with the removal of the existing surface being carried out initially. Then full road construction will be carried out for the widening sections, the existing hard shoulder and the emergency refuge areas. Pavement overlay works for lane 1 and lane 2 will also be carried out.

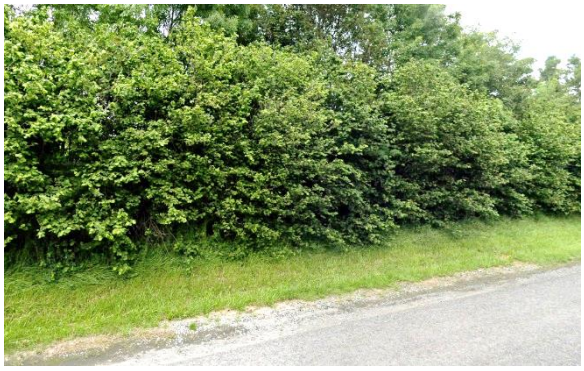
Cut and fill earthworks quantities have been extracted from the design 3D model. The extent of earthworks on the project is limited and predominantly involves cutting into existing cut slopes to allow for the widened cross section and the emergency refuge areas. The total cut will be circa 8,100m^3 and total fill will be circa 480m^3.

All pavement widening areas, including emergency refuge areas will require new full depth pavement construction (sub-base, base, binder, and surface course). Pavement widening areas have been defined as areas where the proposed pavement edge extends beyond the existing pavement edge. The existing hard shoulder area will also require full depth pavement construction. In addition to areas of new pavement construction in widening areas, the existing pavement in non-widening areas of the eastbound carriageway will be overlayed. This includes removal and replacement of the surface and binder courses.

Approximately 5,500m^3 of Granular Type B to Clause 804 sub-base will be utilised, followed by 37,000m^2 of AC 32 Dense 40/60 base, 103,000m^2 of AC 20 Dense bin binder (55mm) and 103,000m^2 of SMA 40mm surface course in the new pavement construction. As part of the rehabilitative works on existing non full depth pavement areas, milling and disposal of approximately 70,000m^2 of existing pavement will be required. The extent of regulating course required will be minimal.

Details of the proposed emergency refuge areas are shown in Table 6.11.

ERA No.	Chainage	Cut/ Fill	Verge at ERA Location
1	2+292	Fill	
2	2+950	Cut	
3	3+537	Fill	

ERA No.	Chainage	Cut/ Fill	Verge at ERA Location
4	4+071	Fill	
5	6+275	Cut	
6	6+980	Cut	
7	7+475	Cut	

ERA No.	Chainage	Cut/ Fill	Verge at ERA Location
8	7+950	Cut	

Table 6.11: Emergency Refuge Areas (ERA) Earthworks Requirements

New drainage infrastructure will be installed, including at each of the emergency refuge areas. This will include new infrastructure, replacement of defective infrastructure, attenuation and pollution control measures. Thereafter, new vehicle restraint systems will be installed. Signage will then be installed. New road markings will be installed when other works are complete.

Finally, the temporary traffic management will be removed.

6.18.3 Construction Materials

Construction materials including pavement, quarry materials, concrete, vehicle restraint systems, steel reinforcement, subsoil, topsoil, signage gantry and cantilever steel and signage will need to be imported onto the site.

6.18.4 Construction Traffic

The proposed development will be divided into the sections noted above. Construction will be carried out on a six-day working week. Construction traffic will utilise the existing M4/N4 and the regional road network.

6.18.5 Traffic Management During Construction

Temporary traffic management (TTM) will be required to implement the proposed development. A Preliminary TTM Plan will be prepared at tender design phase which would set out the constraints and parameters to which the TTM will be designed. This Preliminary TTM Plan will then be utilised to develop the Construction Stage TTM Plan.

The implemented Construction Stage TTM Plan will include the following information; geometric design, extents, working areas, locations and width of alternative traffic lanes, safety zones, duration, construction traffic access, emergency services provisions, timing of operations, road lighting, road signage, cones and temporary markings.

Traffic flow will need to be maintained throughout the duration of the project construction.

It is envisaged that a Narrow Lane System in conjunction with a Roadworks Speed Limit Order of 80km/h will be required to implement the proposals on site. The project will aim to maintain two number M4/N4 eastbound traffic lanes during peak times. This will only be reduced during off-peak times to facilitate critical works. The construction process will be planned to accommodate existing traffic flows and the daily operations adjacent to the project.

Signs erected for traffic safety and control purposes will be manufactured, installed, and maintained in accordance with the Traffic Signs Manual and associated documents.

6.18.6 Construction Compound

A construction compound will be established and is proposed to be located immediately east of Junction 6. The works involved will be minimal. The construction compound will include stores, offices, welfare facilities and plant storage. Following completion of construction, these areas will be cleared and reinstated.

6.18.7 Construction Waste

The main waste types generated by the proposed development will include pavement material, excavation material arising from new road construction, soil, and concrete from excavations for structures.

Quantities of general construction and demolition wastes such as wood, packaging, metals, bricks, blocks, and residual wastes will be generated during the construction phase.

Any materials to be recovered off site will be transported and disposed of in accordance with the requirements of relevant legislation i.e. Waste Management Act 1996 and Amendments and Waste Collection Permit Regulations.

7 Environment

7.1 Appropriate Assessment Screening

A report for the purposes of Appropriate Assessment Screening was prepared by Scott Cawley and is included in the Part 8 Planning documentation.

The conclusion of the Appropriate Assessment Screening is that there is no likelihood of significant effects on any Natura 2000 sites, individually or in combination with any other plans or projects. It is the view of Scott Cawley that it is not necessary to undertake any further stage of the Appropriate Assessment process. The final determination in this regard will be made by the competent authority.

7.2 EIA Screening

A report for the purposes of EIA Screening was prepared by Arup and is included in the Part 8 Planning documentation.

The conclusion of the EIA Screening is based on the nature of the proposed development, the baseline environment in the area and the likely significant effects of the proposed development.

The nature, scale and location of the proposed development is such that there would be no likely significant effects on the environment arising from the proposed development. It is the conclusion of the EIA Screening exercise that an EIA is not required. The final determination in this regard will be made by the competent authority.

8 Conclusion

This report supports a Part 8 Planning Application for the proposed *M4 Eastbound Bus Priority Measures Pilot* project.

The proposed development would result in a substantial improvement to the existing sustainable transport infrastructure along the M4/N4 corridor.

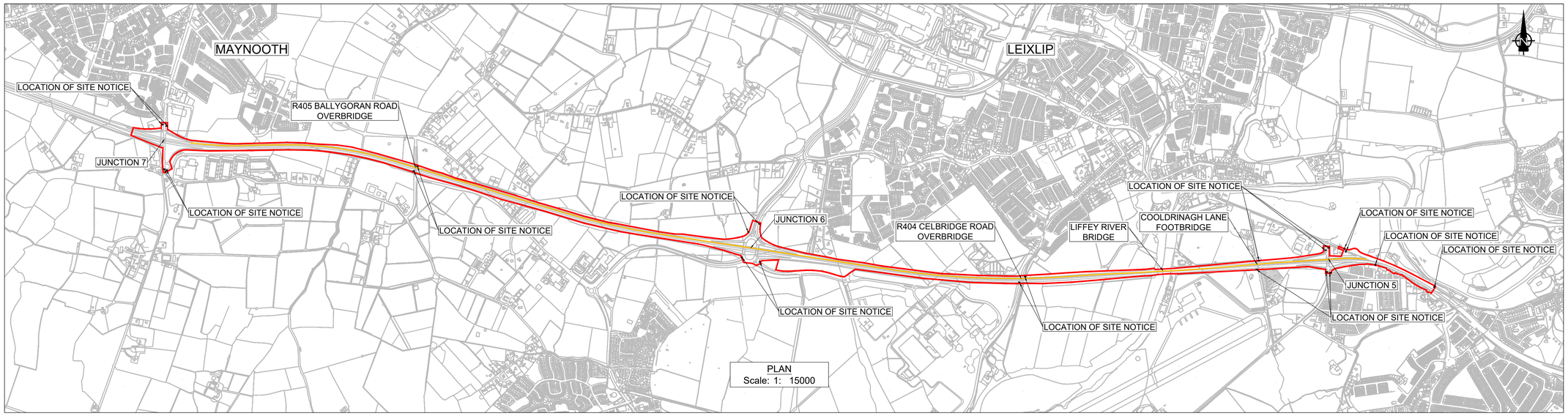
The proposed development is considered to be in accordance with the proper planning and sustainable development of the area and is in accordance with local planning policies and objectives.

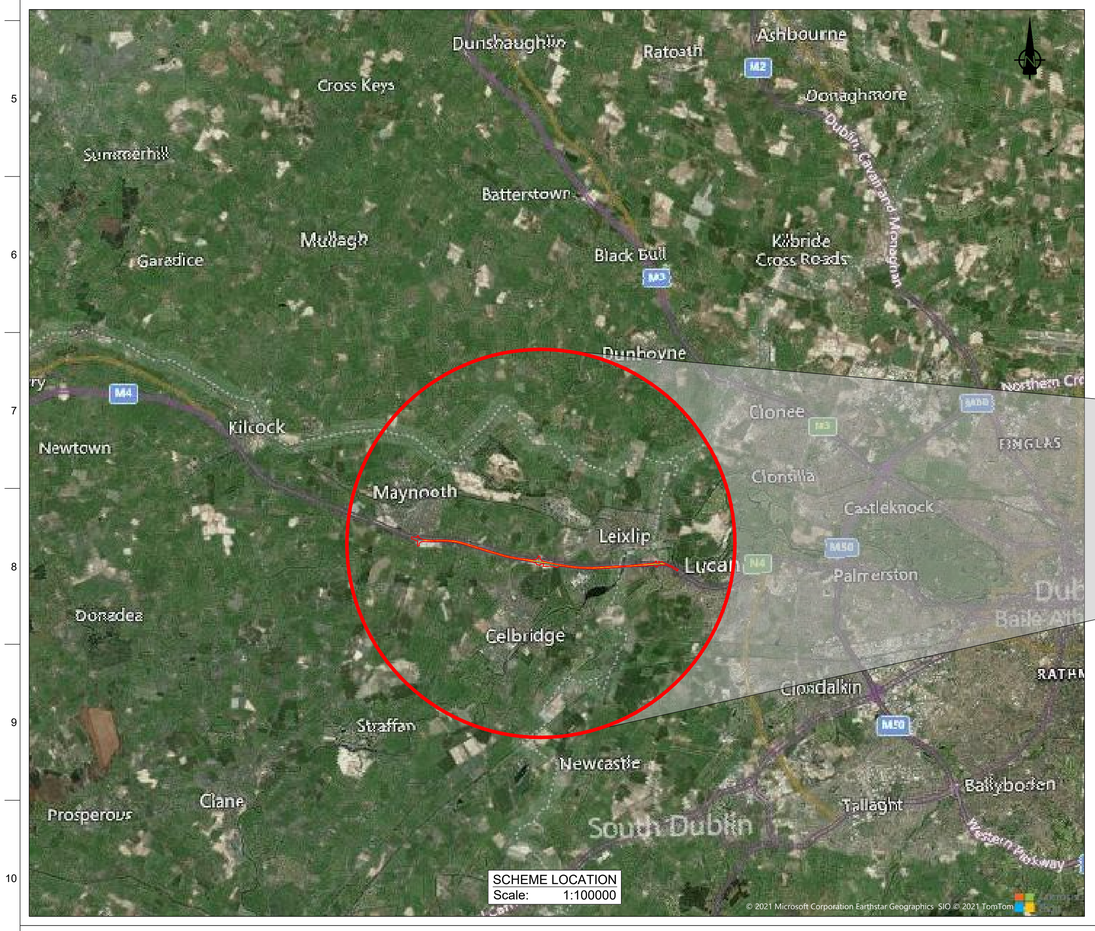
The potential impacts, including environmental, arising from the proposed development have been reviewed and assessed. It is concluded that the construction of the proposed development would have no likely significant impact on the receiving environment, provided the recommendations of the environmental screening reports are followed.

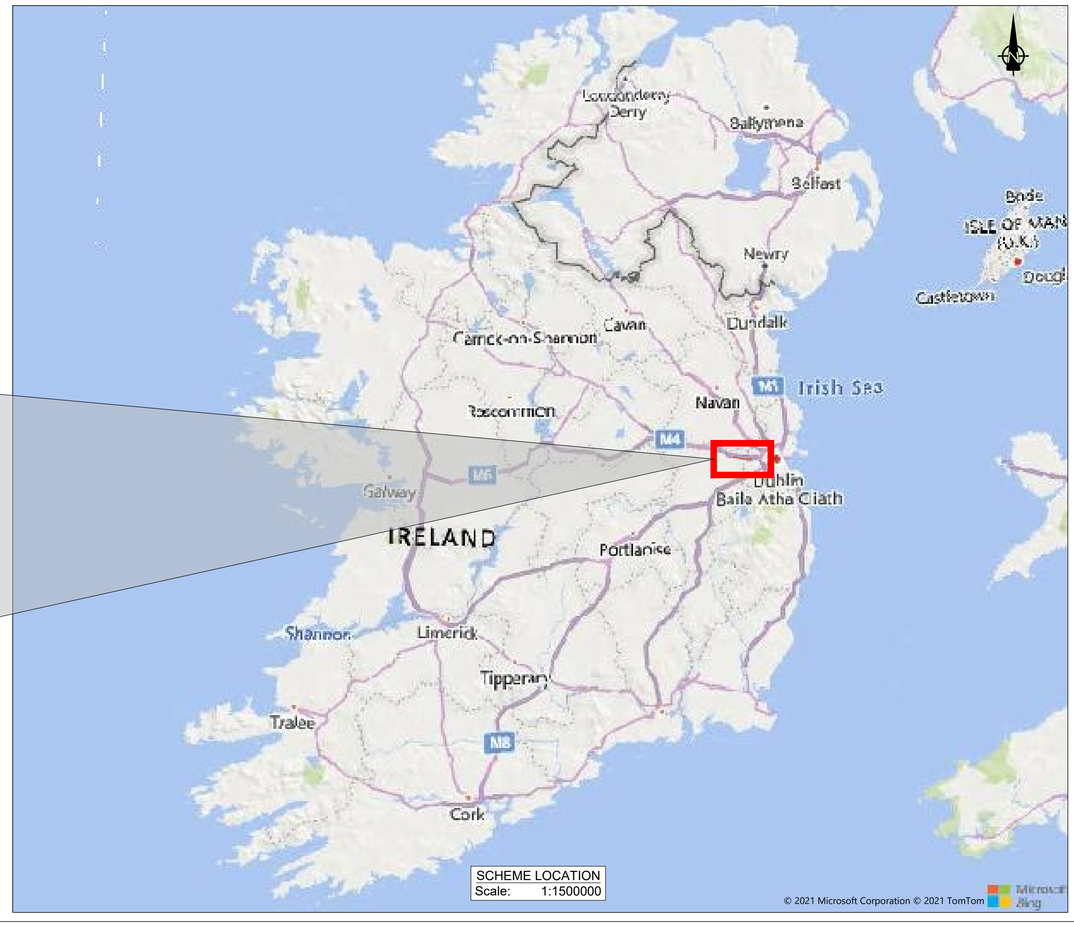
It is recommended that Kildare County Council proceed with the proposal as shown on the drawings accompanying this report.

Appendix A

Site Location Map







PART 8 PLANNING

LEGEND:

Study Area and Planning Boundary. The project is delivering Bus Priority Measures in the Eastbound Carriageway only

Eastbound Bus Priority Measures Pilot Project

Tionscadal Éireann Project Ireland 2040

Notes

Do not scale

Clients: NTA Údarás Náisiúnta Iompair National Transport Authority; TII Bonneagar Iompair Éireann Transport Infrastructure Ireland; An Roinn Iompair Department of Transport; Comhairle Contae Átha Cliath Theas South Dublin County Council; KILDARE nro National Roads Office; Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant: ARUP
One Albert Quay, Cork, Ireland. T12 X8N6
Tel +353 (0)21 4225200 www.arup.ie

Job Title: M4 Eastbound Bus Priority Measures Pilot Project

Scale: NTS
Role: Civil - Highways
Date: December 2021

Issue	Date	By	Chkd	Appd
C01	01/10/2022	JD	GH	SB
Issued For Part 8 Planning (Status A1)				
P02	17/12/2021	JD	GH	SB
Issued For Information (Status S2)				
P01	15/10/2021	JD	GH	SB
Issued For Information (Status S2)				

Drawing Title: Site Location Map

Sheet 01 of 01

Suitability: A1 - Suitable for Part 8 Planning

Job No: 272691
Rev.: C01

Drawing No: 272691-ARUP-07-CF-DR-CH-000054

Drawing filepath & name: \\globalarup.com\Cork\Jobs\272000\272691-00\4. Internal\4-02 Drawings\3. Bus Pilot\2. Phase 1 and 2\ 272691-ARUP-07-CF-DR-CH-000054.dwg
User and Plot Date: Jade Dalrymple - 26/9/2022 - 7:13 am

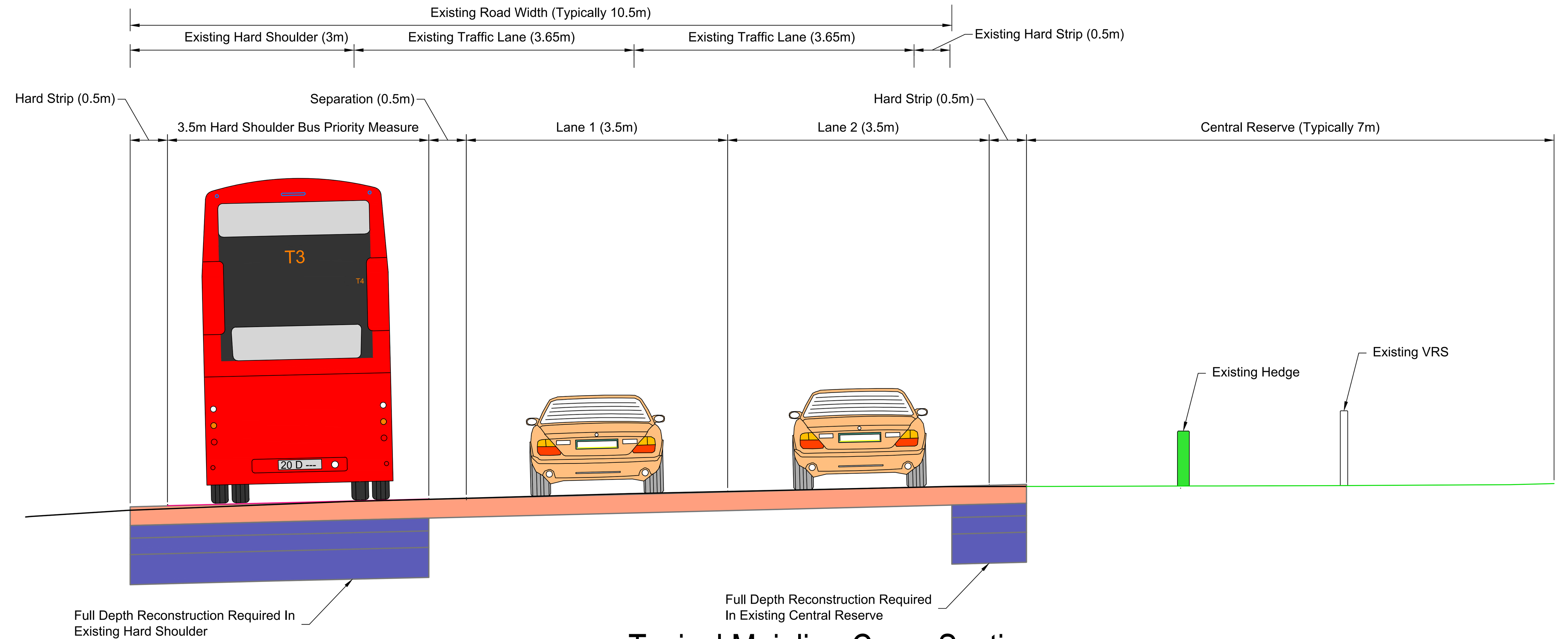
Appendix B

General Arrangement and
Typical Cross Sections
Drawings and Graphics

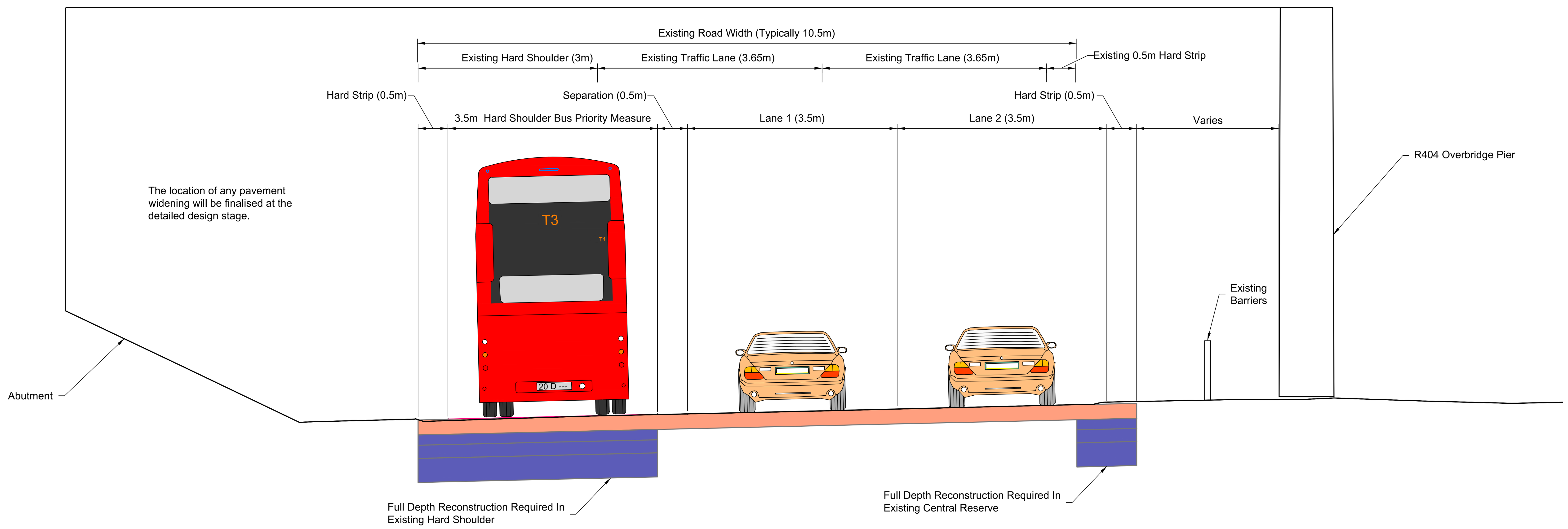
PART 8 PLANNING

LEGEND:

- Low Noise Surface Course e.g. SMA
- Full Depth Pavement Foundation Layers e.g. Binder Course, Base Course and Sub-base



Typical Mainline Cross Section



Typical Cross Section at Overbridge - R404 Example

Tionscadal Éireann Project Ireland 2040

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Notes

Clients: NTA Údarás Náisiúnta Iompair National Transport Authority; TII Bonneagar Iompair Éireann Transport Infrastructure Ireland; An Roinn Iompair Department of Transport; Comhairle Contae Átha Cliath Theas South Dublin County Council; Kildare NRO National Roads Office; Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant: ARUP

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Tel +353 (0)21 4225200 www.arup.ie

Job Title: M4 Eastbound Bus Priority Measures Pilot Project

Scale: NTS

Role: Civil - Highways

Date: December 2021

Issue	Date	By	Chkd	Appd
C01	01/10/2022	JD	GH	SB
Issued For Part 8 Planning (Status A1)				
P03	01/02/2022	JD	GH	SB
Issued For Information (Status S2)				
P02	17/12/2021	JD	GH	SB
Issued For Information (Status S2)				
P01	08/10/2021	JD	GH	SB
Issued For Information (Status S2)				

Drawing Title: Typical Cross Section

Sheet 01 of 02

Suitability: A1 - Suitable for Part 8 Planning

Job No: 272691

Rev.: C01

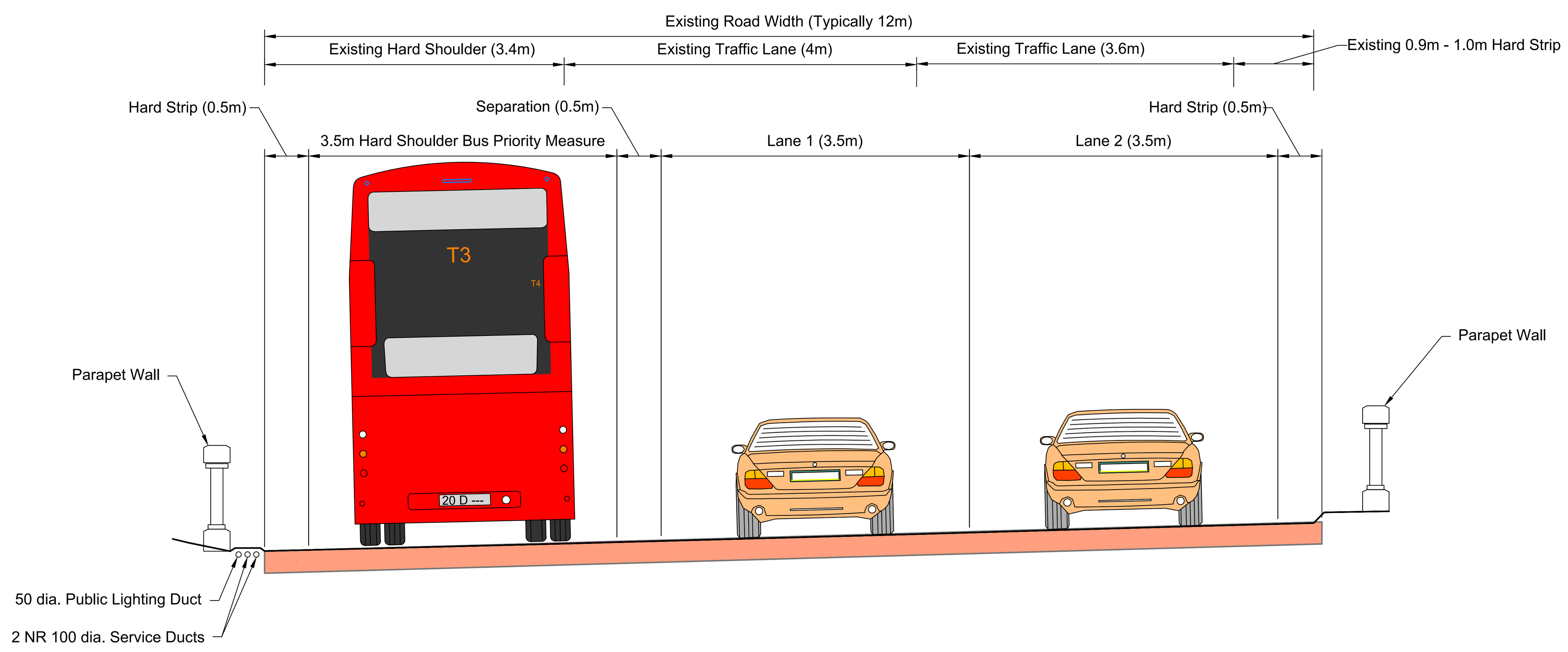
Drawing No: 272691-ARUP-07-CF-DR-CH-000052

Do not scale

PART 8 PLANNING

LEGEND:

Low Noise Surface Course e.g. SMA



Typical Cross Section at River Liffey

Tionscadal Éireann Project Ireland 2040

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Notes

Clients: NTA Údarás Náisiúnta Iompair National Transport Authority; TII Bonneagar Iompair Éireann Transport Infrastructure Ireland; An Roinn Iompair Department of Transport; Comhairle Contae Átha Cliath Theas South Dublin County Council; Kildare NRO National Roads Office; Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant: ARUP
One Albert Quay,
Cork, Ireland.
T12 X8N6
Tel +353 (0)21 4225200
www.arup.ie

Job Title: M4 Eastbound Bus Priority Measures Pilot Project

Scale: NTS

Role: Civil - Highways

Date: December 2021

Issue	Date	By	Chkd	Appd
C01	01/10/2022	JD	GH	SB
Issued For Part 8 Planning (Status A1)				
P03	01/02/2022	JD	GH	SB
Issued For Information (Status S2)				
P02	17/12/2021	JD	GH	SB
Issued For Information (Status S2)				
P01	08/10/2021	JD	GH	SB
Issued For Information (Status S2)				

Drawing Title: Liffey River Bridge-Typical Cross Section

Sheet 02 of 02

Suitability: **A1 - Suitable for Part 8 Planning**

Job No: **272691**

Rev.: **C01**

Drawing No: **272691-ARUP-07-CF-DR-CH-000053**

Do not scale

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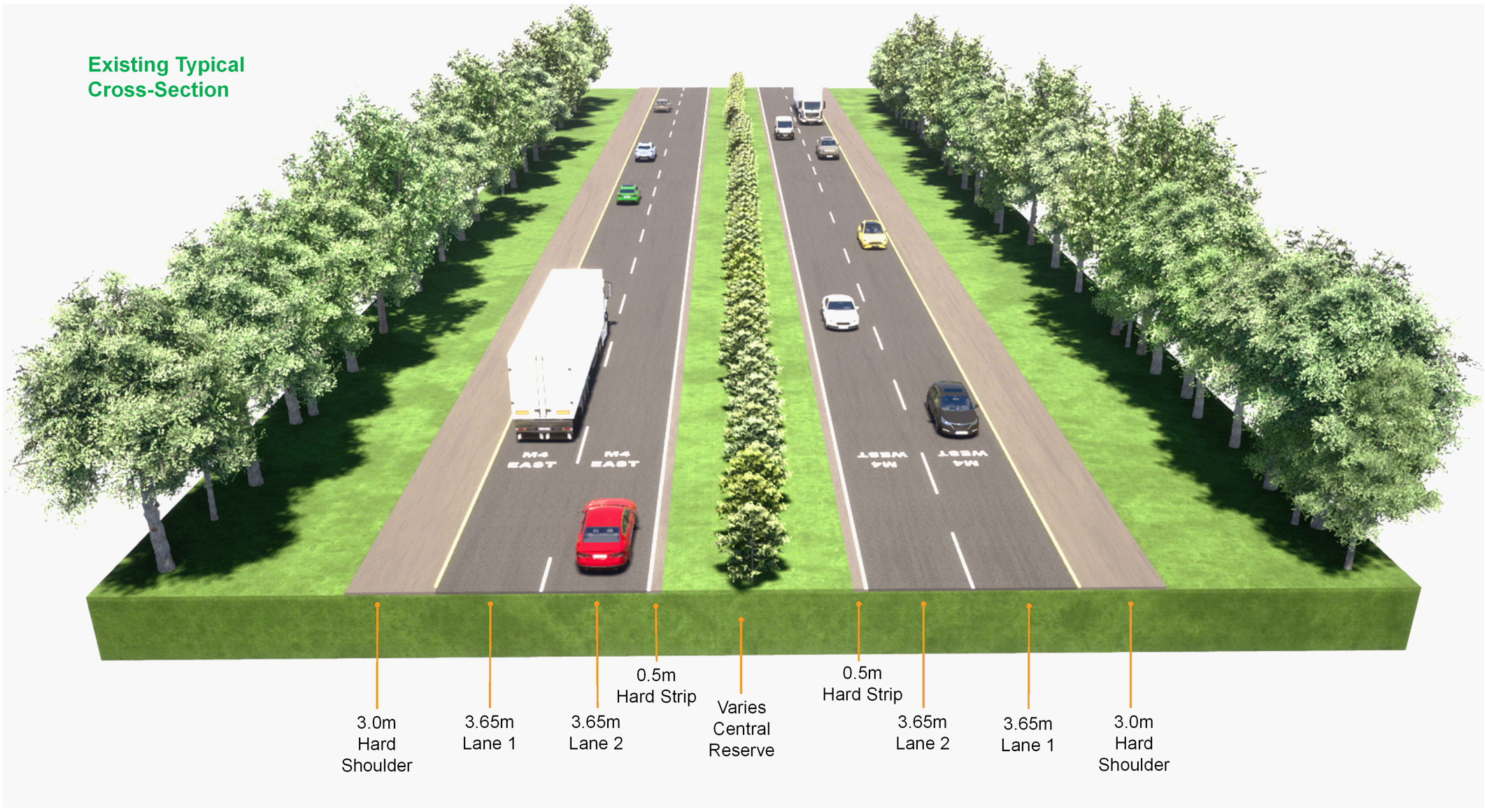
User and Plot Date : Jade.Daloyoc : 15:9:2022 - 12:9 pm

PART 8 PLANNING

Existing Typical Cross-Section



Tionscadal Éireann Project Ireland 2040

Notes

Do not scale

Clients

NTA Údarás Náisiúnta Iompair National Transport Authority
TII Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Theas South Dublin County Council
KILDARE nro NATIONAL ROADS OFFICE
Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant

ARUP

One Albert Quay, Cork, Ireland. T12 X8N6

Tel +353 (0)21 4225200 www.arup.ie

Job Title

M4 Eastbound Bus Priority Measures Pilot Project

Scale: NTS
Role: Civil - Highways
Date: December 2021

Issue	Date	By	Chkd	Appd
C01	01/10/2022	JD	GH	SB
Issued For Part 8 Planning (Status A1)				
P02	01/02/2022	JD	GH	SB
Issued For Information (Status S2)				
P01	17/12/2021	JD	GH	SB
Issued For Information (Status S2)				

Drawing Title

Existing Typical Cross Section Rendering

Sheet 01 of 01

Suitability

A1 - Suitable for Part 8 Planning

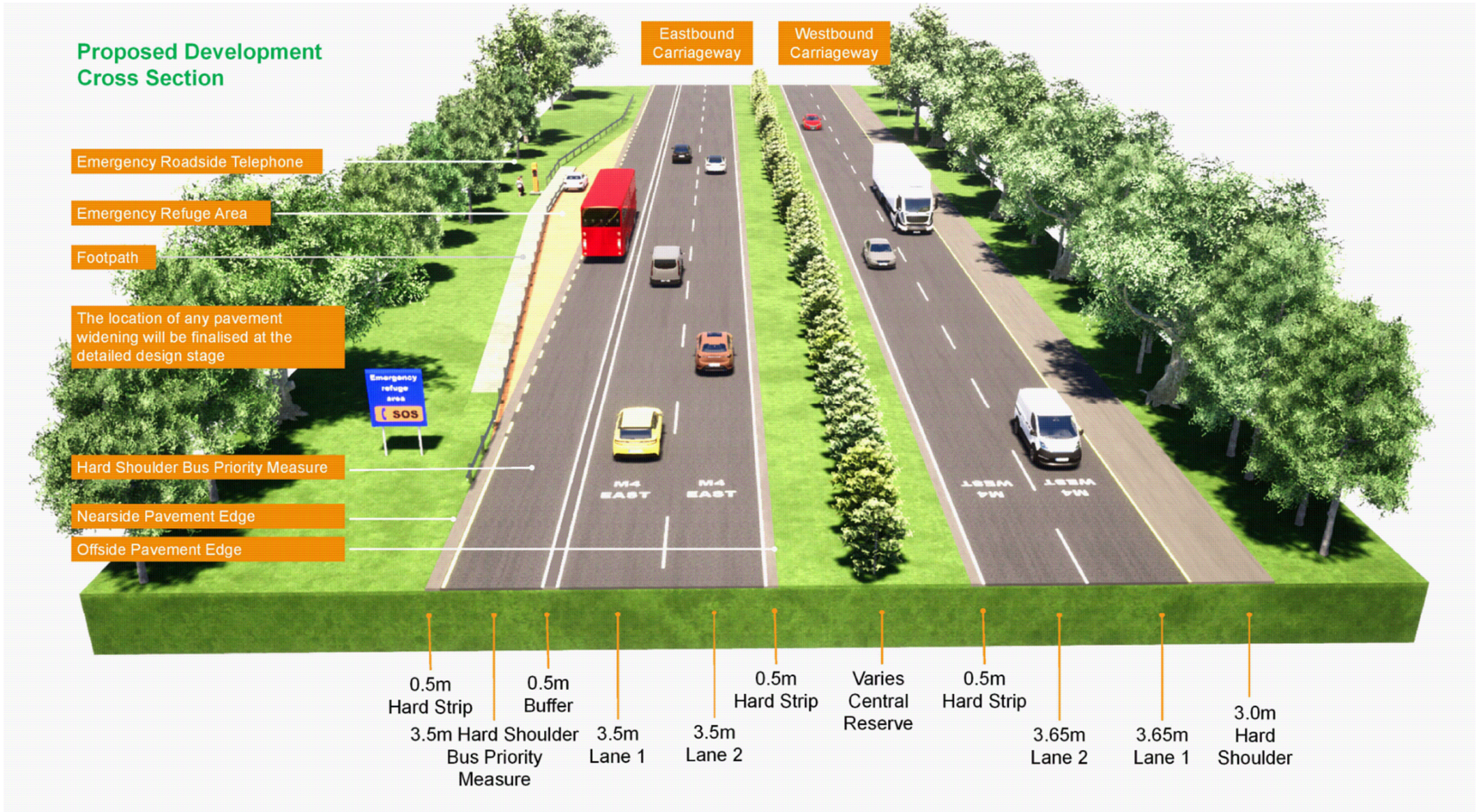
Job No: 272691
Rev.: C01

Drawing No

272691-ARUP-07-CF-DR-CH-000055

Drawing file path & name: \\dublinarupnet\Cork\Jobs\272600\272691-h004 Internal\4-02\2 Drawings\4-02-3 Highways\3. Bus Pilot\2. Phase 1 and 2\ 272691-ARUP-07-CF-DR-CH-000055.dwg
User and Plot Date: Jade Balogun - 15/2/2022 - 12:5 pm

PART 8 PLANNING



Tionscadal Éireann Project Ireland 2040

Notes

Do not scale

Clients

NTA Údarás Náisiúnta Iompair National Transport Authority

TII Bonneagar Iompair Éireann Transport Infrastructure Ireland

An Roinn Iompair Department of Transport

Comhairle Contae Átha Cliath Theas South Dublin County Council

Kildare nro National Roads Office

Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant

ARUP

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www.arup.ie

Job Title

M4 Eastbound Bus Priority Measures Pilot Project

Scale: NTS

Role: Civil - Highways

Date: December 2021

Issue	Date	By	Chkd	Appd
C01	01/10/2022	JD	GH	SB
Issued For Part 8 Planning (Status A1)				
P02	01/02/2022	JD	GH	SB
Issued For Information (Status S2)				
P01	17/12/2021	JD	GH	SB
Issued For Information (Status S2)				

Drawing Title

Eastbound Bus Priority Measures with Refuge Area
Proposed Typical Cross Section Rendering
Sheet 01 of 01

Suitability: **A1 - Suitable for Part 8 Planning**

Job No: **272691**

Rev.: **C01**

Drawing No: **272691-ARUP-07-CF-DR-CH-000056**

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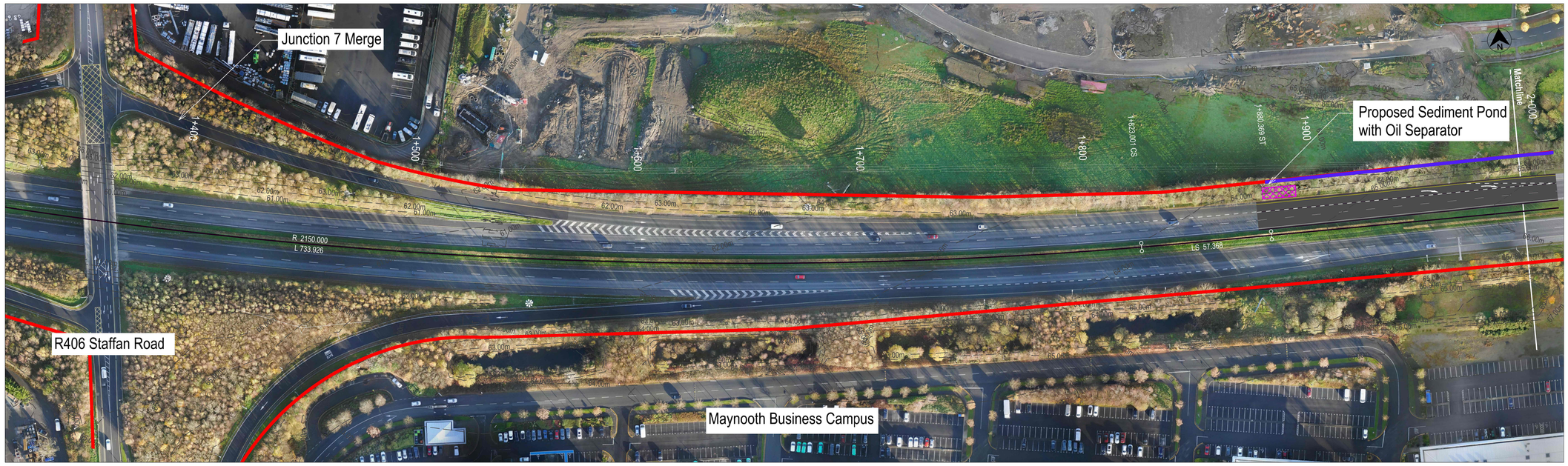
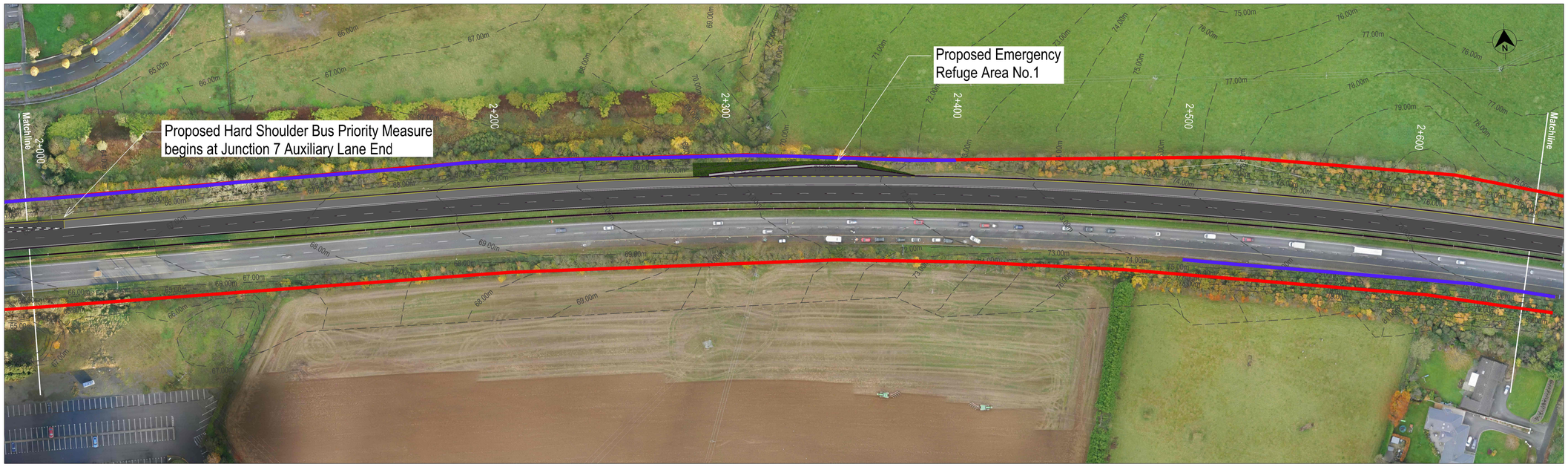
User and Plot Date: Jade Balcopoc - 15.2.2022 - 12:9 pm





Part 8 Planning

LEGEND - PLAN

- Proposed Hard Shoulder Bus Priority Measure (surfaced in low noise surfacing)
- Resurfaced with low noise surfacing
- Proposed Development Boundary
- Proposed Site Compound
- Proposed Sediment Pond with Oil Separator
- Proposed Oil Separator
- Proposed Active Travel Facility
- Proposed Noise Barrier. The height varies from 2m to 3.5m

Tionscadal Éireann Project Ireland 2040

Notes

1. The proposed noise barrier locations shown are indicative only and are subject to change. Further detailed assessments, design and on-going studies may result in amendments to the location, length and height of the proposed noise barriers.

Client's

NTA Údarás Náisiúnta Iompair National Transport Authority
TII Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Theas South Dublin County Council
Kildare National Roads Office
Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant

ARUP

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Ireland

Tel +353 (0)21 422 5200
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Job Title
M4 Eastbound Bus Priority Measures Pilot Project

Scale at A1: 1:1000
Role: Civil - Highways
Date: October 2022

Issue	Date	By	Chkd	Appd
C01	01/10/2022	AM	SB	SB
Issued For Part 8 Planning (Status A1)				
P01	25/01/2022	AM	SB	SB
Issued For Information (Status S2)				

Drawing Title
General Arrangement

Sheet 1 of 7

Suitability
A1 - Suitable for Part 8 Planning

Job No	Figure ID	Rev.
272691		C01

Drawing No
272691-ARUP-07-CF-DR-CH-000060

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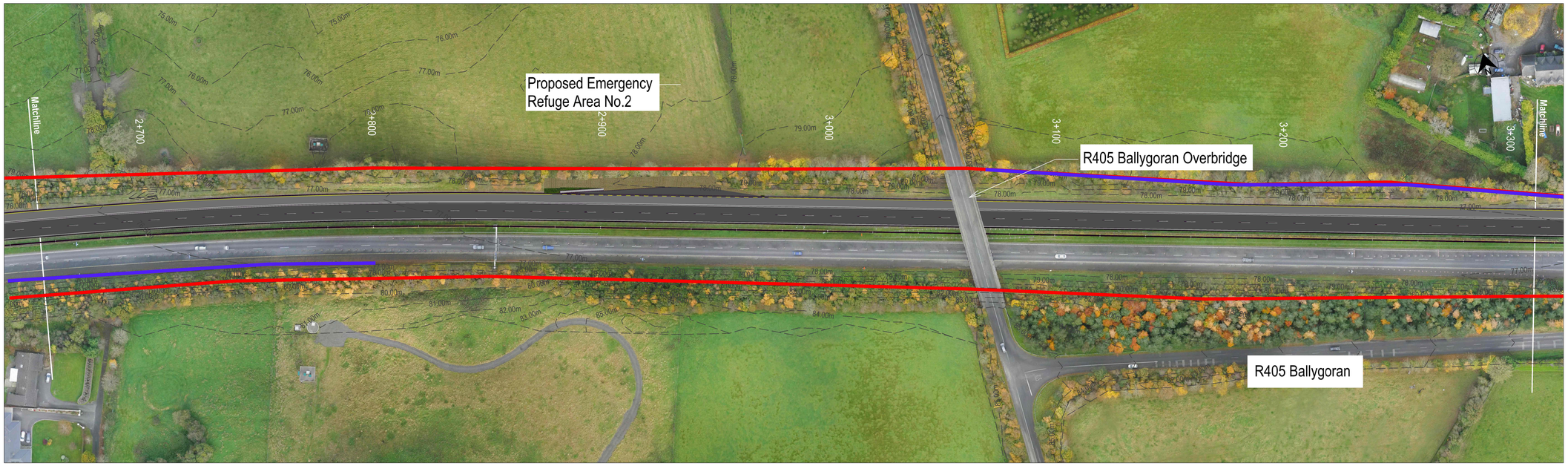

Part 8 Planning

LEGEND - PLAN

- Proposed Hard Shoulder Bus Priority Measure (surfaced in low noise surfacing)
- Resurfaced with low noise surfacing
- Proposed Development Boundary
- Proposed Site Compound
- Proposed Sediment Pond with Oil Separator
- Proposed Oil Separator
- Proposed Active Travel Facility
- Proposed Noise Barrier. The height varies from 2m to 3.5m

Tionscadal Éireann
Project Ireland
2040

Notes

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Clients: NTA Údarás Náisiúnta Iompair / National Transport Authority; TII Bonneagar Iompair Éireann / Transport Infrastructure Ireland; An Roinn Iompair / Department of Transport; Comhairle Contae Átha Cliath Theas / South Dublin County Council; KILDARE nro National Roads Office; Kildare County Council / Comhairle Contae Chill Dara

Key Plan

Consultant: ARUP
One Albert Quay
Cork, T12 X8N6
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Tel +353 (0)21 422 5200
www.arup.ie

Job Title: M4 Eastbound Bus Priority Measures Pilot Project

Scale at A1: 1:1000
Role: Civil - Highways
Date: October 2022

Issue	Date	By	Chkd	Appd
C01	01/10/2022	AM	SB	SB
Issued For Part 8 Planning (Status A1)				
P01	25/01/2022	AM	SB	SB
Issued For Information (Status S2)				

Drawing Title: **General Arrangement**

Sheet 2 of 7

Suitability: **A1 - Suitable for Part 8 Planning**

Job No: **272691** | Figure ID | Rev.: **C01**

Drawing No: **272691-ARUP-07-CF-DR-CH-000061**

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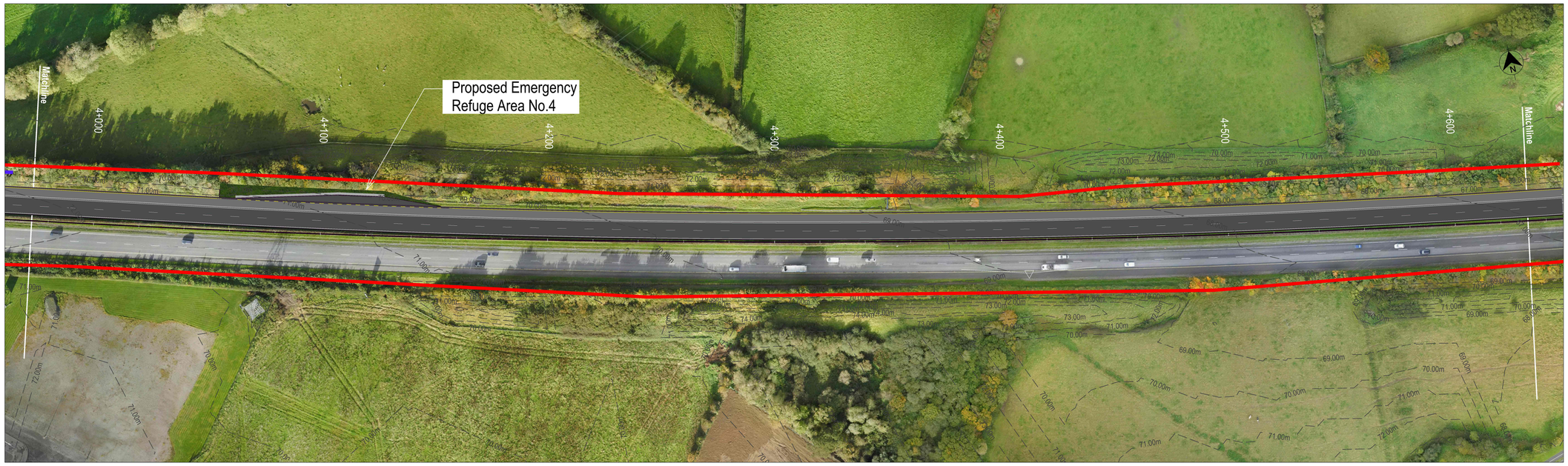

Part 8 Planning

LEGEND - PLAN

- Proposed Hard Shoulder Bus Priority Measure (surfaced in low noise surfacing)
- Resurfaced with low noise surfacing
- Proposed Development Boundary
- Proposed Site Compound
- Proposed Sediment Pond with Oil Separator
- Proposed Oil Separator
- Proposed Active Travel Facility
- Proposed Noise Barrier. The height varies from 2m to 3.5m

Tionscadal Éireann Project Ireland 2040

Notes

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Client's

NTA Údarás Náisiúnta Iompair National Transport Authority
Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Theas South Dublin County Council
KILDARE nro NATIONAL ROADS OFFICE
Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant

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www.arup.ie

Job Title
M4 Eastbound Bus Priority Measures Pilot Project

Scale at A1
1:1000

Role
Civil - Highways

Date
October 2022

C01	01/10/2022	AM	SB	SB
Issued For Part 8 Planning (Status A1)				
P01	25/01/2022	AM	SB	SB
Issued For Information (Status S2)				

Issue	Date	By	Chkd	Appd

Drawing Title
General Arrangement

Sheet 3 of 7

Suitability
A1 - Suitable for Part 8 Planning

Job No	Figure ID	Rev.
272691		C01

Drawing No
272691-ARUP-07-CF-DR-CH-000062

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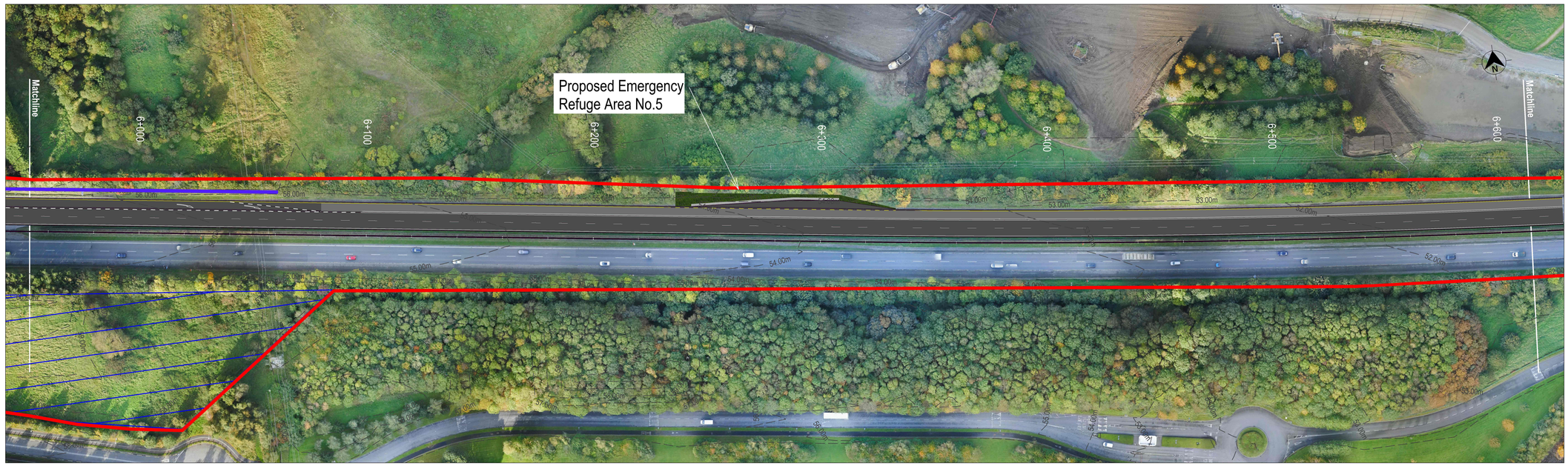

Part 8 Planning

LEGEND - PLAN

- Proposed Hard Shoulder Bus Priority Measure (surfaced in low noise surfacing)
- Resurfaced with low noise surfacing
- Proposed Development Boundary
- Proposed Site Compound
- Proposed Sediment Pond with Oil Separator
- Proposed Oil Separator
- Proposed Active Travel Facility
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Tionscadal Éireann Project Ireland 2040

Notes

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Client's

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Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Theas South Dublin County Council
Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant

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Tel +353 (0)21 422 5200
www.arup.ie

Job Title
M4 Eastbound Bus
Priority Measures
Pilot Project

Scale at A1 1:1000
Role Civil - Highways
Date October 2022

C01	01/10/2022	AM	SB	SB
Issued For Part 8 Planning (Status A1)				
P01	25/01/2022	AM	SB	SB
Issued For Information (Status S2)				
Issue	Date	By	Chkd	Appd

Drawing Title
General Arrangement

Sheet 4 of 7

Suitability
A1 - Suitable for Part 8 Planning

Job No	Figure ID	Rev.
272691		C01

Drawing No
272691-ARUP-07-CF-DR-CH-000063

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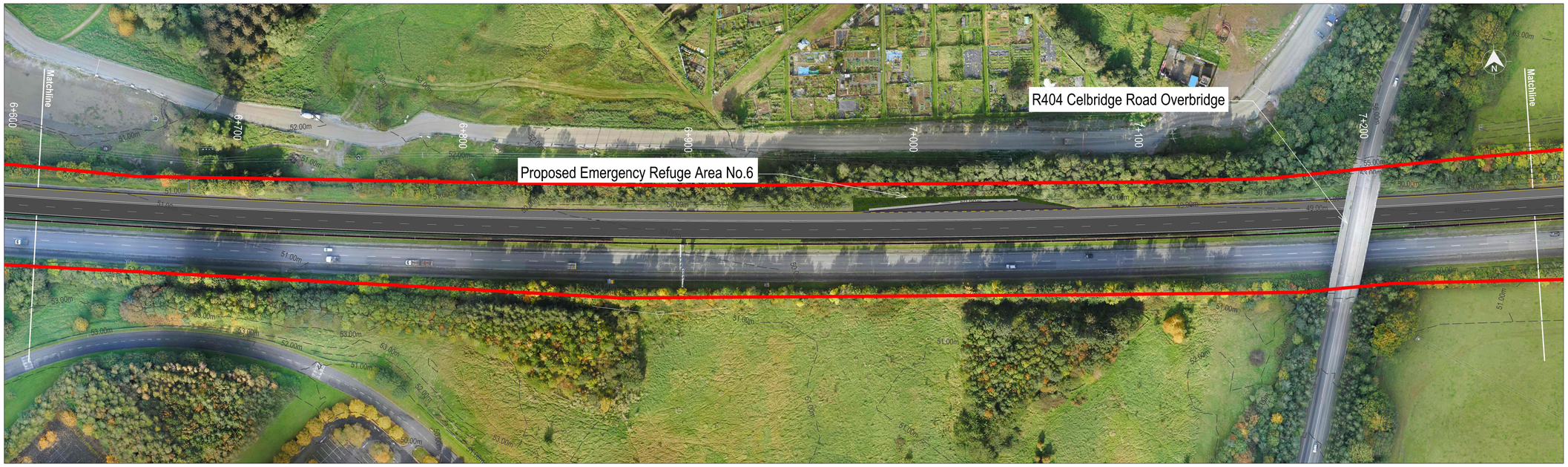

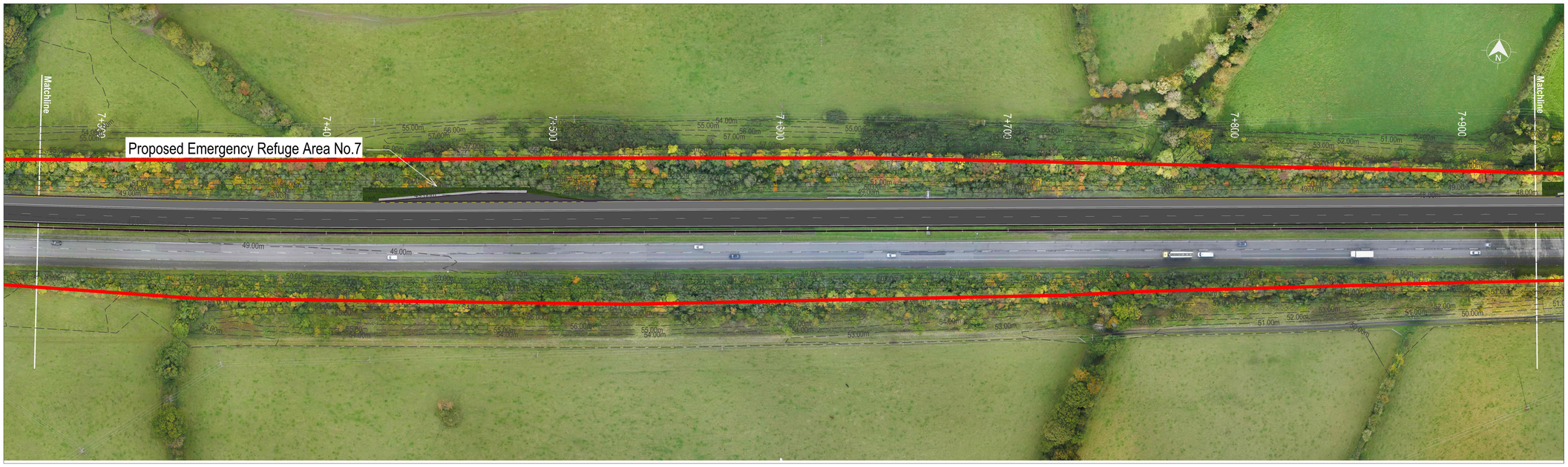

FOR INFORMATION

LEGEND - PLAN

- Proposed Hard Shoulder Bus Priority Measure (surfaced in low noise surfacing)
- Resurfaced with low noise surfacing
- Proposed Development Boundary
- Proposed Site Compound
- Proposed Sediment Pond with Oil Separator
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Tionscadal Éireann
Project Ireland
2040

Notes

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Clients: NTA National Transport Authority; TII Bonneagar Iompair Éireann Transport Infrastructure Ireland; An Roinn Iompair Department of Transport; Comhairle Contae Átha Cliath Theas South Dublin County Council; KILDARE nro NATIONAL ROADS OFFICE; Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant: ARUP
One Albert Quay
Cork, T12 X8N6
Ireland
Tel +353 (0)21 422 5200
www.arup.ie

Job Title: M4 Eastbound Bus Priority Measures Pilot Project

Scale at A1: 1:1000
Role: Civil - Highways
Date: October 2022

Issue	Date	By	Chkd	Appd
C01	01/10/2022	AM	SB	SB
Issued For Part 8 Planning (Status A1)				
P01	25/01/2022	AM	SB	SB
Issued For Information (Status S2)				

Drawing Title: **General Arrangement**

Sheet 5 of 7

Suitability: **A1 - Suitable for Part 8 Planning**

Job No: **272691** | Figure ID | Rev.: **C01**

Drawing No: **272691-ARUP-07-CF-DR-CH-000064**

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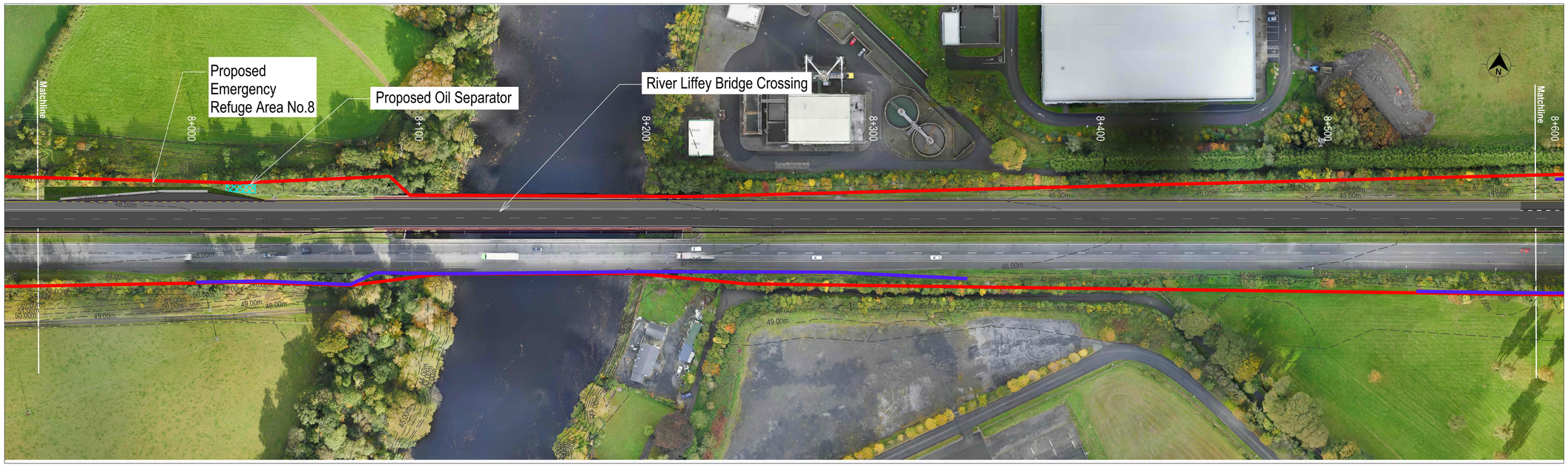

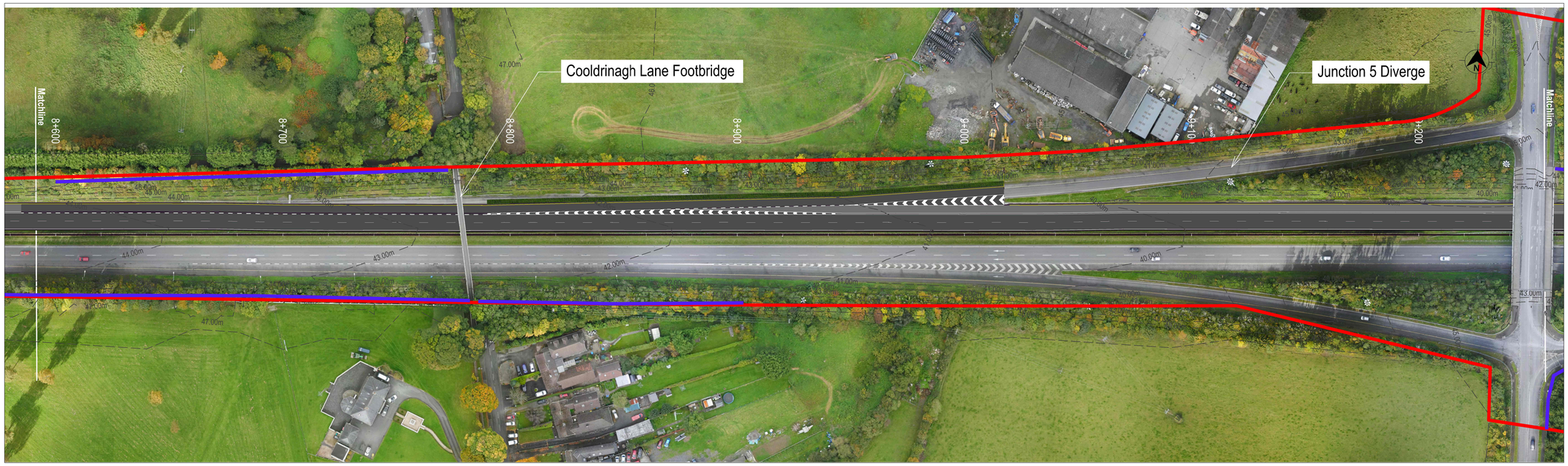

Part 8 Planning

LEGEND - PLAN

- Proposed Hard Shoulder Bus Priority Measure (surfaced in low noise surfacing)
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Tionscadal Éireann Project Ireland 2040

Notes

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Clients: NTA Údarás Náisiúnta Iompair National Transport Authority; TII Bonneagar Iompair Éireann Transport Infrastructure Ireland; An Roinn Iompair Department of Transport; Comhairle Contae Átha Cliath Theas South Dublin County Council; Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant: ARUP
One Albert Quay
Cork, T12 X8N6
Ireland
Tel +353 (0)21 422 5200
www.arup.ie

Job Title: M4 Eastbound Bus Priority Measures Pilot Project

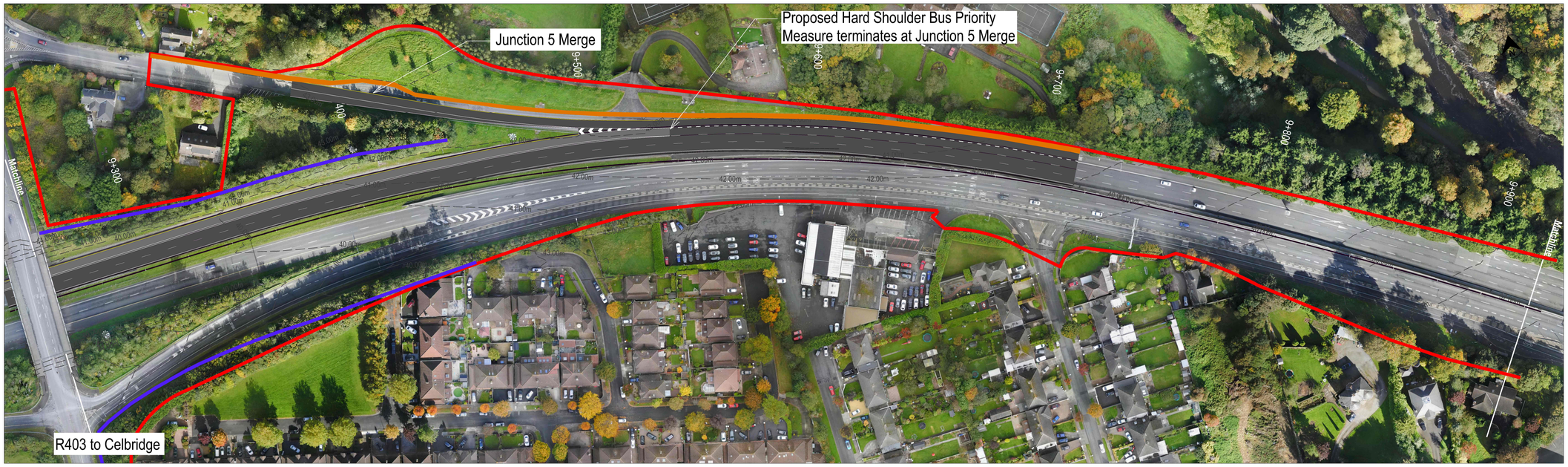
Scale at A1: 1:1000
Role: Civil - Highways
Date: October 2022

C01	01/10/2022	AM	SB	SB
Issued For Part 8 Planning (Status A1)				
P01	25/01/2022	AM	SB	SB
Issued For Information (Status S2)				
Issue	Date	By	Chkd	Appd

Drawing Title: General Arrangement
Sheet 6 of 7
Suitability: A1 - Suitable for Part 8 Planning
Job No: 272691
Figure ID:
Rev.: C01
Drawing No: 272691-ARUP-07-CF-DR-CH-000065

Do not scale

A1



Part 8 Planning

LEGEND - PLAN

- Proposed Hard Shoulder Bus Priority Measure (surfaced in low noise surfacing)
- Resurfaced with low noise surfacing
- Proposed Development Boundary
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Tionscadal Éireann Project Ireland 2040

Notes

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Kildare County Council Comhairle Contae Chill Dara

Key Plan

Consultant

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Ireland

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www.arup.ie

Job Title
M4 Eastbound Bus Priority Measures Pilot Project

Scale at A1: 1:1000
Role: Civil - Highways
Date: October 2022

Issue	Date	By	Chkd	Appd
C01	01/10/2022	AM	SB	SB
Issued For Part 8 Planning (Status A1)				
P01	25/01/2022	AM	SB	SB
Issued For Information (Status S2)				

Drawing Title
General Arrangement

Sheet 7 of 7

Suitability
A1 - Suitable for Part 8 Planning

Job No	Figure ID	Rev.
272691		C01

Drawing No
272691-ARUP-07-CF-DR-CH-000066

Do not scale