



Clifton Scannell Emerson
Associates

Preliminary Design Report

The Crescent / Sea Road Junction Upgrade Works



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1 Introduction

Clifton Scannell Emerson Associates (CSEA) were commissioned by Galway County Council (GCC) to carry out consultancy services for the re-design of the junction of The Crescent, Salthill Road Lower, Taylor's Hill and St. Mary's Road. The Scheme also includes the upgrading of the junctions of Crescent Green, Palmyra Park and Sea Road with The Crescent as well as the adjacent pedestrian facilities.

1.1 Project Background

An aspiration of the Galway Transport Strategy (GTS) is to develop a city centre access network to ensure that the transport system can cater for the projected future demand. This includes the provision of continuous bus priority from Salthill Road Lower to Saint Mary's Road and Newcastle Road. To achieve this objective, the junction of The Crescent, Salthill Road Lower, Taylor's Hill and St. Mary's Road is included and a series of junctions subject to revision to enable this. The Crescent, Taylor's Hill and St. Mary's Road are identified in the GTS as potential feeder cycle routes.

The proposed solution, which emerged as the preferred option from an options study commissioned by GCC, proposes to maintain a rationalised level of on-street parking and removing the left slip-lane from The Crescent to Salthill Road Lower. The proposal also includes to resurface the route and install crossing points with zebra crossings, buildouts and raised platforms at the junctions of the Crescent with Crescent Green, Palmyra Park and Sea Road. This solution will achieve the scheme objectives whilst providing the NTA and GCC with the best value-for-money design for the medium to long term.

The current route of the Bus Eireann service 401 uses the slip lane between The Crescent and Salthill Road Lower. Within the re-modelled bus routes under the GTS, the bus routes will go directly between lower Salthill and St Mary's Road. This scheme will precede the implementation of the GTS.

1.2 Project Concept

The overriding purpose of the project is the delivery of continuous and consistent traffic calmed roads and pedestrian facilities.

The proposed scheme must not only increase accessibility and permeability within the immediate study area, but also provide enhanced and safer connectivity with other areas and routes. Ultimately the route should be delivered to improve safety, reduced vehicle speeds, reduce journey times, and contribute towards increased numbers of trips being made by foot and by public transport in the local catchment.

1.2.1 Aims

The aims of The Crescent / Sea Road Junction Upgrade Works are:

- To develop the area in line with the GTS through the delivery of the core city centre access area and the supply and management of parking to facilitate travel demand;
- To provide a safe, direct, cohesive, comfortable and attractive pedestrian network;
- To support increased accessibility and permeability on foot/ by bike, along, and through, the route – enhancing connections to homes, workplaces, schools, leisure facilities, public transport and services nearby; and
- To maintain access to local services and amenities that residents are accustomed to.

1.2.2 Objectives

These aims will be achieved through delivery of the following scheme objectives:

- To provide safe, accessible and functional pedestrian network through improvement of footpath & crossing facilities for vulnerable road users and pedestrians, e.g. continuous and consistent pedestrian facilities; reduced crossing delays; and additional crossing locations for pedestrians;

- To provide a level of parking that is sufficient to facilitate access to local businesses but not to encourage commuter parking;
- Reduced carriageway widths on self-enforcing traffic calmed roads where cycle facilities are on the carriageway;
- To introduce traffic calming measures (tree lining, reduced carriageway width, toucan crossings etc) to enhance safety for vulnerable road users and reduce traffic speeds;
- To provide a route that can cater for demand;
- To maintain, and enhance where possible, the residential identity of the street and corresponding visual cohesion to avoid a 'built-up' streetscape whilst giving public transport and active modes priority where practicable. i.e. bollards instead of guard rails, providing shelter from wind/rain where possible and provision of smooth surfaces that are free from obstructions.

1.2.3 Target Users

The target users of the scheme are local residents, students/staff of Scoil Fursa, and staff/customers of the numerous small businesses along the route.

The proposed solutions will achieve the above objectives, whilst providing the best value-for-money design for the medium to long-term.

1.3 Purpose of Preliminary Design Report

This Report has been prepared by Clifton Scannell Emerson Associates (CSEA) on behalf of GCC outlining the proposed works for the approximately 330m of road and pedestrian infrastructure along the Crescent, from the junction with Taylor's Hill Road to the junction with St Pauls Road.

2 Project Description

2.1 Description of the Scheme

The proposed scheme is identified as part of a necessary series of junction revisions needed to facilitate the implementation of the GTS. The proposed layout is shown in CSEA Drawing No. 19_151A-CSE-GEN-XX-DR-C-3190 (Figure 2-1 and Appendix A).

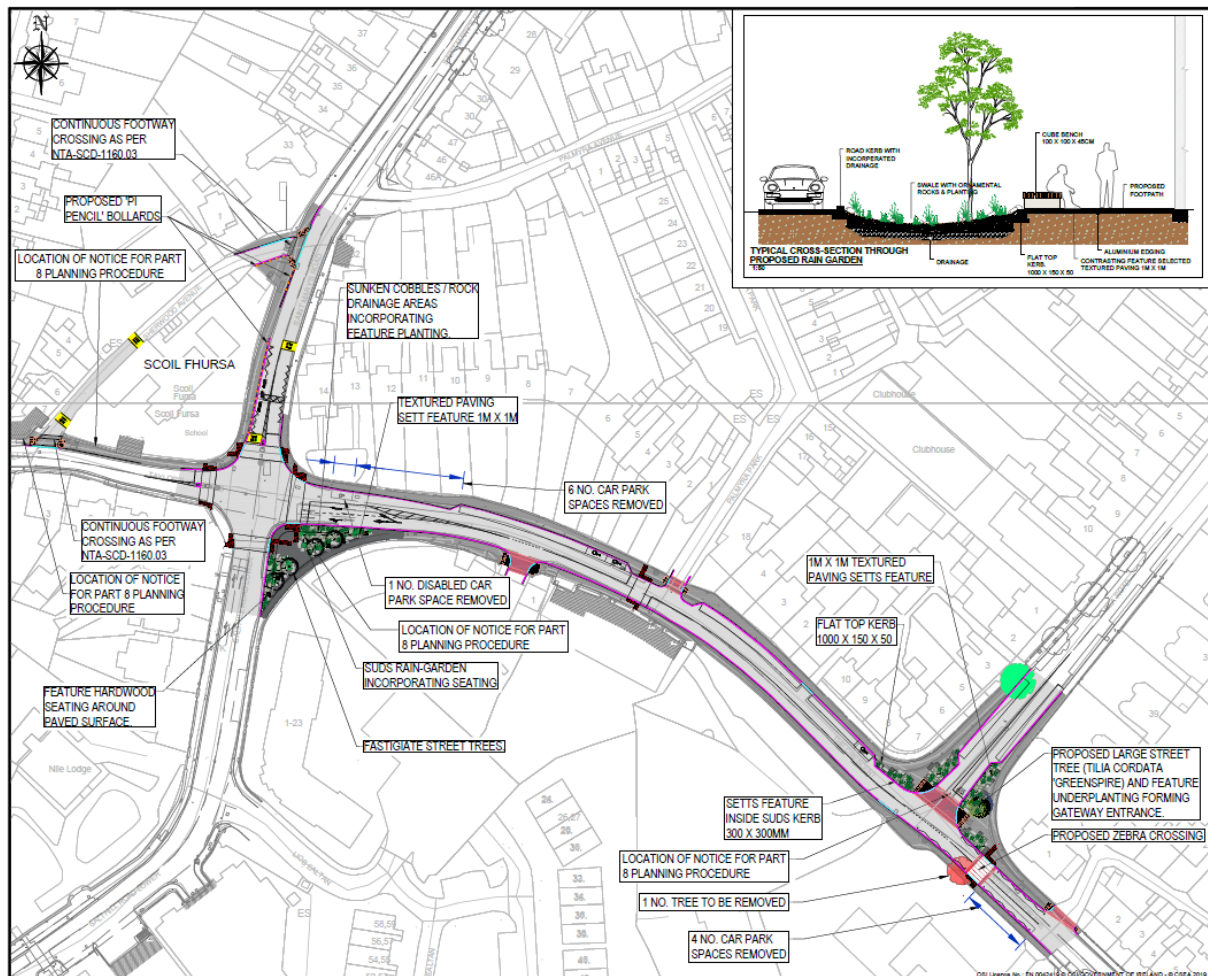


Figure 2-1: Proposed Layout

The scheme is proposed to include;

- The resurfacing of Sherwood Avenue from Taylor's Hill Road to Scoil Fursa;
- The redesign of junction of The Crescent, Salthill Road Lower, Taylor's Hill and St. Mary's Road to include the tightening of the junction facilitated by the removal of some on-street parking;
- The removal of the left slip lane from The Crescent to Salthill Road Lower;
- Resurfacing of the space to facilitate enhanced pedestrian facilities and public realm.
- The upgrade to the traffic signals at this junction and linkages with the UTMCC so as to provide better control on this Junction, CCTV, and add bus priority;

- The provision of raised tables at the junctions of Crescent Green, Palmyra Park and Sea Road;
- The narrowing of the Sea Road junction facilitated by build-out and the removal of 1 no. lane of traffic from the Sea Road approach;
- The provision of a toucan crossing of The Crescent, directly west of the junction with St Pauls Road;
- The provision of an uncontrolled crossing of The Crescent, directly east of the junction with Palmyra Park ; and
- Resurfacing of adjacent pedestrian facilities of length approximately 330m.

In addition, Bus priority could be provided at the junction by use of a smart micro radar.

2.2 Policy Context and Design Guidance

As the existing infrastructure within the study area is considered substandard for some road users, a review of current Policy was undertaken so that necessary changes to comply with these current requirements can be proposed.

The following policy documents and relevant national design guidelines have been reviewed.

As the existing infrastructure within the study area is considered substandard for some road users, particularly for cyclists, a review of current policy was undertaken so that necessary changes to comply with these current requirements can be proposed.

The relevant policy documents have been reviewed with respect to all road users however the highest level of consideration was given to the provision of a safe and accessible cycle network. Subsequent modes have been assessed in the context of prioritising for cyclists and what policies will best complement those proposed for the cycle network within Galway City. This ensures that the objectives of the cycle network are met at the foremost and that objectives relating to walking, public transport and private car are achieved where practical.

The following local, regional and national policy documents and relevant national design guidelines have been reviewed.

2.2.1 Draft Galway City Development Plan 2023-2029

The Draft Galway City Development Plan 2023-2029, published in 2022 by GCC sets out policies for the sustainable development of Galway City. The plan has been developed against a background of significant national policy changes to promote sustainable transport and reduce transport related greenhouse gas emissions. Travel demands for Galway City are increasing in conjunction with population growth and improvements to the transportation network will be essential if Galway is to become a sustainable, compact and connected city in line with national and regional policy direction.

Policy 4.4 of the Plan relates to 'Sustainable Mobility – Walk and Cycle'. The relevant policy points to this Scheme are outlined as:

1. Support the Galway Transport Strategy proposals for a primary cycle network to facilitate safe and convenient medium distance journeys.
2. Support the Galway Transport Strategy proposals for a secondary cycle network and feeder links to facilitate safe and convenient local journeys and to afford linkage into the primary cycle network.
4. Implement a structured programme of improvements across the whole city pedestrian network and at street crossings.

8. Promote, facilitate and maintain maximum connectivity and permeability for pedestrians and cyclists in the design and management of new public and private projects and in upgrading and retrofitting existing developments in accordance with the Design Manual for Urban Roads and Streets (2019) and Permeability a Best Practice Guide, NTA (2015).
9. Ensure facilities for pedestrians and cyclists are designed in accordance with national standards.
10. Promote the implementation of a Wayfinding Scheme with provision of directional information and signage at appropriate locations across the city as part of the implementation of the Public Realm Strategy.

2.2.2 Galway City Development Plan 2017-2023

'The City Development Plan is centred on a vision for Galway City to be a successful, sustainable, socially inclusive regional capital. It aspires to create prosperity while also being environmentally responsible.'

These goals can be achieved through the following policies and objectives relevant to this report:

- *Continue to progress a sustainable transport solution for the city through the implementation of measures included in the GTS and required supporting projects...* (Policy 3.3)
- *Support the GTS proposals for a primary cycle network to facilitate safe and convenient medium distance journeys.* (Policy 3.6)
- *Support the GTS proposals for a secondary cycle network and feeder links to facilitate safe and convenient local journeys and to afford linkage into the primary cycle network.* (Policy 3.6)
- *Implement a structured programme of improvements across the whole city pedestrian network and at road crossings.* (Policy 3.6)
- *Promote, facilitate and maintain maximum connectivity and permeability for pedestrians and cyclists in the design of new developments and in upgrading existing developments in accordance with the Design Manual for Urban Roads and Streets (2013) and Permeability a Best Practice Guide, NTA (2015).* (Policy 3.6)
- *Ensure facilities for pedestrians and cyclists are designed in accordance with national standards.* (Policy 3.6)
- *Implement traffic management and infrastructural changes to facilitate the development of a cycle network including for a core, secondary and feeder network in accordance with the GTS (GTS).* (Specific Objective, Cycling)
- *Develop pedestrian and cycle ways at Knocknacarra, Doughiska and Castlegar linking residential areas with existing and future services and amenities as supported in the GTS.* (Specific Objective, Community Spaces)

2.2.3 Metropolitan Area Strategic Plan: Draft Galway County Development Plan 2022 - 2028

Chapter 6 of the Metropolitan Area Strategic Plan: Draft Galway County Development Plan 2022 -2028 outlines aims to "encourage investment and improvements across all sectors of transport that will support targeted population, economic growth and more sustainable modes of travel including, walking, cycling and public transport".

The plan recognises the benefits to the promotion of both walking and cycling including a reduction of congestion in urban areas, reduced greenhouse gas emissions, a healthier population, enhanced quality of life and more sustainable communities.

The relevant policy objectives for walking and cycling are:

- **WC 1 - Pedestrian and Cycling Infrastructure**

To require the design of pedestrian and cycling infrastructure to be in accordance with the principles, approaches and standards set out in the National Cycle Manual and the Design Manual for Urban Roads and Streets.

- **WC 3 - Sustainable Transport Movement**

To require sustainable transport movement to be given priority at the earliest design stage of development proposals.

- **WC 4 - Modern Network of Walking and Cycling Infrastructure**

To continue to work and engage with the National Transport Authority, the Department of Transport and other agencies in developing a modern network of walking and cycling infrastructure in the County.

2.2.4 Galway Transport Strategy

The GTS is an integrated transport management programme for Galway City and environs which was published in August 2016. *This Transport Strategy will facilitate Galway with an opportunity to grow both physically and economically, offering better transport choices, and creating a public realm to be enjoyed by residents and visitors alike.*

The Current Issues with respect to the movement of people and goods outlined in this Strategy that are particularly relevant to the proposed Galway Cycle Network Stage 2 scheme include:

- An over-reliance on private cars;
- Large amounts of residential development located proximate to major employment and educational destinations city-wide, but not readily accessible by walking, cycling or public transport, thereby encouraging travel by private car;
- Limited roadspace on most of the principal roads, which reduces opportunities for safe and comfortable cycling.

The GTS proposes a Cross-City Link Concept comprising of bus priority, a city centre access network, improved pedestrian/cycle network and access to car parking facilities. The Crescent is proposed to form part of the city centre access network to reduce through-car movement and traffic speeds in the city centre.

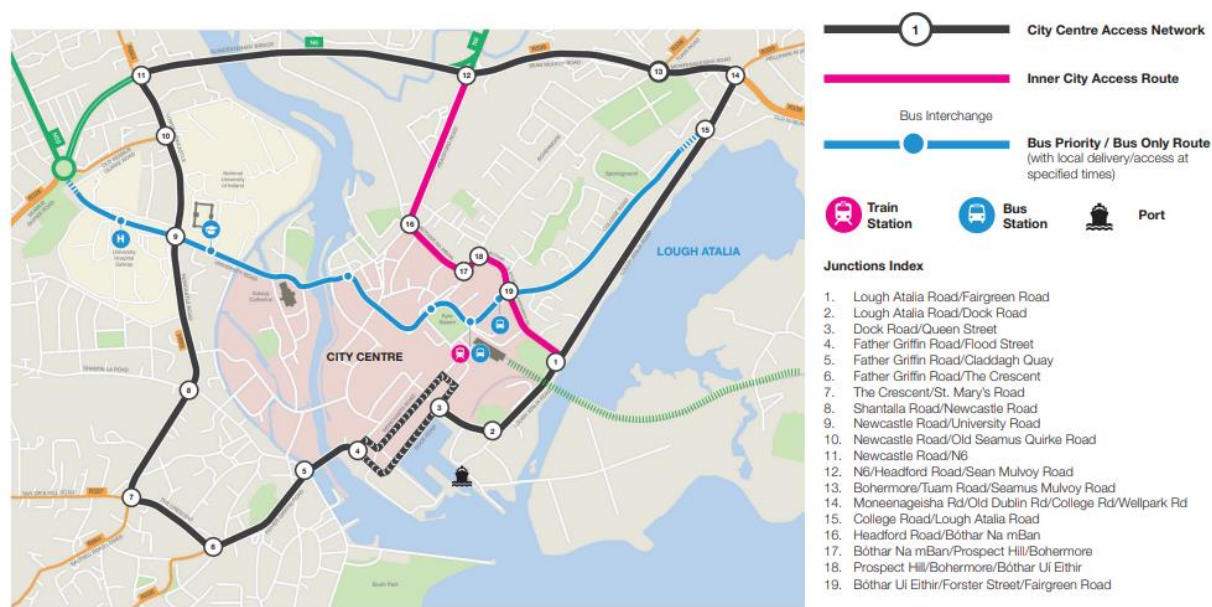


Figure 2-1 Galway City Centre Access Network, GTS

The Crescent is also a component of the core city centre access which seeks to promote active travel and public transport to facilitate public realm improvements.

The GTS recognises that the supply and management of parking is a critical factor in a transport network and proposes to retain access to all car parks and implement a parking strategy to provide for efficient city centre access, sufficient parking pricing so that it is not cheaper than public transport and to minimise the impact of on-street parking.

Appendix F of the GTS proposes a cycle network and infrastructure development taking cognisance of the existing facilities, previous proposals, journey types most suited to cycling and travel desire lines. Taylors Hill, St Mary's Road and The Crescent are identified as Feeder Routes within the network (Figure 2-2). The proposed infrastructure is to improve pedestrian facilities and provide traffic calming measures and signage to reduce vehicular speeds to create an environment more conducive to cycling.

Feeder	Taylor's Hill	Currently no facility in place. Proposal to improve pedestrian facilities in this area, and to provide traffic calming measures and signage to reduce motorised traffic speeds and advertise the presence of cyclists.	1570 m
	St Mary's Road	Currently no facility in place. Proposal to provide traffic calming measures and signage to reduce motorised traffic speeds and advertise the presence of cyclists.	440 m
	The Crescent	Currently no facility in place. Proposal to provide traffic calming measures and signage to reduce motorised traffic speeds and advertise the presence of cyclists.	350 m
	Whitestrاند Road	Currently no facility in place. Proposal to provide traffic calming measures and signage to reduce motorised traffic speeds and advertise the presence of cyclists.	680 m
	Father Griffin Road	Currently no facility in place. Proposal to provide traffic calming measures and signage to reduce motorised traffic speeds and advertise the presence of cyclists.	450 m

Figure 2-2 Proposed Infrastructure, Appendix F of the GTS

2.2.5 Smarter Travel – A Sustainable Transport Future

This policy document is A New Transport Policy for Ireland 2009-2020 and includes five key aims, such as:

- 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 dependence on imported fossil fuels.

2.2.6 National Cycle Policy Framework 2009-2020

This plan sets out a substantial suite of interventions to improve the ease and safety of cycling in order to achieve greater mode share going forward. It states that making provision for cyclists in the urban environment does not merely consist of providing dedicated cycling facilities but also involves wider traffic interventions that benefit all vulnerable road users. It acknowledges that investment in a cycling network has an impact on an entire geographical area not just the liner corridor where the cycle facility is installed. It has an impact on road safety within that area as well as a positive impact on the health of the population using the whole network which amounts to a societal effect.

2.2.7 National Cycle Manual

The National Cycle Manual (NCM) is a national guidance document to guide planners and engineers in their work to improve cycling provision in urban areas.

Cycling as a vulnerable mode of transport should be supported by a good design with principles of sustainable safety applied.

There are five principles, which should be followed in every design:

- Functionality – cycle facility design is fit for purpose and follows movement related functions and place related functions.
- Homogeneity – reduction in the relative speed, mass and directional differences of different road users sharing the same space.
- Legibility – self-evident, self-explanatory and self-enforcing road environment.
- Forgivingness
- Self-awareness

The NCM also notes that pedestrians are the most vulnerable road users and recognises the need for integration between walking and cycling to create a sustainable transport network. This is to be achieved through pedestrian priority to be reinforced by signage and cycling alignment and speed reduction measures. The Hierarchy of Provision within a network, as proposed by the NCM is as follows:

1. Traffic Reduction;
2. Traffic Calming;
3. Junction treatment and traffic management;
4. Redistribution of carriageway;
5. Cycle lanes and cycle tracks; and
6. Cycleway (public roads for the exclusive use of cyclists and pedestrians)

2.2.8 Sustainable Mobility Policy Review

The Sustainable Mobility Policy Review, Background Paper 2, Active Travel was published by the Department of Transport, Tourism and Sport to inform public consultation on Ireland's sustainable mobility policy. The purpose of the paper is to provide an opportunity to review public transport policy 'to ensure services are sustainable into the future and area meeting the needs of a modern economy' and by reviewing the role of Active Travel modes in the context of the wider transport network while raising some issues for consideration in developing future policy.

The five benefits of Active Travel that can be capitalised on are identified as:

- Environmental - reduced levels of carbon emissions and greenhouse gases;
- Health - improved levels of fitness and public health generally from increased activity;
- Safety - increased levels of active travel can stimulate the increased provision of quality footpaths and cycle paths by public authorities;
- Economic - increased active travel usage can lead to reduced congestion levels and improved accessibility in urban areas; and
- Social - increased provision for active travel modes can drive improved transport equity.

The road user hierarchy, as set out in the National Sustainable Mobility Policy, states that the order of consideration to encourage sustainable travel patterns and safer streets is shown in Figure 2-3.

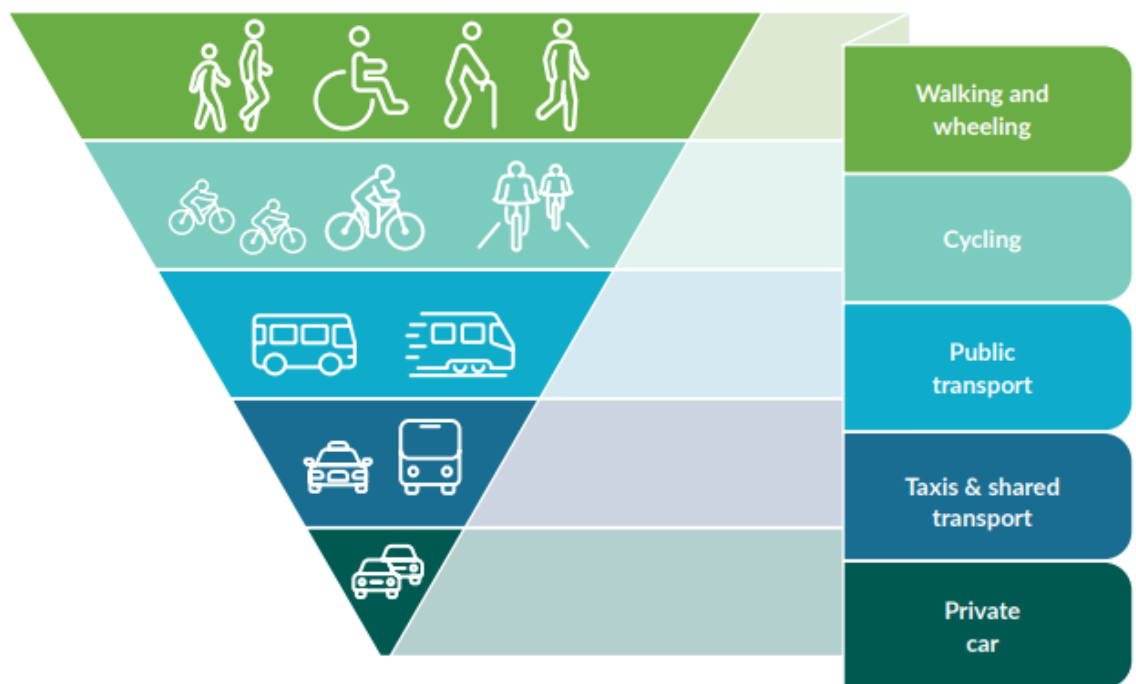


Figure 2-3 Road User Hierarchy from the National Sustainable Mobility Policy

Walking is recognised as the most sustainable form of transport. Furthermore, all journeys begin and end on foot. By prioritising design for pedestrians first, the number of short journeys taken by car can be reduced and public transport made more accessible.

2.2.9 Design Manual for Urban Roads and Streets

This document provides guidance relating to the design of urban roads and streets. It outlines principles, approaches and standards that are necessary to achieve balanced, best practice design outcomes with

regard to street networks and individual streets. This Manual sets out an integrated design approach influenced by the type of place in which the street is located and balance the needs of all users. It also aims to put well designed streets at the heart of sustainable communities creating physical, social and transport networks that promote real alternatives to car journeys, namely walking, cycling and public transport. The manual key design principles are as follows:

- To support the creation of integrated street networks, which promote higher levels of permeability and legibility for all users, and in particular more sustainable forms of transport.
- The promotion of multi-functional, place-based streets that balance the needs of all users within a self-regulating environment.
- The quality of the street is measured by the quality of the pedestrian environment
- Greater communication and co-operation between design professional through the promotion of a plan-led, multidisciplinary approach design.

2.2.10 Project Ireland 2040

This document is the Government's high-level strategic plan to improve transport, tourism and sport infrastructure by 2040. Project Ireland 2040 seeks to achieve ten strategic outcomes, building around the overarching themes of wellbeing, equality and opportunity. Two of these ten shared priorities are Sustainable Mobility and Enhanced Amenity and Heritage.

Sustainable Mobility's special focus is on the provision of safe alternative active travel options to alleviate congestion and help to meet climate action objectives, where Enhanced Amenity and Heritage aims to invest in high-quality infrastructure to create living space with defined character and attractiveness. Active travel is a feature of the two overarching policy documents – the National Planning Framework and the ten-year National Development Plan (NDP) 2018-2027 .

Investment in active travel infrastructure will support the realisation of a number of National Strategic Outcomes (NSOs) as identified in Project Ireland 2040, namely:

- NSO 1 – Compact Growth
- NSO 3 – Strengthened Rural Economies and Communities
- NSO 4 – Sustainable Mobility
- NSO 7 – Enhanced Amenity and Heritage
- NSO 8 – Transition to a Low Carbon and Climate Resilient Society

Project Ireland 2040 states the Government's objective to "*ensure the integration of safe and convenient alternatives to the car into the design of our communities, by prioritising walking and accessibility to both existing and proposed developments, and integrating physical activity facilities for all ages.*"

This document supports an ambitious growth target to enable a city like Galway to grow by 50-60% by 2040. The relevant key future growth enablers for Galway are:

- Improving access and sustainable transport links to, and integration with, the existing employment areas to the east of the City at Parkmore, Ballybrit and Mervue;
- Development of a strategic cycleway network with a number of high capacity flagship routes;
- Provision of a Citywide public transport network, with enhanced accessibility between existing and proposed residential areas and the City Centre, third level institutions and the employment areas to the east of the city; and
- Development of a strategic cycleway network with a number of high capacity flagship routes,

2.2.11 Climate Action Plan 2023

This document is the Government's plan for tackling climate breakdown. It outlines the current state of play across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and charts a course towards ambitious decarbonisation targets. The Climate Action Plan 2023 (CAP23) builds on the Climate Action Plan 2021 (CAP21) with the objective to achieve a net zero carbon energy system and create a resilient, vibrant and sustainable country.

To meet the required level of emissions reduction as set out in the CAP21 by the Government of Ireland, transport related emissions are set to reduce by 51% by 2030. The CAP23 calls for a significant cut in transport emissions by 2030 in order to meet this sectoral emission ceiling. This includes a 20% reduction in total vehicle kilometres, a reduction in fuel usage, and significant increases to sustainable transport trips and modal share.

The CAP23 highlights that meeting the 2030 transport abatement targets will require transformational change and accelerated action across all key decarbonisation channels. The CAP21 targets have been revised to meet this higher level of ambition, including a 20% reduction in total vehicle kilometres, a reduction in fuel usage, and significant increases to sustainable transport trips and modal share.

This is to be done through active travel infrastructure, improved public transport, planning, innovation and financial supports for improved system, travel, vehicle and demand efficiencies.

As outlined in the CAP23, the approach to achieve a more sustainable transport sector is based on the Avoid-Shift-Improve principle (Figure 2-4).

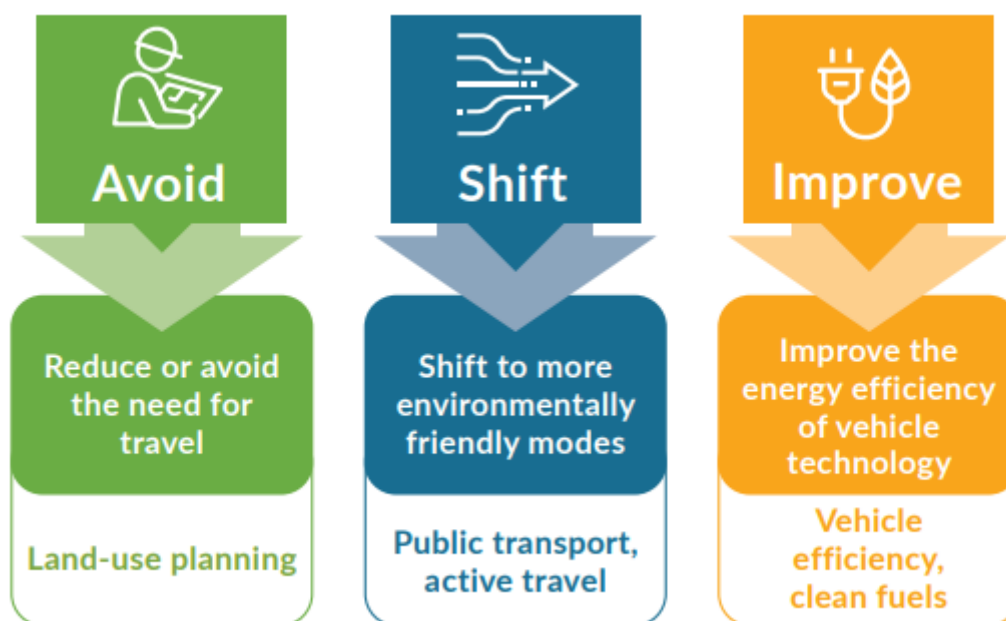


Figure 2-4 'Avoid-Shift-Improve' Principle from the National Sustainable Mobility Policy

2.2.12 Regional Planning Guidelines for the West Region (2010-2022)

SG2 of the Regional Planning Guidelines for the West Region aims to 'put in place an integrated sustainable transport and access infrastructure' that, among other advantages, 'minimises the need for car-based travel'.

These RPGs include the following relevant policy objectives:

IO9: Support the sustainable development of an integrated transportation system for Galway City and County Areas;

IP13: Promote on-going Traffic Management policies and plans... ..with particular emphasis on measures to facilitate public transport, walking and cycling;

IP21: Promote a better environment for pedestrians, cyclists and persons with disabilities... ..so as to facilitate increased mobility and access for citizens;

IO32: Promote the development of safe and convenient pedestrian and cycling facilities in Galway City... ..to minimise the dependence on private motor vehicles and to encourage an active and healthy lifestyle.

2.2.13 Regional Spatial and Economic Strategy for the Northern and Western Region (RSES)

The RSES 2020-2032 for the Northern and Western Assembly is a strategic development framework published by the Northern and Western Regional Assembly and sets out a vision for the sustainable physical, economic and social development of the region and provide guidance for local level policies. The relevant priorities from the RSES are;

- Provision of a core, secondary and feeder cycle network which includes segregated cycle routes, on-road cycle lanes and /or wide bus lanes to cater for both buses and cyclists along the same route;
- Provision of a primary network of cycle routes comprising of two greenways connecting into the county settlements – the Oranmore to the City Centre and onwards to Bearna Greenway and City Centre to Oughterard Greenway;
- Provision of additional primary routes including cross-city routes to the north of the city and some key north –south links;
- Develop a secondary cycle network that will comprise connections from residential areas and areas of employment to the primary network accessing key destinations;
- Promotes appropriate public transport services – rail or bus transport and other sustainable modes of travel such as walking and cycling;
- Provide for Park and ride facilities on the periphery of the city linked in with the bus network to reduce the amount of commuter traffic entering into the city;
- Development of a cross-city network of bus services which can serve the major trip attractors with five core bus routes to provide a minimum 15-minute frequency service during the peak periods and sustain a high-frequency service throughout the day; and
- Support the extension of the public transportation options available to the travelling public throughout the region through the pursuit of a variety of options, including new/additional Quality Bus Corridors, commuter rail service, and appropriately located park and ride facilities, particularly in relation to the Gateway, the Tuam Hub, the Linked Hub Castlebar/Ballina and other towns such as Ballinasloe, Gort and Claremorris. Consideration should also be given, where appropriate, to the creation of additional lanes or alteration to existing lanes for Quality Bus Corridors on the main commuter routes into the Gateway, Hub and Linked Hub

2.2.14 BusConnects Galway

BusConnects Galway is an infrastructure project underpinned by the Galway City Development Plan, Project Ireland 2040 and the RSES with the aim to transform the city bus services. The objectives of the BusConnects projects are to:

- Connect – with 4km of multi-modal routes, creating new connections and links;
- Bus Patronage – Increase bus passenger numbers by 8% (average annual increase);
- Time – Bus priority to ensure journey saving times of up to 9 minutes;
- Opportunity – Service future developments and create a network of connected amenities and services; and
- Growth – Cater for Galway's predicted population growth to reach 120,000 by 2040.

2.2.15 Healthy Ireland Framework 2019-2025

The Healthy Ireland Framework 2019-2025 is a roadmap published by the Department of Health. Its vision is to create a society in which an individual's physical and mental wellbeing is valued and realised to its full potential. It provides guidance for building a healthier Ireland around the following four key goals:

- To increase the proportion of people who are healthy at all stages of life;
- To reduce health inequalities;
- To protect the public from threats to health and wellbeing; and
- To create an environment where every individual and sector of society can play their part in achieving a healthy Ireland.

Additional Government policy documents that support the above scheme objectives include:

"People, Place and Policy Growing Tourism to 2025", "Sustainable Residential Development in Urban Areas" and the "Urban Design Manual".

2.2.16 Healthy Ireland Framework 2019-2025

The Healthy Ireland Framework 2019-2025 is a roadmap published by the Department of Health. Its vision is to create a society in which an individual's physical and mental wellbeing is valued and realised to its full potential. It provides guidance for building a healthier Ireland around the following four key goals:

- To increase the proportion of people who are healthy at all stages of life;
- To reduce health inequalities;
- To protect the public from threats to health and wellbeing; and
- To create an environment where every individual and sector of society can play their part in achieving a healthy Ireland.

Additional Government policy documents that support the above scheme objectives include: "People, Place and Policy Growing Tourism to 2025", "Sustainable Residential Development in Urban Areas" and the "Urban Design Manual".

3 Constraints

A review of the site of the proposed road development identified the following main constraints within and directly adjacent to the site.

3.1 Residential, Businesses, Schools and Parks

There are a number of constraints to consider when developing improvement works along the route. The key constraints and opportunities for the route are given in Table 1.

Table 1 Summary of Key Constraints

Constraints	
Land Use	Mostly residential with a mix of restaurants/cafes and retail. Business are concentrated at the The Crescent, Salthill Road Lower, Taylor's Hill and St. Mary's Road junction. Scoil Fursa is located at the north-west of this junction. On Sherwood Avenue.
Existing Carriageway	One lane (widths varying from 2.5m-3m) for general traffic provided in each direction.
Parking/Loading	Intermittent parking provided along the northern extent.
Public Transport	Bus route 401 travels along The Crescent and use the left-turn slip lane to turn onto Salthill Road Lower.
Traffic	Junction of The Crescent, Salthill Road Lower, Taylor's Hill and St. Mary's Road AADT: 14,829 vehicles %HGV: 2% % Cyclist: 3%
Landscaping	Minimal trees located along footpaths and significant over-hanging growth from boundary walls.
Utilities	Underground MV/LV ESB at The Crescent Salthill Road Lower, Taylor's Hill and St. Mary's Road junction to Palmyra Park. Underground HV ESB - none known. Overhead LV ESB and Eir along Sea Road, The Crescent and at The Crescent Salthill Road Lower, Taylor's Hill and St. Mary's Road junction Watermain along Sea Road, The Crescent and at The Crescent Salthill Road Lower, Taylor's Hill and St. Mary's Road junction Foul/combined sewer along Sea Road, The Crescent and at The Crescent Salthill Road Lower, Taylor's Hill and St. Mary's Road junction

Gas along Sea Road, The Crescent and at The Crescent Salthill Road Lower, Taylor's Hill and St. Mary's Road junction

Virgin Media along Sea Road and The Crescent

ENET along The Crescent and Taylor's Hill.

Issues arising from these constraints include the removal of on-street parking that many local businesses may feel are necessary. This is particularly true for short-stay appointment based businesses along the route.

3.2 Existing Road Network

The Scheme includes the upgrading of the major junctions of The Crescent, Salthill Road Lower, Taylor's Hill and St. Mary's Road and the minor junctions of Crescent Green, Palmyra Park and Sea Road with The Crescent as well as the adjacent pedestrian facilities. The scheme is approximately 270m in length (Figure 3-1).



Figure 3-1 Scheme Location

3.2.1 The Crescent

The Crescent extends for approximately 260m providing for 1 no. lane (widths varying from 2.5m-3m) for general traffic in each direction. There is residential access and intermittent parking provided along the northern extent.

The western extent ties into a crossroads with Saint Mary's Road to the north, Salthill Road Lower to the south and Taylor's Hill Road to the west.

The crossroads junction of Saint Mary's Road to the north, Salthill Road Lower to the south, The Crescent to the east and Taylor's Hill Road to the west has the four approaches of:

- Saint Mary's Road - One lane for straight, left and right traffic;
- Salthill Road Lower – One lane for straight and left traffic and a short lane (24.7m) for right turning traffic;
- The Crescent – One lane for straight traffic, a short lane (27.5m) for right turning traffic and a slip lane for left turning traffic; and
- Taylor's Hill Road – One lane for straight, left and right traffic.

All four exits from the junction are one lane wide and there is a pedestrian crossing across each arm of the junction.

Traveling east, there is a minor priority t-junction with Crescent Villas to the south and Palmyra Park to the north.

There is a major priority t-junction with Sea Road to the north with one exit lane and two approach lanes.

There is a minor priority t-junction with St Pauls Road to the north.

3.3 Existing Trees

A tree located on the footpath at the southern extent of the junction of The Crescent, Sea Road and Father Griffin Road (Figure 3-2) has been subject to an independent arborist assessment.



Figure 3-2 Tree Located at the Southern Extent of the Junction of The Crescent, Sea Road and Father Griffin Road

The report concluded that:

“..it is also possible to retain the tree and integrate into any new designs. If the proposed design allowed for the extending of the footpath into the road and creating a traffic calming effect in conjunction with the zebra crossing the tree could potentially be retained. Care would need to be taken when removing the existing hard surface so as not to cause undue damage to the trees root system. Geocells and permeable resin-bound surfaces could be used around the tree to protect the roots and prevent the lifting of any surfaces in the future“.

The report also notes that tree is acknowledged as “restricting pedestrian access and inevitably forces people onto the road” (Figure 3-3) as well as having “outgrown its local area and that a species with the potential to grow to such a large mature height was the wrong option for such a restricted area”. This is demonstrated by the roots of the tree displacing the kerbing (Figure 3-4). Additionally, the tree also obstructs visibility for pedestrian crossing at the junction which is particularly notable as it is in close proximity to a bus stop. The full Arbor Assessment Report is shown in Appendix B. In the context of pedestrian and road safety, it is proposed to remove the tree to create a more accessible, continuous and functional pedestrian network.



Figure 3-3 Restricted Pedestrian Access at the Location of the Tree

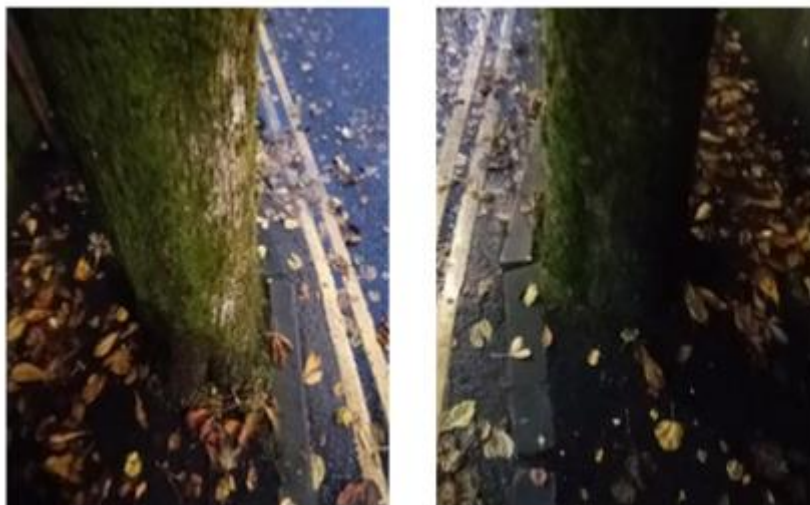


Figure 3-4 Tree Roots Displacing the Kerbing

4 Design Data Collection

4.1 Topographical Survey

A topographical survey of the site was carried out of the scheme extents by APEX Surveys in Spring/Summer 2020 and has been incorporated in developing the preliminary layout

4.2 Underground Utilities Survey

Records of underground utilities have been collected from the relevant statutory bodies and have been incorporated in developing the preliminary layout.

4.3 Traffic Survey

Traffic volumes were recorded by IDASO as part of a 12hr classified traffic count on Thursday November 14th 2019. The traffic count was carried out as part of an annual traffic count commissioned by GCC and records made available.

It should be noted that more up to date traffic volumes would not be worthwhile as traffic volumes are heavily influenced by the government enforced COVID-19 restrictions against non-essential work, non-essential travel, organised events and social gatherings. The restrictions have been in effect, to varying degrees, since March 2020 and an end is not yet forecast.

5 Traffic Assessment and Modelling

5.1 Traffic Volumes

The traffic volumes modelled were recorded from a classified 12hr (07:00-19:00) traffic count carried out 14/11/2019 on behalf of CSEA. The AM peak hour was 08:00-09:00 with a total of 1328 PCU's passing through the junction and the PM peak hour was 14:45-15:45 with 1246 PCU's passing through the junction. Traffic flows are shown in Figure 5-1.

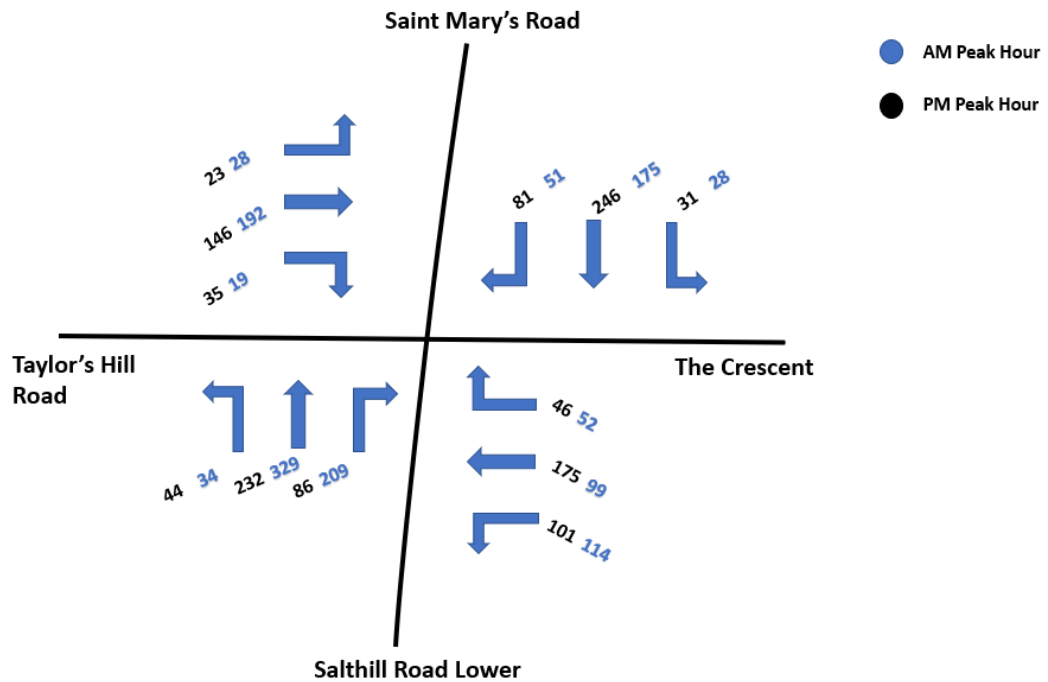


Figure 5-1 Traffic Volumes

5.2 Traffic Signals

The stage sequences for the existing and proposed scenarios are shown in Figure 5-2 and Figure Figure 5-3 respectively.

Stage Sequence Diagram

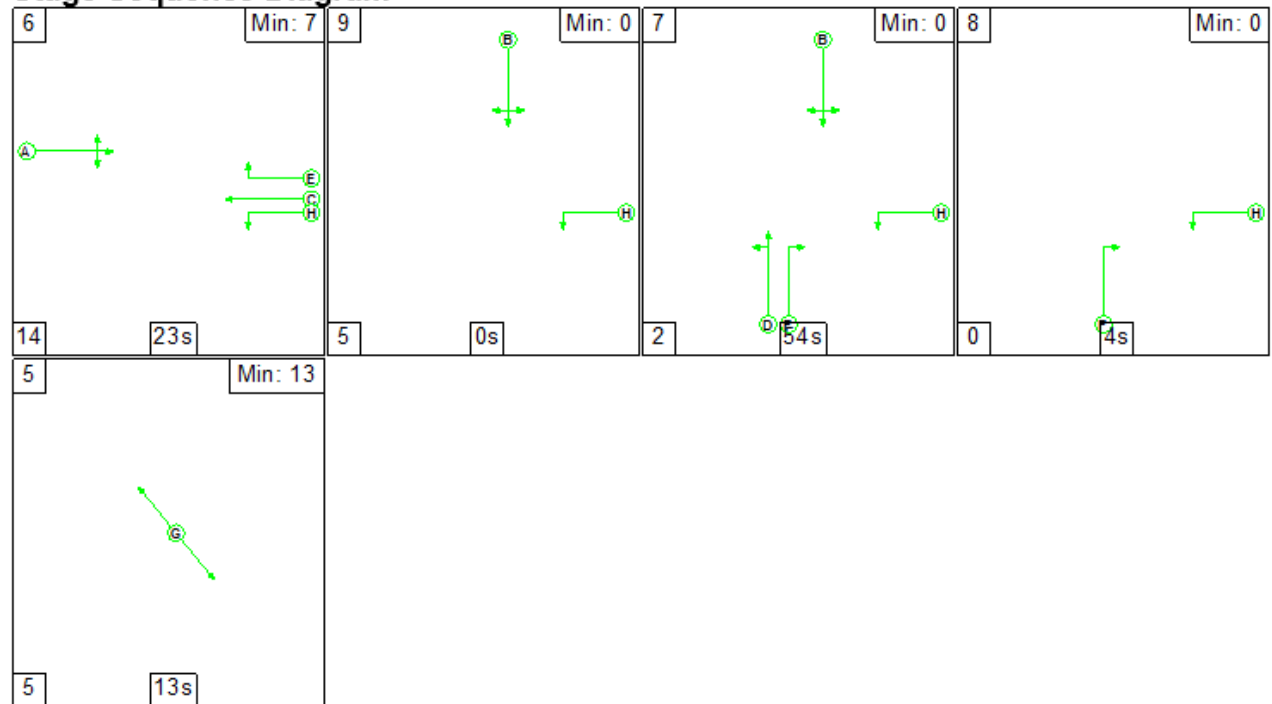


Figure 5-2 Existing Scenario Stage Sequence (signal timings are for the AM peak and stage 5 is an all pedestrian phase)

Stage Sequence Diagram

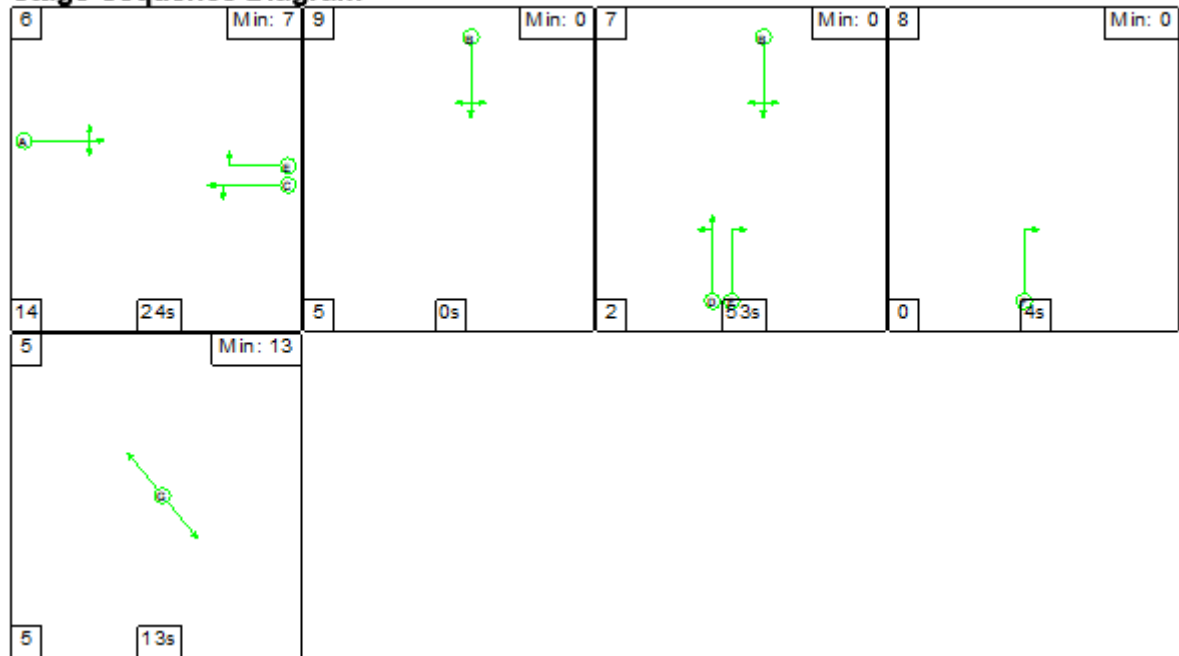


Figure 5-3 Proposed Scenario Stage Sequence (signal timings are for the AM peak and stage 5 is an all pedestrian phase)

5.3 Modelling Results

A summary of the results is shown in Table 5-1.

The full LINSIG Reports (including for different stage sequences) are shown in Appendix C.

Table 5-1 LinSig Results Summary

	AM Peak (08:00-09:00)		PM Peak (14:45-15:45)	
	Existing Layout	Proposed Layout	Existing Layout	Proposed Layout
Highest DoS* (%) (*Degree of Saturation)	63.7 @ Salthill Road Lower	63.9 @ Salthill Road Lower	48.0 @ Saint Mary's Road	57.7 @ The Crescent
Longest Mean Maximum Queue (pcu)	12.2 @ Salthill Road Lower	12.4 @ Salthill Road Lower	8.6 @ Saint Mary's Road	9.5 @ Saint Mary's Road
Total Delay (pcu Hr)	13.1 For whole network	14.7 For whole network	12.0 For whole network	14.1 For whole network
PRC** (%) (** Practical Reserve Capacity)	41.3 For whole network	40.8 For whole network	87.7 For whole network	55.9 For whole network

5.4 Traffic Modelling Conclusions

Overall, the removal of the left slip lane from The Crescent to Salthill Road does not have an impact on the junction performance during the AM peak and does not have an overwhelmingly negative impact during the PM peak.

The performance of The Crescent does change notably with the removal of the left slip lane (from an average DoS across the three lanes in the Existing Scenario to an average Dos across the two lanes in the Proposed Scenario of 26.7% to 62.4% during the AM peak and 25.7% to 57.7% during the PM peak). However, the DoS remains below the threshold of congestion (90%) in both scenarios. Furthermore, The Crescent is not the worst performing arm across the junction and therefore the overall junction performance is not hugely affected.

5.5 Traffic Collision Survey

The Road Safety Authority (RSA) has not published any data on road traffic collisions since 2016 and is currently reviewing their road traffic collision (RTC) data sharing policies and procedures in light of General Data Protection Regulation (GDPR) requirements. However the area has been assessed using the most recent data available.

The area within and surrounding the scheme extents of the proposed development was analysed to gain an understanding of the collision history. The collision data around the development site was obtained from the Road Safety Authority (RSA) online mapping tool – CollStats, available from the RSA website (<https://www.rsa.ie/RSA/Road-Safety/RSA-Statistics/Collision-Statistics/Ireland-Road-Collisions/>).

Available data for the most-recent five years (2012 – 2016) were included in the data analysis. While the data on the database does not contain detailed records by An Garda Siochana (e.g. road surface, weather, lighting conditions), the CollStats data provides a good initial picture of the existing collision problems.

As the site is a main route the city centre and sees high motor, cyclist and pedestrian volumes, only the junctions within the site and their approaches were analysed as the substantial traffic volumes from the neighbouring developments minimise the traffic impact of traffic travelling to and from the site location.

Figure 3-1 shows the RSA Collision Map showing the extent of the area for which data was analysed and Table 5-2 shows a summary of the recorded collisions.

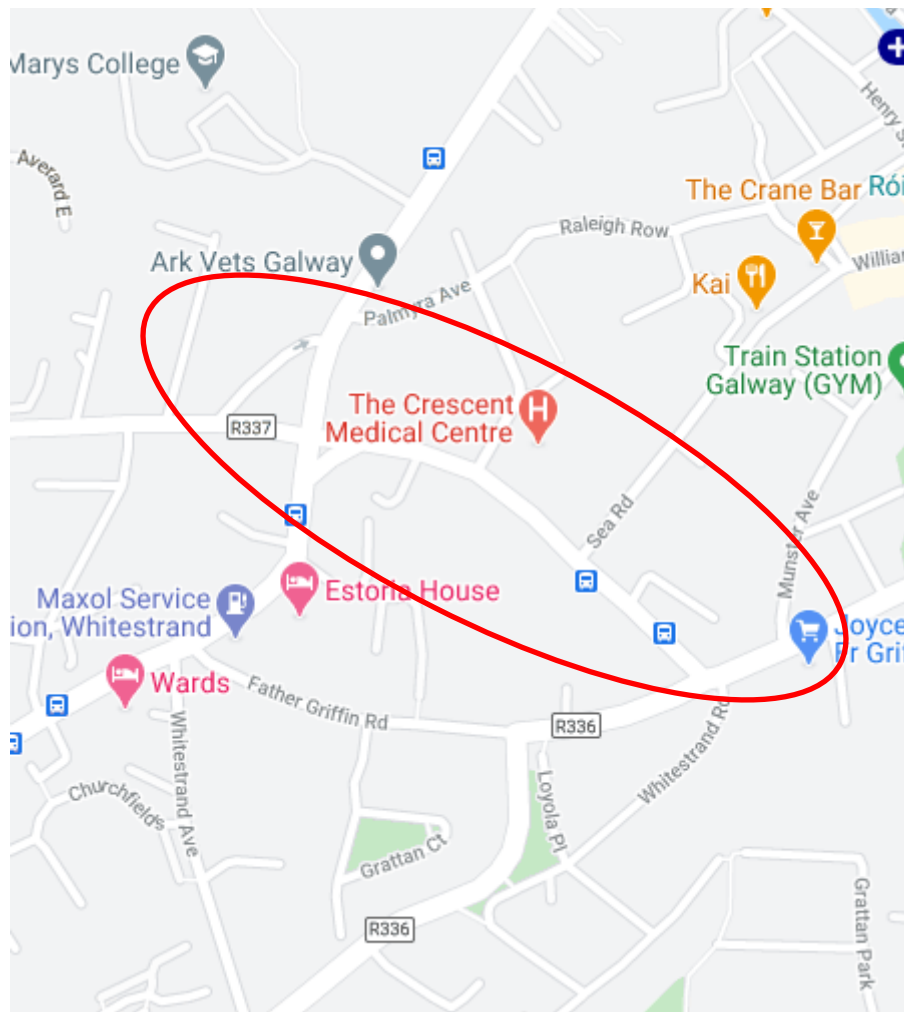


Figure 5-4 Collision Survey Extents

Table 5-2 Collision Survey Summary

Location	Severity	Vehicle	Type	No. of Casualties	Year	Day	Time	Speed Limit
Left Turn Slip Road from The Crescent to Salthill Road Lower	Minor	Bicycle	Other	1	2014	Tuesday	07:00-10:00	50kph
Sea Road Approach (approx. 80m from The Crescent Junction)	Minor	Bus	Pedestrian	1	2014	Saturday	03:00-07:00	50kph

St Marys Road at the junction with Palmyra Ave (approx. 85m from The Crescent Junction)	Minor	Car	Pedestrian	2	2013	Tuesday	10:00-16:00	50kph
Sea Road Approach (approx. 25m from The Crescent Junction)	Minor	Car	Pedestrian	1	2013	Friday	16:00-19:00	50kph
St Marys Road (approx. 55m from The Crescent Junction)	Minor	Car	Rear end, straight	1	2012	Thursday	10:00-16:00	50kph
Junction of The Crescent, Salthill Road Lower, Taylor's Hill and St. Mary's Road	Minor	Car	Other	2	2012	Friday	10:00-16:00	50kph

6 no. collisions were recorded within the period 2012-2016, of which all were minor in severity, with 0 no. were serious 0 no. were fatal (Figure 5-5).

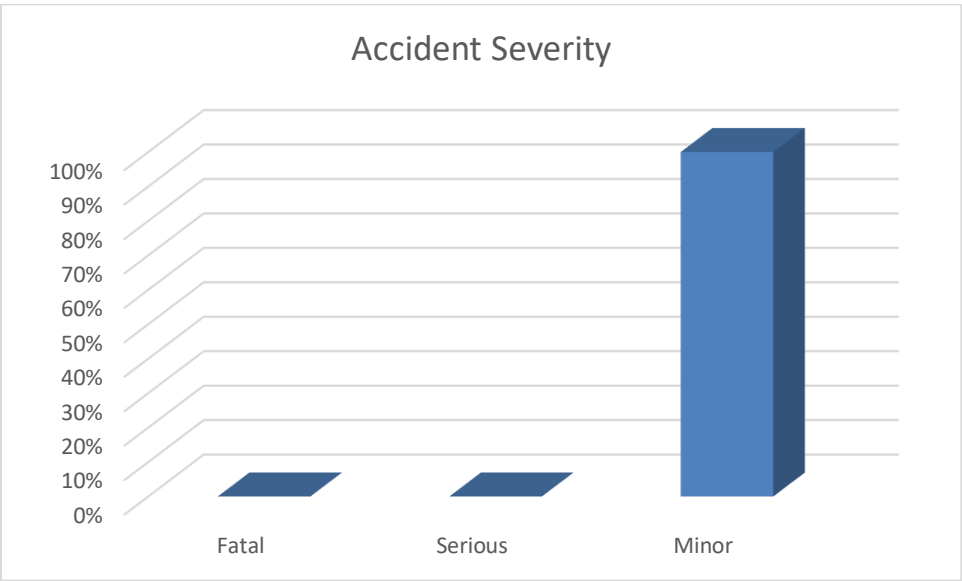


Figure 5-5 Accident Severity

50% (3 no.) of the collisions recorded involved a pedestrian with 17% (1 no.) described as ‘Rear end, straight’. 33% (6 no.) were described as ‘other’ (Figure 5-6).

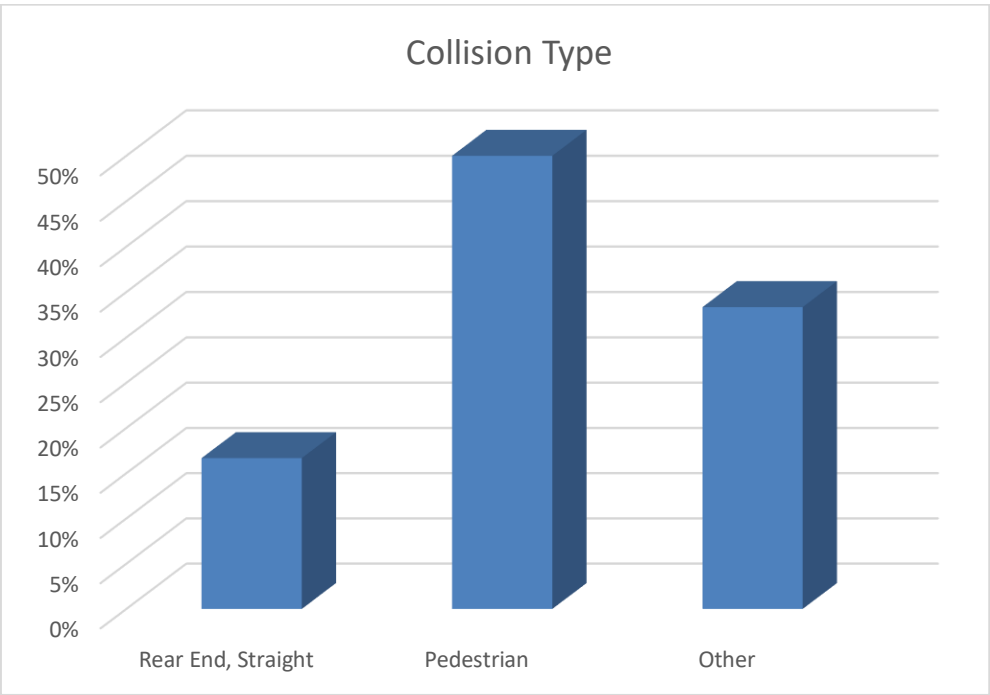


Figure 5-6 Collision Type

Tuesdays and Fridays each recorded the highest collision rate accounting for 33% (2 no.) of total collisions. Thursdays and Saturdays each recorded 17% (1 no.) of all collisions. Mondays, Wednesdays, and Sundays each recorded 0 collisions (Figure 5-7).

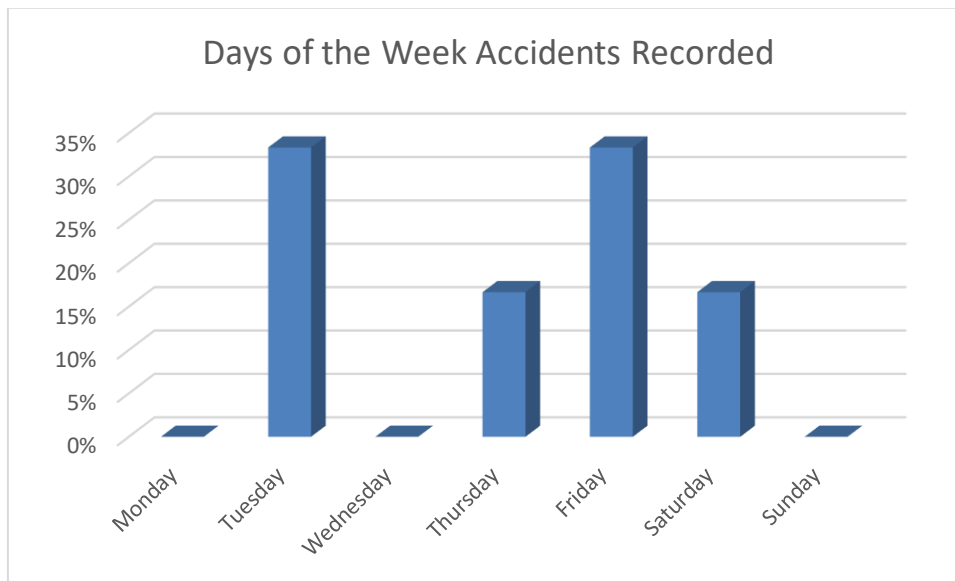


Figure 5-7 Days of the Week Accidents were Recorded

Error! Reference source not found. shows the time of day collisions in the study area occurred. Times are categorised into six time periods as follows:

- 03:00-07:00 (4 hrs)
- 07:00-10:00 (3 hrs)
- 10:00-16:00 (6 hrs)
- 16:00-19:00 (3 hrs)
- 19:00-23:00 (4 hrs)
- 23:00-03:00 (4 hrs)

Table 5-3 Summarises the accident rate per hour of each of the time periods.

Table 5-3 Accident Rate per Hour

Time Period	03:00-07:00	07:00-10:00	10:00-16:00	16:00-19:00	19:00-23:00	23:00-03:00
Percentage of Total Collisions	17	17	50	17	0	0
Accident Rate (How many collisions per hour) (%)	1	1	3	1	0	0

Table 4: Accident Rate per Hour

The 10:00-16:00 time period recorded 50% (3 no.) of all collisions and had the highest accident rate of 3% per hour. The 03:00-07:00, 07:00-10:00 and 16:00-19:00 time periods each recorded 17% (1 no.) of collisions and for accident rates of 1% per hour in each scenario. No collisions were recorded during the time periods 19:00-23:00 or 23:00-03:00 ()Figure 5-8.

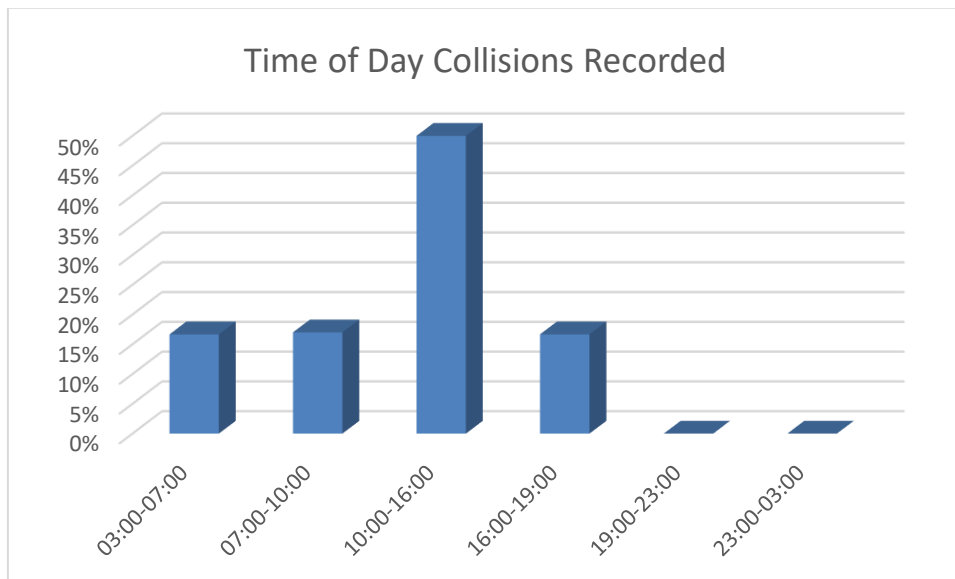


Figure 5-8 Time of Day Collisions were Recorded

Given the lack of a clearly defined pattern of collision severity, type and time and spread of location within the study site, it can be concluded that the road configuration, which is broadly similar to the proposed layout does not negatively impact road safety.

6 Design Strategy – Geometrics and Safety

6.1 Design Basis

The design has been prepared in accordance with the Design Manual for Urban Roads and Streets (DMURS) published by DTTAS & DoECLG in 2013.

6.2 Existing Roadway Arrangement

Eastbound on The Crescent

- Carriageway- Approximately 2.5m;
- On-street Parking - Approximately 2.3m; and
- Footpath- Approximately 1.6m.

Westbound on The Crescent

- Carriageway - Approximately 3.3m.

6.3 Design Speed

In accordance with Chapter 4.1.1 of the Design Manual for Urban Roads and Streets and due to the proposed route classed as 'Link' in a 'suburban area', a 50km/hr speed limit is proposed to be imposed for the proposed road scheme, with a design speed limit of 50km/hr.

6.4 Design Parameters

In accordance with Table 4.2 of DMURS, the minimum stopping sight distance (SSD) for a design speed of 50kph is 45m.

6.4.1 Proposed Road Type and Mainline Cross-Section

Eastbound on The Crescent

- Carriageway- Approximately 2.5m;
- On-street Parking - Approximately 2.3m; and
- Footpath- Approximately 1.6m.

Westbound on The Crescent

- Carriageway - Approximately 3.3m.

6.4.2 Relaxation & Departures from Standards

The geometric design of the proposed road scheme is in compliance with the DMURS.

6.4.3 Stopping Sight Distance (SSD)

The scheme shall achieve full SSD as per DMURS.

6.4.4 Minor Junctions and Corner Radii

The scheme, which runs in a north-south direction, encompasses east-west junctions with:

- The Crescent Villas;
- Palymra Park; and
- Sea Road.

These junctions are all minor, priority t-junctions and are proposed to be realigned in accordance with *Section 4.3.3 Corner Radii* has been realigned to widen the corner radii as per *Section 4.3.3 Corner Radii* of DMURS.

The junction crossings have been realigned to allow for installation of raised tables, buff tactile paving and road markings at the uncontrolled crossing as per *Section 4.3.2 Pedestrian Crossings* of DMURS.

6.4.5 Major Junctions and Corner Radii

Th major junctions include:

- The Crescent/Taylor's Hill/St Marys Road Junction; and
- Sea Road.

The corner radii at these junction approaches have also been realigned in accordance with *Section 4.3.3 Corner Radii* of DMURS to allow for rigid body trucks/commercial vehicles to turn corners without crossing the centre line of the intersecting road.

The junction crossings have been realigned to allow for installation of raised tables, buff tactile paving and road markings at the uncontrolled crossing as per *Section 4.3.2 Pedestrian Crossings* of DMURS.

7 Pavement

7.1 Design Basis

The mainline pavement design was prepared in accordance with Volume 7 of the NRA Design Manual for Roads and Bridges (DMRB) HD 25-26/10. Additionally, NRA DMRB HD 24/06 was used to assess the design traffic for the pavement design.

7.2 Existing Pavement

In general, the route is in moderate condition with the exception of areas where patches were observed due to utilities work.

7.3 Proposed Pavement Type

The design proposes an overlay treatment, for shape correction, to the existing pavement along the route as part of refurbishing works within the proposed scheme for shape correction to the existing pavement. The existing pavement will be repaired at the defect sections, levelled to designed levels, cleaned and coated with binding agent prior to overlaying treatment.

At locations where full pavement repair/ restoration is required (at crossings and footpaths), the pavement shall be constructed as per Table 7-1 and Table 7-2.

Table 7-1 Mainline Pavement Inlay & Overlay

Description	Thickness	Layer
SMA 10 Surf PMB 65/105-60 des	40mm to 150mm	*See note
*Note: Pavement Inlay: Regulating course to be laid following completion of Cold Milling of the area to a maximum depth of 50mm. Pavement Overlay: Regulating course to be laid following completion of Cold Milling of the area to a maximum depth of 150mm (dependant on proposed levels). The Regulating course shall be required to be installed in a minimum of 2 No. even layers		

Table 7-2 Pavement Repair

Description	Thickness	Layer
SMA 10 Surf PMB 65/105-60 des	40mm	Surface Course
AC 20 Bin 40/60 des	60mm	Binder Course
AC 32 Dense Base 40/60 des	200mm	Base Course
Clause 808 material	150mm	Sub-base
Capping (CBR $\geq$ 5%)	350mm	Capping

8 Signage & Lining, Lighting

8.1 Kerbs

All kerbs at the edge of the road carriageway shall have an upstand of 125mm in accordance with DMURS and Standard Construction Detail TII CC-SCD-01102.

A dropped kerb ramp with tapered kerbs and drop kerbs will be provided at crossing points in accordance with Standard Construction Detail TII CC-SCD-01103. The drop kerb shall have a raised lip of between 0 to 6mm.

8.2 Footpath

All footways shall be 100mm reinforced concrete on 100mm thick sub-base constructed in accordance with Standard Construction Detail CC-SCD-01105.

8.3 Tactile Paving

Tactile paving with a blister surface is to be provided at all pedestrian crossings to provide information to vision impaired people. The tactile paving shall be provided in accordance with the guidance set out in the Guidance on the use of Tactile Paving Surfaces (2005) published by the UK Department of the Environment, Transport and the Regions. At controlled crossings, "L" shaped tactile paving shall be laid across the full width of the drop kerb with the stem extending to the back of the footway.

8.4 Signage and Road Marking

Traffic signs and road markings have been prepared in accordance with the TII Publications (Standards) and the Department of Transport, Tourism and Sport Traffic Signs Manual (TSM).

8.5 Public Lighting

The public lighting along the route is being upgraded as part the 'LED retrofit Program' commissioned by GCC. This scheme is separate to the works but its impact is noted.

8.6 Pedestrian Guardrails

DMURS states that the use of pedestrian guardrails can be ineffective in forcing pedestrians to follow diversionary routes away from their desire lines, and they can be counterproductive as they may:

- Increase vehicle speeds and aggressive driver behaviour;
- Create a false sense of safety for both drivers and pedestrians;
- Block inter-visibility between drivers and children;
- Result in pedestrians/cyclists being trapped on the carriageway or found in locations that are not anticipated by drivers;
- Reduce the width and capacity of footways and crossings; and
- Create a collision hazard for cyclists where built in close proximity to cycle lanes

Therefore, guardrails should not be used as a tool for directing and/or shepherding pedestrians and should only be installed where there is a proven or demonstrable safety benefit, such as, for example where people may inadvertently step onto the carriageway. No locations within the extents of the proposed road development have been identified and as such, no pedestrian guarding is recommended within the scheme.

9 Utilities

9.1 ESB – Overhead and Underground

The ESB network assets identified in study area include MV/LV overhead lines and underground cables. There are no known or identifiable ESB sub-stations located within the extents of the proposed scheme.

9.2 EIR

There are overhead LV EIR lines along the length of The Crescent.

There shall be no diversion/ relocation of the existing Eir services required within the proposed scheme.

9.3 Gas

There is an existing gas main along the length of The Crescent.

There shall be no diversion/ relocation of the existing gas main required within the proposed scheme.

9.4 Public Lighting

There are existing overhead public lighting poles along the length of The Crescent.

There shall be no diversion/ relocation of the existing public lighting required within the proposed scheme.

9.5 Water

Watermain

There is an existing watermain along the length of The Crescent.

There shall be no diversion/ relocation of the existing watermain required within the proposed scheme.

Foul

There is an existing foul/combined sewer at along the length of The Crescent.

There shall be no diversion/ relocation of the existing foul water required within the proposed scheme.

Drainage

There is an existing surface water/combined sewer along The Crescent.

There shall be no diversion/ relocation of the surface water required within the proposed scheme.

There are a number of manhole covers with decorated covers (Celtic symbols). These should be retained if possible.

Flood Risk

A preliminary review of flood risk has been undertaken by reviewing information from the Office of Public Works (OPW) Natural Flood Hazard Mapping (www.floodinfo.ie), the Western CFRAM Study, which shows no flood risk for the area of this scheme.

9.6 BT/E-SAT

BT/E-SAT underground services are likely to contain fibre optics that is used for commercial purposes. Any work to these services requires a minimum of 90 days' notice to the service provider. BT requests to be in attendance for any works adjacent to their services. Depth of service unknown.

There is an existing ENET service along the length of The Crescent.

9.7 Fibre

There is an existing Virgin Media on along the length of The Crescent.

10 Landscape mitigation

10.1 Construction Stage

Landscape mitigation will be drawn up by the main contractor using the NRA's 'Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan' during the construction stage, if required, and will be implemented on the basis of an Environmental Operating Plan (EOP).

10.2 Operational Stage

Operation stage measures are focused on re-instatement and future maintenance of features and landscapes. Maintenance shall ensure that landscape measures, including seeding and planting establish successfully and that any failures or defects observed within two years of implementation are made good.

11 Preliminary TTMP

During the construction phase of the proposed development, an appropriate Temporary Traffic Management Plan (TTMP) shall be put in-place in accordance with the Department of Transport's Traffic Signs Manual to ensure the safety of road users.

It is also important during the construction phase to maintain access to residential properties and businesses. It is anticipated that there will be little disruption to accesses but this shall not be significant. Road closures shall be avoided under all circumstances.

Consideration shall be given to the public utility diversions / protection during the construction phase of the proposed scheme. It is anticipated that some of the utilities diversions, if required, may need to be carried out in advance of the main works.

12 Road Safety Audit

Road Safety Audit 1 & 2 will be evaluated on the preliminary layout in *Appendix D*.

13 Public Engagement Strategy

Lands Ownership

A survey of lands ownership affected by the works was undertaken using the Land Direct Register. No private lands are within/adjacent to the proposed scheme will be impacted.

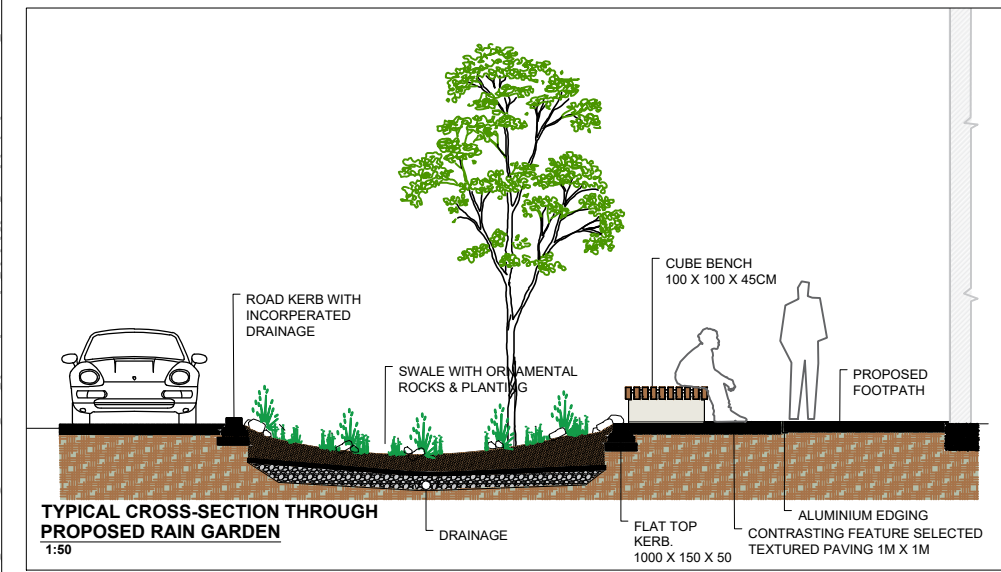
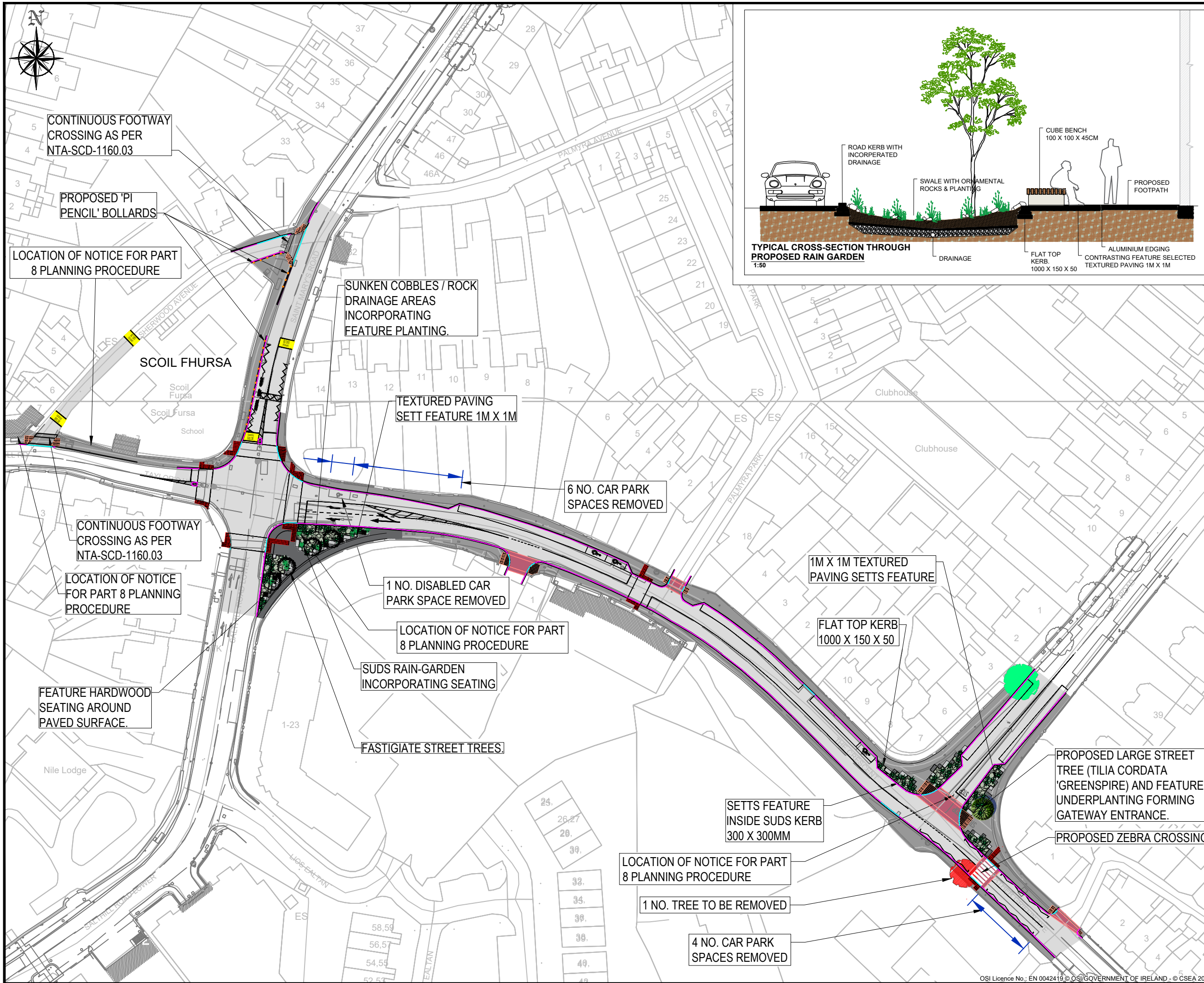
Project Number: 19_151A

Project: The Crescent / Sea Road Junction Upgrade Works

Title: Preliminary Design Report

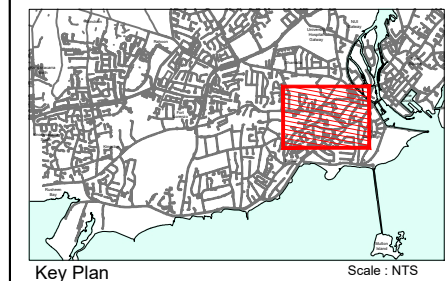
Appendix A

CSEA Drawing No. 19_151A-CSE-GEN-XX-DR-C-3910



DRAWING IS PRODUCED USING THE IRISH TRANSVERSE MERCATOR (ITM) GEOGRAPHIC COORDINATE SYSTEM

A1



- LEGEND :**
- CARRIAGEWAY -
 - PROPOSED CONCRETE PATH -
 - LANDSCAPED AREA -
 - PROPOSED RAISED CROSSING -
 - PROPOSED 125mm IN SITU UPSTAND EXTRUDED CONCRETE KERB TO TII CC-SCD-01102 -
 - IN SITU DROPPED KERB TO TII CC-SCD-01102 -
 - PROPOSED TACTILE PAVING -
 - PROPOSED 'PI-PENCIL' BOLLARDS
 - EXISTING TREES TO BE RETAINED -
 - EXISTING TREES TO BE REMOVED -

CUNNANE STRATTON REYNOLDS LAND PLANNING & DESIGN

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P01	PLANNING PART 8	KF	CB	APRIL 2023
Rev	Description	Drawn	Checked	Date

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GALWAY CITY COUNCIL
THE CRESCENT / SEA ROAD JUNCTION
UPGRADE WORKS
THE CRESCENT / SEA ROAD JUNCTIONS
PART 8

Drawn By	KF	Date	APRIL 2023			19_151A
Checked By	CB	Scale	1:500 @ A1			
		CSEA Job No.				
Project Code	Originator	Zone/ Phase	Level	Type	Role	Dwg. No.
19_151A - CSE - GEN - XX - DR - C - 3901						
S2			PLANNING			
Status Code	Suitability Description					
P01			PLANNING			
Revision	Project Status					

Appendix B

Arbor Assessment Report

Tree 0950 – Junction of Sea Rd & The Crescent

T0950 is a Mature *Tilia Cordata* (Small-Leaved Lime). Measuring a DBH (Diameter at Breast Height) of 49.3cm and Root Area radius of 5.9 m. The RPA of this tree will not have a root area radius of 5.9m in all directions due to the hard surface and underground services to the north and east along the verge of the road.

The tree itself is in good health with a dense canopy and good extension growth on all lateral branching systems. It is a twin stemmed tree from approx. 3m with bark inclusion evident on the southern side of the trunk – bark inclusion is a weak attachment point where two or more stems have not formed a whole growth ring and grow from a single point of origin with no direct connect between the stems. This creates a weakness that has the potential to lead to stem failure. If the T0950 is to be retained it is recommended that the stem to the north-east over the road be pruned by 30-40% to reduce stresses on this weak union.

T0950 also has a large wound on the east side of the stem over the road. It is highly possible that the wound was caused by direct damage from a large vehicle as the stem is growing out over the road.

T0950 is also causing damage to the footpath and edge kerbing. The roots of the tree are pushing the kerbing towards the road and lifting the tarmac around the base of the tree on footpath.

The tree also acts as a barrier to pedestrian traffic along the footpath, especially to a child's buggy or wheelchair bound people. The restricted access around the tree on the footpath side will inevitably force people onto the road.

It would seem that the tree has outgrown its local area and that a species with the potential to grow to such a large mature height was the wrong option for such a restricted area. If the tree is to be removed consideration should be given to planting another in its place. A similar smaller growing species of the same genera such as *Tilia Cordata* 'Greenspire' or *Carpinus betulus* 'Fastigata' could be viable options.

However, it is also possibly to retain the tree and integrate into any new designs. If the proposed design allowed for the extending of the footpath into the road and creating a traffic calming effect in conjunction with the zebra crossing the tree could potentially be retained. Care would need to be taken when removing the existing hard surface so as not to cause undue damage to the trees root system. Geocells and permeable resin-bound surfaces could be used around the tree to protect the roots and prevent the lifting of any surfaces in the future.



Fig 1 – full canopy tree with restricted access



Fig 2 – bark Inclusion



Fig 3 – Roots displacing kerbing



Fig 4 – Large Wound on stem over road



Fig 5 – Restricted access on footpath

Appendix C

LinSig Results Summary

Project: 19_151: Galway Cycle Network Stage 2
Saint Mary's Road, Salthill Road Lower, The
Subject: Crescent and Taylor's Hill Road Junction
Redesign

File No: 19_151MEMO-19_151-001
Date: January 2020

This File Note compares the performance of the Saint Mary's Road, Salthill Road Lower, The Crescent and Taylor's Hill Road junction before and after the implementation of the proposed redesign using the LinSig V3 modelling software.

1. Junction Layout

1.1 Existing Layout

The junction modelled (Figure 1-1) is a crossroads with Saint Mary's Road to the north, Salthill Road Lower to the south, The Crescent to the east and Taylor's Hill Road to the west. The four approaches to the junction are:

- Saint Mary's Road - One lane for straight, left and right traffic;
- Salthill Road Lower – One lane for straight and left traffic and a short lane (24.7m) for right turning traffic;
- The Crescent – One lane for straight traffic, a short lane (27.5m) for right turning traffic and a slip lane for left turning traffic; and
- Taylor's Hill Road - One lane for straight, left and right traffic.

All four exits from the junction are one lane wide and there is a pedestrian crossing across each arm of the junction.

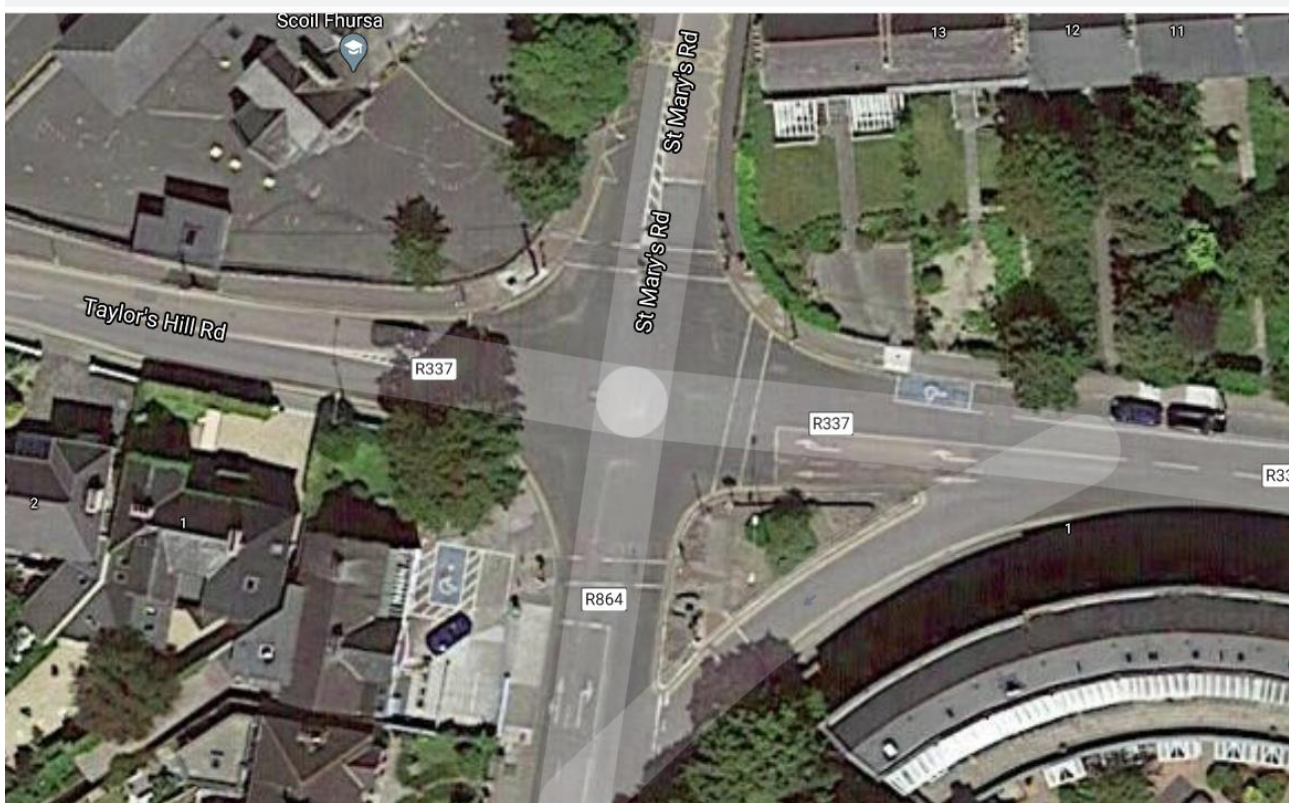


Figure 1-1 Existing Junction Layout

1.2 Proposed Layout

The proposed junction layout (Figure 1-2) involves;

- Removing the left slip lane from The Crescent to Salthill and having a lane for straight and left traffic;
- Moving the stop lines back on all four approaches to widen the pedestrian crossings; and
- Narrowing the width of the exit on The Crescent, removing 1 no. disabled parking space and 6 no. parking spaces and affecting the left turn radius from Saint Mary's Road to The Crescent.

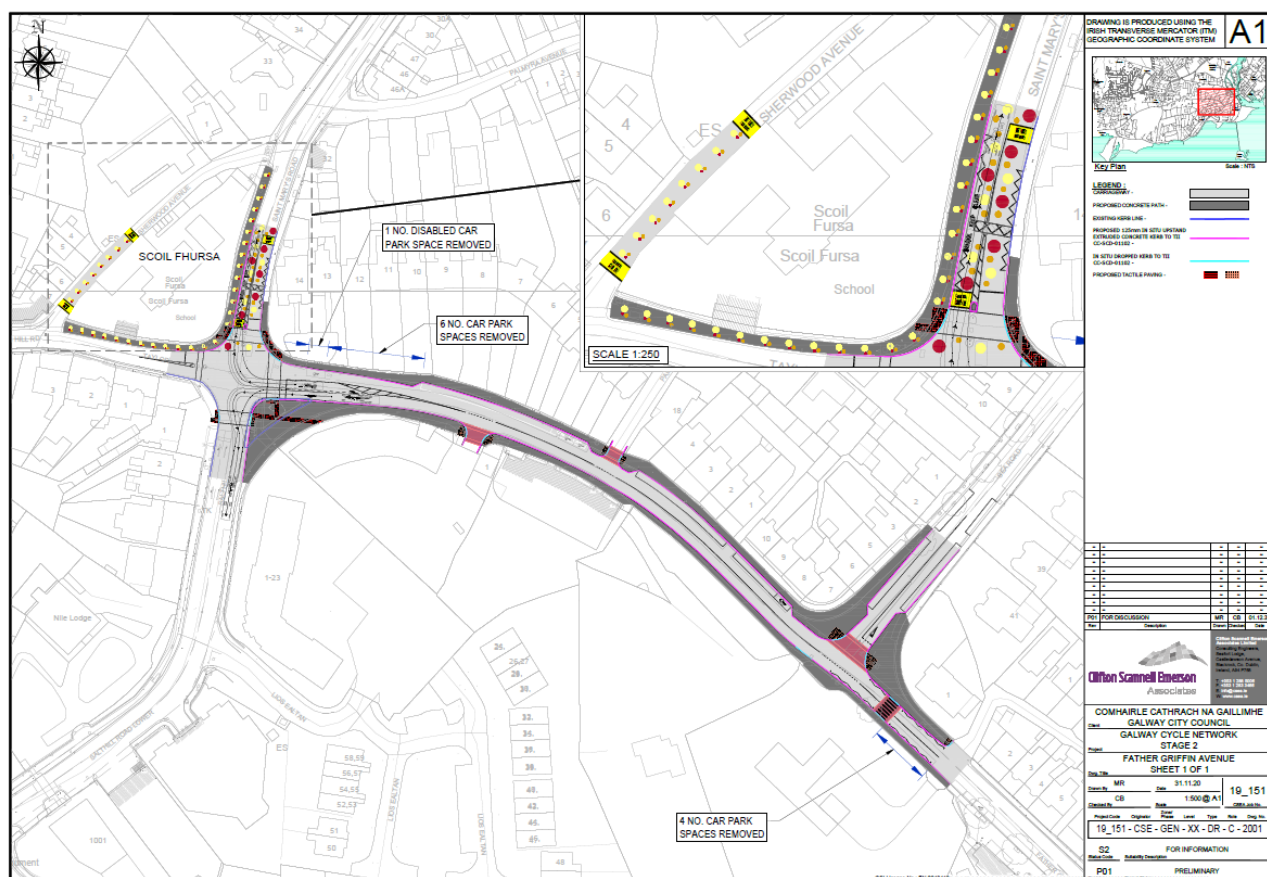


Figure 1-2 Proposed Junction Layout

2. Traffic Modelling

2.1 Traffic Volumes

The traffic volumes modelled were recorded from a classified 12hr (07:00-19:00) traffic count carried out 14/11/2019 on behalf of CSEA. The AM peak hour was 08:00-09:00 with a total of 1328 PCU's passing through the junction and the PM peak hour was 14:45-15:45 with 1246 PCU's passing through the junction. Traffic flows are shown in Figure 2-1.

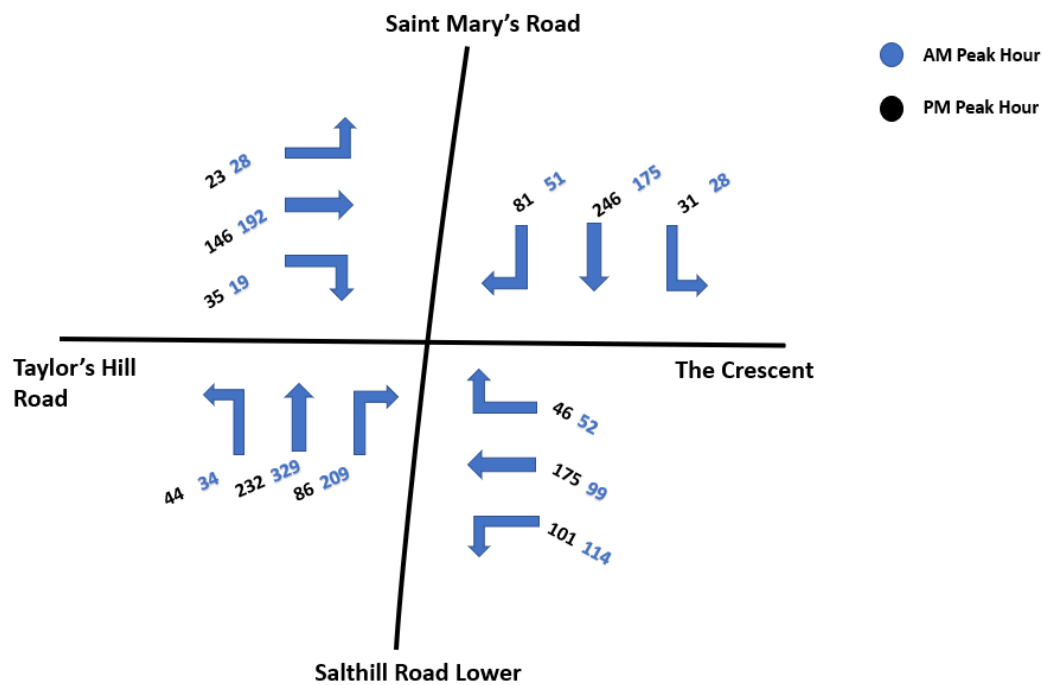


Figure 2-1 Traffic Volumes

2.2 Traffic Signals

The stage sequences for the existing and proposed scenarios are shown in Figure 2-2 and Figure 2-3 respectively.

Stage Sequence Diagram

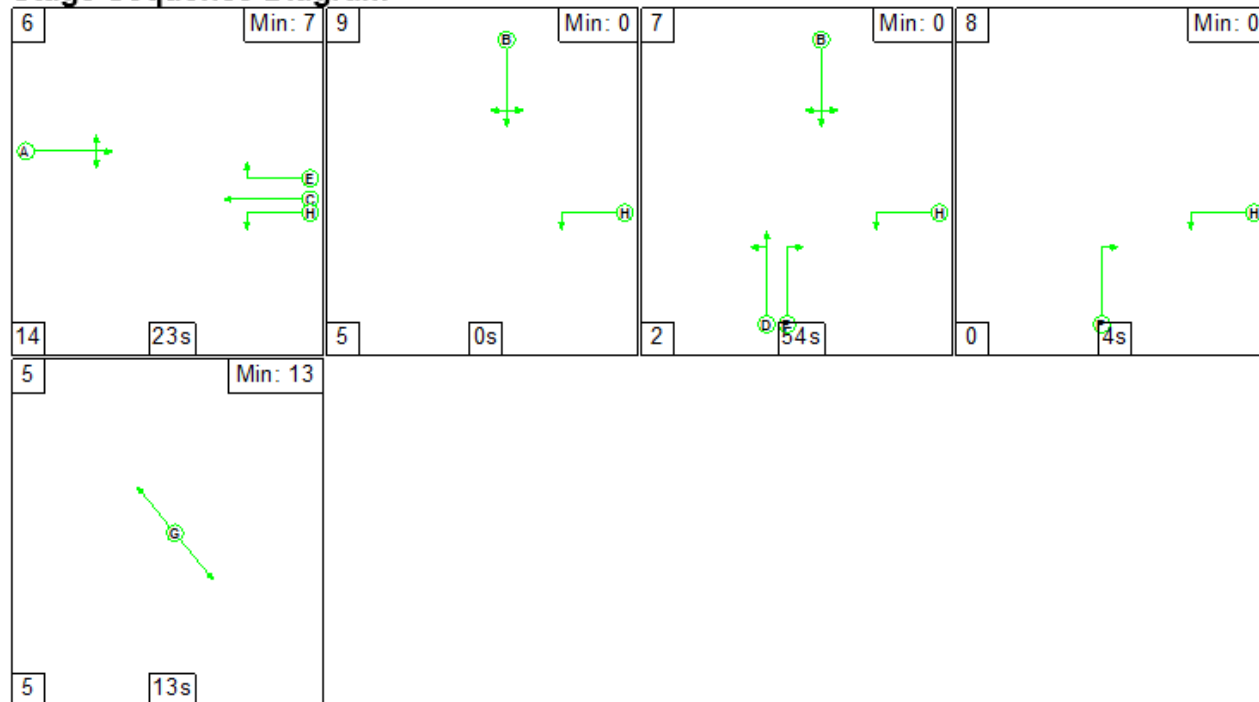


Figure 2-2 Existing Scenario Stage Sequence (signal timings are for the AM peak and stage 5 is an all pedestrian phase)

Stage Sequence Diagram

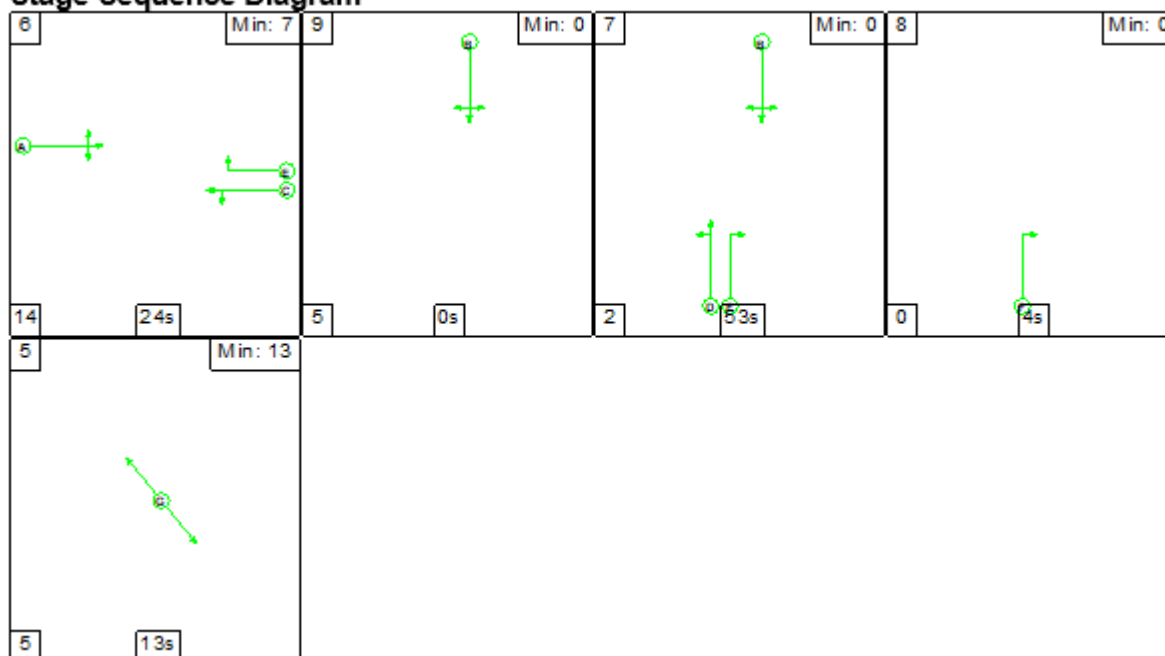


Figure 2-3 Proposed Scenario Stage Sequence (signal timings are for the AM peak and stage 5 is an all pedestrian phase)

3. Modelling Results

A summary of the results is shown in Table 3-1.

The full LINSIG Reports (including for different stage sequences) are shown in Appendices 1 & 2.

Table 3-1 LINSIG Outputs Summary

	AM Peak (08:00-09:00)		PM Peak (14:45-15:45)	
	Existing Layout	Proposed Layout	Existing Layout	Proposed Layout
Highest DoS* (%) (*Degree of Saturation)	63.7 @ Salthill Road Lower	63.9 @ Salthill Road Lower	48.0 @ Saint Mary's Road	57.7 @ The Crescent
Longest Mean Maximum Queue (pcu)	12.2 @ Salthill Road Lower	12.4 @ Salthill Road Lower	8.6 @ Saint Mary's Road	9.5 @ Saint Mary's Road
Total Delay (pcu Hr)	13.1 For whole network	14.7 For whole network	12.0 For whole network	14.1 For whole network
PRC** (%) (** Practical Reserve Capacity)	41.3 For whole network	40.8 For whole network	87.7 For whole network	55.9 For whole network

4. Conclusions

Overall, the removal of the left slip lane from The Crescent to Salthill Road does not have an impact on the junction performance during the AM peak and does not have an overwhelmingly negative impact during the PM peak.

The performance of The Crescent does change notably with the removal of the left slip lane (from an average DoS across the three lanes in the Existing Scenario to an average Dos across the two lanes in the Proposed Scenario of 26.7% to 62.4% during the AM peak and 25.7% to 57.7% during the PM peak). However, the DoS remains below the threshold of congestion (90%) in both scenarios. Furthermore, The Crescent is not the worst performing arm across the junction and therefore the overall junction performance is not hugely affected.

Appendix 1

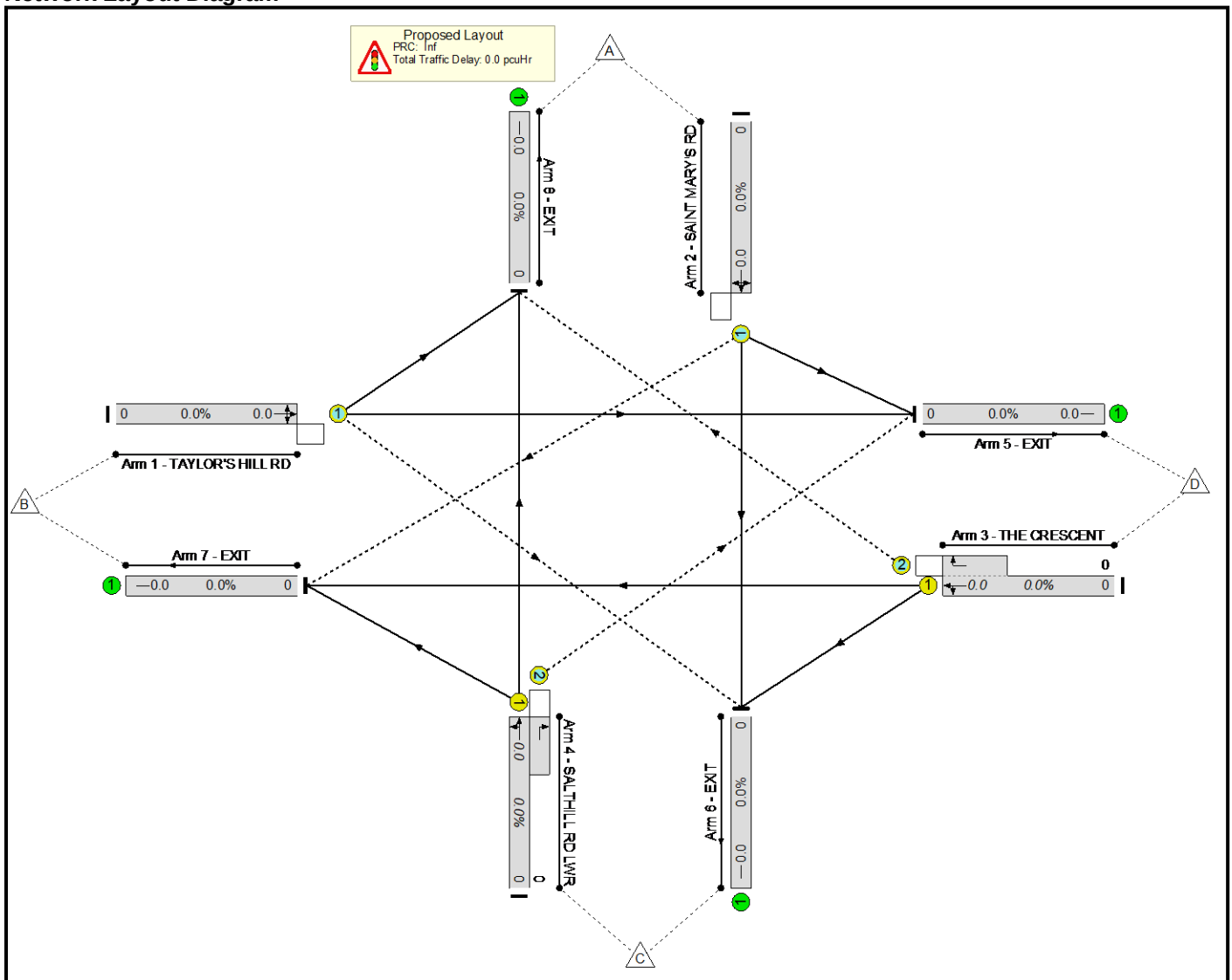
**LINSIG Report for Saint Mary's Road, Salthill Road Lower, The Crescent and Taylor's Hill
Road Existing Layout**

User and Project Details

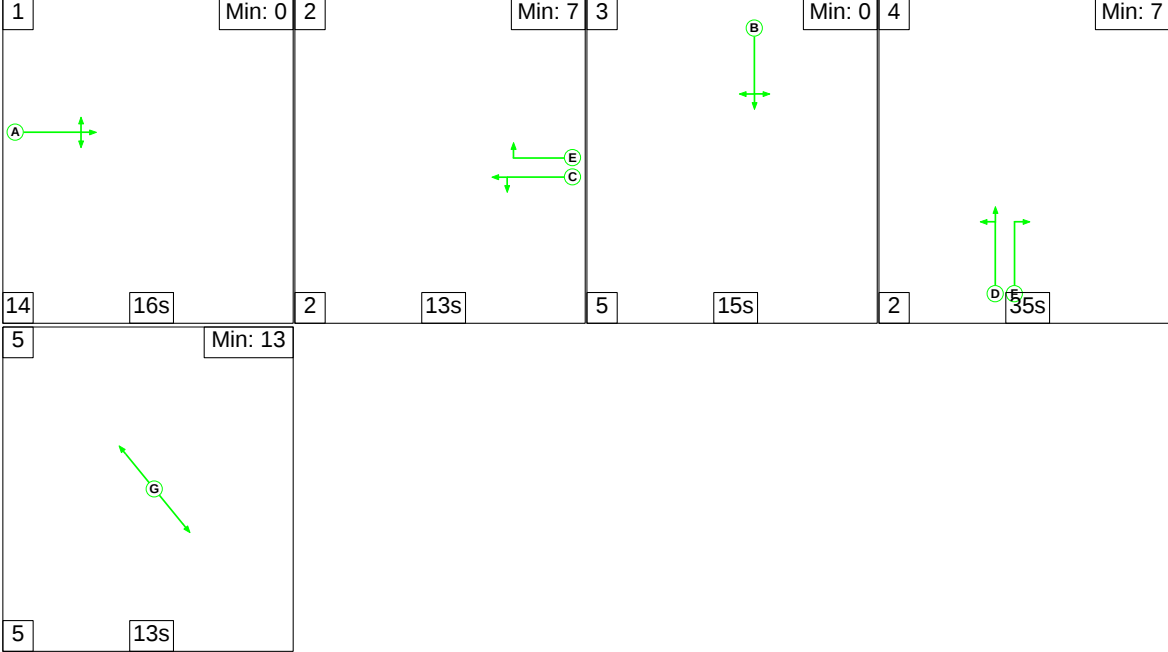
Project:	
Title:	
Location:	
Additional detail:	
File name:	Proposed.lsg3x
Author:	
Company:	
Address:	
Linsig Version:	3, 2, 40, 0

Scenario 1: 'Single Phase AM' (FG1: 'AM Peak 2019', Plan 1: 'Single Phase')

Network Layout Diagram



Stage Sequence Diagram



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
Proposed Layout	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	0	1915	271	0.0%	0	0	0	0.0	0.0	0.0
2/1	SAINT MARY'S RD Left Ahead Right	O	0	2015	269	0.0%	0	0	0	0.0	0.0	0.0
3/1+3/2	THE CRESCENT Left Ahead Right	U+O	0	1965:1905	342	0.0%	0	0	0	0.0	0.0	0.0
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	0	1915:1835	651	0.0%	0	0	0	0.0	0.0	0.0
5/1	EXIT	U	0	1965	1965	0.0%	-	-	-	0.0	0.0	0.0
6/1	EXIT	U	0	2015	2015	0.0%	-	-	-	0.0	0.0	0.0
7/1	EXIT	U	0	1945	1945	0.0%	-	-	-	0.0	0.0	0.0
8/1	EXIT	U	0	1940	1940	0.0%	-	-	-	0.0	0.0	0.0
C1	PRC for Signalled Lanes (%): PRC Over All Lanes (%):		Inf Inf	Total Delay for Signalled Lanes (pcuHr): Total Delay Over All Lanes(pcuHr):		0.00 0.00	Cycle Time (s): 120					

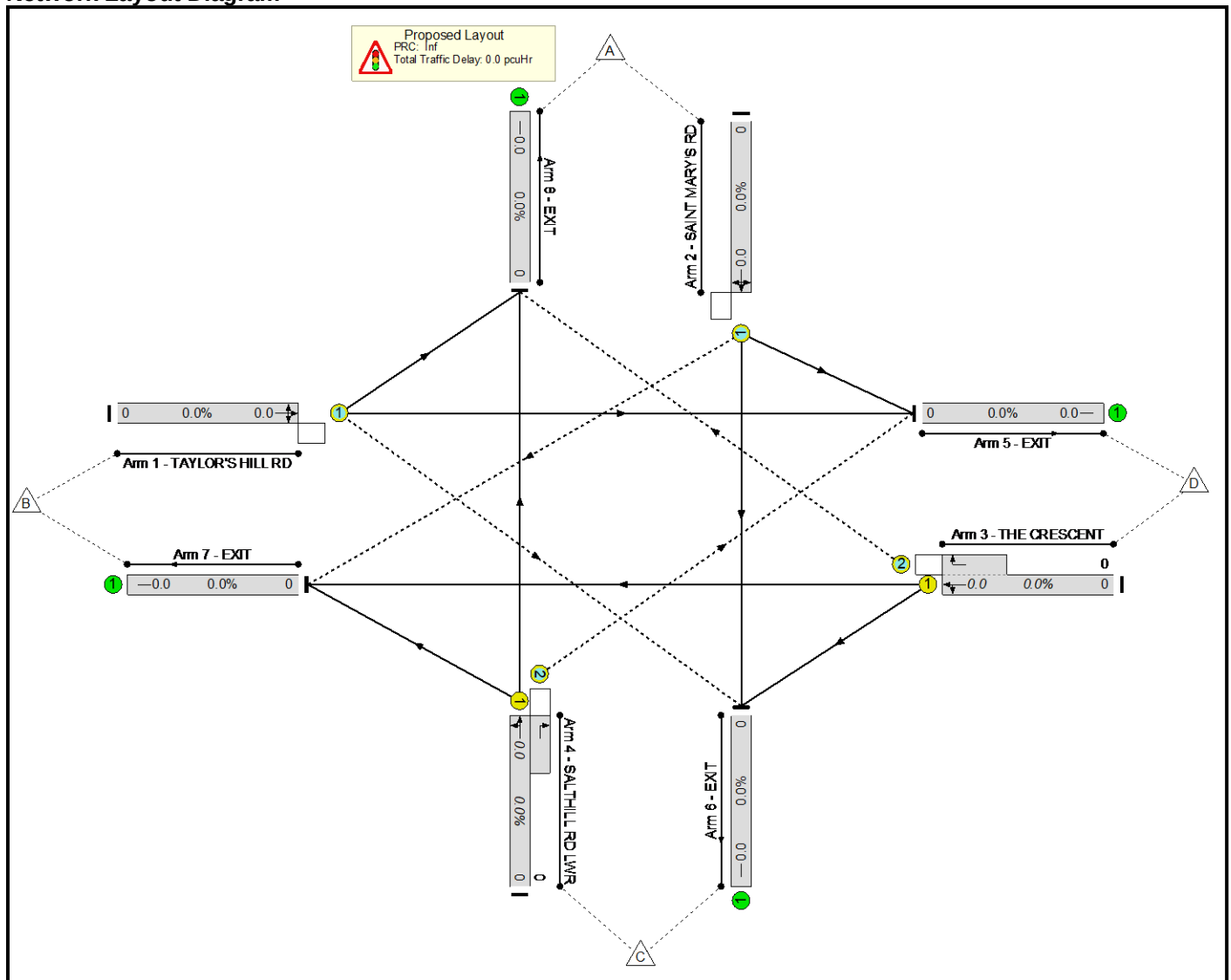
Results Summary

Ped Route Delay Times

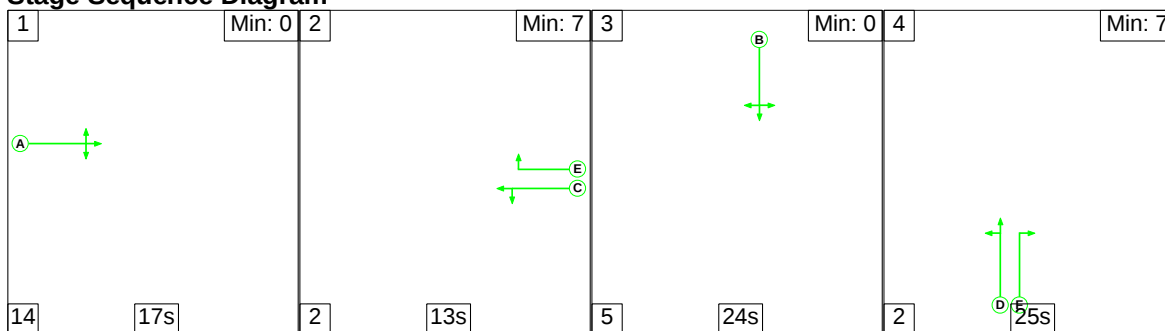
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 1: Single Phase AM
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Scenario 2: 'Single Phase PM' (FG2: 'PM Peak 2019', Plan 1: 'Single Phase')

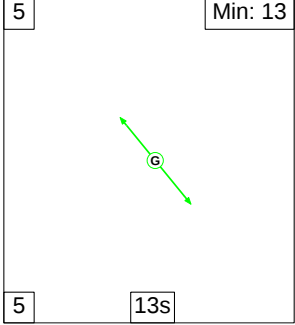
Network Layout Diagram



Stage Sequence Diagram



Results Summary



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
Proposed Layout	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	0	1915	287	0.0%	0	0	0	0.0	0.0	0.0
2/1	SAINT MARY'S RD Left Ahead Right	O	0	2015	420	0.0%	0	0	0	0.0	0.0	0.0
3/1+3/2	THE CRESCENT Left Ahead Right	U+O	0	1965:1905	342	0.0%	0	0	0	0.0	0.0	0.0
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	0	1915:1835	494	0.0%	0	0	0	0.0	0.0	0.0
5/1	EXIT	U	0	1965	1965	0.0%	-	-	-	0.0	0.0	0.0
6/1	EXIT	U	0	2015	2015	0.0%	-	-	-	0.0	0.0	0.0
7/1	EXIT	U	0	1945	1945	0.0%	-	-	-	0.0	0.0	0.0
8/1	EXIT	U	0	1940	1940	0.0%	-	-	-	0.0	0.0	0.0
C1 PRC for Signalled Lanes (%): Inf Total Delay for Signalled Lanes (pcuHr): 0.00 PRC Over All Lanes (%): Inf Total Delay Over All Lanes(pcuHr): 0.00 Cycle Time (s): 120												

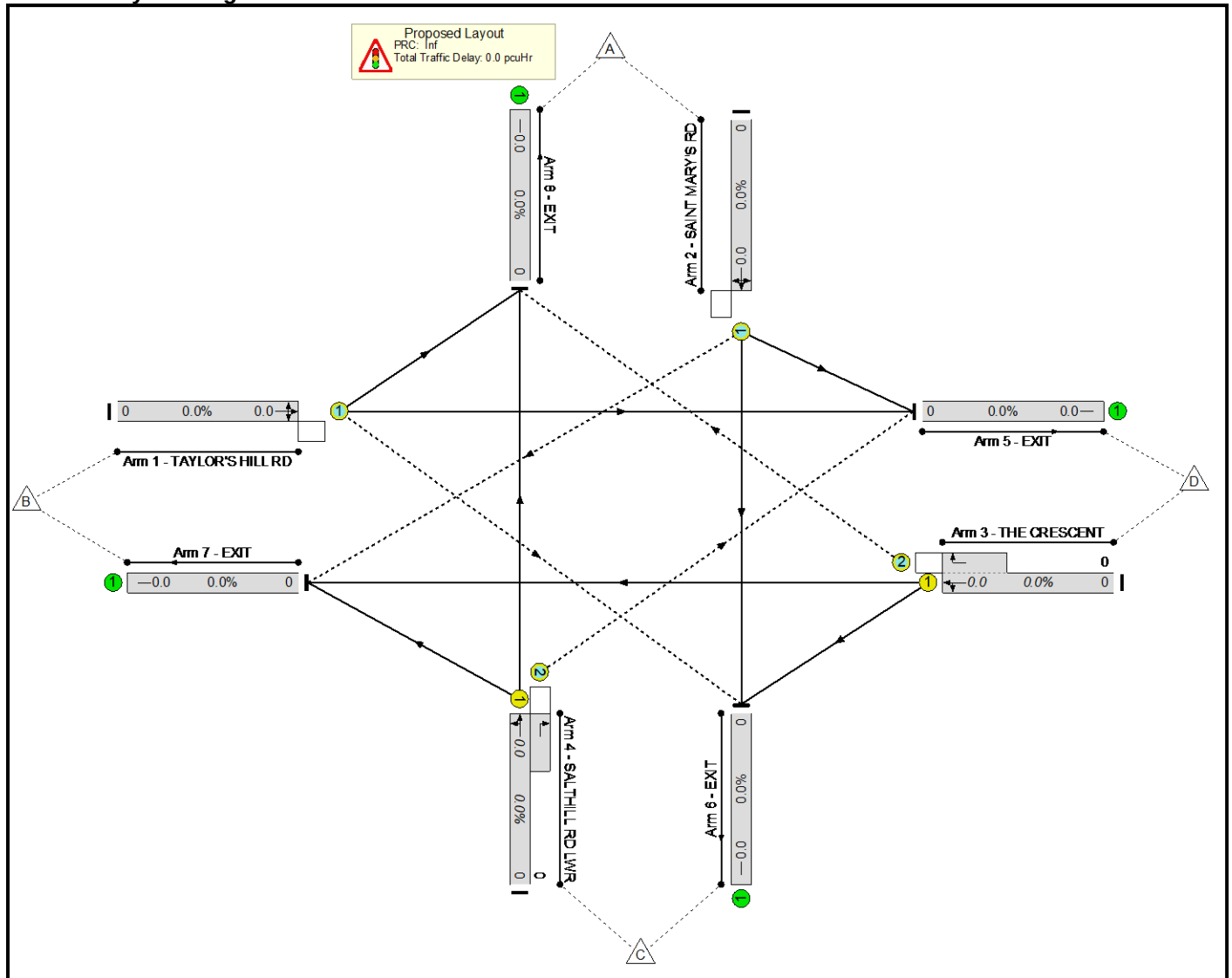
Results Summary

Ped Route Delay Times

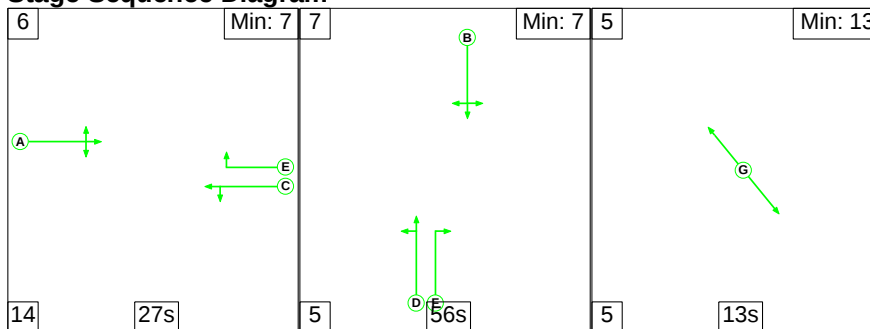
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 2: Single Phase PM
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Scenario 3: 'Opposed Phase AM' (FG1: 'AM Peak 2019', Plan 2: 'Opposed Phase')

Network Layout Diagram



Stage Sequence Diagram



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
Proposed Layout	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	0	1915	447	0.0%	0	0	0	0.0	0.0	0.0
2/1	SAINT MARY'S RD Left Ahead Right	O	0	2015	957	0.0%	0	0	0	0.0	0.0	0.0
3/1+3/2	THE CRESCENT Left Ahead Right	U+O	0	1965:1905	568	0.0%	0	0	0	0.0	0.0	0.0
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	0	1915:1835	980	0.0%	0	0	0	0.0	0.0	0.0
5/1	EXIT	U	0	1965	1965	0.0%	-	-	-	0.0	0.0	0.0
6/1	EXIT	U	0	2015	2015	0.0%	-	-	-	0.0	0.0	0.0
7/1	EXIT	U	0	1945	1945	0.0%	-	-	-	0.0	0.0	0.0
8/1	EXIT	U	0	1940	1940	0.0%	-	-	-	0.0	0.0	0.0
C1 PRC for Signalled Lanes (%): Inf Total Delay for Signalled Lanes (pcuHr): 0.00 Cycle Time (s): 120 PRC Over All Lanes (%): Inf Total Delay Over All Lanes(pcuHr): 0.00												

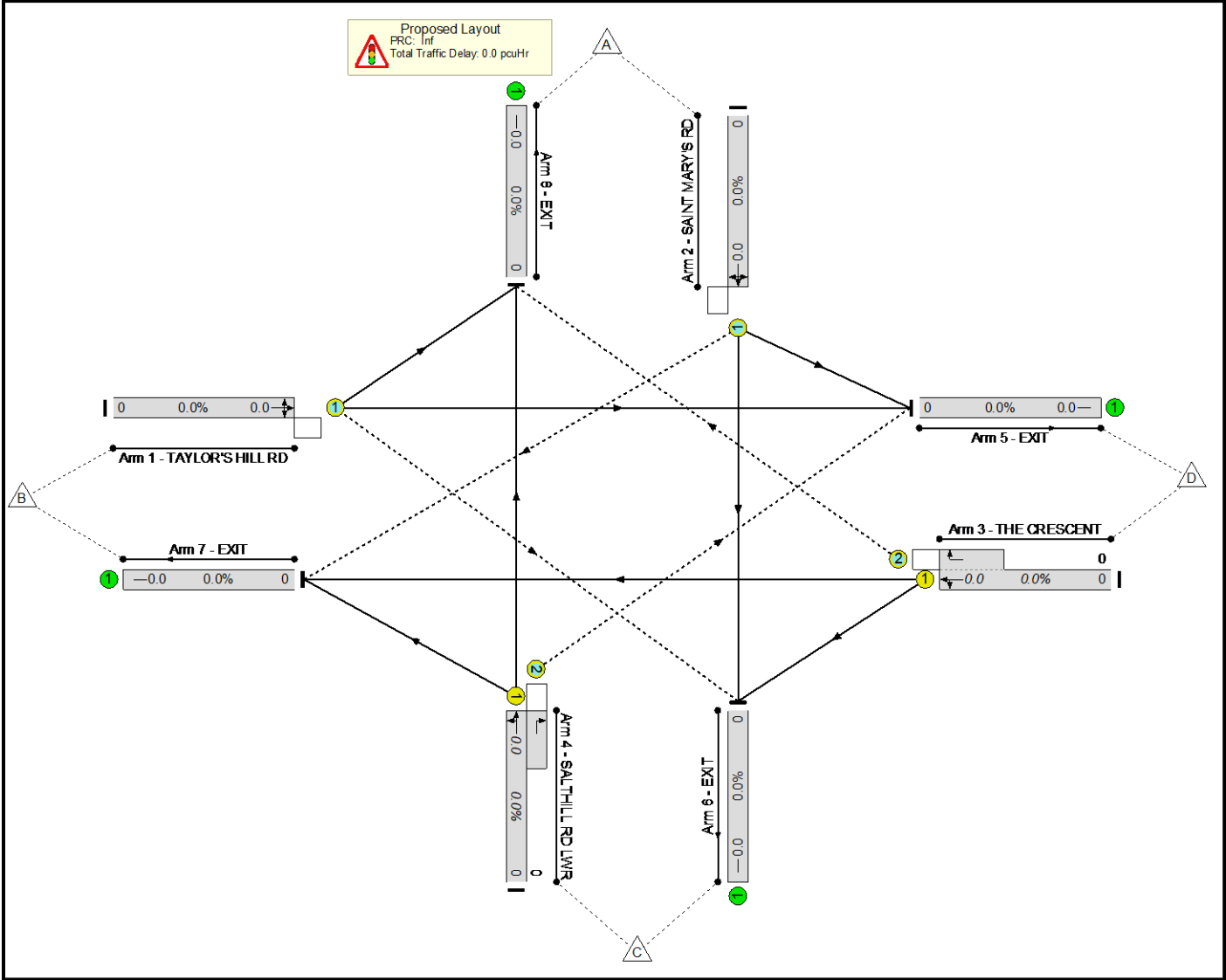
Results Summary

Ped Route Delay Times

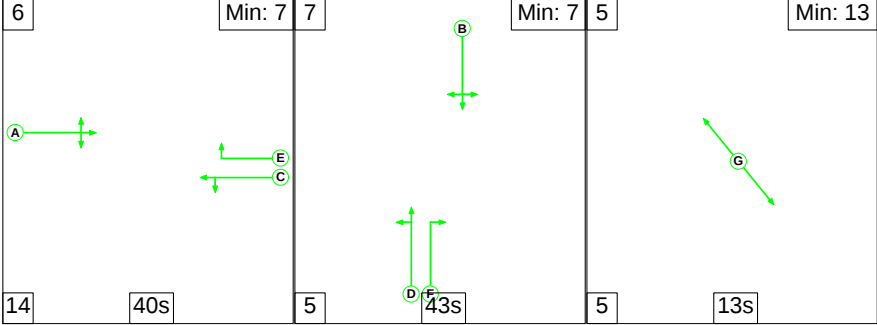
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 3: Opposed Phase AM
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Scenario 4: 'Opposed Phase PM' (FG2: 'PM Peak 2019', Plan 2: 'Opposed Phase')

Network Layout Diagram



Stage Sequence Diagram



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
Proposed Layout	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	0	1915	654	0.0%	0	0	0	0.0	0.0	0.0
2/1	SAINT MARY'S RD Left Ahead Right	O	0	2015	739	0.0%	0	0	0	0.0	0.0	0.0
3/1+3/2	THE CRESCENT Left Ahead Right	U+O	0	1965:1905	778	0.0%	0	0	0	0.0	0.0	0.0
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	0	1915:1835	776	0.0%	0	0	0	0.0	0.0	0.0
5/1	EXIT	U	0	1965	1965	0.0%	-	-	-	0.0	0.0	0.0
6/1	EXIT	U	0	2015	2015	0.0%	-	-	-	0.0	0.0	0.0
7/1	EXIT	U	0	1945	1945	0.0%	-	-	-	0.0	0.0	0.0
8/1	EXIT	U	0	1940	1940	0.0%	-	-	-	0.0	0.0	0.0
C1 PRC for Signalled Lanes (%): Inf Total Delay for Signalled Lanes (pcuHr): 0.00 PRC Over All Lanes (%): Inf Total Delay Over All Lanes(pcuHr): 0.00 Cycle Time (s): 120												

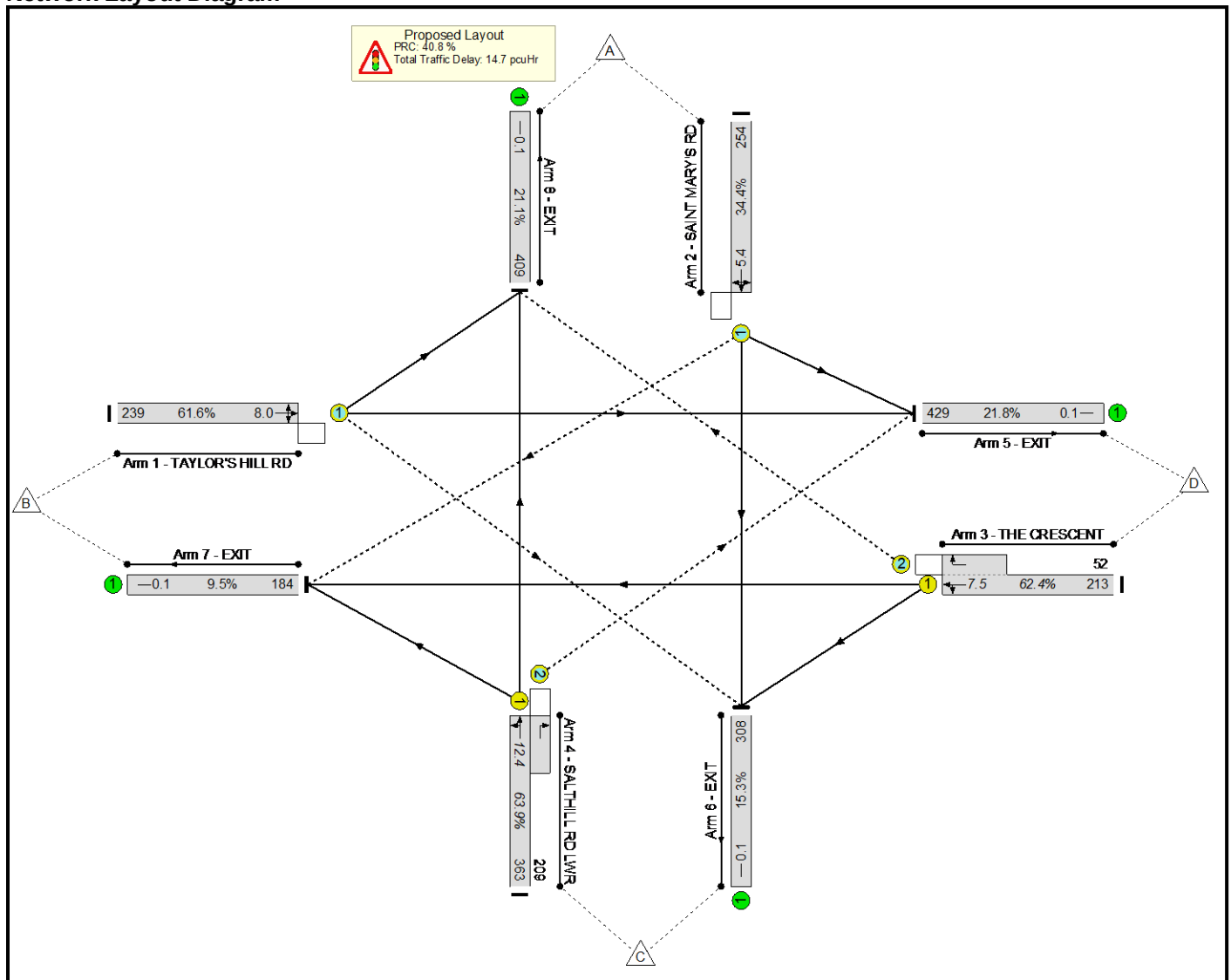
Results Summary

Ped Route Delay Times

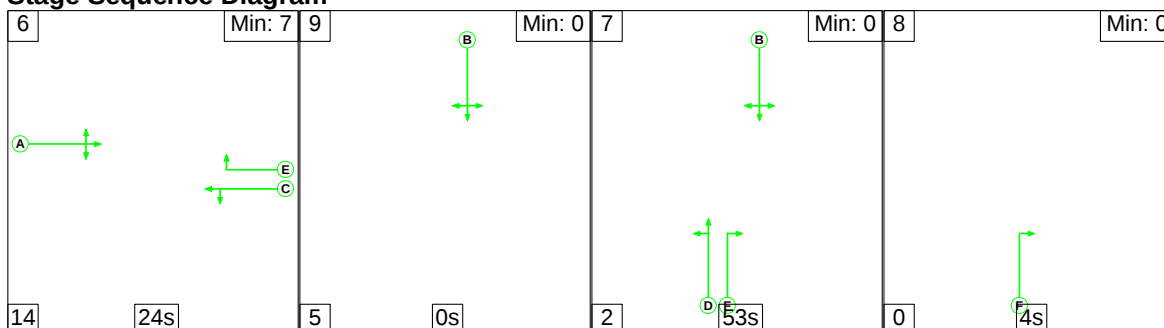
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 4: Opposed Phase PM
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Scenario 5: 'NS Filters AM' (FG1: 'AM Peak 2019', Plan 3: 'NS Filters')

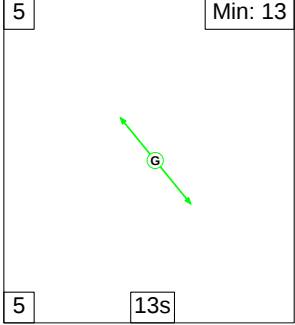
Network Layout Diagram



Stage Sequence Diagram



Results Summary



Network Results

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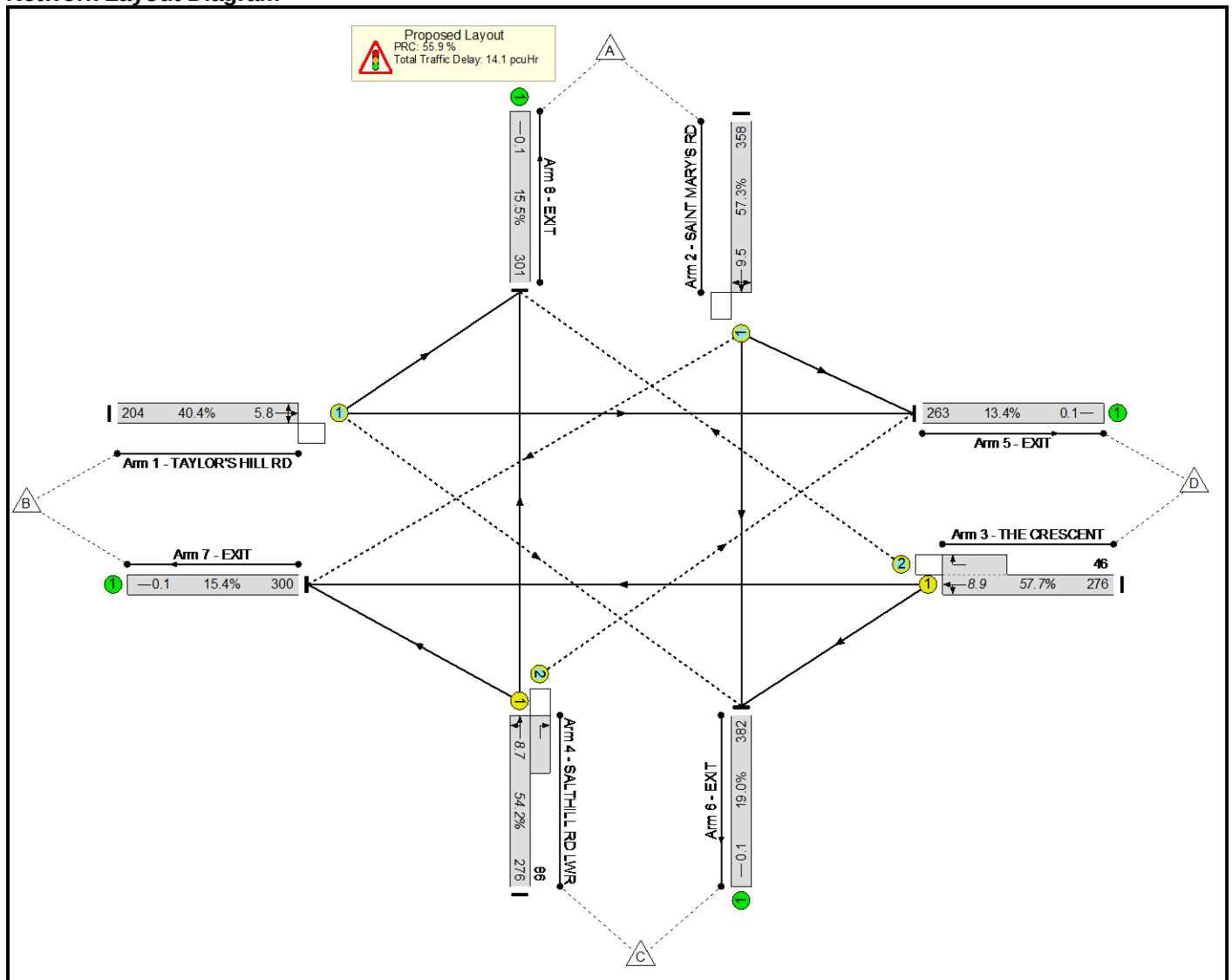
Results Summary

Ped Route Delay Times

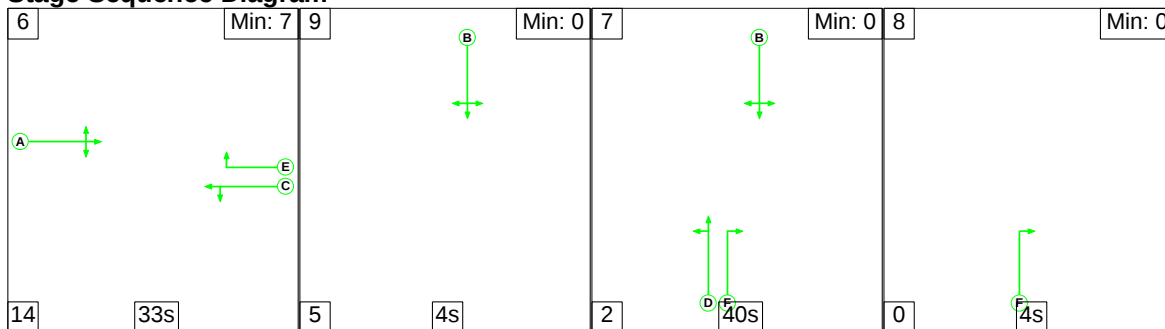
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 5: NS Filters AM
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Scenario 6: 'NS Filters PM' (FG2: 'PM Peak 2019', Plan 3: 'NS Filters')

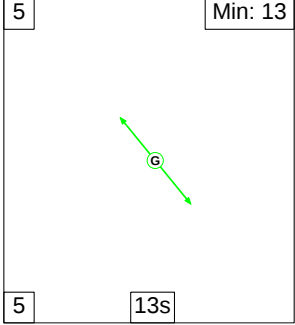
Network Layout Diagram



Stage Sequence Diagram



Results Summary



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	57.7%	230	16	1	14.1	-	-
Proposed Layout	-	-	-	-	-	57.7%	230	16	1	14.1	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	204	1846	505	40.4%	35	0	0	2.4	42.4	5.8
2/1	SAINT MARY'S RD Left Ahead Right	O	358	1959	624	57.3%	66	15	0	3.6	36.4	9.5
3/1+3/2	THE CRESCENT Left Ahead Right	U+O	322	1870:1761	558	57.7%	46	0	0	4.0	44.4	8.9
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	362	1874:1691	668	54.2%	83	1	1	3.7	37.1	8.7
5/1	EXIT	U	263	1965	1965	13.4%	-	-	-	0.1	1.1	0.1
6/1	EXIT	U	382	2015	2015	19.0%	-	-	-	0.1	1.1	0.1
7/1	EXIT	U	300	1945	1945	15.4%	-	-	-	0.1	1.1	0.1
8/1	EXIT	U	301	1940	1940	15.5%	-	-	-	0.1	1.1	0.1
C1			PRC for Signalled Lanes (%):		55.9	Total Delay for Signalled Lanes (pcuHr):		13.73	Cycle Time (s): 120			
			PRC Over All Lanes (%):		55.9	Total Delay Over All Lanes(pcuHr):		14.11				

Results Summary

Ped Route Delay Times

Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 6: NS Filters PM
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Appendix 2

LINSIG Report for Saint Mary’s Road, Salthill Road Lower, The Crescent and Taylor’s Hill Road Junction Proposed Design

Results Summary

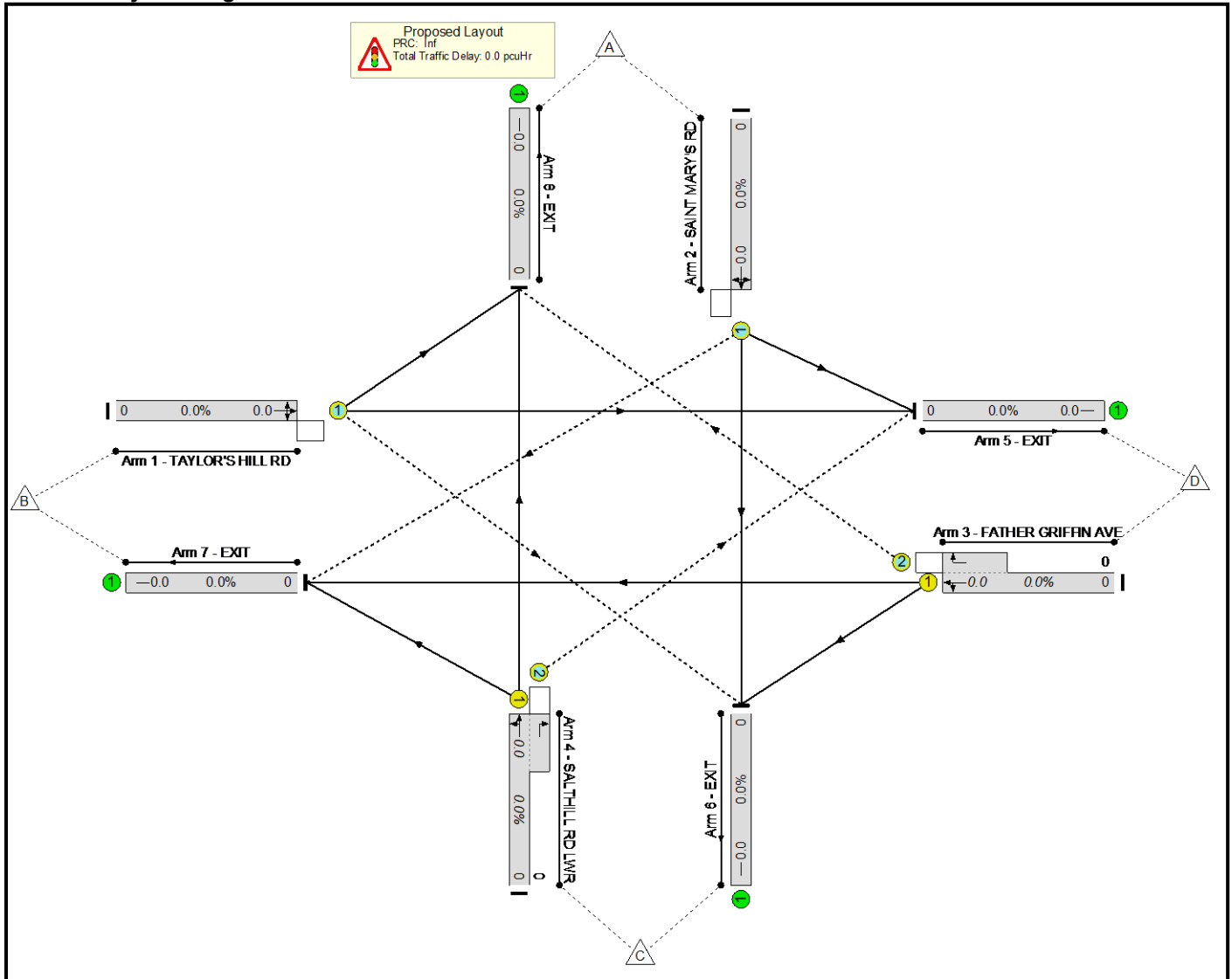
User and Project Details

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Additional detail:	
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Company:	
Address:	
Linsig Version:	3, 2, 40, 0

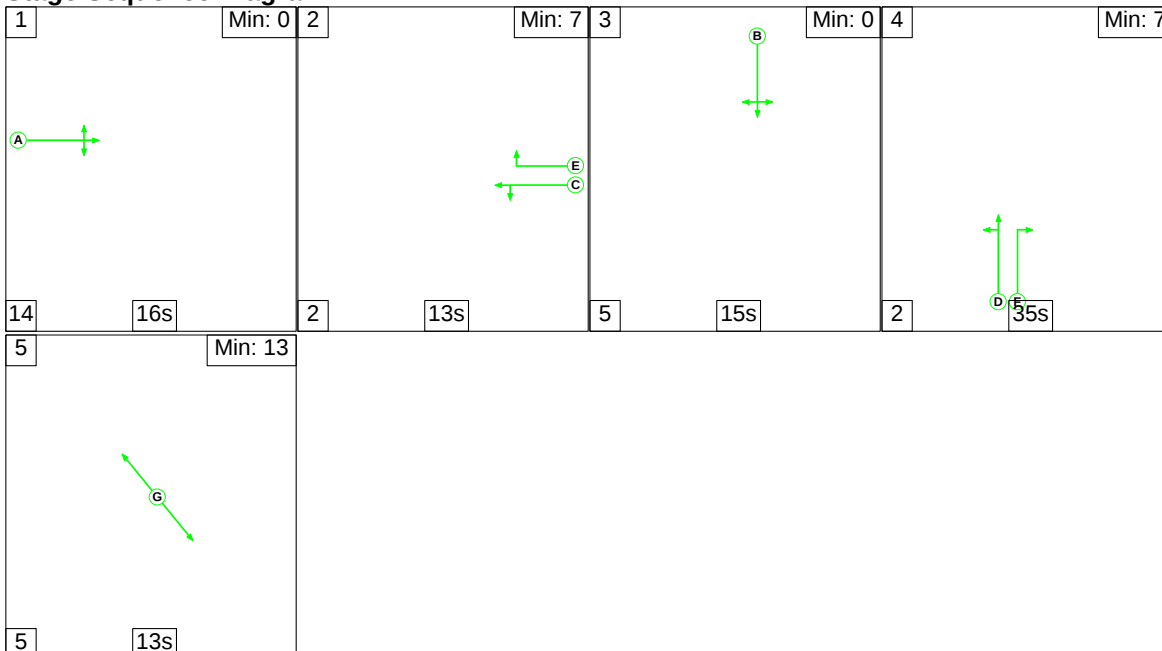
Results Summary

Scenario 1: 'Single Phase AM' (FG1: 'AM Peak 2019', Plan 1: 'Single Phase')

Network Layout Diagram



Stage Sequence Diagram



Results Summary

Network Results

[illegible]

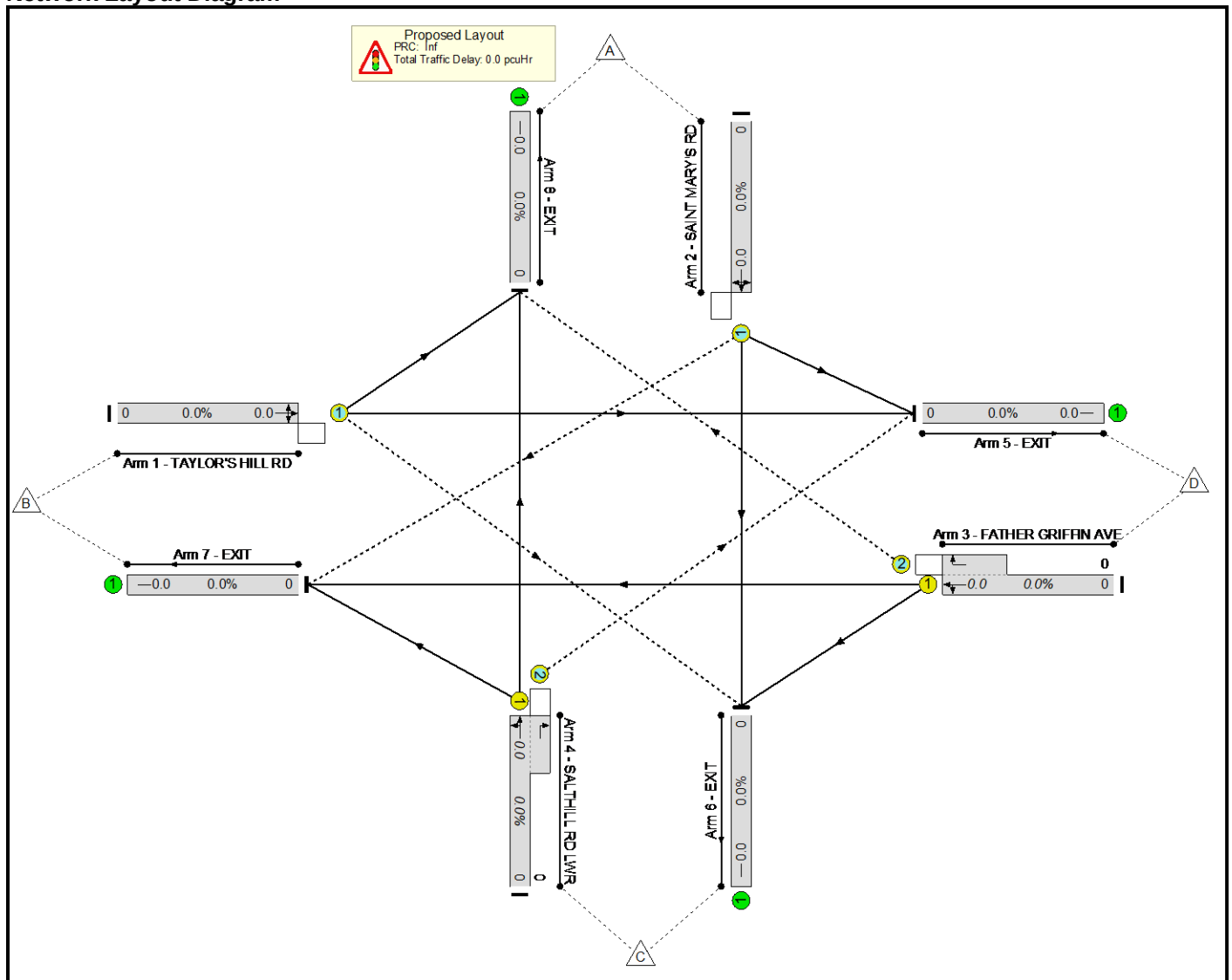
Results Summary

Ped Route Delay Times

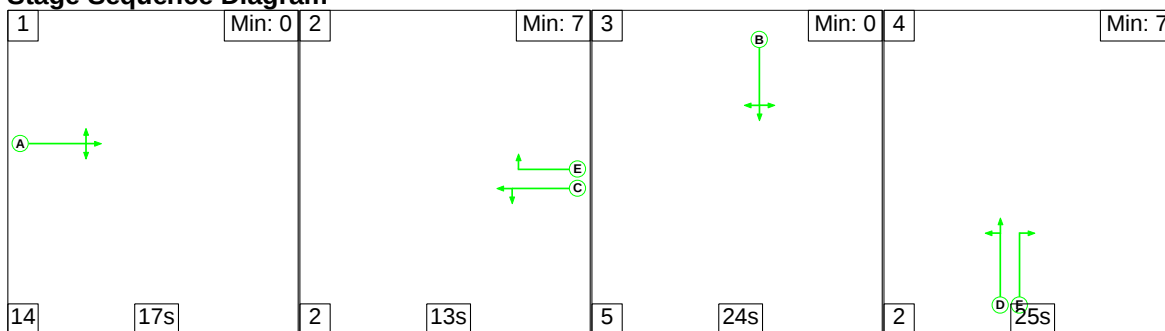
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 1: Single Phase AM
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Scenario 2: 'Single Phase PM' (FG2: 'PM Peak 2019', Plan 1: 'Single Phase')

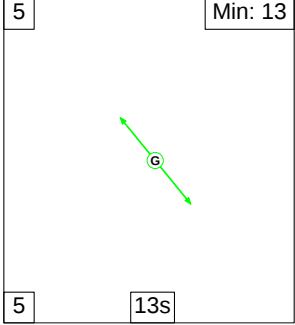
Network Layout Diagram



Stage Sequence Diagram



Results Summary



Network Results

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Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
Proposed Layout	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	0	1915	287	0.0%	0	0	0	0.0	0.0	0.0
2/1	SAINT MARY'S RD Left Ahead Right	O	0	2015	420	0.0%	0	0	0	0.0	0.0	0.0
3/1+3/2	FATHER GRIFFIN AVE Left Ahead Right	U+O	0	1965:1915	342	0.0%	0	0	0	0.0	0.0	0.0
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	0	1915:1835	534	0.0%	0	0	0	0.0	0.0	0.0
5/1	EXIT	U	0	1965	1965	0.0%	-	-	-	0.0	0.0	0.0
6/1	EXIT	U	0	2015	2015	0.0%	-	-	-	0.0	0.0	0.0
7/1	EXIT	U	0	1945	1945	0.0%	-	-	-	0.0	0.0	0.0
8/1	EXIT	U	0	1940	1940	0.0%	-	-	-	0.0	0.0	0.0
C1 PRC for Signalled Lanes (%): Inf Total Delay for Signalled Lanes (pcuHr): 0.00 Cycle Time (s): 120 PRC Over All Lanes (%): Inf Total Delay Over All Lanes(pcuHr): 0.00												

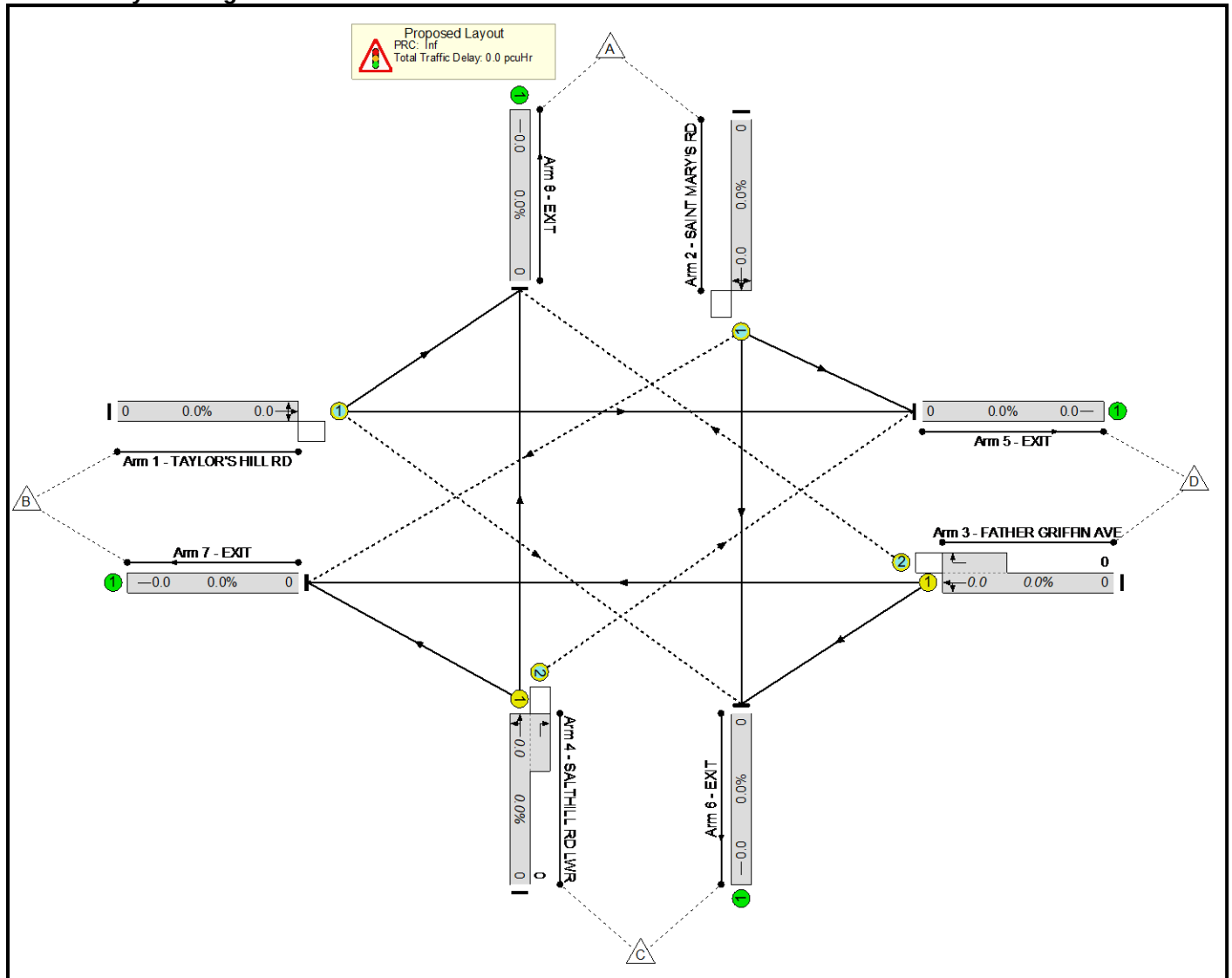
Results Summary

Ped Route Delay Times

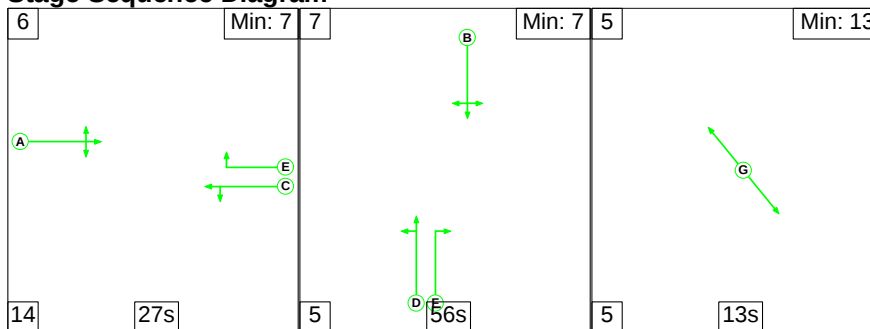
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 2: Single Phase PM
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Scenario 3: 'Opposed Phase AM' (FG1: 'AM Peak 2019', Plan 2: 'Opposed Phase')

Network Layout Diagram



Stage Sequence Diagram



Network Results

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Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
Proposed Layout	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	0	1915	447	0.0%	0	0	0	0.0	0.0	0.0
2/1	SAINT MARY'S RD Left Ahead Right	O	0	2015	957	0.0%	0	0	0	0.0	0.0	0.0
3/1+3/2	FATHER GRIFFIN AVE Left Ahead Right	U+O	0	1965:1915	569	0.0%	0	0	0	0.0	0.0	0.0
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	0	1915:1835	980	0.0%	0	0	0	0.0	0.0	0.0
5/1	EXIT	U	0	1965	1965	0.0%	-	-	-	0.0	0.0	0.0
6/1	EXIT	U	0	2015	2015	0.0%	-	-	-	0.0	0.0	0.0
7/1	EXIT	U	0	1945	1945	0.0%	-	-	-	0.0	0.0	0.0
8/1	EXIT	U	0	1940	1940	0.0%	-	-	-	0.0	0.0	0.0
C1 PRC for Signalled Lanes (%): Inf Total Delay for Signalled Lanes (pcuHr): 0.00 Cycle Time (s): 120 PRC Over All Lanes (%): Inf Total Delay Over All Lanes(pcuHr): 0.00												

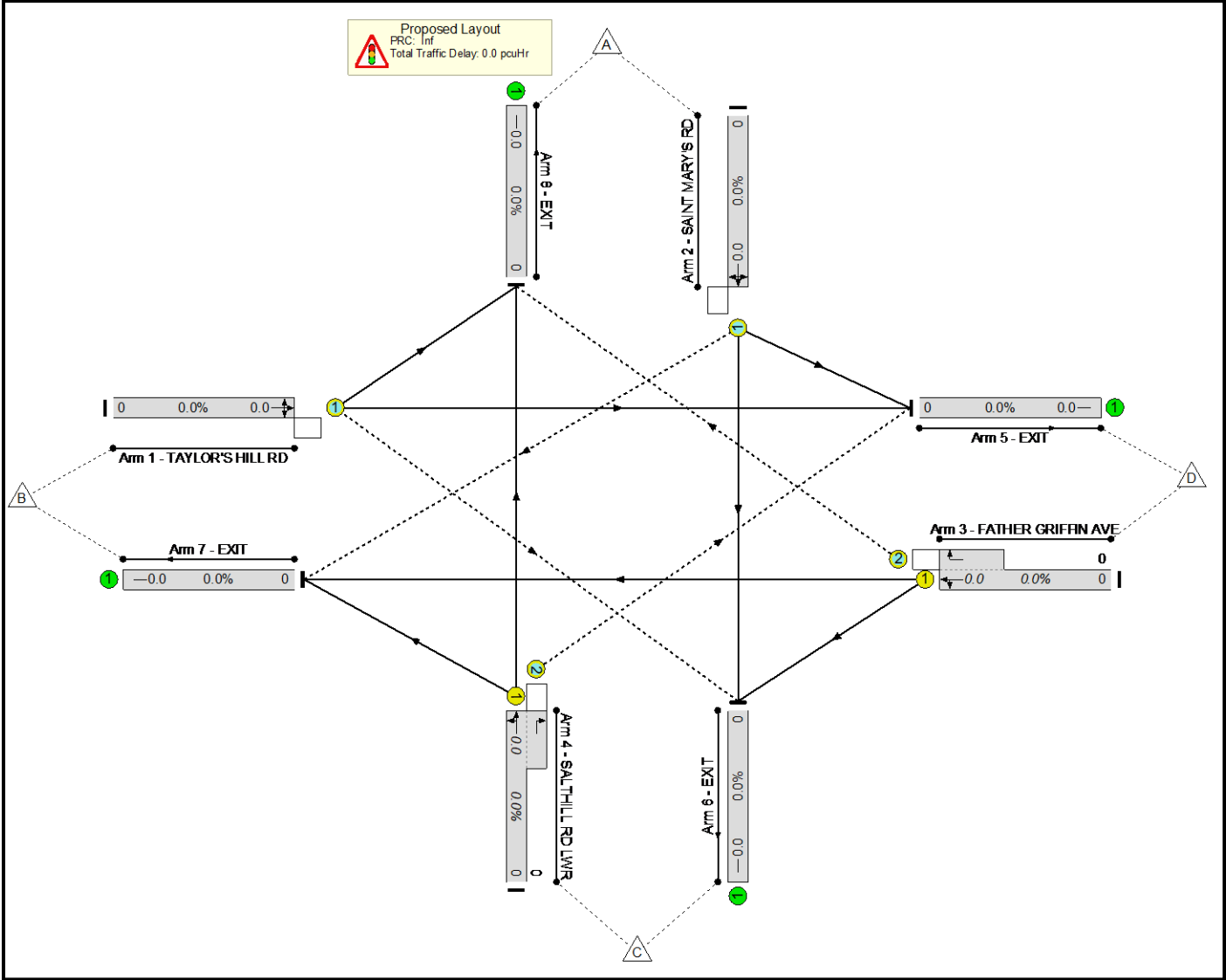
Results Summary

Ped Route Delay Times

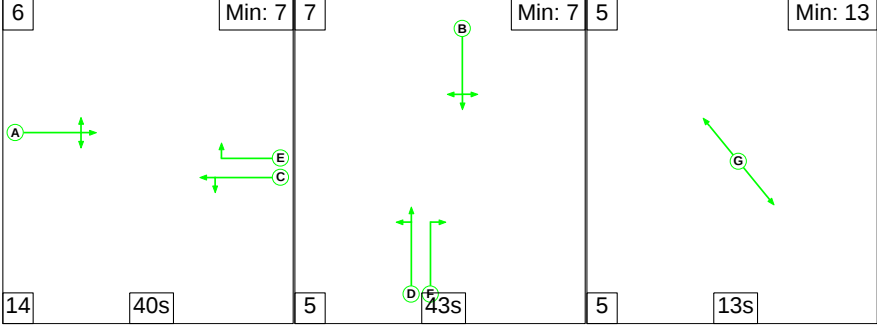
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 3: Opposed Phase AM
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Scenario 4: 'Opposed Phase PM' (FG2: 'PM Peak 2019', Plan 2: 'Opposed Phase')

Network Layout Diagram



Stage Sequence Diagram



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat (pcu/Hr)	Flow Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
Proposed Layout	-	-	-	-	-	0.0%	0	0	0	0.0	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	0	1915	654	0.0%	0	0	0	0.0	0.0	0.0
2/1	SAINT MARY'S RD Left Ahead Right	O	0	2015	739	0.0%	0	0	0	0.0	0.0	0.0
3/1+3/2	FATHER GRIFFIN AVE Left Ahead Right	U+O	0	1965:1915	780	0.0%	0	0	0	0.0	0.0	0.0
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	0	1915:1835	816	0.0%	0	0	0	0.0	0.0	0.0
5/1	EXIT	U	0	1965	1965	0.0%	-	-	-	0.0	0.0	0.0
6/1	EXIT	U	0	2015	2015	0.0%	-	-	-	0.0	0.0	0.0
7/1	EXIT	U	0	1945	1945	0.0%	-	-	-	0.0	0.0	0.0
8/1	EXIT	U	0	1940	1940	0.0%	-	-	-	0.0	0.0	0.0
C1			PRC for Signalled Lanes (%):		Inf	Total Delay for Signalled Lanes (pcuHr):		0.00	Cycle Time (s): 120			
			PRC Over All Lanes (%):		Inf	Total Delay Over All Lanes(pcuHr):		0.00				

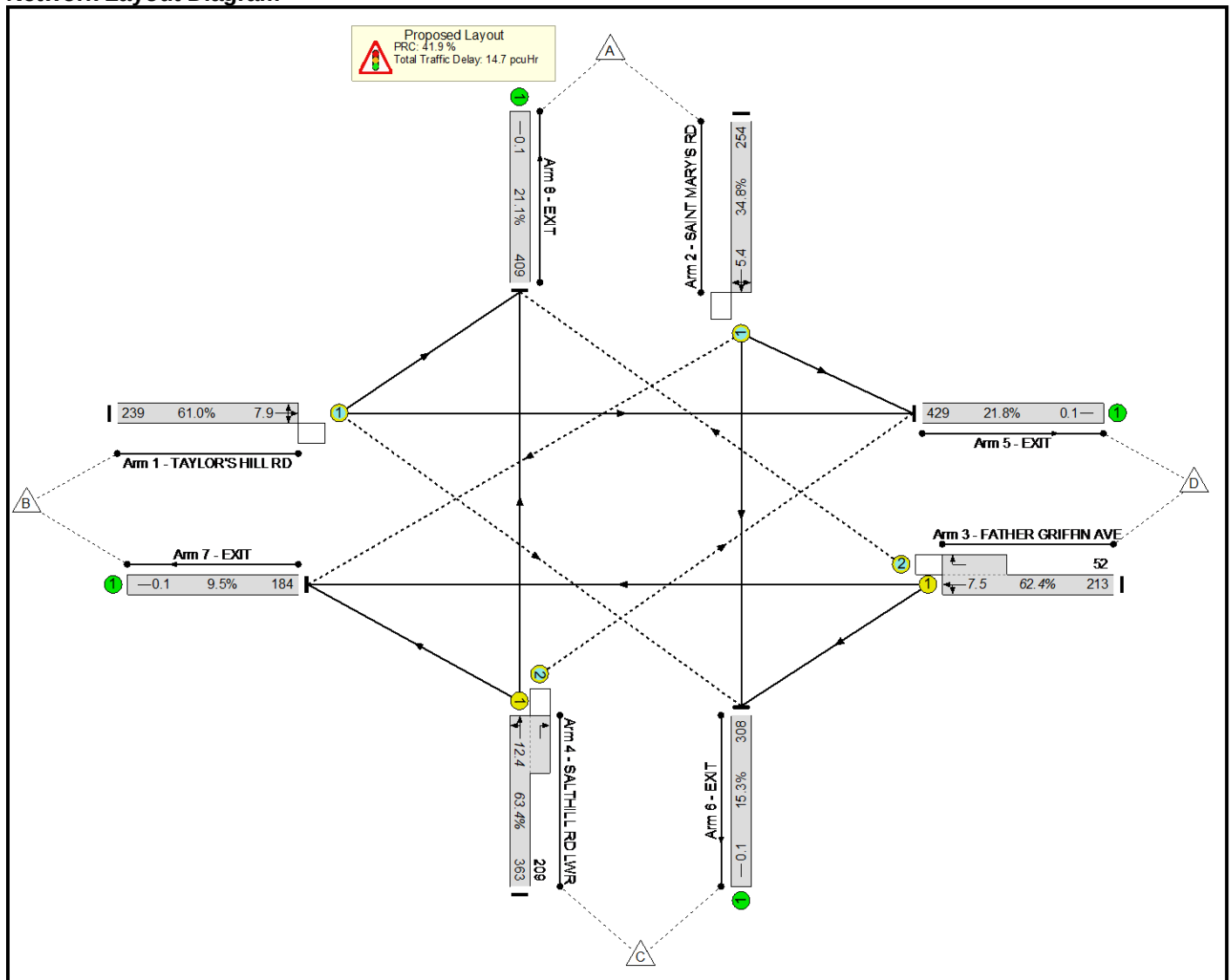
Results Summary

Ped Route Delay Times

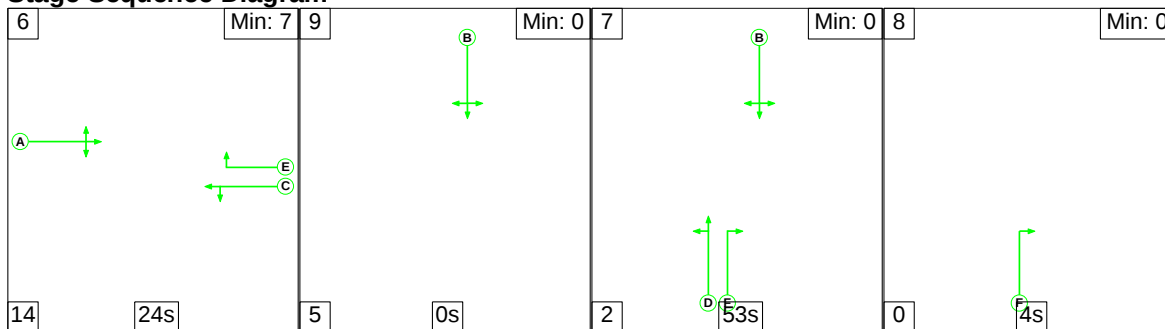
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 4: Opposed Phase PM
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Scenario 5: 'NS Filters AM' (FG1: 'AM Peak 2019', Plan 3: 'NS Filters')

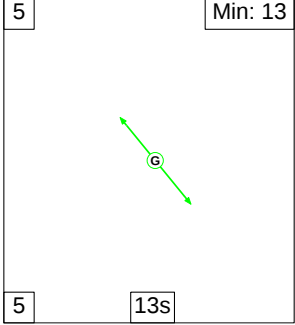
Network Layout Diagram



Stage Sequence Diagram



Results Summary



Network Results

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Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	63.4%	324	3	3	14.7	-	-
Proposed Layout	-	-	-	-	-	63.4%	324	3	3	14.7	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	239	1880	392	61.0%	19	0	0	3.7	55.2	7.9
2/1	SAINT MARY'S RD Left Ahead Right	O	254	1965	729	34.8%	51	0	0	1.9	26.7	5.4
3/1+3/2	FATHER GRIFFIN AVE Left Ahead Right	U+O	265	1835:1740	425	62.4%	52	0	0	4.1	55.5	7.5
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	572	1898:1723	902	63.4%	202	3	3	4.6	29.2	12.4
5/1	EXIT	U	429	1965	1965	21.8%	-	-	-	0.1	1.2	0.1
6/1	EXIT	U	308	2015	2015	15.3%	-	-	-	0.1	1.1	0.1
7/1	EXIT	U	184	1945	1945	9.5%	-	-	-	0.1	1.0	0.1
8/1	EXIT	U	409	1940	1940	21.1%	-	-	-	0.1	1.2	0.1
C1 PRC for Signalled Lanes (%): 41.9 Total Delay for Signalled Lanes (pcuHr): 14.27 Cycle Time (s): 120 PRC Over All Lanes (%): 41.9 Total Delay Over All Lanes(pcuHr): 14.68												

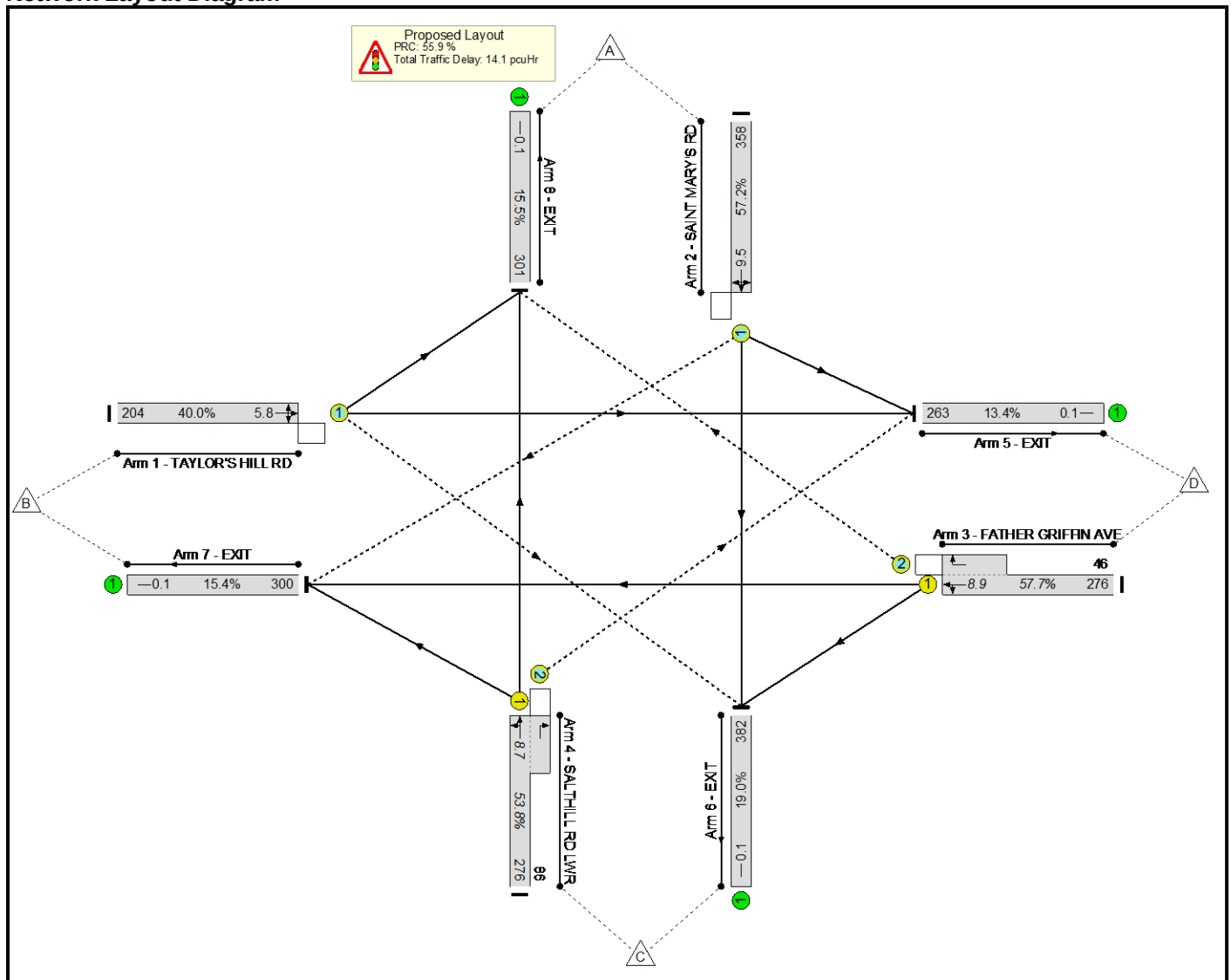
Results Summary

Ped Route Delay Times

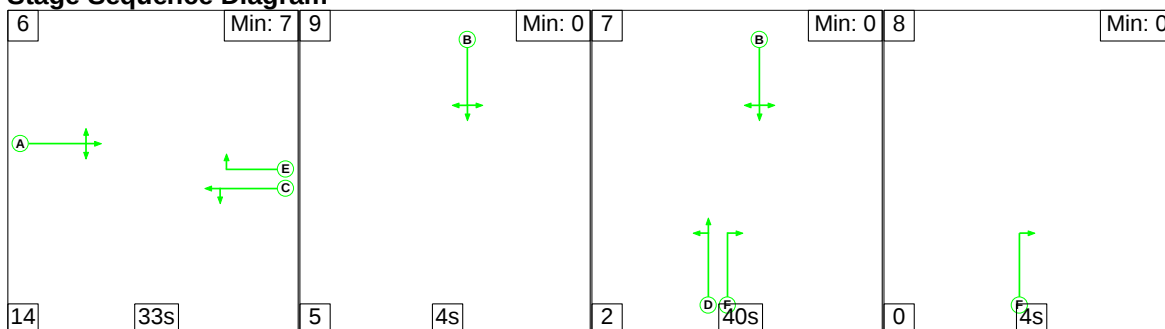
Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 5: NS Filters AM
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Scenario 6: 'NS Filters PM' (FG2: 'PM Peak 2019', Plan 3: 'NS Filters')

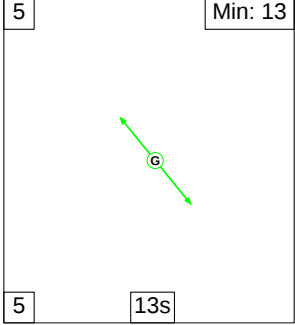
Network Layout Diagram



Stage Sequence Diagram



Results Summary



Network Results

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Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-	-	-	57.7%	230	16	1	14.1	-	-
Proposed Layout	-	-	-	-	-	57.7%	230	16	1	14.1	-	-
1/1	TAYLOR'S HILL RD Ahead Right Left	O	204	1871	511	40.0%	35	0	0	2.4	42.3	5.8
2/1	SAINT MARY'S RD Left Ahead Right	O	358	1965	625	57.2%	66	15	0	3.6	36.3	9.5
3/1+3/2	FATHER GRIFFIN AVE Left Ahead Right	U+O	322	1874:1740	558	57.7%	46	0	0	4.0	44.4	8.9
4/1+4/2	SALTHILL RD LWR Right Left Ahead	U+O	362	1886:1723	673	53.8%	83	1	1	3.7	37.0	8.7
5/1	EXIT	U	263	1965	1965	13.4%	-	-	-	0.1	1.1	0.1
6/1	EXIT	U	382	2015	2015	19.0%	-	-	-	0.1	1.1	0.1
7/1	EXIT	U	300	1945	1945	15.4%	-	-	-	0.1	1.1	0.1
8/1	EXIT	U	301	1940	1940	15.5%	-	-	-	0.1	1.1	0.1
C1 PRC for Signalled Lanes (%): 55.9 Total Delay for Signalled Lanes (pcuHr): 13.70 Cycle Time (s): 120 PRC Over All Lanes (%): 55.9 Total Delay Over All Lanes(pcuHr): 14.08												

File Note

Ped Route Delay Times

Route Num	Org Zone	Org Lane	Dest Zone	Dest Lane	Scenario 6: NS Filters PM
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Appendix D

Stage 1&2 Road Safety Audit

Clifton Scannell Emerson & Associates

The Crescent/Sea Road Junction Upgrade Works

Stage 1 & 2 Road Safety Audit

Clifton Scannell Emerson & Associates

The Crescent/Sea Road Junction Upgrade Works

Stage 1 & 2 Road Safety Audit

Document Ref: P21-066-PSW1-RP-001

Rev	Prepared By	Reviewed By	Approved By	Issue Date	Reason for Revision
2.0	PJM	MAH	PJM	7 th July 2021	Final
1.0	PJM	MAH	PJM	15 th Jun. 2021	Draft Report

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	Appendix C – Feedback Form	14
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Table 2.1: Collisions Recorded on the RSA Collision Database within the Extents of the Proposed Scheme (Source: www.RSA.ie)	3
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1 Introduction

1.1 General

This report results from a Stage 1 & 2 Road Safety Audit on the proposed The Crescent/Sea Road Junction Upgrade Works carried out at the request of Ms Hilary Owens of Clifton Scannell Emerson & Associates.

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

Mr. Peter Monahan

(BE MSc CEng FIEI RSACert)
Road Safety Audit Team Leader

Mr. Mazen Al Hosni

(BEng, MIEI)
Road Safety Audit Team Member

The Road Safety Audit took place during June 2021 and comprised an examination of the documents provided by the designers (see Appendix B). In addition to examining the documents supplied the Road Safety Audit Team visited the site of the proposed measures on the 1st June 2021. Weather conditions during the site visit were dry and the road surface was dry. Traffic volumes during the site visit moderate, pedestrian and cyclist volumes were moderate and traffic speeds were considered to be generally within the posted speed limit.

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

This has been carried out in accordance with the requirements of GE-STY-01024 - Road Safety Audit (December 2017), contained on the Transport Infrastructure Ireland (TII) Publications website.

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

If any of the recommendations within this road safety audit report are not accepted, a written response is required, stating reasons for non-acceptance. Comments made within the report under the heading of Observations are intended to be for information only. Written responses to Observations are not required.

1.2 Items Not Submitted for Auditing

Details of the following items were not submitted for audit; therefore no specific problems have been identified at this stage relating to these design elements, however where the absence of this information has given rise to a safety concern it has been commented upon in Section 3: -

- Vehicle swept paths;
- Road Signage;
- Drainage;
- Public Lighting; and
- Visibility splays.

2 Project Description

2.1 General



FIGURE 2-1: LOCATION PLAN

It is proposed to improve pedestrian facilities along The Crescent (R337) between its junction with Saint Mary's Road and its junction with Sea Road. The proposed works include improvements at both these junctions, and also along nearby Sherwood Avenue. The scheme is located in an urban area with posted speed of 50kph.

The proposed improvements will consist of:

- renewed footpaths along The Crescent over length of approximately 330m;
- the provision of a new toucan crossing of The Crescent, west of its junction with Palmyra Park;
- the provision of a new zebra crossing of The Crescent, east of its junction with Sea Road;
- alterations to the Sea Road junction to reduce the number of lanes on the Sea Road entry, and to reduce the width of the pedestrian crossing at this location;
- the provision of uncontrolled raised-table pedestrian crossings at the Crescent Green, Palmyra Park & Sea Road junctions;
- resurfacing of Sherwood Avenue between its junction with Taylor's Hill Road and St Mary's Road, and the provision of new "School Zone" Road markings and associated bollards;
- amendments to the layout of the junction between The Crescent & St Mary's Road, including the removal of some existing on-street parking spaces; and
- upgrading of the existing traffic signals at the junction between The Crescent & St Mary's Road.

As part of the proposed improvements the existing dedicated left-turn slip between The Crescent and Salthill Road Lower will be removed. However, it will be retained in an interim arrangement until proposed bus rerouting is implemented.

2.2 Collision History

The Road Safety Authority website (www.rsa.ie) was consulted to identify historical collisions in the vicinity of the proposed scheme. The website includes summary information on recorded collision occurrence for the period 2005 to 2016 (see Figure 2-2).

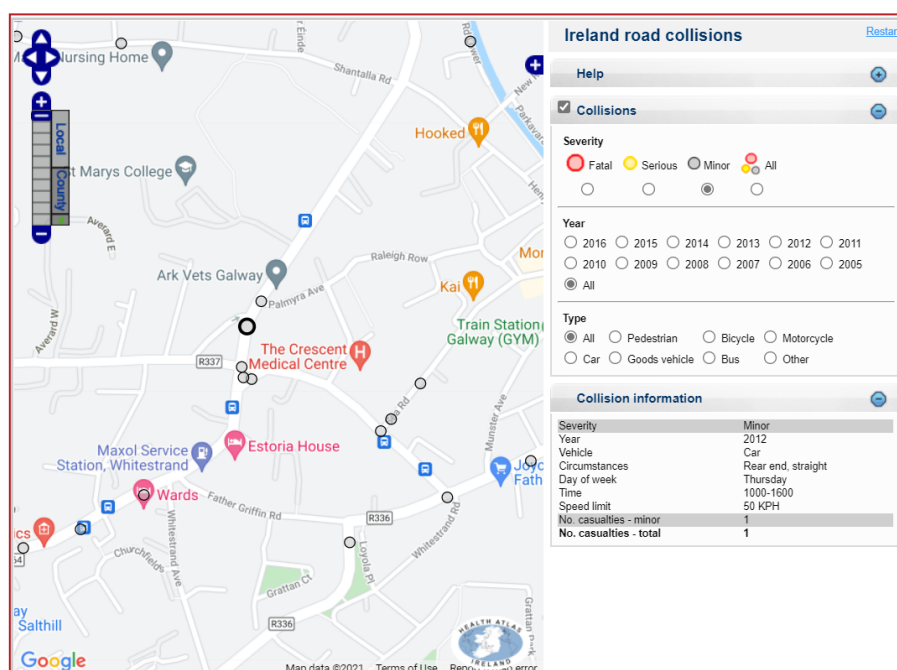


FIGURE 2-2: HISTORICAL COLLISIONS IN THE VICINITY OF THE SCHEME (SOURCE WWW.RSA.IE)

As shown in Figure 2-2, a total of 5 collisions were recorded within the extents of the Scheme between 2005 and 2016, all of which are Minor Injury Collisions. Table 2.1 provides a summary of the collisions recorded within the Scheme during this period.

TABLE 2.1: COLLISIONS RECORDED ON THE RSA COLLISION DATABASE WITHIN THE EXTENTS OF THE PROPOSED SCHEME (SOURCE: WWW.RSA.IE)

Severity	Year	Vehicle	Collision Type	Day of week	Time	Speed limit	Casualties	Location
Minor	2014	Bicycle	Other	Tuesday	0700-1000	50 KPH	1	The Crescent
Minor	2013	Car	Pedestrian	Friday	1600-1900	50 KPH	1	Sea Road
Minor	2012	Car	Other	Friday	1000-1600	50 KPH	2	Saint Mary's Road/The Crescent Junction
Minor	2008	Motorcycle	Rear end, right turn	Saturday	1600-1900	50 KPH	1	The Crescent/Sea Road Junction
Minor	2006	Car	Other	Sunday	1000-1600	50 KPH	1	Saint Mary's Road/The Crescent Junction

3 Main Report

3.1 Problem

Location: Saint Mary's Road/The Crescent Junction

Summary: Lack of sufficient space for waiting pedestrians at signalised pedestrian crossings within the junction.

The proposed amendments to the layout of the junction between St Mary's Road & The Crescent include the provision of widened signalised pedestrian crossings on the northern, southern & eastern arms of the junction. It is proposed to retain the existing corner radii in all corners of the junction, with the exception of the south-eastern quadrant, where the corner radius will be reduced following the removal of the left-turn dedicated slip at this location.



It is unclear if there will be adequate space within the footpath at the crossings to accommodate the likely/expected volumes of pedestrians, in particular during peak times (e.g. school opening/closing), possibly resulting in some pedestrians entering the carriageway in order to continue along the road where they are at increased risk of being struck by a passing vehicle.

In addition, the available space within the footpaths results in tactile paving layouts which may be difficult for visually impaired pedestrians to understand, in particular within the north-eastern corner of the junction, leading to difficulties for visually impaired pedestrians in safely & independently navigating the revised junction layout.

Recommendation

Ensure that there is adequate space within the footpath at the pedestrian crossings to accommodate the expected/likely volumes of pedestrians, in particular during peak times, and that the tactile paving layouts are such that they can be readily understood by a visually impaired pedestrian.

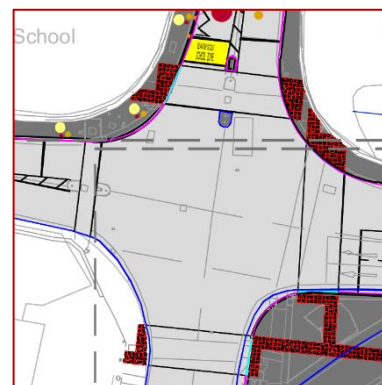
3.2 Problem

Location: Saint Mary's Road/The Crescent Junction

Summary: Proposed corner radii may lead to inappropriate speeds within & through the junction.

The proposed amendments to the layout of the junction retain the existing corner radii in all corners of the junction, with the exception of the south-eastern quadrant, where the corner radius will be reduced following the removal of the left-turn dedicated slip at this location.

The retention of the existing corner radii may encourage higher vehicular speeds for some manoeuvres, leading to increased injury severity should collisions occur.



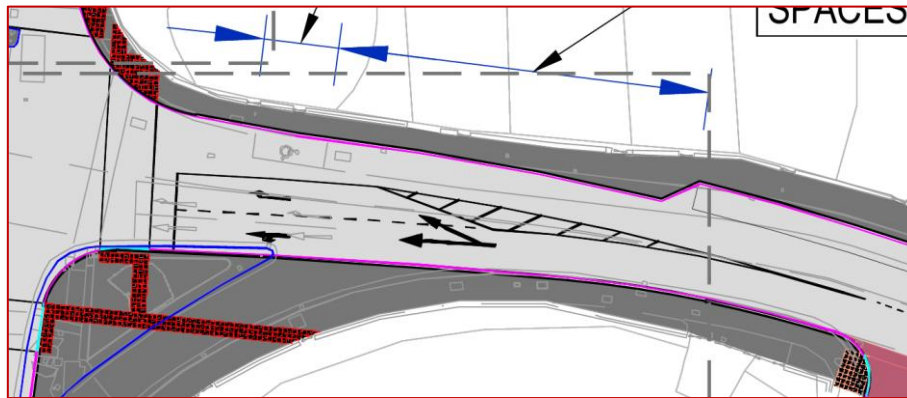
Recommendation

Provide consistent corner radii, in line with the guidance in the Design Manual for Roads & Streets (DMURS). Shorter corner radii could assist in increasing the width of the footpath at the pedestrian crossings. A swept path analysis should be undertaken to ensure that all movements can be safely accommodated.

3.3 Problem

Location: Saint Mary's Road/The Crescent Junction

Summary: Excessive queues may lead to unsafe manoeuvres.



On The Crescent's approach to its junction with St Mary's Road junction it is proposed to reduce the length of the right turning lane on for drivers turning onto Saint Mary's Road. Should the reduced length of the right turn lane leads to queues of right-turning vehicles extending back and blocking the straight-ahead & left-turning lane, there is a concern that some drivers may attempt to pass the queuing traffic by mounting the adjacent footpath, with a resulting risk of collisions with vulnerable road users.

Recommendation

A traffic assessment should be undertaken to assess the expected queues at the junction. Should queues from the right-turn lane be expected to block the straight-ahead & left-turn lane on The Crescent, then measures should be included to prevent drivers from mounting the footpath to pass queuing traffic.

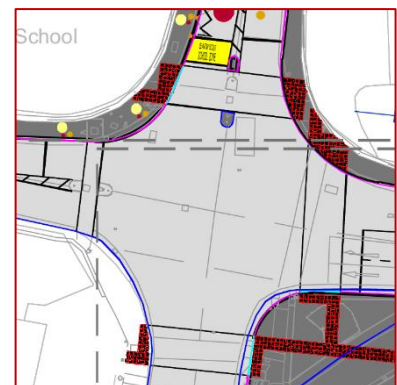
3.4 Problem

Location: St Mary's Road/The Crescent Junction

Summary: Existing splitter islands may impede turning HGVs resulting in overhang into the adjacent footpath.

The existing splitter islands on the Taylor's Hill Road arm and the Saint Mary's Road arm of the junction may compromise the swept path of a large vehicle leading to overhang into the footpaths, which are relatively narrow, increasing the possibility of a turning vehicle striking a pedestrian.

It would appear that these splitter islands are to be retained under the proposals.



Recommendation

Undertake a swept path analysis of the amended junction layout in order to ensure that the swept path of all vehicles likely to use the junction can be safely accommodated. If necessary consider omitting the splitter islands within the Taylor's Hill Road arm and the Saint Mary's Road arm of the junction. Removing them may permit wider footpaths and better accommodate swept paths.

3.5 Problem

Location: Taylor's Hill Road arm of the St Mary's Road/The Crescent Junction

Summary: Existing pedestrian crossing is too narrow, and tactile paving layouts are incomplete/incorrect.



It is not proposed to amend the existing signalised pedestrian crossing on the Taylor's Hill Road arm of the St Mary's Road/The Crescent Junction. The crossing width at this location appears to be insufficient for the likely/expected pedestrian volumes and the existing tactile paving is not of the correct shape, in that it does not have a stem, and ironwork is located within the tactile paving which may compromise the ability of a visually impaired pedestrian to correctly identify the crossing arrangement.

Recommendation

Provide a wider crossing, in line with the recommendations of DMURS, and amend the tactile paving layouts.

3.6 Problem

Location: South-eastern quadrant of the St Mary's Road/The Crescent Junction (Interim Arrangement)

Summary: Proposed tactile paving layout likely to be difficult to understand.

The proposed tactile paving layout within the splitter island in the south-eastern quadrant of St Mary's Road/The Crescent Junction, in the interim arrangement, appears overly complicated and may not be readily understood by visually impaired pedestrians.

It would be preferable to omit the stems from the proposed tactile paving layout in the interim arrangement, and provide alternative means of navigating/negotiating the proposed splitter/refuge island layout.



Recommendation

Amend the proposed tactile paving layout so that it is more readily capable of being understood by visually impaired pedestrians.

3.7 Problem

Location: The Crescent/Sea Road Junction

Summary: Unclear if the required visibility is available for the proposed Yield-controlled junction and proposed junction priority may result in higher speed left-turns on the approach to the proposed Zebra crossing.

It is proposed to amend the junction between The Crescent and Sea Road by reducing the number of lanes entering the junction on Sea Road, and hence reducing the width of the junction mouth and a new zebra crossing of The Crescent is indicated immediately east of its junction with Sea Road.

A change to the junction control from a 'Stop' to a 'Yield' control has also been indicated. The use of a Yield controls will not require approaching drivers to come to a halt before entering the junction, and may reduce a left-turning driver's awareness of a pedestrian on the downstream zebra crossing, leading to a failure to stop and possible overshoot incidents. In addition, it is unclear if the visibility requirements for a 'Yield' control junction are available.



Recommendation

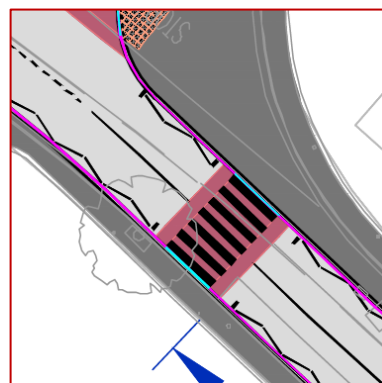
Retain the existing 'Stop' control at this junction.

3.8 Problem

Location: Zebra Crossing of The Crescent

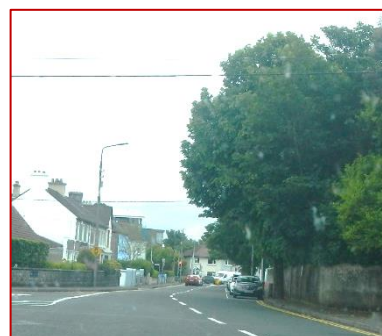
Summary: Existing tree in close proximity to proposed zebra crossing of The Crescent may impede inter-visibility.

An existing, mature, tree is located on the southern side of The Crescent, east of the junction with Sea Road. It is unclear from the information provided if it is intended to retain this tree at its current location. If retained, it may impede inter-visibility between an approaching driver and an NMU about to commence a crossing at the raised table zebra crossing.



Recommendation

Ensure adequate inter-visibility is available between non-motorised road users at the crossing and approaching drivers.

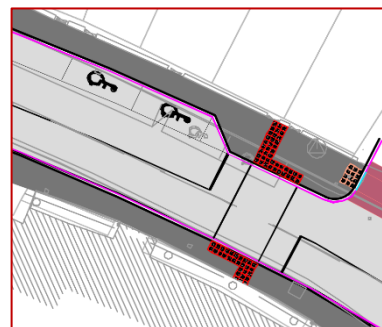


3.9 Problem

Location: Proposed Signalised Crossing

Summary: Parking provision in close proximity to proposed signalised pedestrian crossing of The Crescent may impede inter-visibility.

Existing parking spaces are to be retained to the west of the proposed signalised pedestrian crossing of The Crescent. It is unclear if a parked vehicle within the parking space closest to the crossing would impede inter-visibility between an approaching driver and a pedestrian about to commence a crossing. Insufficient inter-visibility could result in unsafe crossings and possible vehicular/pedestrian collisions.



Recommendation

Ensure adequate inter-visibility is available between non-motorised road users at the crossing and approaching drivers.

3.10 Problem

Location: General Problem

Summary: Unclear what the height of the proposed dropped kerbs is to be.

It is unclear from the information provided if there will be a difference between the proposed dropped kerbs at vehicular access locations and at pedestrian crossings. An insufficient kerb upstand at vehicular access dropped kerbs could lead to visually impaired pedestrians inadvertently entering the carriageway with an increased risk of being struck by a vehicle. Excessive kerb upstands at pedestrian crossings would present difficulties for mobility-impaired road users.

Recommendation

Ensure dropped kerbs at pedestrian crossings are flush with the carriageway (not greater than 6mm in height), and that kerbs at private vehicular access locations are a minimum of 25mm in height.

4 Observations

- 4.1 It is unclear if the proposed width of the proposed crossings are sufficient for the likely/expected pedestrian volumes in all locations. Section 4.3.2 of the Design Manual for Urban Roads and Streets (DMURS) recommends 4m wide crossings within “Centres” and on Arterial streets.
- 4.2 No dropped kerbs have been indicated at the vehicular access located between Devon Place & Montpellier Terrace, on the northern side of The Crescent. It is assumed that vehicular access will be required at this location in the future, as a gap has been indicated in the parallel parking provision at this location. The absence of a dropped (25mm) kerb could impede vehicular access.

5 Road Safety Audit Team Statement

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

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

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

ROAD SAFETY AUDIT TEAM LEADER

Peter Monahan

Signed:



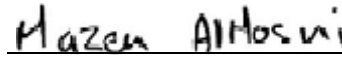
Dated:

7th July 2021

ROAD SAFETY AUDIT TEAM MEMBER

Mazen Al Hosni

Signed:



Dated:

7th July 2021

Appendix A – Road Safety Audit Brief Checklist

Have the following been included in the audit brief?: (if 'No', reasons should be given below)

	Yes	No
1. The Design Brief	☐	☒
2. Departures from Standard	☐	☒
3. Scheme Drawings	☒	☐
4. Scheme Details such as signs schedules, traffic signal staging	☐	☒
5. Collision data for existing roads affected by scheme	☒	☐
6. Traffic surveys	☒	☐
7. Previous Road Safety Audit Reports and Designer's Responses/Feedback Form	☐	☒
8. Previous Exception Reports	☐	☒
9. Start date for construction and expected opening date	☐	☒
10. Any elements to be excluded from audit	☐	☒

Any other information?

(if 'Yes', describe below)

☐ ☒

Appendix B – Documents Submitted to the Road Safety Audit Team

DOCUMENT/DRAWING TITLE	DOCUMENT/DRAWING NO.	REVISION
The Crescent / Sea Road Junctions Sheet 1 of 1	19_151A-CSE-GEN-XX-DR-C-1001	P01 (S2)
Draft Preliminary Design Report	RPT-19_151A-001	Draft

Appendix C – Feedback Form

Road Safety Audit Feedback Form

Scheme: Galway Cycleway Network Stage 2

Route No.: R337

Audit Stage: Stage 1 & 2 Road Safety Audit Date Audit Completed: 15/06/2021

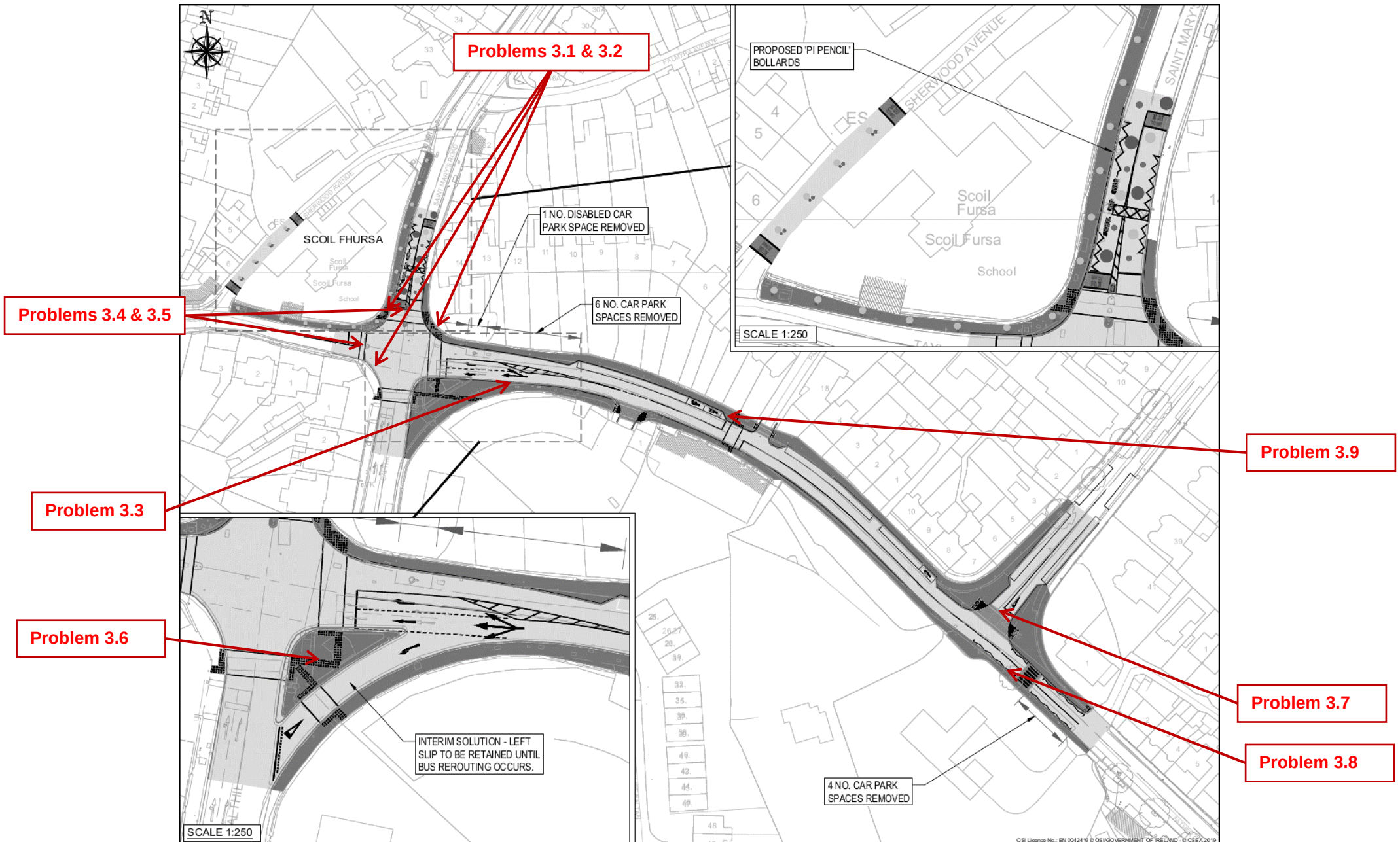
To Be Completed By Designer				To Be Completed By Audit Team Leader
Paragraph No. in Safety Audit Report	Problem Accepted (Yes/No)	Recommended Measure(s) Accepted (Yes/No)	Describe Alternative Measure(s). Give reasons for not accepting recommended measure	Alternative Measures or Reasons Accepted by Auditors (Yes/No)
3.1	Yes	Yes		
3.2	Yes	Yes		
3.3	Yes	Yes		
3.4	Yes	Yes		
3.5	Yes	Yes		
3.6	Yes	Yes		
3.7	Yes	Yes		
3.8	Yes	Yes		
3.9	Yes	Yes		
3.10	Yes	Yes		

Signed: Caroline Butler Designer Date 7th July 2021

Signed: Peter J. Monahan Audit Team Leader Date 7th July 2021

Signed: Paula Conner Employer Date 25th July 2021

Appendix D – Problem Locations



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