DART+ South West

PRELIMINARY OPTIONS SELECTION REPORT

MAIN REPORT

NTA
Údarás Náisiúnta Iompair
National Transport Authority

Rialtas na hÉireann
Government of Ireland

Tionscadal Éireann
Project Ireland
2040

Co-financed by the Connecting Europe Facility of the European Union

Iarnród Éireann
Irish Rail

Table of Contents

Tables

Figures

LIST OF ANNEXES

GLOSSARY OF TECHNICAL TERMS

Glossary of Technical Terms

AA	Appropriate Assessment
ABP	An Bord Pleanála
Alternating Current (AC)	Electrical current that changes direction 50 times per second.
Attenuation Tank	Stormwater attenuation tanks provide a storage system for rainwater and surface water. The stored water inside the attenuation tank is released via a flow-control chamber and is either pumped via a pumping chamber or run-off through a gravity stormwater pipe system.
ATP	Automatic Train Protection
CAF	Common Appraisal Framework
Cantilever	OHLE structure comprising horizontal or near horizontal members supporting the catenary projecting from a single mast on one side of the track.
Catenary	The longitudinal wire that supports the contact wire.
CCRP	City Centre Re-signalling Project
CIÉ	Córas Iompair Éireann
Contact wire	Carriers the electricity which is supplied to the train by its pantograph.
Cork Mainline	The DART+ South West Project includes part of the existing Cork Mainline between Hazelhatch & Celbridge Station and Heuston Station. This part of the Cork Mainline is also referred to in policy documents and publications as the 'Kildare Line'.
Cross overs	A set of railway parts at the crossing of several tracks which helps trains change tracks to other directions.
Cutting	A railway in cutting means the rail level is below the surrounding ground level.
CRR	Commission for Rail Regulation (formerly RSC – Railway Safety Commission)
CSO	Central Statistics Office
CTC	Central Traffic Control
DART	Dublin Area Rapid Transit (IÉ's Electrified Network)
DCC	Dublin City Council
DCDP	Dublin City Development Plan 2016 - 2022
Direct Current (DC)	Electrical current that flows in one direction, like that from a battery.
D&B	Design & Build (contractor)
DMURS	Design Manual for Urban Roads and Streets (DMURS)
DTTAS	Department of Transport, Tourism and Sport
Electrification	Electrification is the term used in supplying electric power to the train fleet without the use of an on-board prime mover or local fuel supply.
EN	European Engineering Standard

EMC	Electromagnetic Compatibility
EMRA	Eastern and Midland Regional Assembly
EIA	Environmental Impact Assessment (EIA) is the process of examining the anticipated environmental effects of the proposed project - from consideration of environmental aspects at design stage through consultation and the preparation of an Environmental Impact Assessment Report (EIAR).
EIAR	Environmental Impact Assessment Report
EMU	Electric Multiple Unit (DART train)
EPA	Environmental Protection Agency
ERM	National Transport Authority's Eastern Regional Model
ERTMS	European Rail Traffic Management System
ESB	Electricity Supply Board
Four-tracking	Four-tracking is a railway line consisting of four parallel tracks with two tracks used in each direction. Four track railways can handle large amounts of traffic and are often used on busy routes.
FSP	Final Supply Points
GDA	Greater Dublin Area
GI	Ground Investigation
GSWR	Great Southern & Western Railway (i.e., the Phoenix Park Tunnel Branch Line)
Horizontal Clearance	The horizontal distance between a bridge support and the nearest railway track is referred to as horizontal clearance. Bridge supports include abutments (at the ends of the bridge) and piers (at intermediate locations).
KCC	Kildare County Council
KCDP	Kildare County Development Plan 2017-2023
KDA	Key Development Area. Identified in the Celbridge Local Area Plan
Kildare Line	The DART+ South West Project includes the part of the existing Cork Mainline between Hazelhatch & Celbridge Station and Heuston Station. This part of the Cork Mainline is also referred to in policy documents and publications as the 'Kildare Line'.
IÉ / IR	Iarnród Éireann / Irish Rail
IINEA	Innovation and Networks Executive Agency
Insulators	Components that separate electricity live parts of the OHLE from other structural elements and the earth. Traditionally ceramic, today they are often synthetic materials.
IM	Infrastructure Manager (IÉ)
Lateral Clearance	Clearances between trains and structures.
LV	Low Voltage
LAP	Local Area Plan
MASP	Dublin Metropolitan Area Strategic Plan

Mast	Trackside column, normally steel that supports the OHLE.
MCA	Multicriteria analysis
MDC	Multi-disciplinary Consultant (consultant)
MEP	Mechanical electrical and plumbing
MSE	Mechanically Stabilised Earth
NIAH	National Inventory of Architectural Heritage
NDP	National Development Plan 2018–2027
NPF	National Planning Framework
NSO	National Strategic Outcomes
NTA	National Transport Authority
Overbridge (OB)	A bridge that allows traffic to pass over a road, river, railway etc.
Over Headline Equipment (OHLE)	This is a key requirement for the DART+ South West Project. OHLE generally refers to the mechanical and electrical items used to carry and deliver electrical power to the train units. OHLE is required to provide electrical power to the network's new electrified train fleet.
PAC	Pre-Application Consultations
Pantograph	The device on top of the train that collects electric current from the contact wire to power the train.
Permanent Way	A term used to describe the track or railway corridor and includes all ancillary installations such as rails, sleepers, ballast as well as lineside retaining walls, fencing and signage.
P&C	Points and Crossings
PLUTO	Planning Land Use and Transport Outlook 2040
PPT	Phoenix Park Tunnel
PPT Branch Line	The Phoenix Park Tunnel Branch Line links Heuston Station to Glasnevin through the Phoenix Park Tunnel. It is part of the Great Southern and Western Railway constructed in the 19th Century which linked Kingsbridge Station (now Heuston Station) to the Dublin Docklands. Historically it was used for freight, but it was opened to passenger traffic in 2016.
Project route corridor	Comprises the both the section of the Cork Mainline between Hazelhatch & Celbridge Station and Heuston Station, and the Phoenix Park Tunnel Branch Line between Heuston Station and Glasnevin Station.
REB	Relocatable Equipment Buildings are aaccommodation for signalling equipment and associated power supplies
RC	Reinforced Concrete
Re-signalling	Re-signalling of train lines will regulate the sage movement of trains and increase the capacity of train services along the route.
RMP	Record of Monuments and Places
RO	Railway Order. Broadly similar to the planning application process, the project is categorised as Strategic Infrastructure Development (SID) and Iarnród Éireann applies directly to An Bord Pleanála for permission.
RS	Rolling Stock

RSES	Regional Spatial and Economic Strategy
RSC-G	Railway Safety Commission Guideline
RPS	Record of Protected Structures
RU	Railway Undertaking (IÉ)
SAM	Safety Assurance Manager
SDZ	Strategic Development Zone
SDCC	South Dublin County Council
SDCDP	South Dublin County Development Plan 2016-2022
SET	Signalling, Electrical and Telecommunications
Shunting	The pushing or pulling motion (a train or part of a train) from the main line to a siding or from one line of rails to another line.
Slab Track	Modern form of track construction which offers proven higher performance in service and a longer life than traditional ballasted track.
SMR	Sites and Monuments Record
Sidings	A siding is a short stretch of railway track used to store rolling stock or enable trains on the same line to pass
SER	Signalling Equipment Rooms are accommodation for signalling equipment and associated power supplies
STC	Single Track Cantilevers
Track Alignment	Refers to the direction and position given to the centre line of the railway track on the ground in the horizontal and vertical planes. Horizontal alignment means the direction of the railway track in the plan including the straight path and the curves it follows.
TPHPD	Trains Per Hour Per Direction
Turnback	A turnback is a rail crossover that connects two tracks together allowing trains to reverse direction (turn back) to provide continuing service in the opposite direction.
TII	Transport Infrastructure Ireland
TMS	Train Management System
TSS	Train Service Specification
TTAJV	TYPSA, TUC RAIL and ATKINS Design Joint Venture (also referred to as TTA)
TTC	Two Track Cantilevers
Underbridge (UB)	A bridge that allows traffic to pass under a road, river, railway etc. The underneath of a bridge.
URDF	Urban Regeneration and Development Fund
VDC	Direct Current Voltage
Vertical Clearance	For overbridges, an adequate vertical distance between railway tracks and the underside of the bridge deck (soffit) must be provided in order to safely accommodate the rail vehicles and the OHLE. This distance is known as vertical clearance and it is measured from the highest rail level.

EXECUTIVE SUMMARY

Executive Summary

ES1.1 DART+ Programme Overview

The DART+ Programme is a transformative railway investment programme that will modernise and improve the existing rail services in the Greater Dublin Area. It will provide a sustainable, electrified, reliable and more frequent rail service, improving capacity on rail corridors serving Dublin.

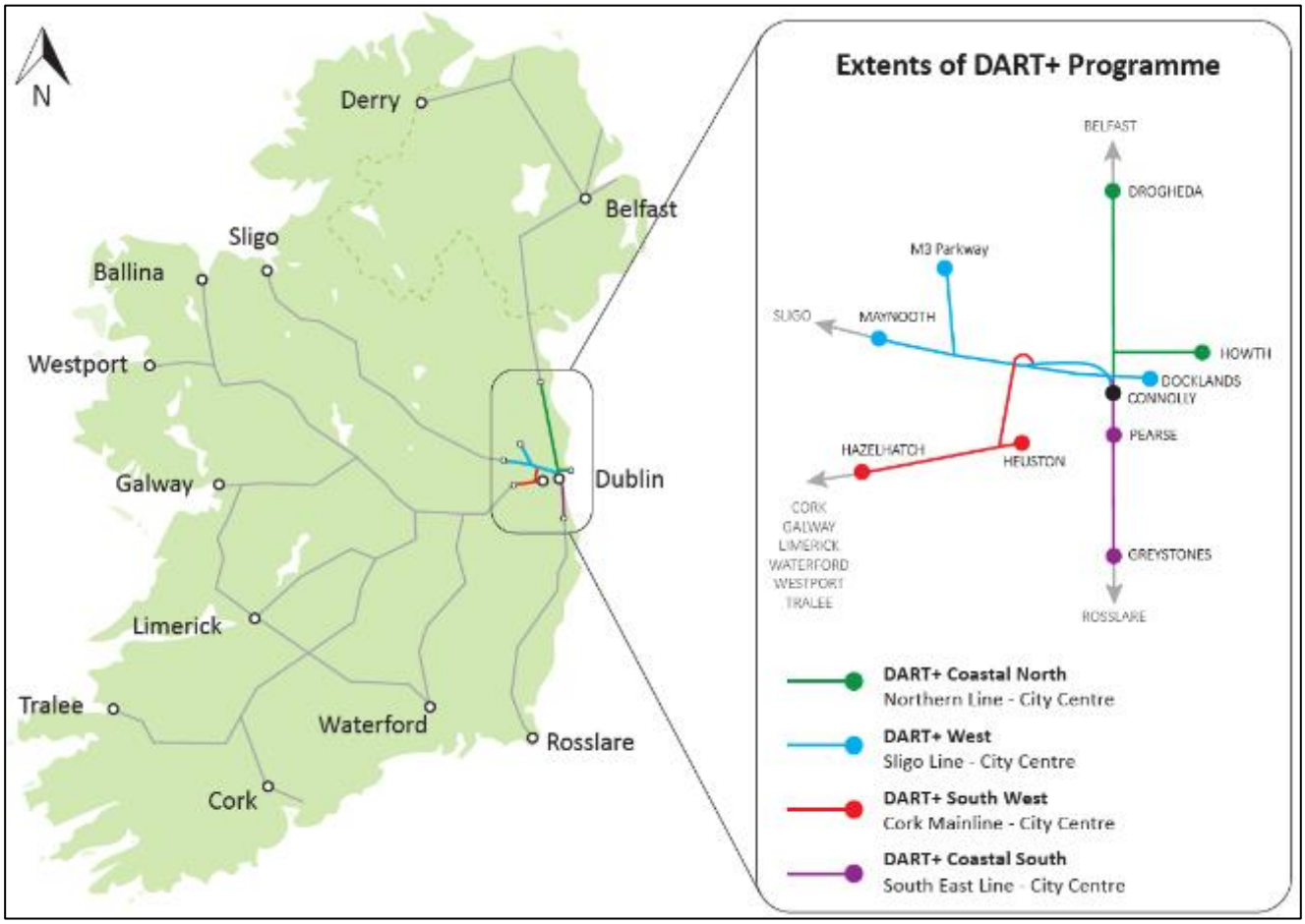

Figure ES-0-1 DART+ Programme

The current electrified DART network is 50km long, extending from Malahide / Howth to Greystones. The DART+ Programme seeks to increase the network to 150km. The DART+ Programme will increase the length of the DART network to 150km of railway corridor through the electrification and upgrade of existing lines transforming commuter train travel in the Greater Dublin Area. This modernisation includes the electrification, re-signalling, and certain interventions to remove constraints across the four main rail corridors, as per the following:

- DART+ South West (this Project) – circa 16km between Hazelhatch & Celbridge Station to Heuston Station and also circa 4km between Heuston Station to Glasnevin, via the Phoenix Park Tunnel Branch Line.
- DART+ West – circa 40km from Maynooth & M3 Parkway Stations to the City Centre.
- DART+ Coastal North – circa 50km from Drogheda to the City Centre.
- DART+ Coastal South – circa 30km from Greystones to the City Centre.
- DART+ Fleet – purchase of new electrified fleet to serve new and existing routes.

DART+ Programme is a key transportation improvement to form a high quality and integrated public transport system. It will have benefits for the residents of the Greater Dublin Area and also those living in the other regions. It will assist in providing a sustainable transport system and a societal benefit for current and future generations.

The Programme has also been prioritised as part of *Project Ireland 2040* and the *National Development Plan 2018-2027* as it is integral to the provision of an integrated, high-quality public transport system.

Delivery of the Programme will also promote transport migration away from the private car and to public transport. This transition will be achieved through a more frequent and accessible electrified service, which will result in reduced road congestion, especially during peak commuter periods.

Ultimately, the DART+ Programme will provide enhanced, greener public transport to communities along the DART+ Programme routes, delivering economic and societal benefits for current and future generations.

ES1.2 DART+ SOUTH WEST OVERVIEW

The DART+ South West Project will deliver an electrified network, with increased passenger capacity and enhanced train service between Hazelhatch & Celbridge Station to Heuston Station (circa 16km) on the Cork Mainline, and Heuston Station to Glasnevin via Phoenix Park Tunnel Branch Line (circa 4km).

DART+ South West will complete four tracking between Park West & Cherry Orchard Station and Heuston Station, in addition to re-signalling and electrification of the entire route. The completion of the four tracking will remove a significant existing constraint on the line (i.e., where the rail corridor reduces to two tracks), which is currently limiting the number of train services that can operate on this route. DART+ South West will also deliver track improvements along the Phoenix Park Tunnel Branch Line, which will allow a greater number of trains to access the city centre.

Upon completion of DART+ South West electrification, new DART trains will be used on this railway corridor, similar to those currently operating on the Malahide / Howth to Bray / Greystones Line.

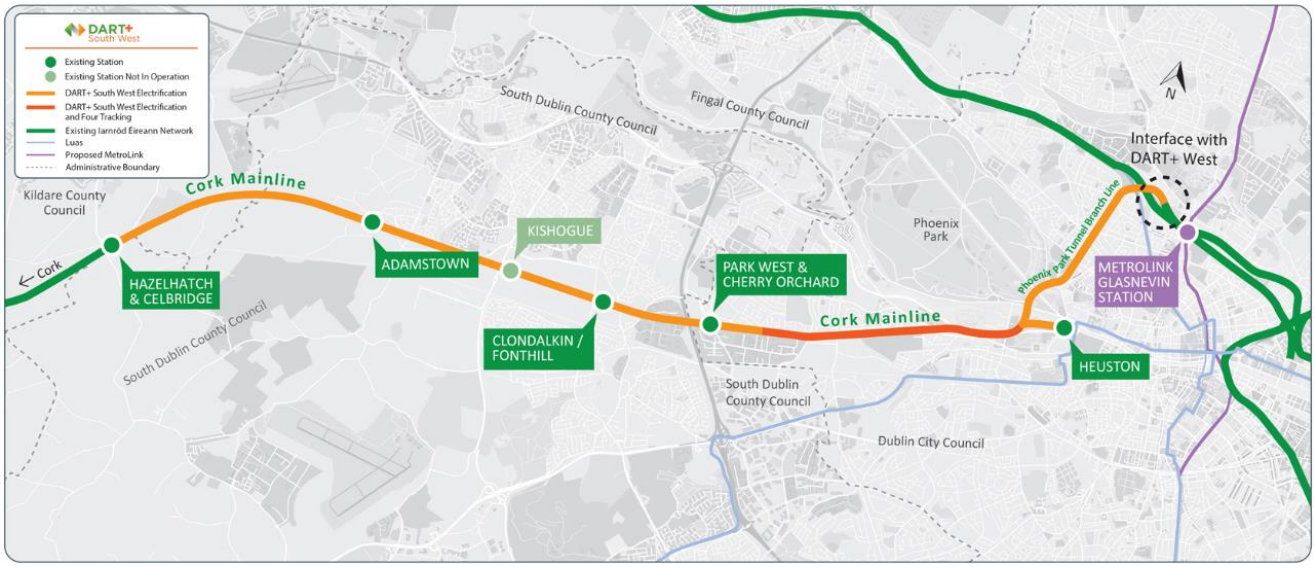

Figure ES-0-2 DART+ South West Route Map

ES1.2.1 Capacity Increases Associated with DART+ South West

DART+ South West will improve performance and increase train and passenger capacity on the route between Hazelhatch & Celbridge Station to Heuston Station and through the Phoenix Park Tunnel Branch Line to the City Centre, covering a distance of circa 20km. It will significantly increase train capacity from the current 12 trains per hour per direction to 23 trains per hour per direction (i.e. maintain the existing 12 services, with an additional 11 train services provided by DART+ South West). This will increase passenger capacity from the current peak capacity of approximately 5,000 passengers per hour per direction to approximately 20,000 passengers per hour per direction.

ES1.2.2 Key Infrastructure Elements of DART+ South West Project

The key elements of DART+ South West include:

- Completion of four-tracking from Park West & Cherry Orchard Station to Heuston Station, extending the works completed on the route in 2009.
- Electrification of the line from Hazelhatch & Celbridge Station to Heuston Station and also from Heuston Station to Glasnevin, via the Phoenix Park Tunnel Branch Line, where it will link with proposed DART+ West.
- Undertaking improvements / reconstructions of bridges to achieve vertical and horizontal clearances.
- Remove rail constraints along the Phoenix Park Tunnel Branch Line.
- Feasibility report and concept design for a potential new Heuston West Station.

The 'Emerging Preferred Option' will be compatible with future stations at Kylemore and Cabra, although the construction of these stations is not part of the DART+ South West Project.

ES1.3 The Emerging Preferred Option

The starting principle for the Project is to upgrade the existing railway corridor and undertake all works, within the railway corridor. This can be achieved over the majority of the route, including building on the groundwork carried out under the original Kildare Route Project, which delivered the existing four track system and several reconstructed bridges from Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station. The last remaining significant constraint is the area between Park West and Heuston Station, where the rail corridor reduces to two tracks. Expanding to four tracks will require widening of the rail corridor and this will have a potential impact on adjoining property owners.

The process to determine the Emerging Preferred Option for the DART+ South West Project followed a two-step optioneering process – Stage 1: Preliminary Assessment (Sifting) (long list of options), followed by Stage 2: Multi-Criteria Analysis (feasible options), where appropriate. This led to the identification of Emerging Preferred Options in respect of interventions required. These, and general linear works required along the full length of the Project, are the key elements of the Emerging Preferred Option.

For the purpose of describing the Emerging Preferred Option, general linear works are described first followed by sections (from west to east) with similar Project requirements and resulting levels of works or interventions, as follows:

- General Linear Works.
- Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station.
- Park West & Cherry Orchard Station to Heuston Station.
- East of St John's Road Bridge to Glasnevin Junction.

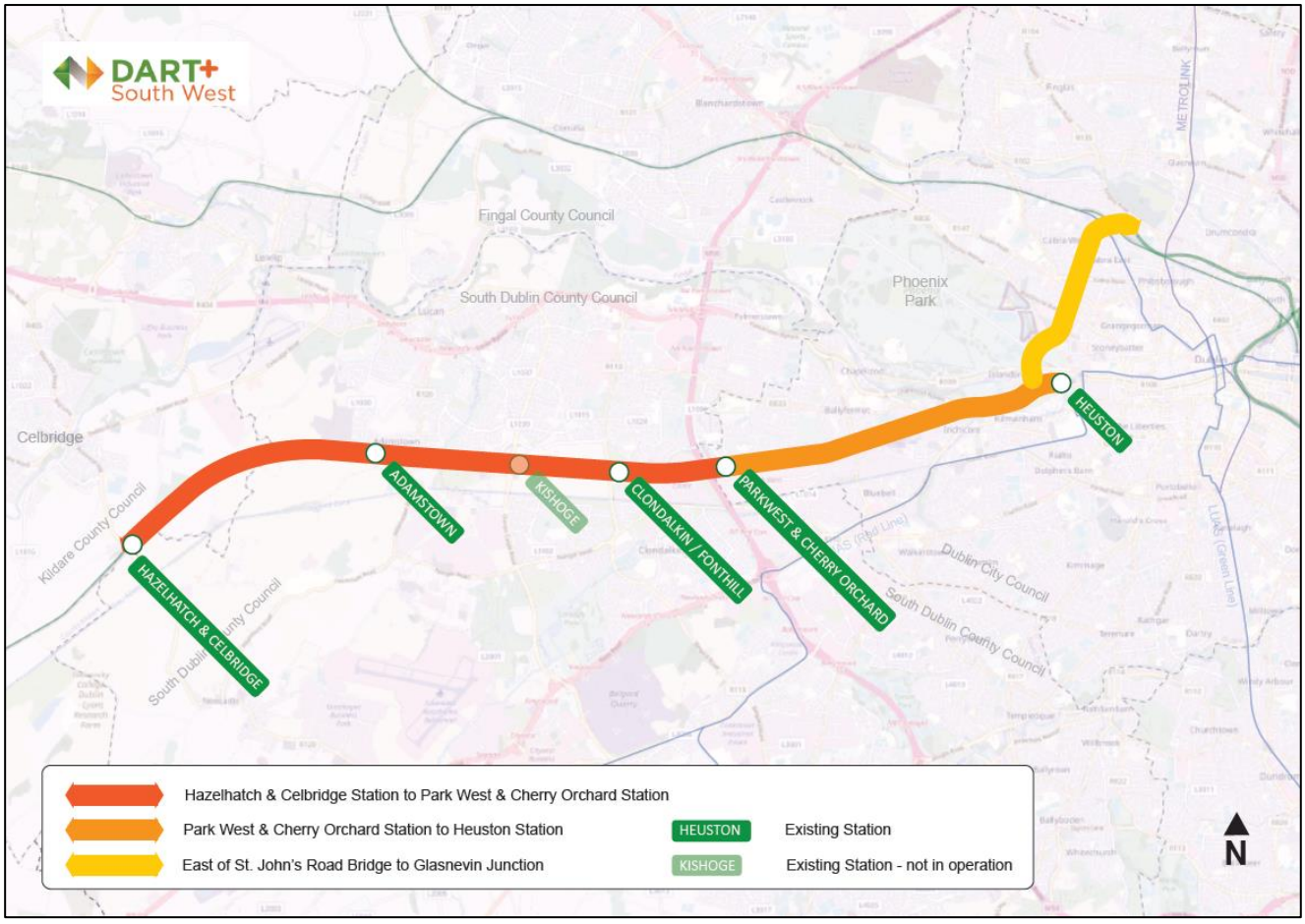

Figure ES-0-3 Sections of the Project Route Corridor with Similar Project Requirements and Resulting Levels of Works or Interventions

ES1.3.1 General Linear Works

The Project will require modernisation and modifications to the existing railway line. There is a range of general linear works required along the full length of the Project to enable the electrification of the line and the upgrade of the existing network. These are:

- Overhead electrification equipment (OHLE) will be required along the full extent of the railway line from Hazelhatch & Celbridge Station to Heuston Station and through the Phoenix Park Tunnel Branch Line up to Glasnevin Junction, where it will link with the proposed DART+ West Project. This will be similar to the overhead electrification equipment currently used on the existing DART network.
- Six electrical substations will be required at intervals along the rail line to provide power to the network.
- Signalling upgrades and additional signalling will be required to the upgraded infrastructure.

- Where existing bridges do not provide the necessary clearance for overhead electrification of the lines or lateral clearance for four tracking, options are being considered on a case-by-case basis, these include:
    - Provision of specialist electrical solutions for the OHLE with reduced clearance;
    - Lowering the rail track under the bridge;
    - Modification of the existing structure;
    - Removal of the existing structure and provision of a replacement structure; or
    - A combination of the above.
- Overhead electrified line protection works will be required at all existing rail overbridges.
- Interfaces with existing utilities, boundary treatments (including new retaining walls), drainage works, vegetation management and other ancillary works will be required along the length of the Project.

ES1.3.2 Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station

The works carried out under the original Kildare Route Project between 2006 and 2009 provided the main groundwork for DART+ South West including the existing four track system and several reconstructed bridges.

The Emerging Preferred Option for this circa 11km section comprises the general linear works as outlined in ES1.3.1. The electrification works can be run under the existing bridges with no / minimal intervention in the bridge structures and minor localised track lowering works and use of specialist OHLE solutions to achieve the required clearance. All these works can be accommodated within the existing rail corridor.

ES1.3.3 Park West & Cherry Orchard Station to Heuston Station

The section between Park West & Cherry Orchard Station and Heuston Station requires electrification and widening to four tracks. To meet these Project requirements, the track corridor must be widened, and the physical surroundings must be altered. Extending to four tracks in this area will require an increase in the width of the existing rail corridor outside of lands owned by Iarnród Éireann, potentially interfering with property rights (on a permanent and / or temporary basis).

Following an option selection process that included developing and evaluating a number of options at each location, the Emerging Preferred Option for each location was established. These are described below.

ES1.3.4 Area around Le Fanu Road Bridge

The rail corridor on the Cork Mainline between Cherry Orchard Footbridge (OBC8B) and Le Fanu Road Bridge (OBC7), initially comprises three existing tracks and at Le Fanu Road Bridge (OBC7) narrows

to two existing tracks. Increasing to four tracks requires the realignment of the existing tracks and an increase in the overall railway corridor width. Le Fanu Road Bridge (OBC7) is a narrow arch structure and is inadequate in both span length and height for the four tracks and electrification infrastructure.

The Emerging Preferred Option replaces the bridge with a longer span or spans to facilitate the additional width required for the additional tracks. To overcome the lack of height available for the electrification infrastructure, the road level will be raised in combination with lowering the rail track. Retaining walls are required to the north and south of the corridor adjacent to the new bridge to allow the widening of the corridor while minimising the impact on the adjacent properties. The raising of the road level will also mean that retaining walls will be required along the road to the north of the railway.

The proposed replacement bridge will be a modern structure that will provide segregation for pedestrians, cyclists and improved sightlines and will be a significant improvement on the existing situation for all road users.

The proposed new bridge is presented below in sectional elevation looking east.

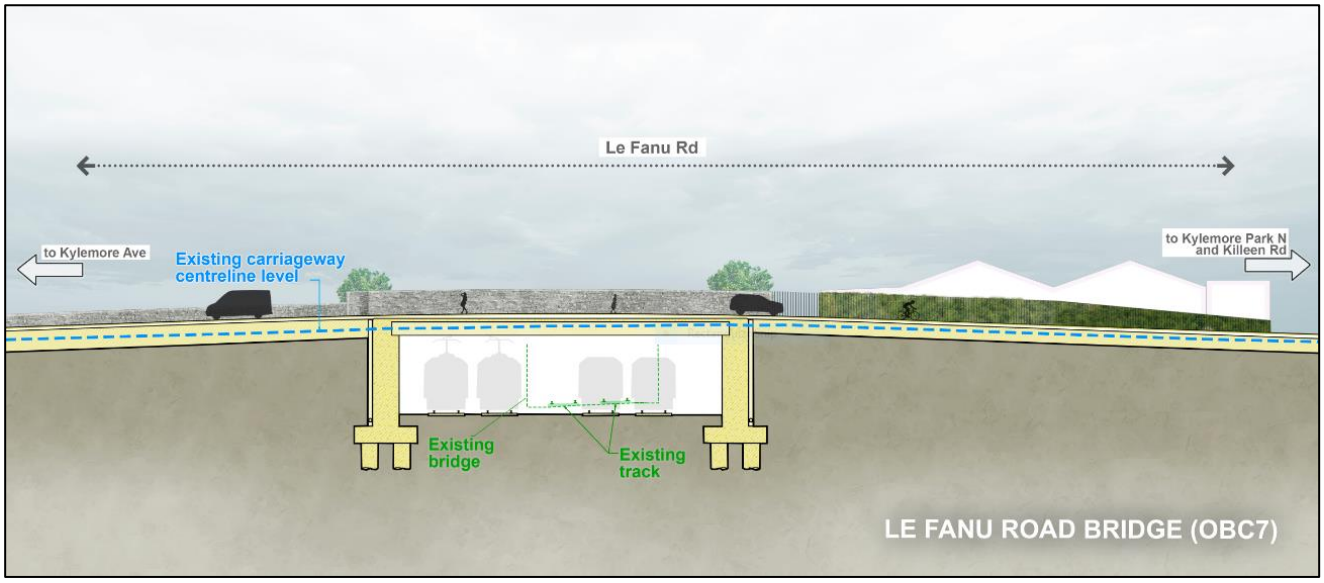

Figure ES-0-4 Emerging Preferred Option for Le Fanu Road Bridge (OBC7)

ES1.3.5 Area around Kylemore Road Bridge

This section of the railway comprises two existing tracks and one bridge structure (Kylemore Road Bridge (OBC5A)). The bridge does not have adequate span length to fit four tracks and is not high enough for the DART line electrification infrastructure to pass under. There are a number of constraints in this area including:

- The railway corridor is bounded on both sides by soil slopes.
- To the north and south of the bridge are road junctions and access points that significantly restrict alterations that may be required to the road geometry.

- Kylemore Road is a potential route for a future LUAS line. Therefore, the design must consider this potential new infrastructure.
- The west of Kylemore Road Bridge has been identified for a potential future railway station to the west of the bridge. The designs for this area must not prejudice its delivery in the future.

The Emerging Preferred Option for Kylemore Road Bridge replaces the bridge with a longer span to facilitate the additional track width. To overcome the lack of height available for the electrification infrastructure, the road level will be raised in combination with lowering the rail track.

Retaining walls are required to the north and south of the corridor to allow the widening of the corridor while minimising the impact on the adjacent properties. The raising of the road level will also mean that retaining walls will be required along the road to the north and south of the railway.

The proposed new bridge is presented below in sectional elevation looking east.

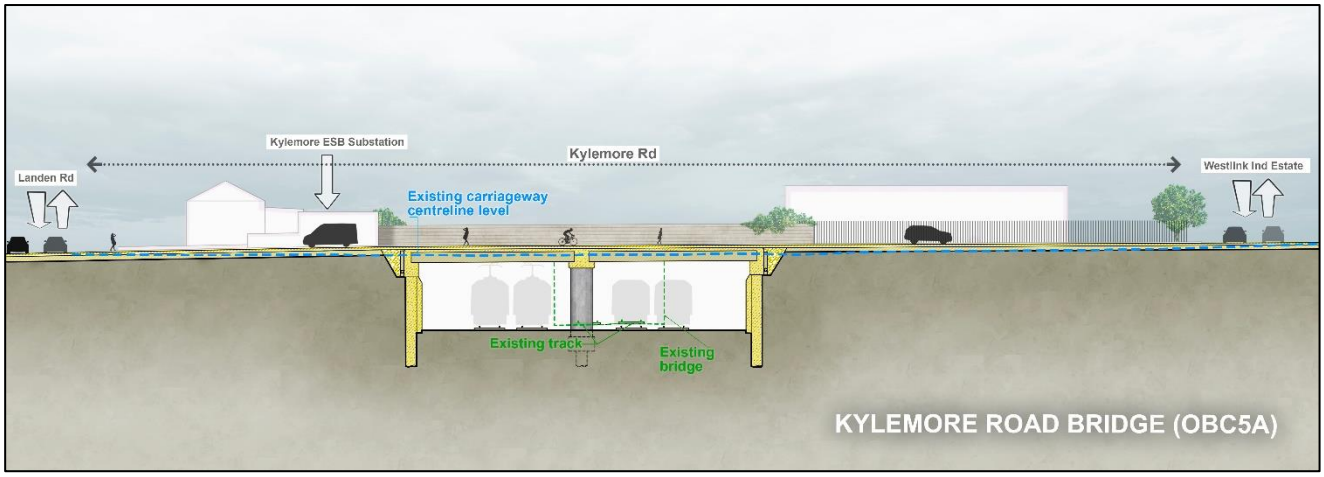

Figure ES-0-5 Emerging Preferred Option for the Kylemore Road Bridge (OBC5A)

ES1.3.6 Area around Inchicore Works

The railway in this area (between Kylemore Road Bridge (OBC5A) and Sarsfield Road Bridge (UBC4)) comprises two mainline tracks which are joined by two additional short tracks (or sidings) connected to the Inchicore Depot. The existing tracks through the area would not provide the required four tracking while maintaining the functionality of the depot. Therefore, the laying of additional tracks is required, which in turn requires the realignment of the existing tracks and an increase in the railway corridor width in this area.

The Emerging Preferred Option focuses this enhancement of the corridor to the south requiring the demolition / modification of some Iarnród Éireann facilities within the Inchicore Depot. There is potential interference to third party property rights but further design development and technical and construction related solutions will seek to minimise this.

Khyber Pass Footbridge

Khyber Pass Footbridge (OBC5) is an existing pedestrian overbridge linking Inchicore Works to Sarsfield Road to the north. The existing structure has three tracks beneath it and is not wide enough to safely accommodate an increase to four tracks.

The Emerging Preferred Option provides a new pedestrian bridge with sufficient height and width to meet the requirements for four-tracking and electrification. The extent of works may potentially interfere with property rights in the immediate area but further design development and technical and construction related solutions will seek to minimise this.

The proposed new pedestrian bridge is presented below in sectional elevation looking east towards Heuston Station.

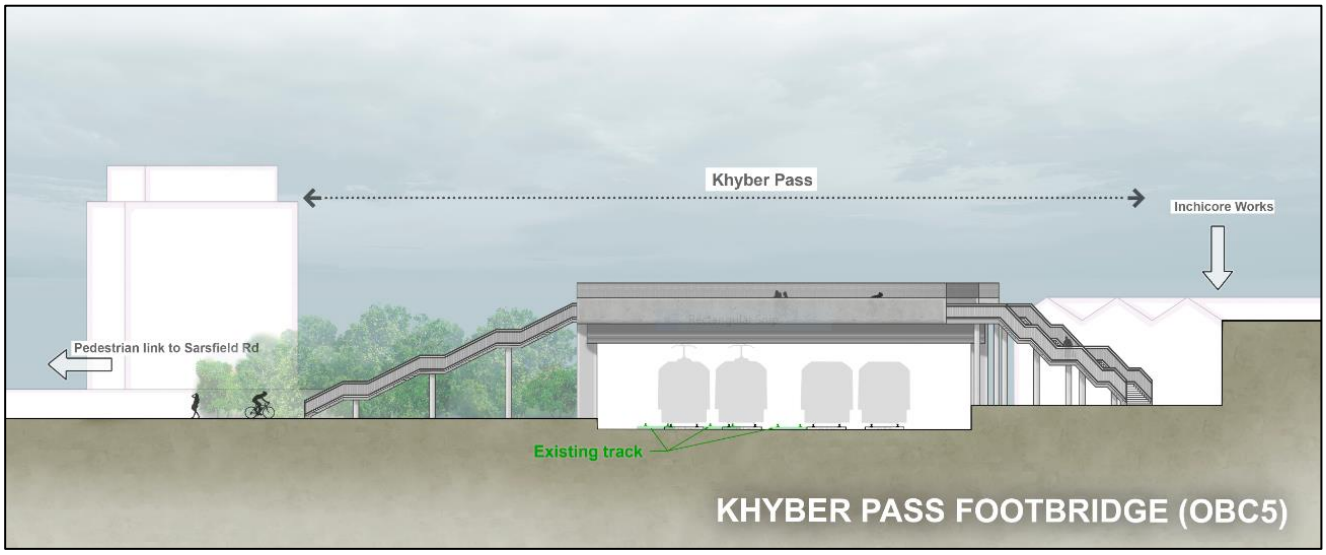

Figure ES-0-6 Emerging Preferred Option for Khyber Pass Footbridge (OBC5)

ES1.3.7 Sarsfield Road Bridge Area

Sarsfield Road underbridge (UBC4) carries the railway over Sarsfield Road. Both the bridge and the railway corridor in this area comprise three mainline tracks and are not wide enough to carry the fourth track that is required.

The Emerging Preferred Option replaces the existing bridge deck with two parallel bridge decks, one for the Intercity service and one for the DART service. The existing walls along Sarsfield Road would be mostly left untouched by the construction works. The proposed bridge is presented below in sectional elevation looking east towards Heuston Station.

There is potential interference to third party property rights but further design development and technical and construction related solutions will seek to minimise this.

Heading east of the bridge the corridor will predominantly be widened to the north to add a fourth track (into the embankment between the railway and Con Colbert Road).

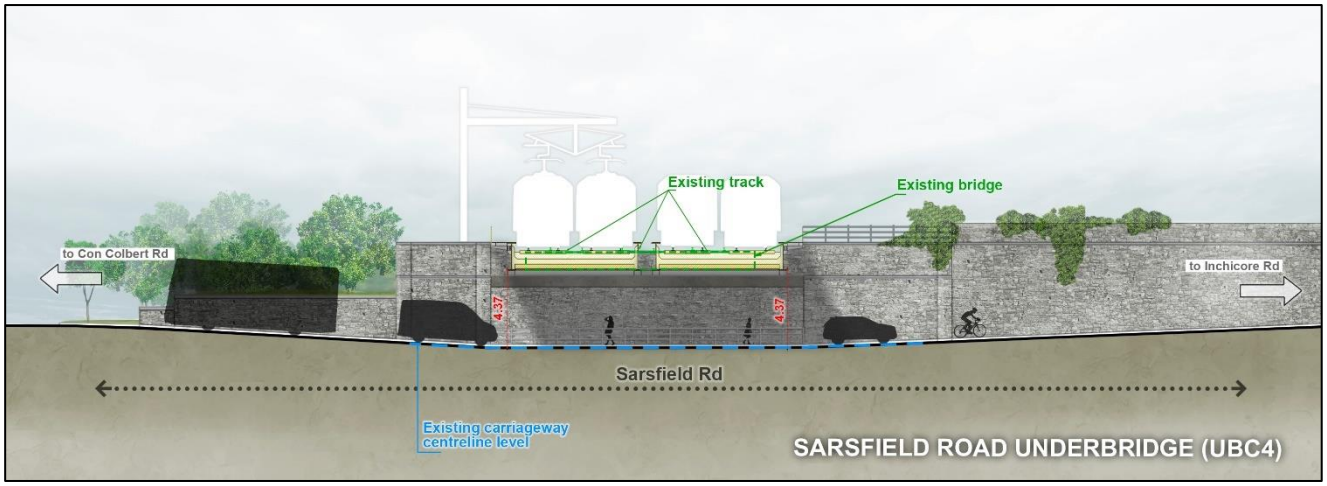

Figure ES-0-7 Emerging Preferred Option for Sarsfield Road Underbridge (UBC4)

ES1.3.8 Area around Memorial Road Bridge

The existing Memorial Road Bridge (OBC3) is too short in span length to accommodate the additional fourth track, so a longer span bridge is required. The existing bridge also does not have the height required to accommodate the electrification infrastructure beneath the bridge. The bridge is very close to the Con Colbert dual carriageway so any increases in the height of the road would have an impact on the dual carriageway.

The Emerging Preferred Option replaces the bridge with a longer span bridge. In addition, the rail tracks will be lowered to facilitate the electrification infrastructure beneath the new bridge. The masonry retaining walls on the southern side would need to be strengthened due to the lowering of the track and new retaining walls would be required along the northern side.

The permanent way boundary wall along Con Colbert Road will need to be reconstructed to a higher containment standard and height, as it will be removed to provide retaining wall construction access.

The proposed bridge is presented below in sectional elevation looking east towards Heuston Station.

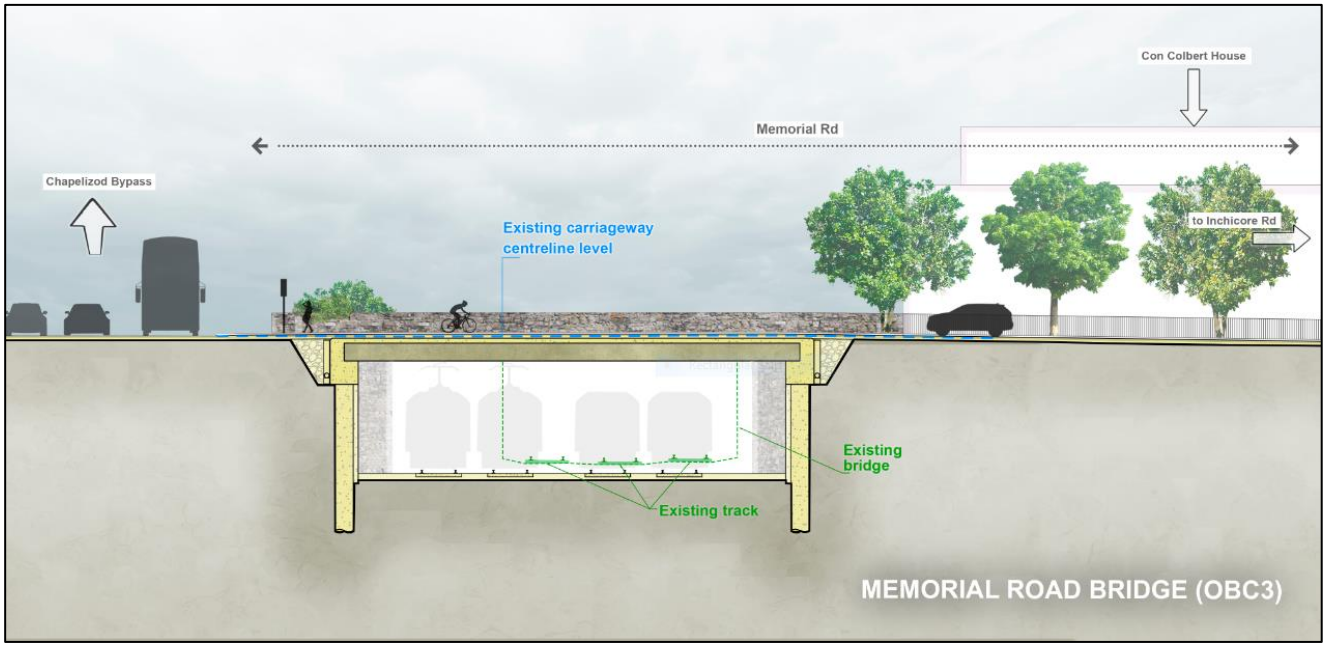

Figure ES-0-8 Emerging Preferred Option for Memorial Road Bridge (OBC3)

ES1.3.9 South Circular Road Junction Area

This area extends from Memorial Road Bridge (OBC3) to the South Circular Road Junction. There are two major bridge structures in this area which are part of the junction namely South Circular Road (OBC1) and St. John's Road Bridge (OBC0A). St. John's Road Bridge (OBC0A) has an adequate span length to enable a layout with the minimum four tracks requirement and is high enough for the electrification infrastructure required for DART. South Circular Road Bridge (OBC1) does not have adequate span length to fit four tracks and is not high enough for the electrification infrastructure to pass under.

The Emerging Preferred Option leaves South Circular Road Bridge (OBC1) in place and includes the construction of a new structure to the north of the existing bridge. The new structure would be for the new DART tracks and the existing Intercity service would continue under the existing South Circular Road Bridge (OBC1). The new structure requires retaining walls to be constructed on both sides beyond the junction area to the west.

The South Circular Road Junction is extremely busy and frequently has traffic queues, so any works in this area are likely to impact traffic. In order to minimise impact on traffic during the works, the construction will be carried out in phases, utilising all available road space to safely divert all road users around the affected area.

The new structure will accommodate DART trains. This means that the existing South Circular Road Bridge (OBC1) would not need to be electrified and the track levels can be left as they are currently.

The proposed intervention is presented below in sectional elevation looking east towards Heuston Station.

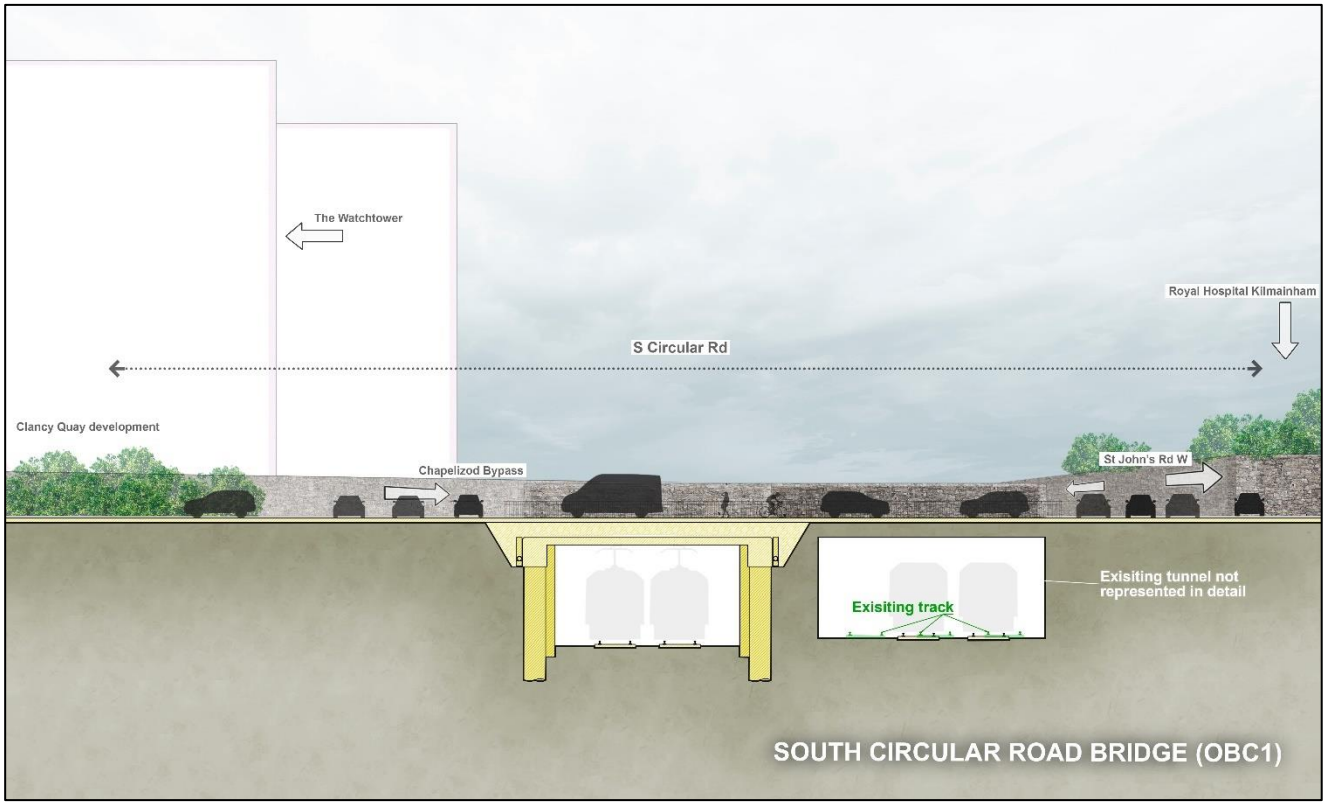

Figure ES-0-9 Emerging Preferred Option for South Circular Road Bridge (OBC1)

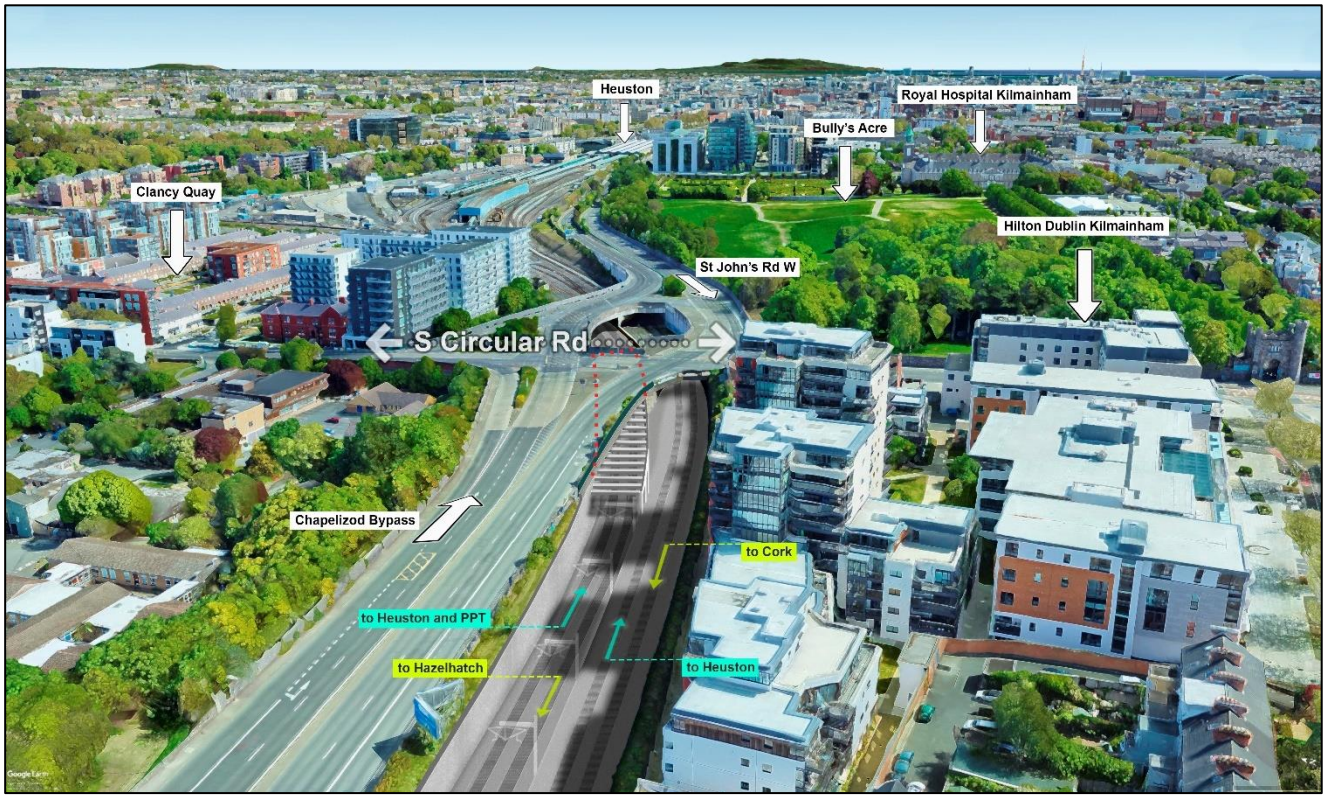

Figure ES-0-10 Aerial View of Emerging Preferred Option for South Circular Road Junction

ES1.3.10 Heuston Station and Yard

Heuston Station currently does not have any provisions for electrification. Platforms and sidings within the Heuston area are to be electrified to receive the DART+ Fleet. These works will require re-arrangement to provide access to the DART platforms and to update access to inter-city tracks.

In terms of Permanent Way works, the constraints on track work in Heuston Station are predominantly those posed by the need to maintain the operational capability of the existing freight routes, station platforms and servicing infrastructure (such as the train wash, service and stabling sidings), as well as the existing drainage and signalling. The sheer number of tracks, their configuration and connectivity through existing Points & Crossings (P&C's) mean that any modifications must be carefully considered to tie in with the platforms and service facilities.

In the station area, platforms and sidings will be electrified as required for the DART services. The scope of which will be fully concluded at Public Consultation No. 2.

All works can be undertaken within land owned by Iarnród Éireann.

ES1.3.11 East of South John's Road Bridge to Glasnevin Junction

This area extends from the east of St John's Road Bridge (OBC0A) and northwards over the River Liffey via the Liffey Bridge (UBO1) and under Conyngham Road Overbridge (OBO2) where it enters the Phoenix Park Tunnel.

Close to the junction of the Cabra Road and Navan Road the line exits the Phoenix Park Tunnel and continues north under several road bridges as follows: McKee Barracks Bridge (OBO3), Blackhorse Avenue Bridge (OBO4), Old Cabra Road Bridge (OBO5), Cabra Road Bridge (OBO6), Fassaugh Road Bridge (OBO7), Royal Canal and LUAS Twin Arch (OBO8), the Maynooth Line Twin Arch (OBO9) and Glasnevin Cemetery Road Bridge (OBO10). The line then continues east and interfaces with the proposed DART+ West Project at Glasnevin Junction.

A requirement of the DART+ South West Project is to investigate the feasibility of a new station at Heuston West, at the site of the existing Platform 10, located to the north west of the greater Heuston Station complex adjacent to the Liffey Bridge (UBO1). A preliminary assessment for the station has been undertaken by the Project Team and concept design options are being considered.

The Emerging Preferred Option for Liffey Bridge (UB01) features electrification and retention of the existing fixed track system.

The existing twin tracks along the Phoenix Park Tunnel Branch Line will be electrified. DART+ South West is currently undertaking surveys and analysis along this section, including within the tunnel, to understand the current characteristics and constraints. The Emerging Preferred Option will follow the existing rail corridor may involve track lowering and/or bridge modifications at certain locations to achieve the height requirements for electrification.

The specific interventions at each bridge along this rail section will be based on the analysis of survey data and presented at Public Consultation No. 2.

Figure ES-0-11 Northern and Southern Portals to the Phoenix Park Tunnel and view of inside tunnel

ES1.3.12 Further Design Development & Option Selection

The preliminary options selection and design development that has been undertaken has led to the determination of the Emerging Preferred Option which is now the focus of this public consultation (Public Consultation No. 1).

Once the public consultation process on the Emerging Preferred Option is complete, all feedback and submissions received will be reviewed and considered as part of the next stage of the design development towards identifying the Preferred Route. Following a full appraisal of the feedback and consideration, a public consultation report will be prepared to document this process. This will be incorporated into the Options Selection Report that will be presented at Public Consultation No. 2.

All information gathered by the Project Team during these public consultation events will be used to inform the design development of the project which will be the subject of the Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) (if required), and ultimately the Railway Order application will be submitted to An Bord Pleanála for planning approval.

DART+ Programme is a key transportation improvement to form a high quality and integrated public transport system. It will have benefits for the residents of the Greater Dublin Area and also those living in the other regions. It will assist in providing a sustainable transport system and a societal benefit for current and future generations.

The DART+ South West Project will deliver an improved electrified network, with increased passenger capacity and enhanced train service between Hazelhatch & Celbridge Station and Heuston Station on the Cork Mainline, and Heuston Station to Glasnevin via Phoenix Park Tunnel Branch Line. Upon completion of DART+ South West electrification, new DART trains will be used on this railway corridor, similar to those currently operating on the Malahide / Howth to Greystones Line.

1. Introduction

1.1. Strategic Context

Delivering a sustainable transport system is a key adaptation measure to respond to the challenge of climate change and Ireland's international obligation to meet its EU 2030 and 2050 climate agreements as a signatory of the international treaty on climate change (Paris Agreement, 2016). The government is currently implementing a range of major projects that will assist in meeting increased transport demand through greener public transport to tackle climate change but also provide a better and more sustainable quality of life, cleaner air and health benefits for current and future generations. The DART+ Programme is one of these major projects.

The DART+ Programme will provide a high-capacity, sustainable and efficient rail transit system for the Greater Dublin Area that delivers a substantial increase to peak-hour capacity, frequency, and reliability. The Programme will benefit all transport users in the region, with improved connectivity for regional towns and cities and reduced congestion and will enable high density and sustainable development along the railway corridor.

The Programme has been prioritised as part of the *National Development Plan 2018-2027* and *Project Ireland 2040* and will be integral to the provision of an integrated, high quality public transport system in line with national, regional, and local planning policy.

Figure 1-1 DART+ Programme Delivery of the Three Pillars of Sustainable Development

1.2. DART+ Programme Overview

DART+ Programme is a key transportation improvement to form a high quality and integrated public transport system. It will have benefits for the residents of the Greater Dublin Area and also those living in the other regions. It will assist in providing a sustainable transport system and a societal benefit for current and future generations.

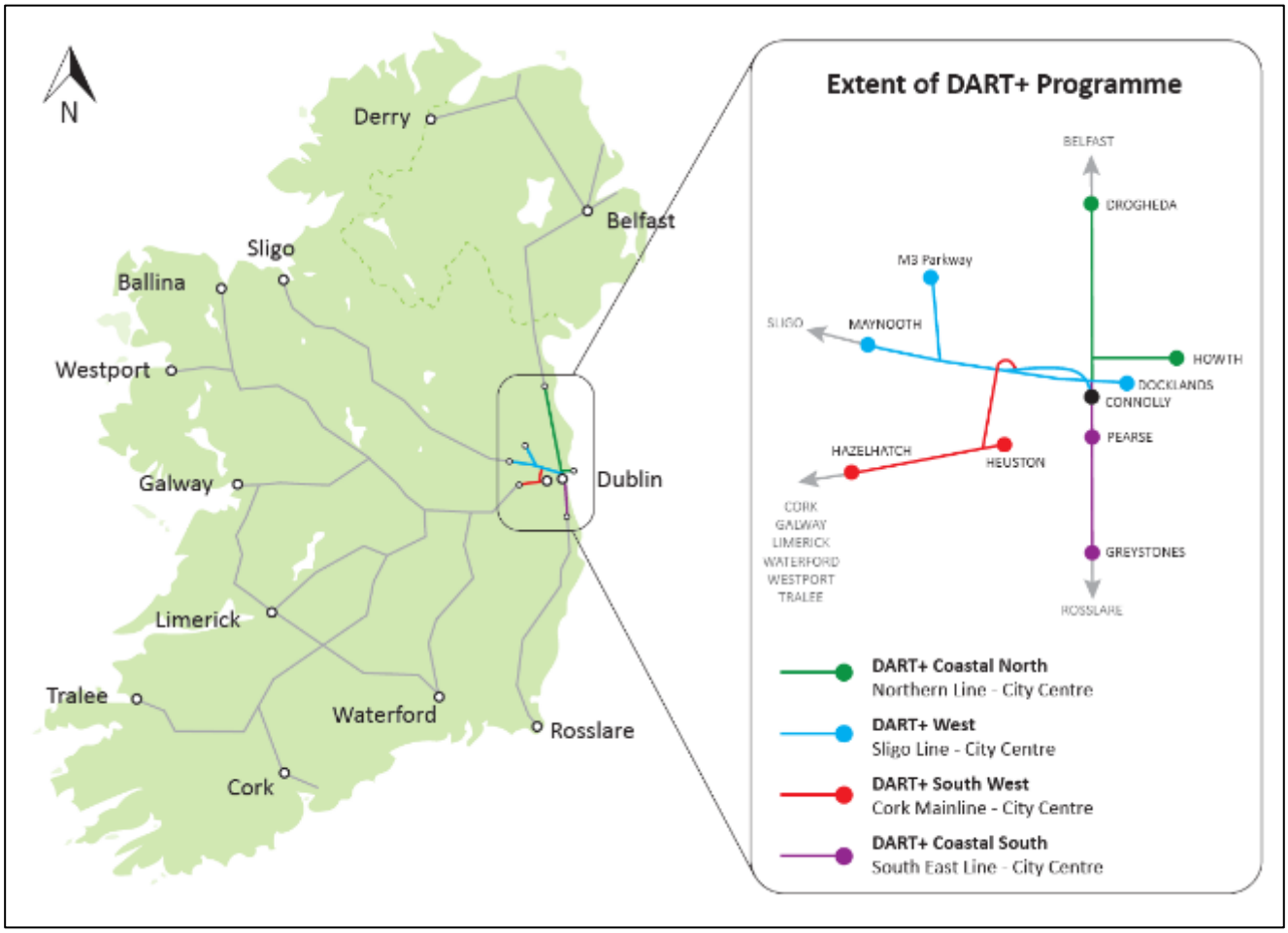

Figure 1-2 Schematic of Overall DART+ Programme

The current electrified DART network is circa 50km long, extending from Malahide / Howth to Bray / Greystones, and the DART+ Programme seeks to increase the high capacity and electrified network to network to 150km. The DART+ Programme is required to facilitate increased train capacity to meet current and future demands, which will be achieved through a modernisation of the existing railway corridors. This modernisation includes the electrification, re-signalling and certain interventions to remove constraints across the four main rail corridors within the Greater Dublin Area, as per below:

- DART+ South West (this Project) – circa 16km between Hazelhatch & Celbridge Station to Heuston Station and also circa 4km between Heuston Station to Glasnevin, via the Phoenix Park Tunnel Branch Line.
- DART+ West – circa 40km from Maynooth & M3 Parkway Stations to the City Centre.
- DART+ Coastal North – circa 50km from Drogheda to the City Centre.

- DART+ Coastal South – circa 30km from Greystones to the City Centre.
- DART+ Fleet – purchase of new electrified fleet to serve new and existing routes.

The DART+ Programme is a key element to the national public transportation network, as it will provide a high-capacity transit system for the Greater Dublin Area and better connectivity to outer regional cities and towns. This will benefit all public transport users.

Delivery of the DART+ Programme will promote transport migration away from the private car and to public transport. This transition will be achieved through a more frequent and accessible electrified service, which will result in reduced road congestion, especially during peak commuter periods.

The DART+ Programme will provide enhanced, greener public transport to communities along the DART+ Programme routes delivering economic and societal benefits for current and future generations.

1.3. DART+ South West Project

The DART+ South West Project will deliver an electrified network, with increased passenger capacity and enhanced train service between Hazelhatch & Celbridge Station to Heuston Station (circa 16km) on the Cork Mainline, and Heuston Station to Glasnevin via Phoenix Park Tunnel Branch Line (circa 4km).

DART+ South West Project will complete four tracking between Park West & Cherry Orchard Station and Heuston Station and will also re-signal and electrify the route. The completion of the four tracking will remove a significant existing constraint on the line, which is currently limiting the number of train services that can operate on this route. DART+ South West will also deliver track improvements along the Phoenix Park Tunnel Branch Line, which will allow a greater number of trains to access the city centre.

Upon completion of the electrification of the DART+ South West route, new DART trains will be used on this railway corridor, similar to those currently operating on the Malahide / Howth to Bray / Greystones Line.

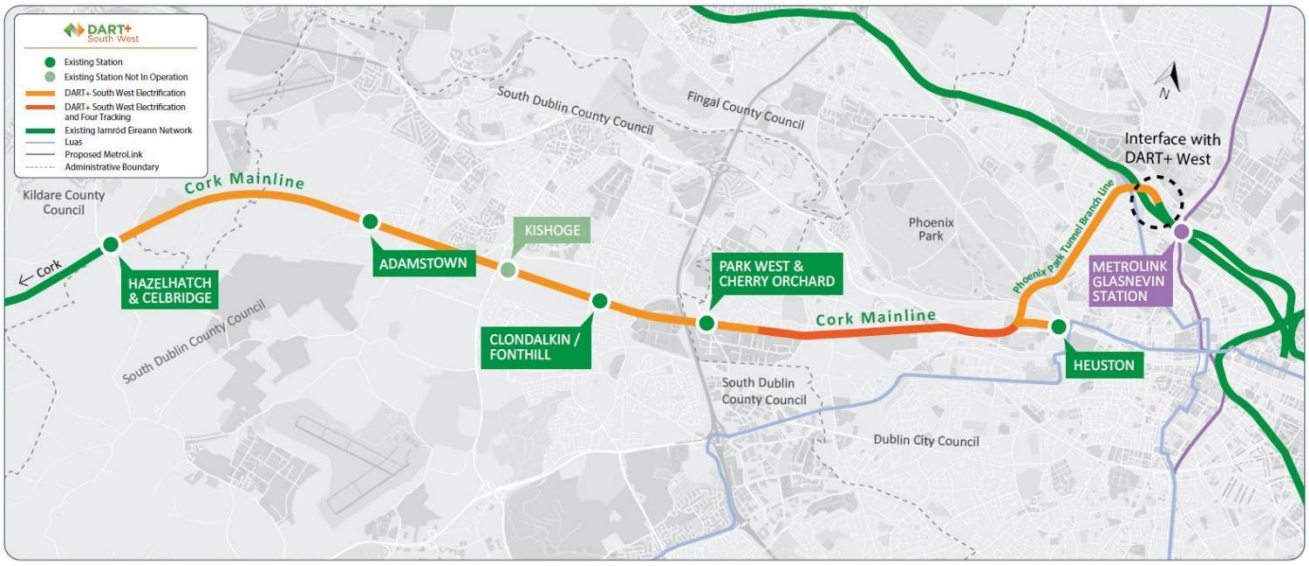

Figure 1-3 DART+ South West

1.3.1. Capacity Increases Associated with DART+ South West

The operating capacity of services in the Heuston area is currently constrained by railway infrastructure limitations and the ability of Heuston Station to accommodate terminating trains. Iarnród Éireann currently operates at a maximum capacity of 12 inbound trains in the AM peak hour and 12 outbound trains in the PM peak hour along the Cork Mainline. This provides a peak capacity of approximately 5,000 passengers per hour per direction during the AM and PM peak hours; operating inbound and outbound, respectively. DART+ South West aims to improve train service and increase train and passenger capacity on the route between Hazelhatch & Celbridge Station to Heuston Station and through the Phoenix Park Tunnel Branch Line to the City Centre, covering a distance of circa 20km.

DART+ South West will significantly increase train capacity from the current 12 trains per hour per direction to 23 trains per hour per direction (i.e., maintain the existing 12 services, with an additional 11 train services provided by DART+ South West). This will increase passenger capacity from the current peak capacity of approximately 5,000 passengers per hour per direction to approximately 20,000 passengers per hour per direction.

1.3.2. Key infrastructural elements of DART+ South West

The key elements of DART+ South West include:

- Completion of four-tracking from Park West & Cherry Orchard Station to Heuston Station, extending the works completed on the route in 2009.
- Electrification of the line from Hazelhatch & Celbridge Station to Heuston Station and also from Heuston Station to Glasnevin, via the Phoenix Park Tunnel Branch Line, where it will link with proposed DART+ West.
- Undertaking improvements/reconstructions of bridges to achieve vertical and horizontal clearances.
- Remove rail constraints along the Phoenix Park Tunnel Branch Line.

- Feasibility report and concept design for a potential new Heuston West Station.

The 'Emerging Preferred Option' will be compatible with future stations at Kylemore and Cabra, although the construction of these stations is not part of the DART+ South West Project.

1.3.3. DART+ South West Timeline

A high-level timeline for statutory approval process for the DART+ South West is set out in **Figure 1-4**. Looking beyond that construction is expected to commence in 2023.

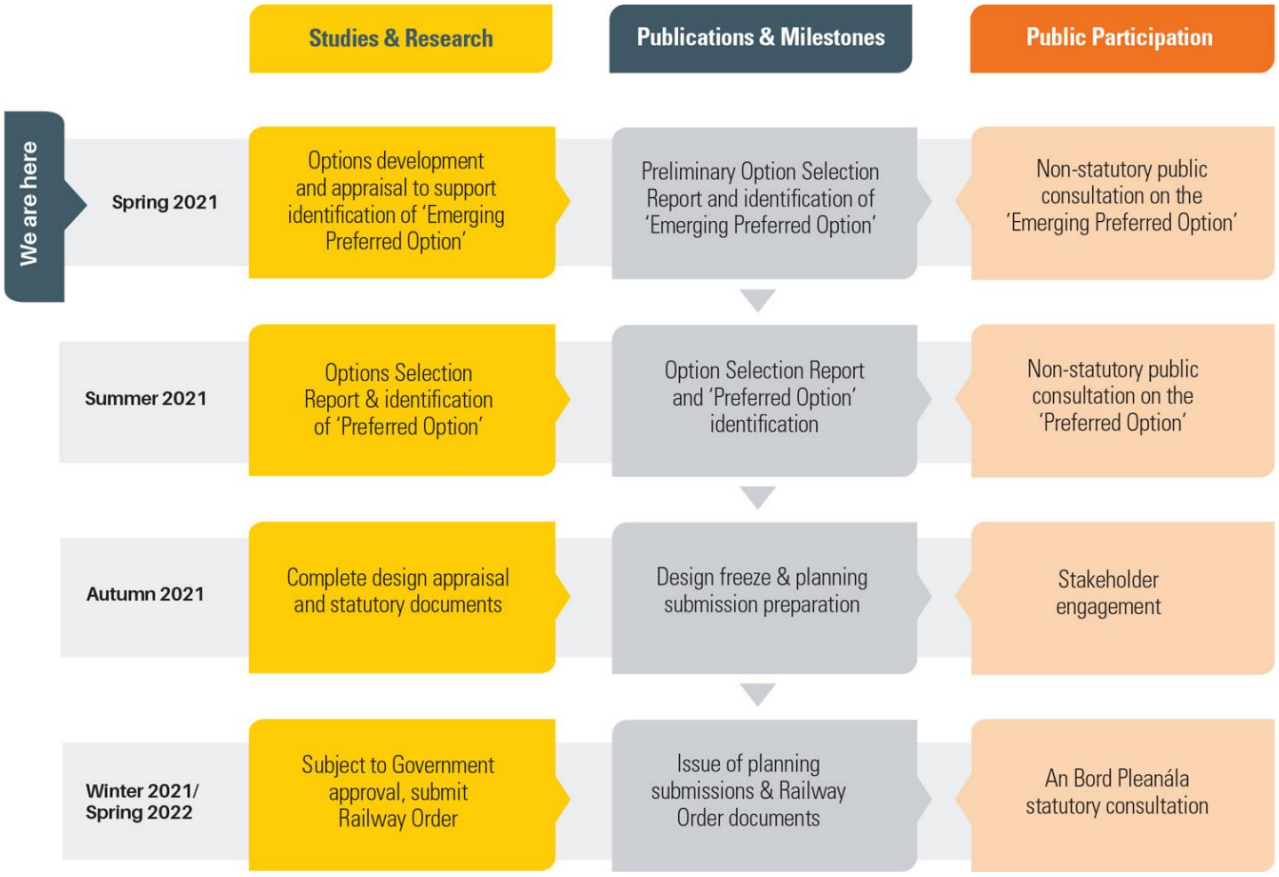

Figure 1-4 DART+ South West Timeline for Statutory Approval Process

1.4. Purpose of the Report

The purpose of this report is to summarise the early work undertaken to date in respect of the Project, and in particular to explain the preliminary options selection process leading to the identification of the

end-to-end Emerging Preferred Option[1]. The main elements of the Project for which options have been considered are:

- Permanent Way – e.g., modifications to the existing rail corridor to achieve the necessary width for four-tracking.
- Structures – e.g., modifications to existing structures (over bridges, the Phoenix Park Tunnel, etc) to achieve the necessary height clearance for electrification.
- Signalling, Electrical and Telecom (SET) requirements.

The report draws together work undertaken to date by the Project Team and:

- Explains the need for the Project and the policy context for the DART+ Programme.
- Presents and evaluates the information gathered to date in relation to technical and environmental constraints along the DART+ South West rail corridor.
- Provides a summary of relevant findings to date with reference to technical reports and associated drawings.
- Identifies feasible options that have been developed to date.
- A summary of the sifting and Multi-Criteria Analysis (MCA) evaluation process that led to the identification of the Emerging Preferred Option.

1.4.1. Structure of Report

This Preliminary Option Selection Report and related material is presented in a manner consistent with how it is presented on the Iarnród Éireann website:

- Main report (this report)
- Annex 1 – Emerging Preferred Option Maps
- Annex 2 – Supporting Material
- Annex 3 – Technical Reports

1.4.1.1. Annexes

This report is supported by a series of maps that illustrate the Emerging Preferred Option. The Annex reference, map title and area of the railway corridor covered by each map is set out in **Table 1-1.**

[1] It is highlighted that the Emerging Preferred Option is for the purposes of ongoing technical and environmental analysis, as well as consultation and engagement with the public and potentially affected property owners. In this regard, the Emerging Preferred Option will continue to be analysed, developed and fine-tuned by the Project Team, with consideration for technical and public consultation feedback, to inform the final proposed design.

Table 1-1 Annex 1: Emerging Preferred Option Maps

Annex. Ref	Title	Area Covered by the Map
1.0	Emerging Preferred Option	Key Plan Map
1.1	Emerging Preferred Option - Map 1 of 13	Hazelhatch
1.2	Emerging Preferred Option - Map 2 of 13	Hazelhatch & Celbridge Station and surrounds
1.3	Emerging Preferred Option - Map 3 of 13	Stacumny Lane and Tubber Lane Road and surrounds
1.4	Emerging Preferred Option - Map 4 of 13	Adamstown
1.5	Emerging Preferred Option - Map 5 of 13	Adamstown to Tullyhall
1.6	Emerging Preferred Option - Map 6 of 13	Kishoge
1.7	Emerging Preferred Option - Map 7 of 13	Clondalkin / Fonthill Station to Clondalkin Industrial Estate (west side of the M50)
1.8	Emerging Preferred Option - Map 8 of 13	Clondalkin Industrial Estate to Park West
1.9	Emerging Preferred Option - Map 9 of 13	Park West Industrial Estate, including Clover Hill Road to Inchicore Works
1.10	Emerging Preferred Option - Map 10 of 13	Inchicore Works, including Landen Road to Memorial Gardens
1.11	Emerging Preferred Option - Map 11 of 13	Memorial Gardens to East of Phoenix Park Tunnel
1.12	Emerging Preferred Option - Map 12 of 13	East of Phoenix Park Tunnel to Cabra Road Bridge
1.13	Emerging Preferred Option - Map 13 of 13	Cabra Road Bridge to Glasnevin Junction

There are several key background reports that provide the policy context, objectives, and requirements for the DART+ Programme and for the DART+ South West Project. Many are publicly available documents. Other documents include previous technical studies undertaken and base options considered which have helped to underpin the specific technical and infrastructural requirements of the Project. Links to these documents are provided. Refer to **Table 1-2**.

Table 1-2 Annex 2: Supporting Material

Annex. Ref	Title	Detail
2.1	Policy Context	This presents a detailed review of the European, National, Regional, and Local policy context for the DART+ Programme and the DART+ South West Project.
2.2	Useful Links	A list of links to publicly available documents referred to in this Report.

The process by which the end-to-end Emerging Preferred Option has been selected is supported by a series of technical studies undertaken by the Project Team. These technical studies are set out in Annex 3 and are identified in **Table 1-3**.

For the purposes of the technical optioneering reports, the existing rail corridor has been divided so as to focus on key areas of intervention or structures (e.g. bridges).

Table 1-3 Annex 3: Technical Reports

Annex Ref.	Technical Reports	Summary
3.1	Constraints Report Appendix A - Planning Application Monitor Appendix B - Heritage Memo **Appendices C – K Constraints Mapping:** Appendix C - Population Constraints Appendix D - My Plan Zones Appendix E – Noise Appendix F - Biodiversity Constraints Appendix G - Landscape Constraints Appendix H - Cultural Heritage Constraints Appendix I - Soils and Geology Constraints Appendix J - Hydrogeology Constraints Appendix K - Key Utilities and Licensed Facilities	This Report presents the main constraints in summary tables and a series of maps across a wide range of environmental topics along the existing railway corridor.

Annex Ref.	Technical Reports	Summary
3.2	Technical Optioneering Reports - Introduction	This report presents the design codes, standards, and guidelines for works and interventions likely to be associated with the DART+ South West Project. The options developed have had regard to these design requirements. This report also outlines the option selection methodology followed for the DART+ South West Project.
3.3	Hazelhatch to Park West – Technical Optioneering Report Appendix A - Supporting Drawings Appendix B – Sifting Process Backup	These technical optioneering reports provide background technical information of relevance to option development, assessment, and selection. The reports include inputs by the following Design Workstreams and specialist Project Team members: • Permanent Way • Civils and Structures • Signalling, Electrical and Telecommunications • Overhead Line Equipment (OHLE) • Environment • Highways • Geotechnical The reports also provide: • An area overview and a detailed description of the existing railway infrastructure and challenges. • The specific Project requirements. • The technical and environmental constraints, including the horizontal and vertical clearances at structures. • The options considered. • The option selection process leading to the identification of the Emerging Preferred Option, including the Stage 1: Sifting Process and, where relevant Stage 2 the Multi-Criteria Analysis (MCA) process. Each report is supported by appendices, as required.
3.4	Park West to Heuston Station – Technical Optioneering Report (Area around Le Fanu Road Bridge) Appendix A – Sifting Process Backup Appendix B – MCA Process Back Up Appendix C - Supporting Drawings	
3.5	Park West to Heuston Station – Technical Optioneering Report (Area around Kylemore Road Bridge) Appendix A – Sifting Process Backup Appendix B – MCA Process Back Up Appendix C - Supporting Drawings	
3.6	Park West to Heuston Station – Technical Optioneering Report (Area around Inchicore Works) Appendix A – Sifting Process Backup Appendix B – MCA Process Back Up Appendix C - Supporting Drawings	
3.7	Park West to Heuston Station – Technical Optioneering Report (Area around Khyber Pass) Appendix A – Sifting Process Backup Appendix B - Supporting Drawings	

Annex Ref.	Technical Reports	Summary
3.8	Park West to Heuston Station – Technical Optioneering Report (Area around Sarsfield Road Bridge) Appendix A – Sifting Process Backup Appendix B – MCA Process Back Up Appendix C - Supporting Drawings	
3.9	Park West to Heuston Station – Technical Optioneering Report (Area around Memorial Bridge) Appendix A – Sifting Process Backup Appendix B – MCA Process Back Up Appendix C - Supporting Drawings	
3.10	Park West to Heuston Station – Technical Optioneering Report (Area around South Circular Road Junction) Appendix A – Sifting Process Backup Appendix B – MCA Process Back Up Appendix C - Supporting Drawings	
3.11	Park West to Heuston Station – Technical Optioneering Report - (Area around Heuston Station and Yard) Appendix A – Sifting Process Backup Appendix B – MCA Process Back Up Appendix C - Supporting Drawings	
3.12	East of St John's Road Bridge to Glasnevin Junction – Technical Optioneering Report (Area from East of St John's Road Bridge to East of the Phoenix Park Tunnel) Appendix A – Sifting Process Backup Appendix B - Supporting Drawings	
3.13	East of St John's Road Bridge to Glasnevin Junction – Technical Optioneering Report (Area from East of the Phoenix Park Tunnel to Glasnevin Junction) Appendix A – Sifting Process Backup	

1.4.2. Status of Design Presented in this Report

This report presents the Emerging Preferred Option for the purposes of ongoing technical and environmental analysis, as well as consultation and engagement with the public and potentially affected property owners. In this regard, the Emerging Preferred Option will continue to be analysed and recalibrated based on public consultation feedback. This ongoing work will inform the 'Preferred Route' which will be published as part of Public Consultation No.2 (PC2) when additional surveys and assessments have been completed.

Therefore, the information presented to the public and stakeholders as part of this public consultation (Public Consultation No. 1) is a snapshot of available information and design development. Not all design detail or construction requirements are known at this time.

The purpose of presenting this Preliminary Options Selection Report at this stage of the Project is to show the public the current status of the options selection process, the methodology being followed to identify the Emerging Preferred Option and to assist in eliciting feedback. As part of the public consultation process, the public will be invited to make observations on the proposals for consideration by the Project Team.

The DART+ Programme has been prioritised as part of the National Development Plan 2018-2027 and *Project Ireland 2040* and will be integral to the provision of an integrated, high quality public transport system.

2. Need, Strategic Fit

The section sets out the policy context for the DART+ Programme and its predecessor the DART Expansion Programme. However, the need for the DART+ Programme and, specifically the DART+ South West Project is considered in the first instance below and summarised in **Figure 2-1.**

- **To improve land use planning**

  Land use and development is the primary influencing factor for travel demand. The historic sprawl of urban development with a focus on expanding the road network to cater for private car-based transport has long since been recognised as unsustainable. The resolve that Dublin's growth will be anchored by higher density development around strengthened and efficient public transport corridors has been the cornerstone of integration of land use and transport policies in recent years.

  By shaping the pattern of development and influencing the location, scale, density, design and mix of land-uses, integrated land use and transportation planning can help reduce the need to travel and facilitate sustainable urban development and city living. The *Transport Strategy for the Greater Dublin Area 2016-2045* notes that the primary goals of land use and transport integration include reducing the need to travel, the distance travelled, and the time taken to travel, as well as promoting walking, cycling and the use of public transport.

  It is evident that focusing development along rail corridors and providing higher densities at key transport nodes to create a compact urban form will increase the viability of public transport facilities, combat unnecessary urban sprawl, and reduce the unsustainable reliance on private car transportation. However, the public transport systems must be in place for this to happen. The DART+ Programme will ensure a high capacity, integrated network is provided enabling a more plan-led transport-oriented development (TOD) which is fully aligned with Ireland's international and national policy positions, and with recent institutional developments in relation to active land management by the State, as set out in *Transport-Oriented Development: Assessing the Opportunity for Ireland (No. 148 June 2019)*. Refer to **Annex 2.2 Useful Links**.

  The existing Cork Mainline serves several communities and includes stations at existing and future transport-oriented development areas such as Adamstown, Clonburris, and Cherry Orchard and Park West (refer to **Section 4**). However, the current frequency, capacity and connectivity of train services cannot cater for the planned growth of these areas.

- **To improve integration**

  Modern transport infrastructure must be accompanied by an efficient, integrated, and appropriate network of transport services. Integrated transport systems are essential in making sustainable, compact growth work. While the rail network has continued to be developed over recent decades, significant work remains to be done to create a fully integrated rail network and a fully integrated multi-modal public transport network.

  The DART+ Programme will significantly upgrade our existing infrastructure and improve multimodal connectivity through interchanges with other public transport networks.

Services on the Cork Mainline primarily terminate on the outskirts of the City Centre at Heuston Station; however, there is a limited number of passenger services using the Phoenix Park Tunnel Branch Line (two trains per hour per direction between Hazelhatch and Grand Canal Dock). While the Luas (Red Line) and bus services connect Heuston to Conolly Station, there is no direct link between the Cork Mainline and the other heavy rail services.

The DART+ South West Project will improve multimodal connectivity through interchanges with other public transport networks including:

- Allowing for Intercity / regional services to operate efficiently alongside DART services on the Cork Mainline.
- Linking with the Maynooth Line at Glasnevin interchange (via the Phoenix Park Tunnel Branch Line).

- **To support economic and population growth**

The Central Statistics Office's (CSO) *Regional Population Projections 2017-2036* notes that the population of Dublin could potentially increase by 31.9% by 2036, with the number of people living in Dublin rising from 1.34 million in 2016 to 1.76 million by 2036. To cater for this potential growth, *Project Ireland 2040* promotes the provision of higher density developments at accessible locations to encourage a more sustainable, compact urban form.

The DART+ Programme will bring fast, frequent, reliable, and sustainable transport to existing communities along existing rail corridors, making it easier to travel for work, education, or leisure purposes. It will also facilitate the development of new communities that will greatly benefit from the connectivity that the DART+ Programme will deliver.

- **To reduce reliance on private car use**

The *TomTom Traffic Index* has ranked Dublin as the 17th most congested city in the world, with waiting times having increased by 3% in 2019. According to the most recent CSO data (2016), the private car remains the dominant mode of transport in Dublin, accounting, on average, for 54% of all journeys.

Within the GDA, the highest levels of car dependency are evident around the outer edge of the Metropolitan area and in peri-urban fringe locations, where more than 7 in 10 people drive to work. This contrasts with the city centre, where less than 1 in 4 people drive to work. This reliance on the private car for those living on the outer edge of Dublin places substantial pressure on the road network – particularly during the morning and evening peak commuting times.

The Report *The Costs of Congestion – An Analysis of the Greater Dublin Area* (2017) suggests that the cost of time lost to congestion is €358 million in the base year (2012) and estimates the cost to rise to €2.08 billion per year by 2033. Most of this cost is the time lost by personal vehicle users as a result of increased journey times.

Additionally, the current lower frequency and capacity, and poor integration of public transport services within the wider network, does not encourage road users to leave their cars at home and use the public transport option.

The DART+ Programme will provide both existing and future residents along the Project route corridor with a viable alternative to the private car.

- **To achieve climate change targets**

In 2018, Ireland's transport emissions per capita were the fourth highest in the EU and well above the average. The Environmental Protection Agency (EPA) identifies that transport is Ireland's second largest emitter at 20.3%[2] of the national total emissions. The private car was the largest contributor at 48%. The EPA recognises an urgent need for better urban and spatial planning, as well as a major investment programme to encourage much more fuel-efficient transport, a switch to cleaner and alternative fuels, a rapid increase in the electrification of our car stock and a very significant shift from private car to public transport.

Tackling the challenges of climate change is a priority for Ireland, as outlined in the *Climate Action and Low Carbon Development (Amendment) Bill 2021*.

Electrification will provide a low carbon energy source for rail transport, reducing greenhouse gas emissions, and an additional fleet of electric trains will assist in the de-carbonisation of the transport sector, enable a transition away from fossil fuels and ultimately allow for reduction of CO^2 emissions by 2050 in line with Government targets.

Figure 2-1 Why Investment in DART+ Programme is Needed

- **To improve capacity and frequency of services**

The current services along the Project route corridor are limited to 12 trains per hour per direction with a peak passenger capacity of approximately 5,000. This low frequency and capacity not only affect the viability of the service in the eyes of local communities, but also limits the potential growth

[2] https://www.epa.ie/ghg/transport/

and delivery of new communities along the corridor. To promote a modal shift from unsustainable private car usage to public transport, higher frequency and higher capacity services must be provided to ensure convenient and viable alternatives for road users.

DART+ South West will significantly increase train capacity to 23 trains per hour per direction (i.e., maintain the existing 12 services, with an additional 11 train services provided by DART+ South West). This will increase passenger capacity from the current peak capacity to approximately 20,000 passengers per hour per direction.

- **To improve track alignment**

  The current track alignment between Cherry Orchard & Park West and Heuston Station does not allow for the potential for Intercity and regional services to overtake future DART services that, due to their higher frequency of stops, would operate at a slower average speed. As such, if DART services were introduced with the current two track alignment maintained, the journey time for Intercity and regional services would be governed by the DART services. The upgrading of this section of railway to include four tracks will remove this limitation and allow Intercity / regional services to operate efficiently and independently alongside DART services.

2.1.1. Objectives (DART+ Programme and DART+ South West)

The primary objective of the DART+ Programme is to support urban compact growth and contribute to reducing transport congestion and emissions in Dublin by enabling modernised high-quality commuter rail services between Dublin City Centre and the areas of Drogheda, Maynooth, Dunboyne, Celbridge and Greystones. This is aimed to provide a safe, sustainable, efficient, integrated, and accessible public transport service along these corridors.

Sub-objectives of the DART+ Programme include :

- Cater for existing heavy rail travel demand and improve customer services along established rail corridors in the Greater Dublin Area through the provision of a higher frequency, higher capacity, electrified heavy rail service which supports sustainable economic development and population growth.
- Improve accessibility to jobs, education, and other social and economic opportunities through the provision of improved inter-rail and inter-modal connectivity and integration with other public transport services.
- Enable further urban compact growth along existing rail corridors, unlock regeneration opportunities and more effective use of land in the Greater Dublin Area, for present and future generations.
- Deliver an efficient, sustainable, low carbon and climate resilient heavy rail network, which contributes to a reduction in congestion on the road network in the Greater Dublin Area and which supports the advancement of Ireland's transition to a low emissions transport system and delivery of Ireland's emission reduction targets.
- Provide a higher standard of customer experience including provision of clean, safe, quiet, modern vehicles and a reliable and punctual service with regulated and integrated fares.

The primary objective for the DART+ South West Project focuses on the target to increase the carrying capacity on the Project route corridor between Hazelhatch to Heuston and Glasnevin from the current peak capacity of approximately 5,000 passengers per hour per direction to approximately 20,000 passengers per hour per direction.

Sub-objectives of the DART+ South West Project include:

- To deliver higher frequency, higher capacity, electrified rail service along the Project route corridor to enable the extension of the DART service to Hazelhatch & Celbridge Station.
- To separate Intercity and fast regional services from the future DART service by providing additional tracks between Park West & Cherry Orchard Station and Heuston Station.
- To tie-in the Cork Mainline with the wider DART+ Programme using the recently opened rail link and existing connector tunnel through the Phoenix Park.
- To identify sustainable cost-effective solutions from a capital, operations, and maintenance perspective.
- To minimise adverse impacts on the natural and built environment during construction and operation.
- To minimise impacts on existing rail services, road users and landowners during construction.
- To deliver a sustainable, low carbon and climate resilient design solution including making use of existing infrastructure where possible with targeted improvement works.
- To deliver an improved customer experience and service for customers along the Project route corridor from Hazelhatch & Celbridge Station to the city centre.

The delivery of DART+ South West Project and the enhancement of the heavy rail network between Hazelhatch & Celbridge Station and Dublin City Centre will clearly assist in meeting the DART+ Programme objectives to create a full metropolitan DART network with all lines linked and connected, and with frequency and capacity of services significantly enhanced.

2.2. DART+ South Project Requirements

The requirements for the DART+ South West Project comprise technical and functional attributes derived from the need for the project. These requirements are:

- Completion of four-tracking from Park West & Cherry Orchard Station to Heuston Station, extending the works completed on the route in 2009.
- Electrification of the line from Hazelhatch & Celbridge Station to Heuston Station and also from Heuston Station to Glasnevin, via the Phoenix Park Tunnel Branch Line, where it will link with proposed DART+ West.
- Undertaking improvements / reconstructions of bridges to achieve vertical and horizontal clearances.

- Remove rail constraints along the Phoenix Park Tunnel Branch Line.
- Feasibility report and concept design for a potential new Heuston West Station.

The 'Emerging Preferred Option' will be compatible with the future stations at Kylemore and Cabra, although the construction of these stations is not part of the DART+ South West Project.

Project requirements need to be delivered having regard to all necessary technical specifications and guidelines.

2.3. Policy Context

The following sections of this Report provide an overview of the strategic fit of the DART+ Programme and DART+ South West Project in relation to European, national, regional, and local policy. A more detailed review of the policy context is provided in **Annex 2.1 Policy Context**.

2.3.1. European Policy

2.3.1.1. Trans-European Transport Network

The Trans-European Transport Network (TEN-T) policy supports the development of a Europe-wide network of railway lines, roads, inland waterways, maritime shipping routes, ports, airports, and railroad terminals. The 'Core Network' of the TEN-T policy includes the most important connections and links between key transport nodes, with nine corridors identified to streamline and facilitate the coordinated development of the Core Network by 2030.

DART+ South West is identified as an Action under the TEN-T Connecting Europe Facility Programme (CEF) which acknowledges that the "*upgrading this railway line to four electrified tracks will bridge the missing link by connecting the Cork Line and the Belfast Line through two stations in Dublin (the Hazelhatch and Connolly stations)"*. The Action concerns *"developing the designs for the DART+ South West from the preliminary design to the detail design phases, completing the approval process and subsequently launching the procurement for works on electrifying, re-signalling, the railway infrastructure components of stations, bridge replacements and tracking to construct the necessary infrastructure along the Kildare line in Dublin."*

The EU (under the Innovation and Networks Executive Agency (INEA) - the successor of the Trans-European Transport Network Executive Agency (TEN-T EA)) is part funding (50%) the DART+ South West preliminary design and RO application.

2.3.2. National Policy

2.3.2.1. Project Ireland 2040

'*Project Ireland 2040*' was launched in February 2018 and comprises the *National Planning Framework* and the *National Development Plan 2018 – 2027*. *'Project Ireland 2040'* is a long-term overarching strategy that aligns investment decisions with a clearly defined development strategy and National Strategic Outcomes.

2.3.2.2. National Planning Framework

The *National Planning Framework* is the primary articulation of spatial, planning and land use policy in Ireland. The framework is based on directing development to existing settlements rather than allowing the continual expansion and sprawl of cities and towns. The framework provides each region with a set of objectives and key principles from which detailed plans are to be developed.

The *National Planning Framework* defines ten National Strategic Outcomes that represent a shared set of goals for every community across the country.

Of relevance to the DART+ Programme are National Strategic Outcomes 1, 4 and 8:

- NSO 1 - Compact Growth seeks to manage the sustainable growth of cities, towns, and villages to create compact and attractive places in which people can live and work. NSO 1 seeks to achieve effective densities and consolidation of built form rather than further sprawl of urban development.
- NSO 4 - Sustainable Mobility is identified as being central to enhancing competitiveness, sustaining economic progress, and enabling mobility choices for citizens. Under NSO 4, the *National Planning Framework* aims to expand the range of public transport services available and to reduce congestion and emissions. The policy also commits to invest in key transport projects such as the DART+ Programme, BusConnects and Metro Link.
- NSO 8 - Transition to a Low Carbon and Climate Resilient Society, notes that the progressive and strategic development of new, sustainable energy systems, will support "*the conversion of the built environment into both generator/consumer of energy and the electrification of transport fleets*". Electrification of commuter services by means of the DART+ Programme will enable a transition away from diesel-based commuter trains to a highly decarbonised electricity supply.

2.3.2.3. National Development Plan 2018-2027

The *National Development Plan 2018–2027* is the most recent infrastructure investment plan adopted by the government. The plan is aligned with the delivery of the *National Planning Framework* objectives and sets out the state's investment priorities from 2018 to 2027 within the context of a changing demographic, the need for Ireland to move to a low carbon society, Brexit and the sustainable growth opportunities brought about by a growing population. The plan supports the delivery of *Project Ireland 2040* through public capital investment over the next ten years and guides national, regional, and local planning and investment decisions in Ireland.

The DART+ Programme, along with BusConnects and Metrolink, is specifically included in the plan (under NSO 4) as a major national infrastructure project for appraisal and delivery and has been allocated €2 billion Exchequer funding for the development and delivery of the programme.

The *National Development Plan* outlines the scope of the DART+ Programme to include investment in new rolling stock, new infrastructure and the electrification of the Sligo line to Maynooth and M3 parkway, the Northern line to Drogheda and the Cork Mainline to Hazelhatch & Celbridge Station to create a full metropolitan area DART network with all lines linked and connected as shown in **Figure 2-2**.

The Plan does not make provisions for any new tunnelling but does include the utilisation of the existing Phoenix Park Tunnel and requires that the route for any future DART Underground be protected to allow for its future delivery.

Figure 2-2 Public Transport Network 2027
Source: National Development Plan 2018-2027

2.3.3. Smarter Travel – A Sustainable Transport Future

The Department of Transport, Tourism and Sport's (DTTAS) *Smarter Travel - A Sustainable Transport Future A New Transport Policy for Ireland 2009-2020* is a national policy document that sets out five key goals as follows:

> *"(i) to reduce overall travel demand*
>
> *(ii) to maximise the efficiency of the transport network*
>
> *(iii) to reduce reliance on fossil fuels*
>
> *(iv) to reduce transport emission*
>
> *(v) to improve accessibility to transport."*

The national policy outlines targets to:

- Address unsustainable transport and travel patterns and to reduce the health and environment impacts of current trends.
- Deliver a sustainable transport system in line with climate change targets.
- Reduce work related commuting by car from a current modal share of 65% down to 45% by 2020.
- Increase commuting by alternative sustainable modes to 55% by 2020.

The goals and targets of *Smarter Travel - A Sustainable Transport Future* align with and support the DART+ South West Project.

2.3.4. Strategic Investment Framework for Land Transport

DTTAS's *Strategic Investment Framework for Land Transport, 2015* (SIFLT) lays out the role of transport in the future development of the Irish economy. The SIFLT's priorities outlined below echo *Project Ireland 2040*'s NSOs and guide investment decisions for transport schemes:

- **Address Urban Congestion:** The need to address urban congestion is prioritised within the Framework to improve the efficiency and sustainability of the urban transport system. This is to be achieved by improving and expanding public transport capacity, the expansion of walking and cycling infrastructure and the wider use of technology within transport systems; and
- **Maximise the contribution of Land Transport to National Development:** Transport systems should aim to enhance the efficiency of the existing network, improve connections to key ports and airports and support national and regional spatial planning priorities.

The objectives of the SIFLT align with and support the DART+ South West Project.

2.3.5. Planning Land Use and Transport Outlook 2040

Following the publication of *Project Ireland 2040*, DTTAS commenced the *Planning Land Use and Transport Outlook 2040* (PLUTO) initiative to update the SIFLT and ensure the alignment of planning regarding land use and transport projects across government departments and agencies. PLUTO has established priorities for transport projects up to 2040, which include:

- A land transport network that delivers a high level of service for the population of Ireland.

- Enabling the delivery of the *National Planning Framework* objectives regarding where people live and work.
- Maximising the sector's contribution to Ireland's economic competitiveness.
- Realising a low carbon sustainable transport system.

The objectives of PLUTO align with and support the DART+ South West Project.

2.3.6. Climate Action and Low Carbon Development (Amendment) Bill 2021

In March 2021, the Government published the *Climate Action and Low Carbon Development (Amendment) Bill 2021*[3]. It provides a governance framework setting out how Ireland will transition to 'Net Zero' and achieve a climate neutral economy by no later than 2050.

The key features of the Bill are:

- Placing on a statutory basis a 'national climate objective', which commits to pursue and achieve, the transition to a climate resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy, by no later than 2050.
- Carbon budgets including a provision for setting sectoral targets.
- Actions for each sector to be included in an annually revised Climate Action Plan.
- Strengthened role for the Climate Change Advisory Council.
- New oversight and accountability by the Oireachtas.
- Public Bodies will be obliged to perform their functions in a manner consistent with national climate plans and strategies and furthering the achievement of the national climate objective.

2.3.7. Regional Policy

2.3.7.1. Eastern and Midland Regional Spatial & Economic Strategy 2019-2031

The *Regional Spatial & Economic Strategy 2019-2031* (RSES) for the Eastern and Midland Region including the Metropolitan Area Spatial Plan for Dublin was published in June 2019. The RSES addresses the implementation of *Project Ireland 2040* at the regional level. It considers spatial and economic factors, which relate to the future of the region and ensures that employment opportunities, services, ease of travel and the overall wellbeing of citizens is being addressed.

The RSES highlights the DART Expansion Programme (now the DART+ Programme) and its role in the consolidation of Dublin City Centre and surrounding areas. It notes:

> *"The RSES supports a feasibility study for the provision of high-speed rail links between Dublin and Limerick/ Junction Cork and enhanced rail services including the extension of the DART to Celbridge/ Hazelhatch in north Kildare"*

[3] Following publication of the draft text of the Bill in October 2020 the final text reflects the strong censuses for increased ambition and enhanced climate action.

The RSES identifies a Strategic Development Corridor to the south west of the city and notes the role that the DART+ Programme plays in this regard:

> *"The consolidation of the western suburbs of Clonburris, Kilcarberry and Adamstown, linked to increased capacity and electrified services on the Kildare line, to be delivered by 2027"*

Policy Objective RPO 8.8 supports the DART+ South West with the following rail projects noted in the associated Table 8.2 of the RSES:

> *"DART Expansion Programme- new infrastructure and electrification of existing lines, including provision of electrified services to Drogheda or further north on the Northern Line, Celbridge-Hazelhatch or further south on the Kildare, Maynooth and M3 Parkway…"*

2.3.7.2. Metropolitan Area Spatial Plan

The requirement for the development of a Metropolitan Area Spatial Plan for Dublin (MASP) for Dublin City, as part of the RSES is outlined in *Project Ireland 2040*. The objectives of the MASP include the management of sustainable and compact growth of Dublin City and better use of underused lands.

The MASP contains several objectives for the Dublin Metropolitan Area, including Sustainable Transport Objectives to include:

> **RPO 5.2** "*Support the delivery of key sustainable transport projects including Metrolink, DART and LUAS expansion programmes, BusConnects and the Greater Dublin Metropolitan Cycle Network and ensure that future development maximises the efficiency and protects the strategic capacity of the metropolitan area transport network, existing and planned*".
>
> "*To focus growth along existing and proposed high quality public transport corridors and nodes on the expanding public transport network and to support the delivery and integration of 'BusConnects', DART expansion and LUAS extension programmes, and Metro Link, while maintaining the capacity and safety of strategic transport networks*".

The objectives of the Eastern and Midland RSES and MASP align with and support the DART+ Programme and the DART+ South West Project.

2.3.7.3. Transport Strategy for the Greater Dublin Area 2016-2035

The *Transport Strategy for the Greater Dublin Area 2016-2035* (the Transport Strategy) provides a framework for the planning and delivery of transport infrastructure and services in the Greater Dublin Area (GDA) until 2035. It integrates short, medium and long-term plans for rail, bus, cycling, walking and roads and sets out the transport provisions necessary to "*contribute to the economic, social and cultural progress of the GDA by providing for the efficient, effective and sustainable movement of people and goods*".

While the strategy acknowledges the development of the rail network in recent decades, it advises that significant work remains to create a fully integrated rail network. Of particular relevance to DART+ South West it highlights: *"In particular, the Kildare / Cork line terminates on the outskirts of the City Centre at Heuston and does not link into the heart of the city, and to the other three lines, for passenger services".*

The Transport Strategy identifies the heavy rail infrastructure required to be delivered within the lifetime, as follows:

- Reopen the Phoenix Park Tunnel Link for passenger services, which will link the Kildare/Cork line to the city centre. [The tunnel reopened in 2016 for regular passenger traffic]

  Complete the City Centre Re-signalling programme, which will provide additional train paths through the city centre section of the rail network. [The Programme was completed late 2020.]

- Implement the DART Expansion Programme, which will provide DART services as far north as Drogheda; to Hazelhatch on the Cork Mainline (including a tunnel connection from the Cork Mainline to link with the Northern / South-Eastern Line); to Maynooth in the west and to the M3 Parkway. [All three major DART+ Projects are currently progressing towards Railway Order applications in the next two years (i.e., DART+ West, DART+ South West and DART+ Coastal)]
- Develop a new train control centre to manage the operation of the rail network.
- Construct additional train stations in developing areas with sufficient demand.
- Implement a programme of station upgrades and enhancement.
- Ensure an appropriate level of train fleet, of an appropriate standard, to operate on the rail network.

The Transport Strategy also outlines objectives for 'Transport Services' and Integration nothing that: "*The DART services will operate to a high frequency with adequate capacity to cater for the passenger demand. It is anticipated that DART services in the city centre section of the network will operate to a regular ten-minute service frequency in the peak hours from 2016 and will transition to a five-minute service frequency following the completion of the DART Expansion Programme*".

It is clear that the objectives of the Transport Strategy are in the process of successfully being delivered by the DART+ Programme and this includes progressing the DART+ South West Project.

2.3.7.4. Greater Dublin Area Cycle Network Plan

The *Greater Dublin Area Cycle Network Plan* sets out a 10-year strategy to expand the urban cycle network from 500km to 2,480km. The overarching ambition of the scheme is, by 2021, to increase the numbers who commute by bike to be the same as those who commute by bus.

The network will consist of a series of primary, secondary and feeder routes as well as greenways routes. These routes will comprise of a mix of cycle tracks and lanes, cycleways, and infrastructure-free cycle routes in low traffic environments.

The proposed network of primary, secondary and greenway cycle routes include several crossings of the DART+ South West Project corridor; however, none of the cycle routes are severed or materially affected by the Project.

2.3.7.5. Integrated Implementation Plan 2019-2024

The NTA's *Integrated Implementation Plan 2019-2024* (the Implementation Plan) supports the delivery of the Transport Strategy and is aligned with the objectives of the NDP. The Implementation Plan

identifies the key investment areas with respect to bus, light rail, heavy rail and integration and sustainable transport investment.

The Implementation Plan provides further detail on the sequencing and allocation of the €4.6b available to the NTA across Bus, Light Rail, Metro and Heavy Rail projects up to 2024.It also notes that the "*integrated rail network will provide a core, high-capacity transit system for the region and will deliver a very substantial increase in peak-hour capacity on all lines from Drogheda, Maynooth, Celbridge/Hazelhatch and Greystones*".

The investment programme and overall funding provision of the Implementation Plan align with and support the DART+ South West Project.

2.3.8. Local Policy

2.3.9. Dublin City Development Plan 2016-2022

The route departs from the administrative area of Dublin City Council (DCC), the future development of which is governed by the *Dublin City Development Plan 2016-2022* (the DCDP). The DCDP provides an integrated, coherent spatial framework to ensure Dublin city is developed in an inclusive way, which improves the quality of life for its citizens, while also being a more attractive place to visit and work.

The DCDP aims to create a platform to facilitate and promote a sustainable and long-term vision for the city, which includes the delivery of large-scale infrastructure developments and public transport systems.

The main DCDP policies and objectives that are of relevance to the DART+ Programme include:

> **Policy MT4**: "*To promote and facilitate the provision of Metro, all heavy elements of the DART Expansion Programme including DART Underground (rail interconnector), the electrification of existing lines, the expansion of Luas, and improvements to the bus network in order to achieve strategic transport objectives*".
>
> **Policy MT3**: "*To support and facilitate the development of an integrated public transport network with efficient interchange between transport modes, serving the existing and future needs of the city in association with relevant transport providers, agencies and stakeholders*".
>
> **Policy MT6(i)**: "*To work with Iarnród Eireann, the NTA, Transport Infrastructure Ireland (TII) and other operators to progress a coordinated approach to improving the rail network, integrated with other public transport modes to ensure maximum public benefit and promoting sustainable transport and improved connectivity*".
>
> **Policy MTO5(i)**: "*To facilitate and support measures proposed by transport agencies to enhance capacity on existing public transport lines and services, to provide/improve interchange facilities and provide new infrastructure*".

Section 8.5.3 of the DCDP (Public Transport) further states that:

> "*DCC policy on public transport will be implemented in collaboration with the NTA's Transport Strategy for the Greater Dublin Area 2016-2035. Key public transport elements of this strategy*

include Metro North and South, and the DART expansion programme including DART underground".

The DART+ South West Project aligns with, and is supported by, the policies and objectives of the DCDP.

2.3.9.1. Park West - Cherry Orchard Local Area Plan 2019

The *Park West - Cherry Orchard Local Area Plan* (LAP) was adopted in 2019 and provides a framework for the future development of the area.

The LAP identifies 46 hectares of land available for development with the potential to deliver approximately 2,000 new residential units alongside new mixed-use and commercial development. It identifies several vacant Key Development Sites, including sites immediately adjacent to the Project rail corridor (north and south).

The proposed land use strategy for the land includes mixed-use development with employment generating uses around the Park West & Cherry Orchard Station.

The DART+ South West Project will improve commuter rail services at this location and therefore enhance the social and economic potential of the area.

2.3.9.2. Naas – Ballymount – Cherry Orchard – Park West URDF Masterplan

In November 2018, the Department of Housing Planning and Local Government committed Urban Regeneration and Development Fund (URDF) funding to a joint Dublin City Council / South Dublin County Council study of 700 hectares of strategically located land at Naas, Ballymount, Cherry Orchard and Park West.

A project team has been appointed to prepare a strategic framework for these lands by the end of 2021 with the objective of investigating how a plan-led evidence-based new mixed-use urban quarter can be successfully developed as an organic extension of the city.

The Project Brief[4] advised "*The Study Area provides a unique opportunity to regenerate a historical industrial/manufacturing edge location in Dublin to provide for new homes, jobs, schools, community facilities and amenities in a sustainable and compact form of urban development which is served by high quality public transport and active modes.*"

The DART+ South West Project provides the opportunity to better integrate existing and new public transport systems to serve the existing and future communities in this area.

2.3.10. South Dublin County Development Plan 2016-2022

The route travels through the administrative area of South Dublin County Council (SDCC), the future development of which is governed by the *South Dublin County Development Plan 2016-2022* (the SDCDP). The SDCDP provides the spatial framework for the county in the context of national and regional policy frameworks and outlines qualitative and quantitative development management standards against which the DART+ South West Project will be assessed.

[4] Naas Road – Ballymount – Cherry Orchard URDF Masterplan Brief to Procure Consultants.

The SDCDP supports the delivery of key infrastructure and transport developments with CS7 Objective 2 aiming to:

> *"To support the delivery of sufficient public transport and road capacity to facilitate sustainable new development in Strategic Development Zones".*

This is supported by TM2 Objective 1:

> *"To secure the implementation of major public transport projects as identified within the relevant public transport strategies and plans for the Greater Dublin Area"*

Regarding specific objectives for the DART+ Programme, Section 6.1.0 of the SDCDP seeks to:

> *"Support the NTA in implementing major transport projects such as the reopening of the Phoenix Park Tunnel for rail services, DART Underground and Tallaght Swiftway (Bus Rapid Transport)".*

The DART+ South West Project aligns with, and is supported by, the policies and objectives of the SDCDP.

2.3.10.1. Adamstown Strategic Development Zone

The Adamstown Strategic Development Zone Planning Scheme (the Planning Scheme) was originally approved by An Bord Pleanála in 2003, and further amended in 2014. When complete, the 223.5ha area will provide approximately 7,000 no. residential units focused around Adamstown Railway Station.

The Planning Scheme was prepared having regard to best practice in the planning and design of new urban communities. Its holistic design approach seeks to "*create urban place with a strong sense of identity that is attractive and desirable as well as safe and secure, in a traditional town and village format*".

The Planning Scheme was conceived to: *"Provide alternatives to the private car in the form of a new railway station and transport interchange, additional rail capacity, dedicated bus routes and a continuous network of walking and cycling links".*

The delivery of DART+ South West Project will significantly improve the frequency and reliability of commuter services at Adamstown Station, which will bring social and economic benefits to this growing community.

2.3.10.2. Clonburris Strategic Development Zone 2019

In 2015, Government Order (SI No. 604 of 2104) designated 280 hectares of land at Clonburris-Balgaddy as a Strategic Development Zone (SDZ). The lands which are deemed to be of economic and social importance to the state, are *"for residential development and the provision of schools and other educational facilities, commercial activities, including employment office, hotel, leisure and retail facilities, rail infrastructure, emergency services and the provision of community facilities, including health and childcare services."*

The Cork Mainline runs centrally / along the northern boundary of the lands and there are two train stations within the SDZ – the Clondalkin / Fontill Station (which is operational) and the Kishoge Station

(which was constructed as part of the Kildare Route Project and is to come operational in tandem with the delivery of housing).

Like Adamstown, Clonburris was conceived as a transport-oriented development; with the Planning Scheme(s) designed to provide alternatives to private car use, via both existing and new rail stations, additional rail capacity, the future planned electrification of the rail line and dedicated bus routes. The DART+ South West Project is therefore a key enabler for Clonburris to reach its full and intended sustainable transport-oriented development potential.

2.3.11. Kildare County Development Plan 2017-2023

The western portion of the route runs through the administrative area of Kildare County Council (KCC) and terminates at Hazelhatch. The future development of this area is governed by *Kildare County Development Plan 2017-2023* (the KCDP). The Development Plan sets out an overall strategy for the proper planning and sustainable development of the functional area of County Kildare and aims to strengthen the county by facilitating sustainable development through the provision of physical and social infrastructure.

At its adjourned meeting on 9th June 2020, KCC adopted a Variation (Variation No. 1) of the Development Plan in response to changes in national and regional policy, namely the publication of the National Planning Framework and the Regional Spatial and Economic Strategies. The Development Plan now designates Celbridge a 'Self-Sustaining Town' and as such will require "*contained growth, focusing on driving investment in services, employment growth and infrastructure while balancing housing delivery*."

The aim of the Development Plan in terms of Transportation and Movement is to *"promote ease of movement within and access to County Kildare, by integrating sustainable land use planning with a high-quality integrated transport system; to support improvements to the road, rail and public transport network, together with cycleway and pedestrian facilities".*

The main policies and objectives stated in the Development Plan, which are of specific relevance to the DART+ Programme, include:

> **MT 1**: "*Promote the sustainable development of the county through the creation of an appropriately phased integrated transport network that services the needs of communities and businesses*."
>
> **MT 2**: "*Support sustainable modes of transport by spatially arranging activities around existing and planned high quality public transport systems*."
>
> **MT 3**: "*Influence people's travel behaviour and choices towards more sustainable options by working closely with relevant organisations in improving and accessing public transport facilities*."
>
> **MT 8:** ***"****Seek to address urban congestion with particular emphasis on facilitating improved bus transport movement and reliability and improved links to bus and railway stations."*
>
> **PT 1**: "*Promote the sustainable development of the county by supporting and guiding national agencies including the National Transport Authority in delivering major improvements to the*

public transport network and to encourage public transport providers to provide an attractive and convenient alternative to the car".

PT 2: "*Generate additional demand for public transport services by strengthening development around existing and planned high capacity transport routes and interchanges throughout the county*".

PT 3: "*Support the delivery of the NTA's Greater Dublin Area Transport Strategy (2016-2035) in Kildare*".

PT 5: "*Investigate, in co-operation with Irish Rail and the National Transport Authority, the provision of new railway stations in the county and the upgrading/relocation of existing stations, to rectify existing constraints in the network*".

PT 7: "*Promote and support the upgrading of the Maynooth rail line and the Kildare rail line, in accordance with the Transport Strategy for the Greater Dublin Area 2016-2035 and in co-operation with the NTA*".

The DART+ South West Project will significantly contribute to the realisation of the policies of the Development Plan.

2.3.11.1. Celbridge Local Area Plan

The DART+ South West Project corridor terminates at Hazelhatch & Celbridge Station, circa 2km to the southeast of Celbridge's town centre. One of the aims of the *Celbridge Local Area Plan 2017-2023* is to set out a framework for enhancement of the town's existing transport network by increasing permeability, particularly for sustainable modes of transport and improving access to public transport.

The Local Area Plan identifies several Key Development Areas (KDAs) including KDA 2 Ballyoulster and KDA 5 Simmonstown located to the south of the River Liffey between Celbridge town centre and Hazelhatch & Celbridge Station.

The expansion of DART rail services to Hazelhatch and future housing (delivered through the KDAs) are identified as additional pressures for an already congested network and Kildare has appointed consultants to progress a scheme comprising a second river crossing of the River Liffey and a mainline carriageway linking Celbridge to Hazelhatch train station.

DART+ South West will significantly increase train capacity on the railway corridor from the current 12 trains per hour per direction to 23 trains per hour per direction.

3. Transportation Analysis

3.1. Train Service Specification (TSS)

In 2018, the *DART-Expansion-Programme-Options-Assessment* (Oct 2018) by Jacobs and Systra recommended that the DART Expansion Programme (now the DART+ Programme) be delivered by enhancing the existing rail network in the short to medium term (Scheme Bundle 6). This recommendation followed modelling of the bundle options using the National Transport Authority's (NTA) Eastern Regional Model (ERM) which allowed for the performance and attractiveness of the bundles to be analysed by considering how transport demand is served by the rail system within a multi-modal network (i.e., including the public transport modes of rail, bus, Luas, Metro as well as that of car, walking and cycling). Refer to **Annex 2.2 Useful Links** for a hyper link to *DART-Expansion-Programme-Options-Assessment (Aug 2018)*.

In 2018, the *DART-Expansion-Programme-Options-Assessment-Addendum* (August 2010) was published (also by Jacobs and Systra). It details the strategic modelling outputs of a revised Train Service Specification (TSS) Option 1 – Balanced City Centre Distribution of the preferred option (i.e., Scheme Bundle 6). Refer to **Annex 2.2 Useful Links** for a hyperlink to *DART-Expansion-Programme-Options-Assessment-Addendum (June 2019)*.

The main outcome of the assessment is the definition of the TSS, which is the 'desired' number of train services to have on each branch of the DART network (i.e., trips per hour per direction (tphpd)).

Building on the work undertaken by Jacobs and Systra, the DART+ West Multi-disciplinary Consultant (MDC) undertook feasibility and robustness analysis to demonstrate whether the desired timetable is feasible / achievable and the effects of each key element of the infrastructure on performance. The analysis provides a set of recommendations for further enhancements and considerations in order to obtain a more robust and predictable timetable; this included specific recommendations for the Cork Mainline. Refer to **Figure 3-1.**

DART+ South West has reviewed the analysis and is considering how to address the recommendations for the Project on the basis the underlying assumption is to increase the capacity and the available number of train services and give more robustness to performance.

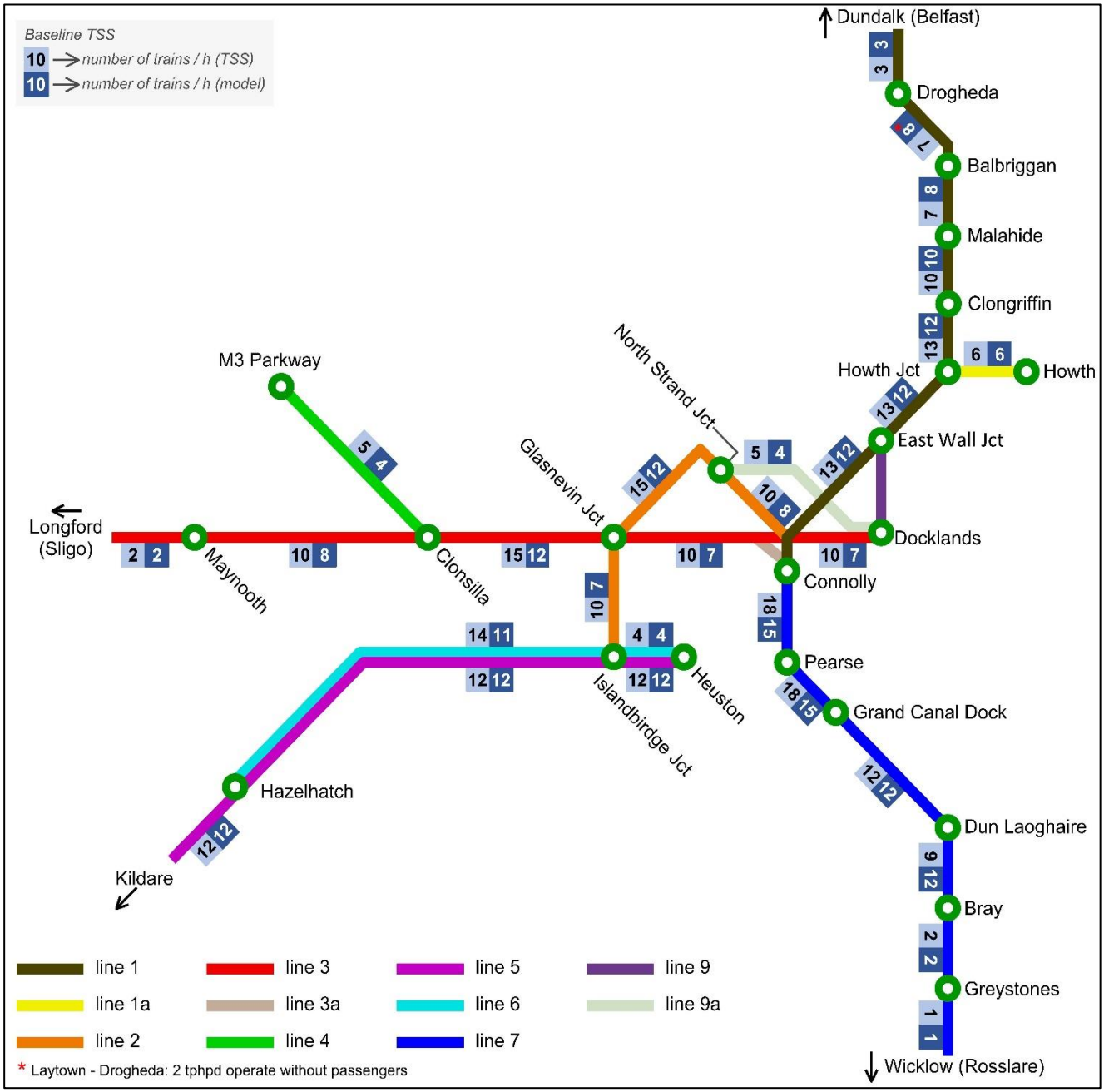

Figure 3-1 Train Service Specification

As set out in **Section 1.3.1**, the operating capacity of services in the Heuston area is currently constrained by railway infrastructure limitations in the network like Connolly, Glasnevin Junction and other spots, and by the ability of Heuston Station to accommodate terminating trains, which results in a reduced TSS for DART+ South West with regards to the originally foreseen scenario.

Still, DART+ South West will significantly increase train capacity from the current 12 trains per hour per direction to 23 trains per hour per direction (i.e., maintain the existing 12 services, with an additional 11 train services). This will increase passenger capacity from the current peak capacity of

approximately 5,000 passengers per hour per direction to approximately 20,000 passengers per hour per direction. Upon completion of the Project, train services will be increased according to passenger demand. See **Table 3-1** below.

Table 3-1 Baseline Train Service Specification (Passenger Numbers for DART+ South West)

Current Single Peak Hour		
PPT (Hazelhatch – Connolly)	2	800
Heuston Commuter	4	1,600
Heuston Commuter	6	2,700
Total	12	5,100

Baseline TSS – Single Peak Hour		
PPT (Hazelhatch - Connolly Docklands)	7	8,400
DART Hazelhatch/Heuston	4	4,800
Heuston Commuter 2 x Portlaoise 1 x Athlone 1 x Carlow	4	2,400
	8	4,560
	23	20,160

Note: DART+ South West - Increasing passenger capacity from approximately 5,000 to 20,000 passenger per hour, by utilising new DART trains and lengthening existing diesel trains, operating at increased service frequency (i.e. 12 (existing) to 23 (proposed) trains per hour)

3.2. The NTA Eastern Regional Traffic Model

The Eastern Regional Model (ERM) is one of five models that comprise the National Transport Authority's (NTA) Regional Modelling System. The ERM covers the whole of Ireland with a focus on the counties within Leinster and the Greater Dublin Area (GDA). These areas are represented by 1844 detailed zones with travel between these areas and the rest of Ireland represented by 7 external zones. The base year of the model is 2016 and it represents an average weekday with five separate peak periods modelled;

- AM peak (07:00-10:00);
- Morning Inter peak (10:00-13:00);
- Afternoon Inter peak (13:00-16:00);
- PM peak (16:00-19:00); and
- Off peak (19:00-07:00).

The model covers all surface access modes for personal travel and goods vehicles including private vehicles (taxis and cars), public transport (bus, rail, Luas, BRT, Metro), active modes (walking and cycling) and goods vehicles (light goods vehicles and heavy goods vehicles).

The model is being used to carry out the demand modelling associated with the DART+ Programme. This work is currently being carried out by AECOM and the output from the study will be used to update the transportation modelling for the DART+ Programme.

There have been proposals to build two extra sets of railway tracks on the Cork Mainline since 1999. Following a Railway Order application, in 2009 the Kildare Route Project delivered significant enabling infrastructure for DART including four tracking, bridges with the necessary clearances, and new stations between Park West and Hazelhatch.

Despite the onset of the economic recession and changes in Government spending, investment in rail and in the DART+ Programme has remained a priority. Feasibility studies have been ongoing to deliver a cost-effective solution for DART+ Programme. These studies provided the basis for the scope for the DART+ South West Project, which will resolve the outstanding constraints between Park West and Heuston Station by four tracking the line into Heuston Station; it will provide all the necessary infrastructure for electrification out to Hazelhatch and it will link directly to the City Centre through the Phoenix Park Tunnel Branch Line. It will also be compatible with the future DART Underground rail project.

4. Previous Studies

The following sections provide an outline of relevant plans, projects and studies undertaken in recent years, which set out the need and scope of the DART+ South West Project.

4.1. Context

The need for improvements and modernisation of the rail network has long been identified. The DART+ Programme, and more specifically the DART+ South West Project, is a continuation of improvements that commenced from 2000 onwards. The underlying rationale was that integration of land-use and transportation can help reduce the need to travel and facilitate sustainable urban development. These objectives have consistently featured in strategic investment and land use plans published over the last 20 years; as have the specific improvements required to deliver these objectives, including the improvements needed on the Cork Mainline[5].

In the *National Development Plan 2000 – 2006* and *Strategic Planning Guidelines for the Greater Dublin Area* (1999) investment in the rail network was identified as a key requirement to provide a better service for the working and resident population of the Greater Dublin Area (GDA); both plans also promoted the concept of maximising existing transportation corridors along which future development of the GDA would occur.

In 2000, Iarnród Éireann and CIE published the *Dublin Suburban Rail Strategic (DSRS) Review*, which provided the genesis for the DART Expansion Programme (subsequently renamed the DART+ Programme). Of relevance to DART+ South West, there has been a long-standing rail industry recognition that operating a mixed railway (where commuter services, inter-city long distance services, and urban transit and freight services operate on the same tracks) severely compromises performance and capacity. Given the number of inter-city and commuter services using this section of the Cork Mainline the proposal to build two extra sets of railway tracks in order to separate Intercity / regional and suburban railway services and eliminate the existing capacity constraint, has been identified as a pre-requisite to improve capacity along the line.

This DSRS Review noted that, in order to maximize the use of the existing network, capacity improvements on the Cork Mainline were required (again focusing on the need for additional tracks to separate Intercity and suburban railway services). The Report recommended amongst other things:

- *"four tracking of the Kildare line should start with the Cherry Orchard- Hazelhatch section to permit up to 6tph Heuston-Hazelhatch or 4tph to Sallins and 2tph Kildare, if suitable terminal facilities are provided"*
- *"electrification of the suburban lines from Maynooth and Sallins/Kildare"*

The DSRS Review also recommended the electrification of lines. The Review further identified that the development of an underground interconnector linking Spencer Dock and the City Centre would provide for cross-city rail services and would widen the city centre rail catchment. The development of

[5] The DART+ South West Project includes part of the existing Cork Mainline between Hazelhatch & Celbridge Station and Heuston Station. This part of the Cork Mainline is often referred to in policy documents and publications as the 'Kildare Line'.

such a tunnel would also provide capacity for more intensive development along the Cork Mainline. It was from this document that the DART Underground Programme was devised (i.e., underground rail interconnector and electrification of the radial lines).

In 2001, *A Platform for Change - An Integrated Transportation Strategy for the Greater Dublin Area 2000 to 2016* (published by the Dublin Transportation Office) reiterated the key objectives of investing in rail and maximising the use of existing rail lines and reiterated the underlying requirements for the DART+ Programme. Those of relevance to DART+ South West, were:

- Four tracking from Cherry Orchard to Sallins;
- An east-west city centre tunnel; and
- Electrification of the Cork Mainline to the city centre.

In 2003, the Department of Transport commissioned a report to evaluate the long-term rail requirements from a national perspective in light of the emerging spatial planning and regional development trends and policies. This was presented in the *Strategic Rail Review* (2003). This report was cognisant of the recommendations of the DTO's *A Platform for Change* but considered more detailed analysis to take account of the localised development potential that would result in increased passenger demand (i.e. greater than assumed in *A Platform for Change*). The *Strategic Rail Review* (2003) acknowledged that the more detailed analysis could affect the timing of elements of the investment strategy.

The recommendation of the Strategic Rail Review (Section 4.5.4) was to develop the Dublin Suburban Routes in four phases, including as Phase 3: "*Widening of the rail corridors between Dublin Connolly and Howth Junction and between Dublin Heuston and Hazelhatch on the Kildare route from two to four track, enabling separation of stopping DART services from fast intercity and commuter train services.*" The investment strategy recommended included:

- Progressing construction of the a new turnback facility at Newbridge.
- The lengthening of platforms at Sallins and Hazelhatch.
- Secure a Railway Order and proceed to construction of the four tracking on the Kildare Line to separate Intercity and commuter traffic.

Since 2001, these objectives and requirements have remained constant including establishing Hazelhatch & Celbridge as the termination point for four tracking and Sallins the termination point for electrification; however, having regard to interdependencies between some elements, they have had to be brought forward as different projects or phases at different times.

An early project (one of the investment strategy recommendations of the *Strategic Review 2003*), involved delivering platform lengthening at Hazelhatch & Celbridge Station and Sallins & Naas Station to accommodate longer trains in 2003.

However, addressing the existing constraints of the Cork Mainline was the priority; and the four-tracking of the line, between Park West & Cherry Orchard Station and Hazelhatch & Celbridge Station, was brought forward as the Kildare Route Project in 2006. At the time, it was not possible to include the four-tracking further into the city as part of the project because the design alignment of DART

Underground and its interface with the Cork Mainline around Heuston and Inchicore had not been finalised. For further details, refer to **Section 4.2**.

The delivery of the Kildare Route Project in 2009 laid down significant groundwork for the DART+ South West Project, providing four-tracking for 11km and reconstructing several bridges to provide the necessary lateral clearance and vertical clearance for future electrification.

In 2009, with the DART Underground alignment finalised, the second phase of the Kildare Route Project was progressed. This looked at continuing four-tracking from the end of Kildare Route Project at Park West & Cherry Orchard through to the end of proposed DART Underground within the IÉ Inchicore Works. With the onset of the economic recession, the Government decided to defer the DART Expansion Programme in the *Capital Expenditure Programme 2012-2016*, with a view to progressing it again when funding permitted. The progression of the Railway Order application for Kildare Route Project Phase 2 Project was put on hold.

In 2015, the Government deferred authorisation for construction of DART Underground. Refer to **Section 4-3**.

In this regard, the onset of the financial crisis in 2010 and a series of capital spending reviews has affected the timing, but not the objectives or underlying requirements for the DART Expansion Programme (now the DART+ Programme).

In 2018, the *DART-Expansion-Programme-Options-Assessment* (Oct 2018) by Jacobs and Systra sought to identify a lower cost alternative to the proposed DART underground tunnel component of the DART Expansion Programme. It considered a range of 'scheme bundles' and recommended that the DART Expansion programme be delivered by enhancing the existing rail network in the short to medium term (Scheme Bundle 6). Of relevance to DART+ South West, Scheme Bundle 6 - DART Expansion with Existing Network Enhancement (No DART Underground) initially included:

- Upgrading of the Phoenix Park Tunnel Branch Line (as an alternative to the DART Underground tunnel).[6]
- New stations at Heuston West (Platform 10) and Cabra.
- Four tracking on the Cork Line from Park West to Heuston station.

Following optimisation an above-ground station at Kylemore on the Cork Mainline was recommended as an alteration to Scheme Bundle 6. This in turn meant that the Heuston West (Platform 10) station was no longer required and was removed from Scheme Bundle 6.

As part of future transport policy and strategy further improvements of the Cork Mainline may be promoted, which may include full InterCity and/or Commuter electrification extensions. There is nothing being designed by DART+ South West that will preclude these future plans. These future projects will be subject to their own designs, technical assessment, and statutory approval.

In conclusion, the DART+ South West Project continues the railway modernisation works already significantly progressed by previous projects delivered since the early 2000s. DART+ South West is

[6] It is noted that DART Underground remains a proposal and the tunnel alignment is protected for potential future development.

fully compliant with recent government transport and climate policy, most particularly the *National Development Plan 2018-2027* for completion of four-tracking from Park West to Heuston and electrification of the commuter lines from Hazelhatch to Heuston and along the Phoenix Park Tunnel Branch Line. In this context, the DART+ South West Project is an up to date upgrading the suburban railway service along this section of the Cork Mainline.

4.2. Kildare Route Project (Delivered in 2009)

The Kildare Route Project involved upgrading the suburban railway service along the section of the Dublin – Cork railway line, between Cherry Orchard (west of Le Fanu Road Bridge (OBC7)) and a point 1km west of Hazelhatch & Celbridge Station.

As part of the Kildare Route Project design development process, different solutions to improving passenger rail services between Dublin and Hazelhatch were considered. This included the option of constructing an entirely new rail line corridor between Kildare and Heuston Station. However, this option was discounted because of cost (including substantial property acquisition costs in built up area), poor use of the existing railway infrastructure including stations, no passenger interlinkage (from suburban to Intercity at certain stations) and a lack of flexibility for trains when maintenance of a track is being carried out.

The option considered to have clear economic and social advantages was to widen the existing railway corridor confining the railway works to an area that already has a railway presence and where duplication of items such as signalling structures and road overbridges, could be avoided.

An option of providing for the section from Heuston to Cherry Orchard was also technically examined; however, it did not form part of the Kildare Route Project Railway Order, as clarification of the DART Underground final design alignment was pending, and it would ultimately enable suburban services from Hazelhatch to run through to Connolly station, Spencer Dock and to link with the existing DART and Luas lines.

An option of an electrified service was also considered; however, it was not so much regarded as an alternative, but rather as a future development opportunity and enabler (delivering the basic railway line infrastructure) for a future DART type service on the railway corridor.

Figure 4-1 Route and Extent of the Kildare Route Project (in red) (2006 EIS)

The upgrading works included:

- Two extra sets of railway tracks between Cherry Orchard and Hazelhatch stations in order to separate Intercity / regional and suburban railway services.
- New / relocated railway stations (including at Park West, Fonthill Road and Kishoge).
- Upgrading Hazelhatch & Celbridge Station to provide additional platforms.
- Demolition and reconstruction (where appropriate) of several road bridges over the railway line to accommodate the widened railway corridor, including bridges located at:
  - Station Road Bridge (OBC13)
  - Ninth Lock Road Bridge (OBC13)
  - Stacumny Road Bridge (OBC21)
  - Hazelhatch Road Bridge (OBC25)
  - Hazelhatch Footbridge (OBC24A)
- Associated station, upgrades amended road layouts and all associated and ancillary works including cycle facilities and bus interchanges.

The Railway Order application was lodged in 2005 and approved in 2006. The project was completed in 2009.

The Kildare Route Project delivered significant enabling infrastructure for the DART+ South West Project, including four-tracking between Park West & Cherry Orchard Station and Hazelhatch & Celbridge Station and several bridge reconstructions along the section which provide the necessary clearances for electrification. Other relevant enabling works included the 2003 platform lengthening at Hazelhatch & Celbridge Station to accommodate longer trains and construction of the turnback in Newbridge in order to improve outer commuter services served by the Kildare Arrow Route (including *inter alia* Newbridge, Sallins and Celbridge).

Refer to **Annex 2.2 Useful Links** for a hyperlink to the Kildare Route Project Railway Order.

Figure 4-2 Four-tracking and Bridge Reconstruction (delivered as part of the Kildare Route Project)

4.3. DART Underground (2002 - 2011)

In 2002, CIÉ commenced a three-phase process considering several route alignments and station locations for DART Underground, as follows:

- **Phase 1 – Feasibility:** commenced in 2002 by Parsons Brinckerhoff Ireland Ltd. It identified an alignment running from East Wall to Pearse Station, and on to Heuston Station with additional stations at Docklands (under the River Liffey), St. Stephen's Green and the Digital Hub.
- **Phase 2 – Preliminary Design:** commenced in 2006 by Mott MacDonald Pettit Ireland. The alignment did not change significantly in this phase, but the design detail was refined. For the Western Portal underground station, a range of options were initially considered. Options west of Islandbridge were discounted, and ultimately two options remained:
  - Heuston Plan A - beneath the Diageo-owned St. James' Gate Brewery, east of the existing Heuston mainline station and adjacent to Victoria Quay.
  - Heuston Plan B - the underground station was moved westwards, partially out of Diageo lands and partially into CIÉ lands. The alignment would come to the surface in the centre of the Kildare Route Project track configuration thereby negating the need to provide a grade-separated junction as would have been required for Plan A. Plan B was selected as the preferred option.
- **Phase 3 – Reference Design:** commenced in 2008 by Arup Halcrow Joint Venture. As part of this design process several further options were considered in order to optimise the final scheme design. However, during design development, it became clear that the constraints at Heuston Station were significant and potentially could have a major impact on existing train operations and on the local infrastructure and environs.

- In order to address the impacts of Plan B, the option of extending the DART Underground tunnel to Inchicore, referred to as Plan C, was investigated. Given that the concept of the Plan C extension was a new development for the DART Underground project, several assessments had to be carried out to bring the proposed extension into line with the remainder of the project, including route options with varying arrangements for station provision and turnbacks.
- In early 2009 it was decided to advance with the extension to Inchicore and to connect with the existing mainline in the vicinity of Kylemore Road.
- This phase culminated with the preparation of an EIS and Railway Order Documentation. In 2010, the railway order application was submitted to An Bord Pleanála. It was approved in 2011. Refer to **Annex 2.2 Useful Links** for a hyperlink to the DART Underground Railway Order**.**
- The final alignment of the DART Underground Project had implications for the upgrading of the remaining section of the Cork Mainline into Heuston Station and informed the scope of Kildare Route Project Phase 2.

Note: For the avoidance of doubt, the *National Development Plan 2018-27* requires that the initial sequencing of investment of the DART+ Programme *"focus on delivery of non- underground tunnel elements of the programme"* and provides for the *"route for the remaining element of the overall DART Expansion Programme, the DART Underground Tunnel, will be established and protected to allow for its future delivery."* References to the DART Underground Tunnel in the context of other studies (below) are therefore provided for context only. The requirement for the DART+ South Project is to be compatible with the future provision of DART Underground.

4.4. Kildare Route Project Phase 2 (2010)

In 2009, Iarnród Éireann commenced preparation of a Railway Order application for the Kildare Route Project Phase 2. It followed the decision to advance with the extension of the DART Underground to Inchicore and to connect with the existing mainline in the vicinity of Kylemore Road. Kildare Route Project Phase 2 was to consist of four-tracking from the previous end of Kildare Route Project at Cherry Orchard through to the end of DART Underground within the CIÉ Inchicore Works.

The primary objectives of the project were to address the two constraints on the Cork Mainline that would prevent the full capacity of the DART Underground being realised. These were:

- The bottleneck between Cherry Orchard and Inchicore where four tracks reduced to two.
- The DART Underground would only accommodate Electric Multiple Units (EMU). Future Commuter trains will be EMUs operating from Hazelhatch to the Belfast Line, hence the line to Hazelhatch must be electrified.

It was proposed to:

- Install two new railway tracks in parallel to existing tracks between Cherry Orchard and Inchicore.
- Electrify the route from Inchicore to Hazelhatch in order to deliver DART services (approximately 15 kilometres).

- Upgrade two bridges at Le Fanu Road and Kylemore Road.
- Provide a new junction at Inchicore to separate DART services from Intercity and regional services bound for Heuston.

A detailed design was developed, and a draft Environmental Impact Statement was prepared. Consultation with the public and local communities was also undertaken.

With the onset of the economic recession, the Government decided to defer the DART Expansion Programme in the *Capital Expenditure Programme 2012-2016*, with a view to progressing again when funding is permitted. The Kildare Route Project Phase 2 Project was put on hold.

4.5. Western Tie-in Study (2017)

Refer to **Annex 2.2 Useful Links** for a hyperlink to this Study and other publicly available reports referred to in this section.

In 2015 the Government deferred authorisation for construction of DART Underground and instructed Iarnród Éireann to examine the current design with an objective of delivering a lower cost technical solution, whilst retaining the required rail connectivity for the DART Expansion Programme.

The assessment review, including transport benefits modelling carried out by Iarnród Éireann and the NTA in 2016 and 2017 concluded that:

- DART Expansion with DART Underground offers the greatest benefits.
- Other network arrangement scenarios focused on delivering non-tunnel city centre capacity enhancements, with integration through the Phoenix Park Tunnel, allow early delivery of service capacity and meet projected passenger demand in the short to medium term at a lower cost.

To find a more commercially viable solution, Arup was commissioned to re-evaluate the possible connection options to link the proposed DART Underground tunnel project to the existing surface rail line serving Heuston Station.

The *DART Underground Western Tie-in Study (2018)* was undertaken in four distinct phases, culminating in the Emerging Preferred Option. It comprised a running connection onto the Cork Mainline, occurring immediately east of the existing Sarsfield Road Underbridge and four track widening of the existing rail corridor until the end of the previously completed Kildare Route Project Phase 1. A twin bore tunnel configuration was also recommended with the tunnel portal sited on the Ballyfermot approach to the junction of the Chapelizod Bypass and the Con Colbert Road (moving the western portal of the tunnel from within Inchicore Works (as approved by the DART Underground Railway Order)).

The Study recommendations were complemented by the findings of the *DART-Expansion-Programme-Options-Assessment Study,* namely Bundle 6 - DART Expansion with Existing Network Enhancement (No DART Underground).

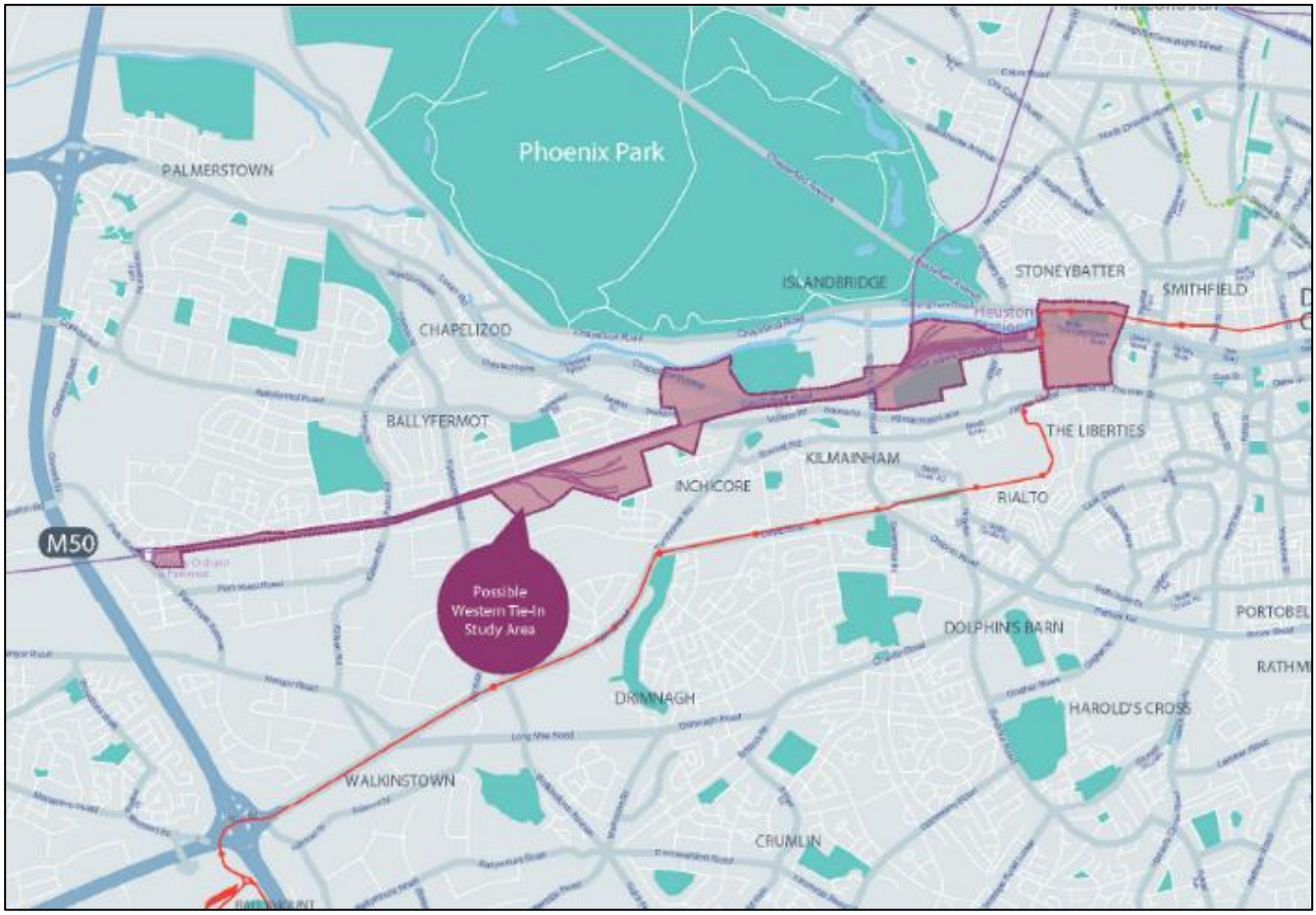

Figure 4-3 Overview of the Study Area for the Western Tie-In

Source: DART Underground Western Tie-in Study (2018)

4.6. DART Expansion – Rail Four-tracking from West of Hazelhatch to Phoenix Park Tunnel (2018)

The short to medium term non-tunnel DART Expansion network was included in the *National Development Plan 2018-2027* but noted that a DART Underground Tunnel alignment would be protected for potential future development. This decision required alteration to the Cork Mainline previously designed with the tie-in through the DART Underground tunnel from Inchicore.

In 2018, the NTA commissioned Arup to undertake a review of options to tie-in the Cork Mainline to the DART Expansion scheme connecting to the Phoenix Park Tunnel, in a manner that would not impede development of a DART Underground in the future. The assessment considered and complements previous studies, including the DART Underground design and Western Tie-In Study carried out as part of the 2016 and 2017 DART Expansion review.

The Study examined amongst other things:

- Options to widen the existing rail corridor to accommodate four tracks from Heuston Yard, as far as the end of the previously constructed Kildare Route Project near Park West / Cherry Orchard into Heuston (previously incomplete due to the tie-in to the proposed DART Underground).
- The implications of changing the operational track configuration from the existing Fast-Slow-Slow-Fast (FSSF) design with commuter trains in the centre lanes as designed for the initial DART Underground design, to Slow-Slow-Fast-Fast (SSFF) for the DART Expansion network to match the Phoenix Park Tunnel Branch Line which is on the north side of Heuston and Fast-Fast-Slow-Slow (FFSS) for a future DART Underground network to match the tunnel route recommended on the south side of Heuston Station.
- Review the alignment from west of Park West & Cherry Orchard Station to just west of Hazelhatch to identify any changes to the existing trackwork or systems to accommodate future DART expansion running.

The Study concluded with a recommended solution (an Emerging Preferred Option, design drawings covering alignment, structures and property, and a feasibility working cost estimate). There are a number of aspects of the study and recommended solution, which are relevant to the DART+ South West Project, as follows:

- The Study identified horizontal and clearance issues associated with South Circular Road Bridge (OBC1), Memorial Road Bridge (OBC3), Sarsfield Road Underbridge (UBC4), Khyber Pass Footbridge (OBC5), Kylemore Road Bridge (OBC5A) and Le Fanu Road Bridge (OBC7) and the requirement to replace these bridges to accommodate four tracking.
- The Study identified a station to the west of Kylemore Road to act as a replacement for the Inchicore Station proposed in the original DART Underground.
- The Study identified the requirement for retaining walls along the length of the widened corridor to accommodate the four tracking (from the end of the Kildare Route Project Phase 1 Works at Cherry Orchard to Sarsfield Road).
- The Study identified a number of consequences for widening the existing rail corridor through Inchicore, which included potential land take:
  - Removal / relocation of buildings and structures within Inchicore Works, including the Signal Box, the Sanction Wood Tower (also referred to as the Turret) which projects from the Old Running Shed, part of the Maintenance Shed Building, annexes.
  - Impacts to properties and land acquisition requirements.
  - Relocation of existing track drainage attenuation.
- The above interventions should still be compatible with a future tie-in with DART Underground South of Heuston station (Islandbridge area), as opposed to the tie-in location proposed in the Western Tie In report, and the design accounted for that.

The associated preliminary design was intended to, and has, informed the infrastructural requirements for this Project (to be brought forward through the Railway Order (RO) process). In this regard, it established a concept option that comprised the baseline feasibility option which has been carefully considered by the DART+ South West Project Team.

Refer to **Annex 2.2 Useful Links** for a hyperlink to the *DART Expansion – Rail Four-tracking from West of Hazelhatch to Phoenix Park Tunnel* (2018).

Consideration of various options to determine the ‘Emerging Preferred Option’ for DART+ South West followed a structured optioneering process.

5. Option Selection Process

5.1. Introduction

The primary purpose of this report is to present an early-stage characterisation of the options selection and decision-making process for the DART+ South West Project at the time of advancing the first round of public consultation.

A clearly defined appraisal methodology has been used in the selection of the end-to-end Emerging Preferred Option for the Project. Consistent with other NTA projects, it is based on '*Guidelines on a Common Appraisal Framework for Transport Projects and Programmes*' (CAF) published by the Department of Transport, Tourism, and Sport (DTTAS), March 2016 (updated 2020), TII's *Project Management Guidelines* (TII PMG 2019) and Iarnród Éireann's *Project Approval Guidelines*. The process comprises of a two-stage approach (if / as appropriate):

- **Stage 1** – Preliminary Assessment (Sifting); and
- **Stage 2** – Multi-Criteria Analysis (MCA).

This section of this report provides an overview of these two stages, with a more detailed methodology provided in the **Annex 3.2** *'Technical Optioneering Reports - Introduction'*. In keeping with principles of the CAF Preliminary Appraisal approach, the purpose of Stage 1: Preliminary Assessment (Sifting) is to subject a range of options to a preliminary appraisal, before subjecting a smaller number of options to a more detailed Stage 2: Multi-Criteria Analysis (MCA). Not all works require option selection and the two-stage approach is not applicable to all works or interventions that require option selection.

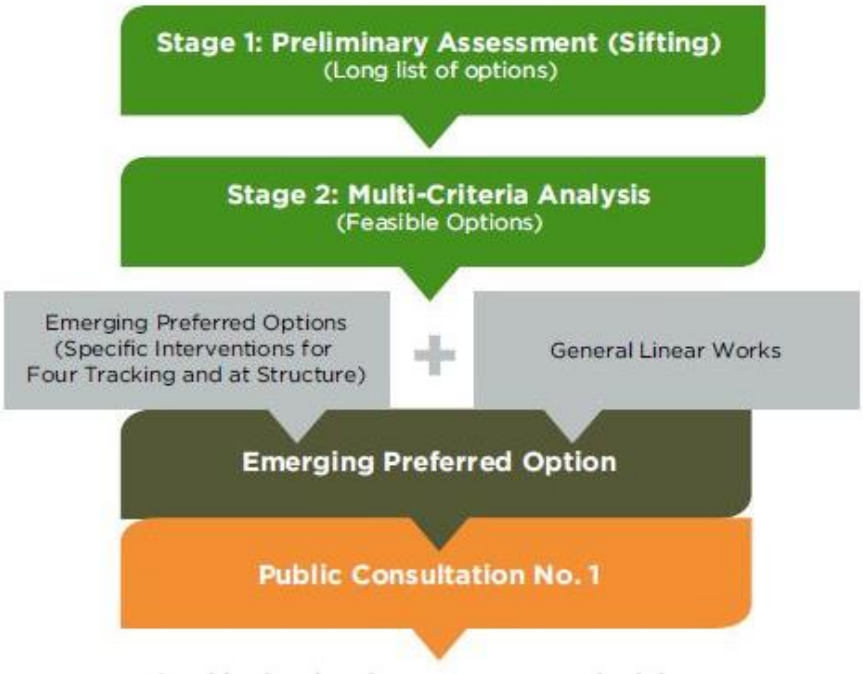

Figure 5-1 Option Selection Process (Emerging Preferred Option)

5.2. Options to be Assessed

Many elements of the Project require option assessment at a local level prior to incorporation into the end-to-end Emerging Preferred Option for the Project. The options presented for assessment include:

- A Do-Nothing Option. This option describes what is likely to occur in the absence of works and interventions needed to meet the Project objectives and requirements. In the case of the DART+ South West Project, this would include no four-tracking and no electrification.
- A Do-Minimum Option. This option describes the least burdensome option to maintain an intervention. For the DART+ South West Project, it is the option where the works and interventions that are needed to meet the Project objectives and requirements can generally be met within the existing rail corridor, minimising the potential for new or additional impacts on the receiving environment. Do-Minimum in this context is not passive, as some level of works and intervention is necessary to meet the Project objectives and requirements, albeit the least burdensome.
- Do-Something Option(s): These options are available to address the objective of the intervention (i.e., the Project objectives and requirements). In the case of the DART+ South West Project, these options involve interventions and related works that are required beyond the existing railway corridor.

The starting principle for the Project is to accommodate the works and interventions needed to meet the Project objectives and requirements within the existing rail corridor. In many cases this 'Do-Minimum Option' is technically feasible and will be the Emerging Preferred Option for the particular element of the Project / intervention required. However, in some cases it is not technically feasible. These cases that are the focus of more extensive options assessment. The methodology is as follows:

- If the 'Do-Minimum' option is feasible and meets the Project objectives / requirements, it is the Emerging Preferred Option in respect of the intervention required. Stage 2 MCA is not necessary.
- If the 'Do-Minimum' option is not feasible and/or does not meet the Project objectives / requirements, other options are brought forward for detailed assessment as part of the Stage 2 MCA in order to identify the Emerging Preferred Option in respect of the intervention required.
- In some instances, while the 'Do-Minimum' option is preferred and considered likely, verification is required, and therefore other options remain open and are presented for information. However, they will not be brought forward for detailed assessment (including Stage 2 MCA, where appropriate) unless the 'Do-Minimum' option is determined not to be feasible.

5.3. Stage 1: Preliminary Assessment (Sifting)

Stage 1: Preliminary Assessment (Sifting Process) commenced with a long list of high-level options for the key elements of the scheme. The options for particular interventions e.g., at a bridge location, needed to be considered holistically because of the knock-on implications both within the rail corridor and outside of the rail corridor in terms of track alignment, road levels, other bridges etc.

Consistent with CAF guidelines, the headline criteria which the options were assessed were: Engineering; Environment; and Economy. Of these, the key 'pass' or 'fail' criteria was Engineering and whether an option was 'Feasible' and met the Project objectives and requirements. Fundamentally, this reflects the fact this Project is focused on an existing railway line and the interventions required are very localised; therefore, technical considerations have a direct bearing on the feasibility or otherwise of particular options.

This approach only brought forward feasible options to be explored at Stage 2 in greater detail.

5.4. Stage 2: MCA Methodology

Stage 2 of the optioneering process comprises a detailed multi-disciplinary comparative analysis of those feasible options that passed through Stage 1: Preliminary Sifting. The options are assessed against the criteria of Economy, Safety, Environment, Accessibility and Social Inclusion, Integration and Physical Activity in line with the criteria required for multi-criteria analysis in the CAF guidelines. These parameters were split into a number of sub-criteria considered relevant to the DART+ South West Project.

The assessment compares the options, identifying and summarising the comparative merits and disadvantages of each alternative under all applicable criteria and sub-criteria leading to an Emerging Preferred Option for the intervention required.

Presented in a matrix format, each specialist included a commentary of his or her analysis for each option. They then compared the options relative to each other based on whether an option had *'some'* or a '*significant'* advantage or disadvantage over other options or whether all options were *'comparable / neutral'.* (The terms 'some' and 'slight' are used interchangeably in supporting documentation).

5.4.1. Observations on the Optioneering Process

After completing the Stage 1 Preliminary Assessment (Sifting) it was noted that there was a distinct choice in routing and/or spatial variation in the options for around Inchicore and South Circular Road Junction, which would lend themselves well to the MCA process. However, in respect of other areas (i.e. Le Fanu Road Bridge (OBC7), Kylemore Road Bridge (OBC5A) and Memorial Road Bridge (OBC3)) the spatial difference in the feasible options was much less clear. In these cases, only two feasible options progressed through the Stage 1 Preliminary Assessment (Sifting) process and the differences between the options were focused on technical design matters.

Notwithstanding this, the options were reviewed by a range of specialists undertaking the Stage 2: MCA. The observations of the findings of the Stage 1 Preliminary Assessment (Sifting) for Le Fanu Road Bridge (OBC7), Kylemore Road Bridge (OBC5A) and Memorial Road Bridge (OBC3) were confirmed when the specialists could not discern a noticeable difference between the two feasible options across a wide range of sub-criteria and assessed the two options as '*comparable / neutral'*.

In order to streamline and simplify the reporting of results, it was considered appropriate at this stage (i.e., after the Stage 2: MCA process), to combine the two feasible options at each of these locations into a single option which would be the Emerging Preferred Option. The detailed technical design differences between the options remaining a potential design variation and /or comparator to be further explored through the future design process.

Project development and optioneering is an iterative process. The fact that the Stage 2: MCA process could not differentiate between the two feasible options does not undermine the value of the process itself. Rather it reinforces the particular characteristics of the DART+ South West Project that requires, amongst other things, very localised technical interventions along an existing rail corridor.

5.5. End-to-End Emerging Preferred Option

The various Emerging Preferred Options in respect of particular elements or interventions were then combined with general linear works needed to upgrade and modernise the railway to make up the end-to-end 'Emerging Preferred Option'. Other end-to-end considerations factored into the option development and assessment process and will continue to inform the project development process (refer to **Section 10.1)**,

5.6. Overview of the Level of Intervention Required

Table 5-1 and **Figure 5-2** provide a strategic overview of the interventions required along the Project route corridor. The following sections of this report provide greater detail of these interventions; first presenting general interventions and works that are required along the entire route (**Section 6**), and then addressing interventions (e.g., bridge replacements) that are specific to particular locations (**Sections 7, 8 and 9**).

The existing route corridor can be broken into sections with the same project objectives and requirements. For example, the line between Hazelhatch & Celbridge Station and Park West & Cherry Orchard Station requires only electrification as the four-tracking is in place, while the section between Park West & Cherry Orchard Station and South Circular Road Junction will require four-tracking, electrification, and associated bridge interventions. Refer to **Table 5-1** and **Figure 5-2**.

Table 5-1 Overview of Level of Intervention (and Optioneering) Required for Each Area

Area	Intervention Required	Status	Colour Code
Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station	Electrification infrastructure required on northern track. [Note: Four tracking and bridge reconstructions along this section were delivered by the Kildare Route Project in 2009].	Where the works and interventions needed to meet the Project objectives and requirements can generally be met within the existing rail corridor. Do-Minimum Option is feasible.	
Park West & Cherry Orchard Station to Heuston Station	Electrification of tracks required including track lowering and / or raising of bridges to accommodate. Four tracking throughout section including widening of existing rail corridor.	Where significant works and interventions are required to meet the Project objectives and requirements, including potential infringement of property rights outside the rail corridor / IE's property boundary. Do-Minimum Options are not feasible. Assessments of feasible Do-Something options required.	
East of St John's Road Bridge to Glasnevin Junction	Electrification of tracks required including track lowering and / or raising of bridges to accommodate OHLE.	Where the works and interventions needed to meet the Project objectives and requirements will follow the existing rail corridor and may involve track lowering and / or bridge modifications at certain locations to achieve the height requirements for electrification. DART+ South West is currently undertaking surveys and analysis along this section, including within the tunnel, to understand the current characteristics and constraints. The specific interventions at each bridge along this rail section will be based on the analysis of survey data and presented at Public Consultation No. 2.	

Note: Information is presented for Public Consultation No. 1. Not all design detail or construction related detail is known at this time. For example, substation locations, construction compounds, temporary bridge requirements, temporary utility diversions and other elements (with a spatial footprint within or outside of the existing rail corridor) will be presented at Public Consultation No. 2.

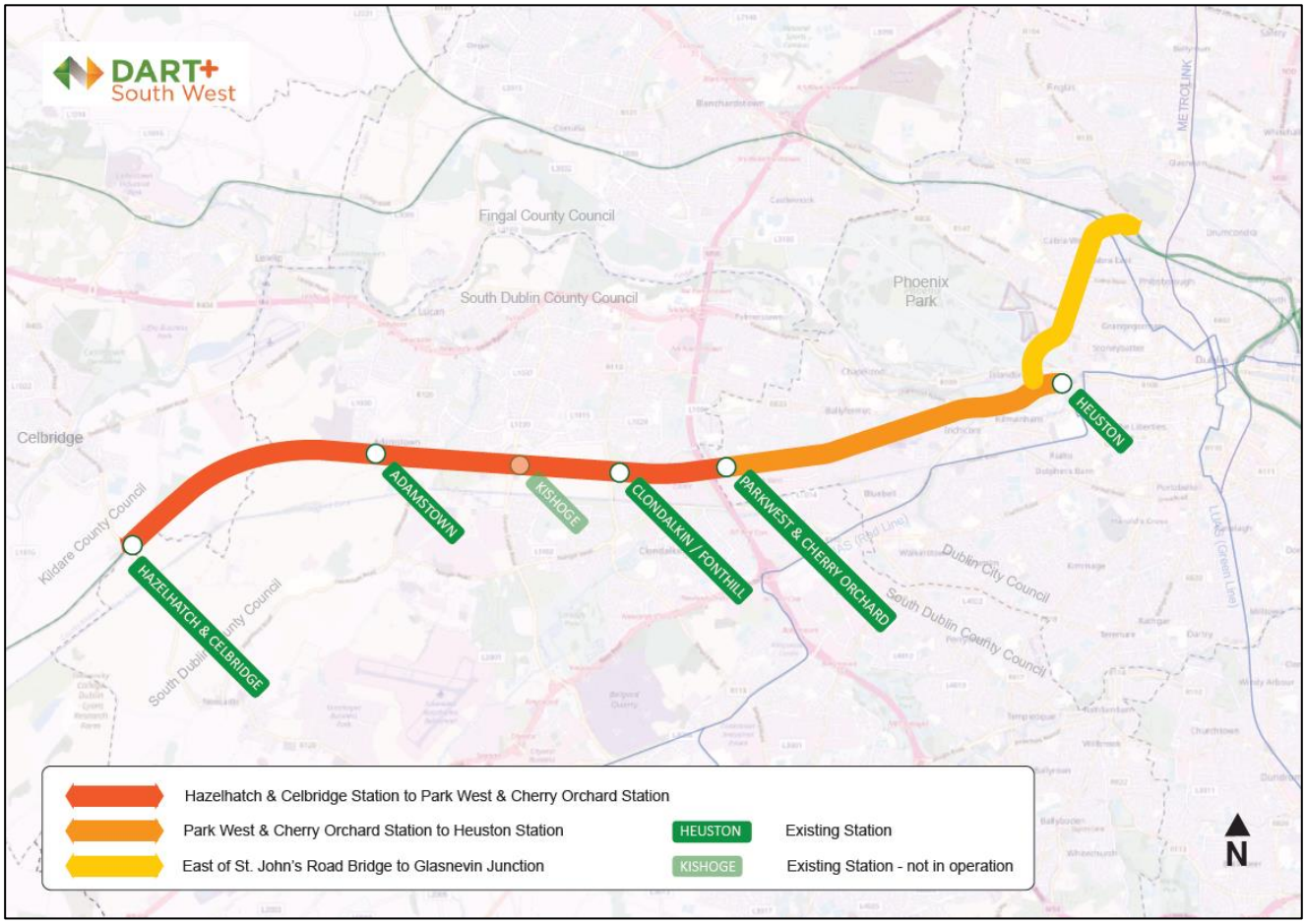

Figure 5-2 Overview of Level of Intervention Required

A range of general linear works is required to modernise and electrify the existing railway line as part of the DART+ South West Project.

6. General Works Required 'End to End'

In this Section we introduce the range of general linear works required to modernise and electrify the existing railway line as part of the DART+ South West Project. These works are required along the full length of the Project route corridor and relate to:

- Signalling, Electricity and Telecoms (SET) requirements.
- Permanent Way (track or railway corridor) requirements.
- Other ancillary work requirements.

Where relevant, we also outline the high-level consideration of options which, has occurred to date in respect of particular elements of the general linear works.

This Section also introduces and explains many of the railway infrastructure terminology relevant to the Project.

6.1. Signalling, Electrical and Telecommunications Requirements

Signalling, Electricity and Telecoms (SET) are key requirements for the DART+ South West Project.

Electrification and power supply is required along the full length of the Project, from Hazelhatch to Dublin Heuston and through the Phoenix Park Tunnel up to the Glasnevin Junction to support projected capacity increase with the minimal carbon footprint, in alignment with the main objectives of DART+ Programme.

6.1.1. Electricity (DART System-Wide)

It is a Project requirement to provide an electrification system that is compatible with the existing DART system and other electrification projects associated with the DART+ Programme.

The DART+ Programme will adopt a 1500V Direct Current (DC) system which provides synergy with the existing DART network with traction power provided to the train by Overhead Line Equipment (OHLE).

For a further detail, refer to **Annex 3** for the '*Technical Optioneering Reports – Introduction'* and the individual Technical Optioneering Reports.

6.1.2. Alternatives for Overhead Line Equipment

Overhead Line Equipment (OHLE) generally refers to the mechanical and electrical items used to carry and deliver electrical power to the trains.

Electrical energy is supplied to the train through contact between the equipment mounted on the top of the train (pantograph) and an electrically live overhead cable. This cable is suspended from a system of steel masts. The live overhead cable is fed electricity from individual substations which are located along the route.

The existing Project route corridor is not currently electrified and no OHLE infrastructure has been installed. OHLE will therefore be required. Options for OHLE are currently being considered and will

be subject to more detailed assessment as the design progresses. However, the OHLE concept for DART+ Programme will comprise a pre-sagged simple (2-wire) auto-tensioned system, supported on galvanised steel support structures. While functionally similar to the OHLE on the existing DART network, modern design is being considered to maximise reliability and safety on the route.

While a standardised approach to electrification will be adopted, specific arrangements will also need to be considered at particular locations.

6.1.2.1.1. OHLE Mechanical Compensation Equipment

OHLE is formed by auto-tensioned section lengths by means of a fixed-point anchor at one end and balance weights or spring solutions at the opposite end ensuring constant tension regardless of the variation of temperature.

The mechanical tension can be achieved by two main solutions, springs or counterweights/balance weights. The type of OHLE mechanical compensation equipment shall be determined at a later stage of the design process when further information is available.

6.1.2.1.2. OHLE Support Structures

OHLE masts will carry support frameworks for the OHLE system over each of the electrified tracks. Vertical hangers will support and separate the upper and lower wires; additional feeder cables, insulators and earth wire will also be suspended from the masts.

Two main types of lineside mast are being considered by the MDC: HEB steel beams and circular structures. The type of OHLE support structure shall be determined at a later stage of the design process when further information is available.

Option 1: HEB Steel Beam

Option 2: Circular Structure

Figure 6-1 OHLE Mast Options

6.1.2.1.3. OHLE Foundations

OHLE foundations will be a critical and key element for the electrification works to be undertaken under the DART+ Programme. Three foundation options were considered (steel pile driven, concrete bored pile and concrete PAD). The type of foundation shall be determined at a later stage of the design process when further information is available.

6.1.2.2. OHLE Alternative Arrangements

6.1.2.2.1. OHLE Multi-Track Sections

In multi-track areas particularly around Islandbridge Junction and Inchicore more complex structures spanning multiple tracks will be needed. In such areas, it is generally not possible to use single mast structures as there is insufficient space between the tracks.

The options being considered are headspans which includes wires spanning between masts either side of the tracks to support the OHLE catenary and contact wires, and a portal frame which consists of masts joined by a horizontal boom which supports the OHLE system.

Option 1: Headspans

Option 2: Portal Frame

Figure 6-2 Images of Headspans and Portal Frames

In four track sections, Two Track Cantilevers (TTCs) will generally only be placed on the north side of the line, to support OHLE on the northern two tracks. TTCs may also be used on two track sections where obstructions prohibit the use of single cantilevers.

The multi-track OHLE solution shall be determined at a later stage of the design process, when further information is available

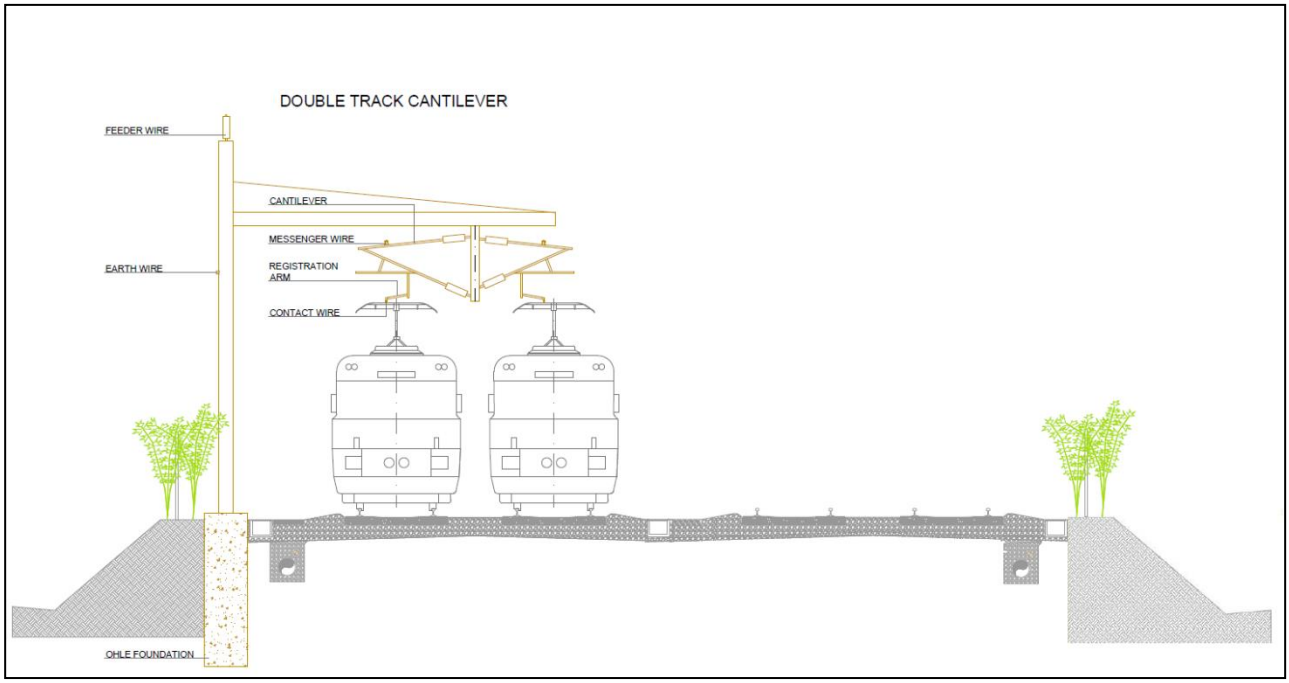

Figure 6-3 Typical OHLE Arrangement in 4-track Section

6.1.2.2. OHLE Bridges

Wherever a bridge crosses over the railway, it is necessary to ensure that the OHLE passes safely below the bridge. This can often mean that the height of the wires needs to be reduced to pass under the bridge. In this case, the wire height will be reduced gradually on approach to the bridge so that the performance of the system is maintained.

At some bridges, the OHLE will pass through without connection to the bridge. At other low bridges, it will be necessary to connect the OHLE safely to the bridge, using insulators. Occasionally, it may be necessary to place an OHLE mast directly next to the bridge to support the OHLE.

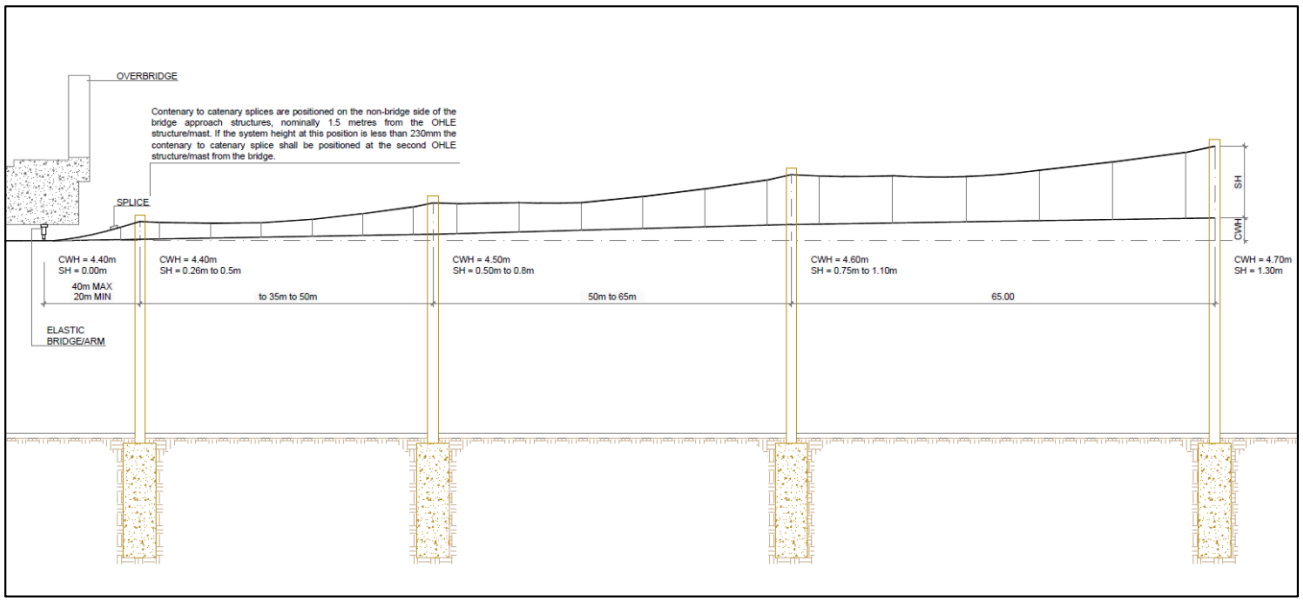

Figure 6-4 Typical Arrangement on approach to a Low Bridge

6.1.2.2.3. OHLE Phoenix Park Tunnel

The Phoenix Park Tunnel is directly adjacent to the overbridge Conyngham Road Overbridge (OBC2), and so these two structures need to be considered together when defining the OHLE solution for each option. Two options are under consideration and described in detail in **Annex 3.12** *East of St John's Road Bridge to East of Phoenix Park Tunnel – Technical Optioneering Report.* These options are:

- **OHLE Solution Option 1 – Flexible OHLE Arrangement:** This arrangement provides for closer spacing of OHLE supports. This option may offer some advantages in terms of visual amenity at the open sections of the route south of Conyngham Road Overbridge (OBC2) and north of the tunnel.
- **OHLE Solution Option 2 – Rigid Overhead Bar Arrangement:** This option may offer some advantages over the flexible OHLE arrangement in terms of robustness, which can be advantageous in tunnels with a corrosive environment.

6.1.2.3. OHLE Protection Measures

The DART+ South West Project route corridor and its structures were originally designed as non–electrified lines, therefore existing structures may not currently comply with necessary safety requirements for OHLE i.e., protecting the public against direct contacts. Reasonable steps to prevent people from accidentally or otherwise falling onto or touching the OHLE are required to:

- Prevent access.
- Prevent falling.
- Prevent contact / sparking.

Two main options to achieve the necessary level of protection are currently under consideration and involve increasing the heights of existing bridge parapets (by either wall or panels) or installing safety screens over the OHLE.

Option 1: Increased Parapet Heights to Achieve Safety Requirements for OHLE

Option 2: Installing Safety Screens over the OHLE

Figure 6-5 Protection Works – Options

6.1.3. Substations

The OHLE system will be supplied with electrical power from the ESB distribution network at regular intervals, at locations known as substations. These substations will receive power from the local power distribution network at voltages up to 110 kV AC and transform this into the required 1500V DC for distribution along the OHLE system. The specific voltage to be adopted will be determined at a later date in discussions with the ESB.

A DART system-wide Power Study indicates that six substations will be required at various locations along the length of the DART+ South West Project to provide power to the network.

The site-specific location and layout locations for the proposed substations have yet to be finalised, but preliminary findings from the simulation studies have identified potential locations along the line, these are:

- Heuston / Islandbridge

- Kylemore
- Park West
- Kishoge
- Adamstown
- Hazelhatch

Further studies will be needed to decide their exact location; however:

- Consideration will be given to the land-use and development context of potential locations.
- The substations will be located adjacent to the railway line in the form of a fenced compound surrounding a building which will house all the necessary electrical switching and feeding equipment.
- The substations will be connected to the local power distribution network and the OHLE system using insulated cables. These cables will be installed in buried routes for additional protection.
- The substations will need to be accessible from the local road network for construction and maintenance purposes.
- The footprint of the substations is estimated to be 20m by 50m for the substation building and compound.

Substation locations will be shown in Public Consultation No. 2 and engagement with landowners will start as soon as the potential sites are identified and assessed.

While every effort will be made to locate substations within existing Iarnród Éireann owed lands; this may not be possible.

Figure 6-6 Examples of Substations

6.1.4. Signalling and Telecoms

In order to achieve the necessary capacity enhancements and performance required for the introduction of the new DART+ Fleet, it will be necessary to upgrade the existing signalling system as well as replacing some of the legacy signalling system. This will include the provision of Signalling Equipment Rooms (SER), low voltage rooms and Relocatable Equipment Buildings (REB) where required along the route in order to accommodate signalling equipment and associated power supplies and backup.

Significant upgrades to the existing telecommunications infrastructure will also be required to facilitate improvements to the radio-based technologies used on the network and for signalling and communication with the existing and future network control centres.

6.2. Permanent Way (PW) Requirements

The Permanent Way (PW) is a term used to describe the track or railway corridor and includes all ancillary installations such as rails, sleepers, ballast as well as lineside retaining walls, fencing and signage. It is therefore the focus for the DART+ South West Project requirements as follows:

- Widening of the railway corridor and completing four-tracking between Park West & Cherry Orchard Station and Heuston Station.
- Bridge reconstructions arising from rail corridor widening and electrical clearance requirements as necessary.
- Track lowering arising from electrical clearance requirements, as necessary.
- Improvements to the Phoenix Park Tunnel Branch Line to support the increased capacity.
- Potential future station at Heuston West.
- Ancillary and accommodation work as necessary.

A key aspect of the permanent way is where intervention is required, e.g., at bridge location, as it has knock on issues extending beyond the area of intervention of the bridge location itself, with implications for track alignment, road levels on adjoining roads, other bridges etc – and hence the need for a solution to be considered more holistically.

6.2.1. Four-tracking

A key requirement of the DART+ South West Project is to separate Intercity and fast regional services from the future DART service. This allows the potential for the faster Intercity and regional services to overtake future DART services that, due to their higher frequency of stops, would operate at a slower average speed. The last remaining constraint is the area between Park West & Cherry Orchard Station and Heuston Station with the current two track alignment. The upgrading of this section of railway to include four tracks will remove this limitation and allow Intercity / regional services and freight services to operate efficiently alongside DART services.

The requirement for four-tracking also has implications for several existing structures along the alignment as the increased width of the rail corridor will require existing bridges to be reconstructed, independent of whether the bridges have sufficient vertical clearance to accommodate the OHLE infrastructure.

In order to maximise the capacity of the system (i.e., by reducing train crossing conflicts):

- The electrified tracks will be constructed to the north on the Cork Mainline and tie into the Phoenix Park Tunnel Branch Line and northern terminating platforms at Heuston Station.
- The non-electrified tracks will be constructed to the south on the Cork Mainline and tie into the terminating platforms at Heuston Station.

This configuration was considered in *DART Expansion – Rail Four-tracking from West of Hazelhatch to Phoenix Park Tunnel (2018)*. A hyperlink to this report is included in **Annex 2.2 Useful Links.**

6.2.2. OHLE Clearances

Where existing bridges do not, or may not, provide the necessary clearance for OHLE, a range of options have been considered on a case-by-case basis. The options include modifications to the track layout and structural solutions to gain the necessary vertical and horizontal clearance. The options are considered in further detail in **Sections 7, 8, and 9**, and include the following (either standalone or in combination):

- Provision of specialist electrical solutions for the OHLE with reduced clearance.
- Lowering the rail track under the bridge.
- Modification of the existing structure.
- Removal of the existing structure and provision of a replacement structure.

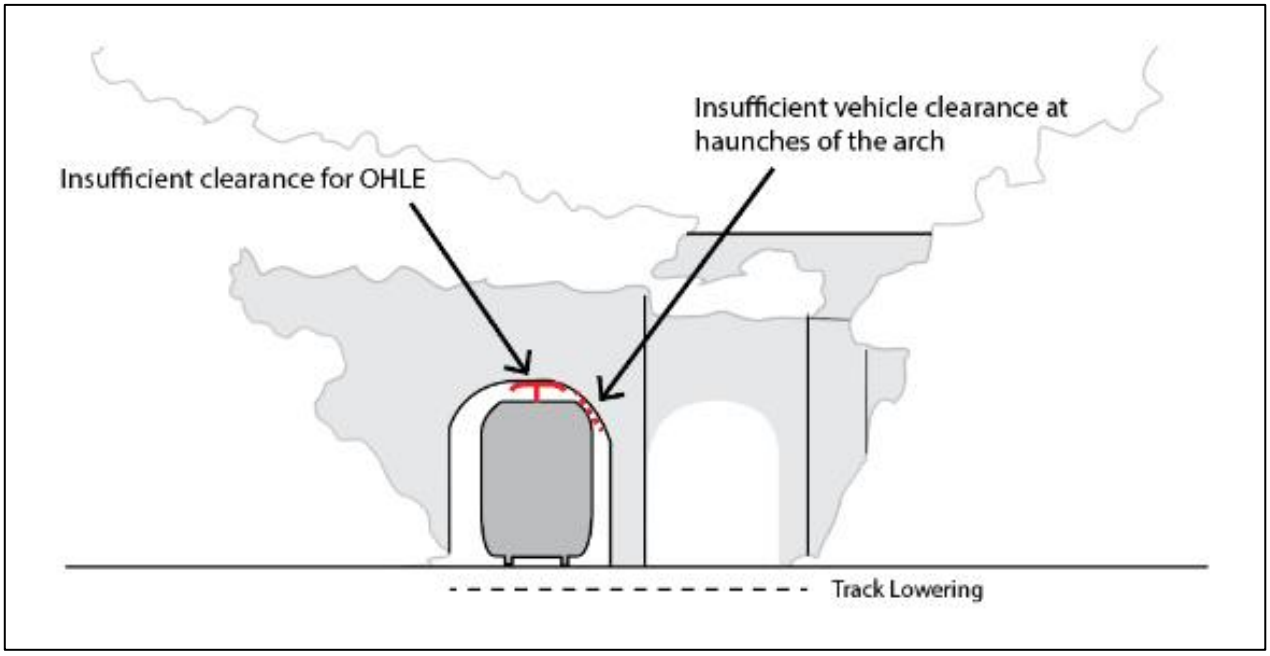

Figure 6-7 Twin Arch Bridge (OBO8) on Phoenix Park Tunnel Branch Line

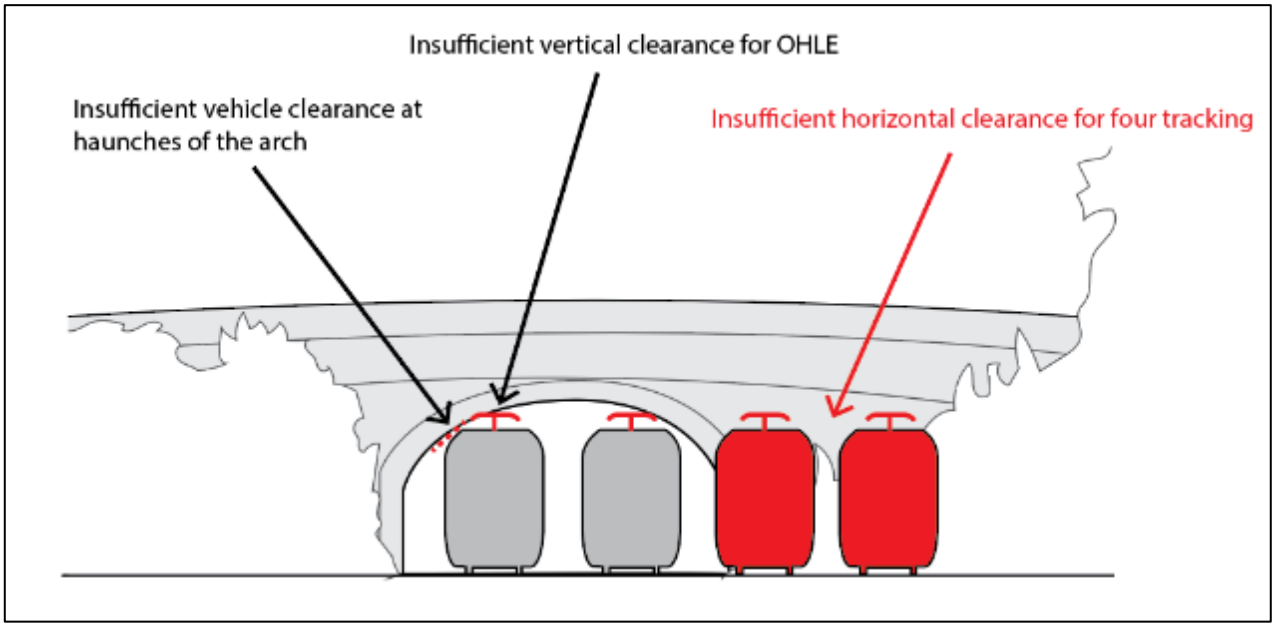

Figure 6-8 Le Fanu Road Bridge (OBC7) – Limited Vertical and Horizontal Clearances

Along the Project route corridor, there are several bridges that have insufficient vertical headroom for OHLE or lateral clearances for four-tracking (where required) therefore, reconstruction is unavoidable to meet the Project requirements. The reconstruction of existing structures is predominantly located in the section between Cherry Orchard Footbridge (OBC8B) and Heuston Station.

For other bridges, including those along the Phoenix Park Tunnel Branch Line, where the required electrical clearance beneath the bridges is sub-standard, clearances will be increased by means of track lowering, fitted OHLE and / or derogation from Standard. Detailed surveys are currently being undertaken, and this information will be used to establish if the Do-minimum Options under consideration are feasible, or if more significant interventions are required to the bridges. Should derogations not be acceptable then bridge interventions will be required. A range of options remains under consideration for these bridges.

DART+ South West Project includes for the electrification of the Phoenix Park Tunnel.

6.2.3. Other Track Alterations

As part of four-tracking and electrification the Project Team will be identifying other track alterations to optimise the design. These works will include amongst other things:

- Identifying locations for new / additional crossovers (when a train switches from one track to another across points), to accommodate the new operational model.
- The sidings strategy at Inchicore Works, to allow continuity of the operations.
- Track geometry improvements (within the current corridor's limits) to remove existing speed restrictions.
- Upgrade of the track safety for workers, implementing the prescribed separation between groups of two track and side space for walkways, where not available (i.e., at Inchicore and the three-track section between Inchicore and Heuston Station).

6.2.4. Other Ancillary Works

6.2.4.1. Attenuation

Elements of the DART+ South West Project which can modify the performance of the current drainage system include track lowering, an increase in the rail corridor width (resulting in a larger catchment area for rainfall), and the introduction of slab track along parts of the corridor.

A preliminary assessment of existing drainage system along the Project route corridor and the attenuation requirements for the DART+ South West Project has been undertaken. Relevant considerations include:

- Existing and potential levels of run-off including the existing outfall to the River Liffey.
- The source and quantity of seepage into the Phoenix Park Tunnel.
- The possibilities for the existing attenuation system (including pumping stations, pressure pipes, attenuation tanks and soakaways) to cope with the potential changes.

Stormwater attenuation tanks are currently recommended for the following locations: Le Fanu Road, Inchicore, and Islandbridge. Where possible these will be accommodated along the railway corridor or on adjoining land owned by Iarnród Éireann. However, the extent of attenuation required and potential to infringe property rights of adjoining landowners requires further design development. This will be presented at Public Consultation No. 2.

6.2.4.2. Utility Diversions

The utilities that cross the existing rail corridor along the Project route corridor are generally concentrated in road bridges and train stations. There are also several utilities that cross underneath the tracks or run parallel to the tracks, such as Irish Water pipes (including both water supply and wastewater) and ESB ducts.

Utilities will be constraints during both the design and construction phases. As such, their treatment in the temporary and permanent situations has been carefully considered during the development of options.

Discussions are ongoing with service providers regarding the location and nature of existing utility services and structures, to determine whether diversion is required.

6.2.4.3. Existing Stations

The reorganisation of tracks and the future increase in passenger demand requires the analysis of the station sizing and the accesses to the platforms – this is of particular relevance between Hazelhatch & Celbridge and Park West & Cherry Orchard.

Current capacity review studies anticipate the existing stations will be, in general, adequate for future passenger demand. Specific adjustments or works may be required locally to meet Project requirements, and compliance with the necessary Building Regulations and Codes; these are being identified to be subject of future enhancement.

6.3. General Linear Works Required Summary

In summary, the DART+ South West Project will require modernisation and modifications to the existing railway line as follow. These are:

- Overhead electrification equipment will be required along the full extent of the railway line from Hazelhatch to Heuston Station and through the Phoenix Park Tunnel Branch Line up to Glasnevin Junction, where it will link with the proposed DART+ West. This will be similar to that currently used on the existing DART network.
- Six electrical substations will be required at intervals along the rail line to provide power to the network.
- Signalling upgrades and additional signalling will be required to the upgraded infrastructure.
- Where existing bridges do not provide the necessary clearance for overhead electrification of the lines or lateral clearance for four tracking, the options considered include the following (either standalone or in combination):
    - Provision of specialist electrical solutions for the OHLE with reduced clearance.
    - Lowering the rail track under the bridge.
    - Modification of the existing structure.
    - Removal of the existing structure and provision of a replacement structure.
- Overhead Line protection works will be required at all existing rail overbridges.
- Interfaces with existing utilities, boundary treatments (including new retaining walls), drainage works, vegetation management and other ancillary works will be required along the length of the Project.

Following a Railway Order application, in 2009 the Kildare Route Project delivered significant enabling infrastructure for the arrival of DART including four tracking, bridges with the necessary clearances and new stations between Hazelhatch & Celbridge Station and Park West & Cherry Orchard Station.

These enabling works means that DART+ South West can focus on providing the overhead electrical line infrastructure and ancillary works which generally can be accommodated within the existing rail corridor.

7. Hazelhatch to Park West & Cherry Orchard Station

7.1. Introduction

The circa 11km section of the railway between Hazelhatch & Celbridge Station and Park West & Cherry Orchard Station has been the subject of previous rail enhancements as part of the original Kildare Route Project, including provision of the four-track system out to Hazelhatch and several reconstructed bridges to achieve the necessary rail corridor width for four-tracking and vertical clearances for electrification. These enabling works mean that DART+ South West can focus on providing the overhead electrical line infrastructure and ancillary works as described in **Section 6**.

Along this section of the railway line, it is therefore possible to provide the necessary infrastructure to meet the Project requirements with no, or minimal, intervention outside of the existing rail corridor, or significant intervention to existing structures. Refer to **Figure 7-1.**

As the 'Do-Minimum Option' is feasible and meets the Project objectives / requirements, it is the Emerging Preferred Option in respect of this section of the Project route corridor.

Refer to the following line route maps in **Annex 1** as follows:

- *Annex 1.1 Map 1 - Hazelhatch*
- *Annex 1.2 Map 2 - Hazelhatch & Celbridge Station and surrounds*
- *Annex 1.3 Map 3 - Stacumny Lane and Tubber Lane Road and surrounds*
- *Annex 1.4 Map 4 - Adamstown*
- *Annex 1.5 Map 5 – Adamstown to Tullyhall*
- *Annex 1.6 Map 6 – Kishoge*
- *Annex 1.7 Map 7 - Clondalkin / Fonthill Station to Clondalkin Industrial Estate (west side of the M50)*
- *Annex 1.8 Map 8 - Clondalkin Industrial Estate (west side of the M50) to Park West Industrial Estate*

Also, refer to **Annex 3.3** *Hazelhatch to Park West– Technical Optioneering Report*.

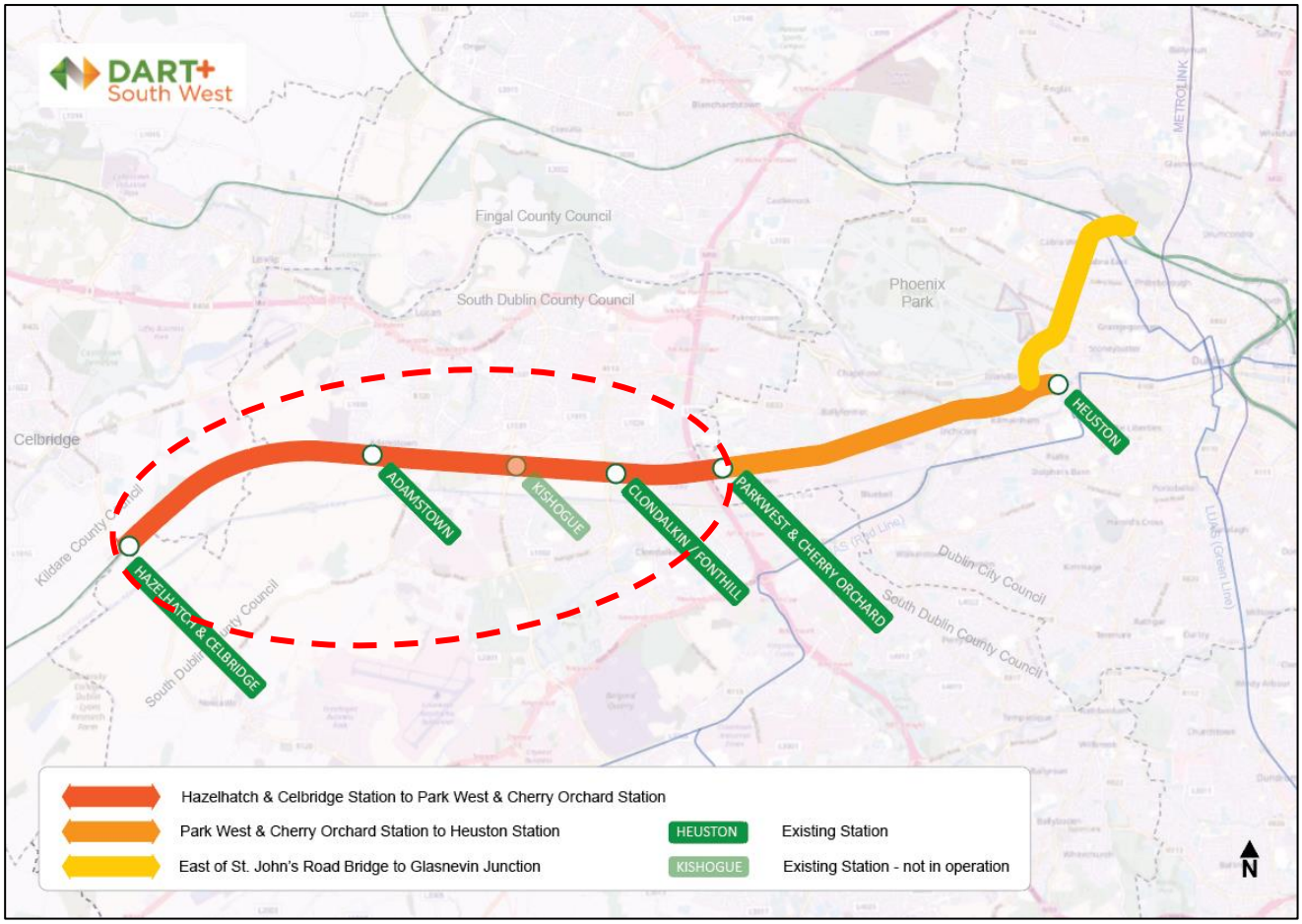

Figure 7-1 Hazelhatch to Park West

7.2. Description of Railway Corridor

Hazelhatch, on the border between County Kildare and South Dublin marks the western extent of the DART+ South West Project. Heading east from Hazelhatch & Celbridge Station the line crosses the Grand Canal before heading into open countryside passing through the townland of Stacumny and onwards towards Adamstown Station. North of the railway has witnessed significant residential development at Adamstown and west of the R120 (Newcastle Road) at Hanstead and Tullyhall. Continuing east, the line heads towards Kishoge Station (currently not in operation) and onwards to Clondalkin / Fonthill Station. Although undeveloped, this area is the location of Clonburris Strategic Development Zone (SDZ) where significant future development is envisaged focused on the two railway stations. As the line continues east, the landscape changes from a more open area to built-up industrial areas. The line then passes under the M50 and heads into Park West & Cherry Orchard Station. Refer to **Figure 7-2**.

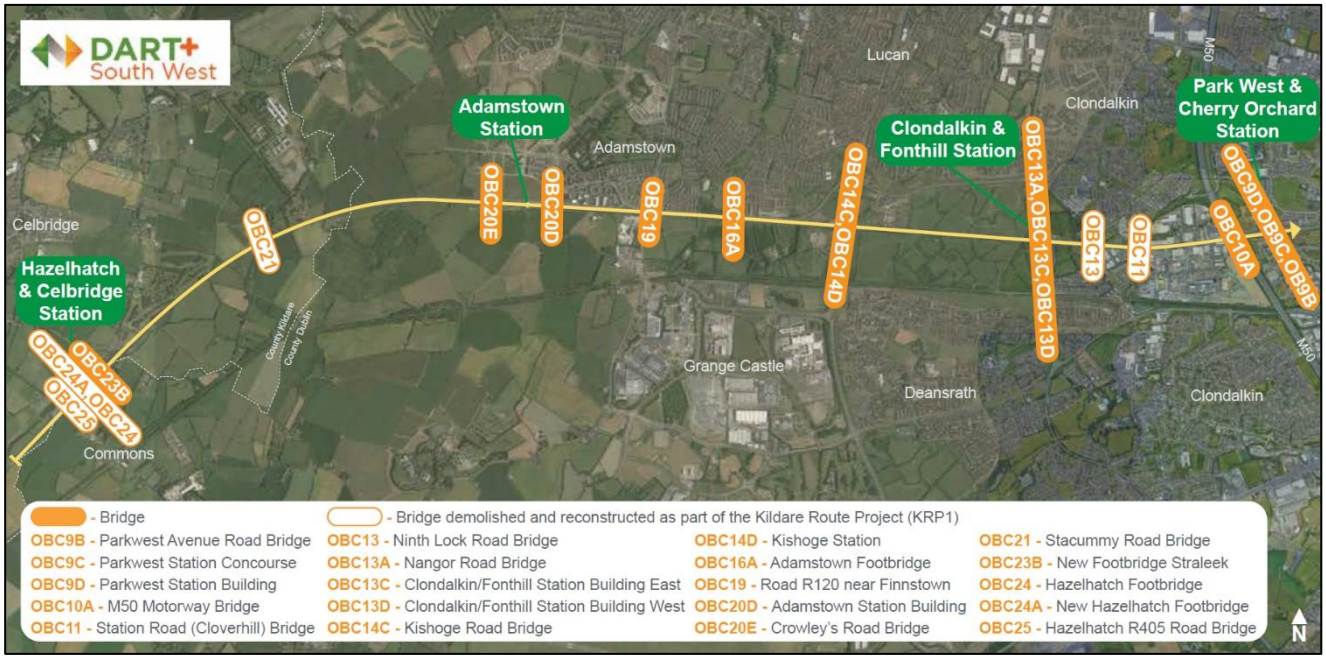

Figure 7-2 Aerial View of the Section of the Railway Corridor

There are several road overbridges and footbridges along this section of the line. The bridges demolished and reconstructed as part of the Kildare Route Project were: Hazelhatch Footbridge (OBC24A), Hazelhatch Road Bridge (OBC25), Stacumny Road Bridge (OBC21), Ninth Lock Road Bridge (OBC13) and Station Road Bridge (OBC11). These bridges are indicated on **Figure 7-2**.

Figure 7-3 illustrates how the rail corridor and bridges completed as part of the Kildare Route Project have delivered four-tracking and the necessary bridge height for future electrification along this section.

Hazelhatch R405 Road Bridge (OBC25)

Stacumny Road Bridge (OBC21)

Ninth Lock Road Bridge (OBC13)

Station Road Bridge (OBC11)

Figure 7-3 Examples of Reconstructed Overbridges and Four Tracking Delivered by the Kildare Route Project in 2009

There are five existing stations along this section. From west to east they are: Hazelhatch & Celbridge; Adamstown (see **Figure 7-4**); Kishoge (not currently operational); Clondalkin/Fonthill (see **Figure 7-4**); and Park West & Cherry Orchard. The station buildings illustrate the significant investment and enhancement delivered by the Kildare Route Project.

Clondalkin/Fonthill Station Building East (OBC13C)

Adamstown Station Building (OBC20D)

Figure 7-4 Examples of Stations along this section of the Project Route Corridor

7.3. Stage 1: Preliminary Sifting

7.3.1. Feasibility and Project Requirements

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this area are:

- Signalling reconfiguration of the four-tracking between Hazelhatch and Park West (slow DART lines to the north, fast Intercity lines to the south).
- Electrification of the two tracks to the north to accommodate DART services.

- Electrical clearance to structures.
- Keep current functionality of the existing network and public roads.
- Track alignment and drainage requirements (in accordance with their respective standards).

7.3.2. Findings

Both the 'Do-Nothing' and a 'Do-Minimum Option' were assessed for Stage 1 (refer to **Table 7-1**). The 'Do-Nothing Option' will not deliver the works necessary to meet the Project objectives or requirements (as identified above); this would include no electrification of the tracks.

However, the 'Do-Minimum Option' does deliver the works necessary to meet all the Project objectives or requirements and these works can generally be accommodated within the existing rail corridor. It therefore is the Emerging Preferred Option in respect of this section of the Project route corridor and is described below.

Table 7-1 Preliminary Assessment (Sifting) - Hazelhatch & Celbridge to Park West & Cherry Orchard

Preliminary Assessment (Sifting) – Hazelhatch & Celbridge to Park West & Cherry Orchard		
Option	Description	
Option 0: Do Nothing	Leave as is	Will not deliver project objectives or requirements.
Option 1: Do-Minimum)	Electrification and signal reconfiguration.	Feasible

7.4. Emerging Preferred Option

The works carried out under the original Kildare Route Project have provided the main groundwork for DART+ South West including the existing four track system out to Hazelhatch and several reconstructed bridges.

Electrification works under the existing bridges is possible with no intervention in the bridge structures and minimal track lowering.

Re-signalling reconfigurations with minimal permanent way modifications is required.

The clearances in all stations are suitable for the electrification of the future DART tracks; however, the change of the operation scheme and the future increase in passenger demand requires the analysis of the station sizing and the accesses to the platforms. Work is ongoing but no works at existing stations is currently envisaged. The ongoing design development will validate this assumption.

There are several roads crossing the railway along this section, all of which all are via overbridges. In principle there is no intervention foreseen for these sections of road. However, protection works (e.g., parapet height increases) will be required.

In addition, as set out in **Section 6.1.3**, following initial power simulation studies the preliminary location for substations includes Adamstown and Hazelhatch. The site-specific locations of the substations or layouts have yet to be finalised and will be brought forward as part of Public Consultation No. 2.

The area between Park West & Cherry Orchard Station and Heuston Station where four tracks reduce to two is currently limiting the number of train services that can operate on this route.

The upgrading of this section of railway to include four tracks will remove this limitation and allow Intercity / regional services to operate efficiently alongside DART services.

8. Park West & Cherry Orchard Station to Heuston Station

8.1. Introduction

A key requirement of the DART+ South West Project is to separate Intercity and fast regional services from the future DART service. The last remaining constraint in this regard is where the four tracks reduces to two tracks between Park West & Cherry Orchard Station and Heuston Station. The upgrading of this section of railway to include four tracks will remove this limitation allowing Intercity / regional and freight services to operate efficiently alongside DART services.

Expanding from two tracks to four tracks will require a horizontal width extension across the railway corridor. Where possible the extension will be contained within Iarnród Éireann's land ownership, however in specific locations it may potentially affect adjoining property owners.

Also, the bridge structures along this section were constructed to accommodate non-electric trains spanning two tracks. Therefore, existing bridges will require interventions to provide the necessary span width to accommodate the expanded four-track configuration and the vertical clearance for overhead electrification apparatus.

Along this section of the rail corridor significant works and interventions are required to meet the Project objectives and requirements, including potential infringement of property rights outside the rail corridor / Iarnród Éireann's property boundary. In many cases, the Do-Minimum Option is not feasible and the assessment of feasible 'Do Something Options' is required. Refer to **Figure 8-1**.

Refer to the following line route maps in **Annex 1**, as follows:

- *Annex 1.9 Map 9 - Park West Industrial Estate, including Clover Hill Road to Inchicore Works*
- *Annex 1.10 Map 10 - Inchicore Works, including Landen Road to Memorial Gardens*
- *Annex 1.11 Map 11 - Memorial Gardens to Liffey Bridge*

Refer to the following Technical Optioneering Reports in **Annex 3**, as follows:

- *Annex 3.4 Park West to Heuston Station – Technical Optioneering Report (Area around Le Fanu Road Bridge)*
- *Annex 3.5 Park West to Heuston Station – Technical Optioneering Report (Area around Kylemore Road Bridge)*
- *Annex 3.6 Park West to Heuston Station – Technical Optioneering Report (Area around Inchicore Works)*
- *Annex 3.7 Park West to Heuston Station – Technical Optioneering Report (Area around Khyber Pass)*
- *Annex 3.8 Park West to Heuston Station – Technical Optioneering Report (Area around Sarsfield Road Bridge)*

- *Annex 3.9 Park West to Heuston Station – Technical Optioneering Report (Area around Memorial Road Bridge)*
- *Annex 3.10 Park West to Heuston Station – Technical Optioneering Report (Area around South Circular Road Junction)*

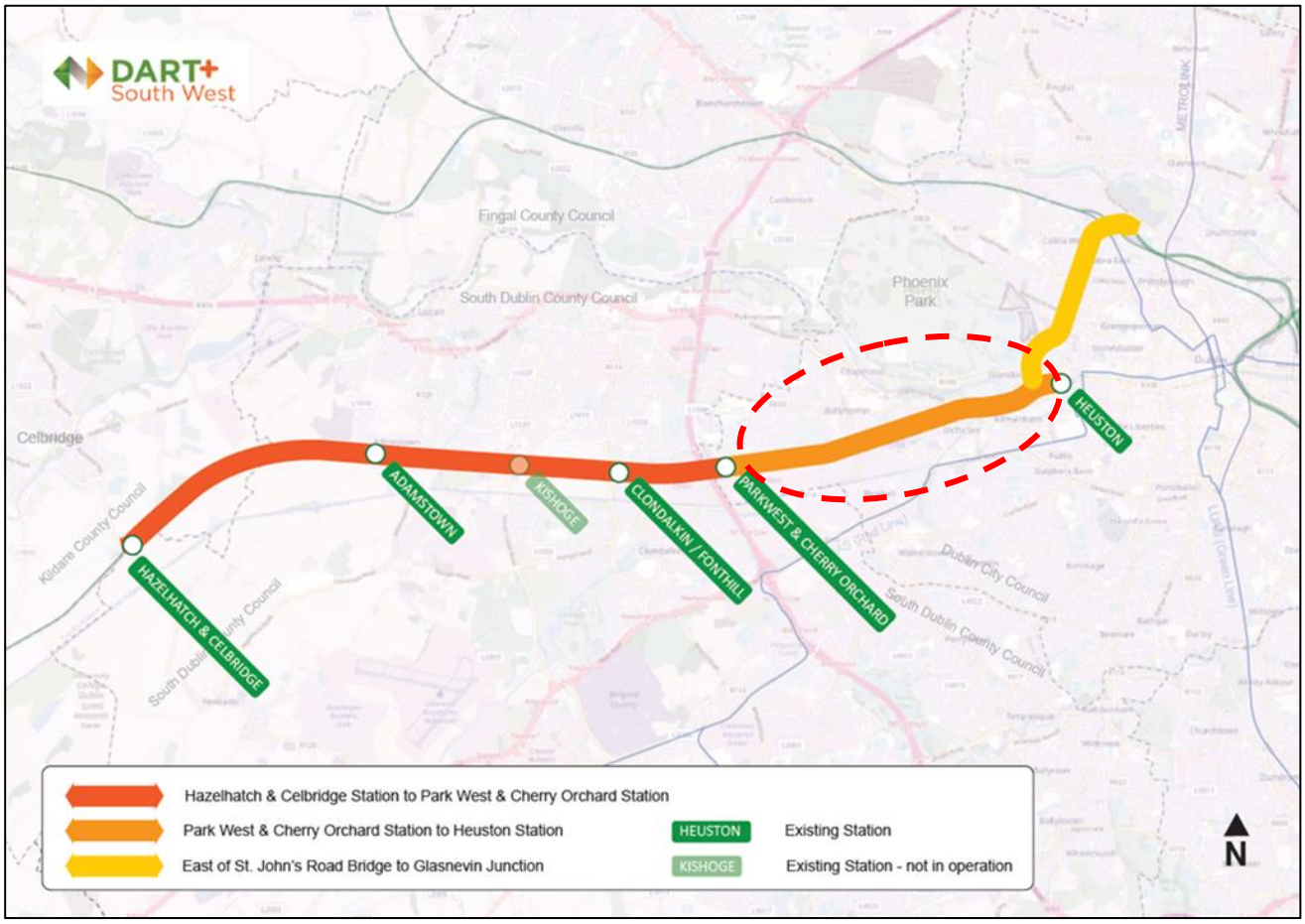

Figure 8-1 Park West & Cherry Orchard to Heuston Station

8.2. Description of Railway Corridor

The western end of this section begins at Park West & Cherry Orchard Station and runs east, through an area that is generally characterised by residential properties to the north (including Cherry Orchard Park) and industrial properties to the south (including Park West). The line passes under a footbridge at Cherry Orchard (OBC8B) and continues to Le Fanu Road Bridge (OBC7) and Kylemore Road Bridge (OBC5A). Inchicore Works front onto the existing rail line for approx.1km. The complex provides several track infrastructure and related facilities for the maintenance of rolling stock (Intercity trains), and offices for Iarnród Éireann. The existing two sidings at this location are currently used for the entrance of the vehicles into the depot.

From here, the rail line continues east to pass under Khyber Pass Footbridge (OBC5), over Sarsfield Road (UBC4) and under Memorial Road Bridge (OBC3) where the line begins to run parallel to the Chapelizod Bypass. The line then approaches the South Circular Road at one of Dublin's busiest road

junctions, with two bridges carrying traffic over the railway – South Circular Road Bridge (OBC1) and St John's Road Bridge (OBC0A). The line then takes a more northerly direction as it approaches the area where the Phoenix Park Tunnel Branch Line merges with lines into/out of the existing Heuston station (refer to **Figure 8-2**).

Figure 8-2 Aerial View of the Section of the Railway Corridor

The following sections of this report are a summary output of Technical Optioneering Reports in **Annex 3**, which should be referred to for more detailed information in respect of individual areas / structures along this section of the Project rail corridor. These reports explain the Stage 1: Preliminary Sifting process in respect of these areas, and asses the 'Do-Nothing' option, the 'Do-Minimum' options and the 'Do-Something' options.

Having regard to the level of intervention required along this section of the rail line due to the requirement to extend the existing rail corridor to accommodate four tracks and the limited horizontal and vertical clearance of existing bridges, both the 'Do Nothing' or 'Do Minimum' options fail to meet the Engineering Feasibility and Project requirements. The focus is therefore on the 'Do-Something' options. The exception is Cherry Orchard Footbridge (OBC8B), which has sufficient width and height to meet the Engineering Feasibility and Project requirements.

Where only one 'Do-Something Option' meets the necessary Engineering Feasibility and Project Requirements for the particular intervention (and passes the Stage 1: Preliminary Sifting Stage) it is the Emerging Preferred Option and there will be no Stage 2 MCA Assessment.

8.3. Area around Le Fanu Road Bridge (OBC7)

Refer to **Annex 3.4** *Park West to Heuston Station – Technical Optioneering Report (Area around Le Fanu Road Bridge).*

8.3.1. Context

The area extends from the west side of Cherry Orchard Footbridge (OBC8B) to just east of Le Fanu Road overbridge (OBC7).

The rail corridor consists of two or three tracks primarily below the surrounding ground level with the residential properties of Clover Hill Road backing on to the railway to the north, and the industrial units of Park West Industrial Estate backing onto the railway to the south.

There are residential properties to the north of Le Fanu Road overbridge (OBC7) at Le Fanu Drive, and on the east side of Le Fanu Road itself, with logistics and industrial units to the south.

Le Fanu Road overbridge is a single-carriageway road bridge carrying road traffic over the rail corridor in a north-south direction. Pedestrians and vehicle movements are neither segregated nor defined over the existing bridge.

The major infrastructure features the area are illustrated in **Figure 8-3**.

Figure 8-3 Aerial View of Area (dotted white line)

8.3.2. Stage 1: Preliminary Sifting

8.3.2.1. Requirements and Challenges

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this area are:

- Increase the number of tracks from two to four.
- Electrification of the two tracks to accommodate DART services.

- Provide vertical electrical clearance through existing structures. If necessary, amend or reconstruct structures to provide the required clearance.
- Maintain functionality of existing roads.

Cherry Orchard Footbridge (OBC8B) currently has four tracks beneath and sufficient vertical clearance for OHLE.

Figure 8-4 Cherry Orchard Footbridge, OBC8B (East Elevation)

The main technical challenges are the narrow rail corridor in the vicinity of Le Fanu Road Bridge (OBC7) and the geometry of the bridge itself. The narrow corridor has insufficient width to provide four tracks and insufficient vertical clearance for OHLE. Furthermore, the road level for a potentially reconstructed bridge is going to be constrained by the proximity of the existing side road junctions on the north (Le Fanu Road cul-de-sac) and on the south (Kylemore Park North) and full realignment of the approach (from the north) would be required.

Figure 8-5 Le Fanu Road Bridge (OBC7) (West Elevation)

The existing approach roads (carriageway and footpaths) are also not compliant with current standards for all user categories but particularly the vulnerable; namely pedestrians, cyclists, and those with disabilities. Any works would need to be compliant with current design standards to accommodate these user categories.

Any closure of Le Fanu Road Bridge (OBC7) for its reconstruction, along with associated road works would have short-term impact on traffic and cause delays as diversions reroute traffic over Kylemore Road Bridge (OBC5A).

8.3.2.2. Findings

Nine options (excluding the 'Do Nothing' Option) were identified for the area. All 'Do-Something' Options require the following elements:

- A fitted OHLE arrangement for Cherry Orchard Footbridge (OBC8B).
- Earthworks and track-bed formation design for new tracks.
- New bridge abutment piles and/or bridge wingwall modifications (OBC7).
- New retaining wall designs along the northern and southern boundary of the railway corridor to provide the necessary horizontal width for the four-tracking.
- Relocation of a variety of service cables, utilities, etc.
- Drainage works to the track.

The 'Do Minimum' and 'Do Something' options are compatible with the investment guidelines and requirements for the DART+ Programme. In terms of the Environment, there are no environmental issues at this stage which would discount any option solely on environment criteria i.e., no impact on

environmental sites of National or International significance. Both Economy and Environment criteria feed into the Stage 2: MCA process.

The findings of the Preliminary Assessment (Sifting) are set out in **Table 8-1**.

Table 8-1 Stage 1: Preliminary Assessment (Sifting) Findings for Area Le Fanu (OBC7)

Preliminary Assessment (Sifting) for Le Fanu (OBC7)		
Option	**Description**	**Findings**
Option 0: Do Nothing	Leave as is	Will not deliver project objectives or requirements.
Option 1: Do Minimum	Four-tracking and electrification without widening the existing rail corridor or providing additional vertical and horizontal clearances at Le Fanu Road Bridge (OBC7).	Four-tracking and electrification cannot be achieved due to the span of the existing bridge - there is insufficient space available to accommodate the required track layout. It will not therefore deliver project objectives or requirements.
Option 2	Four-tracking and electrification by making openings in the sides of the existing structure, through the wingwalls, to provide space for additional tracks without replacing the existing bridges.	There is insufficient space to provide the necessary sized openings to accommodate the additional tracks. In addition, the existing bridge does not provide the necessary vertical clearance required for electrification. It will not therefore deliver project objectives or requirements.
Option 3	Replaces the existing bridge with a new road bridge that would have sufficient vertical and horizontal clearances. The vertical clearance requirements would be achieved by increasing the road levels only.	This option would require a minimum road level increase of 1.1m approx., which would have a significant impact on the approach roads. It will not therefore deliver project objectives or requirements.
Option 4	Replaces the existing bridge with a new road bridge that has sufficient vertical and horizontal clearances. The vertical clearance requirements are achieved by track lowering only.	This option would require the track to be lowered by a minimum of 1.1m approx. which is not feasible at Le Fanu Road. It will not therefore deliver project objectives or requirements.
Option 5	Replaces the existing bridge with a new road bridge that has sufficient vertical and horizontal clearance. The vertical clearance requirements are achieved by increasing the road level up to a point above which the road would require departures from Standards and track lowering.	Feasible.
Option 6	Replaces the existing bridge with a new road bridge that has sufficient vertical and horizontal clearances. The vertical clearance requirements would be achieved by sharing	Feasible.

Preliminary Assessment (Sifting) for Le Fanu (OBC7)		
	the level increase at the bridge between track lowering (50%) and road raising (50%).	
Option 7	This Option is similar to Option 6, however the vertical clearance requirements would be achieved through a combination of track lowering and road raising, that is not shared evenly; where the apportionment between the limits of both has yet to be determined.	Track lowering of 1.4m approx. is required. This level of track lowering is not feasible at Le Fanu Road. It will not therefore deliver project objectives or requirements.
Option 8	Removes the road bridge and replaces it with a pedestrian and cycle friendly bridge with sufficient vertical and horizontal clearance to facilitate four-tracking and OHLE.	Road bridge would not be reinstated. It will not therefore deliver project objectives or requirements.
Option 9	This Option proposes to replace the existing bridge with a new road bridge in the form of a truss which endeavours to minimise the road level increase required. The clearance requirements would be achieved by sharing the level increase at the bridge between track lowering and road raising, where the apportionment between the limits of both has yet to be determined.	This option would require a minimum track lowering of 1.73m. This level of track lowering is not feasible at Le Fanu Road. It will not therefore deliver project objectives or requirements.

The summary findings of the Stage 1: Preliminary Assessment (Sifting) are as follows:

- Options 0, 1, 2, 3, 4, 7, 8 and 9 failed to meet the necessary Engineering Feasibility and Project Requirements (highlighted in grey in **Table 8-1**); and
- Options 5 and 6 met the necessary Engineering Feasibility and Project Requirements and were brought forward to Stage 2: MCA for detailed assessment ((highlighted in green) in **Table 8-1**).

8.3.3. Stage 2: MCA

Two options met the necessary Engineering Feasibility and Project Requirements for the area and were brought forward to Stage 2: MCA for detailed assessment, namely Option 5 and Option 6. These are described in summary below.

8.3.3.1. Option 5

Option 5 includes a replacement bridge at Le Fanu with a longer span or spans to facilitate the additional width required for the additional tracks.

To overcome the lack of height available for the electrification infrastructure, the road will be raised in combination with lowering the track. This option maintains the road at the limit of design standards and reduces the track level by the remainder required so that electrification infrastructure can pass beneath the bridge.

Retaining walls are required to the north and south of the corridor adjacent to Le Fanu Road Bridge (OBC7) to allow the widening of the corridor while minimising the impact on the adjacent properties, (a more significant impact would arise if the current cross-section in cutting, with slopes, is replicated).

The road across the structure will be widened to provide a standard cross-section. The raising and widening of the road will mean that walls will be required along the road to the north of the railway.

8.3.3.2. Option 6

Option 6 is structurally similar to Option 5 but the ratio of road raising versus track lowering is different. This option assumes raising the road and lowering the track in equal proportion to achieve the additional height. This option therefore shares the impact of the additional height beneath the bridge between road and the rail equally.

8.3.3.3. MCA Assessment Findings

Table 8-2 shows the summary findings of the comparative assessment undertaken during Stage 2 MCA.

Table 8-2 Stage 2: MCA Findings for Le Fanu Road Bridge (OBC7)

CAF Parameters	Option 5 Assessment	Option 6 Assessment
1. Economy	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
2. Integration	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
3. Environment	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
4. Accessibility and Social Inclusion	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
5. Safety	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
6. Physical Activity	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
Conclusion	**Comparable to the Other Option / Neutral**	**Comparable to Other Option / Neutral**

Across all the CAF Parameters, Criteria and Sub-Criteria the individual specialists / disciplines could not discern a noticeable difference between the two options and assessed them as 'comparable / neutral'. This was the case notwithstanding there were technical design differences between the options. This reflects the particular characteristics of the DART+ South West Project and the fact that the options are focused on very specific locations and include technical design considerations.

In order to streamline and simplify the reporting from the MCA results, it was considered appropriate at this stage to combine the two feasible options into a single option. The detailed design differences will remain as a potential design variation to be further explored through the future design process.

Therefore Option 5 is brought forward as the Emerging Preferred Option, with option 6 as a design variation and/or comparator to be further explored through the future design process.

8.3.4. Emerging Preferred Option

The Emerging Preferred Option involves the reconstruction of the Le Fanu Road Bridge (OBC7), replacing it with a larger span and higher structure to facilitate the additional width required for the additional tracks and removing the skew. To overcome the lack of height available for the electrification infrastructure, the road level will be raised in combination with lowering the rail track. Retaining walls are required to the north and south of the corridor adjacent to the new bridge to allow the widening of the corridor while minimising the impact on the adjacent properties. The raising of the road level will also mean that retaining walls will be required along the road to the north of the railway.

The proposed replacement bridge will be a modern structure that will segregate vulnerable users from vehicular traffic as well as remove of the skew which currently provides restrictive sightline, both amendments would provide a significant improvement on the existing situation.

The Emerging Preferred Option is considered the optimum solution in terms of minimising impacts on third party property owners. Based on the level of information and design available at this time for Public Consultation No. 1, the extent of permanent works is not envisaged to interfere with third party residential or commercial property rights. There may be temporary interference of property rights during construction along the rail corridor and around the bridge works however technical and construction related solutions will seek to minimise these. Construction requirements (including potential temporary interference of property rights) and methodologies will be presented at Public Consultation No. 2.

8.4. Area around Kylemore Road Bridge (OBC5A)

Refer to Annex 3.4 *Park West to Heuston Station – Technical Optioneering Report* (Area around Kylemore Road Bridge*).*

8.4.1. Context

This section of the rail line extends from just east of Le Fanu Road Bridge (OBC7) to west of Kylemore Road Bridge (OBC5A).

The rail corridor consists of two tracks primarily below the surrounding ground level with the residential properties of Kylemore Drive and Landen Road backing on to the railway to the north, and the industrial units of Park West Industrial Estate and Westlink Industrial Estate backing onto the railway to the south.

Kylemore Road overbridge (OBC5A) is a single-carriageway road bridge carrying road traffic over the rail corridor in a north-south direction.

The major infrastructure features of the area are illustrated in **Figure 8-6**.

Figure 8-6 Aerial View of Area (white dotted outline)

8.4.2. Stage 1: Preliminary Sifting

8.4.2.1. Requirements and Challenges

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this area are:

- Increase the number of tracks from two to four.
- Electrification of the two tracks for DART services.
- Provide vertical electrical clearance through existing structures or amend or reconstruct structures to provide the required clearance.
- Maintain functionality of existing roads.
- Passive load capacity provision for LUAS on Kylemore Road Bridge (OBC5A) (not geometric passive provision i.e. not providing the full construction width, nor final finished alignment level above the bridge deck but rather allowing for future adaptability for widening).
- Passive provision for a potential future railway station at Kylemore, in such a way that, should the construction of the station proceed in the future, it would not require to demolish and reconstruct the bridge. The rest of the corridor will be enhanced only to accommodate the four tracks, thus avoiding the impacts and disruption associated with the additional enhancement that the construction of the platforms of the station, currently not certain, could require.

The density and proximity of the residential properties along the north side of the rail corridor between Le Fanu Road Bridge (OBC7) and Kylemore Road Bridge (OBC5A) is a major constraint in terms of achieving the Project requirements.

There are also a number of interrelated considerations for track alignment through this area (both horizontal and vertical alignment), as follows:

- It must be compatible with proposals for Le Fanu Road Bridge (OBC7) due to proximity with Kylemore Road Bridge (OBC5A).
- It needs to consider the passive provision requirements for the possible future station at Kylemore (to the west side of the bridge). This specifically relates to Kylemore Road Bridge (OBC5A) span width.
- The connection to Inchicore Works must be retained and this impacts the vertical levels on the east side of the area and through Kylemore Road Bridge (OBC5A) itself.

The existing Kylemore Road Bridge (OBC5A) has insufficient span length to accommodate two additional tracks and inadequate vertical clearance to implement track electrification. Proposed interventions include replacement of the bridge, or to create openings through the wingwalls on the north and south side to create space for two additional tracks (one north and one south).

Figure 8-7 View of Kylemore Road Bridge (OBC5A) (eastwards)

A new bridge would require an increased vertical clearance. The proximity of public and private road junctions / accesses to the bridge poses significant constraints in terms of meeting the necessary road design standards as set by Transport Infrastructure Ireland (TII) and *Design Manual for Urban Roads and Streets* (DMURS) guidance and on the intention to minimise road works at these junctions/accesses and as well as to private property.

8.4.2.2. Findings

Ten options (excluding the 'Do-Nothing' option) were identified for the area. All 'Do Something' Options include:

- New bridge abutment piles and/or bridge wingwall modifications.
- New retaining wall designs along the northern and southern boundary of the railway to provide the necessary horizontal width for the four-tracking.
- The closure of the auxiliary / residential plots service road junction immediately north-west of the bridge due to the requirement for a retaining wall to retain the carriageway.
- Relocation of a variety of service cables, utilities, etc.
- Drainage works to the track.

The 'Do Minimum' and 'Do Something' options are compatible with the investment guidelines and requirements for the DART+ Programme. In terms of the Environment, there are no environmental issues at this stage which would discount any option solely on environment criteria i.e., no impact on environmental sites of National or International significance. Both Economy and Environment criteria feed into the Stage 2: MCA process.

The findings of the Preliminary Assessment (Sifting) are set out in **Table 8-3**.

Table 8-3 Stage 1: Preliminary Assessment (Sifting) Findings for Kylemore Road Bridge (OBC5A)

Preliminary Assessment (Sifting) for Kylemore Road Bridge (OBC5A)		
Option	**Description**	**Findings**
Option 0: Do Nothing	The existing infrastructure remains unchanged. There are no interventions.	Will not deliver project objectives or requirements.
Option 1: Do Minimum	Four tracking and electrification without widening the existing rail corridor or providing additional vertical and horizontal clearance at Kylemore Road Bridge (OBC5A).	Will not deliver project objectives or requirements.
Option 2	Retain the existing Kylemore Road Bridge (OBC5A) and place 2 no. additional electrified tracks in an opening made at the side (i.e., through wingwalls).	This option is not feasible due to the geometry of the existing structure and design standard requirements. It does not provide passive provision for potential future LUAS loading. It will not therefore, deliver the project objectives or requirements.
Option 3	Replace the existing bridge with a new bridge that has the additional horizontal and vertical clearance required for electrification, four-tracking and passive provision for potential future station platforms under the	This option would not maintain functionality of the roads or provide passive provision for potential future LUAS loading. It will not therefore, deliver the project objectives or requirements.

Preliminary Assessment (Sifting) for Kylemore Road Bridge (OBC5A)		
	bridge. It also included for a structural extension that could be used as part of a potential traffic management solution. The replacement bridge would not provide passive provision for LUAS. Adequate vertical clearance would be achieved by raising the existing road only.	
Option 4	Replace the existing bridge with a new bridge that has the additional horizontal and vertical clearance required for electrification, four-tracking and passive provision for potential future station platforms under the bridge. It also included for a structural extension that could be used as part of a potential traffic management solution. The replacement bridge would not provide passive provision for LUAS. Adequate vertical clearance would be achieved by lowering the existing tracks only.	This amount of track lowering is considered not feasible from a technical perspective in terms of track gradients and longitudinal drainage. It does not provide passive provision for potential future LUAS loading. It will not therefore, deliver the project objectives or requirements.
Option 5	Replace the existing bridge with a new bridge that has the additional horizontal and vertical clearance required for electrification, four-tracking and passive provision for potential future station platforms under the bridge. It also included for a structural extension that could be used as part of a potential traffic management solution. The replacement bridge would not provide passive provision for LUAS, Adequate vertical clearance would be achieved by lowering the existing tracks and raising the existing road. Both the road levels and tracks levels would be adjusted by 50% of the total adjustment required for this Option.	This option would not provide passive provision for potential future LUAS loading. It will not therefore, deliver the project objectives or requirements.
Option 6	Replace the existing bridge with a new bridge that has the additional horizontal and vertical clearance required for electrification, four-tracking and passive provision for potential future station platforms under the bridge. It also included for a structural extension that could be used as part of a potential traffic management solution. The replacement bridge would not provide passive provision for LUAS . Adequate vertical clearance would be achieved by lowering the existing tracks and raising the existing road. Both the road levels and tracks levels would be adjusted proportionately other than by 50% of the total adjustment required for this Option.	This option would not provide passive provision for potential future LUAS loading. It will not therefore, deliver the project objectives or requirements.

Preliminary Assessment (Sifting) for Kylemore Road Bridge (OBC5A)		
Option 7	Replace the existing bridge with a new bridge that has the additional horizontal and vertical clearance required for electrification, four-tracking and passive provision for potential future station platforms under the bridge. The replacement bridge would also provide passive provision for LUAS loading. Adequate vertical clearance would be achieved by raising the existing road only.	This amount of road level increase would require extensive works to the approach roads. It is not a feasible solution in terms of maintaining the functionality of roads. It will not therefore, deliver the project objectives or requirements.
Option 8	Replace the existing bridge with a new bridge that has the additional horizontal and vertical clearance required for electrification, four-tracking and passive provision for potential future station platforms under the bridge. The replacement bridge would also provide passive provision for LUAS loading. Adequate vertical clearance would be achieved by lowering the existing tracks only	This amount of track lowering is considered not feasible from a technical perspective in terms of track gradients and longitudinal drainage. It will not therefore, deliver the project objectives or requirements.
Option 9	Replace the existing bridge with a new bridge that has the additional horizontal and vertical clearance required for electrification, four-tracking and passive provision for potential future station platforms under the bridge. The replacement bridge would also provide passive provision for LUAS loading. Adequate vertical clearance would be achieved by lowering the existing tracks and raising the existing road. Both the road levels and tracks levels would be adjusted by 50% of the total adjustment required for this Option.	Feasible
Option 10	Replace the existing bridge with a new bridge that has the additional horizontal and vertical clearances required for electrification, four-tracking and provision for potential future station platforms under the bridge. The replacement bridge would also provide passive provision for LUAS loading. Adequate vertical clearance would be achieved by lowering the existing tracks and raising the existing road. Both the road levels and tracks levels would be adjusted proportionately, other than by 50%, of the total adjustment required for this Option	Feasible

The findings of the Stage 1: Preliminary Assessment (Sifting) are as follows:

- Options 0 to 8 failed to meet the necessary Engineering Feasibility and Project Requirements for the area (highlighted in grey in **Table 8-3**); and
- Options 9 and 10 met the necessary Engineering Feasibility and Project Requirements for the area and were brought forward to Stage 2: MCA for detailed assessment (highlighted in green) in **Table 8-3).**

8.4.3. Stage 2: MCA

Two options met the necessary Engineering Feasibility and Project Requirements and were brought forward to Stage 2: MCA for detailed assessment, namely Option 9 and Option 10. These are described in summary below.

8.4.3.1. Option 9

Option 9 includes a replacement bridge with longer spans to facilitate the additional width required for the additional tracks.

To overcome the lack of height available for the electrification infrastructure, the road will be raised in combination with lowering the track. This option assumes raising the road and lowering the track in equal proportion to achieve the additional height. This option therefore shares the impact of the additional height beneath the bridge between road and the rail equally.

Retaining walls are required to the north and south of the corridor to allow the widening of the corridor while minimising the impact on the adjacent properties (a more significant impact would arise if the current cross-section in cutting, with slopes, is replicated).

8.4.3.2. Option 10

Option 10 is similar to Option 9 but the ratio of road raising versus track lowering is different. Option 10 maintains the road at the limit of design standards as Option 9 does, but the split of clearance is initially absorbed by the road levels up to that limit, and reduces the track level by the remainder required so that electrification infrastructure can pass beneath the bridge.

8.4.3.3. MCA Assessment Findings

Table 8-4 shows the summary findings of the comparative assessment undertaken during Stage 2 MCA.

Table 8-4 Stage 2: MCA Findings -for Kylemore Road Bridge (OBC5A)

CAF Parameters	Option 9 Assessment	Option 10 Assessment
1. Economy	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
2. Integration	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
3. Environment	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
4. Accessibility and Social Inclusion	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral

CAF Parameters	Option 9 Assessment	Option 10 Assessment
5. Safety	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
6. Physical Activity	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral

Conclusion	Comparable to the Other Option / Neutral	Comparable to Other Option / Neutral

Across all the CAF Parameters, Criteria and Sub-Criteria the individual specialists / disciplines could not discern a noticeable difference between the two options and assessed them as 'comparable / neutral'. This was the case notwithstanding there were technical design differences between the options. This reflects the particular characteristics of the DART+ South West Project and the fact that the options are focused on very specific locations and include technical design considerations.

In order to streamline and simplify the reporting from the MCA results, it was considered appropriate at this stage to combine the two feasible options into a single option. The detailed design differences will remain as a potential design variation to be further explored through the future design process. Therefore, Option 10 is brought forward as the Emerging Preferred Option, with Option 9 as a design variation and/or comparator to be further explored through the future design process.

8.4.4. Emerging Preferred Option

The Emerging Preferred Option for Kylemore Road Bridge (OBC5A) replaces the bridge with a longer span to facilitate the additional track width. The new bridge structure would also incorporate passive provision for LUAS loading over the bridge. To overcome the lack of height available for the electrification infrastructure, the road level will be raised in combination with lowering the rail track.

Retaining walls are required to the north and south of the corridor to allow the widening of the corridor while minimising the impact on the adjacent properties. The raising of the road level will also mean that retaining walls will be required along the road to the north and south of the railway.

The Emerging Preferred Option is considered the optimum solution in terms of minimising impacts on third party property owners. Based on the level of information and design available at this time for Public Consultation No. 1, the extent of permanent and construction related works may extend into the 3m strip of land between the existing railway corridor and the rear of properties along Kylemore Drive. There may also be temporary interference of other property rights during construction along the rail corridor and works around the bridge however technical and construction related solutions will seek to minimise these. Construction requirements (including potential temporary interference of property rights) and methodologies will be presented at Public Consultation No. 2.

8.5. Area around Inchicore Works

Refer to Annex 3.5 *Park West to Heuston Station – Technical Optioneering Report* (Area around Inchicore Works*).*

8.5.1. Context

This section of the rail line is dominated by Inchicore Works to the south. It fronts onto the existing rail line for approx.1km. The complex provides several facilities for the maintenance of rolling stock (Intercity trains), the track infrastructure and offices for Iarnród Éireann. Residential properties are also present to further to the south of railway and east of Inchicore Works, particularly at St. Georges Villas, Inchicore Parade.

The area to the north of the railway corridor is broadly residential in nature, with a focus on properties along Landen Road. Currently the rear gardens of these properties back onto the rail corridor with a retaining wall providing separation. There are also apartment blocks located to the north as the corridor approaches Sarsfield Road.

The railway along this section comprises two main line tracks which are joined by two sidings (used to access the depot and for train storage).

The western extent of this section is located within a steep cutting on both sides. A retaining wall provides separation between the railway and the residential properties at Landen Road to the north. A retaining wall also sits behind the cutting slope on the southern boundary between Kylemore and Inchicore Works and terminates at the sidings where the railway reaches ground level.

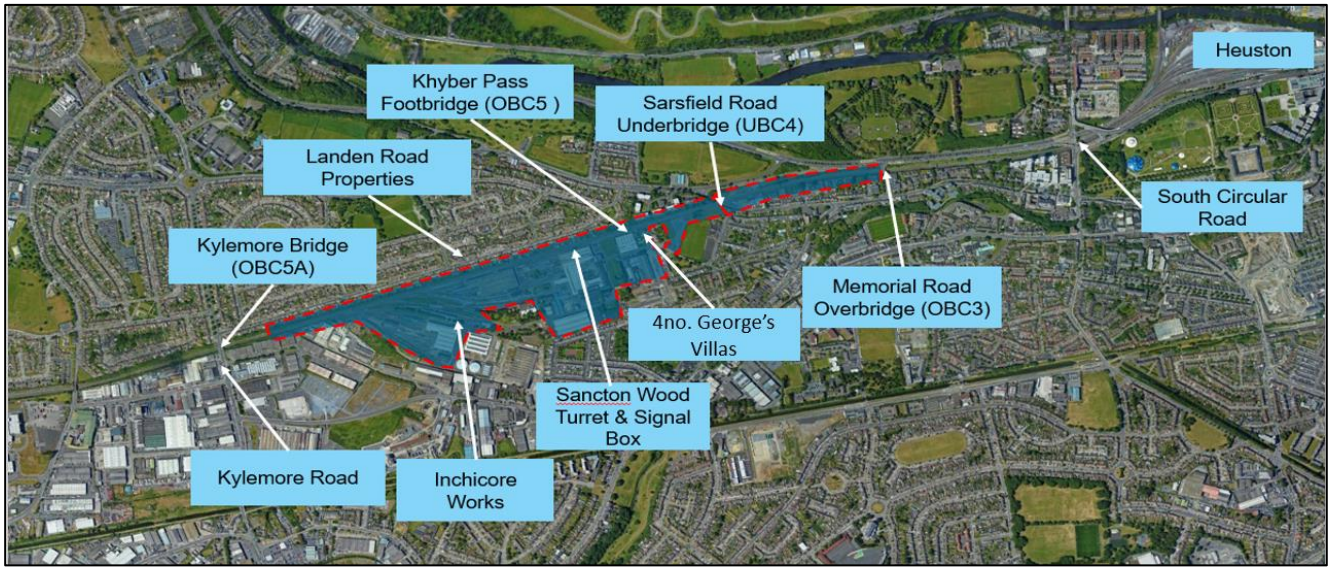

Figure 8-8 Aerial view with Infrastructural Features

A number of the buildings within the Inchicore Railway Works are identified on the National Inventory of Architectural Heritage (NIAH). Key features include a signal box within the rail corridor to the immediate north of the rail line (Regional Rating Reg No. 50080417) and a turret associated with a locomotive shed to the south of the line (Regional Rating Reg. No. 50080418).

8.5.2. Stage 1: Preliminary Sifting

8.5.2.1. Requirements and Challenges

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this area are:

- Four tracking Park West to Heuston.
- Electrification of the two DART tracks.
- Electrical clearance for electrification.
- Keep current functionality of railway (Inchicore Works).
- Track alignment and drainage requirements.

The existing tracks through the area would not provide the required four tracking while maintaining the functionality of the depot; therefore, the relaying of additional tracks must be considered, and this requires the widening the corridor, realignment of the existing tracks and retaining walls either side of the corridor.

Figure 8-9 View of area looking eastwards

There is a clear pinch point along the rail corridor between the Signal Box (on the northern side of the line) and the Turret associated with a locomotive shed to the south of the line. Extending the rail corridor in this area will directly impact these buildings. See **Figure 8-10** below.

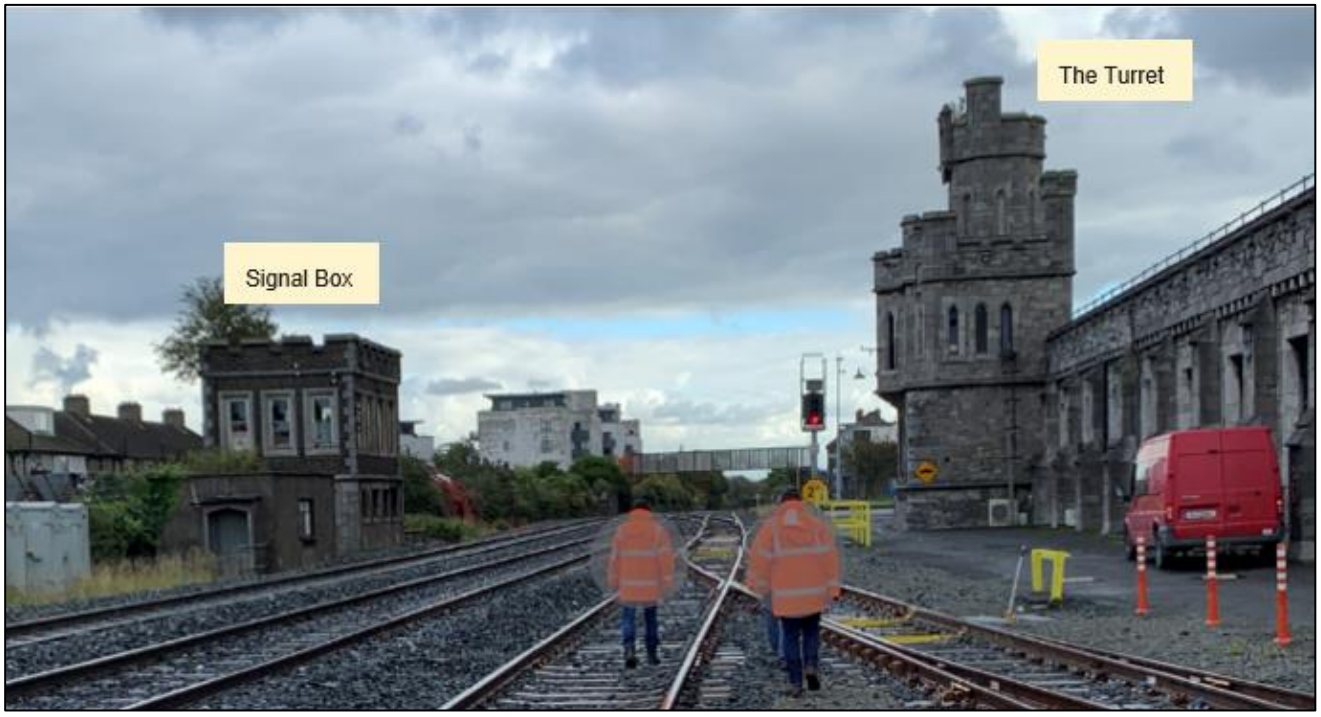

Figure 8-10 Eastwards view of the area around ´The Turret' and the Signal Box

8.5.2.2. Findings

A total of four options have been developed for this area (excluding the 'Do-Nothing' Option). All 'Do Something' Options include:

- New retaining wall designs along the northern and southern boundary (where appropriate) of the railway to provide the necessary horizontal width for the four-tracking;
- Drainage works to the track;
- Attenuation tank; and
- Relocation of a variety of service cables, utilities etc.

In terms of the Economy, all options (except for Option 2) are compatible with the investment guidelines and requirements for the DART+ Programme. However, Option 2 is not aligned with Government Policy for the DART+ Programme.

In terms of the Environment, there no environmental issues at this stage which would discount any option solely on environment criteria i.e., no impact on environmental sites of National or International significance. However, relevant environmental issues include potential impact of options on residential properties to the north (Option 3 and 4), the Signal Box (NIAH) (Option 3 and 4), the Turret (NIAH) and Inchicore buildings and residential properties on the south side (Option 4). These and other Economy and Environment considerations feed into the Stage 2: MCA process.

The findings of the Preliminary Assessment (Sifting) are set out in **Table 8-5**.

Table 8-5 Stage 1: Preliminary Assessment (Sifting) Findings for Inchicore

Preliminary Assessment (Sifting) for Inchicore		
Option	**Description**	**Findings**
Option 0: Do Nothing	The existing infrastructure remains unchanged. There are no interventions.	Will not deliver project objectives or requirements.
Option 1: Do-Minimum)	Makes use of the existing four tracks and siding tracks. Electrification of the two northern tracks.	There is insufficient space for four-tracking to the south in this area, and the electrification tie-in of the southern track (current sidings) would result in significant loss of functionality at the Irish Rail Inchicore Works. It therefore will not deliver project objectives or requirements.
Option 2	This option provides four-tracking and electrification by providing additional tracks in a new tunnel.	There is insufficient space to accommodate a tunnel due to the necessary approach distances required to accommodate a tunnel portal. It therefore will not deliver project objectives or requirements.
Option 3	This option provides an additional track to the north, includes electrification, and the Inchicore siding remains operational. The existing track is extended to the north (towards the boundary with Landen Road).	Feasible.
Option 4	This option provides an additional track to the south and electrification. The existing rail corridor is extended to the south (towards the boundary with Inchicore Works)	Feasible.

The summary findings of the Stage 1: Preliminary Assessment (Sifting) are as follows:

- Options 0, 1 and 2 failed to meet the necessary Engineering Feasibility and Project Requirements (highlighted in grey in **Table 8-5**); and
- Options 3 and 4 met the necessary Engineering Feasibility and Project Requirements and were brought forward to Stage 2: MCA for detailed assessment (highlighted in green) in **Table 8-5**).

8.5.3. Stage 2: MCA

Two options met the necessary Engineering Feasibility and Project Requirements and were brought forward to Stage 2: MCA for detailed assessment, namely Option 3 and Option 4.

8.5.3.1. Option 3

At the western end of the area, the position of the tracks will depend on the final arrangements at Kylemore Road Bridge (OBC5A). The track alignment can be adjusted to link the design with several options.

The railway corridor in this area needs to be widened on both the north and south side and retaining structures will be required on both sides of the tracks to contain the resulting slope height difference between the track and the adjacent property.

Heading east towards the Maintenance Shed the increase in rail corridor width would impact on the rear gardens of properties along Landen Road and require the removal of the Signal Box (NIAH - Regional Rating Reg No. 50080417) on the northern side of the tracks.

To the south, the Inchicore yard would need to be reconfigured. The building attached to the Maintenance Shed and drivers' hut will need to be removed and the facilities relocated.

For the rest of the area heading east, the extension of the railway corridor to the north has the potential to infringe property rights to both the north and south of the railway.

8.5.3.2. Option 4

Option 4 is the same as Option 3 from the west end up to the western corner of the Maintenance Shed where the position of the tracks will depend on the final arrangements at Kylemore Road Bridge (OBC5A). The track alignment can be adjusted to link the design with several options.

However, from this point, the railway corridor is extended, and tracks realigned towards the south compared to Option 3.

This option concentrates most of the impact of four tracking requirements on Iarnród Éireann´s premises, with a number of railway facilities needing removal and/or relocation, thereby minimising the potential to infringe properties rights to the north of the railway corridor.

The realignment of the tracks would also come close to the Turret heritage feature (NIAH - Regional Rating Reg. No. 50080418) and it may need to be removed. This is in addition to the removal of the Signal Box heritage feature (NIAH – Regional Rating Reg No. 50080417).

Further east, beyond Inchicore Works, the extension of the railway corridor and the track would be realigned towards the south and has the potential to infringe property rights to the south.

8.5.3.3. MCA Findings

Table 8-6 shows the summary findings of the comparative assessment undertaken during Stage 2 MCA.

Table 8-6 Stage 2: MCA Findings for Inchicore Works

CAF Parameters	Option 3 Assessment	Option 4 Assessment
1. Economy	Some Comparative Disadvantage compared to the Other Option	Some Comparative Advantage over the Other Option
2. Integration	Some Comparative Disadvantage compared to the Other Option	Some Comparative Advantage over the Other Option
3. Environment	Some Comparative Disadvantage compared to the Other Option	Some Comparative Advantage over the Other Option
4. Accessibility and Social Inclusion	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
5. Safety	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
6. Physical Activity	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral

Conclusion		**Emerging Preferred Option**

Option 4 is identified as the Emerging Preferred Option in respect of the intervention required for the Inchicore area. The basis for the selection of Option 4 as the preferred option is as follows:

Economy: Option 4 is preferred because it requires less permanent land take than Option 3 – in particular from the residential properties to the north along Landen Road. It also requires less retaining structure to the north to contain the resulting slope.

In terms of Economy, Option 4 is the preferred option.

Integration: Option 4 is considered to have some Comparative Advantage over Option 3 because it will have reduced long-term impact on residential properties and residentially zoned land. Land to the south is identified as having significant regeneration potential and is part of the Naas-Ballymount-Cherry Orchard-Park West URDF Masterplan, currently being prepared by Dublin City Council and South Dublin County Council. It is anticipated in the long term that low density industrial units will give way to more sustainable high-density development adjacent to the railway.

In terms of Integration, Option 4 is the preferred option.

Environment: Option 4 was found to have 'Some Comparative Advantage' over option 3 in terms of minimising the potential effect on the following environmental factors: Noise and Vibration, Air and Climate; Landscape and Visual; Water Resources, Agricultural and Non-agricultural Land Use; and Geology and Soils. Moving the railway and works away from the residential properties to the north was the key advantage of Option 4.

Due to the removal of both the Signal Box and Turret in Option 4, Option 3 was found to have 'Some Comparative Advantage' in respect of Cultural Heritage and Architectural Heritage and Biodiversity (potential for bat roosts); however, this did not change the overall assessment findings.

In terms of Environment, Option 4 is the preferred option.

Accessibility and Social Inclusion: There is no comparative advantage or disadvantage between the options. This criterion is not relevant for this zone. Both options are focused on widening the existing rail corridor for four tracking where there is no access to the public.

In terms of Accessibility and Social Inclusion all options are identified as comparable.

Safety: There is no comparative advantage or disadvantage between the options.

In terms of Safety all options are identified as comparable.

Physical Activity: There is no comparative advantage or disadvantage between all the options. This criterion is not relevant for this area. Both options are focused on widening the existing rail corridor for four tracking where there is no access to the public.

In terms of Physical Activity all options are identified as comparable.

8.5.4. Emerging Preferred Option

The Emerging Preferred Option focuses the necessary enhancement of the rail corridor to the south requiring the demolition / relocation of some Iarnród Éireann facilities within the Inchicore Depot, but minimising third party properties and land to be affected. However, there will be potential interference to property rights.

Based on the level of information and design available at this time for Public Consultation No. 1, the extent of permanent works that may potentially interfere with property rights relate to:

- The 3m strip between the existing railway corridor and the rear of properties along Landen Road.
- Part of the garden of No. 4 George's Villas.
- The yard area and plant/attachments to the rear of commercial units in Westlink Industrial Estate and at the end of Jamestown Road.

There may also be temporary interference of these and other property rights during construction of the permanent works along the rail corridor however technical and construction related solutions will seek to minimise these. Construction requirements (including potential temporary interference of property rights) and methodologies will be presented at Public Consultation No. 2.

8.6. Area around Khyber Pass Footbridge (OBC5)

Refer to Annex 3.7 *Park West to Heuston Station – Technical Optioneering Report* (Area around Khyber Pass*).*

8.6.1. Context

This focus of area is four-tracking and the clearances of the Khyber Pass Footbridge (OBC5) which is an existing pedestrian overbridge linking Inchicore Works and Sarsfield Road via a lane between Landen Road and the Seven Oaks development.

The footbridge was installed by Iarnród Éireann in the early 2000s and crosses the railway at a high skew. The edge of stairways incorporates a bicycle ledge that allows users to manoeuvre bicycles more easily to and from deck level.

Access to the Sarsfield Road on the north side is secured by means of a keypad locked steel access gate. The bridge is exclusively for use by Irish Iarnród Éireann staff and does not form part of a public footway.

Figure 8-11 Khyber Pass Footbridge (West elevation)

8.6.2. Stage 1: Preliminary Sifting

8.6.2.1. Feasibility and Project Requirements

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this area are:

- Increase number of tracks from three to four.
- Electrification of two tracks for DART services.
- Provide vertical electrical clearance through existing structures or amend or reconstruct structures to provide the required clearance.
- Keep current functionality of footbridge.
- Replacement bridge options to be ambulant disabled accessible and incorporate a bicycle ledge.

The existing footbridge currently has three tracks beneath it and has insufficient horizontal clearance to safely accommodate four tracks.

The Track & Signal headquarters building on the south side of the bridge poses a geometric constraint for bridge replacement options with increased span lengths and higher deck levels (as they would require longer stairs). The wall of the back gardens of private properties to the north also constrains options.

In addition, the track alignment through this area is linked to the solutions for Inchicore where the rail corridor is either widened to the north or to the south.

A total of three options have been developed including a 'Do-Nothing' Option and a 'Do-Minimum' Option. The options will require the following elements:

- Earthworks (embankment steepening or widening) and track bed formation design for new tracks.
- Derailment blocks (Option 1 only).
- Bridge foundation design.
- Replacement of northern boundary wall (1m – 2m in height) and replacement of southern boundary minor retaining walls (Options 1 and 2). Replacement masonry and concrete walls are considered to be suitable at this stage of development. Intervention on the masonry wall only locally if / where required.

8.6.2.2. Findings

The 'Do Minimum' and 'Do Something' options are compatible with the investment guidelines and requirements for the DART+ Programme. In terms of the Environment, there are no environmental issues at this stage which would discount any option solely on environment criteria i.e., no impact on environmental sites of National or International significance. Both Economy and Environment criteria feed into the Stage 2: MCA process.

The findings of the Preliminary Assessment (Sifting) are set out in **Table 8-7**.

Table 8-7 Stage 1:Preliminary Assessment (Sifting) Findings for Khyber Pass Footbridge (UBC4)

Preliminary Assessment (Sifting) for Khyber Pass Footbridge (UBC4)		
Option	**Description**	**Findings**
Option 0: Do Nothing	The existing infrastructure remains unchanged. There are no interventions.	Will not deliver project objectives or requirements.
Option 1: Do Minimum	Four-tracking and electrification with the least amount of work to the Khyber Pass Footbridge (OBC5A) itself.	The addition of another track would result in insufficient horizontal clearance between the tracks and derailment protection walls. It therefore will not deliver project objectives or requirements.
Option 2	Remove the Khyber Pass Footbridge (OBC5) permanently and implement the use of an alternative (existing) pedestrian access route.	Will not deliver project objectives or requirements as it does not maintain functionality.
Option 3	Replace the existing bridge with a new bridge that has increased horizontal and vertical clearance.	Feasible

The summary findings of the Stage 1: Preliminary Assessment (Sifting) are as follows:

- Options 0, 1 and 2 failed to meet the necessary Engineering Feasibility and Project Requirements (highlighted in grey in **Table 8-7**); and
- Option 3 meets the necessary Engineering Feasibility and Project Requirements (highlighted in green in **Table 8-7**). As only Option 3 meets the necessary Engineering Feasibility and Project Requirements it is the preferred solution for the area. No requirement for Stage 2: MCA

8.6.3. Emerging Preferred Option

The Emerging Preferred Option will replace the existing footbridge with a new footbridge that has increased horizontal and vertical clearance.

Based on the level of information and design available at this time for Public Consultation No. 1, the extent of permanent works (to include the base of the replacement footbridge) may extend beyond the existing railway corridor and Iarnród Éireann's property boundary to encroach on properties to the immediate west (i.e., the rear gardens of properties along Landen Road) and east.

There may also be temporary interference of property rights during construction of the replacement footbridge given the narrow nature of the lane between Landen Road and the Seven Oaks Apartment Complex; however technical and construction related solutions will seek to minimise these. Construction requirements (including potential temporary

interference of property rights) and methodologies will be presented at Public Consultation No. 2.

8.7. Works around Sarsfield Road Bridge (UBC4)

Refer to **Annex 3.8** *Park West to Heuston Station – Technical Optioneering Report* (Area around Sarsfield Road Bridge*).*

8.7.1. Context

This area extends from the west side of Sarsfield Road Bridge (UBC4) to just west of Memorial Road Bridge (OBC3). Refer to **Figure 8-12**.

The railway corridor along this section comprises three tracks and it includes Sarsfield Road Bridge (UBC4) which carries the three rail tracks over the single-carriageway Sarsfield Road below. The road is in a deep cutting that is supported by masonry retaining walls on all four sides. The carriageway width is narrow, and a yield system is in operation which permits only a single lane of traffic beneath the structure.

There is a commercial property located on the south-east side of the bridge retained along Sarsfield Road by a masonry wall. Its northern boundary with the rail corridor is a masonry and blockwork retaining wall. A horse sanctuary/field is located on the opposite (northern side of the corridor).

Further to the east, the railway is at grade then generally returns to a cutting formed by retaining walls along the south side and an earthwork cutting slope along the north side between the railway and the Chapelizod Bypass.

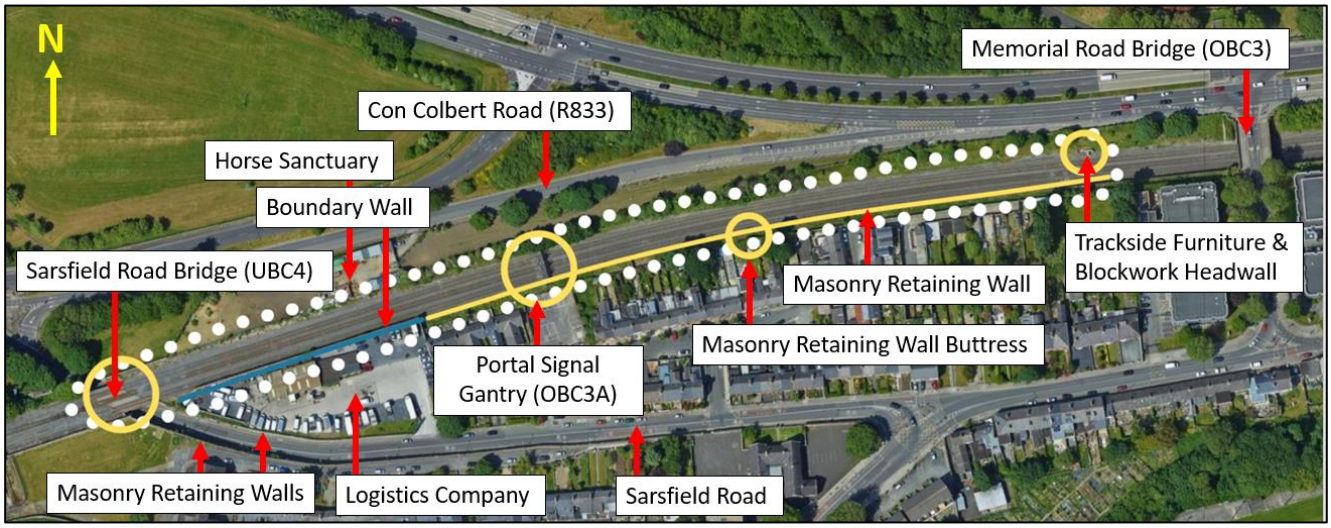

Figure 8-12 Aerial view (white dotted outline)

8.7.2. Stage 1: Preliminary Sifting

8.7.2.1. Requirements and Challenges

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this area are:

- Increase the number of tracks from three to four.
- Electrification of two tracks for DART services.
- Provide vertical electrical clearance through existing structures or amend or reconstruct structures to provide the required clearance.
- Maintain functionality of existing roads.

The existing Sarsfield Road Bridge (UBC4), which currently carries three tracks, has insufficient width to carry an additional track. The options proposed involve reconstructing the bridge with new structures that have sufficient width for four tracks. As this structure is an underbridge, the installation of overhead line electrification (OHLE) at the bridge is not a significant challenge.

Sarsfield Road is in a deep cutting. Masonry walls up to circa 5m retain the adjacent grounds on all four sides of the structure. Although not protected, the bridge is noted as part of the Dublin Industrial Heritage register associated with the Great Southern and Western Railway. Minimising the potential impact on the walls and abutments and maintaining their stability is a challenge.

Figure 8-13 Sarsfield Road Bridge (UBC4) (South Elevation)

8.7.2.2. Findings

Three options (excluding the Do-Nothing Option) were identified for the Sarsfield Road Underbridge (UBC4). All 'Do Something' Options include:

- Earthworks and track-bed formation design for new tracks.
- New bridge abutment piles and/or new decking and wingwall modifications (e.g. ground anchors to retain existing retaining walls).
- New retaining wall designs along with the majority of the northern and southern boundary of the railway. The retaining walls would be required to provide the necessary horizontal width for the four tracking.
- New earthworks or retaining walls likely to require encroachment on land outside the existing southern railway boundary to the east of Sarsfield Road Bridge (UBC4) to accommodate the new alignments.
- New lighting under the bridge to replace existing lighting.

Other relevant considerations include, need for negotiation with Bus Connects to co-ordinate implementation programmes where possible, as well as the sequencing of the works with respect the works proposed at Memorial Road Bridge (OBC3) and South Circular Road Bridge (OBC1), respectively.

In terms of the Economy, all options are compatible with the investment guidelines and requirements for the DART+ Programme. In terms of the Environment, there are no environmental issues at this stage which would discount any option solely on environment criteria i.e., no impact on environmental sites of National or International significance. Economy and Environment criteria both feed into the Stage 2: MCA process.

The findings of the Preliminary Assessment (Sifting) are set out in **Table 8-8**.

Table 8-8 Stage 1: Preliminary Assessment (Sifting) Findings for Sarsfield Road Bridge (UBC4)

Preliminary Assessment (Sifting) for Sarsfield Road Bridge (UBC4)		
Option	**Description**	**Findings**
Option 0: Do Nothing	Leave as is.	Will not deliver project objectives or requirements.
Option 1: Do Minimum	Reuses the existing three. tracks on the existing bridge and provide an additional track on a new bridge on the south side of the existing structure.	Reusing the existing tracks at their current line and level is not compatible with vertical and horizontal design constraints for the track / corridor (Permanent Way). It therefore will not deliver project objectives or requirements

Preliminary Assessment (Sifting) for Sarsfield Road Bridge (UBC4)		
Option 2	Replaces the existing bridge deck with two new decks capable of carrying four tracks.	Feasible
Option 3	Retains the existing bridge (width of two tracks) and placement of ballast on top to become a ballasted bridge structure. A new bridge carrying two new tracks would be constructed on the south side of the existing bridge.	Current structure not suitable for the amendments proposed. It therefore will not deliver project objectives or requirements

The summary findings of the Stage 1: Preliminary Assessment (Sifting) are as follows:

- Options 0, 1, and 3 failed to meet the necessary Engineering Feasibility and Project Requirements (highlighted in grey in **Table 8-8**); and
- Option 2 meets the necessary Engineering Feasibility and Project Requirements for the area (highlighted in green in **Table 8-8**).

Option 2 meets the necessary Engineering Feasibility and Project Requirements and is the Emerging Preferred Option in respect of the intervention required for the area. No requirement for Stage 2: MCA.

8.7.3. Emerging Preferred Option

The Emerging Preferred Option widens the rail corridor to the north (adding a fourth track) and replaces the existing bridge deck with two new bridge decks capable of carrying four tracks. Based on the level of information and design available at this time for Public Consultation No. 1, the extent of permanent works will extend beyond the existing railway corridor and Iarnród Éireann's property boundary with potential interference of property rights to the south of the existing rail corridor, including the commercial property fronting onto the railway line to the south east of Sarsfield Road Bridge (Dan Ryan Truck Rental).

There may also be temporary interference of this and other property rights during construction of the permanent works along the rail corridor and works around the bridge however technical and construction related solutions will seek to minimise these. Construction requirements (including potential temporary interference of property rights) and methodologies will be presented at Public Consultation No. 2.

8.8. Works Around Memorial Road Bridge (OBC3)

Refer to **Annex 3.9** *Park West to Heuston Station – Technical Optioneering Report (Area around Memorial Road Bridge).*

8.8.1. Context

This area is focused on Memorial Road Bridge (OBC3). The rail corridor consists of three tracks below the surrounding ground level. Refer to **Figure 8-14**.

Memorial Road Bridge carries two lanes of northbound traffic over the railway from Inchicore Road (R839) to Con Colbert Road / Chapelizod Bypass (R148). There are no southbound traffic lanes on the bridge. The signalised junction of Memorial Road and the Chapelizod Bypass is immediately adjacent to the north side of the bridge.

The bridge is a highly trafficked pedestrian route providing access between Memorial Park and the Kilmainham Gaol historical sector and community facilities.

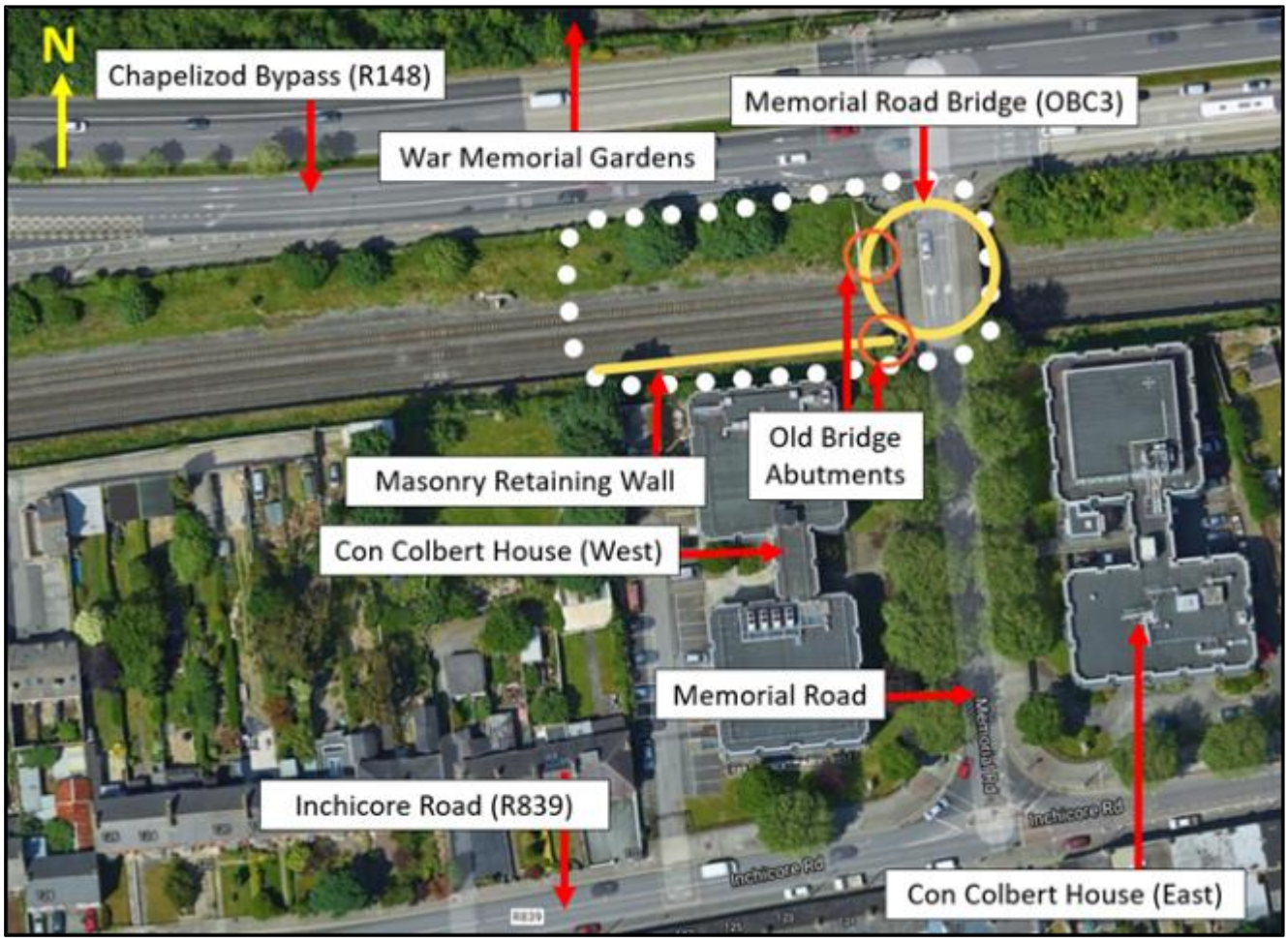

Figure 8-14 Aerial View (White Dotted Outline)

Figure 8-15 Memorial Road Bridge, OBC3 (East Elevation)

8.8.2. Stage 1: Preliminary Sifting

8.8.2.1. Requirements

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this area are:

- Increase number of tracks from three to four.
- Electrification of two tracks for DART services.
- Provide vertical electrical clearance through existing structures, or amend or reconstruct structures, to provide the required clearance.
- Maintain functionality of existing roads.

The track alignment through this area is linked to the rail corridor solutions at Inchicore where the rail corridor is widened either to the north or to the south. However, in this area all options look to widen the corridor to the north into the cutting slope between the existing rail line and the Chapelizod Bypass having regard to the proximity of commercial and residential properties to the south.

The existing Memorial Road Bridge (OBC3), which currently has three tracks beneath it, has insufficient horizontal clearance for four tracks. The options involve reconstructing the bridge with a new structure that has sufficient horizontal and vertical clearance for four tracks and overhead line electrification.

Due to the existing road profiles and proximity of the Chapelizod Bypass on the north side of the bridge, minor road level increases would require a significant amount of highly disruptive roadworks to tie-in new (increased) road levels to the existing levels. Therefore, track lowering forms the basis of all feasible options considered. Replacement bridge interventions consider various combinations of track lowering and increasing road levels to achieve the necessary vertical clearance.

8.8.2.2. Stage 1: Findings

A total of seven options have been developed for including a 'Do-Nothing' option and a 'Do-Minimum' option. The 'Do Something' all will require the following elements:

- New retaining walls to create space in the existing cutting slope on the north side of the corridor.
- Removal of disused abutments on the north-west and south-west sides of Memorial Road Bridge (OBC3).
- Intervention to stabilise the wall along the southern boundary, if /as required.
- Widening of the bell mouth at the junction with the o Colbert Road / Chapelizod Bypass (R148) and tie in requirements; the extent of roadworks in a southerly direction from the bridge would be almost directly proportional to the level of bridge raising.
- Relocation of a variety of service cables, utilities etc.

In terms of the Economy, all options are compatible with the investment guidelines and requirements for the DART+ Programme. In terms of the Environment, there no environmental issues at this stage which would discount any option solely on environment criteria i.e., no impact on environmental sites of National or International significance. Economy and Environment criteria both feed into the Stage 2: MCA process.

The findings of the Preliminary Assessment (Sifting) are presented in **Table 8-9**.

Table 8-9 Stage 1: Preliminary Assessment (Sifting) Findings for Memorial Road Bridge (OBC3)

Preliminary Assessment (Sifting) for Memorial Road Bridge (OBC3)		
Option	**Description**	**Findings**
Option 0: Do Nothing	The existing infrastructure remains unchanged. There are no interventions.	Will not deliver project objectives or requirements.
Option 1: Do Minimum	Endeavours to achieve the four-tracking and electrification project requirements without widening the existing rail corridor or providing additional vertical and horizontal clearance at Memorial Road Bridge (OBC3).	Minor interventions cannot achieve four-tracking or electrification clearances. It will therefore not deliver project objectives or requirements.
Option 2	Replaces the existing bridge with a new road bridge that has sufficient vertical and horizontal clearance. The vertical clearance requirements are achieved by increasing the road level only.	This road level increase at OBC7 would require extensive works to a significant length of the westbound carriageway of the Chapelizod Bypass.

Preliminary Assessment (Sifting) for Memorial Road Bridge (OBC3)		
		It will therefore not deliver project objectives or requirements
Option 3	Replaces the existing bridge with a new road bridge that has sufficient vertical and horizontal clearance. The vertical clearance requirements are achieved by track lowering only.	Feasible
Option 4	Replaces the existing bridge with a new road bridge that has sufficient vertical and horizontal clearance. The vertical clearance requirements are achieved by track lowering (50%) and increasing road levels (50%).	This road level increase would require extensive works to a significant length of the westbound carriageway of the Chapelizod Bypass which is immediately adjacent to the structure on the north side. It will therefore not deliver project objectives or requirements
Option 5	Replaces the existing bridge with a new road bridge that has sufficient vertical and horizontal clearance. The vertical clearance requirements are achieved by track lowering and increasing road levels (other than a 50% split). This Option includes the original Concept Design (ARUP, 2018).	This road level increase would require extensive works to a significant length of the westbound carriageway of the Chapelizod Bypass which is immediately adjacent to the structure on the north side. It will therefore not deliver project objectives or requirements
Option 6	Replaces the existing bridge with a new road bridge that has sufficient vertical and horizontal clearance. The vertical clearance requirements are achieved by increasing the road level to a maximum level, above which works would be required to the Chapelizod Bypass.	Feasible

The summary findings of the Stage 1: Preliminary Assessment (Sifting) are as follows:

- Options 0, 1, 2, 4 and 5 failed to meet the necessary Engineering Feasibility and Project Requirements (highlighted in grey in **Table 8-9**); and
- Options 3 and 6 met the necessary Engineering Feasibility and Project Requirements and were brought forward to Stage 2: MCA for detailed assessment (highlighted in green in **Table 8-9).**

8.8.3. Stage 2: MCA

Two options met the necessary Engineering Feasibility and Project Requirements and were brought forward to Stage 2: MCA for detailed assessment, namely Option 3 and Option 6. These are described in summary below.

8.8.3.1. Option 3

This option comprises the replacement of the bridge with a longer span bridge. In addition, the rail tracks would need to be lowered to facilitate the electrification infrastructure beneath the new bridge.

The masonry wall on the southern side would need to be strengthened due to the lowering of the track.

8.8.3.2. Option 6

Option 6 is similar to Option 3 but slightly increases the height of the bridge to minimise the lowering of the track.

8.8.3.3. MCA Findings

Table 8-10 shows the summary findings of the comparative assessment undertaken during Stage 2 MCA.

Table 8-10 Stage 2: MCA Findings Memorial Road Bridge (OBC3)

CAF Parameters	Option 3 Assessment	Option 6 Assessment
1. Economy	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
2. Integration	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
3. Environment	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
4. Accessibility and Social Inclusion	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
5. Safety	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral
6. Physical Activity	Comparable to the Other Option / Neutral	Comparable to the Other Option / Neutral

Conclusion	Comparable to the Other Option / Neutral	Comparable to Other Option / Neutral

Across the CAF Parameters of Economy, Integration, Accessibility and Social inclusion, Safety and Physical Activity there was no comparative advantage or disadvantage between the two options.

In terms of the Environment, despite some advantage recorded under the landscape and visual factor for Option 3, the overall findings for the MCA for Environment are assessed as neutral. The point of difference between the options related to construction stage impacts to the road surface, including potential to impact trees which form the 'avenue vista' of the road; however, these potential impacts can be addressed through detailed construction stage planning and alone would not be reasonable to evaluate the MCA above neutral finding.

In order to streamline and simplify the reporting from the MCA results, it was considered appropriate at this stage to combine the two feasible options into a single option. The detailed design differences will remain as a potential design variation to be further explored through the future design process. Therefore, Option 3 is brought forward, with Option 6 as a design variation / comparator to be further explored through the future design process.

8.8.4. Emerging Preferred Option

The Emerging Preferred Option is considered the optimum solution in terms of minimising impacts on third party property owners. Based on the level of information and design available at this time for Public

Consultation No. 1, the extent of permanent works is not envisaged to interfere with third party residential or commercial property rights although strengthening of the masonry wall on the southern side may be required.

There may be temporary interference of property rights during construction along the rail corridor and works around the bridge however technical and construction related solutions will seek to minimise these. Construction requirements (including potential temporary interference of property rights) and methodologies will be presented at Public Consultation No. 2.

8.9. Works Around South Circular Road Bridge (OBC1)

Refer to **Annex 3.10** *Park West to Heuston Station – Technical Optioneering Report* (Area around South Circular Road Junction*).*

8.9.1. Context

This area extends from the east side of Memorial Road Bridge (OBC3) to the where the main rail line enters Heuston Station yard (known as Islandbridge Junction). Refer to **Figure 8-16**. The railway corridor currently consists of three tracks between Memorial Road Bridge (OBC3) and South Circular Road Bridge (OBC1). The number of tracks then increases to the east side of South Circular Road Bridge (OBC1) at Islandbridge Junction.

The rail corridor along this section is primarily in cutting (i.e., the rail level is below the surrounding ground level) with retaining walls along the south side and earthwork slopes along the north side.

There are two major road overbridges along this section - the South Circular Road Bridge (OBC1) and St. John's Road Bridge (OBC0A). Together these structures carry road traffic, pedestrians and cyclists' traffic across the rail line and facilitate traffic movements at the junction of South Circular Road (R111), the Chapelizod Bypass (R148) and St. Johns Road West (also R148).

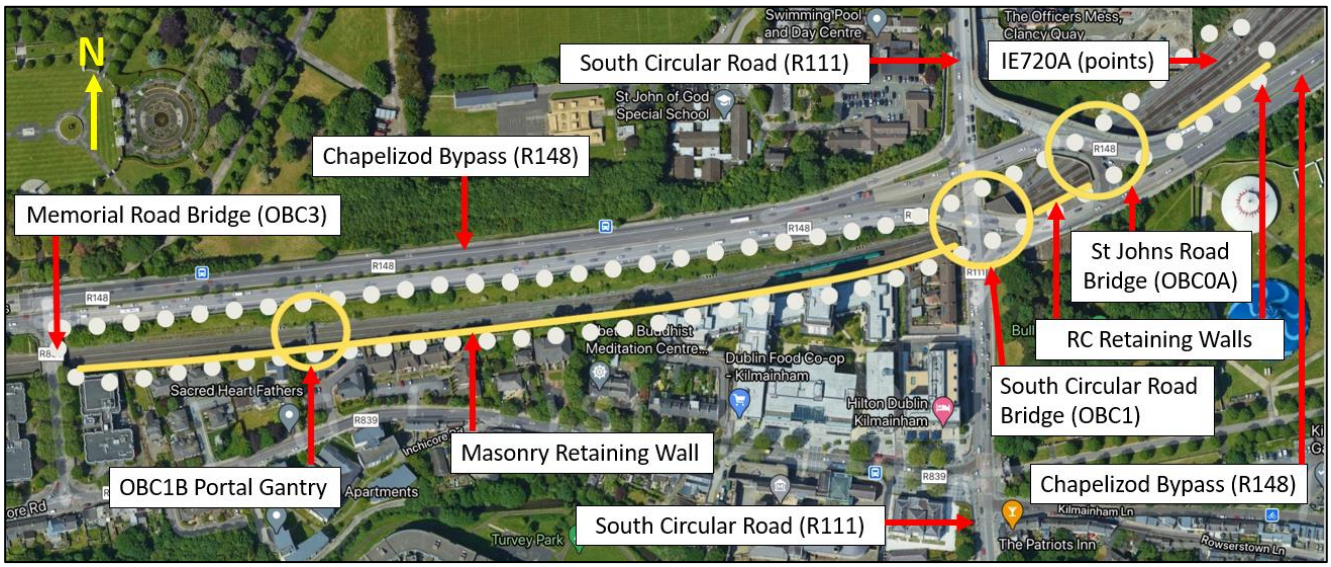

Figure 8-16 Aerial View (White Dotted Outline)

Figure 8-17 Masonry Retaining Wall Facing West towards Inchicore

Figure 8-18 St. John's Road Bridge (OBC0A) with South Circular Road Bridge (OBC1) in the Background

8.9.2. Stage 1: Preliminary Sifting

8.9.2.1. Requirements

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this area are:

- Increase number of tracks from three to four.
- Electrification of two tracks for DART services.
- Either provide vertical electrical clearance through existing structures or amend or reconstruct structures to provide the required clearance.
- Maintain functionality of existing roads.

The existing road network poses significant constraints in terms of achieving the project requirements of providing an additional fourth track and electrification, both in terms of area available for the enhancement of the corridor and flexibility to change its vertical alignment for the accommodation of the electrical clearance

It is not considered practical to add an additional track on the south side of the rail corridor due to the density and proximity of commercial and residential properties between Memorial Road Bridge (OBC3) and South Circular Road Bridge (OBC1).

The additional track can be placed on the north side by installing a retaining structure along the cutting slope between the two bridges. The track will be placed between the existing rail line and the Chapelizod Bypass, which runs parallel.

The existing South Circular Road Bridge (OBC1), currently has three tracks underneath, already close to limit of the allowed horizontal clearance, so it cannot accommodate an additional track. It also lacks vertical clearance for electrification.

To the east, the existing St John's Road Bridge (OBC0A) which currently has three tracks beneath the southern span and one track beneath the northern one, has sufficient horizontal clearance for more than four tracks between both spans, but lacks vertical clearance for electrification.

Due to their proximity, the solution to the above issues requires a combined intervention for both that addresses both the lack of horizontal and vertical clearance in South Circular Road Bridge (OBC1) and the lack of vertical clearance in St John's Road Bridge (OBC0A). Such a solution requires either to reconstruct the bridge with a wider replacement structure (to facilitate four tracks) or to retain the existing structure (three tracks) and install a buried portal structure (cut and cover) on the north side of South Circular Road Bridge (OBC1) to provide space for an additional fourth track.

The buried structure solution requires significant track lowering to achieve the general clearance requirements for new structures in accordance with Iarnród Éireann standards. This solution also requires some lowering of the existing tracks beneath the existing northern span of St John´s Road Bridge (OBC0A) structure to facilitate the installation of the Overhead Line Electrification (OHLE) equipment needed for electrification, but it is not as significant. The new tracks beneath the new structure would be at a lower level than the two remaining tracks beneath South Circular Road Bridge

(OBC1), as the latter won´t need electrification. A retaining structure will be required to separate and retain tracks on the approach to OBC1, but there´s still a significant advantage by separating both the Intercity tracks from the DART tracks is that the first do not require electrification, so they can fit vertically underneath the existing structures. In the above case, removing one of the existing tracks from OBC1 would improve lateral clearance thus significantly improving safety.

Reconstructing South Circular Road Bridge (OBC1) to provide a wider structure for four tracks would require significant track lowering to achieve the clearance requirement for new structures and the OHLE.

In both cases (i.e., a buried structure solution or South Circular Road Bridge (OBC1) reconstruction solution), track lowering to absorb the vertical clearance requirements is preferable over increasing the road levels at the South Circular Road junction. Due to the existing road profiles on the approach to the junction, road level increases would require a significant extent of highly disruptive roadworks to tie-in new (increased) road levels to the existing levels. Therefore, track lowering forms the basis of feasible options considered. These issues are discussed further throughout the *Park West to Heuston Station – Technical Optioneering Report (Area around South Circular Road Junction)* - **Annex 3.10.**

8.9.2.2. Stage 1: Findings

A total of eight options (excluding the 'Do-Nothing' Option) were identified for the area.

In terms of the Economy, all options are compatible with the investment guidelines and requirements for the DART+ Programme. In terms of the Environment, there are no issues this stage which would discount any option solely on environment criteria i.e., no impact on environmental sites of National or International significance. Economy and Environment criteria both feed into the Stage 2: MCA process.

The findings of the Preliminary Assessment (Sifting) are set out in **Table 8-11**.

Table 8-11 Stage 1: Preliminary Assessment (Sifting) Findings for South Circular Road Bridge (OBC1)

Preliminary Assessment (Sifting) for South Circular Road Bridge (OBC1)		
Option	**Description**	**Findings**
Option 0: Do Nothing	No interventions.	Will not deliver project objectives or requirements.
Option 1: Do Minimum	Four tracking without widening the existing rail corridor or providing additional vertical and horizontal clearance at South Circular Road Bridge (OBC1) and St. John's Road Bridge (OBC0A).	Cannot be achieved. Does not meet project objectives.
Option 2	South Circular Road Bridge (OBC1) is reconstructed with a greater span and height to provide sufficient vertical and horizontal clearance. All vertical clearance requirements would be absorbed by track lowering.	Feasible

Preliminary Assessment (Sifting) for South Circular Road Bridge (OBC1)		
Option 3	Similar to Option 2, but all vertical clearance requirements and increases to structural depth would be absorbed by track lowering (50%) and increasing road levels (50%).	The level of road level increase would require extensive works to the junction and to the approach roads. It does not meet the project requirement of maintaining functionality of roads.
Option 4	Replace South Circular Road Bridge (OBC1) with a wider structure i.e., a long over-widened single span portal, constructed in 2 phases. All vertical clearance requirements would be absorbed by track lowering	Feasible
Option 5	Similar to Option 4, but all vertical clearance requirements and increases to structural depth would be absorbed by track lowering (50%) and increasing road levels (50%).	The level of road level increase would require extensive works to the junction and to the approach roads. It does not meet the project requirement of maintaining functionality of roads.
Option 6	Retain South Circular Road Bridge (OBC1). A new 'cut and cover' buried portal structure would be constructed on the north side of the existing bridge. The existing bridge would facilitate two non-electrified tracks. The new structure would provide the space for the two electrified tracks. All vertical clearance requirements would be absorbed by track lowering and localized road level increases.	Feasible
Option 7	Similar to Option 2 but would incorporate a minor and localised increase to road levels on the Chapelizod Bypass on the north west side of the new bridge.	Feasible
Option 8	Similar to Option 4 but would incorporate a minor and localised increase to road levels on the Chapelizod Bypass on the north west side of the new bridge.	Feasible

The summary findings of the Stage 1: Preliminary Assessment (Sifting) are as follows:

- Options 0, 1, 3 and 5 failed to meet the necessary Engineering Feasibility and Project Requirements for the area (highlighted in grey in **Table 8-11**); and
- Options 2, 4, 6, 7, and 8 met the necessary Engineering Feasibility and Project Requirements for the area and were brought forward to Stage 2: MCA for detailed assessment ((highlighted in green) in **Table 8-11**).

8.9.3. Stage 2: MCA

Five options met the necessary Engineering Feasibility and Project Requirements for the area and were brought forward to Stage 2: MCA for detailed assessment, namely Options 2, 4, 6, 7 and 8.

8.9.3.1. Option 2

Option 2 considers the replacement of OBC1 in combination with lowering of the track. The replacement bridge span will be long enough to accommodate the 4 tracks and the lowering of the track will ensure that the electrification infrastructure can pass under the bridge.

The road junction in this area is extremely busy and frequently has traffic queues so any work in this area is likely to impact traffic. Due to the way the existing bridge is configured a replacement bridge will require full demolition and reconstruction in one phase and hence the area of the bridge will not be accessible to traffic during construction, which could last up to 6 months. This means that traffic will be severely disrupted during this period.

Lowering the track in this area is difficult because the boundary wall to the south has foundations that will be disturbed. To do this, some structural strengthening of the base of the wall may be required.

The boundary to the north comprises a sloped soil cutting. Widening the corridor for the additional track will require a new wall to be built along this boundary.

Most of the works will be undertaken within the property ownership of CIE or Dublin City Council, but there may be interference of the property rights at the south west corner of the bridge to enable bridge construction.

8.9.3.2. Option 4

Option 4 considers the replacement of South Circular Road Bridge (OBC1) in combination with lowering of the track. The replacement bridge span will be long enough to accommodate the four tracks and the lowering of the track will ensure that the electrification infrastructure can pass under the bridge.

The road junction in this area is extremely busy and frequently has traffic queues, so any work in this area is likely to impact traffic. Therefore, the demolition of the existing bridge and the construction of the new bridge is carried out in phases to enable some degree of traffic to flow while the construction is ongoing. To lower the impact on traffic, this option will use a wider bridge. This enables part of the new bridge to be constructed first and traffic to be diverted on to it before the remainder of the existing bridge is demolished and reconstructed.

While there is a great improvement over Option 2 in terms of traffic, there is still an impact, and increased queuing of traffic will be expected.

Lowering the track in this option is difficult because the boundary wall to the south has foundations that will be disturbed. To do this, some structural strengthening of the base of the wall may be required.

The boundary to the north comprises a sloped soil cutting. Widening the corridor for the additional track will require a new wall to be built along this boundary. There is likely to be interference of the property rights at the south west corner of the bridge to enable the construction of this option.

8.9.3.3. Option 6

Option 6 leaves South Circular Road Bridge (OBC1) in place and instead includes the construction of a new structure to the north of South Circular Road Bridge (OBC1). The new structure would be for the new DART tracks and the existing Intercity service would continue under South Circular Road Bridge (OBC1).

The road junction in this area is extremely busy and frequently has traffic queues, so any work in this area is likely to impact traffic. The new structure can be built in phases and there is enough road space where the new structure is located to enable traffic impact to be much reduced over other options.

Because the new structure would be for the DART trains, it would need to be electrified. This means that OBC1 would not need to be electrified and the track levels could be left as they are currently. This means that the boundary wall to the south can also be left as it is.

The new structure is long walls need to be constructed on both sides of the new structure beyond the junction area to the west.

All works could be undertaken within land owned by CIE and Dublin City Council.

8.9.3.4. Option 7

Option 7 is similar to Option 2 but increases the road level in a localised area to minimise the extent that the track needs to be lowered.

8.9.3.5. Option 8

Option 8 is similar to Option 4 but increases the road level in a localised area to minimise the extent that the track needs to be lowered.

8.9.3.6. MCA Findings

Table 8-12 shows the summary findings of the comparative assessment undertaken during Stage 2 MCA for South Circular Road Bridge (OBC1).

Table 8-12 Stage 2: MCA Findings for South Circular Road Bridge (OBC1)

CAF Parameters	Option 2	Option 4	Option 6	Option 7	Option 8
1. Economy	Some Comparative Disadvantage over Other Options	Some Comparative Disadvantage over Other Options	Significant Comparative Advantage over Other Options	Some Comparative Disadvantage over Other Options	Significant Comparative Disadvantage over Other Options
2. Integration	Some Comparative Disadvantage over Other Options	Some Comparative Advantage over Other Options	Some Comparative Advantage over Other Options	Some Comparative Disadvantage over Other Options	Some Comparative Advantage over Other Options
3. Environment	Some Comparative Disadvantage over Other Options	Some Comparative Disadvantage over Other Options	Some Comparative Advantage over Other Options	Some Comparative Disadvantage over Other Options	Some Comparative Disadvantage over Other Options
4. Accessibility and Social Inc	Some Comparative Advantage over Other Options	Some Comparative Advantage over Other Options	Some Comparative Disadvantage over Other Options	Some Comparative Advantage over Other Options	Some Comparative Advantage over Other Options
5. Safety	Some Comparative Disadvantage over Other Options	Some Comparative Disadvantage over Other Options	Some Comparative Advantage over Other Options	Some Comparative Disadvantage over Other Options	Some Comparative Advantage over Other Options
6. Physical Activity	Comparable to Other Options / Neutral	Comparable to Other Options / Neutral	Comparable to Other Options / Neutral	Comparable to Other Options / Neutral	Comparable to Other Options / Neutral
Conclusion			Preferred Option		

Option 6 is identified as the emerging preferred option in respect of the intervention required for the area. The basis for this is as follows:

Economy: With regard to costs, Option 6 is the least expensive option having regard to land take, traffic disruption (temporary works) and capital costs of the works. Option 8 is the most expensive because of extent of capital works and potential for greater traffic disruption.

Neither Option 2 nor 7 allow for phased construction (requiring the removal of the entire bridge) and this would result in significant disruption and diversions (and associated costs) during construction for uses immediately around the junction, business in the area (in particular Inchicore) but also strategically in the context of the wider transport network. While the other options (Option 4, 6 and 8) allow for phased construction maintaining local and strategic access, Option 6 allows for phasing in more localised areas, allowing traffic to continue throughout the construction period with local diversions. Having regard to the importance of the South Circular Road Junction for local and strategic access to economic activities, Option 6 is preferred because the nature of the proposed works can facilitate less traffic disruption than other options.

In terms of Economy, Option 6 is the preferred option.

Integration: Neither Option 2 nor 7 allow for phased construction (requiring the removal of the entire bridge) and this would result in significant local and strategic accessibility issues from disruption and diversions to the local and wider strategic road network. While the other options (Option 4, 6 and 8) allow for phased construction maintaining local and strategic access, Option 6 allows for phasing in localised areas, allowing traffic to continue throughout construction with local diversions. Having regard to the importance of the South Circular Road Junction for local and strategic accessibility Option 6 is preferred from a constructability perspective.

However, there are some comparable advantages of the over-widened structures of Options 2, 4, 7 and 8 where there is greater potential for enhanced junction geometry in the long term.

Railway services would be significantly affected by the need to lower the existing tracks to achieve OHLE clearances, a feature of all options except Option 6. Option 6, however, does necessitate the construction of a retaining wall between the existing and the new tracks from South Circular Road junction to Memorial Road.

In terms of Integration, Options 4, 6 and 8 are comparable with some comparative advantage over the other options considered.

Environment: Option 6 was found to have 'Some Comparative Advantage' over the other options, in terms of minimising the potential effect on: Air and Climate; Landscape and Visual; Cultural Heritage and Architectural Heritage; and Agricultural and non-agricultural land use factors.

In terms of Environment, Option 6 is the preferred option.

Accessibility and Social Inclusion: Options 2, 4, 7 and 8 are identified as having 'Some Comparative Advantages' over Option 6. This relates to the potential to enhance the junction geometry to the benefit of vulnerable as well as vehicular users.

In terms of Accessibility and Social Inclusion Options 2, 4, 7 and 8 are identified as comparable preferred options.

Safety: Options 6 and Option 8 are identified as having 'Some Comparative Advantage' over Options 2, 4, and 7. This relates to the a combination rail of risks associated with steep gradients, requirements to underpin walls and whether construction can be phased to provide sufficient space to accommodate vulnerable road users.

In terms of Safety, Option 6 and 8 are identified as comparable preferred options.

Physical Activity: There is no comparative advantage or disadvantage between all the options.

In terms of Physical Activity all options are identified as comparable.

8.9.4. Emerging Preferred Option

The Emerging Preferred Option widens the rail corridor to the north (adding a fourth track) and replaces the existing bridge with a longer span. In addition, the rail tracks will be lowered to facilitate the electrification infrastructure beneath the new bridge. The masonry wall on the southern side would need to be strengthened due to the lowering of the track and a new wall would be required along the northern side. These permanent works and interventions will generally occur within the existing railway corridor and Iarnród Éireann's property boundary with limited potential interference of property rights.

There may be temporary interference of property rights during construction; however technical and construction related solutions will seek to minimise these. Construction requirements (including potential temporary interference of property rights) and methodologies will be presented at Public Consultation No. 2.

8.10. Works in Heuston Station and Yard

The area around Heuston Station encompass the existing rail lines servicing platform nos. 1-8, signal structures, associated servicing and valet sidings, a carriage wash siding and a subway (UBC1A) providing access for IE personnel to the valeting plant at Heuston Yard; all within Iarnród Éireann's lands.

To the west, this area is bound by the Clancy Quay residential / mixed use development, with the River Liffey located to the north, St. John's Road and The Royal Hospital Kilmainham to the south and the main Heuston Station terminus to the east.

Refer to **Annex 3.11** *Park West to Heuston Station – Technical Optioneering Report (Area around South Circular Road Junction).*

Figure 8-19 Aerial view of area

8.10.1. Stage 1: Preliminary Sifting

8.10.1.1. Feasibility and Project Requirements

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this area are:

- Provide access to platforms and sidings within the Heuston area, as required for the DART+ services.
- Modification of the connections to running lines due to four-tracking modifications
- Provide electrification of platforms and sidings within the Heuston area, as required for the DART+ services (Platform 6, 7 and 8, and sidings to the north).
- Keep current functionality of the other platforms and station services
- Track alignment and drainage requirements.

8.10.1.2. Findings

Both the 'Do-Nothing' and a 'Do-Minimum Option' were assessed for Stage 1. The 'Do-Nothing Option' will not deliver the works necessary to meet the Project objectives or requirements (as identified above); this would include no electrification of the tracks, sidings or platforms.

However, the 'Do-Minimum Option' does deliver the works necessary to meet all the Project objectives or requirements and these works can generally be met within the Iarnród Éireann lands at Heuston Station. It therefore is the Emerging Preferred Option in respect of this section of the line and is described below.

The findings of the Preliminary Assessment (Sifting) are set out in **Table 8-13**.

Table 8-13 Stage 1: Preliminary Assessment (Sifting) Findings for Heuston Station

Heuston Station		
Option	**Description**	**Findings**
Option 0: Do Nothing	Leave as is	Will not deliver project objectives or requirements.
Option 1: Do-Minimum)	Electrification and track rearrangement to provide access to new DART Platforms and update access to inter-city tracks.	Feasible

8.10.2. Emerging Preferred Option

Heuston Station currently does not have any provisions for electrification. Platforms and sidings within the Heuston area are to be electrified to receive the DART fleet. These works will require re-arrangement to provide access to new DART platforms and to update access to inter-city tracks.

In terms of Permanent Way works, the constraints on track work in Heuston Station are predominantly those posed by the need to maintain the operational capability of the existing freight routes, station platforms and servicing infrastructure (such as the train wash, service and stabling sidings), as well as the existing drainage and signalling. The sheer number of tracks, their configuration and connectivity through existing Points & Crossings (P&C's) mean that any modifications must be carefully considered to tie in with the platforms and service facilities.

In the station area, platforms and sidings will be electrified as required for the DART services. The scope of which will be fully concluded at Public Consultation No. 2.

All works can be undertaken within land owned by Iarnród Éireann.

Electrification of the Phoenix Park Tunnel Branch Line requires works to existing structures. The majority of these can be facilitated within the existing railway corridor, with minimal intervention to the structures themselves.

9. East of St John's Road Bridge to Glasnevin Junction

9.1. Introduction

The main Project requirement along the circa 4km between the South Circular Road Junction to Glasnevin Junction is electrification. This section is referred to as the Phoenix Park Tunnel Branch Line. Refer to **Figure 9-1.**

For several of the overbridges, the Liffey Bridge (UBO1) and the Phoenix Park Tunnel, the necessary electrical infrastructure (refer to **Chapter 6**) can be implemented with no, or minimal, intervention outside of the existing rail corridor or significant intervention.

For other bridges, the most likely scenario is that minor works to the structures themselves may be required with or without additional track alterations (including track lowering) to meet the necessary vertical clearances for electrification. Where the 'Do-Minimum' Option is feasible and meets the Project objectives and requirements, it is the Emerging Preferred Option in respect of these bridges. Where the 'Do-Minimum' Option requires further verification, 'Do-Something' Options have been identified and remain open; however, they will not be brought forward for detailed assessment (including Stage 2 MCA, where appropriate) unless the 'Do-Minimum' Option is determined not to be feasible.

Regarding a potential new station at Heuston West (at the site of the existing Platform 10 - south of the Liffey Bridge (UBO1) a feasibility assessment is currently being undertaken by the Project Team. An update on the assessment is provided in this Chapter.

Regarding a future station at Cabra, both track alignment and electrification requirements for DART+ South West will be compatible with a future station.

Refer to the following Emerging Preferred Option maps **Annex 1.11** *Map 11 – Memorial Gardens to East of Phoenix Park Tunnel***, Annex 1.12***Map 12 –East of the Phoenix Park Tunnel to Cabra Road Bridge (OBO7)* and **Annex 1.13** *Map 13 - Cabra Road Bridge (OBO7) to Glasnevin*.

Refer to **Annex 3.12** *East of St John's Road Bridge to Glasnevin Junction – Technical Optioneering Report (Area from East of St John's Road Bridge to East of the Phoenix Park Tunnel),* and **Annex 3.13** *East of St John's Road Bridge to Glasnevin Junction – Technical Optioneering Report (Area from East of the Phoenix Park Tunnel to Glasnevin Junction)* for details.

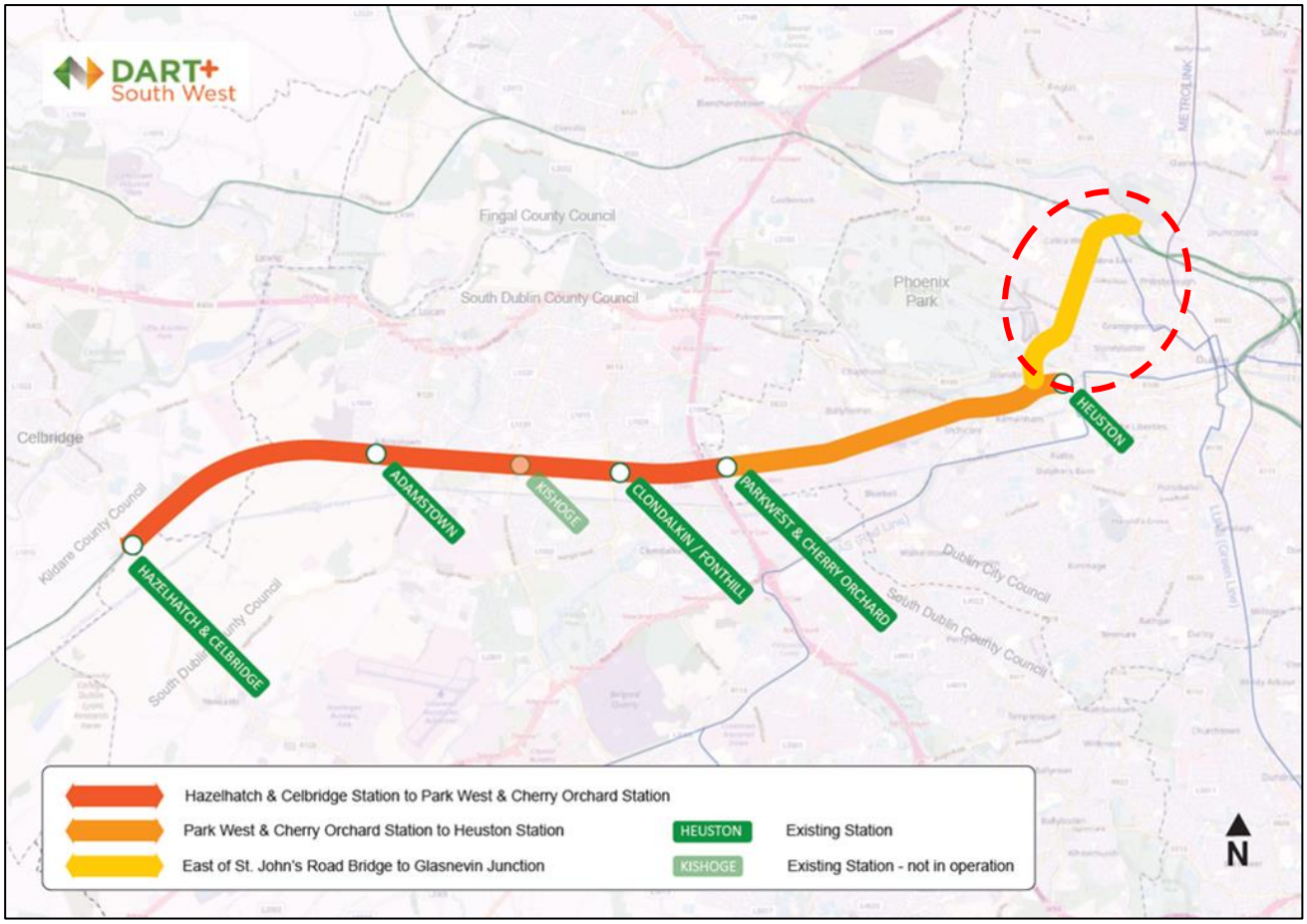

Figure 9-1 East of St John's Road Bridge to Glasnevin Junction

9.2. Description of the Railway Corridor

From the east of the South Circular Road Junction the line continues northwards over the River Liffey via the Liffey Bridge (UBO1) and under Conyngham Road Overbridge (OBO2) where it enters the Phoenix Park Tunnel. The Phoenix Park Tunnel extends 690m under the Phoenix Park and has historically been used for freight and maintenance; however, it reopened in 2016 for regular passenger traffic.

Close to the junction of the Cabra Road and Navan Road the line exits the Phoenix Park Tunnel and continues north under several road bridges. From here, the railway corridor is almost entirely located within steep cuttings (i.e., the rail level is below the surrounding ground level) with vegetation on the side slopes. Bridges along this northern section of the line include McKee Barracks Bridge (OBO3), Blackhorse Avenue Road Bridge (OBO4), Old Cabra Road Bridge (OBO5), Cabra Road Bridge (OBO6), Fassaugh Road Bridge (OBO7), Royal Canal and LUAS Twin Arch (OBO8), the Maynooth Line Twin Arch (OBO9) and, heading east, under the Glasnevin Cemetery Road Bridge (OBO10).

At this point, Glasnevin Cemetery is located to the north of the rail corridor while Prospect Cemetery is located just on the inside bend of the existing line to the south. The line then continues east and

interfaces with the proposed DART+ West line (Maynooth line) at Glasnevin Junction. Refer to **Figure 9-2**.

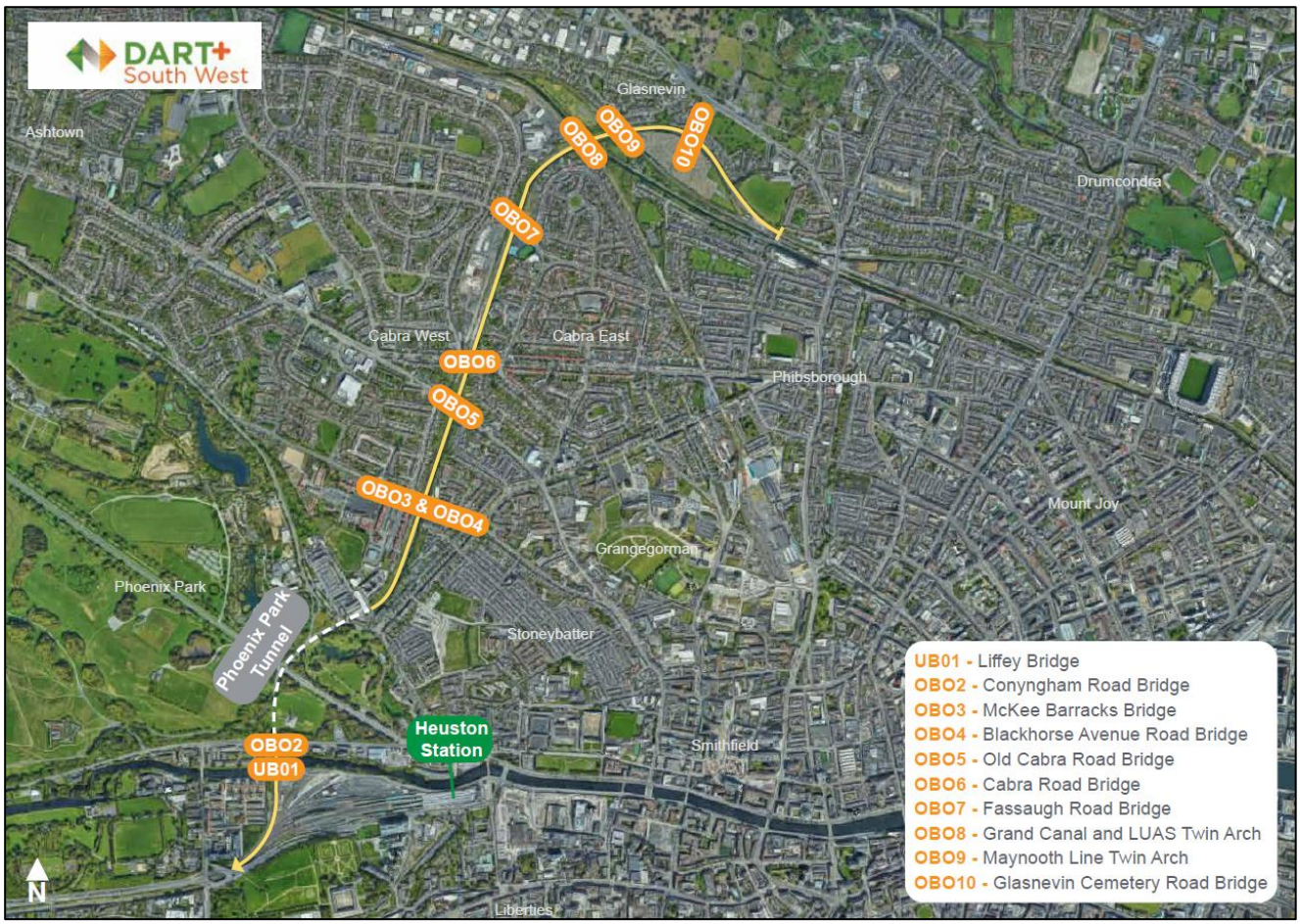

Figure 9-2 Aerial View of the Section of the Railway Corridor

9.3. Stage 1: Preliminary Sifting

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific requirements for this section are:

- Electrification of DART tracks.
- Provide vertical electrical clearance through existing structures or amend structures to provide the required clearance.
- Safe rolling stock passing clearance (required throughout the project, but a particular challenge at the Phoenix Park Tunnel).
- Maintain functionality of existing roads (not applicable to Phoenix Park Tunnel assessment).
- Track alignment and drainage requirements.
- Feasibility of a potential station at Heuston West

The challenges along this section of the line are:

- The existing fixed track system installed on Liffey Bridge (UBO1) is to be retained in order to avoid major bridge reconstruction.
- The alignment of the tracks is constrained by retained structures i.e., Liffey Bridge (UB01), Conyngham Road Overbridge (OBO2) and Phoenix Park Tunnel.
- Phoenix Park Tunnel is narrow, constraining the scope for track realignment to achieve the required clearances for the safe passage of trains.
- In Conyngham Road Overbridge (OBO2) the challenge will be to provide electrical clearance with very limited scope for increasing the road levels of Conyngham Road.
- There are a number of bridges north on the Phoenix Park Tunnel Branch Line with low clearances.

9.3.1. Potential New Station at Heuston West

A preliminary assessment for the station is being undertaken by the Project Team based on the following:

- Two open platforms.
- A pedestrian footbridge or underpass connecting both station sides.
- Platform area and track area will be limited by a fence. Station access will be closed in non-operation hours.
- At least one of the station sides will be accessed by road, including a set-down stop area for vehicles.
- The designs must encompass pedestrian and road accesses to the Heuston LUAS stop and the wider Islandbridge area.

It is noted that the potential new station can be provided with no, or minimal, intervention outside of the existing rail corridor and Iarnród Eireann owned land at Heuston (thereby minimising impacts to the wider area). Further feasibility work is ongoing.

9.3.2. Works to Conyngham Road Overbridge (OBO2)

Conyngham Road Overbridge (OBO2) is a single span bridge that partially covers the entrance to the Phoenix Park Tunnel on the Heuston side. An OHLE solution is not possible with the existing vertical clearance; hence a track or structure intervention is required.

Figure 9-3 Aerial of Conyngham Road Overbridge (OBO2)

A 'Do-Nothing', 'Do-Minimum' and 'Do-Something' option was assessed for Stage 1. The summary findings are set out below.

Figure 9-4 Preliminary Assessment (Sifting) for Conyngham Road Overbridge (OBO2)

Conyngham Road Overbridge (OBO2)		
Option	**Description**	**Findings**
Option 0: Do Nothing	The existing infrastructure remains unchanged. There are no interventions.	Will not deliver project objectives or requirements.
Option 1: Do-Minimum	This Option seeks to achieve the electrification project requirements without widening the existing rail corridor and provides additional vertical clearance at Conyngham Road Overbridge (OBO2) by track lowering only.	Feasible but requires verification.
Option 2: Do Something	This Option combines track lowering with reconstruction of Conyngham Road Overbridge (OBO2) and raising of Conyngham Road in order to provide sufficient vertical clearance to accommodate electrification by providing room for the OHLE.	Feasible.

9.3.2.1. Emerging Preferred Option

In terms of electrification, DART + South West is currently undertaking surveys and analysis along the Phoenix Branch Tunnel Line to understand the current characteristics and constraints. The Emerging Preferred Option will follow the existing rail corridor and may involve track lowering and / or bridge modifications at certain locations to achieve the height requirements for electrification. The specific interventions at each bridge (including Conyngham Road Overbridge (OBO2)) will be based on the analysis of survey data and presented at Public Consultation No. 2.

As noted previously, the Phoenix Park Tunnel and Conyngham Road Overbridge (OBO2) must be considered together when defining the OHLE solution. The options being considered are a flexible OHLE arrangement and a rigid bar arrangement. Refer to **Section 6.1.2.2.3.**

In order to improve the clearances from Liffey River underbridge to the north portal of Phoenix Park Tunnel, a slab track system is also proposed.

All works could be undertaken within the existing rail corridor and land owned by Iarnród Éireann. No interference with third party property rights is envisaged at this time.

9.3.3. Works to Phoenix Park Tunnel

Both the 'Do-Nothing' and a 'Do-Minimum Option' were assessed for Stage 1. The Do-Nothing Option cannot deliver Project objectives or requirements; however, the Do-Minimum Option can provide the necessary electrical infrastructure with no, or minimal, intervention outside of the existing rail corridor or significant intervention to the tunnel. The Do-Minimum Option is therefore the Emerging Preferred Option in respect of works to the Phoenix Park Tunnel. It is described in summary below. While surveys and analysis are ongoing, further optioneering is not envisaged.

Figure 9-5 Northern and Southern Portals to the Phoenix Park Tunnel and view of inside tunnel

9.3.4. Works to Liffey Bridge (UBO1)

The Liffey Bridge (UBO1) is a rail bridge spanning the River Liffey near Heuston Railway Station. It became operational in 1877 and is of wrought iron. Historically used for freight traffic, the bridge has been reopened to regular passenger traffic since November 2016. There is no pedestrian or road traffic access to the bridge.

Both the 'Do-Nothing' and a 'Do-Minimum Option' were assessed for Stage 1. The 'Do-Nothing Option' will not deliver Project objectives or requirements; however, the 'Do-Minimum Option' can provide the

necessary electrical infrastructure with no, or minimal, intervention outside of the existing rail corridor or significant intervention to the bridge. The 'Do-Minimum Option' is therefore the Emerging Preferred Option in respect of works to the Liffey Bridge. It is described in summary below. Further optioneering is not required.

9.3.4.1. Emerging Preferred Option

Liffey Bridge (UBO1) features a fixed track system that constrains the alignment over the structure. The existing fixed track system will remain. The route is also tightly constrained by other existing structures – namely Conyngham Road Overbridge (OBO2) and the Phoenix Park Tunnel.

In order to improve the clearances from Liffey Bridge (UB01) to the north portal of Phoenix Park Tunnel a slab track system is proposed.

Electrification of the Liffey Bridge (UB01) is possible since this structure is an underbridge. The need to install electrification masts attached to the bridge is currently under analysis.

Figure 9-6 Liffey Bridge (Deck Level – Facing South)

All works could be undertaken within the existing rail corridor and land owned by Iarnród Éireann. No interference with third party property rights is envisaged at this time.

Note: Potential Interference with Property Rights is based on the level of information and design available at this time for Public Consultation No. 1. Further work including detailed design and technical and construction related solutions will seek to minimise potential interference with property rights.

9.3.4.2. Emerging Preferred Option

In terms of electrification, the Phoenix Park Tunnel has enough vertical clearance; however, as is directly adjacent to the overbridge Conyngham Road Overbridge (OBO2), these two structures must be considered together when defining the OHLE solution for each option. The options being considered are a flexible OHLE arrangement and a rigid bar arrangement. Refer to **Section 6.1.2.2.3.**

In order to improve the clearances from Liffey Bridge (UB01) to the north portal of Phoenix Park Tunnel a slab track system is proposed. Realignment of the track is also proposed to improve the lateral passing clearances to the tunnel walls and between passing trains.

In addition, there is an existing track drainage system installed in the tunnel. Track realignment may require the reconstruction and integration of the track drainage system.

All works could be undertaken within the existing rail corridor and land owned by Iarnród Éireann. No interference with third party property rights envisaged at this time. The tunnel may require additional improvement works for electrification including surface works (e.g., waterproofing); however, the nature and extent of such works is not known at this time.

9.3.5. Works to Bridges North of the Phoenix Park Tunnel

North of the Phoenix Park Tunnel, the main constraint to the electrification requirements of the Project is the low clearances of existing overbridges in the area (including service bridges), namely: McKee Barracks Bridge (OBO3), Blackhorse Avenue Road Bridge (OBO4), Old Cabra Road Bridge (OBO5), Cabra Road Bridge (OBO6), Fassaugh Road Bridge (OBO7), Royal Canal and LUAS Twin Arch (OBO8), the Maynooth Line Twin Arch (OBO9) and Glasnevin Cemetery Road Bridge (OBO10).

DART + South West is currently undertaking surveys and analysis along this section, including within the tunnel, to understand the current characteristics and constraints.

9.3.5.1. Emerging Preferred Option

For these bridges, the Emerging Preferred Option will follow the existing rail corridor and may involve track lowering and / or bridge modifications at certain locations to achieve the height requirements for electrification. The specific interventions at each bridge along this rail section will be based on the analysis of survey data and presented at Public Consultation No. 2.

Refer to **Annex 3.13** for further details.

McKee Barracks Bridge (OBO3)

Blackhorse Avenue Road Bridge (OBO4)

Cabra Road Bridge (OBO6)

Faussagh Road Bridge (OBO7)

Royal Canal and LUAS Twin Arch (OBO8)

Maynooth Line Twin Arch (OBO9)

Figure 9-7 Sample of the Bridges along the Phoenix Park Tunnel Branch Line

In addition to the vertical clearance issue, the Royal Canal and LUAS Twin Arch (OBO8) and Maynooth Line Twin Arch (OBO9) structures are two narrow masonry arch bridges. Any track realignment around these bridges would require further assessment.

Several roads cross the railway in this area - all of which are via overbridges. No intervention is currently foreseen in respect of these roads.

The end-to-end Emerging Preferred Option comprises the particular interventions and general linear works required to modernise and electrify the full length of the existing railway line.

10. Emerging Preferred Option

10.1. End-to-End Considerations

The end-to-end Emerging Preferred Option comprises the particular interventions and general linear works required to modernise and electrify the full length of the existing railway line.

End-to-End considerations were factored into the option development and assessment process and will continue to inform the project development process, including:

- The phasing of the bridge replacement works will take into consideration the need to keep reasonable levels of traffic. At this moment, it is not envisaged to work simultaneously on more than one bridge at any one time, however the fundamental principle is that works on specific locations will take into consideration the wider impact in order to keep it at reasonable levels.
- Likewise, a number of utilities ducts and mains are associated with the bridges. When a bridge is reconstructed, due consideration will be given to the need to keep these services in operation during construction, either by ensuring that the timing is compatible with alternative back feeding, or doing the necessary arrangements to make such back feeding work, or by providing temporary diversions as required.
- Electrical connections to electrically feed substations from ESB networks will need to be developed. These are currently being analysed with ESB.

10.2. Description of Proposed Emerging Preferred Option

The Emerging Preferred Option comprises general linear works required along the full length of the Project to enable the electrification of the line and the upgrade of the existing network. Along the Hazelhatch & Celbridge to Park West & Cherry Orchard section, these works can generally occur within the existing rail corridor.

The section between Park West & Cherry Orchard and Heuston Station requires electrification and widening to four tracks. To meet these Project requirements the physical surroundings of the rail corridor must be altered. Expanding to four tracks will require widening of the rail corridor and this will have a potential impact on adjoining property owners.

Interventions will also be required at many of the existing bridges to provide enough headroom for OHLE or lateral clearances for four-tracking. Specific interventions in the context of the Emerging Preferred Option are described in **Section 10.2.2**.

10.2.1. General Linear Works

- Overhead electrification equipment will be required along the full extent of the railway line from Hazelhatch to Heuston Station and through the Phoenix Park Tunnel Branch Line up to Glasnevin Junction, where it will link with the proposed DART+ West. This will be similar to that currently used on the existing DART network.
- Six electrical substations will be required at intervals along the rail line to provide power to the network.
- Signalling upgrades and additional signalling will be required to the upgraded infrastructure.
- Where existing bridges do not provide the necessary clearance for overhead electrification of the lines or lateral clearance for four tracking, options are being considered on a case-by-case basis, these include:
    - Provision of specialist electrical solutions for the OHLE with reduced clearance;
    - Lowering the rail track under the bridge;
    - Modification of the existing structure;
    - Removal of the existing structure and provision of a replacement structure; or
    - A combination of the above.
- Overhead Line protection works will be required at all existing rail overbridges.
- Interfaces with existing utilities, boundary treatments (including new retaining walls), drainage works, vegetation management and other ancillary works will be required along the length of the Project.

10.2.2. Specific Elements

10.2.2.1. Area around Le Fanu Road Bridge

An extract of the Emerging Preferred Option map showing the area around Le Fanu Road Bridge (OBC7) is illustrated below.

Annex 1.9 Emerging Preferred Option Map - Map 9 shows the Park West industrial Estate, including Clover Hill Road to Memorial Gardens which includes the area around Le Fanu Road Bridge (OBC7).

A summary of the Emerging Preferred Option is as follows:

- Le Fanu Road Bridge (OBC7) is replaced with a new bridge with a longer span to facilitate the additional width required for the additional tracks.
- The road level will be raised in combination with lowering the rail track.
- Retaining walls are required to the north and south of the corridor adjacent to the new bridge to allow the widening of the corridor. Retaining walls will also be required along the road to the north of the railway.
- The proposed replacement bridge will be a modern structure that will segregate vulnerable users from vehicular traffic as well as remove of the skew which currently provides restrictive sightline, both amendments would provide a significant improvement on the existing situation.

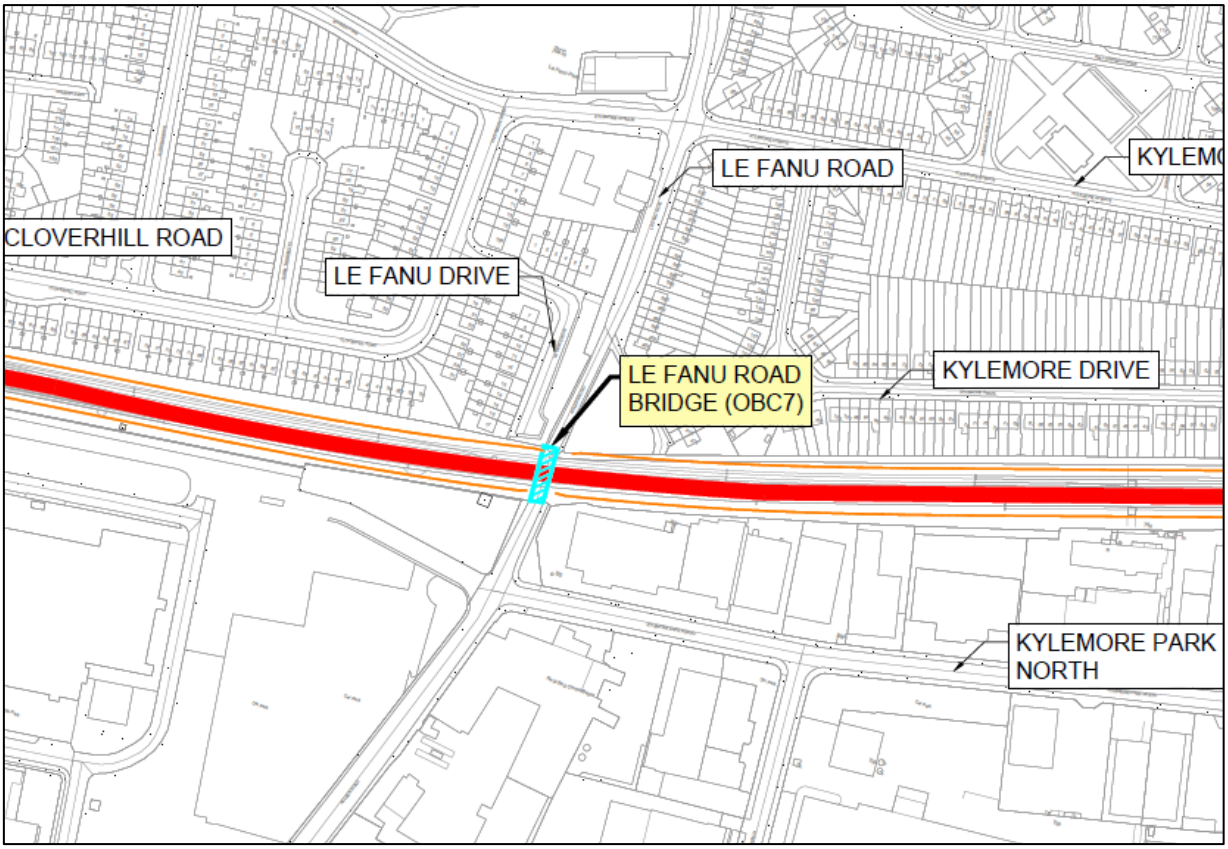

Figure 10-1 Emerging Preferred Option around Le Fanu Road Bridge

10.2.2.2. Area around Kylemore Road Bridge

An extract of the Emerging Preferred Option map showing the area around Kylemore Road Bridge (OBC5A) is illustrated below.

Annex 1.9 Emerging Preferred Option - Map 9 shows the Park West industrial Estate, including Clover Hill Road to Memorial Gardens which includes the area around Kylemore Road Bridge (OBC5A).

A summary of the Emerging Preferred Option is as follows:

- Kylemore Road Bridge (OBC5A) will be replaced by a new bridge with a longer span to facilitate the additional width required for the additional tracks.
- The new bridge structure would also incorporate passive provision for LUAS loading over the bridge.
- The road level will be raised in combination with lowering the rail track. This option assumes raising the road and lowering the track in equal proportion to achieve the additional height.
- Retaining walls are required to the north and south of the corridor to allow the widening of the corridor.

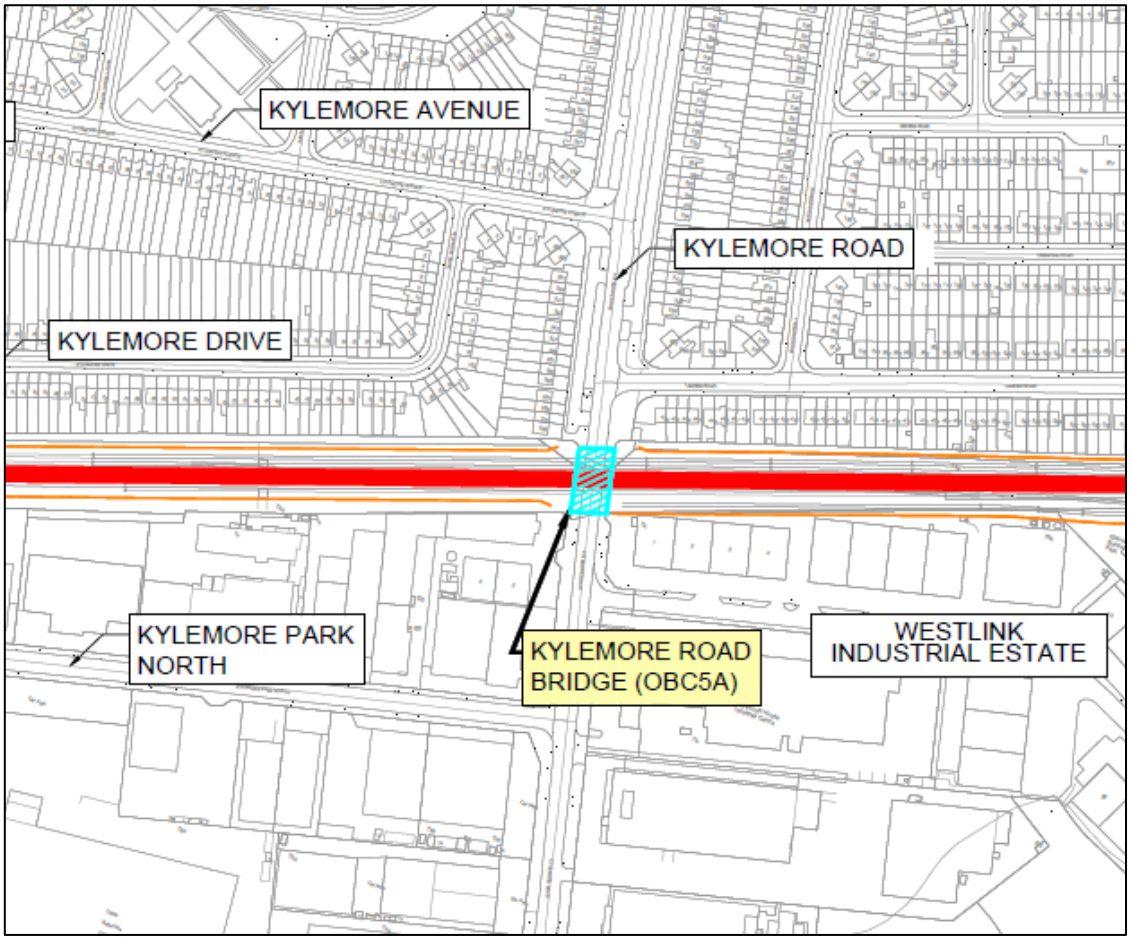

Figure 10-2 Emerging Preferred Option around Kylemore Road Bridge

10.2.2.3. Area around Inchicore Works

An extract of the Emerging Preferred Option map showing the area around Inchicore Works is illustrated below.

Annex 1.10 Emerging Preferred Option - Map 10 shows Inchicore Works, including Landen Road and extending to Memorial Gardens.

A summary of the Emerging Preferred Option is as follows:

- Between Kylemore Road Bridge (OBC5A) and Sarsfield Road Bridge (UBC4) additional tracks to the south of the corridor will provide the four-tracking requirement of the Project.
- Extending the corridor to the south will minimise the number of residential properties to be affected.
- Demolition of some Iarnród Éireann facilities is required.

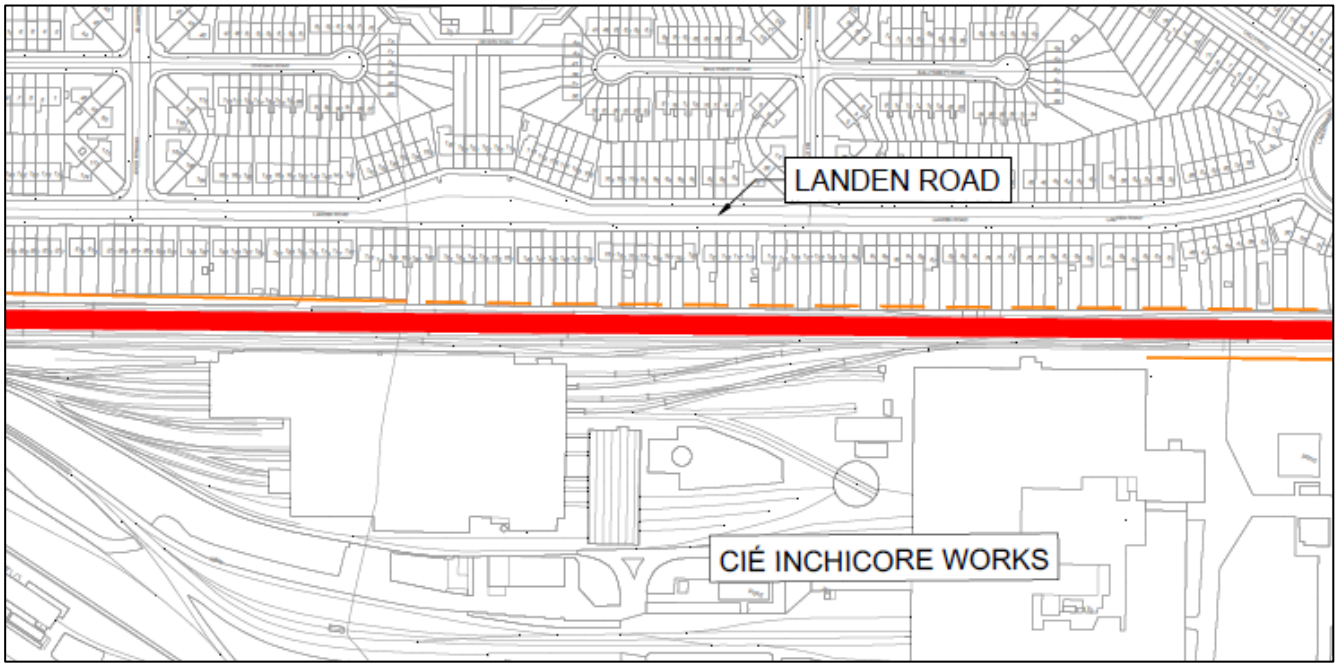

Figure 10-3 Emerging Preferred Option around Inchicore Works

10.2.2.4. Khyber Pass Footbridge

An extract of the Emerging Preferred Option map showing the area around the Khyber Pass Footbridge (OBC5) is illustrated below.

Annex 1.10 Emerging Preferred Option - Map 10 includes the area around the Khyber Pass Footbridge (OBC5).

A summary of the Emerging Preferred Option is as follows:

- Khyber Pass Footbridge (OBC5) is replaced by a new pedestrian bridge with sufficient height and width to meet the requirements for four-tracking and electrification.
- There is potential interference to third party property rights in the immediate area but further design development and technical and construction related solutions will seek to minimise this.

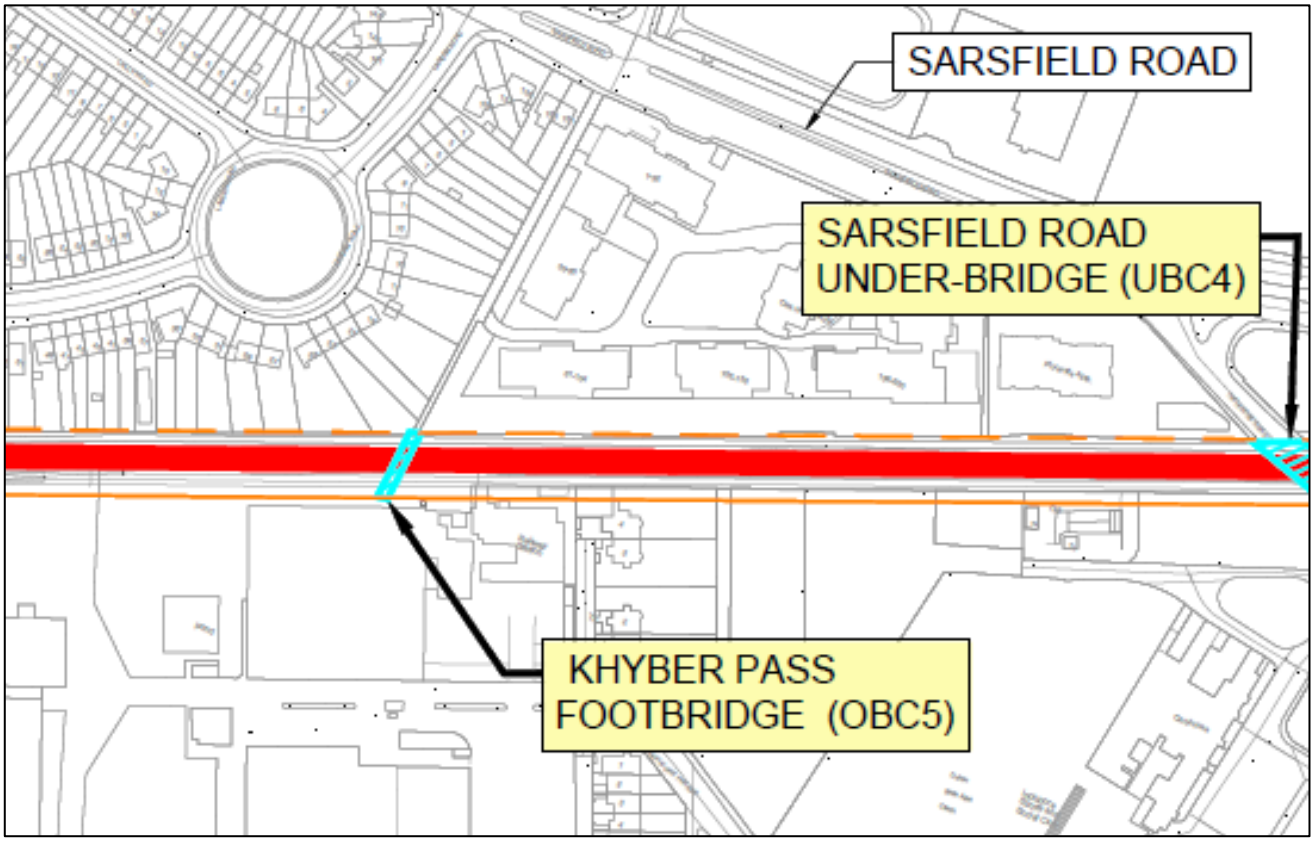

Figure 10-4 Emerging Preferred Option around Khyber Pass

10.2.2.5. Area around Sarsfield Road Bridge

An extract of the Emerging Preferred Option map showing the area around Sarsfield Road Underbridge (UBC4) is illustrated below.

Annex 1.10 Emerging Preferred Option - Map 10 includes the area around the Sarsfield Road Underbridge (UBC4).

A summary of the Emerging Preferred Option is as follows:

- Sarsfield Road underbridge (UBC4) is replaced with a new parallel bridge decks, one for the Intercity service and one for the DART service. The existing walls along Sarsfield Road would be mostly left untouched by the construction works.
- Heading east the rail corridor will be widened to the north to add a fourth track (into the embankment between the railway and Con Colbert Road).
- There is potential interference to third party property rights in the immediate area but further design development and technical and construction related solutions will seek to minimise this.

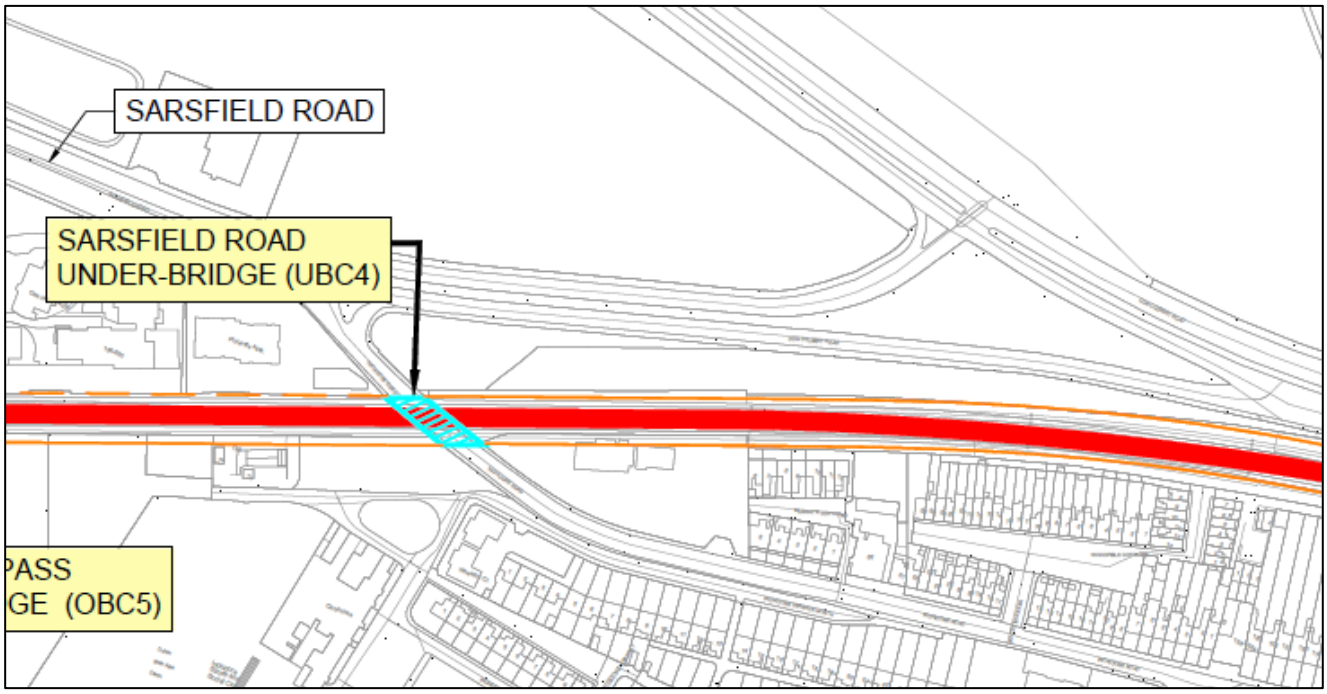

Figure 10-5 Emerging Preferred Option around Sarsfield Road

10.2.2.6. Area around Memorial Road Bridge

An extract of the Emerging Preferred Option map showing the area around Memorial Road Bridge (OBC3) is illustrated below.

Annex 1.10 Emerging Preferred Option - Map 10 includes the area around Memorial Road Bridge (OBC3).

A summary of the Emerging Preferred Option is as follows:

- Memorial Road Bridge (OBC3) will be replaced by a new bridge with a longer span. In addition, the rail tracks will be lowered to facilitate the electrification infrastructure beneath the new bridge.
- The masonry wall on the southern side would need to be strengthened due to the lowering of the track and a new wall would be required along the northern side.

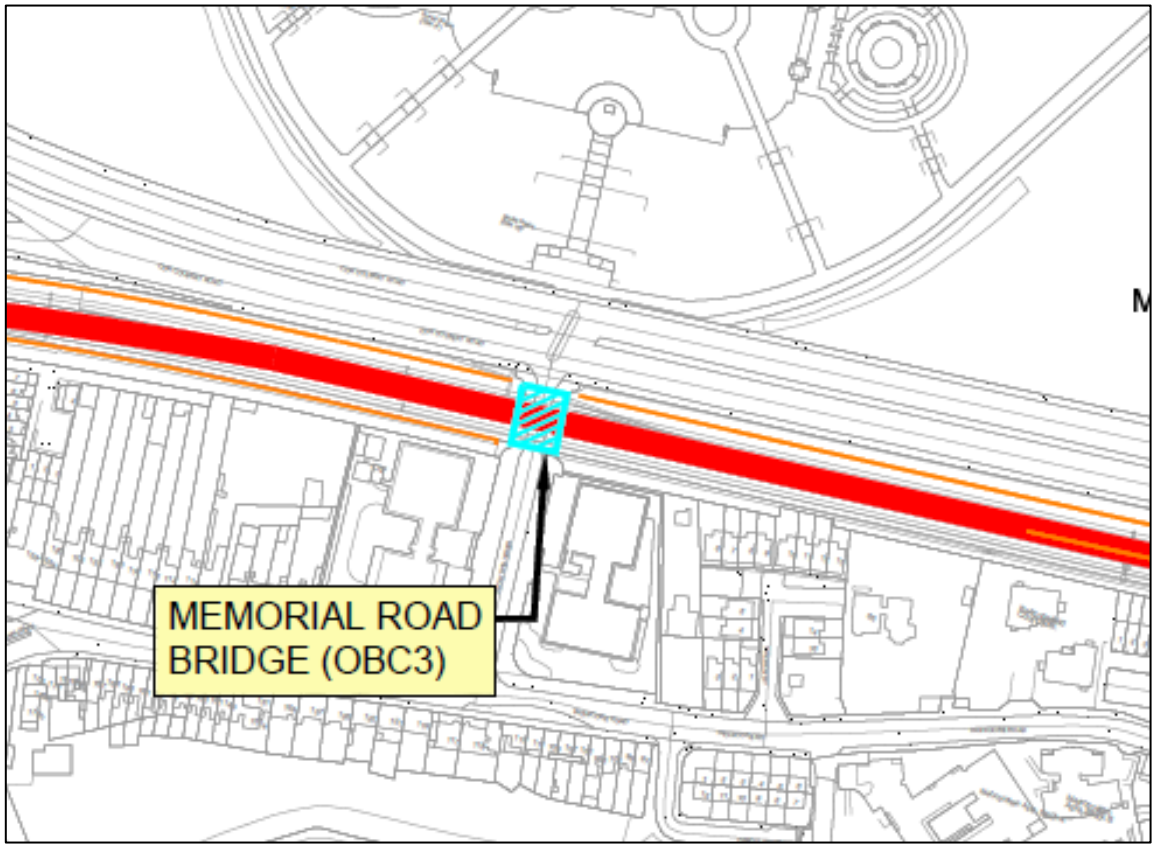

Figure 10-6 Emerging Preferred Option around Memorial Road Bridge

10.2.2.7. South Circular Road Junction Area

An extract of the Emerging Preferred Option map showing the area around the South Circular Road Junction is illustrated below.

Annex 1.11 Emerging Preferred Option - Map 11 includes the area around South Circular Road Junction.

A summary of the Emerging Preferred Option is as follows:

- St John's Road Bridge (OBC0A) is left in place.
- A new structure is constructed to the north of South Circular Road Bridge (OBC1). The new structure would be for the new DART tracks and the existing Intercity service would continue under the South Circular Road Bridge (OBC1).
- The new structure requires walls to be constructed on both sides beyond the junction area to the west.
- As the new structure would be for DART trains, it would need to be electrified; the South Circular Road Bridge (OBC1) would not need to be electrified and the track levels can be left as they are currently.

All works could be undertaken within land owned by Iarnród Éireann and Dublin City Council.

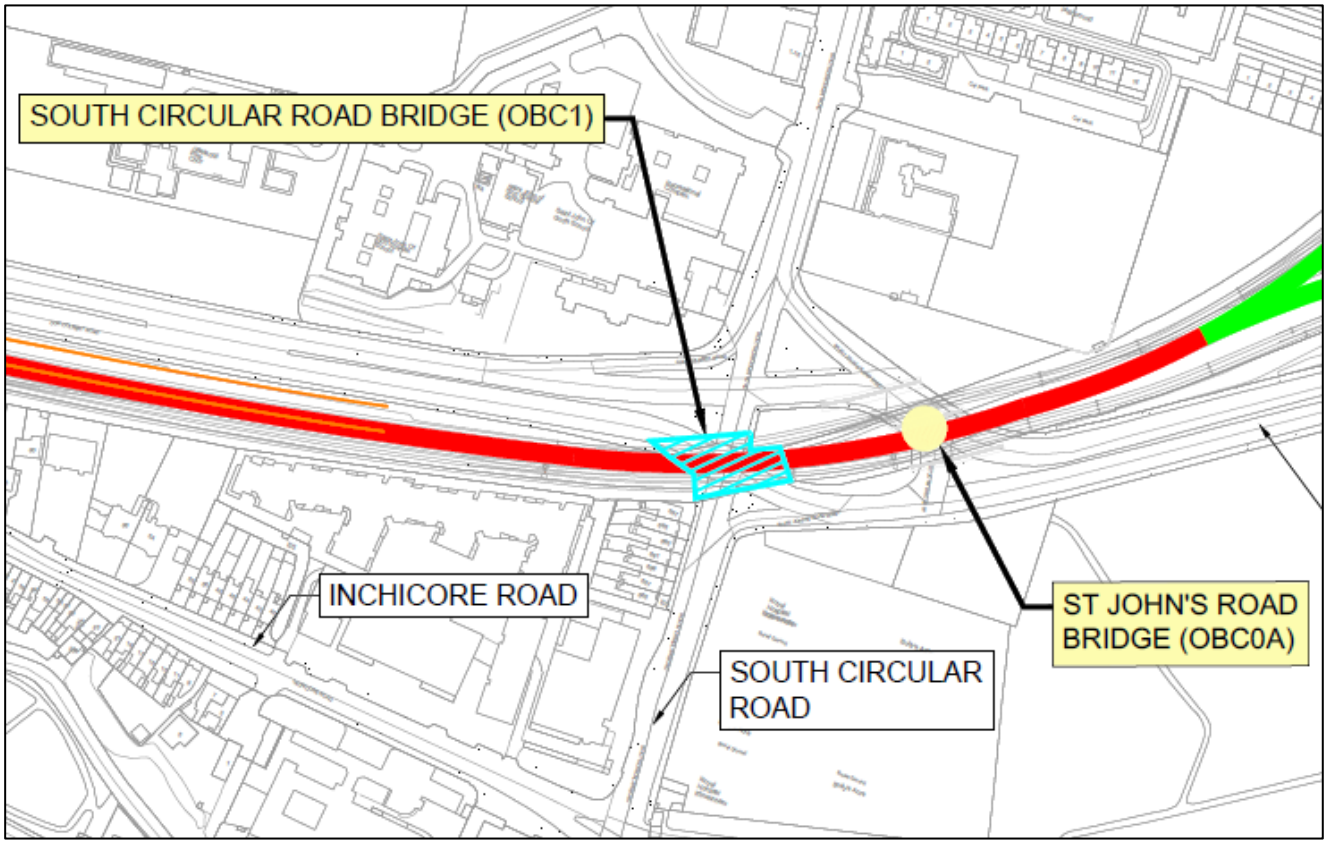

Figure 10-7 Emerging Preferred Option around South Circular Road Junction

10.2.2.8. Heuston Station and Yard

An extract of the Emerging Preferred Option map showing the area around Heuston Station and Yard is illustrated below.

Annex 1.11 Emerging Preferred Option - Map 11 which includes the area.

A summary of the Emerging Preferred Option is as follows:

- Platforms 6, 7 and 8 within Heuston Station will be electrified in order to receive the DART trains and strategically chosen sidings within the yard.

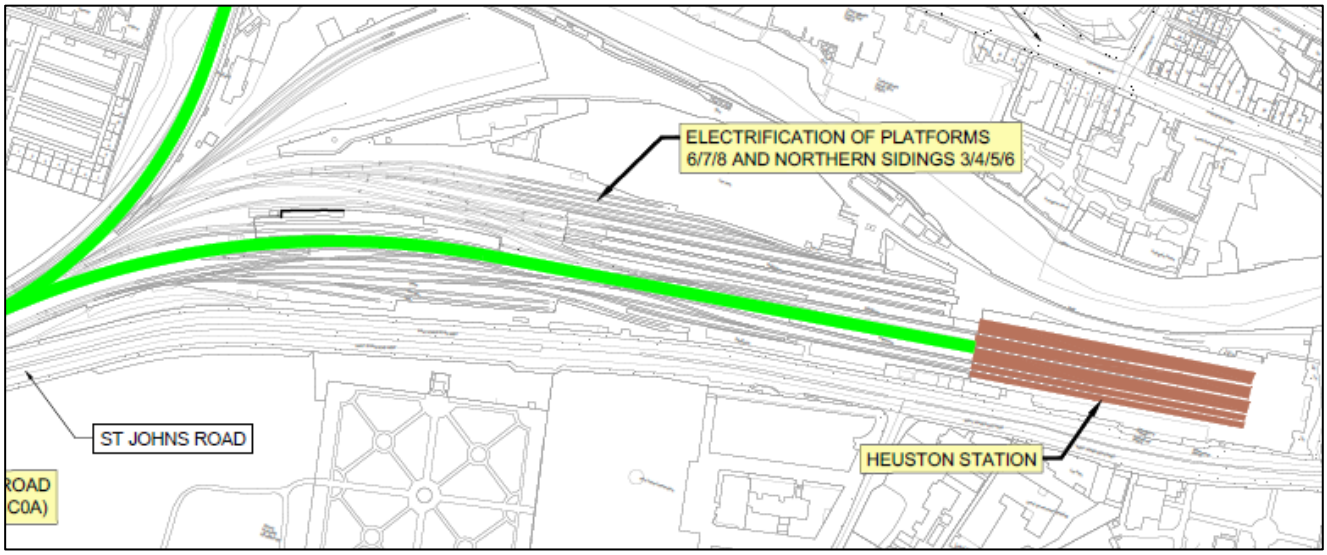

Figure 10-8 Emerging Preferred Option around Heuston Station and Yard

10.2.2.9. East of St John's Road Bridge to Glasnevin Junction

An extract of the Emerging Preferred Option map showing this section of the Project route corridor.

Annex 1.12 Emerging Preferred Option - Map 12 and **Annex 1.13 Emerging Preferred Option - Map 13** show the area.

A summary of the Emerging Preferred Option is as follows:

- A requirement of the DART+ South West Project is to investigate the feasibility of a potential new station at Heuston West, at the site of the existing Platform 10, south of the Liffey Bridge. The feasibility assessment of the future station is still being analysed and the findings will be presented at Public Consultation No. 2 .
- An electrification solution is proposed for Liffey Bridge (UB01) and there will be no change to its existing fixed track system.

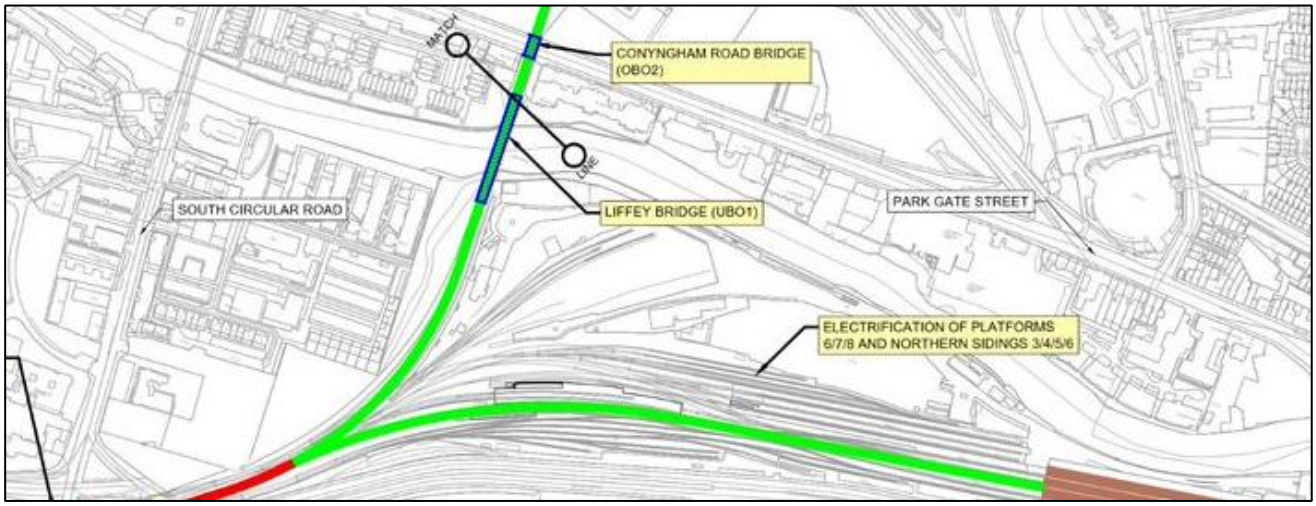

Figure 10-9 Emerging Preferred Option East for Liffey Bridge and Conyngham Road Bridge (OBO2)

- DART + South West is currently undertaking surveys and analysis along this section, including within the tunnel, to understand the current characteristics and constraints. The Emerging Preferred Option will follow the existing rail corridor and may involve track lowering and / or bridge modifications at certain locations to achieve the height requirements for electrification.
- The specific interventions at each bridge along this rail section will be based on the analysis of survey data and presented at Public Consultation No. 2. The bridges are: Conyngham Road Overbridge (OBO2) , McKee Barracks Bridge (OBO3), Blackhorse Avenue Bridge (OBO4), Old Cabra Road Bridge (OBO5), Cabra Road Bridge (OBO6), Faussagh Road Bridge (OBO7), Royal Canal and LUAS Twin Arch (OBO8), Maynooth Line Twin Arch (OBO9) and Glasnevin Cemetery Road Bridge (OBO10)).

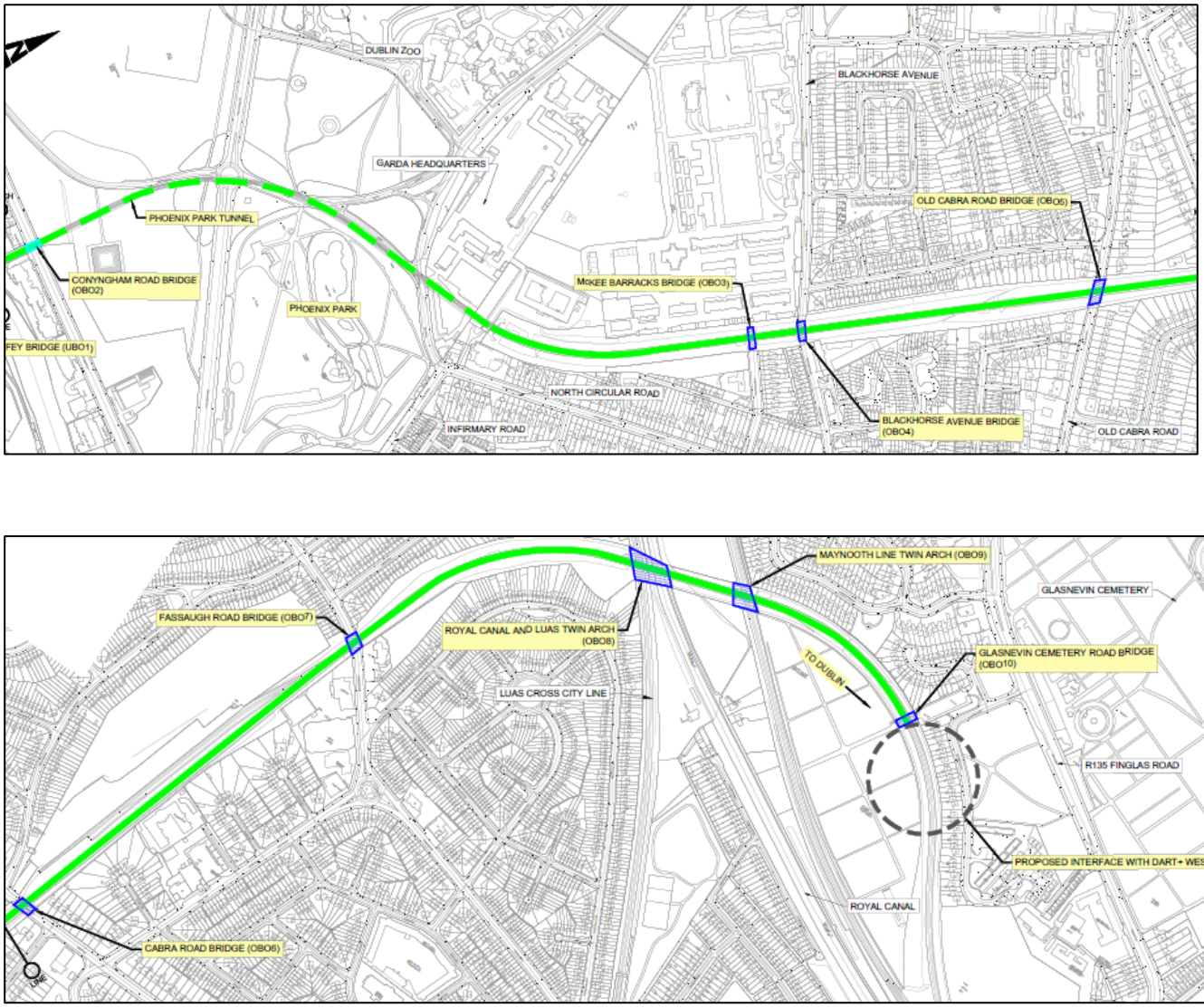

Figure 10-10 Emerging Preferred Option East of Phoenix Park Tunnel to Glasnevin

10.3. Interface with Other Projects

There are several existing and proposed projects which have the potential to interface with DART+ South West.

10.3.1. Future Stations at Kylemore and Cabra

The DART+ South West Project requires consideration of potential future stations along the line insofar as avoiding track alignments which would prejudice their delivery in the future. Potential future stations along the DART+ South West line, are:

- A future station at Kylemore. The *DART Expansion – Rail Four-tracking from West of Hazelhatch to Phoenix Park Tunnel (2018)* identified a location to the west of Kylemore Road Bridge for this station. In terms of the design of the replacement Kylemore Road Bridge (OBC5A), the Emerging Preferred Option will be compatible with a future station to the west of the bridge.
- A future station at Cabra. The track alignment proposals for DART+ South West will be compatible with a future station (the exact location of which has yet to be determined).

  A preliminary assessment for the location of a future station in this area was undertaken by the Project Team to identify the most suitable location for the future station and determine potential implications for the horizontal alignment of the railway. In this regard, a design concept for the station will be dictated by the rail corridor solution and site constraints. The findings confirmed that the horizontal alignment will remain largely unchanged, with no interventions likely to the existing retaining walls or additional land acquisition outside of the existing rail corridor.

These future stations will be the subject of further detailed assessment and will be brought forward where appropriate, as individual projects.

Kishoge Station was built as part of the original Kildare Route Project; however, it is not operational. The intention is for it to open in late 2022 in tandem with the occupation of housing coming on stream at Clonburris. The opening of Kishoge Station is separate to the DART+ South West Project.

10.3.2. DART Underground

As noted in Section 2, the *National Development Plan 2018-27* noted that the DART Underground Tunnel alignment would be protected for potential future development.

The options to tie-in the Kildare Line to the DART Expansion scheme connecting to the Phoenix Park Tunnel identified in the *DART Expansion – Rail Four-tracking from West of Hazelhatch to Phoenix Park Tunnel (2018) were* designed to enable development of a DART Underground in the future.

Alignment proposals for DART+ South West will be compatible with the future provision of DART Underground.

10.3.3. BusConnects

In October 2020, the third round of public consultation on BusConnects was launched. Route 6 Lucan to City Centre is relevant to DART+ South West as it includes proposals to accommodate BusConnects through the South Circular Road Junction. Compatibility with BusConnects has informed the

optioneering process, and the Emerging Preferred Option is compatible with proposals to accommodate BusConnects through the South Circular Road Junction.

10.3.4. Lucan Luas (Line F)

In 2008, a preferred alignment for Luas Lucan (Line F) was published. The line was split in two with Line F1 to run from Lucan and connect with the Red line at the Blackhorse stop near Inchicore and Line F2 leaving the existing Red Line at St James's Hospital St James's Hospital, where it would run to Christchurch, Dame Street and College Green. In 2010, the plans were changed to connect Lucan Luas with the proposed DART Underground at Inchicore.

Commitment for the expansion of Luas lines was confirmed in the *Transport Strategy for the Greater Dublin Area for 2016-2035*.

The original Luas Lucan alignment included Kylemore Road and it crossed over the railway at Kylemore Road Bridge. It is not possible to confirm that this will remain the case.

Notwithstanding this, the Kylemore Road Bridge replacement proposals for DART+ South West will be compatible with the future provision of Luas across Kylemore Road Bridge in terms of accommodating the necessary loading and providing the flexibility to extend the bridge laterally in the future.

10.3.5. Parking Facilities at Existing Stations

The provision of strategic Park & Ride facilities and parking at or near existing train stations is not part of the DART+ Programme. However, the NTA's Park and Ride Development Office is currently working with Iarnród Éireann to identify strategic locations to develop park and schemes that will connect with the rail system. Proposals will be brought forward independently to the DART+ Programme.

10.3.6. Pedestrian and Cycle Facilities

The DART+ South West Project will replace or enhance (where practicable) pedestrian and cycle facilities where bridge reconstruction is necessary. Pedestrian and cycle facilities associated with many of the existing stations were provided as part of the original Kildare Route Project; the facilities are consistently under review and are the remit of the IE Station Enhancement Programme.

10.4. Construction Requirements

The level of information presented for Public Consultation No. 1 focuses on the early work undertaken to date in respect of the Project, and in particular to explain the preliminary options selection process leading to the identification of the end-to-end Emerging Preferred Option. Not all design detail or construction related detail is known at this time.

There are several general considerations for the construction stage and details will be presented during Public Consultation No. 2. For example:

- Construction works (including piling locations, crane positions, etc).
- Temporary bridge requirements and road closures.
- Traffic Management (including diversions).

- Utility diversions and related works.
- The location of contractor compounds during construction. In this regard, a series of construction compounds will be needed along the route.
- Equipment storage compounds.

Some of these will require locations outside of the existing rail corridor / Iarnród Éireann's and will temporarily interfere with property rights.

11. What Next

11.1. Public Consultation 1 (PC1)

The preliminary options selection and design development that has been undertaken has led to the development of the Emerging Preferred Option, which will be the focus of public consultation. Following public consultation, all gathered feedback will be reviewed and considered by the Project Team to inform the next stage of the design development.

Designs will also be informed by further technical and environmental surveys and investigations, as well as consultations with property owners and other stakeholders. This will lead to the development of the Preferred Route that will be presented to the public at Public Consultation No. 2 (PC2).

It is noted that Preferred Route for the Project may differ from the Emerging Preferred Option following consideration of observations from the public and following further development of the design.

All information gathered by the Project Team will be used to inform the design development of the project which will be the subject of the Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) (if required), and ultimately the Railway Order application will be submitted to An Bord Pleanála.

11.2. Public Consultation 2 (PC2)

The Preferred Route will be presented to the public in PC2. It will include an enhanced level of detail to assist the public in appreciating the impacts and the benefits of the project. This will also facilitate the environmental assessment necessary for the Railway Order to be submitted to An Bord Pleanála.

11.3. Statutory Process (RO)

The Railway Order application process is set out in the Transport (Railway Infrastructure) Act 2001 (as amended) and the application will be submitted to An Bord Pleanála for statutory approval. An Environmental Impact Assessment Report (EIAR) will accompany the Railway Order Application and this will detail the nature and extent of the proposed project and identify and describe the impacts on the environment. It will also detail measures that will be taken to avoid, reduce and/or monitor these impacts.

There are a number of public and privately owned properties that will likely be impacted by the DART+ South West, where the acquisition of land and/or property and other interests (including new rights), whether in whole or in part, will be necessary. However, detailed design and technical and construction related solutions will continue to seek to minimise this.

A Compulsory Purchase Order is a legal function that allows certain statutory bodies, like Iarnród Eireann, to acquire land and property for large projects such as road and railway schemes. Land, property, and other interests (including new rights) can only be acquired once the Railway Order has been confirmed by ABP.

Additional guidance on this will be provided at PC2.