Project

Redford Park Junction Improvement Scheme

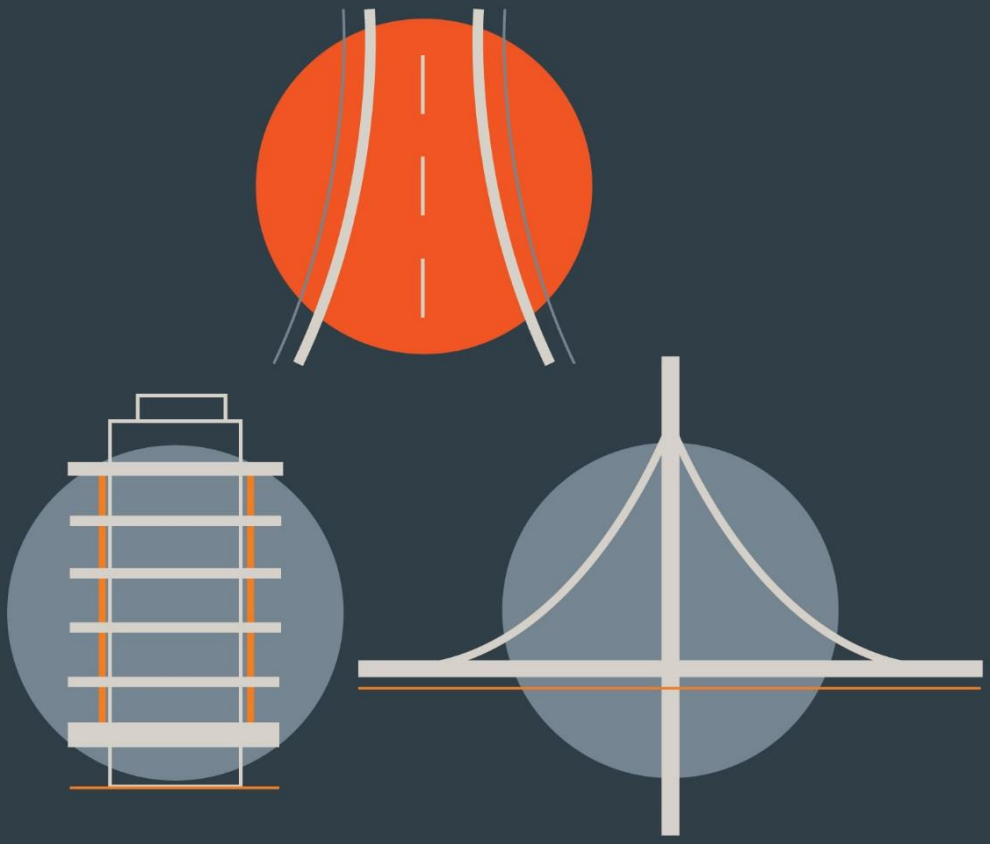
Report Title

Part 8 Design Report

Client

Wicklow County Council

TRANSPORTATION



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APPENDICES

1.0 INTRODUCTION

1.1 INTRODUCTION

1.1.1 DBFL have been commissioned by Wicklow County Council (WCC) to prepare a Part 8 Design Report for the design of the R761/Redford Park/Blacklion Manor Road Signalised Junction (Redford Park Junction) Improvement Scheme.

1.1.2 The overall scheme aims to deliver an upgrade to the existing signal-controlled Redford Park junction which is located within the Redford area of Greystones in County Wicklow. The upgrades will consist of improvements for pedestrians and cyclists with the upgrade of footpaths and inclusion of protected cycle track facilities, as well as an improvement to public transport through the upgrading of two existing bus stops in the immediate vicinity of the junction.

1.2 SITE LOCATION

1.2.1 The junction is located within the Redford area in Greystones, County Wicklow. A site location map, shown in Figure 1-1, outlines the location of the Redford Park junction.

Figure 1-1: Scheme Location (Source: Google Maps)

1.3 BACKGROUND TO SCHEME

1.3.1 The existing junction is located within an area of Greystones that experiences peaks in traffic flows, in particular, during morning and evening times. This is due to a number of factors, including the following which are also illustrated in Figure 1-2 below:

Local Schools: The junction is located in close proximity to three schools, the Greystones Educate Together National School, Temple Carrig School and Gaelscoil na gCloch Liath, all located along the Blacklion Manor Road. There are a number of car, pedestrian and cycle trips, therefore, accessing and egressing the schools for drop off and pick up times.

R761 Regional Road: The R761, which routes through the junction in a north to south direction, is the main Regional Road from Greystones into Bray Town and also provides an access road to the M11 Motorway. The R761, approximately 25km in length, routes from Rathnew in the outskirts of Wicklow, travelling northwards through Kilcoole and Greystones terminating in Bray Town at the junction to the M11. This route is busy at peak times with a typical AADT of between 11,000 – 12,000 Vehicles.

Local Amenities: The junction is located in close proximity to a number of amenities including local shops off Blacklion Manor Road that include a Lidl food store, a Circle K Garage off the R761 southern arm as well as a number of smaller retail shops. These amenities attract a number of vehicle movements throughout the day.

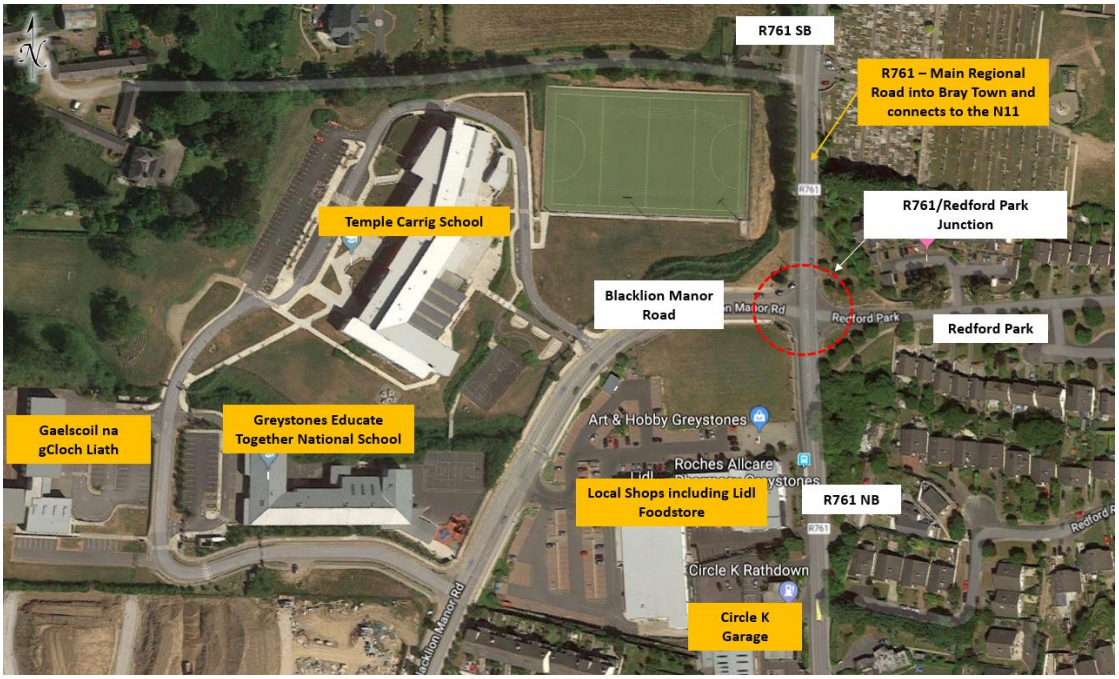


Figure 1-2: Key Trip Attractors (Source: Google Maps)

1.4 AIMS & OBJECTIVES

1.4.1 The main aim is to deliver a scheme for the Redford Park Junction that will improve pedestrian and cycle facilities through the junction as well as improve the junctions safety and operation for all users.

1.4.2 The main objectives for the scheme are therefore:

1. To provide improved pedestrian facilities along the scheme extents, including improved footpaths and pedestrian crossing facilities;
2. To provide high quality, safe and continuous cycle facilities through the scheme extents; and
3. To provide improvements for vehicular movements.

1.5 REPORT STRUCTURE

1.5.1 Following on from **Chapter 1** of this report, which details the Introduction and background to the scheme, **Chapter 2** outlines the relevant policy and guidance documents that justify the scheme on a national, regional and local basis.

1.5.2 **Chapter 3** details the Existing Conditions for the area including the existing roads, footpaths and cycle provision through the junction as well as existing amenities in the surrounding environment.

1.5.3 **Chapter 4** outlines the proposed scheme development for the Redford Park junction including proposed pedestrian, cyclist and public transport enhancements as well as required drainage and utilities works.

1.5.4 **Chapter 5** describes the Environmental Assessment undertaken and findings, including archaeological and built heritage constraints.

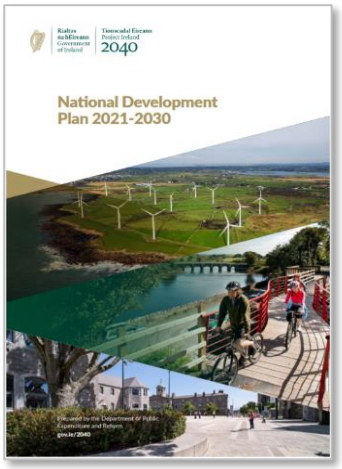
1.5.5 **Chapter 6** provides a Summary of the report as well as a Conclusion.

2.0 POLICY CONTEXT

2.1.1 It is important that a review of current Policy is undertaken and used to inform the development of the options considered for the Redford Park Junction Improvement Scheme. The following policy documents and design guidance have been reviewed as part of this scheme.

2.2 NATIONAL DEVELOPMENT PLAN (2021-2030)

2.2.1 As part of Project Ireland 2040 the National Development Plan sets out the Government's over-arching investment strategy and budget for the period 2021-2030. It is an ambitious plan that balances the significant demand for public investment across all sectors and regions of Ireland with a major focus on improving the delivery of infrastructure projects to ensure speed of delivery and value for money.



2.2.2 The NDP sets out a significant level of investment, almost €165 billion, which will underpin the NPF and drive its implementation over the next nine years. The scale of the Transport-related requirements under the revised NDP amounts to c. €35 billion in total over 2021- 2030.

2.2.3 The National Planning Framework (NPF) recognises the importance of significant investment in sustainable mobility (active travel and public transport) networks if the NPF population growth targets are to be achieved. Investing in high-quality sustainable mobility will improve citizens' quality of life, support our transition to a low-carbon society and enhance our economic competitiveness.

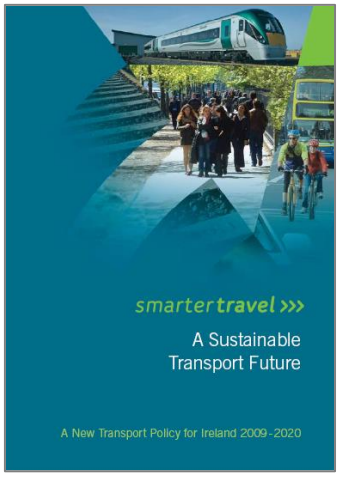
2.2.4 With regard to Ireland's greenhouse gas emissions, the transport sector has been determined as a key contributor to this and is responsible for 20%. The NDP sets out an entire National Strategic Objective that is dedicated to "Sustainable Mobility" and has a range of policies and measures to promote the achievement of sustainable mobility. The following definitions of Sustainable Mobility have been outlined in the NDP:

- Comfortable and affordable journeys to and from work, home, school, college, shops and leisure;
- Travelling by cleaner and greener transport; and
- A shift away from the private car to greater use of active travel (walking and cycling) and public transport.

2.2.5 The Government is firmly committed to encouraging the use of walking, cycling and other active travel methods, and this has been signalled by the recent increase in the active travel budget. Whole-of Government funding equivalent to 20% of the 2020 transport capital budget, or €360 million, has been committed annually for the period 2021-2025. In 2021, the NTA allocated just over €240 million to active travel infrastructure projects in Dublin, the Greater Dublin Area and regional cities.

2.2.6 This investment will help support the delivery of significant levels of new and improved walking and cycling infrastructure by 2025, as well as additional investment in Greenways. Successful delivery of planned projects and programmes should serve to encourage a shift in the population towards walking, cycling and scooting as transport modes as the decade progresses.

2.3 SMARTER TRAVEL: A SUSTAINALBE TRANSPORT FUTURE (2009–2020)



2.3.1 Smarter Travel - A Sustainable Transport Future, was published in February 2009, and represents a new transport policy for Ireland for the period 2009-2020. The policy recognises the vital importance of continued investment in transport to ensure an efficient economy and continued social development, but it also sets out the necessary steps to ensure that people choose more sustainable transport modes such as walking, cycling and public transport.

2.3.2 The policy is a direct response to the fact that continued growth in demand for road transport is not sustainable due to the resulting adverse impacts of increasing congestion levels, local air pollution, contribution to global

warming, and the additional negative impacts to health through promoting increasingly sedentary lifestyles.

2.3.3 The following five key goals form the basis of the Smarter Travel policy document:

- Improve quality of life and accessibility to transport for all and, in particular, for people with reduced mobility and those who may experience isolation due to lack of transport.
- Improve economic competitiveness through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks.
- Minimise the negative impacts of transport on the local and global environment through reducing localised air pollutants and greenhouse gas emissions.
- Reduce overall travel demand and commuting distances travelled by the private car.
- Improve security of energy supply by reducing dependency on imported fossil fuels.

2.3.4 These aims will be achieved through 49 specific actions listed within the Smarter Travel Policy, which can be broadly grouped into 4 key areas:

- Actions to reduce distance travelled by private car and encourage smarter travel,
- Actions aimed at ensuring that alternatives to the private car are more widely available,
- Actions aimed at improving the fuel efficiency of motorised transport through improved fleet structure, energy efficient driving and alternative technologies, and
- Actions aimed at strengthening institutional arrangements.

2.3.5 The Smarter Travel policy also includes for a comprehensive range of supporting 'actions' including mode specific (e.g. walking, cycling and public transport etc.) and behaviour change initiatives which both encourage and provide for sustainable travel practices for all journeys.

2.4 CLIMATE ACTION PLAN (2021)

2.4.1 The Climate Action Plan 2021 sets out a major programme for change in response to reducing Ireland's greenhouse gas emissions. The proposals outlined in the Plan are aimed at achieving a net zero carbon energy system within Ireland and it is envisaged that these proposals will also have associated positive economic and societal benefits, including cleaner air, warmer homes and a more sustainable economy in the longer term.

2.4.2 Irelands transport system plays a critical role in realising the ambitious targets of the Climate Action Plan. Consequently, to make growth less transport intensive a number of key policies are identified, including the expansion of walking, cycling and public transport to promote modal shift. The measures to deliver on the transport related targets set out in the Climate Action Plan cover the following:

- Sustainability;
- System Efficiency and Demand Management;
- Fleet Electrification;
- Renewable and Alternative Transport Fuels for Freight;
- Use of Green Hydrogen and other Emerging Technologies.

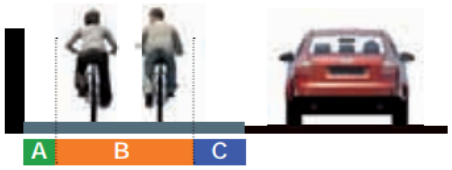
2.5 NATIONAL CYCLE MANUAL (2011)

2.5.1 The National Cycle Manual is a national guidance document that details the principles of sustainable safety that offers a safe traffic environment for all road users including cyclists. The manual provides guidance on integrating the bicycle into the design of urban areas. The manual sets out five principles of Sustainable Safety:

1. Functionality: The principle of functionality is that the design which is fit for purpose is safer. Urban streets, roads and spaces are always multi – functional.
2. Homogeneity: The principle of Homogeneity is that reducing the relative speed, mass and directional differences of different road users sharing the same space increases safety.
3. Legibility: The principle of Legibility is that a road environment that all road users can read and understand is safer. A legible design will be self-evident, self-explanatory and self-enforcing.
4. Forgivingness: The principle of Forgivingness (Passive Safety) is that environments that contribute to benign outcomes of accidents are safer.
5. Self-Awareness: The principle of Self-Awareness is that where road users are aware of their own abilities and limitations to negotiate a road environment, the environment is safer.

2.5.2 The width of a cycle facility as well as the type of facility proposed (Integrated or Segregated) are two key factors for providing adequate, safe facilities and a sub-standard cycle lane/track is never recommended.

2.5.3 The designed width of a cycle facility is comprised of the effective width as well as clearances that are required in different circumstances. The Width Calculator table provides details for determining the actual width required for cycle lanes and tracks. It comprises of three main factors, A, B and C, as well as an additional factor, D, which is only relevant in certain circumstances. The width calculator table is illustrated in Figure 2-1.



A Inside Edge		B Cycling Regime		C Outside Edge		D Additional Features	
Kerb	0.25m	Single File	0.75m	30kph, 3.0m wide lane	0.50m	Uphill	0.25m
						Sharp bends	0.25m
Channel Gully	0.25m	Single File + Overtaking, Partially using next lane	1.25m	50kph, 3.0m wide lane	0.75m	Cyclist stacking, Stopping and starting	0.50m
Wall, Fence or Crash Barrier	0.65m	Basic Two-Way	1.75m	Raised kerb, dropped Kerb or physical barrier	0.50m	Around primary schools, Interchanges, or for larger tourist bikes	0.25m
Poles or Bollards	0.50m	Single File + Overtaking, Partially using next lane	2.00m	Kerb to vegetation etc. (ie. cycleway)	0.25m	Taxi ranks, loading, line of parked cars	1.00m (min 0.8m)
		2 Abreast + overtaking (tracks and cycleways)	2.50m			Turning pocket cyclists	0.50m

Figure 2-1: Cycle width calculator – National Cycle Manual (Source: NCM)

2.5.4 In terms of the type of facility proposed, integrated or segregated, there are a number of factors considered for determining the type of facility most appropriate. Segregated facilities are recommended in the following circumstances:

- The traffic regime cannot be rendered suitable for integrated cycling;
- To preclude traffic from queuing or parking on the facility;
- To confer an advantage on cyclists.

2.5.5 A guidance graph is illustrated in Figure 2-2 that sets out relevant factors for determining the type of facility to provide.

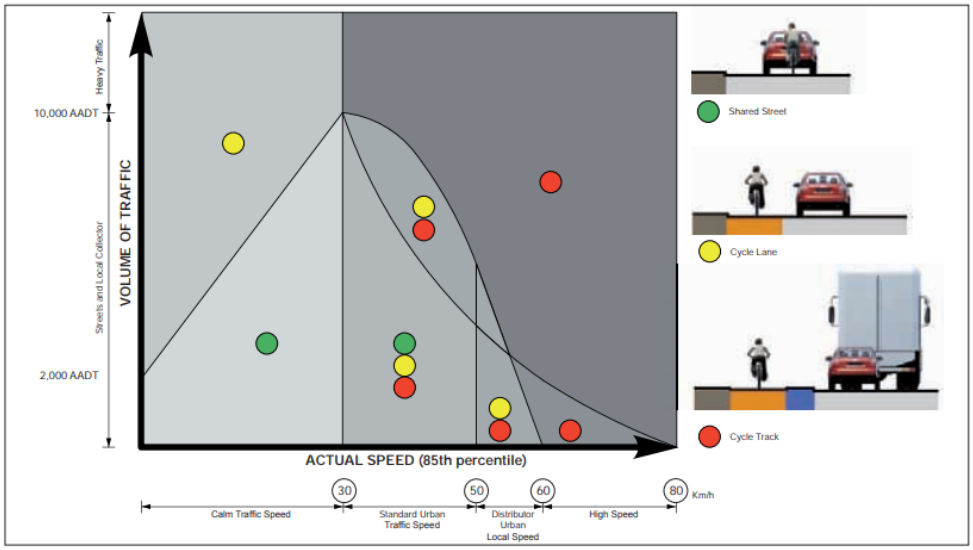
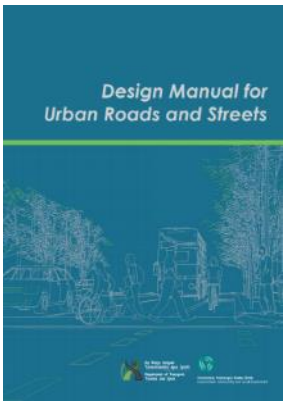


Figure 2-2: Guidance graph for determining type of cycle facility
(Source: NCM)

2.5.6 The graph determines the type of facility necessary, whether the facility is shared, cycle lane or cycle track, based on vehicle speed and AADT of the road.

2.6 DESIGN MANUAL FOR URBAN ROADS AND STREETS (2019)



2.6.1 The Design Manual for Urban Roads and Streets (DMURS) provides guidance relating to the design of urban roads and streets. It presents a series of principles, approaches and standards that are necessary to achieve balanced, best practice design outcomes with regard to street networks and individual streets.

2.6.2 The manual places a significant emphasis on car dominance in Ireland and the implications this has had regarding the pedestrian and cycle environment. The document encourages more sustainable travel patterns and safer streets by proposing a hierarchy for user priorities. This hierarchy places pedestrians at the top, indicating that walking is the most sustainable form of transport and that by prioritising pedestrians first, the number of short car journeys can be reduced and public transport made more accessible.

2.6.3 Second in the hierarchy are cyclists with public transport third in the hierarchy and private motor vehicles at the bottom. By placing private vehicles at the

bottom of the hierarchy, the document indicates that there should be a balance on street networks and cars should no longer take priority over the needs of other users.

2.6.4 The manual emphasises that narrow carriageways are one of the most effective design measures that calm traffic. Standard width of an arterial and link street is 3.25m, however, this may be reduced to 3m where lower design speeds are being applied. Desirable footpath widths are between 2m – 4m. The 2m width should be implemented to allow for low to moderate pedestrian activity. A 3m – 4m footpath should be implemented to allow for moderate to high pedestrian activity.

2.6.5 The focus of the manual is to create a place–based sustainable street network that balances the pedestrian and vehicle movements. The manual references the different types of street networks, including arterial streets, link streets, local streets, and highlights the importance of movement.

2.7 DRAFT PRELIMINARY DESIGN GUIDANCE BOOKLET FOR BUSCONNECTS CORE BUS CORRIDORS (2020)

2.7.1 The Draft Preliminary Design Guidance Booklet for BusConnects has recently been produced to assist with the design of typical corridor scenarios and layouts.

2.7.2 The purpose of the booklet is to complement, and not supersede, existing guidance documents relating to the design of urban streets, bus facilities, cycle facilities and public realm.

2.7.3 The aim of the design booklet is to provide guidance for the various design teams involved in the CBC Project and ensure a consistent design approach across the project. The document focuses on the engineering geometry and CBC operation, whilst acknowledging that the design evolution will result in the rationalisation of junction and link layouts, presenting opportunities to increase the public realm footprint and improve the placemaking offering of the CBC network.

2.7.4 The booklet also recognises that the CBC project is being planned and designed within the context of an existing city, with known constraints. The document provides guidance on the requirement for a more flexible

approach to the design of CBCs and utilising engineering judgement may be necessary in some locations due to these constraints. The optimum CBC cross section is shown in Figure 2-3.

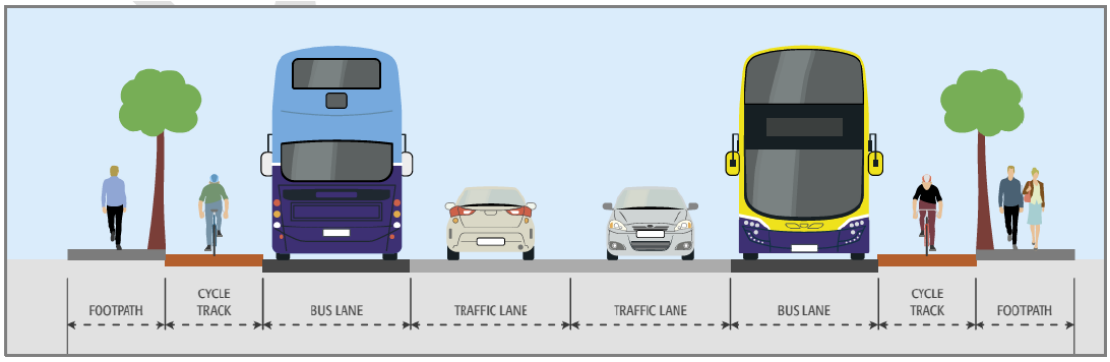


Figure 2-3: Optimum CBC Cross Section (Source: Preliminary Design Guidance Booklet)

2.7.5 With regards to junction design, the design guidance booklet states that the preferred layout for signalised junctions within the CBC project is the protected 'Dutch-style' junction, shown in Figure 2-4, which provides physical kerb buildouts to protect cyclists through the junction.

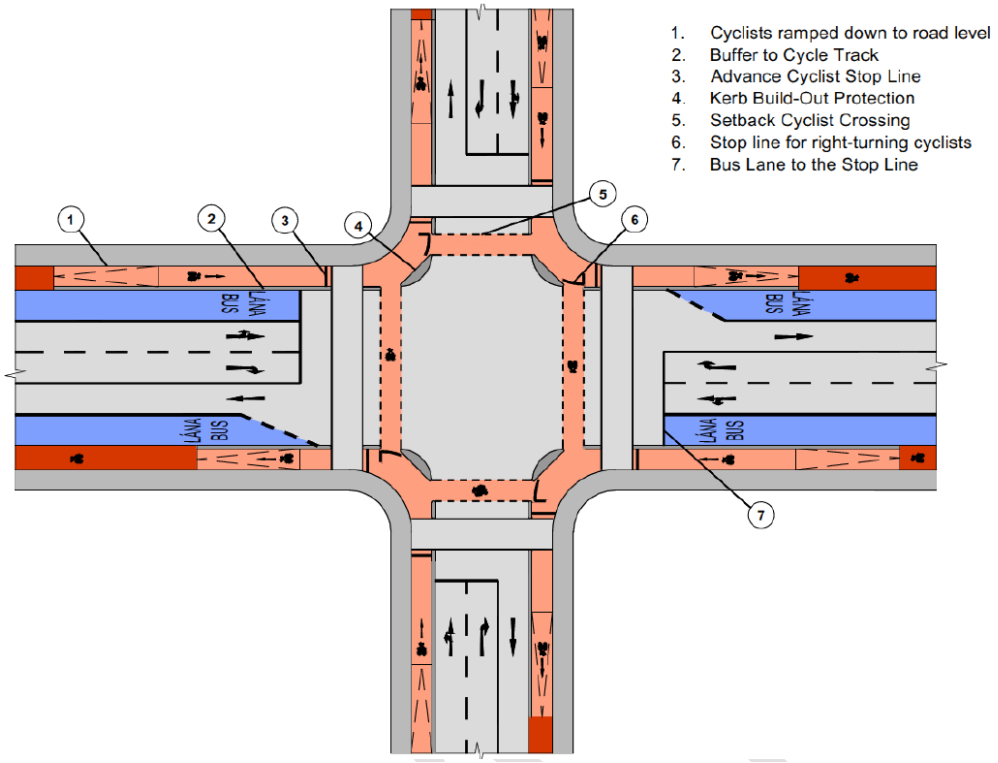


Figure 2-4: Dutch-Style Junction Design (Source: Preliminary Design Guidance Booklet)

2.7.6 With regard to bus stops, Island Bus Stops, such as that illustrated in Figure 2-5 are the preferred bus stop option to be used as standard on the CBC project where space constraints allow.

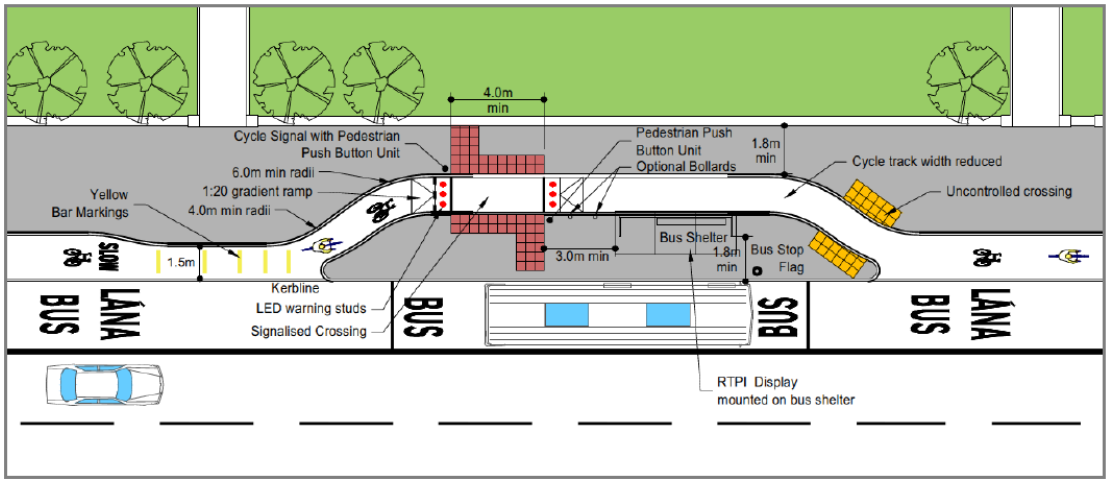
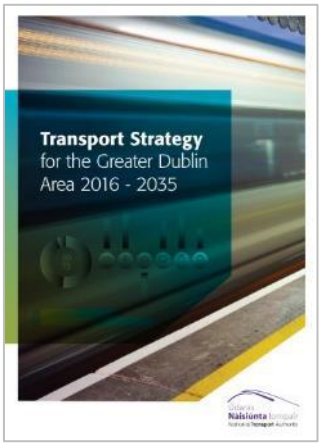


Figure 2-5: Island Bus Stop Arrangement (Source: Preliminary Design Guidance Booklet)

2.8 TRANSPORT STRATEGY FOR THE GREATER DUBLIN AREA (2016-2035)



2.8.1 The purpose of this strategy is '*to contribute to the economic, social and cultural progress of the Greater Dublin Area by providing for the efficient, effective and sustainable movement of people and goods.*'

2.8.2 This transport strategy provides a framework for the planning and delivery of transport infrastructure and services in the Greater Dublin Area (GDA).

2.8.3 There is an onus on the Authority to take full account of current prevailing policies and plans made at central government level, in transport, planning and in other sectors as well as other regional level plans. On review of these policies, the following key messages have emerged:

- Transport must be a key consideration in land use planning;
- In the short term, funding for large scale transport projects will be limited;
- Addressing urban congestion is a priority;
- The capacity of the strategic road network must be protected;

- A significant reduction in the share of trips undertaken by car is required, particularly in relation to short trips and commuter trips;
- An associated increase in walking, cycling and public transport is also required;
- A safe cycling network, with extensive coverage in metropolitan Dublin and in other towns, is needed to cater for the increased use of cycling that is already occurring and to reduce the dominance of the private car in meeting travel needs;
- The enhancement of the pedestrian environment, including measures to overcome severance and to increase permeability, is a priority.

2.8.4 In terms of cycle infrastructure, the GDA cycle network plan proposes to expand the urban cycle network to over 1,485km in length and will provide over 1,300km of new connections between towns in the rural areas of the GDA.

2.8.5 The need for a safe cycling network is recognised and it is intended that many of the key cycling route will be developed as segregated facilities, with cyclists separated from vehicular traffic through the use of kerb separators or by having the cycleway at a higher level than the road carriageway.

2.8.6 In terms of walking and issues raised relating to provision for pedestrians, it is intended to:

- Provide a safer, more comfortable and more convenient walking environment for those with mobility, visual and hearing impairments, and for those using buggies and prams;
- Enhance pedestrian movement along the strategic pedestrian routes by widening footpaths where appropriate, providing better surfacing and by removing unnecessary poles, signs, street cabinets, advertising and other street clutter;
- Revise road junction layouts, where appropriate, to provide dedicated pedestrian crossings, reduce pedestrian crossing distances, provide more direct pedestrian route and reduce the speed of turning traffic;

- Cooperate with other agencies in the enforcement of laws in relation to parking on footpaths;
- Ensure that permeability and accessibility of public transport stops and stations for local communities is maintained and enhanced.

2.9 DRAFT TRANSPORT STRATEGY FOR THE GREATER DUBLIN AREA 2022-2042

2.9.1 The Draft Greater Dublin Area Transport Strategy 2022-2042 has arisen from a review of the original 2016 strategy. The updated document *"sets out the framework for investment in transport infrastructure and services over the next twenty years".*

2.9.2 The overall aim of the Transport Strategy is *"To provide a sustainable, accessible and effective transport system for the Greater Dublin Area which meets the region's climate change requirements, serves the needs of urban and rural communities, and supports economic growth".*

2.9.3 Four primary objectives have been identified as part of the Draft Greater Dublin Area Transport Strategy 2022-2028. These are:

- **An Enhanced Natural and Built Environment -** To Create a better environment and meet our environmental obligations by transitioning to a clean, low emission transport system, reducing car dependency, and increasing walking, cycling and public transport use.
- **Connected Communities and a Better Quality of Life –** To enhance the health and quality of life of our society by improving connectivity between people and places, delivering safe and integrated transport options, and increasing opportunities for walking and cycling.
- **A Strong Sustainable Economy –** To support economic activity and growth by improving the opportunity for people to travel for

work or business where and when they need to, and facilitating the efficient movement of goods.

- **An Inclusive Transport System –** To deliver a high quality, equitable and accessible transport system, which caters for the needs of all members of society.

2.9.4 With regards to cycling, the Strategy acknowledges the growth in cycling in the Greater Dublin Area since the mid-2000s and the need to provide a coherent network of cycle facilities linking origins and destinations to cater for trips within communities. Measured for cycling outlined in the Strategy of particular relevance to this scheme include:

- **Measure CYC1 – GDA Cycle Network** It is the intention of the NTA and the local authorities to deliver a safe, comprehensive, attractive and legible cycle network in accordance with the updated Greater Dublin Area cycle Network.
- **Measure CYC2 – Cycle Infrastructure Design** It is the intention of the NTA to ensure that cycle infrastructure in the GDA provides an appropriate quality of service for all users, through the implementation of the design guidance contained in the latest version of the National Cycle Manual.

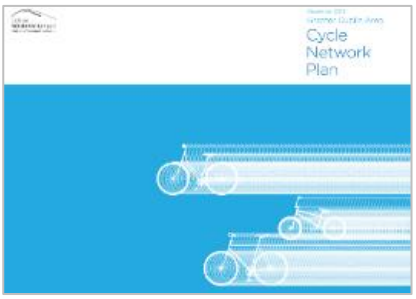
2.9.5 In terms of walking, the Strategy highlights the importance of good quality pedestrian facilities while recognising that walking forms some part of most journeys. Plans to provide a better walking environment include:

- Improving footpaths to ensure they are of sufficient width, adequately lit, serve both sides of the road in most urban areas, have good quality surfacing and are free of unnecessary clutter.
- Improving junctions to reduce the distance pedestrians have to cross and the number of times they must stop and wait during a crossing.
- Optimising crossing times for pedestrians at signalised junctions.
- Installing additional pedestrian crossing points where requirements are identified.
- Expanding and improving wayfinding systems.

2.9.6 The draft of the Transport Strategy is currently out for public consultation until 17th December 2021.

2.10 GDA CYCLE NETWORK PLAN (DECEMBER 2013)

2.10.1 The GDA Cycle Network Plan is a document, prepared on behalf of the National Transport Authority, that identifies and determines a consistent, clear and logical cycle network within the Greater Dublin Area.



2.10.2 The plan aims to ensure that cycling as a transport mode is supported, enhanced and exploited in order to achieve strategic objectives and reach national goals. The steps undertaken within the plan include the following:

1. Collate existing and planned network information;
2. Undertake quality of service review;
3. Identify gaps in existing network;
4. Cycle travel demand assessment;
5. Develop cycle network plan;
6. Target quality of service for routes;
7. Develop design concepts.

2.10.3 These seven steps proposed are in line with the National Cycle Manual methods for designing a Cycle Network.

2.10.4 The GDA Cycle Network map, shown in Figure 2-6, outlines the proposals for the Greystones area, which route through the Redford Park Junction. This shows that there is a proposed primary/secondary route (G1) along the R761 NB arm that extends back into Greystones Town. This route joins into the Inter-Urban route (W4) at the Redford Park junction that continues along the R761 SB arm into Bray. The Blacklion Manor Road and Redford Park are proposed as Feeder routes that connect the primary and secondary cycle network together.

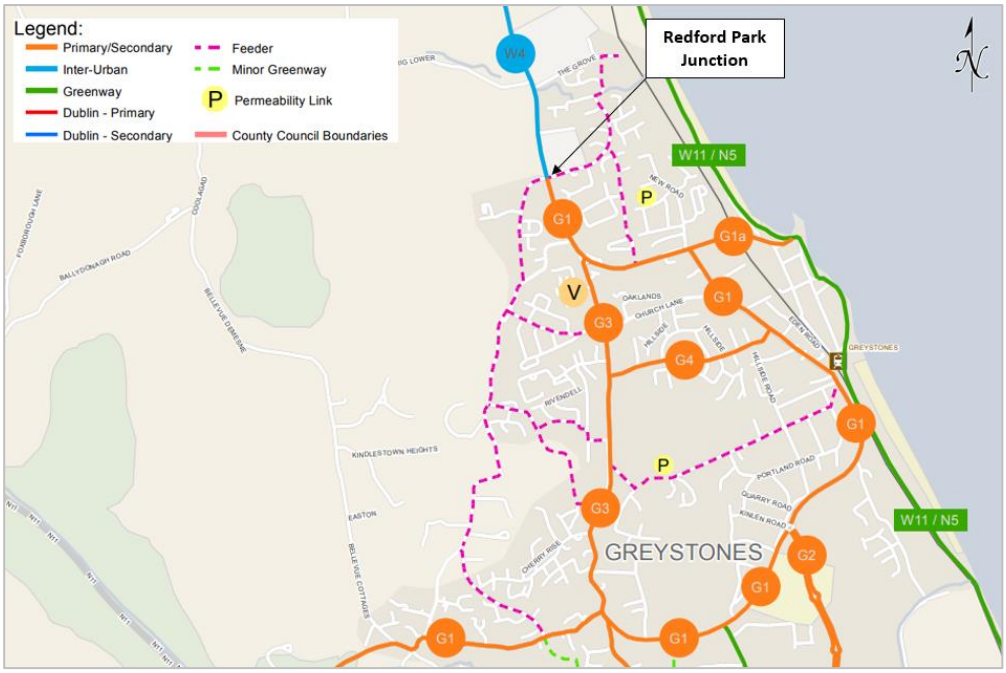
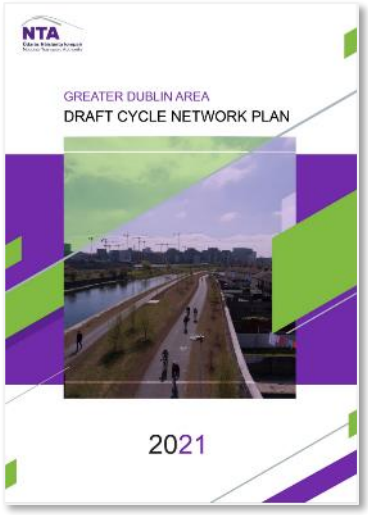


Figure 2-6: GDA Cycle Network Plan for Greystones
(Source: GDA Cycle Network Plan)

2.11 DRAFT GDA CYCLE NETWORK PLAN 2021

2.11.1 The Draft Greater Dublin Area Cycle Network Plan 2021 has arisen as an update to the original 2013 plan, with input from local authorities within the GDA.



2.11.2 While the original 2013 GDA Cycle Network Plan focuses on identifying the routes required to provide an adequate network for cyclists, the updated 2021 plan seeks to enhance and strengthen local accessibility and permeability.

2.11.3 As part of the updated Plan, four manageable goals have been identified to create and improved and inclusive cycle network. These goals are as follows:

- Increase participation;
- Improve safety and accessibility;
- Improve connectivity;
- Create a navigable and coherent network.

2.11.4 The GDA Cycle Network map, shown in Figure 2-7, outlines the proposals for Greystones, including the proposed scheme junction.

2.11.5 Both the Blacklion Manor Road and R761 propose a Secondary Cycle Route along its length. The Draft plan only outlines the Strategic Network, therefore, the local Redford Park arm is not included within this plan at this level.

Figure 2-7: Draft 2021 GDA Cycle Network Plan for Greystones (Source: Draft GDA Cycle Network Plan 2021)

2.12 WICKLOW COUNTY COUNCIL DEVELOPMENT PLAN (2016 – 2022)

2.12.1 The vision for County Wicklow is to be a cohesive community of people enjoying distinct but interrelated urban and rural environments. With regard to transportation, the vision is to integrate lane use planning with transportation planning with the aims of reducing the distance that people need to travel to works, shops, schools and places of recreation and social interaction, facilitating the sustainable transportation of goods and the delivery of improved public transport.

2.12.2 The provision of walking and cycling routes within and connecting towns and villages to each other forms an essential part of a linked-up transport system, involving a variety of transport modes, where public transport can be availed of.

2.12.3 The objective for walking and cycling within the development plan are:

TR9 – To improve existing or provide new foot and cycleways on existing public roads, as funding allows.

TR10 – to require all new regional and local roads to include foot and cycleways, except in cases where shared road space is provided.

TR11 – To facilitate the development of foot and cycleways off road in order to achieve the most direct route to the principal destination while ensuring that personal safety, particularly at night-time, is of the utmost priority.

TR12 – To encourage the provision of secure covered bicycle-parking facilities at strategic locations such as town centres, neighbourhood centres, community facilities and transport nodes.

TR13 – To facilitate the development of cycling and walking amenity routes throughout the County.

3.0 EXISTING CONDITIONS

3.1 INTRODUCTION

3.1.1 This section of the report discusses the existing conditions of the road network surrounding the proposed Redford Park Junction Improvement Scheme including the traffic, pedestrian and cycling environment.

3.2 EXISTING JUNCTION LAYOUT

Road Layout

3.2.1 The Redford Park junction is a 4-arm signal controlled junction. The road network surrounding the junction is illustrated in Figure 3-1 below.

Figure 3-1: R761 / Blacklion Manor Road / Redford Park Junction

3.2.2 The R761 is a Regional Road in County Wicklow that routes in a north–south direction from Rathnew, through Kilcoole and Greystones before terminating in Bray. At the Redford Park Junction, the R761 has a speed limit of 50kph with one lane in each direction on approach to the junction. At the junction, both the northern and southern arms are allocated with one long lane and one flare lane for right turning vehicles.

Figure 3-2: R761 Regional Road at the Redford Park Junction

3.2.3 The Blacklion Manor Road is a recently constructed distributor road in Greystones. The road runs over a short distance, approximately 800m, and connects Chapel Road to the Redford Park Junction. The road operates with the function to provide for new development in the north western side of Greystones.

3.2.4 The road typically takes the form of a single general traffic lane in both directions. At the junction, the road provides one long lane for straight and right turning traffic and one flare lane for left turning vehicles.

Figure 3-3: Blacklion Manor Road

3.2.5 The Redford Park road is a residential access road situated on the north eastern side of Greystones. The road is approximately 7m in width and has one lane in both directions at the junction.

Figure 3-4: Redford Park

Cycle Facilities

3.2.6 There are off road cycle tracks in place along the Blacklion Manor Road. These are located on both sides of the road. Bollards are located along this road in the vicinity of the schools in order to provide protection for cyclists from vehicles parking here.

3.2.7 The off road cycle facilities come on road on approach to the Redford Park junction with bollards provided on the southern side for additional protection measures.

3.2.8 It is noted that the cycle lane along the Blacklion Manor Road on approach to the junction is located in between the left and right turning traffic lanes, as illustrated in the image in Figure 3-5.

Figure 3-5: Cycle Facilities along Blacklion Manor Road

3.2.9 There are no cycle facilities currently on the R761 Regional Road or the Redford Park road.

Pedestrian Facilities

3.2.10 There are footpath facilities on all roads approaching the Redford Park Junction with signalised pedestrian crossings on all arms. Footpaths at the junction are narrow in places considering the high volume of pedestrian activity from the three schools along Blacklion Manor Road, as shown in Figure 3-6.

Figure 3-6: High Volume of Pedestrians at Redford Park Junction

3.3 TRAFFIC SURVEYS

3.3.1 Traffic count data was obtained from WCC for the junction. This data was taken directly from the traffic controller with traffic volumes taken for the 26th November 2019 which represented a mid-week period during school operating times.

3.3.2 Shown in Figure 3-7 below are the AM (08:00 – 09:00) and PM (16:00 – 17:00) peak hour traffic flows through the Redford Park junction.

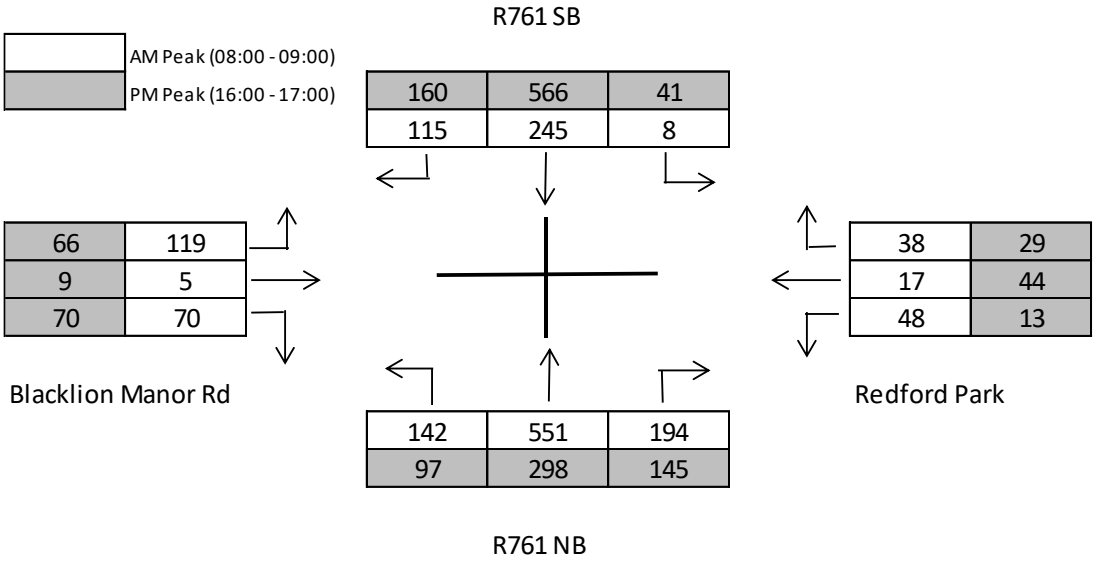


Figure 3-7: 2019 AM and PM Peak Traffic Flows for Redford Park Junction

3.3.3 Results for the AM peak hour show a high level of vehicular flow on the R761 NB arm with a total of 887 vehicles. Traffic flow for the R761 SB arm is lower in the AM peak as compared with the PM peak, showing a total vehicular flow of 368 in the AM peak and 767 in the PM peak.

3.3.4 The Blacklion Manor Road arm and the Redford Park arm show low traffic flows in both peak hours.

3.4 EXISTING TRAFFIC CAPACITY

3.4.1 A traffic model was developed for the Redford Park junction in order to determine the existing capacity at the junction. The TRL Software TRANSYT was used for the analysis. The junction was tested for the AM peak (08:00 – 09:00) and the PM peak (16:00 – 17:00). Results for the analysis for the AM peak hour and PM peak hour are outlined in Table 3-1 and Table 3-2 respectively.

Table 3-1: AM Base TRANSYT Results for the Redford Park Junction

AM Base Signalised Junction 2020 08:00 - 09:00						
Time Segment	**Arm**	**Traffic Stream**	**Degree of saturation (%)**	**Mean Delay per Veh (s)**	**Mean max queue (PCU)**	**Mean max queue (m)**
08:00-09:00	Redford Park	Straight, Left, Right	43	66.07	4.2	23
	Blacklion Manor Road	Left	22	42.09	3.63	20
		Straight, Right	22	53.78	2.66	15
	R761 NB	Straight, Left	76	33.26	27.88	153
		Right	26	13.74	2.04	11
	R761 SB	Straight, Left	27	27.3	7.43	41
		Right	15	17.52	2.54	14

Table 3-2: PM Base TRANSYT Results for the Redford Park Junction

PM Base Signalised Junction 2020 16:00 - 17:00						
Time Segment	**Arm**	**Traffic Stream**	**Degree of saturation (%)**	**Mean Delay per Veh (s)**	**Mean max queue (PCU)**	**Mean max queue (m)**
16:00-17:00	Redford Park	Straight, Left, Right	36	63.92	3.42	19
	Blacklion Manor Road	Left	12	40.54	2.01	11
		Straight, Right	23	54.02	2.8	15
	R761 NB	Straight, Left	43	27.8	12.67	70
		Right	19	15.76	2.02	11
	R761 SB	Straight, Left	66	35.92	22.55	124
		Right	21	17.81	3.03	17

3.4.2 Results show that during the AM peak hour, queuing is evident within the junction, in particular, on the R761 NB arm with a Degree of Saturation (DOS) of 76% and an average queue length of 27.8pcu which equates to 153m. It was noted on site during the AM peak hour that this arm does queue back. Results show that during the PM peak hour, the junction operates overall within capacity. Queueing is evident, however, on the R761 SB arm with a DOS of 66% and an average queue length of 22.5pcus which equates to 124m average queue length.

3.5 EXISTING PUBLIC TRANSPORT

3.5.1 Dublin Bus currently operates a bus route (84) through the Redford Park junction. This service routes between Newcastle and Blackrock, travelling through Kilcoole, Greystones and Bray. This service operates daily on an hourly basis.

3.5.2 Transport for Ireland operates a bus route (No.184) through the Redford Park junction along the R761 in a north to south direction. This service operates between Bray Train Station and Newtownmountkennedy, serving the Greystones Train Station and Delgany. This service operates daily and runs every 30 minutes approximately.

3.5.3 As part of the proposed Bus Connects scheme, there are a number of local and peak time services that are proposed to route from Greystones and along the R761 through the Redford Park junction, continuing to Bray and the City Centre. These services, as displayed in Figure 3-8, are the following:

- ***Route L1:*** This is a Local Route that loops between Greystones and Bray, routing through Newcastle in a clockwise direction.

- ***Route L2***: This is a Local Route that loops between Greystones and Bray, routing through Newcastle in an anticlockwise direction.
- ***Route X1 & X2:*** These are Peak Only/Express Routes. Route X1 routes through Kilcoole, Southern Cross and the City Centre. Route X2 route through Newcastle, Kilcoole, Southern Cross and the City Centre.

Figure 3-8: Bus Connects Proposals for Greystones

3.5.4 At present, there are two bus stops located on the R761 in close proximity to the junction which have been included as part of the upgrade of the Redford Park Junction.

3.5.5 The current layout of the bus stops result in a number of issues for pedestrians and cyclists. The bus stops are located on both sides of the R761 south of the Redford Park junction as shown below in Figure 3-9.

Figure 3-9: Location of Bus Stops included in Junction Design

3.5.6 As shown in Figure 3-9, the bus stops are located on both the outbound (travelling northbound along the R761) and the inbound (travelling southbound along the R761) sides of the R761. Figure 3-10 illustrates the existing layout of these bus stops.

Outbound Bus Stop (R761 NB arm)

Inbound Bus Stop (R761 NB arm)

Figure 3-10: Existing Layout for the Outbound and Inbound Bus Stops on the R761

3.5.7 As shown in Figure 3-10, the outbound bus stop currently operates as an 'In-Line' type of stop where buses stop within the traffic lane in order to pick up and disembark passengers. The inbound bus stop also operates as an 'In-Line' type of stop. This bus stop has recently been improved to provide temporary widening of the path area to accommodate the high volume of pedestrians waiting and walk along here.

3.5.8 It has been noted on site that there are a number of constraints and issues at these stops, these are the following:

- **Location of bus stops**: The bus stops are located very close to the Redford Park signalised junction. When a bus stops at these stops during peak hour periods, cars tend to block back for a short period while passengers board and alight from the bus.
- **Availability of Land**: Although land is available both sides of the road carriageway, this is restricted on the Outbound side by company buildings and on the Inbound side by a residential property.
- **Lack of cycle facilities**: There are no current cycle lane facilities that run along the R761 through the bus stops. It is a requirement in this scheme to accommodate improved facilities for pedestrians and cyclists, which includes cycle lane facilities along this section of the R761.

3.6 EXISTING HORIZONTAL & VERTICAL ALIGNMENT

3.6.1 The R761 runs in a southerly direction through the Redford Park junction and follows a straight downhill alignment from 36mAod to 32mAod. Redford Park approaches the junction from the east and follows a straight uphill alignment from 30.5mAod to 33mAod. Blacklion Manor Road approaches the junction from the west and curves from the south before meeting the junction at a straight downhill alignment from 34.6mAod to 33mAod.

3.7 SURFACE WATER DRAINAGE

3.7.1 All surface water run off within the Redford Park junction will discharge to an existing Wicklow County Council (WCC) 450mm diameter surface water sewer which discharges to an existing stream located to the south of the junction. There is also an existing 225/300mm surface water sewer located in Blacklion Manor Road which discharges to the 450mm surface water sewer in the Redford Park junction.

3.8 FOUL WATER DRAINAGE

3.8.1 Foul water drainage records from Irish Water received from Wicklow County Council show an existing 300mm uPVC foul sewer which runs from the south east corner of the Redford Park junction towards Redford Park to the east.

3.9 UTILITIES

3.9.1 Water supply records from Irish Water received from Wicklow County Council show an existing 6-inch uPVC watermain located in Redford Park to the east which connects to a 6-inch asbestos watermain located in the R761 and runs to the south. These records also show a 100mm uPVC watermain located on the opposite side of the R761 with runs all the way through the junction.

3.9.2 A number of utility companies records were reviewed in order to determine the existing utilities in the Redford Park Junction and within the immediate environs. The following records were determined:

- There is an existing Eir line in each one of the approaches to the Redford Park junction. There are 4nr Eir chambers located within the junction.
- Gas Networks Irelands records show an existing 125PE medium pressure distribution pipe located within each of the 4 approaches to the Redford Park junction.
- ESB records show an existing MV/LV underground cable located within Blacklion Manor Road, Redford Park and in the northern portion of the R761. These records also show LV overhead lines located in the northern portion of the R761. An existing ESB chamber is also located in the southwestern corner of the junction.
- Virgin Media records show ducting located in the south western corner of the junction and a Virgin Media chamber is located here also.

3.10 ROAD COLLISION STATISTICS

3.10.1 As part of this assessment, the Road Safety Authority (RSA) road collision database was reviewed in order to ascertain the safety record along the proposed scheme route.

3.10.2 The data reviewed on the website covers a 12-year period from 2005 – 2016 inclusive and indicates basic information on all reported incidents. It is noted

that information relating to reported collisions for the years 2017 to present are not yet available on the RSA database website.

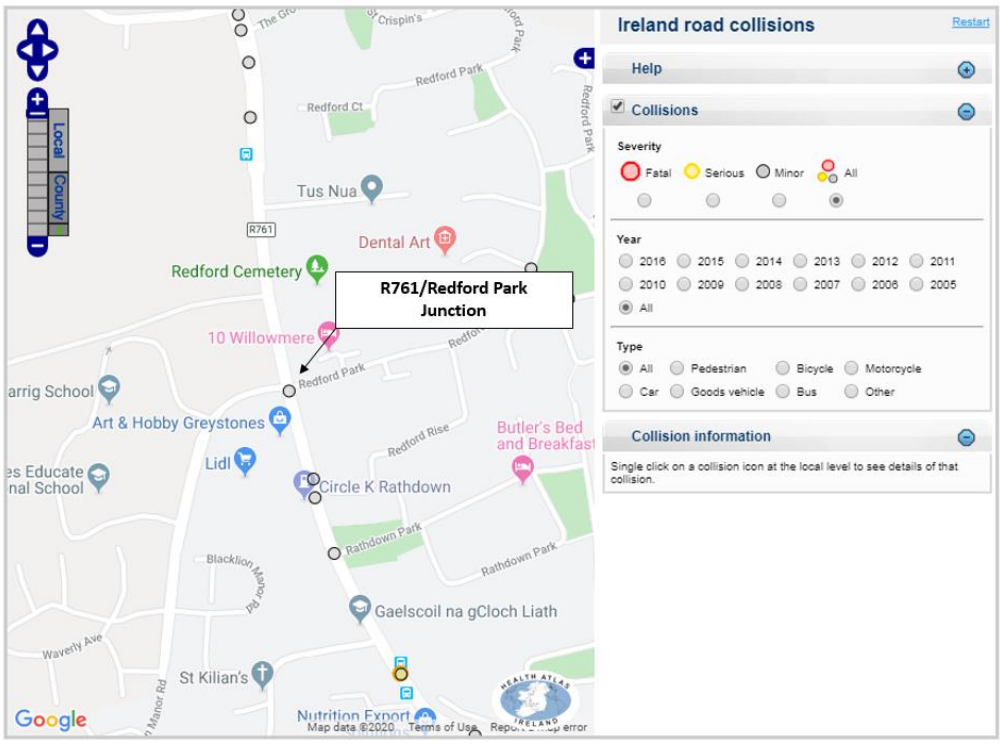


Figure 3-11: RSA Road Collision Database 2005 – 2016 (Source: RSA)

3.10.3 The graph in Figure 3-11 outlines that between the years of 2005 – 2016 there has been one collision recorded at the Redford Park junction. This collision, involving a rear end with a car, occurred in 2010 and was classed as minor in severity.

4.0 PROPOSED SCHEME DEVELOPMENT

4.1 INTRODUCTION

4.1.1 This section discusses the proposals for the scheme with regard to the improvements to the pedestrian and cycle network, the road network, as well as any requirements for utility and water services.

4.1.2 The overall proposals comprise an upgrade to the existing Redford Park junction in order to improve vehicular movement along the road as well as provide enhanced pedestrian and cycle facilities through the junction.

4.1.3 An Options Report, undertaken as part of this scheme design and provided in **Appendix C** of this report, detailed three design options for consideration at the Redford Park Junction, these were the following:

- Option 1: Continental Roundabout;
- Option 2: Improved Signalised Junction;
- Option 3: Cycle Protected Signalised Junction.

4.1.4 Following a detailed assessment that included a Multi-Criteria Analysis, the emerging preferred design option taken forward for Preliminary Design was Option 3; Cycle Protected Signalised Junction, as illustrated in Figure 4-1.

Figure 4-1: Overall Scheme Layout for Redford Park Junction

4.1.5 Detailed in the following sections are the design proposals for the Redford Park junction improvement scheme.

4.2 JUNCTION NETWORK PROPOSALS

4.2.1 The proposals for the Redford Park Junction comprise the upgrade of the existing signalised junction to incorporate proposals for pedestrian and cycle improvements through the junction.

4.2.2 This includes cycle lanes with kerb protection on the R761 and Blacklion Manor Road arm of the junction. Kerb protection along the cycle lane provides additional safety and protection measures for cyclists from vehicular traffic. Cycle lanes are proposed on the Redford Park arm on the approach to and departure of the junction only.

4.2.3 Protected islands are proposed at the corners of the junction. These islands have the purpose of protecting cyclists as they travel through the junction, in particular, in relation to possible conflict with left turning vehicles.

4.2.4 Upgraded footpaths and crossings are proposed at the junction for improved pedestrian movement. The footpaths have been increased to 3m width through the junction to cater for the high pedestrian demand resulting from three schools within close proximity to the junction.

4.2.5 It is noted that the concept for a Cycle Protected Signalised Junction is relatively new in Ireland. The National Transport Authority (NTA) have developed a signal and staging plan for Protected Signalised Junctions as part of the BusConnects Scheme. This staging plan will be adopted as part of this proposed junction and will be reviewed and updated as required as per NTA guidance. The staging plan proposed for the Redford Park junction is detailed within the Options Report provided in **Appendix C** of this report.

4.2.6 It is noted that an analysis assessment for the proposed cycle protected junction was undertaken as part of the Option Development of this scheme with the assessment and results provided within the Options Report appended to this report in **Appendix C**. Overall, the analysis showed that the junction performs similarly to the existing situation within the junction. Queueing does occur along the R761 arms during peak periods as in the existing scenario, however, the junction does operate within capacity for both the AM and PM peak hour.

4.3 PROPOSED HORIZONTAL & VERTICAL ALIGNMENT

4.3.1 All approaches to the junction are to be widened to accommodate new 2m wide cycle tracks on both sides of the road. Additionally, the southern approach will be widened to include an additional left turning flare lane from the R761 to Blacklion Manor Road.

4.4 PROPOSED ROAD LIGHTING

4.4.1 Public lighting is proposed on all sides of the junction and is to be located within the back of footpath.

4.5 TRAFFIC CALMING

4.5.1 Physical traffic calming measures are not proposed on approach or within the proposed junction arrangement. Traffic lanes on approach to the junction are proposed at 3m width which will have the effect of slowing vehicular traffic on approach to the junction. Pedestrian crossings are proposed on all arms of the junction. Protected islands will also increase the awareness of drivers for the presence of cyclists through the junction, in particular, left turning drivers.

4.6 PROPOSED DRAINAGE

Surface Water Drainage

4.6.1 Run-off collected from the updated junction will discharge to the existing 450mm WCC surface water sewer as is currently the case. Existing road gullies will be relocated with the existing spurs being utilised. Any new road gullies will connect to the existing 450mm diameter WCC surface water sewer.

4.7 PROPOSED UTILITIES

4.7.1 Existing utilities at the junction will be diverted to facilitate the proposed scheme.

4.8 PROPOSED BOUNDARY TREATMENT

4.8.1 The proposed junction will utilise the majority of space provided within the existing junction. The junction will impede slightly into the existing grass verges surrounding the junction. The boundary treatment surrounding the junction will remain unchanged as per the existing scenario.

4.8.2 The proposed bus stop improvements will not impact on the existing boundary treatments on either side of the R761.

4.8.3 A Stage 1 Road Safety Audit was undertaken for the junction and bus stop design proposals. This audit report is provided in Appendix D of this report.

5.0 ENVIRONMENTAL ASSESSMENT

5.1 APPROPRIATE ASSESSMENT SCREENING

5.1.1 Altemar Marine & Environmental Consultancy were commissioned to carry out a screening for Appropriate Assessment for this scheme. The full report is contained within **Appendix B** of this report with a summary outlined below.

5.1.2 The AA Screening report contains information required for Wicklow County Council to undertake a screening for Appropriate Assessment. It provides information on and assesses the potential for the proposed development to impact on the Natura 2000 network.

5.1.3 The AA Screening stage examines the likely significant effects of the project, either on its own, or in combination with other plans and projects, upon a Natura 2000 site and considers whether, on the basis of objective scientific evidence, it can be concluded, in view of best scientific knowledge and the conservation objectives of the relevant European sites, that there are not likely to be significant effects on any European site.

5.1.4 The report outlines that no Natura 2000 sites are within the zone of influence of this development. Having taken into consideration the effluent discharge from the proposed development works, the distance between the proposed development site to designated conservation sites, lack of direct hydrological pathway or biodiversity corridor link to conservation sites and mixing within the marine environment, it is concluded that this development would not give rise to any significant effects to designated sites. The construction and operation of the proposed project will not impact on the conservation objectives of features of interest of Natura 2000 sites.

5.1.5 The report presents a Stage 1 Appropriate Assessment Screening for the Proposed Development, outlining the information required for the competent authority to screen for appropriate assessment and to determine whether or not the proposed development, either alone or in combination with other plans and projects, in view of best scientific knowledge, is likely to have a significant effect on any European or Natura 2000 site.

5.1.6 On the basis of the content of the report, the competent authority is enabled to conduct a Stage 1 Screening for Appropriate Assessment and consider

whether, in view of best scientific knowledge and in view of the conservation objectives of the relevant European sites, the proposed development, individually or in combination with other plans or projects is likely to have a significant effect on any European site.

5.1.7 The report concludes that there is no possibility of significant impacts on Natura 2000 sites, features of interest or site specific conservation objectives. A Natura Impact Statement is not required. In carrying out this AA screening, mitigation measures have not been taken into account. Standard best practice construction measures which could have the effect of mitigating any effects on any European Sites have similarly not been taken into account.

5.2 EIAR REQUIREMENTS

5.2.1 Screening is the process of assessing the requirement of a project to be subject to an Environmental Impact Assessment Report (EIAR), based on the project type, scale and on the significance or environmental sensitivity of receiving environment.

5.2.2 The overriding consideration in determining whether a road scheme should be subject to an EIAR is the likelihood of significant environmental effects. Significant effects may arise by virtue of the type of road scheme, the scale or extent of the road scheme and the location of the road scheme in relation to sensitive environments.

5.2.3 In interpreting which projects are likely to have significant environmental effects, the EIAR Directive lists those projects for which the EIA is mandatory and those projects for which an EIAR may be required.

5.2.4 The legal requirements for EIA of a road development are defined in the Roads Act (1993) as amended by the Planning and Development Act (2000 – 2017) and regulations made under the Roads Acts & Planning Acts.

5.2.5 Table 5-1 provides an overview of the legislative requirements that determine whether a road scheme will require an EIA. With reference to the proposed Redford Park Junction Improvement Scheme, the Annex I and Annex II projects have been reviewed with the relevant roads projects outlined and assessed below.

Table 5-1: List of relevant Annex I & Annex II Projects requiring EIA

Annex I & II Projects	Comparative Assessment	EIA Required
Annex I (7)(b) – Construction of Motorways and Express Roads	The proposed scheme is not a motorway	No
Annex I (7)(c) – Construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes, where such new road or realigned and/or widened section of road would be 10 km or more in a continuous length.	Proposed Scheme does not propose the construction of a new road.	No
Annex II (10)(b) - Urban development projects, including the construction of shopping centres and car parks	Proposed scheme does not propose any construction of large scale car parks or shopping centres	No

5.2.6 With reference to Table 5-1, the proposed scheme is sub threshold in all cases and therefore does not require a mandatory EIAR with reference to the Roads Act and also Schedules 5 & 7 of the Planning & Development Regulations (2001 – 2017).

5.3 ARCHAEOLOGICAL & BUILT HERITAGE CONSTRAINTS

5.3.1 A desktop study was undertaken with reference to the Archaeological and Built Heritage environment surrounding the proposed scheme extents. The purpose of this was to evaluate any potential impact of the proposed scheme on the archaeological and architectural heritage within the area and to propose mitigation measures to avoid or reduce any adverse impacts if necessary. Figure 5-1 below illustrates the location of both the National Inventory of Architectural Heritage (NIAH) sites and the National Monuments Service sites in relation to the Redford Park junction.

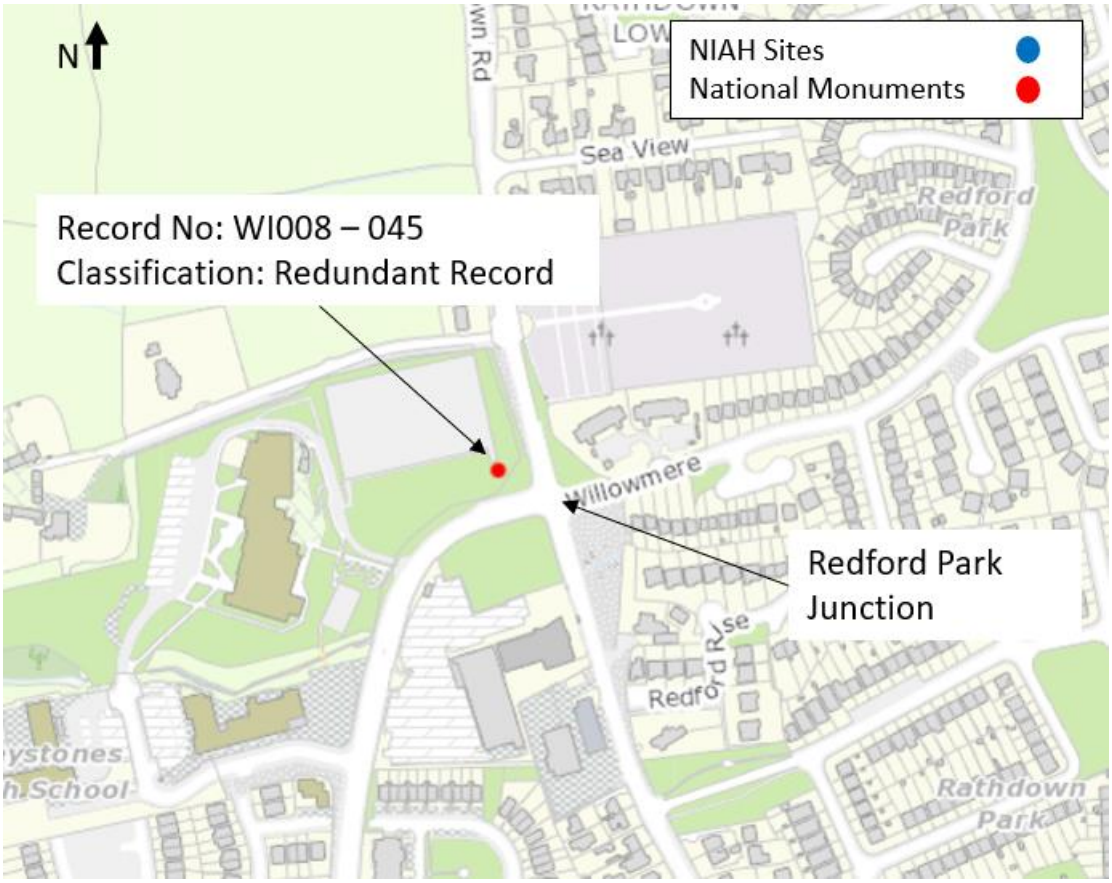


Figure 5-1: Location of NIAH and National Monuments within proximity to the Redford Park Junction

5.3.2 Figure 5-1 outlines that there are no NIAH sites in proximity to the Redford Park junction. There is one National Monument site located close to the junction, however, from the records, this is classed as a 'Redundant Record'. This monument is described as a possible enclosure noted in 2003, however, archaeological testing of the area in 2005 did not produce anything of archaeological significance.

5.3.3 Based on the desktop study of the area, it is not envisaged that the proposed junction improvement scheme will directly impact on any archaeological or architectural site of national importance.

6.0 SUMMARY

6.1 SUMMARY OF REPORT

6.1.1 DBFL were commissioned by Wicklow County Council (WCC) to prepare a Part 8 Design Report for the R761/Redford Park/Blacklion Manor Road Junction (Redford Park Junction) improvement scheme.

6.1.2 The overall scheme aims to deliver an upgrade to the existing signal-controlled Redford Park junction which is located within the Redford area of Greystones in County Wicklow. The upgrades will consist of improvements for pedestrians and cyclists with the upgrade of footpaths and inclusion of protected cycle track facilities through the junction, as well as an improvement to public transport through the upgrading of two existing bus stops in the immediate vicinity of the junction.

6.1.3 A number of policy documents were reviewed as part of this scheme in order to provide guidance and inform the overall scheme design. Documents reviewed include the National Cycle Manual (NCM), Design Manual for Urban Roads and Streets (DMURS), the Draft Preliminary Design Guidance for BusConnects Core Bus Corridors as well as the Wicklow County Council Development Plan. These guidance documents outline the requirement for schemes to provide improved safe environments for vulnerable road users, in particular, for pedestrians and cyclists.

6.1.4 The existing layout of the junction includes a 4 arm signal controlled junction. Traffic volumes are moderate to high through the junction, in particular during peak hour times. There are a number of amenities surrounding the junction including schools and retail centres. There are footpaths and pedestrian crossings located on all arms of the junction. There are currently no cycle facilities through the junction or along the R761. There are cycle facilities on the Blacklion Manor Road arm of the junction.

6.1.5 There is a 450mm diameter surface water sewer that discharges to an existing stream in close proximity to the Redford Park junction. There is also a 300mm uPVC foul sewer that runs in close proximity to the junction. Other utilities surrounding the junction include Eir, ESB and Virgin Media.

6.1.6 The RSA collision database outlines that between the period of 2005 – 2016, there has been one collision at the junction, this occurred in 2010 and was minor in nature.

6.1.7 In terms of the proposed junction design, a detailed options assessment and report was undertaken (shown in **Appendix C** of this report) in order to determine the preferred junction improvement layout for the Redford Park junction. An MCA was undertaken for three potential options with the Cycle Protected Junction emerging as the preferred option.

6.1.8 The cycle protected junction will provide protected kerbs and islands within the junction to provide improved safety for cyclists travelling through the junction. Pedestrian facilities will also be upgraded with 3m footpaths through the junction.

6.1.9 The bus stops, located to the south of the junction along the R761, will be upgraded to include cycle tracks behind the bus stops on both sides of the road. These upgraded bus stops align with the current NTA design guidance.

6.1.10 In terms of proposed surface water, run-off collected from the updated junction will discharge to the existing 450mm WCC surface water sewer as is currently the case. Existing road gullies will be relocated with the existing spurs being utilised. Any new road gullies will connect to the existing 450mm diameter WCC surface water sewer.

6.1.11 Altemar Marine & Environmental Consultancy were commissioned to carry out a screening for Appropriate Assessment for this scheme. The full report is contained within **Appendix B** of this report. The report concluded that there is no possibility of significant impacts on Natura 2000 sites, features of interest or site specific conservation objectives. A Natura Impact Statement is not required.

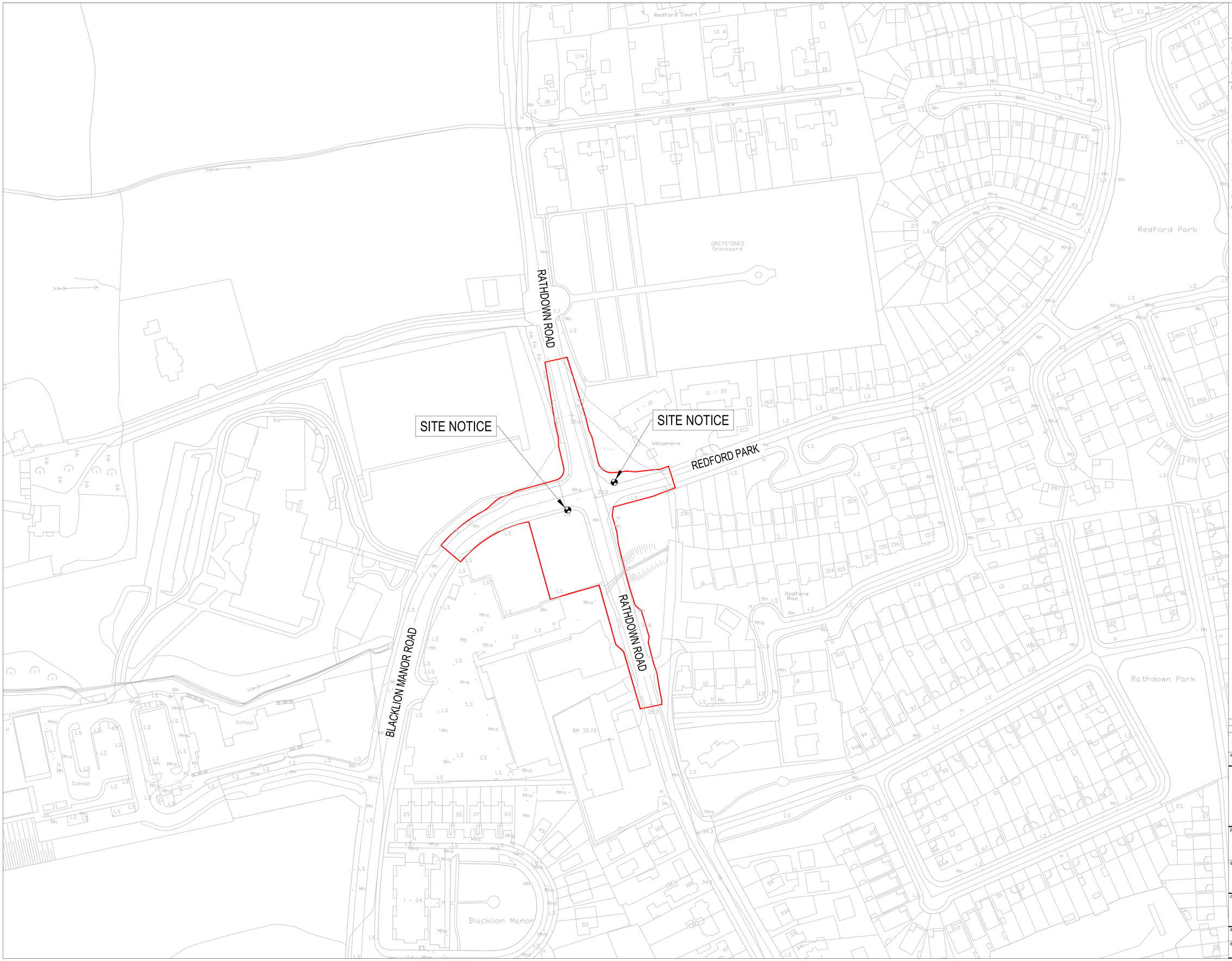
6.1.12 An EIA screening assessment was undertaken in order to determine whether the scheme was subject to a mandatory EIAR. The scheme is seen to be sub-threshold and therefore does not require a mandatory EIAR.

6.1.13 A desktop study was undertaken with reference to the Archaeological and Built Heritage environment surrounding the proposed scheme extents. Based on the desktop study of the area, it is not envisaged that the proposed

junction improvement scheme will directly impact on any archaeological or architectural site of national importance.

APPENDICES

APPENDIX A- PART 8 DRAWINGS



ON ORIGINAL

0 5 10 15 20 30 40 50mm

NOTES:

1. ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH THE TII SPECIFICATION FOR ROAD WORKS UNLESS OVERRIDDEN BY LOCAL OVERSEEING AUTHORITY'S STANDARDS
2. ALL ROAD MARKINGS & SIGNS SHALL COMPLY FULLY WITH THE TRAFFIC SIGNS MANUAL PUBLISHED BY THE DEPARTMENT OF TRANSPORT.
3. SIGNS & MARKINGS: CONTRACTOR TO CONFIRM PRECISE SETTING OUT WITH EMPLOYERS REPRESENTATIVE PRIOR TO COMPLETION.
4. ALL TRAFFIC MANAGEMENT TO COMPLY FULLY WITH THE PROVISIONS OF CHAPTER 8 OF THE TRAFFIC SIGNS MANUAL
5. ALL CO-ORDINATES ARE TO IRISH TRANSVERSE MERCATOR.
6. ALL LEVELS ARE TO ORDNANCE DATUM AND ARE IN METRES
7. ALL PEDESTRIAN, CYCLE AND VEHICULAR ROUTES MUST BE RETAINED IN ACCORDANCE WITH APPROVED TRAFFIC MANAGEMENT PLAN.

LEGEND

SITE BOUNDARY

SITE NOTICE LOCATION

rev	date	description	by	chkd.
P01	13-04-2022	PUBLIC CONSULTATION	JLB	BCM

client approval
- A - Approved
- B - Approved with comments
- C - Do not use

suitability: S2 - INFORMATION
issue purpose: FOR INFORMATION

DBFL Consulting Engineers
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project ref.: REDFORD PARK

drawing title: SITE NOTICE LOCATION

client: WICKLOW COUNTY COUNCIL

designed by	author	scale	sheet size
BCM	JLB	1:1000	A1

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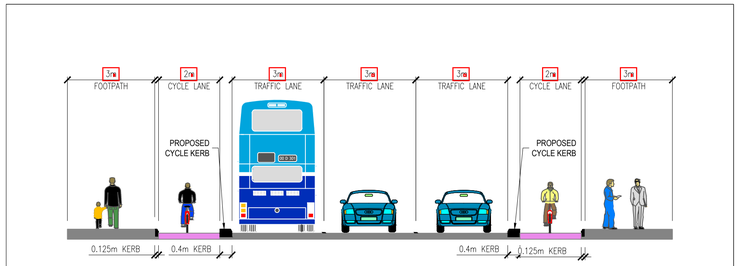

R761 TO BLACKLION MANOR ROAD
LINK SECTION TYPICAL CROSS SECTION A - A

SCALE 1:100

EXISTING FOOTPATH TO BE MAINTAINED

PROPOSED CYCLE PROTECTION BOLLARDS

ON ORIGINAL

0 5 10 15 20 25 30 40 50mm

NOTES:

1. ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH THE TII SPECIFICATION FOR ROAD WORKS UNLESS OVERRIDDEN BY LOCAL OVERSEEING AUTHORITY'S STANDARDS
2. ALL ROAD MARKINGS & SIGNS SHALL COMPLY FULLY WITH THE TRAFFIC SIGNS MANUAL PUBLISHED BY THE DEPARTMENT OF TRANSPORT.
3. SIGNS & MARKINGS: CONTRACTOR TO CONFIRM PRECISE SETTING OUT WITH EMPLOYERS REPRESENTATIVE PRIOR TO COMPLETION.
4. ALL TRAFFIC MANAGEMENT TO COMPLY FULLY WITH THE PROVISIONS OF CHAPTER 8 OF THE TRAFFIC SIGNS MANUAL
5. ALL CO-ORDINATES ARE TO IRISH TRANSVERSE MERCATOR.
6. ALL LEVELS ARE TO ORDNANCE DATUM AND ARE IN METRES
7. ALL PEDESTRIAN, CYCLE AND VEHICULAR ROUTES MUST BE RETAINED IN ACCORDANCE WITH APPROVED TRAFFIC MANAGEMENT PLAN.

LEGEND

- PROPOSED ROAD
- PROPOSED FOOTPATH
- EXISTING FOOTPATH TO BE RETAINED
- PROPOSED CYCLE LANE
- PROPOSED CYCLE TRACK
- GRASS VERGE/LANDSCAPED AREA

rev	date	description	by	chkd.
P01	19-04-2022	PRELIMINARY DESIGN ISSUE	GJS	JH

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- A - Approved
- B - Approved with comments
- C - Do not use

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client: WICKLOW COUNTY COUNCIL

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drawing no.: 190092-DBFL-RD-SP-DR-C-1901

revision: P01

APPENDIX B- AA SCREENING REPORT

ALTEMAR
Marine & Environmental Consultancy

Appropriate Assessment Screening for a proposed upgrade to the junction at Redford, Greystones. Co. Wicklow

24TH JANUARY 2022

Prepared by: Bryan Deegan (MCIEEM) of Altemar Ltd.
On behalf of: Wicklow County Council

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Document Control Sheet			
Client	Wicklow County Council		
Project	Appropriate Assessment Screening for a proposed upgrade to the junction at Redford, Greystones. Co. Wicklow.		
Report	Appropriate Assessment Screening		
Date	24th January 2022		
Project No:		Document Reference: AASDBFL2_22	
Version	Author	Reviewed	Date
Draft 01	Bryan Deegan		8th December 2021
Planning	Bryan Deegan		24th January 2022

CONTENTS

1. INTRODUCTION

An Appropriate Assessment is an assessment of the potential effects of a proposed project or plan, on its own, or in combination with other plans or projects, on one or more NATURA 2000 sites (Special Areas of Conservation (SAC) or Special Protection Areas (SPA)).

The following Appropriate Assessment (Screening Stage) has been prepared by **Altemar Ltd.** at the request Wicklow County Council for upgrade works to the junction at Redford, Greystones. Co. Wicklow.

The AA Screening stage examines the likely significant effects of the project, either on its own, or in combination with other plans and projects, upon a Natura 2000 site and considers whether, on the basis of objective scientific evidence, it can be concluded, in view of best scientific knowledge and the conservation objectives of the relevant European sites, that there are not likely to be significant effects on any European site.

BACKGROUND TO ALTEMAR LTD.

Since its inception in 2001, Altemar has been delivering ecological and environmental services to a broad range of clients. Operational areas include residential, infrastructural, renewable, oil & gas, private industry, local authorities, EC projects and State/semi-State Departments. Bryan Deegan is the managing director of Altemar, is an environmental scientist and marine biologist with 26 years' experience working in Irish terrestrial and aquatic environments, providing services to the State, Semi-State and industry. He is currently contracted to Inland Fisheries Ireland as the sole "External Expert" to environmentally assess internal and external projects. Bryan Deegan (MCIEEM) holds a MSc in Environmental Science, BSc (Hons.) in Applied Marine Biology, NCEA National Diploma in Applied Aquatic Science and a NCEA National Certificate in Science (Aquaculture). Bryan Deegan carried out all elements of this Appropriate Assessment Screening.

2. BACKGROUND TO THE APPROPRIATE ASSESSMENT

The Habitats Directive 92/43/EEC (together with the Birds Directive (2009/1477/EC)) forms the cornerstone of Europe's nature conservation policy. The Directive protects over 1000 animals and plant species and over 200 "habitat types" which are of European importance. In the Directive, Articles 3 to 9 provide the legislative means to protect habitats and species of European Community interest through the establishment and conservation of an EU-wide network of conservation sites (NATURA, 2000). These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Birds Directive), Article 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect NATURA 2000 sites (Annex 1.1). Article 6(3) establishes the requirement for Appropriate Assessment:

"Any plan or project not directly connected with or necessary to the management of the [NATURA 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans and projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implication for the site and subject to the provisions of paragraph 4, the component national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."

As outlined in "Managing Natura 2000 sites The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC" (European Commission, 21 November 2018) *"The purpose of the appropriate assessment is to assess the implications of the plan or project in respect of the site's conservation objectives, either individually or in combination with other plans or projects. The conclusions should enable the competent authorities to ascertain whether the*

plan or project will adversely affect the integrity of the site concerned. The focus of the appropriate assessment is therefore specifically on the species and/or the habitats for which the Natura 2000 site is designated."

As outlined in the EC guidance document on Article 6(4) (January 2007)[1]:

"Appropriate assessments of the implications of the plan or project for the site concerned must precede its approval and take into account the cumulative effects which result from the combination of that plan or project with other plans or projects in view of the site's conservation objectives. This implies that all aspects of the plan or project which can, either individually or in combination with other plans or projects, affect those objectives must be identified in the light of the best scientific knowledge in the field.

Assessment procedures of plans or projects likely to affect NATURA 2000 sites should guarantee full consideration of all elements contributing to the site integrity and to the overall coherence of the network, both in the definition of the baseline conditions and in the stages leading to identification of potential impacts, mitigation measures and residual impacts. These determine what has to be compensated, both in quality and quantity. Regardless of whether the provisions of Article 6(3) are delivered following existing environmental impact assessment procedures or other specific methods, it must be ensured that:

- *Article 6(3) assessment results allow full traceability of the decisions eventually made, including the selection of alternatives and any imperative reasons of overriding public interest.*
- *The assessment should include all elements contributing to the site's integrity and to the overall coherence of the network as defined in the site's conservation objectives and Standard Data Form, and be based on best available scientific knowledge in the field. The information required should be updated and could include the following issues:*
  - *Structure and function, and the respective role of the site's ecological assets;*
  - *Area, representativity and conservation status of the priority and nonpriority habitats in the site;*
  - *Population size, degree of isolation, ecotype, genetic pool, age class structure, and conservation status of species under Annex II of the Habitats Directive or Annex I of the Birds Directive present in the site;*
  - *Role of the site within the biographical region and in the coherence of the NATURA 2000 network; and,*
  - *Any other ecological assets and functions identified in the site.*
- *It should include a comprehensive identification of all the potential impacts of the plan or project likely to be significant on the site, taking into account cumulative impacts and other impacts likely to arise as a result of the combined action of the plan or project under assessment and other plans or projects.*
- *The assessment under Article 6(3) applies the best available techniques and methods, to estimate the extent of the effects of the plan or project on the biological integrity of the site(s) likely to be damaged.*
- *The assessment provides for the incorporation of the most effective mitigation measures into the plan or project concerned, in order to avoid, reduce or even cancel the negative impacts on the site.*
- *The characterisation of the biological integrity and the impact assessment should be based on the best possible indicators specific to the NATURA 2000 assets which must also be useful to monitor the plan or project implementation."*

[1] European Commission. (2007).Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission;

3. STAGES OF THE APPROPRIATE ASSESSMENT

This Appropriate Assessment screening was undertaken in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2001), Part XAB of the Planning and Development Act 2000, as amended, in addition to the December 2009 publication from the Department of Environment, Heritage and Local Government; 'Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities' and the European Communities (Birds and Natural Habitats) Regulations 2011.

In order to comply with the above Guidelines and legislation, the Appropriate Assessment process must be structured as follows:

1) Screening stage:

- Description of plan or project, and local site or plan area characteristics;
- Identification of relevant Natura 2000 sites, and compilation of information on their qualifying interests and conservation objectives
- Assessment of likely effects – direct, indirect and cumulative- undertaken on the basis of available information as a desk study or field survey or primary research as necessary and,
- Screening Statement with Conclusions.

2) Appropriate Assessment (Natura Impact Statement):

- Description of the NATURA 2000 sites that will be considered further;
- Identification and description of potential adverse impacts on the conservation objectives of these sites likely to occur from the project or plan; and,
- Mitigation Measures that will be implemented to avoid, reduce or remedy any such potential adverse impacts
- Assessment as to whether, following the implementation of the proposed mitigation measures, it can be concluded, beyond all reasonable scientific doubt, that there will be no adverse impact on the integrity of the relevant European Site in light of its conservation objectives"
- Conclusions.

3) Alternative Solutions

If mitigation is possible that enables a risk to be avoided fully, then, subject to other necessary approvals, the project or plan may proceed. If mitigation measures are insufficient, or are not actually practicable and achievable to avoid the risk entirely, then, in the light of a negative assessment, the plan or project may not proceed. A wider search for alternative solutions may need to be considered – Stage 3. [2]

4) Imperative Reasons of Overriding Public Interest (IROPI)/Derogation. (: Stage 4 is the main derogation process of Article 6(4) which examines whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a NATURA 2000 site to proceed in cases where it has been established that no less damaging alternative solution exists. The extra protection measures for Annex I priority habitats come into effect when making the IROPI case.

[2] (DoEHLG, 2009) Appropriate Assessment of Plans and projects in Ireland: Guidance for planning authorities.

4. SCREENING STAGE ASSESSMENT

MANAGEMENT OF THE SITE

The plan or project is not directly connected with, or necessary to, the management of NATURA 2000 sites.

DESCRIPTION OF THE PROPOSED PROJECT

The overall scheme aims to deliver an upgrade to the existing signal-controlled Redford Park junction which is located within the Redford area of Greystones in County Wicklow (Figures 1 & 2). The upgrades will consist of improvements for pedestrians and cyclists with the upgrade of footpaths and inclusion of cycle track facilities, as well as an improvement to public transport through the upgrading of two existing bus stops in the immediate vicinity of the junction (Figure 3).

- All surface water drainage will tie into the existing drainage located within Redford Park and no instream works will take place.
- At construction stage a site specific construction management plan will be prepared and implemented by the contractor.
- All water pumped from excavations will be directed to on-site settlement ponds for treatment to reduce pollution to acceptable levels before being discharged to the local environment at a controlled rate.
- Surface water runoff from areas stripped of topsoil, from the construction compound, and from access tracks will be directed to on-site settlement ponds for treatment to reduce pollution to acceptable levels before being discharged to the local environment at a controlled rate.
- Weather conditions and seasonal weather variations will be taken into account when planning stripping of topsoil and excavations, with an objective of minimizing soil erosion and silt run-off. Short term weather forecasts will also be taken into account.
- In order to mitigate against spillages contaminating the surrounding surface water and hydrogeological environments, all oils, fuels, paints and other chemicals shall be stored in a secure bunded hardstand area in the construction compound. Refuelling and servicing of construction machinery will take place in a designated hardstand area which will be remote from any surface water inlets and outlets (where it is not possible to carry out such activities off site). Hydrocarbon spill kits will be available and to hand for refuelling crews in the event of any spills.
- Concrete batching will take place off site and wash out of concrete chutes will take place at designated locations in the site and the washout of truck drums will take place after back at the batching plant to minimise pollution release within the subject site.
- Discharge from any vehicle wheel wash areas will be directed to on-site settlement ponds for treatment prior to discharge to the local environment.
- Groundwater pumped from excavations is to be directed to on-site settlement ponds for treatment prior to discharge to the local environment.

SURFACE WATER

- Surface water runoff may contain increased silt levels (e.g. runoff across areas stripped of topsoil) or become polluted by construction activities (Run off from vehicles, cement, oil spills etc).
- Discharge of rainwater pumped from excavations containing increase levels of silt, oil, cement, etc.
- Accidental spills and leaks associated with storage of oils and fuels, leaks from construction machinery and spillage during refuelling and maintenance contaminating the surrounding surface water and hydrogeological environments.
- Concrete runoff, particularly discharge of wash water from concrete trucks.
- Discharge of vehicle wheel wash water containing high silt levels, oil and fuels, cement (potential impact on existing hydrology e.g. discharge to existing surface water drainage infrastructure).
- Discharge of foul water drainage from contractor's compound (impact on existing hydrology e.g. cross-contamination of existing surface water drainage).
- Infiltration of groundwater into excavations.
- Cross-contamination of temporary potable water supply to construction compound.
- Increased impermeable surface area will reduce local groundwater recharge rate.
- Accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network (e.g. along roads).

Figure 1. Site outline and location.

Figure 2. Satellite Image of proposed site

Figure 3. Site Outline

IDENTIFICATION OF NATURA 2000 SITES/SPECIES POTENTIALLY AFFECTED.

The proposed works are not within a NATURA 2000 site. The NATURA 2000 sites within 15km are seen in Figures 10 & 11 and Table 1. The features of interest and the potential impact of the works on the features of interest of Natura 2000 sites within 15km, are seen in Table 2. As can be seen from the EPA Waterframework Directive (WFD) data in Figure 12, there is a small stream (Greystones Stream) that runs west to east through the subject site and enters the marine environment. There is no direct pathway to 2000 sites, however and indirect pathway exists via surface water run-off that may enter the existing watercourses and, ultimately, the marine environment where significant dilution and mixing will take place. No Natura 2000 sites are deemed to be in the potential Zone of Influence (ZoI). However, following the precautionary principle screening of all Natura 2000 within 15km (Table 1) is carried out in Table 2. All Natura 2000 sites beyond 15km have no direct or indirect pathways or, are within the marine environment where significant dilution and mixing will take place.

Code	Natura 2000 Site	Distance
Special Areas of Conservation		
IE000714	Bray Head SAC	0.7 km
IE000719	Glen of the Downs SAC	1.9 km
IE002249	The Murrough Wetlands SAC	4.7 km
IE000716	Carriggower Bog SAC	6.3 km
IE000713	Ballyman Glen SAC	6.1 km
IE000725	Knocksink Wood SAC	6.8 km
IE002122	Wicklow Mountains SAC	7.8 km
IE003000	Rockabill to Dalkey Island SAC	10.2 km
Special Protection Areas		
IE004186	The Murrough SPA	5.6 km
IE004040	Wicklow Mountains SPA	7.4 km
IE004172	Dalkey Islands SPA	12.6 km

Table 2. Initial screening of NATURA 2000 sites within 15km of the proposed development.

NATURA CODE	NAME	Screened In/Out	Reason
Special Protection Areas			
IE004186	The Murrough SPA	**Out**	**Conservation Objectives** The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. **Features of Interest** Red-throated Diver (Gavia stellata) [A001] Greylag Goose (Anser anser) [A043] Light-bellied Brent Goose (Branta bernicla hrota) [A046] Wigeon (Anas penelope) [A050] Teal (Anas crecca) [A052] Black-headed Gull (Chroicocephalus ridibundus) [A179] Herring Gull (Larus argentatus) [A184] Little Tern (Sterna albifrons) [A195] Wetland and Waterbirds [A999]

			Potential Impact The development site is located 5.6 km from The Murrough SPA. There is no direct hydrological pathway from the proposed development site to the SPA. There is an indirect pathway from the site to the SPA via the marine environment from the Greystones Stream and surface water networks. In the absence of any measures on site, due to the distance (5.6km) via the indirect pathway (e.g. surface water networks) any pollutants or silt will be dispersed and diluted within the marine environment. The indirect pathway of surface water will not result in a significant effect on the Natura 2000 site. The construction and operation of the proposed development will not impact on the conservation interests of the site. **No significant effects are likely.**
IE004040	Wicklow Mountains SPA	**Out**	**Conservation Objectives** The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. **Features of Interest** *Falco colombarius* (Merlin) [A098] *Falco peregrinus* (Peregrine) [A103] **Potential Impact** The site is 7.4 km from the Wicklow Mountains SPA. The development site is not and important foraging or roosting area for these species. There is no direct or indirect pathway to the proposed development site. The construction and operation of the proposed development will not impact on the conservation interests of the site. **No significant effects are likely.**
IE0004172	Dalkey Islands SPA	**Out**	**Conservation Objectives:** The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. **Features of Interest** Roseate Tern (*Sterna dougallii*) [A192] Common Tern (*Sterna hirundo*) [A193] Arctic Tern (*Sterna paradisaea*) [A194] The favourable conservation status of a species is achieved when: • population dynamics data on the species concerned indicate that it is maintaining itself on a long - term basis as a viable component of its natural habitats, and • the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and • there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long - term basis.

			Potential Impact The development site is located within an urban area 12.6 km from this SPA (Figure 10). There is no direct hydrological pathway from the proposed development site to the SPA. There is an indirect pathway from the site to the SPA via the marine environment from public surface networks. Due to the distance (12.6km) via the indirect pathway (e.g. surface water networks) any pollutants or silt will be dispersed and diluted. The indirect pathway of surface will not result in a significant effect on the Natura 2000 site. The construction and operation of the proposed development will not impact on the conservation interests of the site. **No significant effects are likely**
Special Areas of Conservation			
NATURA CODE	**NAME**	**Screened In/Out**	**Reason**
IE000714	Bray Head SAC	**Out**	**Conservation Objectives** To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected **Features of Interest** Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030] **Potential Impact** The development site is located within a rural area 0.7 km from the Bray Head SAC. This SAC is marine/coastal in nature and its features of interest are coastal habitats. There is no direct hydrological pathway from the proposed development site to the SAC. There is an indirect pathway from the site to the SAC via the marine environment. In the absence of any mitigation measures on site silt or pollution would enter the marine environment where it would be dispersed, mix and settle. The features of interest of this SAC are terrestrial habitats and would not be impacted by silt or pollution entering the marine environment, which would naturally disperse, mix and settle. However, as the works are in the vicinity of a watercourse the proposed project must comply with Water Pollution Acts. However, these measures are not required to prevent significant effects on the features of interest of the SAC. Due to the distance (0.7 km) via the indirect pathway (e.g. surface water networks) any pollutants or silt will be dispersed and diluted in the marine environment. The indirect pathway of surface water will not result in a significant effect on the Natura 2000 site. The construction and operation of the proposed development will not impact on the conservation interests of the site. **No significant effects are likely.**
IE000719	Glen of the Downs SAC	**Out**	**Conservation objectives** The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. **Features of Interest** Old sessile oak woods with Ilex and Blechnum [91A0]

			Potential Impact The development site is located 1.9 km from the Glen of the Downs SAC. The development does not have a direct or indirect connection or pathway to the SAC. There is no intact biodiversity corridor from the proposed development to this SAC. The proposed development would not impact on the features of interest or the conservation objectives of this SAC. **No significant effects are likely.**
IE002249	Murrough Wetlands SAC	**Out**	**Conservation Objectives** To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected: **Features of Interest** Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)[1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae** [7210] Alkaline fens [7230] * denotes a priority habitat **Potential Impact** The development site is located within a rural area 4.7 km from the Murrough Wetlands SAC. There is no direct hydrological pathway from the proposed development site to the SAC. There is an indirect pathway from the site to the SPA via the marine environment. In the absence of any mitigation measures on site silt or pollution would enter the marine environment where it would be dispersed, mix and settle. However, as the works are in the vicinity of a watercourse the proposed project must comply with Water Pollution Acts. However, these measures are not required to prevent significant effects on the features of interest of the SAC. Due to the distance (4.7 km) via the indirect pathway (e.g. surface water networks) any pollutants or silt will be dispersed and diluted in the marine environment. The indirect pathway of surface water will not result in a significant effect on the Natura 2000 site. The construction and operation of the proposed development will not impact on the conservation interests of the site. **No significant effects are likely.**
IE000716	Carriggower Bog SAC	**Out**	**Conservation Objectives** To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected: **Features of Interest** Transition mires and quaking bogs [7140] **Potential Impact** The development is 6.3 km from the Carriggower Bog SAC. The development does not have a direct or indirect connection or pathway to the SAC. The proposed development would not impact on the features of interest or the conservation objectives of this SAC.

			No significant effects are likely.
IE000713	Ballyman Glen SAC	**Out**	**Conservation Objectives** To maintain or restore the favourable conservation condition of Annex I habitat(s) and/or the Annex II species for which the SAC has been selected. **Features of Interest** Petrifying springs with tufa formation (Cratoneurion) [7220] Alkaline fens [7230] **Potential Impact** The development is in a rural area 6.1 km from the Ballyman Glen SAC. The development does not have a direct or indirect connection or pathway to the SAC. The proposed development would not impact on the features of interest or the conservation objectives of this SAC. **No significant effects are likely.**
IE001209	Knocksink Wood SAC	**Out**	**Conservation Objectives** To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected **Features of Interest** Petrifying springs with tufa formation (Cratoneurion) [7220] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] **Potential Impact** The development site is located 6.8 km from the Knocksink Wood SAC. The development does not have a direct or indirect connection or pathway to the SAC. The proposed development would not impact on the features of interest or the conservation objectives of this SAC. **No significant effects are likely.**
IE002122	Wicklow Mountains SAC	**Out**	**Conservation Objectives** To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected. **Features of Interest** Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or Isoeto-Nanojuncetea [3130] Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Apine and Boreal heaths [4060] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bogs (if active bog) [7130] Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220]

			Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] *Lutra lutra* (Otter) [1355] **Potential Impact** The development site is located within a rural area 7.8 km from the Wicklow Mountains SAC. The development does not have a direct or indirect connection or pathway to the SAC. The proposed development would not impact on the features of interest or the conservation objectives of this SAC. **No significant effects are likely.**
IE0003000	Rockabill to Dalkey Island SAC	**Out**	**Conservation Objectives:** To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected. **Features of Interest** 1170 Reefs 1351 Harbour porpoise *Phocoena phocoena* **Potential Impact** The development site is 10.2 km from the Rockabill to Dalkey SAC (Figure 11). There is no direct hydrological pathway from the proposed development site to the SAC. There is an indirect pathway from the site to the SAC via the marine environment. In the absence of any mitigation measures on site silt or pollution would enter the marine environment where it would be dispersed, mix and settle. Silt or pollution entering the marine environment, would naturally disperse, mix and settle. Should harbour porpoise be in the vicinity of the stream at the time of a pollution event it is a highly mobile species and can avoid the area. However, as the works are in the vicinity of a watercourse the proposed project must comply with Water Pollution Acts. However, these measures are not required to prevent significant effects on the features of interest of the SAC. Due to the distance (10.2 km) via the indirect pathway (e.g. surface water networks) any pollutants or silt will be dispersed and diluted in the marine environment. The indirect pathway of surface will not result in a significant effect on the Natura 2000 site. The construction and operation of the proposed development will not impact on the conservation interests of the site. **No significant effects are likely**

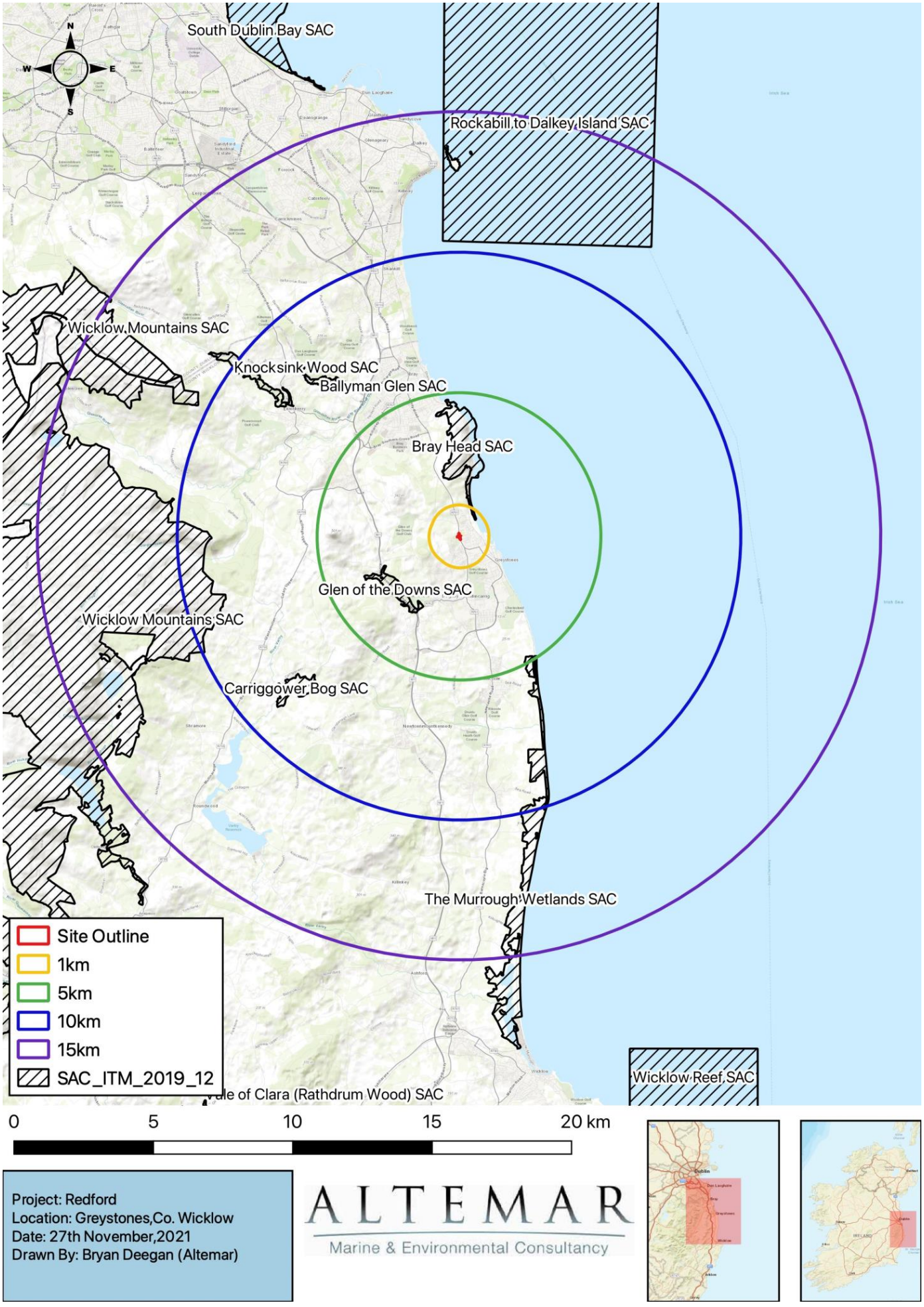


Figure 4. Special Areas of Conservation located within 15km of the proposed development.

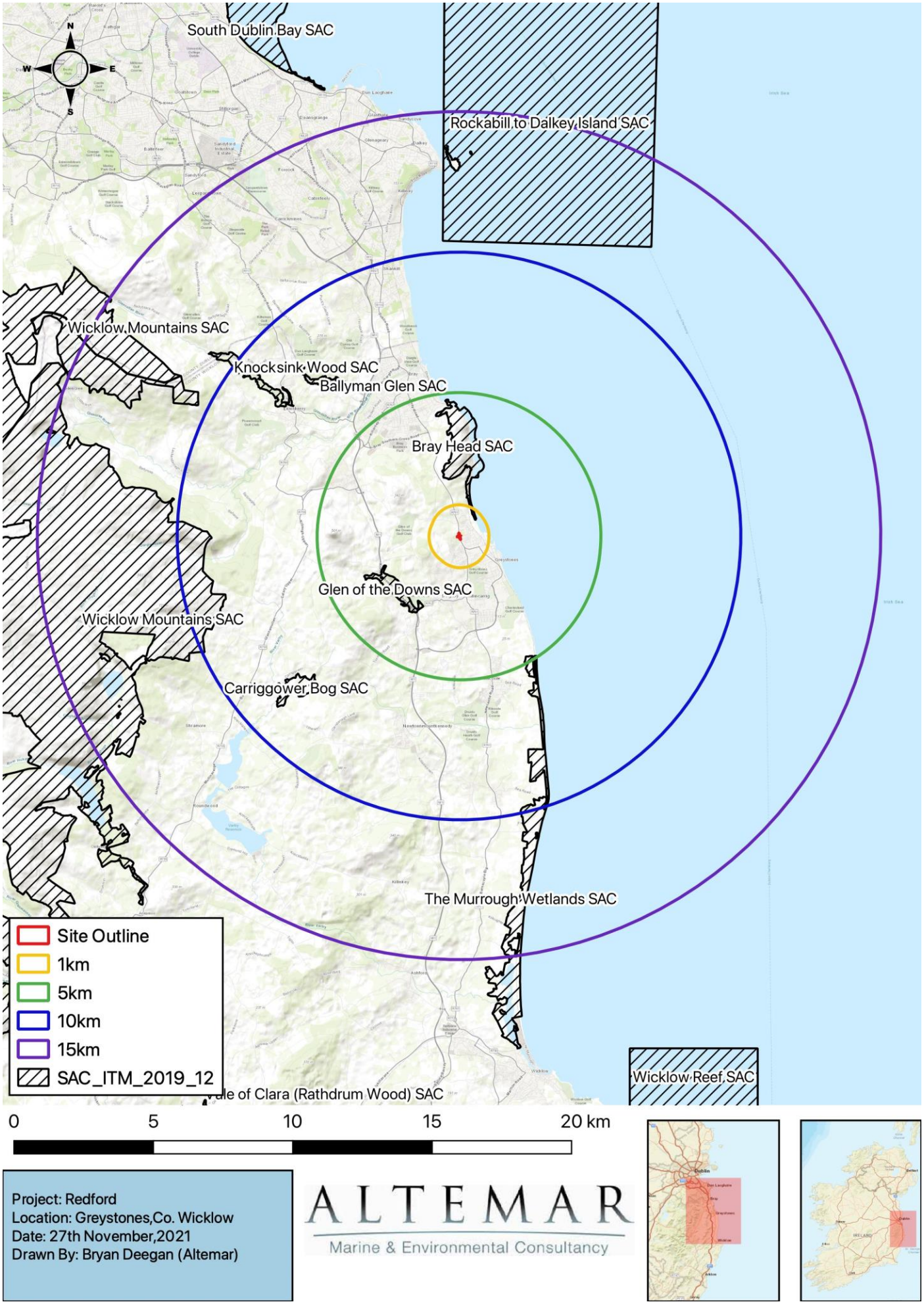


Figure 5. Special Protection Areas located within 15km of the proposed development.

Figure 6. Watercourses within 1km of the proposed development (EPA-WFD data)

IN-COMBINATION EFFECTS

The proposed development site is primarily an existing road junction to the north of Greystones. This area has seen recent development including the Waverly development consisting of 159 residential units comprising 94 houses (2-3 storeys in height), comprising 32 no 4 bed detached units ranging in size from c 140 sqm to c 178 sqm GFA, 14 no 5 bed detached units at c210 sqm GFA, 48 no 3 bed semi-detached units ranging in size from 92 sqm to c115 sqm GFA, and 4 no apartment blocks which range in height from 3-4 storey (4 storeys overall), comprising a total of 65 no apartments as follows: 10 no 1 bed single storey apartments, 26 no 2 bed single storey apartments, 13 no 3 bed single storey apartments, 4 no 2 bed two storey apartments, 12 no 3 bed two storey apartments. The provision of 340 no car parking spaces, (42 within garages, 112 on driveways, 186 on street/within designated car parking area) with a new vehicular access from the Blacklion Link Road and all site development, landscaping, road and boundary treatment works.

However, other developments in the area consist of small developments and consist of single residential units or, modifications to existing dwellings. There is no direct pathway from the site to Natura 2000 sites.

No in-combination effects are foreseen.

CONCLUSIONS

The proposed site is located 0.7 km from the nearest Natura 2000 site (Bray Head SAC). In the absence of any standard controls on site, watercourses and surface runoff are seen as the main potential pathway for impacts on Natura 2000 sites. There is no direct pathway to Natura 2000 sites. Indirect pathways via the Greystones Stream, public surface network lead to the marine environment, where significant mixing and dilution takes place in the open marine environment prior to reaching Natura 2000 sites including the Bray Head SAC. None of the features of interest of these Natura 2000 sites would be impacted by the proposed development.

No Natura 2000 sites are within the zone of influence of this development. Having taking into consideration the effluent discharge from the proposed development works, the distance between the proposed development site to designated conservation sites, lack of direct hydrological pathway or biodiversity corridor link to conservation sites and mixing within the marine environment, it is concluded that this development that would not give rise to any significant effects to designated sites. The construction and operation of the proposed project will not impact on the conservation objectives of features of interest of Natura 2000 sites.

This report presents a Stage 1 Appropriate Assessment Screening for the Proposed Development, outlining the information required for the competent authority to screen for appropriate assessment and to determine whether or not the Proposed Development, either alone or in combination with other plans and projects, in view of best scientific knowledge, is likely to have a significant effect on any European or Natura 2000 site.

On the basis of the content of this report, the competent authority is enabled to conduct a Stage 1 Screening for Appropriate Assessment and consider whether, in view of best scientific knowledge and in view of the conservation objectives of the relevant European sites, the Proposed Development, individually or in combination with other plans or projects is likely to have a significant effect on any European site.

There is no possibility of significant impacts on Natura 2000 sites, features of interest or site specific conservation objectives. A Natura Impact Statement is not required. In carrying out this AA screening, mitigation measures have not been taken into account. Standard best practice construction measures which could have the effect of mitigating any effects on any European Sites have similarly not been taken into account.

Accordingly, having carried out the Stage 1 Appropriate Assessment Screening, the competent authority may determine that a Stage 2 Appropriate Assessment of the Proposed Development is not required following screening under this Regulation 42 of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, as it can be concluded that the possibility of any significant impacts on any European Sites, whether arising from the project itself or in combination with other plans and projects, can be excluded on the basis of the best scientific knowledge available.

DATA USED FOR THE AA SCREENING ASSESSMENT

NPWS site synopses and Conservation objectives of sites within 15km. The most recent SAC and SPA boundary shapefiles were downloaded and overlaid on Bing road map and satellite imagery. Several site visits were carried out including survey to determine if the site contained possible threats to a NATURA 2000 site.

REFERENCES

The following references were used in the preparation of this AA screening report.

1. Department of Environment Heritage and Local Government Circular NPW 1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities March 2010.
2. Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities, Department of the Environment, Heritage and Local Government 2009; http://www.npws.ie/publications/archive/NPWS_2009_AA_Guidance.pdf
3. Managing NATURA 2000 Sites: the provisions of Article 6 of the Habitats Directive 92/43/EEC, European Commission 2000; http://ec.europa.eu/environment/nature/Natura2000/management/docs/art6/provision_of_art6_en.pdf
4. Assessment of Plans and Projects Significantly Affecting NATURA 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC; http://ec.europa.eu/environment/nature/Natura2000management/docs/art6/Natura_2000_assess_en.pdf
5. Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission; http://ec.europa.eu/environment/nature/Natura2000/management/docs/art6/guidance_art6_4_en.pdf
6. Guidance document on the implementation of the birds and habitats directive in estuaries and coastal zones with particular attention to port development and dredging; http://ec.europa.eu/environment/nature/Natura2000/management/docs/guidance_doc.pdf
7. The Status of EU Protected Habitats and Species in Ireland. http://www.npws.ie/publications/euconservationstatus/NPWS_2007_Conservation_Status_Report.pdf
8. NPWS (2013) Conservation Objectives: Rockabill to Dalkey Island SAC 003000. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
9. NPWS (2021) Conservation objectives for Dalkey Islands SPA 004172. Generic Version 4.0. Department of Arts, Heritage and the Gaeltacht.
10. NPWS (2021) Conservation objectives for Wicklow Mountains SPA [004040]. Generic Version 6.0. Department of Arts, Heritage and the Gaeltacht.
11. NPWS (2021) Conservation objectives for The Murrough SPA [004186]. Generic Version 6.0. Department of Arts, Heritage and the Gaeltacht.
12. NPWS (2019) Conservation Objectives: Ballyman Glen SAC 000713. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.
13. NPWS (2017) Conservation objectives for Bray Head SAC [000714]. Generic Version 6.0. Department of Arts, Heritage and the Gaeltacht.
14. NPWS (2021) Conservation objectives for Knocksink Wood SAC [000725]. Department of Arts, Heritage and the Gaeltacht.

15. NPWS (2020) Conservation objectives for Glen of the Downs SAC [000719]. Generic Version 6.0. Department of Arts, Heritage and the Gaeltacht.
16. NPWS (2020) Conservation objectives for The Murrough Wetlands SAC [002249]. Generic Version 6.0. Department of Arts, Heritage and the Gaeltacht.
17. NPWS (2018) Conservation objectives for Carriggower Bog SAC [000716]. Generic Version 6.0. Department of Arts, Heritage and the Gaeltacht.
18. NPWS (2017) Conservation Objectives: Wicklow Mountains SAC 002122. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

FINDING OF NO SIGNIFICANT EFFECTS REPORT

Details of project	Appropriate Assessment Screening for a proposed upgrade to the junction at Redford, Greystones. Co. Wicklow
Name and Location of the NATURA 2000 sites within 15km.	The Murrough SPA Wicklow Mountains SPA Dalkey Islands SPA Glen of the Downs SAC Bray Head SAC Murrough Wetlands SAC Carriggower Bog SAC Ballyman Glen SAC Wicklow Mountains SAC Knocksink Wood SAC Rockabill to Dalkey Island SAC
Description of the Project	The overall scheme aims to deliver an upgrade to the existing signal-controlled Redford Park junction which is located within the Redford area of Greystones in County Wicklow. The upgrades will consist of improvements for pedestrians and cyclists with the upgrade of footpaths and inclusion of cycle track facilities, as well as an improvement to public transport through the upgrading of two existing bus stops in the immediate vicinity of the junction.
Is the Project directly connected with the management of the NATURA 2000 site?	No
Details of any other projects or plans that together with this project could affect the NATURA 2000 site	None
The assessment of significant effects	
Describe how the project is likely to affect the NATURA 2000 site	Negligible Impact Predicted
Response to consultation	N/A
Data collected to carry out the assessment	Site Visit and Supporting NPWS data.
Who carried out the assessment	Altemar Ltd.
Sources of data	NPWS website, standard data form, conservation objectives data, field surveys of the site and references outlined in the AA Screening Report.
Explain why the effects are not considered significant	No Natura 2000 sites are within the zone of influence of this development. Having taking into consideration the effluent discharge from the proposed development works, the distance between the proposed development site to designated conservation sites, lack of direct hydrological pathway or biodiversity corridor link to conservation sites and mixing within the marine environment it is concluded that this development that would not give rise to any significant effects to designated sites.
Level of assessment completed	Stage 1 Screening
Overall conclusions	
On the basis of the content of this report, the competent authority is enabled to conduct a Stage 1 Screening for Appropriate Assessment and consider whether, in view of best scientific knowledge and in view of the conservation objectives of the relevant European sites, the Proposed Development, individually or in combination with other plans or projects is likely to have a significant effect on any European site.	

APPENDIX C- REDFORD PARK OPTIONS REPORT

Project

Redford Park Junction Improvement

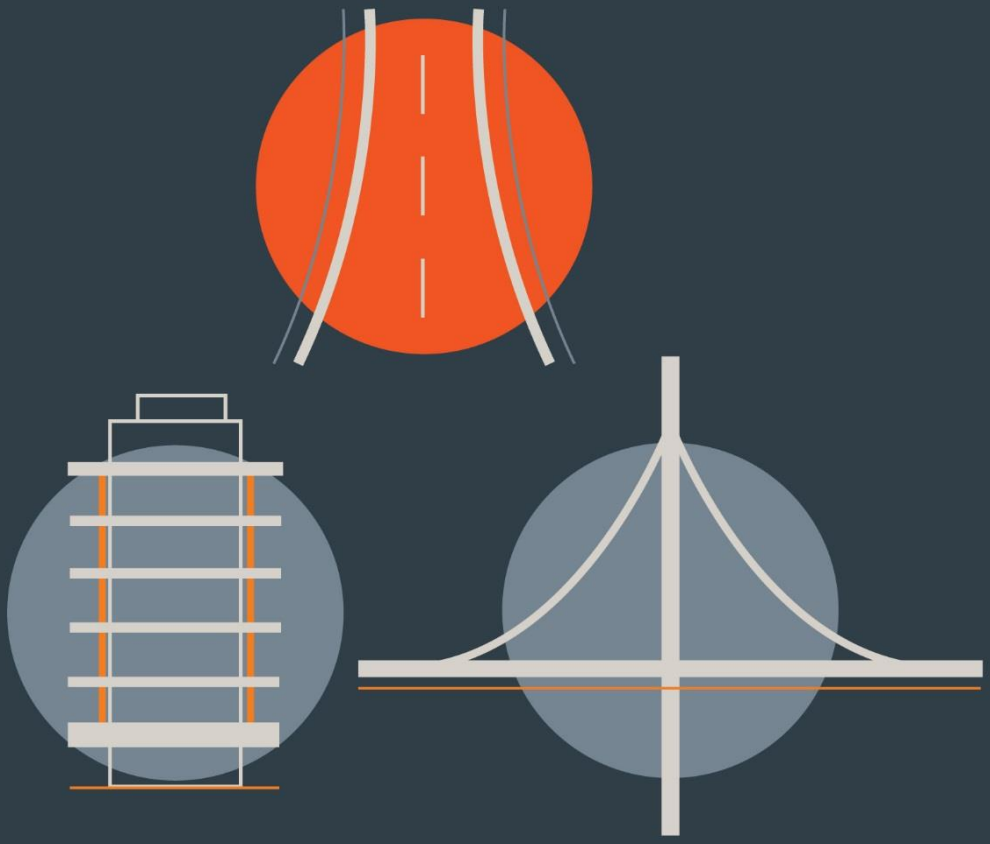
Report Title

Options Report

Client

Wicklow County Council

TRANSPORTATION



DBFL CONSULTING ENGINEERS

Document Control

Job Title: Redford Park Junction Assessment

Job Number: P190092

Report Ref: P190092-DBFL-RP-0001

Author: Jane Hennaghan

Reviewed by: Robert Kelly

Date: January 2022

Distribution: Client

Revision	Issue Date	Description	Prepared	Reviewed	Approved
1	May 2020	Draft for Client	JLH	RJK	RJK
2	July 2020	Final Draft	JLH	RJK	RJK
3	December 2020	Final	JLH	RJK	RJK
4	January 2022	Final	JLH	RJK	RJK

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CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 INTRODUCTION

1.1.1 DBFL have been commissioned by Wicklow County Council (WCC) to undertake an Options Assessment for the R761/Redford Park/Blacklion Manor Road Signalised Junction (Redford Park Junction).

1.1.2 The junction is located within the Redford area of Greystones in County Wicklow. The junction currently operates as a 4-arm signal controlled junction.

1.1.3 The objectives of this report are as follows:

1. Review the current operation of the junction in terms of pedestrian and cycle safety;
2. Review the current operation for the junction in terms of traffic capacity; and
3. Undertake an assessment for improving the operation of the junction for both vehicular use and pedestrian and cycle movement and safety.

1.1.4 The purpose of this report, therefore, is to identify a number of junction design options for the Redford Park junction and to assess these options against Multiple Criteria in order to determine the preferred design option that meets the requirements of WCC.

1.2 SITE LOCATION

1.2.1 The junction is located within the Redford area in Greystones, County Wicklow. A site location map, shown in Figure 1-1, outlines the location of the Redford Park junction.

Figure 1-1: Scheme Location (Source: Google Maps)

1.3 BACKGROUND

1.3.1 The existing junction is located within an area of Greystones that experiences peaks in traffic flows, in particular, during morning and evening times. This is due to a number of factors, including the following:

Schools

- The junction is located in close proximity to three schools, the Greystones Educate Together National School, Temple Carrig School and Gaelscoil na gCloch Liath, all located along the Blacklion Manor Road. There are a number of car, pedestrian and cycle trips, therefore, accessing and egressing the schools for drop off and pick up times.

R761 Regional Road

- The R761, which routes through the junction in a north to south direction, is the main Regional Road from Greystones into Bray Town and also provides an access road to the M11 Motorway. The R761, approximately 25km in length, routes from Rathnew in the outskirts of Wicklow, travelling northwards through Kilcoole and Greystones terminating in Bray Town at the junction to the M11. This route is busy at peak times with a typical AADT of between 11,000 – 12,000 Vehicles.

Local Amenities

- The junction is located in close proximity to a number of amenities such as a local shops area off Blacklion Manor Road that includes a Lidl food store, a Circle K Garage off the R761 southern arm as well as a number of smaller retail shops. These amenities attract a number of vehicle movements throughout the day.

1.3.2 These local factors and their proximity to the junction are illustrated in the image in Figure 1-2 below.

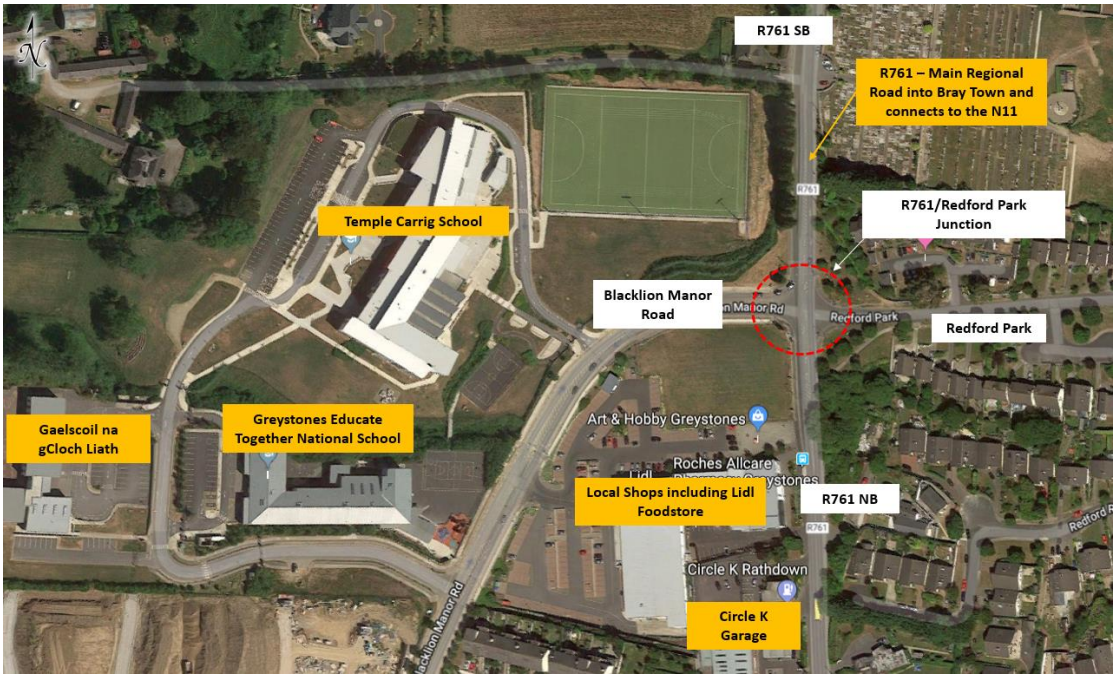


Figure 1-2: Location (Source: Google Maps)

1.4 OBJECTIVES OF REPORT

1.4.1 This report aims to consider a number of design options for the Redford Park Junction that will improve on the pedestrian and cycle facilities through the junction as well as improve the junction safety, capacity and operation. A preferred design option will be taken forward and finalised for Preliminary Design.

1.5 REPORT STRUCTURE

1.5.1 Following on from **Chapter 1** of this report, which details the Introduction and background to the scheme, **Chapter 2** outlines the relevant policy and guidance documents that justify the scheme on a National, Regional and Local basis.

1.5.2 **Chapter 3** details the Existing Conditions for the area including the existing roads, footpaths and cycle provision through the junction as well as existing amenities in the surrounding environment.

1.5.3 **Chapter 4** outlines the proposed design options for the Redford Park junction and gives the various advantages and disadvantages for each option proposed.

1.5.4 **Chapter 5** describes the Multi-Criteria Analysis (MCA) assessment criteria and details the MCA for each design option.

1.5.5 **Chapter 6** outlines the Emerging Preferred Option as a result of the MCA assessment.

1.5.6 **Chapter 7** outlines the design of bus stops south of the Redford Park junction which will be incorporated into the preferred design option for the junction.

1.5.7 **Chapter 8** provides a Summary of the report as well as a Conclusion.

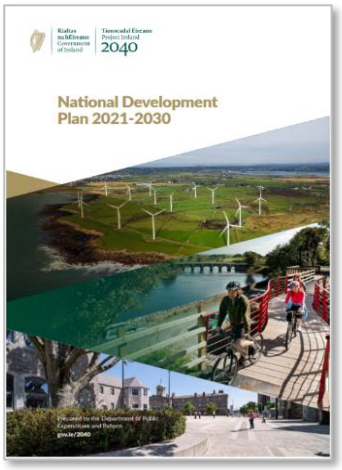
2.0 POLICY CONTEXT

2.1.1 It is important that a review of current Policy is undertaken and used to inform the development of the options considered for the Redford Park Options Report.

2.1.2 The following policy documents and design guidance have been reviewed as part of this scheme.

2.2 NATIONAL DEVELOPMENT PLAN (2021-2030)

2.2.1 As part of Project Ireland 2040 the National Development Plan sets out the Government's over-arching investment strategy and budget for the period 2021-2030. It is an ambitious plan that balances the significant demand for public investment across all sectors and regions of Ireland with a major focus on improving the delivery of infrastructure projects to ensure speed of delivery and value for money.



2.2.2 The NDP sets out a significant level of investment, almost €165 billion, which will underpin the NPF and drive its implementation over the next nine years. The scale of the Transport-related requirements under the revised NDP amounts to c. €35 billion in total over 2021- 2030.

2.2.3 The National Planning Framework (NPF) recognises the importance of significant investment in sustainable mobility (active travel and public transport) networks if the NPF population growth targets are to be achieved. Investing in high-quality sustainable mobility will improve citizens' quality of life, support our transition to a low-carbon society and enhance our economic competitiveness.

2.2.4 With regard to Ireland's greenhouse gas emissions, the transport sector has been determined as a key contributor to this and is responsible for 20%. The NDP sets out an entire National Strategic Objective that is dedicated to "Sustainable Mobility" and has a range of policies and measures to promote the achievement of sustainable mobility. The following definitions of Sustainable Mobility have been outlined in the NDP:

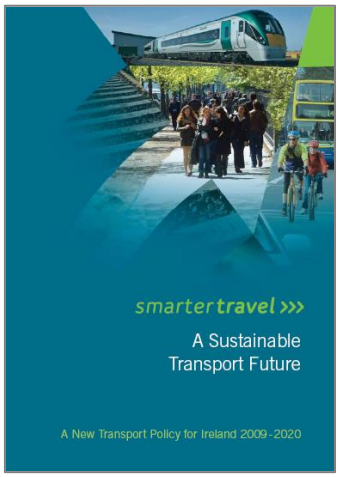
- Comfortable and affordable journeys to and from work, home, school, college, shops and leisure;
- Travelling by cleaner and greener transport; and
- A shift away from the private car to greater use of active travel (walking and cycling) and public transport.

2.2.5 The Government is firmly committed to encouraging the use of walking, cycling and other active travel methods, and this has been signalled by the recent increase in the active travel budget. Whole-of Government funding equivalent to 20% of the 2020 transport capital budget, or €360 million, has been committed annually for the period 2021-2025. In 2021, the NTA allocated just over €240 million to active travel infrastructure projects in Dublin, the Greater Dublin Area and regional cities.

2.2.6 This investment will help support the delivery of significant levels of new and improved walking and cycling infrastructure by 2025, as well as additional investment in Greenways. Successful delivery of planned projects and programmes should serve to encourage a shift in the population towards walking, cycling and scooting as transport modes as the decade progresses.

2.3 SMARTER TRAVEL – A SUSTAINALBE TRANSPORT FUTURE 2009 - 2020

2.3.1 Smarter Travel - A Sustainable Transport Future, was published in February 2009, and represents a new transport policy for Ireland for the period 2009-2020. The policy recognises the vital importance of continued investment in transport to ensure an efficient economy and continued social development, but it also sets out the necessary steps to ensure that people choose more sustainable transport modes such as walking, cycling and public transport.



2.3.2 The policy is a direct response to the fact that continued growth in demand for road transport is not sustainable due to the resulting adverse impacts of increasing congestion levels, local air pollution, contribution to global

warming, and the additional negative impacts to health through promoting increasingly sedentary lifestyles.

2.3.3 The following five key goals form the basis of the Smarter Travel policy document:

- Improve quality of life and accessibility to transport for all and, in particular, for people with reduced mobility and those who may experience isolation due to lack of transport.
- Improve economic competitiveness through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks.
- Minimise the negative impacts of transport on the local and global environment through reducing localised air pollutants and greenhouse gas emissions.
- Reduce overall travel demand and commuting distances travelled by the private car.
- Improve security of energy supply by reducing dependency on imported fossil fuels.

2.3.4 These aims will be achieved through 49 specific actions listed within the Smarter Travel Policy, which can be broadly grouped into 4 key areas:

- Actions to reduce distance travelled by private car and encourage smarter travel,
- Actions aimed at ensuring that alternatives to the private car are more widely available,
- Actions aimed at improving the fuel efficiency of motorised transport through improved fleet structure, energy efficient driving and alternative technologies, and
- Actions aimed at strengthening institutional arrangements.

2.3.5 The Smarter Travel policy also includes for a comprehensive range of supporting 'actions' including mode specific (e.g. walking, cycling and public transport etc.) and behaviour change initiatives which both encourage and provide for sustainable travel practices for all journeys.

2.4 CLIMATE ACTION PLAN (2021)

2.4.1 The Climate Action Plan 2021 sets out a major programme for change in response to reducing Ireland's greenhouse gas emissions. The proposals outlined in the Plan are aimed at achieving a net zero carbon energy system within Ireland and it is envisaged that these proposals will also have associated positive economic and societal benefits, including cleaner air, warmer homes and a more sustainable economy in the longer term.

2.4.2 Irelands transport system plays a critical role in realising the ambitious targets of the Climate Action Plan. Consequently, to make growth less transport intensive a number of key policies are identified, including the expansion of walking, cycling and public transport to promote modal shift. The measures to deliver on the transport related targets set out in the Climate Action Plan cover the following:

- Sustainability;
- System Efficiency and Demand Management;
- Fleet Electrification;
- Renewable and Alternative Transport Fuels for Freight;
- Use of Green Hydrogen and other Emerging Technologies.

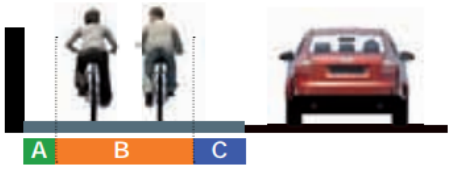
2.5 NATIONAL CYCLE MANUAL - 2011

2.5.1 The National Cycle Manual is a national guidance document that details the principles of sustainable safety that offers a safe traffic environment for all road users including cyclists. The manual provides guidance on integrating the bicycle in to the design of urban areas. The manual sets out five principles of Sustainable Safety:

1. Functionality: The principle of functionality is that the design which is fit for purpose is safer. Urban streets, roads and spaces are always multi – functional.
2. Homogeneity: The principle of Homogeneity is that reducing the relative speed, mass and directional differences of different road users sharing the same space increases safety.
3. Legibility: The principle of Legibility is that a road environment that all road users can read and understand is safer. A legible design will be self-evident, self-explanatory and self-enforcing.
4. Forgivingness: The principle of Forgivingness (Passive Safety) is that environments that contribute to benign outcomes of accidents are safer.
5. Self-Awareness: The principle of Self-Awareness is that where road users are aware of their own abilities and limitations to negotiate a road environment, the environment is safer.

2.5.2 The width of a cycle facility as well as the type of facility proposed (Integrated or Segregated) are two key factors for providing adequate, safe facilities and a sub-standard cycle lane/track is never recommended.

2.5.3 The designed width of a cycle facility is comprised of the effective width as well as clearances that are required in different circumstances. The Width Calculator table provides details for determining the actual width required for cycle lanes and tracks. It comprises of three main factors, A,B and C, as well as an additional factor, D, which is only relevant in certain circumstances. The width calculator table is illustrated in Figure 2-1.



A Inside Edge		B Cycling Regime		C Outside Edge		D Additional Features	
Kerb	0.25m	Single File	0.75m	30kph, 3.0m wide lane	0.50m	Uphill	0.25m
						Sharp bends	0.25m
Channel Gully	0.25m	Single File + Overtaking, Partially using next lane	1.25m	50kph, 3.0m wide lane	0.75m	Cyclist stacking, Stopping and starting	0.50m
Wall, Fence or Crash Barrier	0.65m	Basic Two-Way	1.75m	Raised kerb, dropped Kerb or physical barrier	0.50m	Around primary schools, Interchanges, or for larger tourist bikes	0.25m
Poles or Bollards	0.50m	Single File + Overtaking, Partially using next lane	2.00m	Kerb to vegetation etc. (ie. cycleway)	0.25m	Taxi ranks, loading, line of parked cars	1.00m (min 0.8m)
		2 Abreast + overtaking (tracks and cycleways)	2.50m			Turning pocket cyclists	0.50m

Figure 2-1: Cycle width calculator – National Cycle Manual (Source: NCM)

2.5.4 In terms of the type of facility proposed, integrated or segregated, there are a number of factors considered for determining the type of facility most appropriate. Segregated facilities are recommended in the following circumstances:

- The traffic regime cannot be rendered suitable for integrated cycling;
- To preclude traffic from queuing or parking on the facility;
- To confer an advantage on cyclists.

2.5.5 A guidance graph is illustrated in Figure 2-2 that sets out relevant factors for determining the type of facility to provide.

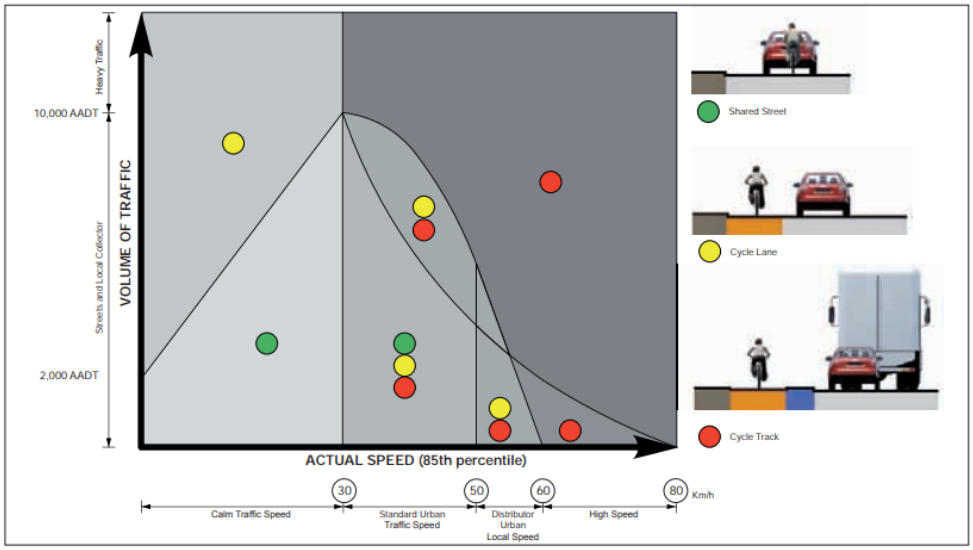
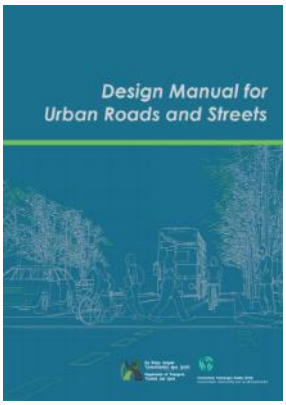


Figure 2-2: Guidance graph for determining type of cycle facility (Source: NCM)

2.5.6 The graph determines the type of facility necessary, whether the facility is shared, cycle lane or cycle track, based on vehicle speed and AADT of the road.

2.6 DESIGN MANUAL FOR URBAN ROADS AND STREETS (2019)



2.6.1 DMURS provides guidance relating to the design of urban roads and streets. It presents a series of principles, approaches and standards that are necessary to achieve balanced, best practice design outcomes with regard to street networks and individual streets.

2.6.2 The manual places a significant emphasis on car dominance in Ireland and the implications this has had regarding the pedestrian and cycle environment. The document encourages more sustainable travel patterns and safer streets by proposing a hierarchy for user priorities. This hierarchy places pedestrians at the top, indicating that walking is the most sustainable form of transport and that by prioritising pedestrians first, the number of short car journeys can be reduced and public transport made more accessible.

2.6.3 Second in the hierarchy are cyclists with public transport third in the hierarchy and private motor vehicles at the bottom. By placing private vehicles at the bottom of the hierarchy, the document indicates that there

should be a balance on street networks and cars should no longer take priority over the needs of other users.

2.6.4 The manual emphasises that narrow carriageways are one of the most effective design measures that calm traffic. Standard width of an arterial and link street is 3.25m, however, this may be reduced to 3m where lower design speeds are being applied. Desirable footpath widths are between 2m – 4m. The 2m width should be implemented to allow for low to moderate pedestrian activity. A 3m – 4m footpath should be implemented to allow for moderate to high pedestrian activity.

2.6.5 The focus of the manual is to create a place – based sustainable street network that balances the pedestrian and vehicle movements. The manual references the different types of street networks, including arterial streets, link streets, local streets, and highlights the importance of movement.

2.7 DRAFT PRELIMINARY DESIGN GUIDANCE BOOKLET FOR BUSCONNECTS CORE BUS CORRIDORS (2020)

2.7.1 The Draft Preliminary Design Guidance Booklet for BusConnects has recently been produced to assist with the design of typical corridor scenarios and layouts.

2.7.2 The purpose of the booklet is to complement, and not supersede, existing guidance documents relating to the design of urban streets, bus facilities, cycle facilities and public realm.

2.7.3 The aim of the design booklet is to provide guidance for the various design teams involved in the CBC Project and ensure a consistent design approach across the project. The document focuses on the engineering geometry and CBC operation, whilst acknowledging that the design evolution will result in the rationalisation of junction and link layouts, presenting opportunities to increase the public realm footprint and improve the placemaking offering of the CBC network.

2.7.4 The booklet also recognises that the CBC project is being planned and designed within the context of an existing city, with known constraints. The document therefore provides guidance, however a more flexible approach to the design of CBCs, utilising engineering judgement, may be necessary

in some locations due to these constraints. The optimum CBC cross section is shown in Figure 2-3.

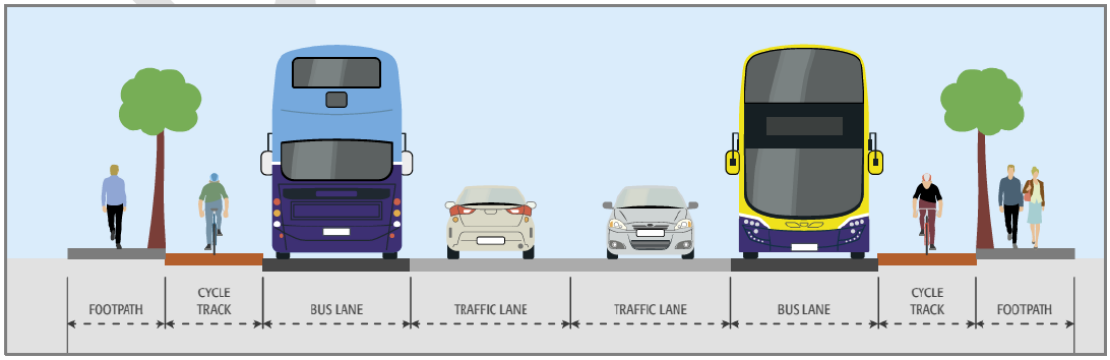


Figure 2-3: Optimum CBC Cross Section (Source: Preliminary Design Guidance Booklet)

2.7.5 With regards to junction design, the design booklet states that the preferred layout for signalised junctions within the CBC project is the protected 'Dutch-style' junction, shown in Figure 2-4, which provides physical kerb buildouts to protect cyclists through the junction.

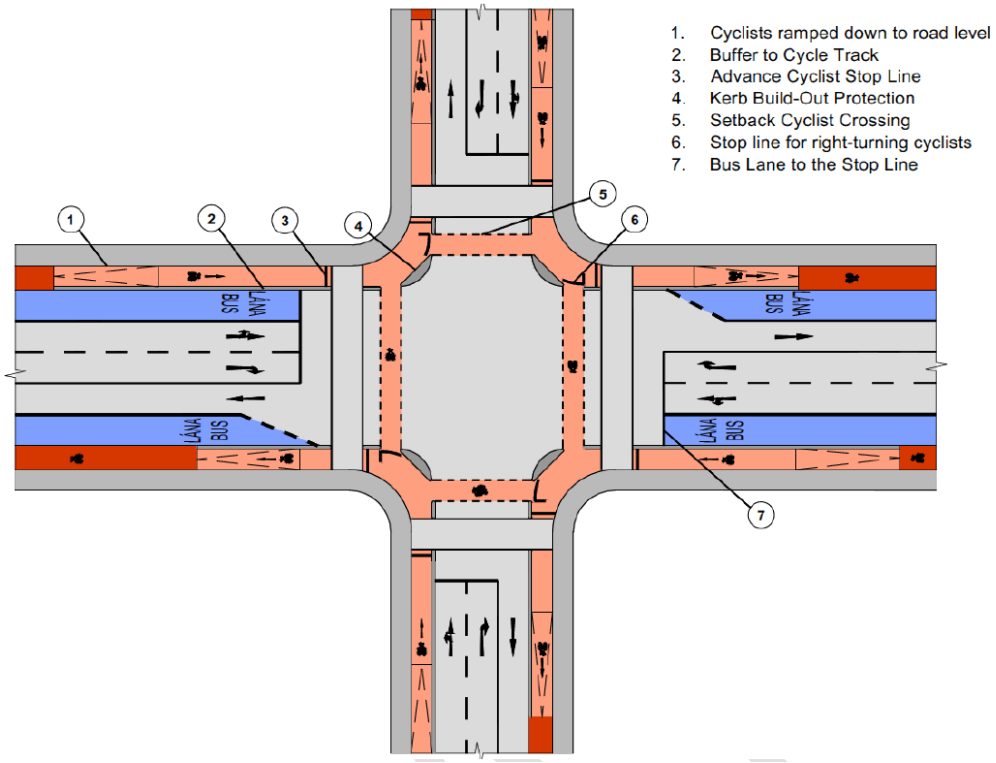


Figure 2-4: Dutch-Style Junction Design (Source: Preliminary Design Guidance Booklet)

2.7.6 The design guidance states that the preferred approach at 'Dutch-style' junctions is to continue the bus lane to the stop line to provide continuous bus priority. A number of variations to this layout to cater for left-turning vehicles, may be permitted based on site specific parameter (e.g. available spaces) and led by traffic modelling. Bus Priority Signals (or Pre-Signals) may also be considered in certain circumstances, being utilised on the approaches to junctions to give priority to buses and/or to gate general traffic at signals.

2.7.7 With regard to bus stops, Island Bus Stops, such as that illustrated in **Figure 2-5** are the preferred bus stop option to be used as standard on the CBC project where space constraints allow.

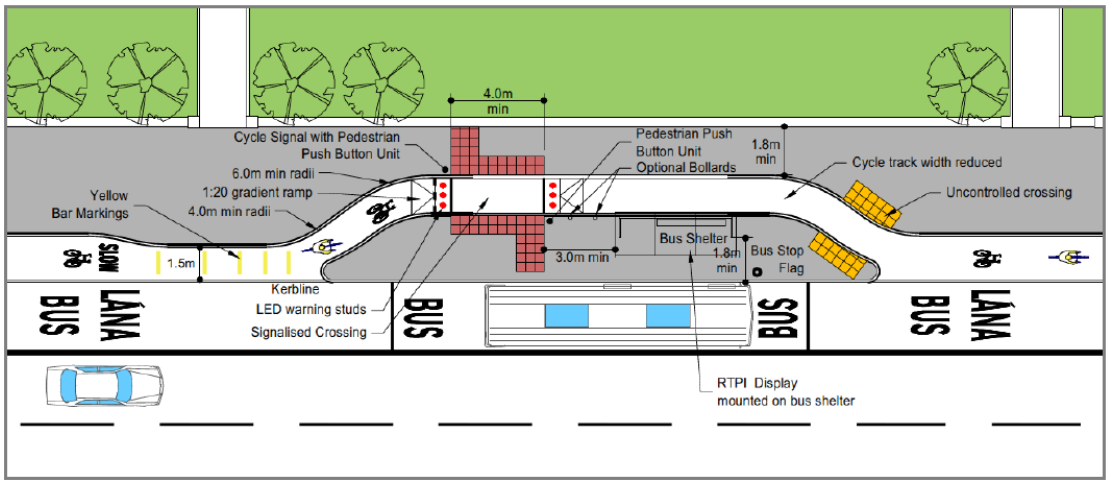


Figure 2-5: Island Bus Stop Arrangement (Source: Preliminary Design Guidance Booklet)

2.8 TRANSPORT STRATEGY FOR THE GREATER DUBLIN AREA 2016-2035

2.8.1 The purpose of this strategy is 'to contribute to the economic, social and cultural progress of the Greater Dublin Area by providing for the efficient, effective and sustainable movement of people and goods.'

2.8.2 This transport strategy provides a framework for the planning and delivery of transport infrastructure and services in the Greater Dublin Area (GDA).

2.8.3 There is an onus on the Authority to take full account of current prevailing policies and plans made at central government level, in transport, planning and in other sectors as well as other regional level plans. On review of these policies, the following key messages have emerged:

- Transport must be a key consideration in land use planning;
- In the short term, funding for large scale transport projects will be limited;
- Addressing urban congestion is a priority;
- The capacity of the strategic road network must be protected;
- A significant reduction in the share of trips undertaken by car is required, particularly in relation to short trips and commuter trips;
- An associated increase in walking, cycling and public transport is also required;
- A safe cycling network, with extensive coverage in metropolitan Dublin and in other towns, is needed to cater for the increased use of cycling that is already occurring and to reduce the dominance of the private car in meeting travel needs;
- The enhancement of the pedestrian environment, including measures to overcome severance and to increase permeability, is a priority.

2.8.4 In terms of cycle infrastructure, the GDA cycle network plan proposes to expand the urban cycle network to over 1,485km in length and will provide over 1,300km of new connections between towns in the rural areas of the GDA. Recognising the need for a safe cycling network, it is intended that many of the key cycling route will be developed as segregated facilities, with cyclists separated from vehicular traffic through the use of kerb separators or by having the cycleway at a higher level than the road carriageway.

2.8.5 In terms of walking and issues raised relating to provision for pedestrians, it is intended to:

- Provide a safer, more comfortable and more convenient walking environment for those with mobility, visual and hearing impairments, and for those using buggies and prams;

- Enhance pedestrian movement along the strategic pedestrian routes by widening footpaths where appropriate, providing better surfacing and by removing unnecessary poles, signs, street cabinets, advertising and other street clutter;
- Revise road junction layouts, where appropriate, to provide dedicated pedestrian crossings, reduce pedestrian crossing distances, provide more direct pedestrian route and reduce the speed of turning traffic;
- Cooperate with other agencies in the enforcement of laws in relation to parking on footpaths;
- Ensure that permeability and accessibility of public transport stops and stations for local communities is maintained and enhanced.

2.9 DRAFT TRANSPORT STRATEGY FOR THE GREATER DUBLIN AREA 2022-2042

2.9.1 The Draft Greater Dublin Area Transport Strategy 2022-2042 has arisen from a review of the original 2016 strategy. The updated document *"sets out the framework for investment in transport infrastructure and services over the next twenty years".*

2.9.2 The overall aim of the Transport Strategy is *"To provide a sustainable, accessible and effective transport system for the Greater Dublin Area which meets the region's climate change requirements, serves the needs of urban and rural communities, and supports economic growth".*

2.9.3 Four primary objectives have been identified as part of the Draft Greater Dublin Area Transport Strategy 2022-2028. These are:

- **An Enhanced Natural and Built Environment -** To Create a better environment and meet our environmental obligations by transitioning to a clean, low emission transport system, reducing car

dependency, and increasing walking, cycling and public transport use.

- **Connected Communities and a Better Quality of Life –** To enhance the health and quality of life of our society by improving connectivity between people and places, delivering safe and integrated transport options, and increasing opportunities for walking and cycling.
- **A Strong Sustainable Economy –** To support economic activity and growth by improving the opportunity for people to travel for work or business where and when they need to, and facilitating the efficient movement of goods.
- **An Inclusive Transport System –** To deliver a high quality, equitable and accessible transport system, which caters for the needs of all members of society.

2.9.4 With regards to cycling, the Strategy acknowledges the growth in cycling in the Greater Dublin Area since the mid-2000s and the need to provide a coherent network of cycle facilities linking origins and destinations to cater for trips within communities. Measured for cycling outlined in the Strategy of particular relevance to this scheme include:

- **Measure CYC1 – GDA Cycle Network** It is the intention of the NTA and the local authorities to deliver a safe, comprehensive, attractive and legible cycle network in accordance with the updated Greater Dublin Area cycle Network.
- **Measure CYC2 – Cycle Infrastructure Design** It is the intention of the NTA to ensure that cycle infrastructure in the GDA provides an appropriate quality of service for all users, through the implementation of the design guidance contained in the latest version of the National Cycle Manual.

2.9.5 In terms of walking, the Strategy highlights the importance of good quality pedestrian facilities while recognising that walking forms some part of most journeys. Plans to provide a better walking environment include:

- Improving footpaths to ensure they are of sufficient width, adequately lit, serve both sides of the road in most urban areas, have good quality surfacing and are free of unnecessary clutter.

- Improving junctions to reduce the distance pedestrians have to cross and the number of times they must stop and wait during a crossing.
- Optimising crossing times for pedestrians at signalised junctions.
- Installing additional pedestrian crossing points where requirements are identified.
- Expanding and improving wayfinding systems.

2.9.6 The draft of the Transport Strategy is currently out for public consultation until 17th December 2021.

2.10 GDA CYCLE NETWORK PLAN – DECEMBER 2013

2.10.1 The GDA Cycle Network Plan is a document, prepared on behalf of the National Transport Authority, that identifies and determines a consistent, clear and logical cycle network within the Greater Dublin Area.

2.10.2 The plan aims to ensure that cycling as a transport mode is supported, enhanced and exploited in order to achieve strategic objectives and reach national goals. The steps undertaken within the plan include the following:

1. Collate existing and planned network information;
2. Undertake quality of service review;
3. Identify gaps in existing network;
4. Cycle travel demand assessment;
5. Develop cycle network plan;
6. Target quality of service for routes;
7. Develop design concepts.

2.10.3 These seven steps proposed are in line with the National Cycle Manual methods for designing a Cycle Network.

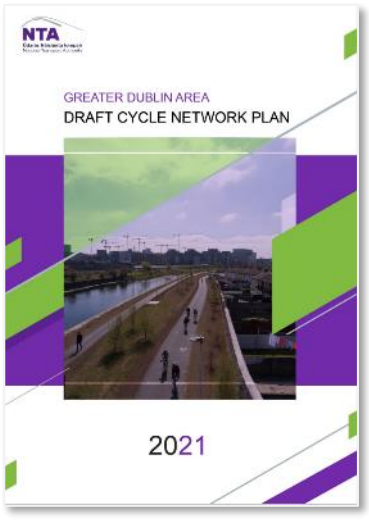
2.10.4 The GDA Cycle Network map, shown in Figure 2-6, outlines the proposals for the Greystones area, which route through the Redford Park Junction. This shows that there is a proposed primary/secondary route (G1) along the R761 NB arm that extends back into Greystones Town. This route joins into the Inter-Urban route (W4) at the Redford Park junction that continues

along the R761 SB arm into Bray. The Blacklion Manor Road and Redford Park are proposed as Feeder routes that connect the primary and secondary cycle network together.

Figure 2-6: GDA Cycle Network Plan for Greystones (Source: GDA Cycle Network Plan)

2.11 DRAFT GDA CYCLE NETWORK PLAN 2021

2.11.1 The Draft Greater Dublin Area Cycle Network Plan 2021 has arisen as an update to the original 2013 plan, with input from local authorities within the GDA.



2.11.2 While the original 2013 GDA Cycle Network Plan focuses on identifying the routes required to provide an adequate network for cyclists, the updated 2021 plan seeks to enhance and strengthen local accessibility and permeability.

2.11.3 As part of the updated Plan, four manageable goals have been identified to create and improved and inclusive cycle network. These goals are as follows:

- Increase participation;

- Improve safety and accessibility;
- Improve connectivity;
- Create a navigable and coherent network.

2.11.4 The GDA Cycle Network map, shown in Figure 2-7, outlines the proposals for Greystones, including the proposed scheme junction.

2.11.5 Both the Blacklion Manor Road and R761 propose a Secondary Cycle Route along its length. The Draft plan only outlines the Strategic Network, therefore, the local Redford Park arm is not included within this plan at this level.

Figure 2-7: Draft 2021 GDA Cycle Network Plan for Greystones (Source: Draft GDA Cycle Network Plan 2021)

2.12 WICKLOW COUNTY COUNCIL DEVELOPMENT PLAN – 2016 – 2022

2.12.1 The vision for County Wicklow is to be a cohesive community of people enjoying distinct but interrelated urban and rural environments. With regard to transportation, the vision is to integrate lane use planning with transportation planning with the aims of reducing the distance that people need to travel to works, shops, schools and places of recreation and social interaction, facilitating the sustainable transportation of goods and the delivery of improved public transport.

2.12.2 The provision of walking and cycling routes within and connecting towns and villages to each other forms an essential part of a linked-up transport system, involving a variety of transport modes, where public transport can be availed of. The objective for walking and cycling within the development plan are:

TR9 – To improve existing or provide new foot and cycleways on existing public roads, as funding allows.

TR10 – to require all new regional and local roads to include foot and cycleways, except in cases where shared road space is provided.

TR11 – To facilitate the development of foot and cycleways off road in order to achieve the most direct route to the principal destination while ensuring that personal safety, particularly at night time, is of the utmost priority.

TR12 – To encourage the provision of secure covered bicycle-parking facilities at strategic locations such as town centres, neighbourhood centres, community facilities and transport nodes.

TR13 – To facilitate the development of cycling and walking amenity routes throughout the County.

3.0 EXISTING CONDITIONS

3.1 INTRODUCTION

3.1.1 This section of the report discusses the existing conditions of the road network for the scheme including the traffic, pedestrian and cycling environment.

3.2 EXISTING JUNCTION LAYOUT

3.2.1 Detailed below are the existing layout and characteristics for the Redford Park junction, including the existing road layout as well as the existing provision of the pedestrian and cycle facilities.

Road Layout

3.2.2 The Redford Park junction is a 4 arm signal controlled junction. The road network surrounding the junction is illustrated in Figure 3-1 below.

Figure 3-1: R761 / Blacklion Manor Road / Redford Park Junction

3.2.3 The R761 is a Regional Road in County Wicklow that routes in a north – south direction from Rathnew, through Kilcoole and Greystones before terminating in Bray. At the Redford Park Junction, the R761 has a speed limit of 50kph and has one lane in each direction on the approach to the junction. At the junction, both the northern and southern arms are allocated with one long lane and one flare lane for right turning vehicles.

Figure 3-2: R761 Regional Road at the Redford Park Junction

3.2.4 The Blacklion Manor Road is a recently constructed distributor road in Greystones. The road runs over a short distance, approximately 800m, and connects Chapel Road to the Redford Park Junction. The road operates with the function to provide for new development in the north western side of Greystones. The road typically takes the form of a single general traffic lane in both directions. At the junction, the road provides one long lane and one flare lane for left turning vehicles.

Figure 3-3: Blacklion Manor Road

3.2.5 The Redford Park road is a residential access road situated on the north eastern side of Greystones. The road is approximately 7m in width and has one lane in both directions at the junction.

Figure 3-4: Redford Park

Cycle Facilities

3.2.6 There are off road cycle tracks in place along the Blacklion Manor Road. These are located on both sides of the road, with bollards provided along the cycle lanes for protection from vehicles.

Figure 3-5: Cycle Facilities along Blacklion Manor Road

3.2.7 There are no cycle facilities on the R761 or the Redford Park road.

Pedestrian Facilities

3.2.8 There are footpath facilities on all roads approaching the Redford Park Junction with signalised pedestrian crossings on all arms. Footpaths at the junction are narrow in places considering the high volume of pedestrian

activity from the three schools along Blacklion Manor Road, as shown in Figure 3-6.

Figure 3-6: High Volume of Pedestrians at Redford Park Junction

3.3 TRAFFIC SURVEYS

3.3.1 Traffic count data was obtained from WCC for the junction. This data was taken directly from the traffic controller with traffic volumes taken for the 26th November 2019 which represented a mid-week period during school operating times.

3.3.2 Shown in Figure 3-7 below are the AM (08:00 – 09:00) and PM (16:00 – 17:00) peak hour traffic flows through the Redford Park junction.

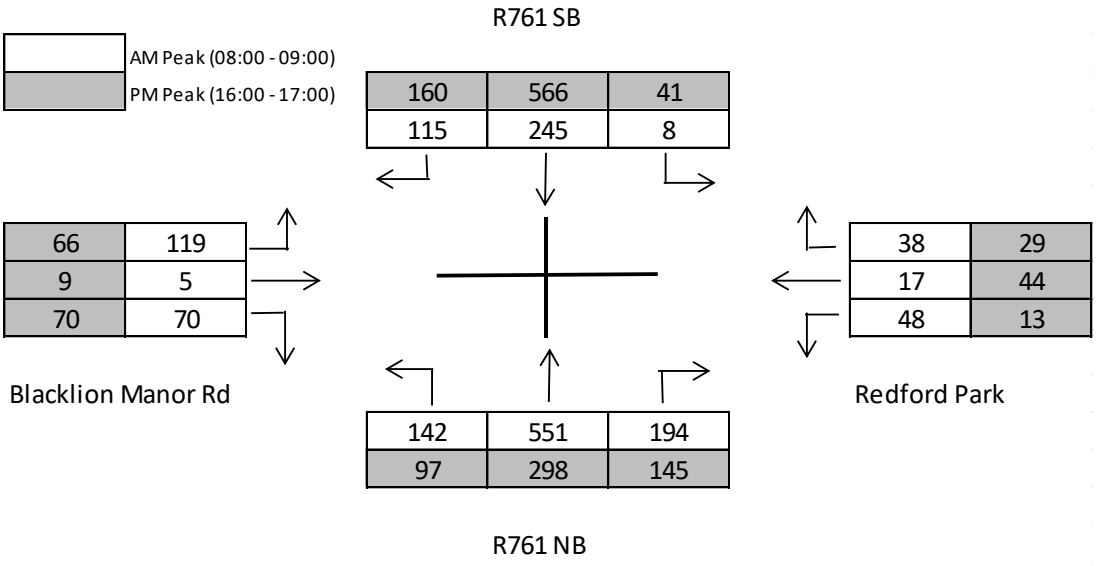


Figure 3-7: 2019 AM and PM Peak Traffic Flows for Redford Park Junction

3.3.3 Results for the AM peak hour show a high level of vehicular flow on the R761 NB arm with a total of 887 vehicles. Traffic flow for the R761 SB arm is lower in the AM peak as compared with the PM peak, showing a total vehicular flow of 368 in the AM peak and 767 in the PM peak.

3.3.4 The Blacklion Manor Road arm and the Redford Park arm show low traffic flows in both peak hours.

3.4 EXISTING TRAFFIC CAPACITY

3.4.1 A traffic model was developed for the Redford Park junction in order to determine the existing capacity at the junction. The TRL Software TRANSYT was used for the analysis. The junction was tested for the AM peak (08:00 – 09:00) and the PM peak (16:00 – 17:00). Results for the analysis for the AM peak hour and PM peak hour are outlined in Table 3-1 and Table 3-2 respectively.

Table 3-1: AM Base TRANSYT Results for the Redford Park Junction

AM Base Signalised Junction 2019 08:00 - 09:00						
Time Segment	**Arm**	**Traffic Stream**	**Degree of saturation (%)**	**Mean Delay per Veh (s)**	**Mean max queue (PCU)**	**Mean max queue (m)**
08:00-09:00	Redford Park	Straight, Left, Right	43	66.07	4.2	23
	Blacklion Manor Road	Left	22	42.09	3.63	20
		Straight, Right	22	53.78	2.66	15
	R761 NB	Straight, Left	76	33.26	27.88	153
		Right	26	13.74	2.04	11
	R761 SB	Straight, Left	27	27.3	7.43	41
		Right	15	17.52	2.54	14

Table 3-2: PM Base TRANSYT Results for the Redford Park Junction

PM Base Signalised Junction 2019 16:00 - 17:00						
Time Segment	**Arm**	**Traffic Stream**	**Degree of saturation (%)**	**Mean Delay per Veh (s)**	**Mean max queue (PCU)**	**Mean max queue (m)**
16:00-17:00	Redford Park	Straight, Left, Right	36	63.92	3.42	19
	Blacklion Manor Road	Left	12	40.54	2.01	11
		Straight, Right	23	54.02	2.8	15
	R761 NB	Straight, Left	43	27.8	12.67	70
		Right	19	15.76	2.02	11
	R761 SB	Straight, Left	66	35.92	22.55	124
		Right	21	17.81	3.03	17

3.4.2 Results show that during the AM peak hour, queuing is evident within the junction, in particular, on the R761 NB arm with a Degree of Saturation (DOS) of 76% and an average queue length of 27.8pcu which equates to

153m. It was noted on site during the AM peak hour that this arm does queue back. Results show that during the PM peak hour, the junction operates overall within capacity. Queueing is evident, however, on the R761 SB arm with a DOS of 66% and an average queue length of 22.5pcus which equates to 124m average queue length.

3.5 ACCIDENT STATISTICS

3.5.1 As part of this assessment, the Road Safety Authority (RSA) accident database was reviewed in order to ascertain the safety record along the proposed scheme route.

3.5.2 The data reviewed on the website covers an 11 year period from 2005 – 2016 inclusive and indicates basic information on all reported incidents. It is noted that information relating to reported collisions for the years 2017 to present is not yet available on the RSA database website.

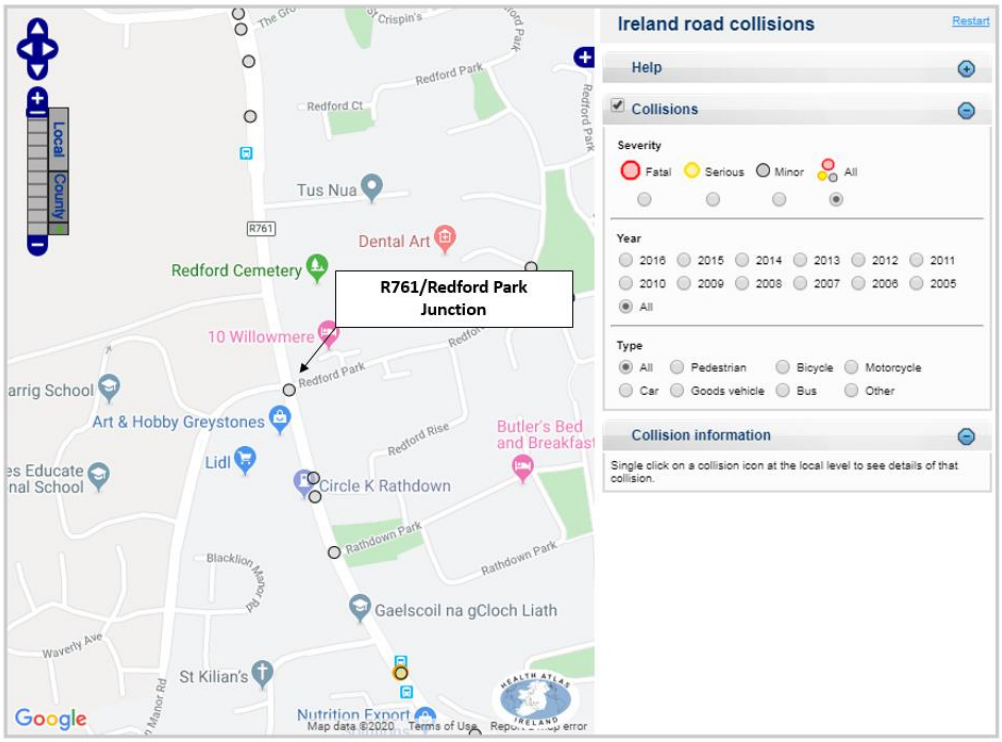


Figure 3-8: RSA Road Collision Database 2005 – 2015 (Source: RSA)

3.5.3 The graph in Figure 3-8 outlines that between the years of 2005 – 2016 there has been one collision recorded at the Redford Park junction. This collision, involving a rear end with a car, occurred in 2010 and was classed as minor in nature.

3.6 BUS ROUTES

3.6.1 Dublin Bus currently operates a bus route (84) through the Redford Park junction. This service routes between Newcastle and Blackrock, travelling through Kilcoole, Greystones and Bray. This service operates daily on an hourly basis.

3.6.2 Transport for Ireland operates a bus route (No.184) through the Redford Park junction along the R761 in a north to south direction. This service operates between Bray Train Station and Newtownmountkennedy, serving the Greystones Train Station and Delgany. This service operates daily and runs every 30 minutes approximately.

3.6.3 As part of the proposed Bus Connects scheme, there are a number of local and peak time services that are proposed to route from Greystones and along the R761 through the Redford Park junction, continuing to Bray and the City Centre. These services, as displayed in Figure 3-9, are the following:

Route L1 – This is a Local Route that loops between Greystones and Bray, routing through Newcastle in a clockwise direction.

Route L2 – This is a Local Route that loops between Greystones and Bray, routing through Newcastle in an anticlockwise direction.

Route X1 & X2 – These are Peak Only/Express Routes. Route X1 routes through Kilcoole, Southern Cross and the City Centre. Route X2 route through Newcastle, Kilcoole, Southern Cross and the City Centre.

Figure 3-9: Bus Connects Proposals for Greystones

4.0 DESIGN OPTIONS

4.1 INTRODUCTION

4.1.1 This section focuses and details the design options considered for the Redford Park junction. These options have been developed to improve the overall junction layout for pedestrian and cycle safety as well as traffic movements.

4.2 JUNCTION DESIGN OPTIONS

4.2.1 A total of three design options were considered for this junction. These are as follows and are detailed below;

Option A – Continental Roundabout

Option B – Upgraded Signalised Junction

Option C – Cycle Protected Signalised Junction

OPTION A – CONTINENTAL ROUNDABOUT

4.2.1 Option A, shown in Figure 4-1 and detailed further in Appendix A of this report, proposes a continental style roundabout with zebra crossings proposed on all arms and 90 degree approach lanes to the roundabout. Each arm has a single lane approach to the roundabout as per the National Cycle Manual and international best practice.

4.2.2 This option proposes a shared cycle and pedestrian path around the roundabout with footpaths and cycle tracks proposed on approach.

4.2.3 The Continental Roundabout option is appropriate for AADT levels below 25,000. The AADT for the junction is between 18,000 – 19,000 vehicles. Therefore, this option is considered acceptable at the Redford Park junction.

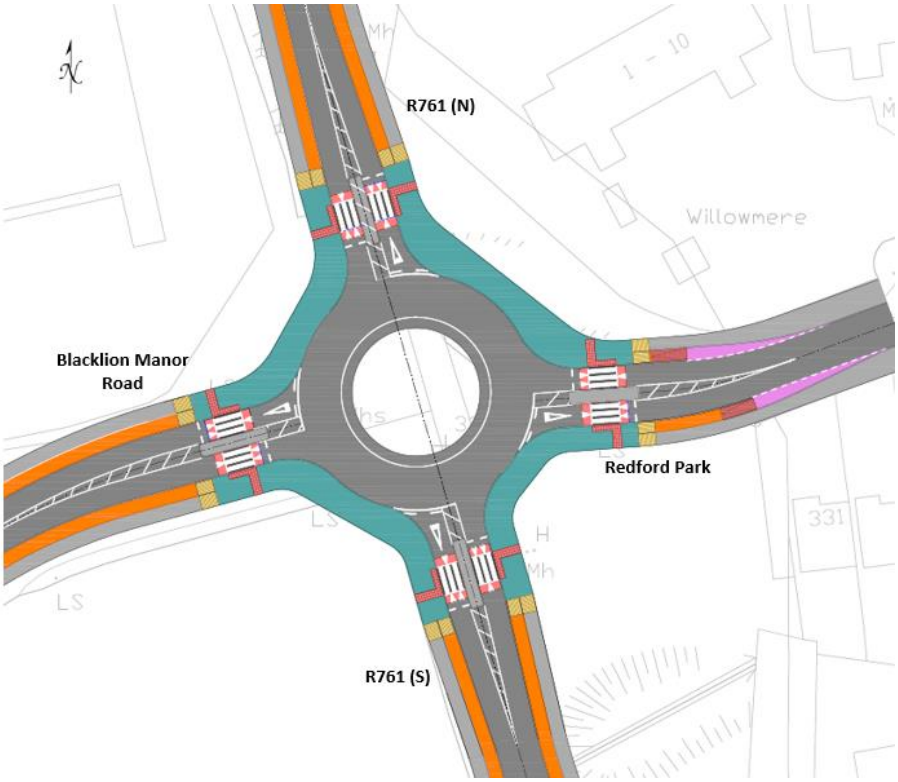


Figure 4-1: Option A – Continental Roundabout

4.2.4 Table 4-1 below outlines the Opportunities and Constraints for Option A – Continental Roundabout.

Table 4-1: Opportunities and Constraints for Option A

OPPORTUNITIES FOR OPTION A	CONSTRAINTS FOR OPTION A
Improvement in footpaths and crossing facilities. Pedestrians afforded priority.	Requires additional infrastructure and expenditure in comparison to Option B and Option C.
Improvement in cycle lane facilities at the junction	Reduction in traffic capacity
Improvement in road safety with reduced traffic speeds through the roundabout	Possibility of conflict between pedestrians and cyclists
Reduction in vehicle / cycle conflict	
Does not require additional land take	

OPTION B – UPGRADED SIGNALISED JUNCTION

4.2.5 Option B, shown in Figure 4-2 and detailed further in Appendix A of this report, considers the upgrade of the existing signalised junction to incorporate proposals for pedestrian and cycle improvements through the

junction as well as improvements to vehicular movements through updated signal timings.

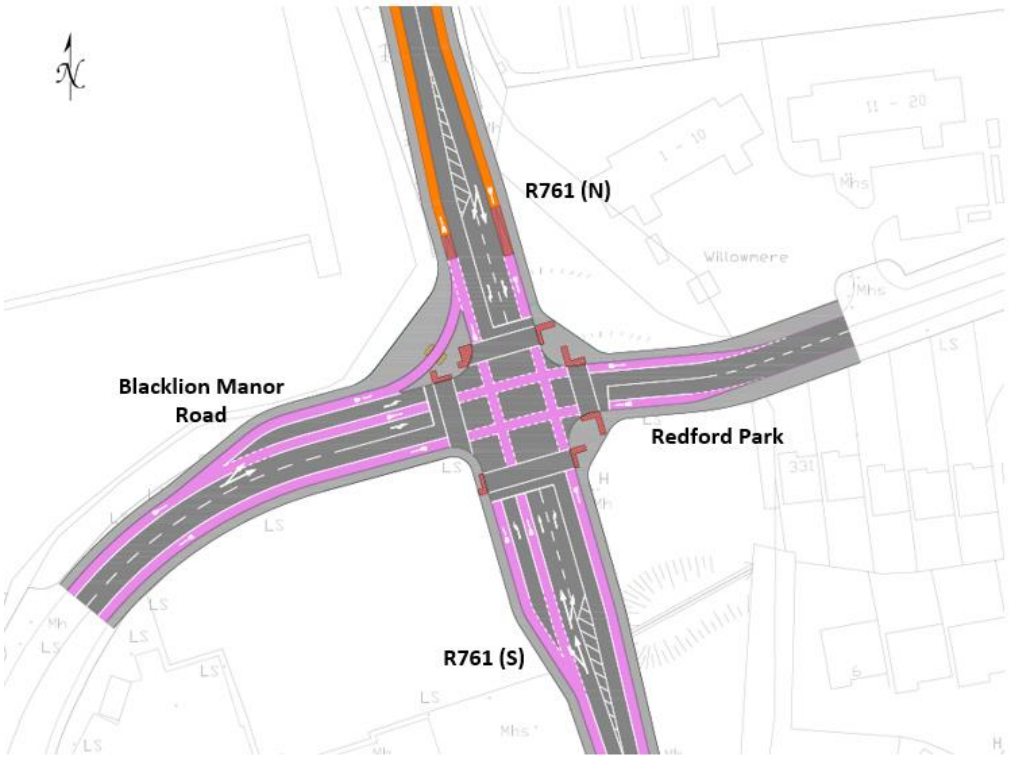


Figure 4-2: Option B – Signalised Junction

4.2.6 This option proposes cycle lanes on the R761 arms as well as the Blacklion Manor Road arm. Cycle lanes are proposed on the Redford Park arm on approach to the junction. Upgraded footpaths and crossings are proposed at the junction for improved pedestrian movement.

4.2.7 Footpath build outs and reduced turning radii provide a more compact junction with reduced pedestrian crossing distances.

4.2.8 Table 4-2 below outlines the Opportunities and Constraints for Option B – Signalised Junction.

Table 4-2: Opportunities and Constraints for Option B

OPPORTUNITIES FOR OPTION B	CONSTRAINTS FOR OPTION B
Improvement in footpaths and crossing facilities	No protection for cyclists at the junction
Improvement in cycle lane facilities through the junction	
Improvement in traffic capacity with upgraded signals and staging	

OPTION C – CYCLE PROTECTED SIGNALISED JUNCTION

4.2.9 Option C, shown in Figure 4-3 and detailed further in Appendix A of this report, considers the upgrade of the existing signalised junction to incorporate proposals for pedestrian and cycle improvements through the junction as well as improvements to vehicular movements through upgraded signal timings.

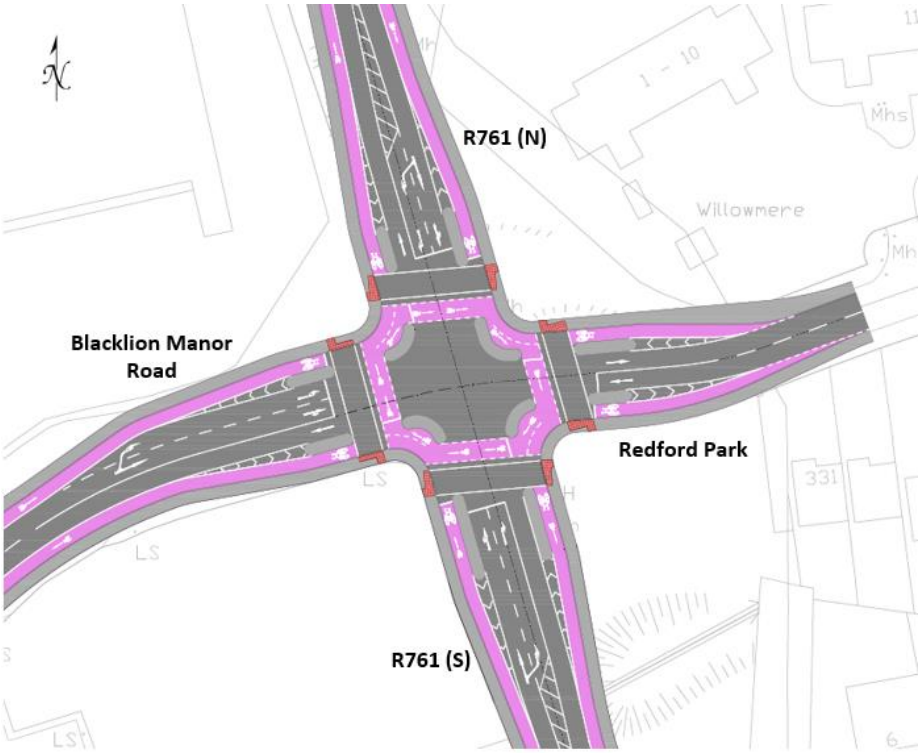


Figure 4-3: Option C – Cycle Protected Signalised Junction

4.2.10 This option proposes cycle lanes on the R761 and Blacklion Manor Road arm of the junction. Cycle lanes are proposed on the Redford Park arm on approach to the junction only.

4.2.11 Islands are proposed at the corners of the junction. These islands have the purpose of protecting cyclists as they travel through the junction, in particular, in relation to possible conflict with left turning vehicles.

4.2.12 Upgraded footpaths and crossings are proposed at the junction for improved pedestrian movement.

4.2.13 Table 4-3 below outlines the Opportunities and Constraints for Option C – Cycle Protected Signalised Junction.

Table 4-3: Opportunities and Constraints for Option C

OPPORTUNITIES FOR OPTION C	CONSTRAINTS FOR OPTION C
Improvement in footpaths and crossing facilities	Requires additional infrastructure and expenditure in comparison to Option B.
Improvement in cycle lane facilities through the junction	
Improvement in traffic capacity with upgraded signals and staging	
Additional protection/segregation for cyclists	

4.2.1 All three options as detailed in this section were subject to an options appraisal through Multi Criteria Analysis. This is discussed in Chapter 5.

4.3 PROPOSED TRAFFIC CAPACITY

4.3.1 A junction analysis exercise was undertaken on the design options in order to determine how these options operated in terms of traffic capacity. The Base 2019 traffic flows outlined above were utilised for this analysis.

4.3.2 Option A, Continental Roundabout, was assessed using the TRL software ARCADY. Option B and Option C, Signalised junctions, were assessed using the TRL software TRANSYT.

4.3.3 Results for the Continental Roundabout, outlined in Table 4-4 below, indicate that the roundabout would operate over capacity in the AM peak hour on the R761 NB arm with an excessive queue length of 185pcu and in the PM peak hour on the R761 SB arm with a queue length of 95.6pcu.

Table 4-4: ARCADY results for proposed Continental Roundabout option

	AM Peak Hour			PM Peak Hour		
	Queue (pcu)	Delay (s)	RFC	Queue (pcu)	Delay (s)	RFC
Redford Park	0.3	8.14	0.19	0.3	9.98	0.19
R761 NB	185.3	882.9	1.38	6	38.49	0.86
Blacklion Manor Road	0.8	13.14	0.41	0.4	9.78	0.28
R761 SB	1.6	14.17	0.59	95.6	495.58	1.24

4.3.4 Results for the proposed signalised junction options for the AM peak and PM peak are outlined in Table 4-5 and Table 4-6 respectively. The signal timings

and cycle time for the junction have been altered from the existing scenario in order to improve traffic capacity through the junction. The cycle time used for this assessment was 120 seconds with the pedestrian crossing being called every cycle, ie, every 2 minutes over the peak hour.

Table 4-5: AM TRANSYT results for proposed signalised junction options

AM Proposed Signalised Junction 08:00 - 09:00						
Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Mean Delay per Veh (s)	Mean max queue (PCU)	Mean max queue (m)
08:00-09:00	Redford Park	Straight, Left, Right	50	59.91	3.48	19
	Blacklion Manor Road	Left	36	44.43	3.28	18
		Straight, Right	34	53.8	2.4	13
	R761 NB	Left	17	20.18	1.96	11
		Straight	64	26.96	14.17	78
		Right	28	14.53	2.05	11
	R761 SB	Straight, Left	30	24.84	5.69	31
		Right	16	16.55	1.9	10

Table 4-6: PM TRANSYT results for proposed signalised junction options

PM Proposed Signalised Junction 16:00 - 17:00						
Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Mean Delay per Veh (s)	Mean max queue (PCU)	Mean max queue (m)
16:00-17:00	Redford Park	Straight, Left, Right	41	56.79	2.82	16
	Blacklion Manor Road	Left	20	41.37	1.79	10
		Straight, Right	36	54.33	2.54	14
	R761 NB	Left	12	21.69	1.67	9
		Straight	35	24.61	6.88	38
		Right	21	16.23	2.03	11
	R761 SB	Straight, Left	72	35.09	17.77	98
		Right	23	17.5	2.66	15

4.3.5 Results for the AM peak hour show that the junction operates within capacity with the highest DOS of 64% recorded along the R761 NB arm, similar to the existing scenario. The average queue length has reduced on this arm to 78m in comparison to the existing scenario which displayed an average queue length of 153m on this arm.

4.3.6 For the PM peak hour, the junction operates within capacity and displays the highest DOS of 72% on the R761 SB arm and an average queue length of 98m. This has reduced in comparison to the existing scenario which displayed an average queue length of 124m on this arm.

4.3.7 It is noted that the staging arrangement used for the TRANSYT assessment of Option B (signalised junction) does not cater for any form of cycle signal within the staging plan. Option C (Cycle Protected Signalised Junction) would require an alternative signal and staging plan from Option B in order to cater for the cycle movements through the junction. This alternative staging arrangement is provided in detail in Section 7 of this report.

5.0 MULTI-CRITERIA ANALYSIS

5.1 INTRODUCTION

5.1.1 In order to determine the preferable design option for each junction, it is necessary to undertake an options appraisal. This appraisal is based on a number of criteria as set out by the Department of Transport, Tourism and Sport (DTTAS).

5.1.2 An MCA is used to describe any structured approach to determine overall preferences among alternative options, where the options should accomplish multiple objectives.

5.1.3 The 'Guidelines on a Common Appraisal Framework for Transport Projects and Programmes' published by the DTTAS, March 2016, requires schemes to undergo a 'Multi-Criteria Analysis' (MCA) under the following criteria:

- **Economy**: The impacts of a transport investment on economic growth and competitiveness are assessed under the economic impact and economic efficiency criteria;
- **Integration**: Integration considers the extent to which the project being evaluated promotes Integration of transport networks and is compatible with a range of Government policies, including national and spatial planning policy;
- **Safety**: Safety is concerned with the impact of the investment on the number of transport related accidents;
- **Environment**: Environment embraces a range of impacts, such as emissions to air, noise and ecological and architectural impacts;
- **Physical Activity**: This relates to the health benefits derived from using different transport modes.

5.2 MCA CRITERIA

5.2.1 Table 5-1 below outlines the MCA criteria and sub-criteria. These sub-criteria are discussed in more detail below.

Table 5-1: MCA Assessment Criteria

Assessment Criteria	Assessment Sub-Criteria
1. Economy	1a. Capital Cost 1b. Transport Quality & Reliability
2. Integration	2a. Cycle Network Integration 2b. Pedestrian Network Integration 2c. Traffic Network Integration
3. Safety	3a. Road Safety 3b. Pedestrian Safety 3c. Cycle Safety
4. Environment	4a. Flora & Fauna 4b. Soils, Geology & Hydrology 4c. Landscape & Visual 4d. Air Quality, Noise & Vibration 4e. Land Use Character
5. Physical Activity	5a. Health Benefits

1. Economy

1a. Capital Cost: Capital Cost estimates consist of both the indicative infrastructure cost estimate and land acquisition costs. At this early stage, specific estimates have not been produced but professional judgement has been used based on an understanding of the level of works required and also any potential land acquisition.

1b. Transport Quality & Reliability: This criterion assesses the reliability and quality of facilities proposed from a sustainable transport perspective and relates to the accessibility and reliability for movement of people through the junction via quality cycle and pedestrian facilities.

2. Integration

2a. Cycle Network Integration: This criterion assesses the options for the practicality of achieving integrated high-quality cycle facilities in line with the GDA Cycle Network Plan.

2b. Pedestrian Network Integration: This criterion assesses the options for the practicality of achieving high quality pedestrian facilities.

2c. Traffic Network Integration: This criterion assesses the options for the practicality of achieving integrated junction design layouts that balance the requirements of vehicular traffic with the needs of vulnerable road users. This criteria also assesses the impact that each design option would have on the traffic capacity of the junction.

3. Safety

3a. Road Safety: This criterion addresses the road safety for all users, including vehicular traffic.

3b. Pedestrian Safety: This criterion addresses the design options for safety of pedestrian facilities.

3c. Cycle Safety: This criterion addresses the design options for safety of cycle facilities.

4. Environment

4a. Flora & Fauna: This criterion assesses the impact on specific flora or fauna or on defined habitats should the construction, presence or the operation of transport infrastructure impact on this.

4b. Soils, Geology & Hydrology: This criterion assesses the impact of the options on soil and geology as a result of land-take and possible ground excavation.

4c. Landscape & Visual: This criterion assesses the potential to impact on townscape/streetscape quality.

4d. Air Quality, Noise & Vibration: This criterion assesses the impact of a route in terms of its proximity to quality of air and noise environment.

4e. Land Use Character: This criteria assesses each option in terms of the impact that the proposals have on the character of the street and existing land uses nearby.

5. Physical Activity

5a. Health Benefits: This criterion is based on the quality of the cycle and pedestrian facilities proposed and whether users will be encouraged to take up more sustainable travel modes as a result, ie, are the facilities proposed of high quality to attract users.

5.2.2 For each option proposed, a summary table in Project Appraisal Balance Sheet (PABS) format has been prepared which collates and summarises the appraisal of the options under each of the assessment criteria.

5.2.3 For each assessment criterion considered, options have been relatively compared against each other based on a five point scale, ranging from

having 'significant advantages' to having 'significant disadvantages' over other design options. For illustrative purposes, this five-point scale is colour coded as presented in Table 5-2, with advantageous options graded to 'dark green' and disadvantageous options graded to 'red'.

Table 5-2: MCA Colour Coded Ranking Scale

Colour	Description
	Significant advantages over other options
	Some advantages over other options
	Neutral compared to other options
	Some disadvantages compared to other options
	Significant disadvantages compared to other options

5.3 MULTI CRITERIA ANALYSIS ASSESSMENT

5.3.1 Shown below in Table 5-3 is the MCA results for the Redford Park junction options.

Table 5-3: MCA Assessment for Redford Park Junction

		Existing Scenario	Op A - Continental Roundabout	Op B - Signalised Junction	Op C - Protected Intersection
Economy	Capital Cost				
	Transport Quality & Reliability				
Integration	Cycle Network				
	Pedestrian Network				
	Traffic Network				
Safety	Road Safety				
	Pedestrian Safety				
	Cycle Safety				
Environment	Flora & Fauna				
	Soils, Geology & Hydrology				
	Landscape & Visual				
	Air Quality, Noise & Vibration				
	Land Use Character				
Physical Activity	Health Benefits				

5.3.2 In terms of 'Economy', Option B and Option C emerge with advantages over other options. For Capital Cost, Option A shows some disadvantages over other options as this will involve a conversion of the existing signal controlled junction to a roundabout which will inevitably provide a higher capital cost.

For Transport Quality, all three options proposed provide for advantages over the existing scenario as all options propose good quality pedestrian and cycle facilities as compared with the existing scenario.

5.3.3 In terms of 'Integration', for the Cycle Network Integration, Option B and Option C proposes advantages over other options. These options propose high quality dedicated cycle lanes through the junction which align with the GDA Proposed Cycle Network Plan for cycle facilities through this junction. Option A shows disadvantages for Cycle Network Integration as this option proposes a shared path through the roundabout which may not integrate as well as other options that propose dedicated cycle facilities.

5.3.4 For the Pedestrian Network Integration, all three options show advantages in comparison to the existing scenario. All options propose good quality pedestrian facilities with upgraded footpaths and crossings on all arms.

5.3.5 For the Traffic Network Integration, Option A shows disadvantages over other options. Traffic capacity is reduced at the junction as a result of this option. Option B and Option C show some advantages for Traffic Integration.

5.3.6 In terms of 'Safety', for Road Safety, Option A shows advantages over other options. Provision of a Continental Roundabout will slow traffic speeds on approach to the junction, and therefore will improve road safety.

5.3.7 For Pedestrian Safety, Option B and Option C shows some advantages. These options propose dedicated footpaths for pedestrians through the junction, whereas, Option A, Continental Roundabout, proposes pedestrians to share the path with cyclists, which may create conflict points.

5.3.8 For Cycle Safety, the existing scenario shows significant disadvantages over other options due to the lack or current cycle provision through the junction. Option B shows some disadvantages over other options due to the possible conflict point between cyclists and left turning vehicles at the junction. Option A and Option C provide forms of protection for cyclists and therefore show advantages over Option B and the existing layout.

5.3.9 In terms of 'Environment' the first two sub criteria 'Flora and Fauna' and 'Soils, Geology & Hydrology' were not considered to have an impact for these options, therefore, all options were given a neutral rating.

5.3.10 For Landscape and Visual, Option A shows some advantages over other options. This option provides a small continental roundabout with one lane approaches which allows for large areas surrounding the roundabout to be given back to possible urban design and landscape.

5.3.11 For Air Quality, Noise & Vibration, Option A shows disadvantages over other options. This option shows high levels of traffic queueing on some arms, which will have an impact on the air quality and noise for the surrounding residential area. All other options show advantages for this criteria.

5.3.12 For Land Use Character, Option A shows some disadvantages over other options. This option is not in keeping with the surrounding land use character of the area, with traffic capacity issues and queue lengths potentially impacting on access to and from the various amenities surrounding the junction.

5.3.13 In terms of 'Physical Activity', for Health Benefits, Option B and Option C show some advantages over other options. The quality of cycle facilities proposed for these options will attract users to the route and encourage people to cycle and walk. Option A shows some disadvantages. A shared path may not attract as many users as other options proposed.

5.3.14 Table 5-4 shows a summary of results for the 5 main criteria.

Table 5-4: Summary of MCA Assessment

	Existing Scenario	Op A - Continental Roundabout	Op B - Signalised Junction	Op C - Protected Junction
Economy				
Integration				
Safety				
Environment				
Health Benefits				

5.3.15 The overall summary results for the MCA show that from the Options assessed, Option C, Cycle Protected Junction, emerges as the preferred design option for the junction. It is noted that Option B, Signalised Junction, also shows good advantages in the majority of criteria assessed, however, shows some disadvantages over Option C in terms of Cycle Safety.

6.0 EMERGING PREFERRED OPTION

6.1.1 Option C, Protected Intersection, emerges as the preferred option following the Multi-Criteria Analysis. It is noted that the concept for a Cycle Protected Signalised Junction is relatively new in Ireland. A design guidance has been developed by the National Transport Authority (NTA) as part of the Bus Connects scheme. These standards will be applied to this junction operation. A proposed staging plan has been considered and is outlined in Section 7 below.

6.1.2 Option C has been taken forward as the preferred design option for the Redford Park junction.

7.0 PROTECTED INTERSECTION STAGING PLAN

7.1.1 A preliminary staging plan for the Protected Intersection style junction has been developed as part of this Options Assessment. This staging plan has been developed in line with the current NTA design guidance as part of the BusConnects proposals and provides staging arrangements for all modes of travel including vehicles, cyclists and pedestrians.

7.1.2 It is noted that should NTA guidance change in relation to the staging arrangements of these junction types, this staging plan may be altered to accommodate these changes.

7.1.3 The potential staging plan proposed is outlined from Figure 7-1 to Figure 7-7 inclusive.

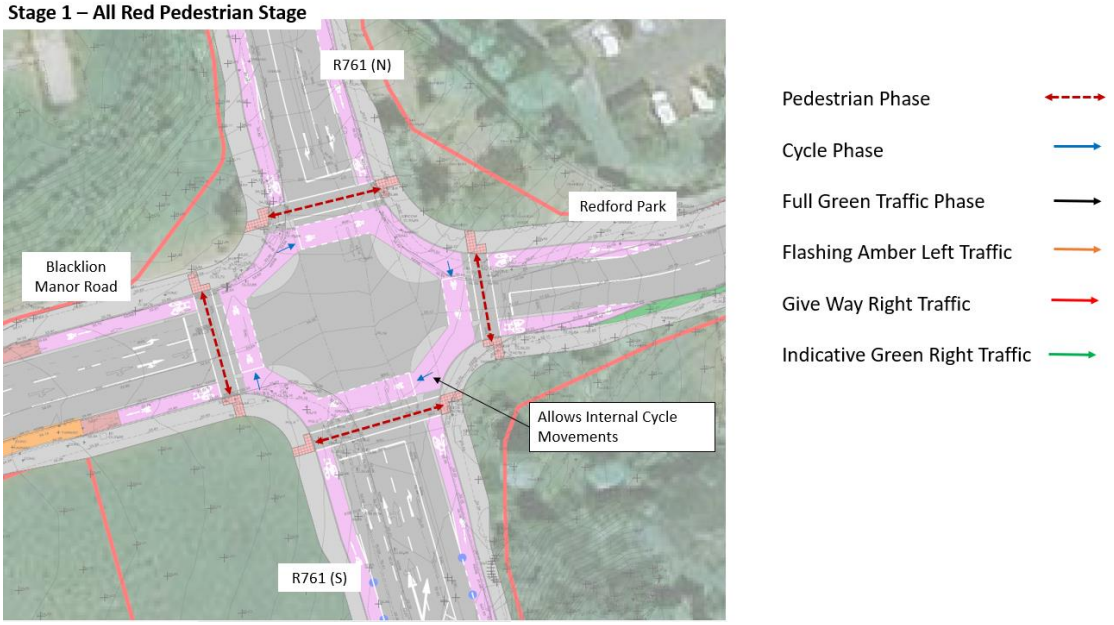


Figure 7-1: Stage 1 – All Red Pedestrian Stage

Figure 7-2: Stage 2 – Advanced cycle stage for R761 arms

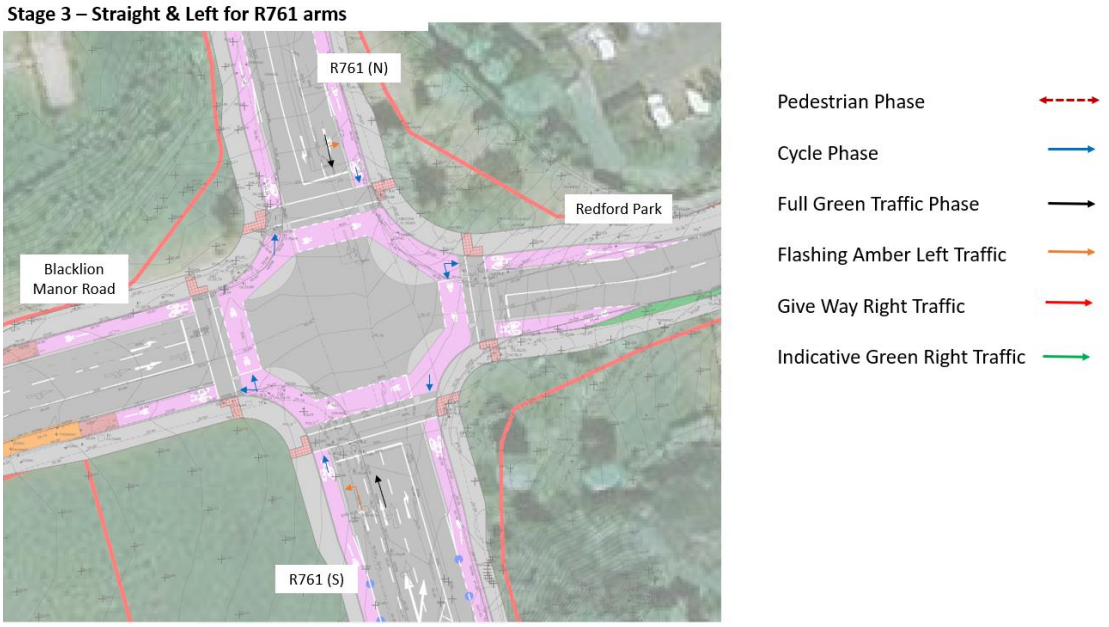


Figure 7-3: Stage 3 – Straight & Left for R761 arms

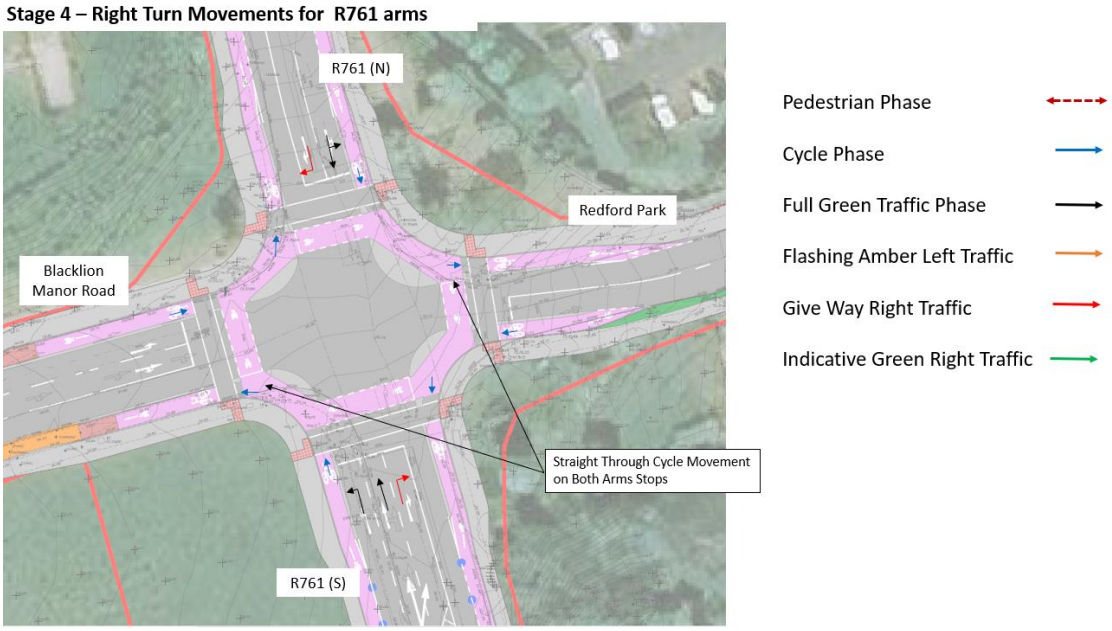


Figure 7-4: Stage 4 – Right turn for R761 arms

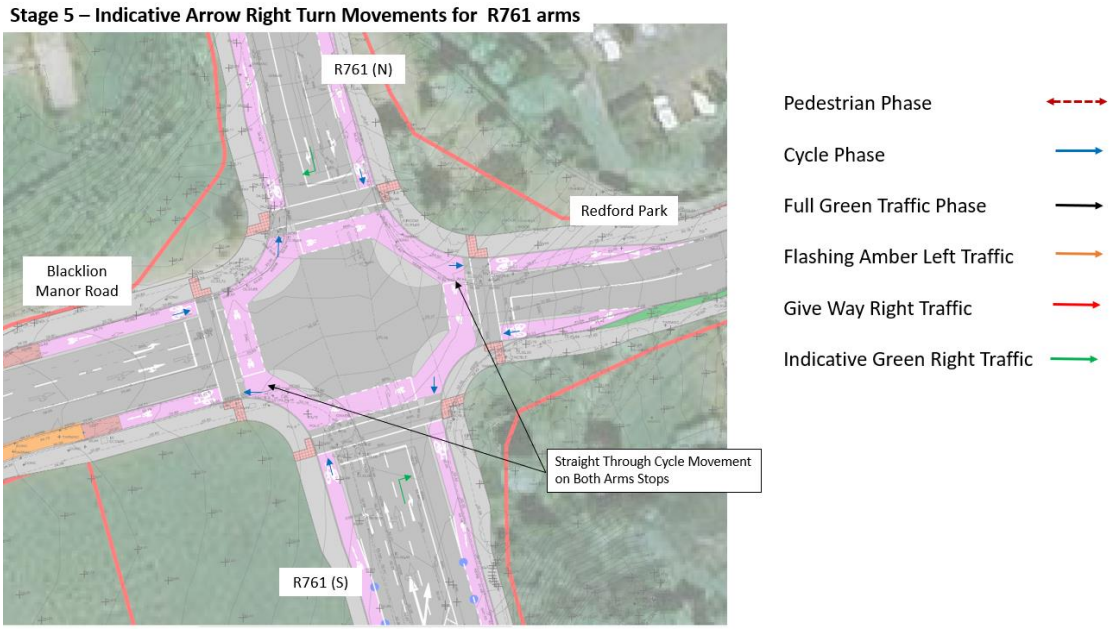


Figure 7-5: Stage 5 – Indicative Green for Right Turn R761 arms

Stage 6 – Blacklion Manor Road arm

Figure 7-6: Stage 6 – Blacklion Manor Road arm

Stage 7 – Redford Park arm

Figure 7-7: Stage 7 – Redford Park arm

7.1.4 This staging plan incorporates advanced cycle phases, flashing amber left turning movements as well as an all-red pedestrian stage at the beginning of the stage sequence.

7.1.5 Stage 1 of the proposed staging plan accommodates an all red traffic / all green pedestrian stage.

7.1.6 Stage 2 of the proposed staging plan provides an advanced cycle stage for the R761 arms. This allows cyclists to advance first through the junction before vehicular traffic which reduces potential conflict further.

7.1.7 Stage 3 of the proposed staging plan runs the straight and left turn movements for the R761 north and south arm. The left turn movements are provided with a flashing amber rather than a full green in this stage as the cycle green light is continued during this stage for straight ahead cycle movements.

7.1.8 Stage 4 of the proposed staging plan continues the R761 arms which includes for the right turn movements as well as continuing the straight and left turn movements. The straight ahead cycle movements for the R761 are stopped during this stage in order to avoid potential conflict between cyclists and right turning vehicle movements.

7.1.9 Stage 5 provides an indicative green arrow for the right turn movements on the R761 to allow unopposed movements for right turners.

7.1.10 Stage 6 of the proposed staging plan runs the Blacklion Manor Road arm. It is noted that the advanced cycle green for the Blacklion Manor Road arm can be run within the previous stage (Stage 5) and so does not require isolated green time for this.

7.1.11 Stage 7 of the proposed staging plan runs the Redford Park arm. It is noted that the advanced cycle green for the Redford Park arm can be run within the previous stage (Stage 6) and so does not require isolated green time for this.

7.1.12 The staging plan was analysed using the TRANSYT software in order to determine the traffic capacity impact at the junction for both the AM and PM peak hours. The TRANSYT staging plan is illustrated in Figure 7-8 below. The cycle time proposed for the junction is 120 seconds. The pedestrian stage is being run every second cycle, ie, every 4 minutes over the hour. The staging is optimised for green time. Table 7-1 outlines the phasing allocation for each arm within the junction.

7.1.13 It is noted that in order to make a comparison between this proposed junction layout and the existing scenario, the 2019 traffic data was used in

this assessment. Up to date survey data has not been available within the period of 2020 to present due to the ongoing pandemic.

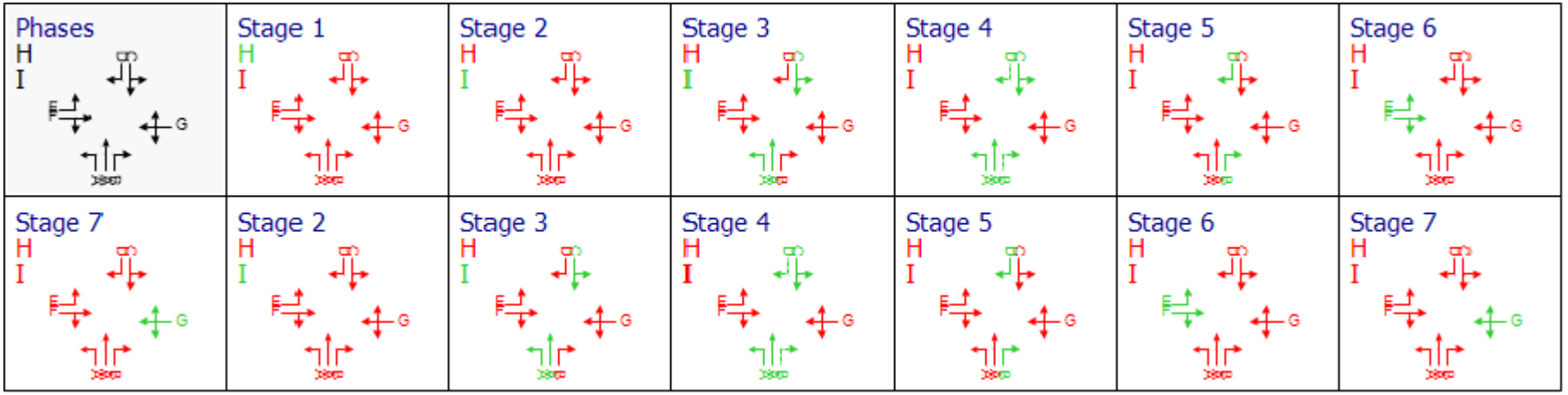


Figure 7-8: TRANSYT Staging Plan for Cycle Protected Intersection

Stage	Phase	Arm	Direction
1	H	All Arms	Pedestrian Crossing
2	I	R761 (N) & R761 (S)	Advanced Cycle Phase
3	A	R761 (S)	Straight/Left
	C	R761 (N)	Straight/Left
4	A	R761 (S)	Straight/Left
	C	R761 (N)	Straight/Left
	B	R761 (S)	Right (Give Way)
	D	R761 (N)	Right (Give Way)
5	B	R761 (S)	Right
	D	R761 (N)	Right
6	E	Blacklion Manor Road	Left
	F	Blacklion Manor Road	Straight/Right
7	G	Redford Park	Left/Straight/Right

Table 7-1: Staging & Phasing Allocation for TRANSYT Staging Plan

7.1.14 Results for the TRANSYT assessment of the Cycle Protected Intersection for both the AM peak hour (08:00 – 09:00) and PM peak hour (16:00 – 17:00) are outlined below in Table 7-2 and Table 7-3 respectively.

Table 7-2: AM TRANSYT Results for the Cycle Protected Signalised Junction

AM Proposed Cycle Protected Signalised Junction 08:00 - 09:00						
Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Mean Delay per Veh (s)	Mean max queue (PCU)	Mean max queue (m)
08:00-09:00	Redford Park	Straight, Left, Right	48	58.5	3.6	19.8
	Blacklion Manor Road	Left	40	48	3.7	20.3
		Straight, Right	21	43.7	2.3	12.6
	R761 NB	Left	19	24.8	2	11
		Straight	71	33	14.4	79.2
		Right	31	15.7	2	11
	R761 SB	Straight, Left	33	29.5	7	38.5
		Right	18	22.6	2.6	14.3

Table 7-3: PM TRANSYT Results for the Cycle Protected Signalised Junction

PM Proposed Cycle Protected Signalised Junction 16:00 - 17:00						
Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Mean Delay per Veh (s)	Mean max queue (PCU)	Mean max queue (m)
16:00-17:00	Redford Park	Straight, Left, Right	40	55.7	2.8	15.4
	Blacklion Manor Road	Left	28	48.6	2	11
		Straight, Right	27	48	2.5	13.7
	R761 NB	Left	12	23.5	1.8	9.9
		Straight	36	26.1	6.2	34.1
		Right	22	18.1	2	11
	R761 SB	Straight, Left	75	39	22.5	123.7
		Right	24	20.4	3	16.5

7.1.15 The results for the AM peak hour show that overall the junction operates within capacity for all arms. The R761 (NB) arm operates with the highest degree of saturation of 71% for the straight ahead movement. This has a mean max queue length of almost 80m.

7.1.16 The results for the PM peak hour show that overall the junction operates within capacity for all arms. The R761 (SB) operates with the highest degree of saturation of 75% with a mean max queue length of 123.7m.

7.1.17 A comparison of TRANSYT results was undertaken between the Existing Scenario, the Proposed Signalised Junction as well as the Proposed Cycle Protected Junction assessments. It is noted that the Existing Scenario has a cycle time of 146 seconds and runs the pedestrian stage every 2nd cycle over the hour. The Proposed Signalised Junction has a reduced cycle time of 120

seconds and runs the pedestrian stage every cycle. The Proposed Cycle Protected Junction has a proposed cycle time of 120 seconds and runs the pedestrian stage every 2nd cycle, similar to the existing scenario.

7.1.18 Shown in Figure 7-9 and Figure 7-10 below are the comparison graphs for all three scenarios tested with the Degree of Saturation (%) displayed for all scenarios.

7.1.19 Results show that for the AM peak hour, overall, the Proposed Cycle Protected Signalised Junction is comparable to the performance of the existing scenario for most arms within the junction. The Proposed Cycle Scenario has a lower DOS for the R761 (NB) arm with slightly higher DOS for the other arms. The Proposed Cycle Scenario shows slightly higher saturation levels in comparison to the Signalised Junction Scenario. This increase accounts for the additional cycle advanced stage within the staging sequence. Overall, the AM peak hour shows minor increments in saturation levels between the three scenarios tested.

7.1.20 Results show that for the PM peak hour, the Protected Cycle Scenario shows the lowest saturation for most of the arms within the junction with the exception of the R761 (NB) arm. Overall, all three scenarios do not vary significantly in terms of saturation levels within the junction.

7.1.21 The overall advantages for all modes of travel for the Cycle Protected Signalised Junction, in particular for cyclists, in comparison to other options assessed results in this option providing the more favourable option as was noted and assessed within the Options Assessment in Section 5.

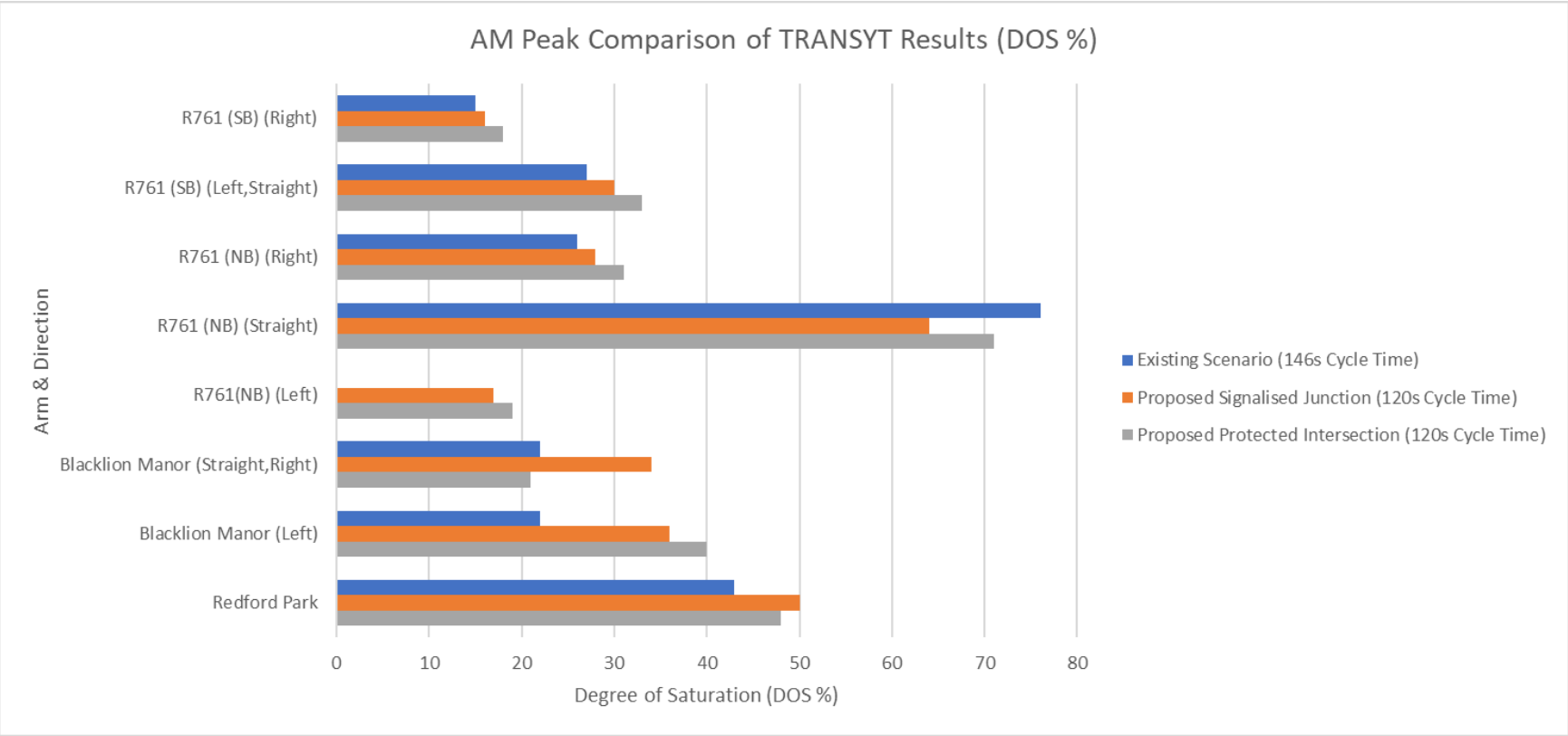


Figure 7-9: AM Peak Comparison of TRANSYT Results (DOS %)

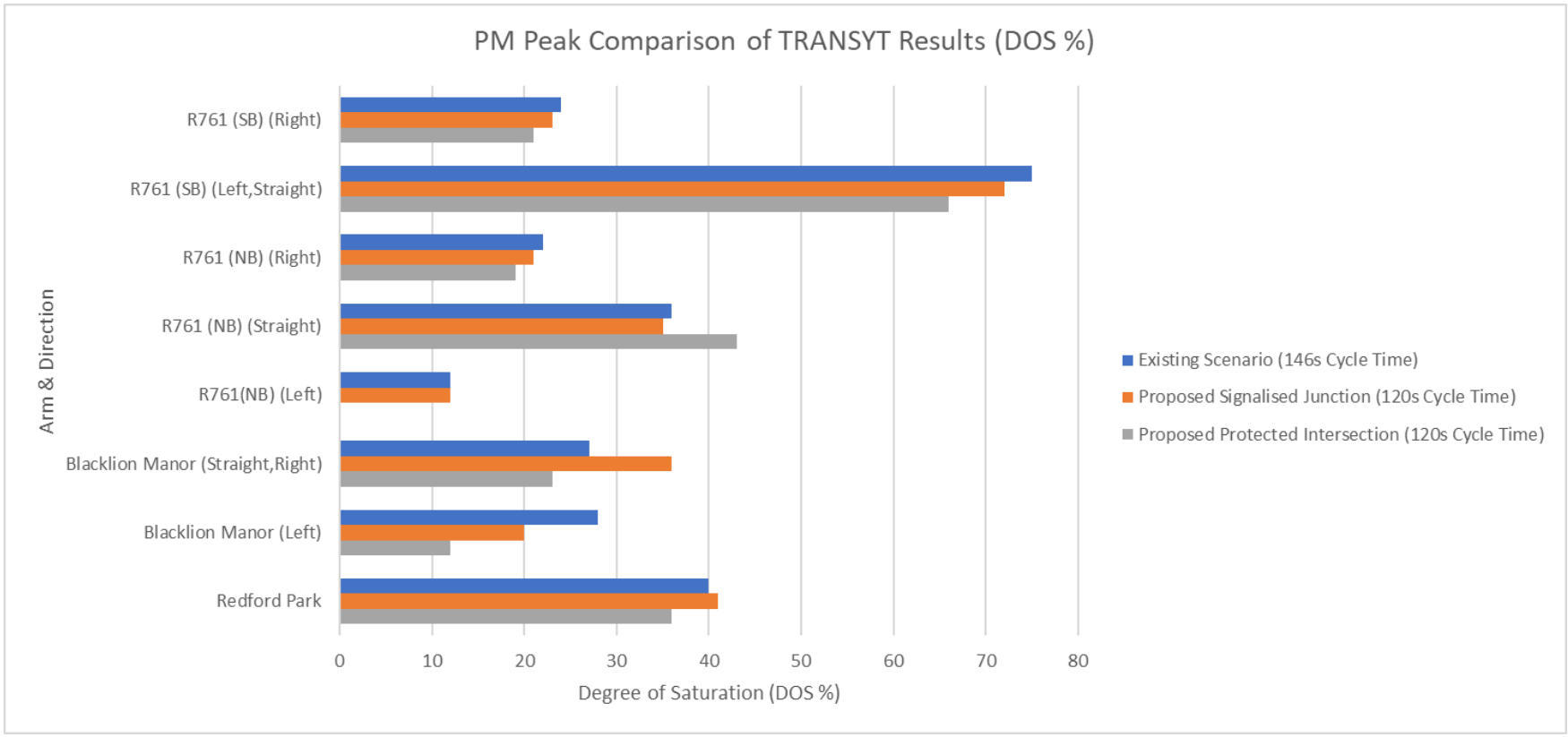


Figure 7-10: PM Peak Comparison of TRANSYT Results (DOS %)

8.0 DESIGN OF BUS STOPS

8.1 INTRODUCTION

8.1.1 As part of the upgrade of the Redford Park Junction, two bus stops located on the R761 NB arm have been included in the design. The current layout of the bus stops result in a number of issues for pedestrians, cyclists and motorists. A number of design options has therefore been considered as part of the upgrade of these stops.

8.2 EXISTING BUS STOP LAYOUTS

8.2.1 The bus stops are located on both sides of the R761 NB arm south of the Redford Park junction and are shown below in Figure 8-1.

Figure 8-1: Location of Bus Stops included in Junction Design

8.2.2 As shown in Figure 8-1, the bus stops are located on both the outbound (travelling northbound along the R761) and the Inbound (travelling southbound along the R761) side of the R761.

8.2.3 Figure 8-2 outlines the existing layout of these bus stops.

Outbound Bus Stop (R761 NB arm)

Inbound Bus Stop (R761 NB arm)

Figure 8-2: Existing Layout for the Outbound and Inbound Bus Stops on the R761

8.2.4 As shown in Figure 8-2, the outbound bus stop currently operates as an 'In-Line' type of stop where buses stop within the traffic lane in order to collect and disembark passengers. The inbound bus stop also operates as an 'In-Line' type of stop. This bus stop has recently been improved to provide temporary widening of the path area to accommodate the high volume of pedestrians waiting at this stop.

8.2.5 It has been noted on site that there are a number of constraints and issues at these stops, these are the following:

- **Location of bus stops**: The bus stops are located very close to the Redford Park signalised junction. When a bus stops at these stops, in particular, at the Outbound stop, this currently impacts on the operational performance of the junction.
- **Availability of Land**: Although land is available both sides of the road carriageway, this is restricted on the Outbound side by company buildings and on the Inbound side by a residential property.
- **Lack of cycle facilities**: There are no current cycle lane facilities that run along the R761 through the bus stops. It is a requirement in this scheme to accommodate improved facilities for pedestrians and cyclists, which includes cycle lane facilities along this section of the R761.

8.3 PROPOSED BUS STOP OPTIONS

8.3.1 A total of 3 design options were considered and developed for this assessment. These are detailed below with opportunities and constraints identified for each option.

Option 1: In-Line Bus Stop with Cycle Lane and Floating Island

8.3.2 Figure 8-3 below outlines Option 1 for the bus stops along the R761. This option considers in-line bus stops with a cycle lane behind the bus stop and a floating island for passengers to wait, board and exit from the bus. A formal crossing is also proposed for pedestrians to cross over the cycle lane from the footpath to the island.

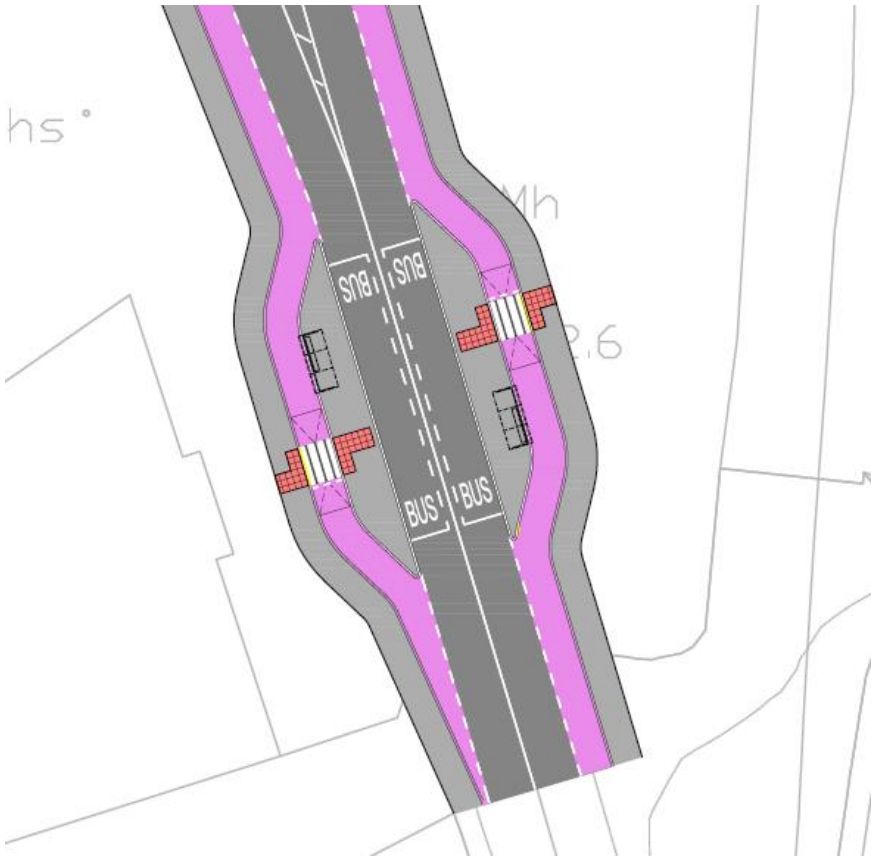


Figure 8-3: In-Line Bus Stop with Cycle Track behind Bus Stop

8.3.3 The following opportunities and constraints have been identified for Option 1.

Table 8-1: Opportunities and Constraints for Option 1 – In-Line Bus Stop

OPPORTUNITIES FOR OPTION 1	CONSTRAINTS FOR OPTION 1
In-Line bus stops are preferred option for the bus in order to avoid delays.	Increased risk of conflict between cyclist and pedestrian
Reduced risk of conflict between bus and cyclist	In-Line option for these bus stops may cause traffic delays, in particular, during peak times.

Option 2: Lay-By Bus Stop with Cycle Lane and Floating Island

8.3.4 Figure 8-4 below outlines Option 2 for the bus stops along the R761. This option considers lay-by bus stops with a cycle lane behind the bus stop and a floating island for passengers to wait, board and exit from the bus.

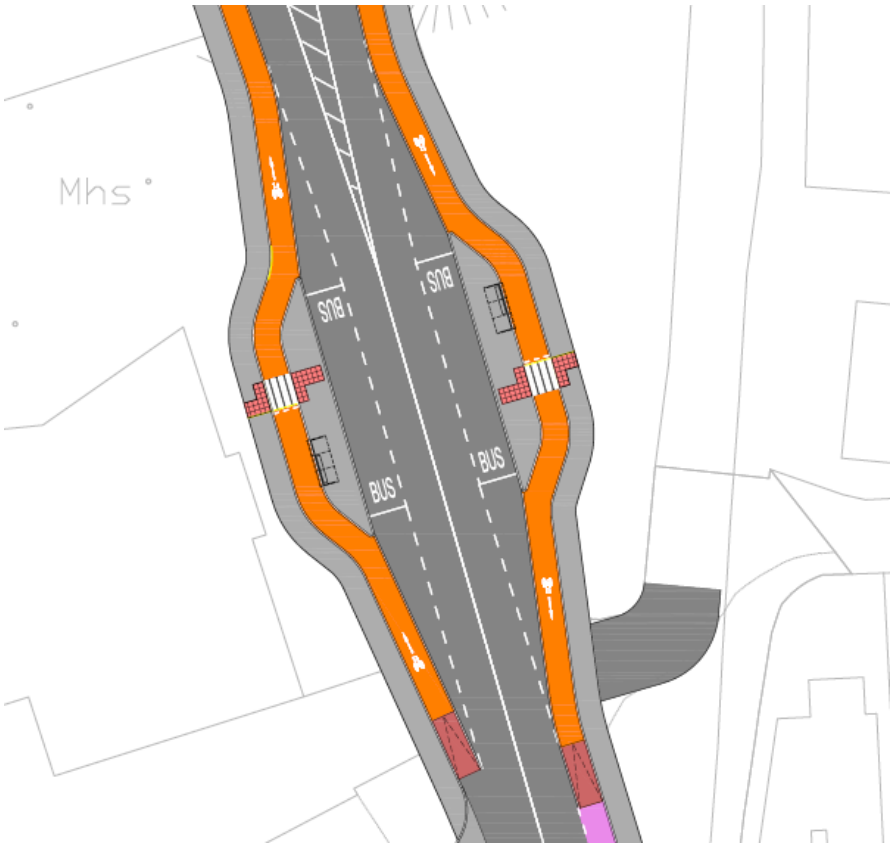


Figure 8-4: Lay-by Bus Stop with Cycle Lane behind Bus Stop

8.3.1 The following opportunities and constraints have been identified for Option 2.

Table 8-2: Opportunities and Constraints for Option 2 – Lay-By Bus Stop

OPPORTUNITIES FOR OPTION 2	CONSTRAINTS FOR OPTION 2
Improvement in traffic movements along the R761 with lay-by bus stops	Delay for buses entering back into the traffic lanes.
Reduced risk of conflict between bus and cyclist	Increased risk of conflict between cyclist and pedestrian
	Possible Land Take constraints with Lay-by bus option.

Option 3: Lay-By Bus Stop with Cycle Lane on Road

8.3.2 Figure 8-5 below outlines Option 3 for the bus stops along the R761. This option considers lay-by bus stops with on road cycle lanes and light forms of segregation, where feasible.

Figure 8-5: Lay-By Bus Stops with Cycle Lanes on Road

8.3.1 It is noted that this option provides reduced segregation for cyclists from general road traffic in comparison to other options that route the cycle lane behind the bus stop.

8.3.2 In order to provide and improve safety for cyclists for this option, bollards have been considered where feasible along the R761 south arm for cyclists.

8.3.3 The following opportunities and constraints have been identified for Option 3.

Table 8-3: Opportunities and Constraints for Option 3 – Lay-By Bus Stop

OPPORTUNITIES FOR OPTION 3	CONSTRAINTS FOR OPTION 3
Improvement in traffic movements along the R761 with lay-by bus stops	Delay for buses entering back into the traffic lanes.
Reduced risk of conflict between cyclist and pedestrian	Increased risk of conflict between cyclist and bus.
	Increased risk of conflict between cyclist and general traffic with advisory on road cycle lanes.

8.4 COMPARISON OF RESULTS

8.4.1 Option 1 considers an In-Line bus stop design with segregated cycle facilities located behind the bus stop, as per the preferred NTA guidance. This type of bus stop may result in short term delays for general road traffic when a bus is stopped, however, these are short term in nature. There are no land take requirements on either side of the road for this option.

8.4.2 Option 2 considers a Lay-By bus stop design. This option provides cycle facilities behind the bus stop with a floating island for bus passengers. This option requires significant space to allow for both a lay-by bus stop as well as a dedicated off road cycle lane and floating island. The outbound bus stop, in particular, would result in the footpath being located directly adjacent to an existing building which would encroach significantly in terms of land take required. Therefore, this option would not be feasible in terms of land take requirement. Lay-by bus stops are also not the preferred NTA

design option due to delays in bus movement when emerging from the bus stop.

8.4.3 Option 3 considers a Lay-By bus stop design. This option provides on road cycle lanes with light segregation, which route past the lay-by bus stop. A lay-by bus stop design would improve on traffic movements along the R761, however, bus delays may occur for buses trying to emerge back into general traffic. The on road advisory cycle lane also increases the potential conflict between traffic and cyclists.

8.4.4 Option 1 is considered to be the preferable option for these bus stops. This option achieves an in-line bus stop on both sides of the road with segregated cycle facilities located behind the bus stop. This option provides improved pedestrian waiting area with bus shelters for both bus stops and waiting areas.

9.0 SUMMARY AND CONCLUSION

9.1 SUMMARY OF REPORT

9.1.1 DBFL were commissioned by Wicklow County Council (WCC) to undertake an Options Assessment for the R761/Redford Park/Blacklion Manor Road Junction (Redford Park Junction).

9.1.2 The objectives for the scheme were to improve the junction for pedestrians and cyclists as well as for vehicular movements. The purpose of the report was to identify a number of junction design options that would accommodate the objectives and to assess these options against Multi-Criteria Analysis to determine the preferred design option that meets the requirements of WCC.

9.1.3 The junction is located within the Redford area in Greystones, County Wicklow. Existing traffic flows through the junction are high during peak times; this is due to a number of factors including that it is located close to three primary schools, as well as local shops including a large Lidl store. The R761, which runs through the junction from Greystones to Bray, is one of the main traffic routes to the M11 Motorway.

9.1.4 The junction, at present, is a wide junction with large radii at the corners. Footpaths are provided on all arms, however, they are narrow in places particularly considering the large volume of pedestrians that emerge from the schools. Cycle lanes are provided on the Blacklion Manor Road arm. Cycle facilities are not provided on the R761 or the Redford Park arm of the junction.

9.1.5 A total of 3 design options were developed for this assessment. Option A proposed a Continental Roundabout, Option B proposed an Upgraded Signalised Junction and Option C proposed a Cycle Protected Signalised Junction. These options were assessed in detail using Multi-Criteria Analysis (MCA).

9.1.6 The MCA appraisal was based on a number of criteria set out within the Department of Transport, Tourism & Sport (DTTAS). The criteria used for the MCA included Economy, Integration, Safety, Environment and Physical Activity with relevant sub criteria for each main criteria.

9.1.7 The three options were assessed within the MCA as well as the Existing Scenario.

9.1.8 The results of the MCA indicated that both Option B (Upgraded Signalised Junction) and Option C (Cycle Protected Signalised Junction) emerged as the preferred options over Option A (Continental Roundabout). Option B showed slight disadvantages in terms of cycle safety as compared with Option C which provides protected islands for cyclists through the junction. Option C emerged as the preferred option.

9.1.9 A comparison was undertaken for the junction capacity analysis between the existing scenario as well as the Standard Signalised Junction and Cycle Protected Signalised Junction. Results showed that, overall, there were minor differences between the existing scenario and the Cycle Protected junction with the Signalised Junction performing best overall in terms of capacity. The Signalised Junction does not, however, cater for any form of cycle priority in comparison to the Cycle Protected Junction. Therefore, as per the MCA assessment, the Cycle Protected Junction provides the more favourable option.

9.1.10 Two bus stops along the R761 arm south of the Redford Park junction were also considered for improvement for this assessment. A total of three design options were developed with Option 1 (In-line bus stop with segregated cycle facility) emerging as the preferred option.

9.2 CONCLUSION OF REPORT

9.2.1 This Options Report concludes that the preferred option for the Redford Park Junction is Option C, Cycle Protected Junction. The preferred option for the bus stops along the R761 is Option 1, In-line bus stop with segregated cycle facilities.

APPENDICES

APPENDIX A- SCHEME DESIGN DRAWING

ON ORIGINAL

0 5 10 15 20 30 40 50mm

NOTES:

1. ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH THE TII SPECIFICATION FOR ROAD WORKS UNLESS OVERRIDDEN BY LOCAL OVERSEEING AUTHORITY'S STANDARDS
2. ALL ROAD MARKINGS & SIGNS SHALL COMPLY FULLY WITH THE TRAFFIC SIGNS MANUAL PUBLISHED BY THE DEPARTMENT OF TRANSPORT.
3. SIGNS & MARKINGS: CONTRACTOR TO CONFIRM PRECISE SETTING OUT WITH EMPLOYERS REPRESENTATIVE PRIOR TO COMPLETION.
4. ALL TRAFFIC MANAGEMENT TO COMPLY FULLY WITH THE PROVISIONS OF CHAPTER 8 OF THE TRAFFIC SIGNS MANUAL
5. ALL CO-ORDINATES ARE TO IRISH TRANSVERSE MERCATOR.
6. ALL LEVELS ARE TO ORDNANCE DATUM AND ARE IN METRES
7. ALL PEDESTRIAN, CYCLE AND VEHICULAR ROUTES MUST BE RETAINED IN ACCORDANCE WITH APPROVED TRAFFIC MANAGEMENT PLAN.

LEGEND

SITE BOUNDARY

SITE NOTICE LOCATION

SITE NOTICE

SITE NOTICE

RATHDOWN ROAD

REDFORD PARK

BLACKLION MANOR ROAD

RATHDOWN ROAD

Redford Court

SEA VIEW

GREYSTONES Graveyard

Redford Park

Willowmere

Redford Rise

Rathdown Park

Blacklion Manor

School

School

BM 35.72

rev	date	description	by	chkd.
P01	13-04-2022	PUBLIC CONSULTATION	JLB	BCM

client approval
- A - Approved
- B - Approved with comments
- C - Do not use

suitability: S2 - INFORMATION
issue purpose: FOR INFORMATION

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project ref.: REDFORD PARK

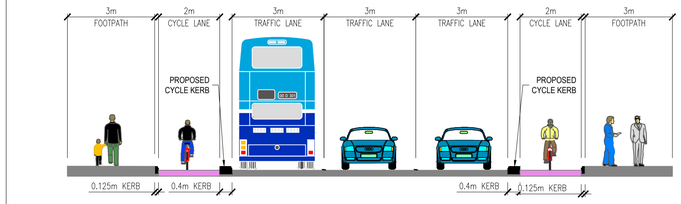
drawing title: SITE NOTICE LOCATION

client: WICKLOW COUNTY COUNCIL

designed by	author	scale	sheet size
BCM	JLB	1:1000	A1

drawing no.: 190092-DBFL-RD-SP-DR-C-1903

revision: P01



R761 TO BLACKLION MANOR ROAD
LINK SECTION TYPICAL CROSS SECTION A - A

SCALE 1:100

EXISTING FOOTPATH TO BE MAINTAINED

PROPOSED CYCLE PROTECTION BOLLARDS

ON ORIGINAL

0 5 10 15 20 25 30 40 50mm

NOTES:

1. ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH THE TII SPECIFICATION FOR ROAD WORKS UNLESS OVERRIDDEN BY LOCAL OVERSEEING AUTHORITY'S STANDARDS
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6. ALL LEVELS ARE TO ORDNANCE DATUM AND ARE IN METRES
7. ALL PEDESTRIAN, CYCLE AND VEHICULAR ROUTES MUST BE RETAINED IN ACCORDANCE WITH APPROVED TRAFFIC MANAGEMENT PLAN.

LEGEND

- PROPOSED ROAD
- PROPOSED FOOTPATH
- EXISTING FOOTPATH TO BE RETAINED
- PROPOSED CYCLE LANE
- PROPOSED CYCLE TRACK
- GRASS VERGE/LANDSCAPED AREA

rev	date	description	by	chkd.
P01	19-04-2022	PRELIMINARY DESIGN ISSUE	GJS	JH

client approval
A - Approved
B - Approved with comments
C - Do not use

suitability: S2 - INFORMATION
issue purpose: PRELIMINARY DESIGN ISSUE

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project ref.
REDFORD PARK

drawing title
PROTECTED SIGNALISED JUNCTION

client
WICKLOW COUNTY COUNCIL

designed by	author	scale	sheet size
JH	OWF	1:500	A1

drawing no.: 190092-DBFL-RD-SP-DR-C-1901
revision: P01

APPENDIX B- MCA TABLES

Appraisal Criteria	Sub-Criteria	Existing Scenario	Option A - Continental Roundabout	Option B - Signalised Junction	Option C - Protected Intersection
Economy	Capital Cost	The existing scenario will provide the lowest cost option and is a Do Nothing scenario	Option A requires the removal of the existing signalised junction and the construction of a roundabout. Therefore this option shows some disadvantages over other options	Option B proposes to retain the signalised junction and undertake minor amendments such as including for improved pedestrian and cycle infrastructure. Therefore, this option provides some advantages over options in terms of capital cost.	Option B proposes to retain the signalised junction and undertake minor amendments such as including for improved pedestrian and cycle infrastructure. Therefore, this option provides some advantages over options in terms of capital cost.
	Rank				
	Transport Quality & Reliability	The existing layout does not currently provide for transport reliability or any quality facilities for sustainable travel modes	This option shows advantages over the existing scenario. This option provides adequate cycle and pedestrian facilities through the junction that provide good quality and reliability in comparison	This option shows advantages over other options. This option provides segregated facilities for pedestrians and cyclists through the junction.	This option shows advantages over other options. This option provides segregated facilities for pedestrians and cyclists through the junction.
	Rank				
Integration	Cycle Network	The existing scenario does not provide any cycle facilities through the junction and therefore does not integrate well with the GDA Cycle Network Plan proposals	This option proposes a shared path through the junction. This does not integrate as well as other options in terms of the GDA Cycle Network Plan that proposes a Primary/Secondary Route through the junction	This option shows some advantages over other options. This option proposes segregated cycle facilities through the junction and is therefore in line with the GDA Cycle Network Plan Proposals	This option shows some advantages over other options. This option proposes segregated cycle facilities through the junction and is therefore in line with the GDA Cycle Network Plan Proposals
	Rank				
	Pedestrian Network	The existing environment for pedestrians is good, however, crossing distances are long and footpaths through the junction are narrow in some locations. Therefore, this option shows some disadvantages over other options.	This option integrates well. This option proposes upgraded crossings on all arms as well as reduced crossing widths for pedestrians in comparison to the existing layout.	This option integrates well. This option proposes upgraded crossings on all arms as well as reduced crossing widths for pedestrians in comparison to the existing layout.	This option integrates well. This option proposes upgraded crossings on all arms as well as reduced crossing widths for pedestrians in comparison to the existing layout.
	Rank				
	Traffic Network	The existing scenario, with the current signal arrangement, does not integrate well into the surrounding road network	This option does not integrate well into the surrounding traffic network and is expected to show some queuing through the junction	This option would integrate well within the road network, with optimised signal arrangement	This option would integrate well within the road network, with optimised signal arrangement
	Rank				
Safety	Road Safety	This option shows some disadvantages over other options. The existing scenario provides for a signal controlled junction with large radii which may encourage speeding through the junction.	This option shows some advantages over other options. This option proposes a roundabout with reduced traffic lanes on all arms which will slow traffic speeds considerably	This option shows some disadvantages over other options. This option proposes a signalised junction with two to three traffic lanes on each arm. This may encourage traffic speeds through the junction.	This option shows some disadvantages over other options. This option proposes a signalised junction with two to three traffic lanes on each arm. This may encourage traffic speeds through the junction.
	Rank				
	Pedestrian Safety	The existing scenario provides a separate path for pedestrians through the junction and does not mix with cyclists, therefore , this option shows advantages over other options.	This option provides a shared path for pedestrians and cyclists through the junction. Considering the potential high volume of cyclists and pedestrians using this junction, this option therefore shows some disadvantages over other options.	This option provides a separate path for pedestrians through the junction and does not mix with cyclists, therefore , this option shows advantages over other options.	This option provides a separate path for pedestrians through the junction and does not mix with cyclists, therefore , this option shows advantages over other options.
	Rank				
	Cycle Safety	This option shows significant disadvantages over other options. This option does not provide cycle facilities through the junction.	This option shows some advantages over other options. This option provides off road shared cycle facilities which protects cyclists through the junction from vehicular traffic. There is a possibility of conflict with pedestrians for this option	This option shows some disadvantages over other options. This option proposes on road cycle lanes through the junction. There is potential conflict between cyclists and left turning traffic .	This option provides significant advantages over other options. This option proposes cycle lanes through the junction, however, proposes protected islands for cyclists to cycle behind, which reduces the conflict between cyclists and left turning traffic. This option also does not conflict with pedestrians
	Rank				
Environment	Flora and Fauna	The existing scenario will not impact on any flora and fauna surrounding the junction	It is not envisaged that this option will impact on the flora and fauna surrounding the junction	It is not envisaged that this option will impact on the flora and fauna surrounding the junction	It is not envisaged that this option will impact on the flora and fauna surrounding the junction
	Rank				
	Soils, Geology & Hydrology	The existing scenario does not impact on the soils or geology within the junction	It is not envisaged that this option will impact on the soils, geology or hydrology of the junction	It is not envisaged that this option will impact on the soils, geology or hydrology of the junction	It is not envisaged that this option will impact on the soils, geology or hydrology of the junction
	Rank				
	Landscape & Visual	The existing scenario shows some disadvantages over other options , this option retains the existing signalised junction and does not show any level of urban realm surrounding the junction	This option provides a small continental roundabout with one lane approaches which allows for large areas surrounding the roundabout to be given back to possible urban design , therefore , this option provides some advantages over other options	This option proposes to retain the signalised junction , however, proposes to upgrade the junction with reduced radii. This option shows slight disadvantages over other option A as it would not provide as good a visual aspect as this option.	This option proposes to retain the signalised junction , however, proposes to upgrade the junction with reduced radii. This option shows slight disadvantages over other option A as it would not provide as good a visual aspect as this option.
	Rank				
	Air Quality, Noise and Vibration	The existing scenario will not impact on the air quality or noise within the area .	This option shows some disadvantages over other options , this option redcues traffic capacity through the junction which increases queuing on some arms . This would have an impact on the air quality and noise within the surrounding area.	The proposed signalised junction shows some advantages over other options, this option retains and optimises the signals which will result in improved traffic capacity through the junction with reduced queue lengths	The proposed signalised junction shows some advantages over other options, this option retains and optimises the signals which will result in improved traffic capacity through the junction with reduced queue lengths
	Rank				
	Land Use Character	The existing scenario shows some advantages over other options . Signalised junction is in keeping with the surrounding land use character of the area and WCC future proposals	This option is not in keeping with the surrounding land use character of the area, as this option may provide some traffic capacity issues which may impact on access to and from the various amenities surrounding the junction.	This option shows some advantages over other options. This option will result in improved traffic capacity which may result in lower queue lengths . Therefore this may impact well on access to and from the surrounding amenities	This option shows some advantages over other options. This option will result in improved traffic capacity which may result in lower queue lengths . Therefore this may impact well on access to and from the surrounding amenities
	Rank				
Physical Activity	Health Benefits	The existing scenario does not provide for any cycle facilities through the junction, therefore , does not encourage users to take up sustainable modes of travel.	This option shows disadvantages , although this option provides good facilities for both cyclists and pedestrians, the facilities are not considered as high quality as other options.	This option shows some advantages over other options . This option provides high quality cycle and pedestrian facilities to encourage use of sustainable modes	This option shows some advantages over other options . This option provides high quality cycle and pedestrian facilities to encourage use of sustainable modes
	Rank				

APPENDIX C- JUNCTION MODELLING REPORTS

TRANSYT 15

Version: 15.5.2.7994

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: 190092 Existing Signals - Scenario B_JH.t15
Path: G:\2019\p190092\calcs\transyt
Report generation date: 23/04/2020 10:28:14

»A4 - 2020 8-9 AM : D5 - 2020 8-9 AM* :
»A5 - 2020 4-5 PM : D4 - 2020 4-5 PM* :

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	23/04/2020
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	HEADOFFICE\mcgeoughp
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber

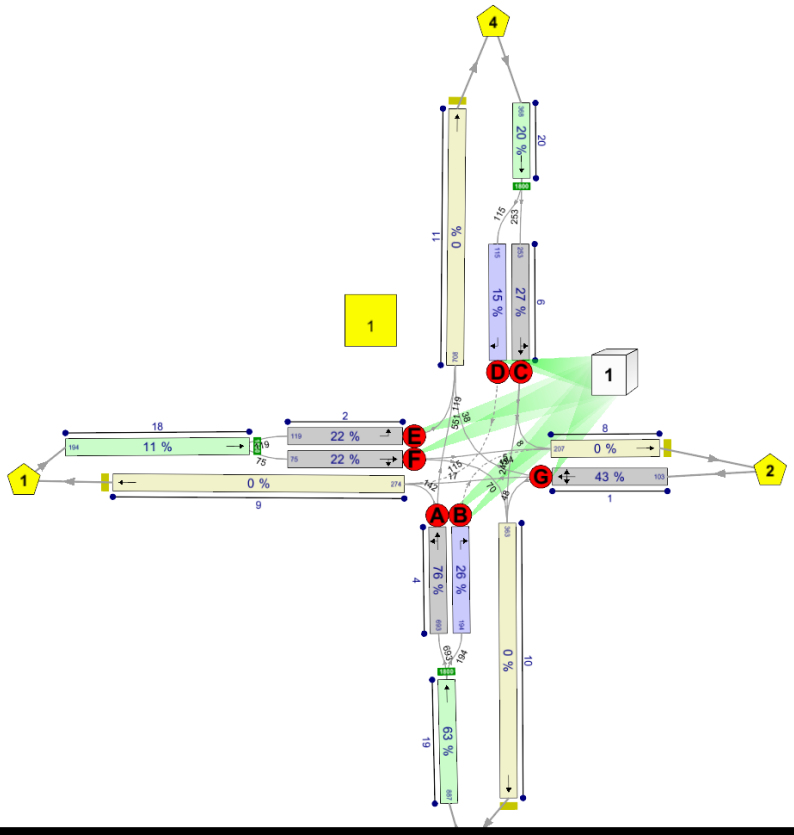
Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Network Diagrams



A4 - 2020 8-9 AM
D5 - 2020 8-9 AM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signali	Item with worst unsignal	Item with worst over	Network within

			(HH:mm)			-hr/hr)					sed PRC	ised PRC	all PRC	capacity
4	23/04/2020 10:27:51	23/04/2020 10:27:52	08:00	293	252.76	16.49	75.57	4/1	0	0	4/1	19/1	4/1	✓

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
2020 8-9 AM		D5	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2020 8-9 AM				08:00	

Network Options

Network timings

Network cycle time (s)	Restrict to SCOOT cycle times	Time segment length (min)	Number of time segments	Modelled time period (min)
293		60	1	60

Signals options

Start displacement (s)	End displacement (s)
2	3

Advanced

Phase minimum broken penalty (£)	Phase maximum broken penalty (£)	Intergreen broken penalty (£)	Starting Red-with-Amber (s)
10000.00	10000.00	10000.00	2

Traffic options

Traffic model	Vehicle flow scaling factor (%)	Pedestrian flow scaling factor (%)	Cruise times or speeds
Platoon Dispersion (PDM)	100	100	Cruise Speeds

Advanced

Resolution	DOS Threshold (%)	Cruise scaling factor (%)	Use link stop weightings	Use link delay weightings	Exclude pedestrians from results calculation	Random delay mode	Type of Vehicle-in-Service	Type of random parameter	PCU Length (m)	Calculate results for Path Segments	Generate PDM Profile Data
1	90	100	✓	✓		Complex	Uniform (TRANSYT)	Uniform (TRANSYT)	5.75		✓

Normal Traffic parameters

Dispersion type	Dispersion coefficient	Travel time coefficient
Default	35	80

Normal Traffic Types

Name	PCU Factor
Normal	1.00

Bus parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient

Bus	1.00	Default	0.94	30	85

Tram parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Tram	1.00	Default	0.94	100	100

Pedestrian parameters

Dispersion type
Default

Optimisation options

Enable optimisation	Auto redistribute	Optimisation level	Enable OUT Profile accuracy
✓	✓	Offsets And Green Splits	✓

Advanced

Optimisation type	Hill climb increments	OUTProfile accuracy	Use enhanced optimisation	Auto optimisation order	Optimisation order	Master controller	Offsets relative to master controller	Master controller offset after each run
Hill Climb (Fast)	15, 40, -1, 15, 40, 1, -1, 1	50, 50, 5, 5, 0.5, 0.5, 0.05, 0.05		✓	1			Do nothing

Economics

Vehicle Monetary Value Of Delay (£ per PCU-hr)	Vehicle Monetary Value Of Stops (£ per 100 stops)	Pedestrian monetary value of delay (£ per Ped-hr)
14.20	2.60	14.20

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
(ALL)			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
1	1			✓	100.00	✓	Sum of lanes	2050	✓		Normal	
2	1				23.00	✓	Sum of lanes	1989	✓		Normal	
	2				23.00	✓	Sum of lanes	2005	✓		Normal	
4	1				12.00	✓	Sum of lanes	2083	✓		Normal	
	2				12.00	✓	Sum of lanes	2059	✓	✓	Normal	
6	1				20.00	✓	Sum of lanes	2101	✓		Normal	
	2				20.00	✓	Sum of lanes	2067	✓	✓	Normal	
8	1			✓	209.23						Normal	
9	1			✓	366.47						Normal	
10	1			✓	349.28						Normal	
11	1			✓	349.37						Normal	

18	**1**			✓	159.81	✓	Sum of lanes	1800			Normal	
19	**1**			✓	107.58	✓	Sum of lanes	1800			Normal	
20	**1**			✓	65.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
1	**1**	**1**	(untitled)		✓	N/A	N/A	0	3.60	✓	83	39.19		2050
2	**1**	**2**	(untitled)		✓	N/A	N/A	0	3.00	✓	100	45.54		1989
	2	**1**	(untitled)		✓	N/A	N/A	0	3.00	✓	93	56.01		2005
4	**1**	**1**	(untitled)		✓	N/A	N/A	0	3.50	✓	20	28.91		2083
	2	**2**	(untitled)		✓	N/A	N/A	0	3.50	✓	100	66.51		2059
6	**1**	**1**	(untitled)		✓	N/A	N/A	0	3.50	✓	3	25.69		2101
	2	**2**	(untitled)		✓	N/A	N/A	0	3.50	✓	100	80.57		2067
8	**1**	**1**	(untitled)											
9	**1**	**1**	(untitled)											
10	**1**	**1**	(untitled)											
11	**1**	**1**	(untitled)											
18	**1**	**1**	(untitled)											1800
19	**1**	**1**	(untitled)											1800
20	**1**	**1**	(untitled)											1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
1	**1**	NetworkDefault	100	100	100		0.00		
2	**1**	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
4	**1**	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
6	**1**	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
8	**1**	NetworkDefault	100	100	100		0.00		
9	**1**	NetworkDefault	100	100	100		0.00		
10	**1**	NetworkDefault	100	100	100		0.00		
11	**1**	NetworkDefault	100	100	100		0.00		
18	**1**	NetworkDefault	100	100	100		0.00		
19	**1**	NetworkDefault	100	100	100		0.00		
20	**1**	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	293

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
1	1	103	103
2	1	119	119
	2	75	75
4	1	693	693
	2	194	194
6	1	253	253
	2	115	115
8	1	207	207
9	1	274	274
10	1	363	363
11	1	708	708
18	1	194	194
19	1	887	887
20	1	368	368

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
1	1	1	G	
2	1	1	E	
	2	1	F	
4	1	1	A	
	2	1	B	
6	1	1	C	
	2	1	D	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
1	1	12.00	30.00
18	1	19.18	30.00
19	1	12.91	30.00
20	1	7.85	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
2	1	1	18/1	2/1	2.76	30.00	✓	Straight	Straight Movement
	2	1	18/1	2/2	2.76	30.00	✓	Straight	Straight Movement

4	1	1	19/1	4/1	1.44	30.00	✓	Straight	Straight Movement
	2	1	19/1	4/2	1.44	30.00	✓	Straight	Straight Movement
6	1	1	20/1	6/1	2.40	30.00	✓	Straight	Straight Movement
	2	1	20/1	6/2	2.40	30.00	✓	Straight	Straight Movement
8	1	1	6/1	8/1	25.11	30.00	✓	Nearside	25.69
9	1	1	4/1	9/1	43.98	30.00	✓	Nearside	28.91
10	1	1	1/1	10/1	41.91	30.00	✓	Nearside	39.19
11	1	1	4/1	11/1	41.92	30.00	✓	Straight	Straight Movement
8	1	2	4/2	8/1	25.11	30.00	✓	Offside	66.51
9	1	2	1/1	9/1	43.98	30.00	✓	Straight	Straight Movement
10	1	2	6/1	10/1	41.91	30.00	✓	Straight	Straight Movement
11	1	2	1/1	11/1	41.92	30.00	✓	Offside	84.44
8	1	3	2/2	8/1	25.11	30.00	✓	Straight	Straight Movement
9	1	3	6/2	9/1	43.98	30.00	✓	Offside	80.57
10	1	3	2/2	10/1	41.91	30.00	✓	Offside	56.01
11	1	3	2/1	11/1	41.92	30.00	✓	Nearside	45.54

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
4	2	AllTraffic		
6	2	Movement		

Give Way Data - All Movements - Conflicts

Traffic Stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
2		TrafficStream	6/1	100	0.00		0	0

Give Way Data - Movements

Arm	Traffic Stream	Movement	Destination traffic stream	Max Flow (Opposed) (PCU/hr)	Max Flow (Unopposed) (PCU/hr)	Percentage opposed (%)
6	2	1	9/1	1200	2067	100

Give Way Data - Movements - Conflicts

Arm	Traffic Stream	Movement	Destination traffic stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
6	2	1	9/1		TrafficStream	4/1	100	0.00		0	0

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation			✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To			
		1	2	3	4
From	1	0	5	70	119
	2	17	0	48	38
	3	142	194	0	551
	4	115	8	245	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows not shown as they are blank.

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	18/1	9/1	#0000FF
	2	(untitled)	1/1	8/1	#FF0000
	3	(untitled)	19/1	10/1	#00FF00
	4	(untitled)	20/1	11/1	#FFFF00

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	2		2	1	1/1, 9/1	Normal	17
	6		2	4	1/1, 11/1	Normal	38
	10		1	4	18/1, 2/1, 11/1	Normal	119
	11		2	3	1/1, 10/1	Normal	48
	12		4	1	20/1, 6/2, 9/1	Normal	115
	13		3	1	19/1, 4/1, 9/1	Normal	142
	14		3	4	19/1, 4/1, 11/1	Normal	551
	15		3	2	19/1, 4/2, 8/1	Normal	194
	16		1	2	18/1, 2/2, 8/1	Normal	5
	17		1	3	18/1, 2/2, 10/1	Normal	70
	18		4	2	20/1, 6/1, 8/1	Normal	8
	19		4	3	20/1, 6/1, 10/1	Normal	245

Signal Timings

Network Default: 293s cycle time; 293 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	NetworkDefault	293

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Absolute

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Unknown
	B	(untitled)	7	300	0	0	Unknown
	C	(untitled)	7	300	0	0	Unknown
	D	(untitled)	7	300	0	0	Unknown
	E	(untitled)	7	300	0	0	Unknown
	F	(untitled)	7	300	0	0	Unknown
	G	(untitled)	7	300	0	0	Unknown
	H	(untitled)	6	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	A, B, C, D	1
	2	B, D, E	1
	3	E, F	1
	4	G	1
	5	H	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 1, 2, 3, 4, 5	47, 65, 96, 113, 199, 213, 242, 269, 281

Intergreen Matrix for Controller Stream 1

		To							
		A	B	C	D	E	F	G	H
From	A					7	7	7	6
	B						6	6	6
	C						7	7	6
	D						6	6	6
	E	6						6	6
	F	6	6	6	6			6	6
	G	6	6	6	6	6	6		6
	H	12	12	12	12	12	12	12	

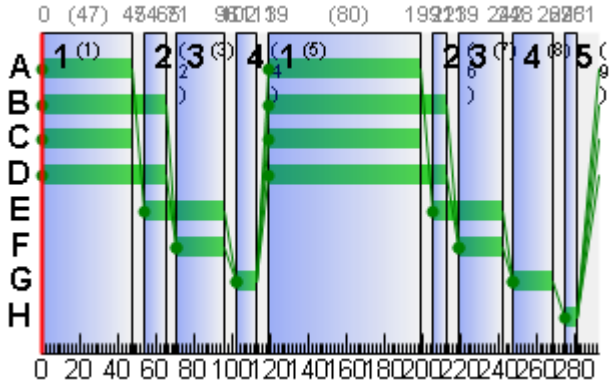
Banned Stage transitions for Controller Stream 1

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

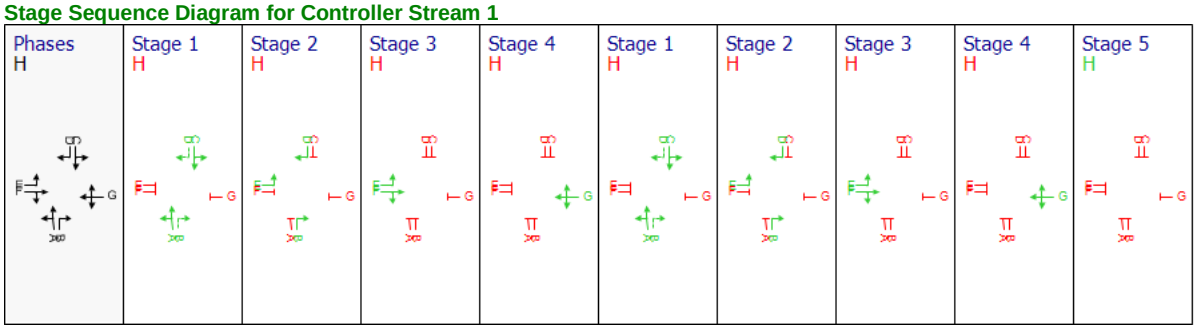
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
1	1		1	G	102	113	11	248	269	21
2	1		1	E	54	96	42	206	242	36
2	2		1	F	71	96	25	219	242	23
4	1		1	A	119	199	80	0	47	47
4	2		1	B	119	213	94	0	65	65
6	1		1	C	119	199	80	0	47	47
6	2		1	D	119	213	94	0	65	65

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	**1**	0.00	0.00	0.00	0.00

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (PCU)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	**1**	**1**	43	108	103	2050	32	66.07	4.20	24.14	26.84	1.24	28.08
	2	**1**	22	311	119	1989	78	42.09	3.63	90.84	19.76	1.13	20.88
		2	22	311	75	2005	48	53.78	2.66	66.39	15.91	0.81	16.72
	4	**1**	76	19	693	2083	127	33.26	27.88	1336.00	90.91	7.33	98.23
		2	26	249	194	1371	159	13.74	2.04	102.23	10.52	0.74	11.26
	6	**1**	27	229	253	2101	127	27.30	7.43	213.63	27.24	1.99	29.23
		2	15	490	115	1372	159	17.52	2.54	84.58	7.95	0.71	8.65
	8	**1**	0	Unrestricted	207	Unrestricted	293	0.00	0.00	0.00	0.00	0.00	0.00
	9	**1**	0	Unrestricted	274	Unrestricted	293	0.00	0.00	0.00	0.00	0.00	0.00

	10	**1**	0	Unrestricted	363	Unrestricted	293	0.00	0.00	0.00	0.00	0.00	0.00
	11	**1**	0	Unrestricted	708	Unrestricted	293	0.00	0.00	0.00	0.00	0.00	0.00
	18	**1**	11	715	194	1800	293	0.18	0.22	0.80	0.14	0.04	0.18
	19	**1**	63	43	887	1800	293	9.88	21.97	117.40	34.55	4.59	39.14
	20	**1**	20	340	368	1800	293	0.26	0.03	0.23	0.37	0.00	0.37

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Calculated sat flow (PCU/hr)	Calculated capacity (PCU/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	**1**	**1**	103	103	0		2050	238	43		108	0.00	32
	2	**1**	119	119	0		1989	543	22		311	0.04	78
		2	75	75	0		2005	342	22		311	0.04	48
	4	**1**	693	693	0		2083	917	76		19	0.42	127
		2	194	194	0		1371	753	26		249	0.42	159
	6	**1**	253	253	0		2101	925	27		229	0.00	127
		2	115	115	0		1372	754	15		490	0.00	159
	8	**1**	207	207	0		Unrestricted	Unrestricted	0		Unrestricted	0.77	293
	9	**1**	274	274	0		Unrestricted	Unrestricted	0		Unrestricted	0.72	293
	10	**1**	363	363	0		Unrestricted	Unrestricted	0		Unrestricted	0.55	293
	11	**1**	708	708	0		Unrestricted	Unrestricted	0		Unrestricted	0.60	293
	18	**1**	194	194	0		1800	1757	11		715	0.00	293
	19	**1**	887	887	0		1800	1411	63		43	0.00	293
	20	**1**	368	368	0		1800	1800	20		340	0.00	293

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	**1**	**1**	12.00	66.07	1.89	26.84	95.78	98.65	1.24
	2	**1**	2.76	42.09	1.39	19.76	75.45	89.78	1.13
		2	2.76	53.78	1.12	15.91	85.86	64.39	0.81
	4	**1**	1.44	33.26	6.40	90.91	84.31	584.27	7.33
		2	1.44	13.74	0.74	10.52	30.40	58.97	0.74
	6	**1**	2.40	27.30	1.92	27.24	62.79	158.86	1.99
		2	2.40	17.52	0.56	7.95	48.91	56.24	0.71
	8	**1**	25.11	0.00	0.00	0.00	0.00	0.00	0.00
	9	**1**	43.98	0.00	0.00	0.00	0.00	0.00	0.00
	10	**1**	41.91	0.00	0.00	0.00	0.00	0.00	0.00
	11	**1**	41.92	0.00	0.00	0.00	0.00	0.00	0.00
	18	**1**	19.18	0.18	0.01	0.14	1.80	3.49	0.04
	19	**1**	12.91	9.88	2.43	34.55	41.30	366.37	4.59
	20	**1**	7.85	0.26	0.03	0.37	0.00	0.00	0.00

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (PCU)	Mean max queue (PCU)	Max queue storage (PCU)	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))	Estimated blocking
	1	**1**	0.00	4.20	17.39	24.14	0.00	0.00	

08:00-09:00	2	1	0.00	3.63	4.00	90.84	0.00	0.00	
		2	0.00	2.66	4.00	66.39	0.00	0.00	
	4	1	0.00	27.88	2.09	1336.00	0.00	0.00	
		2	0.00	2.04	2.00	102.23	0.00	0.00	
	6	1	0.00	7.43	3.48	213.63	0.00	0.00	
		2	0.00	2.54	3.00	84.58	0.00	0.00	
	8	1	0.00	0.00	36.39	0.00	0.00	102.00	
	9	1	0.00	0.00	63.73	0.00	0.00	70.00	
	10	1	0.00	0.00	60.74	0.00	0.00	16.00	
	11	1	0.00	0.00	60.76	0.00	0.00	13.00	
	18	1	0.00	0.22	27.79	0.80	0.00	7.00	
	19	1	0.00	21.97	18.71	117.40	0.00	237.00	
	20	1	0.00	0.03	11.37	0.23	0.00	89.00	

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (PCU)	Max End of Green Queue EoTS (PCU)	Max End of Red Queue EoTS (PCU)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	1	1	0.00	0.00	✓	4.20	0.16	4.00	1.00	0.00	28.08
	2	1	0.00	0.00	✓	3.63	0.03	3.63	1.00	0.00	20.88
		2	0.00	0.00	✓	2.66	0.03	2.57	1.00	0.00	16.72
	4	1	0.00	0.00	✓	27.89	1.16	11.77	1.00	0.00	98.23
		2	0.00	0.00	✓	2.04	0.04	2.04	1.00	0.00	11.26
	6	1	0.00	0.00	✓	7.43	0.05	6.59	1.00	0.00	29.23
		2	0.00	0.00	✓	2.54	0.01	2.54	1.00	0.00	8.65
	8	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	10	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	11	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	18	1	0.00	0.00	✓	0.22			1.00	0.00	0.18
	19	1	0.00	0.00	✓	21.97			1.00	0.00	39.14
	20	1	0.00	0.00	✓	0.03			1.00	0.00	0.37

Network Results

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Item with worst overall PRC	Network within capacity
4	23/04/2020 10:27:51	23/04/2020 10:27:52	08:00	293	252.76	16.49	75.57	4/1	0	0	4/1	19/1	4/1	✓

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)

08:00-09:00	76	19	4553	2781	13.04	234.19	18.57	252.76

Network Results: Flows and signals

Time Segment	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
08:00-09:00	4553	4553	0		76		19	2781

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	18.48	13.04	16.49	234.19	32.53	1481.03	18.57

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))
08:00-09:00	1336.00	0.00	534.00

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	252.76

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	101.0	117.8	106.1
	2	122.1	0.0	120.0	120.0
	3	101.5	63.1	0.0	99.4
	4	72.0	62.9	79.7	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (PCU/hr)	Normal journey time (s)	Calculated Total Flow (PCU/hr)	Avg journey time (s)
2	2	1	17	122.05	17	122.05
6	2	4	38	120.00	38	120.00
10	1	4	119	106.13	119	106.13
11	2	3	48	119.99	48	119.99
12	4	1	115	72.00	115	72.00
13	3	1	142	101.46	142	101.46
14	3	4	551	99.41	551	99.41
15	3	2	194	63.08	194	63.08
16	1	2	5	101.01	5	101.01
17	1	3	70	117.81	70	117.81
18	4	2	8	62.91	8	62.91
19	4	3	245	79.71	245	79.71

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES	WEIGHTS		PENALTIES	P.I.
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)	Delay weighting multiplier (%)	Stop weighting multiplier (%)	Cost of traffic penalties (£ per hr)	P.I.
1	1			1	G	103	2050	32	0.00	43	108	78.07	66.07	95.78	4.20	100	100	0.00	28.08
2	1			1	E	119	1989	78	0.00	22	311	44.85	42.09	75.45	3.63	100	100	0.00	20.88
	2			1	F	75	2005	48	0.00	22	311	56.54	53.78	85.86	2.66	100	100	0.00	16.72
4	1			1	A	693 <	2083	127	0.00	76	19	34.70	33.26	84.31	27.88 +	100	100	0.00	98.23
	2			1	B	194 <	1371	159	0.00	26	249	15.18	13.74	30.40	2.04 +	100	100	0.00	11.26
6	1			1	C	253 <	2101	127	0.00	27	229	29.70	27.30	62.79	7.43 +	100	100	0.00	29.23
	2			1	D	115	1372	159	0.00	15	490	19.92	17.52	48.91	2.54	100	100	0.00	8.65
8	1					207	Unrestricted	293	102.00	0	Unrestricted	25.11	0.00	0.00	0.00	100	100	0.00	0.00
9	1					274	Unrestricted	293	70.00	0	Unrestricted	43.98	0.00	0.00	0.00	100	100	0.00	0.00
10	1					363	Unrestricted	293	16.00	0	Unrestricted	41.91	0.00	0.00	0.00	100	100	0.00	0.00
11	1					708	Unrestricted	293	13.00	0	Unrestricted	41.92	0.00	0.00	0.00	100	100	0.00	0.00
18	1					194	1800	293	7.00	11	715	19.36	0.18	1.80	0.22	100	100	0.00	0.18
19	1					887 <	1800	293	237.00	63	43	22.78	9.88	41.30	21.97 +	100	100	0.00	39.14
20	1					368	1800	293	89.00	20	340	8.10	0.26	0.00	0.03	100	100	0.00	0.37

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	701.12	39.86	17.59	16.49	234.19	18.57	0.00	252.76
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians								
TOTAL	701.12	39.86	17.59	16.49	234.19	18.57	0.00	252.76

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

A5 - 2020 4-5 PM
D4 - 2020 4-5 PM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Item with worst overall PRC	Network within capacity
5	23/04/2020 10:27:44	23/04/2020 10:27:44	16:00	293	225.67	14.79	65.78	6/1	0	0	6/1	20/1	6/1	✓

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
2020 4-5 PM		D4	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2020 4-5 PM				16:00	

Network Options

Network timings

Network cycle time (s)	Restrict to SCOOT cycle times	Time segment length (min)	Number of time segments	Modelled time period (min)
293		60	1	60

Signals options

Start displacement (s)	End displacement (s)
2	3

Advanced

Phase minimum broken penalty (£)	Phase maximum broken penalty (£)	Intergreen broken penalty (£)	Starting Red-with-Amber (s)
10000.00	10000.00	10000.00	2

Traffic options

Traffic model	Vehicle flow scaling factor (%)	Pedestrian flow scaling factor (%)	Cruise times or speeds
Platoon Dispersion (PDM)	100	100	Cruise Speeds

Advanced

Resolution	DOS Threshold (%)	Cruise scaling factor (%)	Use link stop weightings	Use link delay weightings	Exclude pedestrians from results calculation	Random delay mode	Type of Vehicle-in-Service	Type of random parameter	PCU Length (m)	Calculate results for Path Segments	Generate PDM Profile Data
1	90	100	✓	✓		Complex	Uniform (TRANSYT)	Uniform (TRANSYT)	5.75		✓

Normal Traffic parameters

Dispersion type	Dispersion coefficient	Travel time coefficient
Default	35	80

Normal Traffic Types

Name	PCU Factor
Normal	1.00

Bus parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Bus	1.00	Default	0.94	30	85

Tram parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Tram	1.00	Default	0.94	100	100

Pedestrian parameters

Dispersion type
Default

Optimisation options

Enable optimisation	Auto redistribute	Optimisation level	Enable OUT Profile accuracy
✓	✓	Offsets And Green Splits	✓

Advanced

Optimisation type	Hill climb increments	OUTProfile accuracy	Use enhanced optimisation	Auto optimisation order	Optimisation order	Master controller	Offsets relative to master controller	Master controller offset after each run
Hill Climb (Fast)	15, 40, -1, 15, 40, 1, -1, 1	50, 50, 5, 5, 0.5, 0.5, 0.05, 0.05		✓	1			Do nothing

Economics

Vehicle Monetary Value Of Delay (£ per PCU-hr)	Vehicle Monetary Value Of Stops (£ per 100 stops)	Pedestrian monetary value of delay (£ per Ped-hr)
14.20	2.60	14.20

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
(ALL)			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
1	1			✓	100.00	✓	Sum of lanes	2076	✓		Normal	
2	1				23.00	✓	Sum of lanes	1989	✓		Normal	
	2				23.00	✓	Sum of lanes	2007	✓		Normal	
4	1				12.00	✓	Sum of lanes	2078	✓		Normal	

	2				12.00	✓	Sum of lanes	2059	✓	✓	Normal	
6	1				20.00	✓	Sum of lanes	2096	✓		Normal	
	2				20.00	✓	Sum of lanes	2067	✓	✓	Normal	
8	1			✓	209.23						Normal	
9	1			✓	366.47						Normal	
10	1			✓	349.28						Normal	
11	1			✓	349.37						Normal	
18	1			✓	159.81	✓	Sum of lanes	1800			Normal	
19	1			✓	107.58	✓	Sum of lanes	1800			Normal	
20	1			✓	65.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
1	1	1	(untitled)		✓	N/A	N/A	0	3.60	✓	49	39.19		2076
2	1	2	(untitled)		✓	N/A	N/A	0	3.00	✓	100	45.54		1989
	2	1	(untitled)		✓	N/A	N/A	0	3.00	✓	89	56.01		2007
4	1	1	(untitled)		✓	N/A	N/A	0	3.50	✓	25	28.91		2078
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	66.51		2059
6	1	1	(untitled)		✓	N/A	N/A	0	3.50	✓	7	25.69		2096
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	80.57		2067
8	1	1	(untitled)											
9	1	1	(untitled)											
10	1	1	(untitled)											
11	1	1	(untitled)											
18	1	1	(untitled)											1800
19	1	1	(untitled)											1800
20	1	1	(untitled)											1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
1	1	NetworkDefault	100	100	100		0.00		
2	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
4	1	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
6	1	NetworkDefault	100	100	100		0.00		

	2	Flare	100	100	100		0.00		
8	1	NetworkDefault	100	100	100		0.00		
9	1	NetworkDefault	100	100	100		0.00		
10	1	NetworkDefault	100	100	100		0.00		
11	1	NetworkDefault	100	100	100		0.00		
18	1	NetworkDefault	100	100	100		0.00		
19	1	NetworkDefault	100	100	100		0.00		
20	1	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	293

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
1	1	86	86
2	1	66	66
	2	79	79
4	1	395	395
	2	145	145
6	1	607	607
	2	160	160
8	1	195	195
9	1	301	301
10	1	649	649
11	1	393	393
18	1	145	145
19	1	540	540
20	1	767	767

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
1	1	1	G	
2	1	1	E	
	2	1	F	
4	1	1	A	
	2	1	B	
6	1	1	C	
	2	1	D	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
1	1	12.00	30.00
18	1	19.18	30.00
19	1	12.91	30.00
20	1	7.85	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
2	1	1	18/1	2/1	2.76	30.00	✓	Straight	Straight Movement
	2	1	18/1	2/2	2.76	30.00	✓	Straight	Straight Movement
4	1	1	19/1	4/1	1.44	30.00	✓	Straight	Straight Movement
	2	1	19/1	4/2	1.44	30.00	✓	Straight	Straight Movement
6	1	1	20/1	6/1	2.40	30.00	✓	Straight	Straight Movement
	2	1	20/1	6/2	2.40	30.00	✓	Straight	Straight Movement
8	1	1	6/1	8/1	25.11	30.00	✓	Nearside	25.69
9	1	1	4/1	9/1	43.98	30.00	✓	Nearside	28.91
10	1	1	1/1	10/1	41.91	30.00	✓	Nearside	39.19
11	1	1	4/1	11/1	41.92	30.00	✓	Straight	Straight Movement
8	1	2	4/2	8/1	25.11	30.00	✓	Offside	66.51
9	1	2	1/1	9/1	43.98	30.00	✓	Straight	Straight Movement
10	1	2	6/1	10/1	41.91	30.00	✓	Straight	Straight Movement
11	1	2	1/1	11/1	41.92	30.00	✓	Offside	84.44
8	1	3	2/2	8/1	25.11	30.00	✓	Straight	Straight Movement
9	1	3	6/2	9/1	43.98	30.00	✓	Offside	80.57
10	1	3	2/2	10/1	41.91	30.00	✓	Offside	56.01
11	1	3	2/1	11/1	41.92	30.00	✓	Nearside	45.54

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
4	2	AllTraffic		
6	2	Movement		

Give Way Data - All Movements - Conflicts

Traffic Stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
2		TrafficStream	6/1	100	0.00		0	0

Give Way Data - Movements

Arm	Traffic Stream	Movement	Destination traffic stream	Max Flow (Opposed) (PCU/hr)	Max Flow (Unopposed) (PCU/hr)	Percentage opposed (%)
6	2	1	9/1	1200	2067	100

Give Way Data - Movements - Conflicts

Arm	Traffic Stream	Movement	Destination traffic stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
6	2	1	9/1		TrafficStream	4/1	100	0.00		0	0

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation			✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To			
		1	2	3	4
From	1	0	9	70	66
	2	44	0	13	29
	3	97	145	0	298
	4	160	41	566	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows not shown as they are blank.

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	18/1	9/1	#0000FF
	2	(untitled)	1/1	8/1	#FF0000
	3	(untitled)	19/1	10/1	#00FF00
	4	(untitled)	20/1	11/1	#FFFF00

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	2		2	1	1/1, 9/1	Normal	44
	6		2	4	1/1, 11/1	Normal	29
	10		1	4	18/1, 2/1, 11/1	Normal	66
	11		2	3	1/1, 10/1	Normal	13
	12		4	1	20/1, 6/2, 9/1	Normal	160
	13		3	1	19/1, 4/1, 9/1	Normal	97
	14		3	4	19/1, 4/1, 11/1	Normal	298
	15		3	2	19/1, 4/2, 8/1	Normal	145
	16		1	2	18/1, 2/2, 8/1	Normal	9
	17		1	3	18/1, 2/2, 10/1	Normal	70
	18		4	2	20/1, 6/1, 8/1	Normal	41
	19		4	3	20/1, 6/1, 10/1	Normal	566

Signal Timings

Network Default: 293s cycle time; 293 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	NetworkDefault	293

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Absolute

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Unknown
	B	(untitled)	7	300	0	0	Unknown
	C	(untitled)	7	300	0	0	Unknown
	D	(untitled)	7	300	0	0	Unknown
	E	(untitled)	7	300	0	0	Unknown
	F	(untitled)	7	300	0	0	Unknown
	G	(untitled)	7	300	0	0	Unknown
	H	(untitled)	6	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	A, B, C, D	1
	2	B, D, E	1
	3	E, F	1
	4	G	1
	5	H	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 1, 2, 3, 4, 5	47, 65, 96, 113, 199, 213, 242, 269, 281

Intergreen Matrix for Controller Stream 1

		To							
		A	B	C	D	E	F	G	H
From	A					7	7	7	6
	B						6	6	6
	C						7	7	6
	D						6	6	6
	E	6						6	6
	F	6	6	6	6			6	6
	G	6	6	6	6	6	6		6
	H	12	12	12	12	12	12	12	

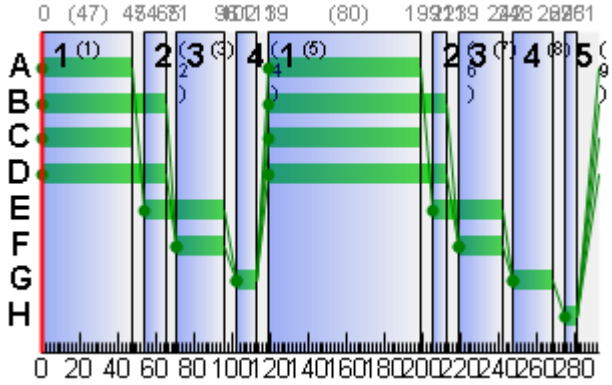
Banned Stage transitions for Controller Stream 1

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

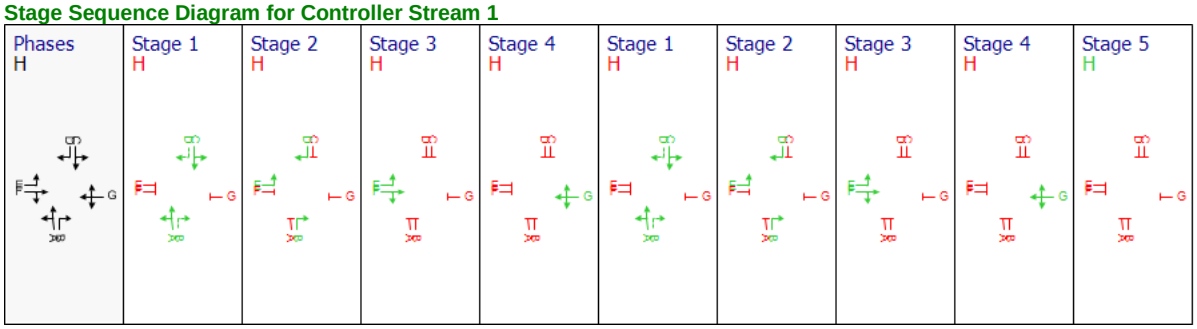
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
1	1		1	G	102	113	11	248	269	21
2	1		1	E	54	96	42	206	242	36
2	2		1	F	71	96	25	219	242	23
4	1		1	A	119	199	80	0	47	47
4	2		1	B	119	213	94	0	65	65
6	1		1	C	119	199	80	0	47	47
6	2		1	D	119	213	94	0	65	65

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
16:00-17:00	1	0.00	0.00	0.00	0.00

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (PCU)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
16:00-17:00	1	1	36	152	86	2076	32	63.92	3.42	19.66	21.68	1.01	22.70
	2	1	12	641	66	1989	78	40.54	2.01	50.17	10.55	0.61	11.17
		2	23	290	79	2007	48	54.02	2.80	69.99	16.83	0.85	17.68

	4	1	43	108	395	2078	127	27.80	12.67	607.19	43.31	3.38	46.70
		2	19	368	145	1371	159	15.76	2.02	101.15	9.01	0.75	9.76
	6	1	66	37	607	2096	127	35.92	22.55	648.21	86.00	6.06	92.06
		2	21	324	160	1372	159	17.81	3.03	100.95	11.24	0.97	12.20
	8	1	0	Unrestricted	195	Unrestricted	293	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	0	Unrestricted	301	Unrestricted	293	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	0	Unrestricted	649	Unrestricted	293	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	0	Unrestricted	393	Unrestricted	293	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	8	1013	145	1800	293	0.09	0.04	0.16	0.05	0.00	0.06
	19	1	34	161	540	1800	293	3.14	6.84	36.56	6.70	1.16	7.86
	20	1	45	100	767	1800	293	1.55	5.94	52.20	4.69	0.80	5.49

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Calculated sat flow (PCU/hr)	Calculated capacity (PCU/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
16:00-17:00	1	1	86	86	0		2076	241	36		152	0.00	32
	2	1	66	66	0		1989	543	12		641	0.00	78
		2	79	79	0		2007	342	23		290	0.00	48
	4	1	395	395	0		2078	915	43		108	0.25	127
		2	145	145	0		1371	753	19		368	0.25	159
	6	1	607	607	0		2096	923	66		37	0.10	127
		2	160	160	0		1372	754	21		324	0.10	159
	8	1	195	195	0		Unrestricted	Unrestricted	0		Unrestricted	0.78	293
	9	1	301	301	0		Unrestricted	Unrestricted	0		Unrestricted	0.63	293
	10	1	649	649	0		Unrestricted	Unrestricted	0		Unrestricted	0.71	293
	11	1	393	393	0		Unrestricted	Unrestricted	0		Unrestricted	0.62	293
	18	1	145	145	0		1800	1794	8		1013	0.00	293
	19	1	540	540	0		1800	1567	34		161	0.00	293
	20	1	767	767	0		1800	1704	45		100	0.00	293

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
16:00-17:00	1	1	12.00	63.92	1.53	21.68	93.80	80.67	1.01
	2	1	2.76	40.54	0.74	10.55	74.14	48.93	0.61
		2	2.76	54.02	1.19	16.83	85.93	67.88	0.85
	4	1	1.44	27.80	3.05	43.31	68.34	269.93	3.38
		2	1.44	15.76	0.63	9.01	41.12	59.63	0.75
	6	1	2.40	35.92	6.06	86.00	79.63	483.33	6.06
		2	2.40	17.81	0.79	11.24	48.18	77.08	0.97
	8	1	25.11	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	43.98	0.00	0.00	0.00	0.00	0.00	0.00

	10	1	41.91	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	41.92	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	19.18	0.09	0.00	0.05	0.22	0.31	0.00
	19	1	12.91	3.14	0.47	6.70	17.14	92.54	1.16
	20	1	7.85	1.55	0.33	4.69	8.31	63.76	0.80

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (PCU)	Mean max queue (PCU)	Max queue storage (PCU)	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))	Estimated blocking
16:00-17:00	1	1	0.00	3.42	17.39	19.66	0.00	0.00	
	2	1	0.00	2.01	4.00	50.17	0.00	0.00	
		2	0.00	2.80	4.00	69.99	0.00	0.00	
	4	1	0.00	12.67	2.09	607.19	0.00	0.00	
		2	0.00	2.02	2.00	101.15	0.00	0.00	
	6	1	0.00	22.55	3.48	648.21	0.00	0.00	
		2	0.00	3.03	3.00	100.95	0.00	0.00	
	8	1	0.00	0.00	36.39	0.00	0.00	98.00	
	9	1	0.00	0.00	63.73	0.00	0.00	52.00	
	10	1	0.00	0.00	60.74	0.00	0.00	23.00	
	11	1	0.00	0.00	60.76	0.00	0.00	17.00	
	18	1	0.00	0.04	27.79	0.16	0.00	1.00	
	19	1	0.00	6.84	18.71	36.56	0.00	167.00	
	20	1	0.00	5.94	11.37	52.20	0.00	197.00	

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (PCU)	Max End of Green Queue EoTS (PCU)	Max End of Red Queue EoTS (PCU)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
16:00-17:00	1	1	0.00	0.00	✓	3.42	0.10	3.30	1.00	0.00	22.70
	2	1	0.00	0.00	✓	2.01	0.01	2.01	1.00	0.00	11.17
		2	0.00	0.00	✓	2.80	0.03	2.71	1.00	0.00	17.68
	4	1	0.00	0.00	✓	12.67	0.16	7.59	1.00	0.00	46.70
		2	0.00	0.00	✓	2.02	0.02	2.02	1.00	0.00	9.76
	6	1	0.00	0.00	✓	22.55	0.63	14.37	1.00	0.00	92.06
		2	0.00	0.00	✓	3.03	0.03	3.03	1.00	0.00	12.20
	8	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	10	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	11	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	18	1	0.00	0.00	✓	0.04			1.00	0.00	0.06
	19	1	0.00	0.00	✓	6.84			1.00	0.00	7.86
	20	1	0.00	0.00	✓	5.94			1.00	0.00	5.49

Network Results

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Item with worst over	Network within capacity

						- hr/hr)							all PRC	
5	23/04/2020 10:27:44	23/04/2020 10:27:44	16:00	293	225.67	14.79	65.78	6/1	0	0	6/1	20/1	6/1	✓

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
16:00-17:00	66	37	4528	2781	11.76	210.07	15.60	225.67

Network Results: Flows and signals

Time Segment	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
16:00-17:00	4528	4528	0		66		37	2781

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
16:00-17:00	18.03	11.76	14.79	210.07	27.48	1244.07	15.60

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))
16:00-17:00	648.21	0.00	555.00

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
16:00-17:00	0.00	0.00	✓	1.00	0.00	0.00	225.67

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	101.2	118.0	104.5
	2	119.9	0.0	117.8	117.8
	3	89.3	58.4	0.0	87.2
	4	73.6	72.8	89.6	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (PCU/hr)	Normal journey time (s)	Calculated Total Flow (PCU/hr)	Avg journey time (s)
2	2	1	44	119.90	44	119.90
6	2	4	29	117.85	29	117.85
10	1	4	66	104.49	66	104.49
11	2	3	13	117.84	13	117.84
12	4	1	160	73.58	160	73.58

13	3	1	97	89.27	97	89.27
14	3	4	298	87.22	298	87.22
15	3	2	145	58.36	145	58.36
16	1	2	9	101.16	9	101.16
17	1	3	70	117.96	70	117.96
18	4	2	41	72.82	41	72.82
19	4	3	566	89.63	566	89.63

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES	WEIGHTS		PENALTIES	P.I.
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity (%)**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**	**Delay weighting multiplier (%)**	**Stop weighting multiplier (%)**	**Cost of traffic penalties (£ per hr)**	**P.I.**
1	**1**			1	G	86	2076	32	0.00	36	152	75.92	63.92	93.80	3.42	100	100	0.00	22.70
2	**1**			1	E	66	1989	78	0.00	12	641	43.30	40.54	74.14	2.01	100	100	0.00	11.17
	2			1	F	79	2007	48	0.00	23	290	56.78	54.02	85.93	2.80	100	100	0.00	17.68
4	**1**			1	A	395 <	2078	127	0.00	43	108	29.24	27.80	68.34	12.67 +	100	100	0.00	46.70
	2			1	B	145 <	1371	159	0.00	19	368	17.20	15.76	41.12	2.02 +	100	100	0.00	9.76
6	**1**			1	C	607 <	2096	127	0.00	66	37	38.32	35.92	79.63	22.55 +	100	100	0.00	92.06
	2			1	D	160 <	1372	159	0.00	21	324	20.21	17.81	48.18	3.03 +	100	100	0.00	12.20
8	**1**					195	Unrestricted	293	98.00	0	Unrestricted	25.11	0.00	0.00	0.00	100	100	0.00	0.00
9	**1**					301	Unrestricted	293	52.00	0	Unrestricted	43.98	0.00	0.00	0.00	100	100	0.00	0.00
10	**1**					649	Unrestricted	293	23.00	0	Unrestricted	41.91	0.00	0.00	0.00	100	100	0.00	0.00
11	**1**					393	Unrestricted	293	17.00	0	Unrestricted	41.92	0.00	0.00	0.00	100	100	0.00	0.00
18	**1**					145	1800	293	1.00	8	1013	19.27	0.09	0.22	0.04	100	100	0.00	0.06
19	**1**					540	1800	293	167.00	34	161	16.05	3.14	17.14	6.84	100	100	0.00	7.86
20	**1**					767	1800	293	197.00	45	100	9.40	1.55	8.31	5.94	100	100	0.00	5.49

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	680.27	37.47	18.16	14.79	210.07	15.60	0.00	225.67
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians								
TOTAL	680.27	37.47	18.16	14.79	210.07	15.60	0.00	225.67

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

Junctions 9

ARCADY 9 - Roundabout Module

Filename: 190092 Roundabout Option.j9
Path: G:\2019\p190092\calcs\Arcady
Report generation date: 22/04/2020 15:50:31

Summary of junction performance

	AM				PM			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
	2020							
1 - Redford Park	0.3	8.14	0.19	A	0.3	9.98	0.19	A
2 - R761 South	185.3	882.90	1.38	F	6.0	38.49	0.86	E
3 - Blacklion Manor Road	0.8	13.14	0.41	B	0.4	9.78	0.28	A
4 - R761 North	1.6	14.17	0.59	B	95.6	495.58	1.24	F

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

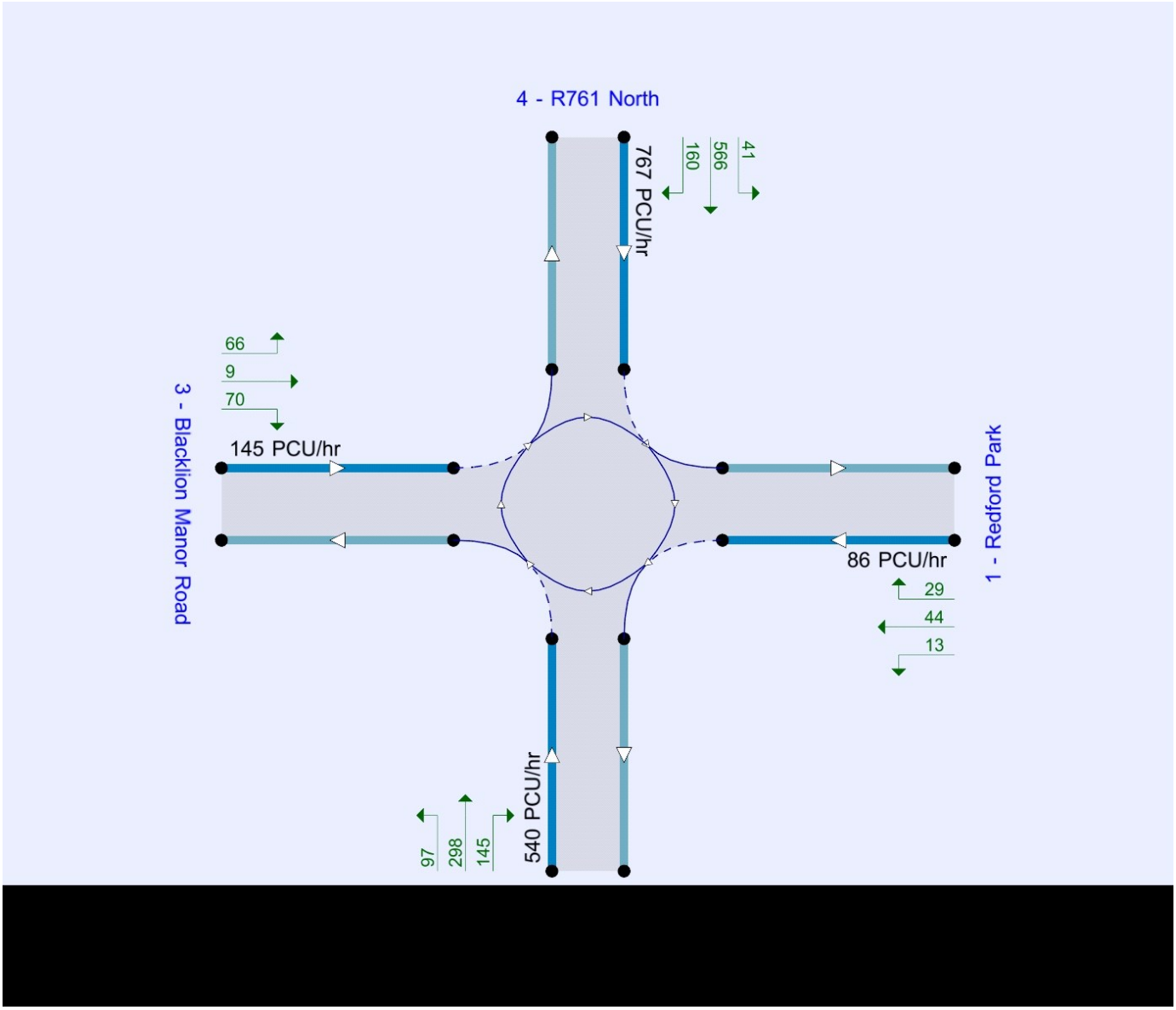
File summary

File Description

Title	(untitled)
Location	
Site number	
Date	12/03/2020
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	HEADOFFICE"mcgeoughp
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin



The junction diagram reflects the last run of Junctions.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

Scenario name	Time Period name	Traffic profile type	Model start time (HH:mm)	Model finish time (HH:mm)	Time segment length (min)
2020	AM	ONE HOUR	08:00	09:30	15
2020	PM	ONE HOUR	17:00	18:30	15

2020, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1 - untitled	untitled	Standard Roundabout	510.13	F

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Redford Park	
2	R761 South	
3	Blacklion Manor Road	
4	R761 North	

Capacity Options

Arm	Minimum capacity (PCU/hr)	Maximum capacity (PCU/hr)
1 - Redford Park	0.00	99999.00
2 - R761 South	0.00	99999.00
3 - Blacklion Manor Road	0.00	99999.00
4 - R761 North	0.00	99999.00

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - Redford Park	3.00	3.00	0.0	9.0	33.0	45.0	
2 - R761 South	3.00	3.00	0.0	9.0	33.0	52.0	
3 - Blacklion Manor Road	3.00	3.00	0.0	9.0	33.0	52.0	
4 - R761 North	3.00	3.00	0.0	9.0	33.0	52.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1 - Redford Park	0.438	807.359
2 - R761 South	0.426	785.279
3 - Blacklion Manor Road	0.426	785.279
4 - R761 North	0.426	785.279

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Model start time (HH:mm)	Model finish time (HH:mm)	Time segment length (min)
D1	2020	AM	ONE HOUR	08:00	09:30	15

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Redford Park		✓	103.00	100.000
2 - R761 South		✓	887.00	100.000
3 - Blacklion Manor Road		✓	194.00	100.000
4 - R761 North		✓	368.00	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Redford Park	2 - R761 South	3 - Blacklion Manor Road	4 - R761 North
From	1 - Redford Park	0.000	48.000	17.000	38.000
	2 - R761 South	194.000	0.000	142.000	551.000
	3 - Blacklion Manor Road	5.000	70.000	0.000	119.000
	4 - R761 North	8.000	245.000	115.000	0.000

Vehicle Mix

Heavy Vehicle proportion

		To			
		1 - Redford Park	2 - R761 South	3 - Blacklion Manor Road	4 - R761 North
From	1 - Redford Park	10	10	10	10
	2 - R761 South	10	10	10	10
	3 - Blacklion Manor Road	10	10	10	10
	4 - R761 North	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS
1 - Redford Park	0.19	8.14	0.3	A
2 - R761 South	1.38	882.90	185.3	F
3 - Blacklion Manor Road	0.41	13.14	0.8	B
4 - R761 North	0.59	14.17	1.6	B

Main Results for each time segment

Main results: (08:00-08:15)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	77.54	320.39	666.95	0.116	76.97	0.1	6.707	A
2 - R761 South	667.78	126.80	731.23	0.913	637.76	7.5	35.335	E
3 - Blacklion Manor Road	146.05	564.06	544.84	0.268	144.47	0.4	9.853	A
4 - R761 North	277.05	195.34	702.01	0.395	274.23	0.7	9.196	A

Main results: (08:15-08:30)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	92.59	385.23	638.53	0.145	92.43	0.2	7.249	A
2 - R761 South	797.39	152.38	720.32	1.107	706.81	30.2	113.317	F
3 - Blacklion Manor Road	174.40	627.76	517.69	0.337	173.79	0.5	11.494	B
4 - R761 North	330.82	221.78	690.74	0.479	329.69	1.0	10.930	B

Main results: (08:30-08:45)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	113.41	470.98	600.95	0.189	113.13	0.3	8.114	A
2 - R761 South	976.61	186.34	705.85	1.384	704.96	98.1	339.490	F
3 - Blacklion Manor Road	213.60	633.84	515.10	0.415	212.75	0.8	13.059	B
4 - R761 North	405.18	236.43	684.50	0.592	402.97	1.5	13.952	B

Main results: (08:45-09:00)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	113.41	473.32	599.93	0.189	113.40	0.3	8.139	A
2 - R761 South	976.61	187.14	705.51	1.384	705.33	165.9	676.793	F
3 - Blacklion Manor Road	213.60	634.25	514.92	0.415	213.56	0.8	13.136	B
4 - R761 North	405.18	236.83	684.33	0.592	405.07	1.6	14.165	B

Main results: (09:00-09:15)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	92.59	388.91	636.92	0.145	92.86	0.2	7.281	A
2 - R761 South	797.39	153.63	719.79	1.108	719.54	185.3	880.023	F
3 - Blacklion Manor Road	174.40	638.60	513.07	0.340	175.18	0.6	11.746	B
4 - R761 North	330.82	225.10	689.33	0.480	332.94	1.0	11.178	B

Main results: (09:15-09:30)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	77.54	325.07	664.90	0.117	77.71	0.1	6.747	A
2 - R761 South	667.78	128.44	730.53	0.914	726.22	170.7	882.897	F
3 - Blacklion Manor Road	146.05	638.63	513.06	0.285	146.58	0.4	10.821	B
4 - R761 North	277.05	215.50	693.42	0.400	278.22	0.7	9.566	A

2020, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

Junction Network

Junctions

Junction	Name	Junction Type	Junction Delay (s)	Junction LOS
1 - untitled	untitled	Standard Roundabout	262.14	F

Junction Network Options

[same as above]

Arms

Arms

[same as above]

Capacity Options

[same as above]

Roundabout Geometry

[same as above]

Slope / Intercept / Capacity

[same as above]

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Model start time (HH:mm)	Model finish time (HH:mm)	Time segment length (min)
D2	2020	PM	ONE HOUR	17:00	18:30	15

Default vehicle mix	Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1 - Redford Park		✓	86.00	100.000
2 - R761 South		✓	540.00	100.000
3 - Blacklion Manor Road		✓	145.00	100.000
4 - R761 North		✓	767.00	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1 - Redford Park	2 - R761 South	3 - Blacklion Manor Road	4 - R761 North
From	1 - Redford Park	0.000	13.000	44.000	29.000
	2 - R761 South	145.000	0.000	97.000	298.000
	3 - Blacklion Manor Road	9.000	70.000	0.000	66.000
	4 - R761 North	41.000	566.000	160.000	0.000

Vehicle Mix

Heavy Vehicle proportion

		To			
		1 - Redford Park	2 - R761 South	3 - Blacklion Manor Road	4 - R761 North
From	1 - Redford Park	10	10	10	10
	2 - R761 South	10	10	10	10
	3 - Blacklion Manor Road	10	10	10	10
	4 - R761 North	10	10	10	10

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS
1 - Redford Park	0.19	9.98	0.3	A
2 - R761 South	0.86	38.49	6.0	E
3 - Blacklion Manor Road	0.28	9.78	0.4	A
4 - R761 North	1.24	495.58	95.6	F

Main Results for each time segment

Main results: (17:00-17:15)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	64.75	583.55	551.62	0.117	64.17	0.1	8.111	A
2 - R761 South	406.54	171.55	712.15	0.571	400.87	1.4	12.508	B
3 - Blacklion Manor Road	109.16	350.50	635.87	0.172	108.26	0.2	7.493	A
4 - R761 North	577.44	166.63	714.25	0.808	561.29	4.0	23.869	C

Main results: (17:15-17:30)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	77.31	682.73	508.15	0.152	77.11	0.2	9.183	A
2 - R761 South	485.45	202.08	699.14	0.694	481.69	2.4	17.890	C
3 - Blacklion Manor Road	130.35	421.17	605.75	0.215	130.06	0.3	8.319	A
4 - R761 North	689.52	200.21	699.94	0.985	654.95	12.7	61.345	F

Main results: (17:30-17:45)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	94.69	718.31	492.56	0.192	94.43	0.3	9.940	A
2 - R761 South	594.55	221.53	690.85	0.861	582.27	5.4	33.132	D
3 - Blacklion Manor Road	159.65	509.52	568.09	0.281	159.15	0.4	9.672	A
4 - R761 North	844.48	243.06	681.67	1.239	677.71	54.4	193.816	F

Main results: (17:45-18:00)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	94.69	720.43	491.63	0.193	94.68	0.3	9.975	A
2 - R761 South	594.55	222.16	690.58	0.861	592.41	6.0	38.487	E
3 - Blacklion Manor Road	159.65	517.92	564.51	0.283	159.62	0.4	9.780	A
4 - R761 North	844.48	246.04	680.40	1.241	679.70	95.6	405.457	F

Main results: (18:00-18:15)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	77.31	715.84	493.64	0.157	77.53	0.2	9.521	A
2 - R761 South	485.45	209.65	695.91	0.698	498.49	2.7	21.202	C
3 - Blacklion Manor Road	130.35	435.09	599.82	0.217	130.84	0.3	8.452	A
4 - R761 North	689.52	205.14	697.84	0.988	689.54	95.6	495.583	F

Main results: (18:15-18:30)

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1 - Redford Park	64.75	719.88	491.87	0.132	64.90	0.2	9.277	A
2 - R761 South	406.54	202.09	699.14	0.581	411.02	1.6	13.951	B
3 - Blacklion Manor Road	109.16	359.07	632.22	0.173	109.47	0.2	7.578	A
4 - R761 North	577.44	170.01	712.81	0.810	704.70	63.7	408.846	F

TRANSYT 15

Version: 15.5.2.7994

For sales and distribution information, program advice and maintenance, contact TRL:
+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

Filename: 190092 Proposed Signals_JH.t15
Path: G:\2019\p190092\calcs\transyt
Report generation date: 23/04/2020 10:44:54

»A4 - 2020 8-9 AM : D5 - 2020 8-9 AM* :
»A5 - 2020 4-5 PM : D4 - 2020 4-5 PM* :

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	23/04/2020
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	HEADOFFICE\mcgeoughp
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber

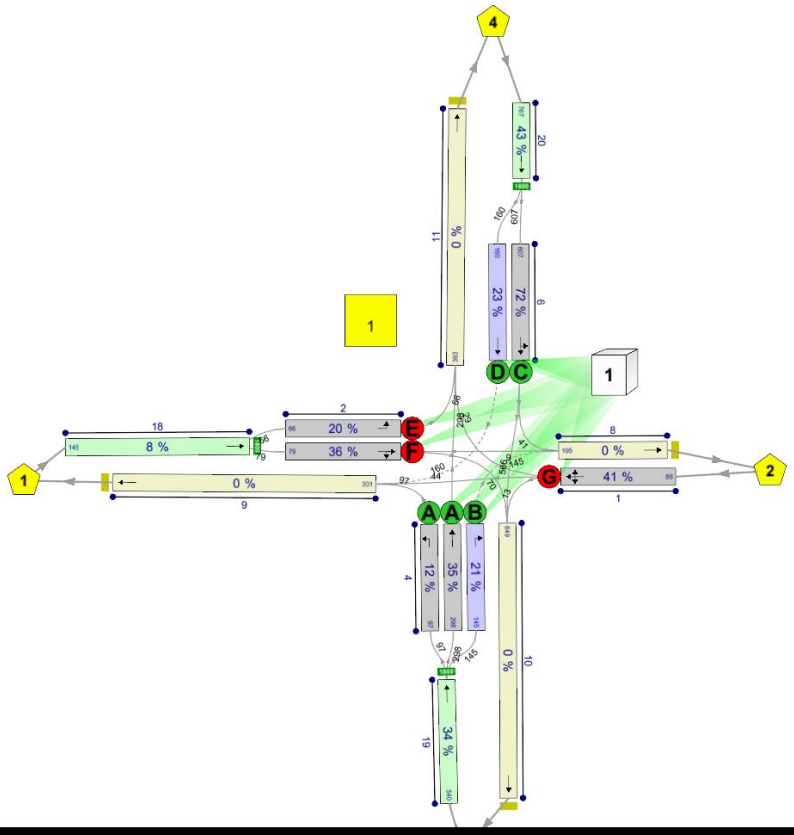
Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Network Diagrams



A4 - 2020 8-9 AM
D5 - 2020 8-9 AM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signali	Item with worst unsignal	Item with worst over	Network within

			(HH:mm)			-hr/hr)					sed PRC	ised PRC	all PRC	capacity
4	23/04/2020 10:43:59	23/04/2020 10:44:00	08:00	120	218.29	14.14	64.10	4/2	0	0	4/2	19/1	4/2	✓

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
2020 8-9 AM		D5	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2020 8-9 AM				08:00	

Network Options

Network timings

Network cycle time (s)	Restrict to SCOOT cycle times	Time segment length (min)	Number of time segments	Modelled time period (min)
120		60	1	60

Signals options

Start displacement (s)	End displacement (s)
2	3

Advanced

Phase minimum broken penalty (£)	Phase maximum broken penalty (£)	Intergreen broken penalty (£)	Starting Red-with-Amber (s)
10000.00	10000.00	10000.00	2

Traffic options

Traffic model	Vehicle flow scaling factor (%)	Pedestrian flow scaling factor (%)	Cruise times or speeds
Platoon Dispersion (PDM)	100	100	Cruise Speeds

Advanced

Resolution	DOS Threshold (%)	Cruise scaling factor (%)	Use link stop weightings	Use link delay weightings	Exclude pedestrians from results calculation	Random delay mode	Type of Vehicle-in-Service	Type of random parameter	PCU Length (m)	Calculate results for Path Segments	Generate PDM Profile Data
1	90	100	✓	✓		Complex	Uniform (TRANSYT)	Uniform (TRANSYT)	5.75		✓

Normal Traffic parameters

Dispersion type	Dispersion coefficient	Travel time coefficient
Default	35	80

Normal Traffic Types

Name	PCU Factor
Normal	1.00

Bus parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient

Bus	1.00	Default	0.94	30	85

Tram parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Tram	1.00	Default	0.94	100	100

Pedestrian parameters

Dispersion type
Default

Optimisation options

Enable optimisation	Auto redistribute	Optimisation level	Enable OUT Profile accuracy
✓	✓	Offsets And Green Splits	✓

Advanced

Optimisation type	Hill climb increments	OUTProfile accuracy	Use enhanced optimisation	Auto optimisation order	Optimisation order	Master controller	Offsets relative to master controller	Master controller offset after each run
Hill Climb (Fast)	15, 40, -1, 15, 40, 1, -1, 1	50, 50, 5, 5, 0.5, 0.5, 0.05, 0.05		✓	1			Do nothing

Economics

Vehicle Monetary Value Of Delay (£ per PCU-hr)	Vehicle Monetary Value Of Stops (£ per 100 stops)	Pedestrian monetary value of delay (£ per Ped-hr)
14.20	2.60	14.20

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
(ALL)			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
1	1			✓	100.00	✓	Sum of lanes	2051	✓		Normal	
2	1				23.00	✓	Sum of lanes	1644	✓		Normal	
	2				23.00	✓	Sum of lanes	2010	✓		Normal	
4	1				12.00	✓	Sum of lanes	2019	✓		Normal	
	2				12.00	✓	Sum of lanes	2105	✓		Normal	
	3				12.00	✓	Sum of lanes	2044	✓	✓	Normal	
6	1				20.00	✓	Sum of lanes	2069	✓		Normal	
	2				20.00	✓	Sum of lanes	2105	✓	✓	Normal	
8	1			✓	210.77						Normal	
9	1			✓	363.21						Normal	
10	1			✓	353.16						Normal	

11	**1**			✓	348.70						Normal	
18	**1**			✓	159.81	✓	Sum of lanes	1800			Normal	
19	**1**			✓	107.58	✓	Sum of lanes	1800			Normal	
20	**1**			✓	65.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
1	**1**	**1**	(untitled)		✓	N/A	N/A	0	3.60	✓	83	40.10		2051
2	**1**	**2**	(untitled)		✓	N/A	N/A	0	3.00		100	6.00		1644
	2	**1**	(untitled)		✓	N/A	N/A	0	3.00	✓	93	62.68		2010
4	**1**	**2**	(untitled)		✓	N/A	N/A	0	3.50	✓	100	35.42		2019
	2	**2**	(untitled)		✓	N/A	N/A	0	3.50	✓	0	99999.00		2105
	3	**1**	(untitled)		✓	N/A	N/A	0	3.50		24	12.00		2044
6	**1**	**1**	(untitled)		✓	N/A	N/A	0	3.50		7	6.00		2069
	2	**2**	(untitled)		✓	N/A	N/A	0	3.50	✓	0	99999.00		2105
8	**1**	**1**	(untitled)											
9	**1**	**1**	(untitled)											
10	**1**	**1**	(untitled)											
11	**1**	**1**	(untitled)											
18	**1**	**1**	(untitled)											1800
19	**1**	**1**	(untitled)											1800
20	**1**	**1**	(untitled)											1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
1	**1**	NetworkDefault	100	100	100		0.00		
2	**1**	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
4	**1**	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
	3	Flare	100	100	100		0.00		
6	**1**	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
8	**1**	NetworkDefault	100	100	100		0.00		
9	**1**	NetworkDefault	100	100	100		0.00		
10	**1**	NetworkDefault	100	100	100		0.00		
11	**1**	NetworkDefault	100	100	100		0.00		

18	**1**	NetworkDefault	100	100	100		0.00		
19	**1**	NetworkDefault	100	100	100		0.00		
20	**1**	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	**(ALL)**	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	**(ALL)**	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	**(ALL)**	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
1	**1**	103	103
2	**1**	119	119
	2	75	75
4	**1**	142	142
	2	551	551
	3	194	194
6	**1**	253	253
	2	115	115
8	**1**	207	207
9	**1**	274	274
10	**1**	363	363
11	**1**	708	708
18	**1**	194	194
19	**1**	887	887
20	**1**	368	368

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
1	**1**	1	G	
2	**1**	1	E	
	2	1	F	
4	**1**	1	A	
	2	1	A	
	3	1	B	
6	**1**	1	C	
	2	1	D	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
1	**1**	12.00	30.00
18	**1**	19.18	30.00
19	**1**	12.91	30.00
20	**1**	7.85	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
2	1	1	18/1	2/1	2.76	30.00	✓	Straight	Straight Movement
	2	1	18/1	2/2	2.76	30.00	✓	Straight	Straight Movement
4	1	1	19/1	4/1	1.44	30.00	✓	Straight	Straight Movement
	2	1	19/1	4/2	1.44	30.00	✓	Straight	Straight Movement
	3	1	19/1	4/3	1.44	30.00	✓	Straight	Straight Movement
6	1	1	20/1	6/1	2.40	30.00	✓	Straight	Straight Movement
	2	1	20/1	6/2	2.40	30.00	✓	Straight	Straight Movement
8	1	1	6/1	8/1	25.29	30.00	✓	Nearside	32.33
9	1	1	4/1	9/1	43.59	30.00	✓	Nearside	35.42
10	1	1	1/1	10/1	42.38	30.00	✓	Nearside	40.10
11	1	1	1/1	11/1	41.84	30.00	✓	Offside	91.65
8	1	2	2/2	8/1	25.29	30.00	✓	Straight	Straight Movement
9	1	2	1/1	9/1	43.59	30.00	✓	Straight	Straight Movement
10	1	2	6/1	10/1	42.38	30.00	✓	Straight	Straight Movement
11	1	2	2/1	11/1	41.84	30.00	✓	Nearside	47.20
8	1	3	4/3	8/1	25.29	30.00	✓	Offside	62.46
9	1	3	6/2	9/1	43.59	30.00	✓	Straight	Straight Movement
10	1	3	2/2	10/1	42.38	30.00	✓	Offside	62.68
11	1	3	4/2	11/1	41.84	30.00	✓	Straight	Straight Movement

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
(ALL)	(ALL)	Movement		

Give Way Data - Movements

Arm	Traffic Stream	Movement	Destination traffic stream	Max Flow (Opposed) (PCU/hr)	Max Flow (Unopposed) (PCU/hr)	Percentage opposed (%)
4	3	1	8/1	1200	2044	100
6	2	1	9/1	1200	2105	100

Give Way Data - Movements - Conflicts

Arm	Traffic Stream	Movement	Destination traffic stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
4	3	1	8/1		TrafficStream	6/1	100	0.00		0	0
6	2	1	9/1		TrafficStream	4/1	100	0.00		0	0

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation			✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To			
		1	2	3	4
From	1	0	5	70	119
	2	17	0	48	38
	3	142	194	0	551
	4	115	8	245	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows not shown as they are blank.

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	18/1	9/1	#0000FF
	2	(untitled)	1/1	8/1	#FF0000
	3	(untitled)	19/1	10/1	#00FF00
	4	(untitled)	20/1	11/1	#FFFF00

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	2		2	1	1/1, 9/1	Normal	17
	6		2	4	1/1, 11/1	Normal	38
	10		1	4	18/1, 2/1, 11/1	Normal	119
	11		2	3	1/1, 10/1	Normal	48
	12		4	1	20/1, 6/2, 9/1	Normal	115
	16		1	2	18/1, 2/2, 8/1	Normal	5
	17		1	3	18/1, 2/2, 10/1	Normal	70
	18		4	2	20/1, 6/1, 8/1	Normal	8
	19		4	3	20/1, 6/1, 10/1	Normal	245
	20		3	1	19/1, 4/1, 9/1	Normal	142
	21		3	4	19/1, 4/2, 11/1	Normal	551
	22		3	2	19/1, 4/3, 8/1	Normal	194

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	NetworkDefault	120

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type

1	Unspecified						Absolute

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Unknown
	B	(untitled)	7	300	0	0	Unknown
	C	(untitled)	7	300	0	0	Unknown
	D	(untitled)	7	300	0	0	Unknown
	E	(untitled)	7	300	0	0	Unknown
	F	(untitled)	7	300	0	0	Unknown
	G	(untitled)	7	300	0	0	Unknown
	H	(untitled)	6	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	A, B, C, D	1
	2	B, D, E	1
	3	E, F	1
	4	G	1
	5	H	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5	47, 59, 77, 94, 106

Intergreen Matrix for Controller Stream 1

		To							
		A	B	C	D	E	F	G	H
From	A					7	7	7	6
	B						6	6	6
	C						7	7	6
	D						6	6	6
	E	6						6	6
	F	6	6	6	6			6	6
	G	6	6	6	6	6	6		6
	H	13	13	13	13	13	13	13	

Banned Stage transitions for Controller Stream 1

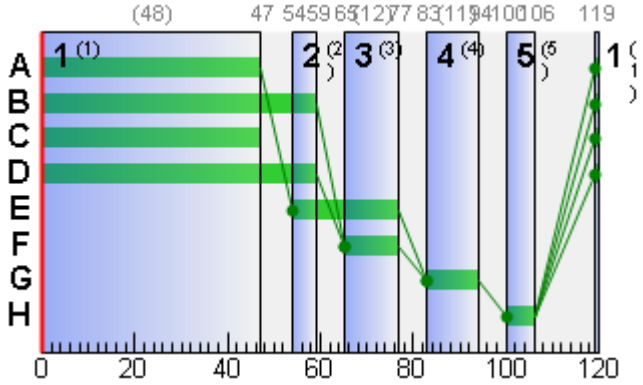
		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

Traffic Stream Green Times

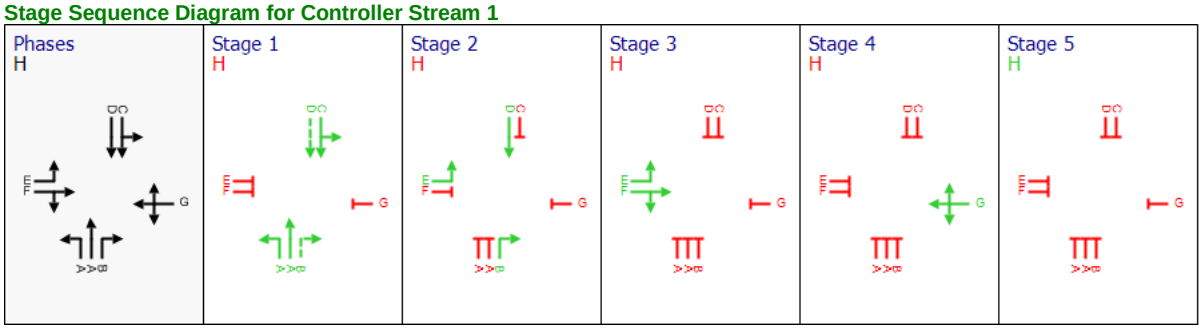
Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1

					Start	End	Duration
1	1		1	G	83	94	11
2	1		1	E	54	77	23
2	2		1	F	65	77	12
4	1		1	A	119	47	48
4	2		1	A	119	47	48
4	3		1	B	119	59	60
6	1		1	C	119	47	48
6	2		1	D	119	59	60

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (PCU)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	1	1	50	79	103	2051	11	59.91	3.48	20.03	24.34	1.30	25.64
	2	1	36	149	119	1644	23	44.43	3.28	81.89	20.85	1.28	22.14
		2	34	161	75	2010	12	53.80	2.40	60.06	15.92	0.89	16.81

	4	1	17	423	142	2019	48	20.18	1.96	97.76	11.30	0.74	12.04
		2	64	40	551	2105	48	26.96	14.17	679.06	58.60	4.98	63.58
		3	28	222	194	1366	60	14.53	2.05	102.70	11.12	0.86	11.98
	6	1	30	201	253	2069	48	24.84	5.69	163.48	24.79	2.11	26.90
		2	16	448	115	1378	60	16.55	1.90	63.36	7.51	0.77	8.28
	8	1	0	Unrestricted	207	Unrestricted	120	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	0	Unrestricted	274	Unrestricted	120	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	0	Unrestricted	363	Unrestricted	120	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	0	Unrestricted	708	Unrestricted	120	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	11	707	194	1800	120	0.21	0.22	0.80	0.16	0.06	0.23
	19	1	63	44	887	1800	120	7.38	12.84	68.65	25.83	4.51	30.34
	20	1	20	340	368	1800	120	0.26	0.03	0.23	0.37	0.00	0.37

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Calculated sat flow (PCU/hr)	Calculated capacity (PCU/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	1	1	103	103	0		2051	205	50		79	0.00	11
	2	1	119	119	0		1644	329	36		149	0.05	23
		2	75	75	0		2010	218	34		161	0.05	12
	4	1	142	142	0		2019	824	17		423	0.41	48
		2	551	551	0		2105	860	64		40	0.41	48
		3	194	194	0		1366	694	28		222	0.41	60
	6	1	253	253	0		2069	845	30		201	0.00	48
		2	115	115	0		1378	701	16		448	0.00	60
	8	1	207	207	0		Unrestricted	Unrestricted	0		Unrestricted	0.83	120
	9	1	274	274	0		Unrestricted	Unrestricted	0		Unrestricted	0.76	120
	10	1	363	363	0		Unrestricted	Unrestricted	0		Unrestricted	0.51	120
	11	1	708	708	0		Unrestricted	Unrestricted	0		Unrestricted	0.61	120
	18	1	194	194	0		1800	1740	11		707	0.00	120
	19	1	887	887	0		1800	1415	63		44	0.00	120
	20	1	368	368	0		1800	1800	20		340	0.00	120

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	1	1	12.00	59.91	1.71	24.34	100.32	103.33	1.30
	2	1	2.76	44.43	1.47	20.85	85.99	102.33	1.28
		2	2.76	53.80	1.12	15.92	94.91	71.18	0.89
	4	1	1.44	20.18	0.80	11.30	41.31	58.65	0.74
		2	1.44	26.96	4.13	58.60	72.03	396.91	4.98
		3	1.44	14.53	0.78	11.12	35.26	68.40	0.86
	6	1	2.40	24.84	1.75	24.79	66.41	168.02	2.11

		2	2.40	16.55	0.53	7.51	53.39	61.40	0.77
	8	1	25.29	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	43.59	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	42.38	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	41.84	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	19.18	0.21	0.01	0.16	2.57	4.98	0.06
	19	1	12.91	7.38	1.82	25.83	40.55	359.70	4.51
	20	1	7.85	0.26	0.03	0.37	0.00	0.00	0.00

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (PCU)	Mean max queue (PCU)	Max queue storage (PCU)	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))	Estimated blocking
08:00-09:00	1	1	0.00	3.48	17.39	20.03	0.00	0.00	
	2	1	0.00	3.28	4.00	81.89	0.00	0.00	
		2	0.00	2.40	4.00	60.06	0.00	0.00	
	4	1	0.00	1.96	2.00	97.76	0.00	0.00	
		2	0.00	14.17	2.09	679.06	0.00	0.00	
		3	0.00	2.05	2.00	102.70	0.00	0.00	
	6	1	0.00	5.69	3.48	163.48	0.00	0.00	
		2	0.00	1.90	3.00	63.36	0.00	0.00	
	8	1	0.00	0.00	36.66	0.00	0.00	45.00	
	9	1	0.00	0.00	63.17	0.00	0.00	29.00	
	10	1	0.00	0.00	61.42	0.00	0.00	4.00	
	11	1	0.00	0.00	60.64	0.00	0.00	6.00	
	18	1	0.00	0.22	27.79	0.80	0.00	4.00	
	19	1	0.00	12.84	18.71	68.65	0.00	85.00	
	20	1	0.00	0.03	11.37	0.23	0.00	32.00	

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (PCU)	Max End of Green Queue EoTS (PCU)	Max End of Red Queue EoTS (PCU)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	1	1	0.00	0.00	✓	3.48	0.25	3.34	1.00	0.00	25.64
	2	1	0.00	0.00	✓	3.28	0.10	3.28	1.00	0.00	22.14
		2	0.00	0.00	✓	2.40	0.09	2.32	1.00	0.00	16.81
	4	1	0.00	0.00	✓	1.96	0.02	1.96	1.00	0.00	12.04
		2	0.00	0.00	✓	14.17	0.57	8.09	1.00	0.00	63.58
		3	0.00	0.00	✓	2.05	0.05	2.05	1.00	0.00	11.98
	6	1	0.00	0.00	✓	5.69	0.06	5.05	1.00	0.00	26.90
		2	0.00	0.00	✓	1.90	0.02	1.90	1.00	0.00	8.28
	8	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	10	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	11	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	18	1	0.00	0.00	✓	0.22			1.00	0.00	0.23
	19	1	0.00	0.00	✓	12.84			1.00	0.00	30.34
	20	1	0.00	0.00	✓	0.03			1.00	0.00	0.37

Network Results

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Item with worst overall PRC	Network within capacity
4	23/04/2020 10:43:59	23/04/2020 10:44:00	08:00	120	218.29	14.14	64.10	4/2	0	0	4/2	19/1	4/2	✓

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	64	40	4553	1150	11.18	200.80	17.49	218.29

Network Results: Flows and signals

Time Segment	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
08:00-09:00	4553	4553	0		64		40	1150

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	18.49	11.18	14.14	200.80	30.64	1394.92	17.49

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))
08:00-09:00	679.06	0.00	205.00

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	218.29

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	101.2	118.3	108.4
	2	115.5	0.0	114.3	113.8
	3	85.5	61.6	0.0	90.5
	4	70.6	60.6	77.7	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (PCU/hr)	Normal journey time (s)	Calculated Total Flow (PCU/hr)	Avg journey time (s)
2	2	1	17	115.50	17	115.50

6	2	4	38	113.76	38	113.76
10	1	4	119	108.42	119	108.42
11	2	3	48	114.29	48	114.29
12	4	1	115	70.64	115	70.64
16	1	2	5	101.24	5	101.24
17	1	3	70	118.33	70	118.33
18	4	2	8	60.64	8	60.64
19	4	3	245	77.73	245	77.73
20	3	1	142	85.50	142	85.50
21	3	4	551	90.54	551	90.54
22	3	2	194	61.55	194	61.55

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES	WEIGHTS		PENALTIES	P.I.
Arm	**Traffic Stream**	**Name**	**Traffic node**	**Controller stream**	**Phase**	**Calculated flow entering (PCU/hr)**	**Calculated sat flow (PCU/hr)**	**Actual green (s (per cycle))**	**Wasted time total (s (per cycle))**	**Degree of saturation (%)**	**Practical reserve capacity (%)**	**JourneyTime (s)**	**Mean Delay per Veh (s)**	**Mean stops per Veh (%)**	**Mean max queue (PCU)**	**Delay weighting multiplier (%)**	**Stop weighting multiplier (%)**	**Cost of traffic penalties (£ per hr)**	**P.I.**
1	**1**			1	G	103	2051	11	0.00	50	79	71.91	59.91	100.32	3.48	100	100	0.00	25.64
2	**1**			1	E	119	1644	23	0.00	36	149	47.19	44.43	85.99	3.28	100	100	0.00	22.14
	2			1	F	75	2010	12	0.00	34	161	56.56	53.80	94.91	2.40	100	100	0.00	16.81
4	**1**			1	A	142	2019	48	0.00	17	423	21.62	20.18	41.31	1.96	100	100	0.00	12.04
	2			1	A	551 <	2105	48	0.00	64	40	28.40	26.96	72.03	14.17 +	100	100	0.00	63.58
	3			1	B	194 <	1366	60	0.00	28	222	15.97	14.53	35.26	2.05 +	100	100	0.00	11.98
6	**1**			1	C	253 <	2069	48	0.00	30	201	27.24	24.84	66.41	5.69 +	100	100	0.00	26.90
	2			1	D	115	1378	60	0.00	16	448	18.95	16.55	53.39	1.90	100	100	0.00	8.28
8	**1**					207	Unrestricted	120	45.00	0	Unrestricted	25.29	0.00	0.00	0.00	100	100	0.00	0.00
9	**1**					274	Unrestricted	120	29.00	0	Unrestricted	43.59	0.00	0.00	0.00	100	100	0.00	0.00
10	**1**					363	Unrestricted	120	4.00	0	Unrestricted	42.38	0.00	0.00	0.00	100	100	0.00	0.00
11	**1**					708	Unrestricted	120	6.00	0	Unrestricted	41.84	0.00	0.00	0.00	100	100	0.00	0.00
18	**1**					194	1800	120	4.00	11	707	19.39	0.21	2.57	0.22	100	100	0.00	0.23
19	**1**					887	1800	120	85.00	63	44	20.29	7.38	40.55	12.84	100	100	0.00	30.34
20	**1**					368	1800	120	32.00	20	340	8.10	0.26	0.00	0.03	100	100	0.00	0.37

Network Results

	Distance travelled (PCU-km/hr)	Time spent	Mean journey	Total delay	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue	Performance Index (£ per hr)

		(PCU-hr/hr)	speed (kph)	(PCU-hr/hr)			penalty (£ per hr)	
Normal traffic	701.48	37.52	18.69	14.14	200.80	17.49	0.00	218.29
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians								
TOTAL	701.48	37.52	18.69	14.14	200.80	17.49	0.00	218.29

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

A5 - 2020 4-5 PM
D4 - 2020 4-5 PM*

Summary

Data Errors and Warnings
No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Item with worst overall PRC	Network within capacity
5	23/04/2020 10:44:03	23/04/2020 10:44:04	16:00	120	209.41	13.67	71.85	6/1	0	0	6/1	20/1	6/1	✓

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
2020 4-5 PM		D4	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2020 4-5 PM				16:00	

Network Options

Network timings

Network cycle time (s)	Restrict to SCOOT cycle times	Time segment length (min)	Number of time segments	Modelled time period (min)
120		60	1	60

Signals options

Start displacement (s)	End displacement (s)
2	3

Advanced

Phase minimum broken penalty (£)	Phase maximum broken penalty (£)	Intergreen broken penalty (£)	Starting Red-with-Amber (s)
10000.00	10000.00	10000.00	2

Traffic options

Traffic model	Vehicle flow scaling factor (%)	Pedestrian flow scaling factor (%)	Cruise times or speeds
Platoon Dispersion (PDM)	100	100	Cruise Speeds

Advanced

Resolution	DOS Threshold (%)	Cruise scaling factor (%)	Use link stop weightings	Use link delay weightings	Exclude pedestrians from results calculation	Random delay mode	Type of Vehicle-in-Service	Type of random parameter	PCU Length (m)	Calculate results for Path Segments	Generate PDM Profile Data
1	90	100	✓	✓		Complex	Uniform (TRANSYT)	Uniform (TRANSYT)	5.75		✓

Normal Traffic parameters

Dispersion type	Dispersion coefficient	Travel time coefficient
Default	35	80

Normal Traffic Types

Name	PCU Factor
Normal	1.00

Bus parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Bus	1.00	Default	0.94	30	85

Tram parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Tram	1.00	Default	0.94	100	100

Pedestrian parameters

Dispersion type
Default

Optimisation options

Enable optimisation	Auto redistribute	Optimisation level	Enable OUT Profile accuracy
✓	✓	Offsets And Green Splits	✓

Advanced

Optimisation type	Hill climb increments	OUTProfile accuracy	Use enhanced optimisation	Auto optimisation order	Optimisation order	Master controller	Offsets relative to master controller	Master controller offset after each run
Hill Climb (Fast)	15, 40, -1, 15, 40, 1, -1, 1	50, 50, 5, 5, 0.5, 0.5, 0.05, 0.05		✓	1			Do nothing

Economics

Vehicle Monetary Value Of Delay (£ per PCU-hr)	Vehicle Monetary Value Of Stops (£ per 100 stops)	Pedestrian monetary value of delay (£ per Ped-hr)
14.20	2.60	14.20

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
(ALL)			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
1	1			✓	100.00	✓	Sum of lanes	2077	✓		Normal	
2	1				23.00	✓	Sum of lanes	1644	✓		Normal	
	2				23.00	✓	Sum of lanes	2012	✓		Normal	
4	1				12.00	✓	Sum of lanes	2019	✓		Normal	
	2				12.00	✓	Sum of lanes	2105	✓		Normal	
	3				12.00	✓	Sum of lanes	2044	✓	✓	Normal	
6	1				20.00	✓	Sum of lanes	2069	✓		Normal	
	2				20.00	✓	Sum of lanes	2105	✓	✓	Normal	
8	1			✓	210.77						Normal	
9	1			✓	363.21						Normal	
10	1			✓	353.16						Normal	
11	1			✓	348.70						Normal	
18	1			✓	159.81	✓	Sum of lanes	1800			Normal	
19	1			✓	107.58	✓	Sum of lanes	1800			Normal	
20	1			✓	65.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
1	1	1	(untitled)		✓	N/A	N/A	0	3.60	✓	49	40.10		2077
2	1	2	(untitled)		✓	N/A	N/A	0	3.00		100	6.00		1644
	2	1	(untitled)		✓	N/A	N/A	0	3.00	✓	89	62.68		2012
4	1	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	35.42		2019
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	0	99999.00		2105
	3	1	(untitled)		✓	N/A	N/A	0	3.50		24	12.00		2044
6	1	1	(untitled)		✓	N/A	N/A	0	3.50		7	6.00		2069
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	0	99999.00		2105
8	1	1	(untitled)											

9	**1**	**1**	(untitled)											
10	**1**	**1**	(untitled)											
11	**1**	**1**	(untitled)											
18	**1**	**1**	(untitled)											1800
19	**1**	**1**	(untitled)											1800
20	**1**	**1**	(untitled)											1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
1	**1**	NetworkDefault	100	100	100		0.00		
2	**1**	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
4	**1**	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
	3	Flare	100	100	100		0.00		
6	**1**	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
8	**1**	NetworkDefault	100	100	100		0.00		
9	**1**	NetworkDefault	100	100	100		0.00		
10	**1**	NetworkDefault	100	100	100		0.00		
11	**1**	NetworkDefault	100	100	100		0.00		
18	**1**	NetworkDefault	100	100	100		0.00		
19	**1**	NetworkDefault	100	100	100		0.00		
20	**1**	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	**(ALL)**	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	120

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	**(ALL)**	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	**(ALL)**	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
1	**1**	86	86
2	**1**	66	66
	2	79	79
4	**1**	97	97
	2	298	298
	3	145	145
6	**1**	607	607
	2	160	160

8	**1**	195	195
9	**1**	301	301
10	**1**	649	649
11	**1**	393	393
18	**1**	145	145
19	**1**	540	540
20	**1**	767	767

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
1	**1**	1	G	
2	**1**	1	E	
	2	1	F	
4	**1**	1	A	
	2	1	A	
	3	1	B	
6	**1**	1	C	
	2	1	D	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
1	**1**	12.00	30.00
18	**1**	19.18	30.00
19	**1**	12.91	30.00
20	**1**	7.85	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
2	**1**	**1**	18/1	2/1	2.76	30.00	✓	Straight	Straight Movement
	2	**1**	18/1	2/2	2.76	30.00	✓	Straight	Straight Movement
4	**1**	**1**	19/1	4/1	1.44	30.00	✓	Straight	Straight Movement
	2	**1**	19/1	4/2	1.44	30.00	✓	Straight	Straight Movement
	3	**1**	19/1	4/3	1.44	30.00	✓	Straight	Straight Movement
6	**1**	**1**	20/1	6/1	2.40	30.00	✓	Straight	Straight Movement
	2	**1**	20/1	6/2	2.40	30.00	✓	Straight	Straight Movement
8	**1**	**1**	6/1	8/1	25.29	30.00	✓	Nearside	32.33
9	**1**	**1**	4/1	9/1	43.59	30.00	✓	Nearside	35.42
10	**1**	**1**	1/1	10/1	42.38	30.00	✓	Nearside	40.10
11	**1**	**1**	1/1	11/1	41.84	30.00	✓	Offside	91.65
8	**1**	**2**	2/2	8/1	25.29	30.00	✓	Straight	Straight Movement
9	**1**	**2**	1/1	9/1	43.59	30.00	✓	Straight	Straight Movement
10	**1**	**2**	6/1	10/1	42.38	30.00	✓	Straight	Straight Movement
11	**1**	**2**	2/1	11/1	41.84	30.00	✓	Nearside	47.20
8	**1**	**3**	4/3	8/1	25.29	30.00	✓	Offside	62.46
9	**1**	**3**	6/2	9/1	43.59	30.00	✓	Straight	Straight Movement

10	**1**	**3**	2/2	10/1	42.38	30.00	✓	Offside	62.68
11	**1**	**3**	4/2	11/1	41.84	30.00	✓	Straight	Straight Movement

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
(ALL)	**(ALL)**	Movement		

Give Way Data - Movements

Arm	Traffic Stream	Movement	Destination traffic stream	Max Flow (Opposed) (PCU/hr)	Max Flow (Unopposed) (PCU/hr)	Percentage opposed (%)
4	**3**	**1**	8/1	1200	2044	100
6	**2**	**1**	9/1	1200	2105	100

Give Way Data - Movements - Conflicts

Arm	Traffic Stream	Movement	Destination traffic stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
4	**3**	**1**	**8/1**		TrafficStream	6/1	100	0.00		0	0
6	**2**	**1**	**9/1**		TrafficStream	4/1	100	0.00		0	0

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation			✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To			
		1	**2**	**3**	**4**
From	**1**	0	9	70	66
	2	44	0	13	29
	3	97	145	0	298
	4	160	41	566	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows not shown as they are blank.

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	**1**	(untitled)	18/1	9/1	#0000FF
	2	(untitled)	1/1	8/1	#FF0000
	3	(untitled)	19/1	10/1	#00FF00
	4	(untitled)	20/1	11/1	#FFFF00

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	2		2	1	1/1, 9/1	Normal	44
	6		2	4	1/1, 11/1	Normal	29
	10		1	4	18/1, 2/1, 11/1	Normal	66
	11		2	3	1/1, 10/1	Normal	13
	12		4	1	20/1, 6/2, 9/1	Normal	160
	16		1	2	18/1, 2/2, 8/1	Normal	9
	17		1	3	18/1, 2/2, 10/1	Normal	70
	18		4	2	20/1, 6/1, 8/1	Normal	41
	19		4	3	20/1, 6/1, 10/1	Normal	566
	20		3	1	19/1, 4/1, 9/1	Normal	97
	21		3	4	19/1, 4/2, 11/1	Normal	298
	22		3	2	19/1, 4/3, 8/1	Normal	145

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	NetworkDefault	120

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Absolute

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Unknown
	B	(untitled)	7	300	0	0	Unknown
	C	(untitled)	7	300	0	0	Unknown
	D	(untitled)	7	300	0	0	Unknown
	E	(untitled)	7	300	0	0	Unknown
	F	(untitled)	7	300	0	0	Unknown
	G	(untitled)	7	300	0	0	Unknown
	H	(untitled)	6	300	0	0	Unknown

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	A, B, C, D	1
	2	B, D, E	1
	3	E, F	1
	4	G	1
	5	H	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5	47, 59, 77, 94, 106

Intergreen Matrix for Controller Stream 1

		To							
		A	B	C	D	E	F	G	H
From	A					7	7	7	6
	B						6	6	6
	C						7	7	6
	D						6	6	6
	E	6						6	6
	F	6	6	6	6			6	6
	G	6	6	6	6	6	6		6
	H	13	13	13	13	13	13	13	

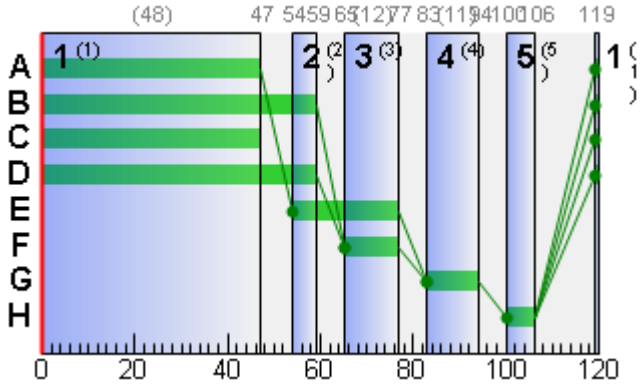
Banned Stage transitions for Controller Stream 1

		To				
		1	2	3	4	5
From	1					
	2					
	3					
	4					
	5					

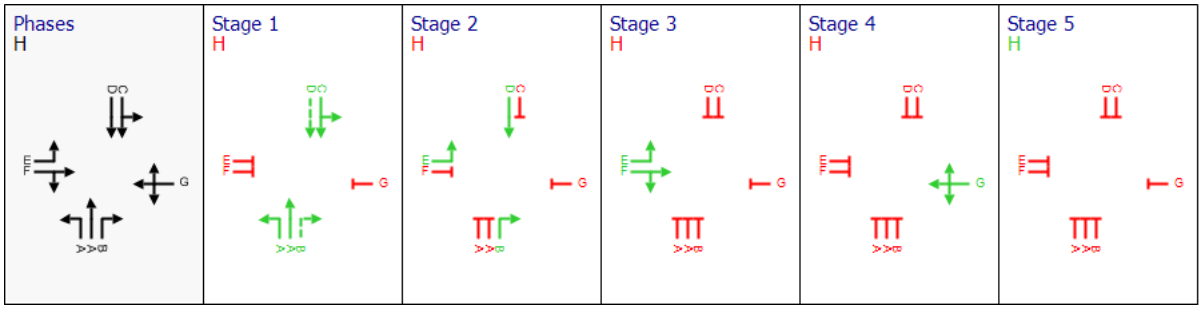
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1		
					Start	End	Duration
1	1		1	G	83	94	11
2	1		1	E	54	77	23
2	2		1	F	65	77	12
4	1		1	A	119	47	48
4	2		1	A	119	47	48
4	3		1	B	119	59	60
6	1		1	C	119	47	48
6	2		1	D	119	59	60

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
16:00-17:00	1	0.00	0.00	0.00	0.00

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (PCU)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
16:00-17:00	1	1	41	117	86	2077	11	56.79	2.82	16.22	19.26	1.05	20.31
	2	1	20	348	66	1644	23	41.37	1.79	44.63	10.77	0.68	11.45
		2	36	148	79	2012	12	54.33	2.54	63.45	16.93	0.94	17.88
	4	1	12	665	97	2019	48	21.69	1.67	83.46	8.30	0.63	8.93
		2	35	160	298	2105	48	24.61	6.88	329.46	28.93	2.49	31.42
		3	21	331	145	1366	60	16.23	2.03	101.38	9.28	0.88	10.16
	6	1	72	25	607	2069	48	35.09	17.77	510.76	84.02	6.56	90.58
		2	23	294	160	1378	60	17.50	2.66	88.53	11.04	1.12	12.16
	8	1	0	Unrestricted	195	Unrestricted	120	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	0	Unrestricted	301	Unrestricted	120	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	0	Unrestricted	649	Unrestricted	120	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	0	Unrestricted	393	Unrestricted	120	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	8	1008	145	1800	120	0.10	0.04	0.16	0.06	0.01	0.07
	19	1	34	168	540	1800	120	1.54	2.79	14.89	3.28	0.93	4.21
	20	1	43	111	767	1800	120	0.74	0.16	1.39	2.24	0.00	2.24

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Calculated sat flow (PCU/hr)	Calculated capacity (PCU/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))

16:00-17:00	1	1	86	86	0		2077	208	41		117	0.00	11
	2	1	66	66	0		1644	329	20		348	0.01	23
		2	79	79	0		2012	218	36		148	0.01	12
	4	1	97	97	0		2019	824	12		665	0.21	48
		2	298	298	0		2105	860	35		160	0.21	48
		3	145	145	0		1366	694	21		331	0.21	60
	6	1	607	607	0		2069	845	72		25	0.00	48
		2	160	160	0		1378	701	23		294	0.00	60
	8	1	195	195	0		Unrestricted	Unrestricted	0		Unrestricted	0.83	120
	9	1	301	301	0		Unrestricted	Unrestricted	0		Unrestricted	0.62	120
	10	1	649	649	0		Unrestricted	Unrestricted	0		Unrestricted	0.72	120
	11	1	393	393	0		Unrestricted	Unrestricted	0		Unrestricted	0.60	120
	18	1	145	145	0		1800	1785	8		1008	0.00	120
	19	1	540	540	0		1800	1606	34		168	0.00	120
	20	1	767	767	0		1800	1800	43		111	0.00	120

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
16:00-17:00	1	1	12.00	56.79	1.36	19.26	97.34	83.71	1.05
	2	1	2.76	41.37	0.76	10.77	82.45	54.42	0.68
		2	2.76	54.33	1.19	16.93	95.36	75.34	0.94
	4	1	1.44	21.69	0.58	8.30	51.62	50.07	0.63
		2	1.44	24.61	2.04	28.93	66.51	198.20	2.49
		3	1.44	16.23	0.65	9.28	48.42	70.21	0.88
	6	1	2.40	35.09	5.92	84.02	86.25	523.54	6.56
		2	2.40	17.50	0.78	11.04	55.69	89.11	1.12
	8	1	25.29	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	43.59	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	42.38	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	41.84	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	19.18	0.10	0.00	0.06	0.53	0.77	0.01
	19	1	12.91	1.54	0.23	3.28	13.73	74.16	0.93
	20	1	7.85	0.74	0.16	2.24	0.00	0.00	0.00

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (PCU)	Mean max queue (PCU)	Max queue storage (PCU)	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))	Estimated blocking
16:00-17:00	1	1	0.00	2.82	17.39	16.22	0.00	0.00	
	2	1	0.00	1.79	4.00	44.63	0.00	0.00	
		2	0.00	2.54	4.00	63.45	0.00	0.00	
	4	1	0.00	1.67	2.00	83.46	0.00	0.00	
		2	0.00	6.88	2.09	329.46	0.00	0.00	
		3	0.00	2.03	2.00	101.38	0.00	0.00	
	6	1	0.00	17.77	3.48	510.76	0.00	0.00	
		2	0.00	2.66	3.00	88.53	0.00	0.00	
	8	1	0.00	0.00	36.66	0.00	0.00	43.00	
	9	1	0.00	0.00	63.17	0.00	0.00	16.00	
	10	1	0.00	0.00	61.42	0.00	0.00	13.00	
	11	1	0.00	0.00	60.64	0.00	0.00	11.00	
	18	1	0.00	0.04	27.79	0.16	0.00	1.00	

	19	1	0.00	2.79	18.71	14.89	0.00	58.00	
	20	1	0.00	0.16	11.37	1.39	0.00	85.00	

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (PCU)	Max End of Green Queue EoTS (PCU)	Max End of Red Queue EoTS (PCU)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
16:00-17:00	1	1	0.00	0.00	✓	2.82	0.15	2.73	1.00	0.00	20.31
	2	1	0.00	0.00	✓	1.79	0.03	1.79	1.00	0.00	11.45
		2	0.00	0.00	✓	2.54	0.10	2.45	1.00	0.00	17.88
	4	1	0.00	0.00	✓	1.67	0.01	1.67	1.00	0.00	8.93
		2	0.00	0.00	✓	6.88	0.09	5.20	1.00	0.00	31.42
		3	0.00	0.00	✓	2.03	0.03	2.03	1.00	0.00	10.16
	6	1	0.00	0.00	✓	17.77	0.91	12.88	1.00	0.00	90.58
		2	0.00	0.00	✓	2.66	0.03	2.66	1.00	0.00	12.16
	8	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	10	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	11	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	18	1	0.00	0.00	✓	0.04			1.00	0.00	0.07
	19	1	0.00	0.00	✓	2.79			1.00	0.00	4.21
	20	1	0.00	0.00	✓	0.16			1.00	0.00	2.24

Network Results

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Item with worst overall PRC	Network within capacity
5	23/04/2020 10:44:03	23/04/2020 10:44:04	16:00	120	209.41	13.67	71.85	6/1	0	0	6/1	20/1	6/1	✓

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
16:00-17:00	72	25	4528	1150	10.87	194.12	15.29	209.41

Network Results: Flows and signals

Time Segment	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
16:00-17:00	4528	4528	0		72		25	1150

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
16:00-17:00	18.07	10.87	13.67	194.12	26.93	1219.54	15.29

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))
16:00-17:00	510.76	0.00	227.00

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
16:00-17:00	0.00	0.00	✓	1.00	0.00	0.00	209.41

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	101.7	118.7	105.3
	2	112.4	0.0	111.2	110.6
	3	81.2	57.4	0.0	82.3
	4	72.1	71.4	88.5	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (PCU/hr)	Normal journey time (s)	Calculated Total Flow (PCU/hr)	Avg journey time (s)
2	2	1	44	112.37	44	112.37
6	2	4	29	110.63	29	110.63
10	1	4	66	105.25	66	105.25
11	2	3	13	111.17	13	111.17
12	4	1	160	72.07	160	72.07
16	1	2	9	101.66	9	101.66
17	1	3	70	118.75	70	118.75
18	4	2	41	71.37	41	71.37
19	4	3	566	88.46	566	88.46
20	3	1	97	81.16	97	81.16
21	3	4	298	82.34	298	82.34
22	3	2	145	57.41	145	57.41

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES	WEIGHTS		PENALTIES	P.I.
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)	Delay weighting multiplier (%)	Stop weighting multiplier (%)	Cost of traffic penalties (£ per hr)	P.I.

1	**1**			1	G	86	2077	11	0.00	41	117	68.79	56.79	97.34	2.82	100	100	0.00	20.31
2	**1**			1	E	66	1644	23	0.00	20	348	44.13	41.37	82.45	1.79	100	100	0.00	11.45
	2			1	F	79	2012	12	0.00	36	148	57.09	54.33	95.36	2.54	100	100	0.00	17.88
4	**1**			1	A	97	2019	48	0.00	12	665	23.13	21.69	51.62	1.67	100	100	0.00	8.93
	2			1	A	298 <	2105	48	0.00	35	160	26.05	24.61	66.51	6.88 +	100	100	0.00	31.42
	3			1	B	145 <	1366	60	0.00	21	331	17.67	16.23	48.42	2.03 +	100	100	0.00	10.16
6	**1**			1	C	607 <	2069	48	0.00	72	25	37.49	35.09	86.25	17.77 +	100	100	0.00	90.58
	2			1	D	160	1378	60	0.00	23	294	19.90	17.50	55.69	2.66	100	100	0.00	12.16
8	**1**					195	Unrestricted	120	43.00	0	Unrestricted	25.29	0.00	0.00	0.00	100	100	0.00	0.00
9	**1**					301	Unrestricted	120	16.00	0	Unrestricted	43.59	0.00	0.00	0.00	100	100	0.00	0.00
10	**1**					649	Unrestricted	120	13.00	0	Unrestricted	42.38	0.00	0.00	0.00	100	100	0.00	0.00
11	**1**					393	Unrestricted	120	11.00	0	Unrestricted	41.84	0.00	0.00	0.00	100	100	0.00	0.00
18	**1**					145	1800	120	1.00	8	1008	19.27	0.10	0.53	0.04	100	100	0.00	0.07
19	**1**					540	1800	120	58.00	34	168	14.45	1.54	13.73	2.79	100	100	0.00	4.21
20	**1**					767	1800	120	85.00	43	111	8.59	0.74	0.00	0.16	100	100	0.00	2.24

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	681.85	36.40	18.73	13.67	194.12	15.29	0.00	209.41
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians								
TOTAL	681.85	36.40	18.73	13.67	194.12	15.29	0.00	209.41

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

TRANSYT 15

Version: 15.5.2.7994

For sales and distribution information, program advice and maintenance, contact TRL:
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Filename: 190092 Proposed Signals_EMJ_120seconds_ped2ndcycle.t15
Path: G:\2019\p190092\calcs\transyt
Report generation date: 10/01/2022 15:40:04

»A1 - 2017 Base AM : D1 - 2017 Base AM* :
»A2 - 2017 Base PM : D2 - 2017 Base PM* :
»A3 - 2020 7-8 AM : D3 - 2020 6-7 AM* :
»A4 - 2020 4-5 PM : D4 - 2020 4-5 PM* :
»A5 - 2020 8-9 AM : D5 - 2020 8-9 AM* :

File summary

File description

File title	(untitled)
Location	
Site number	
UTCRegion	
Driving side	Left
Date	28/11/2019
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	HEADOFFICE\mcgeoughp
Description	

Model and Results

Enable controller offsets	Enable fuel consumption	Enable quick flares	Display journey time results	Display level of service results	Display blocking and starvation results	Display end of red and green queue results	Display excess queue results	Display separate uniform and random results	Display unweighted results	Display TRANSYT 12 style timings	Display effective greens in results	Display Red-With-Amber	Display End-Of-Green Amber

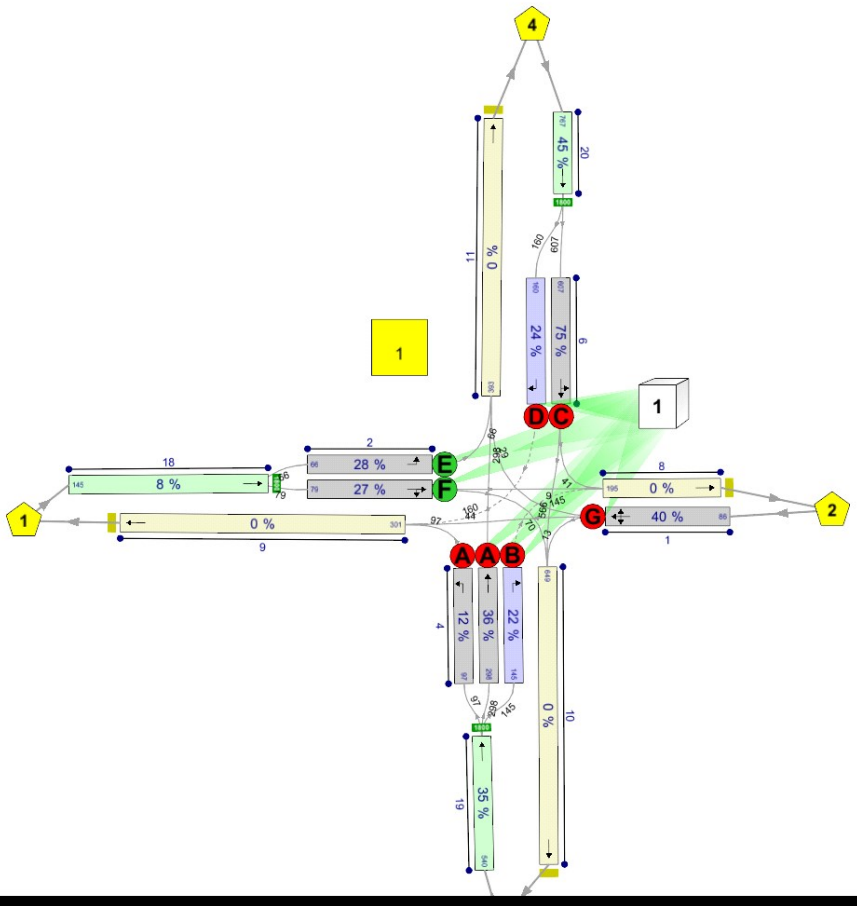
Units

Cost units	Speed units	Distance units	Fuel economy units	Fuel rate units	Mass units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
£	kph	m	mpg	l/h	kg	PCU	PCU	perHour	s	-Hour	perHour

Sorting

Show names instead of IDs	Sorting direction	Sorting type	Ignore prefixes when sorting	Analysis/demand set sorting	Link grouping	Source grouping	Colour Analysis/Demand Sets
	Ascending	Numerical		ID	Normal	Normal	✓

Network Diagrams



A1 - 2017 Base AM
D1 - 2017 Base AM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
1	10/01/2022 15:39:28	10/01/2022 15:39:31	08:00	120	218.26	14.29	60.08	6/1	0	0	6/1	19/1	6/

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
2017 Base AM		D1	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2017 Base AM				08:00	

Network Options

Network timings

Network cycle time (s)	Restrict to SCOOT cycle times	Time segment length (min)	Number of time segments	Modelled time period (min)
120		60	1	60

Signals options

Start displacement (s)	End displacement (s)
2	3

Advanced

Phase minimum broken penalty (£)	Phase maximum broken penalty (£)	Intergreen broken penalty (£)	Starting Red-with-Amber (s)
10000.00	10000.00	10000.00	2

Traffic options

Traffic model	Vehicle flow scaling factor (%)	Pedestrian flow scaling factor (%)	Cruise times or speeds
Platoon Dispersion (PDM)	100	100	Cruise Speeds

Advanced

Resolution	DOS Threshold (%)	Cruise scaling factor (%)	Use link stop weightings	Use link delay weightings	Exclude pedestrians from results calculation	Random delay mode	Type of Vehicle-in-Service	Type of random parameter	PCU Length (m)	Calculate results for Path Segments	Generate PDM Profile Data
1	90	100	✓	✓		Complex	Uniform (TRANSYT)	Uniform (TRANSYT)	5.75		✓

Normal Traffic parameters

Dispersion type	Dispersion coefficient	Travel time coefficient
Default	35	80

Normal Traffic Types

Name	PCU Factor
Normal	1.00

Bus parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Bus	1.00	Default	0.94	30	85

Tram parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Tram	1.00	Default	0.94	100	100

Pedestrian parameters

Dispersion type
Default

Optimisation options

Enable optimisation	Auto redistribute	Optimisation level	Enable OUT Profile accuracy
✓	✓	Offsets And Green Splits	✓

Advanced

Optimisation type	Hill climb increments	OUTProfile accuracy	Use enhanced optimisation	Auto optimisation order	Optimisation order	Master controller	Offsets relative to master controller	Master controller offset after each run
Hill Climb (Fast)	15, 40, -1, 15, 40, 1, -1, 1	50, 50, 5, 5, 0.5, 0.5, 0.05, 0.05		✓	1			Do nothing

Economics

Vehicle Monetary Value Of Delay (£ per PCU-hr)	Vehicle Monetary Value Of Stops (£ per 100 stops)	Pedestrian monetary value of delay (£ per Ped-hr)
14.20	2.60	14.20

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
(ALL)			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
1	1			✓	100.00	✓	Sum of lanes	2050	✓		Normal	
2	1				23.00	✓	Sum of lanes	1644	✓		Normal	
	2				23.00	✓	Sum of lanes	2013	✓		Normal	
4	1				12.00	✓	Sum of lanes	2019	✓		Normal	
	2				12.00	✓	Sum of lanes	2105	✓		Normal	
	3				12.00	✓	Sum of lanes	2044	✓	✓	Normal	
6	1				20.00	✓	Sum of lanes	2069	✓		Normal	
	2				20.00	✓	Sum of lanes	2073	✓	✓	Normal	
8	1			✓	207.10						Normal	
9	1			✓	360.14						Normal	
10	1			✓	349.62						Normal	
11	1			✓	348.70						Normal	
18	1			✓	159.81	✓	Sum of lanes	1800			Normal	
19	1			✓	107.58	✓	Sum of lanes	1800			Normal	
20	1			✓	65.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
1	1	1	(untitled)		✓	N/A	N/A	0	3.60	✓	85	40.10		2050
2	1	2	(untitled)		✓	N/A	N/A	0	3.00		100	6.00		1644
	2	1	(untitled)		✓	N/A	N/A	0	3.00	✓	88	62.68		2013
4	1	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	35.42		2019
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	0	99999.00		2105
	3	1	(untitled)		✓	N/A	N/A	0	3.50		24	12.00		2044
6	1	1	(untitled)		✓	N/A	N/A	0	3.50		7	6.00		2069
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	96.34		2073
8	1	1	(untitled)											
9	1	1	(untitled)											
10	1	1	(untitled)											
11	1	1	(untitled)											
18	1	1	(untitled)											1800
19	1	1	(untitled)											1800
20	1	1	(untitled)											1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
1	1	NetworkDefault	100	100	100		0.00		
2	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
4	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
	3	Flare	100	100	100		0.00		
6	1	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
8	1	NetworkDefault	100	100	100		0.00		
9	1	NetworkDefault	100	100	100		0.00		
10	1	NetworkDefault	100	100	100		0.00		
11	1	NetworkDefault	100	100	100		0.00		
18	1	NetworkDefault	100	100	100		0.00		
19	1	NetworkDefault	100	100	100		0.00		
20	1	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	240

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
1	1	82	82
2	1	125	125
	2	151	151
4	1	119	119
	2	367	367
	3	51	51
6	1	404	404
	2	98	98
8	1	96	96
9	1	229	229
10	1	552	552
11	1	520	520
18	1	276	276
19	1	537	537
20	1	502	502

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
1	1	1	G	
2	1	1	E	
	2	1	F	
4	1	1	A	
	2	1	A	
	3	1	B	
6	1	1	C	
	2	1	D	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
1	1	12.00	30.00
18	1	19.18	30.00
19	1	12.91	30.00
20	1	7.85	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
2	1	1	18/1	2/1	2.76	30.00	✓	Straight	Straight Movement
	2	1	18/1	2/2	2.76	30.00	✓	Straight	Straight Movement
4	1	1	19/1	4/1	1.44	30.00	✓	Straight	Straight Movement
	2	1	19/1	4/2	1.44	30.00	✓	Straight	Straight Movement
	3	1	19/1	4/3	1.44	30.00	✓	Straight	Straight Movement
6	1	1	20/1	6/1	2.40	30.00	✓	Straight	Straight Movement
	2	1	20/1	6/2	2.40	30.00	✓	Straight	Straight Movement
8	1	1	6/1	8/1	24.85	30.00	✓	Nearside	33.17
9	1	1	4/1	9/1	43.22	30.00	✓	Nearside	35.42
10	1	1	1/1	10/1	41.95	30.00	✓	Nearside	40.10
11	1	1	1/1	11/1	41.84	30.00	✓	Offside	91.65
8	1	2	2/2	8/1	24.85	30.00	✓	Straight	Straight Movement
9	1	2	1/1	9/1	43.22	30.00	✓	Straight	Straight Movement
10	1	2	6/1	10/1	41.95	30.00	✓	Straight	Straight Movement
11	1	2	2/1	11/1	41.84	30.00	✓	Nearside	47.20
8	1	3	4/3	8/1	24.85	30.00	✓	Offside	62.46
9	1	3	6/2	9/1	43.22	30.00	✓	Offside	96.34
10	1	3	2/2	10/1	41.95	30.00	✓	Offside	62.68
11	1	3	4/2	11/1	41.84	30.00	✓	Straight	Straight Movement

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
(ALL)	(ALL)	Movement		

Give Way Data - Movements

Arm	Traffic Stream	Movement	Destination traffic stream	Max Flow (Opposed) (PCU/hr)	Max Flow (Unopposed) (PCU/hr)	Percentage opposed (%)
4	3	1	8/1	1200	2044	100
6	2	1	9/1	1200	2073	100

Give Way Data - Movements - Conflicts

Arm	Traffic Stream	Movement	Destination traffic stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
4	3	1	8/1		TrafficStream	6/1	100	0.00		0	0
6	2	1	9/1		TrafficStream	4/1	100	0.00		0	0

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation			✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To			
		1	2	3	4
From	1	0	18	133	125
	2	12	0	42	28
	3	119	51	0	367
	4	98	27	377	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows not shown as they are blank.

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	18/1	9/1	#0000FF
	2	(untitled)	1/1	8/1	#FF0000
	3	(untitled)	19/1	10/1	#00FF00
	4	(untitled)	20/1	11/1	#FFFF00

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	2		2	1	1/1, 9/1	Normal	12
	6		2	4	1/1, 11/1	Normal	28
	10		1	4	18/1, 2/1, 11/1	Normal	125
	11		2	3	1/1, 10/1	Normal	42
	12		4	1	20/1, 6/2, 9/1	Normal	98
	16		1	2	18/1, 2/2, 8/1	Normal	18
	17		1	3	18/1, 2/2, 10/1	Normal	133
	18		4	2	20/1, 6/1, 8/1	Normal	27
	19		4	3	20/1, 6/1, 10/1	Normal	377
	20		3	1	19/1, 4/1, 9/1	Normal	119
	21		3	4	19/1, 4/2, 11/1	Normal	367
	22		3	2	19/1, 4/3, 8/1	Normal	51

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	Manual	240

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Absolute

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Unknown
	B	(untitled)	7	300	0	0	Unknown
	C	(untitled)	7	300	0	0	Unknown
	D	(untitled)	7	300	0	0	Unknown
	E	(untitled)	7	300	0	0	Unknown
	F	(untitled)	7	300	0	0	Unknown
	G	(untitled)	7	300	0	0	Unknown
	H	(untitled)	6	300	0	0	Unknown
	I	(untitled)	7	300	0	0	Cycle

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	H	1
	2	I	1
	3	A, C, I	1
	4	A, B, C, D	1
	5	B, D	1
	6	E, F	1
	7	G	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6, 7, 2, 3, 4, 5, 6, 7	24, 40, 46, 81, 82, 125, 146, 154, 160, 189, 190, 238, 11

Intergreen Matrix for Controller Stream 1

		To								
		A	B	C	D	E	F	G	H	I
From	A					7	7	7	7	
	B						6	6	7	
	C						7	7	7	
	D					6	6	6	7	
	E	6			6			6	7	
	F	6	6	6	6			6	7	
	G	6	6	6	6	6	6		7	7
	H	15	15	15	15	15	15	15		15
	I							7	7	

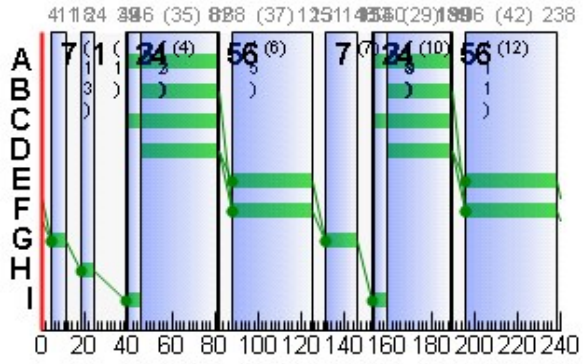
Banned Stage transitions for Controller Stream 1

		To						
		1	2	3	4	5	6	7
From	1							
	2							
	3							
	4							
	5							
	6							
	7							

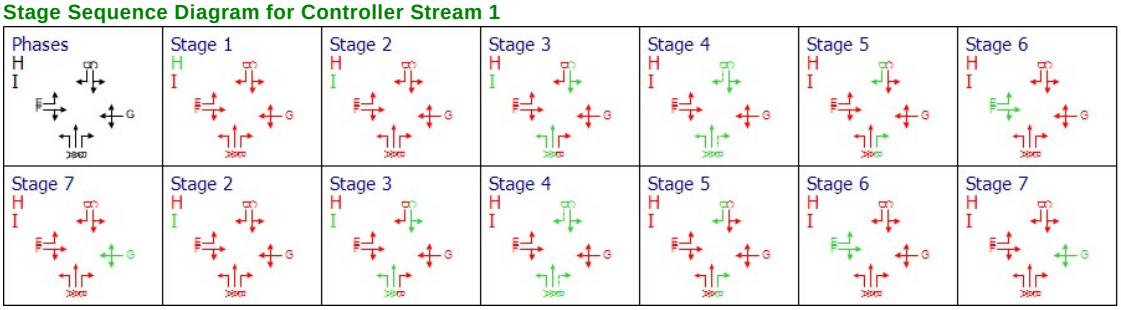
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
1	1		1	G	131	146	15	4	11	7
2	1		1	E	88	125	37	196	238	42
2	2		1	F	88	125	37	196	238	42
4	1		1	A	40	81	41	154	189	35
4	2		1	A	40	81	41	154	189	35
4	3		1	B	46	82	36	160	190	30
6	1		1	C	40	81	41	154	189	35
6	2		1	D	46	82	36	160	190	30

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (PCU)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	1	1	40	125	82	2050	22	56.96	2.93	16.87	18.42	1.00	19.42
	2	1	23	299	125	1644	79	29.81	3.12	78.07	14.70	1.10	15.80
		2	22	305	151	2013	79	29.60	4.00	99.97	17.63	1.32	18.94
	4	1	18	396	119	2019	76	27.11	2.02	101.00	12.72	0.76	13.48
		2	54	68	367	2105	76	32.39	11.12	532.98	46.88	3.57	50.45
		3	15	512	51	1225	66	29.71	0.93	46.65	5.98	0.38	6.36
	6	1	60	50	404	2069	76	38.39	12.91	371.03	61.18	4.33	65.51
		2	28	219	98	1226	66	35.97	2.64	88.05	13.90	0.96	14.86
	8	1	0	Unrestricted	96	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	0	Unrestricted	229	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	0	Unrestricted	552	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	0	Unrestricted	520	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	16	472	276	1800	240	0.25	0.32	1.16	0.27	0.07	0.33
	19	1	38	139	537	1800	240	4.93	7.27	38.88	10.44	1.90	12.34
	20	1	28	223	502	1800	240	0.39	0.05	0.47	0.77	0.00	0.77

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Calculated sat flow (PCU/hr)	Calculated capacity (PCU/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	1	1	82	82	0		2050	205	40		125	0.00	22
	2	1	125	125	0		1644	555	23		299	0.04	79
		2	151	151	0		2013	679	22		305	0.04	79
	4	1	119	119	0		2019	656	18		396	0.41	76
		2	367	367	0		2105	684	54		68	0.41	76
		3	51	51	0		1225	347	15		512	0.41	66
	6	1	404	404	0		2069	672	60		50	0.00	76
		2	98	98	0		1226	347	28		219	0.00	66
	8	1	96	96	0		Unrestricted	Unrestricted	0		Unrestricted	0.95	240
	9	1	229	229	0		Unrestricted	Unrestricted	0		Unrestricted	0.99	240
	10	1	552	552	0		Unrestricted	Unrestricted	0		Unrestricted	0.62	240
	11	1	520	520	0		Unrestricted	Unrestricted	0		Unrestricted	0.65	240
	18	1	276	276	0		1800	1755	16		472	0.00	240
	19	1	537	537	0		1800	1425	38		139	0.00	240
	20	1	502	502	0		1800	1800	28		223	0.00	240

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	1	1	12.00	56.96	1.30	18.42	96.94	79.49	1.00
	2	1	2.76	29.81	1.04	14.70	69.98	87.47	1.10
		2	2.76	29.60	1.24	17.63	69.54	105.00	1.32
	4	1	1.44	27.11	0.90	12.72	50.93	60.60	0.76
		2	1.44	32.39	3.30	46.88	77.56	284.65	3.57
		3	1.44	29.71	0.42	5.98	59.28	30.24	0.38
	6	1	2.40	38.39	4.31	61.18	85.44	345.18	4.33
		2	2.40	35.97	0.98	13.90	78.17	76.61	0.96
	8	1	24.85	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	43.22	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	41.95	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	41.84	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	19.18	0.25	0.02	0.27	1.91	5.28	0.07
	19	1	12.91	4.93	0.73	10.44	28.25	151.70	1.90
	20	1	7.85	0.39	0.05	0.77	0.00	0.00	0.00

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (PCU)	Mean max queue (PCU)	Max queue storage (PCU)	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))	Estimated blocking
08:00-09:00	1	1	0.00	2.93	17.39	16.87	0.00	0.00	
	2	1	0.00	3.12	4.00	78.07	0.00	0.00	
		2	0.00	4.00	4.00	99.97	0.00	0.00	
	4	1	0.00	2.02	2.00	101.00	0.00	0.00	
		2	0.00	11.12	2.09	532.98	0.00	0.00	
		3	0.00	0.93	2.00	46.65	0.00	48.00	
	6	1	0.00	12.91	3.48	371.03	0.00	0.00	
		2	0.00	2.64	3.00	88.05	0.00	0.00	
	8	1	0.00	0.00	36.02	0.00	0.00	133.00	
	9	1	0.00	0.00	62.63	0.00	0.00	103.00	
	10	1	0.00	0.00	60.80	0.00	0.00	9.00	
	11	1	0.00	0.00	60.64	0.00	0.00	13.00	
	18	1	0.00	0.32	27.79	1.16	0.00	6.00	
	19	1	0.00	7.27	18.71	38.88	0.00	161.00	
	20	1	0.00	0.05	11.37	0.47	0.00	148.00	

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (PCU)	Max End of Green Queue EoTS (PCU)	Max End of Red Queue EoTS (PCU)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	1	1	0.00	0.00	✓	2.93	0.13	2.84	1.00	0.00	19.42
	2	1	0.00	0.00	✓	3.12	0.03	3.12	1.00	0.00	15.80
		2	0.00	0.00	✓	4.00	0.03	3.76	1.00	0.00	18.94
	4	1	0.00	0.00	✓	2.02	0.02	2.02	1.00	0.00	13.48
		2	0.00	0.00	✓	11.12	0.31	6.48	1.00	0.00	50.45
		3	0.00	0.00	✓	0.93	0.01	0.93	1.00	0.00	6.36
	6	1	0.00	0.00	✓	12.91	0.45	10.55	1.00	0.00	65.51
		2	0.00	0.00	✓	2.64	0.06	2.64	1.00	0.00	14.86
	8	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	10	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	11	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	18	1	0.00	0.00	✓	0.32			1.00	0.00	0.33
	19	1	0.00	0.00	✓	7.27			1.00	0.00	12.34
	20	1	0.00	0.00	✓	0.05			1.00	0.00	0.77

Network Results

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
1	10/01/2022 15:39:28	10/01/2022 15:39:31	08:00	120	218.26	14.29	60.08	6/1	0	0	6/1	19/1	6/

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	60	50	4109	2220	12.52	202.89	15.38	218.26

Network Results: Flows and signals

Time Segment	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
08:00-09:00	4109	4109	0		60		50	2220

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	18.76	12.52	14.29	202.89	29.84	1226.23	15.38

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))
08:00-09:00	532.98	0.00	621.00

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	218.26

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	76.6	93.7	93.8
	2	112.2	0.0	110.9	110.8
	3	89.6	73.8	0.0	93.5
	4	89.8	73.9	91.0	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (PCU/hr)	Normal journey time (s)	Calculated Total Flow (PCU/hr)	Avg journey time (s)
2	2	1	12	112.17	12	112.17
6	2	4	28	110.80	28	110.80
10	1	4	125	93.84	125	93.84
11	2	3	42	110.91	42	110.91
12	4	1	98	89.82	98	89.82
16	1	2	18	76.63	18	76.63
17	1	3	133	93.73	133	93.73
18	4	2	27	73.88	27	73.88
19	4	3	377	90.98	377	90.98
20	3	1	119	89.60	119	89.60
21	3	4	367	93.51	367	93.51
22	3	2	51	73.84	51	73.84

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES	
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)	D wei mu
1	1			1	G	82	2050	22	0.00	40	125	68.96	56.96	96.94	2.93	
2	1			1	E	125	1644	79	0.00	23	299	32.57	29.81	69.98	3.12	
	2			1	F	151	2013	79	0.00	22	305	32.36	29.60	69.54	4.00	
4	1			1	A	119 <	2019	76	0.00	18	396	28.55	27.11	50.93	2.02 +	
	2			1	A	367 <	2105	76	0.00	54	68	33.83	32.39	77.56	11.12 +	
	3			1	B	51	1225	66	48.00	15	512	31.15	29.71	59.28	0.93	
6	1			1	C	404 <	2069	76	0.00	60	50	40.79	38.39	85.44	12.91 +	
	2			1	D	98	1226	66	0.00	28	219	38.37	35.97	78.17	2.64	
8	1					96	Unrestricted	240	133.00	0	Unrestricted	24.85	0.00	0.00	0.00	
9	1					229	Unrestricted	240	103.00	0	Unrestricted	43.22	0.00	0.00	0.00	
10	1					552	Unrestricted	240	9.00	0	Unrestricted	41.95	0.00	0.00	0.00	
11	1					520	Unrestricted	240	13.00	0	Unrestricted	41.84	0.00	0.00	0.00	
18	1					276	1800	240	6.00	16	472	19.42	0.25	1.91	0.32	
19	1					537	1800	240	161.00	38	139	17.84	4.93	28.25	7.27	
20	1					502	1800	240	148.00	28	223	8.23	0.39	0.00	0.05	

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	642.41	35.70	17.99	14.29	202.89	15.38	0.00	218.26
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians								
TOTAL	642.41	35.70	17.99	14.29	202.89	15.38	0.00	218.26

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

A2 - 2017 Base PM
D2 - 2017 Base PM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
2	10/01/2022 15:39:31	10/01/2022 15:39:36	15:00	120	235.24	15.42	69.68	4/2	0	0	4/2	19/1	4/

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
2017 Base PM		D2	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2017 Base PM				15:00	

Network Options

Network timings

Network cycle time (s)	Restrict to SCOOT cycle times	Time segment length (min)	Number of time segments	Modelled time period (min)
120		60	1	60

Signals options

Start displacement (s)	End displacement (s)
2	3

Advanced

Phase minimum broken penalty (£)	Phase maximum broken penalty (£)	Intergreen broken penalty (£)	Starting Red-with-Amber (s)
10000.00	10000.00	10000.00	2

Traffic options

Traffic model	Vehicle flow scaling factor (%)	Pedestrian flow scaling factor (%)	Cruise times or speeds
Platoon Dispersion (PDM)	100	100	Cruise Speeds

Advanced

Resolution	DOS Threshold (%)	Cruise scaling factor (%)	Use link stop weightings	Use link delay weightings	Exclude pedestrians from results calculation	Random delay mode	Type of Vehicle-in-Service	Type of random parameter	PCU Length (m)	Calculate results for Path Segments	Generate PDM Profile Data
1	90	100	✓	✓		Complex	Uniform (TRANSYT)	Uniform (TRANSYT)	5.75		✓

Normal Traffic parameters

Dispersion type	Dispersion coefficient	Travel time coefficient
Default	35	80

Normal Traffic Types

Name	PCU Factor
Normal	1.00

Bus parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Bus	1.00	Default	0.94	30	85

Tram parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Tram	1.00	Default	0.94	100	100

Pedestrian parameters

Dispersion type
Default

Optimisation options

Enable optimisation	Auto redistribute	Optimisation level	Enable OUT Profile accuracy
✓	✓	Offsets And Green Splits	✓

Advanced

Optimisation type	Hill climb increments	OUTProfile accuracy	Use enhanced optimisation	Auto optimisation order	Optimisation order	Master controller	Offsets relative to master controller	Master controller offset after each run
Hill Climb (Fast)	15, 40, -1, 15, 40, 1, -1, 1	50, 50, 5, 5, 0.5, 0.5, 0.05, 0.05		✓	1			Do nothing

Economics

Vehicle Monetary Value Of Delay (£ per PCU-hr)	Vehicle Monetary Value Of Stops (£ per 100 stops)	Pedestrian monetary value of delay (£ per Ped-hr)
14.20	2.60	14.20

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
(ALL)			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
1	1			✓	100.00	✓	Sum of lanes	2051	✓		Normal	
2	1				23.00	✓	Sum of lanes	1644	✓		Normal	
	2				23.00	✓	Sum of lanes	2010	✓		Normal	
4	1				12.00	✓	Sum of lanes	2019	✓		Normal	
	2				12.00	✓	Sum of lanes	2105	✓		Normal	
	3				12.00	✓	Sum of lanes	2044	✓	✓	Normal	
6	1				20.00	✓	Sum of lanes	2069	✓		Normal	
	2				20.00	✓	Sum of lanes	2073	✓	✓	Normal	
8	1			✓	207.10						Normal	
9	1			✓	360.14						Normal	
10	1			✓	349.62						Normal	
11	1			✓	348.70						Normal	
18	1			✓	159.81	✓	Sum of lanes	1800			Normal	
19	1			✓	107.58	✓	Sum of lanes	1800			Normal	
20	1			✓	65.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
1	1	1	(untitled)		✓	N/A	N/A	0	3.60	✓	84	40.10		2051
2	1	2	(untitled)		✓	N/A	N/A	0	3.00		100	6.00		1644
	2	1	(untitled)		✓	N/A	N/A	0	3.00	✓	93	62.68		2010
4	1	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	35.42		2019
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	0	99999.00		2105
	3	1	(untitled)		✓	N/A	N/A	0	3.50		24	12.00		2044
6	1	1	(untitled)		✓	N/A	N/A	0	3.50		7	6.00		2069
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	96.34		2073
8	1	1	(untitled)											
9	1	1	(untitled)											
10	1	1	(untitled)											
11	1	1	(untitled)											
18	1	1	(untitled)											1800
19	1	1	(untitled)											1800
20	1	1	(untitled)											1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
1	1	NetworkDefault	100	100	100		0.00		
2	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
4	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
	3	Flare	100	100	100		0.00		
6	1	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
8	1	NetworkDefault	100	100	100		0.00		
9	1	NetworkDefault	100	100	100		0.00		
10	1	NetworkDefault	100	100	100		0.00		
11	1	NetworkDefault	100	100	100		0.00		
18	1	NetworkDefault	100	100	100		0.00		
19	1	NetworkDefault	100	100	100		0.00		
20	1	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	240

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
1	1	137	137
2	1	177	177
	2	112	112
4	1	113	113
	2	440	440
	3	21	21
6	1	273	273
	2	107	107
8	1	38	38
9	1	242	242
10	1	432	432
11	1	668	668
18	1	289	289
19	1	574	574
20	1	380	380

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
1	1	1	G	
2	1	1	E	
	2	1	F	
4	1	1	A	
	2	1	A	
	3	1	B	
6	1	1	C	
	2	1	D	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
1	1	12.00	30.00
18	1	19.18	30.00
19	1	12.91	30.00
20	1	7.85	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
2	1	1	18/1	2/1	2.76	30.00	✓	Straight	Straight Movement
	2	1	18/1	2/2	2.76	30.00	✓	Straight	Straight Movement
4	1	1	19/1	4/1	1.44	30.00	✓	Straight	Straight Movement
	2	1	19/1	4/2	1.44	30.00	✓	Straight	Straight Movement
	3	1	19/1	4/3	1.44	30.00	✓	Straight	Straight Movement
6	1	1	20/1	6/1	2.40	30.00	✓	Straight	Straight Movement
	2	1	20/1	6/2	2.40	30.00	✓	Straight	Straight Movement
8	1	1	6/1	8/1	24.85	30.00	✓	Nearside	33.17
9	1	1	4/1	9/1	43.22	30.00	✓	Nearside	35.42
10	1	1	1/1	10/1	41.95	30.00	✓	Nearside	40.10
11	1	1	1/1	11/1	41.84	30.00	✓	Offside	91.65
8	1	2	2/2	8/1	24.85	30.00	✓	Straight	Straight Movement
9	1	2	1/1	9/1	43.22	30.00	✓	Straight	Straight Movement
10	1	2	6/1	10/1	41.95	30.00	✓	Straight	Straight Movement
11	1	2	2/1	11/1	41.84	30.00	✓	Nearside	47.20
8	1	3	4/3	8/1	24.85	30.00	✓	Offside	62.46
9	1	3	6/2	9/1	43.22	30.00	✓	Offside	96.34
10	1	3	2/2	10/1	41.95	30.00	✓	Offside	62.68
11	1	3	4/2	11/1	41.84	30.00	✓	Straight	Straight Movement

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
(ALL)	(ALL)	Movement		

Give Way Data - Movements

Arm	Traffic Stream	Movement	Destination traffic stream	Max Flow (Opposed) (PCU/hr)	Max Flow (Unopposed) (PCU/hr)	Percentage opposed (%)
4	3	1	8/1	1200	2044	100
6	2	1	9/1	1200	2073	100

Give Way Data - Movements - Conflicts

Arm	Traffic Stream	Movement	Destination traffic stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
4	3	1	8/1		TrafficStream	6/1	100	0.00		0	0
6	2	1	9/1		TrafficStream	4/1	100	0.00		0	0

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation			✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To			
		1	2	3	4
From	1	0	8	104	177
	2	22	0	64	51
	3	113	21	0	440
	4	107	9	264	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows not shown as they are blank.

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	18/1	9/1	#0000FF
	2	(untitled)	1/1	8/1	#FF0000
	3	(untitled)	19/1	10/1	#00FF00
	4	(untitled)	20/1	11/1	#FFFF00

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	2		2	1	1/1, 9/1	Normal	22
	6		2	4	1/1, 11/1	Normal	51
	10		1	4	18/1, 2/1, 11/1	Normal	177
	11		2	3	1/1, 10/1	Normal	64
	12		4	1	20/1, 6/2, 9/1	Normal	107
	16		1	2	18/1, 2/2, 8/1	Normal	8
	17		1	3	18/1, 2/2, 10/1	Normal	104
	18		4	2	20/1, 6/1, 8/1	Normal	9
	19		4	3	20/1, 6/1, 10/1	Normal	264
	20		3	1	19/1, 4/1, 9/1	Normal	113
	21		3	4	19/1, 4/2, 11/1	Normal	440
	22		3	2	19/1, 4/3, 8/1	Normal	21

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	Manual	240

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Absolute

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Unknown
	B	(untitled)	7	300	0	0	Unknown
	C	(untitled)	7	300	0	0	Unknown
	D	(untitled)	7	300	0	0	Unknown
	E	(untitled)	7	300	0	0	Unknown
	F	(untitled)	7	300	0	0	Unknown
	G	(untitled)	7	300	0	0	Unknown
	H	(untitled)	6	300	0	0	Unknown
	I	(untitled)	7	300	0	0	Cycle

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	H	1
	2	I	1
	3	A, C, I	1
	4	A, B, C, D	1
	5	B, D	1
	6	E, F	1
	7	G	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6, 7, 2, 3, 4, 5, 6, 7	29, 45, 51, 80, 81, 121, 146, 154, 160, 189, 190, 238, 16

Intergreen Matrix for Controller Stream 1

		To								
		A	B	C	D	E	F	G	H	I
From	A					7	7	7	7	
	B						6	6	7	
	C						7	7	7	
	D					6	6	6	7	
	E	6			6			6	7	
	F	6	6	6	6			6	7	
	G	6	6	6	6	6	6		7	7
	H	15	15	15	15	15	15	15		15
	I							7	7	

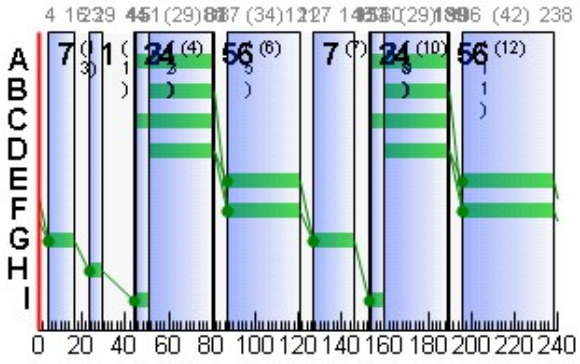
Banned Stage transitions for Controller Stream 1

		To						
		1	2	3	4	5	6	7
From	1							
	2							
	3							
	4							
	5							
	6							
	7							

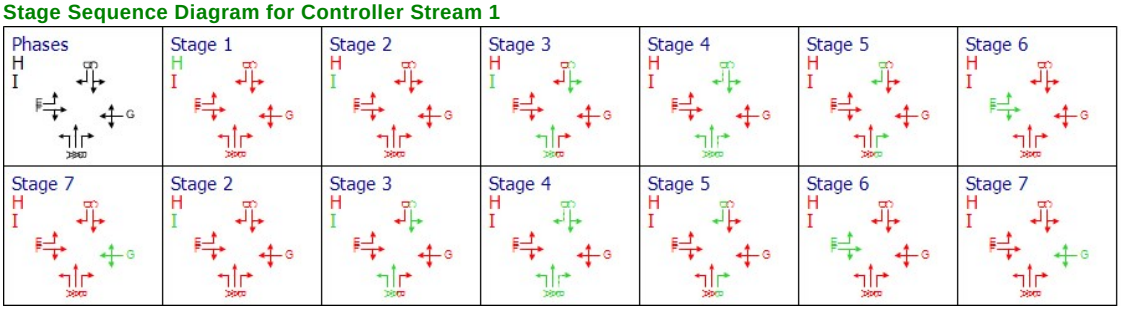
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
1	1		1	G	127	146	19	4	16	12
2	1		1	E	87	121	34	196	238	42
2	2		1	F	87	121	34	196	238	42
4	1		1	A	45	80	35	154	189	35
4	2		1	A	45	80	35	154	189	35
4	3		1	B	51	81	30	160	190	30
6	1		1	C	45	80	35	154	189	35
6	2		1	D	51	81	30	160	190	30

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
15:00-16:00	1	0.00	0.00	0.00	0.00

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (PCU)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
15:00-16:00	1	1	49	85	137	2051	31	53.99	4.68	26.91	29.18	1.64	30.82
	2	1	33	172	177	1644	76	31.93	4.08	102.04	22.29	1.52	23.81
		2	17	425	112	2010	76	29.47	2.55	63.72	13.02	0.93	13.94
	4	1	19	382	113	2019	70	29.33	2.02	101.07	13.07	0.76	13.83
		2	70	29	440	2105	70	39.79	15.45	740.52	69.05	5.02	74.07
		3	7	1259	21	1227	60	30.96	0.40	19.90	2.56	0.15	2.72
	6	1	44	105	273	2069	70	36.70	8.44	242.54	39.52	2.77	42.29
		2	34	167	107	1228	60	39.65	3.06	101.92	16.73	1.10	17.84
	8	1	0	Unrestricted	38	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	0	Unrestricted	242	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	0	Unrestricted	432	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	0	Unrestricted	668	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	18	412	289	1800	240	0.89	1.46	5.27	1.01	0.31	1.32
	19	1	40	124	574	1800	240	5.32	8.43	45.04	12.04	2.08	14.12
	20	1	21	321	380	1800	240	0.30	0.35	3.04	0.44	0.04	0.49

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Calculated sat flow (PCU/hr)	Calculated capacity (PCU/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
15:00-16:00	1	1	137	137	0		2051	282	49		85	0.00	31
	2	1	177	177	0		1644	534	33		172	0.16	76
		2	112	112	0		2010	653	17		425	0.16	76
	4	1	113	113	0		2019	606	19		382	0.40	70
		2	440	440	0		2105	632	70		29	0.40	70
		3	21	21	0		1227	317	7		1259	0.40	60
	6	1	273	273	0		2069	621	44		105	0.02	70
		2	107	107	0		1228	317	34		167	0.02	60
	8	1	38	38	0		Unrestricted	Unrestricted	0		Unrestricted	0.96	240
	9	1	242	242	0		Unrestricted	Unrestricted	0		Unrestricted	0.95	240
	10	1	432	432	0		Unrestricted	Unrestricted	0		Unrestricted	0.55	240
	11	1	668	668	0		Unrestricted	Unrestricted	0		Unrestricted	0.61	240
	18	1	289	289	0		1800	1643	18		412	0.00	240
	19	1	574	574	0		1800	1427	40		124	0.00	240
	20	1	380	380	0		1800	1778	21		321	0.00	240

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
15:00-16:00	1	1	12.00	53.99	2.05	29.18	95.60	130.97	1.64
	2	1	2.76	31.93	1.57	22.29	68.29	120.88	1.52
		2	2.76	29.47	0.92	13.02	66.01	73.93	0.93
	4	1	1.44	29.33	0.92	13.07	53.66	60.64	0.76
		2	1.44	39.79	4.86	69.05	90.92	400.05	5.02
		3	1.44	30.96	0.18	2.56	57.22	12.02	0.15
	6	1	2.40	36.70	2.78	39.52	80.84	220.68	2.77
		2	2.40	39.65	1.18	16.73	82.16	87.91	1.10
	8	1	24.85	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	43.22	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	41.95	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	41.84	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	19.18	0.89	0.07	1.01	8.55	24.70	0.31
	19	1	12.91	5.32	0.85	12.04	28.89	165.85	2.08
	20	1	7.85	0.30	0.03	0.44	0.89	3.38	0.04

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (PCU)	Mean max queue (PCU)	Max queue storage (PCU)	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))	Estimated blocking
15:00-16:00	1	1	0.00	4.68	17.39	26.91	0.00	0.00	
	2	1	0.00	4.08	4.00	102.04	0.00	0.00	
		2	0.00	2.55	4.00	63.72	0.00	5.00	
	4	1	0.00	2.02	2.00	101.07	0.00	0.00	
		2	0.00	15.45	2.09	740.52	0.00	0.00	
		3	0.00	0.40	2.00	19.90	0.00	44.00	
	6	1	0.00	8.44	3.48	242.54	0.00	0.00	
		2	0.00	3.06	3.00	101.92	0.00	0.00	
	8	1	0.00	0.00	36.02	0.00	0.00	195.00	
	9	1	0.00	0.00	62.63	0.00	0.00	86.00	
	10	1	0.00	0.00	60.80	0.00	0.00	8.00	
	11	1	0.00	0.00	60.64	0.00	0.00	10.00	
	18	1	0.00	1.46	27.79	5.27	0.00	20.91	
	19	1	0.00	8.43	18.71	45.04	0.00	192.00	
	20	1	0.00	0.35	11.37	3.04	0.00	107.00	

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (PCU)	Max End of Green Queue EoTS (PCU)	Max End of Red Queue EoTS (PCU)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
15:00-16:00	1	1	0.00	0.00	✓	4.68	0.23	4.41	1.00	0.00	30.82
	2	1	0.00	0.00	✓	4.08	0.08	4.08	1.00	0.00	23.81
		2	0.00	0.00	✓	2.55	0.02	2.55	1.00	0.00	13.94
	4	1	0.00	0.00	✓	2.02	0.02	2.02	1.00	0.00	13.83
		2	0.00	0.00	✓	15.46	0.79	8.58	1.00	0.00	74.07
		3	0.00	0.00	✓	0.40	0.00	0.40	1.00	0.00	2.72
	6	1	0.00	0.00	✓	8.44	0.17	7.38	1.00	0.00	42.29
		2	0.00	0.00	✓	3.06	0.09	3.06	1.00	0.00	17.84
	8	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	10	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	11	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	18	1	0.00	0.00	✓	1.46			1.00	0.00	1.32
	19	1	0.00	0.00	✓	8.43			1.00	0.00	14.12
	20	1	0.00	0.00	✓	0.35			1.00	0.00	0.49

Network Results

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
2	10/01/2022 15:39:31	10/01/2022 15:39:36	15:00	120	235.24	15.42	69.68	4/2	0	0	4/2	19/1	4/

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
15:00-16:00	70	29	4003	2193	13.87	218.93	16.31	235.24

Network Results: Flows and signals

Time Segment	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
15:00-16:00	4003	4003	0		70		29	2193

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
15:00-16:00	19.38	13.87	15.42	218.93	32.50	1301.00	16.31

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))
15:00-16:00	740.52	0.00	667.91

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
15:00-16:00	0.00	0.00	✓	1.00	0.00	0.00	235.24

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	77.1	94.2	96.6
	2	109.2	0.0	107.9	107.8
	3	92.2	75.5	0.0	101.3
	4	93.4	72.1	89.2	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (PCU/hr)	Normal journey time (s)	Calculated Total Flow (PCU/hr)	Avg journey time (s)
2	2	1	22	109.21	22	109.21
6	2	4	51	107.84	51	107.84
10	1	4	177	96.59	177	96.59
11	2	3	64	107.95	64	107.95
12	4	1	107	93.41	107	93.41
16	1	2	8	77.14	8	77.14
17	1	3	104	94.25	104	94.25
18	4	2	9	72.10	9	72.10
19	4	3	264	89.20	264	89.20
20	3	1	113	92.21	113	92.21
21	3	4	440	101.30	440	101.30
22	3	2	21	75.48	21	75.48

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES	
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)	D wei mu
1	1			1	G	137	2051	31	0.00	49	85	65.99	53.99	95.60	4.68	
2	1			1	E	177 <	1644	76	0.00	33	172	34.69	31.93	68.29	4.08 +	
	2			1	F	112	2010	76	5.00	17	425	32.23	29.47	66.01	2.55	
4	1			1	A	113 <	2019	70	0.00	19	382	30.77	29.33	53.66	2.02 +	
	2			1	A	440 <	2105	70	0.00	70	29	41.23	39.79	90.92	15.45 +	
	3			1	B	21	1227	60	44.00	7	1259	32.40	30.96	57.22	0.40	
6	1			1	C	273 <	2069	70	0.00	44	105	39.10	36.70	80.84	8.44 +	
	2			1	D	107 <	1228	60	0.00	34	167	42.05	39.65	82.16	3.06 +	
8	1					38	Unrestricted	240	195.00	0	Unrestricted	24.85	0.00	0.00	0.00	
9	1					242	Unrestricted	240	86.00	0	Unrestricted	43.22	0.00	0.00	0.00	
10	1					432	Unrestricted	240	8.00	0	Unrestricted	41.95	0.00	0.00	0.00	
11	1					668	Unrestricted	240	10.00	0	Unrestricted	41.84	0.00	0.00	0.00	
18	1					289	1800	240	20.91	18	412	20.06	0.89	8.55	1.46	
19	1					574	1800	240	192.00	40	124	18.23	5.32	28.89	8.43	
20	1					380	1800	240	107.00	21	321	8.14	0.30	0.89	0.35	

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	646.61	36.97	17.49	15.42	218.93	16.31	0.00	235.24
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians								
TOTAL	646.61	36.97	17.49	15.42	218.93	16.31	0.00	235.24

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

A3 - 2020 7-8 AM
D3 - 2020 6-7 AM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
3	10/01/2022 15:39:36	10/01/2022 15:39:40	06:00	120	818.94	55.54	105.07	19/1	1	7	4/2	19/1	19/

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
2020 7-8 AM		D3	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2020 6-7 AM				06:00	

Network Options

Network timings

Network cycle time (s)	Restrict to SCOOT cycle times	Time segment length (min)	Number of time segments	Modelled time period (min)
120		60	1	60

Signals options

Start displacement (s)	End displacement (s)
2	3

Advanced

Phase minimum broken penalty (£)	Phase maximum broken penalty (£)	Intergreen broken penalty (£)	Starting Red-with-Amber (s)
10000.00	10000.00	10000.00	2

Traffic options

Traffic model	Vehicle flow scaling factor (%)	Pedestrian flow scaling factor (%)	Cruise times or speeds
Platoon Dispersion (PDM)	100	100	Cruise Speeds

Advanced

Resolution	DOS Threshold (%)	Cruise scaling factor (%)	Use link stop weightings	Use link delay weightings	Exclude pedestrians from results calculation	Random delay mode	Type of Vehicle-in-Service	Type of random parameter	PCU Length (m)	Calculate results for Path Segments	Generate PDM Profile Data
1	90	100	✓	✓		Complex	Uniform (TRANSYT)	Uniform (TRANSYT)	5.75		✓

Normal Traffic parameters

Dispersion type	Dispersion coefficient	Travel time coefficient
Default	35	80

Normal Traffic Types

Name	PCU Factor
Normal	1.00

Bus parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Bus	1.00	Default	0.94	30	85

Tram parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Tram	1.00	Default	0.94	100	100

Pedestrian parameters

Dispersion type
Default

Optimisation options

Enable optimisation	Auto redistribute	Optimisation level	Enable OUT Profile accuracy
✓	✓	Offsets And Green Splits	✓

Advanced

Optimisation type	Hill climb increments	OUTProfile accuracy	Use enhanced optimisation	Auto optimisation order	Optimisation order	Master controller	Offsets relative to master controller	Master controller offset after each run
Hill Climb (Fast)	15, 40, -1, 15, 40, 1, -1, 1	50, 50, 5, 5, 0.5, 0.5, 0.05, 0.05		✓	1			Do nothing

Economics

Vehicle Monetary Value Of Delay (£ per PCU-hr)	Vehicle Monetary Value Of Stops (£ per 100 stops)	Pedestrian monetary value of delay (£ per Ped-hr)
14.20	2.60	14.20

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
(ALL)			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
1	1			✓	100.00	✓	Sum of lanes	2051	✓		Normal	
2	1				23.00	✓	Sum of lanes	1644	✓		Normal	
	2				23.00	✓	Sum of lanes	2010	✓		Normal	
4	1				12.00	✓	Sum of lanes	2019	✓		Normal	
	2				12.00	✓	Sum of lanes	2105	✓		Normal	
	3				12.00	✓	Sum of lanes	2044	✓	✓	Normal	
6	1				20.00	✓	Sum of lanes	2069	✓		Normal	
	2				20.00	✓	Sum of lanes	2073	✓	✓	Normal	
8	1			✓	207.10						Normal	
9	1			✓	360.14						Normal	
10	1			✓	349.62						Normal	
11	1			✓	348.70						Normal	
18	1			✓	159.81	✓	Sum of lanes	1800			Normal	
19	1			✓	107.58	✓	Sum of lanes	1800			Normal	
20	1			✓	65.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
1	1	1	(untitled)		✓	N/A	N/A	0	3.60	✓	84	40.10		2051
2	1	2	(untitled)		✓	N/A	N/A	0	3.00		100	6.00		1644
	2	1	(untitled)		✓	N/A	N/A	0	3.00	✓	93	62.68		2010
4	1	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	35.42		2019
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	0	99999.00		2105
	3	1	(untitled)		✓	N/A	N/A	0	3.50		24	12.00		2044
6	1	1	(untitled)		✓	N/A	N/A	0	3.50		7	6.00		2069
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	96.34		2073
8	1	1	(untitled)											
9	1	1	(untitled)											
10	1	1	(untitled)											
11	1	1	(untitled)											
18	1	1	(untitled)											1800
19	1	1	(untitled)											1800
20	1	1	(untitled)											1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
1	1	NetworkDefault	100	100	100		0.00		
2	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
4	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
	3	Flare	100	100	100		0.00		
6	1	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
8	1	NetworkDefault	100	100	100		0.00		
9	1	NetworkDefault	100	100	100		0.00		
10	1	NetworkDefault	100	100	100		0.00		
11	1	NetworkDefault	100	100	100		0.00		
18	1	NetworkDefault	100	100	100		0.00		
19	1	NetworkDefault	100	100	100		0.00		
20	1	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	240

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
1	1	119	119
2	1	175	175
	2	111	111
4	1	157	157
	2	609	609
	3	119	119
6	1	190	190
	2	135	135
8	1	133	133
9	1	311	311
10	1	343	343
11	1	828	828
18	1	286	286
19	1	885	885
20	1	325	325

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
1	1	1	G	
2	1	1	E	
	2	1	F	
4	1	1	A	
	2	1	A	
	3	1	B	
6	1	1	C	
	2	1	D	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
1	1	12.00	30.00
18	1	19.18	30.00
19	1	12.91	30.00
20	1	7.85	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
2	1	1	18/1	2/1	2.76	30.00	✓	Straight	Straight Movement
	2	1	18/1	2/2	2.76	30.00	✓	Straight	Straight Movement
4	1	1	19/1	4/1	1.44	30.00	✓	Straight	Straight Movement
	2	1	19/1	4/2	1.44	30.00	✓	Straight	Straight Movement
	3	1	19/1	4/3	1.44	30.00	✓	Straight	Straight Movement
6	1	1	20/1	6/1	2.40	30.00	✓	Straight	Straight Movement
	2	1	20/1	6/2	2.40	30.00	✓	Straight	Straight Movement
8	1	1	6/1	8/1	24.85	30.00	✓	Nearside	33.17
9	1	1	4/1	9/1	43.22	30.00	✓	Nearside	35.42
10	1	1	1/1	10/1	41.95	30.00	✓	Nearside	40.10
11	1	1	1/1	11/1	41.84	30.00	✓	Offside	91.65
8	1	2	2/2	8/1	24.85	30.00	✓	Straight	Straight Movement
9	1	2	1/1	9/1	43.22	30.00	✓	Straight	Straight Movement
10	1	2	6/1	10/1	41.95	30.00	✓	Straight	Straight Movement
11	1	2	2/1	11/1	41.84	30.00	✓	Nearside	47.20
8	1	3	4/3	8/1	24.85	30.00	✓	Offside	62.46
9	1	3	6/2	9/1	43.22	30.00	✓	Offside	96.34
10	1	3	2/2	10/1	41.95	30.00	✓	Offside	62.68
11	1	3	4/2	11/1	41.84	30.00	✓	Straight	Straight Movement

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
(ALL)	(ALL)	Movement		

Give Way Data - Movements

Arm	Traffic Stream	Movement	Destination traffic stream	Max Flow (Opposed) (PCU/hr)	Max Flow (Unopposed) (PCU/hr)	Percentage opposed (%)
4	3	1	8/1	1200	2044	100
6	2	1	9/1	1200	2073	100

Give Way Data - Movements - Conflicts

Arm	Traffic Stream	Movement	Destination traffic stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
4	3	1	8/1		TrafficStream	6/1	100	0.00		0	0
6	2	1	9/1		TrafficStream	4/1	100	0.00		0	0

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation			✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To			
		1	2	3	4
From	1	0	8	103	175
	2	19	0	56	44
	3	157	119	0	609
	4	135	6	184	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows not shown as they are blank.

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	18/1	9/1	#0000FF
	2	(untitled)	1/1	8/1	#FF0000
	3	(untitled)	19/1	10/1	#00FF00
	4	(untitled)	20/1	11/1	#FFFF00

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	2		2	1	1/1, 9/1	Normal	19
	6		2	4	1/1, 11/1	Normal	44
	10		1	4	18/1, 2/1, 11/1	Normal	175
	11		2	3	1/1, 10/1	Normal	56
	12		4	1	20/1, 6/2, 9/1	Normal	135
	16		1	2	18/1, 2/2, 8/1	Normal	8
	17		1	3	18/1, 2/2, 10/1	Normal	103
	18		4	2	20/1, 6/1, 8/1	Normal	6
	19		4	3	20/1, 6/1, 10/1	Normal	184
	20		3	1	19/1, 4/1, 9/1	Normal	157
	21		3	4	19/1, 4/2, 11/1	Normal	609
	22		3	2	19/1, 4/3, 8/1	Normal	119

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	Manual	240

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Absolute

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Unknown
	B	(untitled)	7	300	0	0	Unknown
	C	(untitled)	7	300	0	0	Unknown
	D	(untitled)	7	300	0	0	Unknown
	E	(untitled)	7	300	0	0	Unknown
	F	(untitled)	7	300	0	0	Unknown
	G	(untitled)	7	300	0	0	Unknown
	H	(untitled)	6	300	0	0	Unknown
	I	(untitled)	7	300	0	0	Cycle

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	H	1
	2	I	1
	3	A, C, I	1
	4	A, B, C, D	1
	5	B, D	1
	6	E, F	1
	7	G	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6, 7, 2, 3, 4, 5, 6, 7	35, 51, 57, 86, 91, 129, 146, 154, 160, 193, 210, 2, 22

Intergreen Matrix for Controller Stream 1

		To								
		A	B	C	D	E	F	G	H	I
From	A					7	7	7	7	
	B						6	6	7	
	C						7	7	7	
	D					6	6	6	7	
	E	6			6			6	7	
	F	6	6	6	6			6	7	
	G	6	6	6	6	6	6		7	7
	H	15	15	15	15	15	15	15		15
	I							7	7	

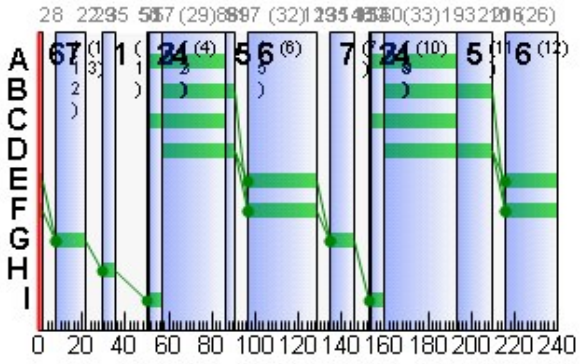
Banned Stage transitions for Controller Stream 1

		To						
		1	2	3	4	5	6	7
From	1							
	2							
	3							
	4							
	5							
	6							
	7							

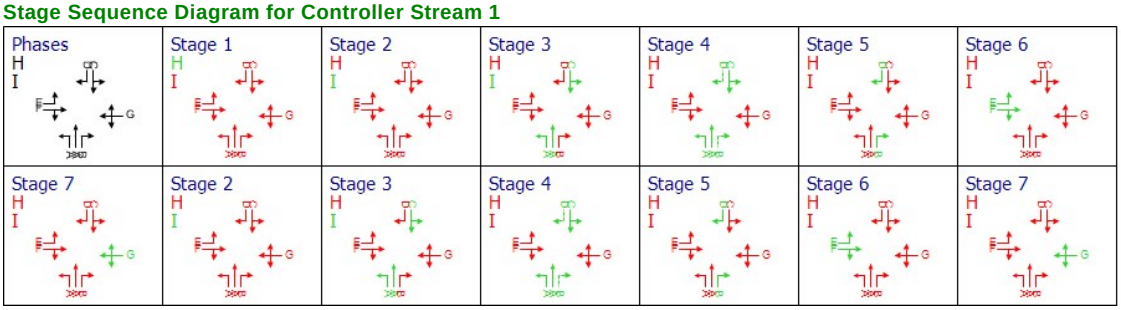
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
1	1		1	G	135	146	11	8	22	14
2	1		1	E	97	129	32	216	2	26
2	2		1	F	97	129	32	216	2	26
4	1		1	A	51	86	35	154	193	39
4	2		1	A	51	86	35	154	193	39
4	3		1	B	57	91	34	160	210	50
6	1		1	C	51	86	35	154	193	39
6	2		1	D	57	91	34	160	210	50

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
06:00-07:00	1	0.00	0.00	0.00	0.00

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (PCU)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
06:00-07:00	1	1	52	75	119	2051	25	58.51	4.17	23.99	27.46	1.48	28.95
	2	1	43	111	175	1644	58	39.75	4.16	103.93	27.44	1.58	29.01
		2	22	307	111	2010	58	36.09	2.57	64.21	15.80	0.97	16.77
	4	1	23	285	149	2019	74	29.99	2.04	101.81	17.68	0.77	18.44
		2	87	4	580	2105	74	49.41	17.53	839.78	112.97	6.15	119.11
		3	22	303	113	1416	84	14.89	1.32	66.09	6.65	0.38	7.03
	6	1	29	210	190	2069	74	32.82	5.18	148.88	24.60	1.70	26.30
		2	26	240	135	1423	84	29.25	3.05	101.58	15.58	1.21	16.78
	8	1	0	Unrestricted	127	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	0	Unrestricted	303	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	0	Unrestricted	343	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	0	Unrestricted	799	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	18	387	286	1800	240	1.69	1.93	6.94	1.91	0.53	2.45
	19	1	105	-14	885	1800	240	154.12	84.42	451.21	538.01	15.31	553.32
	20	1	19	378	325	1800	240	0.48	1.11	9.72	0.62	0.17	0.79

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Calculated sat flow (PCU/hr)	Calculated capacity (PCU/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
06:00-07:00	1	1	119	119	0		2051	231	52		75	0.00	25
	2	1	175	175	0		1644	411	43		111	0.26	58
		2	111	111	0		2010	503	22		307	0.26	58
	4	1	149	149	8	✓	2019	639	23		285	1.05	74
		2	580	580	29	✓	2105	667	87		4	1.05	74
		3	113	113	6	✓	1416	507	22		303	1.05	84
	6	1	190	190	0		2069	655	29		210	0.08	74
		2	135	135	0		1423	510	26		240	0.08	84
	8	1	127	127	6	✓	Unrestricted	Unrestricted	0		Unrestricted	0.94	240
	9	1	303	303	8	✓	Unrestricted	Unrestricted	0		Unrestricted	0.88	240
	10	1	343	343	0		Unrestricted	Unrestricted	0		Unrestricted	0.51	240
	11	1	799	799	29	✓	Unrestricted	Unrestricted	0		Unrestricted	0.60	240
	18	1	286	286	0		1800	1546	18		387	0.00	240
	19	1	885	842	0		1800	842	105	✓	-14	0.00	240
	20	1	325	325	0		1800	1725	19		378	0.00	240

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
06:00-07:00	1	1	12.00	58.51	1.93	27.46	99.42	118.30	1.48
	2	1	2.76	39.75	1.93	27.44	71.83	125.71	1.58
		2	2.76	36.09	1.11	15.80	69.41	77.04	0.97
	4	1	1.44	29.99	1.24	17.68	40.88	61.09	0.77
		2	1.44	49.41	7.96	112.97	84.60	490.35	6.15
		3	1.44	14.89	0.47	6.65	26.87	30.43	0.38
	6	1	2.40	32.82	1.73	24.60	71.26	135.40	1.70
		2	2.40	29.25	1.10	15.58	71.37	96.35	1.21
	8	1	24.85	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	43.22	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	41.95	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	41.84	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	19.18	1.69	0.13	1.91	14.89	42.57	0.53
	19	1	12.91	154.12	37.89	538.01	144.96	1220.94	15.31
	20	1	7.85	0.48	0.04	0.62	4.16	13.53	0.17

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (PCU)	Mean max queue (PCU)	Max queue storage (PCU)	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))	Estimated blocking
06:00-07:00	1	1	0.00	4.17	17.39	23.99	0.00	0.00	
	2	1	0.00	4.16	4.00	103.93	0.00	0.00	
		2	0.00	2.57	4.00	64.21	0.00	6.00	
	4	1	0.00	2.04	2.00	101.81	0.00	0.00	
		2	0.00	17.53	2.09	839.78	0.00	0.00	
		3	0.00	1.32	2.00	66.09	0.00	0.00	
	6	1	0.00	5.18	3.48	148.88	0.00	0.00	
		2	0.00	3.05	3.00	101.58	0.00	0.00	
	8	1	0.00	0.00	36.02	0.00	0.00	119.00	
	9	1	0.00	0.00	62.63	0.00	0.00	67.00	
	10	1	0.00	0.00	60.80	0.00	0.00	17.00	
	11	1	0.00	0.00	60.64	0.00	0.00	11.00	
	18	1	0.00	1.93	27.79	6.94	0.00	34.00	
	19	1	0.00	84.42	18.71	451.21	0.00	240.00	
	20	1	0.00	1.11	11.37	9.72	0.00	50.00	

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (PCU)	Max End of Green Queue EoTS (PCU)	Max End of Red Queue EoTS (PCU)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
06:00-07:00	1	1	0.00	0.00	✓	4.17	0.27	3.97	1.00	0.00	28.95
	2	1	0.00	0.00	✓	4.16	0.16	4.16	1.00	0.00	29.01
		2	0.00	0.00	✓	2.57	0.03	2.57	1.00	0.00	16.77
	4	1	0.00	0.00	✓	2.04	0.04	2.04	1.00	0.00	18.44
		2	0.00	0.00	✓	17.63	2.78	10.54	1.00	0.00	119.11
		3	0.00	0.00	✓	1.32	0.03	1.32	1.00	0.00	7.03
	6	1	0.00	0.00	✓	5.18	0.06	5.16	1.00	0.00	26.30
		2	0.00	0.00	✓	3.05	0.05	3.05	1.00	0.00	16.78
	8	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	10	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	11	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	18	1	0.00	0.00	✓	1.93			1.00	0.00	2.45
	19	1	0.00	0.00	✓	106.76			1.00	0.00	553.32
	20	1	0.00	0.00	✓	1.11			1.00	0.00	0.79

Network Results

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
3	10/01/2022 15:39:36	10/01/2022 15:39:40	06:00	120	818.94	55.54	105.07	19/1	1	7	4/2	19/1	19/

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
06:00-07:00	105	-14	4641	2211	43.09	788.70	30.24	818.94

Network Results: Flows and signals

Time Segment	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
06:00-07:00	4641	4598	85	✓	105	✓	-14	2211

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
06:00-07:00	18.91	43.09	55.54	788.70	53.30	2411.72	30.24

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))
06:00-07:00	839.78	0.00	544.00

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
06:00-07:00	0.00	0.00	✓	1.00	0.00	0.00	818.94

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	84.6	101.7	105.2
	2	113.7	0.0	112.5	112.4
	3	241.7	208.2	0.0	259.7
	4	83.2	68.4	85.5	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (PCU/hr)	Normal journey time (s)	Calculated Total Flow (PCU/hr)	Avg journey time (s)
2	2	1	19	113.72	19	113.72
6	2	4	44	112.35	44	112.35
10	1	4	175	105.22	175	105.22
11	2	3	56	112.46	56	112.46
12	4	1	135	83.20	135	83.20
16	1	2	8	84.57	8	84.57
17	1	3	103	101.67	103	101.67
18	4	2	6	68.40	6	68.40
19	4	3	184	85.51	184	85.51
20	3	1	157	241.68	157	241.68
21	3	4	609	259.73	609	259.73
22	3	2	119	208.21	119	208.21

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES	
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)	w m
1	1			1	G	119	2051	25	0.00	52	75	70.51	58.51	99.42	4.17	
2	1			1	E	175 <	1644	58	0.00	43	111	42.51	39.75	71.83	4.16 +	
	2			1	F	111	2010	58	6.00	22	307	38.85	36.09	69.41	2.57	
4	1			1	A	149 <	2019	74	0.00	23	285	31.43	29.99	40.88	2.04 +	
	2			1	A	580 <	2105	74	0.00	87	4	50.85	49.41	84.60	17.53 +	
	3			1	B	113	1416	84	0.00	22	303	16.33	14.89	26.87	1.32	
6	1			1	C	190 <	2069	74	0.00	29	210	35.22	32.82	71.26	5.18 +	
	2			1	D	135 <	1423	84	0.00	26	240	31.65	29.25	71.37	3.05 +	
8	1					127	Unrestricted	240	119.00	0	Unrestricted	24.85	0.00	0.00	0.00	
10	1					343	Unrestricted	240	17.00	0	Unrestricted	41.95	0.00	0.00	0.00	
11	1					799	Unrestricted	240	11.00	0	Unrestricted	41.84	0.00	0.00	0.00	
18	1					286	1800	240	34.00	18	387	20.87	1.69	14.89	1.93	
19	1					885 <	1800	240	240.00	105	-14	167.03	154.12	144.96	84.42 +	
20	1					325	1800	240	50.00	19	378	8.33	0.48	4.16	1.11	

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	731.27	79.92	9.15	55.54	788.70	30.24	0.00	818.94
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians								
TOTAL	731.27	79.92	9.15	55.54	788.70	30.24	0.00	818.94

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

A4 - 2020 4-5 PM
D4 - 2020 4-5 PM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
4	10/01/2022 15:39:44	10/01/2022 15:39:48	16:00	120	231.06	15.12	74.91	6/1	0	0	6/1	20/1	6/

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
2020 4-5 PM		D4	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2020 4-5 PM				16:00	

Network Options

Network timings

Network cycle time (s)	Restrict to SCOOT cycle times	Time segment length (min)	Number of time segments	Modelled time period (min)
120		60	1	60

Signals options

Start displacement (s)	End displacement (s)
2	3

Advanced

Phase minimum broken penalty (£)	Phase maximum broken penalty (£)	Intergreen broken penalty (£)	Starting Red-with-Amber (s)
10000.00	10000.00	10000.00	2

Traffic options

Traffic model	Vehicle flow scaling factor (%)	Pedestrian flow scaling factor (%)	Cruise times or speeds
Platoon Dispersion (PDM)	100	100	Cruise Speeds

Advanced

Resolution	DOS Threshold (%)	Cruise scaling factor (%)	Use link stop weightings	Use link delay weightings	Exclude pedestrians from results calculation	Random delay mode	Type of Vehicle-in-Service	Type of random parameter	PCU Length (m)	Calculate results for Path Segments	Generate PDM Profile Data
1	90	100	✓	✓		Complex	Uniform (TRANSYT)	Uniform (TRANSYT)	5.75		✓

Normal Traffic parameters

Dispersion type	Dispersion coefficient	Travel time coefficient
Default	35	80

Normal Traffic Types

Name	PCU Factor
Normal	1.00

Bus parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Bus	1.00	Default	0.94	30	85

Tram parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Tram	1.00	Default	0.94	100	100

Pedestrian parameters

Dispersion type
Default

Optimisation options

Enable optimisation	Auto redistribute	Optimisation level	Enable OUT Profile accuracy
✓	✓	Offsets And Green Splits	✓

Advanced

Optimisation type	Hill climb increments	OUTProfile accuracy	Use enhanced optimisation	Auto optimisation order	Optimisation order	Master controller	Offsets relative to master controller	Master controller offset after each run
Hill Climb (Fast)	15, 40, -1, 15, 40, 1, -1, 1	50, 50, 5, 5, 0.5, 0.5, 0.05, 0.05		✓	1			Do nothing

Economics

Vehicle Monetary Value Of Delay (£ per PCU-hr)	Vehicle Monetary Value Of Stops (£ per 100 stops)	Pedestrian monetary value of delay (£ per Ped-hr)
14.20	2.60	14.20

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
(ALL)			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
1	1			✓	100.00	✓	Sum of lanes	2077	✓		Normal	
2	1				23.00	✓	Sum of lanes	1644	✓		Normal	
	2				23.00	✓	Sum of lanes	2012	✓		Normal	
4	1				12.00	✓	Sum of lanes	2019	✓		Normal	
	2				12.00	✓	Sum of lanes	2105	✓		Normal	
	3				12.00	✓	Sum of lanes	2044	✓	✓	Normal	
6	1				20.00	✓	Sum of lanes	2069	✓		Normal	
	2				20.00	✓	Sum of lanes	2073	✓	✓	Normal	
8	1			✓	207.10						Normal	
9	1			✓	360.14						Normal	
10	1			✓	349.62						Normal	
11	1			✓	348.70						Normal	
18	1			✓	159.81	✓	Sum of lanes	1800			Normal	
19	1			✓	107.58	✓	Sum of lanes	1800			Normal	
20	1			✓	65.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
1	1	1	(untitled)		✓	N/A	N/A	0	3.60	✓	49	40.10		2077
2	1	2	(untitled)		✓	N/A	N/A	0	3.00		100	6.00		1644
	2	1	(untitled)		✓	N/A	N/A	0	3.00	✓	89	62.68		2012
4	1	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	35.42		2019
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	0	99999.00		2105
	3	1	(untitled)		✓	N/A	N/A	0	3.50		24	12.00		2044
6	1	1	(untitled)		✓	N/A	N/A	0	3.50		7	6.00		2069
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	96.34		2073
8	1	1	(untitled)											
9	1	1	(untitled)											
10	1	1	(untitled)											
11	1	1	(untitled)											
18	1	1	(untitled)											1800
19	1	1	(untitled)											1800
20	1	1	(untitled)											1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
1	1	NetworkDefault	100	100	100		0.00		
2	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
4	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
	3	Flare	100	100	100		0.00		
6	1	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
8	1	NetworkDefault	100	100	100		0.00		
9	1	NetworkDefault	100	100	100		0.00		
10	1	NetworkDefault	100	100	100		0.00		
11	1	NetworkDefault	100	100	100		0.00		
18	1	NetworkDefault	100	100	100		0.00		
19	1	NetworkDefault	100	100	100		0.00		
20	1	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	240

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
1	1	86	86
2	1	66	66
	2	79	79
4	1	97	97
	2	298	298
	3	145	145
6	1	607	607
	2	160	160
8	1	195	195
9	1	301	301
10	1	649	649
11	1	393	393
18	1	145	145
19	1	540	540
20	1	767	767

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
1	1	1	G	
2	1	1	E	
	2	1	F	
4	1	1	A	
	2	1	A	
	3	1	B	
6	1	1	C	
	2	1	D	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
1	1	12.00	30.00
18	1	19.18	30.00
19	1	12.91	30.00
20	1	7.85	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
2	1	1	18/1	2/1	2.76	30.00	✓	Straight	Straight Movement
	2	1	18/1	2/2	2.76	30.00	✓	Straight	Straight Movement
4	1	1	19/1	4/1	1.44	30.00	✓	Straight	Straight Movement
	2	1	19/1	4/2	1.44	30.00	✓	Straight	Straight Movement
	3	1	19/1	4/3	1.44	30.00	✓	Straight	Straight Movement
6	1	1	20/1	6/1	2.40	30.00	✓	Straight	Straight Movement
	2	1	20/1	6/2	2.40	30.00	✓	Straight	Straight Movement
8	1	1	6/1	8/1	24.85	30.00	✓	Nearside	33.17
9	1	1	4/1	9/1	43.22	30.00	✓	Nearside	35.42
10	1	1	1/1	10/1	41.95	30.00	✓	Nearside	40.10
11	1	1	1/1	11/1	41.84	30.00	✓	Offside	91.65
8	1	2	2/2	8/1	24.85	30.00	✓	Straight	Straight Movement
9	1	2	1/1	9/1	43.22	30.00	✓	Straight	Straight Movement
10	1	2	6/1	10/1	41.95	30.00	✓	Straight	Straight Movement
11	1	2	2/1	11/1	41.84	30.00	✓	Nearside	47.20
8	1	3	4/3	8/1	24.85	30.00	✓	Offside	62.46
9	1	3	6/2	9/1	43.22	30.00	✓	Offside	96.34
10	1	3	2/2	10/1	41.95	30.00	✓	Offside	62.68
11	1	3	4/2	11/1	41.84	30.00	✓	Straight	Straight Movement

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
(ALL)	(ALL)	Movement		

Give Way Data - Movements

Arm	Traffic Stream	Movement	Destination traffic stream	Max Flow (Opposed) (PCU/hr)	Max Flow (Unopposed) (PCU/hr)	Percentage opposed (%)
4	3	1	8/1	1200	2044	100
6	2	1	9/1	1200	2073	100

Give Way Data - Movements - Conflicts

Arm	Traffic Stream	Movement	Destination traffic stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
4	3	1	8/1		TrafficStream	6/1	100	0.00		0	0
6	2	1	9/1		TrafficStream	4/1	100	0.00		0	0

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation			✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To			
		1	2	3	4
From	1	0	9	70	66
	2	44	0	13	29
	3	97	145	0	298
	4	160	41	566	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows not shown as they are blank.

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	18/1	9/1	#0000FF
	2	(untitled)	1/1	8/1	#FF0000
	3	(untitled)	19/1	10/1	#00FF00
	4	(untitled)	20/1	11/1	#FFFF00

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	2		2	1	1/1, 9/1	Normal	44
	6		2	4	1/1, 11/1	Normal	29
	10		1	4	18/1, 2/1, 11/1	Normal	66
	11		2	3	1/1, 10/1	Normal	13
	12		4	1	20/1, 6/2, 9/1	Normal	160
	16		1	2	18/1, 2/2, 8/1	Normal	9
	17		1	3	18/1, 2/2, 10/1	Normal	70
	18		4	2	20/1, 6/1, 8/1	Normal	41
	19		4	3	20/1, 6/1, 10/1	Normal	566
	20		3	1	19/1, 4/1, 9/1	Normal	97
	21		3	4	19/1, 4/2, 11/1	Normal	298
	22		3	2	19/1, 4/3, 8/1	Normal	145

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	Manual	240

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Absolute

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Unknown
	B	(untitled)	7	300	0	0	Unknown
	C	(untitled)	7	300	0	0	Unknown
	D	(untitled)	7	300	0	0	Unknown
	E	(untitled)	7	300	0	0	Unknown
	F	(untitled)	7	300	0	0	Unknown
	G	(untitled)	7	300	0	0	Unknown
	H	(untitled)	6	300	0	0	Unknown
	I	(untitled)	7	300	0	0	Cycle

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	H	1
	2	I	1
	3	A, C, I	1
	4	A, B, C, D	1
	5	B, D	1
	6	E, F	1
	7	G	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6, 7, 2, 3, 4, 5, 6, 7	35, 51, 57, 97, 109, 128, 146, 154, 160, 200, 219, 5, 22

Intergreen Matrix for Controller Stream 1

		To								
		A	B	C	D	E	F	G	H	I
From	A					7	7	7	7	
	B						6	6	7	
	C						7	7	7	
	D					6	6	6	7	
	E	6			6			6	7	
	F	6	6	6	6			6	7	
	G	6	6	6	6	6	6		7	7
	H	15	15	15	15	15	15	15		15
	I							7	7	

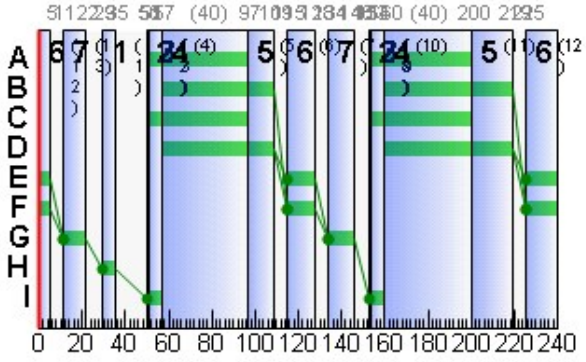
Banned Stage transitions for Controller Stream 1

		To						
		1	2	3	4	5	6	7
From	1							
	2							
	3							
	4							
	5							
	6							
	7							

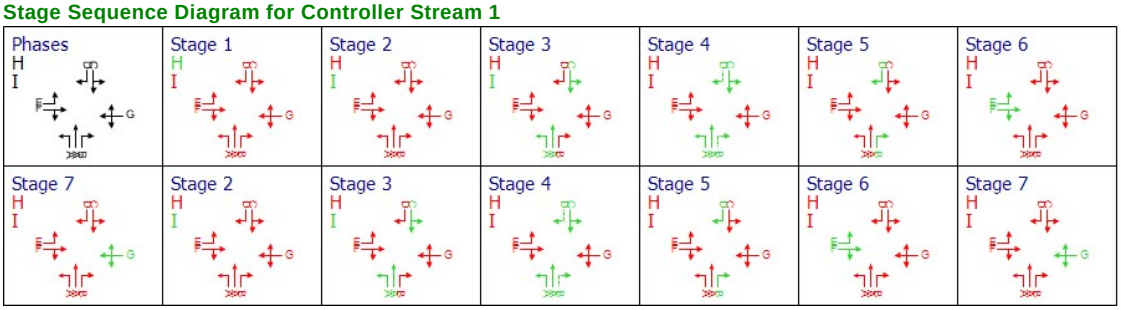
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
1	1		1	G	134	146	12	11	22	11
2	1		1	E	115	128	13	225	5	20
2	2		1	F	115	128	13	225	5	20
4	1		1	A	51	97	46	154	200	46
4	2		1	A	51	97	46	154	200	46
4	3		1	B	57	109	52	160	219	59
6	1		1	C	51	97	46	154	200	46
6	2		1	D	57	109	52	160	219	59

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
16:00-17:00	1	0.00	0.00	0.00	0.00

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (PCU)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
16:00-17:00	1	1	40	126	86	2077	23	55.75	2.88	16.54	18.91	1.04	19.95
	2	1	28	227	66	1644	33	48.64	2.05	51.26	12.66	0.74	13.40
		2	27	234	79	2012	33	48.01	2.52	63.09	14.96	0.88	15.84
	4	1	12	634	97	2019	92	23.59	1.86	92.92	9.03	0.64	9.66
		2	36	149	298	2105	92	26.15	6.24	298.76	30.74	2.11	32.85
		3	22	318	145	1432	111	18.19	2.03	101.47	10.40	0.89	11.30
	6	1	75	20	607	2069	92	39.01	22.51	647.21	93.40	6.81	100.21
		2	24	281	160	1439	111	20.47	3.04	101.21	12.92	1.15	14.07
	8	1	0	Unrestricted	195	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	0	Unrestricted	301	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	0	Unrestricted	649	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	0	Unrestricted	393	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	8	1008	145	1800	240	0.10	0.04	0.16	0.06	0.01	0.07
	19	1	35	156	540	1800	240	3.30	6.39	34.18	7.04	1.28	8.31
	20	1	45	99	767	1800	240	1.50	5.09	44.72	4.55	0.84	5.39

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Calculated sat flow (PCU/hr)	Calculated capacity (PCU/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
16:00-17:00	1	1	86	86	0		2077	216	40		126	0.00	23
	2	1	66	66	0		1644	240	28		227	0.01	33
		2	79	79	0		2012	293	27		234	0.01	33
	4	1	97	97	0		2019	791	12		634	0.28	92
		2	298	298	0		2105	824	36		149	0.28	92
		3	145	145	0		1432	674	22		318	0.28	111
	6	1	607	607	0		2069	810	75		20	0.10	92
		2	160	160	0		1439	678	24		281	0.10	111
	8	1	195	195	0		Unrestricted	Unrestricted	0		Unrestricted	0.88	240
	9	1	301	301	0		Unrestricted	Unrestricted	0		Unrestricted	0.63	240
	10	1	649	649	0		Unrestricted	Unrestricted	0		Unrestricted	0.74	240
	11	1	393	393	0		Unrestricted	Unrestricted	0		Unrestricted	0.62	240
	18	1	145	145	0		1800	1785	8		1008	0.00	240
	19	1	540	540	0		1800	1539	35		156	0.00	240
	20	1	767	767	0		1800	1698	45		99	0.00	240

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
16:00-17:00	1	1	12.00	55.75	1.33	18.91	96.42	82.92	1.04
	2	1	2.76	48.64	0.89	12.66	89.51	59.07	0.74
		2	2.76	48.01	1.05	14.96	88.99	70.30	0.88
	4	1	1.44	23.59	0.64	9.03	52.38	50.81	0.64
		2	1.44	26.15	2.16	30.74	56.47	168.28	2.11
		3	1.44	18.19	0.73	10.40	49.11	71.20	0.89
	6	1	2.40	39.01	6.58	93.40	89.51	543.32	6.81
		2	2.40	20.47	0.91	12.92	57.45	91.92	1.15
	8	1	24.85	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	43.22	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	41.95	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	41.84	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	19.18	0.10	0.00	0.06	0.53	0.77	0.01
	19	1	12.91	3.30	0.50	7.04	18.89	102.00	1.28
	20	1	7.85	1.50	0.32	4.55	8.72	66.87	0.84

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (PCU)	Mean max queue (PCU)	Max queue storage (PCU)	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))	Estimated blocking
16:00-17:00	1	1	0.00	2.88	17.39	16.54	0.00	0.00	
	2	1	0.00	2.05	4.00	51.26	0.00	0.00	
		2	0.00	2.52	4.00	63.09	0.00	0.00	
	4	1	0.00	1.86	2.00	92.92	0.00	7.00	
		2	0.00	6.24	2.09	298.76	0.00	0.00	
		3	0.00	2.03	2.00	101.47	0.00	0.00	
	6	1	0.00	22.51	3.48	647.21	0.00	0.00	
		2	0.00	3.04	3.00	101.21	0.00	0.00	
	8	1	0.00	0.00	36.02	0.00	0.00	92.00	
	9	1	0.00	0.00	62.63	0.00	0.00	38.00	
	10	1	0.00	0.00	60.80	0.00	0.00	22.00	
	11	1	0.00	0.00	60.64	0.00	0.00	19.00	
	18	1	0.00	0.04	27.79	0.16	0.00	2.00	
	19	1	0.00	6.39	18.71	34.18	0.00	119.00	
	20	1	0.00	5.09	11.37	44.72	0.00	178.00	

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (PCU)	Max End of Green Queue EoTS (PCU)	Max End of Red Queue EoTS (PCU)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
16:00-17:00	1	1	0.00	0.00	✓	2.88	0.13	2.78	1.00	0.00	19.95
	2	1	0.00	0.00	✓	2.05	0.05	2.05	1.00	0.00	13.40
		2	0.00	0.00	✓	2.52	0.05	2.44	1.00	0.00	15.84
	4	1	0.00	0.00	✓	1.86	0.01	1.86	1.00	0.00	9.66
		2	0.00	0.00	✓	6.24	0.10	5.79	1.00	0.00	32.85
		3	0.00	0.00	✓	2.03	0.03	2.03	1.00	0.00	11.30
	6	1	0.00	0.00	✓	22.52	1.11	15.69	1.00	0.00	100.21
		2	0.00	0.00	✓	3.04	0.04	3.04	1.00	0.00	14.07
	8	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	10	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	11	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	18	1	0.00	0.00	✓	0.04			1.00	0.00	0.07
	19	1	0.00	0.00	✓	6.39			1.00	0.00	8.31
	20	1	0.00	0.00	✓	5.09			1.00	0.00	5.39

Network Results

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
4	10/01/2022 15:39:44	10/01/2022 15:39:48	16:00	120	231.06	15.12	74.91	6/1	0	0	6/1	20/1	6/

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
16:00-17:00	75	20	4528	2267	12.02	214.67	16.39	231.06

Network Results: Flows and signals

Time Segment	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
16:00-17:00	4528	4528	0		75		20	2267

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
16:00-17:00	17.97	12.02	15.12	214.67	28.88	1307.47	16.39

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))
16:00-17:00	647.21	0.00	477.00

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
16:00-17:00	0.00	0.00	✓	1.00	0.00	0.00	231.06

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	94.9	112.0	112.5
	2	111.0	0.0	109.7	109.6
	3	84.5	60.7	0.0	85.7
	4	75.4	75.6	92.7	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (PCU/hr)	Normal journey time (s)	Calculated Total Flow (PCU/hr)	Avg journey time (s)
2	2	1	44	110.97	44	110.97
6	2	4	29	109.59	29	109.59
10	1	4	66	112.52	66	112.52
11	2	3	13	109.70	13	109.70
12	4	1	160	75.44	160	75.44
16	1	2	9	94.90	9	94.90
17	1	3	70	112.00	70	112.00
18	4	2	41	75.61	41	75.61
19	4	3	566	92.72	566	92.72
20	3	1	97	84.46	97	84.46
21	3	4	298	85.65	298	85.65
22	3	2	145	60.70	145	60.70

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES	
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)	D wei mu
1	1			1	G	86	2077	23	0.00	40	126	67.75	55.75	96.42	2.88	
2	1			1	E	66	1644	33	0.00	28	227	51.40	48.64	89.51	2.05	
	2			1	F	79	2012	33	0.00	27	234	50.77	48.01	88.99	2.52	
4	1			1	A	97	2019	92	7.00	12	634	25.03	23.59	52.38	1.86	
	2			1	A	298 <	2105	92	0.00	36	149	27.59	26.15	56.47	6.24 +	
	3			1	B	145 <	1432	111	0.00	22	318	19.63	18.19	49.11	2.03 +	
6	1			1	C	607 <	2069	92	0.00	75	20	41.41	39.01	89.51	22.51 +	
	2			1	D	160 <	1439	111	0.00	24	281	22.87	20.47	57.45	3.04 +	
8	1					195	Unrestricted	240	92.00	0	Unrestricted	24.85	0.00	0.00	0.00	
9	1					301	Unrestricted	240	38.00	0	Unrestricted	43.22	0.00	0.00	0.00	
10	1					649	Unrestricted	240	22.00	0	Unrestricted	41.95	0.00	0.00	0.00	
11	1					393	Unrestricted	240	19.00	0	Unrestricted	41.84	0.00	0.00	0.00	
18	1					145	1800	240	2.00	8	1008	19.27	0.10	0.53	0.04	
19	1					540	1800	240	119.00	35	156	16.21	3.30	18.89	6.39	
20	1					767	1800	240	178.00	45	99	9.35	1.50	8.72	5.09	

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	677.91	37.71	17.97	15.12	214.67	16.39	0.00	231.06
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians								
TOTAL	677.91	37.71	17.97	15.12	214.67	16.39	0.00	231.06

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

A5 - 2020 8-9 AM
D5 - 2020 8-9 AM*

Summary

Data Errors and Warnings

No errors or warnings

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
5	10/01/2022 15:39:40	10/01/2022 15:39:44	08:00	120	275.61	18.01	72.72	19/1	0	0	4/2	19/1	19/

Analysis Set Details

Name	Description	Demand set	Include in report	Locked
2020 8-9 AM		D5	✓	

Demand Set Details

Name	Description	Composite	Demand sets	Start time (HH:mm)	Locked
2020 8-9 AM				08:00	

Network Options

Network timings

Network cycle time (s)	Restrict to SCOOT cycle times	Time segment length (min)	Number of time segments	Modelled time period (min)
120		60	1	60

Signals options

Start displacement (s)	End displacement (s)
2	3

Advanced

Phase minimum broken penalty (£)	Phase maximum broken penalty (£)	Intergreen broken penalty (£)	Starting Red-with-Amber (s)
10000.00	10000.00	10000.00	2

Traffic options

Traffic model	Vehicle flow scaling factor (%)	Pedestrian flow scaling factor (%)	Cruise times or speeds
Platoon Dispersion (PDM)	100	100	Cruise Speeds

Advanced

Resolution	DOS Threshold (%)	Cruise scaling factor (%)	Use link stop weightings	Use link delay weightings	Exclude pedestrians from results calculation	Random delay mode	Type of Vehicle-in-Service	Type of random parameter	PCU Length (m)	Calculate results for Path Segments	Generate PDM Profile Data
1	90	100	✓	✓		Complex	Uniform (TRANSYT)	Uniform (TRANSYT)	5.75		✓

Normal Traffic parameters

Dispersion type	Dispersion coefficient	Travel time coefficient
Default	35	80

Normal Traffic Types

Name	PCU Factor
Normal	1.00

Bus parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Bus	1.00	Default	0.94	30	85

Tram parameters

Name	PCU Factor	Dispersion type	Acceleration (ms^[-2])	Stationary time coefficient	Cruise time coefficient
Tram	1.00	Default	0.94	100	100

Pedestrian parameters

Dispersion type
Default

Optimisation options

Enable optimisation	Auto redistribute	Optimisation level	Enable OUT Profile accuracy
✓	✓	Offsets And Green Splits	✓

Advanced

Optimisation type	Hill climb increments	OUTProfile accuracy	Use enhanced optimisation	Auto optimisation order	Optimisation order	Master controller	Offsets relative to master controller	Master controller offset after each run
Hill Climb (Fast)	15, 40, -1, 15, 40, 1, -1, 1	50, 50, 5, 5, 0.5, 0.5, 0.05, 0.05		✓	1			Do nothing

Economics

Vehicle Monetary Value Of Delay (£ per PCU-hr)	Vehicle Monetary Value Of Stops (£ per 100 stops)	Pedestrian monetary value of delay (£ per Ped-hr)
14.20	2.60	14.20

Arms and Traffic Streams

Arms

Arm	Name	Description	Traffic node
(ALL)			

Traffic Streams

Arm	Traffic Stream	Name	Description	Auto length	Length (m)	Has Saturation Flow	Saturation flow source	Saturation flow (PCU/hr)	Is signal controlled	Is give way	Traffic type	Allow Nearside Turn On Red
1	1			✓	100.00	✓	Sum of lanes	2051	✓		Normal	
2	1				23.00	✓	Sum of lanes	1644	✓		Normal	
	2				23.00	✓	Sum of lanes	2010	✓		Normal	
4	1				12.00	✓	Sum of lanes	2019	✓		Normal	
	2				12.00	✓	Sum of lanes	2105	✓		Normal	
	3				12.00	✓	Sum of lanes	2044	✓	✓	Normal	
6	1				20.00	✓	Sum of lanes	2069	✓		Normal	
	2				20.00	✓	Sum of lanes	2073	✓	✓	Normal	
8	1			✓	207.10						Normal	
9	1			✓	360.14						Normal	
10	1			✓	349.62						Normal	
11	1			✓	348.70						Normal	
18	1			✓	159.81	✓	Sum of lanes	1800			Normal	
19	1			✓	107.58	✓	Sum of lanes	1800			Normal	
20	1			✓	65.40	✓	Sum of lanes	1800			Normal	

Lanes

Arm	Traffic Stream	Lane	Name	Description	Use RR67	Surface condition	Site quality factor	Gradient (%)	Width (m)	Use connector turning radius	Proportion that turn (%)	Turning radius (m)	Nearside lane	Saturation flow (PCU/hr)
1	1	1	(untitled)		✓	N/A	N/A	0	3.60	✓	83	40.10		2051
2	1	2	(untitled)		✓	N/A	N/A	0	3.00		100	6.00		1644
	2	1	(untitled)		✓	N/A	N/A	0	3.00	✓	93	62.68		2010
4	1	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	35.42		2019
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	0	99999.00		2105
	3	1	(untitled)		✓	N/A	N/A	0	3.50		24	12.00		2044
6	1	1	(untitled)		✓	N/A	N/A	0	3.50		7	6.00		2069
	2	2	(untitled)		✓	N/A	N/A	0	3.50	✓	100	96.34		2073
8	1	1	(untitled)											
9	1	1	(untitled)											
10	1	1	(untitled)											
11	1	1	(untitled)											
18	1	1	(untitled)											1800
19	1	1	(untitled)											1800
20	1	1	(untitled)											1800

Modelling

Arm	Traffic Stream	Traffic model	Stop weighting multiplier (%)	Delay weighting multiplier (%)	Assignment Cost Weighting (%)	Exclude from results calculation	Max queue storage (PCU)	Has queue limit	Has degree of saturation limit
1	1	NetworkDefault	100	100	100		0.00		
2	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
4	1	Flare	100	100	100		0.00		
	2	NetworkDefault	100	100	100		0.00		
	3	Flare	100	100	100		0.00		
6	1	NetworkDefault	100	100	100		0.00		
	2	Flare	100	100	100		0.00		
8	1	NetworkDefault	100	100	100		0.00		
9	1	NetworkDefault	100	100	100		0.00		
10	1	NetworkDefault	100	100	100		0.00		
11	1	NetworkDefault	100	100	100		0.00		
18	1	NetworkDefault	100	100	100		0.00		
19	1	NetworkDefault	100	100	100		0.00		
20	1	NetworkDefault	100	100	100		0.00		

Modelling - Advanced

Arm	Traffic Stream	Initial queue (PCU)	Type of Vehicle-in-Service	Vehicle-in-Service	Type of random parameter	Random parameter	Auto cycle time	Cycle time
(ALL)	(ALL)	0.00	NetworkDefault	Not-Included	NetworkDefault	0.50	✓	240

Normal traffic - Modelling

Arm	Traffic Stream	Stop weighting (%)	Delay weighting (%)
(ALL)	(ALL)	100	100

Normal traffic - Advanced

Arm	Traffic Stream	Dispersion type for Normal Traffic
(ALL)	(ALL)	NetworkDefault

Flows

Arm	Traffic Stream	Total Flow (PCU/hr)	Normal Flow (PCU/hr)
1	1	103	103
2	1	119	119
	2	75	75
4	1	142	142
	2	551	551
	3	194	194
6	1	253	253
	2	115	115
8	1	207	207
9	1	274	274
10	1	363	363
11	1	708	708
18	1	194	194
19	1	887	887
20	1	368	368

Signals

Arm	Traffic Stream	Controller stream	Phase	Second phase enabled
1	1	1	G	
2	1	1	E	
	2	1	F	
4	1	1	A	
	2	1	A	
	3	1	B	
6	1	1	C	
	2	1	D	

Entry Sources

Arm	Traffic Stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)
1	1	12.00	30.00
18	1	19.18	30.00
19	1	12.91	30.00
20	1	7.85	30.00

Sources

Arm	Traffic Stream	Source	Source traffic stream	Destination traffic stream	Cruise time for Normal Traffic (s)	Cruise speed for Normal Traffic (kph)	Auto turning radius	Traffic turn style	Turning radius (m)
2	1	1	18/1	2/1	2.76	30.00	✓	Straight	Straight Movement
	2	1	18/1	2/2	2.76	30.00	✓	Straight	Straight Movement
4	1	1	19/1	4/1	1.44	30.00	✓	Straight	Straight Movement
	2	1	19/1	4/2	1.44	30.00	✓	Straight	Straight Movement
	3	1	19/1	4/3	1.44	30.00	✓	Straight	Straight Movement
6	1	1	20/1	6/1	2.40	30.00	✓	Straight	Straight Movement
	2	1	20/1	6/2	2.40	30.00	✓	Straight	Straight Movement
8	1	1	6/1	8/1	24.85	30.00	✓	Nearside	33.17
9	1	1	4/1	9/1	43.22	30.00	✓	Nearside	35.42
10	1	1	1/1	10/1	41.95	30.00	✓	Nearside	40.10
11	1	1	1/1	11/1	41.84	30.00	✓	Offside	91.65
8	1	2	2/2	8/1	24.85	30.00	✓	Straight	Straight Movement
9	1	2	1/1	9/1	43.22	30.00	✓	Straight	Straight Movement
10	1	2	6/1	10/1	41.95	30.00	✓	Straight	Straight Movement
11	1	2	2/1	11/1	41.84	30.00	✓	Nearside	47.20
8	1	3	4/3	8/1	24.85	30.00	✓	Offside	62.46
9	1	3	6/2	9/1	43.22	30.00	✓	Offside	96.34
10	1	3	2/2	10/1	41.95	30.00	✓	Offside	62.68
11	1	3	4/2	11/1	41.84	30.00	✓	Straight	Straight Movement

Give Way Data

Arm	Traffic Stream	Opposed traffic	Use Step-wise Opposed Turn Model	Visibility restricted
(ALL)	(ALL)	Movement		

Give Way Data - Movements

Arm	Traffic Stream	Movement	Destination traffic stream	Max Flow (Opposed) (PCU/hr)	Max Flow (Unopposed) (PCU/hr)	Percentage opposed (%)
4	3	1	8/1	1200	2044	100
6	2	1	9/1	1200	2073	100

Give Way Data - Movements - Conflicts

Arm	Traffic Stream	Movement	Destination traffic stream	Description	Controlling type	Controlling traffic stream	Percentage opposing (%)	Slope coefficient	Upstream signals visible	Conflict shift	Conflict duration
4	3	1	8/1		TrafficStream	6/1	100	0.00		0	0
6	2	1	9/1		TrafficStream	4/1	100	0.00		0	0

Local OD Matrix - Local Matrix: 1

Local Matrix Options

OD Matrix	Name	Use for point to point table	Auto calculate	Allocation mode	Allow paths past exit locations	Allow looped paths on arms	Allow looped paths on traffic nodes	Copy flows	Matrix to copy flows from	Limit paths by length	Path length limit multiplier	Limit paths by number	Path number limit
1	(untitled)	✓	✓	Path Equalisation			✓			✓	1.25		

Normal Input Flows (PCU/hr)

		To			
		1	2	3	4
From	1	0	5	70	119
	2	17	0	48	38
	3	142	194	0	551
	4	115	8	245	0

Bus Input Flows not shown as they are blank.

Tram Input Flows not shown as they are blank.

Pedestrian Input Flows not shown as they are blank.

Locations

OD Matrix	Location	Name	Entries	Exits	Colour
1	1	(untitled)	18/1	9/1	#0000FF
	2	(untitled)	1/1	8/1	#FF0000
	3	(untitled)	19/1	10/1	#00FF00
	4	(untitled)	20/1	11/1	#FFFF00

Normal Paths and Flows

OD Matrix	Path	Description	From location	To location	Path items	Allocation type	Normal Calculated Flow (PCU/hr)
1	2		2	1	1/1, 9/1	Normal	17
	6		2	4	1/1, 11/1	Normal	38
	10		1	4	18/1, 2/1, 11/1	Normal	119
	11		2	3	1/1, 10/1	Normal	48
	12		4	1	20/1, 6/2, 9/1	Normal	115
	16		1	2	18/1, 2/2, 8/1	Normal	5
	17		1	3	18/1, 2/2, 10/1	Normal	70
	18		4	2	20/1, 6/1, 8/1	Normal	8
	19		4	3	20/1, 6/1, 10/1	Normal	245
	20		3	1	19/1, 4/1, 9/1	Normal	142
	21		3	4	19/1, 4/2, 11/1	Normal	551
	22		3	2	19/1, 4/3, 8/1	Normal	194

Signal Timings

Network Default: 120s cycle time; 120 steps

Controller Stream 1

Controller Stream	Name	Description	Use sequence	Cycle time source	Cycle time (s)
1	(untitled)		1	Manual	240

Controller Stream 1 - Properties

Controller Stream	Manufacturer name	Type	Model number	(Telephone) Line Number	Site number	Grid reference	Gaining delay type
1	Unspecified						Absolute

Controller Stream 1 - Optimisation

Controller Stream	Allow offset optimisation	Allow green split optimisation	Optimisation level	Auto redistribute	Enable stage constraint
1	✓	✓	Offsets And Green Splits	✓	

Phases

Controller Stream	Phase	Name	Minimum green (s)	Maximum green (s)	Relative start displacement (s)	Relative end displacement (s)	Type
1	A	(untitled)	7	300	0	0	Unknown
	B	(untitled)	7	300	0	0	Unknown
	C	(untitled)	7	300	0	0	Unknown
	D	(untitled)	7	300	0	0	Unknown
	E	(untitled)	7	300	0	0	Unknown
	F	(untitled)	7	300	0	0	Unknown
	G	(untitled)	7	300	0	0	Unknown
	H	(untitled)	6	300	0	0	Unknown
	I	(untitled)	7	300	0	0	Cycle

Library Stages

Controller Stream	Library Stage	Phases in stage	User stage minimum (s)
1	1	H	1
	2	I	1
	3	A, C, I	1
	4	A, B, C, D	1
	5	B, D	1
	6	E, F	1
	7	G	1

Stage Sequences

Controller Stream	Sequence	Name	Multiple cycling	Stage IDs	Stage ends
1	1	(untitled)	Single	1, 2, 3, 4, 5, 6, 7, 2, 3, 4, 5, 6, 7	35, 51, 57, 91, 106, 130, 146, 154, 160, 200, 214, 3, 22

Intergreen Matrix for Controller Stream 1

		To								
		A	B	C	D	E	F	G	H	I
From	A					7	7	7	7	
	B						6	6	7	
	C						7	7	7	
	D					6	6	6	7	
	E	6			6			6	7	
	F	6	6	6	6			6	7	
	G	6	6	6	6	6	6		7	7
	H	15	15	15	15	15	15	15		15
	I							7	7	

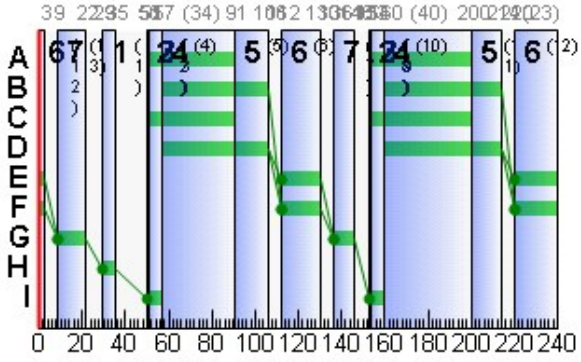
Banned Stage transitions for Controller Stream 1

		To						
		1	2	3	4	5	6	7
From	1							
	2							
	3							
	4							
	5							
	6							
	7							

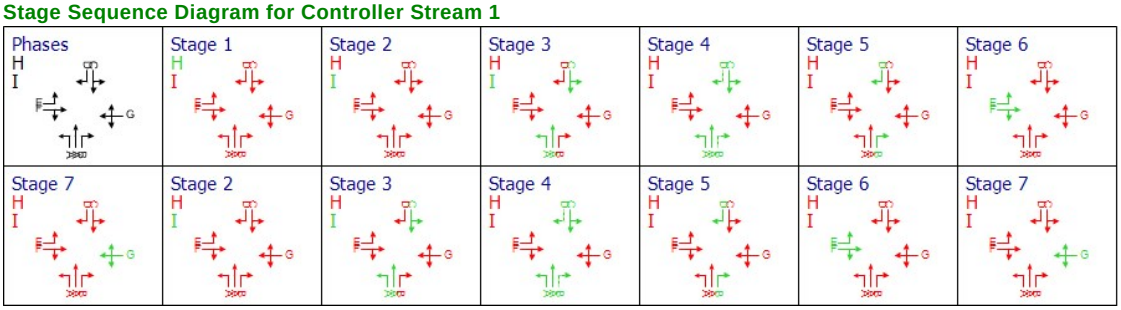
Traffic Stream Green Times

Arm	Traffic Stream	Traffic Node	Controller Stream	Phase	Green Period 1			Green Period 2		
					Start	End	Duration	Start	End	Duration
1	1		1	G	136	146	10	9	22	13
2	1		1	E	112	130	18	220	3	23
2	2		1	F	112	130	18	220	3	23
4	1		1	A	51	91	40	154	200	46
4	2		1	A	51	91	40	154	200	46
4	3		1	B	57	106	49	160	214	54
6	1		1	C	51	91	40	154	200	46
6	2		1	D	57	106	49	160	214	54

Phase Timings Diagram for Controller Stream 1



Stage Sequence Diagram for Controller Stream 1



Resultant penalties

Time Segment	Controller stream	Phase min max penalty (£ per hr)	Intergreen broken penalty (£ per hr)	Stage constraint broken penalty (£ per hr)	Cost of controller stream penalties (£ per hr)
08:00-09:00	1	0.00	0.00	0.00	0.00

Traffic Stream Results

Traffic Stream Results: Vehicle summary

Time Segment	Arm	Traffic Stream	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Mean max queue (PCU)	Utilised storage (%)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	1	1	48	87	103	2051	23	58.58	3.60	20.69	23.80	1.28	25.08
	2	1	40	123	119	1644	41	48.03	3.71	92.65	22.55	1.33	23.87
		2	21	332	75	2010	41	43.71	2.33	58.30	12.93	0.80	13.73
	4	1	19	369	142	2019	86	24.87	2.02	101.14	13.93	0.76	14.69
		2	71	26	551	2105	86	33.02	14.41	690.70	71.76	4.58	76.33
		3	31	191	194	1433	103	15.75	2.07	103.37	12.05	0.80	12.85
	6	1	33	170	253	2069	86	29.54	7.25	208.48	29.48	2.27	31.75
		2	18	393	115	1441	103	22.61	2.64	87.99	10.26	0.88	11.14
	8	1	0	Unrestricted	207	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	0	Unrestricted	274	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	0	Unrestricted	363	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	0	Unrestricted	708	Unrestricted	240	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	11	707	194	1800	240	0.22	0.28	0.99	0.17	0.06	0.23
	19	1	73	24	887	1800	240	16.72	23.87	127.60	58.48	7.08	65.56
	20	1	20	340	368	1800	240	0.26	0.03	0.23	0.37	0.00	0.37

Traffic Stream Results: Flows and signals

Time Segment	Arm	Traffic Stream	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Calculated sat flow (PCU/hr)	Calculated capacity (PCU/hr)	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Mean modulus of error	Actual green (s (per cycle))
08:00-09:00	1	1	103	103	0		2051	214	48		87	0.00	23
	2	1	119	119	0		1644	295	40		123	0.05	41
		2	75	75	0		2010	360	21		332	0.05	41
	4	1	142	142	0		2019	740	19		369	0.63	86
		2	551	551	0		2105	772	71		26	0.63	86
		3	194	194	0		1433	627	31		191	0.63	103
	6	1	253	253	0		2069	759	33		170	0.00	86
		2	115	115	0		1441	630	18		393	0.00	103
	8	1	207	207	0		Unrestricted	Unrestricted	0		Unrestricted	0.92	240
	9	1	274	274	0		Unrestricted	Unrestricted	0		Unrestricted	0.80	240
	10	1	363	363	0		Unrestricted	Unrestricted	0		Unrestricted	0.56	240
	11	1	708	708	0		Unrestricted	Unrestricted	0		Unrestricted	0.62	240
	18	1	194	194	0		1800	1740	11		707	0.00	240
	19	1	887	887	0		1800	1220	73		24	0.00	240
	20	1	368	368	0		1800	1800	20		340	0.00	240

Traffic Stream Results: Stops and delays

Time Segment	Arm	Traffic Stream	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	1	1	12.00	58.58	1.68	23.80	99.11	102.08	1.28
	2	1	2.76	48.03	1.59	22.55	88.90	105.79	1.33
		2	2.76	43.71	0.91	12.93	84.59	63.44	0.80
	4	1	1.44	24.87	0.98	13.93	42.73	60.68	0.76
		2	1.44	33.02	5.05	71.76	66.23	364.92	4.58
		3	1.44	15.75	0.85	12.05	32.85	63.73	0.80
	6	1	2.40	29.54	2.08	29.48	71.57	181.08	2.27
		2	2.40	22.61	0.72	10.26	61.18	70.36	0.88
	8	1	24.85	0.00	0.00	0.00	0.00	0.00	0.00
	9	1	43.22	0.00	0.00	0.00	0.00	0.00	0.00
	10	1	41.95	0.00	0.00	0.00	0.00	0.00	0.00
	11	1	41.84	0.00	0.00	0.00	0.00	0.00	0.00
	18	1	19.18	0.22	0.01	0.17	2.59	5.02	0.06
	19	1	12.91	16.72	4.12	58.48	63.66	564.65	7.08
	20	1	7.85	0.26	0.03	0.37	0.00	0.00	0.00

Traffic Stream Results: Queues and blocking

Time Segment	Arm	Traffic Stream	Initial queue (PCU)	Mean max queue (PCU)	Max queue storage (PCU)	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))	Estimated blocking
08:00-09:00	1	1	0.00	3.60	17.39	20.69	0.00	0.00	
	2	1	0.00	3.71	4.00	92.65	0.00	0.00	
		2	0.00	2.33	4.00	58.30	0.00	3.00	
	4	1	0.00	2.02	2.00	101.14	0.00	4.00	
		2	0.00	14.41	2.09	690.70	0.00	0.00	
		3	0.00	2.07	2.00	103.37	0.00	0.00	
	6	1	0.00	7.25	3.48	208.48	0.00	0.00	
		2	0.00	2.64	3.00	87.99	0.00	0.00	
	8	1	0.00	0.00	36.02	0.00	0.00	105.00	
	9	1	0.00	0.00	62.63	0.00	0.00	62.00	
	10	1	0.00	0.00	60.80	0.00	0.00	13.00	
	11	1	0.00	0.00	60.64	0.00	0.00	13.00	
	18	1	0.00	0.28	27.79	0.99	0.00	8.00	
	19	1	0.00	23.87	18.71	127.60	0.00	183.00	
	20	1	0.00	0.03	11.37	0.23	0.00	76.00	

Traffic Stream Results: Advanced

Time Segment	Arm	Traffic Stream	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	Mean Max Queue EoTS (PCU)	Max End of Green Queue EoTS (PCU)	Max End of Red Queue EoTS (PCU)	PCU Factor	Cost of traffic penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	1	1	0.00	0.00	✓	3.60	0.22	3.46	1.00	0.00	25.08
	2	1	0.00	0.00	✓	3.71	0.14	3.71	1.00	0.00	23.87
		2	0.00	0.00	✓	2.33	0.03	2.28	1.00	0.00	13.73
	4	1	0.00	0.00	✓	2.02	0.02	2.02	1.00	0.00	14.69
		2	0.00	0.00	✓	14.42	0.88	8.64	1.00	0.00	76.33
		3	0.00	0.00	✓	2.07	0.07	2.07	1.00	0.00	12.85
	6	1	0.00	0.00	✓	7.25	0.08	6.41	1.00	0.00	31.75
		2	0.00	0.00	✓	2.64	0.02	2.64	1.00	0.00	11.14
	8	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	9	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	10	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	11	1	0.00	0.00	✓	0.00			1.00	0.00	0.00
	18	1	0.00	0.00	✓	0.28			1.00	0.00	0.23
	19	1	0.00	0.00	✓	23.88			1.00	0.00	65.56
	20	1	0.00	0.00	✓	0.03			1.00	0.00	0.37

Network Results

Run Summary

Analysis set used	Run start time	Run finish time	Modelling start time (HH:mm)	Network Cycle Time (s)	Performance Index (£ per hr)	Total network delay (PCU-hr/hr)	Highest DOS (%)	Item with highest DOS	Number of oversaturated items	Percentage of oversaturated items (%)	Item with worst signalised PRC	Item with worst unsignalised PRC	Ite wit wor over PR
5	10/01/2022 15:39:40	10/01/2022 15:39:44	08:00	120	275.61	18.01	72.72	19/1	0	0	4/2	19/1	19/

Network Results: Vehicle summary

Time Segment	Degree of saturation (%)	Practical reserve capacity (%)	Calculated flow entering (PCU/hr)	Actual green (s (per cycle))	Mean Delay per Veh (s)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Performance Index (£ per hr)
08:00-09:00	73	24	4553	2249	14.24	255.78	19.83	275.61

Network Results: Flows and signals

Time Segment	Calculated flow entering (PCU/hr)	Calculated flow out (PCU/hr)	Flow discrepancy (PCU/hr)	Adjusted flow warning	Degree of saturation (%)	DOS Threshold exceeded	Practical reserve capacity (%)	Actual green (s (per cycle))
08:00-09:00	4553	4553	0		73		24	2249

Network Results: Stops and delays

Time Segment	Mean Cruise Time per Veh (s)	Mean Delay per Veh (s)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Mean stops per Veh (%)	Total stops (Stops per hr)	Weighted cost of stops (£ per hr)
08:00-09:00	18.41	14.24	18.01	255.78	34.74	1581.77	19.83

Network Results: Queues and blocking

Time Segment	Utilised storage (%)	Excess queue penalty (£ per hr)	Wasted time total (s (per cycle))
08:00-09:00	690.70	0.00	467.00

Network Results: Advanced

Time Segment	Degree of saturation penalty (£ per hr)	Ped gap accepting penalty (£ per hr)	Warmed up	PCU Factor	Cost of traffic penalties (£ per hr)	Controller stream penalties (£ per hr)	Performance Index (£ per hr)
08:00-09:00	0.00	0.00	✓	1.00	0.00	0.00	275.61

Point to Point Journey Time

Average Journey Time (s) for Local Matrix: 1

		To			
		1	2	3	4
From	1	0.0	90.7	107.8	112.0
	2	113.8	0.0	112.5	112.4
	3	99.1	71.7	0.0	105.9
	4	76.3	64.9	82.0	0.0

Path Journey Time

Path	From Location	To Location	Normal Calculated Flow (PCU/hr)	Normal journey time (s)	Calculated Total Flow (PCU/hr)	Avg journey time (s)
2	2	1	17	113.80	17	113.80
6	2	4	38	112.43	38	112.43
10	1	4	119	112.03	119	112.03
11	2	3	48	112.54	48	112.54
12	4	1	115	76.33	115	76.33
16	1	2	5	90.71	5	90.71
17	1	3	70	107.82	70	107.82
18	4	2	8	64.90	8	64.90
19	4	3	245	82.00	245	82.00
20	3	1	142	99.15	142	99.15
21	3	4	551	105.93	551	105.93
22	3	2	194	71.67	194	71.67

Final Prediction Table

Traffic Stream Results

				SIGNALS		FLOWS		PERFORMANCE				PER PCU			QUEUES	
Arm	Traffic Stream	Name	Traffic node	Controller stream	Phase	Calculated flow entering (PCU/hr)	Calculated sat flow (PCU/hr)	Actual green (s (per cycle))	Wasted time total (s (per cycle))	Degree of saturation (%)	Practical reserve capacity (%)	JourneyTime (s)	Mean Delay per Veh (s)	Mean stops per Veh (%)	Mean max queue (PCU)	D wei mu
1	1			1	G	103	2051	23	0.00	48	87	70.58	58.58	99.11	3.60	
2	1			1	E	119	1644	41	0.00	40	123	50.79	48.03	88.90	3.71	
	2			1	F	75	2010	41	3.00	21	332	46.47	43.71	84.59	2.33	
4	1			1	A	142 <	2019	86	4.00	19	369	26.31	24.87	42.73	2.02 +	
	2			1	A	551 <	2105	86	0.00	71	26	34.46	33.02	66.23	14.41 +	
	3			1	B	194 <	1433	103	0.00	31	191	17.19	15.75	32.85	2.07 +	
6	1			1	C	253 <	2069	86	0.00	33	170	31.94	29.54	71.57	7.25 +	
	2			1	D	115	1441	103	0.00	18	393	25.01	22.61	61.18	2.64	
8	1					207	Unrestricted	240	105.00	0	Unrestricted	24.85	0.00	0.00	0.00	
9	1					274	Unrestricted	240	62.00	0	Unrestricted	43.22	0.00	0.00	0.00	
10	1					363	Unrestricted	240	13.00	0	Unrestricted	41.95	0.00	0.00	0.00	
11	1					708	Unrestricted	240	13.00	0	Unrestricted	41.84	0.00	0.00	0.00	
18	1					194	1800	240	8.00	11	707	19.39	0.22	2.59	0.28	
19	1					887 <	1800	240	183.00	73	24	29.63	16.72	63.66	23.87 +	
20	1					368	1800	240	76.00	20	340	8.10	0.26	0.00	0.03	

Network Results

	Distance travelled (PCU-km/hr)	Time spent (PCU-hr/hr)	Mean journey speed (kph)	Total delay (PCU-hr/hr)	Weighted cost of delay (£ per hr)	Weighted cost of stops (£ per hr)	Excess queue penalty (£ per hr)	Performance Index (£ per hr)
Normal traffic	698.60	41.30	16.92	18.01	255.78	19.83	0.00	275.61
Bus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pedestrians								
TOTAL	698.60	41.30	16.92	18.01	255.78	19.83	0.00	275.61

- *< = adjusted flow warning (upstream links/traffic streams are over-saturated)*
- ** = Traffic Stream - Normal, Bus or Tram Stop or Delay weighting has been set to a value other than 100%*
- *^ = Traffic Stream - Normal, Bus or Tram Stop or Delay Path weighting has been set to a value other than 100%*
- *+ = average link/traffic stream excess queue is greater than 0*
- ***P.I. = PERFORMANCE INDEX***

APPENDIX D- STAGE 1 ROAD SAFETY AUDIT REPORT

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ROAD SAFETY ENGINEERING

Redford Park Protected Signalised Junction

Stage 1 Road Safety Audit

Wicklow County Council

January 2022

traffico

Redford Park Protected Signalised Junction

Stage 1 Road Safety Audit

January 2022

Notice

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Document History

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1	Final Issue	MD	CP	MD	MD	18th Jan 2022
0	Draft Issue	MD	CP	MD	MD	22nd Dec 2021
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date

Contents

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Appendices

1. Introduction

1.1 Report Context

This report describes the findings of a Stage 1 Road Safety Audit associated with Redford Park Protected Signalised Junction.

The Audit has been completed by Traffico Ltd. on behalf of Wicklow County Council.

1.2 Details of Site Inspection

Date	Daylight / Darkness	Weather & Road Conditions
Thursday 16th December 2021	Daylight	Overcast with damp roads.

Table 1.1 – Site Inspection Details

1.3 The Road Safety Audit Team

The members of the Road Safety Audit Team have been listed following:

Status	Name / Qualifications	TII Auditor Reference No:
Audit Team Leader (ATL)	**Martin Deegan** BEng(Hons) MSc CEng MIEI	MD101312
Audit Team Member (ATM)	**Colin Prendeville** BEng(Hons) CEng MIEI CIHT	CP3369500
Audit Trainee (AT)	-	-

Table 1.2 – Audit Team Details

1.4 Design Drawings Examined as Part of the Audit Process

The following drawing(s) were examined as part of the Road Safety Audit (RSA) process:

Drawing No.	Drawing Title	Revision
190092-DBFL-RD-SP-DR-C-1901	Redford Park Redford Park Protected Signalised Junction OPTION A	P01

Table 1.3 – Designers Drawing List

1.5 Road Safety Audit Compliance

Procedure and Scope

This Road Safety Audit has been carried out in accordance with the procedures and scope set out in TII publication number GE-STY-01024 - Road Safety Audit.

As part of the road safety audit process, the Audit Team have examined only those issues within the design which relate directly to road safety.

Compliance with Design Standards

The road safety audit process is not a design check, therefore verification or compliance with design standards has not formed part of the audit process.

Minimizing Risk of Collision Occurrence

All problems described in this report are considered by the Audit Team to require action in order to improve the safety of the scheme and minimise the risk of collision occurrence.

2. Road Safety Issues Identified

2.1 Problem: Existing Footpath Serving Pedestrian Desire Line

Location: South-East Section of Junction

Failing to incorporate the existing section of footpath could result in slips and trips for pedestrians who will (habitually) continue to walk along the established pedestrian desire line.

Figure 2.1 – Existing Section of Footpath in Southeast Section of Junction

Recommendation

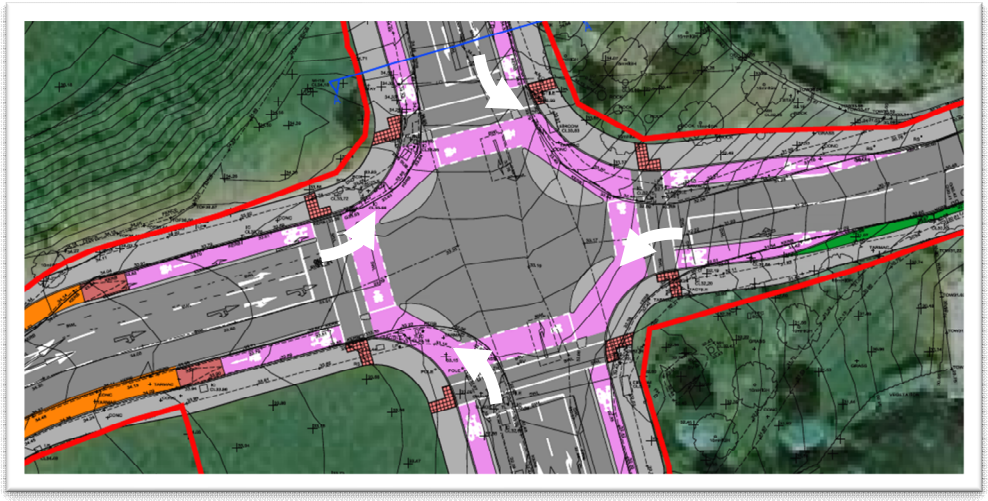
The existing section of footpath should be incorporated into the junction improvement proposals.

2.2 Problem: Errant Vehicles Accessing 'Cycle' Only Areas

Location: Behind Protective Islands

Errant drivers may enter 'cycle only' areas, placing cyclists at risk of conflict with general traffic.

Figure 2.2 – Possible Vehicle Trajectory through 'Cycle Only' Areas



Recommendation

The potential for vehicle entry to these locations should be physically restricted.

2.3 Problem: Insufficient Width for Right Turn Lane

Location: Existing Right Turn Lane Serving Redford Cemetery

The proximity of the northern scheme tie-in could result in there being insufficient cross section to incorporate the existing lane configuration which includes a northbound lane, right turning lane and southbound lane. This could result in side swipe and opposition type conflicts.

Figure 2.3 – Existing Right Turn Lane Serving Cemetery

Recommendation

The following options are proposed to mitigate the risk described:

1. Remove the right turn lane and utilise the space it occupied to maintain two opposing traffic lanes, improved footpath widths and continuous cycle lanes on approach to the junction.
2. Maintain the right turn lane and move the northern scheme tie-in south to the commencement of the central hatched area serving the existing cemetery right turn lane.

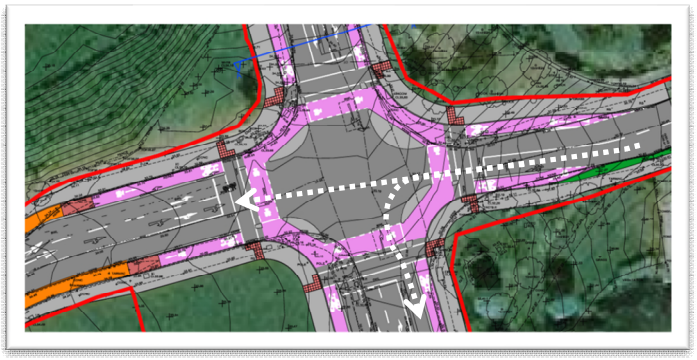
2.4 Problem: Side Road Approach Alignment

Location: Redford Park – Westbound Approach

The right hand horizonal curve on the immediate westbound approach to the junction:

1. Directs drivers into the opposing traffic lane on the eastbound approach arm.
2. Makes the left turn onto the R761 more challenging for drivers to negotiate.

Figure 2.4 – Alignment of Westbound Approach for Straight Ahead & Left Turn Movements



Recommendation

A swept path analysis should be undertaken on the movements described, with a view to improving the approach alignment of the Redford Park westbound approach if required.

3. Audit Team Statement

3.1 Certification & Purpose

We certify that we have examined the drawing(s) listed in Chapter 1 of this Report.

Sole Purpose of the Road Safety Audit

The Road Safety Audit has been carried out with the sole purpose of identifying any features of the design which could be removed or modified to improve the road safety aspects of the scheme.

3.2 Implementation of RSA Recommendations

The problems identified herein have been noted in the Report together with their associated recommendations for road safety improvements.

We (the Audit Team) propose that these recommendations should be studied with a view to implementation.

Audit Team's Independence to the Design Process

No member of the Audit Team has been otherwise involved with the design of the measures audited.

3.3 Road Safety Audit Team Sign-Off

Martin Deegan
Audit Team Leader
Road Safety Engineering Team
traffico

Signed: 

Date: 22nd December 2021

Colin Prendiville
Audit Team Member
Road Safety Engineering Team
traffico

Signed: 

Date: 22nd December 2021

4. Designers Response

4.1 How the Designer Should Respond to the Road Safety Audit

The Designer should prepare an Audit Response for each of the recommendations using the Road Safety Audit Feedback Form attached in Appendix A.

When completed, this form should be signed by the Designer and returned to the Audit Team for consideration. See flow-chart following for further description.

Figure 4.1 – Road Safety Audit Sign-Off and Completion Process

4.2 Returning the Completed Feedback Form

The Designer should return the completed Road Safety Audit Feedback Form attached in Appendix A of this report to the following email address:

- Email address: martin@traffico.ie

The Audit Team will consider the Designer's response and reply indicating acceptance or otherwise of the Designers response to each recommendation.

Triggering the Need for an Exception Report

Where the Designer and the Audit Team cannot agree on an appropriate means of addressing an underlying safety issue identified as part of the audit process, an Exception Report must be prepared by the Designer on each disputed item listed in the audit report.

Appendix A

A.1 Road Safety Audit Feedback Form

Road Safety Audit Feedback Form

Scheme: Redford Park Protected Signalised Junction	
Audit Stage: Stage 1 Road Safety Audit	**Audit Date:** 22nd December 2021

Problem Reference (Section 2)	Designer Response Section			Audit Team Response Section
	Problem Accepted (yes / no)	Recommended Measure Accepted (yes / no)	Alternative Measures or Comments	Alternative Measures Accepted (yes / no)
2.1	Yes	Yes		
2.2	Yes	Yes	In order to prevent vehicles from entering the cycle lane in these locations, the location of the protected islands will ensure that vehicles cannot physically undertake this movement. A swept path analysis will be undertaken to ensure this.	Noted with thanks.
2.3	Yes	Yes		
2.4	Yes	Yes	This is the existing alignment within the junction, a swept path analysis will be undertaken to ensure vehicles can still undertake these movements within the junction.	Noted with thanks.

**The Designer should complete the Designer Response Section above, then fill out the designer details below and return the completed form to the Road Safety Audit Team for consideration and signing.*

Designer's Name:	DBFL Consulting Engineers	Designer's Signature:	Jane Hennessy	Date:	14th Jan. 2022
Employer's Name:	Wicklow Co Co	Employer's Signature:		Date:	14th Jan. 2022
Audit Team's Name:	Martin Deegan	Audit Team's Signature:		Date:	18th Jan 2022

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