



Chapter 05

Construction

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5. Construction

5.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) describes the construction activities associated with the Clongriffin to City Centre Core Bus Corridor Scheme, hereafter referred to as the Proposed Scheme.

The design of the Proposed Scheme has been developed to a stage where all potential environmental impacts can be identified, and a fully informed environmental impact assessment can be carried out.

The NTA (the Employer for the construction works) shall set out the Employer's Requirements in the Construction Contract including all applicable mitigation measures identified in this EIAR, as well as additional measures required pursuant to conditions attached to any decision to grant approval. Procurement of the contractor will involve the determination that the appointed contractor is competent to carry out the works, including the effective implementation of the mitigation measures. The appointed contractor will be required to plan and construct the Proposed Scheme construction works in accordance with the Employer's Requirements, and the NTA will employ an Employer's Representative team with appropriate competence to administer and monitor the Construction Contract for compliance with the Employer's Requirements.

In order to allow an assessment of the construction stage impacts associated with the Proposed Scheme, this Chapter describes the construction phasing and programme as well as the construction activities necessary to undertake the works, including information on the Construction Compound, construction plant and equipment. This Chapter includes the following information:

- An overview of how the Proposed Scheme has been divided into sections is presented in Section 5.2;
- An overview of the construction activities proposed at each section along the Proposed Scheme (i.e., a description of what is proposed to be constructed) is presented in Section 5.3;
- A programme for the Proposed Scheme (i.e., when the sections will be constructed) is presented in Section 5.4;
- A general description of the construction methodology to be carried out at each section (i.e., how the Proposed Scheme will be built) is presented in Section 5.5;
- Information on the plant and equipment (i.e., what machinery will be used to construct the Proposed Scheme) is presented in Section 5.6;
- Information on the Construction Compound is presented in Section 5.7;
- The temporary traffic management measures, including the staging measures to be carried out (i.e., how the vehicles, cyclists and pedestrians will be impacted and safely catered for, during the works) are presented in Section 5.8; and
- Infrastructure projects and developments which are expected to interface with the construction of the Proposed Scheme are referenced in Section 5.9.

Details of mitigation measures proposed to address potential impacts arising from construction activities are described in Chapter 6 (Traffic & Transport) to Chapter 21 (Cumulative Impacts & Environmental Interactions) as appropriate and are summarised in Chapter 22 (Summary of Mitigation & Monitoring Measures) of this EIAR.

A Construction Environmental Management Plan (CEMP) has also been prepared and is included as Appendix A5.1 in Volume 4 of this EIAR. The CEMP will be updated by the NTA prior to the commencement of the Construction Phase, so as to include any additional measures required pursuant to conditions attached to any decision to grant approval. The CEMP has regard to the guidance contained in the TII Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan, and the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

All of the measures set out in the CEMP appended to this EIAR will be implemented in full.

5.2 Construction Phasing

The Proposed Scheme has been divided into two primary sections. The division line between sections has been determined by grouping similar carriageway types together. These sections have been further subdivided into 13 sub-sections, according to the types of construction works required. The sections / sub-sections are:

- **Section 1:** Mayne River Avenue to Gracefield Road – Malahide Road:
 - **Section 1a:** Mayne River Avenue Junction;
 - **Section 1b:** Clarehall Avenue / Malahide Road Junction;
 - **Section 1c:** Clarehall Avenue to Blunden Drive / Priorswood Road;
 - **Section 1d:** Blunden Drive / Priorswood Road / Malahide Road Junction;
 - **Section 1e:** Blunden Drive / Priorswood Road to Santry River;
 - **Section 1f:** Santry River to Ardlea Road / Gracefield Road; and
 - **Section 1g:** Ardlea Road / Gracefield Road / Malahide Road Junction.
- **Section 2:** Gracefield Road to Marino Mart / Fairview – Malahide Road:
 - **Section 2a:** Ardlea Road / Gracefield Road to Killester Avenue;
 - **Section 2b:** Killester Avenue to Collins Avenue;
 - **Section 2c:** Collins Avenue Junction;
 - **Section 2d:** Collins Avenue to Clancarthy Road;
 - **Section 2e:** Clancarthy Road to Marino Avenue; and
 - **Section 2f:** Marino Avenue to Marino Mart / Clontarf Road.

The location of each section / sub-section along the Proposed Scheme is shown in Figure 5.1 in Volume 3 of this EIAR. The construction activities to be carried out at each section / sub-section are described in Section 5.3.

5.3 Overview of Construction Works

The construction activities to be undertaken, and the anticipated duration of the works, in each section / sub-section are described in Sections 5.3.1 and Section 5.3.2. The location of each section / sub-section along the Proposed Scheme is shown in Figure 5.1 in Volume 3 of this EIAR. This section should be read in conjunction with the drawings listed in Table 5.1. These drawings are contained in Volume 3 of this EIAR.

Table 5.1: List of Relevant Drawings

Drawing Series Number	Description
BCIDA-ACM-SPW_ZZ-0001_XX_00-DR-CR-9001	Site Location Plan
BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001	General Arrangement
BCIDA-ACM-GEO_HV-0001_ML_00-DR-CR-9001	Mainline Plan and Profile
BCIDA-ACM-GEO_CS-0001_XX_00-DR-CR-9001	Typical Cross Sections
BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001	Landscaping General Arrangement
BCIDA-ACM-PAV_PV-0001_XX_00-DR-CR-9001	Pavement Treatment Plans
BCIDA-ACM-SPW_BW-0001_XX_00-DR-CR-9001	Fencing and Boundary Treatment (including gates)
BCIDA-ACM-TSM_GA-0001_XX_00-DR-CR-9001	Traffic Signs and Road Markings
BCIDA-ACM-LHT_RL-0001_XX_00-DR-EO-9001	Street Lighting
BCIDA-ACM-TSM_SJ-0001_XX_00-DR-TR-9001	Junction System Design
BCIDA-ACM-DNG_RD-0001_XX_00-DR-CD-9001	Proposed Surface Water Drainage Works
BCIDA-ACM-UTL_UD-0001_XX_00-DR-CU-9001	IW Foul Sewer Asset Alterations
BCIDA-ACM-UTL_UE-0001_XX_00-DR-CU-9001	ESB Asset Alterations

Drawing Series Number	Description
BCIDA-ACM-UTL_UG-0001_XX_00-DR-CU-9001	GNI Asset Alterations
BCIDA-ACM-UTL_UW-0001_XX_00-DR-CU-9001	IW Water Asset Alterations
BCIDA-ACM-UTL_UL-0001_XX_00-DR-CU-9001	Telecommunications Asset Alterations
BCIDA-ACM-UTL_UC-0001_XX_00-DR-CU-9001	Combined Existing Utility Records

Further details on the design specifications, with regards to matters such as parking and loading bay widths, signalised junctions, priority junctions, bus stops, accessibility, traffic signals, lighting, utilities, drainage, pavement and landscape design, can be found in the Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors, contained in Appendix A4.1 in Volume 4 of this EIAR.

5.3.1 Section 1: Mayne River Avenue to Gracefield Road – Malahide Road

5.3.1.1 Section 1a: Mayne River Avenue Junction

Section 1a is located at the Mayne River Avenue junction. The construction activities at Section 1a will comprise pavement reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new street furniture (rubbish bins, seats, lighting, benches, planters, bollards, cycle racks, bus stop (including shelters and information displays etc.)) and landscaping works. Fencing will be constructed along the southeast side of Malahide Road, for the length of Section 1a. Some minor utility diversions and / or protections will be required. The expected construction duration will be approximately two months.

5.3.1.2 Section 1b: Clarehall Avenue / Malahide Road Junction

Section 1b is located at the junction of Clarehall Avenue and Malahide Road. The existing signalised junction will be upgraded. The main construction activities at Section 1b will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new street furniture and landscaping works. Some minor utility diversions and / or protections will be required. The expected construction duration will be approximately three months.

5.3.1.3 Section 1c: Clarehall Avenue to Blunden Drive / Priorswood Road

Section 1c encompasses a length of approximately 700m (metres) along the Malahide Road, between Clarehall Avenue and Blunden Drive, Priorswood Road. The construction activities at Section 1c will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new street furniture and landscaping works. Trees and plantings will be removed at this junction. Fencing will be constructed at discrete sections along the northwest side of Malahide Road. A wall will also be constructed along the northwest side of Malahide Road, north of the Blunden Drive, Priorswood Road, Malahide Road Junction. Some minor utility diversions and / or protections will be required. The expected construction duration will be approximately three months.

5.3.1.4 Section 1d: Blunden Drive / Priorswood Road / Malahide Road Junction

Section 1d is located at the junction of Blunden Drive, Priorswood Road, and Malahide Road. At Section 1d, the existing roundabout will be converted to a signalised junction. Construction activities will comprise reconstruction, widening and resurfacing of both the roads and footpaths, new kerbs, additional signage, new road markings, new street furniture, new traffic lights and landscaping works. A small retaining wall will also be constructed along a footpath at the southwest corner of Priorswood Road, Malahide Road. The works will include the construction of a bus turning head on Priorswood Road, approximately 250m west from the Blunden Drive, Priorswood Road, Malahide Road Junction, opposite Marigold Avenue. Some minor utility diversions and / or protections will be required. The expected construction duration will be approximately nine months.

5.3.1.5 Section 1e: Blunden Drive / Priorswood Road to Santry River

Section 1e encompasses a length of approximately 850m along Malahide Road, between Blunden Drive, Priorswood Road, and Santry River. The construction activities at Section 1e will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new bus stops, new street furniture and landscaping works. A boundary wall will be constructed at the southeast corner of the Malahide Road, Greencastle Road junction. Some minor utility diversions and / or protections will be required. The expected construction duration will be approximately three months.

5.3.1.6 Section 1f: Santry River to Ardlea Road / Gracefield Road

Section 1f encompasses a length of approximately 1200m along the Malahide Road, between Santry River and the Ardlea Road, Gracefield Road Junction. Construction activities will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new bus stops, new street furniture and landscaping works. Some minor utility diversions and / or protections will be required. Additionally, road humps / raised crossing points will be installed at St Brendan's Avenue junction, along with pedestrian crossing points. The expected construction duration will be approximately three months.

5.3.1.7 Section 1g: Ardlea Road / Gracefield Road / Malahide Road Junction

Section 1g is located at the Ardlea Road, Gracefield Road, Malahide Road Junction. The existing roundabout will be converted to a signalised junction. The construction activities at Section 1g will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new street furniture and landscaping works. Trees and plantings will be removed at this junction. Some utility diversions and / or protections will be required. The expected construction duration will be approximately nine months.

5.3.2 Section 2: Gracefield Road to Marino Mart / Fairview – Malahide Road

5.3.2.1 Section 2a: Ardlea Road / Gracefield Road to Killester Avenue

Section 2a encompasses a length of approximately 720m along Malahide Road, between the Ardlea Road / Gracefield Road and Killester Avenue. The construction activities at Section 2a will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new bus stops, new street furniture and landscaping works. Vegetation and planting will be removed at the open space alongside Pinebrook Road, St David's Wood. Boundary walls, fencing, and any associated gates, where adjusted due to land acquisition will be reconstructed along both sides of Malahide Road at multiple locations. Some minor utility diversions and / or protections will be required. The expected construction duration will be approximately four months.

5.3.2.2 Section 2b: Killester Avenue to Collins Avenue

Section 2b encompasses a length of approximately 500m along Malahide Road, between Killester Avenue and Collins Avenue. The construction activities at Section 2b will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new bus stops, new street furniture and landscaping works. Fencing will be constructed south of Killester Avenue, along the park / playing pitch. Boundary walls, fencing and any associated gates to properties will be realigned along the southeast side of Malahide Road. Some minor utility diversions and / or protections will be required. The expected construction duration will be approximately three months.

5.3.2.3 Section 2c: Collins Avenue Junction

Section 2c is located at the Malahide Road, Collins Avenue Junction. The construction activities at Section 2c will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new street furniture and landscaping works. Boundary walls and any associated gates to properties will be realigned at this junction, along the northeast corner. Urban realm

improvements (including the upgrading of the paving) will be undertaken outside the grounds of Our Lady of Consolation Church, Donnycarney. The expected construction duration will be approximately three months.

5.3.2.4 Section 2d: Collins Avenue to Clancarthy Road

Section 2d encompasses a length of approximately 270m along Malahide Road, between Collins Avenue and Clancarthy Road. The construction activities at Section 2d will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new bus stops, new street furniture and landscaping works. Boundary walls and any associated gates to properties will be realigned along the southeast side of Malahide Road. Some minor utility diversions and / or protections will be required. The expected construction duration will be approximately two months.

5.3.2.5 Section 2e: Clancarthy Road to Marino Avenue

Section 2e encompasses a length of approximately 770m along the Malahide Road, between Clancarthy Road and Marino Avenue. The construction activities at Section 2e will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new bus stops, new street furniture and landscaping works. Boundary walls will be realigned along the northwest side of Malahide Road, south of Griffith Avenue. Some minor utility diversions and / or protections will be required. The expected construction duration will be approximately four months.

5.3.2.6 Section 2f: Marino Avenue to Marino Mart / Clontarf Road

Section 2f encompasses a length of approximately 400m along the Malahide Road, between Marino Avenue and Marino Mart / Clontarf Road Junction. The construction activities at Section 2f will comprise reconstruction, widening and resurfacing of both the roads and the footpaths, new kerbs, additional signage, new road marking and traffic lights, new bus stops, new street furniture and landscaping works. Boundary walls and any associated gates to properties will be realigned along both sides of Malahide Road. Some minor utility diversions and / or protections will be required. On Brian Road, Carleton Road and Haverty Road, which is the alternative cycle route, planing and resurfacing of the existing road, along with application of additional road markings, will be undertaken. The expected construction duration will be approximately three months.

5.4 Construction Programme

A programme for the Proposed Scheme is provided in Table 5.2. The total Construction Phase duration for the overall Proposed Scheme is estimated at approximately 24 months. However, construction activities in individual sections will have shorter durations as outlined in Section 5.3. The programme identifies the approximate duration of works at each section. The location of each section / sub-section along the Proposed Scheme is shown in Figure 5.1 in Volume 3 of this EIAR.

Table 5.2: Construction Programme

Section Ref.	Approximate Construction Duration	Approximate Length (m)	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Section 1a	2 months	150								
Section 1b	3 months	200								
Section 1c	3 months	700								
Section 1d	9 months	200								
Section 1e	3 months	850								
Section 1f	3 months	1,200								
Section 1g	9 months	100								
Section 2a	4 months	720								
Section 2b	3 months	500								
Section 2c	3 months	100								
Section 2d	2 months	270								

Section Ref.	Approximate Construction Duration	Approximate Length (m)	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Section 2e	4 months	770								
Section 2f	3 months	400								

In order to achieve the overall programme duration, it will for the most part, be necessary to work on more than one section / sub-section at any one time. The programme has been prepared with a view to providing as much separation as practicable between sections under construction at any given time. This has been done in order to minimise traffic disruption and facilitate the ease of movement of sustainable modes, bus services and goods along the Proposed Scheme.

5.5 Construction Methodology

This section provides an outline of how each element of the Proposed Scheme infrastructure will be constructed. It should be read in conjunction with the phasing set out in Section 5.3 and Section 5.4, and also with the traffic management stages set out in Section 5.8.

5.5.1 Pre-Construction

The NTA will prepare the Construction Contract documents, which will include all applicable mitigation measures identified in this EIAR, as well as any additional measures required in any conditions attached to An Bord Pleanála's decision, should they grant approval.

The preparations will also include the need for additional investigative survey works (such as ground investigation and slit trenching to confirm the location of existing utilities) to supplement the information in the Construction Contract documents. Any such additional investigative survey works that could be deemed to be construction activities will follow the requirements of the CEMP, where necessary.

The NTA will also serve notices on impacted landowners in accordance with the requirements of the Compulsory Purchase Order (CPO) process to ensure necessary lands are available for the construction works.

5.5.2 Preparatory and Site Clearance Works

Additional preparations will be required prior to commencing the road and street upgrade works, to confirm the construction methodology, such as additional investigative survey works (such as confirmatory invasive species surveys, ground investigation and slit trenching to confirm the location of existing utilities).

There will be elements of preparatory works, including establishing the Construction Compound, the installation of fencing and signage, vegetation clearance and treatment of non-native invasive species, demolition works (e.g., such as boundary walls) etc. required in preparation for the main construction activities.

5.5.2.1 Land Acquisition and Boundary Treatment

Condition surveys of properties adjacent to the Proposed Scheme that the works have the potential to effect will be undertaken prior to works commencing. Liaison with impacted landowners will be carried out in advance of commencement of boundary works to properties.

Boundary works will be commenced where both permanent and temporary land acquisition is required to ensure that sufficient space is available to construct the Proposed Scheme. Boundary treatments will be carried out on a section-by-section basis (with sections / sub-sections defined in Section 5.3), and in line with the traffic management Stages set out in Section 5.8.3.

This will be a mixture of boundary walls / fencing along industrial / commercial land, railings along parks and temporary boundaries, as required. Any land temporarily acquired from a landowner will only be utilised for the purposes of undertaking boundary works or accommodation works related to the land in question.

Any lands acquired temporarily to facilitate construction work will be returned to landowners on completion of the works. Existing boundary walls or fencing being relocated will be constructed to match the existing conditions, unless otherwise agreed. The removal of trees, vegetation, lawns, paving etc will be minimised in so far as practicable.

5.5.2.2 Fencing

Fencing will be erected on a section-by-section basis (with sections / sub-sections defined in Section 5.3), and in line with the traffic management Stages set out in Section 5.8.3.

5.5.2.3 Construction Traffic Management Measures and Signage

Prior to commencing the construction works described below within a sub-section of the Proposed Scheme, temporary traffic management measures will be installed. The temporary traffic management measures, including measures for pedestrians, cyclists, public transport users, general traffic, proposed lane closures, road closures and diversions are discussed in detail in Section 5.8 of this EIAR. Temporary traffic management signage will be put in place in accordance with the requirements of the Department of Transport's Traffic Signs Manual, Chapter 8, Temporary Traffic Measures and Signs for Roadworks (DTTS 2019), hereafter referred to as the Traffic Signs Manual. Further information is also provided in the Construction Traffic Management Plan CTMP) in Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.5.2.4 Tree Protection

Trees to be retained within and adjoining the works areas will be suitably protected as necessary as per 'British Standard (BS) 5837:2012 Trees in Relation to Design, Demolition, and Construction' (British Standards Institution (BSI) 2012). Trees identified for removal will be removed in accordance with 'BS 3998:2010 Tree Work. Recommendations' (BSI 2010). The location of trees to be retained, and trees to be removed is shown on the Landscaping General Arrangement Drawings (BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001).

A suitably qualified arborist will be appointed by the contractor to monitor tree protection, and tree removal related activities. The design has been developed to ensure removal of trees has been minimised in so far as practicable. Where necessary, protective fencing will be erected, and mitigation measures will be put in place, prior to construction works commencing in the immediate vicinity. Works required within the root protection areas of trees to be retained will follow the arboricultural methodology included in Appendix A17.1 Arboricultural Method Statement in Volume 4 of this EIAR. Further information on mitigation measures with regards to the removal, and protection of trees is provided in Chapter 12 (Biodiversity) and further information on the assessment of tree removal with regards to landscape and visual impact is provided in Chapter 17 (Landscape (Townscape) & Visual) of this EIAR.

5.5.2.5 Vegetation Clearance and Treatment of Non-Native Invasive Species

Vegetation (e.g., hedgerows, scrub, grassland) clearance and treatment of non-native invasive species (e.g., Japanese knotweed, Himalayan balsam, Giant hogweed) will be undertaken within the Proposed Scheme boundary, where necessary.

A suitably qualified specialist will be appointed by the contractor to monitor vegetation clearance, and treatment of non-native invasive species. Prior to construction, confirmatory invasive species surveys will be undertaken by the specialist to re-confirm the presence and / or extent of species within the footprint of the Proposed Scheme. Further information with regards to pre-construction ecological surveys and restrictions are provided in Chapter 12 (Biodiversity) of this EIAR. Vegetation identified for removal will be removed in accordance with 'BS 3998:2010 Tree Work. Recommendations' (BSI 2010) and best arboricultural practices as detailed and monitored by the specialist. The Invasive Species Management Plan (ISMP) for the control of invasive plant species on the Proposed Scheme is included in the Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.5.2.6 Archaeological Investigations

The NTA will procure the services of a suitably qualified archaeologist as part of its Employer's Representative team administering and monitoring the works. In addition, a suitably qualified archaeologist will be appointed by

the contractor to monitor archaeological and cultural heritage matters during construction; to acquire any licenses / consents required to conduct the work, and to supervise and direct the archaeological measures associated with the Proposed Scheme in accordance with the Employer's Requirements. In the event of archaeological features or material being uncovered during the Construction Phase, all machine work will cease in the immediate area to allow the archaeologist time to inspect and record any such material. Further information on archaeological management is included in Section 15.5 in Chapter 15 (Archaeological & Cultural Heritage) of this EIAR.

5.5.2.7 Ground Investigations

Prior to construction localised confirmatory ground investigations will be undertaken to verify the results of the assessments, undertaken and reported in this EIAR. Information on the specific ground investigations conducted along the Proposed Scheme have been outlined in Chapter 14 (Land, Soils, Geology & Hydrogeology) of this EIAR.

5.5.2.8 Construction Compound

As part of preparatory works, the Construction Compound will be set up, which will include installation of the necessary facilities including the site office, welfare facilities, etc. Controlled access to the Construction Compound will be implemented, fencing will be erected, and lighting will be installed. The Construction Compound will be secured with Closed-Circuit Television (CCTV), to ensure safe storage of all material, plant and equipment. Further information on the Construction Compound is included in Section 5.7.

5.5.2.9 Lighting

The majority of the Proposed Scheme is already artificially lit, however temporary lighting will be required at times along the Proposed Scheme at certain locations during the Construction Phase, where necessary. Where it is necessary to disconnect public lighting during the construction works or to undertake works outside of daylight hours where the existing lighting is low, appropriate temporary lighting will be provided. Temporary lighting will also be installed at the Construction Compound for the duration of the Construction Phase.

The standard of temporary lighting installed during the Construction Phase will meet the standard of the existing carriageway and will be appropriate to the speed and volume of traffic during construction. Temporary construction lighting will generally be provided by tower mounted floodlights, which will be cowled and angled downwards to minimise spillage of light from the site.

New permanent lighting and upgrades to the existing lighting infrastructure are also proposed as part of the Proposed Scheme's lighting strategy, the details of which are addressed in Section 4.6 (Key Infrastructure Elements) in Chapter 4 (Proposed Scheme Description) of this EIAR.

5.5.2.10 Demolition

In some locations along the Proposed Scheme, items, such as walls, gates, fencing, lighting poles, bus stops, etc., will need to be removed or demolished. The impacts of materials arising from the Proposed Scheme demolitions are assessed in Chapter 18 (Waste & Resources) of this EIAR. Measures for managing demolition materials are included in the Construction Demolition Resource Waste Management Plan (CDRWMP) in Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.5.3 Road and Street Upgrades

The Proposed Scheme will be constructed in a manner which will minimise, as much as practicable, any disturbance to residents, businesses and road users. Road and street upgrade works will be completed in a Staged manner, as described in Section 5.8.2, whereby traffic of all modes will be managed to ensure construction can continue while ensuring the safety of all road users, and personnel, and maintaining flow of all modes of transport wherever practicable.

5.5.3.1 Parking and Access

When roads and streets are being upgraded, there will be some temporary disruption / alterations to on-street and off-street parking provision, and access to premises in certain locations along the Proposed Scheme. Local arrangements will be made on a case-by-case basis to maintain continued access to homes and businesses affected by the works, at all times, where practicable. Details regarding temporary access provisions will be discussed with homes and businesses prior to construction starting in the area. The duration of the works will vary from property to property, but access and egress will be maintained at all times. The location of temporary land acquisition, proposed gates, and the relocation of existing gates are shown in the Fencing and Boundary Treatment Drawings (BCIDA-ACM-SPW_BW-0001_XX_00-DR-CR-9001) in Volume 3 of this EIAR.

Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

5.5.3.2 Earthworks

Topsoil and subsoil will be excavated as part of the Proposed Scheme; for foundations, bus stop shelters, signs, public lights, traffic signal poles, tree pits etc. This topsoil and subsoil may be temporarily stored at the Construction Compound for reuse where practicable, in line with the principles of circular economy. The Proposed Scheme will aim to minimise the amount of materials brought onto the Proposed Scheme in so far as practicable. The acceptability of earthworks material for reuse will be determined, by testing and analysis, to determine if materials meet the specific engineering standards for their proposed end-use.

All earthworks will be managed having regard to the Transport Infrastructure Ireland (TII) Guidelines for the Management of Waste from National Road Construction Projects (TII 2017), and the Waste Management Act, 1996, as amended. The management of materials is discussed in Chapter 18 (Waste & Resources) of this EIAR. The overall estimated quantities of demolition, excavation, imported and recycled fill are outlined respectively in Table 18.7, Table 18.8, Table 18.9, Table 18.13 in Chapter 18 (Waste & Resources) of this EIAR.

5.5.3.3 Drainage

Adjustment or upgrade works will be required to service chambers and manholes, gullies, etc. Access manholes located in the footways will be lowered or raised to match the proposed carriageway levels, where the carriageway will be widened into the existing footways.

Specific controls and mitigation measures will be put in place to manage runoff and minimise pollution to receiving waterbodies during the Construction Phase of the Proposed Scheme. Further information with regards to drainage, and drainage design is included in Chapter 4 (Proposed Scheme Description), Chapter 13 (Water), Chapter 19 (Material Assets) and the Surface Water Management Plan (SWMP) in Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.5.3.4 Utility Works

Realignment, upgrade or replacement of utilities and services will be required in conjunction with, or to accommodate the Proposed Scheme. Any such works to utilities and services will be along or immediately adjacent to the Proposed Scheme. A list of utility and service works along the Proposed Scheme is provided in Chapter 19 (Material Assets) of this EIAR.

Utilities and services, including overhead and underground, comprise amongst others:

- Water mains;
- Storm water and foul sewers;
- Fuel pipelines;
- Electricity ducts and cabling;
- Gas mains;
- Telecommunications and TV ducting and cabling; and

- Traffic signalling ducting and cabling.

The existing overhead utilities and services will be located and recorded prior to the commencement of works. Any relocation of existing overhead lines will be coordinated to ensure interruption to the existing network is minimised.

Proposed utility works are based on available records, and preliminary site investigations. Prior to excavation works being commenced, localised confirmatory surveys will be undertaken to verify the results of the pre-construction assessments undertaken and reported in this EIAR.

Areas to be excavated for utility trenches will first be traced for live services using established scanning techniques. Where necessary, trenches excavated for utility diversions will be supported to ensure that the sides of the excavation are secure. Each of the different utilities will be re-laid at a location, depth and spacing in accordance with the appropriate standards and the trench then backfilled.

5.5.3.5 Pavement and Carriageway Works

This section describes the pavement and carriageway works to be completed along the Proposed Scheme, including construction, or alterations to the carriageway, kerbs, roundabouts, parking and loading bays, footpaths, cycle infrastructure (cycle paths, cycle tracks, cycle lanes), bus stops (island, shared landing area, layby) etc. The following options outline the pavement construction / reconstruction scenarios required along the Proposed Scheme:

- Where the existing road surfacing is showing signs of deterioration, the existing pavement will be replaced (i.e., road pavement and surfacing will be removed and replaced to similar levels as existing);
- Where the quality of the existing road pavement is poor or where the existing road will be widened, full depth road foundation and pavement reconstruction will be carried out; and
- In some instances, road overlay (i.e., the addition of new pavement / road surfacing material), with no excavation, will be provided.

The proposed pavement treatment along the Proposed Scheme is provided in the Pavement Treatment Plans Drawings (BCIDA-ACM-PAV_PV-0001_XX_00-DR-CR-9001) in Volume 3 of this EIAR.

Existing asphalt / bituminous layers will be removed using road planers, with planings being recycled where practicable, as is common practice. Following this, existing lower courses of road make-up or ground will be excavated in layers using mechanical excavators in order to segregate materials for reuse, recycling, or disposal as appropriate, with materials being transported using lorries. The new or rehabilitated pavement will then be constructed from formation level, in coordination with the installation of street furniture assets. Plant used in construction of the new road make-up will be excavators, rollers, dumpers, and lorries, as detailed in Section 5.6. Specialist road paving machines will be used to lay bituminous layers. Road markings and reflective road studs will also be installed.

The choice of materials will include unbound or hydraulically bound granular materials for the foundation, hydraulically bound materials, hot or cold bituminous mixtures for base and binder layers and natural stone or concrete paving units, bituminous mixtures or concrete materials for the surface. Specialist products such as high friction surfacing treatments will also be applied to the surface of the pavement where appropriate.

5.5.3.6 Traffic Signal Junctions

During the works, the existing traffic signals will remain in operation, supplemented as necessary by temporary traffic signals, until such time as the new signals become operational.

The existing signalised junctions along the Proposed Scheme will be upgraded to provide bus priority, enhanced pedestrian crossings, and segregated cycling facilities. In general, traffic signals will be replaced, and additional dedicated signals will be provided for buses, cyclists and pedestrians. Extensive underground works will be required to provide additional ducts for traffic signal electrical and telecommunication cables, as described in

Section 5.5.3.4, with associated chambers and control boxes above ground. Additional traffic monitoring equipment will be provided, including closed circuit television (CCTV) cameras.

5.5.3.7 Ancillary Road Furnishings

The appointed contractor will install street furniture such as rubbish bins, signage, seats, lighting, benches, planters, bollards, cycle racks, and bus stops (including shelters and information displays etc.).

5.5.3.8 Landscaping

Where vegetation, grassed areas and hedgerows are disturbed during the works, these will be reinstated, and replaced, where practicable. New trees will be planted, in suitable tree pits where necessary, at various locations as shown in the Landscaping General Arrangement Drawings (BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

5.5.4 Construction Site Decommissioning

On completion of construction, all construction facilities and equipment such as plant, materials, temporary signage, laydown areas, and the Construction Compound, etc. will be removed. The area which was occupied by the Construction Compound will be reinstated – refer to the Landscaping General Arrangement Drawings (BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

5.6 Construction Plant and Equipment

In order to assess a reasonable worst case Construction Phase impact scenario, with regards to air quality, noise and vibration, an estimate of construction plant and equipment that will be necessary to construct the Proposed Scheme has been prepared. The estimated peak daily numbers of principal items of plant and equipment working within a section is indicated in Table 5.3. It should be noted that these are peak daily numbers.

The appointed contractor will select and utilise plant and equipment in a manner that ensures Construction Noise Thresholds, as defined in Chapter 9 (Noise & Vibration) of this EIAR, are not exceeded. Refer to Chapter 7 (Air Quality) and Chapter 9 (Noise & Vibration) of this EIAR for the Construction Phase air quality and noise and vibration assessments, and associated mitigation measures.

Table 5.3: Estimated Peak Daily Plant and Equipment Numbers

Plant / Equipment	Plant and Equipment Numbers per Section												
Type	1a	1b	1c	1d	1e	1f	1g	2a	2b	2c	2d	2e	2f
Lorry	6	10	19	2	23	28	4	13	14	3	11	16	11
Backhoe Mounted Hydraulic Breaker	2	2	5	1	6	7	1	4	4	1	3	4	3
8t Excavator	2	2	5	1	6	7	2	4	4	1	3	4	3
13t (Rubber Wheeled) Excavator	2	2	5	1	6	7	1	4	4	1	3	4	3
16t (Rubber Wheeled) Excavator	2	2	5	1	6	7	1	4	4	1	3	4	3
6t Dumper	2	2	5	1	6	7	2	4	4	1	3	4	3
Road Planer	2	2	2	1	2	3	1	2	2	1	2	2	2
Road Sweeper	1	1	1	1	1	2	1	1	1	1	1	1	1
Asphalt Paver	2	2	2	1	2	3	1	2	2	1	2	2	2
Asphalt Roller	2	2	2	1	2	3	1	2	2	1	2	2	2
3t Roller	2	2	5	1	6	7	1	4	4	1	3	4	3
Vacuum Excavator	1	1	1	1	1	2	1	4	2	2	2	3	2

5.7 Construction Compound

In order to construct the Proposed Scheme, the appointed contractor will require a Construction Compound from which they can manage the delivery of the Proposed Scheme.

5.7.1 Construction Compound Location

The location of the Construction Compound in relation to the Proposed Scheme is shown in Figure 5.1 in Volume 3 of this EIAR. The Construction Compound (CL1) will be located at the area between Buttercup Park and Malahide Road, as shown in Image 5.1.

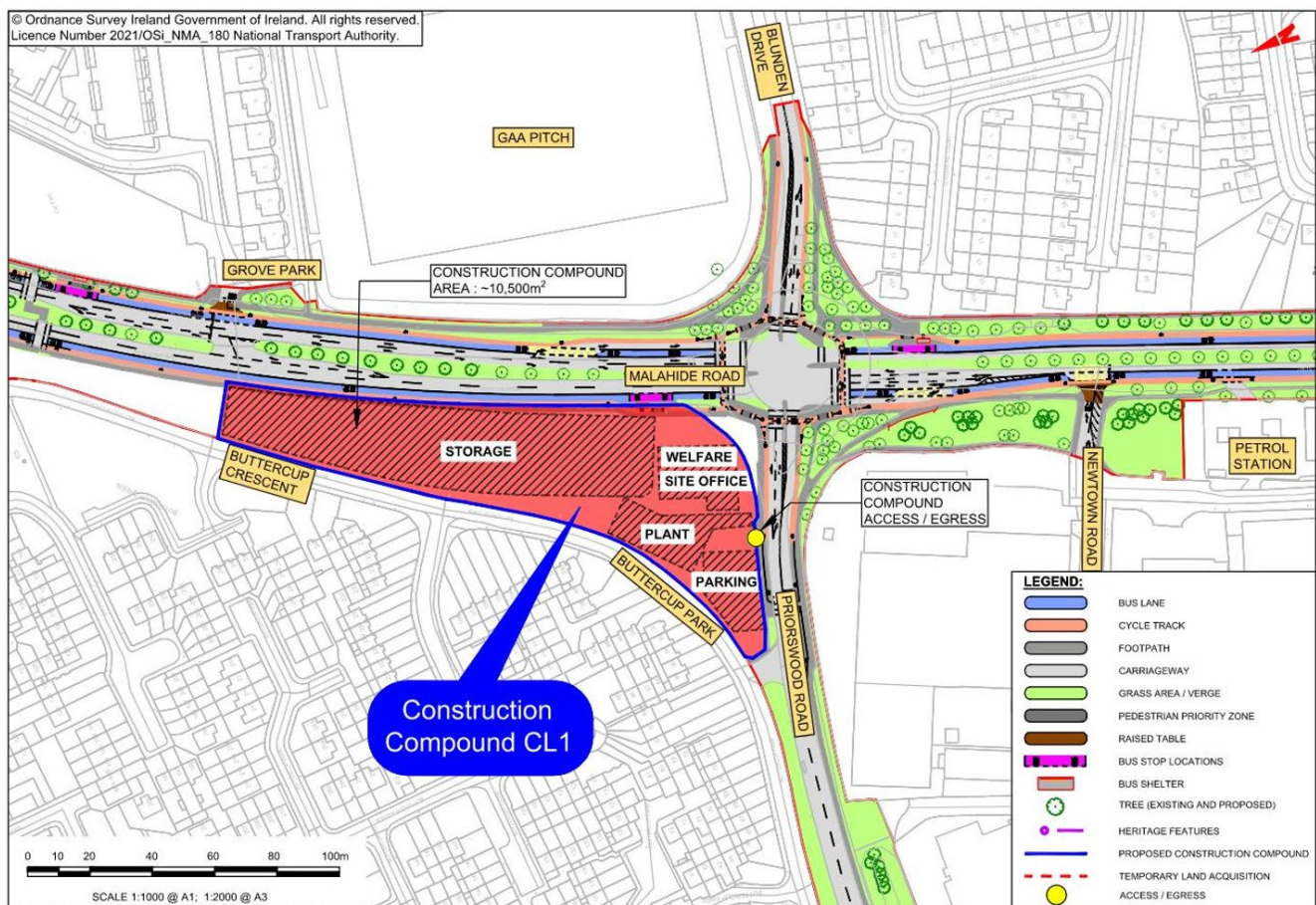


Image 5.1: Location, Extent and Layout of Construction Compound CL1

The Construction Compound location has been selected due to the amount of available space at this location, its location near the majority of the Proposed Scheme major works and its access to the National and Regional Road Network. Refer to Chapter 6 (Traffic & Transport) of this EIAR for an assessment of the construction traffic.

The area of Construction Compound is approximately 10,500m².

5.7.2 Construction Compound Activities

As shown in Image 5.1, the Construction Compound will contain a site office, and welfare facilities for NTA personnel and contractor personnel. Limited car parking will be allowed at the Construction Compound, in line with the principles of the Construction Stage Mobility Management Plan (CSMMP), as described in Appendix A5.1 CEMP in Volume 4 of this EIAR, which will be prepared by the appointed contractor. Materials such as topsoil, subsoil, concrete, rock etc., will be stored at the Construction Compound for reuse as necessary. Items of plant and equipment, described in Section 5.6, will also be stored within the Construction Compound.

Certain materials will be re-used where practicable, primarily, site-sourced concrete and excavated material. Any crushing of materials will be undertaken by a mobile crusher that will be located in the Construction Compound, and due to the limited volume of this material generated as part of the works, it is anticipated that crushing will only be undertaken for short periods of time.

All necessary authorisations, under the Waste Management Act 1996, as amended, will be obtained prior to undertaking crushing and temporary storage. Further information on the reuse of material within the Proposed Scheme is included in Chapter 18 (Waste & Resources) of this EIAR. Further information on the air quality, and noise and vibration assessments, and associated mitigation measures, at the Construction Compound is included in Chapter 7 (Air Quality) and Chapter 9 (Noise & Vibration) of this EIAR.

5.7.3 Construction Compound Services

The Construction Compound will be fenced off, lit (during working hours) and secured with CCTV, as described in Section 5.5.2.8. Temporary lighting, including security lighting will be required at the Construction Compound, as described in Section 5.5.2.9. Access to the Construction Compound will be restricted to site personnel and authorised visitors only.

The Construction Compound will be engineered with appropriate services. Water, wastewater, power, and communications connections will be organised by the appointed contractor. At work areas along the Proposed Scheme, where permanent provisions (for the duration of the construction programme) are not practicable, appropriate temporary provisions will be made, including the use of generators if required. Temporary welfare facilities will need to be used, for example, portable toilets in the vicinity of works. Wastewater from temporary welfare facilities will be collected and disposed of to a suitably licensed facility.

Appropriate environmental management measures will be implemented at the Construction Compound for example, to minimise the risk of fuel spillage, and to ensure that the Construction Compound and the approaches to it are appropriately maintained. Further information on the air quality, noise and vibration, and water related mitigation measures that will be implemented are described in Chapter 7 (Air Quality), Chapter 9 (Noise & Vibration) and Chapter 13 (Water) of this EIAR.

Following completion of the construction works, the Construction Compound area will be cleared and reinstated to match pre-existing conditions.

5.8 Construction Traffic Management

The Construction Traffic Management Plan (CTMP) has been prepared to facilitate the assessment of the potential impacts on traffic and transport along the Proposed Scheme. The CTMP includes details of the temporary traffic management measures that will be implemented during the construction of the Proposed Scheme.

The staging of construction and associated temporary traffic management measures has considered the receiving environment when developing the schedule of works.

The CTMP has given due consideration to facilitate the maximum practicable movement of people during the construction period through implementing the following hierarchy of transport mode users:

- Pedestrians;
- Cyclists;
- Public Transport; and
- General Traffic.

Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

The construction traffic management measures have been developed in accordance with the Traffic Signs Manual. Construction traffic management measures are summarised in Section 5.8.1 to Section 5.8.4, with further

details (such as routing of construction vehicles, timings of material deliveries, etc.) included in the CTMP in Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.8.1 Pedestrian and Cyclist Provisions

The measures set out in Section 8.2.8 of the Traffic Signs Manual will be implemented, wherever practicable, to ensure the safety of all road users, in particular pedestrians (including able-bodied pedestrians, wheel-chair users, mobility impaired pedestrians, pushchair users) and cyclists. Therefore, where footpaths or off-road cycle tracks are affected by construction, a safe route will be provided past the works area, and where practicable, provisions for matching existing facilities for pedestrians and cyclists will be made.

5.8.2 Public Transport Provisions

Existing public transport routes will be maintained throughout the duration of the Construction Phase of the Proposed Scheme (notwithstanding potential for occasional road closures / diversions as discussed in Section 5.8.4). Wherever practicable, bus services will be prioritised over general traffic. However, the temporary closure of sections of existing dedicated bus lanes will be required to facilitate the construction of new bus priority infrastructure that is being developed as part of the Proposed Scheme. Some existing bus stop locations will need to be temporarily relocated to accommodate the works. In such cases, bus stops will be safely accessible to all users and all temporary impacts on bus services will be determined in consultation with the NTA and the service providers.

5.8.3 General Traffic Provisions

The roads and streets along the Proposed Scheme, will remain open to general traffic wherever practicable during the Construction Phase; however lane closures, road closures and diversions will be necessary to facilitate construction.

Two-way traffic will generally be maintained along the Proposed Scheme, however in circumstances where there is not sufficient road width to allow two-way traffic (e.g. reduced lane width), single lane traffic controlled by a stop / go system of temporary traffic lights will be implemented during the day with priority provided to traffic travelling towards the City Centre during the morning, and reversed during the afternoon where appropriate. Lane closures and route diversions will supplement this system if traffic volumes are heavy. Short delays may occur outside of the AM and PM peaks, for example as a result of vehicles accessing the works.

For most of the Proposed Scheme the existing carriageway width is sufficient to maintain full width two-way traffic throughout the works. However, where the carriageway width is restricted, at various sections throughout the Proposed Scheme, the construction works will be split into three main traffic management stages (Stage A to Stage C) as described in Section 5.8.3.1 to Section 5.8.3.3.

5.8.3.1 Stage A

To carry out Stage A works safely, traffic management will be implemented as shown in Image 5.2, by means of narrowing the existing lanes carrying public transport and general traffic to 3.0m (3.3m north of Tonlegee Road due to higher HGV volumes). A lateral safety zone will be implemented between the carriageway and the works area, with an appropriate safe distance as per Table 8.2.2.2 of the Traffic Signs Manual.

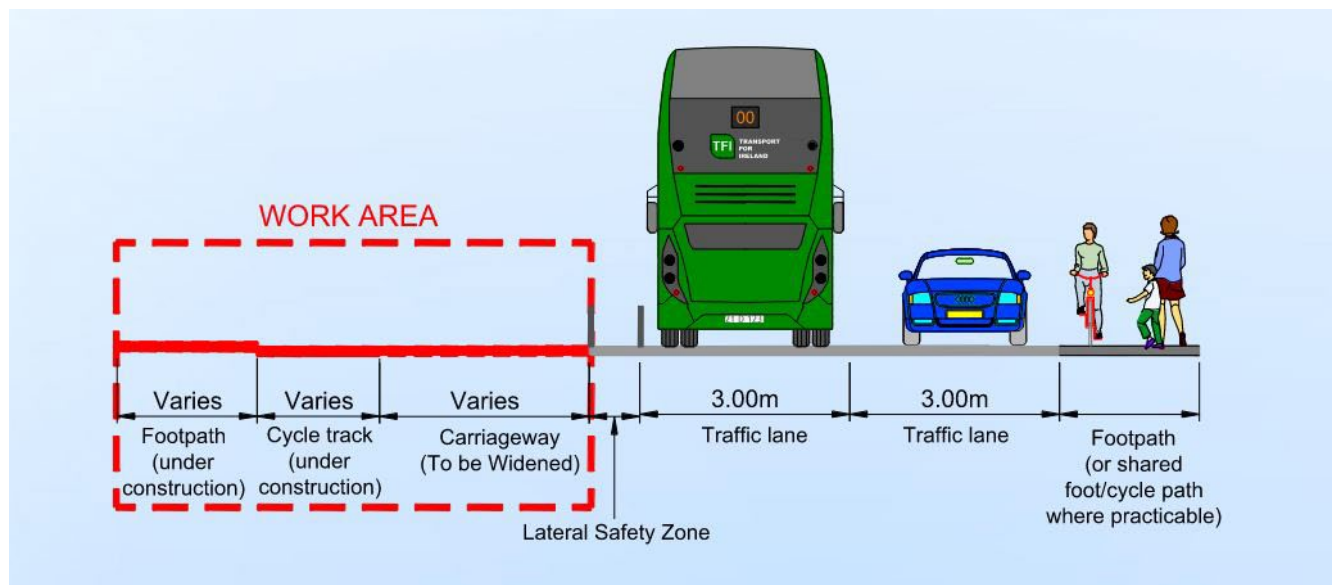


Image 5.2: Work Area - Stage A

5.8.3.2 Stage B

Stage B commences following the completion of Stage A. Public transport, general traffic, pedestrians and cyclists will be transferred to the opposite side of the carriageway to facilitate Stage B works. This stage will include the same methodology as outlined in Stage A, however carried out on the opposite side of the carriageway, as shown in Image 5.3.

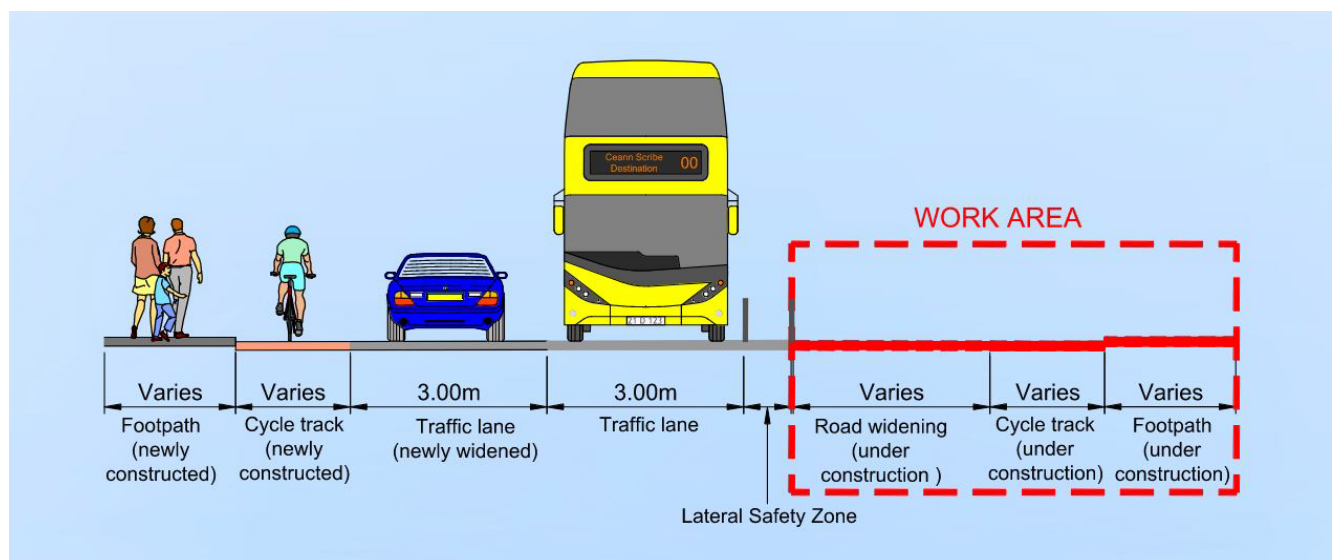


Image 5.3: Work Area - Stage B

5.8.3.3 Stage C

Once Stage B is complete, Stage C will entail completion of the proposed final road surfacing. To maintain traffic movement at this stage, lane closures, road closures, or diversions will be implemented, as appropriate.

5.8.4 Road Closures and Diversions

Road closures and diversions will need to be carried out during the Construction Phase of the Proposed Scheme, however these measures will be minimised wherever possible. Where necessary, road closures and diversions

will take into consideration the impact on road users, residents, businesses etc. Road closures and diversions will be carried out with regard to the Traffic Signs Manual. All road closures and diversions will be determined by the NTA, in consultation with the local authority and An Garda Síochána, as necessary. Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

5.9 Interface with Other Projects

The likely timelines of the Proposed Scheme construction works have considered the potential for simultaneous construction of, and cumulative impacts with other infrastructure projects and developments which are proposed along, or in the vicinity of, the Proposed Scheme. The likely significant cumulative impacts caused by the Proposed scheme in combination with other existing or planned projects were identified and assessed in Chapter 21 (Cumulative Impacts & Environmental Interactions) of this EIAR.

Interface liaison will take place on a case-by-case basis through the NTA, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

5.10 Construction Environmental Management

5.10.1 Construction Environmental Management Plan

As stated in Section 5.1, a Construction Environmental Management Plan (CEMP) has been prepared for the Proposed Scheme and is included as Appendix A5.1 in Volume 4 of this EIAR. The CEMP will be updated by the NTA prior to the commencement of the Construction Phase, so as to include any additional measures required pursuant to conditions attached to any decision to grant approval. The CEMP has regard to the guidance contained in the TII Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan, and the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

Details of mitigation measures proposed to address potential impacts arising from construction activities are described in Chapter 6 (Traffic & Transport) to Chapter 21 (Cumulative Impacts & Environmental Interactions) as appropriate and are summarised in Chapter 22 (Summary of Mitigation & Monitoring Measures) of this EIAR.

A number of sub-plans have also been prepared as part of the CEMP and these are summarised in the following sections. For the avoidance of doubt, all of the measures set out in the CEMP and the sub-plans appended to this EIAR will be implemented in full by the appointed contractor to the satisfaction of the NTA.

5.10.1.1 Construction Traffic Management Plan

The Construction Traffic Management Plan (CTMP) has been prepared to demonstrate the manner in which the interface between the public and construction-related traffic will be managed and how vehicular movement will be controlled. It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the CTMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála, should they grant approval. Further details on the assessment of construction traffic, and traffic related mitigation measures are provided in Chapter 6 (Traffic & Transport) of this EIAR.

5.10.1.2 Invasive Species Management Plan

The Invasive Species Management Plan (ISMP) has been prepared which provides the strategy to be adopted in order to manage and prevent the spread of non-native invasive plant species. No non-native invasive plant species were identified in close proximity to the Proposed Scheme during ecological surveys, however a number of non-native invasive species are known to occur in the wider area. It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the ISMP how it is intended to complete the works in accordance with the Employer's Requirements, and will be subject to the

NTA's approval. Further details on the assessment of non-native invasive species, and associated mitigation measures are provided in Chapter 12 (Biodiversity) of this EIAR.

5.10.1.3 Surface Water Management Plan

The Surface Water Management Plan (SWMP) has been prepared which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme. It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the SWMP how it is intended to effectively implement all the applicable measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval.

5.10.1.4 Construction and Demolition Resource and Waste Management Plan

The Construction and Demolition Resource and Waste Management Plan (CDRWMP) has been prepared which provides the strategy that will be adopted in order to ensure that optimum levels of reduction, re-use and recycling are achieved. It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the CDRWMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval. Further details on waste management are provided in Chapter 18 (Waste & Resources) of this EIAR.

5.10.1.5 Environmental Incident Response Plan

The Environmental Incident Response Plan (EIRP) has been prepared to ensure that in the unlikely event of an incident (environmental, or non-environmental), response efforts are prompt, efficient, and suitable for the particular circumstances. The EIRP details the procedures to be undertaken in the event of a significant release of sediment into a watercourse, or a significant spillage of chemical, fuel or other hazardous substances (e.g. concrete), non-compliance incident with any permit or license, or other such risks that could lead to a pollution incident, including flood risks. It will be a condition of the Employers Requirements that the successful contractor, immediately following appointment must detail in the EIRP, the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval.

5.10.2 Mitigation Measures

Mitigation and monitoring measures have been identified as environmental commitments and overarching requirements which shall avoid, reduce or offset potential impacts which could arise throughout the Construction Phase of the Proposed Scheme. These mitigation and monitoring measures which are relevant to the Construction Phase of the Proposed Scheme are detailed in Chapter 6 (Traffic & Transport) to Chapter 21 (Cumulative Impacts & Environmental Interactions) and summarised in Chapter 22 (Summary of Mitigation & Monitoring Measures) and Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.10.3 Working Hours

It is envisaged that generally construction working hours will be between 07:00 and 23:00 on weekdays, and between 08:00 and 16:30 on Saturdays. Night-time and Sunday working will be required during certain periods to facilitate street works that cannot be undertaken under day time/ evening conditions. The planning of such works will take consideration of sensitive receptors, in particular any nearby residential areas.

5.10.4 Personnel

Throughout the Construction Phase there will be some variation in the numbers of personnel working on site. It is anticipated there will be between 70 and 80 personnel directly employed across the Proposed Scheme, rising to 100 personnel at peak construction.

5.10.5 Construction Health and Safety

The requirements of the Safety, Health and Welfare at Work Act 2005, the Safety, Health and Welfare at Work (Construction) Regulations, 2013 and other relevant Irish and EU safety legislation will be complied with at all times. As required by the Regulations, a Health and Safety Plan will be formulated which will address health and safety issues from the design stages through to the completion of the Construction Phase. This plan will be reviewed as the Proposed Scheme progresses. The contents of the Health and Safety Plan will follow the requirements of the Regulations. In accordance with the Regulations, a “Project Supervisor Design Process” has been appointed and “Project Supervisor Construction Stage” will be appointed as appropriate.

5.11 References

British Standards Institution (2010). British Standard 3998:2010 Tree Work. Recommendations.

British Standards Institution (2012). British Standard 5837:2012 Trees in Relation to Design, Demolition, and Construction. Recommendations.

Construction Industry Research and Information Association (2015). Environmental Good Practice on Site Guide, 4th Edition.

Department of Transport, Tourism and Sport (2019). Chapter 8, Temporary Traffic Measures and Signs for Roadworks, Traffic Signs Manual.

Transport Infrastructure Ireland (2007). Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.

Transport Infrastructure Ireland (2017). The Management of Waste from National Road Construction Projects.

Directives and Legislation

Safety, Health and Welfare at Work (Construction) regulations 2013.

Safety, Health and Welfare at Work Act 2005, as amended.

Waste Management Act 1996, as amended.