METROLINK

Integrated Transport. Integrated Life.

MetroLink Non-Technical Summary

TII Bonneagar Iompair Éireann Transport Infrastructure Ireland

NTA Údarás Náisiúnta Iompair National Transport Authority

Rialtas na hÉireann Government of Ireland

Tionscadal Éireann Project Ireland 2040

Contents

1. Introduction

This document is the Non-Technical Summary (NTS) of the Environmental Impact Assessment Report (EIAR) for the proposed MetroLink Project (hereafter referred to as MetroLink). The preparation of an NTS is a requirement under the European Directive on Environmental Impact Assessment (EIA) (Directive 2014/52/EU, referred to as the EIA Directive).One of the fundamental objectives of the EIA Directive is to "*ensure that the public are made aware of the environmental implications of any decisions about whether to allow new projects to take place*".

This document summarises in non-technical language the EIAR, including the likely significant effects identified, the mitigation and monitoring measures proposed, as well as any residual effects arising from MetroLink that have been identified during the Construction and Operational Phases to inform the planning consent process. The EIAR has been prepared to accompany the Railway Order (RO) application for consent for MetroLink to An Bord Pleanála (hereafter referred to as "The Board").

For the purpose of the EIA, Transport Infrastructure Ireland (TII) is the 'developer/applicant' for MetroLink, and The Board is the 'competent authority' that will undertake the EIA and decide whether to grant consent for MetroLink. A number of other relevant documents, including a Natura Impact Statement (NIS), a draft RO, a Planning Report, schedules and drawings and Compulsory Purchase Order (CPO) documentation have also been prepared.

The EIA process has been undertaken in line with the EIA Directive, based on the guidance presented in the Environmental Protection Agency (EPA) "Guidelines on the Information to be contained in EIARs" (EPA 2022) and other relevant guidance.

1.1 MetroLink

MetroLink is a transformative piece of new public transport infrastructure, the first of its kind in Ireland. It will comprise a high-capacity, high-frequency, modern and efficient metro railway, with 16 new stations running from Swords to Charlemont. The alignment will link Dublin Airport, Irish Rail, DART, Dublin Bus and Luas services and create a fully integrated public transport network for the Greater Dublin Area (GDA). The MetroLink alignment is shown in Diagram 1.

As well as linking major transport hubs, MetroLink will connect key destinations including Ballymun, the Mater Hospital, the Rotunda Hospital, Dublin City University (DCU) and Trinity College Dublin (TCD). Much of the 18.8km route will run underground, an exciting innovation for Irish public transport.

When operations commence there will be trains every three minutes during peak periods. This can rise to a service every 90/100 seconds by 2060 if required. The system will be capable of carrying up to 20,000 passengers per hour in each direction. For comparison, current Luas Green Line services can carry circa 9,000 passengers per direction per hour.

When completed passengers will be able travel from Swords to Dublin city centre in approximately 25 minutes and it is estimated that MetroLink will carry up to 53 million passengers annually.

MetroLink differs from other rail services currently available in Ireland (DART, InterCity and Luas) in that it will:

- Offer higher frequency services;
- Carry more people over shorter distances;
- Be fully segregated from all other road users (interference with road traffic or pedestrians); and
- Be fully automated (Driverless train service).

Diagram 1 Infographic Overview of Principal Locations along the Alignment

1.2 Role of Transport Infrastructure Ireland

TII is a statutory non-commercial body, which operates under the umbrella of the Department of Transport (formerly known as the Department of Transport, Tourism and Sport (DTTAS)). TII was established through a merger of the National Roads Authority and the Railway Procurement Agency under the Roads Act 2015. TII's purpose is to provide sustainable transport infrastructure and services, delivering a better quality of life, supporting economic growth and respecting the environment.

In the case of MetroLink, the functions of TII include undertaking the design and planning process, seeking (and obtaining) all development consents (planning permission) and, to the extent necessary, related compulsory acquisition approvals from, in addition to subsequently procuring the required construction of MetroLink (if approved).

As part of their role, TII is managing the RO application process for MetroLink. The RO process is the planning application process for railway projects under the Transport (Railway Infrastructure) Act 2001 as amended.

1.3 Aims and Objectives of this Project

The overall project objective for MetroLink, as established by the National Transport Authority (NTA) and TII and as informed by planning policy context is:

> *'To provide a sustainable, a safe, efficient, integrated and accessible public transport service between Swords, Dublin Airport and Dublin city centre'.*

2. EIA Process and Methodology

2.1 Introduction

Environmental Impact Assessment (EIA) is a systematic and a thorough process that assess the potential likely significant environmental effects of a proposed Project and establishes appropriate design and mitigation measures to avoid, reduce or offset any predicted environmental impacts.

The EIA process is undertaken by The Board and this EIAR has been prepared to allow The Board to undertake the EIA for MetroLink. It takes into account information compiled through desk-based assessment, field surveys and consultation with the public, relevant stakeholders and certain bodies. The main objectives of the EIAR are to:

- Describe the baseline (existing) conditions before any work on MetroLink has commenced and provide a description of the changes to the baseline conditions in the absence of MetroLink (Do Nothing scenario);
- Describe MetroLink, including the construction works required to build and operate MetroLink;
- Provide a description of reasonable alternatives studied in the development of MetroLink and the main reasons for choosing MetroLink;
- Describe the assessment methodologies used to assess the predicted environmental impacts of MetroLink;
- Describe environmental impacts and any likely significant effects which may arise during the construction and operation of MetroLink; and
- Propose mitigation measures to reduce or avoid any likely significant effects which may arise during the construction and operation of MetroLink.

2.2 EIAR Format and Structure

This EIAR will follow the 'Grouped Format Structure' which means that the EIAR has been prepared in a format which examines each environmental topic in a separate section in the EIAR. For each topic, the baseline environment is described, potential impacts are assessed, and mitigation measures and monitoring are proposed where required and residual impacts are defined. This EIAR has been split into five volumes as follows:

- **Volume 1 – Non-Technical Summary (This Document)**: Presentation of the EIAR in a concise and engaging manner which allows the public and key stakeholders to understand the proposed Project and the key environmental issues associated with it.
- **Volume 2 – Introduction & Project Description**: This volume provides the project description, comprising information on the location, design and scale of the proposed Project and the physical

characteristics of the proposed Project having regard to the Construction and Operational Phases. This section also includes a description of the reasonable alternatives considered and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

- **Volume 3 – Environmental Baseline & Assessment**: This volume provides an accurate and comprehensive description of the environmental baseline and assessment of the impacts of the proposed Project divided into separate chapters; one for each environmental factor. The assessment identifies and assesses the likely significant effects during the Construction and Operational Phases, provides a description of the mitigation measures and monitoring required to ensure that significant adverse environmental effects are minimised, and describes the residual post-mitigation effects.
- **Volume 4 – Figures**: This volume contains a copy of all the drawings which are cross-referenced in each of the EIAR chapters.
- **Volume 5 – Appendices**: The appendices contain a collection of technical reference information supporting the EIAR chapters.

2.3 Environmental Impact Assessment Process

This EIAR has been prepared by competent experts in accordance with best practice and takes into account information compiled through desk-based assessment, field surveys and consultation with the relevant statutory bodies and the general public. An overview of the stages of the EIA process for MetroLink is presented in Diagram 2.

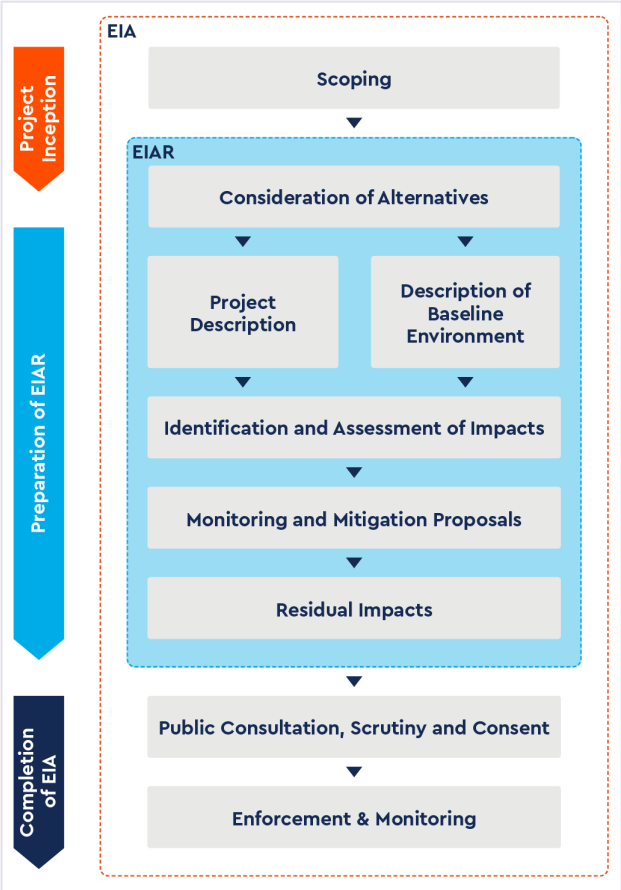

Diagram 2 EIA Process

2.4 Methodology

The assessment of the potential effects of MetroLink generally follows the Guidelines on the Information to be Contained in EIARs (EPA 2022). For some topics, industry sector or professional institute specific

guidance is followed. In addition to the applicable EIA legislation and guidance, all EU Directives and national legislation relating to the specialist areas will also be considered as part of the process.

2.4.1 Identification of Impacts

A key step in the process is to identify the likely significant effects. Will the quality of the effect be positive, neutral or negative?. The next step is to identify how important an effect is having regard to the sensitivity of the receiving environment. The importance or sensitivity of a receptor includes consideration of International and National legislation and the protections required by certain stakeholders and professional body guidance. The magnitude of the effect includes consideration of its size, duration and whether the effect is permanent or reversible.

2.4.2 Mitigation Measures

The EIAR addresses potential environmental effects and proposes mitigation where significant effects are identified. As part of the design development process, where an impact to the environment has been deemed as unacceptable, mitigation has been embedded in the design, or the unacceptable option has been designed out. All proposed mitigation measures are reported within the relevant chapter of the EIAR.

Mitigation and control measures required during the Construction Phase are provided in each chapter and in the outline Construction Environmental Management Plan (CEMP) which is included as an appendix to the EIAR. The EIAR also includes summaries of the route-wide mitigation measures which brings together all of the mitigation measures recommended in the various EIAR chapters for ease of reference.

Any potential impacts that remain following the implementation of mitigation measures are recorded as residual effects. A residual effect is any that remains after the implementation of the proposed mitigation measures.

2.4.3 Monitoring

In addition to the proposed mitigation measures, monitoring programmes have been developed to oversee the implementation and maintenance of the mitigation measures proposed, and their efficacy to ensure no unacceptable effects occur. Monitoring also allows for the comparison of pre and post project conditions and will enable any unforeseen effects to be identified and mitigated where required.

3. Railway Order Process

New railway works are governed by the Transport (Railway Infrastructure) Act, 2001 (as amended), hereafter referred to as the '2001 Act'. The 2001 Act provides for a RO application to be made by TII to The Board. MetroLink is categorised as a Strategic Infrastructure Development (SID) under the Planning and Development (Strategic Infrastructure) Act 2006 as amended. The RO application process is broadly similar to other SID planning application processes.

Sections 37 to 47F of the 2001 Act (as amended by the Planning and Development (Strategic Infrastructure) Act 2006, the Dublin Transport Authority Act 2008 and the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743/2021)) set out the process required for making an application for an RO. Section 37(3) states that,

An application under Subsection (1) shall be made in writing in such form as the Minister may specify and shall be accompanied by-

- a draft of the proposed order,
- a plan of the proposed railway works,

- in the case of an application by the Agency or a person with the consent of the Agency, a plan of any proposed commercial development of land adjacent to the proposed railway works,

- a book of reference to a plan required under this subsection (indicating the identity of the owners and of the occupiers of the lands described in the plan), and

- a statement on the likely effects on the environment (referred to subsequently in this Part as an 'environmental impact assessment report') of the proposed railway works.

In order to meet these requirements, the RO application will include a number of schedules, and drawings that present the details of the proposed Project. The application will also include an EIAR and associated appendices. This material together with any feedback/submissions received during the statutory public consultation period (which will commence following the submission of the lodgement of the RO application) will be reviewed and considered by The Board. It is likely at this stage that The Board will call an Oral Hearing prior to making a decision on the RO application. The Oral Hearing is a process whereby TII and its specialists are given an opportunity to present evidence on the proposed Project and on submissions received. There is also an opportunity for The Board and parties who made submissions during the statutory consultation process to question TII and its specialists. Following this process and based on the information available to The Board, they will make a decision on the application.

4. Background and Need for the Project

4.1 Introduction

MetroLink is the single biggest investment in transport infrastructure in the history of the State and is part of an integrated transport system for the Greater Dublin Area (GDA). This system also includes for BusConnects and DART+ all of which are included under Project Ireland 2040. Together these projects will result in reliable, sustainable, affordable, integrated public transport system that will support the economy, help Ireland meet its climate change targets in line with Climate Action Plan (CAP) 2021 and make Dublin a more liveable and sustainable city. While MetroLink is a critical part of the proposed integrated transport system for the GDA, it is a standalone project that is not dependent on any other projects for its delivery or effective operation.

The proposal for a metro system for Dublin has been central to planning and transport strategy for the GDA for over 20 years. The proposed MetroLink Project presented here has evolved from the previous proposal in response to the development of planning and transport policy and to address the challenges that face Dublin and Ireland today and into the future. Diagram 3 provides a summary of the development of MetroLink since it was first identified in plans and strategies.

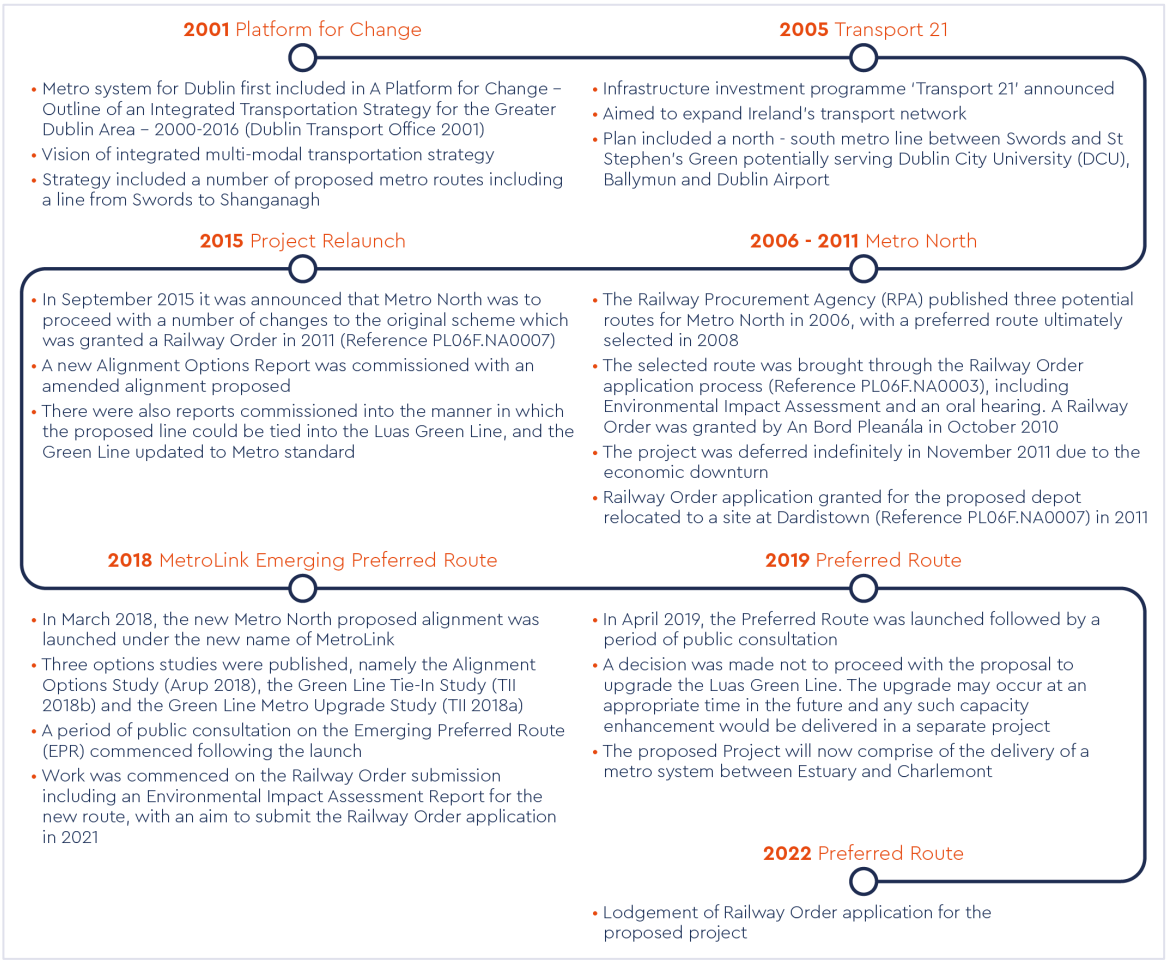

Diagram 3 Project History

4.2 Policy Support for MetroLink

The need for the proposed Project has been established in every relevant transport study and policy document going as far back as A Platform for Change – An integrated transportation strategy for the GDA 2000 to 2016 (Dublin Transportation Office (DTO) 2001). The requirement for the proposed Project is also supported in current policy from national to local level and is included the following;

- The Transport Strategy for the GDA 2016-2035 (NTA, 2016);
- The Draft Transport Strategy for the GDA 2022-2042 (NTA, 2021);
- The Draft GDA Cycle Network Plan 20221;
- The Regional Spatial and Economic Strategy for the Eastern and Midland Region 2019 – 2031;
- The NDP 2018-2027 (Government of Ireland, 2018a);
- The revised NDP 2021-2030 (Government of Ireland, 2020);
- The National Investment Framework for Transport in Ireland 2021 (DoT 2021) and
- The National Sustainable Mobility Policy (DoT, 2022).

4.3 Need for MetroLink

Dublin and Ireland face a number of significant challenges moving into the future, most of which are associated with the growth and success of the Irish economy over the last few decades, particularly in the Dublin area. These challenges are becoming more significant as we face the need to transform to a carbon neutral economy.

4.3.1 The Problem

At a global level the human race faces an existential crisis due to potential impacts of climate change on the world's population and on the natural systems that support it. This crisis requires major changes to be made at every level of Irish society to introduce new systems that result in significant reductions in Greenhouse Gas Emissions (GHGs) to mitigate future climate impacts.

There will continue to be unsustainable sprawling growth patterns around and outside of our cities and larger towns and stagnation in inner city areas, unless future development patterns change. This will mean car-based commuting will continue to dominate, increasing traffic congestion, noise emissions and air pollution. Research by transport data analysts Inrix suggested that Dublin was the 5th worst city in the world for time spent in traffic in 2018 and the 10th for the overall impact of congestion. Similar analysis by Tom Tom ranks Dublin as the 17th worst city in the world for urban congestion in 2019. The Swords, Dublin Airport, Dublin city centre corridor is a major artery for the Irish economy and is becoming increasingly impacted by the trends identified above. Almost 8,000 workers currently commute from Swords to Dublin city centre, but only 12% of those commuters use public transport (Central Statistics Office (CSO), 2016).

"Project Ireland 2040 – National Planning Framework" projects a 20% to 25% growth in population, resulting in a total population of about 1.4 million by 2040 for the Dublin region. The National Planning Framework projects a 30% increase in jobs in Dublin by 2040. Congestion on the road network will deteriorate further unless public transport capacity is increased. Travel demand is anticipated to grow by up to 40% by 2033, which will have significant adverse implications for the road network, with average speeds decreasing by 19% and overall delay increasing by 72%. These figures clearly demonstrate that a continued lack of integrated transport and urban development planning, will guarantee much worst traffic congestion in the future making it very difficult to achieve net zero carbon emissions by 2050 as required under the Climate Action and Low Carbon Development (Amendment) Act 2021.

While the impact of congestion and the lost hours for commuters are significant, the inefficiency of the transportation system hides a lot of additional socioeconomic costs. For example, transport system inefficiencies during peak hours can force many to commute at times that avoid the natural peak times. This is sometimes called "peak spreading" and has been identified by TII on the M50 between the hours of 06:00 and 08:00 and between 15:00 and 16:00 prior to the COVID-19 pandemic in the National Roads Network Indicator 2019 (TII 2020).

Peak spreading puts pressure on families, with one or more parent's being absent from the home for longer periods. This leads to increased childcare demands, increased pressure on parents in the household, which can create a cycle of increased stress, reduced disposable income and reduced quality of life. On the other side, for those that can afford it, it also can generate the desire for multiple vehicles at home (with associated negative environmental and sustainability impacts). It follows that, an inefficient transportation system will generate other societal and economic inefficiencies, making an efficient, reliable and demand responsive transportation system crucial to a sustainable and resilient economy and society.

Lack of access to affordable quality homes constitutes a significant challenge for workers, families, and communities. This is compounded by the lack of serviced land which is viable for new housing and commercial development. Housing and commercial developments must have good connectivity and services to make it viable and attractive to potential residents and businesses.

In 2019 just over 21,200 new dwellings were completed in Ireland, with the majority built in the suburbs of Dublin. However, the Central Bank of Ireland estimates that Ireland will need 34,000 new homes a year to curb the influx in demand and make homeownership more affordable. The lack in supply of housing post 2008 has resulted in average property prices in Dublin rising to €429,000 in 2022. This means home ownership is out of reach for many citizens. This problem is exacerbated by the lack of a high quality public transport that would facilitate the development of higher density quality housing.

4.3.2 The Solution

MetroLink will respond to these challenges by offering, a safe, reliable and efficient transport alternative to the use of cars, thereby promoting "modal shift" away from car-based commuting towards public transport. This will reduce commuting times for the population generally and particularly along the Swords, Airport, city centre corridor. This will result in reductions in GHG emissions, noise and air pollution.

The high passenger carrying capacity and service frequency that MetroLink will provide will enable "Compact Growth" whereby high-quality, high-density housing developments that can be planned and built on available land banks in close proximity to the alignment and its stations. MetroLink will support this development by allowing higher numbers of people to commute and travel without the need for private cars.

By removing cars from the road, MetroLink will facilitate the optimisation of the transport network by freeing up capacity for more efficient roads based public transport and for the efficient transport of goods.

The efficiency of traffic movements along and around Swords, Dublin Airport, Dublin city centre corridor has implications for the entire island of Ireland as the corridor includes key economic locations of national importance. It also forms part of the wider Belfast to Dublin Corridor. Improving the resilience of this corridor is critical and it is this combination of need to address economic development, housing and land-use patterns as our population continues to increase, that elevates the importance of a significant public transport intervention in this area.

MetroLink is a key public transport intervention forming part of a future integrated public transport system which is planned for Dublin. It is a critical project in the delivery of a more sustainable and equitable future for all. MetroLink will make the transportation network more sustainable and create a more sustainable and liveable environment, generating an opportunity for much needed housing development along the alignment, without the requirement for car-based transport. In this way MetroLink will allow Dublin and Ireland to achieve a much more sustainable compact growth solution and a reduction in GHG emissions.

5. Consideration of the Alternatives

5.1 Introduction

This section presents an overview of the reasonable alternatives considered at all stages of the MetroLink project development in order to clearly outline:

- The robust decision-making process that has led to MetroLink's development;
- How environmental analysis was integrated into MetroLink's development from the earliest stages of the proposed Project;
- The main reasons, environmental and otherwise, for choosing MetroLink or the specific element of MetroLink from the reasonable alternatives; and
- The likely evolution of the current state of the environment without implementation of the project (do nothing scenario).

An outline of how the alternatives have been considered and assessed is provided in chronological order in Table 1.

Table 1 Outline of Alternatives Considered during the Development of MetroLink

Alternatives Considered	Description
Old Metro North	
Old Metro North	Outline of the consideration of alternatives as relevant to Metro North having regard to environmental effects.
Strategy/Policy where Alternatives to Metro type project considered	
Fingal North Dublin Transport Study/Transport Strategy for the GDA	Outline of the consideration of alternatives having regard to environmental effects as referred to in the Fingal North Dublin Transport Study 2005 as it informed the Transport Strategy for the Greater Dublin Area.
'Do-Nothing' – Alternative	
'Do Nothing' Scenario	This is a general description of the key environmental effects that would be expected for the Do Nothing scenario should the proposed Project not proceed.
Identification of the Emerging Preferred Route (EPR)	
Alternative options for MetroLink including an analysis of a "Modified Old Metro North" Scenario.	This section summarises the proposed Project alternatives considered leading to the Emerging Preferred Route (EPR) having consideration of the potential environmental effects.
Refinement of the Preferred Route (PR)	
Further assessment of alternative options for MetroLink	This section summarises further alternatives assessments undertaken to determine the preferred route having regard to public consultation feedback.
Alternative Project Level Design	This section summarises the proposed Project alternatives considered having regard to environmental effects leading to decisions made on project design fundamentals including: ▪ Tunnelling Strategy ▪ Depot Location; ▪ Luas Greenline Deferral: and ▪ Grid Connection & ESBN Substation Location.
Alternative Technologies	Discussion of alternative technologies considered having regard to environmental effects leading to decisions made on project covering: ▪ Rolling Stock/Trains, level of automation; and ▪ The overhead catenary system (power supply to the trains).
Alternative Alignments	Alternative alignment options which were assessed having regard to environmental effects to determine the final preferred project alignment: ▪ Crossing the M50 Motorway; ▪ Route Alignment at Lissenhall; ▪ Route alignment along R132; and ▪ Realignment under Trinity College Dublin (TCD).
Station locations and layouts	Discussion on how the specific station locations and layouts emerged based on the project design decisions at Emerging Preferred Route (EPR) and Preferred Route (PR) stage having regard to constraints of each site and potential environmental effects.
Construction Alternatives	This section examines the chapter considered alternatives assessed having regard to environmental effects as they relate to the construction phase of the proposed Project: ▪ Tunnel Boring Machine (TBM) launch sites; ▪ Location of Construction Compounds; and ▪ Construction of Stations.

5.2 Fingal North Dublin Transport Study

In October 2010, "Old" Metro North was granted a RO by The Board (Reference PL06F.NA0003). A subsequent RO application was granted for the proposed depot to be relocated to a site at Dardistown (Reference PL06F.NA0007).

Following the economic downturn in 2008, The Infrastructure and Capital Investment 2012 – 2016: Medium Term Infrastructure Framework (DPER, 2011) laid out a plan to defer a number of major infrastructural projects including the Metro North project in order to achieve fiscal consolidation.

In 2014 the NTA commissioned the 'Fingal/North Dublin Transport Study' (NTA 2015) to identify the optimum long term public transport solution to connect three core areas, namely Dublin city centre, Dublin Airport and Swords, running north/south through the Fingal and Dublin City Local Authority areas. This study identified and assessed 25 options for the provision of public transport along this corridor. These options included heavy rail options, light rail and Metro options and Bus Rapid Transit (BRT) options

The study recommended that an "Optimised Metro North" be further developed as the preferred solution to address the transport needs on the key Swords, Dublin Airport, Dublin city centre corridor.

5.3 The Do Nothing Scenario

The consideration of alternative options included a 'Do Nothing' Scenario. This is a scenario where MetroLink would not be constructed. In the 'Do Nothing' Scenario there are no improvements made to the current transport systems and as a consequence traffic congestion will continue to grow. This will result in increased journey times for commuters and impacts on the efficiency of transport and haulage services vital to the economy as well as increased pollution and Greenhouse Gas (GHG) emissions. The Do Nothing Scenario is therefore an unacceptable scenario.

5.4 Route and Design Alternatives

The development of the MetroLink design has been informed by the feedback received during non-statutory public consultations and by environmental data, transport data, geotechnical information and surveys carried out during the design development stage.

5.4.1 Emerging Preferred Route (EPR)

In 2016 The NTA and TII commissioned an Alignment Options Study to determine the EPR for New Metro North proposed in the 'Transport Strategy for the Greater Dublin Area 2016 – 2035' (NTA 2016). The New Metro North Alignment Options Report (TII 2018) and all relevant appendices was generated and can be reviewed at https://pc1.metrolink.ie/#/home. The study area for New Metro North was based around a corridor from Swords to Dublin city centre via Dublin Airport and was consistent with the Transport Strategy for the Greater Dublin Area (GDA).

The New Metro North Alignment Options Report analysis was carried out using a phased approach as follows:

- **Phase 1:** Initial identification of options: Feasible and practicable route options were identified within three distinct geographical areas, Area A (Dublin City); Area B (Ballymun/Airport); and Area C (Swords). Potential station locations were identified to serve transport demand and route options to connect the stations were then developed. The feasible options which met the project objectives were carried forward to the next phase.
- **Phase 2:** Preliminary assessment of options: Feasible route options were assessed against a range of environmental and technical criteria. This concluded with the identification of six feasible route options in Study Area A, nine in Study Area B, and five in Study Area C, including the associated station locations.

- **Phase 3 - Stage 1:** Multi-Criteria Analysis (MCA): The feasible route options within each study area were appraised against multiple criteria. These criteria were aligned with the 'Guidelines on a Common Appraisal Framework for Transport Projects and Programmes' (CAF) published by the Department of Transport, Tourism and Sport (DTTAS 2016). Eight options across the three study areas were taken forward to the next phase, three in Study Area A, three in Study Area B, and two in Study Area C.
- **Phase 3 - Stage 2:** Multi-Criteria Analysis (MCA): The study area options were combined in different arrangements to arrive at ten end-to-end route options which were assessed using five project-specific route options assessment criteria; economy, integration, accessibility & social inclusion and the environment.
- **Phase 4:** Selection of the EPR: Based on the conclusions of the MCA, a preferred "Emerging Preferred Route" was chosen based on its benefit to cost ratio, public transport usage, better integration with the wider transport network, and fit with land use policy.

The EPR was subject to non-statutory public consultation in 2018. Submissions made by stakeholders and the public during the Public Consultation in 2018 were carefully analysed.

The proposed Project was re-named "MetroLink" at this stage of project development in order to clearly differentiate it from the Old Metro North project.

5.4.2 Preferred Route (PR)

Following the conclusion of the EPR consultation the MetroLink route was modified to address stakeholder observations and to incorporate a number of design development changes and improvements. This culminated in the development of a Preferred Route (PR) for MetroLink.

Some of the key changes to the proposed Project are:

- Tunnel configuration from twin bore to single bore and location of tunnel launch sites;
- Crossing of the M50 Motorway using a viaduct;
- The location of the proposed depot at Dardistown;
- The deferral of MetroLink running on the existing Luas Greenline;
- Minor alterations to the alignment when compared to EPR;
- Minor modifications to Station locations;
- Design and location of intervention shafts and tunnels; and
- Alterations to the proposed substation locations.

Detailed assessment of alternatives led to the identification of MetroLink which was brought forward and developed. It was then subject to a full assessment in this EIAR in order to define potential impacts, and to propose mitigation measures to minimise identified impacts.

6. Description of the Project

MetroLink is a fully segregated and automated railway, mostly underground and approximately 18.8km in length. It has 16 stations running from north of Swords at Estuary through Swords, Dublin Airport, Ballymun, Glasnevin and the city centre to Charlemont in the south of Dublin city centre.

It includes a 9.4km section of single bore tunnel running beneath Dublin city centre from Northwood Station to Charlemont Station and a 2.3km section of single bore tunnel running beneath Dublin Airport. Tunnel sections include intervention access facilities for emergency services at Dublin Airport, Albert College Park and just south of Charlemont Station. Tunnel portal structures will be provided at Northwood, Dardistown and Dublin Airport. North of Dublin Airport the alignment will emerge from tunnel and will run at surface level, in cut and cover and on elevated structures to Estuary Station . A new 99m long bridge will be constructed over the M50 Motorway and a 261m long multi-span Viaduct over the Broadmeadow and Ward Rivers.

There will be a total of 16 stations including

- 11 underground stations at Dublin Airport, Northwood, Ballymun, Collins Avenue, Griffith Park, Glasnevin, Mater, O'Connell Street, Tara, St Stephen's Green and Charlemont;
- Four retained cut stations at Seatown, Swords Central, Fosterstown and Dardistown; and
- One at grade station at Estuary.

A multi-storey 3000 space Park & Ride (P&R) close to the M1 Motorway will be provided at Estuary Station.

A maintenance depot is proposed at Dardistown (alongside the station) which will house all the facilities required for the maintenance and operation of MetroLink, its rolling stock and the Operational Control Centre;

The works will also include railway signalling, command and control and communications systems; provision of electrical substations and other electricity infrastructure to power MetroLink; establishment of new and realigned access routes and road junction improvements; diversion of existing utilities; provision of new drainage infrastructure; provision of environmental mitigation measures; and other infrastructural modifications to facilitate the overall project delivery.

6.1 Route Alignment

The alignment consists of sections at surface (ground level), on viaducts/bridges, in open cut and covered and in tunnel. Most of the surface sections will be in retained cut, with shorter sections at ground level in the vicinity of Estuary and around Fosterstown, and along short sections on embankment on approaches to the viaducts. Diagram 4 illustrates the different types of cross sections at the surface and in open cut and covered parts of the MetroLink alignment. The alignment has been designed without tight curves or steep gradients so that the trains run safely and smoothly at speed. The rail corridor will include other features such as signalling, telecommunication and overhead line equipment, electricity cables, railway drainage and access tracks. The width of the railway corridor will vary along its length in order to accommodate the existing ground, cuttings, embankments and tunnels.

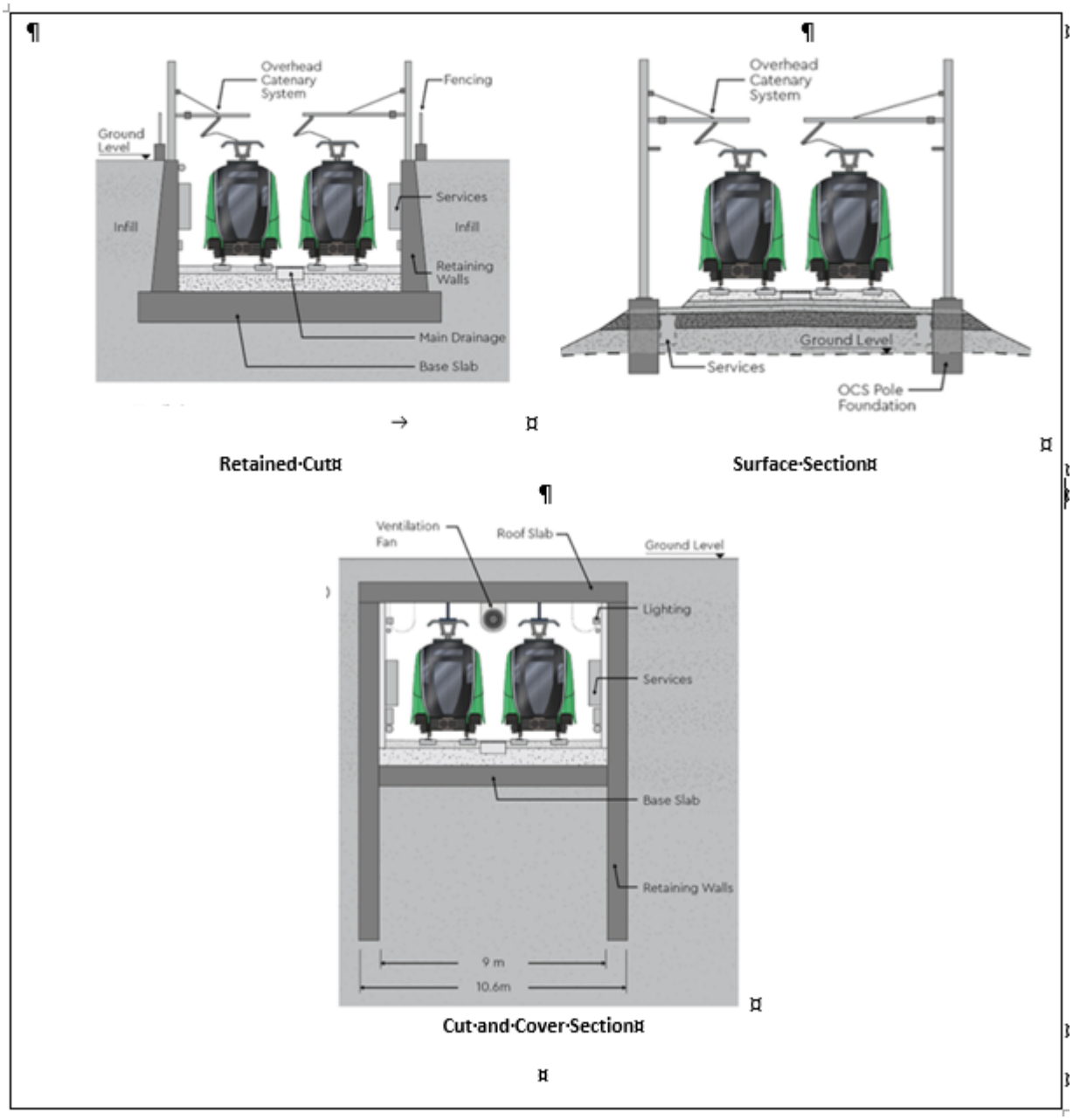

Diagram 4 Surface and Cut Sections

6.1.1 Tunnels and Portals

The main tunnels will comprise a single bore, twin track tunnel containing both northbound and southbound rail lines (Refer to Diagram 5). The tunnels will be fitted out with an overhead conductor rail to supply power to the trains, power cables, ventilation fans, drainage, and equipment for telecommunications, CCTV, lighting and Wi-Fi.

- The Airport Tunnel runs between the Dublin Airport North Portal (DANP) and the Dublin Airport South Portal (DASP). It is approximately 2.3km long and connects to the proposed Dublin Airport MetroLink Station that will be located under the current Terminal 2 Surface Car Park. Two smaller tunnels extending from the DASP northwards along either side of the main tunnel - a 315m long evacuation tunnel and a 600m long ventilation tunnel.
- The City Tunnel is approximately 9.4km long and runs south from the Northwood Portal, through nine stations, and terminates underground 360m south of Charlemont Station. There is no portal at the southern end of MetroLink as the southern terminus is underground. At the Charlemont an evacuation and ventilation tunnel approximately 300m long and close to the end of the City Tunnel is provided.

Evacuation and ventilation shafts will also be provided at each of the underground stations and at the Albert College Park Intervention Shaft.

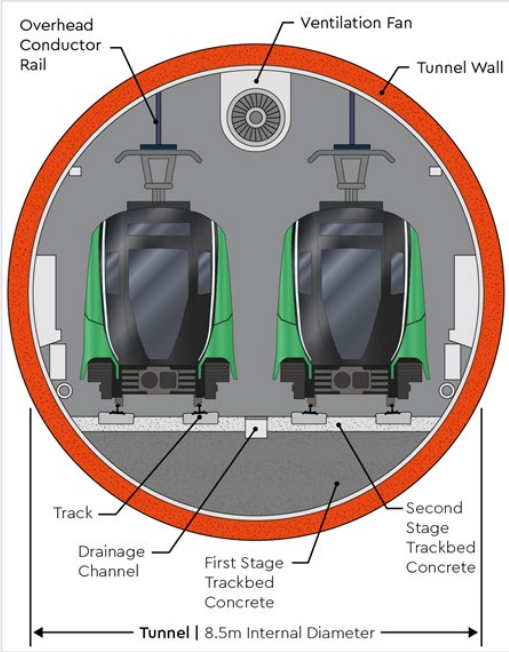

Diagram 5 Indicative Tunnel Cross Section

6.1.2 MetroLink Station Types

The design for the proposed stations has been based on the principles of; safety, accessibility, clear visual identity, easy wayfinding and access, maximising natural daylight, efficient use of space, and provision of cycle parking at stations. All stations will have back of house (BoH) facilities and welfare facilities for staff. All the stations will have full height platform screen doors to control access onto the trains at platform level. There are three different MetroLink station types; Surface Stations, Retained Cut Stations and Underground Stations. The specific design features of each are set out below.

Surface Station (Estuary)

Surface stations are designed to provide a seamless connection for passengers arriving and leaving by bus, car, taxi, cycle and on foot. The design includes bus stops and drop off points, cycle parking, and P&R. The station is integrated with local footpaths and roads and with the planned future development of the surrounding area. The architectural concept for the station building (the canopy, platforms, and finishes) provides for easy passenger movement between the platforms, the P&R, and arrivals from the west and east side of the station. The station has also been designed to ensure accessibility for all through signposting, step free access and visual and auditory aids.

Diagram 6 View of Surface Station (Estuary)

Retained Cut Station (Seatown, Swords Central, Fosterstown & Dardistown)

The canopy for retained cut stations provides visual identification from surrounding areas as well as shelter over the platforms, and an environment to create meeting points for passengers. Glass panels around the station are used to maximise the use of daylight and provide protection from the weather. The urban realm design includes a plaza at the station entrance, planting, seating, bicycle parking and sustainable drainage systems.

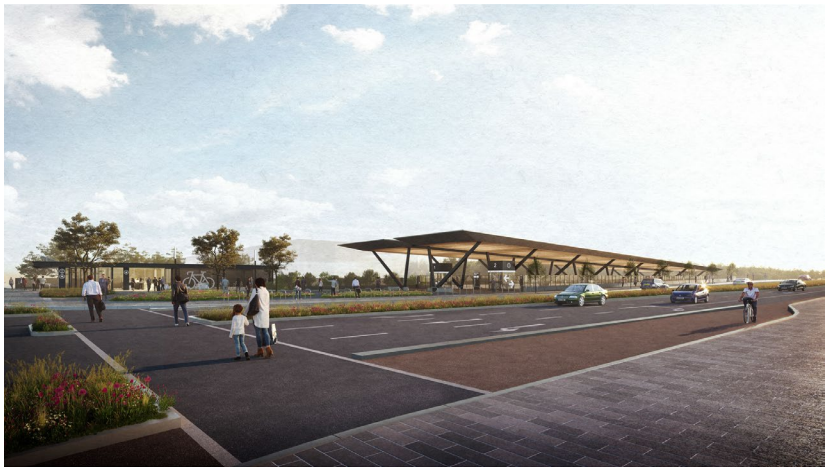

Diagram 7 View of a Station in Retained Cut (Seatown)

Underground Stations (Dublin Airport and all stations from Northwood to Charlemont)

The underground stations have a canopied entrance over escalators and stairs leading into the station. Other surface features include skylights, emergency exits, ventilation grills and air in-takes and a separate canopied passenger lift which is located near the main station entrance. Urban realm around the station entrances includes hard landscaping, planting, seating areas, bicycle parking and sustainable drainage systems. Once inside the station the space consists of a single public open area with inclined walls between the skylights and ceiling and the mezzanine which provides a bright and open space for passengers. The stations have been designed for efficient passenger movement from the entrance to the platforms and to this end escalators, stairs and lifts between the various levels have been provided. Skylights are included to allow natural light over the mezzanine level where feasible.

Diagram 8 View of an Underground Station at Street Level (Tara Station)

6.1.3 Metro Vehicles and Automation

Twin track (one pair of tracks running in each direction) will be provided along the length of the MetroLink alignment consisting of tracks slotted into concrete slabs. MetroLink will operate with automated trains, where the starting and stopping of trains, the operation of doors, and handling of emergencies will be fully automated and controlled from the Operations Control Centre at Dardistown Depot. All automated services will be monitored and fully supported by staff at the Operations Control Centre and all along the alignment.

The trains will be approximately 64m long (Refer to Diagram 9), bi-directional (i.e., can travel in both directions), with three or four carriages likely to accommodate 500 passengers per train including seating capacity for at least 100 passengers. The timetable assumes 40 trains per hour, which provides the required demand of up to 20,000 passengers per hour per direction. The platforms will be at the same height as the floor of the trains for ease of access. The standard operational speed of the train is 80km/hr.

Diagram 9: Indicative Train

Electrical power will be provided by Electricity Supply Board Networks Ltd (ESBN) from the national grid. Minor works are required at Newbury and Belcamp substations and new high voltage transmission cables will be installed, mostly along roadways, to two new electricity substations, one to be located near Dublin Airport North Portal (DANP) and another by Dardistown Depot. The new MetroLink grid connections will be installed under separate planning approval and are therefore not cover by the MetroLink RO, however their installation has been considered by the MetroLink EIAR.

To ensure the efficient and safe operation of MetroLink an integrated communication system will be implemented to connect stations, power system substations, the Dardistown Depot Operation Control Centre and the backup Operation Control Centre at Estuary, the auxiliary substations, and maintenance facilities at Dardistown Depot.

As MetroLink will have a high level of automation, access to the surface track will be isolated from the surrounding area for safety reasons. Fencing and vehicle restraint barriers will be installed along both sides of the surface sections of the railway corridor. Access from the station platforms to the track and tunnel sections will be controlled by the full height platform screen doors.

Technology systems such as Access Control and Intrusion Detection, obstacle detection systems on the trains, and CCTV will be installed at various locations to protect passengers and the railway assets.

6.2 Description of the MetroLink Alignment from North to South

MetroLink will be located fully within County Dublin, passing through the administrative areas of Fingal County Council (FCC) and Dublin City Council (DCC). The following sections describe MetroLink from north to south for each of the four assessment zones (AZ):

- **AZ1 Northern Section:** Estuary Station to Dublin Airport North Portal (DANP);
- **AZ2 Airport Section:** Dublin Airport North Portal (DANP) to Dublin Airport South Portal (DASP);
- **AZ3 Dardistown to Northwood:** DASP (Dublin Airport South Portal) to Northwood; and
- **AZ4 Northwood to Charlemont Section**.

6.2.1 AZ1 Northern Section, Estuary Station to Dublin Airport North Portal (DANP)

Diagram 10 presents an overview of features located between Estuary and the DANP.

Diagram 10: AZ1 Locations and Features

MetroLink commences at Estuary Station and the P&R at Lissenhall. Diagram 11 shows the proposed station, and the bridge connection to the P&R. A bicycle parking facility will be located on the west side. The backup Operational Control Centre will be located here too.

Diagram 11: Indicative View of Estuary Surface Station Platform and Drop off

The P&R (Diagram 12) will provide 3,000 car parking spaces, including 694 Electric Vehicle (EV) charging spaces and 208 accessible parking spaces.

Diagram 12: General Visualisation of the Proposed P&R Facility

New road modifications will provide access to the P&R off the R132 using a short section of the proposed Swords Western Distributor Road to the north, and a new signalised access off the R132 and Ennis Lane to the south. Ennis Lane will be severed, and a new pedestrian/cycle underpass provided under the new MetroLink alignment to mitigate. Extensive landscaping will be provided around the station and the P&R, and further south towards the Broadmeadow River.

The MetroLink alignment runs southwards over the Broadmeadow and Ward Rivers (and their floodplains) on the Broadmeadow and Ward Rivers Viaduct. It will then pass to the east side of Balheary Park before going into a section of cut and cover under the Estuary Roundabout on the R132 Swords Bypass. The Swords Rovers Football Club and Fingallians GAA pitches will need to be modified to accommodate the MetroLink alignment.

South of Estuary Roundabout, the alignment will be in open cut before entering another section of cut and cover to cross to the eastern side of the R132 Swords Bypass. The alignment will then continue south of Seatown Road Roundabout to where Seatown Station will be located. The alignment between Seatown Station and Swords Central Station will lie east of the R132 Swords Bypass and will consist of sections of open retained cut, with localised cut and cover sections under the Malahide Road Roundabout and at specific locations to reinstate access to private properties. Swords Central Station has been designed to link with the Swords Pavilions Shopping Centre via a pedestrian crossing.

Diagram 13: Indicative Aerial View of Swords Central Station (Retained Cut Station)

The alignment between Swords Central Station and Fosterstown Station will consist of sections of retained cut, with cut and cover sections to support future eastern development access and to enable passage under Pinnock Hill Roundabout. At Fosterstown Station a new pedestrian crossing is proposed connecting the station to the west side of the R132. The alignment will then cross to the western side of

the R132 Swords Bypass, just south of the existing junction, before passing through existing agricultural lands, initially in retained cut, then on low embankments and in cuttings. It will then cross the Sluice River and Forrest Little Stream, which will both be culverted. Both culverts will include a mammal ledge to allow otters and other animals access across the alignment. In addition, the Sluice River culvert will incorporate an agricultural accommodation road. This section ends just north of the Naul Road.

6.2.2 AZ2 Airport Section, Dublin Airport North Portal (DANP) to Dublin Airport South Portal (DASP)

Diagram 14 presents an overview of locations and features in AZ2, Airport Section.

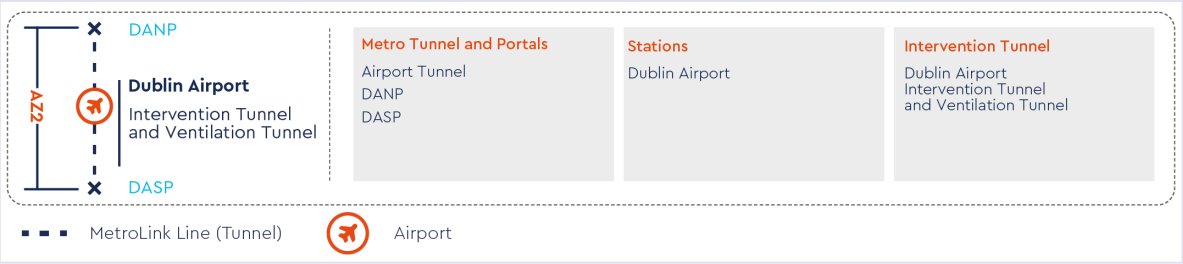

Diagram 14: AZ2 Location and Features

The alignment crosses the Dublin Airport lands in tunnel, with the DANP located north of Naul Road and the DASP located south of the Old Airport Road where parallel evacuation and ventilation tunnels will also exit. Dublin Airport Station (Diagram 15) will be located under the Terminal 2 Surface Car Park. The entrance will be identified by a large canopied structure with safe pedestrian routes provided to both Terminals 1 and 2. Access to the station will be via escalators, lifts and stairs.

Diagram 15: Indicative Aerial View of Dublin Airport Station Entrance

6.2.3 AZ3 Dardistown to Northwood, Dublin Airport South Portal (DASP) to Northwood

Diagram 16 presents an overview of the locations and features in AZ3 between the DASP and Northwood Station.

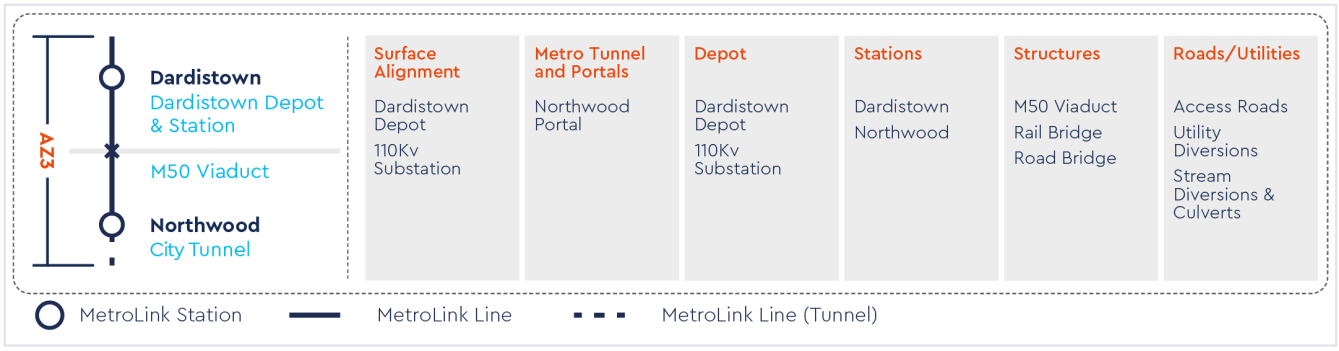

Diagram 16: AZ3 Location and Features

This section of the alignment is 2km long in total. The alignment emerges from the Airport Tunnel in cut-and-cover and retained cut before continuing to Dardistown Station and the Dardistown Depot located to the west side of the station. From here, the MetroLink alignment continues south, rising to cross over the M50 to the east of Junction 4 on a viaduct, before descending to ground level and turning to the southwest and descending below ground level in cut and cover to pass under the R108 Ballymun Road to Northwood Station. For safety and security reasons, there will be no provision for cyclists or pedestrians to use the viaduct.

Dardistown Depot will cover an area of approximately 19.5ha. This land will be levelled and the Turnapin Stream diverted around the northern boundary. It will be necessary to modify the Starlights GAA and Na Fianna GAA football grounds and relocate Whitehall Rangers Football Club. Dardistown Depot will function as the main stabling and maintenance workshops for trains and will house the Operational Control Centre. The layout of Dardistown Depot is presented in Diagram 17.

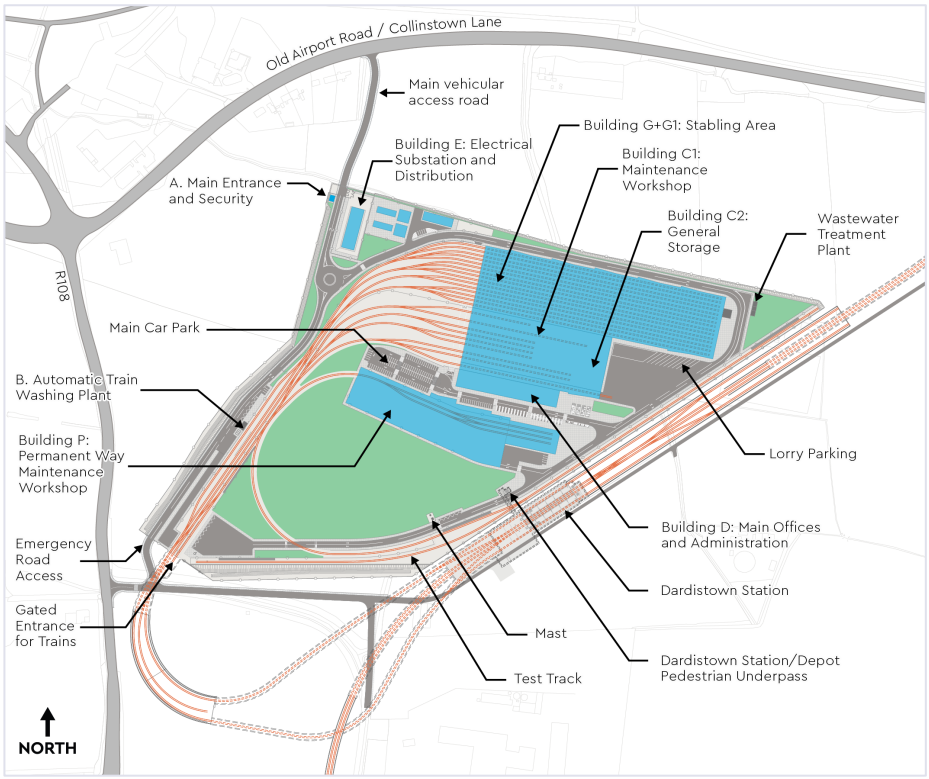

Diagram 17 Dardistown Depot and Dardistown Station

Dardistown Station is located along the south-east boundary of Dardistown Depot. The Dardistown Station will be constructed as part of MetroLink and staff working at Dardistown Depot will be able to arrive by train and enter the Depot via a subway and gated access. However, the station will not be

accessible to the general public when MetroLink first opens. The opening year for Dardistown Station is not yet confirmed and will depend on future development in the area.

Northwood Station will be located diagonally under the R108 Ballymun Road close to the junction with Northwood Avenue and in walking distance to Gulliver's Retail Park.

6.2.4 AZ4 Northwood to Charlemont Station

Diagram 18 presents an overview of the locations and features along AZ4 between Northwood and Charlemont. This section will be 9.4km long and entirely in tunnel, with the tunnel portal located just south of Northwood Station.

From the Northwood Portal the alignment will continue southwards to Ballymun Station on the west side of the R108 Ballymun Road. The station location will be integrated with pedestrian access, bus stops and cycle lanes. A plaza area is provided in front of the station entrance and the urban realm includes for planting, seating, and bicycle parking.

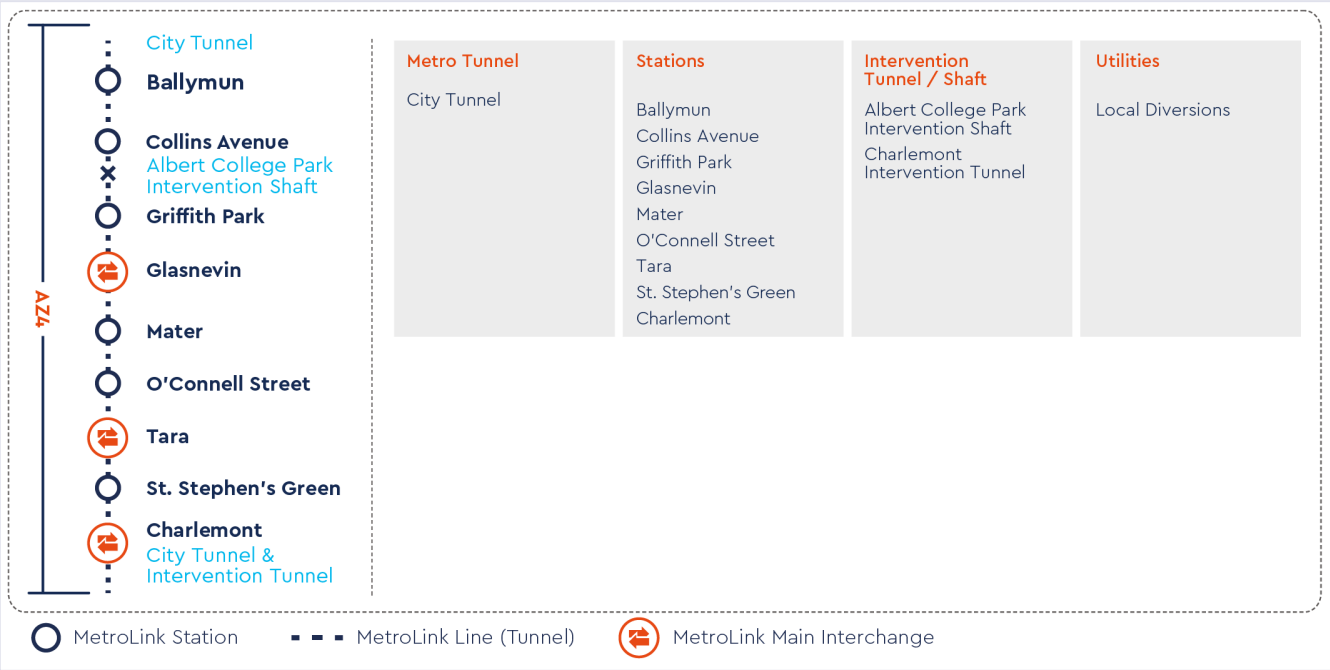

Diagram 18 AZ4 Location and Features

The tunnel alignment will then continue southwards to Collins Avenue Station which will be located in front of Our Lady of Victories Church (Diagram 19).

Diagram 19 Indicative Aerial View of Collins Avenue Underground Station

The alignment will continue south under the R108 Ballymun Road corridor towards the southwest corner of Albert College Park where the Albert College Park Intervention Shaft will be located. The land take required for the Albert College Park Intervention Shaft will affect two 5 a-side football pitches currently located to the east of Ballymun Road (R108) and therefore these pitches will need to be relocated and modified.

The tunnel alignment continues south under St Mobhi Road to Griffith Park Station. The station will be located under the grounds used by Home Farm Football Club (FC) on the east side of the R108 St Mobhi Road. During construction, Home Farm FC will use alternative grounds, returning to this site on completion of the Construction Phase. Griffith Park Station will be accessed from the south off the existing access to Whitehall College of Further Education. The station will connect with bus routes on the R108 St Mobhi Road as well as walking and cycling routes.

The alignment will then continue south passing under the Tolka River and then under the R135 Botanic Road. Continuing south, it will closely follow Botanic Road before reaching Glasnevin Station located on the west side of the R108, Prospect Road. Glasnevin will be a major interchange station providing direct connections for passengers using MetroLink, the Western Commuter Line and the South-Western Commuter Line Iarnród Éireann services, local bus routes, walking and cycling. A pavilion will provide shared entrances for both Iarnród Éireann and MetroLink services with clear wayfinding to direct passengers through the station. The underground station will comprise five levels open to the public; the Iarnród Éireann platforms, an intermediate level for passengers to move between Iarnród Éireann and MetroLink services, and then the concourse, mezzanine and platform levels of MetroLink. At ground level the station layout will be integrated with bus routes and will incorporate a taxi rank, drop off point and bicycle parking.

South of Glasnevin Station the alignment will pass under the Royal Canal in a south-easterly direction towards the Four Masters Park. Mater Station will be located under the Four Masters Park, with the R135 Berkeley Road to the west of the park, Eccles Street and Mater Hospital on the north side of the park, and St Joseph's Church immediately south of the park (Diagram 20). There will be a single entrance to the northwest corner of the park and close to Mater Hospital. The Mater Station location will allow for connections with bus services to and from Dublin City.

From Mater Station, the alignment continues in a south-easterly direction towards O'Connell Street, progressing under rows of Georgian Houses lining Blessington Street, Frederick Street North and Parnell Square East. The alignment will pass near to the Garden of Remembrance, the Rotunda Hospital and the Gate and Ambassador Theatres. O'Connell Street Station will be located within the planned Dublin Central Masterplan site immediately west of O'Connell Street Upper and south of Parnell Street.

Diagram 20 Indicative View of Mater Station

Dublin Central GP Ltd plans to build a mixed-use development to include restaurants and cafes, retail units, offices, and car and bicycle parking. This entire development would be structurally independent of and not prejudicial to the proposals for O'Connell Street Station, i.e., neither the oversite

development or the station would be dependent on one another for structural support. In the event that Dublin Central GP Ltd does not gain planning approval for their redevelopment of this site, or it does not progress, the existing buildings would still be demolished, but with the façades of the protected buildings fronting O'Connell Street retained. The station would be completed to ground level with temporary hoardings provided around the site ready for other oversite development plans.

South of O'Connell Street Station the alignment continues east and under Dublin city centre, where it will pass under the Luas Red Line near the Abbey Theatre. The alignment will then cross under the River Liffey towards Tara Station. The proposed location for Tara Station will lie under the area bordered by the existing DART rail line to the east, Poolbeg Street to the north, Tara Street to the west and Townsend Street to the south. Tara Station will provide good connections to the DART services.

From Tara Station the alignment will continue south passing under the eastern end of the TCD campus, Leinster Street South, under several architecturally important buildings including Leinster House, Government Buildings, the National Gallery, National Library, and the National Museum of Ireland. The alignment will then pass under St Stephen's Green North before reaching St Stephen's Green Station.

St Stephen's Green Station will be located partially under the R138 St Stephen's Green East Road, and partially under the existing park, with the station entrance in the north-eastern corner of St Stephen's Green. This location was chosen to maintain as much of the Park as possible.

Continuing southwest, the alignment will follow St Stephen's Green East and continue along Earlsfort Terrace, passing close to the National Concert Hall. From here it will curve southwards and pass under Harcourt Terrace and the Grand Canal before reaching Charlemont Station located on a site south of the "Carroll's Building" on Grand Parade and bounded on the west side by the Luas Green Line. This site, currently under development by a third party, is where Charlemont Station will be built. Charlemont Station will provide a connection with the Luas Green Line and an improved pedestrian link to the Charlemont Luas Stop.

The City Tunnel continues southwards, terminating 360m beyond Charlemont Station to provide a sufficient length of track to enable trains to be turned back towards the Airport and Estuary Station. A parallel evacuation and ventilation tunnel will also be constructed alongside this section of tunnel that will connect back to Charlemont Station.

The rail corridor will include other features such as signalling, telecommunication and overhead line equipment, electricity cables, railway drainage and access tracks. The width of the railway corridor will vary along its length to accommodate the existing ground, cuttings, embankments and tunnels.

7. Construction of MetroLink

7.1 Introduction

This section provides an overview of the construction activities and methods that are anticipated to be used during the Construction Phase, systems testing and commissioning of the MetroLink Project.

The programme for the construction of MetroLink has been developed to achieve the shortest Construction Phase possible in order to minimise the duration of potential environmental impacts, while ensuring that the areas surrounding the works sites remain operational and functional. The predicted construction programme for MetroLink is 9.25 years.

7.1.1 Working Hours

Standard working hours will be 07:00hrs to 19:00hrs on weekdays, with 30 minutes site preparation time either side of these hours (excluding Bank and Public Holidays), and 07:00hrs to 13:00hrs on Saturdays, again with 30 minutes site preparation time either side of these hours. However, there are certain activities at specific locations where working hours will need to extend beyond the standard working

hours. These include activities such as works at the TBM launch sites (which will operate 24 hours a day), track installation, overnight possessions where work is required at Glasnevin Station in order to avoid impacting existing rail services, and overnight possessions in the vicinity of the M50 Motorway.

Tunnelling and directly associated activities at TBM launch sites will be carried out on a 24 hour a day, seven days a week basis, to allow the MetroLink programme to minimise the duration of impacts arising from the Construction Phase.

In the event that further work is required outside of the standard hours, an approval will be sought from the relevant Local Authority for these works on a case-by-case basis.

7.2 Construction Phase Employment

The construction workforce numbers will vary depending on the Construction Phase stage of the project. However, it is anticipated that at the peak of construction there will be a construction workforce of approximately 4,300 people directly employed. In addition, it is anticipated there will be significant indirect employment supported by MetroLink, for example; logistical support companies, material and plant suppliers, traffic management companies and the local service industry.

7.3 Construction Compounds

Construction compounds and site offices will generally be situated along, or near, the elements of MetroLink that they are intended to support. Construction compounds, including any areas used for access, will be returned to the most appropriate use as soon as reasonably practicable after completion of the works (apart from areas used for permanent land take). Main construction compounds will act as strategic hubs for core project management activities (i.e., engineering, planning and construction delivery) and for office-based construction personnel. They will include:

- Offices and welfare facilities;
- Workshops and stores;
- Storage and laydown areas for materials and equipment (e.g., aggregates, structural steel, steel reinforcement); and
- Limited parking for construction vehicles.

Satellite construction compounds will be smaller generally and provide local office and welfare facilities; local storage for plant and materials; and limited parking for construction vehicles. Lorry holding areas have been allocated within the main and satellite construction compounds as space allows.

The main logistics sites will be located at Estuary, near Pinnock Hill east of the R132 Swords Bypass, and north of Saint Margaret's Road at the Northwood Compound.

Temporary working areas located along the MetroLink alignment will be provided to aid the construction of retained cut, cut and cover, elevated track and surface track sections. These strips of land range from 10m to 25m wide on either side of the alignment and will be used for logistics and access along the route.

7.4 Construction Phase - Enabling Works

Enabling Works are the works to be undertaken in advance of the main infrastructure works, including the preparation of site compounds and land take for the main work activities. Enabling Works survey requirements include further biodiversity surveys, archaeological investigation, contamination investigations, monitoring of groundwater, noise and vibration, and ground movement.

As part of the Enabling Works, trees, vegetation and invasive species will be removed from the proposed construction areas. Before any ground works can occur on-site, remediation of ground contamination will be carried out.

Demolition works will be required to facilitate the construction of MetroLink. The required demolitions include minor demolitions (associated with utility structures and boundary walls) and major demolitions (i.e., demolition of footbridges, residential, community and commercial/industrial properties). Demolition will generally be top-down, where demolition starts on the upper levels before proceeding towards ground level. This method is used as it is less impactful on surrounding property, buildings and the environment. All property to be demolished will require pre-demolition surveys and the preparation of a Demolition Plan (DP).

Archaeological investigation will be required at various locations as included in the Enabling Works programme.

Utility diversions and protection measures will be planned, agreed and undertaken in cooperation with the relevant utility stakeholders and agencies. Relevant approvals will be in place prior to any work commencing on a utility or service.

Movement monitoring of buildings, structures, infrastructure, utilities, and the ground, including groundwater levels, will be undertaken along the route where there is a possibility of small and limited ground movement occurring as a result of MetroLink sub-surface construction and or tunnelling. This monitoring will ensure the safe construction of MetroLink at all times and provide advance warning of any unacceptable ground movement trends before they become an issue.

The extent and nature of the Construction Phase traffic management has been determined by road audit assessments of the proposed site entrances and exits, assessments of predicted heavy goods vehicles (HGV) numbers and existing traffic levels, the agreed haul routes to and from the site, and the location of the vehicle holding areas. Prior to implementation, all traffic management measures will be agreed with Fingal County Council (FCC) and Dublin City Council (DCC), and where relevant, consultation with An Garda Síochána and other statutory stakeholders such as Iarnród Éireann.

7.5 Construction Phase - Main Works

The "main works" are construction works undertaken to build the infrastructure needed for the proposed Project. This includes works such as excavation and construction of roads, sub-surface structures and tunnels, surface stations, buildings and structures.

7.5.1 Road Construction and Traffic

There will be a requirement for road diversions, closures, and/or realignment of existing roads, footways, cycle lanes and entrances. The provision of several new roads and underpasses is also required.

There will be a number of areas where cut and cover construction will be used, primarily where MetroLink passes underneath existing roads such as on the R132 at the Malahide Roundabout at Nevinstown Lane (Diagram 21) and south of Airside Retail Park on the R132.

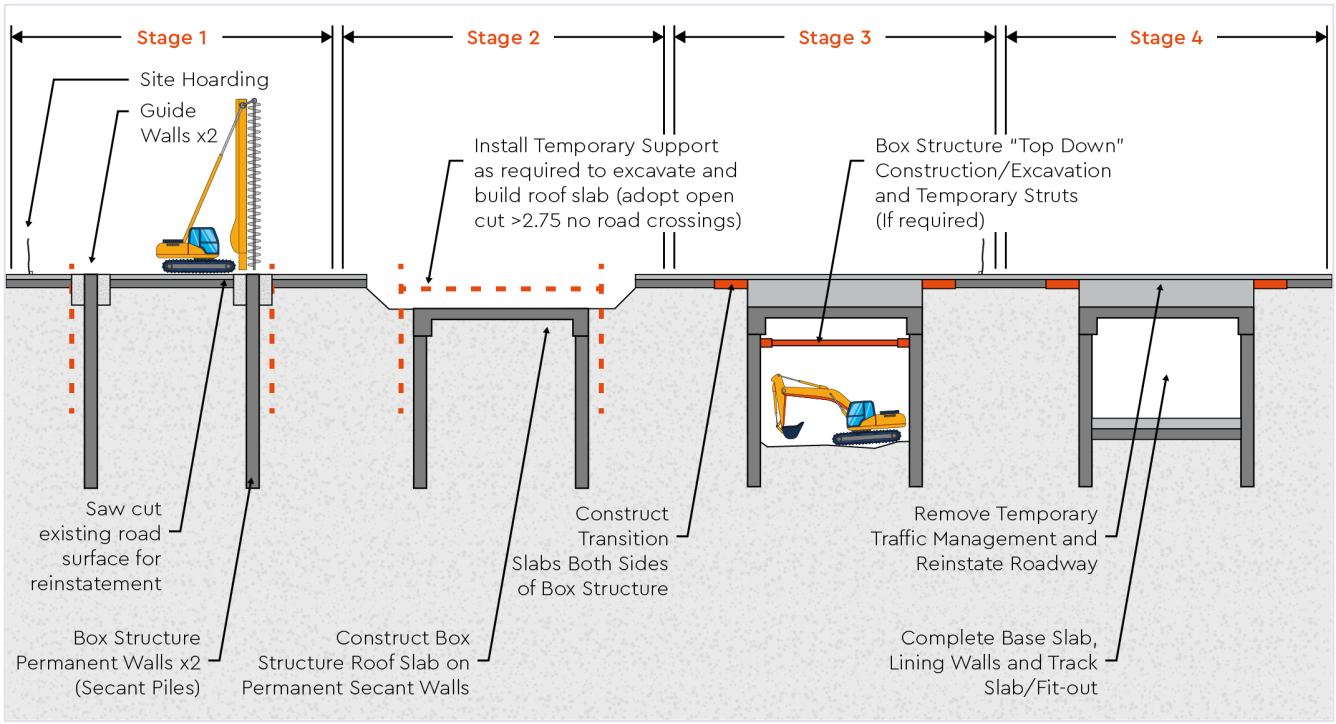

Diagram 21 Typical Cut and Cover Road Crossing Staging

7.5.2 Construction of Subsurface Structures

Construction of permanent subsurface structures such as stations, retained cut, and cut and cover sections will commence with the installation of vertical walls in the form of concrete secant piles or diaphragm walls (D-walls) as shown in Diagram 22.

This will provide ground support prior to the main excavation being carried out and limit ground movements. Once these walls are in place, excavation will commence to remove the rock and soil within the extent of the D-Walls or the secant pile walls.

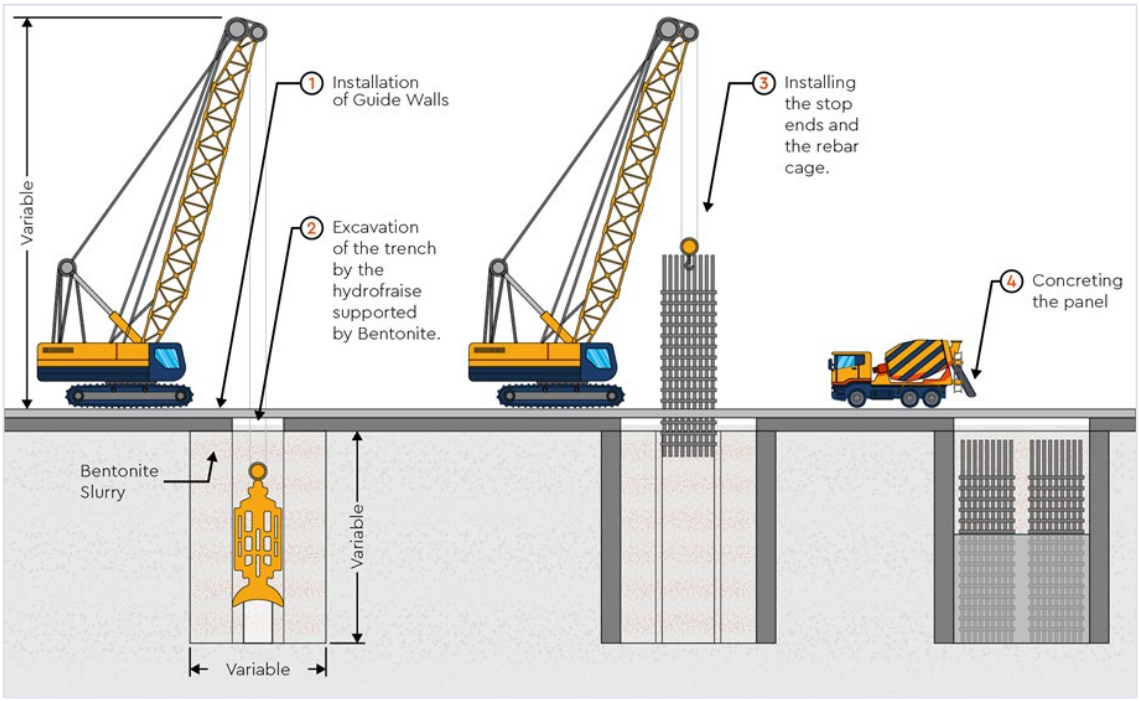

Diagram 22 Example of D-wall Construction

7.5.3 Excavation

7.5.3.1 Mechanical Excavation

Mechanical excavation will be the principal type of excavation used to excavate soil and rock prior to the construction and installation of the railway alignment, stations and other structures. Mechanical excavation will be typically carried out using standard plant such as excavators, bulldozers, vacuum excavators and graders. Specialist equipment such as road headers will be used to excavate rock for tunnel formation where mechanical excavation is required (Diagram 23).

Diagram 23 Example of a Road Header

7.5.3.2 Drilling and Blasting

Drilling and blasting will be used to enable rock excavation to form Dublin Airport Station, Northwood Station, Ballymun Station, Collins Avenue Station, Mater Station, O'Connell Street Station, Tara Station, St Stephen's Green Station and Charlemont Station. It is an established and common construction method that involves pre-drilling a series of small diameter holes in the rock face, loading the holes with small

charges and detonating them to break the rock into removable pieces. Typically, blasting will be carried out at agreed set times each day, and nearby residents and businesses will be informed in advance.

The effects of blasting that cause the most potential concern are ground vibration, air over-pressure (air blast) and dust generation. Drill and blast patterns will be designed to ensure that vibration limits are adhered to so that there is no damage to buildings, infrastructure and property. Following blasting, the broken rock will be moved to the lift out location and water sprays used to minimise the release of dust into the air.

7.5.4 Station Construction

7.5.4.1 Surface Station

There is one surface station located at Estuary. Following the Enabling Works the station will be constructed. Key works consist of:

- Piling and foundation support for the station structure;
- Ground excavation (1m to 2m below existing ground level) and the use of reinforced concrete for civil elements);
- Construction of the station and associated buildings; and
- Architectural and mechanical and electrical fitout.

7.5.4.2 Retained Cut Stations

The walls of retained cut stations will likely be constructed using secant piling. Once these walls are in place, they will be supported by struts as excavation proceeds. All excavation for these stations will be undertaken by way of mechanical excavation. On completion of the excavation, the internal floors and walls will be installed prior to the mechanical and electrical fit out and architectural finishing. Once completed there will be a period of testing, commissioning and trial running to ensure that all the systems constructed and installed function correctly. At ground level, surface works will include the installation of architectural elements including the station canopies, emergency exits and fire fighter entrance points. The surrounding landscape and street furniture will be reinstated or installed in accordance with the MetroLink landscape design.

7.5.4.3 Underground Stations

The walls of the underground stations will most likely be constructed as D-walls. Once these are in place, excavation will proceed to allow the roof slab to be constructed using insitu reinforced concrete, leaving necessary openings to facilitate top-down construction (the construction process by which the permanent structure of the station is constructed as the station is excavated downwards).

The roof slab will ensure that noise emanating from the construction works within the station box will be significantly reduced. Top-down excavation in the soil and rock will then be used and is likely to require a combination of mechanical excavation and drilling and blasting as described above. The walls will be either strutted or floor slabs installed as excavation proceeds to provide structural stability and to minimise ground movement during the Construction Phase. Once each station box has been excavated, the base slab and any remaining floors and internal walls will be installed and final civil and builders works, architectural finishing and the mechanical and electrical fit-out will be undertaken to complete each station.

On completion there will be a period of testing, commissioning and trial running to ensure that all the systems constructed and installed function correctly. At ground level, surface works will include the installation of architectural elements such as station canopies, emergency exits and fire fighter entrance points. The surrounding landscape and street furniture will be reinstated or installed in accordance with the MetroLink landscape design.

7.5.5 Tunnelling

7.5.5.1 Bored Tunnels

The main tunnel construction will require the establishment of construction sites and associated compounds to support the operation of a Tunnel Boring Machine (TBM). A TBM will be used to bore both the Airport and City Tunnels.

There will be two main TBM launch sites; one at the Dublin Airport South Portal (DASP) which will serve the TBM boring the Airport Tunnel, and the second at the Northwood Construction Compound that will serve the TBM boring the City Tunnel. It is important to note that these launch sites have been located away from sensitive receptors due to the scale of work required at these sites.

The TBM launch sites will include a number of support facilities, including a slurry treatment plant, storage of segmental tunnel linings and excavated material from the TBM, workshops, carparking, rainwater collection and the storage of water for recycling.

On arrival at their launch sites, the TBM's (Diagram 24) will be assembled, tested and commissioned. Once operational, the TBM will continuously bore 24 hours a day, 7 days a week at an average rate of about 70m per week.

On completion of the City Tunnel, the TBM will buried and sealed underground once all of the removal elements have been extracted. All recyclable components will be dismantled and then transported off site. The TBM used for the Airport Tunnel will be dismantled and removed from site.

Diagram 24 Example of a TBM

7.5.5.1.1 Tunnel Portals Construction

Tunnel portals will be constructed using cut and cover methods. This will result in temporary disruption at the surface while the tunnel is constructed by excavating downwards, building a structural box and then restoring the land over the top.

7.5.5.1.2 Evacuation and Ventilation Tunnels.

In addition to the two main running tunnels, there are three shorter, smaller diameter tunnels. These are the evacuation and ventilation tunnels (also known as Intervention Tunnels) at Dublin Airport and south of Charlemont Station.

- Airport Evacuation and Ventilation Tunnels - These tunnels will be constructed using a small diameter TBM and sprayed concrete lining (SCL) techniques to construct the connecting passages from these tunnels to the Airport Tunnel.
- Charlemont Evacuation and Ventilation Tunnel - This tunnel will be constructed using sprayed concrete lining (SCL) techniques and mechanical and / or drill and blast excavation.

7.5.6 Other Major Construction Works

7.5.6.1 Estuary Park & Ride

Upon completion of the site establishment, the P&R Facility will be constructed. This will involve the following typical sequence of construction works using excavators, mobile cranes, mobile elevated work platforms (MEWP), concrete pumps and booms:

- Installation of foundations and place concrete for ground floor slabs;
- Installation of the ground floor slab and the floor slabs for Level 1, 2 and 3;
- Progressively complete the external façade as the structure is built; and
- Complete access roads, footways, mechanical, electrical and plumbing systems, drainage, lighting, security systems, connecting footbridge and architectural finishes including hard landscaping.

7.5.6.2 Broadmeadow and Ward River Viaduct

Two embankments (circa 3.5m high) will be constructed to allow for the development of the Broadmeadow and Ward River Viaduct spanning both rivers. The construction of the proposed viaduct over the Broadmeadow River and Ward River will comprise a 13-span concrete piled structure with twin concrete bridge deck beams carrying one track each. Construction of the viaduct will involve the following typical sequence of work:

- Installation of piled foundations for the bridge abutment walls and viaduct support piers in a north to south sequence;
- Installation of the bridge bearings and commencement of the erection of precast concrete beams;
- Placement and laying of the in-situ concrete deck using concrete pumps;
- Completion of the upper part of the viaduct structure (e.g., parapets) and connection to the viaduct deck with in-situ concrete;
- Mechanical and electrical fit out and installation of the Overhead Contact System (OCS); and
- Landscaping and reinstatement works.

No in-river construction works will be required, however temporary 'bailey' bridges crossing the two watercourses will be required for construction traffic access. Temporary foundations will be constructed for the temporary bridge crossings to ensure minimal disturbance of the watercourse bank. Foundations will be excavated with the use of a cofferdam (a watertight structure) to protect the works from flooding and the watercourse from being contaminated.

The installation of track bed and completion of railway systems along the viaduct will follow.

7.5.6.3 M50 Viaduct

Following site establishment, construction of the M50 Viaduct will be broken down into a number of key phases as described above for the Broadmeadow and Ward River Viaduct. Temporary traffic management will be required to provide access for the construction of the north and south piers. The installation of the steel beams and decking over the M50 Motorway will be undertaken in a series of phased temporary weekend night-time road closures. Diagram 25 provides an illustration of the phases required to construct the bridge structure over the M50 Motorway.

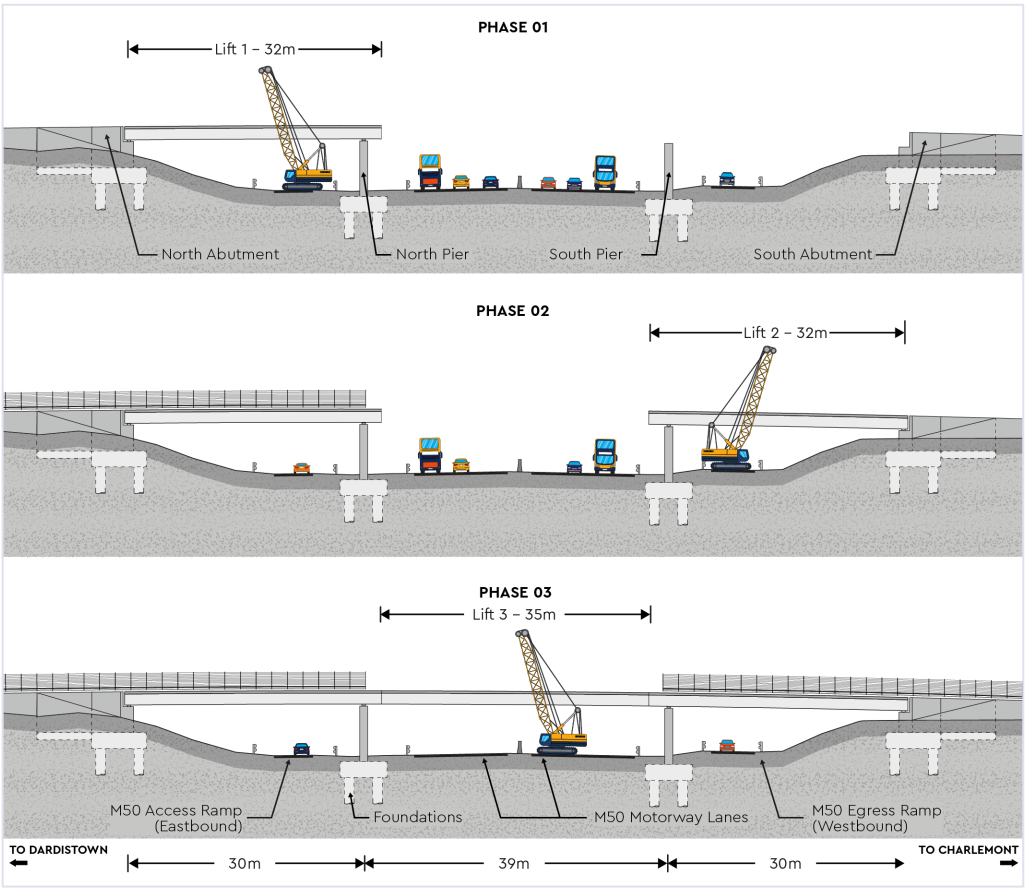

Diagram 25 Phasing of M50 Viaduct Construction

Albert College Intervention Shaft

There is a requirement to have intervention points not more than 1000m apart in order to facilitate access and egress from the tunnel in the event of an emergency. Since the distance between Collins Avenue Station and Griffith Park Station is greater than a 1000m, an additional intervention shaft, located at Albert College Park, is required between these two stations.

The shaft will most likely be constructed using secant piles to retain the ground and mechanically excavated. Sprayed concrete lining (SCL) tunnelling methods will be used to form the connections to the City Tunnel.

7.5.6.3.1 Glasnevin Interchange Station

Most of the underground stations are similar in size and depth. As a result, the construction methodology described above will be used. However, Glasnevin is an exception as it is an interchange station with the existing Iarnród Éireann network. Diagram 26 shows the proposed Glasnevin Interchange Station.

The Glasnevin Station development is a complex project with key interfaces with other infrastructure stakeholders. The station development includes the construction of the new Glasnevin Station, platforms for two Iarnród Éireann commuter railways, the Western Commuter Line (old Midland Great Western Railway (MGWR)) and the South Western Commuter Line (old Great Southern and Western Railway (GSWR)), and a concourse area to connect all three railways together.

There is a requirement to modify the Iarnród Éireann track layout and alignment at this location as part of the proposed Project. This will involve lowering a large section of the track by circa 2m and modification of the existing junction. To undertake the track lowering it is proposed to avoid closing railway lines at the same time during the station construction works. Closure of the Western Commuter Line for a

period of approximately 21 months is proposed, re-opening, and then closure of the South Western Commuter Line for five months. The overall sequence of works in the Glasnevin Station area has been co-ordinated with planned Iarnród Éireann infrastructure works.

The construction working hours also differ at this location due to the interface with existing Iarnród Éireann infrastructure and the live railway line. The work will need to be carried out 24 hours a day, seven days a week for some activities.

The proposed station location is currently occupied by a number of properties that will require prior demolition. In addition, as the works are carried out, demolition of existing railway infrastructure including existing tunnels and retaining walls will be undertaken.

The construction of the underground Glasnevin Station will follow the general principals outlined for underground stations above. Access to the construction site will be from the R108 Prospect Road and temporary traffic management will be required at the junction on the R108 Prospect Road and Whitworth Road to allow for access and egress to the construction site.

In order to provide the required working area for the scheme it will be necessary to temporarily close the Royal Canal, partially infill a section adjacent to the works and then re-open the canal. It is assumed that part of the canal wall will need to be dismantled and rebuilt on completion. Stakeholder engagement was carried out with Iarnród Éireann, Waterways Ireland and local residents to inform the construction methodology.

During construction, vehicular access along Royal Canal Way to Coke Oven Cottages will be severed by the piling works for the station. In order to mitigate this and to allow for connectivity along the Royal Canal Way, the enabling Works will include the construction of a temporary bridge crossing the Royal Canal. The bridge will have sufficient clearance to allow canal traffic to operate and pedestrians on the tow path to pass underneath. A temporary widening of the tow path may be required.

Following the completion of the Construction Phase the canal towpath will be fully reinstated on its existing alignment. In order to maintain the existing width along the towpath, a permanent cantilever structure will be provided to carry the towpath over the proposed Iarnród Éireann platform serving the Western Commuter Line.

Diagram 26 Indicative View of Glasnevin Interchange Station

7.5.6.4 Playing Pitches

As MetroLink is crossing a number of areas that are used for leisure and recreational purposes, there will be a requirement for temporary and permanent re-location of playing pitches in these areas. TII have worked closely with several clubs to agree temporary arrangements during the Construction Phase to allow playing pitches to remain in use or for replacement facilities to be provided. Where possible all

playing pitches that are impacted during the Construction Phase will be reinstated with improved facilities following completion of the Construction Phase.

7.5.7 Rail Systems Installation

Once the tunnel and station works have been completed, works will then commence on the installation of the rail track and railway systems. A Railhead Site (site for storage of rail track) will be established at Estuary to facilitate and manage these works.

Following the completion of all infrastructure and railway systems works there will be a period of testing, commissioning and trial running of the metro line to ensure that all the systems constructed and installed function correctly.

Following the final construction works (i.e., railway systems installations), the construction compounds will be removed, and landscaping and reinstatement will commence.

7.5.8 Power Systems

Two new high voltage substations will be supplied by way of new underground cable routes from existing substations in the area. The cables will be installed by ESBN through public roads or public lands as far as the primary bulk supply substations. The construction of the 110kV substations will consist of:

- An underground ducting system installed to accommodate cable connections to the substation;
- The substation compound areas being covered in a layer of crushed rock and then overlayed with bituminous material to form roads and parking areas;
- A brickwork housing erected on a concrete slab foundation with a concrete roof. The proposed substation buildings will be approximately 15m high by 15m wide by 50m in length and will house all of the required equipment.
- Once these buildings are constructed, equipment such as transformers and switchgear will be installed using cranes; and
- Finally testing and commissioning of equipment will be undertaken.

7.5.9 Limits of Deviation

In order to allow for very minor changes to the alignment during the Construction Phase, Limits of Deviation (LOD) will be applied for. The LODs are limited areas beyond the MetroLink alignment that can be used to make minor changes to the alignment to avoid constraints, obstacles or difficulties encountered during construction. Typically, LODs at ground level are in the range of one to five metres. However, when the alignment is already very close to sensitive or naturally constrained locations, these LODs would not be applied.

7.6 Materials and Waste Management

The materials and waste streams that will arise during the Construction Phase will include excavated material, demolition and construction waste. Nearly 3,000,000m^3 of excavated material is forecast to be generated by MetroLink during the Construction Phase.

Materials and waste management will be based on the principles of the waste hierarchy. Detailed Excavated Materials Management Plans will be developed by the contractors in accordance with this waste hierarchy to ensure full compliance with all relevant waste legislation.

An application under Article 27 of the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011), as amended (Waste Directive Regulations (2011)) (referred to as Article 27) has been made to the Environmental Protection Agency on behalf of TII to classify much of the excavated material to be generated by MetroLink as a by-product and not a waste. This means that the material is approved for re-use. It is predicted that up to 89.6% of the 3,000,000m^3 could be classified as a by-product under Article 27 which is approximately 2,700,000m^3 (4,887,488 tonnes).

7.7 Construction Health and Safety

All construction work in connection with MetroLink will be carried out in accordance with relevant health and safety legislation and best practice. As required by the Regulations, a Health and Safety Plan will be updated from the current design phase progressively through to the construction and maintenance phases.

The fire safety objectives adopted in the design will comply with the Building (Part B Amendment) Regulations 2017, with reference to Part B on Fire Safety.

7.8 Construction Environmental Management

The outline CEMP describes an overarching framework for the management of environmental impacts during the Construction Phase. It sets out how the construction works can be delivered in a logical, sensible and safe sequence and incorporates specific environmental controls which will ensure environmental protection during the Construction Phase. Key elements in the outline CEMP assessed in the EIAR are:

- Construction Phase waste management;
- Mitigation measures for storm water and discharge runoff;
- Dust minimisation;
- Ground settlement mitigation measures;
- Construction noise and vibration sources and mitigation measures; and
- Traffic and transport during construction and mitigation measures.

8. Operational Phase

8.1 Introduction

MetroLink is designed to be able to carry up to 20,000 Passengers Per Hour Per Direction at peak hours. The maximum possible frequency that could be achieved, if required, is 1 minute 30 seconds in the morning weekday peak between Estuary and Charlemont Station. However this frequency is not predicted to be required until such time as MetroLink is extended further south. The maximum frequency required for the current MetroLink alignment would be one train every 100 seconds (1 minute and 40 seconds). Each train will carry up to 500 passengers with seating provided for at least 100 passengers. Based on the passenger requirement for MetroLink, the MetroLink fleet will comprise 40 trains for the Forecast Year (2060).

MetroLink trains will be fully automated and will not require staff on board to drive trains, although staff will be present for other activities such as checking tickets, assisting passengers and security. The automated trains will be controlled from the proposed Operations Control Centre at Dardistown Depot. The alignment will be segregated from other transport systems and surrounding land uses. The operational design speed is 80km/h.

8.1.1 MetroLink Service Pattern

Demand will vary through the day and week, with different service levels provided to meet varying demand. Services will operate between 05:30 and 00:30 every day. Service frequency is reduced on weekends and public holidays to reflect lower demand during these periods.

8.2 MetroLink Wide Operational Systems

8.2.1 Operational Control Centre (OCC)

The Operational Control Centre (OCC) will be the central communications and operational hub for the day-to-day management of MetroLink and will be located at the Dardistown Depot. It will be managed

by approximately 17 people and will control and monitor all services, station operations, ticket sales and local incidents.

8.2.2 Power Usage

The power supply system will provide power to operate the trains and all elements of infrastructure that form part of MetroLink system such as station operations, lighting and ventilation.

Power for the system will be provided by the two distinct High Voltage (HV) 110kV links to the system, one at Dardistown adjacent to the depot and a second at the site of DANP.

8.2.3 Communication Systems

The systems used to communicate with passengers will meet universal design principles, meaning that information will be available in a variety of forms (audio, visual and tactile), to cater for passengers with different needs.

Wi-Fi will be available for passenger use at stations and on trains. Public mobile networks will be available underground.

8.2.4 Ventilation and Air Conditioning Systems

Heating, ventilation and air conditioning (HVAC) will be provided within the stations and on the trains to ensure comfort and fresh air for passengers and staff and to prevent over-heating of sensitive equipment.

8.2.5 Safety, Security and Emergency Evacuation

MetroLink is a complex system with the operation of the system involving multiple spaces, users and equipment in a large urban area. Safety is a key factor that has informed the design from the earliest stages of the project.

During the operation of MetroLink safety will be maintained in line with a Safety Strategy which will set out actions, systems and procedures aimed at minimising safety risks having regard to the European Regulations on Safety in Railway Tunnels (SRT-TSI, Regulation (EU) 1303/2014).

A Fire Safety Strategy has been developed in liaison with Dublin Fire Brigade. In cases of emergency, access to the tunnels for fire fighters will be from the stations or at the intervention shafts/tunnels.

Signage will be designed according to best practice for visually impaired users, and audible communications systems will also be used in cases of emergency.

8.2.6 Public Lighting

Public lighting will be installed on the new roads, at parking areas, the proposed stations, and along the alignment.

All lights proposed for this MetroLink utilise LED light sources and will be future proofed with dimmable drivers. The lighting design minimises light spill beyond the roads and pedestrian areas wherever possible and uses luminaires with zero upward light.

8.2.7 Maintenance and Cleaning

All trains will be cleaned and maintained at Dardistown Depot. A maintenance plan for the track and tunnel sections shall be developed in accordance with the current regulations.

8.3 Station Operation

8.3.1 Access

Station locations are designed to interface with other public transport options and passengers will have the choice to use adjacent bus stops, Luas or DART services. MetroLink will be integrated with other transport projects including BusConnects and DART Expansion.

Provision is also made for bicycle access and bicycle parking facilities at and near each station to facilitate passengers who wish to cycle to/from MetroLink stations.

A review of the demand for each station recommended the provision of taxi ranks and/or drop off facilities at a number of locations along the alignment to ensure compliance with the requirements of the Transport Strategy for the GDA 2016 – 2035 (NTA 2016). These include Estuary Station, Fosterstown Station, Dublin Airport Station, Northwood Station, Ballymun Station and Glasnevin Station.

8.3.2 Access for All

MetroLink has been designed on the principle of *Access for All*. The design has been developed to meet all legislative requirements relevant to accessibility including the Disability Act 2005 and in turn the Sectoral Plan for Accessible Transport under the Disability Act 2005 (DTTAS 2012). The design will also comply with Part M to the Second Schedule of the Building Regulations.

This means that the stations have been designed to ensure that the platform is at the same level as the train to allow easy access, and to ensure there is sufficient space for wheelchair users with lifts and ramps provided to allow accessibility to all levels of the stations. Tactile paving is also provided to assist with wayfinding and hazard identification for people with visual impairment. In addition, there will be clear visible signage and timetables, audio-visual information , audio and braille guides and, ticket machines and smartcard validation systems incorporating audio and visual function indicators.

8.3.3 Fare Collection

The MetroLink tickets will be purchased from Automatic Ticket Vending Machines located at stations and will be designed to facilitate mobile app, card or cash payment. Smart (Leap) Card validators will also be available at stations.

8.4 Dardistown Depot Operation

The Dardistown Depot has been designed to maintain the total number of trains required in the Opening Year and the predicted future growth of train units as demand increases up to 2060. The depot workforce will consist of approximately 100 staff in a range of roles and will operate 24 hours a day.

The key elements of Dardistown Depot include:

- A fully enclosed stabling building is proposed to shelter trains when out of service and to keep them secure;
- Preventive and corrective maintenance of the trains will take place in the Maintenance Workshop;
- A Permanent Way (Track) Maintenance workshop and storage area for equipment installed along the rail corridor and an office for staff;
- An enclosed Automatic Train Washing Plant;
- An external inspection bay with pits under the rail line for visual inspections and basic maintenance;
- An 800m long test track for testing of trains and systems (brake and driving tests); and

The Operational Control Centre (OCC) will also operate from the depot.

8.5 Park & Ride Facility Operation

At the P&R Facility, over 3,000 car spaces will be provided, with 694 electric charging facilities, 208 accessible spaces, 2,139 standard parking spaces and 10 staff parking spaces. In addition, cycle access and bikes stands will be provided.

The accessible parking spaces will be clearly sign-posted. The proposed 208 disabled parking spaces are compliant with the Disability Act 2005, Building for Everyone A Universal Design Approach (NDA 2012), BS8300-1:2018 Design of an accessible and inclusive built environment (BSI 2018) and Technical Guidance Document (TGD) Part M Access and Use (Government of Ireland 2010).

9. Consultation

Public participation has been an integral part of MetroLink from the outset. Non-statutory consultation was carried out to inform the public and other stakeholders about the proposed project from an early stage and to seek feedback and participation throughout its development. The MetroLink team has undertaken a comprehensive consultation and engagement process with stakeholders, landowners and members of the public.

The consultation with the public and stakeholders ensured the views of various groups, individuals and stakeholders were taken into consideration throughout the development of MetroLink and in the preparation of this EIAR.

The overall consultation objectives and how they related to the EIA objectives were:

- To provide an opportunity for the members of the public and other interested parties to become involved with the process and to share with the Project Team any relevant supporting information that should be considered in the design process. This allows for early identification and focused consideration of significant impacts;
- To encourage members of the public to contact the Project Team directly, via the project website, project phoneline and project personnel to ensure that the Project Team is viewed as a trusted and accurate source of information;
- To develop relationships with communities and key stakeholders and to facilitate information sharing for this and future phases. This helps to indicate what information is required to assess the application in a manner that is proportionate and appropriate in defining the likely significant impacts on the environment;
- To ensure consultation and engagement is carried out in a transparent and meaningful way while complying with the regulatory requirements for consultation under the EIA Regulations and the Aarhus Convention. This allows opportunities to be identified to factor mitigation measures into the design of the proposal; and
- To ensure that the design of MetroLink has been undertaken having regard to the consultation responses received.

A Stakeholder Team was set up to ensure key stakeholders were identified and managed accordingly to enable the appropriate allocation of resources and attention to relevant stakeholders.

9.1 Consultation Activities

Nine pre-application consultations have taken place with The Board. These took place on November 6th 2018, December 6th 2018, May 29th 2019, November 8th 2019, December 17th 2019, October 28th 2020, March 31st 2021, September 15th 2021 and October 28th 2021.

Since January 2018, 1,331 meetings have taken place with stakeholders including local authorities and community groups and over 107 organisations have been met by Project Team. Key stakeholders such as Fingal County Council (FCC) and Dublin City Council (DCC) were met regularly by the Project Team to discuss ongoing developments on the proposed project.

During Science, Technology and Engineering Programme for Schools (STEPS) Engineers' Week 2020, engineers from TII engaged with six schools along the route to showcase MetroLink to over 500 students.

Landowner engagement is an ongoing process throughout the project development. A Landowner Liaison team was established that aimed to provide landowners with a dedicated point of contact while endeavouring to address any issues related to MetroLink which may be of concern to individual landowners.

Discussions have taken place with the owners of all properties which may have to be acquired to facilitate MetroLink.

In September 2021, RINA was appointed as Independent Engineering Expert (IEE). Stakeholder Groups who may be affected by the construction and/or operation are able to seek independent engineering advice from the IEE in order to better understand the potential impacts of the project's design and the reasons behind any particular design decisions along the proposed alignment.

9.2 Environmental Impact Assessment Scoping

In order to inform the development of the EIAR, an EIA Scoping Report was prepared, and key statutory and non-statutory stakeholders were identified and consulted on this report. The EIA Scoping Report set out the proposed scope of work and methods to be applied in the development of the EIAR and the proposed structure and contents of the EIAR. The EIA Scoping Report was issued in May 2019.

9.3 Emerging Preferred Route (EPR) Options Consultation

The EPR was announced on the March 22nd 2018. Following the announcement, the public were invited to attend a number of non-statutory public consultation events which were convened to explain the proposed scheme to interested parties. Over an eight-week consultation period (March 22nd 2018 to May 11th 2018) the public and stakeholders were invited to submit their observations on the proposed Project.

A total of 7591 submissions were received by email, post and at consultation events. The issues raised during the EPR non-statutory consultation were considered as part of the route options assessment process and in determining the PR. The EPR proposals were amended to address the issues raised in submissions where possible, including incorporating suggestions and recommendations from local residents, community groups and stakeholders where appropriate. These amendments were incorporated into the design and informed the preferred route design-development which was subsequently also published for non-statutory public consultation.

9.4 Preferred Route (PR) Options Consultations

The PR consultation took place over an eight-week period from March 26th 2019 to May 21st 2019. The purpose of this consultation period was to present the PR and the key changes that were implemented following the consideration of feedback received during the consultation for the EPR, and to receive further feedback from the public on the design development.

Following conclusion of the PR consultation, a total of 2132 submissions were received by email, post and at consultation events. These submissions were analysed, and their content was fed back into the Design and Environment teams for consideration. The issues raised during public consultation have been considered as part of the final PR and formed the basis of the design.

9.5 Albert College Park Local Area Consultation

The Albert College Park Intervention Shaft Local Area Consultation was launched on February 12th 2020 and ran for four weeks until March 11th 2020. Details of the consultation event could be found online. A brochure, a feedback form and freepost envelope were delivered to approximately 4250 local

residents' homes surrounding Albert College Park. Overall, 195 submissions were received by email and post in response to the Albert College Park Local Area Consultation. The design of the Albert College Park Intervention Shaft has been developed having regard to these submissions.

9.6 Ongoing Consultation

Once the RO application has been submitted to The Board, the statutory consultation period will commence. A number of activities will take place, such as stakeholder updates and public displays, and interested stakeholders will have the opportunity to formally submit their views on MetroLink to The Board. An Oral Hearing may follow the statutory consultation. Following this, The Board will make recommendations and a decision regarding the granting of a Railway Order (RO) for MetroLink.

10. Environmental Impacts and Mitigation

The EIA process provides a valuable opportunity to reduce potential environmental effects through design refinements. The design of MetroLink has evolved through the application of a comprehensive iterative design process with particular emphasis on minimising the potential for environmental effects where practicable whilst ensuring the objectives of MetroLink are maintained. Feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development programme have been incorporated where appropriate.

The design, which has been developed for MetroLink, is the preliminary design which will be used by the future appointed contractor to prepare the detailed design for the construction of MetroLink. The future appointed contractor delivering MetroLink will address and meet the requirements of the EIAR.

The EIAR presents an evaluation of the likely significant environmental effects and applicable mitigation and monitoring measured associated with the Construction Phase and Operational Phase of MetroLink based on the current design. The EIAR will inform The Board's EIA of the proposed project. The results of the EIAR are summarised in the following sections of this NTS, which identify and describe the likely significant effects arising from MetroLink.

10.1 Traffic and Transport

10.1.1 Introduction

This section assesses the impact of MetroLink on Traffic and Transport, including public transport, pedestrians, cyclists and private cars during the Construction Phase and Operational Phase and proposes mitigation measures where required.

10.1.2 Assessment Methodology

The Traffic and Transport assessment involved undertaking modelling of predicted future traffic, pedestrian and cycle movements, and public transport movements arising due to MetroLink. Data used as an input into these models included mapping data, traffic survey data, pedestrian survey data and traffic counter data. For the Construction Phase, the analysis considered traffic management, such as road or road lane closures and additional vehicle movements generated during the Construction Phase of the proposed Project. For the Operational Phase, traffic and transport modelling was undertaken for the Opening Year (2035), the Design Year (2050) and the Forecast Year (2065) in order to understand passenger numbers using MetroLink and the impacts that would have on existing transport networks.

10.1.3 Baseline

The Swords, Dublin Airport to city centre corridor is characterised by an urban and suburban environment, where transport and commuting is dominated by private car based transport with over 75% of journeys from Swords to the city centre by private car. The use of public transport and active transport such as walking and cycling become more significant in the areas closest to the city centre.

Currently public transport provision within the corridor is dominated by bus services. Modelling has indicated that in the absence of MetroLink, by 2035, which is the proposed opening year for MetroLink, all bus corridors along the proposed alignment will be well beyond capacity. This includes bus services serving Swords, Dublin Airport and Northwood/Ballymun.

10.1.4 Predicted Impacts

The impacts resulting during the Construction Phase are predicted to occur primarily due to the traffic management arrangements associated with the construction of MetroLink stations, the retained cut, cut and cover sections along the R132 and the associated movement of construction vehicles. The construction of stations will require areas of road space to be removed for some time which will reduce the operating capacity for all road users. Construction Phase impacts on traffic are expected on a limited number of road links during the morning peak at locations along the R132, at Northwood, between Northwood and Ballymun, in the city centre around Mater (hospital), Tara Street, St Stephen's Green and Charlemont with lower levels of congestion identified for the evening peak. However, delays to journey times are minor with a maximum of four minutes delay predicted at any single location.

The construction of the Glasnevin Station Interchange will require the closure of the Western Commuter Line (Maynooth to Docklands) and the South-Western Commuter Line for a significant duration resulting in short term significant impacts. Impacts on bus services during the Construction Phase are generally short term and slight. However, there are a few areas where short term and moderate impacts have been determined including at the Malahide Road Junction on the R132 and Nevinstown Lane Junction on the R132.

The cycle network will be impacted by the associated Construction Phase at a number of stations, however in most instances the impact is slight. In the northern section there is minimal cycling infrastructure present, limiting the severity of impact in these areas. Significant impacts on cyclists occur on the R108 Ballymun Road during the Enabling Works when cycle facilities are removed but not replaced, and at Royal Canal Way where there is a full section closure and diversion.

The pedestrian network will be impacted by the Construction Phase, however in most instances the impact is slight due to the provision of diversions or additional crossings to ensure movements and pedestrian desire lines are maintained. At some locations moderate negative impacts on pedestrians will occur with the exception of the northern section, north of Dublin Airport.

The Operational Phase Opening Year is proposed to be 2035, with a Design Year 2050 and a Forecast Year 2065 for the purposes of this assessment. During the Operational Phase potential negative impacts have been identified on pedestrian comfort levels at stations. There will also be increased traffic movements associated with the proposed P&R at Estuary Station.

During the Operational Phase potential negative impacts have been identified on pedestrian comfort levels at stations. However, the Operational Phase will provide largely positive impacts for the majority of transport users as it will increase the public transport mode share, while reducing use of private vehicles. MetroLink also presents opportunities to interchange with other modes within the public transport network, presenting significant public transport network journey time savings to and from key locations such as Swords, Dublin Airport and Glasnevin and providing increased travel opportunities and better accessibility across the Greater Dublin Areas (GDA). In total, there will be an increase of approximately 6%, on Public Transport for 2035 in the evening peak period due to MetroLink. This increases to 9%, for 2050 and 12%, or an extra 441,000 by 2060.

The proposed Project will result in some people switching from cycling to public transport for longer distance travel, for example Swords to city centre, but it will also result in a large number of new cycling trips with people cycling to the stations. The large number of additional pedestrians that MetroLink is predicted to generate will result in long term significant negative effects on a small number of footpaths in the vicinity of the proposed stations due to some overcrowding. The provision of cycle lanes and cycle parking at the proposed MetroLink stations will result in long term positive effects.

10.1.5 Mitigation Measures

Mitigation measures proposed to mitigate traffic and transport impacts during the Construction Phase include:

- The management of additional construction vehicular traffic through the outline CEMP and Temporary Traffic Management Plans;
- The use of a Mobility Management Plan which supports and promotes sustainable travel for construction staff and constrains the use of private cars to access work compounds; and
- Traffic management procedures such as prioritisation of public transport lanes, redirection of traffic and minimisation of impacts on pedestrians and cycling networks during the construction phase;

Mitigation measures proposed to mitigate impacts on pedestrians during the Construction Phase include:

- Placement of street furniture to maximise available width and monitoring to determine if footway width needs to be increased in future years; and
- Reallocation of road space to widen the pedestrian area.

10.1.6 Residual Impacts

During the Construction Phase, residual temporary negative impacts will remain, primarily due to the traffic management arrangements associated with the construction of the stations and movement of construction vehicles. Following the completion of the Construction Phase these residual impacts will be removed.

During the Operational Phase potential negative impacts have been identified on pedestrian comfort level at stations. Specified mitigation measures will consider the placement of street furniture to maximise available width and monitoring of impacts to determine if further width is required. The implementation of these mitigation measures will reduce these impacts to not significant. However, impacts will remain at Fosterstown Station, at Collins Avenue and therefore further consultation with Local Authorities is required to manage these locations.

Overall, MetroLink will provide a range of long-term positive impacts, ranging from slight to profound. The significant and profound positive impacts will be on the public transport network, with vast improvements to public transport journey times, increases in the mode share held by public transport and improvements to interchange opportunities. This will result in significant public transport network journey time savings to and from key locations such as Swords, Dublin Airport and Glasnevin and provide enhanced accessibility to these locations.

10.2 Human Health

10.2.1 Introduction

This section assesses the impact of MetroLink on Human Health during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.2.2 Assessment Methodology

The human health assessment includes a risk assessment to identify the potential risk to human health in response to identified hazards during the Construction and Operational Phases of the proposed project. The human health assessment is based on identifying the generalised health status of the population within proximity to the proposed project. This information was collected using a desk based assessment of available literature and data, supplemented by additional information used to identify particularly sensitive locations such as health care facilities, schools, aged care facilities etc. The human health assessment is also dependent on the outputs of other assessments presented in the EIAR, where emissions to the environment may impact on human health are assessed. As a result, assessments on the

levels of noise and vibration, air quality and discharges to water are considered as inputs to this assessment.

10.2.3 Baseline

The study area is characterised by a primarily urban/suburban area, which means that the population density is relatively high, particularly in the Dublin city centre. This high population means that there are a large number of potential sensitive receptors who could be vulnerable to negative health effects. Of particular importance are the significant number of healthcare facilities such as hospitals, nursing homes and educational facilities, especially schools within the study area. Main roads through the study area are characterised by traffic congestion particularly during the morning and evening peak hours. This results in elevated noise levels experienced by the population along these routes. Emissions to air are also somewhat elevated but generally below the set EU limit values for nitrogen dioxide and particulate matter.

10.2.4 Predicted Impacts

The greatest potential for an impact on human health as a result of the Construction Phase is due to emissions from the construction activity itself, including demolition of existing buildings or structures, excavation, tunnelling, blasting and traffic. These potential emissions can take the form of airborne noise, groundborne noise and vibration, emissions to air, emissions to water, and contaminated soils. There will be temporary significant negative effects due to groundborne noise and vibration from the TBM, noise emissions (including demolition of existing buildings or structures, excavation, blasting and traffic) and impact on air quality. There will also be some psychological impacts particularly for those whose homes are to be acquired. There will also be some temporary negative impacts on amenity as some leisure facilities will be acquired or temporarily modified to facilitate the construction of MetroLink.

During the Operational Phase there will be permanent significant positive benefits for human health by improving the environment in Dublin city centre and facilitating exercise, reducing social inequalities and improving access to services. Having an efficient public transport system such as MetroLink will bring benefits for physical and psychological human health directly and indirectly with a positive contribution due to reduced environmental emissions. There will be no significant adverse effects on human health arising due to MetroLink upon implementation of mitigation measures proposed to reduce noise and vibration and other emissions/discharges. Risks such as anti-social behaviour, violence or terrorism which could affect the wellbeing of the population have been considered in the design of MetroLink where a safe and secure system has been designed with effective CCTV and other security measures and procedures in place.

10.2.5 Mitigation Measures

Mitigation for the potential impacts to Human Health during the Construction Phase include:

- Limiting of blasting hours and advanced notification to the public;
- Potential for temporary insulation and rehousing due to airborne noise and groundborne noise effects;
- Monitoring programmes for dust, noise and vibration to be implemented during the Construction Phase;
- Control of dust including the implementation of dust management plans;
- Extensive water mitigation measures;
- Prevention measures for Leptospirosis which is a rodent borne disease;
- At the Mater Hospital potential noise impacts will be mitigated by the installation of noise barriers, good communication and prior notification;
- The provision of alternative recreation and sports facilities where required and the temporary relocation of playing pitches during the Construction Phase and reinstatement on completion of works;
- The implementation of a stakeholder engagement and publicity programmes to keep the public informed of the Construction Phase. Information will be provided to increase the public

understanding of the proposed Project and thereby reduce misunderstanding and stress around this phase of the project.

- In recognition of the potential phycological impact on property owners and tenants where properties are to be acquired and given the unique circumstances surrounding the proposed impacts to the College Gate apartment complex, TII will engage the services of a property advisory company. This discretionary scheme will offer property owners the opportunity to negotiate and reach a 'Pre-Agreement' on both a baseline residential unit price and other matters of compensation that an owner would normally be entitled to under the compensation stage. This will provide the parties with as much certainty as possible at an early stage. TII will use reasonable endeavours to provide residential property owners with as much time as possible in which to relocate, beyond that which is provided for under the statutory process.

Mitigation for the potential impacts to human health during the Operational Phase entails the installation of noise barriers and "floating slab track" to reduce noise and vibration levels arising from the operational railway as identified in those chapters/sections.

10.2.6 Residual Impacts

Overall, the residual impacts on human health terms are assessed as overwhelmingly positive.

10.3 Population and Land Use

10.3.1 Introduction

This section assesses the impact of MetroLink on Population and Land Use during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.3.2 Assessment Methodology

The assessment identifies and assesses the likely significant effects on;

- Demography (study of human populations) and households;
- Access to employment, education, health and commercial facilities;
- Employment and economic investment;
- Strategic level benefits;
- Access to tourism and recreation; and
- Land use.

A wide variety of data sources were used to define the baseline (background) environment for the study area including data on population and economics from the Central Statistics Office (CSO). An Post GeoDirectory data has been used to identify building use and development plans for the Fingal and Dublin City areas have been used to understand existing and planned future land use. The data used was primarily sourced by way of desk based research, but information and data received during the consultation process also fed into the analysis.

10.3.3 Baseline

Dublin is the primary economic, and most populous region, of the country with 1,347,359 people living there in April 2016. Preliminary Census 2022 figures identify that the has population has further increased to 1,450,701 in 2022. Fingal has been one of the fastest growing areas in the country, growing by 8% over the five years between 2011 and 2016 and by a further 11% between 2016 and 2022. Dublin City grew at a significantly lower rate over the same period, growing by just 4.8% between 2011 and 2016.

Economically, the study area contains some of the most important areas in the country including Dublin city centre and Dublin Airport, both of which attract employees from a wide geographic area. Unemployment across the study area is variable with significant differences notable between areas. However, the overall unemployment rate by the end of 2019 was just 4.5%. Unemployment rates increased due to COVID-19 but at a national level have reduced down again to pre pandemic levels. The

study area also includes nationally important institutions and facilities for education and health care including Dublin City University (DCU), Trinity College Dublin (TCD) and the Mater and Rotunda Hospitals. The level of education within the study area is high with well above national average levels of third level education levels.

10.3.4 Predicted Impacts

During the Construction Phase, potential negative impacts include land take, requirement for the acquisition and demolition of properties, disturbance from noise and dust, road closures or diversions, traffic congestion, disturbance at recreational facilities such as playing pitches and closure of rights of way. Positive impacts include the generation of employment, both for construction workers and suppliers, with an associated increase in local economic activity due to additional spending by incoming construction workers.

During the Operational Phase, potential impacts will be positive for the population by providing opportunities for increased housing provision, increased business activity and employment, and improved connectivity to educational, health and community services. These opportunities will be unlocked through the improved public transport provision, along the MetroLink alignment allowing improved accessibility through the area for the existing population, while also allowing for new sustainable high quality, high density development to progress on undeveloped land. MetroLink will also provide an enhanced public transport link between Dublin Airport and Dublin city centre which will benefit tourism and general economic efficiency. The increased level of pedestrian footfall that will result due to MetroLink will provide opportunities for local services, enterprises and retail business and contribute to neighbourhood amenity.

10.3.5 Mitigation Measures

The proposed mitigation measures for population and land use during the Construction and Operational Phase include:

- Implementation of the outline CEMP to control emissions and nuisance that may impact the population;
- The provision of alternative recreation and sports facilities where required and the temporary relocation of playing pitches during the Construction Phase and reinstatement on completion of works;
- A Land Acquisition Strategy which sets out the arrangements proposed for the provision of information and assistance to the residential owners/occupiers of land and property which will be subject to compulsory purchase to enable the delivery of MetroLink;
- Implementation of a Property Owner Protection Scheme (POPS) which will be used to identify and remedy any potential property damage resulting during the Construction Phase;.
- A Construction Community Relations Officer (CRO) will be appointed;
- Details of the general construction process/phasing will be publicised prior to implementation and advance notice will be given to the owners of all residential, commercial and community properties ahead of any works commencing;
- During the Operational Phase, a programme of community engagement will be undertaken. This programme will provide the population with information on measures to manage anti-social behaviour and ensure access for all to facilities, stations, trains and public spaces to promote independent mobility;
- Apprenticeship and Trainee Programme providing an inclusive approach to recruitment, staff training and rotas to build community relationships and foster a sense of safety; and
- Collaboration with Local Authorities and developers to fully realise the socio-economic benefits of MetroLink.

10.3.6 Residual Impacts

During the Construction Phase the residual impacts will be slight to moderate and medium term. The residual impacts are due to severance and disruption at several locations, loss of various business premises due to acquisition, residential property acquisition, temporary loss of a portion of St Stephen's

Green, temporary road closures or diversions, traffic congestion, disturbance at recreational facilities and closure of rights of way.

During the Operational Phase, no significant residual negative impacts are anticipated. The increased level of pedestrian footfall will provide opportunities for local services, enterprises and retail business and contribute to neighbourhood amenity. A large range of social infrastructure, open space, leisure, recreation and sports facilities will be within reasonable walking distance and as such is likely to benefit communities.

10.4 Electromagnetic Compatibility and Stray Current

10.4.1 Introduction

This section assesses the impact of MetroLink resulting from electromagnetic interference and stray current during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

Electromagnetic Compatibility (EMC) relates to the ability of different electrical (magnetic) devices to function properly when they are subject to elevated levels of electromagnetic interference and stray current. MetroLink will generate three types of electric and magnetic fields known as; Direct Current (DC) fields (generated by train power); Alternating Current (AC) fields (generated by the electricity drawn from the Electricity Grid); and Radiofrequency (RF) fields (generated by radio systems).

10.4.2 Assessment Methodology

Consultation was undertaken with several stakeholders to identify buildings with equipment highly sensitive to electric magnetic emissions, such as hospitals, industrial facilities, theatres and universities. Based on this consultation, surveys were also undertaken at several locations to identify baseline levels of electromagnetic interference (EMI). In addition, simulations were undertaken where identified sensitive equipment was subject to EMI to understand the potential impacts on electrical equipment

10.4.3 Baseline

The baseline levels of EMI are low except in the vicinity of existing electrical railways i.e. DART or adjacent to electrical infrastructure such as substations. The sensitive receptors to EMI along the MetroLink alignment are located at facilities with highly sensitive bespoke equipment such as at industrial facilities, educational research facilities, hospitals and at Dublin Airport. The vast majority of equipment is not sensitive to EMI as it has a "CE mark" which indicates that the manufacturer declares their equipment meets the EMC directive standards.

10.4.4 Predicted Impacts

No impacts have been identified on the public from EMI, electromagnetic fields (EMF), or stray current perspective during the Construction Phase. Therefore, there are no specific mitigation measures required during the construction of the proposed project.

During the Operational Phase, potential impacts include DC magnetic field impacting certain aircraft types at Dublin Airport, and on sensitive equipment at rinity College Dublin (TCD), and at other locations where sensitive equipment exists in close proximity to the alignment. In addition, elevated AC fields can impact on field harmonics and result in acoustic interference at specific sensitive locations such as music/performance venues and recording studios. Stray Current along the alignment could impact on buried utility pipes and/or cables if not mitigated.

10.4.5 Mitigation Measures

Mitigation measures are required to be implemented during the installation of MetroLink, which will reduce the potential impact of stray currents on nearby buried utilities during the Operational Phase. These available measures include the use of a stray current collector system, adjustment of the power

supply system, improvement of the return circuit (high conductivity in the rails) and isolation of the return circuit from ground (rail-to-earth resistance). The use of a slab track helps facilitate some of these measures. Once MetroLink is operational, monitoring of the earthing system and stray currents will be performed to ensure that potential faults in these mitigation measures or degradation over time is adequately detected.

Mitigation measures to further reduce or eliminate the impacts of DC fields at Trinity College Dublin (TCD), and other locations include relocation of affected equipment, installation of an active-cancellation system, and shielding/filtering of the labs/rooms using specialised material designed to attenuate magnetic fields.

The proposed measures to reduce or eliminate any potential impacts at Dublin Airport from DC currents include the update of information provided to the airlines using the airport on potential EMI.

10.4.6 Residual Impacts

During the Construction Phase there will be no residual impacts remaining. During the Operational Phase, following the implementation of mitigation measures, the residual impacts will be reduced. Continued mitigation measures to minimise stray current and continued monitoring of the power system will be required. Periodic monitoring of nearby buried structures and pipes to indicate potential changes in the stray current environment will also be required.

10.5 Airborne Noise and Vibration

10.5.1 Introduction

This section assesses the impact of MetroLink on Airborne Noise and Vibration during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts. Airborne Noise and Vibration effects occur when soundwaves travelling through the air interact with a receptor such as a person (noise) or a building (vibration).

10.5.2 Assessment Methodology

The Airborne Noise and Vibration assessment has been undertaken, based on publicly available published data sources in addition to measured noise and vibration survey data collected to identify the baseline noise levels throughout the study area. The key study areas during the Construction Phase covers a considerable geographical area in close proximity to high density sensitive residential, educational, amenity, religious and commercial receptors, typically up to 300m from each construction area and includes construction traffic haul routes. Modelling of potential levels generated during the Construction and Operational Phases has also been undertaken.

10.5.3 Baseline

The data used to determine the baseline noise and vibration levels within the study area identified that elevated noise levels are commonplace throughout the study area both during the daytime and night-time. Elevated noise levels are particularly noticeable in the vicinity of busy roads such as the R132, the M50 Motorway, the R108 Ballymun Road and at city centre locations. Other significant noise sources include airplane movements at Dublin Airport.

10.5.4 Predicted Impacts

Potential airborne noise and vibration impacts arising during the Construction Phase arise from the following sources and have the potential to impact noise sensitive locations (NSLs);

- Construction works along the surface sections of the alignment and at MetroLink station construction sites. Particularly noisy activity include excavation, mechanical breaking and piling and D-walling and soil compaction;
- Night-time works required at a small number of locations including at the Glasnevin Station site;

- Construction compound operations, particularly where sites are located in close proximity to sensitive receptors, such as residential areas close to the R132 and at the Mater Hospital;
- Works associated with the construction of the TBM portals and associated with the logistical support to the TBM which will occur 24 hours a day. These sites are at Northwood and Dardistown;
- Utility diversions works;
- Overground structures and buildings (Broadmeadow and Ward River Viaduct, M50 Viaduct, Station compounds, P&R facilities and rail head); and
- Road works and construction traffic.

During the Operational Phase of the proposed Project, potential impacts will arise from the following sources and activities and have the potential to impact NSLs:

- Operation of the surface sections of MetroLink;
- Operational activities associated with Dardistown Depot including noise and vibration from fixed sources from plant and equipment;
- Operational noise associated with ventilation plant for underground stations;
- Noise from public address (PA) systems in retained cut or surface stations;
- Car parking and traffic noise at the P&R facility;
- Changes in road traffic noise along surrounding the road network; and
- Vibration from overground rail sections in retained cut or elevated sections.

10.5.5 Mitigation Measures

During the Construction Phase mitigation measures will include the following:

- The Contractor shall specify noise abatement measures and comply with industry standards, including the use of temporary and mobile acoustic screens, noise barriers, sheds and enclosures around items of plant and equipment at the construction compounds;
- The selection of plant items will comply with requirements set out in the outline CEMP;
- The proposed construction working hours are for the majority limited to daytime hours only Monday to Friday and Saturday morning periods. This approach assists with limiting the duration over which Noise Sensitive Locations (NSLs) are exposed to construction noise impacts;
- A public liaison officer will be appointed and a clear communication programme to inform adjacent building occupants in advance of any significant vibration will be developed; and
- Ongoing monitoring will be undertaken at locations along the alignment throughout the Construction Phase.

TII's Airborne Noise and Groundborne Noise Mitigation Policy (included at Appendix [A14.6] to this EIAR) will be implemented, in order to address any special circumstances which require further mitigation measures to be undertaken during the Construction Phase. The provision of noise insulation, temporary rehousing, or other further mitigation, will be considered on a case by case basis in accordance with this policy.

During the Operational Phase, mitigation measures will include noise barriers where required. These requirements have been identified at the west side of the Estuary Station and P&R, and at properties south of the M50 Viaduct. Low noise rated equipment and ventilation systems will also be selected for the underground stations and tunnels. Selection of station public address systems will consider the location, screening, broadcast levels and ambient noise levels.

10.5.6 Residual Impacts

During the Construction Phase, residual noise levels are below the construction noise threshold at the majority of site compounds, except for residual significant effects at a small number of locations where noise insulation or temporary rehousing may be required in line with the MetroLink Airborne and Groundborne Noise Mitigation Policy. Such locations include the proposed construction works at Seatown Station, locations along the R132 in proximity to residential sensitive receptors, Dublin Airport

station, properties close to the construction of the embankments for the M50 viaduct, properties close to the proposed Glasnevin, Mater, and Charlemont station works.

During the Operation Phase the residual rail noise impacts at Noise Sensitive Locations (NSLs) are negative, not significant, and long term in proximity to the rail viaduct between the M50 Viaduct and Northwood Station during the night-time peak hour. Residual noise impacts at the closest NSLs to the Dardistown Depot are negative, not significant, and long-term. The range of operational noise levels from each fixed source will be controlled in accordance with best practice guidance to control significant noise impacts. The residual impacts are negative, slight, and long-term.

10.6 Groundborne Noise and Vibration

10.6.1 Introduction

This section assesses the impact of MetroLink on Groundborne Noise & Vibration during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

Groundborne Noise & Vibration are essentially the oscillatory movement of soil, rock or structures which is generated by construction or operational activity. Groundborne Noise effects occurs when soundwaves travelling through the ground interact with a receptor, such as a building where it may result in the vibration of floors, walls and ceilings, which could also be heard as a low frequency 'rumbling' sound (noise). The term vibration is mainly used when there is a direct effect on a sensitive receptor (such as a human beings) or a sensitive item such as laboratories or a fragile artefact or structure and vibration can cause structures to radiate airborne sound.

10.6.2 Assessment Methodology

The assessment involved a review of standards and guidelines, consultation, the completion of baseline Groundborne Noise & Vibration monitoring/surveys to establish the current background levels and the modelling of potential groundborne noise and vibration levels generated during the Construction and Operational Phases. The study areas for potential Groundborne Noise & Vibration impacts vary between the Construction and Operational Phases depending on the source of the noise and vibration being generated.

10.6.3 Baseline

It should be noted that there is not significant groundborne noise or vibration in the background environment with the exception of locations in very close proximity to existing railway lines or heavy industrial facilities. For the purposes of this assessment, locations sensitive to Groundborne Noise and Vibration have been identified and these include locations with sensitive equipment such as educational research facilities and hospitals/medical facilities, as well as broadcasting facilities, performance areas and recording studios. Churches and schools can also be sensitive to Groundborne Noise and Vibration during masses/services and school lessons The majority of the population is able to perceive Groundborne Noise and Vibration above certain levels, but some people are more sensitive to it than others.

10.6.4 Predicted Impacts

Construction Phase activities will generate groundborne noise and vibration from a range of activities including tunnel boring, mechanical excavation and blasting, piling and further mechanical construction works. The tunnelling work will generate groundborne noise and vibration that is temporary in nature as the TBM advances i.e. maximum of two weeks at any one location. People will experience groundborne noise and vibration for this period as the TBM passes. The vibration levels will not cause any structural building damage.

Blasting is proposed at some station box excavations and other excavation to reduce the construction duration of the proposed Project. Blasting would result in the generation of groundborne noise and vibration at the moment when blasting occurs.

Trains running along the tracks and through the tunnels has the potential to result in groundborne noise and vibration impacts on sensitive receptors during the Operational Phase. Without mitigation there is the potential for significant vibration effects in the case of laboratories housing scientific equipment of high sensitivity, such as at Trinity College Dublin (TCD).

10.6.5 Mitigation Measures

Potential impacts on the population, arising from groundborne noise or vibration, from the passage of TBMs during construction will be managed by an early stakeholder engagement programme. This programme will be used to notify people of the TBM advancement and this is generally a sufficient mitigation measure, as it allows people to understand what is happening and that there is no potential for damage to property due to the TBM advancement.

It should be noted however that the POP scheme will also be introduced whereby condition surveys of private properties and other selected properties along the alignment of the proposed Project will be undertaken prior to any construction works. The purpose of the condition surveys is to ascertain the condition of the properties before, during (if deemed necessary), and after the completion of the proposed Project to determine whether there has been any deterioration of the properties surveyed that may be attributable to the construction of MetroLink. If any damage did result from the Construction Phase, then damages would be repaired under the POP scheme.

Early stakeholder engagement is also an important mitigation measure in relation to sensitive receptors such as educational research facilities, hospitals or auditoria. Early stakeholder engagement will be used to ensure that sufficient notice is given to these facilities such that any sensitive activity, such as running of sensitive equipment, care for sensitive patients or quiet performances are not impacted by the advancement of the TBM.

Mitigation measures proposed to reduce any potential impacts arising from blasting include the implementation of a correct blast design which will minimise any potential property damage, followed by monitoring of blasting and re-optimising the blast design considering the results. In addition, shields and barriers will be placed between the blasting area and sensitive receptors and blast mats and acoustic sheds will be used where applicable. Where significant effects cannot be avoided due to blasting, then alternatives to blasting can be employed.

Where specific sensitive locations or people are impacted by the groundborne noise during the Construction Phase the process the MetroLink Airborne and Groundborne Noise Mitigation Policy will be used to determine if additional mitigation measures are required on a case by case basis. For very sensitive members of the population, this may involve measures such as temporary re-housing.

During the Operational Phase, there will be no significant effects from groundborne noise or vibration arising from the trains using the tracks and tunnels, on the basis of the designed track support system and installation of enhanced track isolation systems including floating slab track at identified locations along the alignment. These locations include the alignment under the Gate Theatre, Abbey Theatre, TCD Buildings, the National Museum, the National Gallery and the National Concert Hall.

10.6.6 Residual Impacts

There will be some significant residual impacts arising, particularly during the advancement of the TBM and as discussed above these will be managed by advance notification and stakeholder consultation. There will be no significant residual impacts during the Operational Phase following the implementation of the proposed mitigation measures.

10.7 Biodiversity

10.7.1 Introduction

This section assesses the impact of MetroLink on Biodiversity, with particular attention to species and habitats, during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.7.2 Assessment Methodology

The desk study and suite of ecological surveys (April 2018 and July 2021) have established the habitats and species present along the alignment of MetroLink used to inform the Biodiversity assessment.

The Zone of Influence (ZoI), or distance over which a likely significant effect may occur will differ across the key ecological receptors (habitats, fauna species, bats, breeding birds and wintering birds, fish and aquatic macroinvertebrates) and may depend on the predicted impacts and the potential impacted pathway(s) i.e. the potential impacts to bat roosts would not be expected to exceed c. 200m while wintering birds could extend up to c. 300m. These ZoI's are then used to determine the baseline for each ecological receptor. Desk based analysis and surveys are undertaken for each of these zones for the relevant habitats and species. This provides an understanding of the ecological conditions that exist (baseline). An analysis is then undertaken to identify what impacts MetroLink would have on the identified baseline during both the construction and operational phases.

10.7.3 Baseline

Over the last 20 years to the present day, the study area has been generally dominated by built land comprising of roads, pathways, residential, commercial and industrial buildings (including Dublin Airport), agricultural farmland with hedgerow/treeline boundaries, fragmented areas of woodland, watercourses (including the Royal Canal and Grand Canal) and golf courses, parkland and playing pitches. There are 24 European sites (Special Areas of Conservation (SACs) or Special Protection Areas (SPAs)) located within the vicinity of the proposed Project. 17 of these are located within the ZoI of the proposed Project. There were seven non-native invasive plant species identified within or in close proximity, including Canadian pondweed and Giant hogweed.

10.7.4 Predicted Impacts

During the Construction Phase potential negative impacts have been identified from habitat loss, reduction and fragmentation of habitats, habitat degradation, and habitat severance.

During the Operational Phase potential negative impacts have been identified including habitat degradation, potential mortality or injury to birds, bats or otters, indirect disturbance to bat flight patterns due to operational light spill i.e. from Dardistown Depot, habitat severance and water pollution affecting otters.

10.7.5 Mitigation Measures

The Construction Phase will be undertaken in line with the requirements of the outline CEMP. The outline CEMP will include a number of procedures and plans that will mitigate impacts on biodiversity arising during the Construction Phase and these include:

- A Dust Management Plan;
- Any trees or planting to be retained will be fenced off and protected in line with the requirements of the Arboricultural Impact Assessment;
- An Emergency Incident Response Plan will be developed to manage any incidents that have potential to impact the receiving environment;
- Measures to manage discharges to water from the construction compounds areas including those that might occur during flood events. To minimise the effects on fish species, rivers/streams will be fenced off at a minimum distance of 5m from the riverbank during the Construction Phase;

- A Non-native Invasive Species Management Plan will inform the management of invasive species identified during the Construction Phase;; and
- Seasonal restrictions will be put in place for site clearance where protected species such as Bats, Otters and Birds have been identified.

The two proposed permanent culverts on the Sluice River and one of its tributaries, will be constructed in accordance with the Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes (NRA, 2008c), and have been designed to maintain otter connectivity. The provision of a farm underpass at the existing entrance into lands just north of the airport will provide passage for any individual badgers.

During the Operational Phase mitigation measures will be implemented, including the following;

- A Non-native Invasive Species Management Plan;
- Measures to manage and treat groundwater discharges to surface water during operation;
- A detailed operational lighting design shall be reviewed by a suitably qualified bat ecologist;
- Planting of woodland, hedgerow, grassland and wetland habitats as detailed in the landscape drawings; and
- There will be no direct discharge of surface water runoff to ground within any of the below ground sections of MetroLink.

10.7.6 Residual Impacts

MetroLink will not result in any residual likely significant effect on any ecological European sites, any Natural Heritage Areas (NHAs) and predicted Natural Heritage Areas (pNHA's), or any rare and protected plant species at any geographic scale. Mitigation measures will be implemented (and monitored) to minimise the potential risk of MetroLink affecting water quality in the receiving watercourses/waterbodies, to minimise severance of habitats during the Construction and Operational Phases. These measures will ensure that there is not a likely significant negative residual effect on otter population at any geographic scale. Mitigation measures will also minimise the risk of direct harm to bats during demolition and tree felling activities, provide alternative bat habitats and avoid any indirect impacts arising from light disturbance. Mitigation measures will be implemented (and monitored) to minimise the risk of MetroLink impacting badgers, the amphibian populations, reptiles or fish, and therefore no likely significant residual effects will occur.

Despite the implementation of mitigation measures, MetroLink will result in the permanent area loss of a number of habitats valued as being of Local Importance (Higher Value). In addition, there will be a permanent loss of yellowhammer territory which will result in a significant negative residual effect on yellowhammer at a local geographic scale.

10.8 Air Quality

10.8.1 Introduction

This section assesses the impact of MetroLink on Air Quality during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.8.2 Assessment Methodology

This air quality assessment involved consultation, a review of available published data, a review of applicable guidelines, a 12-month air quality monitoring programme at sensitive locations along MetroLink alignment, dust deposition sampling and calculations and modelling future emissions to assess air quality impacts that may occur as a result of MetroLink. The assessment study area is focused on sensitive human receptors and designated ecological sites in proximity to the impacted routes.

10.8.3 Baseline

The monitoring programme identified that for various pollutants, measured concentrations were generally low and well below limits. However, there were exceedances at certain locations primarily related to traffic emissions i.e. elevated nitrogen dioxide (NO_2) was recorded at Prospect Road/Lindsay Grove.

10.8.4 Predicted Impacts

During the Construction Phase, the focus is on air quality at sensitive receptors adjacent to dust generating activities or roads impacted due to congestion resulting from construction vehicle movements associated with MetroLink. Activities that have the potential to generate dust include excavations, spoil and material transport, and construction activities (demolition, controlled blasting, construction of major project elements such as station boxes, intervention and ventilation shafts, above ground rail alignment, bridges, maintenance depot). In addition, there is potential for the generation of airborne spores of Aspergillus (a fungus that survives in soil and dust) if not mitigated during the construction phase.

MetroLink is an electrified system and as a result it is not predicted to have significant direct air quality emissions during the Operational Phase. All ambient air pollutants will remain in compliance with the ambient air quality standards. MetroLink has negligible impacts at all modelled receptors and therefore no specific Operation Phase mitigation measures are required.

10.8.5 Mitigation Measures

A schedule of air emission control measures has been formulated for the Construction Phase associated with MetroLink including:

- Submission of an Air Quality Management Plan for approval to the relevant planning authority;
- A Dust Management Plan;
- A Demolition Survey. This will include a fully intrusive asbestos-containing materials survey;
- Completion of an aspergillus risk assessment and preventative dust mitigation measures; and
- The Scheme Traffic Management Plan.

No Operational Phase mitigation measures are required.

10.8.6 Residual Impacts

During the Construction Phase, with the dust minimisation measures implemented, fugitive emissions of dust from construction activities are not predicted to be significant and therefore pose no nuisance to human health or ecological risk to nearby receptors. There will be no residual dust impacts.

During the Construction Phase, the air dispersion modelling assessment of traffic emissions found there are no significant adverse effects, some likely slight negative and beneficial effects were modelled.

During the Operational Phase, the air dispersion modelling assessment has found that in 2035 no receptors will have ambient air quality exceedances of the ambient air quality standards as a result of MetroLink. It is considered that the operational residual impacts are neutral and not significant

10.9 Climate

10.9.1 Introduction

This section assesses the impact of MetroLink on Climate during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.9.2 Assessment Methodology

The Climate assessment involved a review of baseline Greenhouse Gas (GHG) emissions, a review of applicable guidelines, predictive calculations to predict emissions arising from the proposed Project for the Construction and Operational Phases, an assessment of potential climate impacts, and vulnerability to climate change.

10.9.3 Baseline

For 2021 the Environmental Protection Agency (EPA) estimated that the total national GHG emissions were approximately 60 Mt CO_{2eq} (Million tonnes of carbon dioxide equivalent), which is equivalent to approximately 12 tonnes $CO_{2eq/person}$, which is one of highest rates in Europe. Data published in 2022 by the EPA concluded that Ireland exceeded (without the use of flexibilities) its 2021 annual limit set under EU's Effort Sharing Decision (ESD) (EU 2018/842) by 2.71million tonnes CO_2 equivalent (Mt CO_{2eq}). The sector with the highest emissions in 2021 is agriculture at 35.3% of the total, followed by transport at 20.3%.

10.9.4 Predicted Impacts

During the Construction Phase, the potential impacts are with respect to embodied carbon used for the construction of MetroLink, embodied GHG emissions arising from land clearance activities, embodied carbon from materials and transport, and Construction Phase waste production.

During the Operational Phase there are two significant sources of GHG emissions, firstly the operational power requirements for running the Dardistown Depot, stations, the P&R, and the power system, and secondly road traffic related emissions.

10.9.5 Mitigation Measures

Construction and operational mitigation measures are required to reduce the impact on climate related GHG emissions by implementing low-carbon energy options.

Mitigation measures have been incorporated into the Construction Phase design with the goals of reducing the embodied carbon associated with the Construction Phase of MetroLink. Further reductions in embodied carbon will be required during the construction phase and PAS 2080, a specification for managing whole life carbon in infrastructure will be implemented to achieve these reductions.

Other mitigation measures to be implemented during the Construction Phase include; Traffic mitigation measures including a Scheme Traffic Management Plan (STMP) to reduce traffic congestion and a Mobility Management Plan (MMP) to reduce private car commuting by construction workers.

During the Operational Phase of MetroLink the ambition is to achieve net zero carbon for operational energy by the design year of 2050. Prior to this, TII is exploring the purchase of up to 80% of its operational demand from certified low or zero carbon electricity for operations and additionally to research the feasibility of offsetting any residual emissions. Up to 10% of the power requirement will come from on-site generation of power (Solar). MetroLink will implement a whole-life Carbon Management Plan to inform the design and operation of MetroLink. Mitigation measures will also be applied to the power operational demand as metro systems offer an immediate opportunity for reducing energy requirements. This will be achieved by the recycling of braking energy.

MetroLink's vulnerability to the impact of climate change has been considered for the Construction and Operational Phase of the proposed Project. The majority of mitigation measures with respect to vulnerability to climate change in the Construction Phase will be set out through management plans such as a Severe Weather Management Plan and the outline CEMP where measures to track inclement weather conditions and to manage such eventualities will be implemented at each construction site. Having regard to the Operational Phase, MetroLink has been designed to accommodate future climate change events, with design including the following:

- A design to withstand flooding from river/sea of up to 1 in 1000 year events;
- The proposed Project drainage design for the track is designed to convey water from a 1 in 100 year event and all drainage channels are oversized by 20% to accommodate increased water flows due to climate change; and
- The overhead line equipment will be designed to take into account a range of minimum and maximum temperatures of -20°C to +40°C and loads under current and future climate conditions.

10.9.6 Residual Impacts

With the implementation of mitigation measures, the proposed project will result in residual total Construction Phase GHG emissions of 1,149Kt CO2eq over the construction period equivalent to an annualised total of 0.37% of Ireland's non-ETS 2030 emissions target. (These are targets relating to emissions from homes, cars, small business and agriculture.) Over the predicted 60-year lifespan the annualised emissions due to the initial Construction Phase and ongoing maintenance of MetroLink will reach at most 0.05% of Ireland's non-ETS 2030 emissions target.

The residual sum of the total Opening Year Operational Phase transport related emissions and operational power demands is between -12.26 Kt CO2eq and -11.49 Kt CO2eq. All operational power for power systems and stations will be purchased from a certified renewable energy supplier. This will mitigate the impact on climate by reducing the annual impact. The future power demands will increase due to increased passenger numbers; however the carbon intensity figure will reduce as the national grid moves to net zero carbon by 2036.

In the Opening Year the annualised emissions due to the operation of MetroLink will reduce Irelands emissions by between -0.037% and -0.034% of Ireland's non-ETS 2030 emissions target. By driving "modal shift" where passengers use MetroLink in place of other more carbon intensive transport modes such as the Internal Combustion Engine vehicles (ICEV), the proposed Project will help Ireland in achieving zero carbon emissions by 2050 as required under the Climate Action and Low Carbon Development (Amendment) Act 2021

The overall residual likely effect of MetroLink is not significant for the Construction Phase and a significant beneficial impact in the Operational Phase.

10.10 Hydrology

10.10.1 Introduction

This section assesses the impact of MetroLink on Hydrology (surface water) during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.10.2 Assessment Methodology

The assessment involved a desk-based review, consultations, the completion of field surveys, analytical testing in July and August 2018, December 2018, and April and May 2019 to establish the baseline surface water quality.

10.10.3 Baseline

MetroLink will be located within the Irish River Basin District (formerly ERBD) as defined under the EU Water Framework Directive (WFD) (2000/60EC). The alignment predominantly lies within the Liffey and Dublin Bay Catchment, with the northern portion of the route also crossing within the Nanny-Devlin Catchment, north of Swords, County Dublin (EPA, 2020).

The proposed alignment crosses several watercourses. All rivers, streams and drainage features along the alignment eventually outfall directly or indirectly to the Irish Sea via coastal and transitional waters. Transitional waters are located at Malahide Estuary, Mayne Estuary at Baldoyle, North Bull Island, Tolka Estuary and the Liffey Estuary Lower. MetroLink does not hydrologically overlap with any European sites (valuable ecological sites such as Special Protection Areas (SPAs) and Special Areas of Conservation

(SACs) that are protected under European legislation). However, there are potential indirect pathways to these European sites through rivers and streams crossing the MetroLink alignment.

10.10.4 Predicted Impacts

Predicted impacts during the Construction Phase include the potential to impact the quality of surface waters which are crossed, culverted or diverted, potential impacts on flow due to increased surface water runoff, and the potential for contamination of surface waters arising from accidental leaks or discharges.

During the Operational Phase potential impacts could arise due to the crossing of watercourses with culverts, the permanent diversion of a watercourse (at Dardistown) and due to potential discharges to watercourses. Culverting and crossing of watercourses can have a negative impact (if not adequately designed) on river water bodies by impacting on river flow velocity (up-gradient and/ or down-gradient) or the fishery/ ecological value assigned to that water feature. Inappropriate sizing and design of culverts and surface water crossings can also impact on the value of that waterbody as a habitat for fish by altering sedimentation and river morphology.

10.10.5 Mitigation Measures

Construction Phase mitigation measures include the use of adequate containment measures for chemicals stored within construction compounds and maintenance yards, use of petrol/oil interceptors in maintenance yards and car parking areas and appropriate management to ensure there are no discharges to watercourses. Implementation of a construction-based Sediment Erosion and Pollution Control Plan (as described in the outline CEMP) and a programme of continuous monitoring (such as a maintenance schedule and site-specific procedures) will be established by the Contractor for silt and pollution control measures during the construction period. These will minimise the potential for accidental discharge to receiving waters/ discharge points.

There are a number of measures embedded in the design that will minimise any impacts during the Operational Phase and these include:

- Electrically operated vehicles will be used so there is limited potential for contaminated run-off along the alignment as a result of minimal use of lubricants and chemicals for operational maintenance;
- Limited requirement for bulk chemical storage. Where bulk chemicals will be stored, they will be bunded and located on impermeable hardstanding and under cover within maintenance compounds (mainly at the Dardistown Depot);
- Oil and petrol interceptors will be included prior to outfalls from the Dardistown Depot, P&R area and maintenance area. Additional interceptors will be installed along the drainage system prior to discharge points;
- All wastewater arising from the tunnels (including from the tunnels themselves, emergency access and ventilation shafts, portals, and foul water from station boxes) will ultimately be discharged to public foul sewer under formal consent issued by the relevant Local Authorities (including Irish Water). No wastewater will be discharged to surface waters or the ground during operation;
- All culverts are designed to prevent permanent impact to the river. The potential for permanent impact is prevented by ensuring the width of the river is not significantly exceeded or constricted by the culvert or crossing and that reasonable conveyance above and below the structure is minimised;
- Construction of the viaduct over the Broadmeadow River and Ward River will comprise a 13-span bridge structure which elevates the alignment above the rivers and the flood plain; and
- The drainage system for the proposed Project has been designed to incorporate Sustainable Urban Drainage System (SuDS).

10.10.6 Residual Impacts

The residual impact on surface water during both the Construction and Operational Phase is considered imperceptible to slight.

10.11 Hydrogeology

10.11.1 Introduction

This section assesses the impact of MetroLink on Hydrogeology (groundwater) during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.11.2 Assessment Methodology

The assessment considers elements of MetroLink that will interact with the hydrogeological environment, i.e., those activities that have the capacity to change the groundwater regime in terms of recharge of groundwater levels, regional and local flow patterns, and water quality.

This assessment describes the regional geology and the capacity of the subsoils and bedrock to contain groundwater bodies that may be locally important aquifers, supporting groundwater abstractions and base flow to watercourses. The geographical scope defined comprises all groundwater bodies located within the proposed alignment and approximately a 500m buffer. The assessment comprised an extensive desktop review, consultation, field surveys, groundwater assessments and walkover assessments.

10.11.3 Baseline

The soils across the study area consist of made ground, encountered mainly in urban areas, in addition to some glacial till, alluvium and glaciofluvial sands and gravels. These deposits are all potentially water-bearing by nature and are underlain by limestones and mudstones of the Lucan Formation, the Tober Colleen Formation, the Malahide formation and Waulsortian Limestones which are quite different bedrock units in terms of hydrogeological characteristics. The bedrock underlying the majority of the proposed alignment is classified as a Locally Important Aquifer which is 'moderately productive' only in local zones and belongs to the Swords and Dublin Groundwater Bodies.

10.11.4 Predicted Impacts

The Construction Phase will involve localised removal of very small quantities of the bedrock within the aquifer through tunnelling and the pumping of groundwater from excavations (dewatering). These activities could affect water quality within the hydrogeological environment if not effectively mitigated. Spillages or discharges to groundwater would also have the potential for significant impacts if not mitigated.

The Operational Phase can potentially alter the existing groundwater regime by:

- Lowering of groundwater levels from Operational Phase dewatering (where present);
- Raising of groundwater levels by impeding or impounding groundwater through permanent [unmitigated] 'barrier effects'; and
- Discharge of track run-off and pumped tunnel/cut/station/portal/shaft water to ground.

10.11.5 Mitigation Measures

Construction Phase mitigation measures include:

- Groundwater ingress control measures for tunnelling to ensure groundwater does not flow into tunnel areas;
- In order to maintain the existing groundwater levels during excavations of station boxes it will be necessary to excavate within a water-resistant 'closed box', i.e. the excavation of the retained cut

underground stations are designed with a water retaining sealed enclosure which will be formed by employing the use of either secant pile or diaphragm walls. This methodology will minimise any inflow of groundwater into the excavation;
- Dewatering of the bedrock aquifer will be minimised such that it does not have a significant effect. Further advanced groundwater level monitoring will be undertaken;
- Mitigating against historical and unknown or unrecorded groundwater abstraction wells encountered along the alignment will be undertaken by decommissioning wells in advance. Mitigation will consider the use of surface geophysics (electrical tomography and Ground Penetrating Radar [GPR]) in areas where the likelihood of unknown wells is foreseen in order to identify their presence;
- Monitoring of groundwater supply wells within 150m of the proposed Project boundary for water quality on a monthly basis for 12 months before construction, during construction and for a nominal period of 12 months after construction is completed;
- Monitoring of potable (drinking water) groundwater abstraction wells within 150m of the proposed Project boundary for water quality on a monthly basis for 12 months before construction, during construction and for a nominal period of 12 months after construction is completed;
- Implementation of a Sediment Erosion and Pollution Control Plan and an Incident Response Plan will be included in the detailed CEMP;
- Site-specific constructability reports to clearly specify how water emanating from site activities will be managed from source to final approved discharge point. Final discharged volumes will occur in a controlled manner following appropriate Local Authority discharge permit criteria irrespective of whether this discharge is to sewer or watercourse;
- Excavation material, concrete, bentonite and other waste generated material will be managed in compliance with the Water Quality Management Plan and Waste Management Plan; and
- Protection measures will be put in place to ensure that all hydrocarbons used during the Construction Phase are appropriately handled, stored and disposed of.

During the Operational Phase, the proposed Project has a negligible impact potential on groundwater quality as there is limited potential for accidental releases. Vehicles will be electric and chemicals will be required for maintenance works only and stored within containment bunds. The impact of stormwater discharge is low during operation based on the minimal use of lubricants and chemicals. A programme of regular inspection of Operational Phase discharges will be undertaken such as at Dardistown Depot as part of the long-term operation and maintenance programme.

Further mitigation measures during the Operational Phase include:

- Interceptors to capture oil/fuel spills are included in maintenance yards and carparking areas. As such there is no likely discharge to ground;
- All wastewater arising from the tunnel alignment (including from the tunnel itself, emergency access and ventilation shafts, portals, and foul water from Station boxes will ultimately be discharged to public foul sewer under formal consent by Irish Water. No wastewater will be discharged to ground during operation;
- On-going inspection (at a minimum three-to-five-year frequency) and maintenance will occur to ensure that the swales/wetland ponds/infiltration basins continue to operate as intended for the design life of the proposed Project; and
- It is proposed to install drainage wells on each side of the cut section and retained station box locations. These wells will be hydraulically connected which will allow groundwater to pass freely under the cut/station box feature thereby maintaining flows at depth and alleviating up-gradient pressures.

10.11.6 Residual Impacts

With the implementation of the proposed mitigation measures, no significant local impacts on groundwater are expected. The residual impacts are considered imperceptible to slight.

10.12 Soils and Geology

10.12.1 Introduction

This section assesses the impact of MetroLink on Soils and Geology during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.12.2 Assessment Methodology

A review of existing desk-based information and data from five phases of ground investigation undertaken for the proposed Project has been completed in order to identify the baseline conditions and identify any potential impact arising from the construction and/or operation of MetroLink.

10.12.3 Baseline

The geology (soil and rock) generally comprises of topsoil or made ground (artificial or reworked soils) on top of clay which overlays limestone rock. At the northern section of the proposed Project the alignment will be built primarily on loam, till, sandy gravelly clay and limestone rock with some River alluvium located in the areas around the Broadmeadow River and the Sluice River. The section around the airport consists of urban soils with underlying limestone. Around the Dardistown area the geology consists of loam, till, limestone and some sandstone with some alluvium present south of the M50 Motorway beside the Santry River. The whole of the city section consists of made ground and urban soils with areas of alluvium around the Tolka River. The City Tunnel will pass through limestone and shale rock.

10.12.4 Predicted Impacts

The majority of potential impacts occur during the Construction Phase arising from the physical disturbance of soils and sub-soils. The potential impacts identified during the Construction Phase of the proposed Project include:

- Loss of soil cover and increased risk of soil erosion and compaction;
- Degradation in chemical or organic quality of soil resulting from the stripping, storage and reinstatement of soils during construction;
- Stability of both soils and bedrock geology during earthworks and tunnelling, including settlement effects;
- Risk of a release of Radon or Ground Gas to tunnels or other enclosed spaces;
- Loss of Geological heritage and scientific value;
- Risk of encountering contaminated ground, including potential human health and environmental impacts arising from the excavation, handling, on-site processing, transport and off-site disposal and recovery;
- Risk of contamination of uncontaminated soils and geology by construction activities such as accidental fuel spills and the introduction of new contaminant migration pathways; and
- The generation of large quantities of excavated soils and rock.

During the Operational Phase, MetroLink will lead to little or no long-term loss or degradation of any existing undisturbed soil or subsoil. Where sections of track and other features such as the P&R and Dardistown Depot are present at the surface, the potential for surface water runoff to cause erosion of soil (including made ground and sensitive soils) and sub-soil will be reduced by the installation of a trackside and surface water drainage system. Other features such as underground stations, intervention shafts and portals will also include drainage systems to manage surface water and reduce interactions with soils.

10.12.5 Mitigation Measures

Mitigation measures will be required during the Construction Phase and these include the following:

- For the excavation, movement, temporary storage and removal of topsoil: mitigation includes adherence to best practice construction techniques, environmental management and pollution control procedures as described in the outline CEMP;
- To mitigate potential risks from radon and ground gas migration into tunnels, excavations and other enclosed spaces during construction, an occupational monitoring programme will be implemented to identify whether radon or ground gas migration and build up is occurring. If required, mitigation measures will be implemented such as providing additional ventilation and use of personal protective equipment as a last resort;
- Prior to the Construction Phase, further ground investigations and ground gas/groundwater monitoring will be undertaken to confirm the presence of contaminated material. Appropriate health and safety and waste management procedures for working with potentially contaminated soils (including asbestos) and water will be established;
- Soils and excavated materials will be stockpiled in line with best practice as outlined in the outline CEMP; and
- Measures outlined in the outline CEMP will be followed to manage the risk of contamination of soils arising from Construction Phase activity e.g. all chemicals and fuels will be stored in bunded containers.

10.12.6 Residual Impacts

Following implementation of the mitigation measures, potential impacts and risks are reduced to imperceptible or negligible for many of the aspects considered, with the remainder such as Radon and water pollution (from stockpiles) assessed as low risk.

10.13 Land Take

10.13.1 Introduction

This section assesses the impact of MetroLink on land take during the Construction Phase and Operational Phase. This assessment covers the impact of MetroLink on residential, commercial and public areas located along the route and in particular those properties which will need to be acquired and or will be impacted by MetroLink. This is collectively referred to as 'land take'.

10.13.2 Assessment Methodology

The assessment involved desktop research and analysis of existing documentation to identify property types and uses along the alignment which will be directly impacted upon by the proposed Project. As part of the compilation of this section relevant policy documents were studied in order to fully understand the existing land-use context in which the proposed Project will be constructed and operated. Walkover surveys were carried out within the survey area and on properties that will be directly impacted by the proposed Project. These surveys were carried out in order to confirm the impact on registered and unregistered properties and to confirm that the information acquired through the desktop study was accurate. Based on the data collected and collated for land and property, an analysis was undertaken of the potential impacts resulting during the Construction and Operational Phases. Each land parcel potentially impacted was assessed to determine the sensitivity of the site having regard to its use, and then the impact was determined taking into account the extent of the land take, the duration of the land take and the level of severance resulting.

10.13.3 Predicted Impacts

The acquisition of lands both temporary and permanent has been considered in this assessment. Permanent and temporary land take includes lands which will be acquired for the construction of the MetroLink alignment, stations and other sites such as the P&R and the Dardistown Depot. It also includes land take requirements for construction compounds, road diversions, and realignment, temporary alternative routes, public rights of way and private accesses and land required for the diversion and realignment of watercourses, railways and utilities. A number of properties along the alignment will also need to be permanently acquired due to the need to demolish these properties. Land required for the

proposed Project has been minimised wherever possible and boundaries adjusted to avoid and/or minimise required land take and property demolition as far as possible.

Existing and planned future properties will benefit from being located in close proximity to a new permanent public transport system. Experience of the effects of the Luas Red and Green Lines on property prices along these lines would indicate that generally residential property values and land values in the study area will increase.

10.13.4 Mitigation Measures

In order to mitigate impacts on property, compensation will be provided to property owners for land and property that is deemed to be acquired land in accordance with the general compulsory purchase code. Appropriate compensation will also be payable to owners of properties that are subject to short-term and or temporary acquisition. Compensation will be provided through the Compulsory Purchase Order (CPO) process.

In cases where parts of properties are occupied, access to the remaining unoccupied parts will be maintained where it is possible and safe to do so. Reinstatement of any natural boundaries would be carried out upon completion of the Construction Phase.

10.13.5 Residual Impacts

The most significant land take impacts are those associated with permanent acquisition. Although the compensation scheme for compulsory purchase will financially recompense landowners, it is recognised that the residual impact will remain significant for many owners, particularly of residential properties.

Where the permanent acquisition of sport facilities is required, alternative facilities will be provided by TII. At the proposed Tara Station, given the loss of the Markovich Leisure Centre, TII and DCC will work to provide alternative leisure facilities. This will reduce the residual impact of permanent acquisition to Significant.

Following implementation of the mitigation measures, residual impacts of temporary land take will reduce to moderate or slight.

10.14 Infrastructure and Utilities

10.14.1 Introduction

This section assesses the impact of MetroLink on existing Infrastructure and Utilities during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.14.2 Assessment Methodology

The impacts on infrastructure and utilities are assessed to determine any disruption that might affect these material assets, and mitigation measures required to minimise those impacts. The assessment considers all utilities including gas, electricity and water mains, wastewater sewers, communication infrastructure, rail infrastructure and the Royal Canal.

The identification of utilities and infrastructure within the study area commenced with consultation with the various utility providers, where records were requested from the providers detailing the locations of utilities along the proposed alignment that could be potentially directly impacted i.e. require diversion or be impacted by construction generated ground movement. Supplementary surveys were also undertaken to confirm and refine data provided by utility providers. The utilities and infrastructure were then assessed in terms of the sensitivity of each to disruption and the predicted disruption.

10.14.3 Baseline

Due to the primarily urban nature of the study area there are multiple and significant utilities that will be traversed by the proposed MetroLink alignment. These utilities include surface water, foul and combined sewers, watermains, overhead and underground electricity cables, gas mains and telecommunication cables. The alignment also crosses under both the Royal and Grand canals and railway assets at the proposed Glasnevin station.

10.14.4 Predicted Impacts

All potential impacts associated with utilities and infrastructure will occur during the Construction Phase in the vicinity of surface works, such as the construction of the surface/retained cut alignment at the northern end of the alignment and at station box excavation locations. Where possible, the project design has avoided interactions with other major utilities and infrastructure. MetroLink will involve the crossing or interaction with some utilities including gas, electricity and water mains, wastewater sewers, communication infrastructure, rail infrastructure and the Royal Canal (and tow path). The diversion and/or replacement of this infrastructure will be planned and managed as far as possible in accordance with the requirements and specifications of the affected utility and/or service provider.

There will be no further impacts during the Operational Phase.

10.14.5 Mitigation Measures

Mitigation measures include diversion of utilities away from the alignment where necessary to allow for future maintenance or diversion activities. In some cases, planned services disruptions will be required to facilitate the connection of existing services to the newly diverted services.

Proposals for monitoring of potential impacts and the required strengthening works will be agreed with each of the utility companies. All impacted utilities will be reinstated in accordance with current standards and specifications for the relevant utility.

10.14.6 Residual Impacts

The residual impacts on utilities and infrastructure will be neutral at a minimum. For the railway infrastructure at Glasnevin, the residual impact will be positive, as the new station development will interface with the Iarnród Éireann Western Commuter Line and the South-Western Commuter Line, with a new concourse area to connect all three railway lines together. The overall sequence of works at Glasnevin Station has been coordinated with planned Iarnród Éireann improvement works in the station area and to the west of the station. In relation to the Royal Canal at Glasnevin, the residual impact will be neutral. The canal retaining wall will be strengthened and the functioning of the canal will remain unchanged. Following completion of the Construction Phase, the Royal Canal towpath at Glasnevin will be fully reinstated on its existing alignment. In order to maintain the existing width along the towpath, a permanent cantilever structure will be provided to carry the towpath over the proposed Iarnród Éireann platform serving the Western Commuter Line. No additional impacts are expected during the Operational Phase.

10.15 Agronomy

10.15.1 Introduction

This section assesses the impact of MetroLink on Agronomy during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

Agronomy is the science associated with the interaction between cultivation of land, soil management, and animal and crop production for food production and other human benefits.

10.15.2 Assessment Methodology

The agricultural impact assessment was undertaken following consultations, farm visits, an assessment of responses received to a detailed questionnaire, and a detailed review of mapping. Consultation provided an early understanding of the potential concerns of the consultees and to minimise potential impacts.

10.15.3 Baseline

The study area for the agronomy assessment is defined by a 250m wide corridor, and includes all land described as agricultural within the Project Boundary. This encompasses agricultural land from Estuary to Dardistown and contains seven landowners with a total of 12 land parcels.

10.15.4 Predicted Impacts

Potential impacts could arise from the loss of agricultural land where permanent features of MetroLink are built. There is also the potential for impacts from the temporary loss of land during the Construction Phase to facilitate access and construction compounds. There is potential, before mitigation, for nuisance from construction traffic, noise and dust, for impacts arising from removal of hedgerows and trees and temporary disturbance to farm operations.

There is potential, before mitigation, for Operational Phase impacts due to permanent land take, severance of land parcels, and operational noise impacts on livestock.

10.15.5 Mitigation Measures

During the Construction Phase all requisite measures will be employed to minimise the impacts on farms and allow the continuous operation of all affected holdings. Mitigation will include the implementation of measures contained within the outline CEMP, the Traffic Management Plan, Dust Management Plan, and continued consultation with landowners. Discussions with landowners will be held with regards to land drainage systems and fencing requirements. During the Construction Phase, mitigation will include:

- Crossing points and suitable access arrangements will be provided to accommodate landowners;
- Individual landowners shall be given notice in advance so they can arrange their farming activities on lands held adjacent to construction sites;
- Where existing water and power supplies are disrupted, alternatives will be made available. If permanent access to surface water sources is disrupted, alternative water supplies will be provided (or compensation will be provided);
- Any shelter removed will be reinstated. Where loss of shelter causes disturbance during the regrowth period, compensation may be payable under the statutory process. Drainage systems impacted by MetroLink will be reinstated;
- Disease protocols and farm biosecurity measures will be employed. All construction equipment will arrive on site clean. Wash-down facilities will prevent the potential spread of soil-borne disease;
- Land acquired on a temporary basis will be reinstated by agreement, returned to the landowner and compensation will be payable under the Statuary Process. Reinstatement work will be in accordance with the outline CEMP and the land take plans;
- The permanent loss of agricultural land is approximately 72ha. Under the statutory compensation process, landowners will be compensated for permanent land loss which will enable them to purchase alternative replacement lands; and
- The mitigation measures during the Operational Phase will be the on-going maintenance and upkeep of the boundary fences.

10.15.6 Residual Imapcts

During the Construction Phase, the residual impacts likely to be felt at individual farm level consist of a reduction in the area farmed, land loss, an increase in construction traffic and in some instances increased noise. The majority of residual impacts felt during the Construction Phase will no longer be

experienced during the Operational Phase. As a result of the Operational Phase, there will be residual effects such as a change in land use and permanent land severance at several locations.

MetroLink will necessitate the removal of approximately 76ha during construction, with approximately 27ha permanently removed from 'agricultural' use during the Operational Phase. At a county level, the total agricultural land acquired is 0.002%. There will be no significant change in land use at either the national or local level due to MetroLink. There will be no impact of national or county significance as a result of the construction of MetroLink.

During the Construction Phase, the residual impacts likely to be felt at the individual farm level consist of a reduction in the area farmed, loss of land, an increase in construction traffic and in some instances increased noise. The majority of residual impacts felt during the Construction Phase will no longer be experienced during the Operational Phase. As a result of the Operational Phase, there will be residual effects such as a change in land use and permanent land severance at several locations. Under the statutory compensation process, compensation will be paid to cover additional predicted disturbance caused by severance and temporary and permanent land loss. This will cover additional predicted disturbance caused by severance and enable landowners to purchase alternative replacement lands. During the Operational Phase, the residual impacts predicted to land holdings will range from not significant to imperceptible for the landowners affected.

10.16 Materials and Waste Management

10.16.1 Introduction

This section assesses the impact of MetroLink in terms of materials use and waste generation during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.16.2 Assessment Methodology

The materials and waste management assessment includes a review of relevant policy and legislation, and data on waste generation, consultation with key stakeholders, a comparison of predicted waste and materials management facility capacity and the predicted waste to be generated by MetroLink. Based on this assessment, the management of the proposed materials and waste was designed having regard to the Waste Hierarchy.

10.16.3 Baseline

The baseline for this assessment against which the analysis was undertaken relates to the following:

- The availability of materials required for the construction of MetroLink; and
- The availability of materials and waste management facilities to receive materials and waste generated by the proposed Project.

10.16.4 Predicted Impacts

The proposed Project will source materials for construction from local suppliers and re-use materials on site to minimise environmental impacts and the cost of waste transport and, support the economic well-being of the local communities in line with the proximity principle. Aggregates and concrete are available in Ireland in sufficient quantities for the proposed Project and there are 220 ready-mixed concrete plants and 20 large scale precast concrete plants located throughout the country. Other construction materials such as steel will have to be imported.

In terms of material and waste generation arising from the proposed Project, there will be a requirement to find re-use opportunities or as a last resort, waste management facilities to receive and manage materials. The proposed Project is within the Eastern and Midlands Region (ERM) for waste management. Within this region and within Ireland as a whole there is very limited landfill capacity for the receipt of waste. However, there are a number of options available for material re-use:

- Recovery of construction and demolition (C&D) waste;
- Re-use of clean soils at soil recovery facilities; and
- Re-use of excavated materials such as soil and rock under Article 27 of the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011), as amended (Waste Directive Regulations (2011)).

There are no hazardous material landfills in Ireland, however there are a number of hazardous waste management facilities where there is capacity either to treat the material or to export.

Potential impacts before mitigation arise due to the generation of large quantities of excavated materials from tunnelling and excavations and, the generation of bentonite slurry, demolition materials, and surplus construction materials (such as packaging), during the Construction Phase. Some waste streams (such as oils and paints) will be classified as hazardous waste.

The types and quantities of construction materials required to build the proposed Project, as well as waste to be generated through the Construction Phase, have been estimated along with the quantities to be reused and waste recycled/recovered off-site.

Nearly 3,000,000m^3 of excavated material is forecast to be generated by MetroLink. It has been predicted that approximately 89.6% of the excavated material could be classified for beneficial reuse (i.e., within the construction of embankments, in backfill, and for bunding and landscaping requirements) and the remaining 10.6% would be classified as waste (inert, non-hazardous or hazardous).

A notification under Article 27 of the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011), as amended (Waste Directive Regulations (2011)) (referred to as Article 27) has been made to the Environmental Protection Agency (EPA) on behalf of TII to classify much of the excavated material to be generated by MetroLink as a by-product and not a waste. This means that the material is approved for re-use. It is predicted that up to 89.6% of the 3,000,000m^3 would be classified as a by-product under Article 27 which is approximately 2,700,000m^3 (4,887,488 tonnes).

Operational Phase impacts associated with material and waste management at stations and during maintenance are predicted to not be significant in the context of the proposed Project. All wastes generated during the Operational Phase will be managed in accordance with the waste hierarchy. Operational waste plans will be prepared by the MetroLink operator.

10.16.5 Mitigation Measures

During the Construction Phase mitigation measures will include:

- All materials consumed and waste generated will be managed in accordance with circular economy principles and the waste hierarchy;
- A pre-demolition audit will be undertaken in order to facilitate selective demolition. Selective demolition will be undertaken in order to enable removal and safe handling of hazardous substances and to facilitate reuse and high-quality recycling;
- The excavated Material Management Strategy is to be used by the Contractor(s) to develop an Excavated Materials Management Plan to be followed during the excavation phases;
- Waste and materials will be managed based on measures presented in the outline CEMP and will include a Construction and Demolition Waste Management Plan (C&D WMP);
- A Waste Material and Spoil Management Plan has been prepared that provides a summary of excavated material arisings and how these will be managed;
- Hazardous waste will be managed as per the Waste Management Regulations and stored separately to non-hazardous waste streams; and
- Authorised sites where surplus material can be reused, with any remaining excess material removed by a licensed waste collection permit holder and transferred to a relevant authorised facility.

The assessment has indicated that the Construction Phase is likely to consume large quantities of materials and the generation of potentially large quantities of excavated material and Construction & Demolition (C&D) waste.

10.16.6 Residual Impacts

During the Construction Phase, there is a moderate or significant effect from inert, non-hazardous, and hazardous waste, due to the volume of waste predicted to be generated nationally compared to the remaining inert and non-hazardous landfill void capacity. There will be no significant residual impacts on the use of materials.

There will be no residual effects arising during the Operational Phase of the proposed Project.

10.17 Archaeology and Cultural Heritage

10.17.1 Introduction

This section assesses the impact of MetroLink on Archaeology and Cultural Heritage during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.17.2 Assessment Methodology

This assessment was based on publicly available information, consultation with relevant bodies, field inspections, archaeological investigations, including both non-invasive geophysical surveys and invasive excavations, as well as an underwater wade and metal detection survey for a short section of the Broadmeadow River.

The study area varied along the alignment, extending to 250m either side of the project boundary where the Project is at ground level and extending to 100m either side of the tunnel alignment.

10.17.3 Baseline

The proposed Project commences in Lissenhall to the northeast of the medieval town of Swords, travelling south along and to the east and west of the R132. The very northern end of the alignment is located in an area with green fields, with the remainder traversing mostly built up and previously disturbed areas. The proposed Project also crosses a number of watercourses including the Broadmeadow and Ward Rivers at Swords. Lissenhall Bridge which crosses the Broadmeadow River is a National Monument. There are a further 15 recorded monuments of high importance and 27 archaeological constraints of medium importance between Lissenhall and Dublin Airport.

The landscape in the Dardistown area contains four archaeological sites of high importance and 15 sites of medium importance. This area is dominated by agricultural land and sports pitches to the north of the M50 and the R108 dual carriageway and greenfield areas to the south of the motorway. One watercourse, the River Santry, traverses the proposed Project to the south of the M50.

The remainder of the alignment south of the M50 Motorway is in tunnel from the proposed Northwood Station site. However, there are a large number of archaeological sites through this area including seven sites of very high importance including the Parnell Monument and 14 – 17 Moore St in close proximity to the proposed MetroLink station at O'Connell Street. St Stephen's Green is also a National Monument which is the location for the proposed St Stephen's Green Station. There are a further 26 archaeological sites of high importance and 30 sites of medium importance through this section of the alignment.

10.17.4 Predicted Impacts

During the Construction Phase, in the absence of mitigation measures, direct impacts would potentially arise as a result of ground disturbance due to earthworks and excavations, total or partial demolition of heritage structures and temporary removal, storage, relocation or reinstatement of archaeological and heritage features.

During the Operational Phase, no further direct impacts would occur, however, a range of potential significant negative indirect effects have been identified. MetroLink has the potential to have a very significant indirect negative effect on St Stephen's Green Park National Monument and a significant indirect negative effect on Lissenhall Bridge National Monument.

10.17.5 Mitigation Measures

Mitigation measures will seek to preserve *in situ* any archaeological or cultural heritage assets which may be impacted by MetroLink. Where this is not possible a range of mitigation measures will be implemented in advance of and during the construction which will aim to ameliorate the impacts. A Project Conservation Architect will be appointed to oversee the implementation of mitigation measures during construction.

Mitigation measures which may be undertaken prior to and during the Construction Phase include: full measured, written, drawn and photographic surveys; preparation and implementation of detailed construction methodologies to record how the features are removed so that they can be reinstated at a later date; further archaeological test trenching and excavations, dives, and underwater and wade surveys (including metal detecting) to clear construction sites; preservation by record (archaeological excavation); and archaeological monitoring.

10.17.6 Residual Impacts

Once all the mitigation measures have been implemented, there will be no significant residual impacts on archaeological and cultural heritage resources as a result of the construction and operation of MetroLink.

10.18 Architectural Heritage

10.18.1 Introduction

This section assesses the impact of MetroLink on Architectural Heritage during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.18.2 Assessment Methodology

The assessment undertaken was based on data collected from consultation and a desk-based assessment identifying all documented architectural heritage constraints within the study area. A site walkover was undertaken where architectural constraints were visited to assess their heritage significance and to identify any other structures within the area that may be of architectural heritage significance. The study area is defined as the area within 100m of the project boundary within undeveloped areas and within 50m in urban areas. It also includes an area 50m either side of the tunnel.

10.18.3 Baseline

At the very north of the alignment, there are a number of architectural heritage constraints in the vicinity of Broadmeadow and Ward Rivers. These include Lissenhall Bridge, Balheary Bridge and Balheary Demesne. There are also several early eighteenth-century houses such as Grace Dieu, Turvey House, Balheary House and Lissenhall Little. Further south, between the proposed Swords Central Station and Fosterstown Station there are four architectural heritage constraints identified including the Protected Structures of Scotchstone Bridge and the Milestone at Fosterstown. In the vicinity of the proposed Dublin Airport Station the Church of Our Lady Queen of Heaven is identified as a Protected Structure.

South of the M50 Motorway, Santry Lodge is located and even though it is not a Protected Structure it is of historical and architectural significance. From Northwood south there are large numbers of Protected Structures and structures of architectural heritage significance in the vicinity of proposed station locations. This includes the following:

- Whitehall College adjacent to Griffith Park Station;
- Features of the Royal Canal at the proposed Glasnevin Station;

- The Mater Hospital adjacent to the proposed Mater Station;
- 37, 38, 42, 43, 44 and 45 O'Connell St and 14 – 17 Moore St adjacent to the proposed O'Connell Street Station;
- Tara Street Fire station and Tara Street DART station and Loop Line close to the proposed Tara Station;
- St Stephen's Green Park including surrounding railings, walls, bollards and monuments; and
- Properties on Dartmouth Square and the Carroll's Building adjacent to the proposed station at Charlemont.

10.18.4 Predicted Impacts

Potential impacts during the Construction Phase, before mitigation, include impacts on Protected Structures and other architectural heritage features. Such impacts include the demolition of identified houses, gate lodges and gateways, severance of access to properties (such as Santry Lodge), and indirect impacts resulting from the potential for vibration or settlement to damage sensitive bridges and visual impacts on the settings of Protected Structures.

Potential impacts during the Operational Phase, before mitigation, include impacts associated with visual changes to the setting of architectural heritage, and physical changes or repositioning of heritage features.

10.18.5 Mitigation Measures

The measures proposed to avoid or reduce negative impacts on architectural heritage during the Construction Phase and Operational Phase include:

- Structural surveys of buildings and other structures of architectural heritage significance to be completed prior to the commencement of works;
- A record by means of photography and written description to English Heritage Level 2 or 3 is to be completed of architectural heritage significant buildings that are proposed to be demolished for posterity;
- Appropriate recording, protection, removal, transportation, storage and reinstatement of items of architectural heritage such as at the sites of Mater Station and St Stephen's Green Station. Works to be completed in accordance with method statements to be compiled by the Project Conservation Architect and the works supervised by suitably qualified professionals;
- Mitigation in appropriate locations includes protection against damage and vibration monitoring to ensure that vibration at the building or other structure does not exceed defined limits;
- A method statement, compiled by a conservation engineer, covering propping of the façade of retained or demolished buildings, and settlement monitoring equipment; and
- The reinstatement of the street surfaces, street furniture, railings and lamps in accordance with the relevant authorities and supervised by a suitably qualified architectural heritage professional.

10.18.6 Residual Impacts

Following the Construction Phase and the Operational Phase mitigation, the majority of residual impacts would be imperceptible to moderate and not significant. However, the impact at the following locations will be significant or very significant for the duration of the Construction Phase; the railway tunnel at Cross Guns, Prospect Lodge, Four Masters Park, 43 O'Connell Street Upper, 44 O'Connell Street Upper, 45 O'Connell Street Upper, 52-54 O'Connell Street Upper, 55-56 O'Connell Street Upper, 57 O'Connell Street Upper, 58 O'Connell Street Upper, and the Carroll's Building, Grand Parade.

10.19 Landscape and Visual

10.19.1 Introduction

This section assesses the impact of MetroLink on the landscape and visual amenity during the Construction Phase and Operational Phase and proposes mitigation measures to minimise identified impacts.

10.19.2 Assessment Methodology

Data was collected and collated in order to inform and develop an understanding of the baseline environment and the development of photomontages that have been prepared for the proposed Project. This process involved a number of steps:

- A walk over of potentially affected areas and preparation of a photographic record of the main landscape areas and features;
- Desk studies of the subject site and its immediate environs in relation to its local and broader significance, using the information gathered from site visits, studying aerial photography, Google Street View and Ordnance Survey mapping;
- Review relevant plans and policy documents such as the Dublin City Development Plan 2016-2022, including the City Tree Strategy, the Draft Dublin City Development Plan 2022-2028 and the Fingal Development Plan 2017-2023, including consideration of its Green Infrastructure plans, Tree Management Strategy and Landscape Character Areas; and
- Generation of a detailed photographic record to inform view selection for the development of photomontages.

10.19.3 Baseline

The Landscape and Visual Impact Assessment (LVIA) study area corresponds to the zone of visual influence and varies in width along the alignment, being wider in open areas of countryside and more confined in built up areas. The study area was sub-divided into Local Landscape Character Areas (LLCAs) which exhibit distinctive characteristics. Analysis was undertaken to identify and establish the landscape and visual baseline environments for each sub-divided study area. There are 23 LLCAs along the proposed alignment. The nine LLCAs in the northern section include the agricultural lands around Swords, the remnant historic demesne landscapes attached to Lissenhall and Balheary House, the Broadmeadow and Ward Rivers and associated historical bridges, the recreational grounds of Balheary Park and the R132 Road corridor. At Dublin Airport, MetroLink is in tunnel, except for the tunnel portals and surface expression of the proposed Dublin Airport station. There are three LLCAs in Dardistown to Northwood and these are characterised by the open landscape of agricultural land and sports pitches at Dardistown, the M50, and the mix of remnant parkland and property associated with the historic Santry Demesne, a small number of private residencies, and a distribution depot and retail park off Old Ballymun Road. MetroLink will enter into tunnel near Northwood. The ten LLCAs have been identified for the remainder of the proposed alignment corresponding to the underground station locations and the intervention shaft at Albert College Park.

10.19.4 Predicted Impacts

During the Construction Phase, the presence of the construction sites and compounds and the large range of construction activities will all affect the surrounding landscape character and views, including those sites that are reinstated after the works. Some of the activities will result in medium to longer-term impacts such as the removal of trees and hedgerows.

The construction and operation of the proposed Project will introduce new elements into the landscape. In the northern part of the scheme, this will include the new P&R facility, the alignment, and new stations. In the tunnel sections, the main changes are associated with the entrances to the underground stations, vents, emergency accesses and the Albert College Intervention Shaft.

10.19.5 Mitigation Measures

The mitigation measures proposed during the Construction Phase revolve primarily around the implementation of appropriate site management procedures which are set out in the outline CEMP.

Much of the potential impact of MetroLink during the Operational Phase on landscape and views will be mitigated through measures embedded in the design, such as the use of retained cut and tunnel sections which will reduce and avoid landscape and visual impacts. The high-quality design for the MetroLink stations will create a branded style. Soft landscaping measures include reducing the removal

of trees and hedgerows, the protection of trees to be retained, the design of new plantings associated with the urban realm around the stations and the parkland around Estuary, and the replacement of trees and hedgerows removed. Other measures include the temporary removal and reinstatement of features such as statues, railings, and historical pavement setts and kerbs. The mitigation also includes details such as the use of appropriate materials and choice of finishes which are in keeping with the surrounding area, details of fencing, and a lighting strategy for public areas.

10.19.6 Residual Impacts

During the Construction Phase, significant negative short to medium term residual landscape effects are predicted at the M50 Viaduct and lands south of the M50 Motorway, Griffith Park Station, Glasnevin Station, Mater Hospital Station, and O'Connell Street Upper. Visual effects are predicted at a number of locations due to the construction site/compound activity.

During the Operational Phase, MetroLink is predicted to have negative permanent residual effects on the landscape and visual amenity at certain locations such as O'Connell Street Upper and at St Stephen's Green. MetroLink is predicted to have significant positive permanent residual effects at a number of locations including Estuary Roundabout to Malahide Road Roundabout, Collins Avenue Station, Glasnevin Station and Tara Station.

10.20 Risk of Major Accidents and/or Disasters

10.20.1 Introduction

This assessment considered the potential significant adverse impacts of MetroLink on the environment, resulting from its vulnerability to risks of major accidents and / or disasters during the Construction Phase and Operational Phase. The identification, control and management of risk is an integral part of the design and assessment process throughout all stages of a project lifecycle.

10.20.2 Assessment Methodology

The risk assessment identified major accidents and/or disasters (i.e. unplanned incidents) that MetroLink may be vulnerable to and assessed the likely impacts and consequence of such incidents in relation to the environmental, social and economic receptors that may be affected.

A register of all potential risks and the associated predicted impacts was developed for the Construction and Operational Phases of MetroLink. This register assumed a worst-case scenario, before any mitigation measures or emergency plans would be put in place to reduce the likelihood and potential impact of any major accidents and/or disasters.

Risks are rated by multiplying the likelihood rating (likelihood of a risk happening which ranges from extremely unlikely to very likely) with the consequence rating (level of consequences if a major accident and/or disaster occurred, which ranges from slight effects to profound effects). This gives a risk score of low, medium or high. Low risk scores do not meet the definition of a major accident and/or disaster and high-risk scores would be considered high risk and unacceptable for the development of MetroLink and would need to be designed out. No high risks were identified. Medium risk scores would require a level of mitigation that would reduce the level of impact.

10.20.3 Predicted Impacts

During the Construction Phase and the Operational Phase, there were a number of risks that were deemed low and were not considered further. There were no high risks identified, and the following medium level risks were identified for the Construction and the Operational Phase:

- Ground/building/structure/utilities damage as a result of construction generated ground movements;
- Major road traffic accident;
- Spillage or long-term seepage of pollutants into watercourse;

- MetroLink train derailment;
- Fire and/or explosion, either direct or indirect harm;
- Collapse of embankment;
- Risk of spread of Infectious disease during construction works, particularly during site clearance; and
- Hydrological event – heavy and prolonged rainfall entering tunnel, portal and stations and adjacent lands and watercourses.

10.20.4 Mitigation Measures

The design of MetroLink has been developed to best international practice, Health and Safety Standards and compliance with the relevant design standards which include measures to reduce the likelihood of risk events occurring (e.g. drainage systems have been designed to cater for increased rainfall events). The design of MetroLink will continue to be developed by the appointed contractor(s) to best international practice and standards.

An outline CEMP has been prepared as part of this EIAR. Before works start, contract specific CEMPs will be updated to include method statements, mitigation measures, and any relevant conditions contained in the planning consent. The Contractor(s) will develop a series of detailed plans including, but not limited to:

- Traffic Management Plan;
- An Emergency Response Plan;
- Invasive Species Management and Control Plan;
- Construction Flood Protection Plan; and
- Water Quality Management Plan.

10.20.5 Residual Impacts

During the Construction Phase, once these mitigation measures are applied, there are no identified incidents or major accidents and/or disasters that present a level of risk that would lead to significant impacts or environmental effects.

During the Operational Phase, following the implementation of mitigation measures, there remains a risk of significant operational disruption to MetroLink due to an outbreak of an infectious disease. In the event of an incident, such as the Covid-19 pandemic, it is anticipated that all non-essential maintenance work and walkovers/inspections would be postponed. Services and capacity would be reduced, being used by essential workers only or as required by the Government. All guidance and direction provided by the relevant Department (i.e., Department of Health) would be followed and any required additional biosecurity measures or restrictions would be implemented. Overall, it can be considered that the risk of impacts from an infectious disease will be managed to be "as low as reasonably practicable" (ALARP). As a result, it is considered that there will not be any likely significant environmental effects arising from the vulnerability of MetroLink to Major Accidents and Natural Disasters.

10.21 Interactions between the Various Environmental Aspects

The potential interactions between environmental aspects arising from the MetroLink Project have been considered. An interaction of impacts can occur when two or more types of environmental impact associated with a proposed development arise at a particular location or act upon an environmental resource. For example, a residential property may be subject to both air quality and noise impacts, an area may experience temporary severance of local rights of way as well as increased construction vehicle movements on local roads, and a watercourse may be subject to alterations in flow regime, geomorphology and water quality, which would interact with the aquatic ecology of the watercourse. A summary of where interactions occur between different disciplines is presented in the table below.

Inter-Relationship Matrix – Environmental Elements	Traffic and Transport		Human Health		Population & Land Use		Electromagnetic Compatibility & Stray Current		Airborne Noise & Vibration		Ground-borne Noise &Vibration		Biodiversity		Air Quality		Climate		Hydrology		Hydrogeology		Soils & Geology		Land Take		Infrastructure & Utilities		Agronomy		Materials &Waste Management		Archaeology& Cultural Heritage		Architectural Heritage		Landscape & Visual	
	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.	Con.	Op.
Traffic and Transport																																						
Human Health	✓	✓																																				
Population& Land Use	✓	✓	✓	✓																																		
Electromagnetic Compatibility& Stray Current			✓	✓	✓	✓																																
Airborne Noise &Vibration	✓	✓	✓	✓	✓	✓																																
Ground-borne Noise &Vibration			✓	✓	✓	✓			✓	✓																												
Biodiversity	✓								✓	✓																												
Air Quality	✓	✓	✓	✓	✓	✓							✓	✓																								
Climate	✓	✓	✓	✓	✓	✓							✓	✓	✓	✓																						
Hydrology	✓		✓		✓								✓	✓				✓																				
Hydrogeology	✓		✓		✓								✓	✓					✓	✓																		
Soils & Geology			✓		✓								✓		✓				✓		✓																	
Land Take					✓	✓							✓	✓					✓																			
Infrastructure & Utilities	✓			✓	✓		✓	✓					✓	✓			✓	✓	✓		✓		✓		✓	✓												
Agronomy	✓				✓	✓			✓				✓		✓			✓					✓		✓	✓	✓											
Materials & Waste Management	✓		✓		✓								✓		✓		✓		✓		✓		✓				✓											
Archaeology & Cultural Heritage					✓	✓							✓								✓		✓		✓	✓	✓											
Architectural Heritage					✓	✓			✓		✓										✓		✓		✓	✓	✓						✓	✓				
Landscape &Visual			✓	✓	✓	✓							✓	✓			✓	✓							✓	✓	✓	✓					✓	✓	✓	✓		

Notes: This matrix should be read down, starting with each topic identified across the top ✓ = significant interaction between topics. Blank cells indicate no or weak interaction. Con. = Construction Phase. Op. = Operational Phase.

10.22 Cumulative Impacts

10.22.1 Introduction

This section considers and assesses the potential for cumulative impacts arising from MetroLink in association with other developments during the Construction Phase and Operational Phase.

10.22.2 Assessment Methodology

The cumulative impact assessment considered the way in which an environmental resource, such as air quality, could be impacted by more than one project cumulatively. The impacts from multiple developments may potentially overlap or act in combination, leading to potentially more significant environmental impacts than if one project was considered in isolation.

The assessment involved a desk study of planning applications that have approval, Development Plan documents, relevant development frameworks and any other available sources to identify other developments. The following sources were considered in identifying other relevant developments for the assessment of cumulative impacts:

- An Bord Pleanála website – for details of strategic infrastructure developments and strategic housing developments;
- Local authority websites and the development plans – for details of allocations and areas for regeneration;
- National Planning Application Database – for downloadable list of planning applications sent from Local Authorities;
- NTA website – for details of major transport programmes. This included a review of the NTA's Transport Strategy for the GDA 2016 – 2035;
- Project Ireland 2040, which combines the NDP and NPF and its interactive mapper;
- TII website – for details of major transport programmes;
- The EIA Portal maintained by the Department of Housing, Planning and Local Government – for applications for development consent accompanied by an EIAR; and
- Irish Water's website, which includes a page on its projects.

Planning applications were identified during a data gathering exercise using the data sources above. Once collated, a screening exercise was undertaken to identify approved planning applications with potential for cumulative impacts. This screening exercise identified potential cumulative impacts arising from 176 proposed developments. Notable proposed developments included BusConnects, DART+ Programme, R132 Connectivity Project, Dublin Central, and various Luas projects.

10.22.3 Predicted Impacts

The assessment concluded that the mitigation measures already included for MetroLink will be appropriate and sufficient to mitigate cumulative impacts. The implementation of these measures will avoid or reduce the majority of the identified potential cumulative impacts to an acceptable level with the exception of the following;

- Traffic during the Construction Phase and Operational Phase;
- Airborne Noise and Vibration during the Construction Phase;
- Biodiversity during the Operational Phase; and
- Landscape during the Operational Phase.

10.22.4 Mitigation Measures

Many of the potential impacts arising from the potential interactions were identified at a very early stage in the design process and were either avoided altogether through design measures or they were addressed through specific mitigation measures. This early identification process helped to identify and

minimise the potential for significant impacts arising. The mitigation proposals for specific environmental aspects also help to mitigate the potential effects of impact interactions as far as practicable.

10.22.5 Residual Impacts

With the implementation of the specified mitigation measures the majority of the identified potential negative cumulative impacts will be avoided or reduced to a level that is not considered a significant residual impact. However potential for cumulative positive and negative impacts arise due to interactions with a number of projects.

11. Glossary of Technical Terms

Term	Meaning
(Old) Metro North	Refers to the Metro North project that received a Railway Order on 2011 (Reference PL06F.NA0003)
Air Over-Pressure	A pulse of air pressure in excess of normal atmospheric pressure. A result of blasting.
Air Quality Exceedance	Where air quality pollutant concentrations exceed an air quality standard.
Air Quality Standards	Air quality standards are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health, including the effects on sensitive sub-groups.
Alignment	Alignment refers to the three-dimensional (3D) route of the railway, considering both the horizontal and vertical alignment.
Alternating Current	An electric current that reverses its direction many times a second at regular intervals, typically used in power supplies
Ambient Air Quality	The background concentration of an air pollutant.
Ambient Noise	Ambient noise is the measured background level of noise.
As Low as Reasonably Practicable (ALARP)	Involves weighing a risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which risks are typically controlled.
Back Of House (BoH)	Areas (of stations) accessible just to employees required for the operation and maintenance of the service.
Baseline Data	Data used to describe the current conditions of the environment, against which future predictions can be made.
C&D Waste	Construction and demolition (C&D) waste is waste generated from construction, renovation, repair, and demolition of buildings and structures. C&D waste is generally made up of wood, steel, concrete, gypsum, masonry, plaster, metal, and asphalt.
Carbon Emissions	The release of carbon into the atmosphere, which is one of the main contributors to climate change.
Catchment	The entire surface area feeding water to a given surface or groundwater feature.
Climate	The average weather over a period of time.
Climate Change	Is a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates.
Combined Sewer	A combined sewer is where surface water run off and wastewater is collected in a single pipeline system and carried to a sewage works for treatment.
Conservation	The process of managing change to a heritage asset in its setting in ways that will best sustain its heritage values, while recognising opportunities to reveal or reinforce those values for present and future generations.

Term	Meaning
Construction Compound	An area occupied temporarily for construction-related activities. The main construction compounds will act as strategic hubs for core project management activities (i.e. engineering, planning and construction delivery) and for office-based construction personnel. The main construction compounds will include: offices and welfare facilities, workshops and stores, and storage and laydown areas for materials and equipment (e.g. aggregate, structural steel, and steel reinforcement).
Construction Environmental Management Plan (CEMP)	A document prepared that provides a framework for TII and any contractors appointed to manage and minimize environmental effects during the construction phase.
Construction Phase	The period during which MetroLink will be constructed.
Cut And Cover	Cut and cover construction involves using excavation equipment to dig a large trench or rectangular hole in the ground which is then covered by a concrete roof slab. Once the slab is in place, surface activity can largely resume as construction works continue below.
DANP	Dublin Airport North Portal.
DASP	Dublin Airport South Portal.
Dewatering	Process of draining rainwater or groundwater from an excavated area before construction can begin.
Diaphragm Walls Or 'D-Walls'	Underground structural elements commonly used as ground retention systems and permanent foundation walls. Similar to secant piles, in that they are excavated from the surface and then filled with reinforcing steel and concrete. However, they are constructed as rectangular sections of trench, rather than circular piles.
Direct Current	An electric current flowing in one direction only.
Disaster	May be a natural hazard (such as an earthquake) or a man-made/external hazard (such as an act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident.
Dispersion Model	A dispersion model is a means of calculating air pollution concentrations using information about the pollutant emissions and the nature of the atmosphere.
Dust	All airborne particulate matter.
Effect	Term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource.
Electromagnetic Compatibility (EMC)	The ability of electrical equipment and systems to function acceptably in their electromagnetic environment, by limiting the unintentional generation, propagation and reception of electromagnetic energy which may cause unwanted effects such as electromagnetic interference (EMI) or even physical damage in operational equipment.
Electromagnetic Field	Electrical and magnetic fields that can be generated from electrical systems.
Embankment	An earthwork to establish the railway foundations (along with cuttings), where material is built up on either side of the road, providing potential for visual screening and noise attenuation.
Embodied Carbon	Embodied carbon refers to GHGs emitted during the manufacture, transport and use of building materials, together with end-of-life emissions
Emerging Preferred Route (EPR)	The route option chosen for MetroLink in the New Metro North Alignment Options Report (TII 2008), but subject to more change as the design develops;
Emissions	The production and discharge of something, especially gas or radiation.

Term	Meaning
Enabling Works	These are works to prepare a site in advance of the main construction works, for example; demolition, removal of vegetation, land levelling, utility diversions, establishment of temporary traffic measures.
Environmental Impact Assessment	The assessment of the environmental consequences of a plan, policy, programme or project prior to the decision to move forward with the proposed action.
Exceedance	An exceedance occurs when the concentration of a pollutant is greater than, or equal to, the appropriate criteria.
Foul Sewer	A foul sewer is a pipe (usually below ground) that carries wastewater to a sewage works for treatment. Wastewater includes sanitary wastewater and trade effluent.
Fully Automated	Starting and stopping, operation of doors and other systems is all fully automated without the requirement for any staff.
Grade of Automation	The grade of automation refers to the degree to which aspects of the railway service are automated or controlled manually. Five GoA are recognised from GoA 0 (manual operation) to GoA 4 (maximum level of automation).
Grassland	Area in which the vegetation is dominated by a nearly continuous cover of grasses.
Greater Dublin Area (GDA)	The area of Dublin and its hinterland. The GDA includes the local authority areas of Dublin City, South Dublin, Dún Laoghaire-Rathdown, Fingal, Meath, Kildare and Wicklow.
Greenhouse Gas Emissions (GHGs)	Greenhouse gas emissions are emissions of atmospheric gases such as carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, ozone, and water vapour that slow the passage of re-radiated heat through the Earth's atmosphere.
Groundborne Noise	Vibration that propagates through the ground to surrounding buildings where it might result in the vibration of floors, walls and ceilings, which could also be heard as a "low frequency 'rumbling' sound" that is referred to as groundborne noise.
Groundborne Vibration	Consists of repetitive waves of vibration that propagate form the source through the ground.
Groundwater	That part of the subsurface water that is in the saturated zone, i.e. below the water table
Hazard	Any phenomenon with the potential to cause direct harm to members of the community, the environment or the physical infrastructure, or being potentially damaging to the economic and social infrastructure. Hazards can include natural hazards such as storms and flooding, civil hazards such as infectious diseases and loss of critical infrastructure; transportation hazards such as rail or road; and technological hazards such as industrial incidents and fire.
Heavy Goods Vehicle (HGV)	A Heavy Goods Vehicle (HGV) is any vehicle with a gross combination mass (GCM) of over 3.5 tonnes.
Impact	Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Infrastructure	The physical structures and facilities that are needed in order to support an economy. i.e buildings, roads, railway, power supply.
Intervention Shaft	A structure to provide connection between the surface ground level and the railway tunnel, providing additional ventilation to the tunnel, emergency passenger evacuation and access for emergency services in the event of an incident in the tunnel.
Intervention Tunnel	A tunnel parallel to the railway tunnel to provide emergency access and passenger egress in the event of an incident in the tunnel or to provide additional tunnel ventilation.

Term	Meaning
Invasive Species	Any kind of living organism that is not native to an ecosystem and causes harm to the environment, the economy, or even human health. Invasive species can grow and reproduce quickly and spread aggressively.
Landscape	An area, as perceived by people, the character of which is the result of the action and interaction of natural or human factors.
Landscape And Visual Impact Assessment (LVIA)	General term used by practitioners to describe the activity of assessing landscape and visual impacts.
Light Rail	Form of passenger urban rail transit characterised by a combination of tram and metro features.
Likelihood	In risk management terminology, the word "likelihood" is used to refer to the chance of something happening, whether defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically (such as a probability or a frequency over a given time period).
Local Authority	The public authority whose duty it is to carry out specific planning functions for a particular area.
Logistics Site	During the Construction Phase, logistics sites will be established to help manage the flow of materials to and from the construction sites.
Long-Term Effects	Effects that last fifteen to sixty years.
Made Ground	Deposits/reworked subsoils which have accumulated through human activity and may consist of natural materials, e.g. clay and/or manmade materials.
Main Works	The works undertaken to build the proposed Project following the enabling works.
Magnetic Field	A region around a magnetic material or a moving electric charge within which the force of magnetism acts.
Major Accident	Events that threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the owner/operating organisation or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g., train derailment) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events.
Medium-Term Effects	Effects that last seven to fifteen years.
Metrolink	The name of the proposed Project for which a Railway Order is being sought.
Mitigation	Measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects.
Momentary Effects	Effects that last from seconds to minutes.
Natura Impact Statement (NIS)	A report comprising the scientific examination of a plan or project and the relevant European Site(s), to identify and characterise any possible implications of the plan or project in view of the conservation objectives of the site(s).
Neighbourhood	Areas intensively developed with medium to higher density housing and/or contain a broad mix of uses.
Noise Sensitive Location	Locations where particular sensitivities to noise exist, e.g. residential areas, schools, hospitals, parks etc.
Nominal	In engineering, the nominal size of something is used to refer to the general size of the part and may be greater or smaller in the final or built product.
Operational Phase	The period following the construction phase where MetroLink is operational.
Overhead Conductor Rail (OCR)	A rigid aluminium contact pole incorporating a contact wire to carry the current to power trains in the tunnelled sections.

Term	Meaning
Overhead Contact System (OCS)	A system to connect the trains with the source of electrical power consisting of a single contact wire and a single catenary wire supported from a support structure.
Park & Ride Facility (P&R)	A location usually sited out of the main urban areas comprising a large car park and connected with a mass transit system.
Particulate Matter (PM)	Airborne PM includes a wide range of particle sizes and different chemical constituents. It consists of both primary components, which are emitted directly into the atmosphere, and secondary components, which are formed within the atmosphere as a result of chemical reactions. Of greatest concern to public health are the particles small enough to be inhaled into the deepest parts of the lung. Air quality objectives are in place for the protection of human health for PM10 and PM2.5 – particles of less than 10 and 2.5 micrometres in diameter, respectively.
Permanent Effects	Effects that last over sixty years.
Photomontage	Visualisation which superimposes an image of a proposed development upon a photograph using highly calibrated photographic and computer modelling techniques.
Platform Screen Doors (PSDs)	Automatic platform screen doors are used primarily for passenger safety to avoid the risk of passengers falling in front of a train. The platform screen doors are paired with the train doors so that both sets of doors are aligned and open and close together. The automatic platform screen doors are full height between the platform and the station ceiling.
Preferred Route (PR)	The updated route option chosen for MetroLink based on the Emerging Preferred Route (EPR) but updated to address stakeholder observations and incorporate design development changes and improvements.
Public Address System	An electronic system comprising of microphones, amplifiers, loudspeakers and related equipment.
Railway Order	The approval from the planning authority (An Bord Pleanála) for permission to build and operate a railway and associated works (in this case, MetroLink) under the Transport (Railway Infrastructure) Act, 2001.
Receptor	A component of the natural or built environment (such as a human being, water, air, a building or a plant) affected by an impact of the construction and/or operation of a proposed development.
Recharge	The addition of water to the zone of saturation; also, the amount of water added to the system.
Recycling	The process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products.
Retained Cut	A section of the railway constructed primarily below ground level with vertical retaining walls either side of the alignment and no roof or enclosure overhead.
Retained Cut Station	A railway station constructed primarily below ground level with vertical retaining walls either side of the alignment to reinforce the walls. Canopies provide shelter over the platforms.
Risk	The likelihood of an impact occurring, combined with the effect or consequence(s) of the impact on a receptor if it does occur.
Risk Event	An unidentified, unplanned event, which is considered relevant to the development and has the potential to result in a major accident and/or disaster, subject to assessment of its potential to result in a significant adverse effect on an environmental receptor.
Rolling Stock	Trains to be used on the MetroLink system.
Secant Piles	A construction method used to form a retaining wall for ground retention prior to excavation. The walls are formed by boring circular sections from the surface down into the top of the bedrock and filling the resulting opening with steel reinforcing cages surrounded by concrete.

Term	Meaning
Settlement	A downward movement of the ground caused by vertical strain in the soil. Excessive ground movements can result in damage to buildings, infrastructure and utilities.
Shaft	A tunnel shaft is a pit or vertical excavation sunk from ground level to the lower level of a tunnel.
Short-Term Effects	Effects that last one to seven years.
Significance	A measure of the level of potential impact on the receiving environment.
Station Box	Stations in retained cut and cut and cover are constructed within a box, comprising the walls, floor and in the case of underground stations a slab roof.
Suburb	Predominantly consist of existing lower density housing developed over expansive areas.
Surface Station	A railway station designed at ground level.
Sustainable Drainage Systems (SUDS)	Designed to manage stormwater locally, to mimic natural drainage and encourage its infiltration, attenuation and passive treatment.
Telecommunications	Cables for the transmission of information, including telephone and internet, cable television networks, signaling and traffic cables and other control cables (e.g. other private services).
Temporary Effects	Effects that last less than a year.
Top Down Construction	Top down construction is a common construction methodology used in the construction of underground stations. It entails the installation of the external walls of the station, by way of D-walling or Secant piles. The roof slab is then installed, and temporary struts are used to support the structure as excavation occurs from the ground level down. Once excavation is completed the other floors and station features are then constructed.
Tunnelling	To dig or force a passage underground.
Tunnel Boring Machine	A machine used to excavate tunnels with a circular cross section through a variety of soil and rock strata.
Underground Stations	A railway station located fully underground with a roof slab over the station to enclose it fully.
Utility	A public service supply to homes and businesses. In the context of this document, utilities relates to gas and electricity transmission/distribution systems, potable (drinking) water systems, foul or combined sewers, surface water sewers and telecommunications systems.
Ventilation Tunnel	A tunnel parallel to the railway tunnel to support the ventilation system in the operational phase.
Vibration	Continuous quick, slight shaking movement.
Visual Amenity	The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of people living, working, recreating, visiting or travelling through an area.
Visual Effects	Effects on specific views and on the general visual amenity experienced by people.
Vulnerability	Describes the potential for harm as a result of an event, for example due to sensitivity or value of receptors. In the context of the EIA Directive, the term refers to the 'exposure and resilience' of the development to the risk of a major accident and/or disaster. Vulnerability is influenced by sensitivity, adaptive capacity and magnitude of impact.
Zone of Influence (Zoi)	An area or volume of surface water or groundwater within which some degradation of water quality criteria is anticipated as a result of a pollutant discharge and which area is used to describe an area impacted by thermal, conventional or toxic pollutants.

12. What Happens Next?

A public procurement process will be required to select a contractor to design and build MetroLink. [Placeholder text for Operational Phase].

Subject to a RO being granted and once the contractor has been selected, the construction process will begin and the construction of MetroLink will take approximately 9.25 years.

It is intended that MetroLink will be operational in the 2030's.

A copy of the draft Railway Order and documentation including this EIAR and the Natura Impact Statement (NIS) may be inspected free of charge during public opening hours from 7th October 2022 until the 25th November 2022 at the following locations:

- The Offices of An Bord Pleanála, 64 Marlborough Street, Dublin 1, D01 V902;
- The Offices of Dublin City Council, Civic Offices, Wood Quay, Dublin 8, D08 RF3F;
- The Offices of Fingal County Council, County Hall, Main Street, Swords, County Dublin, K67 X8Y2;
- Transport Infrastructure Ireland (TII) offices at Parkgate Business Centre, Parkgate Street, Dublin 8, D08 DK10; and
- National Transport Authority (NTA) offices at Dún Scéine, Harcourt Lane, Dublin 2, D02 WT20; (9.15am – 4pm Monday to Friday).

Copies or extracts from the documentation accompanying the application for the Railway Order may be purchased on payment of a fee not exceeding the reasonable cost of making such copy or extract from:

- Transport Infrastructure Ireland (TII), Parkgate Business Centre, Parkgate Street, Dublin 8, D08 DK10, Ireland

Such purchase requests may be sent to Transport Infrastructure Ireland, Parkgate Business Centre, Parkgate Street, Dublin 8, D08 DK10 or info@metrolink.ie or by calling 1800 333 777.

The application may also be viewed / downloaded on / from the following website: www.metrolinkro.ie from the 29th September 2022.

Submissions or observations may only be made in writing to The Board from 7th October 2022 to 5.30pm on 25th November 2022.