Bonneagar Iompair Éireann
Transport Infrastructure Ireland

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Luas Finglas

Environmental Impact Assessment Report 2024

Chapter 6: Construction Activities

BARRY TRANSPORTATION
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Project Ireland 2040
Building Ireland's Future

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GLOSSARY OF FREQUENTLY USED TERMS

Acronym	Term
CEMP	Construction Environmental Management Plan
CCTV	Closed-Circuit Television
C&D RWMP	Construction and Demolition Resources and Waste Management Plan
CoP	Code of Practice for Archaeology
CPO	Compulsory Purchase Order
CSMMP	Construction Stage Mobility Management Plan
DCC	Dublin City Council
DECC	Department of the Environment, Climate and Communications
D&B	Design and Build
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIRP	Environmental Incident Response Plan
FCC	Fingal County Council
FRA	Flood Risk Assessment
GDA	Greater Dublin Area
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicles
ICW	Integrated Construction Wetland
IÉ	Iarnród Éireann
LRT	Light Rail Transit
LRV	Light Rail Vehicle
INNS	Invasive Non-native Invasive Species
NMU	Non-Motorised Users
NTA	National Transport Authority
OCS	Overhead Contact System
OPW	Office of Public Works
PSCS	Project Supervisor for the Construction Stage
PSDP	Project Supervisor Design Process
CTMP	Construction Traffic Management Plan
P&R	Park & Ride
RAP	Reclaimed Asphalt Materials
RPS	Record of Protected Structures
SPMT	Self-propelled Modular Transporter
SuDs	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TII	Transport Infrastructure Ireland

Acronym	Term
LR-SC	Light Rail Stop Cubicles

SECTION 6. CONSTRUCTION ACTIVITIES

6.1 Introduction

6.1.1 Purpose of this Report

This Chapter of the Environmental Impact Assessment Report (EIAR) provides an overview of the construction activities and methods that are anticipated to be used during construction, systems testing and commissioning of the Luas Finglas (hereafter referred to as the proposed Scheme). In order to allow an assessment of the construction stage impacts associated with the activities, the Chapter also describes the construction phasing and programme necessary to undertake construction of the proposed Schemes.

This Chapter is presented in the following order:

- An overview of the high-level construction activities proposed along the proposed Scheme (i.e. a description of what is proposed to be constructed) is presented in section 6.2. This overview is initially identified at a high level so as to support the following phasing section;
- The phasing is described by dividing the proposed Scheme into areas and sections, identifying the procurement strategy for the construction activities and establishing the phasing and programme for the construction activities (i.e. how the construction activities will be progressed). This is presented in section 6.3;
- A general description of the construction activities proposed in each area along the proposed Scheme (i.e., how the construction activities will be conducted in each section) is presented then in section 6.4;
- A general description of the construction methodologies to be carried out scheme wide (i.e. how the scheme wide construction activities will be built) is presented in section 6.5;
- Information on working times is presented in section 6.6;
- Information on construction personnel, vehicles, plant and equipment is presented in sections 6.7 and 6.8;
- Information on Construction Health and Safety is presented in section 6.9;
- Information on temporary traffic management is presented in section 6.10;
- Construction interfaces with the proposed Scheme are presented in section 6.11; and
- The Construction Environmental measures are presented in section 6.12.

Details of mitigation measures proposed to address potential impacts arising from the detailed construction activities are described in Volume 3, from Chapter 7 (Human Health) to Chapter 23 (Interactions) inclusive of this EIAR.

6.1.2 Outline Scheme Description

The proposed Scheme comprises a high-capacity, high-frequency light rail running from Broombridge to Charlestown, connecting Finglas and the surrounding areas with Dublin's wider public transport network by providing a reliable, and efficient public transport service to the city centre via Broombridge.

As shown in Volume 4 - Map Figure 1-1, starting from Broombridge, the proposed Scheme travels northwards, crossing the Royal Canal and the Maynooth railway line adjacent to Broome Bridge. It then runs adjacent to the east of Broombridge Road and the Dublin Industrial Estate. It then crosses the Tolka Valley Park before reaching the proposed St Helena's Stop and then proceeds northwards towards the proposed Luas Finglas Village Stop. From here, the route passes through a new corridor created within the Finglas Garda Station car park, making its eastern turn onto Mellowes Road. The route then proceeds through Mellowes Park, crossing Finglas Road, towards the proposed St Margaret's Road Stop. Thereafter, the proposed line continues along St Margaret's Road before reaching the terminus Stop proposed at Charlestown.

The proposed Scheme has been designed to integrate with the existing and future transport network, providing connections with bus services at all new Stops, mainline rail services at Broombridge, and a Park & Ride facility to intercept traffic on the N/M2. In addition, the proposed Scheme through the inclusion of

integrated cycle lanes and cycling infrastructure sets out to facilitate multimodal "cycle- light rail transit (LRT) trips" as a key aspect of the Luas Finglas scheme.

The proposed Scheme will comprise a number of principal elements as outlined in Table 6-1 and Table 6-2. A full description of the proposed Scheme is provided in the following chapters of this EIAR:

- Chapter 1 (Introduction);
- Chapter 5 (Description of the proposed Scheme); and
- Chapter 6 (Construction Activities).

Table 6-1: Overview of the Key Features of the proposed Scheme

Scheme Key Features	Outline Description
Permanent Scheme Elements	
Light Rail track	3.9km extension to the Luas Green Line track from Broombridge to Finglas (2.8km of grass track, 700m of embedded track and 360m of structure track)
Depot Stabling facility	A new stabling facility (with stabling for eight additional LRVs) will be located just south of the existing Broombridge terminus, as an extension of the Hamilton depot area.
Luas Stops	Four Stops located at: St Helena's, Finglas Village, St Margaret's Road and Charlestown to maximise access from the catchment area including the recently re-zoned Jamestown Industrial Estate.
Main structures	Two new Light Rail Transit (LRT) bridges will be constructed as part of the proposed Scheme: a bridge over the River Tolka within the Tolka Valley Park and a bridge over the Royal Canal and the Iarnród Éireann (IÉ) railway line at Broombridge. A number of existing non-residential buildings shall be demolished to facilitate the proposed Scheme. In addition, the existing overbridge at Mellowes Park will be demolished.
At grade signalised junctions	10 at grade signalised junctions will be created at: Lagan Road, Ballyboggan Road, Tolka Valley Road, St. Helena's Road, Wellmount Road, Cappagh Road, Mellowes Road, North Road (N2), McKee Avenue, Jamestown Business Park entrance. Note: The junction at Charlestown will be reconfigured but does not have a LRT crossing.
Uncontrolled crossings	13 at grade uncontrolled crossings (11 pedestrian / cycle crossings and two local accesses located at: Tolka Valley Park, St Helena's, Farnham pitches, Patrickswell Place, Cardiff Castle Road, Mellowes Park, St Margaret's Road, and ESB Networks.
Cycle facilities	Cycle lanes are a core part of the proposed Scheme in order to facilitate multimodal "cycle-LRT trips". Approximately 3km of segregated cycle lanes and 100m of non-segregated cycle lanes along the route. Covered cycle storage facilities will be provided at Broombridge Terminus, Finglas Village Stop and St Margaret's Stop and within the Park & Ride facility. "Sheffield" type cycle stands will be provided at all stop locations.
Power substations	Two new traction power substations for the proposed Scheme will be located near Finglas Village Stop behind the existing Fire Station, and near the N2 junction before St Margaret's Road Stop where the current spiral access ramp to the pedestrian overbridge is located. A third substation is required for the Park & Ride facility.
Park & Ride facility	A new Park & Ride facility, with e-charging substation, located just off the M50 at St Margaret's Stop will be provided with provision for 350 parking spaces and secure cycle storage. The building will feature photovoltaic (PV) panel roofing and is the location for an additional radio antenna. This strategic Park & Ride connecting the N2/M50 to the city centre will increase the catchment area of the proposed Scheme.

Scheme Key Features	Outline Description
Temporary Scheme Elements	
Construction compounds	There will be three principal construction compounds, two located west of Broombridge Road and one located at the northern extents of Mellowes Park. In addition, there are other secondary site compound locations for small works/storage. Details can be found in Chapter 6 (Construction Activities) of this EIAR.

Table 6-2: Summary of New Bridges of the proposed Scheme

Identity	Location	Description
Royal Canal and Rail Bridge	Approximately 10m east of the existing Broome Bridge and then continuing north, parallel with Broombridge Road on its east side	The proposed bridge is an eight-span structure consisting of two main parts: a variable depth weathering steel composite box girder followed by a constant depth solid concrete slab. The bridge has the following span arrangement: 35 + 47.5 + 30 + 17 + 3x22 + 17m. Steel superstructure extends over the first three spans. The bridge deck is continuous over the full length of 212.5m and has solid approach ramps at both ends.
Tolka Valley Park Bridge	Approximately 30m west of the existing Finglaswood Bridge	A three-span structure with buried end spans, thus appearing as a single span bridge. End spans as well as part of the main span consist of post-tensioned concrete variable depth girder, the central section of the main span is a suspended weathering steel composite box girder. The overall length of the bridge is 65m with spans 10m, 45m, 10m.

6.2 Overview of Construction Activities

The design of the proposed Scheme has been developed to a stage where the expected construction activities to be undertaken have been identified. This section provides a high-level overview of these activities. The construction activities to be undertaken are described further in this chapter, and in greater detail. A general description of the construction activities proposed in each area along the proposed Scheme is included in section 6.4 whilst a general description of the construction activities carried out scheme wide is presented in section 6.5.

The overview of the construction activities listed in Figure 6-1 is divided into two categories: Enabling Works and Main Works activities. Where the listed Enabling Works activities are not progressed as part of separate Enabling Works contracts, they will be completed as part of the Main Works activities. The phasing and procurement strategy of these activities is discussed further in section 6.3 of this Chapter.

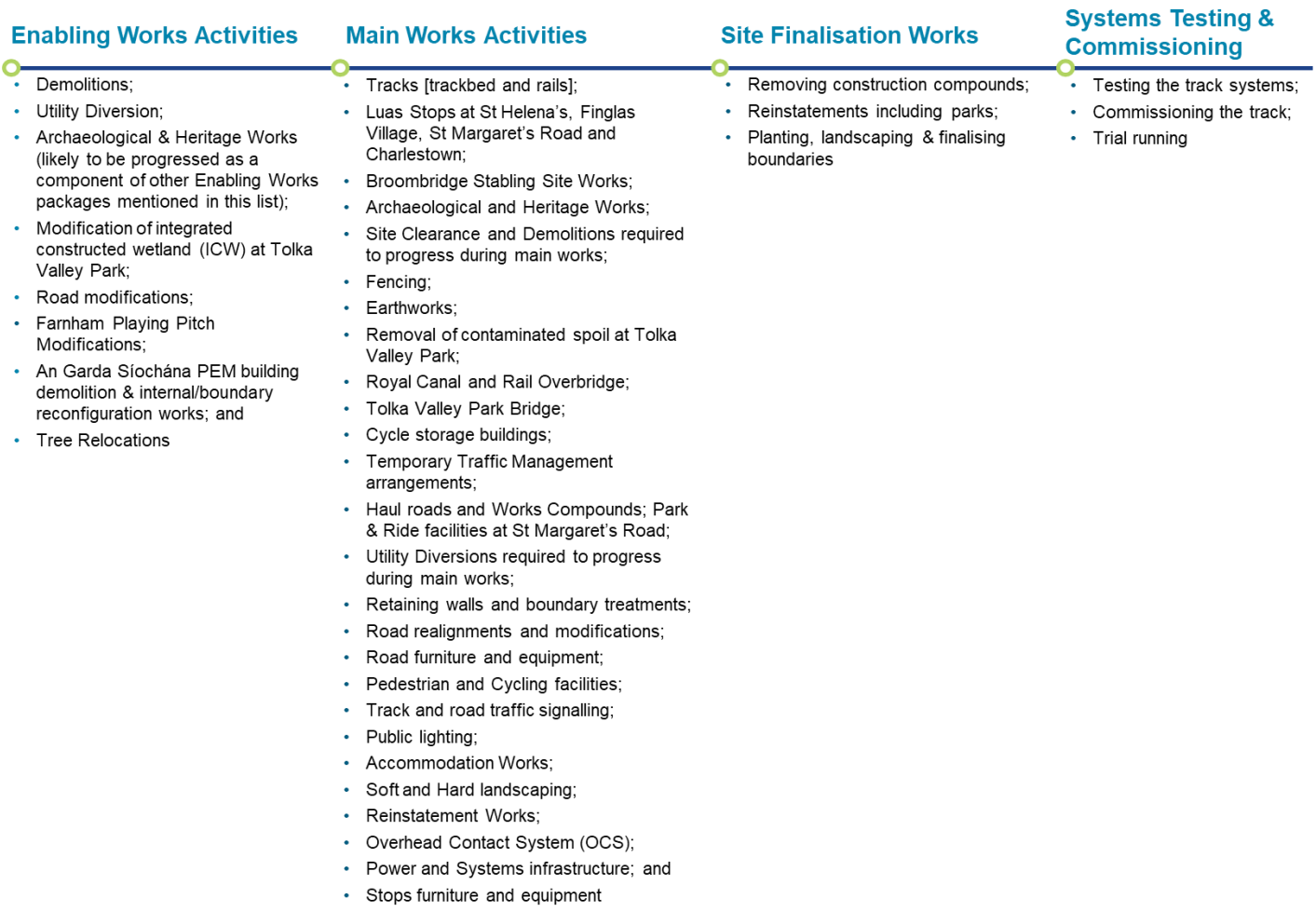


Figure 6-1: Construction Activities for the proposed Scheme

6.3 Construction Phasing

6.3.1 Construction Areas

All construction activities associated with the proposed Scheme will be confined within the defined works boundary, as outlined in Volume 4 of the Map Figures. The proposed Scheme has been divided into four distinct areas as part of the design process and for ease of reference they are retained for this EIAR Chapter (See Volume 4 – Map Figure 1-1), namely:

- Area 30 Broombridge Hamilton depot: This is located at the northern end of the existing Green Line;
- Area 31 Broombridge to Tolka Valley Road: This area is approximately 0.85km long and includes three major structures, the tie-in to the existing Luas Green Line at Broombridge and the crossing of Tolka Valley Park and Tolka River. No Luas Stops are included in this Section;
- Area 32 Tolka Valley Road to Finglas Village Stop: This area is approximately 1.45km long including two Stops: St Helena's and Finglas Village; and
- Area 33 North of Finglas Village Stop to the terminus (Charlestown Stop): This area is approximately 1.42km long and includes two Stops: St Margaret's and Charlestown terminus. This area also includes a major road junction with the N2, and the whole section along St Margaret's Road. This area includes the new Park & Ride facility.

For the purpose of identifying a phasing of construction works, these four areas have been further subdivided into 11 Sections. The sub-division lines for the Sections have been determined in consideration of the construction activities required in each Section and their phasing requirements. It is proposed that

multiple Sections will be progressed at the same time as part of the overall phasing of the proposed Scheme in order to optimise the programme duration. In turn, this approach will lessen the duration of potential environmental impacts. These Sections are as listed and described in Table 6-3 below and the location of the Sections along the proposed Scheme are shown in Volume 4 – Map Figure 6-1 of this EIAR.

Table 6-3: List of Sections

Area	Section Number	Section Description
30	S30.1	Broombridge Stabling Site
31	S31.1	Broombridge to Tolka Valley Park
	S31.2	Tolka Valley Park Bridge
	S31.3	Tolka Valley Park to Tolka Valley Road [overlapping S31.2]
32	S32.1	Tolka Valley Road to St Helena's Road and St Helena's Stop
	S32.2	St Helena's Road to Cardiff Castle Road
	S32.3	Finglas Village and Finglas Village Stop
33	S33.1	Mellowes Park
	S33.2	R135/R104 junction
	S33.3	St Margaret's Stop
	S33.4	St Margaret's Road and Charlestown Terminus

6.3.2 Procurement of Contracts

Transport Infrastructure Ireland (TII) are currently planning to procure the proposed Scheme under Enabling Works contracts, a Main Works – Main Civil and Track Works contract and a Main Works - Power and Systems contract.

6.3.3 Construction Programme

The Sections and procurement strategy previously identified have been taken as a basis for establishing a construction programme for the proposed Scheme.

The programme for the construction of the proposed Scheme has been optimised to minimise the duration of the Construction Phase, where possible, in order to lessen the duration of potential environmental impacts, while ensuring that the areas surrounding the works sites remain operational and functional. In general terms, the construction works will involve the activities laid out in Figure 6-1 and section 6.4 of this Chapter will describe these activities in further detail.

The expected construction programme for the Main Works including testing and commissioning is approximately 3.5 years. Enabling Works contracts will be progressed in advance of this. Multiple work fronts will be progressed concurrently during the Main Works in order to achieve this overall programme.

A programme for the proposed Scheme is provided in Figure 6-2, which identifies the overall proposed duration, the phasing of the various construction contracts and the approximate duration of proposed Scheme in each section.

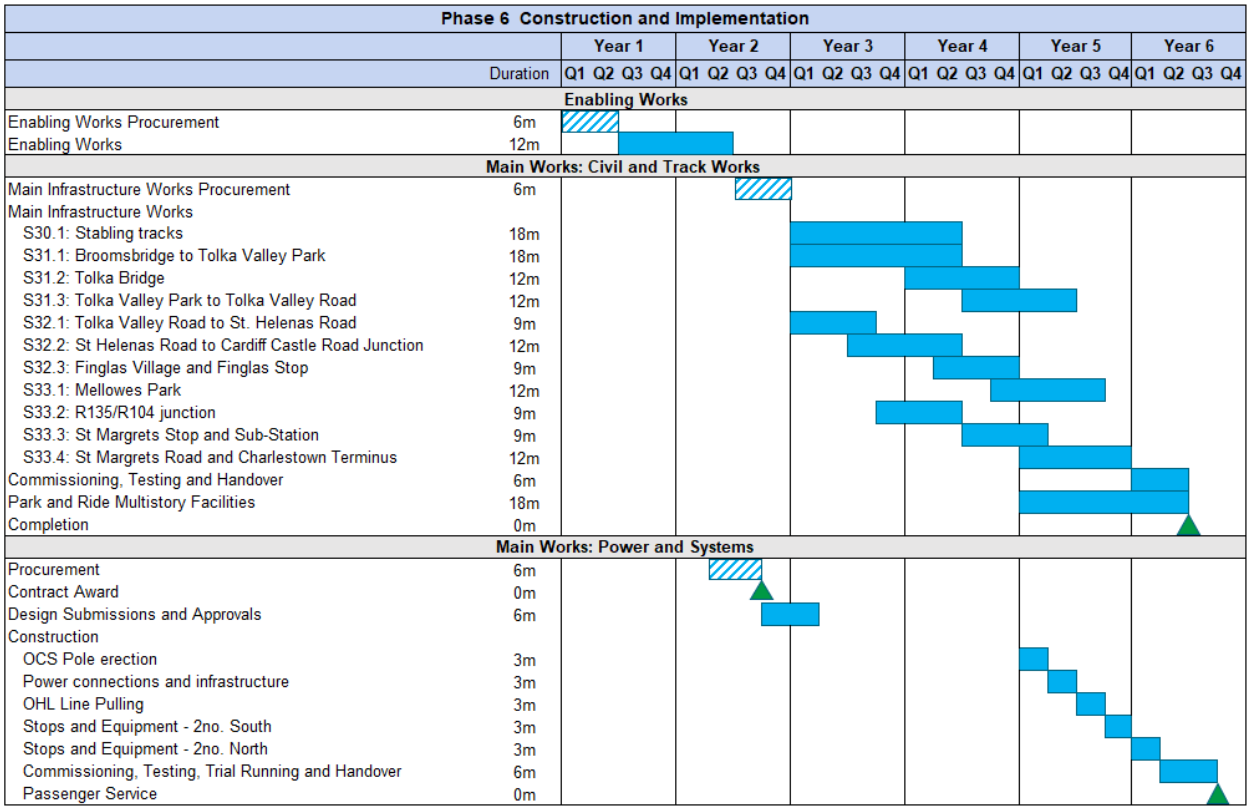


Figure 6-2: Construction Programme

There is likely to be concurrent construction works with other planned projects, should these receive planning consent and funding within the lifetime of the proposed Scheme. The known major projects where a construction overlap is possible with the proposed Scheme alignment include the following:

- Royal Canal Greenway;
- BusConnects; and
- The DART+ West.

During the development of the indicative construction programme for the proposed Scheme, consultation has been undertaken with each of these project teams in order to minimise potential impacts associated with concurrent construction activity.

Many other developments also have the potential to take place concurrently and form part of the cumulative impact assessment presented in Chapter 24 (Cumulative Impacts) of this EIAR.

6.4 Description of Construction Activities

This section describes the construction activities proposed for the proposed Scheme. The proposed Scheme includes repeated elements of works scheme wide such as preparatory works, utilities diversion, earthworks, drainage, road/NMU upgrades, track works, OCS installation, signalling and ancillary works across all Sections. A description of the construction methodologies for these is given with in section 6.5. The location of the Sections along the proposed Scheme are as shown in Volume 4 – Map Figure 6-1.

6.4.1 Broombridge Hamilton Depot Stabling Site (S30.1)

S30.1 is mainly located at the existing Broombridge Hamilton depot. In order to facilitate the proposed Scheme, the existing Broombridge Hamilton depot must be expanded by means of provisions to park an additional eight 55m long LRVs.

The proposed Scheme include the depot stabling works and will also provide and tie in the OCS, signals and control systems for the proposed Scheme with the existing facilities. The construction works consist primarily of additional tracks formed by four (4) two-LRT stabling dead-end tracks, as identified in Figure 6-3 below. Works also include the associated OCS works to link to the existing system, footpaths, buffer stops, lighting and power supply, signalling, perimeter fencing/boundary treatment and ancillary works. The extended stabling area consists of three ballasted tracks and a fourth embedded track lane to facilitate vehicular access. The southern line is proposed as embedded in order to facilitate road vehicle and staff access when not in use for stabling. In addition, a footway east of the buffer stop is proposed to facilitate staff circulation.

The proposed stabling site is within a publicly non-accessible area which will require initial site clearance and removal of existing boundary treatments and the installation of temporary or permanent boundary treatment to secure the construction site. It is proposed to facilitate access for the construction of the stabling area via the existing depot access road to the north and for this, a temporary gate will be provided at the entrance to the site. The current use of the access road will be maintained throughout the construction works. The stabling site will then require earthwork activities to level the uneven ground with suitable material. Drainage and ducting facilities will be provided in advance of and during the track works.

Figure 6-3: 3D modelling of the proposed works at the Stabling Site, looking southwards (15 years post-construction date)

6.4.2 Broombridge to Tolka Valley Park (S31.1)

S31.1 is located, and is to facilitate the section of the alignment, between Broombridge Hamilton depot to the boundary with Tolka Valley Park at Ballyboggan Road. This includes the Royal Canal and Rail Overbridge (with the associated approaches) and the alterations to the alignment of Broombridge Road and the junction and rail crossing at Ballyboggan Road.

The proposed Scheme includes initial demolitions and new boundary treatments along Broombridge Road in order to facilitate working areas for the new cross-section for the road, the Royal Canal and Rail Overbridge and approaches and the alignment and for the new access arrangements to businesses. The new boundaries will include retaining walls to the eastern verge of Broombridge Road to facilitate the proposed Scheme alignment. The existing mini roundabout at Glen Industrial Estate will be changed to a priority junction.

Roadworks on Broombridge Road include road re-alignment both horizontally and vertically to accommodate the alignment and provide access to the Colorman building respectively. Additional widening is required to provide the necessary cycleway, footpaths and landscape buffer zones.

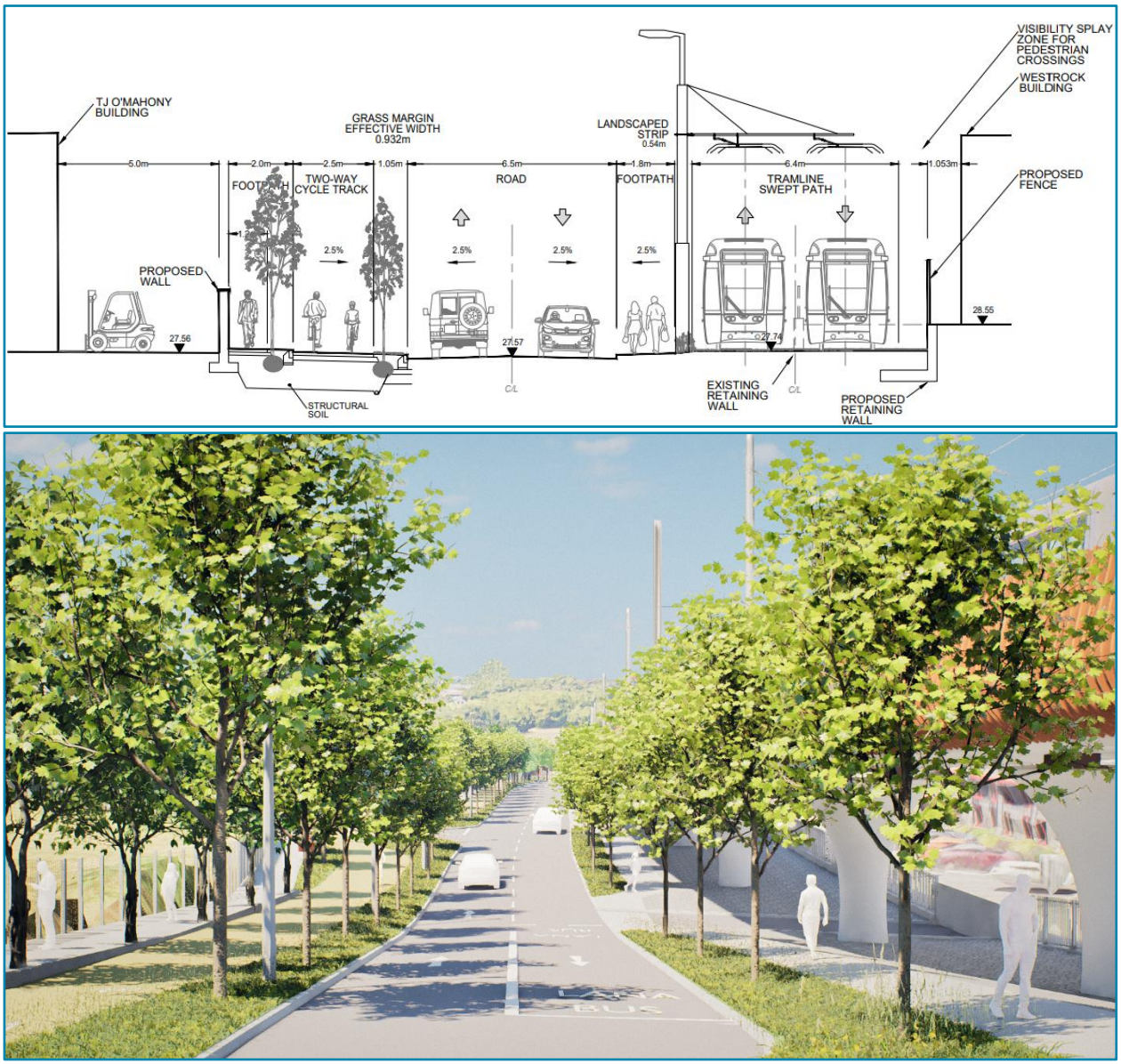


Figure 6-4: Proposed Cross-Section of Broombridge Road (looking northwards) (15 years post-construction date)

This new alignment of Broombridge Road is on or to the west of the existing road with the typical cross-section as indicated in Figure 6-4. This includes the changes to the access arrangements and boundary walls along both sides of Broombridge Road. The new boundaries along this Section will be completed initially. This will facilitate sufficient width to allow the phasing of the roadworks whilst maintaining access for users.

The former Layertite building to East of Broombridge Road will be demolished to facilitate the proposed Scheme. The building to the north of the existing entrance into Glen Industrial Estate is Unit 124 Broombridge Close, and this will be demolished also as a result of the construction works. However, there is potential for the building at Glen Industrial Estate to be used a construction site office compound and for demolition to occur later on in the Construction Phase.

The roadworks will be progressed under either a two-way traffic arrangement or a phased stop/go shuttle traffic management arrangement. The sequencing will facilitate safe construction and minimise the impact on pedestrian and vehicular traffic, including the impacts on Broombridge Road. Access to working premises on both sides of the road will have to be maintained as well as traffic movements including bus lanes and large delivery vehicles. Temporary parking will also need to be provided where business users' parking provisions have been impacted.

The majority of the utility diversions will be constructed in excavated trenches. However, the utilities design has identified the requirement for horizontal directional drilling (HDD) trenchless methodologies to be used so as to divert an existing 600mm watermain and several ducting utilities under the existing railway and Royal Canal, and away from the proposed Royal Canal and Rail Overbridge pier foundation located to the north of the canal. The construction of these utilities will entail the provision of a launch pit area at the southern side where the HDD rig will be set up and a reception pit to the north, at the end of the crossing. The HDD rig and launch pit will be set up and pipes laid out to the south, while the reception pit will be within the construction works area to the north.

6.4.2.1 Royal Canal and Rail Overbridge

The proposed bridge is to facilitate the provision of the Luas alignment over the existing railway line and Royal Canal and with the approaches along Broombridge Road to the north and to Broombridge Stop to the south whilst maintaining access to the Luas, buses and rail services from Broombrige Road.

The Royal Canal and Rail Overbridge spans both the Canal and railway line and continues along the western boundary of the Colorman factory. The structure terminates in a solid ramp structure just south of Lagan Road where the track once more reaches existing ground level to cross Ballyboggan Road via a new signalled junction. The alignment at Fashionflo includes relocated boundary walls. At the Westrock premises, the existing retaining wall will be demolished and a new wall constructed in a position closer to the building. Access modification works for this are required to accommodate access for goods vehicles and staff to Fashionflo including provision of new access gates on Lagan Road. A new vehicular access will be provided to the Colorman premises under an arch between columns of the bridge. Phasing of these construction works will ensure access arrangements are maintained during construction.

A cycle storage facility will be provided at Broombridge and is located under the southern side of the Royal Canal and Rail Overbridge. This will be constructed as part of the overbridge works.

The proposed Scheme entails the construction of the following elements as indicated in Figure 6-5:

- The Royal Canal and Rail bridge is an eight-span structure with the following span distribution from west to east (South Abutment to North Abutment with Piers P1 through P7 in between): 35m; 47.5m; 30m; 17m; 22m; 22m; 22m; 17m. The first three spans have a steel composite superstructure with variable depth box girder, the following five have an in-situ concrete slab deck;
- The overall length of the bridge is 212.5m with the initial steel section (South Abutment to Pier 3) having a complex curved alignment in plan and elevation;
- Pier P1 is positioned beyond the perimeter of the railway platform and pier P2 is positioned to the north beyond the canal bank; and
- There are solid approach ramps/embankments at each end of the bridge abutments.

Figure 6-5: Plan of Proposed Royal Canal and Rail Overbridge (Southbound at the top; Northbound at the bottom) (15 years post-construction date)

The construction activities will entail:

- Completion of piled foundations and parts of substructure. Temporary working platforms will be formed directly adjacent to the pier and abutment foundations with aggregate material so as to provide a safe and durable surface from which the heavy piling plant can operate;
- The abutments will be of reinforced concrete. The bespoke piers will be of in-situ reinforced concrete construction;
- The steel box girder will be fabricated off site, delivered in parts on low-loaders and assembled on site and lifted into position. The superstructure will be erected by SPMTs (self-propelled modular

transporter), set on permanent supports and then connected. The steel superstructure, erected in segments, eliminates the need for temporary works (temporary support) between the railway and canal;
- After the steelwork installation, the concrete deck slab will be poured including use of a mobile concrete pump; and
- The next phase will involve construction of remaining piers, approach ramps behind the abutments, an erection of falsework for the concrete deck section, the pour of the concrete section of the bridge deck as well as the concrete slab on top of the steel box girder.

After completion of the bridge superstructure, remaining works will continue including the multi-tubular ducts and drainage, track construction, parapets, OCS and lighting poles as well as and other bridge furniture.

The requirements of working above the live railway line and Royal Canal and adjacent to Broombridge Road for the bridge construction has been mitigated through the design. However, it will remain a significant construction constraint in this section. All construction works which will affect the railway will be completed during night and weekend possessions. Other construction works will be during daytime. The steelwork will be completed during a short (weekend) railway possession time to minimise operational impacts. The construction works along Broombridge Road will be phased so as to complete first some of the road alignment works thereby allowing sufficient space for the construction.

The bridge is adjacent to protected structure Broome Bridge and Royal Canal [RPS 909]. Refer to Chapter 20 (Cultural Heritage) in relation to required specific protective measures and where a full assessment is provided. A full written and photographic record of the existing setting of this constraint will be prepared prior to the start of construction.

6.4.3 Tolka Valley Park Bridge (S31.2)

S31.2 is to facilitate the provision the new Tolka Valley Park Bridge structure, in Tolka Valley Park.

The proposed Scheme entails the construction of the new Tolka Valley Park Bridge structure and ancillary works. The proposed bridge is a three-span structure with buried end spans hence it will appear to be a single span. End spans as well as part of the main span consist of post-tensioned concrete variable depth girder, while the central section of the main span is a suspended steel composite box girder. The overall length of the bridge is 65m with spans of 10m, 45m and 10m. The bridge deck is 11.62m wide, and its depth varies between 1.5m at midspan and 2.5m at piers. Abutments and piers are set at 0 degrees skew and the superstructure is fully integral with the substructure.

The bridge construction site consists of three main areas:

- South riverbank. Access will be from Ballyboggan Road to construct both the south abutment and for material deliveries for the bridge construction. This may include facilitating a mobile concrete pump for pours of the main span, which will necessitate short duration road closures, with consents from the roads authority;
- North riverbank. This will be the main working area access point and will be used to construct the north abutment as well as the bridge deck. An area for steel box girder assembly and a crane setup will be at this location. The wetlands area will be a restricted area to the north; and
- The construction compound in Tolka Valley Park to the north of the river will facilitate the bridge construction and the machinery and material storage to the north of the river. The Tolka Valley Park Bridge will require the initial construction of a haul road from Tolka Valley Road to the north of the bridge. The haul road will provide access to this compound.

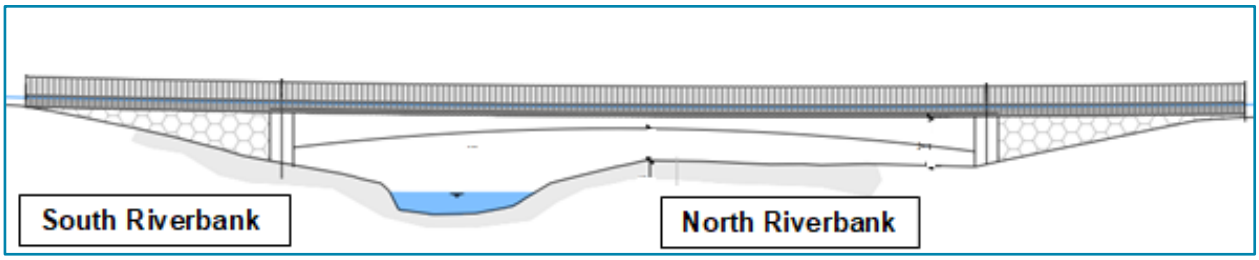


Figure 6-6: Elevation and riverbanks of Tolka Valley Park Bridge

The bridge elevation is shown in Figure 6-6 above.

The construction activities will entail:

- Enabling works to realign park paths, set up steel assemble area to north and setup vibration monitoring for the adjacent existing bridge (Finglas Wood Bridge (RPS_DCC_906));
- Construction of the foundations for the abutments which will be formed by bored piles with reinforced concrete pile caps. Piling rig platforms will be formed with aggregate material in advance adjacent to the two foundations;
- Construction of the abutment stems and piers will be of reinforced concrete construction. The abutments are offset from the river;
- Temporary works for the superstructure construction will include setting up falsework for end spans and main span cantilevers as well as the assembly platform for the steel box girder;
- The bridge superstructure consists of two main phases: Concrete Deck Construction & Composite Steel Deck Construction; and

  – Concrete Deck Construction: Temporary works to support the falsework will be erected first, followed by the formwork and falsework installation, fixing reinforcement, deck pour and post-tensioning. This will include the use of a mobile crane and mobile concrete pump; and
  – Composite Steel Deck Construction: The steel box girders will be delivered on site in parts and assembled into a single unit at the steelwork assembly area. It will be erected by a crane and attached to concrete deck cantilevers. The composite deck section construction will continue with installation of permanent formwork, deck slab reinforcement and concrete deck pour.

- After completion of the bridge superstructure, remaining construction works will continue including multi-tubular ducts and drainage, track construction, parapets, OCS and lighting poles, as well as and other bridge furniture. It is expected these works will progress at the same time as the S31.3 works.

Within Tolka Valley Park, the proposed Scheme is adjacent to the protected structure, the Finglas Wood Bridge (RPS_DCC_906). Refer to Chapter 20 (Cultural Heritage) of this EIAR where an assessment of the protected structure is contained, and mitigation measures are identified. A full written and photographic record of the existing setting of this constraint will be prepared prior to the start of construction.

The Finglas Wood Bridge (RPS_DCC_906) will not be used for construction traffic due to its protected status as discussed in Chapter 20 (Cultural Heritage). Instead, access will be from the north and south so as construction traffic and operatives move freely without impact on Finglas Wood Bridge (RPS_DCC_906). All construction works above and near water will follow the environmental management measures detailed in the Construction Environmental Management Plan (CEMP) in Volume 5 - Appendix A6.1. Also, a Flood Risk Assessment (FRA) was carried out to identify areas at risk of flooding along the proposed Scheme. The FRA is provided as Volume 5 - Appendix A10.2.

The FRA recommends maintaining the existing floodplain of the Tolka Valley Park region. Also, the risks of flooding of the proposed Scheme due to groundwater and pluvial flooding are moderate and will be managed during construction and operation of the proposed Scheme, therefore complying with the Department of the Environment, Climate and Communications (DECC) / OPW requirements. The Contractor will maintain

awareness of rainfall event and weather forecasts by Dublin City Council (DCC), Finglas County Council (FCC) and Met Éireann, as appropriate during construction, and as is current standard practice.

Specific environmental measures at this location will ensure the ICW works which has been identified as progressing under enabling works are completed in advance of the main contract and the bridge construction. There is also extensive tree and overgrowth clearance to be taken into account, as well as fauna, including otters, birds and bats. This will place restrictions on seasonal working which are identified in section 6.12.10 and in the environmental management measures detailed in the CEMP in Volume 5 - Appendix A6.1.

6.4.4 Tolka Valley Park to Tolka Valley Road (S31.3)

S31.3 is to facilitate the section of the alignment from Tolka Valley Park at the Ballyboggan Road to Tolka Valley Road including the new Tolka Valley Road Junction and excluding the Tolka Valley Park Bridge structure.

The construction works are within the DCC-managed Tolka Valley Park area and include a track and road crossing at Tolka Valley Park Road and the associated section of new road modifications and ancillary works.

The park building area is located here and will be used as a construction compound, identified on Volume 4 – Map Figure 6-1. The building is in a poor state of repair and will be demolished as part of the proposed Scheme.

Public access in the park will be maintained as identified in section 6.5.18. The roadworks will facilitate safe construction and minimise the impact on pedestrian and vehicular traffic on Tolka Park Road.

The haul road through this section will be located in the park from Tolka Valley Road to the west of the alignment. This will provide access to the north abutment and to the proposed construction compound at the Parks Building. A separate access will also be required off Ballyboggan Road to the south abutment of the bridge. Refer to Volume 4 – Map Figure 6-1 for the proposed construction compound and haul road locations.

The ICW works are within this section and have been identified as progressing under enabling works to be completed in advance of the main contract. Refer to Section 6.5.1.3 for further details on ICW works.

Protection measures are to be put into place for trees of value where it has been identified that they will be retained as part of the construction works through Tolka Valley Park. Refer to Chapter 21 (Landscaping and Visual Amenity) for the mitigation measures proposed and features to be retained. Protection measures will also need to be put in place for working in the vicinity of overhead HV lines which run through the Park.

6.4.5 Tolka Valley Park to St Helena's Road and St Helena's Stop (S32.1)

S32.1 is to facilitate the section of the alignment from Tolka Valley Road to St Helena's Road, including St Helena's Road Junction and including St Helena's Stop.

The construction works are mainly in parks / open spaces and include the road crossing at St Helena's Road and the associated section of new road modifications, as well as the St Helena's Stop construction.

St Helena's Stop is located to the north of the park adjacent to St Helena's Road, as identified in Figure 6-7. It is proposed to locate a site compound to the west in the area between the Stop and St Helena's Road. A haul road through this section will be located in the park to the west of the alignment between Tolka Park Road and St Helena's Road and this will provide access to the proposed construction compound. The haul road and compounds are as identified in Volume 4 – Map Figure 6-1.

Figure 6-7: 3D image of St Helena's Stop (looking northwards) (15 years post-construction date)

Public access in the park will be maintained as identified in Section 6.5.18. The roadworks will facilitate safe construction and minimise the impact on pedestrian and vehicular traffic on St Helena's Road.

6.4.6 St Helena's Road to Cardiff Castle Road (S32.2)

S32.2 is to facilitate the section of alignment between St Helena's Road and Cardiff Castle Road just south of Ravens Court.

The proposed Scheme includes a track/road crossing at St Helena's Road, Wellmount Road and Cappagh Road and the associated sections of new on-road pavement roadworks along Patrickswell Place and Cappagh Road, Farnham Drive and Casement Road. The proposed Scheme also includes the Farnham pitch reconstruction. A spectator shelter and store will be provided also to the front of the proposed Farnham pitches in order to mitigate the impacts of the scheme on the GAA club.

The Farnham pitches are to be realigned a season in advance of the construction works commencing in the area as indicated in Figure 6-8.

Figure 6-8: 3D image of Proposed Layout at Farnham Pitches (looking westwards) (15 years post-construction date)

The roadworks will facilitate safe construction and minimise the impact on pedestrian and vehicular traffic on the roads in this section. Refer to Section 6.12.3 of this Chapter for further details on this.

A localised temporary road closure will be required along the residential Casement Road, off Dunsink Road, due to the existing width of road. However, access will be maintained for residents at all times. Also, a section of road in the verge area from Wellmount Road to Cappagh Road will be constructed in advance of the track works as its alignment through here is located along the alignment of the existing road. This sequencing will allow traffic to be diverted onto the new road. Cardiff Castle Road will require a localised temporary road closure due to the existing width of road. However, access will be maintained for residents at all times. The sequencing will facilitate safe construction and minimise the impact on pedestrian and vehicular traffic on the Road.

The haul road through this section will be located in the park between the Farnham pitches and the alignment. The route will start at St Helena's Road and continue through to Wellmount Road. A compound is proposed northwest corner of Wellmount road. The haul roads and construction compounds are identified in Volume 4 – Map Figure 6-1. Access for the various roadworks in the section is available via existing roads. Public access in the park will be maintained as identified in Section 6.5.18.

6.4.7 Finglas Village and Finglas Village Stop (S32.3)

S32.3 is to facilitate the section of alignment between Cardiff Castle Road just south of Ravens Court to the southern boundary of Mellowes Park including along Mellowes Road.

The proposed Scheme includes the construction of the new boundary wall with Finglas Garda Station and Ravens Court, the realignment of Mellowes Road and associated track crossing (refer to Figure 6-9), Finglas Village Stop construction, along with a cycle structure and the substation construction further north at the southern end of Mellowes Park.

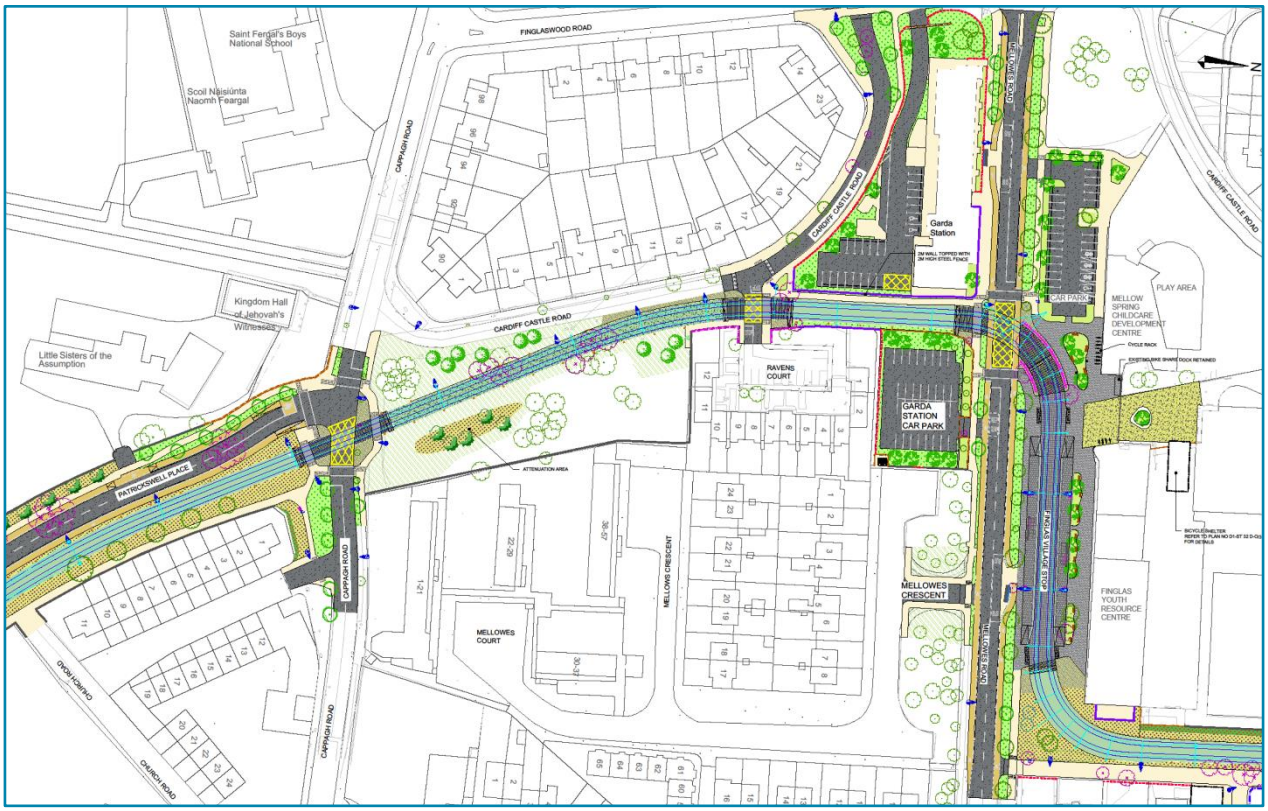


Figure 6-9: Plan of Proposed Road and Track Layout at Mellowes Road

The initial activity in this Section will be the construction of the new boundary walls at Ravens Court and the existing Garda station, and which will facilitate progressing construction works in this Section. The Stop, substation locations and construction are further described in section 6.5.

The alignment curvature requires the demolition of three DCC buildings just to the north of Mellowes Road including the former Park Superintendent's House. The substation will be constructed approximately 100m north of Mellowes Road.

The roadworks will facilitate safe construction and minimise the impact on pedestrian and vehicular traffic on Mellowes Road.

6.4.8 Mellowes Park (S33.1)

S33.1 is to facilitate the section of alignment from the southern boundary of Mellowes Park to the R135/R104 Junction.

The proposed Scheme includes the demolition of the existing pedestrian overbridge across the R135 (refer to Figure 6-10) and buildings to the south of Mellowes Park.

Figure 6-10: Plan of Footbridge to be demolished south of R135/R104 Junction (looking southwards)

The footbridge across the Finglas Road (N2) will be demolished to complete the alignment through Mellowes Park. However, in the interim, the bridge allows safe crossing of the construction works area and the R135 so the timing of the removal of the bridge will be coordinated with the construction works in S33.2 at the R135/R104 roundabout. Safe pedestrian crossings will be in place at the junction prior to the demolition works associated with the existing pedestrian crossing bridge.

The haul road through this section will be located from Mellowes Road to link road into Casement Road. This will be located to the west of the alignment, to the north of existing tennis courts. A construction compound is proposed for the north of the park area. The haul road and construction compound are as identified in Volume 4 – Map Figure 6-1. Public access in the park will be maintained as identified in section 6.5.18.

Protection measures are to be put into place for the root protection areas and canopies of trees of value where it has been identified that they will be retained as part of the proposed Scheme through Mellowes Park.

6.4.9 R135/R104 Junction (S33.2)

S33.2 is to facilitate the section of alignment through the R135/R104 Junction including the junction upgrade.

The proposed Scheme includes the reconfiguration of the R135/R104 roundabout to a signalised junction and the associated track crossing as identified in Figure 6-11.

The roadworks will facilitate safe construction and minimise the impact on pedestrian and vehicular traffic on the R135/R104 Junction. The phasing of the junction works requires provision of pedestrian crossing in advance of the demolition of the alternative existing pedestrian bridge at this location.

Figure 6-11: Plan of Proposed R135/R104 Junction with new road layout and Luas crossing to south

The phasing of the new junction will maintain traffic flows through the existing roundabout. The traffic management phasing will include provision of temporary roundabout form traffic management arrangements to facilitate the excavation and full pavement construction within the existing roundabout.

Refer to Chapter 19 (Material Assets: Resource & Waste Management) of this EIAR for measures related to the reuse or disposal of the bridge materials,

The Liam Mellows memorial at the existing footbridge will be protected during the construction works as discussed in Chapter 20 (Cultural Heritage) and will follow the environmental management measures detailed in the CEMP in Volume 5 - Appendix A6.1. This is located between the two western ramps of the footbridge.

6.4.10 St Margaret's Road Stop (S33.3)

S33.3 is to facilitate the section of track from the R135/R104 Junction through St Margaret's Road just north of the roundabout with McKee Avenue and including St Margaret's Road Stop.

The proposed Scheme includes demolitions, the realignment of the initial section of St Margaret's Road, McKee Road, St Margaret's Road Stop construction, St Margaret's substation construction, a cycle structure and Park & Ride facility.

The demolitions required include the North Road Motor Company and associated buildings as well as the Pizza Hut building with demolitions also in Jamestown Business Park to facilitate an access road at this location.

The roadworks will facilitate safe construction and minimise the impact on pedestrian and vehicular traffic on the roads in this Section.

The Stop, substation and cycle structure locations and construction are further described in section 6.5.

6.4.10.1 Park & Ride Facility

The proposed new Park & Ride facility is located within Area 33.3. The layout for the P&R facility has been developed adjacent to and to the north of the planned redeveloped Lidl site. TII liaised with Lidl in developing the design.

The proposal is to provide a multi-storey car park on the site currently occupied by Discount DIY to the north of the LIDL site. The proposed building is six storeys high including the ground floor. The roof is proposed to be a green or blue roof with PV panels. The eastern side of the ground floor is assigned to LIDL. The current proposed ground floor area is 3,500m^2 and the gross floor area is 19,250m^2. Refer to Figure 6-12.

Approximately 350 car parking spaces will be provided. The facility is designed to facilitate 100% EV parking, with 20% of EV spaces provided from opening year. There will be pedestrian access to the North Road.

The existing Discount DIY building at this location will be demolished in advance of construction. Access and egress arrangements for the construction of the proposed P&R facility will be via an access from the R135 North Road into the proposed P&R facility. A proposed access from the R135 avoids mixing P&R and Lidl traffic, provides the most direct access to the P&R facility from the M50, via a left turn from the N2. A new signalised junction provides ease of egress from the P&R facility back to the M50, via a right turn.

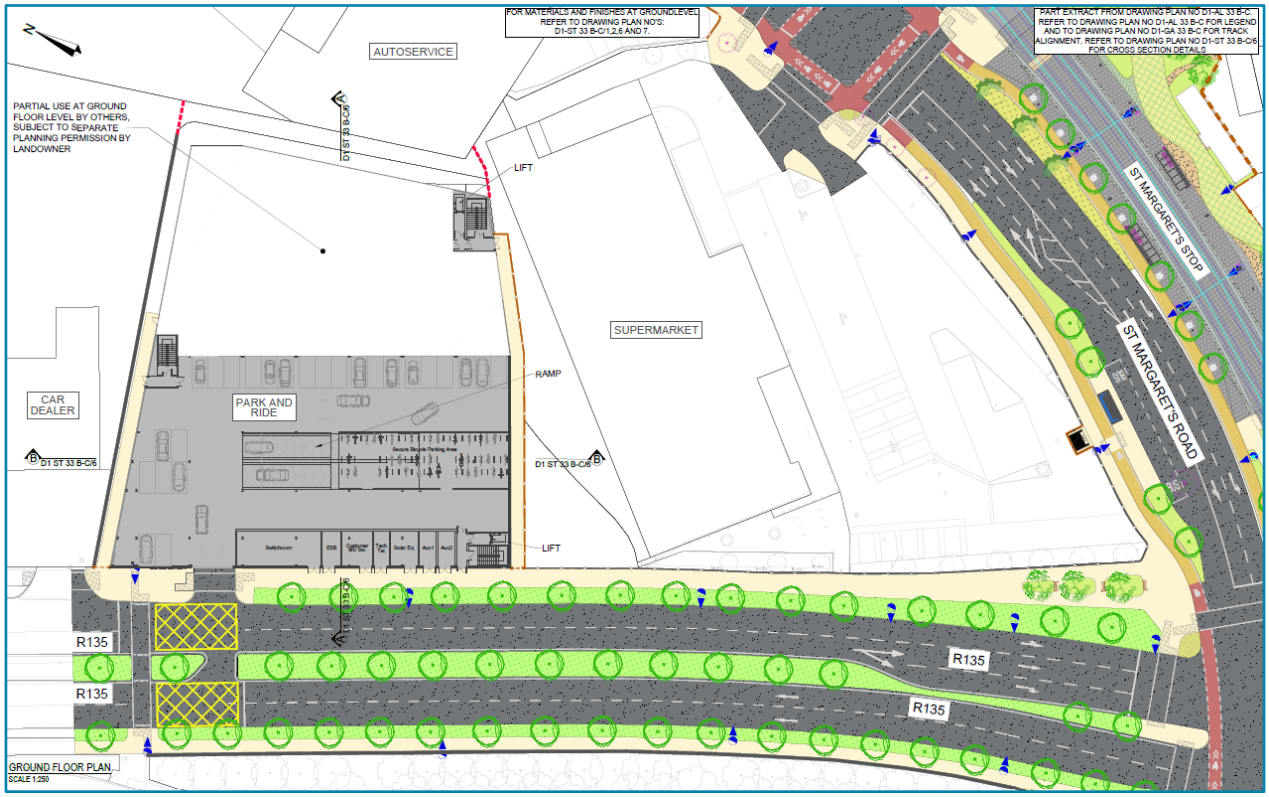


Figure 6-12: Proposed P&R Ground Floor Layout adjacent to Lidl

The construction programme for the Park & Ride is envisaged as 18 months for the main contract. This element will be progressed concurrently with the Main Works and this is identified as progressing in conjunction with this Section.

6.4.11 St Margaret's Road and Charlestown Terminus (S33.4)

S33.4 is to facilitate the section of alignment from the St Margaret's Road just north of the roundabout with McKee Avenue and the northern extents of the proposed Scheme including the Charlestown Terminus. The proposed Scheme includes roadworks at the St Margarets Road and Melville Road intersection.

The proposed Scheme includes demolitions, significant boundary treatment and utilities diversion works, the realignment of St Margaret's Road and the Charlestown Terminus / Stop.

The demolitions required include the Manhattan Peanuts Ltd. substation building as well as substantial demolition and relocation of boundary treatments along this road.

The roadworks will facilitate safe construction and minimise the impact on pedestrian and vehicular traffic on St Margaret's Road and the adjacent junctions.

The new roadway along St Margaret's Road and new footpaths/cycle lanes are on and adjacent to the existing road. The sequencing will minimise impact on pedestrian and vehicular traffic and access to businesses along St Margaret's Road. The proposed Scheme also includes new paved and parking areas due to lost facilities resulting from the proposed Scheme within and outside St Margaret's Court, adjacent to St Margaret's Road. Access to working premises on both sides of the road will have to be maintained as well as traffic movements, including bus lanes and large delivery vehicles. Temporary parking will be provided for business users whose parking has been impacted.

6.5 Scheme Wide Construction Methodology

6.5.1 Enabling Works

TIIs procurement of the proposed Scheme will include Enabling Works which will be progressed either as a single contract or as individual contracts. The preparation of each set of construction contract documents 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. Enabling Works progressed in advance of the Main Works Contracts will follow all the requirements of the CEMP.

The following describes the proposed Enabling Works required and which will progress in all Sections. Enabling Works are the works to be undertaken in advance of the Main Works to facilitate the construction of the Luas infrastructure and ancillary works, and to optimise the programme for the Main Works Contracts. These do not include the site preparation works which will progress as part of the Main Works Contracts.

All the potential environmental impacts of the Enabling Works have been assessed in this EIAR. The proposed scope of Enabling Works Contracts is described further below.

6.5.1.1 Demolitions

The Works will necessitate site preparation including demolitions. Site preparations and such required demolitions will be progressed as part of the Main Civil and Track Works Contract. However, some strategic demolitions may be advanced as Enabling Works so as to facilitate achieving the overall programme for the Main Works Contracts. This could include (subject to Compulsory Purchase Order / land transfer) the demolition of properties along Broombridge Road in order to facilitate the early progression of works at this location.

6.5.1.2 Utilities Diversions

The construction works will necessitate diversions of existing utilities impacted by the proposed Scheme. Diversions will be undertaken as Enabling Works. This will be of benefit in facilitating progress of the Main Civil and Track Works Contract as the majority of utility diversions will have been completed, thereby allowing for a clearer construction path for the track alignment and associated ancillary works. Based on the Preliminary Design for utilities, a significant number of the diversions along Broombridge Road, St Margaret's Road and the N2 junction are more appropriately progressed as part of the road construction and the Main Works so as to minimise disruption and they are included within these sections. Also tie-in works and minor diversions will still arise throughout as part of the Main Works.

The enabling works will also be of benefit for ESBN ducting provisions in order to provide incoming electrical services to the Traction substations and other electrical infrastructure. An application for supply has been

lodged with ESBN for the supply and confirmation of the cable routing and supply source. Two traction power substations are required for the Luas Finglas alignment extension. Refer to section 6.5.16. The first (Finglas Village substation) is located just north of Mellowes Road / Finglas Village Stop and the second (St Margaret's substation) close to the St Margaret's Road Stop at the location of the existing pedestrian overbridge ramp. A third substation is required for the Park & Ride facility to provide an electrical supply for the electric vehicle charging points which are to be installed as part of the proposed Scheme.

6.5.1.3 Integrated Constructed Wetlands (ICW) works

Mitigation measures which are to be implemented for the sustained performance and protection of the Tolka Valley Park ICW will be started ahead of Main Works and in advance of the Tolka Valley Park Bridge construction. To facilitate early commencement of works in this area of the main contract, it is proposed that the ICW will be progressed as an Enabling Works contract.

6.5.1.4 Pitch reconfiguration

The proposed Scheme requires the relocation of the two sports pitches at Farnham. These Enabling Works would complete the pitch reconfiguration in advance so as to facilitate achieving the overall programme for the Main Works and reducing the risk of delay that may arise due to seasonal constraints associated with re-establishing the use of the pitches.

6.5.1.5 Other Potential Enabling Works

Other construction works that may be progressed as Enabling Works are:

- Road modifications to facilitate progression of the Main Works activities; and
- An Garda Síochána PEM building demolition and internal/boundary reconfiguration works.

To ensure soft landscaping is sufficiently mature at the time of the opening of the proposed Scheme, the use of an off-site tree nursery is proposed for the soft landscape planting requirements in advance of the implementation of planting.

6.5.2 Cultural Heritage Works

In accordance with the 2017 *Code of Practice for Archaeology (CoP)*, TII has appointed a Project Archaeologist to oversee and manage the likely cultural heritage impacts arising from the proposed Scheme. As an outcome of the CoP, the TII Project Archaeologist will, in consultation with the Department of Housing, Local Government and Heritage (DHLGH), prepare a 'Luas Finglas Cultural Heritage Strategy', which will be maintained as a live document throughout the Construction Phase of the proposed Scheme. This strategy will be informed by the various cultural heritage surveys undertaken to date, this EIAR, ongoing stakeholder liaison and in response to changes in the receiving baseline environment, inclusive of adjacent developments. Further information on the management of cultural heritage impacts of the proposed Scheme is provided in Chapter 20 (Cultural Heritage) of this EIAR.

6.5.3 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 previous specific ground investigations conducted along the proposed Scheme have been outlined in Chapter 11 (Land and Soils: Soils, Geology and Hydrogeology) of this EIAR.

6.5.4 Tree Protection

The design has been developed to ensure removal of trees has been minimised as far as practicable. Trees to be retained within and adjoining the construction works area 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 locations of trees to be retained, and trees to be removed are identified in Chapter 21 (Landscape & Visual Amenity) of this EIAR. This is shown on the

Landscape Drawings provided in the RO Drawing Pack. A biodiversity net gain approach has been applied to deliver improvements through the creation or enhancement of ecological habitats (Refer to Chapter 9 (Biodiversity) of this EIAR for further details), and an extensive landscape strategy has been developed to replant many more trees than will be removed during construction.

An Arboricultural Impact Assessment has been produced for the area of the proposed Scheme, as well as for any adjoining areas where trees are likely to be impacted by the proposed Scheme, in accordance with British Standard Institution (BSI) British Standard (BS)5837:2012 'Trees in relation to in relation to design, demolition and construction -Recommendations' (BSI 2012). This is included in Volume 5 – Appendix A21.1 of this EIAR. Further information on mitigation measures with regards to the removal, and protection of trees are provided in Chapter 9 (Biodiversity) and further information on the assessment of tree removal with regards to landscape and visual impact is provided in Chapter 21 (Landscape & Visual Amenity) of this EIAR.

The contractors will appoint a suitably qualified arborist conducting works to monitor tree protection, and tree removal related activities. All trees and vegetation to be retained within and adjoining the works area will be protected in accordance with the British Standard Institution (BSI) British Standard BS 5837:2012 'Trees in relation to in relation to design, demolition and construction - Recommendations' (BSI 2012). Works required within the root protection area (RPA) of trees to be retained will follow a project-specific arboricultural methodology for such works, which is included in Volume 5 – Appendix A21.1 of this EIAR.

6.5.5 Vegetation Clearance and Treatment of Non-Native Invasive Species

All vegetation to be retained within and adjoining the construction works area will be protected in accordance with the British Standard Institution (BSI) British Standard BS 5837:2012 *'Trees in relation to in relation to design, demolition and construction - Recommendations'* (BSI 2012). Details of vegetation to be removed will be included in the Arboricultural Impact Assessment Report (and associated Tree Protection Plans) as set out above. Vegetation (e.g., hedgerows, scrub, grassland) clearance and treatment of non-native invasive species (e.g. Himalayan balsam) will be undertaken within the proposed Scheme boundary, where necessary in accordance with the CEMP, Invasive Species Management Plan (ISMP) and Chapter 21 (Landscape & Visual Amenity) of this EIAR. Ecological mitigation: key features will include the canal side vegetation and the riparian and wetland vegetation in Tolka valley which will remain but will be altered due to the bridge constructions.

The contractors will appoint a suitably qualified specialist to monitor any 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 regard to pre-construction ecological surveys and restrictions are provided in Chapter 9 (Biodiversity) of this EIAR. Vegetation identified for removal will be removed in accordance with BS 3998:2010 and best arboriculture practices as detailed and monitored by the specialist. The ISMP for the control of invasive plant species on the proposed Scheme is included in Volume 5 - Appendix A6.3 of this EIAR.

Further information on mitigation measures with regards to the removal, and protection of vegetation is provided in Chapter 9 (Biodiversity) and further information on the assessment of tree removal with regards to landscape and visual impact is provided in Chapter 21 (Landscape & Visual Amenity) of this EIAR.

6.5.6 Initial Works Activities and Demolitions

The site security team will be tasked with ensuring that there is no unauthorised entry to the closed site areas. There will be fencing around the sites to minimise the risk of vandalism and unauthorised access. Fencing will vary from location to location with solid hoarding around specific locations such as substation buildings and 'Heras' type movable fencing elsewhere. 'MASS Guard' or equivalent type fencing systems will be used where required for roadworks areas.

Where the proposed Scheme bounds private property, the initial works may include constructing of the new boundaries, this will also facilitate securing the site and controlling access. These will be a mixture of

retaining walls, free standing walls, railings, fencing and temporary boundaries, as required. In places where permanent walls or fencing cannot be erected immediately or where none is required, temporary construction fencing, or hoarding may be required to secure the site.

The initial activities will include site clearance and demolitions. The following demolitions have been identified as required for the proposed Scheme. Where not completed as enabling works, these will be initial activities to facilitate the Main Works. The locations are identified in Table 6-4.

Table 6-4: Demolitions

No.	Area/ Section	Location
1	S31.1	Irish Rail ramp from Broombridge Road to Northern Platform
2	S31.1	Unit 124 Broombridge Close, Glen Industrial Estate to west of Broombridge Road. The building to the north of the existing entrance into Glen Industrial Estate
3	S31.1	Former Layertite building to East of Broombridge Road
4	S31.2	Park Building in Tolka Valley Park at Proposed Compound Location
5	S32.3	Finglas Garda Station PEM building and boundary reconfiguration works. (OPW)
6	S33.1	Two DCC-owned Parks building along the proposed alignment just to north of Mellowes Road and behind the Parks Superintendent's House
7	S33.1	Pedestrian bridge at southern end of St Margaret's Road over N2.
8	S33.3	North Road Motor Company and associated buildings at southern end of St Margaret's Road
9	S32.3	Pizza Hut building and outbuilding at southern end and to the east of St Margaret's Road
10	S32.3	Shed at 234 McKee Avenue along boundary with Pizza Hut.
11	S32.3	Outbuilding at Kylemore's plot adjacent to 234 McKee Avenue.
12	S33.3	Discount DIY North Road for Park & Ride at southern end and to the west of St Margaret's Road and beside Aldi
13	S33.4	Manhattan Peanuts Ltd. Substation Building at western end of the site and to the east of St Margaret's Road
14	S33.4	Four outbuildings/extensions at Jamestown Business Park: Side extension to south of Finglas Auto Building; Outbuilding to rear of Envision Health and Fitness; Outbuilding in green area to rear of Dunns Seafare Ltd.; Lean-to extension and loading bay of Sail Installations and Logistics
15	Various	Existing boundaries being altered/replaced along route (mainly on Broombridge Road, Finglas Village and St Margaret's Road areas)

Pre-demolition surveys will be undertaken by a specialist appointed by the Contractor to confirm the proposed methodology to be undertaken and provide sufficient detail to allow the full management of the demolition and resulting materials. Pre-demolition surveys will include appropriate hazardous materials surveys to identify all asbestos containing materials and other hazardous materials that may be present. Demolition survey mitigation measures to limit dust, noise, vibration and air pollution (e.g., through dust and fumes) will be implemented. Refer to Chapter 15 (Noise and Vibration) and Chapter 13 (Air Quality) where these measures are discussed further.

The predicted overall recovery rate achieved for construction and demolition (C&D) wastes (excluding soils and stones) is addressed in Chapter 19 (Material Assets: Resources and Waste Management). It is predicted that an overall recovery rate of 95% can be achieved.

Prior to beginning of any demolition or construction activities, the contractor will identify the locations of all utilities within the proposed work area. All electrical relocations, isolations and de-energizations will be performed by a licensed electrical subcontractor in advance of demolition.

It is expected that industry standard top-down methodologies will be used for the demolitions. For these, the demolition proceeds from the roof to ground in a general trend. There are sequences of demolition which may vary, depending on site conditions and structural elements to be demolished. Specific consideration will be given to the demolition sequencing for the footbridge crossing at Mellowes Park. This demolition will require night works under a road closure and the provision of suitable diversionary arrangements. Lifting equipment will be part of the demolition process.

6.5.7 Construction Compounds

As part of preparatory works, the construction compounds 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. The CEMP, as appended to the EIAR, accounts for the proposed construction compounds and this will be further developed by the construction contractor prior to the commencement of the Construction Phase. There will be no environmental impacts greater than those already considered and assessed in the EIAR allowed in this further development.

6.5.7.1 Construction Compound Locations

Compounds will be put in place in advance of progressing the construction works in the associated areas and will provide facilities both for the Contractor and the Employer's Representatives and facilities for the temporary storage of materials. Sufficient service and utility requirements are available and will be sourced locally for all compound areas. Site compounds will include offices, welfare facilities, storage space for materials and plant where necessary as well as limited off street parking for construction personnel.

Compound locations have been identified along the route of the proposed Scheme and these are shown on drawing in Volume 4 – Map Figure 6-1. The buildings which need to be demolished at the compound locations will be available for temporary compound facilities. The compound locations have been assessed as part of the EIAR for suitability and construction impact assessment. These locations will be seen in Volume 4 – Map Figure 6-1.

The Contractor is ultimately responsible for finalising the layout detail of the construction compounds required for the proposed Scheme within the locations identified.

Refer to Table 6-5 for the locations of the proposed construction compounds. These are identified as either Primary or Secondary.

Table 6-5: Location of Site Compounds

No.	Area/ Section	Location	Use (Primary / Secondary)	Compound Size
C-31A	S31.1	West of Broombridge Road – on southern side of rail and canal crossing adjacent to depot entrance	S	2036m^2
C-31B	S31.1	West of Broombridge Road – use of green area to north of railway	P	3427m^2
C-31C	S31.1	West of Broombridge Road – use of unit 124 Broombridge Close in the Glen Industrial estate prior to demolition	P	1522m^2
C-31D	S31.3	Tolka Park – The Parks Building	S	2519m^2
C-32A	S32.1	Adjacent to St Helena's Stop	S	5448m^2
C-32B	S32.2	Northwest corner of Wellmount Road crossing	S	1034m^2

No.	Area/ Section	Location	Use (Primary / Secondary)	Compound Size
C-33A	S33.1	Old Park Superintendent's House and land to north next to Finglas Fire station	S	1829m^2
C-33B	S33.3	Northern extents of Mellowes Park	P	2017m^2
C-33C	S33.3	St Margaret's / Mckee Avenue Junction	S	948m^2

The primary compounds will contain a main site office, and welfare facilities for both the Employer's personnel and Contractor's personnel. An area for materials to be stored for reuse will be provided, as necessary. Items of plant and equipment will also be stored within the compound. Limited parking for construction vehicles will be allowed at the construction compound.

The secondary compounds will contain some local site office and welfare facilities. They will also be localised storage for material, plant and equipment within the compound. Limited parking for construction vehicles will also be available.

6.5.7.2 Construction Compound Activities

Initial site clearance and establishment activities for putting in place the construction compounds will include:

- Form the site entrances and exits;
- Clear and level the site as required;
- Install the site hoarding and gates to ensure that the site is secure;
- Construct hardstanding areas for units, parking and storage;
- Provide construction compound services including necessary connections to mains water, sewage, power and communications;
- Install general site lighting and CCTV; and
- Install the site office, welfare facilities and security facilities.

The construction compounds will contain limited car parking, in line with the principles of the Construction Stage Mobility Management Plan (CSMMP), as described in the CEMP in Volume 5 - Appendix A6.1 and in in the CTMP in Volume 5 - Appendix A6.2 of this EIAR. Items of plant and equipment, described in section 6.8, will be stored within the construction compounds. Measures will be put in place at the compounds to ensure surface run-off is properly managed and treated in accordance with industry standards.

Materials for reuse such as topsoil, subsoil, concrete, rock etc., may also be stored at the construction compounds for reuse as necessary where space permits. Crushing of materials may be undertaken in the compounds by a mobile crusher. All necessary authorisations, under the Waste Management Act 1996, as amended, will be obtained prior to undertaking crushing and temporary storage.

6.5.7.3 Construction Compound Services

The construction compounds will be fenced off and secured, along with CCTV to ensure safe storage of all material, plant and equipment. Temporary lighting, including security lighting will be at the construction compounds for the duration of the Construction Phase. Access to the construction compounds will be restricted to site personnel and authorised visitors only. The construction compounds will be engineered with appropriate services. Water, wastewater, power, and communications connections will be organised by the appointed contractor via locally available connection points agreed by the contractor with service providers.

At secondary compound areas along the proposed Scheme, where permanent provisions are not practicable, appropriate temporary provisions will be made, including the use of generators, if required. Temporary welfare facilities will be provided: 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 compounds, for example, in order to minimise the risk of fuel spillage (including where refuelling). Other measures such as dust suppression and runoff containment will be implemented to ensure that the construction compounds 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 the CEMP included in in Volume 5 - Appendix A6.1, section 1.8 of this EIAR.

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

6.5.8 Haul Roads

6.5.8.1 Haul Road Locations

The initial activities will also involve developing the access arrangements along the route of the proposed Scheme. Where the proposed Scheme will be constructed on and adjacent to existing roads, newly prepared haul roads will not be required. However, where the proposed Scheme will be constructed off existing roads and in parks, haul roads for the transport of excavated material and the movement of construction materials, equipment and plant to and from the proposed Scheme will be required.

Proposed haul roads have been identified along the route of the proposed Scheme and these are shown in Volume 4 – Map Figure 6-1. These will follow the cycle lanes / footpath provisions adjacent to the track where possible. This will mean the materials and formations used can ultimately be used for the cycle lanes and thus minimise environmental impacts.

Access to construction compounds will be via the existing road network adjacent to which they are all located. The compounds in Tolka Valley Park are an exception, in that it will have an associated haul road. Access to and through the park areas is identified in Volume 4 – Map Figure 6-1. Mitigation measures that will be implemented in relation to traffic are described in Volume 4 – Chapter 18 (Material Assets: Traffic and Transport), and Volume 5 – Appendix A6.1 (Construction Traffic Management Plan) of this EIAR.

6.5.8.2 Haul Road Descriptions and Activities

The construction of the haul roads through the parks will entail a 6m wide hydraulically bound compacted layer of granular aggregate materials, constructed parallel and offset from the track alignment. The topsoil will be stripped and set aside in bunds for reuse. A geotextile material will be installed followed by the installation and compaction of a suitable layer of granular material. Importation of these materials will be from local quarries directly to the proposed Scheme.

The haul roads will be maintained and used throughout the construction period to facilitate the construction works. Wheel cleaning facilities will be provided where necessary.

The main proposed haul roads through the park areas are further described in Table 6-6 below.

Table 6-6: Haul Roads through Park Areas

No.	Area/ Section	Location	Access Arrangements	Length
1	S31.1	Tolka Valley Road	A haul route is required to access/egress the Works in Tolka Valley Park and for the Construction of the Tolka Valley Park Bridge from the north at Tolka Valley Road. This will also facilitate access to the construction compound. A turning area will be provided north of the bridge. A separate access to the Tolka Valley Park Bridge from Ballyboggan Road will also be required for the construction works.	254m
2	S32.1	Tolka Valley Road to St Helena's Road	A haul road will be provided the length of St Helena's Park to facilitate the construction works with access/egress at either end. This will follow to the west of the proposed track	545m

No.	Area/ Section	Location	Access Arrangements	Length
			alignment and along the proposed cycle lane. This will provide two-way access to the construction works.	
3	S32.2	Farnham Pitches to Wellmount Road	A haul road will be provided adjacent to Farnham pitches. It will be constructed post repositioning of the pitches and used for construction of the Luas infrastructure. This will follow to the west of the proposed track alignment and to the east of the repositioned pitches. This will provide two-way access to the construction works.	440m
4	S33.1	Mellowes Road to Casement Road	A haul road will be provided along the length of Mellowes Park. The road will follow the proposed footpath route to the west of the track alignment. This will provide two-way access to the construction works.	757m

6.5.9 Utility Works

Due to the urban environment, there will be a significant amount of utility works required to facilitate the construction of the proposed Scheme. Utility works are to be undertaken within existing roads, footpaths and verge areas, however there are also construction works within the park areas.

Utility works entail three categories of works namely Protect, Decommission and Diversion of the various utilities. These are identified in Chapter 17 (Material Assets: Infrastructure and Utilities). Works to existing utilities and services will be along or immediately adjacent to the proposed Scheme. Utilities and services, including overhead and underground, comprise: drinking water; wastewater; drainage; public lighting; ESBN Transmission; ESBN Distribution; GNI Gas Transmission; GNI Gas Distribution; EIR; Virgin Media; BT; other communication ducting owners.

The construction of buried utility installations will follow these construction activities:

- Establishing the extents and locations of the existing utility apparatus is determined using a combination of utility records, surveys and site investigations. Prior to excavation utilities will first be traced using established techniques. Trial pits are excavated to confirm the locations of existing services;
- The area will be cleared and the surfacing removed;
- Pipes (and other material) will be delivered into the compound area and offloaded or to the works area where there is sufficient space away from the excavation;
- The main bulk excavation of trenches required for the proposed Scheme will be completed by mechanical excavators and manually in the vicinity of services. Utility providers' guidance and requirements will be adhered to whilst excavating in the vicinity of their services. Excavated material will be removed from the work area almost immediately;
- Temporary support to trenches will be provided as necessary throughout the pipe installation works;
- Imported bedding material and the pipe/ducting will be placed into position;
- The pipe(s)/ducting will then then backfilled up to the required level. Pipes and ducting will be laid in accordance with the specifications of the utility owner;
- Once the utility diversion works are complete, reinstatement will be in accordance with the local authority's specification and guidance;
- Diversions under the existing railway line and Royal Canal will be conducted using directional drilling methodologies. The diverted utility will pass under both the railway and the canal using Horizontal Directional Drilling (HDD) trenchless technology, thereby removing the requirement to impact the waterbody during the Construction Phase. The activities will include establishing a launch pit and target pit which shall be constructed on either side of the crossing to facilitate these construction works; and
- Protect and decommission works for existing utilities will be undertaken in tandem with the excavations and reinstatement of the Main Works.

6.5.10 Earthworks and imported materials

Earthworks activities will be undertaken to achieve the required formation levels for the various track systems, supporting structures and road and active travel provisions. Material generated during construction will be managed to maximise the opportunities for reuse and recycling where practicable and will also aid to minimise the potential effects of material management on the receiving environment. Materials will be removed using excavators and dump trucks or lorries and where possible either moved directly to areas requiring fill or stored on-site for reuse. There will be a requirement for importation of aggregate material for the proposed Scheme. Preliminary earthworks quantities are included in Chapter 11 (Land and Soils: Soils, Geology and Hydrogeology) of the EIAR.

The track alignment and road upgrades in most instances closely follow the existing ground profiles. A short description of each area is included in Table 6-7.

Table 6-7: Description of Earthworks Activities

No.	Area/ Section	Overview of Earthworks Activities
1	Area 30	Area 30 follows the existing site area, however, there is a localised depression of up to 2m located towards the rear (northern end) to be filled and levelled. The fill material will be sourced from acceptable materials from mounded landforms within the park area of Area 32. Local roads will be used to transfer this material.
2	Area 31	In Area 31, the proposed alignment rises over the railway and Royal Canal via the proposed structure and fall to tie-in to the existing Broombridge Road levels. Further north, within Tolka Valley Park, the proposed alignment navigates between two of the mounded landforms associated with the historic landfills - once operated within the park - with cut and fill operations required. The two plateaus situated either side are 4-5m above the proposed alignment. Unsuitable materials will be disposed directly to a suitably licensed landfill.
3	Area 32	In Area 32, the track alignment closely follows the existing ground levels with maximum cut and fill ranges up to 1m. The earthworks activities to comprise excavation of a box section for the track form and reinstatement with aggregate materials.
4	Area 33	In Area 33, the track alignment closely follows the existing ground levels with maximum cut and fill ranges up to 1m. The earthworks activities to comprise excavation of a box section for the track form and reinstatement with aggregate materials.

The proposed Scheme will require construction materials to be imported to the site for the track, road, non-motorised user (NMU) and structural provisions and associated works such as drainage and ducting. In general, the materials needed, including for construction of the trackbed, are those regularly used in civil engineering infrastructure projects, e.g. major roads and construction projects, and do not raise specific environmental issues in terms of sourcing. Importation of these materials will be from local quarries.

In terms of cut activities, historical landfill material was confirmed in Tolka Valley Park. While environmental testing carried out on samples obtained from the site indicate the historic waste material to be non-hazardous, it will be prudent to assume the material in this area be classified as hazardous unacceptable material Class U2 and will be disposed of directly to a suitably licensed waste facility on this basis. Non-hazardous construction and demolition waste was encountered throughout Made Ground deposits elsewhere throughout the route of the proposed Scheme, and this is classified as unacceptable material (Class U1) with potential for treatment to render it potentially acceptable (Class 2) cohesive fill.

All earthworks will be managed having regard to the 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 further in Chapter 19 (Material Assets: Resources & Waste Management).

6.5.11 Drainage and Ducting

6.5.11.1 Drainage Activities

The proposed Scheme has extensive sections off track running through either park areas, green strips of land or grass verges. The proposed track and road drainage will also include sections along existing roads and require new carrier drains and tie-ins to existing systems. The drainage systems on existing roads will include carrier drains located in the traffic lanes which will be fed by traditional kerb side gullies. For the road and track drainage, the carrier drains and gully connections etc. will be installed early on and in advance of road and track works.

The proposed Scheme includes adopting SuDS (Sustainable Drainage Systems) for surface water collection and attenuation. These also provide both visual aesthetic and environmental benefits. SuDS are designed to manage stormwater locally (and as close to source as possible) to mimic natural drainage and encourage its infiltration, attenuation and passive treatment.

Carrier drains will be installed in trenches which are mechanically dug. Trenches less than 1.25 m in depth will typically not require trench support. Trenches that are greater in depth than 1.25 m will require trench support either by poling boards, waling and struts, trench boxes or sheet piles in the case of excessive depths. Gully connections and gully pots will be laid similarly to the carrier drains. The activities for SuDS features will be similar in nature and include trenches and smaller pipe systems.

The construction activities applied during the construction of a pipe installation are like those identified previously for utilities. The pipe system is laid ensuring gradients are sufficient to allow flow of water. Where the drainage system is sealed this is done by providing an impermeable membrane around the filter material (see Figure 6-13). Manholes will be installed in excavations as precast concrete units, in-situ concrete or block built depending on the local authorities' and utility owners' specification.

Figure 6-13: Typical Rain Garden Construction

6.5.11.2 Integrated Construction Wetlands

Mitigation measures implemented for the sustained performance and protection of the Tolka Valley Park ICW will be started ahead of the Main Works as identified previously in section 6.5.1.3. The activities will also include maintenance and monitoring of the ICW to ensure establishment over time, as detailed in the ICW mitigation and works proposal in Volume 5 – Appendix A10.4.

6.5.11.3 Multi-tubular ducting

Power will be supplied to the OCS via multi-tubular cable ducts which will be located adjacent to or under the trackbed foundation. There will be a parallel set of multi-tubular ducts carrying communications and signalling cables. The main power supply line from the substation is located underground and is connected to the contact wire at intervals. These duct banks will be constructed in conjunction with the track construction. The methodology will be like that outlined in the previous section on Utility Works.

6.5.12 Structures

Structural works for the proposed Scheme consist of principal structures and minor structures. The principal structures proposed are section-specific structures described further within the relevant part of section 6.4 of this report. These are as listed in Table 6-8.

Table 6-8: Principal Structures

No.	Area/ Section where activities further described	Principal Structure
1	S31.1	The Royal Canal and Rail Overbridge at Broombridge – See Section 6.4.2
2	S31.2	The Tolka Valley Park Bridge – See Section 6.4.3

There are minor structures also proposed along the length of the proposed Scheme, and these include those described below.

6.5.12.1 Retaining walls

Retaining walls and boundary walls will be provided throughout the scheme as described in Chapter 5 (Description of the proposed Scheme) of the EIAR. Two types of retaining walls are proposed along the proposed Scheme. For retained height less than 1m, and away from light rail or road traffic, blockwork retaining wall shall be constructed. This type of retaining wall will also serve as a boundary wall separating the Luas corridor from adjacent properties. For retained height over 1m and within the zone of influence of the rail or road traffic, reinforced concrete wall shall be constructed.

The construction activities will involve the initial site clearance and excavation for the reinforced concrete retaining wall or blockwork wall foundation. The construction of the bottom slab/foundation will be followed by the construction of the vertical walls and backfilling and compaction.

6.5.12.2 Substations

The substations will include initial excavation and foundation activities and will be constructed with small, ground bearing concrete elements, such as a reinforced concrete raft foundation. The substations will be constructed of infill block work wall construction. The buildings will include a flat roofing system.

6.5.12.3 Other Minor Structures

Cycle structures are to be provided at three locations. These are at the Broombridge train station, Finglas Village Stop and St Margaret's Stop. These will be metal framed structures.

A spectator shelter and store are also to be provided to the front of the proposed Farnham pitches.

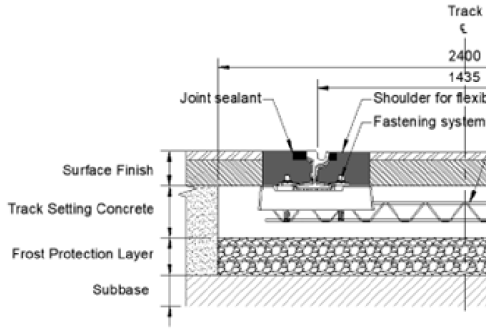
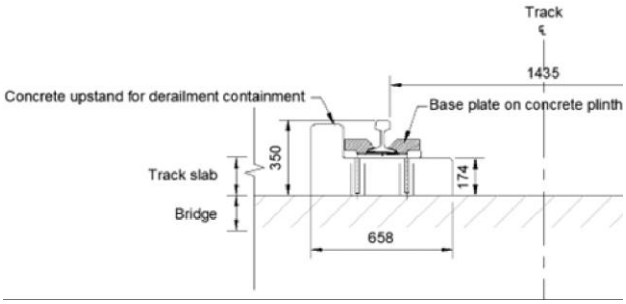
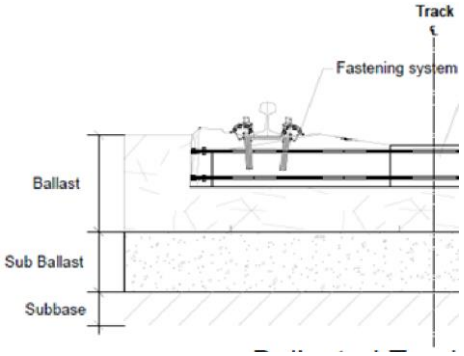
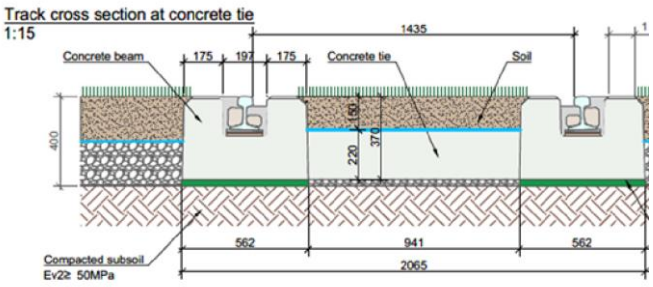
6.5.13 Track Construction

The track construction will entail both the construction of the trackbed and of the track rail system. The trackbed construction will entail the excavation of a 6-7m wide trench varying in depth from 0.8m to 1.5m where level with existing ground. However, the earthworks will vary depending on the specific cut and fill activities required along the route of the proposed Scheme to establish the alignments formation level. Utility diversions and protection works will be advanced prior to the main excavation works.

The track excavations will either be located within pavement materials in roadways or within soil and subsoil materials in the park areas. Multi-tubular ducts which carry the power supply cables and the communications links required for the LRVs will be installed once the trenches has been excavated. The track drainage systems will also be constructed in advance of and during the track construction. The trackbed formation will then be compacted and levelled.

The track construction will consist of four different track types depending on the typical use and location along the route. The construction of all four track types typical entails the activities of excavation to a formation level, installation of aggregate layers underneath the track width, installation of modular prefabrication base and footings systems, pouring in-situ reinforced concrete elements and completing finishes. The activities associated with each are further described in Table 6-9 below.

Table 6-9: Track Construction Activities

Track Type	Trackbed and Rail Activities
Embedded Track - This type will be used when the track is shared with other vehicles or the public such as at road junctions and at Stops.	
	▪ Complete cut/fill earthworks activities. ▪ Install aggregate layers capping / sub-base / frost protection layers. ▪ Install sleeper. ▪ Install rails and attach to sleeper. ▪ Install reinforced concrete. ▪ Install surface finish.
Plinth Track / Structure track - The trackform will be used over structures and has a plinth track design. It will be used over the proposed Royal Canal and Rail Overbridge and Tolka Valley River Bridge.	
	▪ During bridge construction, provide vertical dowels in the deck for future links between the plinth and the structure. ▪ Option 1: Cast in-situ plinth, prepare reinforcement and formwork, anchor the baseplate, and pour concrete in sections. ▪ Option 2: Precast plinth; Precast the plinth offsite, delivery and install the plinth and baseplate in sections. ▪ Install the rail, level and secure.
Ballasted track - This type will be used for the stabling area at the Broombridge Hamilton depot.	
	▪ Complete cut / fill earthworks activities. ▪ Install the aggregate layers capping / sub-base. ▪ Install an initial ballast layer. ▪ Install the concrete monoblock sleeper. ▪ Connect the rails to the sleeper and clamp with fasteners. ▪ Complete the ballast layer and level.
Grass track - This type is to be used at all other locations. The extensive use of this system provides a sustainable approach and to reduce concrete and steel reinforcement	
	▪ Complete cut/fill earthworks activities. ▪ Install the aggregate layers capping / sub-base. ▪ Install the precast units to level. ▪ Install formwork and complete grouting. ▪ Install under rail shims and rail. ▪ Install the filler block. ▪ Install surface finish.

6.5.14 Roads and non-motorised user (NMU) facilities

The proposed Scheme includes both the reinstatement and upgrade of existing roads and the provision of facilities for NMUs along the proposed Scheme. These are further described in Chapter 5 (Description of the proposed Scheme) of this EIAR.

6.5.14.1 Road Works

The reinstatement and upgrades include the roads and junctions at Broombridge Road, Ballyboggan Road, Tolka Valley Road, St Helena's Road, Farnham Drive and its extension, Wellmount Road, Patrickswell Place, Cappagh Road, Mellowes Road, the Finglas Road/North Road, St Margaret's Road and a new Access Road off McKee Avenue for Jamestown Little Industrial Estate and Manhattan Peanuts Ltd.

Road and junction upgrade and reinstatement works will be completed in a staged manner, whereby Works will be managed to ensure construction can continue while ensuring the safety of all road users, and personnel, while maintaining flow of all modes of transport as far as practicable. The road works will tie in to existing roads and will include the following construction activities:

- General site clearance and preparations such as traffic management and site security;
- Where the new roads are not directly on existing pavement, the proposed Scheme will include: earthworks, the removal of topsoil, along with any vegetation, cut and fill works, grading of the area and levelling the ground;
- Road milling and excavation of existing roads as required;
- Installation of the utilities, surface water drainage systems comprising pipes and chambers, as required, and tie-in, diversion and protection works for existing;
- Laying of the road foundation materials;
- Laying of sub-base layer;
- Installation of any required kerbs and the drainage collector system, such as gullies;
- Laying the road pavement materials. Reclaimed asphalt materials (RAP) will be used where possible; and
- Surfacing features such as road ramps and coloured surfacing will then be completed.

At the junctions where there are traffic signals and public lighting provisions, the proposed Scheme will include the provision of foundations and ducting arrangements around the junctions, and will include connections to power and communications and the associated pillars and cabinets. The installation of the traffic signal poles and the traffic signal poles and heads will follow along with the connection of same.

Where construction is on existing pavement, or to install track in roadway, the necessary layers will be removed using road planers, with planed road materials being recycled where practicable. Where required, existing lower courses of road make-up or ground will be excavated in layers using mechanical excavators to segregate materials for reuse, recycling, or disposal as appropriate, with materials being transported using lorries.

6.5.14.2 NMU facilities

Cycle lanes are a core part of the proposed Scheme in order to facilitate multimodal "cycle-LRT trips". Approximately 3km of segregated cycle lanes and 100m of non-segregated cycle lanes are proposed along the route. Covered cycle storage facilities will be provided at Broombridge Terminus, Finglas Village Stop and St Margaret's Stop and within the Park & Ride facility. "Sheffield" type cycle stands will be provided at all stop locations. Cycle facility upgrades will be substantially improved with segregated cycle lanes provided along the links and protected junctions with enhanced signalling for cyclists provided at junctions. Pedestrian facilities will also be upgraded with new footpaths and additional signalised crossings. The roads and NMU facilities will be constructed in a manner which will minimise, as far as practicable, any disturbance to residents, businesses and road users.

The installation of NMU facilities at junctions will be conducted in conjunction and in combination with the road works. Temporary arrangements will be put in place to facilitate existing users through the junctions. In the parks, the phasing of the construction works will take into consideration the maintenance of existing

facilities and public access. Refer to section 6.5.18 in relation to public access in these areas. Refer also to the Construction Traffic Management Plan (Volume 5 - Appendix A6.2) in relation to the provision of temporary NMU facilities during construction.

It is proposed that the permanent NMU facilities through parks will be completed in the latter half of the construction programme. This is to facilitate the construction of the proposed Scheme and the availability of haul roads during the Construction Phase. The construction will entail the establishment of formation level, completion of the unbound aggregate layers, installation of in-situ concrete footpaths, paved cycle lanes and the ancillary facilities.

6.5.14.3 Ancillary Works

The ancillary works for the roads will include the installation of foundations for signage. These activities will be completed in conjunction with the other excavation works. Once the main road works are substantially completed the installation of the signage, road furniture and road markings will then be completed.

6.5.15 OCS support

The construction of the support pole foundations for the OCS will be constructed in tandem with the track works and the road works. The OCS foundations will be formed in sleeved foundations or in reinforced concrete pads, depending on the location and the Contractors preferred methodology. The support poles will then be connected to the foundations. Them they will be dressed in the support equipment for the wiring, using either a cantilever arrangement or a head span arrangement. The equipment is preassembled away from site, delivered on a flatbed truck, and installed using a mobile elevated working platform. OCS poles and lighting will be combined where practical.

6.5.16 Power and Systems

6.5.16.1 Construction Phase – Power and Systems

As indicated in section 6.3.2, once the Main Civil and Track Works contract has been awarded, a separate Power and Systems contract will be procured as a Design and Build contract. The phasing will allow for the development of the Power and Systems design and the progression of the Construction Phase in tandem with the latter stages of the construction works when areas are made available.

These works will be scheme wide with the scope of works following the alignment of the Luas progressed as part of the Main Civil and Track Works contract. The proposed Scheme will include the provision of the Power Supply and the OCS. LRT Signalling, Light Rail Stop Cubicles (LR-SC) (the main function of the LR-SC is to house uninterruptible power system, low voltage distribution boards and communication and control equipment) and Communications and Control Systems will also be provided as part of the Power and Systems contract works. The OCS cabling is installed just prior to being made live.

The Power and Systems construction activities will include the proposed traction power system and substation provision, traffic and LRT signalling arrangements, communications system, and OCS Power and System provisions. These activities will include installing the associated mechanical and electrical equipment (including cabling and wiring) necessary to deliver the required power and telecommunications supplies to the OCS, to signalling at crossing points with traffic and NMUs, as well as to other facilities along the route, including at Stops. These will be routed from the power supply buildings and cabinets through buried ducting to the OCS and to signalling poles and stop furniture. The installation of the OCS wires follows the completion of the track, the pole foundations, and the support pole arrangements. The OCS wires will be strung from rail mounted vehicles. The wire will be paid out from a wiring drum on the back of a truck and mobile platforms are used to install the wiring into temporary pulleys. Tensioning of the wires is then achieved over typical tension lengths.

6.5.16.2 Traction Power Supply

The proposed Scheme extension Traction Power Supply will be via surface substations directly connected to the ESB network. The substations will be connected to the multi-tubular ducting which will have been installed at the same time as the track construction. Proposed substation locations have been identified at

Finglas Village in an area north of Mellowes Road and at St Margaret's Road adjacent to the R135 pedestrian overbridge. These are indicated in Figure 6-14 below.

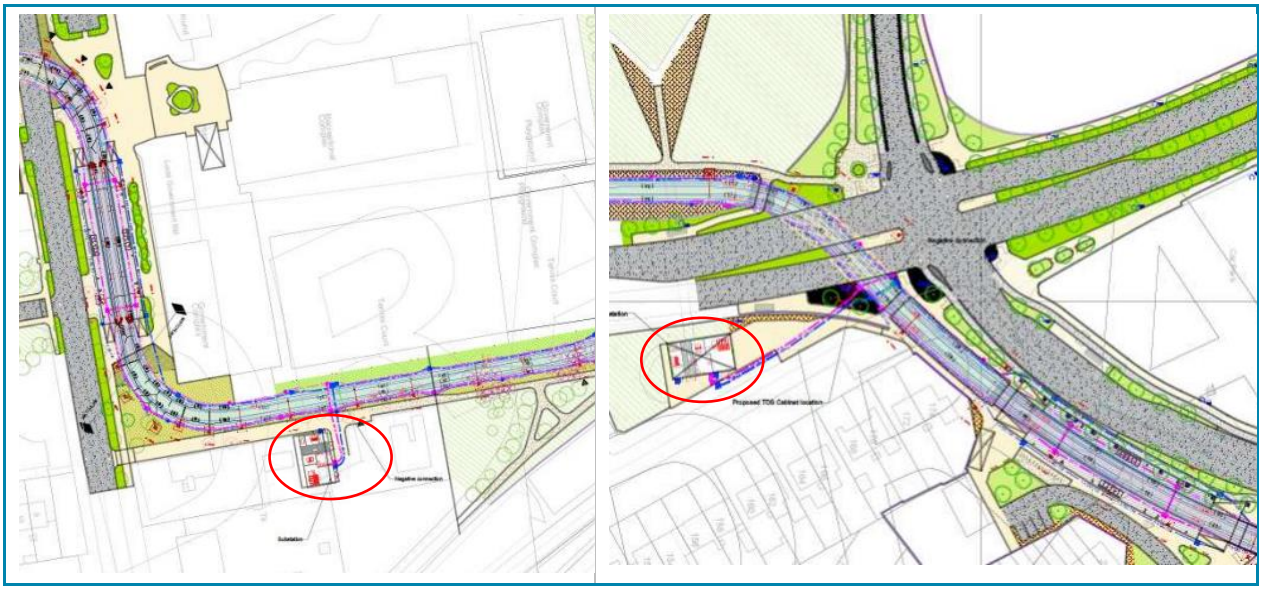


Figure 6-14: Locations of Finglas Village and St Margaret's Road Substations respectively [circled in red]

The substation buildings will be of blockwork wall construction. When the structure of the building is complete, transformers, switchgear and other equipment will be installed and left ready for connection and testing. Supply of cabling for the substations is expected to be a long lead item and will be ordered in advance so as to tie-in the installation with the programme dates.

An additional substation is also proposed for provision of electricity supplies to e-car charging at the site of the Park & Ride facility at North Road.

6.5.16.3 Light Rail Stop Cubicles

The main function of the LR-SC is to house uninterruptible power systems, low voltage distribution boards and communication and control equipment. A LR-SC is proposed at each of the four Stops. For the Finglas Village and St Margaret's Stops, these will be housed within the proposed substations. For St Helena's and Charlestown Terminus, the LR-SCs, including their foundations, are to be constructed at the locations identified in Figure 6-15 below, with ducting connections to be laid back to the track ducting system.

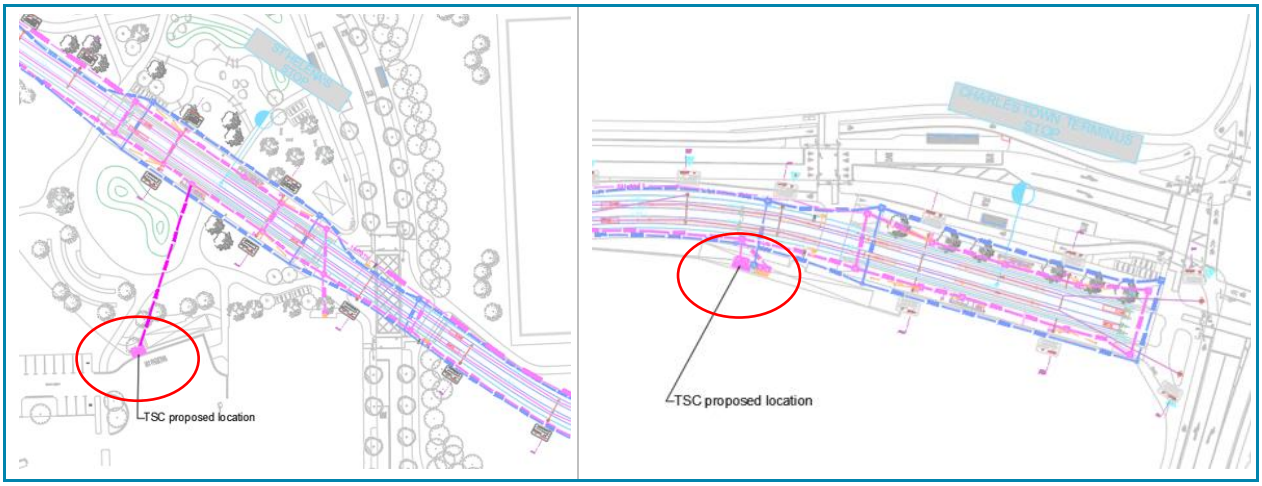


Figure 6-15: St Helena's and Charlestown Terminus LR-SCs respectively [circled in red]

6.5.17 Stop Construction and Surface finishes

The Stop construction takes two forms:

- On Street Lateral Luas Stops (St Margaret's Road and Charlestown Terminus); and
- Off Street Luas Stops within public open spaces (St Helena's and Finglas Village Stops).

Charlestown Terminus will be constructed with a scissor crossover before the Stop and the track layout includes two turnback positions, including one that will be used as a temporary stabling outside of the peak hour.

Once the initial construction activities of earthworks, ducting, poles foundation and track construction have been completed, this will be followed by the stop platforms and surfacing works comprising the surfacing of the embedded track and the completion of the surfacing works at the platforms. Refer to Figure 6-16 for a typical stop platform.

Figure 6-16: Typical Stop Platform

The Stop platforms will be constructed with small, ground bearing concrete elements, such as slabs and paving materials. The platform formation will be established through excavation by cut/fill operations, as required. Ducting and drainage arrangements will be installed. The necessary aggregate materials will be constructed in layers. As part of the construction, localised platform foundations will be constructed to facilitate the platform furniture and OCS through the platform areas. These will include reinforced concrete foundations and bolting arrangements. This will be followed by the construction of the surfacing elements. The Stop furniture including shelters and equipment will then be completed.

6.5.18 Public Areas and Access

The proposed Works pass through public areas and this has the potential for amenity impact during construction. The proposed Scheme will be constructed in a manner which will mitigate this. This will include ensuring that the following measures apply:

- The proposed Scheme will take account of and provide measures for public access to public spaces during construction. This will include ensuring availability of access to allow the local authority to fulfil its maintenance requirements;

- Access for users of the Royal Canal towpath / greenway will be maintained throughout the construction works;
- Access arrangements through the construction works will be put in place for the public in the park areas;
- In Tolka Valley Park: maintaining access across the construction works will include maintaining access to the pitch and putt facilities and for the Tolka Valley Park Run;
- In St Helena's Park: providing permanent pedestrian access in advance of the construction works will be planned for;
- At the Farnham Pitches amenity area: the timing of the pitch re-orientation will be given consideration to minimise the impact on the public area;
- At Mellowes Park: access to and through the park will be maintained including to allow for looped walks of the park and to allow for the Junior Park Run;
- Unauthorised access to these parklands will also be appropriately closed off during construction; and
- Traffic Management arrangements are to take consideration of providing suitable alternative arrangements for NMUs in accordance with Chapter 8 of the Traffic Signs Manual.

6.5.19 Testing and Commissioning and Trial Running Phase

A period for testing and commissioning of the overall system will be completed including gauge testing, shadow running and driver training, all prior to opening the system to paying customers. Rolling stock procured for the proposed Scheme will also have to be tested and commissioned. There will also be a testing and commissioning period of system integration at the existing depot. A six-month period would be required for this in the programme. Suitable measures will be in place to ensure the safety of personnel and of the public during these construction works.

6.5.20 Construction Site Decommissioning

On completion of construction, all construction facilities and equipment such as plant, materials, signage, fencing / hoarding, offices and laydown areas, etc. will be removed from site. All temporary service connections will be decommissioned, and areas will be reinstated as required by the permanent works such as landscaping or restoration to their original condition.

6.6 Working Times

Standard working hours, as set out in Table 6-10, are from 07:00hrs to 19:00hrs on weekdays (excluding Bank and Public Holidays) and from 07:00hrs to 13:00hrs on Saturdays. This includes standard delivery hours to the construction sites.

Table 6-10: Standard Working Times

Days	Hours
Monday to Friday	07:00 hrs to 19:00 hrs (this includes a half hour to prepare site at each end, giving 11 hours working: 07:30 hrs to 18:30 hrs)
Saturday	07:00 hrs to 13:00 hrs (this includes a half hour to prepare site at each end, giving 5 hours working: 07:30 hrs to 12:30 hrs)
Sunday / Public Holidays, including annual and extraordinary events	None (only by exception - refer to activities listed outside standard working hours)

Standard working times will be included in the Works Requirements and construction will take consideration of sensitive receptors, in particular, any nearby residential areas. Working hours on roads requiring lane closures will be restricted so as to minimise impact on traffic during peak traffic hours. These traffic management restrictions will be included in the Works Requirements.

Most construction activities will be undertaken during the proposed standard working hours, as outlined above, however there will be a number of activities that require working outside of these standard hours. These will include:

- Utilities, roadworks and other works affecting traffic may be extended to working outside of standard hours;
- Large structure works and concrete pours impacting on Iarnród Éireann or the Royal Canal will require working outside of standard hours.
- Track bed and track laying and associated concrete batching;
- Works to minimise the impact on road traffic movements as agreed with the roads authority;
- Dewatering excavations, the pumping of groundwater will be continuous (24 hours a day, seven days a week) for the duration required for construction at each location;
- 'Special / abnormal' deliveries not otherwise listed above may require limited extended hours or overnight deliveries; and
- Unforeseen emergency works for safety reasons (i.e. damaged utilities).

6.7 Construction Personnel

Throughout the Construction Phase, the construction workforce numbers will vary depending on the stage of the proposed Scheme. However, it is anticipated that there will be a construction workforce of approximately 180 people directly employed. In addition, it is anticipated that there will be significant indirect employment supported by the proposed Scheme, e.g. in logistical support companies, material and plant suppliers, traffic management companies and in the local service industry.

6.8 Construction Vehicles, 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 necessary to construct the proposed Scheme has been prepared. The estimated peak numbers of vehicles and the plant and equipment working on each activity is indicated in Table 6-11.

Depending on the site activities, typical vehicles, plant and equipment will include the following:

- Trucks/Lorries, dump trucks and dumpers;
- Flatbed trucks, low loaders, curtain-sided delivery vehicles and large goods vehicles;
- Track machines and excavators (including breakers) including vacuum excavators for construction works around utilities;
- Bulldozers and graders;
- Rollers, compactors and wacker plates;
- Hydraulic breakers and hammers;
- Cranes (Crawler and Mobile);
- Generators and compressors;
- Telehandlers and mobile elevated working platforms;
- Concrete pumps and water pumps;
- Asphalt Pavers and other paving vehicles;
- Road planers;
- Jet washers and road sweepers;
- Wheel washers;
- Site lighting;
- Pile boring rig;
- Horizontal directional drilling machine (HDD); and
- Hand-held and small plant and equipment such as disc cutters.

The construction works will progress in multiple locations at one time with localised areas having several activities occurring concurrently. The following is an estimated list of the heavy goods vehicles (HGV) making movements to and from a work activity and the typical plant required for each of these main construction activities.

Working Times for these activities are presented in section 6.6. Where trucks and haulage are required for the construction works, the number of these would be staggered to tie in with the machines involved in the loading/unloading or levelling, during the installation of materials activities.

Table 6-11: Peak HGVs and Plant by Activity

Activity	HGVs; Activity
Demolition Works	6 Trucks / Lorries
	2 Demolition track machines; 2 excavators / track machines; mobile crane
Boundary / Retaining Wall Construction	4 Trucks / Lorries; concrete truck deliveries; large goods vehicles deliveries
	2 Excavators / track machines; 2 dumpers; 2 Rollers; Vacuum Excavator; and dewatering pumps
Drainage and Utility / Ducting Works	4 Trucks / Lorries; concrete truck deliveries; flatbed / large goods vehicle deliveries
	4 Excavators; 2 dumpers; 2 rollers; Vacuum Excavator; dewatering pumps, HDD drilling machine; and grab lorry
Earthworks	8 Trucks / Lorries
	3 Excavators / track machines; 2 dumpers; 4 Rollers; 2 dozers / graders; and dewatering pumps
Road Construction	8 Trucks / Lorries; concrete truck deliveries; and flatbed / large goods vehicle deliveries
	3 Excavators / track machines; backhoe mounter hydraulic breakers; 2 dumpers; mobile crane; 2 Road Planers; 2 Pavers; 3 Rollers; Road Sweepers / Jet Washers; and Tack Coater
Principal Structure Works – Royal Canal and Rail Overbridge	4 Trucks / Lorries; concrete truck deliveries; and flatbed / large goods vehicle deliveries
	Mobile crane; crawler crane; self-propelled modular transporter; piling rig; 3 excavators / track machines; dewatering pumps; 2 Rollers; mobile concrete pump; and 2 forklifts / telehandlers
Principal Structure Works – Tolka Valley Park Bridge	4 Trucks / Lorries; concrete truck deliveries; and flatbed / large goods vehicle deliveries
	Mobile crane; piling rig; 3 excavators / track machines; dewatering pumps; 2 rollers; mobile concrete pump; and 2 forklifts / telehandlers
Park & Ride Facilities	6 Trucks / Lorries; concrete truck deliveries; and flatbed / large goods vehicle deliveries
	Mobile crane; piling rig; 4 excavators / track machines; dewatering pumps; 4 rollers; mobile concrete pump; and 3 forklifts / telehandlers
Substation Construction	Flatbed / large goods vehicles; concrete truck deliveries
	2 excavators; 2 dumpers; 2 Rollers; forklift / telehandler; and mobile crane
Track Works (including Stabling Works)	4 tippers; flatbed / large goods vehicle deliveries; and concrete truck deliveries
	2 Track machines; 2 rollers / compactors; dozers / grader; welding machines; and road-rail vehicle
OCS (including P&S Installation)	Flatbed / large goods vehicle deliveries
	2 track machines; road-rail vehicle
Stops and Surface Finishing Works	4 Trucks / Lorries; flatbed / large goods vehicles deliveries; and concrete truck deliveries

Activity	HGVs; Activity
	2 excavators / track machines; 2 dumpers; 2 rollers; and forklift / telehandler

The appointed contractors will select and use plant and equipment in a manner that ensures construction noise thresholds, as defined in Chapter 15 (Noise & Vibration) of this EIAR, are not exceeded. Refer to Chapter 13 (Air Quality) and Chapter 15 (Noise & Vibration) of this EIAR for the Construction Phase air quality and noise and vibration assessments, and associated mitigation measures which the appointed contractors will comply with.

6.9 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 by the Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) 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 PSDP has been appointed and PSCS will be appointed as appropriate.

6.10 Construction Temporary Traffic Management

All temporary traffic measures required during the Construction Phase are outlined in the Construction Traffic Management Plan (CTMP) (Volume 5 - Appendix A6.2) which will be developed by the Contractor into a Construction Stage Traffic Management Plan.

The CTMP has been developed as part of the design process and is developed in tandem with the detail contained in Chapter 18 (Material Assets: Traffic and Transport) of the EIAR. The CTMP is intended as a guiding plan to manage traffic within the study area during the proposed Scheme Enabling and Main Works contracts. Where required mitigation measures will be provided to minimise Construction Phase or Operational Phase traffic and transport impacts, these are outlined in the CTMP.

6.11 Construction Interfaces

The likely timelines of the proposed Scheme construction works have been programmed, based on the potential for simultaneous construction of and cumulative impacts of 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 developments are identified and assessed in Chapter 24 (Cumulative Impacts) of this EIAR.

Interface liaison will take place on a case-by-case basis through TII, as will be set out in the construction contracts, 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.

6.11.1 Iarnród Éireann

Consents will be attained from IÉ when working in the vicinity of and over their infrastructure. Suspensions of service will be sought and agreed in advance, where required. There have been ongoing consultations relating to working restrictions and timelines and such discussion will continue in this regard. Working restrictions and timelines will be agreed in advance of the construction works.

6.11.2 Waterways Ireland

Consents will be attained from Waterways Ireland for working in the vicinity of the Royal Canal. There have been ongoing consultations relating to working restrictions and timelines and discussion will continue in this regard.

6.12 Construction Environmental Management

6.12.1 Communications

TII and its appointed contractor(s) will ensure that local residents, occupiers, businesses, local authorities and all other stakeholders affected by the proposed construction works, as outlined in this EIAR, will be informed in advance of work taking place. The notifications will detail the estimated duration of the works, the working hours and the nature of the works. In the case of works required in response to an emergency, the local authority, local residents and businesses will be advised as soon as reasonably practicable. All notifications will include a local helpline number. In addition, information on the works will also be available on the proposed Scheme website.

TII will further develop the Community Engagement Plan to encompass the Construction and Operational Phases of the proposed Scheme.

An overall Communications Plan will be prepared by the contractors in advance of construction works which will be cognisant of the Community Engagement Plan and will ensure proper notification and engagement with all residents, businesses and stakeholders in advance and during the construction works.

6.12.2 Construction Environmental Management Plan

A CEMP is prepared for the proposed Scheme and is included in Volume 5 – Appendix A6.1. The CEMP will be updated by each appointed contractor 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 (National Roads Authority, 2007), 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 7 (Human Health) to Chapter 24 (Cumulative Impacts) inclusive as appropriate and are summarised in Chapter 25 (Summary of Mitigation Measures, Monitoring & Residual Impacts) of this EIAR. A number of sub-plans are also 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 contractors to the satisfaction of TII.

6.12.3 Traffic Management Plan

A 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. The CTMP is presented in Volume 5 – A6.2 of this EIAR. The purpose of this CTMP is to demonstrate that the residual impacts to public road network during the Construction Phase of the proposed Scheme, which have been identified in the application documentation, will be minimised and that transport related activities are carried out as safely as possible and with the minimum disruption to other road users. This plan must be finalised and implemented by the PSCS / Contractor prior to commencing the works and should not be implemented until it has been assessed and developed by the PSCS. The PSCS shall co-ordinate the implementation of the developed Traffic Management Plan during construction of the works. The Works Requirements will require the implementation of all the applicable mitigation measures identified in the EIAR (and any additional measures required pursuant to conditions imposed by An Bord Pleanála, with any grant of approval) in the CTMP.

The CTMP will take consideration of the phasing requirements of the proposed Scheme which will ensure safe construction and minimise the impact on traffic on NMUs along the route of the proposed Scheme and maintaining flow of all modes of transport wherever practicable.

6.12.4 Invasive Species Management Plan

The Invasive Species Management Plan (ISMP) presented in Volume 5 – Appendix A6.3 as part of the EIAR provides the strategy to be adopted in order to manage and prevent the spread of non-native invasive plant species. This will be incorporated by the construction contractor into its Plans. Further details on the assessment of invasive non-native species (INNS) and associated mitigation measures are provided in Chapter 9 (Biodiversity) of this EIAR.

Of the INNS identified, two species (and potentially a third), namely Himalayan Balsam, Japanese Knotweed and potentially Giant Hogweed, are located in a sensitive location by the proposed Tolka Valley Park Luas bridge; as such, these species will be the focus of biosecurity measures going forward. Of these species, the Japanese Knotweed and Giant Hogweed boast salinity tolerances which may allow them to colonise saltmarsh habitats, and therefore pose a threat to Natura 2000 sites. The Japanese Knotweed along the River Tolka will be removed to allow for the installation of the new bridge in this area. It is the most likely invasive species to be accidentally spread downstream into the Natura 2000 sites.

6.12.5 Surface Water Management Plan

The Surface Water Management Plan (SWMP), presented in Volume 5 – Appendix A6.4, 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 Works Requirements that the successful contractor, immediately following appointment, must prepare a construction stage plan in accordance with the SWMP so as to ensure it effectively implements all the applicable measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála with any grant of approval.

As identified in Chapter 9 (Biodiversity) of this EIAR and the SWMP, and in order to protect surface water, groundwater and air quality throughout the proposed Scheme, the construction contractor will develop and implement a SWMP with the minimally required list of mitigations measures outlined to be incorporated into that plan.

6.12.6 C&D Resource and Waste Management Plan

A plan has been developed which details the requirement for the construction contractor to develop a Construction and Demolition Resource and Waste Management Plan (C&D RWMP), which incorporates all of the measures outlined in this Chapter, Chapter 11 (Land and Soils) and Chapter 19 (Material Assets: Resource & Waste Management). The C&D RWMP will identify how waste arisings are to be controlled and managed during the lifetime of the proposed Scheme, in particular how waste prevention principles will be applied and how on-site waste will be minimised. Refer to Volume 5 – Appendix A6.5 of this EIAR for the plan and for further details of the Construction Phase mitigation measures which the appointed contractors will comply with to reduce waste.

The Plan shall be produced by the construction contractor in accordance with the ‘Best Practice Guidelines on the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects’ (EPA, 2021) which clearly sets out the Contractor’s proposals regarding the treatment, storage and disposal of waste. Any Class U2 material will be disposed of at a suitably licensed waste facility.

6.12.7 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 suited to particular circumstances. The EIRP presented in Volume 5 – Appendix A6.6 of this EIAR, 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 Employer's Requirements that the successful construction contractor, immediately following appointment, must detail in developed Pollution Control Plans and EIRP, the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR, together with any additional measures required pursuant to conditions imposed by An Bord Pleanála with any grant of approval.

6.12.8 Sustainable Construction Principles

The CEMP for the proposed Scheme has been developed with consideration to TII's Sustainability Implementation Plan principles. Having regard to the TII Sustainability Implementation Plan, sustainability principles will be adopted through the Construction Phase of the proposed Scheme including as follows:

- Minimise the use of materials, natural resources and the production of waste including implementing a Waste Management Plan for Construction and Demolition Waste;
- Reduce the carbon footprint of the proposed Scheme including using sustainable and reusable materials and construction methods;
- Encouraging innovation during the construction process and ensuring sustainable measures are safely and efficiently implemented in the proposed Scheme; and
- Avoid, mitigate, and if not possible, reduce the adverse effects on workers and communities during the construction of the proposed Scheme. Implementing Safety, health and wellbeing measures in accordance with best practice throughout the Construction Phase.

6.12.9 Mitigation Measures

Mitigation and monitoring measures have been identified which shall avoid, reduce or offset potential impacts which could arise throughout the Construction Phase of the proposed Scheme. These mitigation and monitoring measures are detailed in the various Chapters of this EIAR and summarised in Chapter 25 (Summary of Mitigation Measures, Monitoring and Residual Impacts) and in the CEMP included in this EIAR.

6.12.10 Environmental Restrictions

The results of the environmental surveys need to inform the construction methodology with the main environmental programming restrictions as detailed in Table 6-12.

Table 6-12: List of Environmental Restrictions

Item	Description	Construction Restriction and Locations
1	Brent Geese	The Light-bellied Brent Geese were observed utilising green areas over 100m away from the St Helena's Childcare Centre/Farnham pitches area; However, should the proposed Scheme under construction at the Farnham pitches area fall within the 100m disturbance buffer, they will be conducted outside of the migrant bird wintering period (November to March, inclusive) to prevent disturbance to the grazing activities of Brent Geese (and the occasional small group of Barnacle Geese). The disturbance buffer distance may be adjusted following more detailed assessment in consultation with the relevant authorities and in consideration of best practice regarding visual and audible disturbance.
2	Bats	(April to October): Care must be taken to ensure there are no additional lighting impacts within the riparian zone of the River Tolka and the Royal Canal from dusk till dawn, as this would impact on local Bats' foraging activities. Furthermore, unnecessary light spillage will be avoided in parkland and treeline areas which function as foraging grounds for local bats. Dark corridors must be present in all green areas along the proposed Scheme during the Bat active months to allow unhindered commuting activities.
3	Amphibians	Works within and adjacent to the Tolka Valley Park wetlands area should be conducted outside of the amphibian hibernation period (October to February). Should the need arise to work within these areas during this period, a qualified Ecologist will check to ensure that there are no hibernating amphibians in this area before the construction works commence. Should an amphibian be found, it will be relocated by the Ecologist to suitable and safe hibernation environmental within the locality.

Item	Description	Construction Restriction and Locations
4	Otters	No seasonal restrictions as breeding period undefined. Care must be taken to ensure there are no additional lighting impacts within the riparian zone of the River Tolka and the Royal Canal from dusk till dawn, as this would impact on local Otters' hunting activities. No legally protected holts or couches have been recorded within and adjacent to the proposed Scheme; and thus, at present do not limit the proposed Works.
5	Breeding Birds	Any removal of vegetation (shrubs / scrubland / hedges / trees) must be conducted outside of bird nesting season (March to August, inclusive). Should the need arise to clear vegetation during this period, a qualified Ecologist will check to ensure that there are no nests within the vegetation before removal.

6.13 Difficulties Encountered in Compiling Information

No difficulties were encountered during this phase of the EIAR.

6.14 References

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